

Blackwattle Bay
State Significant Precinct

Attachment 21:

Urban and Marine Ecology Constraints and Opportunities

June 2021



A stylized topographic map with green contour lines is positioned on the left side of the page, extending from the top to the bottom. The lines represent elevation changes, with some forming circular shapes.

Urban and Marine Ecology Constraints and Opportunities

A report to support the Blackwattle Bay State Significant Precinct Study

Infrastructure NSW

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Abbreviations

Abbreviation	Description
BAM	Biodiversity Assessment Method
BAMC	Biodiversity Assessment Method Credit Calculator
BC Act	NSW Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
BSSAR	Biodiversity Stewardship Site Assessment Report
CEEC	Critically Endangered Ecological Community
DNG	Derived Native Grassland
DoEE	Commonwealth Department of Environment and Energy
DPE	NSW Department of Planning and Environment
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
FM Act	NSW Fisheries Management Act 1994
GIS	Geographic Information System
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
LLS	Local Land Service
NSW	New South Wales
NOW	NSW Office of Water
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
SEPP	State Environmental Planning Policy
SSD	State Significant Development

Abbreviation	Description
SSI	State Significant Infrastructure
TEC	Threatened Ecological Community
VIS	Vegetation Information System
WM Act	NSW Water Management Act 2000

1. Executive Summary

1.1 Introduction

This Urban and Marine Ecology Constraints and Opportunities report has been prepared by Eco Logical Australia and on behalf of Infrastructure NSW, to form part of the Blackwattle Bay State Significant Precinct Study (SSP Study). The SSP Study seeks a rezoning for new planning controls for Blackwattle Bay, located on the south-western side of Pyrmont.

In 2015 NSW Government recognised The Bays Precinct as one of the highest potential urban transformation sites in Australia with the release of The Bays Precinct, Sydney Transformation Plan. Following this, the Minister for Planning recognised the renewal of Blackwattle Bay and the broader Bays Precinct as a matter of State planning significance and to be investigated for rezoning through the State Significant Precinct (SSP) process. Study Requirements for the Blackwattle Bay investigation area (formerly known as ‘Bays Market District’) were issued by the Minister on 28 April 2017.

This report provides a comprehensive investigation of Urban and Marine Ecology Constraints and Opportunities to address a part of the Study Requirements and support the development of a new planning framework for Blackwattle Bay, and aims to:

- identify potential ecology constraints to the rezoning of Blackwattle Bay
- provide baseline biodiversity information for use in future impact assessments post-rezoning
- identify potential opportunities to enhance marine and terrestrial habitat and offset loss of habitat due to future development
- review policies and guidelines relevant to the ecology of Blackwattle Bay and any future planned development within the precinct
- address relevant Study Requirements for biodiversity, and urban and marine ecology, including the items listed below. The information provided is relevant to the Precinct planning stage. Further detailed impact assessment will be undertaken at future stages of development when detailed design and construction methods are known.
 - Consideration of City of Sydney planning documents, strategies and policies
 - Assess and document biodiversity impacts in accordance with the Framework for Biodiversity Assessment
 - Prepare an ecological assessment, including threatened species, and species and communities of local conservation significance as identified in the City’s Urban Ecology Strategic Action Plan
 - Demonstrate that the findings of ‘Guiding Principles for Marine Foreshore Developments’ developed by the Sydney Institute of Marine Science and the University of Sydney have been considered in the proposed planning controls (concepts are discussed within this report to guide further design)
 - Ensure possibilities for the mitigation and restoration/creation of marine habitat are investigated
 - Integrate the findings of other urban biodiversity/ecology parts of this study and demonstrate how these have shaped the plan for the site and how they contribute to meeting the City’s Urban Ecology requirements and targets (this report integrates findings from the new Sydney Fish Market reports).

1.2 Legislative context

Relevant environmental legislation and for this rezoning and/or future development reports are:

- Commonwealth Environment Protection and Biodiversity Conservation Act 1999
- NSW Environmental Planning and Assessment Act 1979
 - Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005
 - State Environmental Planning Policy (Coastal Management) 2018
- NSW Biodiversity Conservation Act 2016
- NSW Fisheries Management Act 1994
- NSW Coastal Management Act 2016

1.3 Methods

Desktop and field investigations were carried out related to terrestrial and aquatic ecology, including analysis of flora and fauna records, site surveys and underwater photography (July-August 2017 and September 2020).

1.4 Constraints

1.4.1 Aquatic constraints

The aquatic habitat and biodiversity are comparable, if not slightly poorer condition, than nearby bays within Sydney Harbour (Rozelle, White and Johnstons Bay, Gore and Iron Cove). Aquatic habitat in the study area had been modified by vertical seawalls, wharf structures, pontoons, piles and disturbance by regular boat traffic. The dominant habitat was unvegetated subtidal sand. Macroalgae and intertidal rock rubble provided some variation in habitat around the shallow fringes of the bay. Due to historic land reclamation and seawalls, no large areas of saltmarsh or mangroves can establish. No seagrass occurred in the bay, possibly due to poor water clarity, salinity and/or disturbance from boats. No threatened species, populations or communities were observed in the study area, however, protected or proposed threatened seahorses could use the western shallows where macroalgae (seaweed) was more prominent.

1.4.2 Terrestrial constraints

A high proportion of the study area has been mapped as supporting areas of a Biodiversity Corridor. Given the urban context and the type of habitat provided (mostly landscape plantings and street trees) the mapping is taken to refer primarily to highly mobile species such as birds and bats. The vegetation on site does not form a recognisable native vegetation community (or Plant Community Type) and therefore the mapping has categorised the vegetation by its canopy family and understorey. No hollow-bearing trees which may provide roosting/nesting habitat for threatened mammals (including microbats) and birds, were identified during the site inspection. However, there are several areas of high-medium potential microbat habitat located in built structures. These structures may support several species of threatened microbats, such as *Myotis macropus* (Southern Myotis) and *Miniopterus orianae oceanensis* (Large Bent-winged Bat). Several trees in or adjacent to the study area contain potential foraging habitat for the threatened *Pteropus poliocephalus* (Grey-headed Flying Fox). No other threatened fauna are likely to depend on habitat within the study area. Canopy vegetation also provides potential habitat for small birds of local conservation significance. No threatened flora were identified during the terrestrial site inspection.

1.5 Opportunities

1.5.1 Aquatic opportunities

Habitat enhancement opportunities should aim to replicate natural elements, such as cracks, crevices and pools in the intertidal and subtidal zones of the bay. Habitat enhancement should aim to increase the abundance and diversity of sessile and less-mobile marine organisms that support a localised food web and improve ecological complexity and use by larger mobile fauna. Habitat improvement opportunities in the bay are most likely achievable on:

- Subtidal sand (>2 m depth) – deploy ‘oyster reefs’ to provide colonisation and refuge for marine fauna
- Subtidal sand (1-2 m depth) – subject to boat safety considerations, install scattered rubble to connect macroalgae habitat
- Macroalgae (dense *Sargassum linearifolium*) – plant/transplant native macroalgae and/or increase rocky rubble to improve continuity and width
- Intertidal rocky rubble seawalls – construct water retaining features and increase structural complexity of intertidal or subtidal zones of seawalls
- Vertical and sloped smooth seawalls – replace with gentle grade wall and/or retrofit with horizontal features like flowerpots, water retaining features and complex hard surfaces
- Vertical rough seawalls – retrofit with horizontal features like flowerpots
- Sloped stepped seawalls – increase macroalgae habitat at base through planting and/or additional rubble
- Future boardwalks, wharves and jetties – design to allow light penetration to water, and suspend fish aggregation devices
- Future floating boardwalks (temporary) – add benthic habitat features to improve fish shelter and connectivity
- Piles – select products with rough surface and/or attach rough material for macroalgae attachment.

1.5.2 Terrestrial opportunities

Master planning and development design could include indigenous vegetation planting in landscaping works, creation of roof-top gardens, green walls, artificial wetlands and water-sensitive urban design. There is opportunity to connect fragmented habitat by strategic placement of habitat nodes or linear connections. Terrestrial vegetation also influences water quality that then affects marine ecology. Specific design considerations for the bay include:

- Give preference to planting locally native species. The use of deciduous trees should be avoided, as excessive leaf litter blowing/washing into the harbour can impact marine habitat.
- Incorporate trees into the master plan with the aim to shade pavement. This will reduce warming of surface water before entering the harbour. Warm water can favour exotic marine species.
- Incorporate trees, garden beds, microbat habitat boxes and ground complexity into the master plan to connect patches of vegetation. This will aid fauna passage, foraging and breeding opportunities, and dispersal and exchange of genetic material.
- Use pervious surfaces for open-space areas to allow water to soak into the soil rather than flow off quickly to the harbour.

- Select low-spill lighting near habitat vegetation to reduce disturbance to nocturnal animals.

1.6 Recommendations

There are few major ecological constraints to the proposed rezoning and future development which require further consideration as design progresses. However, there are several opportunities to enhance the terrestrial and marine ecology with reasonably simple considerations in design and habitat connectivity. To ensure the full suite of opportunities are explored during future master planning and detailed design, the following recommendations should be adopted:

1. A future impact assessment (BDAR and Marine Impact Assessment) is required to support any future development application, to measure habitat loss and calculate biodiversity offsets. This should include targeted microbat surveys around built structures.
2. Marine design features should aim to increase structural complexity of the intertidal and subtidal zones. This could be achieved through a combination of new gentle-sloped seawalls, retrofitting existing hard structures, adding rocky rubble and deploying artificial reefs to promote macroalgae growth and colonisation by marine fauna. Selection of areas to enhance should consider opportunities to improve habitat connectivity and width and be at a scale that does not cause the significant loss of another habitat type, plus avoid creating navigational hazards.
3. Develop an overarching Aquatic Biota Management Plan (ABMP) to guide design and installation of specific marine habitat elements. The ABMP should consider a monitoring period of at least five years to determine the extent to which the habitat enhancements have been successful – and therefore provide lessons for future harbour infrastructure.
4. Incorporate terrestrial habitat features into landscape plan and building designs. This should aim to provide both micro-habitats, stratified habitats and improve connectivity along existing or broken habitat corridors.

