

Review of Environmental Factors

Station Beach Off-Leash Dog Area – Proposed Trial

59919048



Prepared for
Northern Beaches Council

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Executive Summary

Cardno (NSW/ACT) Pty Ltd (Cardno) was commissioned by Northern Beaches Council (Council) to prepare a Review of Environmental Factors (REF) for the proposed off-leash dog area trial at Station Beach, on Pittwater. The REF was prepared under Division 5.1 of the *Environmental Planning and Assessment Act* (EP&A Act) and assesses the potential environmental impacts associated with the proposed trial.

Council is proposing to conduct a trial of an off-leash dog area with access to swimming areas at Station Beach, to provide greater access to recreational areas for residents with dogs. The trial is proposed to operate for 12 months, should the project proceed.

The trial is in response to calls from the community for additional off-leash foreshore areas with water access. Station Beach is located on the western shore of the Palm Beach tombolo and is bound to the east by Palm Beach Golf Club and Pittwater Estuary to the west.

The objective of the trial is to determine the extent of environmental and community impacts of an off-leash dog area at Station Beach, which will inform a decision about whether or not a permanent off-leash dog area should be established.

The NSW Department of Primary Industry (DPI, Fisheries), NSW Department of Industry (DoI, Lands and Water) and NSW National Parks & Wildlife Service (NPWS) were consulted regarding the proposed trial. Comments received have been addressed in this REF. This REF indicates that the main potential impacts of the trial would be to the aquatic environment including water quality and marine biodiversity. The trial is unlikely to have any significant or long-term negative environmental impacts providing the appropriate mitigation measures outlined in this REF are implemented during the trial.

Table of Contents

	Glossary and Abbreviations	vi
1	Introduction	1
	1.1 Background	1
	1.2 Purpose	1
	1.3 Land Description and Tenure for Proposed Trial	2
	1.4 Document Purpose and Content	2
2	Proposed Trial	5
	2.1 Objectives of Proposed Trial	5
	2.2 Need for Proposed Trial	5
	2.3 Project Description	5
3	Statutory and Planning Framework	9
	3.1 Planning Legislation and Framework	9
	3.2 Other Legislation and Framework	12
	3.3 Summary of Licences and Approvals	15
4	Stakeholder Consultation	16
5	Environmental Assessment	18
	5.1 Traffic and access	18
	5.2 Marine Biodiversity	19
	5.3 Hydrology, Water Quality and Sediments	24
	5.4 Terrestrial Biodiversity	25
	5.5 Socio-economic	26
	5.6 Waste management	27
	5.7 Noise	27
	5.8 Climate and Air Quality	28
	5.9 Heritage	29
	5.10 Cumulative environmental impacts	29
6	Environmental Management	31
7	Conclusions	33
	7.1 Summary of Consideration of Environmental Factors	33
	7.2 Conclusions	34
8	References	35

Appendices

Appendix A EPBC ACT SEARCH

Appendix B Consultation Correspondence

Appendix C Estuarine ecological component Report (Karen Astles, 2019)

Appendix D Station Beach Dog exercise area trial Avifauna report (Phil Straw, 2019)

Tables

Table 1-1	Land tenure of proposed trial	2
Table 3-1	Coastal SEPP Clause 13 matters for consideration	9
Table 3-2	Pittwater LEP 2014 land use zonings	10
Table 3-3	Potential impacts of matters of NES (DOEE, 2019)	12
Table 3-4	Summary of State legislation and required permits and approvals	13
Table 4-1	Summary of comments raised and response	16
Table 5-1	Mitigation measures for traffic and access impacts	19
Table 5-2	Mitigation measures for marine biodiversity impacts	23
Table 5-3	Mitigation measures for hydrology, water quality and sediments impacts	25
Table 5-4	Mitigation measures for terrestrial biodiversity impacts	26
Table 5-5	Mitigation measures for socio-economic impacts	26
Table 5-6	Mitigation measures for waste management impacts	27
Table 5-7	Nearby noise receivers	28
Table 5-8	Mitigation measures for noise impacts	28
Table 5-9	Non-Aboriginal heritage items in the vicinity of the proposed trial area	29
Table 5-10	Mitigation measures for Aboriginal and non-Aboriginal heritage impacts	29
Table 6-1	Summary of proposed mitigation measures	31
Table 7-1	Summary of consideration of environmental factors under Commonwealth and NSW State Legislation	33

Figures

Figure 1-1	Site Location	3
Figure 1-2	Crown Lands tenure (showing lot and parcel)	4
Figure 2-1	Station Beach off-leash dog area trial, concept plan	8
Figure 5-1	Widths of beach and water available for dog activity	22

Glossary and Abbreviations

ABS	Australian Bureau of Statistics
AEST	Australian Eastern Standard Time
AEDT	Australian Eastern Daylight Time
AHIMS	Aboriginal Heritage Information Management System
BC Act	<i>Biodiversity Conservation Act 2016</i>
BOM	Australian Bureau of Meteorology
CAMBA	China-Australia Migratory Bird Agreement
Cardno	Cardno (NSW/ACT) Pty Ltd
Coastal SEPP	<i>State Environmental Planning Policy (Coastal Management) 2018</i>
Council	Northern Beaches Council (comprising former Warringah, Pittwater, and Manly Councils)
DoEE	Department of the Environment and Energy
DoI	Department of Industry
DP&E	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries
EPA	NSW Environment Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EP&A Regulations	<i>Environmental Planning and Assessment Regulation 2000</i>
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
FM Act	<i>NSW Fisheries Management Act 1994</i>
Infrastructure SEPP	<i>State Environmental Planning Policy (Infrastructure) 2007</i>
JAMBA	Japan-Australia Migratory Bird Agreement
LEP	Local Environment Plan
LGA	Local Government Area
NES	National Environmental Significance. Matters of NES are listed under the EPBC Act
OEH	NSW Office of Environment and Heritage
PMST	DoEE's Protected Matters Search Tool
REF	Review of Environmental Factors
Roads and Maritime Services	Roads and Maritime
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
SEPP	State Environmental Planning Policy

1 Introduction

This Review of Environmental Factors (REF) has been prepared by Cardno (NSW/ACT) Pty Ltd (Cardno) on behalf of Northern Beaches Council (Council) to assess the potential environmental impacts associated with the proposed Off-Leash Dog Area Trial at Station Beach, on Pittwater (refer Figure 1-1 for regional location).

The project is considered to be an activity and therefore an REF has been prepared in accordance with Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Development consent under Division 4.1 of the EP&A Act is not required as the proposed dog off-leash trial is not considered to be a development.

1.1 Background

The Northern Beaches Local Government Area (LGA) currently has 29 areas where dogs are allowed off-leash, with a mix of restricted and unrestricted access hours. Rowland Reserve in Bayview is the only permanent and unrestricted area at the northern end of the LGA where dogs have unleashed access to a park area and the water.

The proposed trial area, Station Beach, is bound to the east by Palm Beach Golf Club and Pittwater Estuary to the west. The shallows approaching the beach contain extensive seagrass beds, including that of the endangered *Posidonia australis*, and the area serves as a potential habitat for resident and migratory birds.

The areas around the proposed trial area include Governor Phillip Park, the Boathouse Palm Beach Café, and parking and pedestrian access to Ku-Ring Gai Chase National Park and the heritage listed Barrenjoey Lighthouse. Pittwater Estuary to the west feeds into Broken Bay, part of the Hawkesbury Nepean Catchment Area.

A previous proposal of using Station Beach as an off-leash dog area was investigated by the former Pittwater Council in 2008, however the REF prepared by NGH Environmental (NGH) for the trial did not lead to an outcome. Advice from the Land and Property Management Authority provided in a letter on the 6 November 2009 indicated that the REF lacked of important information including:

- > The parameters that would need to be monitored; and
- > The experimental design required to be used to assess significant impact of increase dog usage at this location.

Requests from residents and community groups have prompted Council to investigate the provision of a foreshore area with access to water for off leash dogs.

1.2 Purpose

The purpose of the REF is to provide guidance to the Council in deciding on whether to conduct the trial or not, describe the proposal, to document the likely impacts of the trial on the environment, and to detail mitigation measures to be implemented. The REF is also required as part of Council's licence application to the Department of Industry (Dol) Lands & Water, as land owner of land below the high water mark, to conduct the trial. The licence is expected to contain conditions for the use of the area to meet the Dol Lands & Water requirements.

The description of the proposed trial and associated environmental impacts have been undertaken in context of Clause 228 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation), the *Biodiversity Conservation Act 2016* (BC Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In doing so, the REF helps to fulfil the requirements of Section 5.5 of the EP&A Act, namely that Council examine and take into account to the fullest extent possible, the matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

- > Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act;
- > The significance of any impact on threatened species as defined by the BC Act, in Section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report; and

- > The potential for the proposal to significantly impact a matter of national environmental significance or Commonwealth land and the need to make a referral to the Australian Government Department of the Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

1.3 Land Description and Tenure for Proposed Trial

Table 1-1 Land tenure of proposed trial

Lot	DP Number	Owner	Description
7005	1117451	Crown Land (Northern Beaches Council as Trustee)	Palm Beach Golf Club (within Governor Phillip Park). Crown Lands extends to Mean High Water Mark (MHWM).
7007	1117454	Crown Land (Northern Beaches Council as Trustee)	Palm Beach Golf Club (within Governor Phillip Park). Crown Lands extends to MHWM.
N/A	N/A	Crown Land	Water below MHWM.

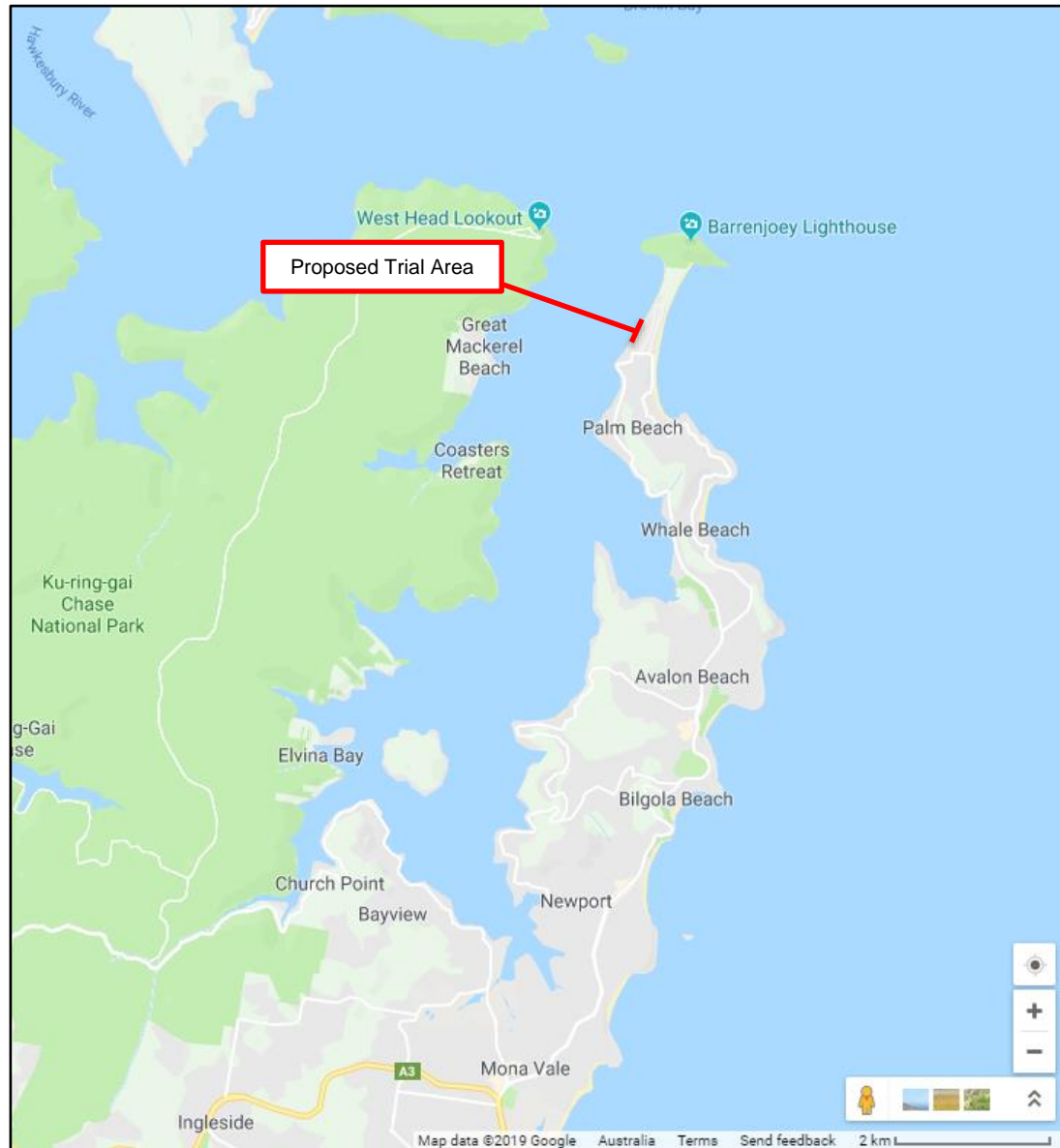
1.4 Document Purpose and Content

The purpose of this REF is to facilitate the assessment of the proposed activity by Council. It provides a description of the proposed trial, relevant planning controls, the existing environment in the vicinity of the proposed trial, the potential environmental impacts associated with the proposed trial, and environmental mitigation measures to address any potential impacts identified.

This REF consists of the following sections:

- > **Section 2** – a description of, need for, and objectives of the proposal. A description of the proposal including proposed monitoring methodology and timeframes is also provided;
- > **Section 3** – presents and overview of the planning and regulatory context for the proposal;
- > **Section 4** – provides details of the stakeholder consultation undertaken;
- > **Section 5** – details the environmental impact assessment undertaken;
- > **Section 6** – summarises recommended environmental mitigation measures;
- > **Section 7** – summarises and concludes the assessment;
- > **Section 8** – lists the references discussed in this assessment; and
- > **Appendices** – contains supporting information including drawings and database searches.

Figure 1-1 Site Location



Source: Google Maps®

Figure 1-2 Crown Lands tenure (showing lot and parcel)



2 Proposed Trial

2.1 Objectives of Proposed Trial

The objectives of the trial are:

- > To allow dogs off leash and swimming at Station Beach on specific days at restricted times;
- > Maintain the environmental integrity of the area;
- > Provide Council with information on the effects of off-leash activities on the environment and on the community particularly nearby residents and businesses;
- > Collect data to predict the impacts of a permanent off-leash dog area; and
- > Gather information to determine the suitability of a permanent off-leash dog area at Station Beach.

2.2 Need for Proposed Trial

The proposed trial is in response to continued calls from Northern Beaches community groups and residents to provide an additional off-leash dog area, which provides dogs access to a foreshore and swimming areas. Council is investigating the suitability of Station Beach as a potential location through the proposed 12-month trial. The REF requires an examination of alternatives to the activity which may have a lesser environmental impact. The decision from Council to undertake the dog off-leash trial at Station Beach was taken during the Ordinary Council Meeting on 26 June 2018. The relevant points from the Council's resolution are summarised below:

Subject: Notice of Motion No 39/2018 - Station Beach Unleashed Dog Trial

Date: 21/08/2018

That:

- A. Council note the existing former Pittwater Council resolution: "subject to receiving support for the proposal from the Government Agencies, it be placed on public exhibition and the results be reported back to Council".
- B. Council note that this Pittwater decision is prior to the introduction of the Northern Beaches Council Code of Meeting Practice requiring a funding source and budget to be identified before a motion can be progressed.
- C. Council invite the Executive Committee of Pittwater Unleashed to help develop the parameters for the Station Beach trial prior to being placed on public exhibition.
- D. The public consultation process begins within 12 weeks, subject to there being no unresolvable barriers to do so, presented in the Government Agency correspondence response.

2.3 Project Description

2.3.1 Overview

The proposed trial would be implemented by Northern Beaches Council, with additional specialist works (seagrass monitoring) carried out by a suitably qualified contractor.

The proposal comprises:

- > Trial of an off-leash dog area with swimming access at Station Beach (southern end); and
- > Twelve-month monitoring of seagrass beds and other requirements, carried out concurrently with the trial by suitably qualified contractor.

2.3.2 Project Details

The proposed trial area is approximately 600m long along the southern end of Station Beach, Pittwater Estuary, commencing north of Beach Road and finishing near Boathouse Palm Beach Cafe, 630m south of Ku-Ring Gai Chase National Park. It is bounded to the east by Palm Beach Golf Club and to the west by Pittwater Estuary. The proposed trial concept plan prepared by Council is shown in Figure 2-1.

2.3.3 Staging

Pre-trial

Once the relevant approvals, permits and licences are obtained, the proposed area would be prepared by Council. This would involve preparing a community engagement plan including internal review points, updating Council's website information, developing management plans and installing temporary signage including at the north and south access points to clearly show the trial site boundaries and approved hours for off-leash activity, and environmental information. Temporary dog-waste disposal facilities, and general garbage bins would also be installed at the north and south access points at this time.

One monitoring event would occur within one week prior to the off-leash trial commencing.

Off-leash trial

The trial is proposed to run for 12 months. During this time, dog owners would be allowed to have their dogs off-leash within the prescribed area, including access to swimming areas east of the proposed minimum buffer zone to the edge of the seagrass (see Section 5.2.3). See Figure 5-1 for a schematic representation of tides at Station Beach generated by Astles (2019).

Signage would be located on the beach at both north and south access points informing dog owners of the relevant restrictions in place. The signage would also include environmental information advising of the sensitivity of the seagrass beds located in the nearshore zone. Dog-waste disposal facilities and general garbage bins would be available at the north and south access points to dog owners for the duration of the trial. Increased Council patrols would occur during the trial to ensure compliance with restrictions.

Monitoring

Surveys of the seagrass beds showing species, distribution, density and condition along Station Beach would be undertaken throughout the trial. The surveys will also assess the presence/absence and potential impacts on the white seahorse potentially present within the seagrass. The surveys are to be conducted by a suitably qualified contractor. An additional site located approximately 100m north of the proposed site would be established as a control area.

Monitoring the seagrass density and condition to identify changes potentially associated with dog activity would be carried out as follows:

- > Monitoring sites;
 - Monitoring of three random sites along the trial area. Each monitoring site would be subdivided into two areas. The first area, 'Area A', within the shoreline seagrass bed. The second area, 'Area B', 10m west of Area A;
 - Seagrass would be assessed in five (5) quadrants of 50 m x 50 m within Area A and Area B and each site, for a total of 30 quadrants;
 - Monitoring of one control site, approximately 100m north of the proposed dog unleashed playing area using the same method as described above Area A and Area B, five (5) 50x50m quadrants;
 - Sixty quadrants would be sampled during each monitoring event (30 within the trial area, 30 within the control area); and
 - The monitoring area and control area are shown in Figure 1-2.
- > Monitoring frequency;
 - A monitoring event of the seagrass beds is to be undertaken immediately prior to the off-leash trial commencing;
 - Undertake a monitoring event during the dog unleashed trial every month (a total of twelve times); and

- A monitoring event of the seagrass beds is to be undertaken immediately after the off-leash trial concluding.
- > Monitoring would be conducted during low tides.

Water quality monitoring would be undertaken for a period of 12 months concurrently with the seagrass/white seahorse monitoring. Water quality monitoring would be undertaken by a qualified consultant engaged by Council.

The monitoring would be carried out during low tide at four preselected locations along Station Beach, three within the dog off leash trial area and one within the control area with testing for the following parameters:

- > Dissolved oxygen (using hand held field equipment);
- > Turbidity (using hand held field equipment);
- > Electrical conductivity (using hand held field equipment);
- > pH (using hand held field equipment);
- > Temperature (using hand held field equipment);
- > Microbial sampling (enterococci) based on AS/NZS 4276.9:2007. Samples would be sent to NATA approved laboratories for analysis.

During the water quality and seagrass monitoring events, observations of potential presence of migratory and threatened birds at the proposed trial area would be undertaken. If shorebirds are observed during the monitoring events, Council would be notified to assess whether a shorebird monitoring program should be implemented.

Post-trial

A monitoring event would occur within one week of the off-leash trial finishing. Using the data from the seagrass and water quality monitoring program, and from community and stakeholder feedback received throughout the off-leash trial period, Council would consider whether or not to continue the site as a permanent off-leash dog area.

2.3.4 Access Hours and Timeframe

The proposed off-leash trial period would be for 12 months from mid - 2019 to mid- 2020.

During this period, off-leash access is planned to be restricted to the following:

Australian Eastern Standard Time (AEST): Monday – Sunday 1600 – 1030

Australian Eastern Daylight Time (AEDT): Monday – Friday 1730 – 1030
(Summer)

Figure 2-1 Station Beach off-leash dog area trial, concept plan



Source: Norther Beaches Council (2018)

3 Statutory and Planning Framework

This section of the REF provides an overview of the key planning instruments and legislation relevant to the proposed off-leash dog area trial at Station Beach.

3.1 Planning Legislation and Framework

3.1.1 Environmental Planning and Assessment Act 1979

An activity in NSW falls under the provisions of the EP&A Act and subordinate legislation. This REF has been prepared in accordance with Division 5.1 of the EP&A Act.

Under Section 5.5 of the EP&A Act, there is a duty for the determining authority to consider the environmental impacts of proposed activities. The specific aspects of these environmental considerations are detailed in Clause 228 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation). All requirements of Clause 228 have been adequately addressed throughout this REF and are summarised in 7.1

Development consent under Division 4.1 of the EP&A Act is not required as the proposed dog off-leash trial is not considered to be a development.

3.1.2 Sydney Regional Environmental Plan No. 20 – Hawkesbury - Nepean River (No 2 -1997)

The aim of the *Sydney Regional Environmental Plan No. 20 Hawkesbury – Nepean River (No 2 – 1997)* is to protect the environment of the Hawkesbury-Nepean River system by ensuring that the impacts of future land uses are considered in a regional context.

According to Clause 4 of the REP:

- 1) The general planning considerations set out in clause 5, and the specific planning policies and related recommended strategies set out in clause 6 which are applicable to the proposed development, must be taken into consideration:
 - (a) by a consent authority determining an application for consent to the carrying out of development on land to which this plan applies, and
 - (b) by a person, company, public authority or a company State owned corporation proposing to carry out development which does not require development consent.
- 2) Those considerations, policies and strategies should be taken into consideration in the preparation of each environmental planning instrument and development control plan that applies to land to which this plan applies.

The activity related to this assessment will need to consider the general planning consideration, specific planning policies and recommended strategies under Part 2 of the REP.

3.1.3 State Environmental Planning Policy (Coastal Management) 2018

Station Beach is subject to the *State Environmental Planning Policy (Coastal Management) 2018* (Coastal SEPP), which aims to promote an integrated and coordinated approach to land use planning in the coastal zone in a manner consistent with the objectives of the *Coastal Management Act 2016*.

Under the Coastal SEPP, the proposed trial area is mapped as a 'Coastal Environment Area' (Clause 13). Clause 13 identifies a number of matters that are to be taken into account by Council when determining a proposal on land in this mapped zone. These have been listed in Table 3-1 along with comments on how they relate to the proposed trial.

The proposed trial area is not mapped as 'Coastal Wetlands' or 'Proximity to Coastal Wetlands' under the Coastal Management SEPP so development consent is not required under the Coastal SEPP.

Table 3-1 Coastal SEPP Clause 13 matters for consideration

Matter	Relevance to Proposal
13 (1)(a) The integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment is maintained	The trial would not negatively impact water quality or ecological environment provided the mitigation measures in this REF are implemented.

Matter	Relevance to Proposal
13 (1)(b) Coastal environmental values and natural coastal processes are not adversely impacted	The proposal would not impact upon coastal processes.
13 (1)(c) The water quality of the marine estate (within the meaning of the <i>Marine Estate Management Act 2014</i>), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1	The trial would not negatively impact the marine estate provided the mitigation measures in this REF are implemented.
13 (1)(d) Marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms	The proposal has moderate potential for short term negative impacts to marine vegetation and marine fauna habitats.
13 (1)(e) Existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability	The proposal would improve access to the foreshore and beach for the public for the duration of the trial.
13 (1)(f) Aboriginal cultural heritage, practices and places	There are no identified Aboriginal sites at, or near the proposed trial.
13 (1)(g) Use of the surf zone	The proposal would not impact the surf zone.

3.1.4 Local Environmental Plans

3.1.4.1 Pittwater Local Environmental Plan 2014

Station Beach is located within the Northern Beaches Council Local Government Area (LGA), formerly the Pittwater Council LGA. This section of the REF considers the consistency of the proposal with the former *Pittwater Local Environmental Plan 2014* (Pittwater LEP).

Under the Pittwater LEP, the proposed trial area is zoned as RE1 Public Recreation, and is adjacent to an area zoned E2 Environmental Conservation. The objectives of each of these zones are discussed in Table 3-2.

As the trial is not considered a development, the Pittwater LEP and development consent under Division 4.1 of the EP&A Act is not required. Nonetheless, issues raised in the LEPs of potential relevance to the proposed trial are considered in Section 5.

Table 3-2 Pittwater LEP 2014 land use zonings

Zone	Objectives
RE1 Public Recreation	<p>The objectives of this zone are:</p> <ul style="list-style-type: none"> To enable land to be used for public open space or recreational purposes; To provide a range of recreational settings and activities and compatible land uses; To protect and enhance the natural environment for recreational purposes; To allow development that does not substantially diminish public use of, or access to, public open space resources; and To provide passive and active public open space resources, and ancillary development, to meet the needs of the community.
E2 Environmental Conservation	<p>The objectives of this zone are:</p> <ul style="list-style-type: none"> To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values; To prevent development that could destroy, damage or otherwise have an adverse effect on those values; To ensure the continued viability of ecological communities and threatened species; and To protect, manage, restore and enhance the ecology, hydrology and scenic values of riparian corridors and waterways, groundwater resources, biodiversity corridors, areas of remnant native vegetation and dependent ecosystems.

3.1.5 Companion Animals Act 1998

The aim of this Act is to “provide for the effective and responsible care and management of companion animals”. Clause 13 (6) of the Act states that “ a local authority can by order declare a public place to be an off-leash area. Such a declaration can be limited so as to apply during a particular period or periods of the day or to different periods of different days. However, there must at all times be at least one public place in the area of a local authority that is an off-leash area.”

Public place within the Act is defined as:

- (a) any pathway, road, bridge, jetty, wharf, road-ferry, reserve, park, beach or garden, and
- (b) any other place,

that the public are entitled to use.

Notwithstanding this, as part of the proposed off-leash area is on land under the care and control of DoI (Lands & Water) (the land above MHWL is under the care and control of Council), DoI has advised that a licence from DoI (Lands & Water) would be required to undertake the proposed trial.

3.2 Other Legislation and Framework

3.2.1 Commonwealth Legislation

3.2.1.1 Environmental Protection and Biodiversity Conservation Act 1999

The *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's key piece of environmental legislation, focusing on matters of National Environmental Significance (NES), with States and Territories having responsibility for matters of State and local significance.

Approval is required from the Commonwealth Minister for the Environment and Energy (Minister) for any controlled action that may result in a significant impact on matters of NES.

A search of the EPBC Act database, using the Protected Matters Search Tool (PMST), was carried out on 12 February 2019 (refer Appendix C). The nine matters of NES protected under the EPBC Act are shown in Table 3-3, which also identifies the potential for occurrence within 1km of the proposed trial.

Table 3-3 Potential impacts of matters of NES (DOEE, 2019)

Matter of NES	Potentially Occurring
World heritage properties	None
National heritage places	1
Wetlands of international importance (listed under the Ramsar Convention)	None
Great Barrier Reef Marine Park	None
Commonwealth marine areas	None
Listed Threatened ecological communities	3
Listed Threatened species	67
Listed Migratory species (protected under international agreements such as the Bonn Convention, JAMBA, CAMBA, AND ROKAMBA ¹)	56
Nuclear action	None

As indicated in Table 3-3, one national heritage place (Ku-Ring Gai National Park), three threatened ecological communities (*Posidonia australis* seagrass meadows of the Manning-Hawkesbury ecoregion, Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community and Coastal Upland Swamps in the Sydney Basin Bioregion), 67 listed threatened species and 56 migratory species have the potential to be located within 1km of the proposed trial.

Based on the outcomes of the investigations summarised in Section 5, the proposed trial is unlikely to have a significant impact on NES and therefore a referral under the EPBC Act is not required.

3.2.2 State Legislation

A summary of relevant State legislation and the permits and approvals that are required for the proposed trial is provided in Table 3-4.

¹Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)Japan-Australia Migratory Bird Agreement (JAMBA), China-Australia Migratory Bird Agreement (CAMBA), Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)

Table 3-4 Summary of State legislation and required permits and approvals

State Legislation	Approval Authority	Relevance to the Proposal	Required Permits and Approvals
<i>Coastal Management Act 2016</i>	Office of the Environment and Heritage (OEH) Northern Beaches Council	The objects of the Act are to manage the coastal environment of New South Wales in a manner consistent with the principles of ecologically sustainable development for the social, cultural and economic wellbeing of the people of the State.	None. The trial would be carried out in a manner consistent with the objectives of the CM Act.
<i>Contaminated Land Management Act 1997</i>	Environment Protection Authority (EPA)	Must report to EPA if contaminated land is encountered during the trial that meets the duty to report contamination requirements under Section 60 of this Act	None. There would be no excavation during the proposed trial.
<i>Heritage Act 1977</i>	OEH (NSW Heritage Office)	Relates to non-Aboriginal artifacts and/or sites (older than 50 years) if uncovered during the trial.	None. There would be no excavation during the proposed trial.
<i>National Parks and Wildlife Act 1974</i>	OEH	Relates to disturbance or destruction of any Aboriginal objects or places and removal of identified native species, populations or ecological communities.	None. No Aboriginal cultural heritage sites or items were identified as part of the due diligence database search. Should any Aboriginal object be detected during construction, a Section 90 consent would need to be obtained if the object named cannot be avoided.
<i>Biodiversity Conservation Act 2016</i>	OEH	The purpose of this Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development	None. The proposed trial is not anticipated to have a significant impact on threatened or endangered species identified near the proposed trial provided the mitigation measures identified in this REF are implemented.
<i>Biosecurity Act 2015</i>	OEH	The object of this Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers	None. However, off-leash dogs pose a potential risk of the introduction and/or spread of invasive species harmful to threatened ecological communities.
<i>Protection of the Environment Operations Act 1997</i> <i>Protection of the Environment Operations (Waste) Regulation 2005</i>	EPA	Relates to noise, air and water pollution and waste management for activities that may cause water pollution. Scheduled activities as listed under Schedule 1 of the Act require an Environmental Protection License (EPL) from the EPA, unless clauses in Schedule 1 specify otherwise.	None. Proposed trial does not require an EPL from the EPA.
<i>Roads Act 1993</i>	Appropriate Roads Authority	Consent of the appropriate roads authority must be received in the event that there is a need to close,	None.