2. Introduction

This Urban and Marine Ecology Constraints and Opportunities report has been prepared by Eco Logical Australia and on behalf of Infrastructure NSW, to form part of the Blackwattle Bay State Significant Precinct Study (SSP Study). The SSP Study seeks a rezoning for new planning controls for Blackwattle Bay, located on the south-western side of Pyrmont.

Blackwattle Bay presents a significant opportunity for urban renewal across 10.4 hectares of predominantly government owned land less than 1 km from the Sydney CBD. NSW Government is investigating the delivery of a Metro Station in Pyrmont and has recognised the potential to transform the Pyrmont Peninsula with a new 20-year vision and planning framework through the Pyrmont Peninsula Place Strategy.

In 2015 NSW Government recognised The Bays Precinct as one of the highest potential urban transformation sites in Australia with the release of The Bays Precinct, Sydney Transformation Plan. Following this, the Minister for Planning recognised the renewal of Blackwattle Bay and the broader Bays Precinct as a matter of State planning significance and to be investigated for rezoning through the State Significant Precinct (SSP) process. Study Requirements for the Blackwattle Bay investigation area (formerly known as 'Bays Market District') were issued by the Minister on 28 April 2017.

A critical part of Blackwattle Bay's revitalisation and vision has been NSW Government's decision to relocate the Sydney Fish Market from its existing location on Bank Street to the head of Blackwattle Bay. This was sought through a State Significant Development Application (SSDA) process and approved in June 2020. The new Sydney Fish Market was designed alongside the baseline Blackwattle Bay studies to ensure that key aspects of the project are consistent with the vision and objectives for Blackwattle Bay.

The outcome of the State Significant Precinct process will be a new planning framework that will enable further development applications for the renewal of the Precinct, connected to the harbour and centred around a rejuvenated Sydney Fish Market. The framework will also provide for new public open spaces including a continuous waterfront promenade, community facilities, and other compatible uses.

This report provides a comprehensive investigation of Urban and Marine Ecology Constraints and Opportunities to address a part of the Study Requirements and support the development of a new planning framework for Blackwattle Bay.

2.1 Purpose

The purpose of this report is to:

- identify potential constraints to the rezoning of Blackwattle Bay
- provide baseline biodiversity information for use in future impact assessments post-rezoning
- identify potential opportunities to enhance marine and terrestrial habitat and offset loss of habitat due to future development
- review policies and guidelines relevant to the ecology of Blackwattle Bay and any future planned development within the precinct
- address relevant Study Requirements for biodiversity, and urban and marine ecology (see Section 2.4, items not addressed in this report would be discussed in future impact assessments for development applications).

2.2 Blackwattle Bay State Significant Precinct

The Blackwattle Bay State Significant Precinct (SSP) study area is located less than 2 km west of Sydney's CBD (Figure 1). The land area is located partially within the City of Sydney local government area (LGA). The water area is within the Sydney Harbour Catchment.



Figure 1: Location and site plan of the Precinct

Source: FJMT

The Blackwattle Bay land area is approximately 10.4 hectares (ha) of primarily government owned land containing the current Sydney Fish Market (wholesale and retail), cruise and boating operations and facilities, and 3 privately owned sites. Blackwattle Bay's land area wraps around the southern and eastern edges of Blackwattle Bay and is bounded by Bridge Road to the south and Bank Street to the east. The Western Distributor road / Anzac Bridge is located adjacent to the eastern boundary before traversing over the northern section of the site. The water area of Blackwattle Bay is approximately 21 hectares.

The location of the existing and proposed Sydney Fish Market site within the Blackwattle Bay study area is shown at Figure 2. The Master Plan and Precinct Plan is shown in Figure 3 and Figure 4.



Figure 2: Blackwattle Bay

Source: FJMT

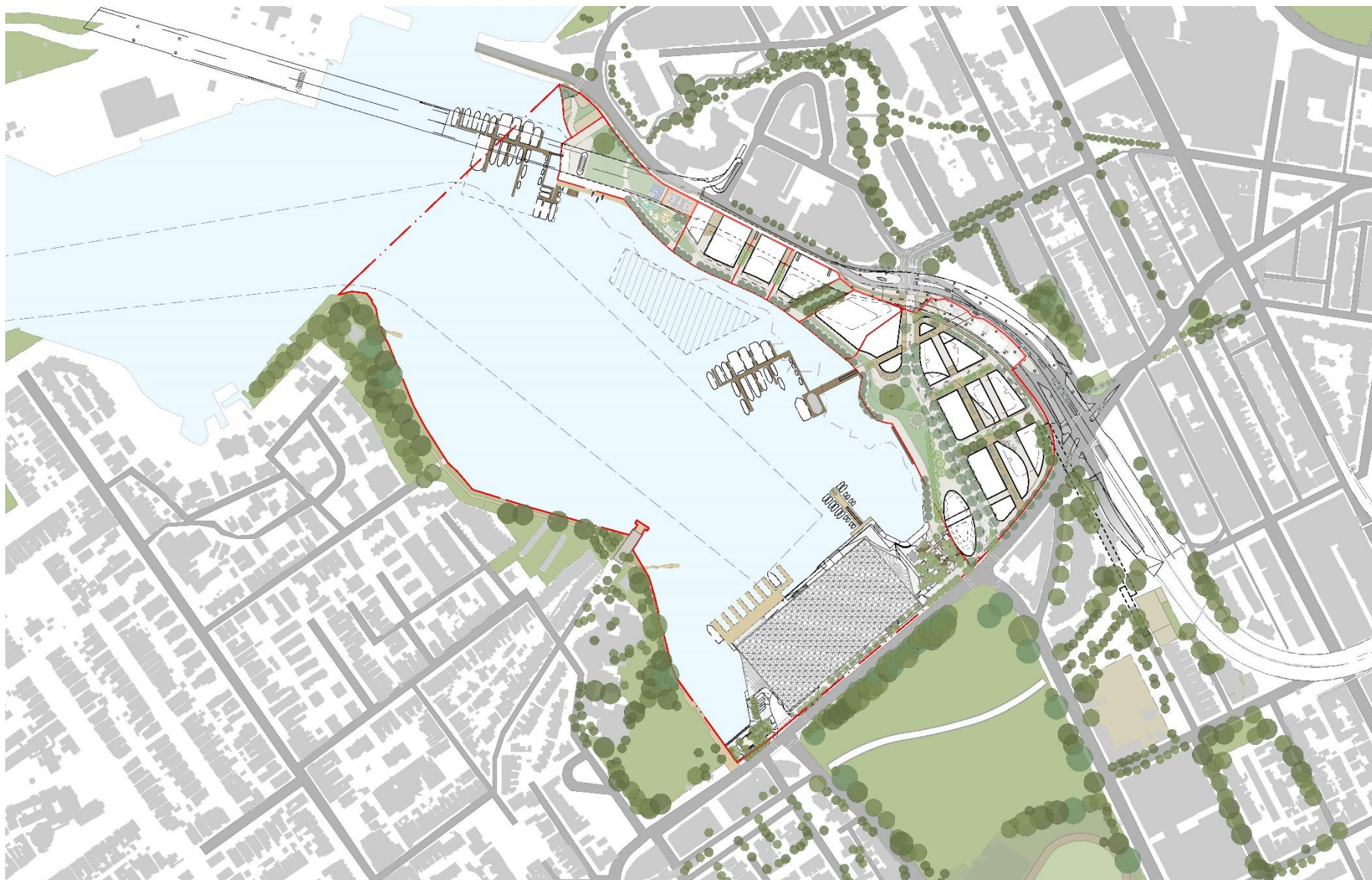


Figure 3: Blackwattle Bay Precinct Master Plan

Source: FJMT

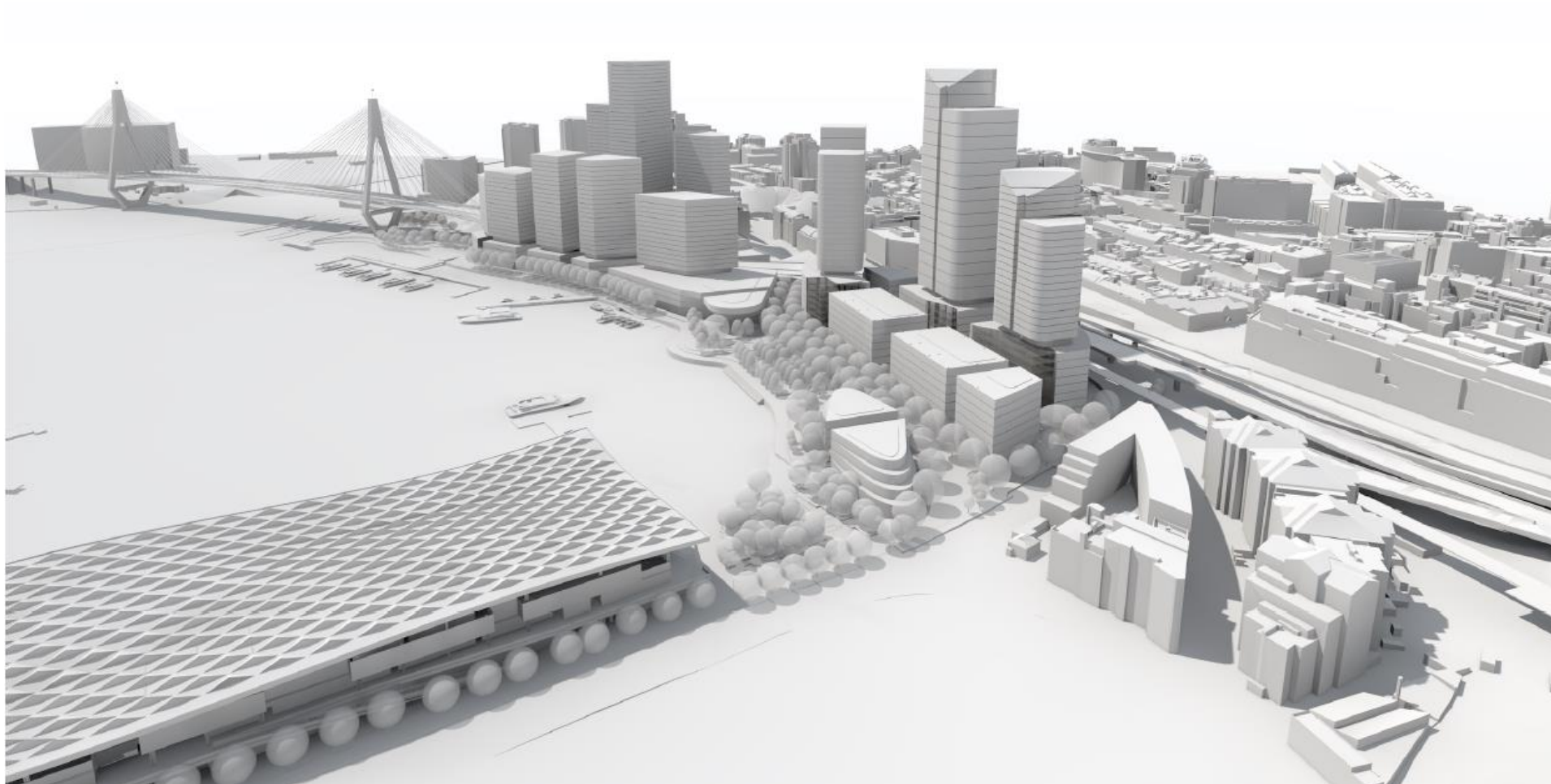


Figure 4: Blackwattle Bay Precinct Massing

Source: FJMT

2.3 Principles and Vision for Blackwattle Bay

Principles for a future Blackwattle Bay were formed through extensive community consultation in August 2017. These were further developed in 2019, together with a vision for the precinct. Both are provided below. These have guided the development of the Precinct Plan and will continue to guide future development proposals within the Study Area.

1. Improve access to Blackwattle Bay, the foreshore and water activities for all users
2. Minimise additional shadowing to Wentworth Park and Glebe Foreshore (in mid-winter) and create new places with comfortable conditions for people to enjoy.
3. Pursue leading edge sustainability outcomes including climate change resilience, improved water quality and restoration of natural ecosystems.
4. Prioritise movement by walking, cycling and public transport.
5. Balance diverse traffic movement and parking needs for all users.
6. Link the Blackwattle Bay precinct to the City, Glebe Island and White Bay and other surrounding communities and attractors.
7. Mandate Design Excellence in the public and private domain.
8. Integrate housing, employment and mixed uses to create a vibrant, walkable, mixed use precinct on the city's edge.
9. Maintain and enhance water uses and activities.
10. Allow for co-existence and evolution of land uses over time.
11. A place for everyone that is inviting, unique in character and socially inclusive.
12. Expand the range of recreational, community and cultural facilities.
13. Plan for the future community's education, health, social and cultural needs.
14. Deliver development that is economically, socially, culturally and environmentally viable.
15. Embed and interpret the morphology, heritage and culture of the site to create an authentic and site responsive place.
16. Foster social and cultural understanding and respect to heal and grow relationships.

The Vision for Blackwattle Bay, which builds on the Principles, is:

“Blackwattle Bay offers an extraordinary opportunity to reconnect the harbour, its surrounding neighbourhoods and the city; to showcase Sydney’s living culture and stories of Country; to build an inclusive and iconic waterfront destination that celebrates innovation, diversity and community.”

2.4 Study Requirements

On 28 April 2017 the Minister issued Study Requirements for the Precinct. Of relevance to this study are the following requirements. As a Precinct Study, detailed design has not yet been undertaken and therefore the impact assessment is undertaken at a precinct scale. Detailed impact assessment will be required with future development applications.

1. VISION, STRATEGIC CONTEXT AND JUSTIFICATION

1.4. Consideration of City of Sydney planning documents, strategies and policies including, but not limited to:

- UrbanGrowth NSW – Guiding Principles for Marine Foreshore Developments – February 2016
- City of Sydney Urban Ecology Strategic Action Plan 2014

- Connected Corridors for Biodiversity: Guide to regulatory tools, financial incentives and other mechanisms for promoting biodiversity conservation on private property (December 2016)
- Greater Sydney LLS – Biodiversity Corridor Mapping <https://trade.maps.arcgis.com/apps/webappviewer/index.html?id=3afa804b96ac4d69a74e9b1ed9780328>
- Urban Ecology Renewal Investigation Project Report – due for release early 2017

7. BIODIVERSITY

7.1. Assess and document biodiversity impacts in accordance with the Framework for Biodiversity Assessment, unless otherwise agreed by OEH, by a person accredited in accordance with s142B(1)(c) of the Threatened Species Conservation Act 1995.

14. URBAN AND MARINE ECOLOGY

14.1. Prepare an ecological assessment by a suitably qualified ecologist. Include species and communities of local conservation significance, as identified in the City's Urban Ecology Strategic Action Plan (UESAP), as well as, listed threatened species and ecological communities. Include in the assessment:

- identify any species that are of particular conservation significance (including threatened species and locally-significant species identified in the City's UESAP),
- determine the nature and extent of impacts to the urban vegetation and fauna and marine habitats, particularly those of conservation significance (if present), that are likely to result from each stage of the development,
- outline the mitigation measures that will be employed to avoid or minimise such impacts, including:
 - clearing and relocating of any onsite indigenous flora and fauna prior to works commencing,
 - protecting of any significant habitat features,
- restoration/creation of compensatory habitat for any important habitat features removed/disturbed as a result of the development
- provide recommendations and identify opportunities to create habitat features that will benefit urban terrestrial biodiversity. This report should identify, but not be limited to, what habitat features are to be retained, species to be planted, and other habitat features are to be created.

14.2. Demonstrate that the findings of 'Guiding Principles for Marine Foreshore Developments' developed by the Sydney Institute of Marine Science and the University of Sydney have been considered in the proposed planning controls.

14.3. Ensure possibilities for the mitigation and restoration/creation of marine habitat are investigated.

14.4. Integrate the findings of other urban biodiversity/ecology parts of this study and demonstrate how these have shaped the plan for the site and how they contribute to meeting the City's Urban Ecology requirements and targets.

This report addresses requirements detailed in Appendix B. The remaining requirements relating to biodiversity and ecology will be addressed as part of the Precinct Study and final ecology reports that support future development applications.

3. Regulatory Context

3.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

Under the EPBC Act, the Commonwealth Environment Minister needs to approve any development that is likely to have a significant impact on Matters of National Environmental Significance (MNES). Should such an impact, as defined in the EPBC Act Policy Statement 1.1 – Significant Impact Guidelines (DEWHA 2009) be likely, the proposal should be referred to the Commonwealth to determine if it is a Controlled Action that requires approval of the Commonwealth. A future report will assess the MNES, although no significant impacts to listed species are expected (e.g. marine mammals and Grey-headed Flying-fox).

3.2 NSW Environmental Planning and Assessment Act 1979 (EP&A Act)

All developments in NSW are assessed in accordance with the provisions of the EP&A Act and the EP&A Regulation. The EP&A Act provides a system for environmental planning and assessment, including approvals and environmental impact assessment requirements for proposed developments.

Under s.3.29 of the EP&A Act, the Bays Precinct is nominated for rezoning via the State Environmental Planning Policy (State Significant Precincts) 2005. Once rezoned, future development would be assessed as State Significant Development.

3.3 NSW Biodiversity Conservation Act 2016 (BC Act)

The BC Act 2016 seeks to conserve biological diversity at bioregional and State scales; to maintain the diversity and quality of ecosystems and enhance their capacity to adapt to change and provide for the needs of future generations; to assess the extinction risk of species and ecological communities and identify key threatening processes through an independent and rigorous scientific process; and to establish a framework to avoid, minimise and offset the impacts of proposed development and land use change on biodiversity.

Future development applications that are State Significant Development will require preparation of a Biodiversity Development Assessment Report to support the environmental impact statement (EIS). This constraints and opportunities report presents baseline data in preparation for a future BDAR.

3.4 NSW Fisheries Management Act 1994 (FM Act)

The FM Act is the principal piece of legislation protecting aquatic habitat in NSW. The act aims to conserve fish stocks, key fish habitat, aquatic vegetation, and threatened species, populations and communities. Threatened aquatic species, populations and communities are listed under Schedules 4, 4A and 5 of the FM Act, while key threatening processes are listed under Schedule 6. Permits under Part 7 of the FM Act to harm marine vegetation, obstruct fish passage, dredge or reclaim land do not apply to State Significant Developments, however, the offset policy applies to ensure there is 'no net loss' of key fish habitat (KFH) in NSW.