State Legislation	Approval Authority	Relevance to the Proposal	Required Permits and Approvals
		or conduct works on or over a public road.	
<i>Waste Avoidance and Resource Recovery Act 2001</i>	EPA	Works which would use resources and generate waste, need to consider the Resource Management Hierarchy (Avoidance, Recovery, Disposal) in the Act.	None.
<i>Water Management Act 2000</i> <i>Water Management (General) Regulation 2004</i>	Department of Industry(Dol) (Natural Resources Access Regulator)	A controlled activity approval is required under the Act to undertake any controlled activities (which include the removal of material by way of extraction) in, on or under waterfront land, where waterfront land includes the bed of the coastal waters and any land up to 40m inland from the mean high water mark of the coastal waters.	None. The proposed trial is located on waterfront land, however, councils are exempt and do not required a controlled activity approval to carry out works in, on or under waterfront land.
<i>Fisheries Management Act 1994</i> <i>Fisheries Management (General) Regulation 2010</i>	Department of Primary Industries (DPI, Fisheries)	Certain marine and estuarine species are listed as vulnerable under the Act and protected under the Regulation. Permits are required under the following sections of the Act to undertake the activities specified: <ul style="list-style-type: none"> Section 201: Carrying out of dredging and reclamation works; Section 205: Works that harm marine vegetation (i.e. seagrass); and Section 219: Works that block the passage of fish. 	None. The proposed trial is not anticipated to harm marine vegetation provided the mitigation measures identified in this REF are implemented. Council should consult with DPI Fisheries to determine if a permit is required.
<i>Crown Lands Management Act 2016</i> <i>Crown Lands Management Regulation 2018</i>	Dol Lands & Water	The objects of this Act are to provide for the ownership, use and management of the Crown land of New South Wales, to provide clarity concerning the law applicable to Crown land, to require environmental, social, cultural heritage and economic considerations to be taken into account in decision-making about Crown land, to provide for the consistent, efficient, fair and transparent management of Crown land for the benefit of the people of New South Wales, and to provide for the management of Crown land having regard to the principles of Crown land management.	As the land on which the works would occur is Dol (Lands & Water) (although the land above MHWL is under the care and control of Council) a licence from Dol (Lands & Water) would be required to undertake the proposed trial. The trial is considered consistent with the principles of Crown Land Management.
<i>Marine Estate Management Act 2014</i> <i>Marine Estate Management Regulations 2017</i>	Department of Primary Industries (DPI, Fisheries)	The objective of this Act mainly is to conserve the biological diversity, and maintain ecosystem integrity and ecosystem function, of bioregions in the marine estate and to provide management and use of resources in the marine parks as well as provide opportunities for public enjoyment of a marine park.	None, as then study area is not located within a marine park or aquatic reserve.

Cardno reviewed the Governor Phillip Park Plan of Management (2002) prepared by Pittwater Council in relation to any restriction to use the park for dog off-leash activity. The plan lists in Table 3.8 Land use Planning dog off leash activity as permissible not requiring development consent, but may require approval under part V of the EPA ACT 1979.

3.3 Summary of Licences and Approvals

Provided that the necessary permits and approvals are obtained as outlined below, the proposal for the Station Beach Off-Leash Dog Area Trial is considered consistent with the relevant legislation and planning instruments.

As per the Dol (Lands & Water) letter to Council on the 15 November 2018 (see Appendix B), a licence would be granted subject to the department's satisfaction of the trial under the *Crown Lands Management Act 2016*.

4 Stakeholder Consultation

To ensure a robust assessment of potential issues in relation to the proposed trial, the following authorities were consulted regarding the proposal:

- > NSW DPI (Fisheries);
- > NSW DoI (Lands and Water); and
- > NSW National Parks and Wildlife Service.

Correspondence from the above agencies were received by Council from August to November 2018. Extract from various comments raised by the agencies are outlined in Table 4-1 and the section of the REF where the issues is attached is also noted. A copy of the correspondence received is provided in Appendix B.

Table 4-1 Summary of comments raised and response

Comment	Section Issue is Addressed in REF
NSW Department of Primary Industries - Fisheries	
NSW DPI (Fisheries) has no objection to the off-leash dog area trial on Station Beach, if the following conditions/comments are met:	
▪ Signage is installed on the beach, stating that dogs must not be allowed to run through seagrass beds at low tide;	2.3.3, 5.2
▪ Consider providing environmental information, advising that seagrass beds are present in the nearshore zone, including the endangered population of <i>Posidonia australis</i> seagrass. Seagrass is important habitat for fish, providing shelter, food and a nursery for young; and	2.3.3, 5.2,
▪ Surveys of the seagrass are undertaken, showing species, distribution and density along Station Beach. The survey should be undertaken immediately prior to and immediately following the trial period.	2.3.3
NSW Department of Industry – Lands and Water	
▪ Section 1.4 of the <i>Crown Land Management Act 2016</i> sets out principles for the management and use of Crown land, which includes;	
(a) that environmental protection principles are observed and	
(b) natural resources are conserved wherever possible.	
These principles support responsible management of Crown land at localities such as Station Beach where land below mean high water mark supports conservation and protection of seagrass beds; and	3.2.2, 5.2
▪ The shoreline at Station Beach provides suitable habitat for shorebirds and other native fauna (e.g. penguins and sea turtles) that would likely be disrupted by the introduction of off-leash dogs. To ensure the potential impacts on shorebirds are addressed, Council is encouraged to engage an ornithologist consultant who is able to provide informed advice regarding the comparative significance of Station Beach to other sandy beaches in Pittwater and whether the potential loss of habitat will impact Australia's three bilateral migratory bird agreements with Japan, China and the Republic of Korea.	5.3
▪ Station Beach is Crown Land and land below the water mark supports seagrass beds that need to be protected. Potential impacts on the surrounding reserve, the beach shoreline environment and the local native fauna are considered. The beach's shoreline provides potential habitats for shorebirds and other native fauna that may be disrupted by off-leash dogs and requests to engage an ornithologist to provide advice on the matter;	5.2, 5.3
▪ Council would need to get a licence, "subject to conditions from the department to conduct a trial, given activities would occur on submerged Crown land";	3.3
▪ Quantitative and qualitative measures to assess impacts such as eutrophication, changes in water quality and the possible increased presence of invasive species on native seagrasses, <i>Posidonia australis</i> and <i>Zostera marina</i> (Eelgrass). Details of one or more control sites to compare outcomes, including who will manage components of the trial, the control site/s and methods to monitor the results".	

Comment	Section	Issue	is Addressed in REF
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National Parks and Wildlife Service (NPWS)**2.4.3, 5.2 and 5.5**

- “NPWS does not have any concerns with this proposal as long as it is clearly signed posted that the northern boundary of the off-leash area is the Boathouse Wharf”
- Council will need to ensure compliance with the northern boundary to prevent off – leash dogs entering the national park to the north”

5 Environmental Assessment

This section of the report provides assessment of the potential environmental impacts of the proposed trial. This section is divided up into headings describing the various environmental impacts assessed, including:

- > Traffic and access;
- > Hydrology, water quality and sediments;
- > Marine biodiversity;
- > Terrestrial biodiversity;
- > Socio-economic;
- > Noise;
- > Waste management;
- > Climate and air quality;
- > Heritage; and
- > Cumulative environmental impacts.

The assessment has been conducted using available published information, detailed reports completed by specialists, and inspections of the proposed trial site in November 2018.

5.1 Traffic and access

5.1.1 Existing Environment

Vehicular access to Palm Beach is via Barrenjoey Road, with vehicular access to Station Beach being via Beach Road only. It serves as the only route into or out of the area surrounding the proposed trial area.

Parking is available near both the north and south access points of the proposed trial site, as well as additional parking along the internal access road through Governor Phillip Park.

The northern access point has a parking area that can accommodate approximately 40 vehicles, and serves as the main parking area for patrons of the Boathouse Palm Beach Café and users of the nearby park.

The parking area near the southern access point has angled parking along Beach Road for approximately 25 vehicles. Along the internal access road within Governor Phillip Park, there are marked and unmarked spaces for over 100 vehicles.

There are two access points for pedestrians using the beach. The northern access point from the carpark adjacent to the Boathouse Palm Beach Café, and the southern access point from the end of Beach Road near Waratah Road.

Access for pedestrians at the southern end of the proposed trial area is via concrete stairs built over the grassed dune. This access point is not easily accessible for the elderly or persons with a disability.

Pedestrian access at the northern end of the proposed trial area is directly over a worn path through the grassed dune adjacent to the Boathouse Palm Beach Café. This access point is not easily accessible for the elderly or persons with a disability. Council has approved construction of improved access to the beach near the northern end of the trial area. The project is being carried out separately from the trial.

The eastern side of the golf course has a fence limiting pedestrian access to the course from Governor Phillip Park. However, there is no boundary between Station Beach and the Palm Beach Golf Club, allowing informal access from and to the proposed trial area at this location. It is important to note that there is a level change of approximately one metre between the beach area and the golf course minimising the potential access from pedestrians to and from the golf course.

5.1.2 Potential Impacts

People travelling to the area to use the dog area have the potential to cause an increase in traffic flow and congestion, particularly during popular times for visitors to the area for other activities (e.g. accessing Ku-Ring Gai Chase National Park, Palm Beach, and Palm Beach Golf Club). Usage is seasonal, with summer and particularly school holidays generally being the busiest times. The increased vehicle traffic is likely to impact demand for parking spaces within, and around Governor Phillip Park, potentially leading to 'informal'

or illegal parking on grassed areas. The proposed trial allows for off leash access at specified times. These times are more likely to coincide with off-peak or lower demand times for other park users. Because of this, the off-leash trial is unlikely to lead to significant additional congestion. It is important to monitor traffic changes/conditions during the proposed trial.

The difficult access points for the elderly and persons with a disability at both the north and south ends of the proposed trial area potentially limit those who are able to utilise the beach and may pose a potential safety hazard for those who do try to access the trial area.

The unfenced boundary between the golf club and the proposed trial area allows unrestricted access for pedestrians from the golf course. However, this access is minimised by the presence of a fence along the eastern side of the golf course and the presence of a level change between both areas.

5.1.3 Mitigation Measures

Table 5-1 outlines measures that would be implemented to manage and mitigate potential impacts to traffic and access to the study area.

Table 5-1 Mitigation measures for traffic and access impacts

Potential Impacts	Mitigation
Increase in vehicle traffic and congestion in surrounding streets	<ul style="list-style-type: none"> Monitor traffic conditions during the 12-month trial; and Limit off-leash hours to non-peak hours to offset traffic impacts.
Vehicles parked illegally in unmarked areas or grassed areas	<ul style="list-style-type: none"> Provide clear signage displaying parking bays and limits; and Increased patrols by Council officers.
Restricted access and safety risk for the elderly or people with a disability	<ul style="list-style-type: none"> Improve pedestrian access points at both the north and south ends of the beach .
Unrestricted access to and from golf club	<ul style="list-style-type: none"> Council to consider undertaking a risk assessment in regards to golf balls exiting the golf course onto Station Beach and take action as required.

5.2 Marine Biodiversity

5.2.1 Existing Environment

A report prepared by an estuarine ecologist (Astles, 2019), based on field studies during November and December 2018, examined the marine biodiversity off Station Beach (refer Appendix C). Three species of seagrasses have been identified as present in Pittwater Estuary, including along Station Beach. These are *Posidonia australis* (*P. australis*), *Zostera muelleri* subspecies *capricornia* (*Z. muelleri*) and *Halophila ovalis* (*H. ovalis*).

The largest bed of seagrass in Pittwater Estuary is located off Station Beach, covering an area of 879,000m² and representing 47% of the total area of seagrass within the estuary. Seagrass at Station Beach estuarine area is dominated by a mix of *P. australis* and *Z. muelleri* c. covering an area of 719,000m², 92.7% of all mixed stands in Pittwater.

P. australis in Pittwater Estuary is part of the Hawkesbury-Manning Bioregion, and is listed as a threatened ecological community under the EPBC Act. The seagrass in Pittwater Estuary is the largest community in the bioregion by area, making up 56.3% of the seagrass in the Hawkesbury estuary. The seagrass beds off Station Beach is the largest continuous bed of seagrass in Pittwater Estuary.

Astles (2019) calculated that the potential dog swimming area covers approximately 35,901m² including the beach and out into the water (in line with end of the wharf). Approximately 28,720m² of this area (65% of the total study area) contains seagrass.

Seagrass located within the potential dog swimming area was calculated to be 2.11% of the total seagrass bed off Station Beach with which it forms a continuous bed of seagrass. In relation to the spatial area of *P. Australia* and *Z. muelleri* within the dog swimming area, it covers an area of approximately 3,633m² that represents 0.46% and 0.49% of the total spatial area of *P. Australia/Z. muelleri* in Pittwater Estuary and Station Beach respectively.

Astles (2019) undertook an analysis of the tides within the study area and the potential exposure of seagrass during low tides. Results from the surveys showed that the average distance between the water's edge and

the seagrass edge at spring high tide is 20.96m compared to 4.53m at spring low tide, with the average depth of seagrass being 1.42m and 0.04m respectively. Astles (2019) concluded that the beach width at spring high tide is narrow (average 9.32m) and wide at spring low tide (average 30.65m) confirming that the seagrass habitat and its surrounding soft sediment habitat is more accessible to dog and human encounter at low tide.

A study in Pittwater undertaken by Shokri et al. in 2009 identified seven species of Syngnathids, including one seahorse and six pipefish species with the hairy pipefish (*Urocampus carinirostris*) as the most abundant one. These species, protected under the FM Act 1994, are generally found in association with seagrass beds, and any disturbance to, or removal of, seagrass habitat could indirectly impact these species. Habitat destruction is one of the main threats to the species globally (Harrasti, 2016).

Seagrass beds off Station Beach provide habitat and food sources for many estuarine species of fish, invertebrates, algae and plankton, including habitat for White's seahorse (*Hippocampus whitei*) listed as endangered under the IUCN Redlist. *H. whitei* lives mainly in three types of habitats including seagrasses, artificial structures and sponge gardens (Vincent et al., 2005; Harasti & Gladstone, 2013) to depths of 20 m (Kuiter, 2009). This species is considered as site faithful to a home range (males averaging 8m² and females 12m²) (Vincent et al. 2005) and their breeding period mainly occurs between October and April.

Harasti et al. in 2012 concluded in its investigation that degradation of habitats could have a detrimental effect on *H. whitei* due to its limited distribution and this species have been found living in some of the most populated estuaries in Australia (NSW EPA, 2012). Shokri et al. in 2009 concluded that even though the species is protected within NSW from fishing activities, the loss of habitat such as seagrass due to anthropogenic activities may impact the future conservation of the species. Astles (2019) concluded that this *H. whitei* only occupies the subtidal component of the existing seagrass in the area which represents less than 0.49% of the total coverage of 3,633.2 m² potentially affected by the dog swimming activity.

Cardno reviewed the NSW Marine Estate Threat and Risk Assessment report (2017) (TARA) and identified that off-leash dogs and dog-walkers on beaches designated for this purpose can disturb shorebirds, nesting turtles and other species of concern in a local area. The TARA recognises that risks such as this are unlikely to be widespread but should be considered in local scale management plans and policies. Hence, the REF and proposed management plans are consistent with this approach.

Turtles do not nest at Station Beach. Phil Straw, Ornithologist from Avifauna Research and Services Avifauna undertook the bird assessment for Station Beach (see report attached in Appendix D) and considered that “shorebirds were unlikely to use the site for foraging or roosting”. Other species of concern include the seagrass *Posidonia australis* and White Seahorse (which could possibly reside in seagrass adjacent to Station Beach).

The Australian Fur Seal, Grey Nurse Shark and White Shark are unlikely to be resident species and encounters would only occur of individuals transiting through the study area.

Caulerpa taxifolia is an invasive marine plant that is listed in NSW as noxious marine vegetation under the FM Act. The species is perceived as a threat because it grows rapidly, and may out-compete other native species. It also produces toxic substances that deter many herbivores from grazing upon it, reducing the potential for grazing to limit its spread (NSW Fisheries, 2009). This species is known to alter physical and chemical habitat, affecting biodiversity. It tends to colonise gaps within seagrass beds and unvegetated habitat outside seagrass beds. Astles (2019) states that “*C. taxifolia* has been spreading in Pittwater since 2001; it may be spread further into the seagrass bed through vegetative growth of broken fragments, especially at the southern end of the DSA where it is less abundant”. During the seagrass survey, the presence of *C. taxifolia* within the study area was observed confirming its presence. The presence of *C. taxifolia* within Pittwater estuary was also confirmed in the 2010 Pittwater estuary management plan prepared by BMT WBM Pty Ltd for Pittwater Council.

5.2.2 Potential Impacts

There is potential that dogs and their owners would interact with seagrass and soft sediment habitats in the intertidal zone, which may generate several impacts including trampling, dislodgement of flowers during reproductive seasons, disruption of the micro topography of sediments affecting seedling distribution, spread of invasive species, and introduction of nutrients from dog faeces.

Trampling by people on seagrass plants can lead to a loss of seagrass canopy, through damaged leaves, and increased disturbed sediments leading to greater turbidity and lower light penetration (Eckrich et al., 2000). Trampling over long periods of time can result in seagrass blades becoming shorter and their plants having fewer shoots. This can reduce the productivity of the seagrass bed (i.e. smaller biomass), and decrease its reproductive output which, in turn, changes the habitat for the ecological community of fish,

invertebrates and algae that use it. Dogs swimming among these plants during their reproductive season could result in dislodgement of flowers and fruits before they are mature leading to mortality, in particular for *P. australis* as they grow in the upper canopy and at maturity rise above the canopy to aid pollination and dispersal.

The likely response to dog swimming disturbance during high tide at the scale of individual plants is estimated to be low for all species. However, the disturbance by dog swimming during low tide at the scale of individual plants and bed is likely to be very high as *P. australis* has low capacity to respond to disturbance while for *Z. muelleri* and *H. ovalis* is considered to be moderate to high at the scale of individual plants as they occur in shallower water and likely will be trampled. This will depend on the level of disturbance. It is important to note that the spatial area of *P. Australia/Z. muelleri* within the potential dog swimming area is 3,633.2m², which represents a 0.46% and 0.49% of the total spatial area of *P. Australia/Z. muelleri* in Pittwater Estuary and Station Beach respectively.

Dog excrement, in particular during low tides where seagrass may get exposed, may also impact seagrasses as it can potentially contribute to enterococci loading in the immediate vicinity of the seagrass, but would likely reduce as it is broken down over a few hours (Zhu et al., 2011). Any substantial increase in enterococci loading would depend on the intensity of dog swimming (number of dogs defecating per day), average size of dogs and frequency of defecating (number of times per week) (Oates et al., 2017). It is considered that the potential of seagrass exposure in the area is low (only during very low tides) and therefore the potential of dogs defecating on seagrass is considered to be low.

The beach width at spring high tide is on average 9.32m while at spring low tide the average was 30.65m. This shows that seagrass habitat and its surrounding soft sediment habitat is more accessible to dog and human encounter at low tide.

There are other activities not related to dog swimming/trampling that may impact on seagrasses including propeller scars, anchoring, moorings and shading (e.g. Colomer et al., 2017; Glasby and West, 2018). The above activities were evident off Station Beach and observed during the site visits.

There is potential for *C. taxifolia* to be remobilised as the trampling of the dogs while unleashed in the estuarine area. Based on Astles (2019) assessment, dogs are considered to be a potential source for spreading non-indigenous invasive species, such as the alga *C. taxifolia*. Dogs may break off parts of this plant as they trample through the intertidal area and pieces of the plant could stick to the fur of dogs and be carried into other areas either within Station Beach or another water body. *C. taxifolia* may also be washed down, where it can colonise and spread through vegetative growth. However, this could be minor compared to natural dispersal.

H. whitei would only occupy the subtidal component of this extent within the dog swimming area which would vary depending on the height of low tide; therefore, percentage of seagrass habitat of *H. whitei* affected would be less than 0.49% (approximately 3,600m²). Therefore, it is unlikely to result in the local occurrence of the White's seahorse becoming extinct. Additionally, given the relatively short timeframe of the dogs swimming in the area and the uncommon occurrence of these species in the study area, any interactions would be considered very unlikely. Indirect impacts to threatened species include a reduction in water quality (such as increased turbidity) due to the potential trampling of dogs and its owners of the seagrass from sediment movement. However, this impact is considered to be minimal.

It is considered that the potential impact on the seagrass community will depend on the level of disturbance and accessibility. To minimise its disturbance, appropriate measures are required to be in place during the proposed dog unleash trial, including the restriction of unleashed dogs accessing the soft sediment and seagrass area. Other human activities not related to the trial such as boating, anchoring, mooring, etc. may interfere in the trial results (if undertaken) and therefore, need to be taken into account.

5.2.3 Mitigation Measures

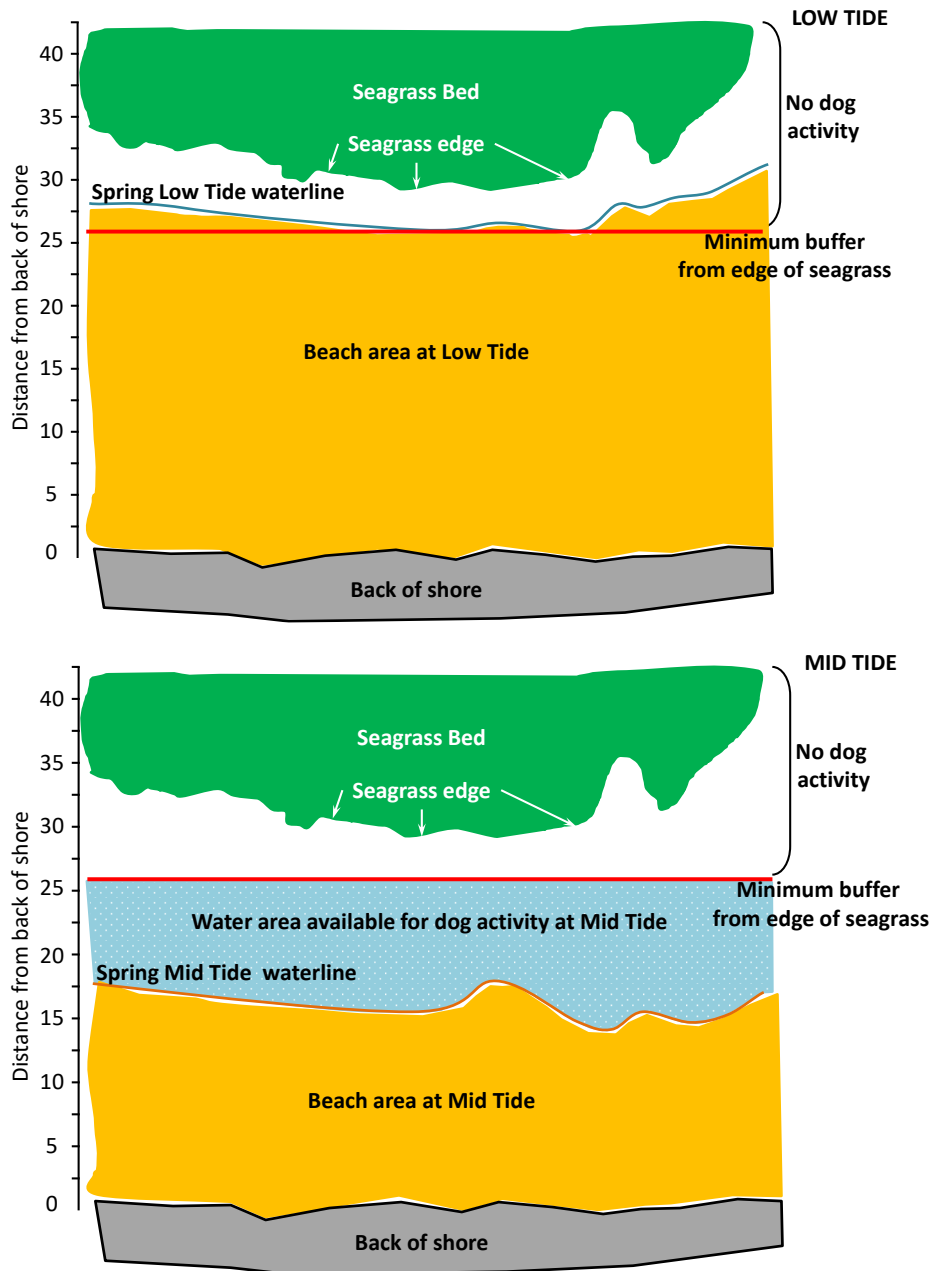
Astles (2019) (based on a Council request), assessed the requirement for allowing dog swimming in the DSA at any time of the tide while protecting the soft sediment and seagrass area (buffer depth). The assessment assumed a minimum depth above the bottom of the seabed of 1 m and the average dog height of 0.6m.

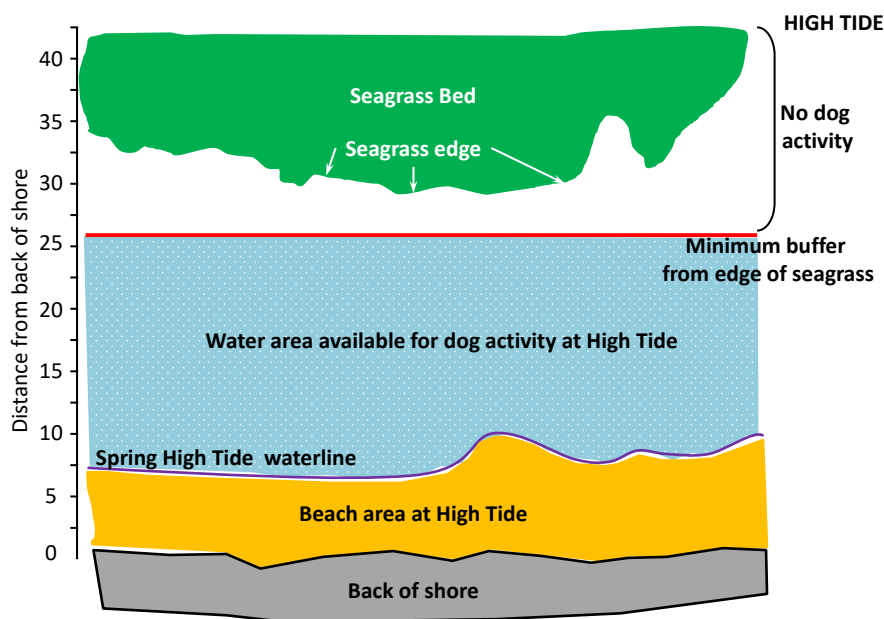
Astles (2019) concluded that at high tide, only three transects located in the southern end showed adequate water depth for dog swimming over the seagrass (See report in Appendix C). The results show that no transects had adequate water depth for dog swimming at low tide, which means that dogs can only walk across the sediments/seagrass beds.

Astles then implemented a width buffer area of 3m from the landward edge of the seagrass bed to protect the seagrass and soft sediment from disturbance. A combined width and depth buffer zones showed that at high tide, only the southern end transects (7-9) have adequate depth and width to allow dog swimming within

the two buffer zones. At low tide none of the transects have adequate depth and width to allow dog swimming.

Based on the above, Astles (2019) considered that, if dog swimming/activity is permitted, a proposed swimming area is required to be identified. This area should be based on a straight boundary line to be placed 3m from the edge of the seagrass bed closest to -and running parallel to the beach. Dog activity should only be allowed east of this line. The Figure 5-1 below (Source: Astles 2019) shows the widths of the beach and water available for dog activity at different tides east of the boundary line.





Astles in 2019 also states that the southern end of the proposed DSA should be shortened (approximately 30 m) to avoid potential impacts with seagrass in that area as it is present close to the shore. Based on the reduction of the 30m on the southern end and the use of the minimum buffer zone, the DSA will be reduced.

Table 5-2 outlines measures that would be implemented to manage and mitigate potential impacts to marine biodiversity.

Table 5-2 Mitigation measures for marine biodiversity impacts

Potential Impacts	Mitigation
Decline in estuarine water quality	<ul style="list-style-type: none"> Install dog waste bins (with waste disposal bags available) at each access point and consider a third in the middle section of the beach; Clearly signpost requirements for beach users to dispose of dog faeces and outline penalties for failing to comply under the <i>Companion Animals Act 1998</i>; Install signs informing users that dogs must not be allowed to run through seagrass beds; Increased compliance patrols by Council officers to ensure compliance with permitted high tide swimming periods; and Carry out water quality monitoring during the trial event.
Impacts to marine vegetation, habitat and fauna	<ul style="list-style-type: none"> Install dog waste bins (with waste disposal bags available) at each access point and consider a third in the middle section of the beach; Clearly signpost requirements for beach users to dispose of dog faeces and outline penalties for failing to comply under the <i>Companion Animals Act 1998</i>; Prior to commencing with the DSA, a minimum buffer zone to the edge of the seagrass closest to - and running parallel to the beach should be identified and marked. This buffer zone line should be located as a minimum 3m east of the edge of the seagrass bed landward; Install markers to sign the minimum buffer zone to the edge of the seagrass. Markers should not interfere with water craft navigation. Prior to installing the markers, consultation with relevant authorities should be undertaken; Dog activity only to be allowed east of the minimum buffer zone; The southern end of the proposed DSA should be shortened to avoid interaction with the endangered population of <i>P. australis</i> seagrass bed that occurs close the shore; Install signs informing users that dogs must not be allowed to run through seagrass beds; Install signs educating site visitors about <i>C. taxifolia</i>, including how to minimise its spread in the area should be placed at both ends of the site;

Potential Impacts	Mitigation
	<ul style="list-style-type: none"> Undertake monitoring of the seagrass and white seahorse on monthly basis during the trial to assess potential impacts of the activity; Increased compliance patrols by Council officers to ensure compliance with permitted dog access areas and times; and Other human activities not related to the trial such as boating, anchoring, mooring, etc. may interfere in the trial results. Such activities should be taken into account when assessing the potential impact of the off-leash dog trial on the marine environment.