DPI Fisheries has identified the area within Blackwattle Bay as KFH. A future impact assessment report will calculate impacts and offsets to KFH. There are unlikely to be any threatened species, populations or communities listed under the FM Act that depend on the site for habitat. Therefore, these would not be impacted as a result of the works and an assessment of significance is not required.

3.5 Sydney Regional Environmental Plan (SREP, Sydney Harbour Catchment) 2005

The proposal is located within the Sydney Harbour Catchment and is subject to the SREP (Sydney Harbour Catchment) 2005, in particular, Clause 21: biodiversity, ecology and environment protection. Water-based recreation and entertainment facilities which have a direct structural connection to the foreshore are currently prohibited in this W1 zone. S89E(3) of the EP&A Act provides that development consent may be granted to State Significant Development despite the development being partly prohibited by an environmental planning instrument. Notwithstanding this provision, an amendment is sought to the planning controls applying to the site to ensure the proposed development is wholly permissible.

3.6 NSW Coastal Management Act 2016 (CM Act)

The CM Act came into effect 3 April 2018, replacing the *Coastal Protection Act 1979*. The objective of this Act is to manage the coastal environment of NSW in a manner consistent with the principles of ecologically sustainable development for the social, cultural and economic well-being of the people of the State. Part 2 of the CM Act identifies objectives related to four coastal management areas of the 'coastal zone':

- Coastal wetlands and littoral rainforests area
- Coastal vulnerability area
- Coastal environment area
- Coastal use area.

Under the State Environmental Planning Policy (Coastal Management) 2018 (Coastal Management SEPP), the area of the proposed works is mapped as 'coastal environment area'. However, under clause 13 (3) of the Coastal Management SEPP, the development objectives for the coastal environment area do not apply to the Foreshores and Waterway Areas within the SREP. Therefore, the Coastal Management SEPP is not applicable to this project.

3.7 Greater Sydney Regional Plan

The Greater Sydney Regional Plan is a vision to boost Sydney's liveability over the next 40 years. As part of this integrated plan there are outlined objectives to achieve this. The principles and vision for Blackwattle Bay has the opportunity to align with the sustainability objectives below if the opportunities outlined in Section 6 of this report are included in the precinct design. The objectives relevant to this project are as follows:

- Objective 25 – The coast and waterways are protected and healthier
- Objective 27 – Biodiversity is protected, urban bushland and remnant vegetation is enhanced
- Objective 30 – Urban tree canopy cover is increased
- Objective 31 – Public open space is accessible, protected and enhanced.

3.8 Eastern City District Plan

The Eastern City District Plan stems from the Greater Sydney Regional Plan, focussing on Eastern Harbour City and Harbour Central Business District as its centre. The following planning priorities are relevant to the precinct design.

- Planning Priority E14 – Protecting and improving the health and enjoyment of Sydney Harbour and the District’s waterways
- Planning Priority E15 – Protecting and enhancing bushland and biodiversity
- Planning Priority E 17 – Increasing urban tree canopy cover and delivering Green Grid connections
- Planning Priority E18 – Delivering high quality open space.

With the incorporation of the opportunities discussed in Section 6, the Blackwattle Bay precinct design could align with the Eastern City District Plan sustainability priorities.

4. Methods

4.1 Desktop assessment

4.1.1 Aquatic ecology

Online database searches were used to confirm the presence of recorded species in the region prior to the field survey. This was then used to infer what was likely to be present in the study area. The desktop search on 24 June 2019 covered Port Jackson (Sydney Harbour including tidal areas of Parramatta River and Lane Cove River) plus a 10 km buffer. The desktop search grid is about 50 x 30 km using the coordinates:

- Latitude: -33.6974792526866, Longitude: 150.915584274089
- Latitude: -33.6974792526866, Longitude: 151.474105513707
- Latitude: -33.9762150862402, Longitude: 151.474105513707
- Latitude: -33.9762150862402, Longitude: 150.915584274089

Only aquatic species known to use estuarine/marine water and intertidal areas were considered in this aquatic assessment (other species are covered in the terrestrial assessment). Databases accessed include:

- EPBC Act – Protected Matters Search Tool
- BC Act – Threatened Species Search Tool (BioNet)
- FM Act – Listed protected and threatened species and populations, including species profiles, ‘Primefact’ publications and expected distribution maps (Riches et al 2016)
- Online Zoological Collections of Australian Museums (OZCAM) and Atlas of Living Australia – individual species searches to determine likelihood of occurrence of threatened species.

4.1.2 Terrestrial ecology

To determine the Likelihood of Occurrence of threatened species, a 10 km search of BioNet records of threatened species under the BC Act, and a 10 km Protected Matters search for threatened species under the EPBC Act, was conducted. Species of Local Conservation Significance under the Urban Ecology Strategic Action Plan (UESAP; City of Sydney) and Connected Corridors for Biodiversity (CCB; Southern Sydney Regional Organisation of Councils Incorporated), were also included in the assessment. The 10 km database searches were run from coordinates:

- Latitude: -33.87259, Longitude: 151.1896

4.2 Field survey

4.2.1 Aquatic survey

A survey was undertaken on 24 – 25 July 2017 to inspect the aquatic habitat of Blackwattle Bay. The survey area included benthic and intertidal habitat within the entire bay. Weather conditions were calm and water clarity was good. Underwater visibility was approximately four meters.

The survey was undertaken by lowering a video camera to the seafloor and around foreshore structures. A triple camera setup (Sea-View, Go-Pro and Kaiser Baas brands) angled down and front allowed for live streaming of habitat features to an on-board monitor (colour/infrared). We were unable to survey directly beneath fixed structures and moored vessels. The shallow intertidal area and foreshore were photographed from the water and on foot where boat access was limited. Habitat types were mapped using a spatial application on a tablet to ensure all habitat types were surveyed adequately. High-definition footage and photographs were also viewed later to confirm habitat extent and condition. ArcMap Version 10.2 was used to merge data into a final map for spatial analysis.

4.2.2 Terrestrial survey

A vegetation survey was undertaken within the study area by an ecologist on 22 August 2017 and 31 August 2017. No Plant Community Types (PCTs) as defined by the NSW BioNet Vegetation Classification system were identified within the area, therefore, no vegetation integrity plots were conducted. A visual microbat habitat survey of structures was undertaken by two ecologists on 22 September 2020. That survey aimed to class structures as low, medium or high potential of providing suitable microbat habitat. The results presented in Section 5.5 should be used to guide where to place targeted surveys for future individual development applications.

5. Constraints

5.1 Previous aquatic habitat mapping

Map 8 of the 'Sydney Harbour - Foreshores and Waterways Area Development Control Plan 2005: Ecological Communities and Landscape Characters', identifies the study area as 'Mixed Rocky Intertidal and Rock Platform', 'Water' and 'Grassland' (Figure 5).

Sheet 4 of the 'Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005: Wetlands Protection Area', shows that there are no Wetland Protection Areas within or near the site, therefore Clause 61 of the SREP is not triggered. (Figure 6).

The State-wide mapping of estuarine macrophytes (mangroves, saltmarsh and seagrass) by DPI Fisheries have not mapped mangrove communities within Blackwattle Bay. The nearest patch of mangroves in Rozelle Bay is outside the study area. There are no records of the threatened *Posidonia* seagrass population within the bay (Creese et al 2009, Figure 7).

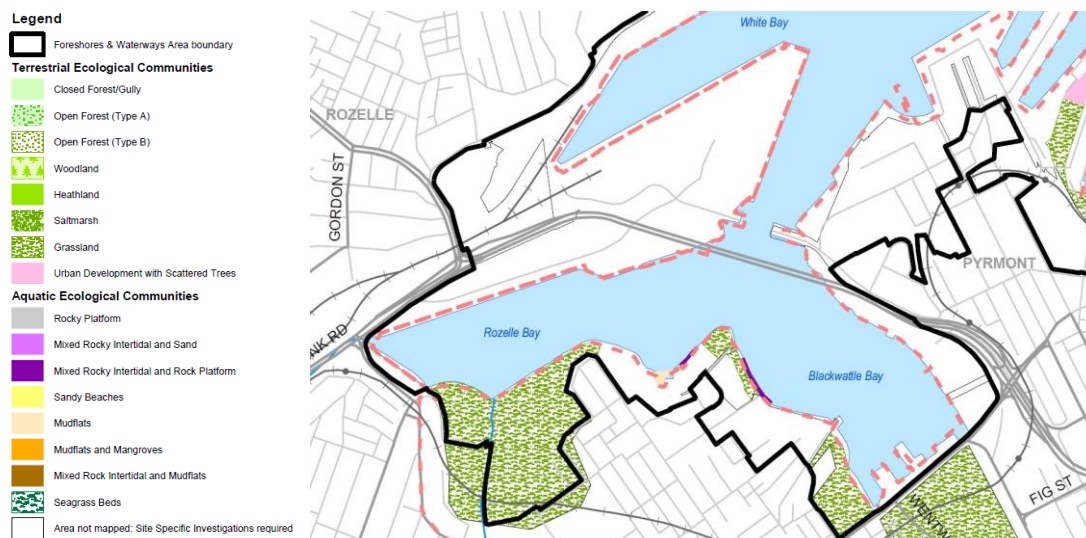


Figure 5: Sydney Harbour - Foreshores and Waterways Area Development Control Plan: Ecological Communities and Landscape Characters (map sheet 8)

Source: <http://www.planning.nsw.gov.au/Policy-and-Legislation/Environment-and-Heritage/Sharing-Sydney-Harbour>

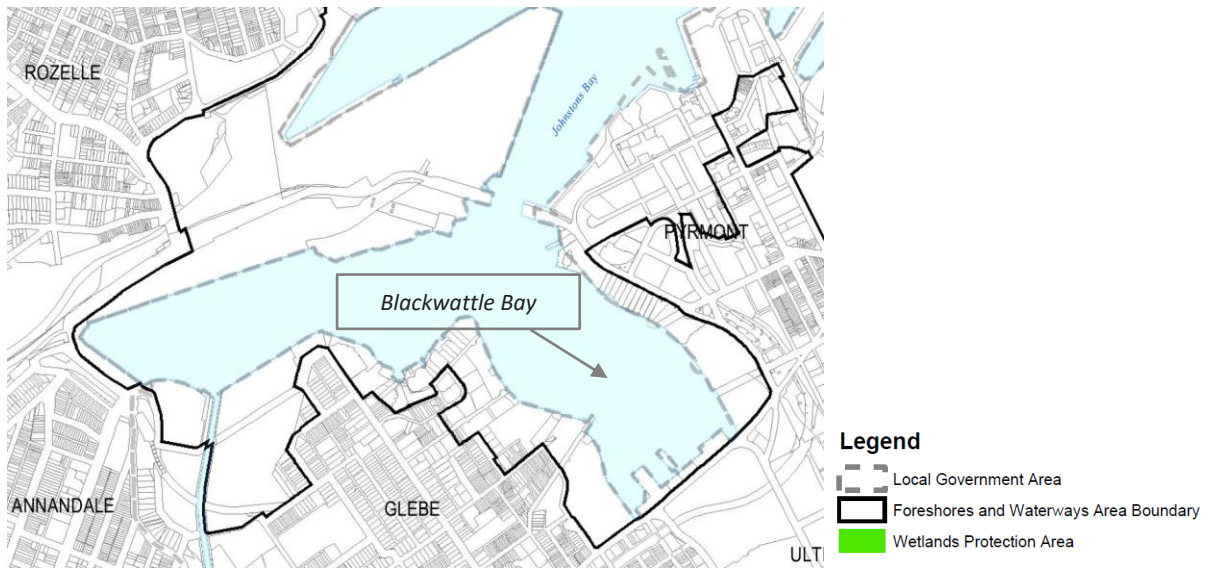


Figure 6: Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005: Wetlands Protection Area (map sheet 4)

Source: <http://www.planning.nsw.gov.au/Policy-and-Legislation/Environment-and-Heritage/Sharing-Sydney-Harbour>



Figure 7: DPI Fisheries mapping of estuarine macrophytes (Creese et al 2009)

Source: <http://www.dpi.nsw.gov.au/content/research/areas/aquatic-ecosystems/estuarine-habitats-maps>.

5.2 Aquatic habitats at Blackwattle Bay

Recent surveys of Blackwattle Bay (Bugnot et al 2016) found the aquatic habitat and biodiversity to be comparable, if not slightly worse, than nearby bays within Sydney Harbour (Rozelle, White and Johnstons Bay, Gore and Iron Cove). Fourteen fish species were recorded in Blackwattle Bay (Table 2). Bugnot et al (2016) identified other habitats including intertidal hard structures with the native *Saccostrea glamerata* (Sydney Rock Oyster), sub-tidal hard structures with kelp and sub-tidal sediments with worms from the Polychaete family. The subtidal sediment had high metal concentrations, with Annelids (worms) as the predominate infauna species. These are indicative of a disturbed environment.

ELA documented the aquatic habitat in the study area, which had been modified by vertical seawalls, wharf structures, pontoons, piles and disturbance by regular boat traffic. These are similar habitat conditions described by Bugnot et al. (2016). The following distinct zones were mapped during the field survey (Figure 8):

- *Manmade structures* (Figure 9) – The foreshore habitat was highly modified by industrial/commercial buildings, footpaths, wharves, pontoons and seawalls. The seawalls create a barrier between the intertidal zone and foreshore, constraining the deposition of sediment and establishment of marine/riparian vegetation. There were thousands of piles in the bay supporting these structures. Observable piles were covered in encrusting organisms, turfing algae, bryozoans, barnacles, oysters and mussels.
- *Subtidal sand* (Figure 9) – The subtidal zone was characterised by coarse sediment, covered with a variety of features including shell fragments, woody debris, rubbish and scattered rocky rubble. Moderate to dense bioturbation was evident throughout the site. No seagrass was observed.
- *Intertidal rock rubble* (Figure 9) – The intertidal zone was characterised by rock rubble extending from the base of some seawalls, covered with sessile organisms including, oysters, barnacles and algae.
- *Macroalgae* (Figure 9) – The subtidal zone featured *Sargassum linearifolium* (brown macroalgae) attached on rock rubble. Densities varied throughout Blackwattle Bay, with the majority of the macroalgae found along the western boundary of the study area.

DPI Fisheries identify three types of key fish habitat (KFH) in their Policy and Guidelines for Fish Habitat Conservation and Management (Fairfull 2013, Table 1). KFH types occurring in the study area are mapped on Figure 8, comprising:

- Type 1 (highly sensitive KFH) – no type 1 KFH habitat was observed within the study area. The nearest mapped type 1 KFH is a seagrass bed 1 km north in Cameron Cove.
- Type 2 (moderately sensitive KFH) – represented onsite by the various densities of *Sargassum linearifolium* (brown macroalgae) and three mangrove seedlings on an intertidal rock bench.
- Type 3 (minimally sensitive KFH) – represented onsite by the subtidal substrate and intertidal seawalls.

Table 1: NSW key fish habitat types and associated sensitivity classification (from Fairfull 2013)

<p>TYPE 1 - Highly sensitive key fish habitat:</p> <ul style="list-style-type: none"> ▪ <i>Posidonia australis</i> (strapweed) ▪ <i>Zostera</i>, <i>Heterozostera</i>, <i>Halophila</i> and <i>Ruppia</i> species of seagrass beds >5m² in area ▪ Coastal saltmarsh >5m² in area ▪ Coral communities ▪ Coastal lakes and lagoons that have a natural opening and closing regime (i.e. are not permanently open or artificially opened or are subject to one off unauthorised openings) ▪ Marine park, an aquatic reserve or intertidal protected area ▪ SEPP 14 coastal wetlands, wetlands recognised under international agreements (e.g. Ramsar, JAMBA, CAMBA, ROKAMBA wetlands), wetlands listed in the Directory of Important Wetlands of Australia² ▪ Freshwater habitats that contain in-stream gravel beds, rocks greater than 500 mm in two dimensions, snags greater than 300 mm in diameter or 3 metres in length, or native aquatic plants ▪ Any known or expected protected or threatened species habitat or area of declared 'critical habitat' under the FM Act ▪ Mound springs 	<p>TYPE 2 – Moderately sensitive key fish habitat:</p> <ul style="list-style-type: none"> ▪ <i>Zostera</i>, <i>Heterozostera</i>, <i>Halophila</i> and <i>Ruppia</i> species of seagrass beds <5m² in area ▪ Mangroves ▪ Coastal saltmarsh <5m² in area ▪ Marine macroalgae such as <i>Ecklonia</i> and <i>Sargassum</i> species ▪ Estuarine and marine rocky reefs ▪ Coastal lakes and lagoons that are permanently open or subject to artificial opening via agreed management arrangements (e.g. managed in line with an entrance management plan) ▪ Aquatic habitat within 100 m of a marine park, an aquatic reserve or intertidal protected area ▪ Stable intertidal sand/mud flats, coastal and estuarine sandy beaches with large populations of in-fauna ▪ Freshwater habitats and brackish wetlands, lakes and lagoons other than those defined in TYPE 1 ▪ Weir pools and dams up to full supply level where the weir or dam is across a natural waterway <p>TYPE 3 – Minimally sensitive key fish habitat may include:</p> <ul style="list-style-type: none"> ▪ Unstable or unvegetated sand or mud substrate, coastal and estuarine sandy beaches with minimal or no in-fauna ▪ Coastal and freshwater habitats not included in TYPES 1 or 2 ▪ Ephemeral aquatic habitat not supporting native aquatic or wetland vegetation
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The majority of the Blackwattle Bay study area is classed as type 3 KFH, represented by unvegetated subtidal and intertidal substrate, which has a high resilience to disturbance. Although classified as minimally sensitive, subtidal sand with dense infauna is critical for many fish and crustaceans. The infaunal burrowers form the base of many food chains and cycle nutrients in the sediment (Johnson et al. 2015).

Type 2 KFH is represented onsite by patches of macroalgae (*Sargassum linearifolium*), which is less resistant to disturbance. This macroalgae is the dominant habitat forming algae within Sydney Harbour and provides habitat for diverse assemblages including isopods and fish (Johnson et al. 2015). Disturbance to these habitats should be avoided where possible, with habitat replacement offsetting indirect and direct impacts to ensure there is no net loss of KFH. ELA has provided an outline of habitat replacement and improvement opportunities for consideration by the designers in Table 5. Some of the habitat-enhancing mechanisms such as flowerpots for fish habitat have been employed by City of Sydney Council along the western rock walls of Blackwattle Bay with early evidence of their use by a variety of fish.