5.3 Hydrology, Water Quality and Sediments

5.3.1 Existing Environment

Hydrology and Water Quality

The OEH 2017-2018 State of the Beaches Report (OEH, 2018) provides a summary of the water quality at Barrenjoey Beach along the same sand stretch to the north of Station Beach. The report indicates that microbial water quality at the beach is suitable for swimming most of the time, but may be susceptible to pollution following rain with several potential sources of faecal contamination. The report also states that Barrenjoey Beach suitability grade was upgraded from poor in 2016 to good grade in 2017 as potential pollution sources were eliminated in November 2016 with the removal of the onsite toilet facilities at the lighthouse, Fisherman's and Boatman's cottages located at the northern end of the beach. The report also states that the water quality at Barrenjoey Beach may take longer to recover from stormwater events as the area is considered as having lower levels of flushing. Therefore, the presence of dogs may also increase the concentrations of faecal contamination at the beach. The area is used by beach and boat users that may also impact the water quality in the area.

The bed of Pittwater Estuary is soft sediment incorporating sand and clay. There is some disturbance of the bed from marine vessel activities (propellers, anchors etc.); however, this occurs in deeper waters.

Sediments

Station Beach consists of exposed sand with grassed soils along the boundary with Palm Beach Golf Club. The intertidal areas supporting seagrass beds are composed of soft sediment (sand or mud). These areas of unvegetated sand and mud also considered important habitats in estuaries as they support a large variety of benthic (bottom-dwelling) invertebrates, including worms considered major sources of food to many fish species (Fonseca et al., 2011; York et al., 2018 in Astles 2019). Recreational use of these areas, including pedestrians and dogs can also impact on substrates by trampling on benthic unvegetated invertebrate habitat and compaction of sediment. There is existing evidence of impacts to the soft sediment intertidal habitats of Station Beach including propeller scars, anchoring, moorings, and shading (Astles, 2019).

Station Beach has previously experienced erosion from increased use along the frontal dune.

5.3.2 Potential Impacts

Hydrology and Water Quality

The proposed trial has potential to impact water quality causing eutrophication through introduction of dog faeces, resulting in damage to marine flora and fauna.

Dog activities in the water can cause potential sediment disruption resulting in increased turbidity and reduced light penetration to seagrass beds.

Sediments

Increased use of the beach by the public has previously been shown to cause dune erosion. An increase in beach goers during the trial has the potential to have a similar impact.

Dogs swimming at the beach has the potential to damage the soft sediment habitats that support seagrass beds. Potential impacts include trampling of seagrass beds causing reduced sediment stability, increased disturbance of sediments causing increased turbidity, dislodgement of seagrass seedlings from the sediment layer, and 'potholing' from dog footprints altering the micro topography of the bed.

5.3.3 Mitigation Measures

Table 5-3 outlines measures that would be implemented to manage and mitigate potential impacts to hydrology, water quality and sediments.

Table 5-3 Mitigation measures for hydrology, water quality and sediments impacts

Potential Impacts	Mitigation
Eutrophication from introduction of dog faeces	<ul style="list-style-type: none"> Install dog waste bins (with waste disposal bags available) at each access point and consider a third in the middle section of the beach; Clearly signpost requirements for beach users to dispose of dog faeces and outline penalties for failing to comply under the <i>Companion Animals Act 1998</i>; and Monitor water quality through the trial period.
Disruption of soft sediment habitats supporting seagrass beds	<ul style="list-style-type: none"> Prior to commencing with the DSA, a minimum buffer zone to the edge of the seagrass closest to - and running parallel to the beach should be identified and marked. This buffer zone line should be located as a minimum 3m east of the edge of the seagrass bed landward; Install markers to sign the minimum buffer zone to the edge of the seagrass. Markers should not interfere with water craft navigation. Prior to installing the markers, consultation with relevant authorities should be undertaken; Dog activity only to be allowed east of the minimum buffer zone; Install signs informing users that dogs must not be allowed to run through seagrass beds; Include erosion information on beach signage; and Increased compliance patrols by Council officers to ensure compliance with permitted dog access areas and times.
Erosion of frontal dune from increased beach traffic	<ul style="list-style-type: none"> Conduct visual inspections of dune health throughout trial period.

5.4 Terrestrial Biodiversity

5.4.1 Existing Environment

Council engaged Phil Straw, Ornithologist from Avifauna Research and Services to undertake the assessment on potential impact of the proposed trial on the bird community including shorebirds and other waterbirds (refer Appendix C). Mr Straw undertook surveys during the months of November and December 2018 and prepared the report titled “Station Beach Dog Exercise Area Trial (2019) Draft Report” (Straw, 2019).

A total of six site visits were undertaken to identify any birds visiting the beach using high resolution binoculars (10x50) within both the project site and north of Boathouse Palm Beach Cafe. Six bird species were observed during the site visits:

- > Little Pied Cormorant (*Phalacrocorax melanoleucos*);
- > White-faced Heron (*Egretta novaehollandiae*);
- > Eastern Great Egret (*Ardea modesta*);
- > Silver Gull (*Chroicocephalus novaehollandiae*);
- > Crested Tern (*Thaasseus bergii*); and
- > Masked Lapwing (*Vanellus miles*).

During the site visits, Straw (2019) carried out a visual inspection of the beach and no migratory shorebirds were seen on site. Additionally, no records were found of shorebirds present in the area based on a search of the Birdlife Australia Shorebirds 2020 database and therefore it is unlikely that the site is used for foraging or roosting. Straw (2019) considers that the survey results show low diversity of birds within the site. The highly disturbed nature and topography (narrow and steeply sloping nature) of the beach is considered not to be suitable foraging habitat for threatened or migratory shorebirds.

Other species likely to visit the study area include cormorants, gulls, terns, pelicans, ducks and swans that feed on or below the surface of the water. However, the majority of these birds would be slightly disturbed by the presence on dogs unless allowed to run into the seagrass beds.

5.4.2 Potential Impacts

Due to the highly disturbed nature, the topography of Station Beach and the absence of shorebirds during the site investigations, it is considered that the presence of shorebirds is unlikely. Therefore, the study area

is not considered suitable for threatened or migratory shorebirds and the impact of unleashed dogs at the beach is considered to be low.

5.4.3 Mitigation Measures

Table 5-4 outlines measures that would be implemented to manage and mitigate potential impacts to terrestrial biodiversity.

Table 5-4 Mitigation measures for terrestrial biodiversity impacts

Potential Impacts	Mitigation
Disturbance to threatened or migratory birds	<ul style="list-style-type: none"> During the water quality and seagrass monitoring events, undertake observations of potential presence of migratory and threatened birds at the proposed trial area. If shorebirds are observed during the monitoring events, notify Council to assess whether a shorebird monitoring program should be implemented.

5.5 Socio-economic

5.5.1 Existing Environment

The 2016 census found that the Northern Beaches LGA had a population of approximately 252,878 people, based on the place of usual residence (ABS, 2016).

The proposed trial area, and the areas surrounding it, are zoned for environmental and public recreation purposes (Pittwater Council, 2014). The area around the proposed location include the publicly accessed Governor Phillip Park to the north, the Boathouse Palm Beach Café, and parking and pedestrian access to Ku-Ring Gai Chase National Park and the heritage listed Barrenjoey Lighthouse.

The Northern Beaches LGA currently has 29 off-leash dog areas, with Rowland Reserve in Bayview providing the only water access at the northern end of the LGA.

The OEH 2017-2018 State of the Beaches Report (OEH, 2018) provides a summary of the water quality at Barrenjoey Beach along the same sand stretch to the north of Station Beach. The report indicates that microbial water quality at the beach is suitable for swimming most of the time, but may be susceptible to pollution following rain with several potential sources of faecal contamination.

The proposed area lies adjacent to the Palm Beach Golf Club. The golf club is not fenced and access to the golf club by the public is not restricted.

5.5.2 Potential Impacts

The proposed trial has potential to impact access to the Ku-Ring Gai Chase National Park and potentially minimise parking accessibility to the Boathouse Palm Beach Café customers.

Incorrectly disposed of dog waste along the trial area has the potential to negatively impact the overall amenity of the beach, as well as the beach's suitability for swimming through a reduction in microbial water quality.

The lack of safety screens to prevent golf balls exiting the golf club boundary poses a safety risk to beach goers.

Interactions between beach users, golf club patrons, and other beach goers, pose a potential risk to the health and safety of both groups. Restricting off-leash dogs to the approved trial boundaries would be dependent upon dog owners maintaining control of their pets.

5.5.3 Mitigation Measures

Table 5-5 outlines measures that would be implemented to manage and mitigate potential socio-economic impacts.

Table 5-5 Mitigation measures for socio-economic impacts

Potential Impacts	Mitigation
Restrictions to public access	<ul style="list-style-type: none"> Monitor traffic conditions during the 12-month trial; Limit off-leash hours to non-peak hours to offset traffic impacts; Provide clear signage displaying parking bays and limits; and

Potential Impacts	Mitigation
	<ul style="list-style-type: none"> Increased patrols by Council officers.
Reduced microbial water quality from dog faeces resulting in loss of suitability for swimming	<ul style="list-style-type: none"> Install dog waste bins (with waste disposal bags available) at each access point and consider a third in the middle section of the beach; and Clearly signpost requirements for beach users to dispose of dog faeces and outline penalties for failing to comply under the <i>Companion Animals Act 1998</i>.
Injuries from interactions between beach goers, dogs, and golf course patrons	<ul style="list-style-type: none"> Council to consider undertaking a risk assessment in regards to golf balls exiting the golf course onto Station Beach and take action as required; Install signage with information for dog owners of their responsibility to maintain control of their dogs while both on and off-leash in public spaces; and Monitor and investigate any complaints made to Council of aggressive dogs in or around the proposed trial area.

5.6 Waste management

5.6.1 Existing Environment

Existing sources of waste would be minor and include general litter from recreational users of the beachfront. A site visit and inspection was carried out on 20 November 2018. No litter was observed at the proposed trial site, and the area is generally considered to be well maintained, with the Northern Beaches LGA community in general placing a high importance on elements of the natural environment and cleanliness of public space (Northern Beaches Council, 2018).

There are currently no public garbage bins on Station Beach or at either the north or south access points.

5.6.2 Potential Impacts

The proposed trial has the potential to impact the site through the incorrect disposal of dog faeces by beach users. There is also potential for an increase in litter in the proposed trial area from increased utilisation of the beach. Increased litter along the proposed trial area has the potential to result in impact to the visual amenity of the beach.

In addition to the potential impacts upon visual amenity, incorrectly disposed of dog faeces poses potential risk to human health (refer Section 5.5), and water quality (refer Section 5.3).

5.6.3 Mitigation Measures

Table 5-6 outlines measures that would be implemented to manage and mitigate potential waste impacts.

Table 5-6 Mitigation measures for waste management impacts

Potential Impacts	Mitigation
Beach users not disposing of dog faeces	<ul style="list-style-type: none"> Install dog waste bins (with waste disposal bags available) at each access point and consider a third in the middle section of the beach; and Clearly signpost requirements for beach users to dispose of dog faeces and outline penalties for failing to comply under the <i>Companion Animals Act 1998</i>.
Increased litter from greater numbers of beach users	<ul style="list-style-type: none"> Provide waste separation bins (general and recyclable waste) at each access point; and Clearly signpost requirements for beach users to dispose of litter appropriately and outline penalties for failing to comply under the <i>Protection of the Environment Operations Act 1997</i> (POEO Act).

5.7 Noise

5.7.1 Existing Environment

The proposed trial area is located within an area used for recreational activities. The background noise levels in the area would be influenced primarily by traffic entering and exiting the parking zone for the National Park and beaches access, customers of the Boathouse Palm Beach Café, and recreational users in Governor Phillip Reserve and Palm Beach Golf Club and along Station Beach.

5.7.2 Potential Impacts

The proposed trial could impact nearby noise receivers (identified in Table 5-7) through the barking of dogs using the beach. An increase in vehicle traffic at peak times could also create minor noise impacts to residents along Beach Road. However, Astles (2019) recommended to avoid undertaking the trial within the first 30m (southern end) of the original proposed area, which is closest to the residential areas.

Table 5-7 Nearby noise receivers

Address	Distance
4 Waratah Rd, Palm Beach	195m
2 Waratah Rd, Palm Beach	165m
1/1A Waratah Rd, Palm Beach	155m
3 Beach Rd, Palm Beach	185m
4 Beach Rd, Palm Beach	190m

5.7.3 Mitigation Measures

Table 5-8 outlines measures that would be implemented to manage and mitigate potential noise impacts.

Table 5-8 Mitigation measures for noise impacts

Potential Impacts	Mitigation
Noise disturbance from barking dogs	<ul style="list-style-type: none"> Ensure signage is clear indicating times and off-leash boundaries to minimise dogs approaching sensitive receivers; Not to undertake the trial within the initial 30m (southern end) of the original proposed trial area; and Monitor any noise complaints received through Council's online complaints management system.
Noise disturbance from increased traffic during peak times	<ul style="list-style-type: none"> Monitor any noise complaints received through Council's online complaints management system.

5.8 Climate and Air Quality

5.8.1 Existing Environment

The closest Bureau of Meteorology automatic weather station to Station Beach is the Observatory Hill weather station in Sydney (site number 066062), approximately 31km south of the study area. Mean daily maximum temperature ranges from 25.9°C in January to 16.3°C in July. Average yearly rainfall is 1,212.8 mm, with the highest mean rainfall occurring in June (BoM, 2015).

The main source of air pollution in the Northern Beaches LGA is from areas outside the LGA. Sources of pollution within the LGA include pollutants from motor vehicles, increased use of private motor vehicles, traffic congestion, smoke from bush fires, use of wood fires in winter, and industrial emissions (SHOROC, 2010). The main sources of local air pollution surrounding the proposed works would be vehicle emissions from vehicles travelling on Beach and Barrenjoey Roads and immediately surrounding roads.

5.8.2 Potential Impacts

The proposed works would have a minimal effect upon air quality, which would be limited to the potential increase of vehicle traffic to the study area.

5.8.3 Mitigation Measures

No specific mitigation measures are considered warranted.

5.9 Heritage

5.9.1 Existing Environment

Aboriginal Heritage

A search of the Aboriginal Heritage Information Management System (AHIMS) was conducted on 3 December 2018 for the proposed area, with a buffer of 50m. The search did not identify any Aboriginal sites or Aboriginal places.

Non-Aboriginal Heritage

As part of this REF, the Australian Heritage Database and the State Heritage Inventory were searched on 13 February 2019 to identify any items of heritage significance that may occur near the proposed area. The Australian Heritage Database contains listings for the World Heritage List, National Heritage List, and the Register of the National Estate (non-statutory archive). The State Heritage Inventory contains listings for the State Heritage Register and the Section 170 NSW State Agency Heritage Register.

Results from the database are presented in Table 5-9.

Table 5-9 Non-Aboriginal heritage items in the vicinity of the proposed trial area

Item	Location	Listing
Barrenjoey Lighthouse Group	Palm Beach	Register of the National Estate (non-statutory archive)
Barrenjoey Headland Lightstation	Barrenjoey Headland, Beach Road, Palm Beach	Pittwater LEP 2014 (Item No. 2270104)
Site of former Customs House	Station Beach, Palm Beach	Pittwater LEP 2014 (Item No. 2270102)

5.9.2 Potential Impacts

Aboriginal Heritage

No known Aboriginal sites would be impacted by the proposed trial.

Non-Aboriginal Heritage

The Barrenjoey Lighthouse Group and the Barrenjoey Headland Lightstation lie approximately 600m to the north of the proposed trial site within the Ku-Ring Gai Chase National Park. Under the OEHP policy, pets and domestic animals that are not certified assistance animals are not permitted within national parks.

The former Customs House site is located at the northern end of Station Beach, approximately 550m away from the proposed site. The listing identifies the site as an archaeological site with no above ground structures remaining. Under the trial, there should be no interaction between off-leash dog area users and the former Customs House site, therefore the potential for impact is minimal.

5.9.3 Mitigation Measures

Table 5-10 outlines measures that would be implemented to manage and mitigate potential heritage impacts.

Table 5-10 Mitigation measures for Aboriginal and non-Aboriginal heritage impacts

Potential Impacts	Mitigation
Previously unidentified Aboriginal and non-Aboriginal archaeological items are discovered.	<ul style="list-style-type: none"> If any unexpected archaeological items are uncovered during the proposed trial Council must be notified; and If any skeletal material is uncovered, trial must cease immediately with access restricted, and Council, OEHP and NSW Police must be notified.

5.10 Cumulative environmental impacts

5.10.1 Existing Environment

There is a requirement under Clause 228(2) of the EP&A Regulations to take into account any cumulative environmental impacts of the proposed trial with other existing or planned future activities. Cumulative impacts

have the potential to arise from the interaction of individual aspects of the site and the effects of the proposal with other projects in the local area.

A search of the DP&E Major Project Register on 13 February 2019 returned no major projects within the locality of the proposed trial area.

5.10.2 Potential Impacts

No cumulative impacts are anticipated for the duration of the proposed trial period. Cardno understands that works to enhance accessibility to the site at the northern end of the study area will be undertaken by Council. However, it is unknown if the works will be carried out during the proposed off leash dog trial period.

5.10.3 Mitigation Measures

No specific mitigation measures are considered warranted.

6 Environmental Management

It is recommended that Council prepare a management plan (incorporating a monitoring program) for the proposed trial. At a minimum, the management plan should include all mitigation measures as detailed in this report, which are summarised in Table 6-1.

Council should ensure that the mitigation measures listed in Table 6.1 are implemented and complied with during the trial. The trial should be reassessed if it should continue if:

- At least one of the below mitigation measures are not regularly applied by the community, in particular if dogs are observed accessing the seagrass area;
- Results of the seagrass and water quality monitoring show that dogs are impacting the seagrass community; and
- The presence of shorebirds is reported frequently visiting the study area.

Table 6-1 Summary of proposed mitigation measures

Aspect	Mitigation Measures
Traffic and access	<ul style="list-style-type: none"> ▪ Monitor traffic conditions during the 12-month trial; ▪ Limit off-leash hours to non-peak hours to offset traffic impacts; ▪ Provide clear signage displaying parking bays and limits; ▪ Increased patrols by Council officers; ▪ Improve pedestrian access points at both the north and south ends of the beach; and ▪ Council to consider undertaking a risk assessment in regards to golf balls exiting the golf course onto Station Beach and take action as required.
Marine biodiversity	<ul style="list-style-type: none"> ▪ Increased compliance patrols by Council officers to ensure compliance with permitted high tide swimming periods; ▪ Prior to commencing with the DSA, a minimum buffer zone to the edge of the seagrass closest to - and running parallel to the beach should be identified and marked. This buffer zone line should be located as a minimum 3m east of the edge of the seagrass bed landward; ▪ Install markers to sign the minimum buffer zone to the edge of the seagrass. Markers should not interfere with water craft navigation. Prior to installing the markers, consultation with relevant authorities should be undertaken; ▪ Dog swimming only to be allowed east of the minimum buffer zone; ▪ The southern end of the proposed DSA should be shortened to avoid interaction with the endangered population of <i>P. australis</i> seagrass bed that occurs close the shore; ▪ Carry out a seagrass, the white seahorse and water quality monitoring during the trial event to assess potential impacts of the activity; ▪ Install signs educating site visitors about <i>C. taxifolia</i>, including how to minimise its spread in the area should be placed at both ends of the site; and ▪ Other human activities not related to the trial such as boating, anchoring, mooring, etc. may interfere in the trial results. Such activities should be taken into account when assessing the potential impact of the off-leash dog trial on the marine environment.
Hydrology, water quality, and sediment	<ul style="list-style-type: none"> ▪ Install dog waste bins (with waste disposal bags available) at each access point and consider a third in the middle section of the beach; ▪ Clearly signpost requirements for beach users to dispose of dog faeces and outline penalties for failing to comply under the <i>Companion Animals Act 1998</i>; ▪ Monitor water quality through the trial period; ▪ Install signs informing users that dogs must not be allowed to run through seagrass beds; ▪ Include erosion information on beach signage; ▪ Increased compliance patrols by Council officers to ensure compliance with permitted dog access areas and times; and ▪ Conduct visual inspections of dune health throughout trial period.
Terrestrial biodiversity	<ul style="list-style-type: none"> ▪ During the water quality and seagrass monitoring events, undertake observations of potential presence of migratory and threatened birds at the proposed trial area. If shorebirds are observed during the monitoring events, notify Council to assess whether a shorebird monitoring program should be implemented.

Aspect	Mitigation Measures
Socio-economic	<ul style="list-style-type: none"> ▪ Council to consider undertaking a risk assessment in regards to golf balls exiting the golf course onto Station Beach and take action as required. ▪ Install signage with information for dog owners of their responsibility to maintain control of their dogs while both on and off-leash in public spaces (Companion Animals Act 1998); and ▪ Monitor and investigate any complaints made to Council of aggressive dogs in or around the proposed trial area.
Waste management	<ul style="list-style-type: none"> ▪ Provide waste separation bins (general and recyclable waste) at each access point.
Noise	<ul style="list-style-type: none"> ▪ Ensure signage is clear indicating times and off-leash boundaries to minimise dogs approaching sensitive receivers; ▪ Not to undertake the trial within the initial 30m (southern end) of the original proposed trial area; and ▪ Monitor any noise complaints received through Council's online complaints management system.
Heritage	<ul style="list-style-type: none"> ▪ If any unexpected archaeological items are uncovered during the proposed trial Council must be notified; and ▪ If any skeletal material is uncovered, trial must cease immediately with access restricted, and Council, OEH and NSW Police must be notified.

7 Conclusions

7.1 Summary of Consideration of Environmental Factors

The factors listed in the EPBC Act and under Clause 228(2) of the EP&A Regulation have been addressed in Table 7-1 in accordance with the requirement that the likely impacts of the proposed trial on the natural and built environment are fully considered.

Table 7-1 Summary of consideration of environmental factors under Commonwealth and NSW State Legislation

Environmental Factors		Impacts
EPBC Act	<i>a. Any environmental impact on a World Heritage property?</i> There are no World Heritage properties in the trial area.	None
	<i>b. Any environmental impact on wetlands of international importance?</i> There are no wetlands of international significance (i.e. Ramsar sites) near the trial area.	None
	<i>c. Any environmental impact on Commonwealth listed threatened species or ecological communities?</i> The search of the EPBC database indicated that 67 listed threatened species may potentially occur (or their habitat occur) within 1km of the trial area. It is not anticipated that the trial would impact threatened species and habitats with the mitigation measures described above in place.	None
	<i>d. Any environmental impact on Commonwealth listed migratory species?</i> The search of the EPBC database indicated that 56 Commonwealth listed migratory species may potentially occur within 1 km of the study area. However, investigations found no evidence to suggest that the proposal area is a significant habitat area for migratory species.	None
	<i>e. Does any part of the proposal involve a nuclear action?</i> The proposal does not involve a nuclear action.	None
	<i>f. Any environmental impact on a Commonwealth marine area?</i> There are no Commonwealth marine areas in the trial area.	None
	<i>g. Any direct or indirect effect on Commonwealth land?</i> There is no Commonwealth land in the trial area.	None
Clause 228 of the EP&A Act	<i>a. Any environmental impact on a community?</i> During the proposed trial period, there may be potential short-term adverse impacts on the community including increased vehicle movements and pressures on parking demands. These impacts would be temporary and localised.	Negative short term
	<i>b. Any transformation of a locality?</i> There is no proposed physical transformation of a locality	None
	<i>c. Any environmental impact on the ecosystems of the locality?</i> The proposal would not involve the clearing or disturbance of any existing vegetation.	None
	<i>d. Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?</i> The proposed trial is not anticipated to result in reduction of environmental quality of endangered seagrass communities. Compliance with mitigation measures would prevent impacts.	None
	<i>e. Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?</i> The proposed trial would not have an impact upon locality	None

Environmental Factors	Impacts
<p><i>f. Any impact on the habitat of any protected fauna (within the meaning of the National Parks and Wildlife Act 1974)?</i></p> <p>The proposed trial is not anticipated to have any direct impacts upon protected fauna.</p>	None
<p><i>g. Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?</i></p> <p>The proposed trial not anticipated to impact upon marine flora.</p>	None
<p><i>h. Any long-term effects on the environment?</i></p> <p>The proposed trial is not anticipated to have any long term effects on the environment.</p>	None
<p><i>i. Any degradation of the quality of the environment?</i></p> <p>The proposed trial is not anticipated to have any long term effects on the environment.</p>	None
<p><i>j. Any risk to the safety of the environment?</i></p> <p>The proposed trial would have no impact upon the safety of the environment providing the mitigation measures outlined in this REF (Section 5.5) are implemented</p>	None
<p><i>k. Any reduction in the range of beneficial uses of the environment?</i></p> <p>The proposed trial would increase the range of beneficial uses of the environment.</p>	Positive short term
<p><i>l. Any pollution of the environment?</i></p> <p>The proposed trial is not anticipated to produce additional pollution.</p>	None
<p><i>m. Any environmental problems associated with the disposal of waste?</i></p> <p>The proposed trial will not produce any contaminated waste.</p>	None
<p><i>n. Any increased demands on resources, natural or otherwise which are, or are likely to become in short supply?</i></p> <p>The proposed trial would not increase demands on any resources.</p>	None
<p><i>o. Any cumulative environmental effect with other existing or likely future activities?</i></p> <p>No cumulative impact on the environment is expected as a result of the proposed development.</p>	None

7.2 Conclusions

The conclusions of this REF are:

- > The proposed trial would be carried out under Division 5.1 of the EP&A Act. Northern Beaches Council is acting as both the proponent and determining authority for the proposed trial;
- > Key environmental considerations for the trial include limiting disruptive impacts to endangered seagrass communities adjacent to and within the proposed trial area, limiting impacts of erosion and sediment disturbance, and maintenance of water quality. It is considered that these risks can be managed through the mitigation measures identified throughout this document, including the implementation of a management plan and monitoring program by Council. The management plan would be developed by Council prior to the commencement of the trial;
- > The proposed trial is unlikely to have any significant or long term negative environmental impacts providing the mitigation measures outlined in this REF are implemented and enforced during the trial;
- > Strict implementation of the proposed mitigation measures is required to mitigate potential impacts on environmental sensitive species (including seagrasses and the white seahorses (potentially)) from the proposed dog off-leash trial at Station Beach; and

Council should assess other areas (including the northern part of Palm Beach) for an off-leash dog area, if the trial does not go ahead or if the trial is unsuccessful.

8 References

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APPENDIX

A

EPBC ACT SEARCH



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.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 12/02/19 15:32:06

[Summary](#)

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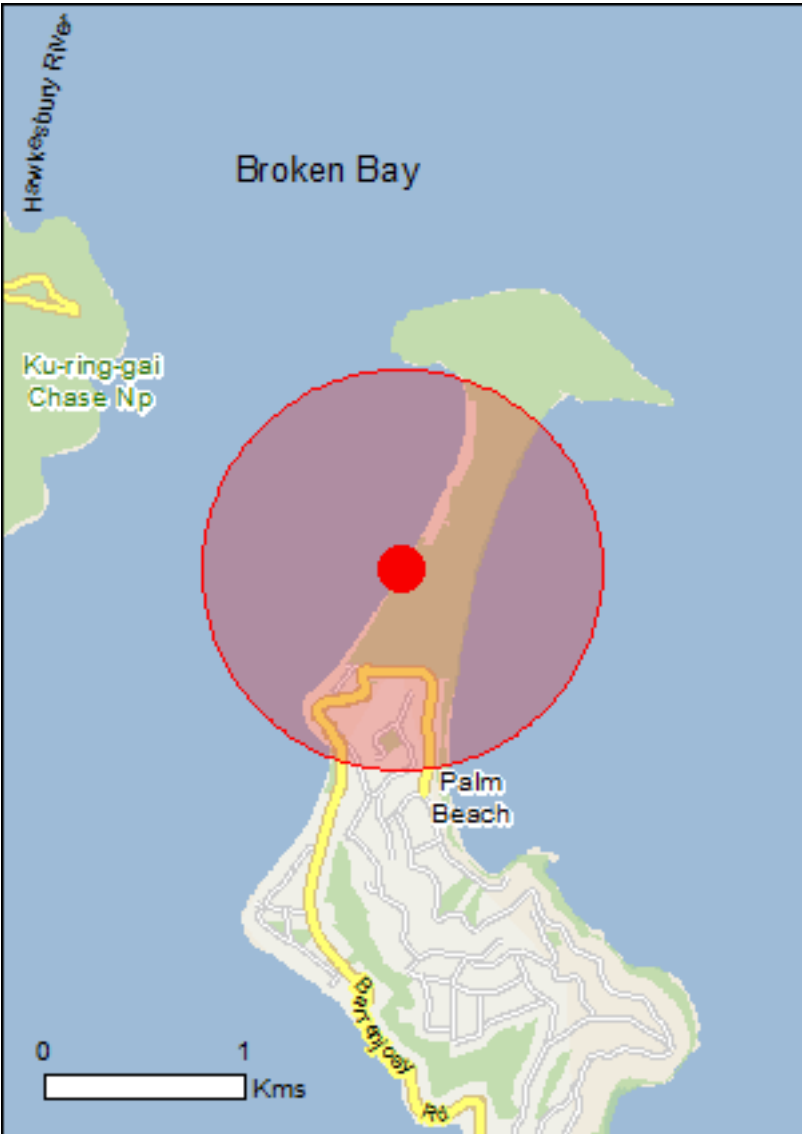
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

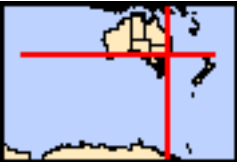
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[Buffer: 1.0Km](#)



Summary

Matters of National Environmental 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:	1
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	67
Listed Migratory Species:	56

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 <http://www.environment.gov.au/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 Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	75
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	48
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

National Heritage Properties		[Resource Information]
Name	State	Status
Natural		
Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves	NSW	Listed place

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.	

Name	Status	Type of Presence
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community may occur within area
Coastal Upland Swamps in the Sydney Basin Bioregion	Endangered	Community may occur within area
Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion	Endangered	Community likely to occur within area

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or

Name	Status	Type of Presence
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	related behaviour likely to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely

Name	Status	Type of Presence
to occur within area		
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Fish		
Epinephelus daemeli Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat likely to occur within area
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat likely to occur within area
Litoria littlejohni Littlejohn's Tree Frog, Heath Frog [64733]	Vulnerable	Species or species habitat may occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Isoodon obesulus obesulus Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) [68050]	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus		
Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat likely to occur within area
Pseudomys novaehollandiae		
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Plants		
Acacia bynoeana		
Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat may occur within area
Asterolasia elegans		
[56780]	Endangered	Species or species habitat likely to occur within area
Astrotricha crassifolia		
Thick-leaf Star-hair [10352]	Vulnerable	Species or species habitat likely to occur within area
Caladenia tessellata		
Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat likely to occur within area
Cryptostylis hunteriana		
Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area
Genoplesium baueri		
Yellow Gnat-orchid [7528]	Endangered	Species or species habitat likely to occur within area
Persoonia hirsuta		
Hairy Geebung, Hairy Persoonia [19006]	Endangered	Species or species habitat likely to occur within area
Pimelea curviflora var. curviflora		
[4182]	Vulnerable	Species or species habitat may occur within area
Syzygium paniculatum		
Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat likely to occur within area
Thesium australe		
Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur

Name	Status	Type of Presence
		within area
Hoplocephalus bungaroides Broad-headed Snake [1182]	Vulnerable	Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sharks		
Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Listed Migratory Species [Resource Information]		
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat likely to occur

Name	Threatened	Type of Presence
Calidris acuminata Sharp-tailed Sandpiper [874]	Endangered	Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]		Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]		Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]	Critically Endangered	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[<u>Resource Information</u>]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat likely to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Sterna albifrons Little Tern [813]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]		Species or species habitat likely to occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area

Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area

Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within

Name	Status	Type of Presence
Balaenoptera musculus Blue Whale [36]	Endangered	area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Foraging, feeding or related behaviour may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat known to occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat likely to occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat may occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Ku-ring-gai Chase	NSW

Invasive Species	[Resource Information]
Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.	

Name	Status	Type of Presence
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Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Asparagus scandens Asparagus Fern, Climbing Asparagus Fern [23255]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw		Species or species

Name	Status	Type of Presence
Creeper, Funnel Creeper [85119]		habitat likely to occur within area
Eichhornia crassipes		
Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista monspessulana		
Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana		
Broom [67538]		Species or species habitat may occur within area
Lantana camara		
Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum		
African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Opuntia spp.		
Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata		
Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate		
Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla		
Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii		
Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta		
Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis		
Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

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.

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

Where very little information is available for 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 reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

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

Coordinates

-33.58867 151.32312

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.

APPENDIX

B

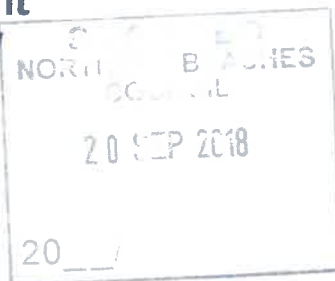
CONSULTATION CORRESPONDENCE



**Department
of Industry**

Our Reference: MN07H4

Chief Executive Officer
Northern Beaches Council
PO Box 882
MONA VALE NSW 1660



Attn: Jenny Cronan – Senior Recreation Planner

Dear Madam

Station Beach, Palm Beach proposal for comment

The Department of Industry - Lands & Water (the department) has received a request from Jenny Cronan at Northern Beaches Council on 20 August 2018 to comment on a proposed dog-off-leash trail at Station Beach, Pittwater.

The department provided comment to Pittwater Council on a similar proposed dog swimming trial at Station Beach on 6 November 2009. A copy of this 2009 response is included in Attachment A.

In consideration of off-leash dog swimming areas in the Pittwater region, the department would prefer that Northern Beaches Council evaluate a range of sites in addition to the Station Beach site, which has inherent environmental sensitivities due to the presences of an endangered species of offshore seagrass. The department is supportive of Council's initiative to accommodate recreational uses within its local government area but would prefer that such an activity be confined to more environmentally resilient sites in Pittwater, rather than Station Beach. For example, Hitchcock Park – Careel Bay, which is only 4.5km from Station Beach, provides a more suitable environment for an off-leash dog area.

In March 2010, areas of *Posidonia australis*, including the beds established off Station Beach, were listed as endangered populations under the threatened species schedules of the *NSW Fisheries Management Act 1994* and listed as endangered under the *Environmental Protection and Biodiversity Conservation (EPBC) Act 1979* by the Commonwealth in May 2015.

These listings flag the significance of such seagrass areas and the need for State and Local governments to protect them. Seagrass beds provide ideal breeding habitat for Stingrays and species of the Syngnathidae family (e.g. seahorse, seadragon, pipefish), many of which are also listed as "protected" under the *NSW Fisheries Management Act 1994* and EPBC Act.

Section 1.4 of the *Crown Land Management Act 2016* sets out Principles of Crown land Management for the management and use of Crown land, which includes; (a) that environmental protection principles are observed and (b) natural resources conserved

wherever possible. These principles support responsible management of Crown land at localities such as Station Beach where land below mean high water mark supports conservation and protection of seagrass beds.

The shoreline at Station Beach provides suitable habitat for shorebirds and other native fauna (e.g. penguins and sea turtles) that would likely be disrupted by the introduction of off-leash dogs. To ensure the potential impacts on shorebirds are addressed, Council is encouraged to engage an ornithologist consultant who is able to provide informed advice regarding the comparative significance of Station Beach to other sandy beaches in Pittwater and whether the potential loss of habitat will impact Australia's three bilateral migratory bird agreements with Japan, China and the Republic of Korea.

If Station Beach is chosen to trial an off-leash dog swimming area, Council would need to take out a licence, subject to conditions from the department to conduct a trial, given activities would occur on submerged Crown land (i.e. land below mean high water mark).

Given the environmental sensitivities of the site, the department will require a Review of Environmental Factors (REF) be included with the licence application in order to set both quantitative and qualitative parameters to adequately monitor the impact of off-leash dogs.

Matters to be considered in the REF include, but are not limited to:

- a) Impacts on the surrounding reserve, the beach shoreline environment and the local native fauna.
- b) Quantitative and qualitative measures to assess impacts such as eutrophication, changes in water quality and the possible increased presence of invasive species on native seagrasses, *Posidonia australis* and *Zostera marina* (Eelgrass).
- c) Details of one or more control sites to compare outcomes, including who will manage components of the trial, the control site/s and methods to monitor the results.

Unauthorised harm to seagrass during the trial may result in the licence being terminated and possible compliance action taken.

Please keep the department informed of any developments.

Should you require further information please contact Mr Stan Rees on 9842 8327.

Yours sincerely



Ben Tax

A/Area Manager, Sydney & South Coast

Date: 10 September 2018

Attachment A

COPY



**Land and Property
Management Authority**

Mr Les Munn
Manager - Reserves, Recreation & Building
Services
Pittwater Council
PO Box 882,
MONA VALE NSW 1660

Regional Manager - Sydney
10 Valentine Ave, Parramatta NSW 2124
PO Box 3935, Parramatta NSW 2150
Telephone: 8836 5300, Facsimile: 8836 5365
www.lands.nsw.gov.au

6 November 2009

Contact Officer: Stan Rees
Telephone: 8836 5346
Email: stan.rees@land.nsw.gov.au
Our Ref: MN07114

Dear Mr Munn,

Re: REF for Proposed Trial Dog Swimming Area at Station Beach, Pittwater

I refer to your letter dated 13 October 2009 enquiring as to a recommended response for the Land and Property Management Authority (LPMA) as to an earlier letters on the subject trial. I apologise for the late response.

Particular reference is made to your letter dated 11 December 2008 which included accompanying Review of Environmental Factors (REF) and Biodiversity Assessment, as prepared by NGH Environmental in October 2008, in support of a proposed trial dog swimming area at Station Beach.

Both the REF and Biodiversity Assessment provide useful background information on the Station Beach environment, with the REF outlining some alternative sites for off-leash dog swimming areas considered. It is noted that the reports indicate that numerous safeguards are proposed in order to mitigate potential impacts of the trial off-leash dog swimming area at Station Beach. However, the reports lack detail on how the trial and safeguard proposals would be implemented.

The LPMA's letter of 3 December 2007 to you flagged the need for an appropriate level of assessment and monitoring, in advance of public consultation.

While the REF and Biodiversity Assessment provided, do generally address assessment and monitoring safeguards proposed at Station Beach, it is apparent that details of the operation of the trial, compliance measures and the specifics of scientific monitoring during the trial and beyond are yet to be documented else otherwise determined.

Given that some aspects of the REF and Biodiversity Assessment were beyond the LPMA's usual expertise, the Department has sought external comment.

Discussion with the local office of the Department of Climate Change and Water has indicated that representatives at that office are not supportive of dog swimming/off leash etc. at Station beach due to the damage and stress caused to wildlife. The office has likely provided correspondence to Council directly on this matter

Recent advice from the Department of Primary Industries (Fisheries), now part of the Department of Industry and Investment, suggested that there was a significant lack of information in the REF relating to:

- the parameters that would need to be monitored; and
- the experimental design that will be used to detect a significant impact of increased dog usage on the beach would be needed as part of this process.

The LPMA understands that conducting a proper scientific trial including monitoring, assessment and using control sites, is beyond the scope of the trial as outlined in the REF and Biodiversity Assessment provided and would likely prove quite costly.

The REF and Biodiversity Assessment documents also do not accurately reflect positions of State agencies. Please note in Table 4.1 of the REF provided, that the statement that the Department of Lands "Agrees to the Proposal under the same conditions as DPI (Fisheries)" is not accurate. The position of the LPMA's predecessor was set out in the letter of the General Manager for the then Department of Lands to you, dated 3 December 2007.

Further to this, the Principles of Crown Land Management (Section 11 of the Crown Lands Act 1989) require that the LPMA apply the principles in managing Crown land for the people of New South Wales. There are six principles, which afford environmental protection principles and conservation of natural resources. A proposed dog swimming trial as outlined is not readily complimentary with the Principles of Crown Land Management if applied to Station beach.

Further, based on its own understanding as well as comment by other agencies on the REF and associated Biodiversity Assessment, the LPMA would not recommend that a dog swimming trial at Station Beach proceed.

Should details of the trial subsequently be resolved to the LPMA's satisfaction, these would need to be subject to public consultation and if then, Council elects to proceed with the trial; the LPMA would require that Council accept a licence for an appropriate purpose at a statutory minimum rent.

Please keep the Department informed of any developments and feel free to contact me on 88365333 or Mr Stan Rees on 88365346, should you require any further information.

Yours sincerely



Andrew McAnespie
Regional Manager
Sydney



Department
of Industry

Our Reference: MN07H4

Jenny Cronan - Senior Recreation Planner Northern Beaches Council
PO Box 882
MONA VALE NSW 1660

Dear Jenny

Proposed dog off-leash trial at Station Beach, Pittwater

Thank you for your email of 7 November 2018 advising of Council's intentions to commence community consultation on 15 November 2018.

The Department of Industry - Lands & Water (the department) is comfortable with Council, as part of their community consultation process, placing the department's letter of 10 September 2018 and the Land and Property Management Authority letter of 6 November 2009 on its website, in an un-altered state, provided that all personal details are deleted from both letters. The department is also comfortable with this letter being placed on Council's website, provided that all personal details are removed.

I would like to take the opportunity to reiterate the department's concern in previous correspondence regarding the environmental sensitivities of the proposed site due to the presence of endangered seagrass species and the important breeding habitats they provide.

As outlined, the proposed trial would require Council to hold a valid tenure over the site with the department. To facilitate this, a licence application can be submitted by Council for consideration by the department.

In order to consider Council's licence application, the department will require a Review of Environmental Factors (REF) and consent from NSW Department of Primary Industries, Fisheries (Fisheries). The granting of a license over the subject site for the proposed purpose would be subject to the department's satisfaction that the application is in line with the principles of Crown Land management and that our before mentioned concerns have been adequately addressed.

Please note the department's reference to Hitchcock Park in the letter of 10 September 2018 relates to the closest designated off-leash dog area and does not suggest the sites suitability as an off-leash dog swimming area. It is noted the Hitchcock Park borders the Careel Bay Intertidal Area - a declared Wildlife Protection Area established in accordance with the *NSW Companion Animals Act 1998*, where dogs are strictly prohibited.

Should you wish to discuss this matter further, Mr Stan Rees, Natural Resource Management Project Officer, can be contacted, on (02) 9842 8327.

Yours sincerely

Ben Tax
A/Area Manager, Sydney & South Coast
Date: 15 November 2018

STAKEHOLDER COMMENTS TO INCORPORATE IN THE REF

Comments received from Fisheries

“DPI Fisheries has no objections to the dog beach trial on Station Beach, provided that:

- Signage is installed on the beach, stating that dogs must not be allowed to run through seagrass beds at low tide. You may also wish to provide environmental information, advising that seagrass beds are present in the nearshore zone, including the endangered population of *Posidonia australis* seagrass. Seagrass is important habitat for fish, providing shelter, food and a nursery for young.
- Surveys of the seagrass are undertaken, showing species, distribution and density along Station Beach. The survey should be undertaken immediately prior to and immediately following the trial period.

There is no need to use the marker buoys, as recommended back in 2007 (due to possible damage caused to the seagrass by the markers themselves).

This isn't a Fisheries matter, but we hope that adequate facilities are provided and maintained for collection of dog droppings.”

Comments received from DoI – Land & Water

“Section 1.4 of the *Crown Land Management Act 2016* sets out Principles of Crown land Management for the management and use of Crown land, which includes;

- (a) that environmental protection principles are observed and
- (b) natural resources conserved wherever possible. These principles support responsible management of Crown land at localities such as Station Beach where land below mean high water mark supports conservation and protection of seagrass beds.

The shoreline at Station Beach provides suitable habitat for shorebirds and other native fauna (e.g. penguins and sea turtles) that would likely be disrupted by the introduction of offleash dogs. To ensure the potential impacts on shorebirds are addressed, Council is encouraged to engage an ornithologist consultant who is able to provide informed advice regarding the comparative significance of Station Beach to other sandy beaches in Pittwater and whether the potential loss of habitat will impact Australia's three bilateral migratory bird agreements with Japan, China and the Republic of Korea.

If Station Beach is chosen to trial an off-leash dog swimming area, Council would need to take out a licence, subject to conditions from the department to conduct a trial, given activities would occur on submerged Crown land (i.e. land below mean high water mark).

Given the environmental sensitivities of the site, the department will require a Review of Environmental Factors (REF) be included with the licence application in order to set both quantitative and qualitative parameters to adequately monitor the impact of off-leash dogs.

Matters to be considered in the REF include, but are not limited to:

- a) Impacts on the surrounding reserve, the beach shoreline environment and the local native fauna.
- b) Quantitative and qualitative measures to assess impacts such as eutrophication, changes in water quality and the possible increased presence of invasive species on native seagrasses, *Posidonia australis* and *Zostera marina* (Eelgrass).
- c) Details of one or more control sites to compare outcomes, including who will manage components of the trial, the control site/s and methods to monitor the results.

Unauthorised harm to seagrass during the trial may result in the licence being terminated and possible compliance action taken”.

APPENDIX

C

ESTUARINE ECOLOGICAL COMPONENT
REPORT (KAREN ASTLES 2019)

Review of Environmental Factors for Dog Swimming Area at Station Beach, Pittwater

Estuarine ecological component

Revised 2

Submitted to Cardno to be incorporated into full Review of Environmental Factors Report
for Northern Beaches Council

April 2019

Karen Astles

Research Scientist

Fisheries Research, Marine Ecosystems Unit

NSW Department of Primary Industries | Fisheries

P.O. Box 5106 Wollongong | NSW 2520

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Not to be circulated separately without express permission of the author

Review of Environmental Factors for Dog Swimming Area at Station Beach, Pittwater

Estuarine ecological component - Revised

1. Introduction

This report forms part of a larger review of environmental factors (REF) for the proposed dog swimming area (DSA) at Station Beach in Pittwater. It focuses only on assessing the estuarine ecological component of the environment. All other components are addressed in the larger report. Descriptions of the proposed activity and area are provided in the larger report. Section 2 provides descriptions of the estuarine communities and species present off Station Beach. Section 3 examines the potential impacts of dog swimming on these communities and species. Section 4 assesses the potential for interactions between dogs, their owners and the estuarine communities. Section 5 addresses the specific questions from the Guidelines for Review of Environmental Factors based on the information in Sections 2-4. Section 6 assesses additional options proposed by Northern Beaches Council. Finally, Section 7 provides a list of recommendations.

2. Descriptions of estuarine ecological communities

2.1 Seagrasses

There are three species of seagrasses present in Pittwater, including along Station Beach (Fig.1). *Posidonia australis* (also known as strap weed), *Zostera muelleri* subspecies *capricornia* (hereafter know as *Z. muelleri*) (also known as eel grass) and *Halophila ovalis* (also known as paddle weed). Tables 1 and 2 summarise the important biological and ecological characteristics of these species. It is important to note that all these characteristics are influenced by environmental conditions such as water and air temperatures, water clarity, sediment type, turbidity, hydrology and tidal regimes (Gobert et al., 2006; Moore and Short, 2006). For example, increased turbidity from natural (e.g. storms) and/or human events (e.g. boating in shallow areas) will affect light availability for photosynthesis which in turn can decrease the biomass of seagrass beds (Ralph et al., 2006; Carr et al., 2016).

Table 1. Summary of key biological and ecological characteristics of seagrass species found in the Pittwater estuary.

Biological/ecological characteristics	<i>Posidonia australis</i>	<i>Zostera muelleri</i>	<i>Halophila ovalis</i>
Plant size	Large, leaf length up to 60cm	Medium, leaf length 5-10cm	Small leaf, width 4-7mm
Depth range	<1m to 8-10m, depends on water clarity	Intertidal, deeper with <i>P. australis</i>	Shallow subtidal, deeper with other species
Habitat in south eastern Australia	Lagoons, estuaries, sheltered bays	Lagoons, estuaries	Lagoons, estuaries
Bed forms	Pure and mixed stands with other species	Pure and mixed stands with other species	Primarily mixed
Plant persistence	Persistent	Variable in time and space, Beds in some estuaries persistent for several years, in others varies in extent over time and location	Ephemeral
Reproductive propagules	Large seed (cm), fruit positively buoyant	Seeds in spathes, negatively buoyant	Small seeds (mm), negatively buoyant
Seed bank	None, direct development from fruit	Transient, < 1 year, replenished annually	Persistent, > 1 year
Flowering period	July– October	October – January	November - January
Fruiting period	November – December	December – March	January – May
Rhizome extension rate	1-35cm/year	25-150cm/year	c.356cm/year

Reference: Sherman et al., 2018, Waycott et al., 2014

Table 2. Flowering periods for three species of seagrass found in Pittwater estuary.

Species	Reproductive stage	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
<i>P. australis</i>	Flowering												
	Fruiting												
<i>Z. muelleri</i>	Flowering												
	Seeds												
<i>H. ovalis</i>	Flowering												
	Seeds												

Reference: Waycott et al. 2014

Figure 1 shows the spatial extent of the three seagrass species in beds and smaller patches throughout the Pittwater estuary and Table 3 presents the areas of each of these patches. As can be seen from Figure 1 Station Beach has the largest bed of seagrass (0.879 km²) in the Pittwater estuary containing 47% of the total area of seagrass of the estuary (1.856 km²) (Table 3). The second largest bed is in Careel Bay (0.397 km²) containing 21% of the total area of seagrass. By species, the largest pure beds of *P. australis* and *Z. muelleri* occur in Careel Bay, 0.191 km² and 0.205km² respectively, representing 41.6% of the total pure stands of *P. australis* and 33.7% of pure *Z. muelleri* stands. The largest mixed stand of *P. australis* and *Z. muelleri* occur at Station Beach (0.719km², 92.7% of all mixed stands in Pittwater).

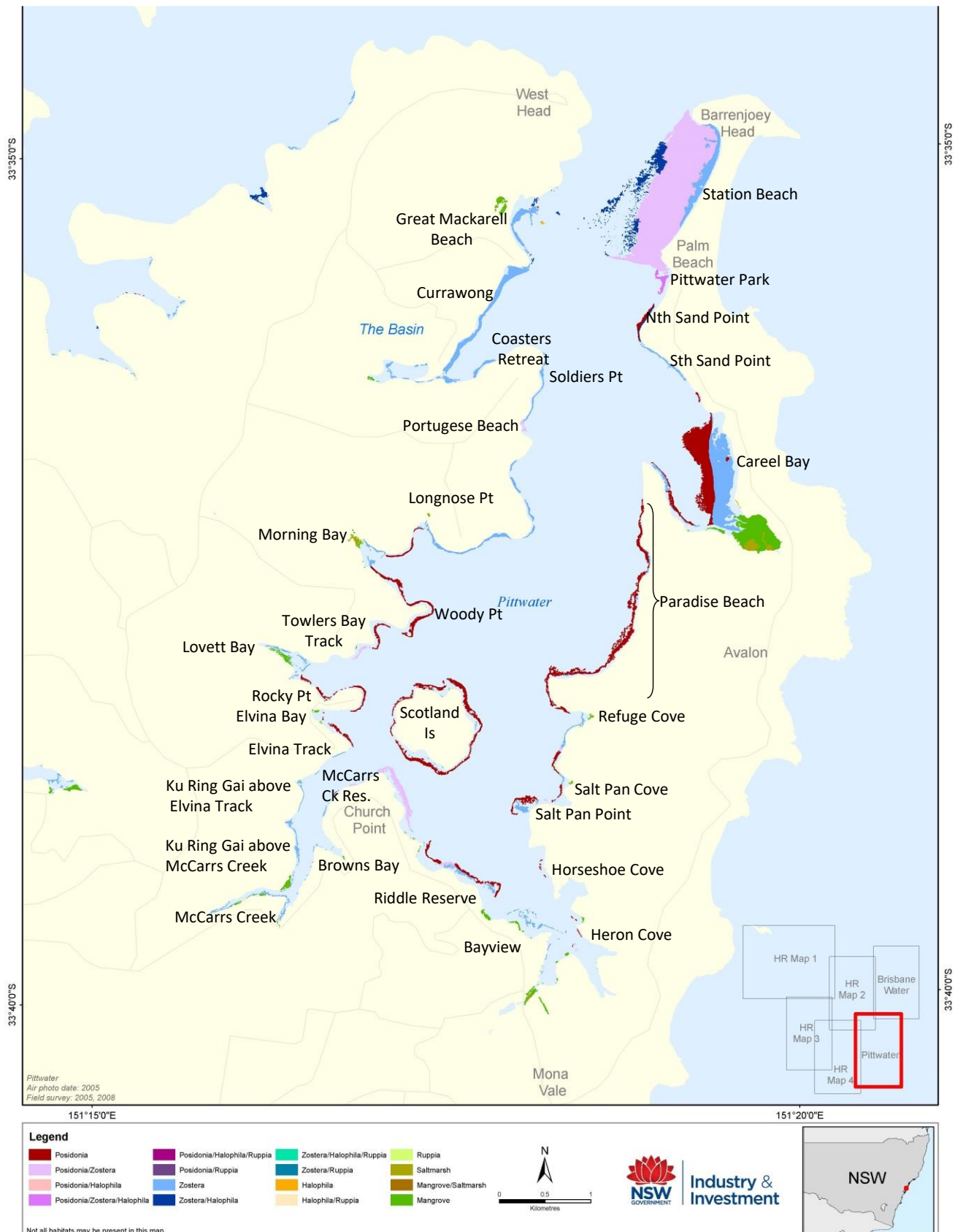


Figure 1. Map of Pittwater estuary showing the different patches of seagrass beds and their composition.

Table 3. List of seagrass beds in Pittwater estuary (see Figure 1), their spatial area and proportion each bed contributes to all seagrass in the Pittwater.

Site name	Species of Seagrass	Area, km ²	Proportion of Total Area
Station Beach	<i>Zostera</i> , <i>Posidonia</i> / <i>Zostera</i> , <i>Zostera</i> / <i>Halophila</i>	0.880	0.474
Pittwater Park	<i>Posidonia</i> / <i>Zostera</i> / <i>Halophila</i>	0.011	0.006
North Sand Point	<i>Zostera</i> / <i>Halophila</i> , <i>Posidonia</i>	0.013	0.007
South Sand Point	<i>Zostera</i> , <i>Posidonia</i>	0.010	0.006
Careel Bay	<i>Posidonia</i> , <i>Zostera</i>	0.397	0.214
Paradise Beach to Taylors Point	<i>Posidonia</i> , <i>Zostera</i>	0.091	0.049
Refuge Cove	<i>Zostera</i> , <i>Posidonia</i> / <i>Zostera</i> , <i>Posidonia</i>	0.011	0.006
Salt Pan Cove	<i>Zostera</i> , <i>Posidonia</i> , <i>Posidonia</i> / <i>Zostera</i>	0.005	0.003
Salt Pan Point	<i>Posidonia</i> , <i>Zostera</i>	0.019	0.010
Horseshoe Cove to Heron Cove	<i>Zostera</i> , <i>Posidonia</i> , <i>Posidonia</i> / <i>Zostera</i>	0.003	0.001
Bayview	<i>Zostera</i>	0.010	0.005
Riddle Reserve	<i>Zostera</i> , <i>Posidonia</i> / <i>Zostera</i> , <i>Posidonia</i>	0.034	0.018
Church Point	<i>Posidonia</i> / <i>Zostera</i> , <i>Zostera</i>	0.034	0.018
Scotland Island	<i>Posidonia</i> , <i>Zostera</i>	0.064	0.035
McCarrs Creek Reserve	<i>Posidonia</i>	0.000	0.000
Browns Bay	<i>Zostera</i>	0.002	0.001
McCarrs Creek (Ck)	<i>Zostera</i>	0.010	0.005
Ku Ring Gai above McCarrs Ck	<i>Zostera</i>	0.008	0.004
Ku Ring Gai below Elvina Track	<i>Zostera</i>	0.002	0.001
Elvina Track	<i>Zostera</i>	0.001	0.001
Elvina Bay	<i>Posidonia</i>	0.007	0.004
Rocky Point	<i>Posidonia</i>	0.013	0.007
Lovett Bay	<i>Zostera</i>	0.007	0.004
Towlers Bay track	<i>Posidonia</i> / <i>Zostera</i> , <i>Posidonia</i>	0.011	0.006
Woody Point	<i>Posidonia</i>	0.031	0.016
Morning Bay	<i>Zostera</i> , <i>Posidonia</i>	0.014	0.008
Longnose Point	<i>Zostera</i>	0.034	0.018
Portugese Beach	<i>Posidonia</i> / <i>Zostera</i>	0.003	0.002
Soldiers Point	<i>Zostera</i>	0.010	0.005
Coastal retreat	<i>Zostera</i>	0.007	0.004
The Basin	<i>Zostera</i>	0.013	0.007
Currawong	<i>Zostera</i>	0.072	0.039
Great Mackerel Beach	<i>Zostera</i> / <i>Halophila</i> , <i>Zostera</i> , <i>Posidonia</i>	0.029	0.016
Pittwater Estuary Total	All species	1.856	

2.1.1 Legislative protection status of seagrass and habitat protection policy in Pittwater

All seagrass in NSW is protected as key fish habitat (Fisheries Management Act 1994). This means a person must not cut, remove, damage or destroy marine vegetation on public water land, except under a permit. All three seagrass species occurring in the waters off Station Beach are listed as Type 1 highly sensitive fish habitat. The Fisheries Management Act defines sensitivity as “the importance of the habitat to the survival of fish (noting that ‘fish’ under the FM Act includes all aquatic invertebrates) and its robustness (ability to withstand disturbance).”

Since 2008 there have been a number of legislative changes regarding the protection of *P. australis* particularly in the Hawkesbury ecoregion. These are summarised as follows:

- i) In NSW *P. australis* is listed as an endangered population in Pittwater, Port Hacking, Botany Bay, Sydney Harbour Brisbane Waters and Lake Macquarie under the Fisheries Management Act (FM Act). It was listed in September, 2010.
- ii) Nationally *P. australis* is listed as a nationally significant ecological community in the Manning-Hawkesbury ecoregions under the EPBC Act (listed in May 2015). Ecological community includes the “assemblage of plants, animals and micro-organisms associated with seagrass dominated by *P. australis*.” (Commonwealth of Australia, 2018). The Pittwater estuary is specifically included in this listing.
- iii) NSW Coastal Management Act 2016 (CM Act) and the State Environmental Planning Policy (Coastal Management) 2018 (SEPP 2018) has identified coastal management areas in the coastal zone to promote an integrated and co-ordinated approach to land use planning in the zone. In Pittwater, Station Beach has two types of proposed coastal management areas – Coastal Use Area of the beach itself and Coastal Environment Area of the waters off the beach, i.e. “land containing coastal features such as the coastal waters of the State, estuaries, coastal lakes, coastal lagoons and land adjoining those features, including headlands and rock platforms”. The first objective of Coastal Environment Area in the CM Act is:
 - (a) to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity.
- iv) Draft Pittwater Waterway Strategy of the Northern Beaches Council includes the following objective - “Improve environment protection to protect our delicate waterway habitat.” Direction 4 of this strategy is to “Investigate with the Department of Primary Industries (DPI Fisheries) establishing a ‘no-go zone’ protecting endangered seagrass habitats within the study area.”

2.2 Estuarine ecological communities

The estuarine ecological communities of Station Beach occur in the seagrass, in the water column of seagrass habitats and in unvegetated soft sediments habitats. Seagrasses are widely recognised as important fish habitats, particularly as a nursery for juvenile fish (York et al., 2018). Appendix 1 Table A1 lists the species of fish caught in seagrass and non-vegetated habitats in Pittwater by two studies (Jelbart et al., 2007; Shokri et al., 2009). They are especially important habitats for recreational and commercial fish species. For example juvenile yellowfin bream, luderick and leatherjackets recruit to, and live in, seagrass habitats (Gillanders, 2007). One study in Pittwater found that newly settled larvae of some fish species were more abundant in seagrass beds at the entrance to the estuary than further down into it at certain times of the year (Bell et al., 1988). This suggests that the seagrass bed off Station Beach, the closest to the estuary entrance, may be an important recruitment habitat for larvae entering from the ocean. Fish assemblages in seagrass are also known to vary in abundance, behavior and diversity between day and night (Gray et al., 1996; Guest et al., 2003;). One study caught more species of fish during the night than in the day (Guest et al., 2003). This may be due to some species being more active at night because of the increased availability of prey at night.

Seagrasses also provide habitat for some endangered fish species, including the group Syngnathiformes containing seahorses, pipefish, pipehorses and seadragons that are known to exist in NSW waters (Kuitert, 2009). The White's seahorse *Hippocampus whitei*, is endemic to NSW and listed as endangered on the IUCN Redlist. Habitat destruction is one of the main threats to the species globally (Harrasti, 2016). All species of the Syngnathiformes are listed as "protected" under the NSW Fisheries Management Act 1994. A study in

Pittwater found seven species of Syngnathids, one seahorse and six pipefish species, with the hairy pipefish *Urocampus carinirostris* the most abundant (Shokri et al., 2009).