Table 2: Previously recorded fish species in Blackwattle Bay (Bugnot et al. 2016)

Scientific name	Common name
<i>Acanthopagrus australis</i>	Yellowfin bream
<i>Ambassis marianus</i>	Estuary glassfish
<i>Amblygobius</i> sp.	Goby
<i>Aspidintus dussumieri</i>	Lance blenny
<i>Dicotylichthys punctulatus</i>	Three bar porcupinefish
<i>Gerres subfasciatus</i>	Common silver belly
<i>Girella tricuspidata</i>	Luderick
<i>Lutjanidae</i>	Snapper
<i>Monacanthus chinensis</i>	Fanbelly leatherjacket
<i>Pelates sexlineatus</i>	Eastern striped trumpeter
<i>Rhabdosargus sarba</i>	Tarwhine
<i>Sillago ciliata</i>	Sand whiting
<i>Sillago maculata</i>	Trumpeter whiting
<i>Tetraodontidae</i>	Toadfish

5.3 Presence or likelihood of threatened and protected aquatic species and populations

Threatened species, populations or communities listed under the FM Act, BC Act and EPBC Act that are known or expected to occur in the region are listed in Appendix A. Within the study area, the only habitat capable of supporting threatened species was the macroalgae growing predominately along the western seawall of the bay. Syngnathiformes (seahorses, seadragons, pipefish, pipehorses, ghostpipefish and seamoths) occur in the harbour and are known to use similar habitats. No seahorses or other Syngnathiformes were observed during the field survey. They may occur in the macroalgae along the western shoreline but are unlikely near piles as there was very little macroalgae in these locations. No other threatened species, populations or communities were observed on site although it is possible that some species may pass through the area, given the connectivity to Sydney Harbour and coastal habitats. It is unlikely that they would rely on the site for habitat or survival.

The threatened fish species identified in the desktop assessment as possibly occurring within the search grid either require freshwater, rocky reefs, caves, rocky overhangs. None of these habitat features occurs within Blackwattle Bay. Deep water occurs within Blackwattle Bay, but not near the proposed foreshore works. Species that utilise deep water would be deterred by frequent boat traffic and are more likely in coastal waters.

Threatened sharks and rays may enter the area while exploring or chasing prey. If they do enter the area, a lack of habitat and frequent boat traffic makes it unlikely they would stay for extended periods.

Threatened aquatic mammals (whales, dolphins, and seals) are known to occur in the harbour and/or along the coast. Large mammals are unlikely to use habitat this close to shore. Dugongs require seagrass beds for foraging, which do not occur on site. Furthermore, there are no records of dugongs within Sydney Harbour. Seals have been sighted closer to the ocean (e.g. Birchgrove Point), but there is no

record of them in Blackwattle Bay. Whales have been recorded in the Harbour, but not west of the Sydney Harbour Bridge. It is unlikely they would venture through the narrow entrance to Blackwattle Bay. Other marine mammals may explore this area but are unlikely to stay for prolonged periods as there is no breeding or foraging habitat. The narrow channel to enter Blackwattle Bay and frequent use of the area by boats would also be a deterrent.

Threatened aquatic reptiles (turtles) are more common along coastal waters than in the harbour. They may explore the greater area but would not depend on the site for feeding habitat or nesting as there is no seagrass.

Threatened shore, wetland, migratory, and pelagic birds use intertidal zones to forage, but are unlikely to occur in the study area, as the intertidal zones are steep and artificial (seawalls). They also avoid areas with concentrated human activities. Aerial foragers may follow a coastal route, fly over open water or hunt over decomposing wrack. Given the large scale of more suitable habitat nearby, the works are not expected to affect their migration or food resources.

Protected fauna listed under the FM Act were also assessed for their likelihood of occurrence. Protected marine or estuarine species include one shark, six fishes and the taxonomic order of Syngnathiformes. The species assessed included:

- The Herbst's nurse shark, which only occurs in deep water (150-600 m) and would not be present in the study area.
- Elegant wrasse, Ballina angelfish, giant Queensland groper, bluefish and eastern blue devil fish require rocky reefs, caves and crevices, which are absent in the study area.
- Estuary cod occurs in a range of habitats, from turbid shallow estuarine waters (juveniles) to the base of drop-offs and deeper water (adults). Sydney is the southern extent of estuary cod, with no records in Blackwattle Bay, or the harbour.
- Syngnathiformes occur in the harbour and are known to use a variety of habitats, such as macroalgae, wharf/jetty piles, seagrass beds and unvegetated shallows. Some of these habitats occur within the site. The wharves/jetty piles would not be suitable habitat as they have no macroalgae growing on them. Seahorses are more likely to use macroalgae along the western boundary, which would not be impacted. As of note, *Hippocampus whitei* (White's Seahorse) is proposed for listing as endangered under the FM Act.

Marine vegetation is protected under the FM Act and includes saltmarsh, seagrasses, mangroves and macroalgae (seaweeds). No seagrass was observed within the study area. Seagrass requires soft sediment with good light penetration which was present within the study area. However, no seagrass was observed or has been mapped in the area by DPI Fisheries. The threatened seagrass population of *Posidonia australis* occurs in the harbour, and is known to grow on subtidal sand up to 10 m deep, however, there are no records of *Posidonia* upstream of Darling Point. *Posidonia australis* was not observed and is not likely within the study area. Mangrove trees can occur in protected bays and tidal waterways with soft intertidal sediment. Three small mangrove trees have grown in an artificial intertidal shelf in the southwest corner of the site (at the new Sydney Fish Market site). These would be removed as part of the demolition works. Combined, these mangrove seedlings equal less than 1 m² of habitat. The threatened ecological community, coastal saltmarsh, was not observed within the study area. The intertidal zone, where saltmarsh is found, is steep and artificial (seawall), so no plants have established. Macroalgae occurs in the harbour along rocky fringes and deeper hard substrate reefs. *Sargassum linearifolium* was observed within the study area in shallow water, attached to intertidal and

subtidal rubble and the fringing hard substrate. These plants are outside the likely foreshore development area, and if CEMP mitigation measures are followed would be unaffected by the works.

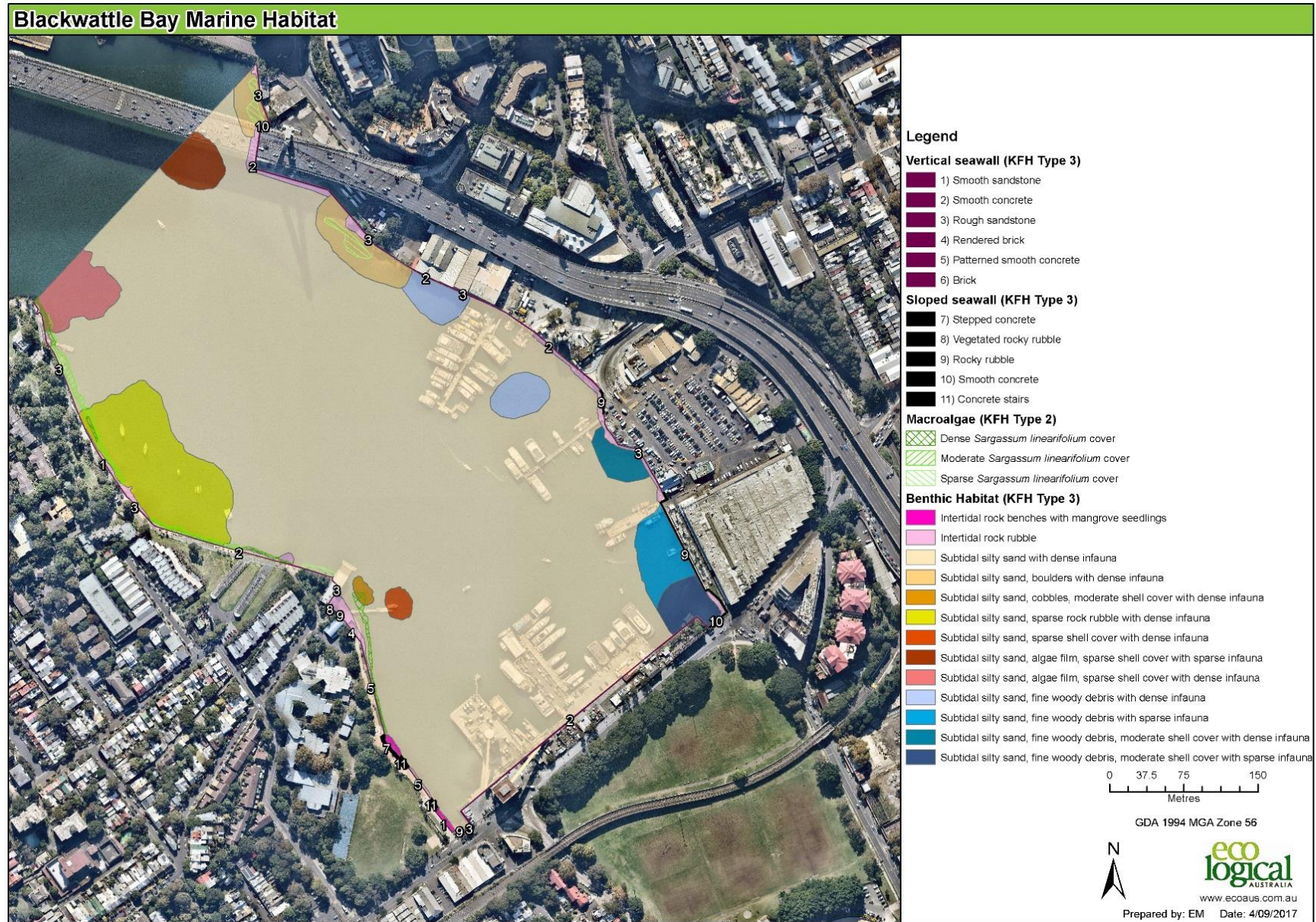
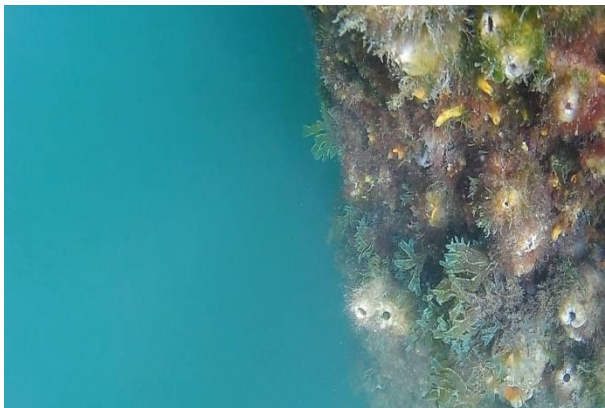
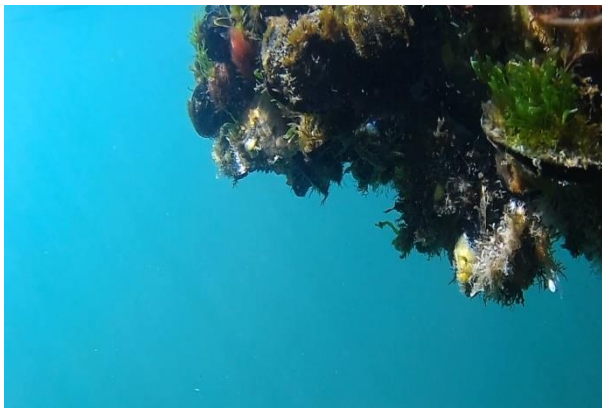
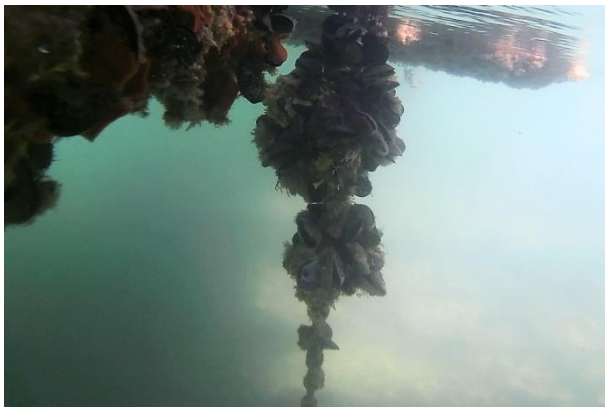
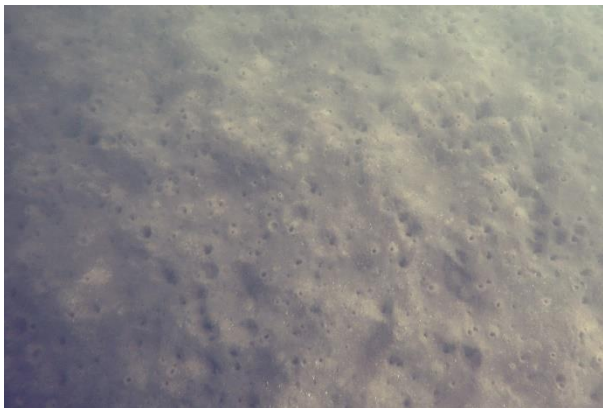
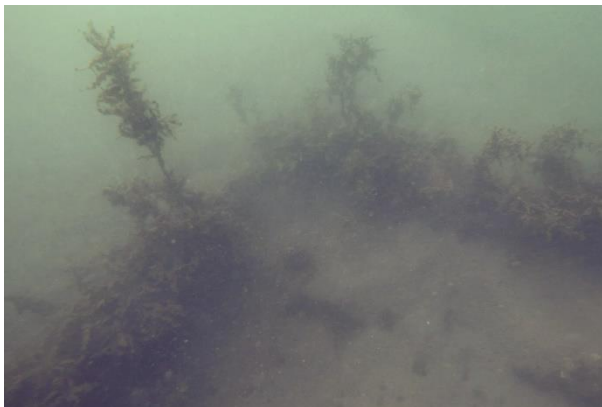