Seagrasses provide a variety of food sources in the form of small invertebrates, plankton and algae living among or on seagrass vegetation and on or in sediments within seagrasses (Barnes, 2017; Whitfield, 2017; York et al., 2018). These fauna are eaten directly by sea urchins, crustaceans, molluscs and some fish species. Seagrass beds also act as ecological engineers by reducing physical stress such as baffling of water movements, absorbing nutrients and trapping sediments. This in turn protects smaller invertebrates from predators and enhances food availability (Orth et al., 1984). Many studies have reported high biomass, abundance, diversity and productivity of the fauna associated with seagrass beds (Edgar et al., 1994; Boström and Bonsdorff, 1997; Webster et al., 1998; Lee et al., 2001; Hirst and Atrill, 2008). Their rhizomes (roots) help to bind the sediment, thereby providing some protection against wave-induced erosion. Dead seagrass, even when washed ashore, is an important habitat and food source for small invertebrates, such as amphipods.

Areas of unvegetated sand or mud in intertidal and subtidal areas also provide important habitat in estuaries. They support a large variety of benthic (bottom-dwelling) invertebrates, including worms, molluscs and crustaceans (Fonseca et al., 2011; York et al., 2018). These invertebrates are a major source of food for many fish species such as flathead, flounder and whiting. Recreational use of these areas can also impact on substrates by trampling on benthic unvegetated invertebrate habitat and compaction of sediment.

3. Potential impacts of dog swimming in soft sediment intertidal areas

Dogs and their owners interacting with seagrass and soft sediment habitats in the intertidal zone can have several impacts. Trampling by people on seagrass plants can lead to a loss of seagrass canopy, through damage leaves, and increased disturbed sediments leading to greater turbidity and lower light penetration (Eckrich et al., 2000). Trampling over long periods of time can result in seagrass blades becoming shorter and their plants having fewer shoots. This can reduce the productivity of the seagrass bed (i.e. smaller biomass), and decrease its reproductive output which, in turn, changes the habitat for the ecological community of fish, invertebrates and algae that use it. For example, a less dense seagrass bed provides less shelter from predators for juvenile fish (Bell and Westoby, 1986a,b).

Whilst dogs, on average, are smaller and lighter than people, swimming among seagrass can still have an effect. The flowers and fruits of *P. australis* grow in the upper canopy and at maturity rise above the canopy to aid pollination and dispersal. Larger dogs will swim but have long legs potentially reaching the tops of the seagrass canopy. Swimming among these plants during their reproductive season could result in dislodgement of flowers and fruits before they are mature leading to mortality. Dogs walking or running through soft sediments and seagrass are often erratic and boisterous. Smaller dogs are more likely to walk/run rather than swim. This can have four effects. First, trampling over seed beds of *Z. muelleri* and *H. ovalis* can result in burying them deeper to a depth where germination is less likely to occur (Sherman et al., 2018). This decreases their capacity to recover from other impacts. Second, it can result in seedlings being dislodged from the sediment before they have time to establish, resulting in mortality. Third, dog foot prints create small “pot holes” in the surface and this changes the micro topography of the sediments affecting seed distribution and microclimate for germination (Sherman et al., 2018). Fourth, dogs can be a means of spreading non-indigenous invasive species, such as the alga *Caulerpa taxifolia*. Dogs may break off parts of this plant as they trample through the intertidal area and pieces of the plant could stick to the fur of dogs and be carried into other areas either within Station Beach or another water body, if they are not first washed down, where it can colonise and spread through vegetative growth. However, this could be minor compared to natural dispersal. *C. taxifolia* has been shown to survive out of water for several days (West et al., 2007). This alga can impact sediment infauna and change the fish fauna and invertebrates that live there (York et al. 2006; Wright et al., 2007; Gallucci et al., 2012). It tends to colonise gaps within seagrass beds and unvegetated habitat outside seagrass beds.

Dogs may also impact seagrasses by defecating in the water or on exposed sand (see Figure 4). Dog faecal events in the water can potentially contribute to enterococci loading in the immediate vicinity of the seagrass but will likely reduce as it is broken down over a few hours (Zhu et al., 2011). However, any substantial increase in enterococci loading will depend on the intensity of dog swimming (number of dogs defecating per day), average size of dogs and frequency of defecating (number of times per week) (Oates et al., 2017).

Increased nutrients from dog faeces may lead to increased epiphytic growth on the leaves of seagrass, which in turn can reduce the photosynthetic capacity of seagrass (less light able to penetrate) potentially reducing its productivity.

There are many other obvious impacts on seagrasses not related to dog swimming including propeller scares, anchoring, moorings and shading (e.g. Colomer et al., 2017; Glasby and West, 2018). All of these are evident off Station Beach (Appendix 2, Figure A2.1). The potential impacts of dogs and their owners in seagrasses and soft sediment intertidal habitats listed above will add to these existing impacts. Therefore, the overall cumulative impact on these intertidal habitats off Station Beach from multiple human activities needs to be taken into consideration (Grech et al., 2011) when assessing the effects of allowing dog swimming on the beach.

4. Potential for interactions between dogs, their owner and the seagrass and soft sediment habitats at Station beach

The possible impacts from dog swimming listed above (Section 3) will depend on three things – seagrasses and soft sediments capacity to respond to disturbance, the overlap and accessibility between dog activity and the habitats and the factors contributing to the level of disturbance.

4.1 Capacity of seagrass and soft sediment habitats to respond to disturbances

The capacity to respond (CTR) relates to an organism's biological and ecological characteristics that enable it to resist and/or recover from a disturbance (Astles, 2014; Unsworth et al., 2015; O'Brien et al., 2018). The CTR of seagrass is related to two aspects – resistance to disturbance and recovery from disturbance. These aspects differ depending on the species of seagrass and local environmental factors through space and time (O'Brien et al., 2018).

Resistance is measured based on the size of the plants and include rhizome diameter, shoot weight and total biomass. Resistance to a disturbance, which equates to survival time, is roughly scaled to the size of the plant. Small colonizing species have a survival time of less than one month but large persistent species may have a survival time of up to two years. Recovery is measured primarily by their ability to recolonize and regrow. Recovery capacity decreases with seagrass size. It is measured by sexual reproduction (seed density), clonal growth (horizontal expansion rate) and growth from fragments (leaf turnover, above ground biomass) (O'Brien et al., 2018). A detailed study is required to quantify all these measures for the seagrass species at Station Beach, which lack of time and resources prohibited for this report. Therefore, a brief qualitative summary of the CTR of the three species present off Station Beach is provided in Table 4.

Table 4. Summary of key characteristics of the seagrass species' capacity to respond (CTR) to disturbance.

Species	Characteristics	CTR summary
<i>P. australis</i>	- long lived, slow growing, large plants, often large standing biomass - seeds develop directly, no seed bank	- CTR strongly dependent on resisting disturbances rather than recovering from disturbances - low recovery rates vulnerable to landscape scale losses
<i>Z. muelleri</i>	- capable of forming large long lived clones, large rhizome diameter, varying ratio of above:below ground biomass - forms annual seed banks	- CTR adapted to wide range of conditions - annual seed bank vulnerable to disruption by environmental and human disturbances
<i>H. ovalis</i>	- short lived, produces large density of seeds, seeds remain viable for months to years, low biomass -forms persistent seed banks	- CTR low resistance to disturbance but rapid recovery - vulnerable to interrupted recruitment and feedbacks preventing recolonisation

Reference: O'Brien et al., 2018

There is substantial variation in the resistance and recovery capacities within species, which will be influenced by environmental conditions and the condition of the seagrass habitat off Station Beach. Species characteristics alone cannot be relied on to predict a seagrass response to environmental change and human disturbances (O'Brien et al., 2018).

4.2 Accessibility to seagrass habitat

To determine the likelihood that dogs and their owners will interact with seagrasses off Station Beach in the dog swimming area two site visits were made, one during spring high tide (7/12/18, 9.02am, 1.79m) and one during spring low tide (22/1/19, 4.30pm, 0.10m), representing the extreme high and low tides respectively. On each of these tides, nine transects within the dog swimming area were laid perpendicular to the shore. Along these transects the following measurements were made: distance from the back of the shore to the water's edge, distance from water's edge to the start of the seagrass bed, depth of water at the seagrass bed, depth of water at one to three intervals between the seagrass bed and the back of the shore. Table 5 provides a summary of these data.

Table 5. Mean (\pm standard error) distance and water depth of nine transects along Station Beach during spring high and low tide. Point 1 - distance from the back of the shore to the water's edge; Point 2 - distance from the back of the shore to the start of the seagrass bed; Points 3-5 - one to three intervals between the back of the shore and the seagrass bed.

Point on transect	Length, m		Depth, m	
	High Tide	Low Tide	High Tide	Low Tide
1	9.32 \pm 0.45	30.65 \pm 0.62	0	0
2	30.27 \pm 0.49	35.17 \pm 1.29	-1.48 \pm 0.06	-0.041 \pm 0.01
3	12.63 \pm 0.57	32.33 \pm 0.74	-0.26 \pm 0.018	-0.09 \pm 0.01
4	20.53 \pm 3.92	37.8 \pm 0.95	-0.49 \pm 0.022	-0.01 \pm 3.33E-05
5	21.12 \pm 0.44	-	-0.78 \pm 0.03	-

The average distance between the water's edge and the seagrass edge at spring high tide is 20.96m compared to 4.53m at spring low tide, with the average depth of seagrass being 1.42m and 0.04m respectively (Figure 2). Conversely, the beach width at spring high tide is narrow (average 9.32m) and wide at spring low tide (average 30.65m) (Figure 2). Therefore, the seagrass habitat and its surrounding soft sediment habitat is more accessible to dog and human encounter at low tide. Figure 3 shows the differences in distance and water depth between high and low tides for three of the transects measured (northern end, middle and southern end of the DSA, remaining graphs are in Appendix 2, Figure A2.3) For location of transects along the beach see Appendix 2, Figure A2.2.

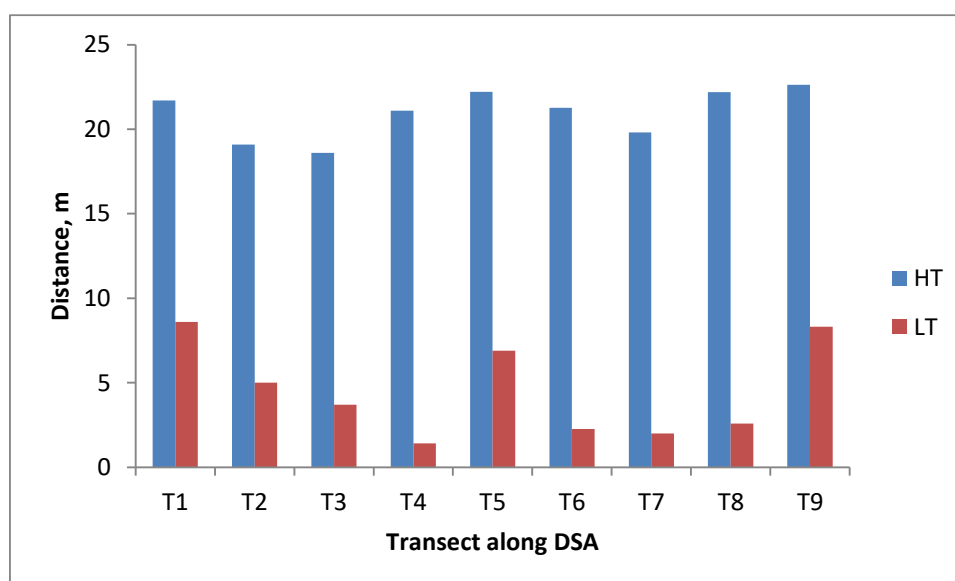


Figure 2. Comparison between high and low tides of the distance between the water's edge and the seagrass edge along the DSA on Station Beach for all transects (north to south). HT – high tide, LT – low tide.

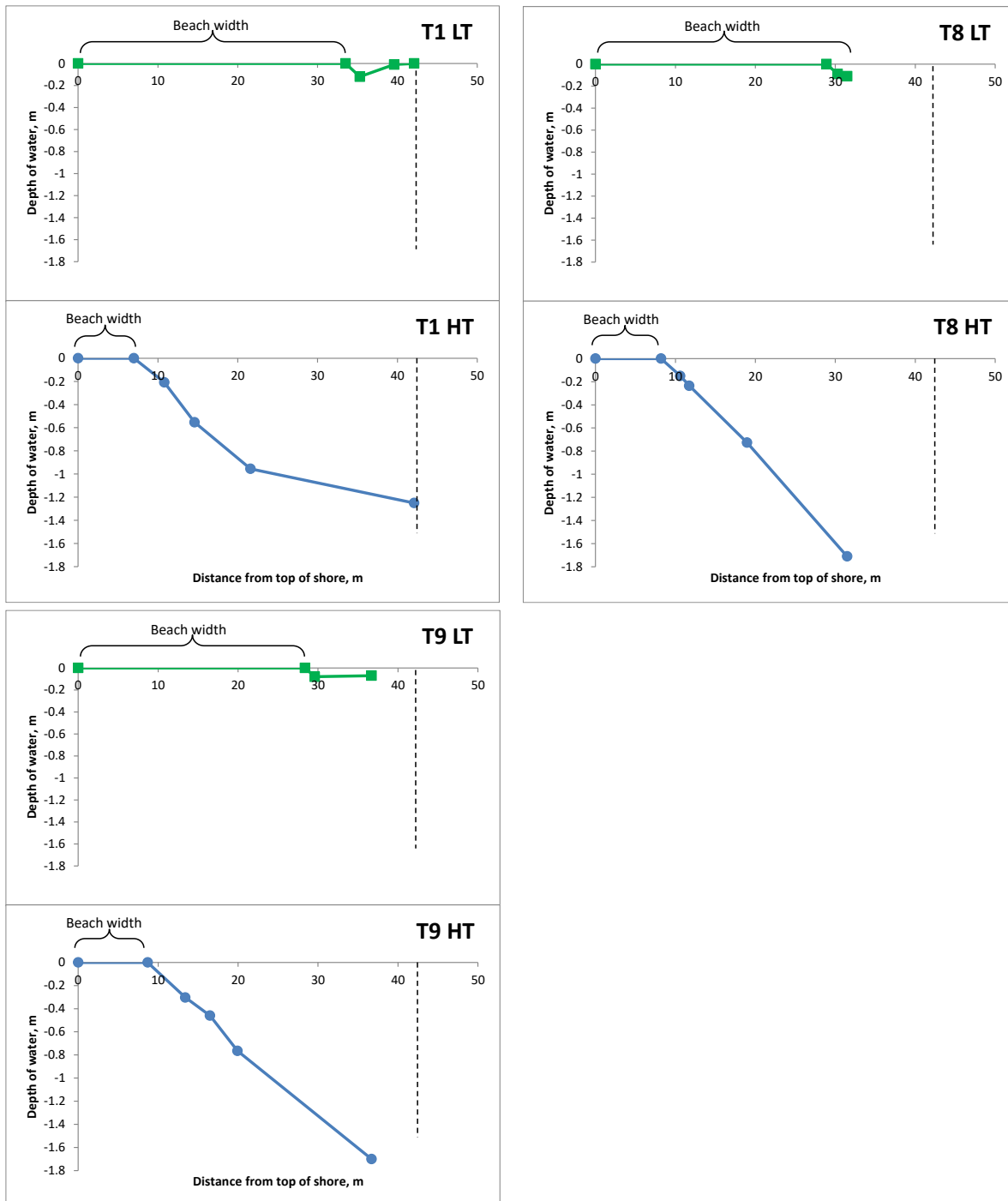


Figure 3. Comparison between high and low tides of the distance and water depth from the back of the shore along Station Beach for three transects. T1 - northern end of the DSA; T8 – middle of the DSA; T9 - southern end of the DSA; Dashed line – position of wharf at the northern end beyond the DSA.

Although it is proposed that the DSA would only be used for dogs off their leash during high tide, it is possible that this restriction may not always be adhered to. Therefore, use of the DSA during low tide must be taken into account. To estimate how often low tides occur during the year at the times of day the DSA would operate, the frequency of high and low tides occurring at 6am and 6pm during five months of the year (2019) was calculated. Week days and weekends were calculated separately to reflect the potential for higher usage on weekend days. The frequencies were then expressed as a proportion of the total number of week days and weekend days in each month. The proportion of week days and weekend days that have low tides in the morning or evening varies depending on the month. For week day evenings January and March have the largest proportions of low tide events, whereas for weekend days the largest proportion of low tide events in the mornings occur in August and in the evenings in January (Figure 3). Therefore, in

these months and times there will be a greater likelihood of dogs and their owners interacting with the seagrass habitat and surrounding soft sediments. Increased compliance patrols would be warranted during these times to minimize this likelihood.

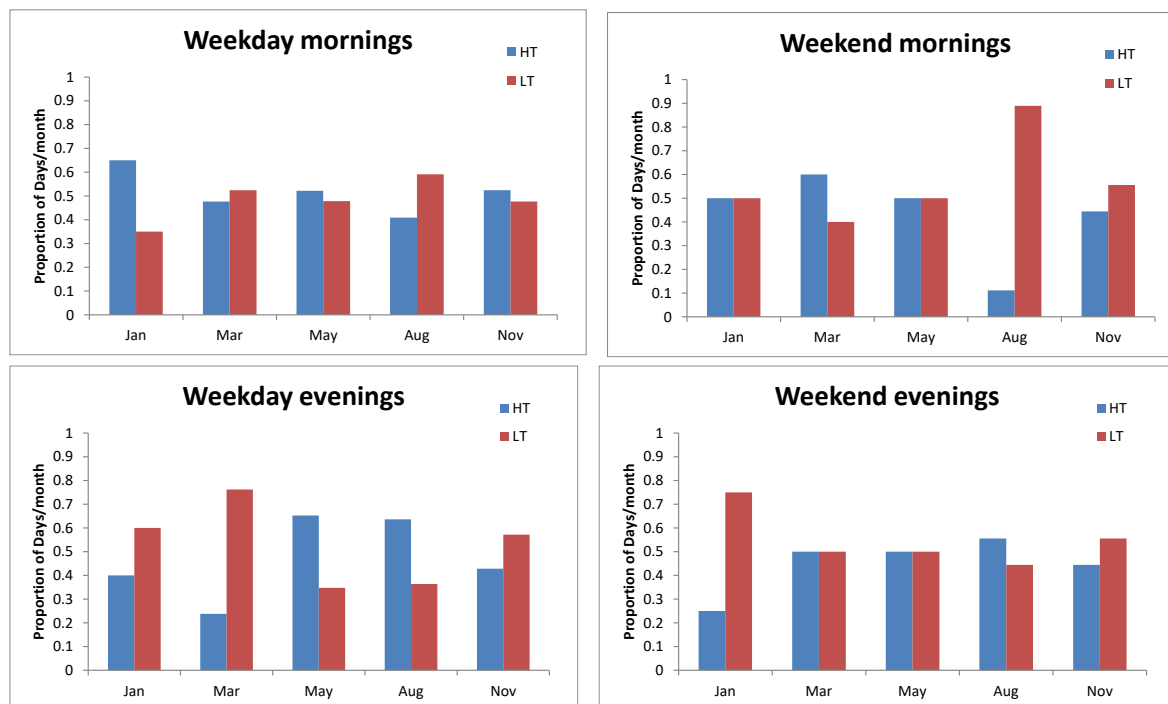


Figure 4. Proportion of days per month when predicted low and high tides occur at 6am and 6pm for 2019.

The estimated areal cover of seagrass within the dog swimming area is 18754.32m² which represents 2.11% of the total seagrass present off Station Beach (Table 6). This areal extent of the seagrass (>5m²) and its species composition means it falls within the Type 1 highly sensitive key fish habitat of DPI Habitat Management Guidelines. The seagrass makes up 65.3 % of the total water area (28,720.9m²) at mid tide within the DSA (Table 6) which means under certain tidal conditions swimming dogs and their owners could interact with the seagrass.

Table 6. Summary of spatial area and percentage of seagrass area, dog swimming area (DSA) and water surface area at Station Beach. SG – seagrass.

	Station Beach	DSA SG	% SG Station Beach	DSA	% SG DSA
SG Area, m ²	890648.41	18754.32	2.11		
Area of DSA, m ²				35901.09	
Water Area of DSA, m ²				28720.87	65.3

4.3 Factors contributing to level of disturbance by dogs and their owners

Whether the interaction between dogs, their owners and seagrass habitats is substantial enough to cause damage to this seagrass and the surrounding soft sediments depends on the intensity of dog activity, frequency, duration and timing, spatial extent, level of compliance to rules and the cumulative effects with other human disturbances in the area. Intensity would be determined by the number and size of dogs using the area, type of activity they engaged in (e.g. walking, running, swimming, see Figure 5) and whether their owners also participated in the activity with their dog in the habitats. Frequency, duration and timing relates to how many week days or weekend days per month the dog swimming area was used, whether this varies during school holidays, public holidays and between winter and summer, how many hours the DSA was used per day and any differences the use between morning and evening. Spatial extent relates to where in the dog swimming area dogs and their owners spend most of their time (e.g. shallow versus deep). Level of

compliance relates to the extent to which dog owners use the DSA during low tide and/or outside the designated area. Finally there are other human disturbances having an impact on the seagrass and soft sediment habitats along Station Beach (e.g. propeller, mooring and anchor scarring) and therefore any additional impacts that maybe caused by dog swimming need to be included in assessing the cumulative pressures on the habitats in this area (Grech et al., 2011).

An appropriately designed study that specifically collects data for these factors would be needed to determine the level of disturbance by dogs within the DSA at Station Beach compared to control areas. During three site visits made to Station Beach for this report, dogs and their owners were observed on the beach despite the fact that there are signs prohibiting dogs on the beach. The number of dogs observed per visit over a three hour period was 2, 3 and 3 and there was evidence of other dogs based on fresh footprints in the sand along the beach. Dogs were medium to large in size and all the dogs were off their leash. This indicates that compliance to the rules of a DSA may be a significant issue. There are approximately 50,000 dogs in the Pittwater area (Northern Beaches Council, pers. comm.) so the potential for more dogs to be using this area is substantial.



Figure 5. Examples of dog activity on Station Beach observed on 22 January, 2019, 4.45pm at low tide.

Green patches are exposed seagrass habitat. The owner of the dog in the right-hand photo removed the dog's faeces immediately after it was deposited.

5. Review of Environment Factors – Questions regarding biological impacts

This section answers the specific questions in Section 3.9 of the Review of Environmental Factor Guidelines (Office of Environment and Heritage, 2016) using the information in the preceding sections of this report. Answers are given in point form.

5.1 Is any vegetation to be cleared or modified?

Yes – three species of seagrass: *Posidonia australis*, *Zostera muelleri*, *Halophila ovalis*

- modification, such as destroying individual plants or part thereof, will likely occur if dog swimming occurs during low or mid-tide, including during night time

Status – *P. australis* in Pittwater is specifically listed as an endangered population in NSW (Fisheries Scientific Committee, 2010)

- *P. australis* in Pittwater is part of the Hawkesbury-Manning Bioregion specifically listed as an endangered ecological community by the Australian government (Commonwealth of Australia, 2015)

Economic and social value – seagrass supports commercial and recreational fisheries by providing habitat for the juvenile stages of important fish species taken by these sectors such as luderick, sand whiting and yellowfin bream.

Habitat provision – seagrass off Station Beach provides habitat and food sources for many estuarine species of fish, invertebrates, algae and plankton.

- provides habitat for White's seahorse (*Hippocampus whitei*) listed as endangered on the IUCN Red List (Harasti and Pollom, 2017).

Area of proposed activity – total area is 35901m² including beach and out into the water level with the end of the wharf, which is accessible during low tide.

- Water area only of the proposed activity is 28720.87m², 65% of which contains seagrass; extent of this area potentially modified by dog interaction cannot be determined until data in the level of disturbance is determined (see 4.3 above)

Condition of the seagrass – *P. australis* off Station Beach is dense with relatively long leaves but in shallow areas tips are affected by exposure to sun during low tides, many shoots with leaves covered with epiphytes with some being grazed by marine snails, abundant fruiting evident in November.

Z. muelleri sparse to dense from intertidal to subtidal with short leaves, shallow intertidal plants affected by exposure to sun, many covered by filamentous brown algae potentially affecting light availability to leaves, *Colpomenia sinuosa* (foliose algae) covering the sediments between shoots in the shallow intertidal potentially affecting light penetration to seed banks in sediments;

H. ovalis sparse throughout bed, short shoots easily disturbed and buried by sediment

Proximity to other natural habitats – seagrass within the dog swimming area is 2.11% of the total seagrass bed off Station Beach with which it forms a continuous bed of seagrass; the seagrass off Station Beach is the largest continuous bed of seagrass in Pittwater (0.879 km², 47% of all seagrass species in Pittwater) and the largest mixed stand of *P. australis* and *Z. muelleri* in Pittwater (0.719km², 92.7%) (see 2.1 above)

Likely response to dog swimming disturbance –disturbance by dog swimming alone during high tide at the scale of individual plants is estimated to be low for all species; disturbance by dog swimming during low tide at the scale of individual plants and bed within the DSA is likely to be very high; *P. australis* has low capacity to respond to disturbance (see 4.1 above); for *Z. muelleri* and *H. ovalis* CTR is moderate to high at the scale of individual plants (see 4.1 above) because they occur in shallower water and likely will be trampled ; but this depends on the level of disturbance (see 4.3 above)

- disturbance by dog swimming in combination with other human disturbances off Station Beach may add to the cumulative impacts affecting the seagrass and its ecological community by depleting the edge of the seagrass habitat along the landward side of the DSA; this may diminish the capacity of the seagrass and its ecological community to re-colonise along this edge and affect the stability of the bed in the area along Station Beach but this depends on the level of cumulative human disturbances (see 4.3 above)

Invasive species – *C. taxifolia* has been spreading in Pittwater since 2001; it may be spread further into the seagrass bed through vegetative growth of broken fragments, especially at the southern end of the DSA where it is less abundant; *C. taxifolia* can potentially change the composition of the fish and invertebrate community (see 3. above).

5.2 Is the activity likely to have a significant effect on threatened flora or fauna species, populations or their habitats or an endangered ecological community or its habitat?

5.2.1 Assessment of significance – endangered population of *P. australis*: will the action proposed likely have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction?

Reduction in population size and reproductive success – depending on the level of disturbance by dog swimming (see 4.3) it is possible individual plants may be damaged and fruits and flowers during its breeding season dislodged before reaching maturity. This could result, over time, in a small reduction of the size of the population and reproductive success. However, the spatial area of *Posidonia/Zostera* within the dog swimming area is 3633.2m² which is 0.46% and 0.49% of the total spatial area of *Posidonia/Zostera* in Pittwater and Station Beach respectively. Therefore, the risk of extinction of the local population of *P. australis* from disturbance by dog swimming alone is low, but depends on the level of disturbance occurring as per section 4.3 of this report.

5.2.2 Assessment of significance – endangered ecological community of *P. australis*: will the action proposed likely have an adverse effect on the extent of the ecological community or substantially modify the

composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Local occurrence - in the Manning-Hawkesbury ecoregion, seagrass in Pittwater is the fourth largest in the region, 245000m² (Commonwealth of Australia, 2018)

- in the Hawkesbury estuary as a whole, the seagrass in Pittwater is the largest by area, making up 56.3% of the seagrass in the Hawkesbury estuary
- since 1980 it is estimated that there has been a 12% decline in the spatial area of seagrass in the whole of Pittwater (Commonwealth of Australia, 2018)
- the above shows that the spatial extent of *Posidonia/Zostera* seagrass beds within Pittwater provide a substantial, complex habitat to sustain its endangered ecological community
- the spatial area of *Posidonia/Zostera* within the dog swimming area is 3633.2m² which is 0.46% and 0.49% of the total spatial area of *Posidonia/Zostera* in Pittwater and Station Beach respectively. Therefore the local occurrence of the ecological community off Station Beach is not likely to be substantially reduced, but depends on the level of disturbance occurring as per section 4.3 of this report.

Risk of extinction – the persistence of the local occurrence of the ecological community may be affected if the dog swimming activity results in a decline of the structure of the *P. australis* bed over time

- given the spatial area of *Posidonia/Zostera* within the dog swimming area is 0.49% of the total in Station Beach, loss of this proportion of habitat alone is unlikely to result in the local occurrence of the ecological community becoming extinct, but depends on the level of disturbance occurring as per section 4.3 of this report.

Composition – the species composition, structure and function of the ecological community may be affected if the dog swimming activity results in the spread of the invasive alga *C. taxifolia* (see 3.0 of this report);

- changes to the composition of the ecological community may occur if mobile species, such as fish and invertebrates, temporarily leave or avoid the dog swimming area, potentially disrupting foraging and increasing stress levels, particularly in juvenile species
- it is difficult to determine whether the composition of the ecological community will be modified without more information about the level of disturbance of dog swimming (section 4.3 of this report) but given the small proportion of the *Posidonia* ecological community exposed to the activity (0.49%) change in composition is likely to be low.

5.2.3 Assessment of significance – population and habitat of the threatened species White's seahorse

(*Hippocampus whitei*): will the action proposed likely have an adverse effect on the life cycle of the species, extent of habitat modification, fragmentation of habitat or importance of the habitat to the long term survival of the species such that a viable local population of the species is likely to be placed at risk of extinction?

Population - *Hippocampus whitei* displays rapid growth, early maturity and reproduction (Harasti et al. 2012), indicating that it has the ability to develop large populations if conditions are appropriate, such as the availability of suitable habitat and few predators (Harasti et al. 2014b); information is available on population status for *H. whitei* from two estuaries where this species was found to be most abundant: Port Stephens and Port Jackson (Sydney Harbour) (Harasti et al. 2012). Resurveys of population abundance at both Port Stephens and Sydney Harbour have found declines in population abundance over the past decade; it is suspected that declines of at least 50-70% have occurred based on the data from the most populated portion of the species' range.

Habitat – *H. whitei* is known to occur at depths to 12 m, using a wide range of habitat types including subtidal seagrasses, macroalgae, corals, sponges, and anthropogenic structures (Kuitert 2009, Harasti et al. 2014); they are site-faithful to a home range (averaging 8 m² for males, 12 m² for females: Vincent et al. 2005) during their breeding season (October to April); The species is known to display strong site fidelity with tagged males occurring on the same site for up to 56 months and females 49 months, whilst no seahorses were ever recorded moving between sites. The species is known not to move far, as the largest distance a tagged animal was found to travel was only 70 m.

Importance of habitat - major threat to *H. whitei* is loss of essential marine and estuarine habitats across its range; as the species displays strong site fidelity and has specific habitat preferences (Vincent et al. 2005, Harasti et al. 2014a), the further loss of key habitats through anthropogenic effects would result in a negative effect on species abundance and distribution; the species has very limited chance for dispersal given that there is no pelagic stage for juveniles, with newborns generally settling in the area of birth and not travelling far (Harasti et al. 2014a); limited geographical distribution and increasing pressures from anthropogenic sources on its habitats.

- life-history parameters of *H. whitei* suggest it may be reasonably resilient if conditions are suitable

Local occurrence – known to be present in Pittwater (see Appendix 1) but there is no information about abundance and distribution over time and spatial extent of *H. whitei* within Pittwater

Extent of seagrass habitat potentially affected by the dog swimming activity – maximum extent is 3633.2m² (0.49% of seagrass off Station Beach); but *H. whitei* would only occupy the subtidal component of this extent within the dog swimming area which would vary depending on the height of low tide; therefore percentage of seagrass habitat of *H. whitei* affected would be less than 0.49%.

- given the spatial area of seagrass habitat within the dog swimming area is less than 1% of the total in Station Beach, it is unlikely to result in the local occurrence of the White's seahorse becoming extinct, but depends on the level of disturbance occurring as per section 4.3 of this report and the abundance and distribution of White's seahorse within Pittwater.

6. Additional Options Proposed by Northern Beaches Council

Northern Beaches Council wanted an evaluation of the option of allowing dog swimming in the area at any time of the tide over the unvegetated (i.e. without seagrass) soft sediment before the seagrass area.

Therefore, at the request of the Council this section provides the following information:

- a) investigation of a buffer zone – for the soft sediment area, before the seagrass area, as an option for dog access to the water at low and mid tide (as well as high tide);
- b) provide a map of the proposed trial area showing where the seagrass is and the soft sediment as well as the buffer;
- c) provide a recommendation for the water depth required above the top of the seagrass and soft sediment bed that would enable dogs to swim in these areas.

It should be noted that DPI Fisheries do not have maps of soft sediment habitats in the Pittwater estuary; it only has maps of where seagrass, mangroves and saltmarsh occur. Therefore, the distribution of soft sediment can only be inferred from the maps available and cannot be relied upon to accurately represent neither the type nor the distribution of the actual soft sediment.

6.1. Assessment of Buffer Zones

6.1.1 Depth buffer zone

In order to allow dog swimming over seagrass and soft sediment at any time of the tide a minimum depth is needed to protect the seagrass canopy and soft sediment near the edge of the seagrass bed from disturbance. The soft sediment needs to be protected from trampling disturbance because this can impact the seed beds of two species of seagrass present in Pittwater, *Zostera muelleri* and *Halophia ovalis*. The following method was used to assess the adequacy of a depth buffer.

For each of the nine transects measured within the dog swimming area (DSA) along Station Beach a minimum depth above the bottom of the seabed of 1 metre (B in Figure 6) was applied to the deepest point measured (see Appendix 3 for diagrams and graphs showing the affect of dog height on depth buffer). The water depth available for dog swimming (D in Figure 6) was calculated by subtracting the buffer (B) from the total depth (A in Figure 6). The available water depth (D) was then compared to the average dog height (shoulder height, see Appendix 3, Table A3.1) of 0.6 metre (C in Figure 6).

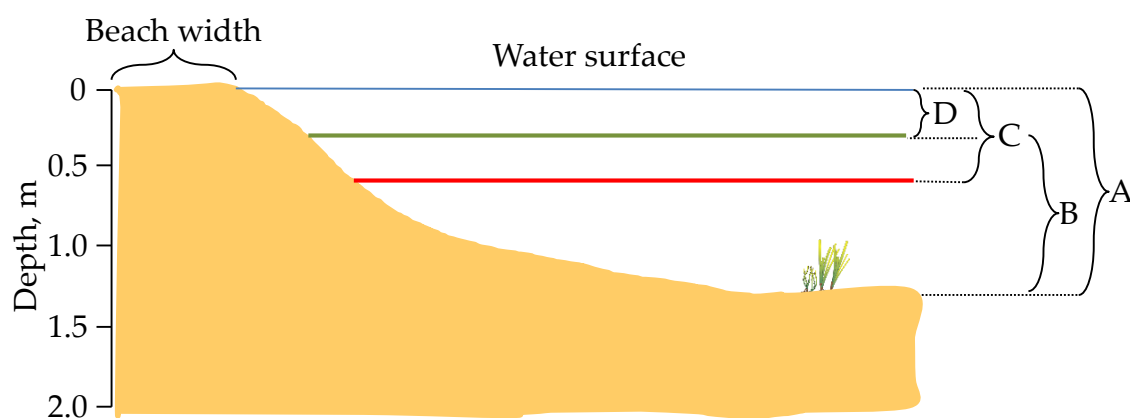


Figure 6. Schematic diagram showing measurements used on each transect to evaluate the adequacy of a depth buffer at high and low tides. A – depth of seagrass, B – depth buffer, 1m, C – average dog height, D – water depth available for dog swimming.

6.1.2 Results

The results show that at high tide only three transects have adequate water depth to accommodate dog swimming over the seagrass (Table 7 and Figure 7). The three transects at high tide are at the mid to southern end of the DSA of Station Beach (see Appendix 2, Figure A2.2). The beach has an increasing depth gradient along its north to south length. Consequently, there are deeper areas at the southern end than the northern end. At low tide no transects had adequate water depth for dog swimming. The transects without adequate water depth means that dogs can only walk across the sediments/seagrass beds.

Table 7. Results of depth buffer analysis for each transect. SG – seagrass, HT – high tide, LT – low tide, ht – height. See Figure 6 for explanation of A- D.

Transect	(A) SG Depth HT, m	(B) Buffer Depth, m	(C) Dog ht, m	(D) Depth available, m	Adequate water available at HT	(A) SG Depth LT, m	Adequate water available at LT
Tr 1	-1.25	-1	-0.6	-0.25	No	0	No
Tr 2	-1.25	-1	-0.6	-0.25	No	-0.0099	No
Tr 3	-1.42	-1	-0.6	-0.42	No	-0.02	No
Tr 4	-1.42	-1	-0.6	-0.42	No	0	No
Tr 5	-1.42	-1	-0.6	-0.42	No	-0.01	No
Tr 6	-1.42	-1	-0.6	-0.42	No	-0.07	No
Tr 7	-1.7	-1	-0.6	-0.7	Yes	-0.08	No
Tr 8	-1.71	-1	-0.6	-0.71	Yes	-0.11	No
Tr 9	-1.7	-1	-0.6	-0.7	Yes	-0.07	No

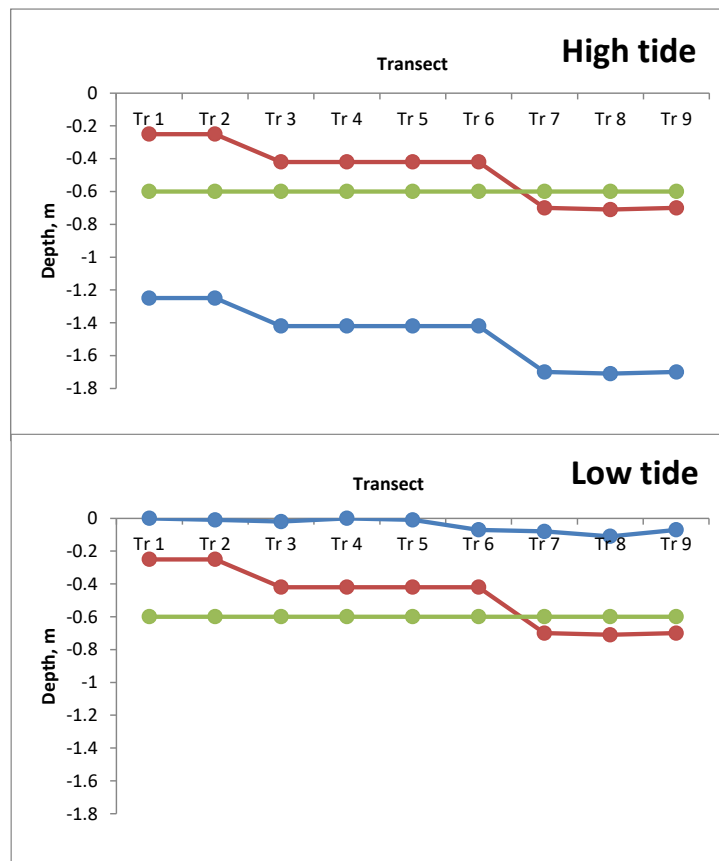


Figure 7. Graphs showing the available water depth above the depth buffer compared to the average dog height for each of the transects along Station Beach in the DSA at high and low tide. Red line – depth available for dog swimming, Green – average dog height, Blue – depth of seagrass bed.

6.1.3 Width buffer zone

In order to allow dog swimming over seagrass and soft sediment at any time of the tide a minimum distance from the landward edge of the seagrass is needed to protect the seagrass and soft sediment near the edge of the seagrass bed from disturbance. The following method was used to assess the adequacy of a width buffer.

For each of the nine transects measured within the dog swimming area (DSA) along Station Beach a minimum width from the landward edge of the seagrass bed of 3 metres (B in Figure 8) was applied to the furthest point measured. The water length available for dog swimming (A in Figure 8) was calculated by subtracting the buffer (B) from the total length from the waters edge to the edge of the seagrass bed (Figure 8). The available water length (A) was then compared to the width buffer (B in Figure 8).

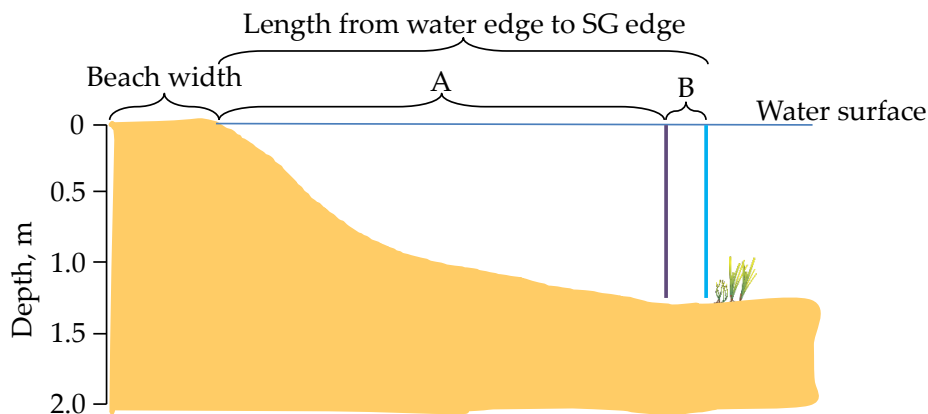


Figure 8. Schematic diagram showing measurements used on each transect to evaluate the adequacy of a width buffer at high and low tides. A – length between water edge and buffer, B – width buffer, 3m.

6.1.4 Results

The results show that at high tide there is adequate water length between the water's edge and the landward edge of the width buffer for dog activity (Table 8 and Figure 9). At low tide, however, only three transects have adequate water length for dog activity, T1, 5, 9. This is due to the irregular landward edge of the seagrass bed north to south along Station Beach. It should be noted that the seagrass edge will vary throughout the year due to seasonal growth patterns of *Z. muelleri* and *H. ovalis*. These species are more productive during summer months and reduce their productivity during winter. Therefore, the seagrass edge will vary naturally as the plants expand and reduce seasonally. The water length in the remaining transects falls within the width buffer zone.

Table 8. Results of width buffer analysis for each transect. SG – seagrass, HT – high tide, LT – low tide.

Transect	Length from back of shore to SG Edge	Width buffer	Length from back of shore to buffer edge	Length from water edge to buffer edge		Available length adequate	
				HT	LT	HT	LT
Tr 1	42.1	3	39.1	32.1	5.6	Yes	Yes
Tr 2	38	3	35	26.1	2	Yes	No
Tr 3	35.6	3	32.6	22.74	0.7	Yes	No
Tr 4	32.1	3	29.1	19	-1.6	Yes	No
Tr 5	38	3	35	25.51	3.9	Yes	Yes
Tr 6	31.29	3	28.29	18.46	-0.74	Yes	No
Tr 7	31.3	3	28.3	16.5	-1	Yes	No
Tr 8	31.48	3	28.48	20.28	-0.42	Yes	No
Tr 9	36.7	3	33.7	25	5.32	Yes	Yes

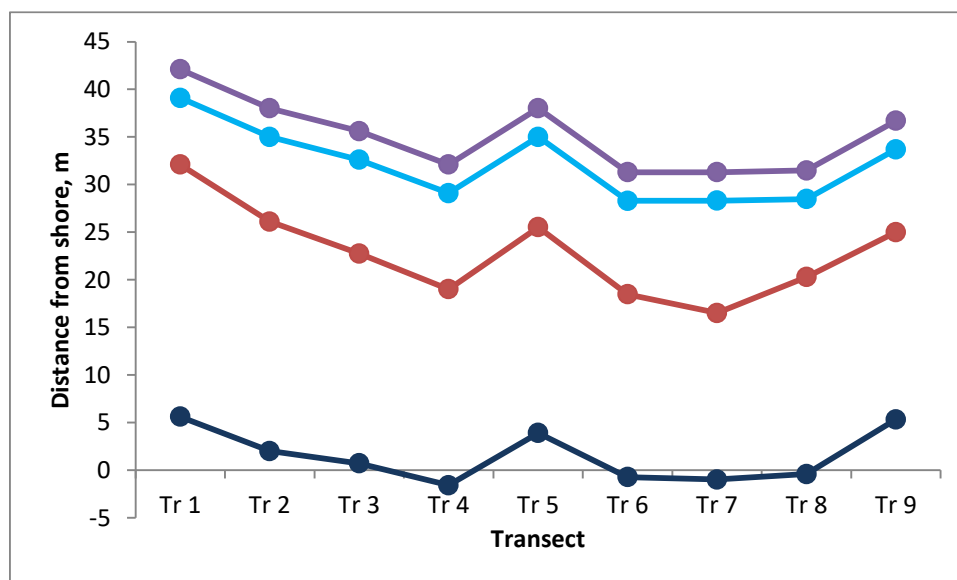


Figure 9. Graph showing the available water length before the width buffer at high and low tides for each of the transects along Station Beach in the DSA Purple – seagrass edge length, Light blue line – buffer width, Red – length from shore at high tide, Dark blue – length from shore at low tide.

6.2 Combining width and depth buffer zones

By combining the depth and width buffer zone analyses the transects where there is both adequate depth and length of water for dog swimming can be identified. At high tide only Transects 7-9 have adequate depth and width to allow dog swimming within the two buffer zones. At low tide none of the transects have adequate depth and width to allow dog swimming. Because of the very shallow topography of the beach

profile from shore to sea, the difference between high and low tide is very small (Figure 10). Therefore, mid tide depths and widths will show little improvement in the available water depth and length. Figure 11 shows profile views of each transect at high and low tide showing the depth and width buffer zones and the available space where dog activity can occur. In order to show the buffer zones clearly the graphs have been plotted at a 1:10 ratio, i.e. 1 metre depth equals 10 metres length. An example of the actual beach profile of 1:1 is compared in Figure 10 for Transect 1.

Figure 10. Graph comparing the high tide beach profile of Transect 1 at actual size (left graph, 1m depth = 1m length) to 1:10 size (right graph, 1 m depth = 10m length) with the depth and width buffer zones. Blue dots and line – water depth to sediment surface, Red line – average dog height, Green line – depth buffer, Purple line – width buffer, Light blue line – seagrass edge.

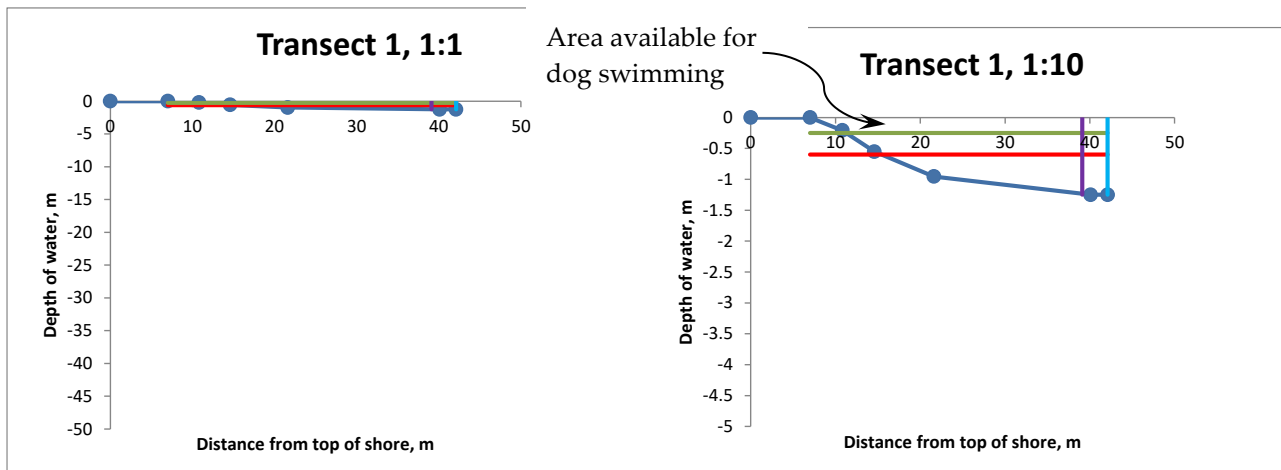


Figure 11. Graphs comparing the beach profiles of each transect at high tide (HT) and low tide (LT) at 1:10 size ratio, showing the depth and width buffer zones. Blue dots and line – water depth to sediment surface high tide, Green squares and line - water depth to sediment surface low tide, Red line – average dog height, Green line – depth buffer, Purple line – width buffer, Light blue line – seagrass edge.

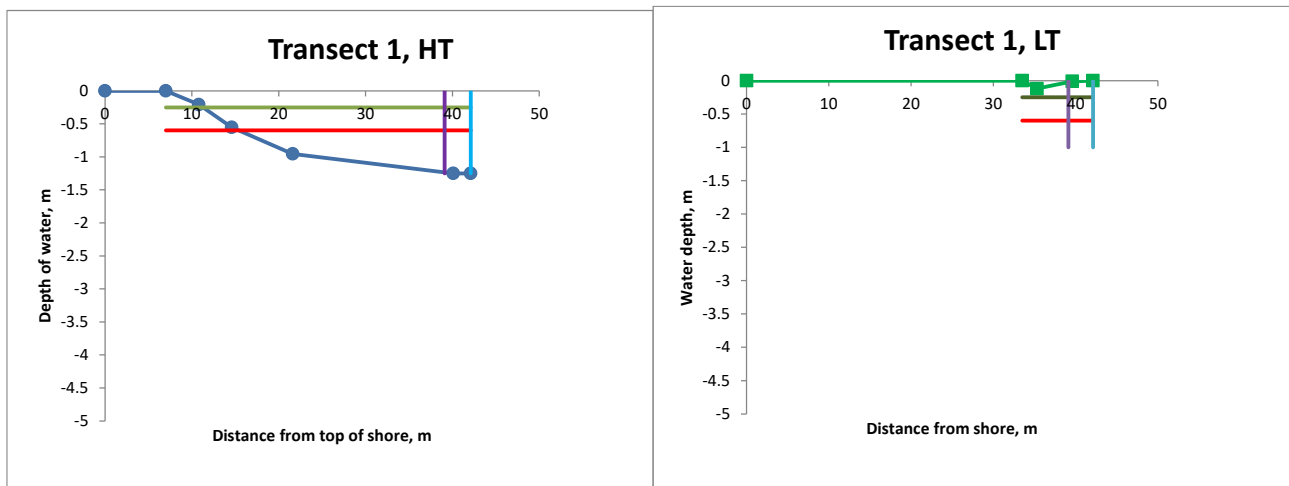


Figure 11 continued

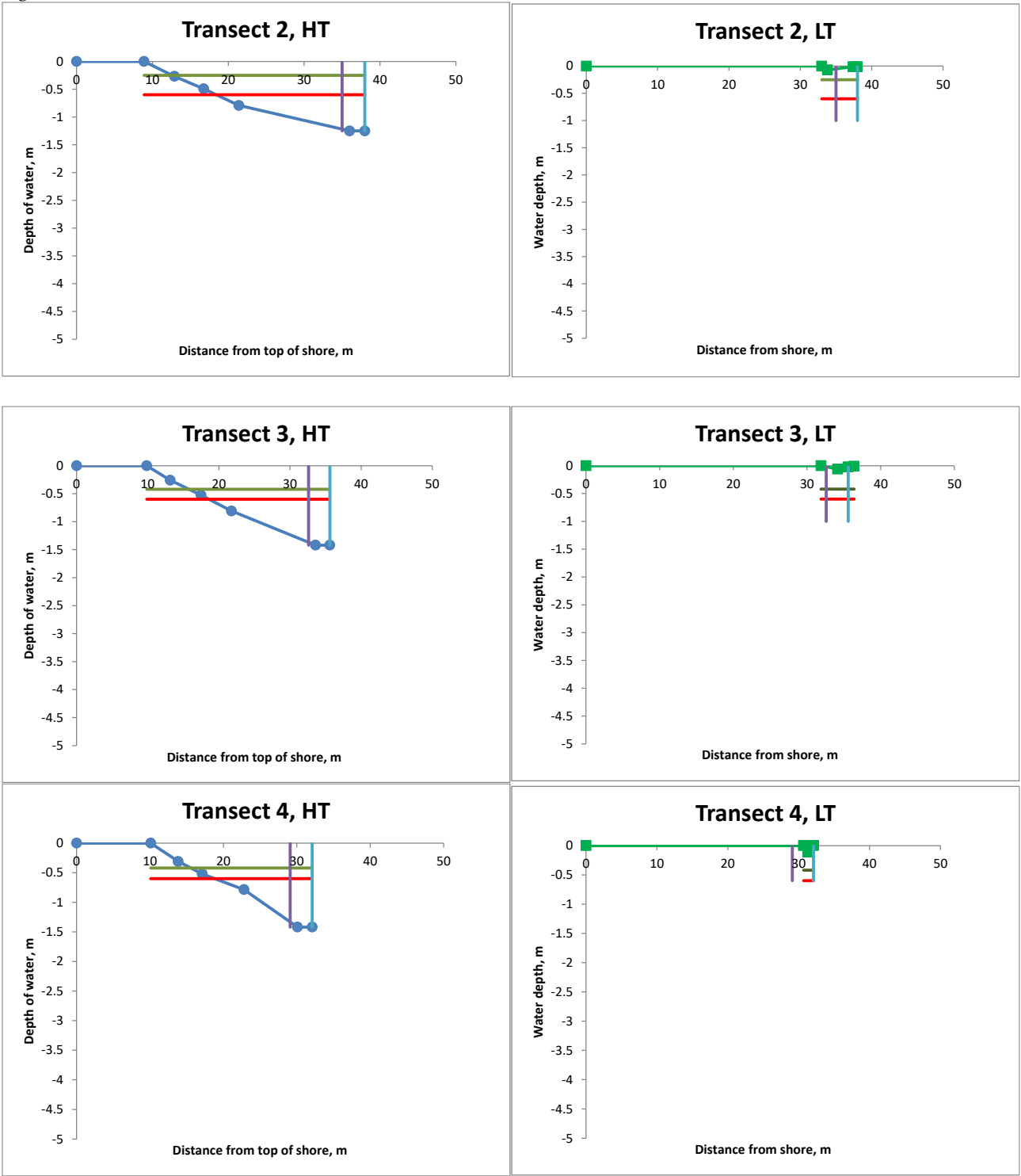


Figure 11 continued

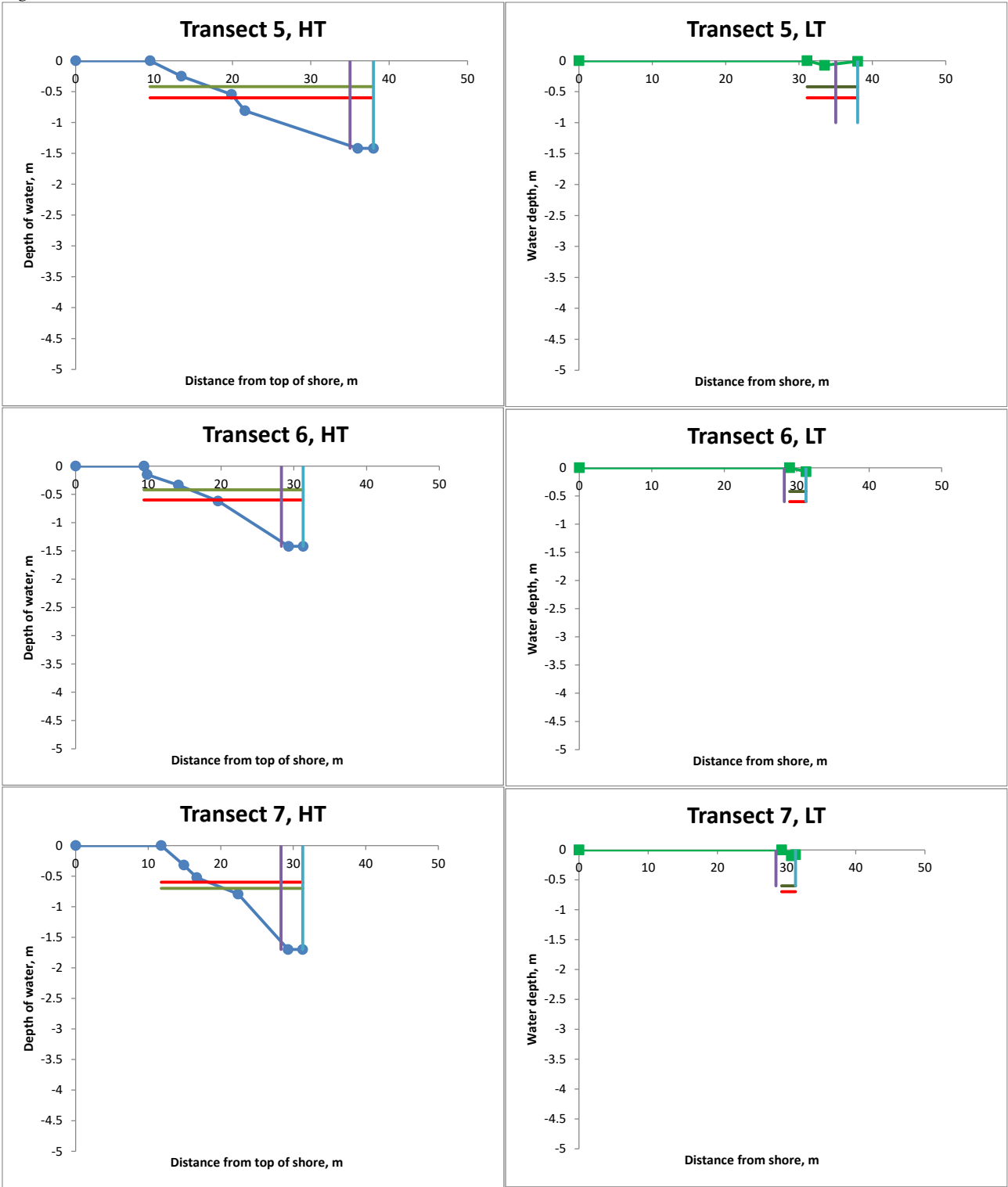
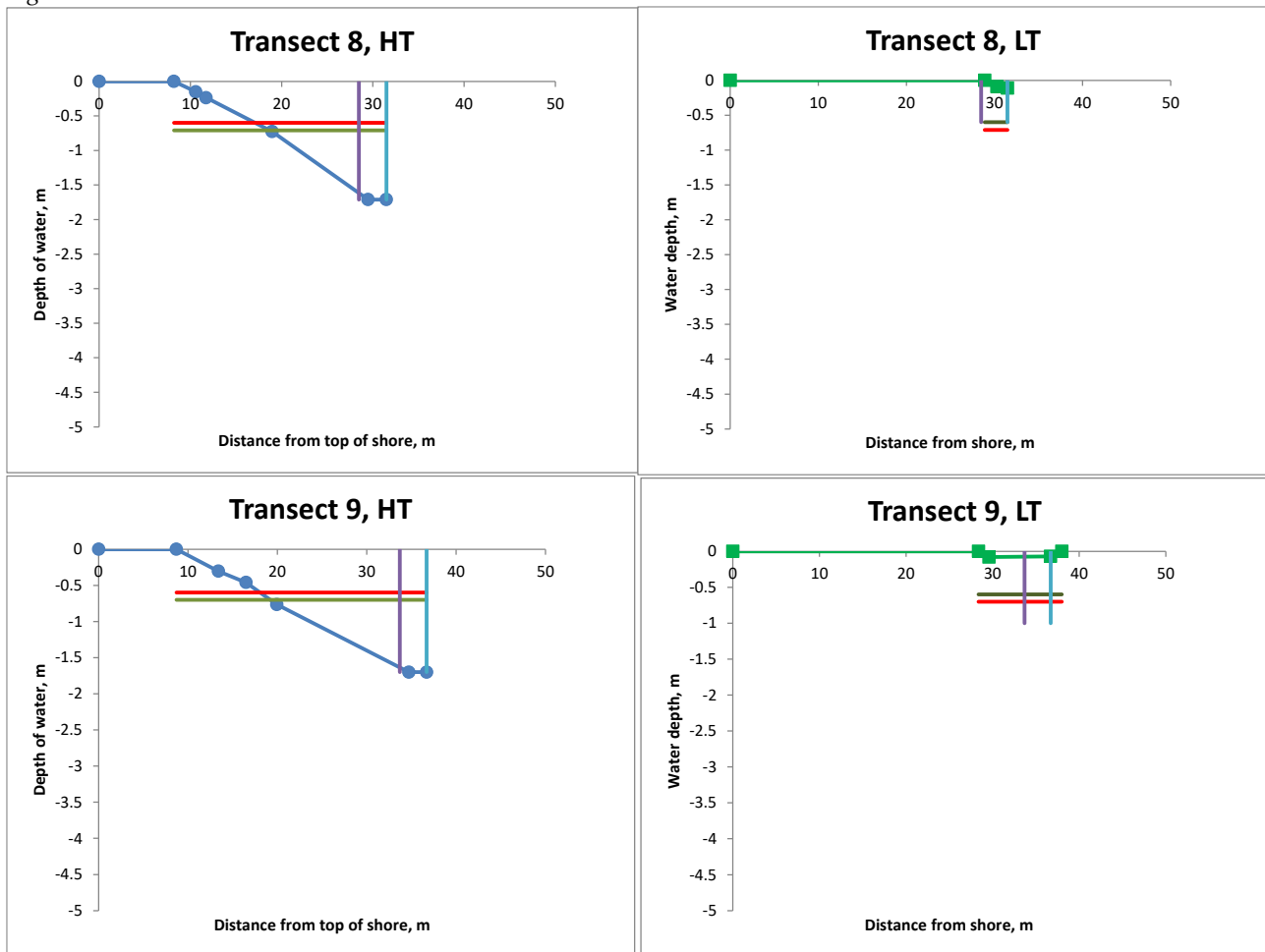


Figure 11 continued



6.3. Map of seagrass bed showing soft sediment edge

Figure 12 show the map of the seagrass bed adjacent to Station Beach. This map is several years old and so the sediment edge may not be accurate. The seagrass beds in Pittwater will be remapped this year (2019) but an updated map will not be available until the end of the year or early next year. Therefore, interpretation of the location of the sediment area in Figure 12 should be done cautiously. It was not possible to show the width buffer zone on this map due to the inaccuracy of the estimate of the sediment edge. It should be noted that seagrass naturally varies seasonally in productivity, more seagrass is produced in summer and less in winter. Consequently, the position of the soft sediment edge will vary throughout the year and from year to year.