Figure 8: Marine habitat





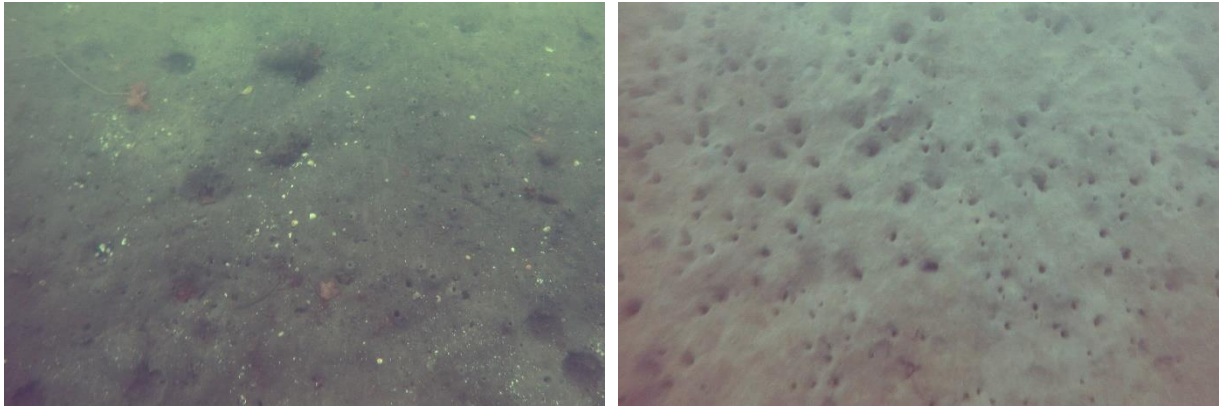


Figure 9: Aquatic habitat photos, including man-made structures, intertidal hard substrate, subtidal rocky rubble with macroalgae, unvegetated soft sediment with debris and bioturbation from infauna

5.4 Previous terrestrial habitat mapping

Figure 10 displays Greater Sydney Local Land Services (GSLLS) Biodiversity Corridor Mapping in the context of the Blackwattle Bay study area (GSLLS 2017). The following definitions apply:

- Supporting habitat - Vegetation mapped as 'Urban & exotic' by OEH (2013), which comprises 'generalised boundaries of mixed vegetation in a highly urbanised environment'.
- Supporting areas – areas within 100 m of potential habitat.

A high proportion of the Blackwattle Bay study area has been mapped as supporting areas of a Biodiversity Corridor. Given the urban context and the type of habitat provided (mostly landscape plantings and street trees) the mapping is taken to refer primarily to highly mobile species such as birds and bats.

5.5 Terrestrial habitats at Blackwattle Bay

Vegetation within the Blackwattle Bay study area is mapped by ELA in Figure 11 to Figure 15. The vegetation on site does not form a recognisable native vegetation community (or PCT) and therefore the mapping has categorised the vegetation by its canopy family and understorey.

No endangered or critically endangered ecological communities were found in the Blackwattle Bay study area.

Microbat habitat was present in the form of built structures (Figure 16), including:

- Low potential habitat
 - sandstone seawalls with shallow crevices and large intertidal zone
 - jetties with no deep fissures or protection from elements, but may act as an emergency overnight roost
 - buildings with some potential openings but currently occupied
- Medium potential habitat
 - small pipe or box culverts discharging at a seawall, especially if above the high tide limit
 - buildings with obvious holes in their eaves, allowing access to the roof cavity

- stacked storage containers and other items providing shelter
- cavity on the underside of elevated roadway
- High potential habitat
 - deep and dark cavity between two buildings
 - disused and derelict buildings with several openings
 - seawall with deep cavities above the high tide limit.

All other areas were classed as not having any potential roosting or breeding habitat due to enclosed structures (i.e. no access openings and cavities) and exposure to wind and light. Other non-built foraging habitat was present broadly as open air and the water surface of the bay.

The Biodiversity Development Assessment Report (BDAR) for the new Sydney Fish Market identified a roosting colony of *Myotis macropus* (Southern Myotis) and *Miniopterus orianae oceanensis* (Large Bent-winged Bat) occupying the underside of the wharf supporting the now-demolished Hanson cement plant (ELA 2020). These microbats were excluded from their roost prior to demolition of the wharves. These species plus other microbats listed Table 3 may utilise the habitats mapped in Figure 16 and would need further targeted ultrasonic and emergency surveys for future development applications.

Table 3: Results of acoustic microbat surveys at the new Sydney Fish Market (ELA 2020)

Scientific Name	Common Name	Presence
<i>Austronomus australis</i>	White-striped Free-tailed Bat	P
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	D
<i>Chalinolobus morio</i>	Chocolate Wattled Bat	D
<i>Miniopterus orianae oceanensis</i> *	Large Bent-winged Bat	D
<i>Myotis macropus</i> *	Southern Myotis	D
<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat	P
<i>Nyctophilus gouldii</i>	Gould's Long-eared Bat	P
<i>Ozimops ridei</i>	Ride's Free-tailed Bat	D
<i>Rhinolophus megaphyllus</i>	Eastern Horseshoe Bat	P
<i>Saccolaimus flaviventris</i> *	Yellow-bellied Sheath-tailed Bat	P
<i>Vespadelus pumilus</i>	Eastern Forest Bat	P
<i>Vespadelus troughtoni</i> *	Eastern Cave Bat	P
<i>Vespadelus vulturnus</i>	Little Forest Bat	P

D = definitely present, P = potentially present (ultrasonic call profile overlaps with other species), *listed as Vulnerable under the BC Act.