6.4. Compromise Option

In consultation with Northern Beaches Council a compromise option was proposed as follows.

A straight boundary line three metres from the edge of the seagrass bed closest to the beach and running parallel to the beach the length of the proposed dog swimming area could be placed to designate the area permitted for dog swimming activity east of the line (Figure 12.). This line would enable dog swimming to be permitted at any time of the tide east of this line.

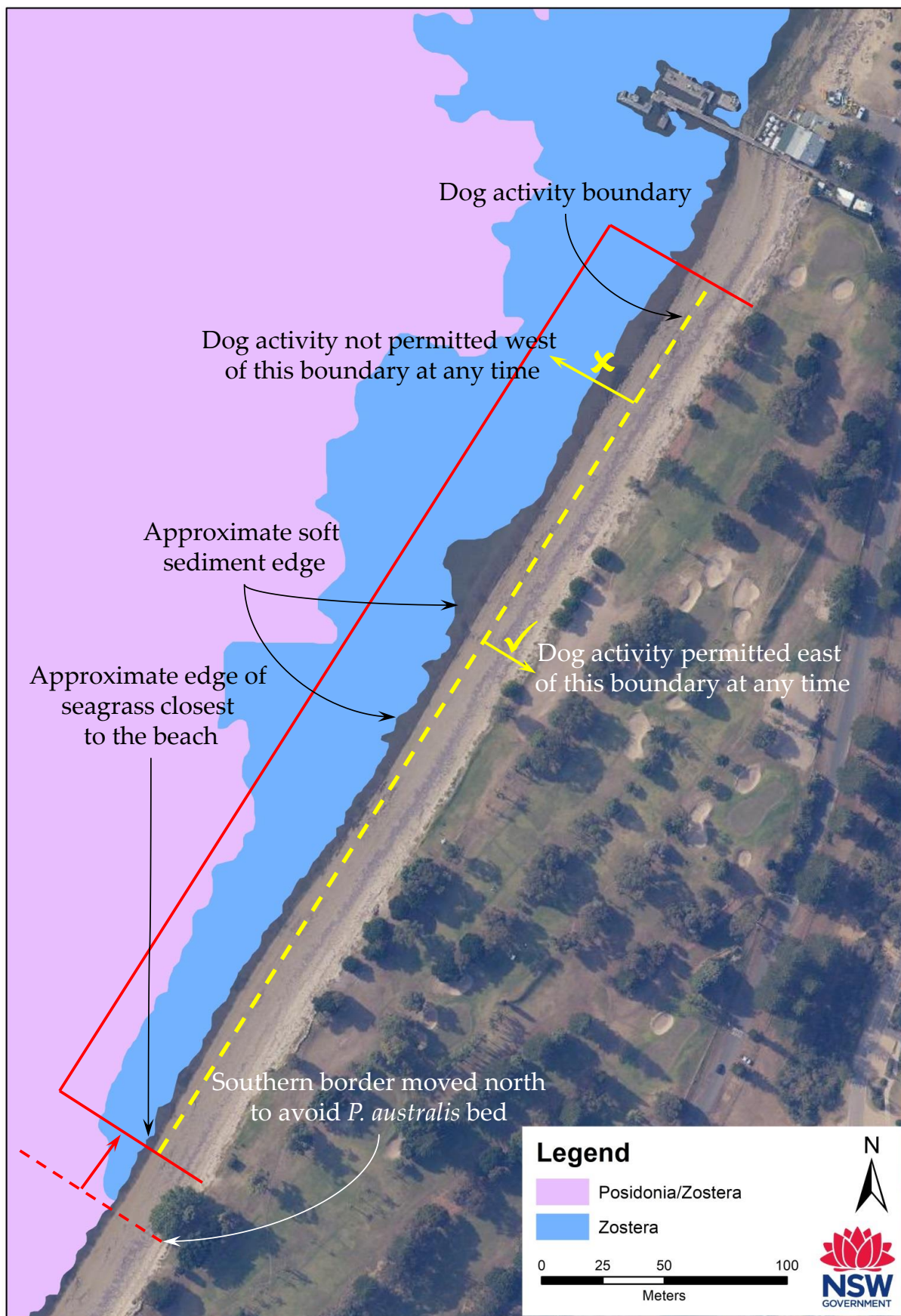


Figure 12. Aerial photo of Station Beach showing the position of the straight boundary line separating dog activity from the seagrass bed.

Application of the line would result in a width of water and beach for dog activity that varies with the tide. Based on the transects measured for this report the average beach width at spring high tide is 9.32m and the average water width available for dog activity east of the straight boundary line is 18.68m. At spring low tide beach width is 30.65 m and the average water width available for dog activity east of the straight boundary line is -2.65m, i.e. no water (Figure 13).

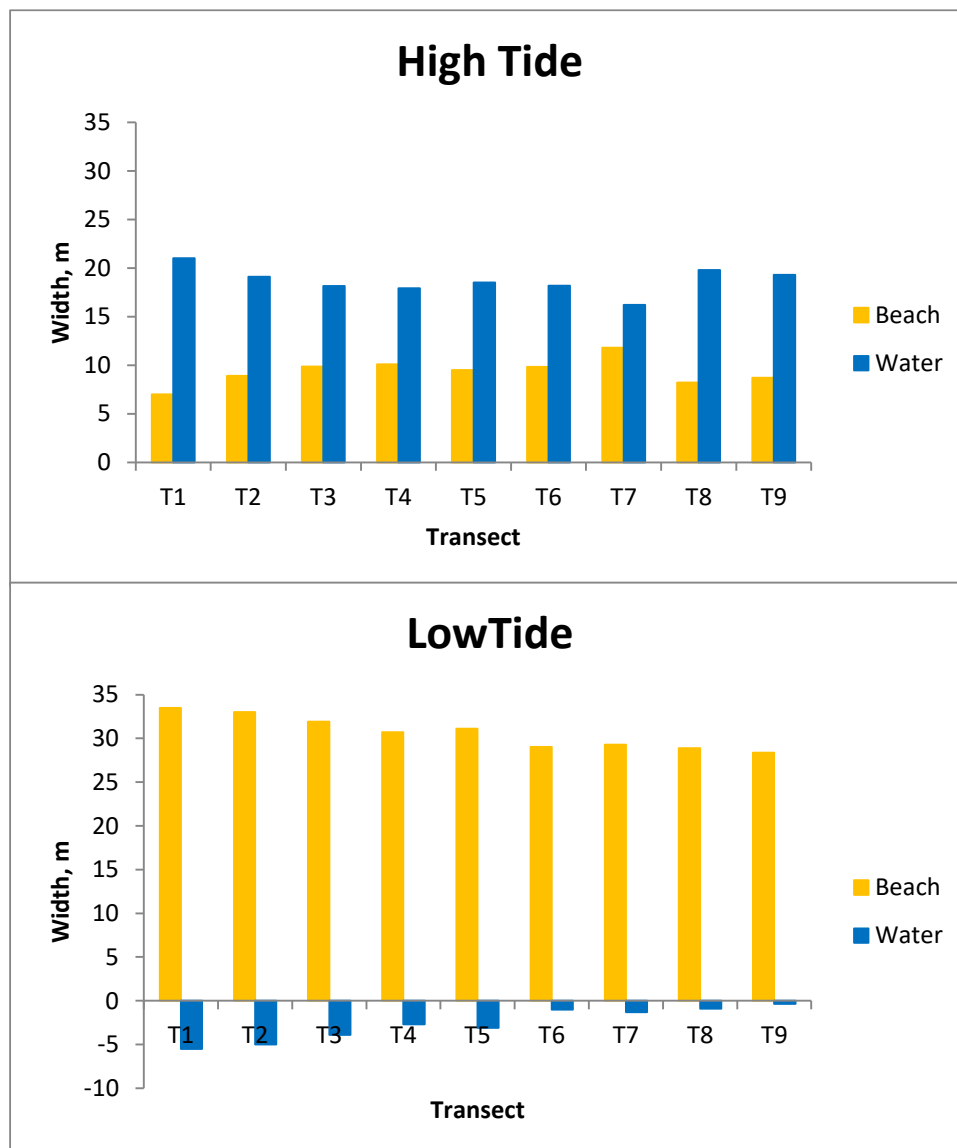


Figure 13. Graphs showing the width of the beach and water available for dog activity at each transect for spring high and low tides on Station Beach.

Figure 14 illustrates schematically the effect of the straight boundary line on the available space for dog activity at different heights of the tide and Figure 15 shows Station Beach at different times of the tide (see also photos in Appendix 4). Only at low tide is there no water available for dog activity. Dogs would only have the beach area to exercise in east of the boundary line during low tide. However, at high and mid tides dogs would have access to a substantial area of water for exercise under their owner's supervision.

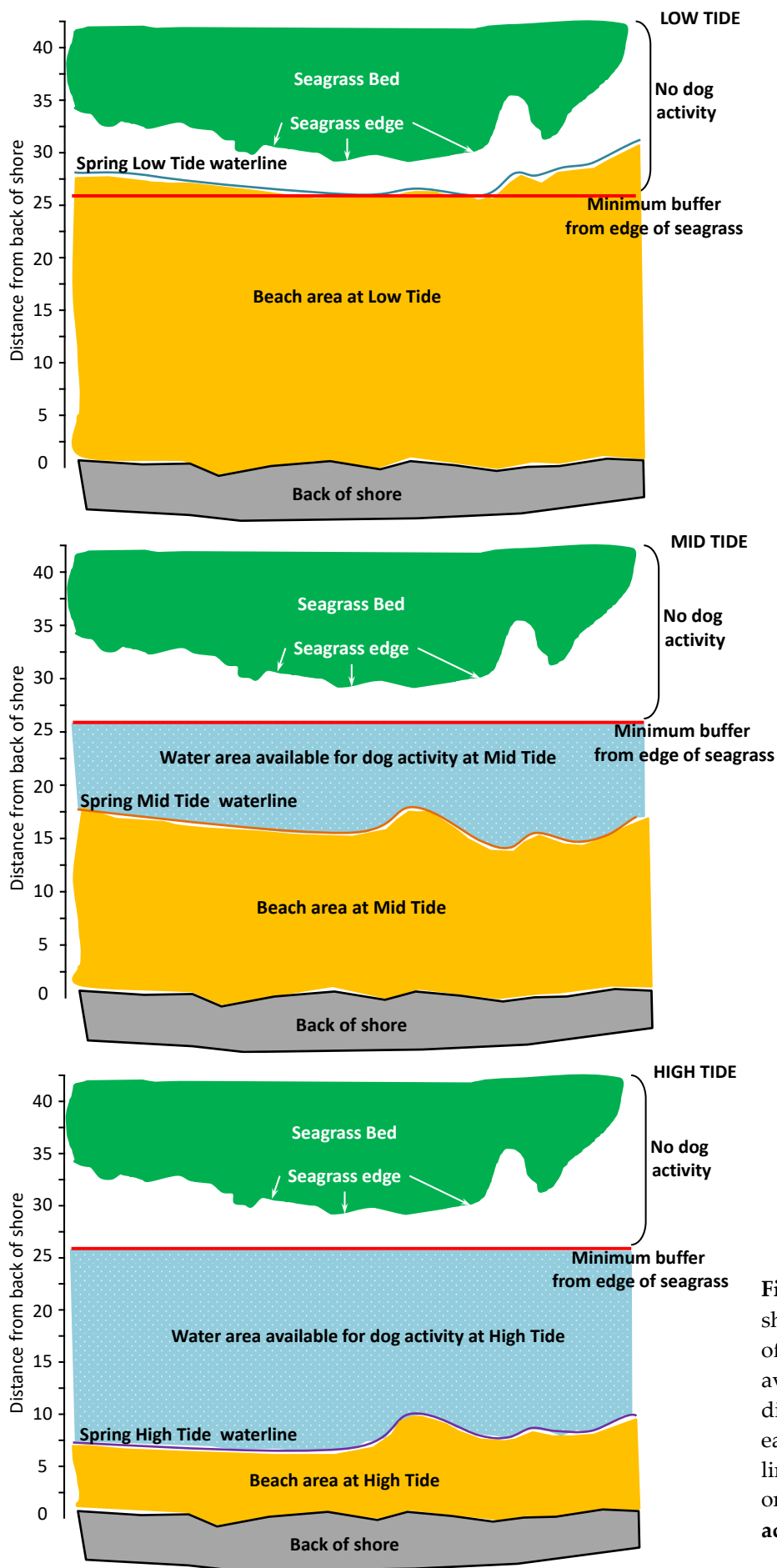


Figure 14. Schematic diagrams showing the different widths of the beach and water available for dog activity at different heights of the tide east of the straight boundary line. This is an illustration only and **does not show the actual minimum buffer line.**

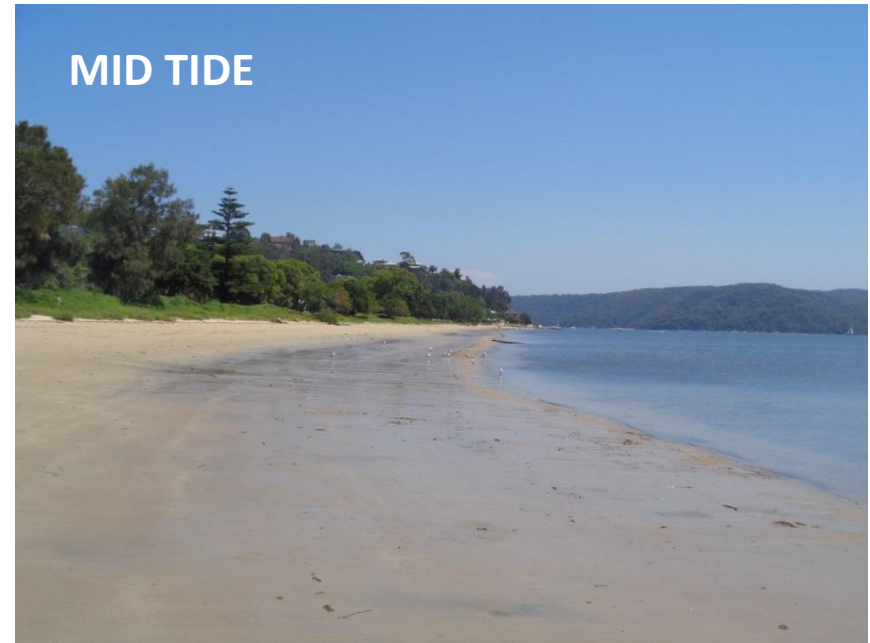


Figure 15. Photos of Station beach at different heights of the tide.

Using a straight boundary line would serve the following functions:

- i) Allows dog swimming activity at any time of the tide whilst keeping dogs and their owners away from the seagrass bed
- ii) Provides a consistent suitable buffer between dog activity and the seagrass bed, limiting disturbance, which allows for seasonal variation in the position of the edge the seagrass bed over time
- iii) Provides a clear permanent boundary line for the community and dog owners that enables them to easily comply with the rules of the DSA
- iv) Provides a clear permanent boundary line for compliance monitoring

7. Recommendations

a) Given the widespread damage to the seagrass bed from other human disturbances off Station Beach, any further damage from disturbances by dog swimming should be avoided. This would be consistent with the conservation advice for *P. australis* ecological community in Pittwater from the Commonwealth of Australia Department of the Environment (2015) (see box below).

Approved Conservation Advice:

4.3 Priority recovery and threat abatement actions

Habitat loss, disturbance and fragmentation

High priorities:

- Avoid further loss and fragmentation of the ecological community.

- b) Serious consideration should be given to whether the introduction of a dog swimming area at Station Beach adjacent to the largest seagrass bed in the Pittwater estuary is consistent with the intent of the legislative and policy commitments provided in Section 2.1.1 of this report and Northern Beaches Council own Draft Pittwater Waterway Strategy.
- c) Educational sessions and information should be provided to local residents of Pittwater, especially dog owners, about the significance and importance of the seagrass beds in Pittwater, particularly regarding their endangered status and the potential impacts of dog swimming and trampling in these habitats.
- d) Council should take the minimum depth buffer zone from the sediment surface to above the seagrass canopy of 1 metre into account in making any decisions regarding allowing human and dog activities in the area off Station Beach
- e) Council should take the minimum width buffer zone from the edge of the seagrass bed landward of 3 metres in making any decisions regarding allowing human and dog activities in the area off Station Beach
If dog swimming/activity is permitted then:
 - f) a straight boundary line be placed three metres from the edge of the seagrass bed closest to the beach and running parallel to the beach the length of the proposed dog swimming area. The latest seagrass habitat map for Pittwater should be used to position this line. NSW Fisheries is in the process of remapping this bed in 2019 and should be contacted for the latest map.
 - g) dog activity be allowed east of this line only, i.e. between the line and the beach, at anytime of the tide
 - h) no dog activity should occur west of this, i.e. over the seagrass area, at anytime
 - i) the southern end of the proposed DSA should be shortened to avoid interaction with the endangered population of *P. australis* seagrass bed that occurs close the shore, see Figure 12.
 - j) compliance patrols should be increased, particularly during peak usage times, such as weekends and school holidays to ensure rules are adhered to
 - k) comprehensive signage at Station Beach should be provided explaining the protection of seagrass in NSW, the endangered status of seagrass in Pittwater and clear explanation of the rules and map of the seagrass and DSA. These signs should be placed at locations at the north and south ends of the DSA where people enter the beach and can be clearly seen and read. The locations of signs on the proposed concept map on the Council's website are inadequate.
 - l) the level of use of the DSA should be monitored to determine the intensity, duration, frequency and timing of disturbances by dogs and their owners on the seagrass and sediment habitats.

m) monitoring the condition and extent of the seagrass habitats within the DSA compared to areas without dog swimming over a year should be conducted to determine whether and to what extent impacts of dog swimming have occurred

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Appendix 1.

Table A1. List of fish species caught in Pittwater in seagrass and unvegetated habitats. Compiled from Jelbart et al. (2006) and Shokri et al., (2009).

Family	Species	Common name
Apogonidae	<i>Apogon cookii</i>	Cook's cardinalfish
	<i>Vincentia novaehollandiae</i>	Eastern Gobbleguts
Atherinidae	<i>Atherinomorus ogilbyi</i>	Ogilby's hardyhead
Blenniidae	<i>Petroscirtes lupus</i>	Brown sabretooth blenny
Carangidae	<i>Caranx spp</i>	Trevally
	<i>Trachinotus spp</i>	Dart
Chandidae	<i>Ambassis jacksoniensis</i>	Glassfish
Clinidae	<i>Cristiceps argyroleura</i>	Silver-sided weedfish
	<i>Cristiceps aurantiacus</i>	Crested Weedfish
	<i>Heteroclinus fasciatus</i>	Weedfish
	<i>Heteroclinus whiteleggi</i>	Banded Weedfish
Clupeidae	<i>Hyperlophus translucidus</i>	Glassy Sprat
	<i>Hyperlophus vittatus</i>	Sandy Sprat
	<i>Spratelloides robustus</i>	Blue sprat
Cynoglossidae	<i>Paraplagusia unicolor</i>	Lemon tongue sole
Dasyatidae	<i>Dasyatis spp</i>	Stingray
Diodontidae	<i>Dicotylichthys punctulatus</i>	Threebar Porcupinefish
Gerreidae	<i>Gerres subfasciatus</i>	Silver biddy
Girellidae	<i>Girella tricuspidata</i>	Luderick
Gobiidae	<i>Arenigobius frenatus</i>	Half-bridled goby
	<i>Bathygobius krefftii</i>	Kreffts goby
	<i>Cristatogobius gobioides</i>	Crested Oystergoby
	<i>Favonigobius exquisitus</i>	Exquisite Sandgoby Goby
	<i>Favonigobius lateralis</i>	Goby
	<i>Redigobius macrostoma</i>	Largemouth Goby
Hemiramphidae	<i>Hyporhamphus regularis</i>	River garfish
Labridae	<i>Achoerodus viridis</i>	Eastern blue groper
Leptoscopidae	<i>Lesueurina platycephala</i>	Flathead pygmy-stargazer
Micricanthidae	<i>Atypichthys strigatus</i>	Australian mado
Monacanthidae	<i>Acanthaluteres spilomelanurus</i>	Bridled leatherjacket
	<i>Brachaluteres jacksonianus</i>	Pygmy leatherjacket
	<i>Cantherhinus pardalis</i>	Honeycomb Leatherjacket
	<i>Eubalichthys mosaicus</i>	Mosaic Leatherjacket,
	<i>Meuschenia freycineti</i>	Six-spined leatherjacket
	<i>Meuschenia trachylepis</i>	Variable (yellow tailed) leatherjacket
	<i>Meuschenia venusta</i>	Chinamen Leatherjacket
	<i>Monacanthus chinensis</i>	Leatherjacket
	<i>Scobinichthys granulatus</i>	Rough Leatherjacket
Mullidae	<i>Liza argentea</i>	Flat-tail mullet
	<i>Mugil cephalus</i>	Striped mullet
	<i>Myxus elongatus</i>	Sand mullet
	<i>Parupeneus signatus</i>	Blacksaddle Goatfish
	<i>Upeneichthys lineatus</i>	Bluestriped Goatfish
	<i>Upeneus tragula</i>	Bartail Goatfish
Odacidae	<i>Neoodax balteatus</i>	Little Weed Whiting
Paralichthyidae	<i>Pseudorhombus jenynsii</i>	Smalltooth Flounder
Platycephalidae	<i>Platycephalus arenarius</i>	Northern sand flathead

Table A1. continued

Family	Species	Common name
	<i>Platycephalus fuscus</i>	Dusky flathead
Plotosidae	<i>Cnidogobius macrocephala</i>	Estuary Catfish
	<i>Plotosus lineatus</i>	Striped Catfish
Rhombosoleidae	<i>Ammotretis rostratus</i>	Flounder, large mouth
Scorpaenidae	<i>Centropogon australis</i>	Eastern fortescue
	<i>Scorpius spp</i>	Sweep juvenile
Serranidae	<i>Epinephelus daemeli</i>	Black Rockcod
Siganidae	<i>Siganus nebulosus</i>	Black Rabbitfish
Sillaginidae	<i>Sillago ciliata</i>	Sand whiting
	<i>Sillago maculata</i>	Trumpeter Whiting
Sparidae	<i>Acanthopagrus australis</i>	Yellowfin bream
	<i>Pagrus auratus</i>	Snapper
	<i>Rhabdosargus sarba</i>	Tarwhine
Sphyraenidae	<i>Sphyraena obtusata</i>	Striped sea pike
Syngnathidae	<i>Filicampus tigris</i>	Tiger pipefish
	<i>Hippocampus whitei</i>	White's seahorse
	<i>Stigmatopora argus</i>	Spotted pipefish
	<i>Stigmatopora nigra</i>	Wide body pipefish
	<i>Urocampus carinirostris</i>	Hairy pipefish
	<i>Vanacampus margaritifer</i>	Mother-of-pearl Pipefish
Terapontidae	<i>Pelates sexlineatus</i>	Eastern striped trumpeter
Tetraodontidae	<i>Reicheltia halsteadii</i>	Halsteads toadfish
	<i>Tetractenos hamiltoni</i>	Common toadfish
	<i>Torquigener pleurogramma</i>	Weeping toad
	<i>Torquigener squamicauda</i>	Brush-tail toadfish
Triglidae	<i>Chelidonichthys kumu</i>	Red gurnard

Appendix 2.



Figure A2.1 Aerial photo showing damage to seagrass off Station Beach from boating, including propeller scaring, anchoring and moorings. Red border – proposed dog swimming area. Image source: Nearmap, Image Date: June 2018.



Figure A2.2 Aerial photo showing positions of transects (T1-9) used to measure seagrass distance from shore and depth. Red dashed border – proposed dog swimming area; Blue lines – transects. Image source: Nearmap, Image Date: August 2017.

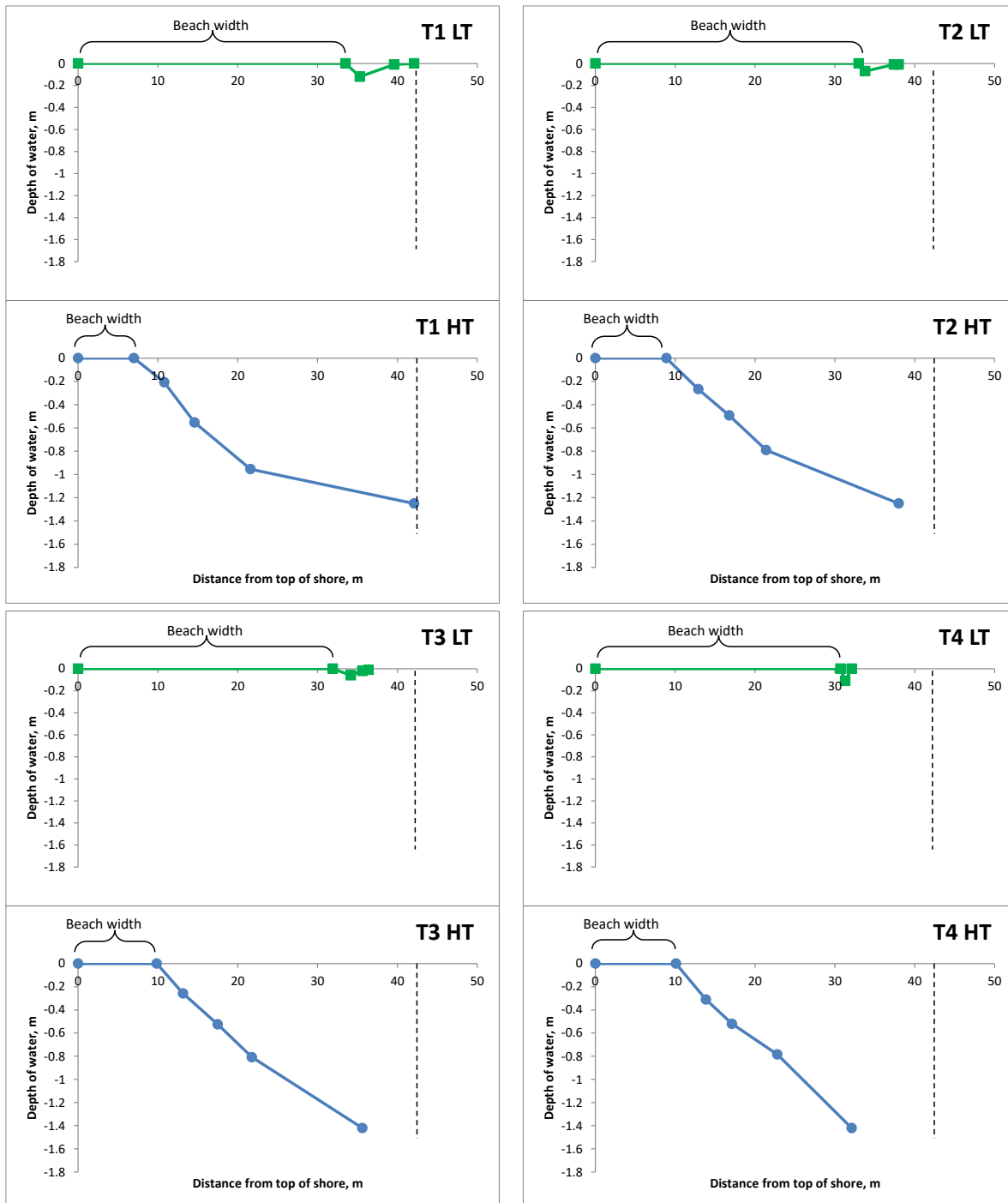


Figure A2.3 Comparison between high and low tides of the distance and water depth from the back of the shore along Station Beach for all transects. Dashed line – position of wharf at the northern end beyond the DSA. HT – high tide; LT – low tide.

Figure A2.3 continued

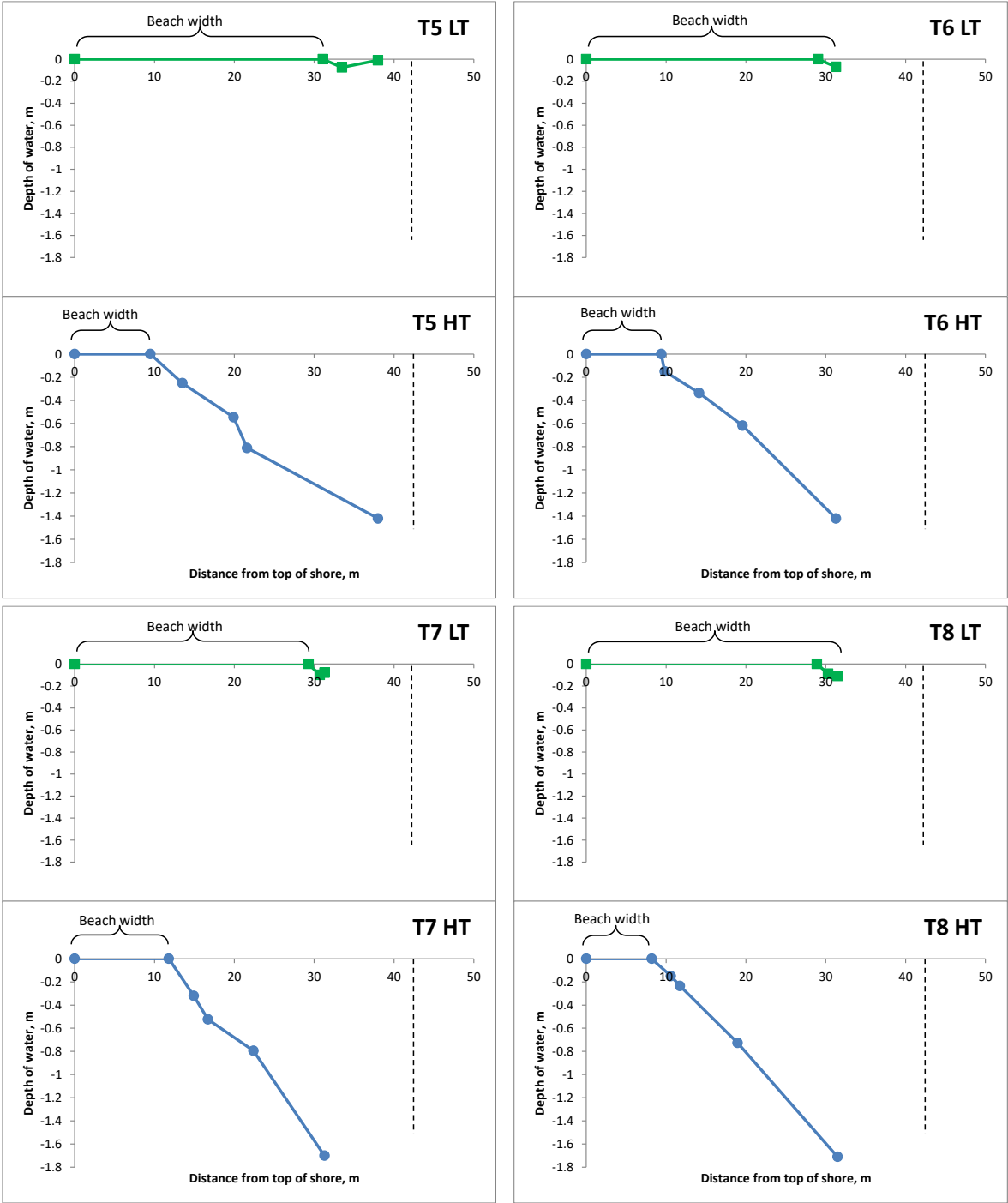
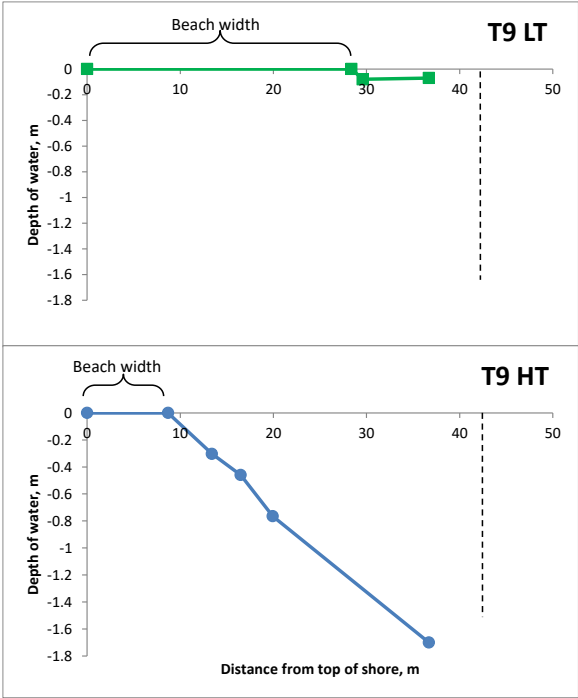


Figure A2.3 continued



Appendix 3

Table A3.1 List of heights of different dog breeds, measured from the shoulder used to calculate average dog height for depth buffer analyses. Source: Wikipedia.

		Shoulder ht, cm		Male	Female
Observed					
Dog Breed	on beach	Male	Female	Max	Max
Great Dane	Yes	76-86	71-81	86	81
Labrador	Yes	57-62	55-60	62	60
Fox terrier	Similar	36-41	33-38	41	38
Jack Russell	Similar	25-38		38	
Toy fox	No	22-29		29	
Average, cm				51.2	59.7
Average, m					0.597

High Tide -Depth of SG sediment is deeper than the buffer

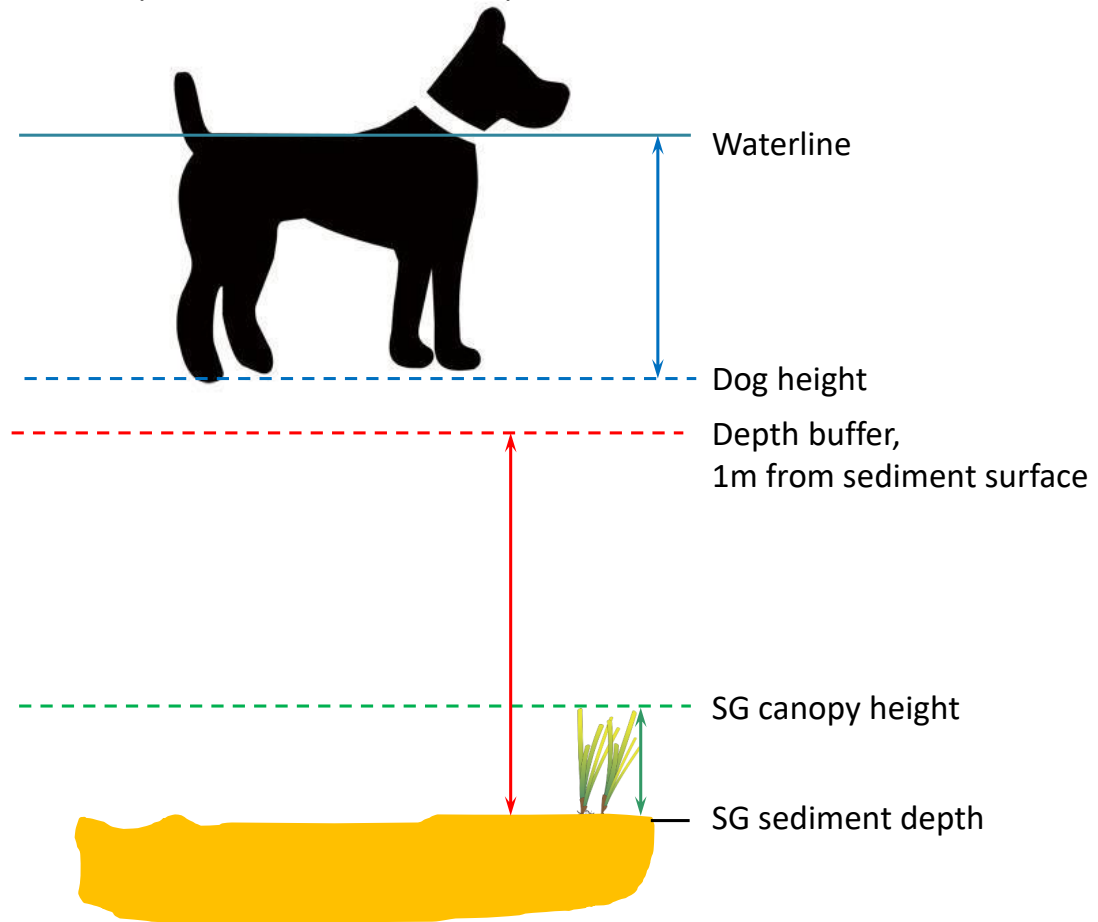


Figure A3.1 Diagram showing average dog height compared to depth buffer at high tide (HT).

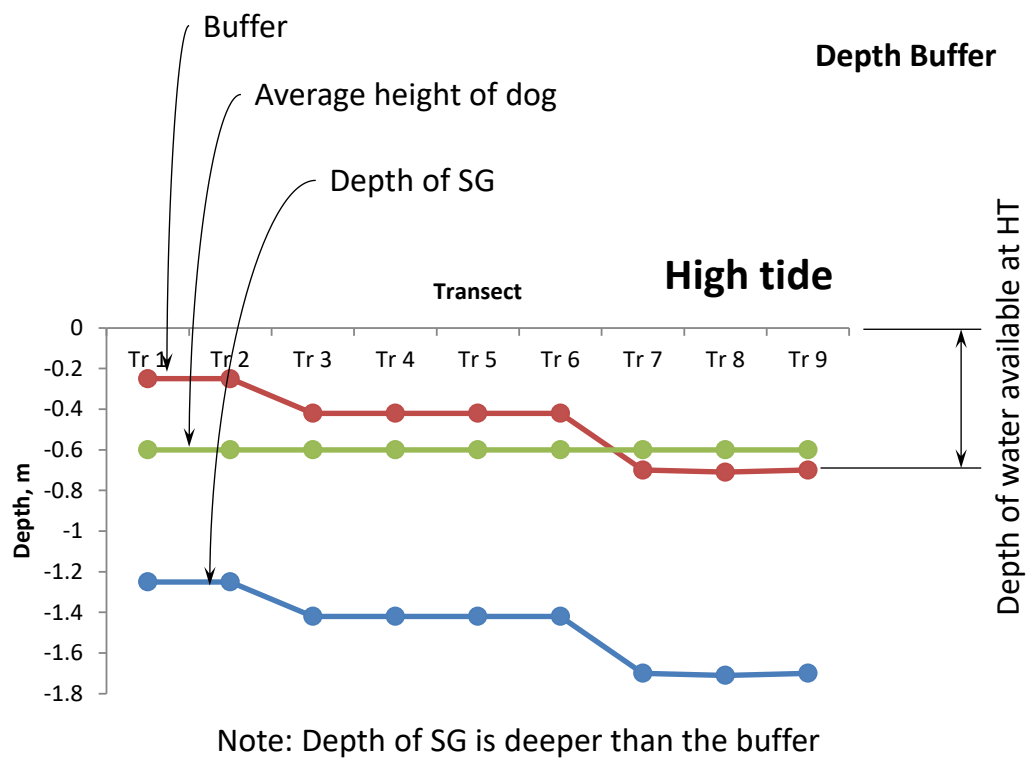


Figure A3.2 Depth of water available at each transect on Station Beach with depth buffer at high tide (HT).

Low Tide - Depth of SG sediment is shallower than the buffer

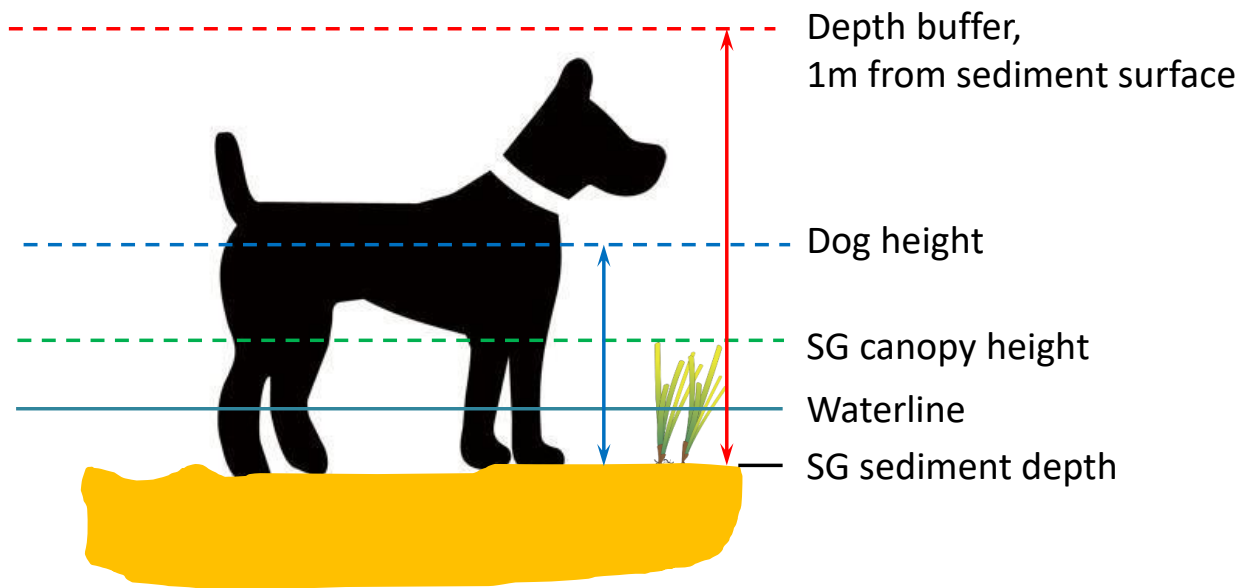


Figure A3.3 Diagram showing average dog height compared to depth buffer at low tide (LT).

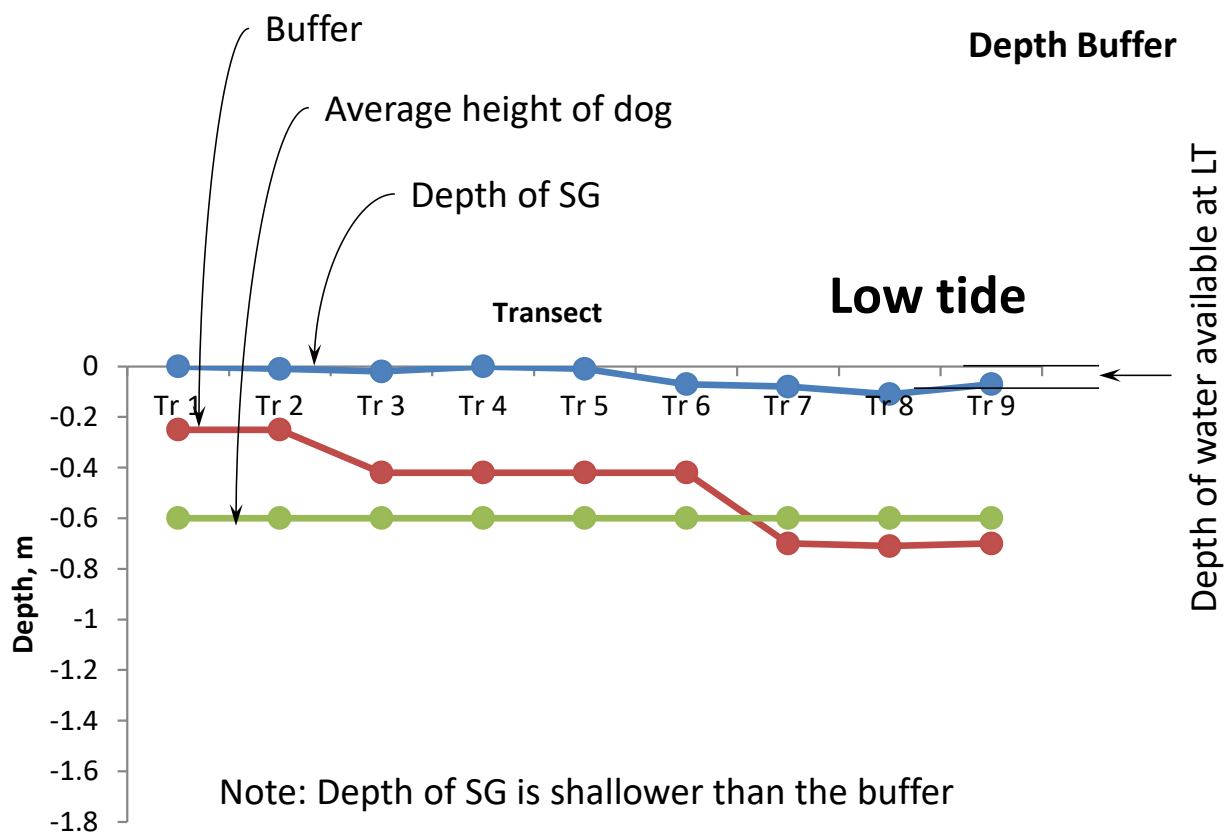


Figure A3.4 Depth of water available at each transect on Station Beach with depth buffer at low tide (LT).

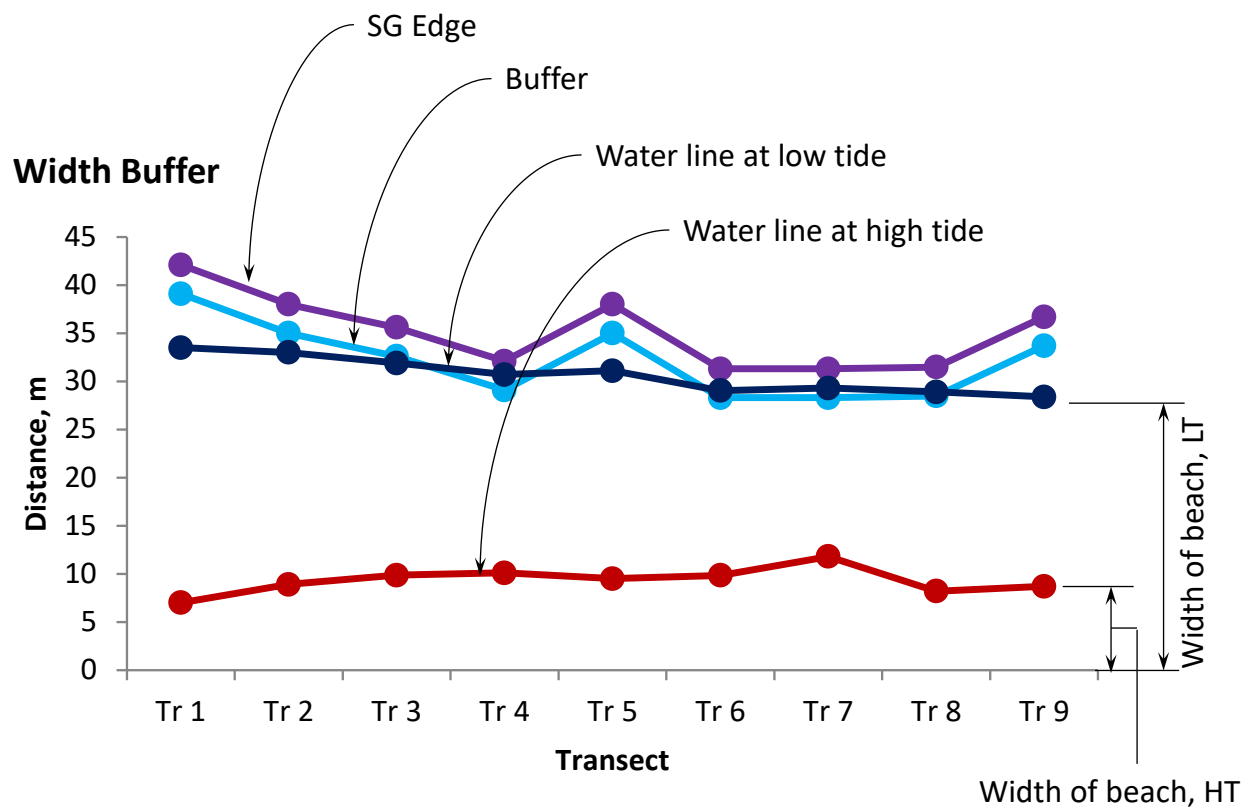


Figure A3.5 Width of beach available at each transect on Station Beach with depth buffer at low (LT) and high tides (HT).

Appendix 4

Figure A4.1. Photographs of Station Beach comparing features at spring high and low tides. DSA – dog swimming area.



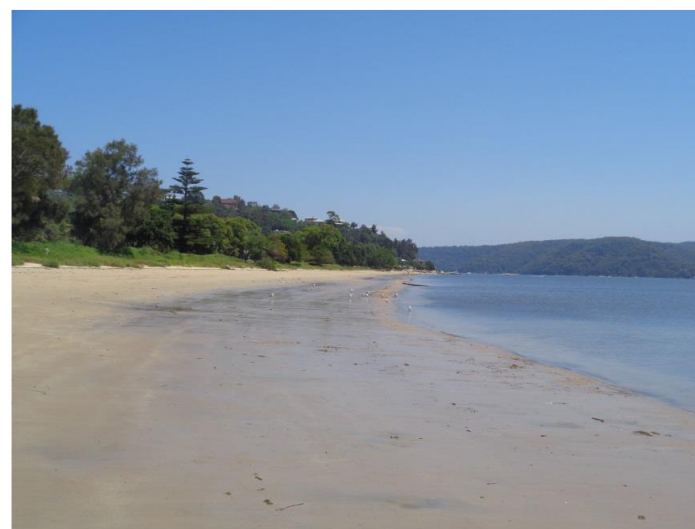
a) Photo of water level at spring high tide (7/12/18, 1.79m)



b) Photo of water level at spring low tide (22/1/19, 0.10m)



c) Photo of beach width at spring high tide (7/12/18, 1.79m)



d) Photo of beach width at spring mid tide (22/1/19, 0.10m)



e) Photo of water level at spring high tide at wharf (7/12/18, 1.79m)



f) Photo of water level at spring low tide at wharf (22/1/19, 0.10m)



g) Photo of exposed seagrass at the southern end of the dog swimming area at spring low tide (22/1/19, 0.10m)



h) Photo of dog exercising within the DSA at spring low tide.



i) Photo of dog foot print in soft sediments within the DSA.



j) Photo of *Z. muelleri* seagrass exposed within the DSA at spring low tide.

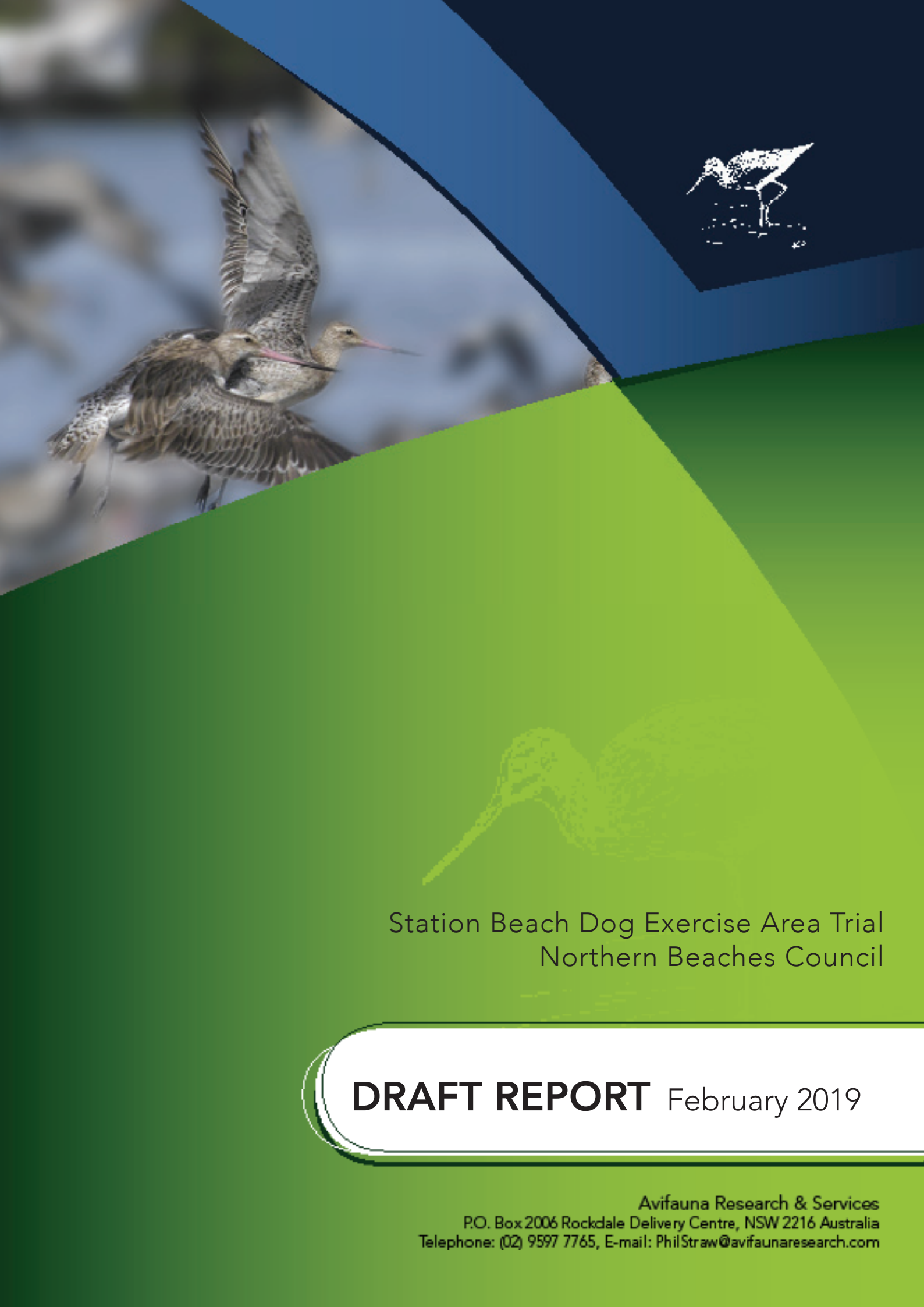


k) Photo of *P. australis* seagrass exposed within the DSA at spring low tide.

APPENDIX

D

STATION BEACH DOG EXERCISE AREA TRIAL
AVIFAUNA REPORT (PHIL STRAW 2019)



Station Beach Dog Exercise Area Trial
Northern Beaches Council

DRAFT REPORT February 2019

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STATION BEACH DOG EXERCISE AREA TRIAL

For NORTHERN BEACHES COUNCIL



Report to Cardno

February 2019

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Station Beach – Dog Exercise/swimming area assessment

Northern Beaches Council is proposing to trial an unleashed dog swimming area at Station Beach, Palm Beach. The proposed site for the trial is approximately 600m long and within the southern end starting at Beach Road and ending at Carmels Boat Shed in the north. The beach is approximately 20m wide at low tide and is bordered by the Palm Beach Golf Course to the east and Pittwater to the west.

Avifauna Research & Services were asked to conduct surveys (diversity of all species and abundance) using tidal flats during receding tides for two hours prior to low tide during November, December 2018 and January 2019. As per requirements for the ornithological section of the REF for the dog exercise area trial at Station Beach.

This report includes the potential impact on birds using the habitats within the study area including shorebirds and other waterbirds. Habitats of woodland and other passerine species of birds were not included in the study area and were not considered likely to be effected by the unleashed dog swimming area subject of this study.

Study methods

Station Beach was traversed the length of southern part of the beach (trial study area) and any birds observed and identified and counted with the use of high resolution 10x50 binoculars and noted in a field note book. It was also noted whether there were any significant bird numbers to the north of Carmels Boat Shed but not recorded (no shorebirds observed there).

Six visits were made on the receding tide to the beach as part of this study during which time birds present were gulls, cormorants, herons (see Table 1)

The surface of the beach was inspected superficially for any signs of benthic organisms that might be prey for migratory shorebirds but no benthic sampling took place to accurately detect the presence or density of any invertebrates that might have been presence. The lack of shorebirds present during each of the surveys and no records of shorebirds found during a search of the BirdLife Australia Shorebirds 2020 database were taken that shorebirds were unlikely to use the site for foraging or roosting. In comparison birds were recorded at nearby sites such as Careel Bay over many years where suitable tidal flats exist.

Potential effect on shorebirds

Shorebirds, in particular migratory shorebirds, rely on tidal mudflats for foraging for prey in the form of benthic invertebrates on or just below the surface of the sand or mud. Shorebirds tend to follow the receding tides as the tidal flats are exposed after roosting during the high tide when the tidal flats are covered and not accessible to the birds.

Frequent disturbance by people, and in particular unleashed dogs, diminishes the time shorebirds have to feed. This is particularly critical just before migration when the birds need to put on fat for an arduous migration, in the case of the Bar-tailed Godwit a 10,000km non-stop flight to the Yellow Sea coastlines of China, a flight taking a week or more (the longest flight recorded for any species of bird).

Frequent disturbance means that the birds have less time to feed and put on fat. This is particularly important just before migration when birds need to put on 50% of their body weight, or more, to sustain their long flights. Frequent disturbance results in the birds having to take flight which also means that they are using up valuable fat reserves each time they are disturbed delaying their migration or in extreme cases preventing them from migrating at all.

All migratory shorebirds are protected by bilateral agreements between Australia and China (CAMBA), Japan (JAMBA), and the Republic of Korea (ROKAMBA) under the EPBC Act 1999. The Department of Planning has responsibility for administration of the bilateral agreement in NSW.

Potential effect on other beach dwelling and waterbirds

The surveys associated with this assessment found a low diversity of birds within the area visited which included only six species of birds. Other species likely to occur include other species of cormorants, gulls, terns, pelicans, ducks and swans that feed on or below the surface of the water in particular over and within the seagrass meadows during high tide or when exposed during extreme low tides where the abundance of fish and other marine fauna appears to be high. Most of these birds would not be disturbed to any significant degree unless dogs were allowed to run into the seagrass beds, except for birds attracted to humans (as a source of food handouts), such as gulls, pelicans or ducks which become habituated to the presence of humans, and to some extent dogs.

Bird species recorded during this assessment at Station Beach:

Little Pied Cormorant	<i>Phalacrocorax melanoleucos</i>
White-faced Heron	<i>Egretta novaehollandiae</i>
Eastern Great Egret	<i>Ardea modesta</i>
Silver Gull	<i>Chroicocephalus novaehollandiae</i>
Crested Tern	<i>Thalasseus bergii</i>
Masked Lapwing	<i>Vanellus miles</i>

Not observed but likely to occur from time to time during a long term study includes other species of cormorants, including Pied Cormorant, Great Cormorant and Little Black. These birds and the Little Pied Cormorant observed during the study spend most of their time swimming and diving from the surface to feed. Little Pied Cormorants were also observed roosting (resting) on barges or the jetty.

Conclusion

The narrow and steeply sloping nature of the beach did not appear to be suitable foraging habitat for shorebirds due to the topography and the confined and highly disturbed nature of the beach which made it less than ideal for shorebirds, other than gulls which are attracted by human presence.

Based on site surveys, the subject land is not considered suitable habitat for threatened or migratory shorebirds and as such, no further impact assessment is considered necessary in relation to potential impacts of the off-leash dog trial on threatened or migratory shorebirds.

Any reduction in the number of dogs off-leash at nearby Careel Bay as a result in the attraction of Station Beach as a dog swimming area would be a bonus to the shorebirds using that site.

Phil Straw
Consultant Avian and Wetlands Ecologist
Avifauna Research & Services.

Table 1: Site visits to Station Beach Nov 2018 to January 2019

Date	Silver Gull	Cr Tern	M Lapwing	White-f Heron	Great Egret	Little Pied Corm	People	Dogs off leash	Dogs on leash		High Tide	Low Tide	Temp	Wind	Knots	Day	
15/11/18	16	2	0	1	0	2	21	0	1	outgoing	14:23	21:26	21	S	18	Thurs	
22/11/18	32	1	2	1	0	2	18	2	1	outgoing nearing	8:11	14:35	24	N	12	Thurs	
5/12/18	26	0	2	1	1	7	45	0	0	low	7:39	14:07	20	ESE	10	Wed	Cormorants roosting on barge
30/12/18	62	1	0	1	1	2	46	1	2	outgoing	15:46	9:43	27	NW	8	Sun	
13/1/19	46	0	0	2	0	3	48	1	2	outgoing	13:43	7:33	22	S	24	Sun	
21/1/19	53	2	2	1	0	2	50	1	2	low tide	9:01	15:43	23	SSE	6	Mon	