The Blackwattle Bay study area does contain potential foraging habitat for *Pteropus poliocephalus* (Grey-headed Flying Fox) which is listed as *Vulnerable* under the NSW Biodiversity Conservation Act 2016 and *Vulnerable* under the Commonwealth EPBC Act 1999. The nectar and pollen of native trees, especially Myrtaceae (e.g. *Eucalyptus saligna*) and Proteaceae (e.g. *Grevillea robusta*) (Eby and Law 2008) are

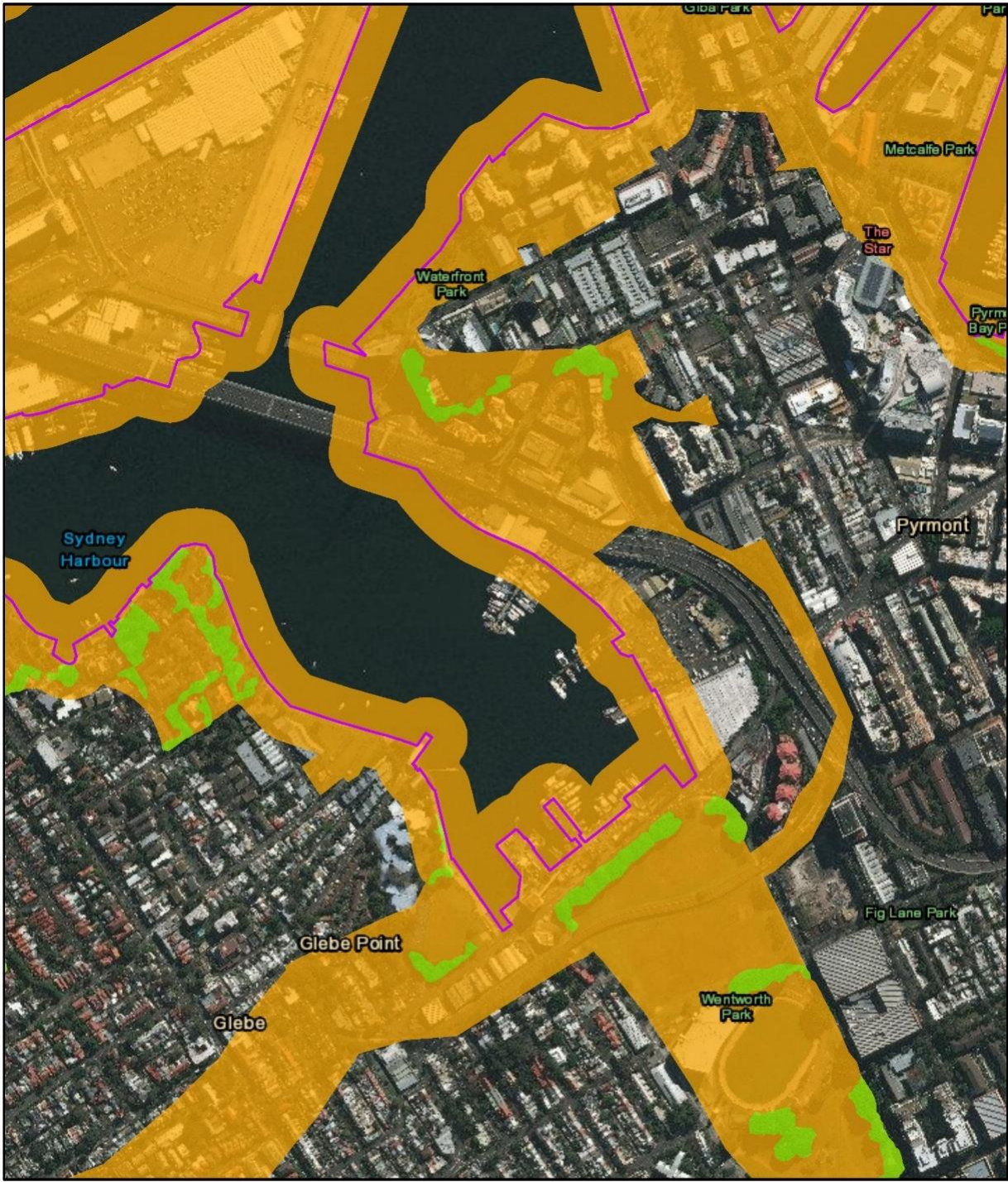
utilised by GHFF. The fruit of fig trees (Moraceae family) are another important food source (Figure 11 to Figure 15). Potential habitat for GHFF is dispersed throughout the Blackwattle Bay study area, along with a large stand of primary *Ficus* species within Wentworth Park which is outside but adjacent to the southern boundary of the Blackwattle Bay study area (Figure 17).

No other threatened flora or fauna species were identified during the terrestrial site inspection nor are likely to occur. No hollow-bearing trees which may provide roosting/nesting habitat for threatened mammals (including microbats) and birds, were identified during the site inspection. For example, Powerful Owl requires tree hollows >20 cm diameter for nesting habitat. As no hollow bearing trees occur on site, Powerful Owl would be excluded as a candidate species (species credit) for consideration in the BDAR. The foraging component if relevant would be included in any ecosystem credits (assessed through PCTs).

Although the Blackwattle Bay study area lacks areas of dense native mid-storey vegetation, canopy vegetation provides potential habitat for small birds, including *Pardalotus punctatus* (Spotted Pardalote) and *Phylidonyris novaehollandiae* (New Holland Honeyeater), both birds of local conservation significance (Figure 18).



No occurrences of naturally occurring sandstone outcrops were identified. Sandstone outcrops provide potential habitat for fauna, specifically reptiles such as *Eulamprus tenuis* (Bar-sided Skink), when cracks and crevices are present. Although some sections of sea wall comprised of sandstone, no conspicuous deep crevices were observed.

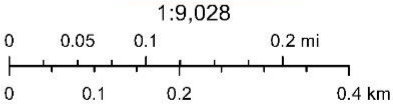
No freshwater streams or inundations, which may provide habitat for amphibians and waterbirds, were identified.



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Connected Biodiversity Corridors version 2019

-  Supporting Habitats
-  Supporting Areas



Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Southern Sydney Regional Organisation of Council (SSROC) and Sydney Greater Sydney Connected Corridors for Biodiversity Map has been produced by a web mapping application developed by Greater Sydney Local Land Services in collaboration with the Southern

Figure 10: Greater Sydney Local Land Services (GSLLS) produced Biodiversity Corridor Mapping (2019)

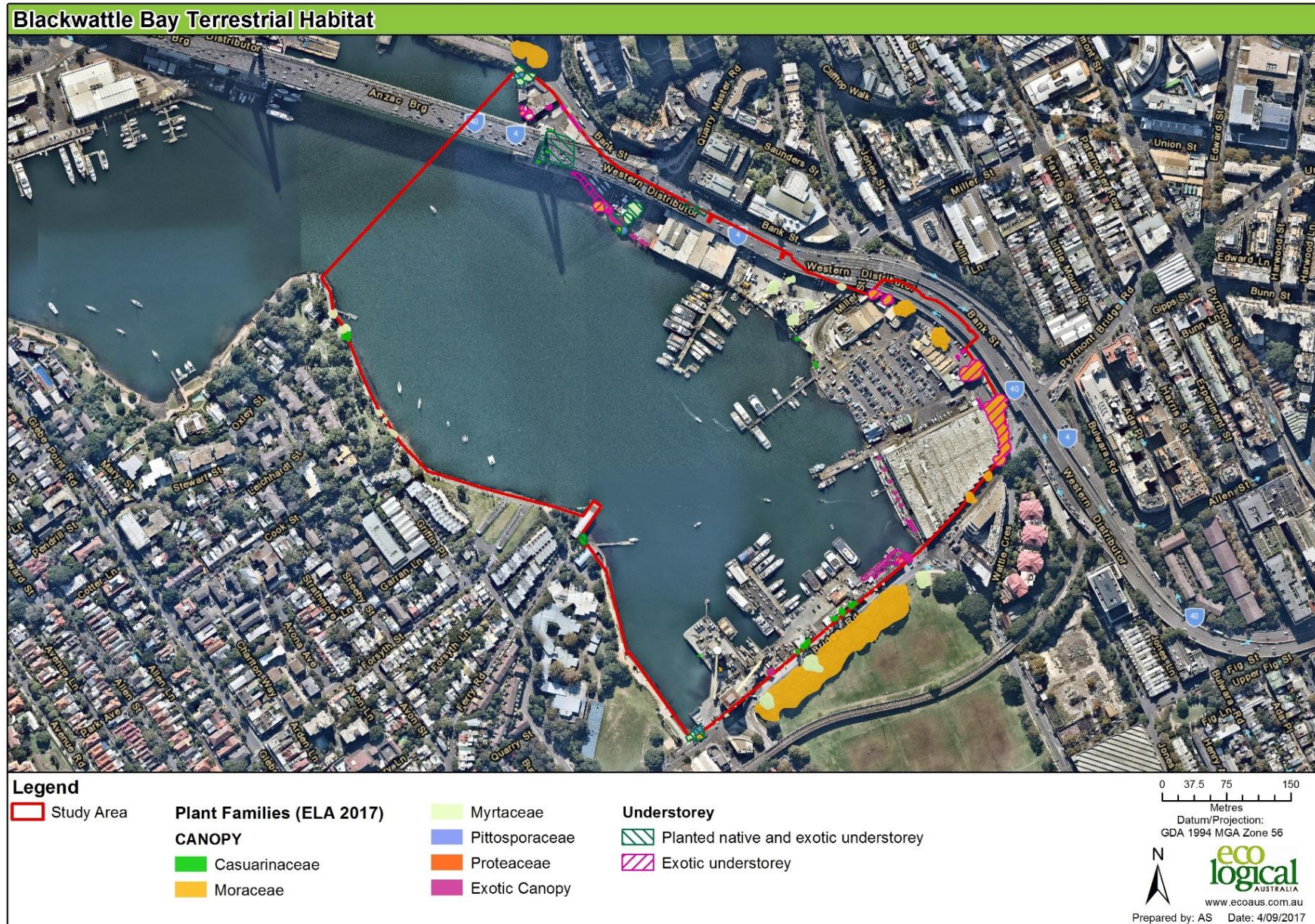


Figure 11: Terrestrial habitat within the Blackwattle Bay study area

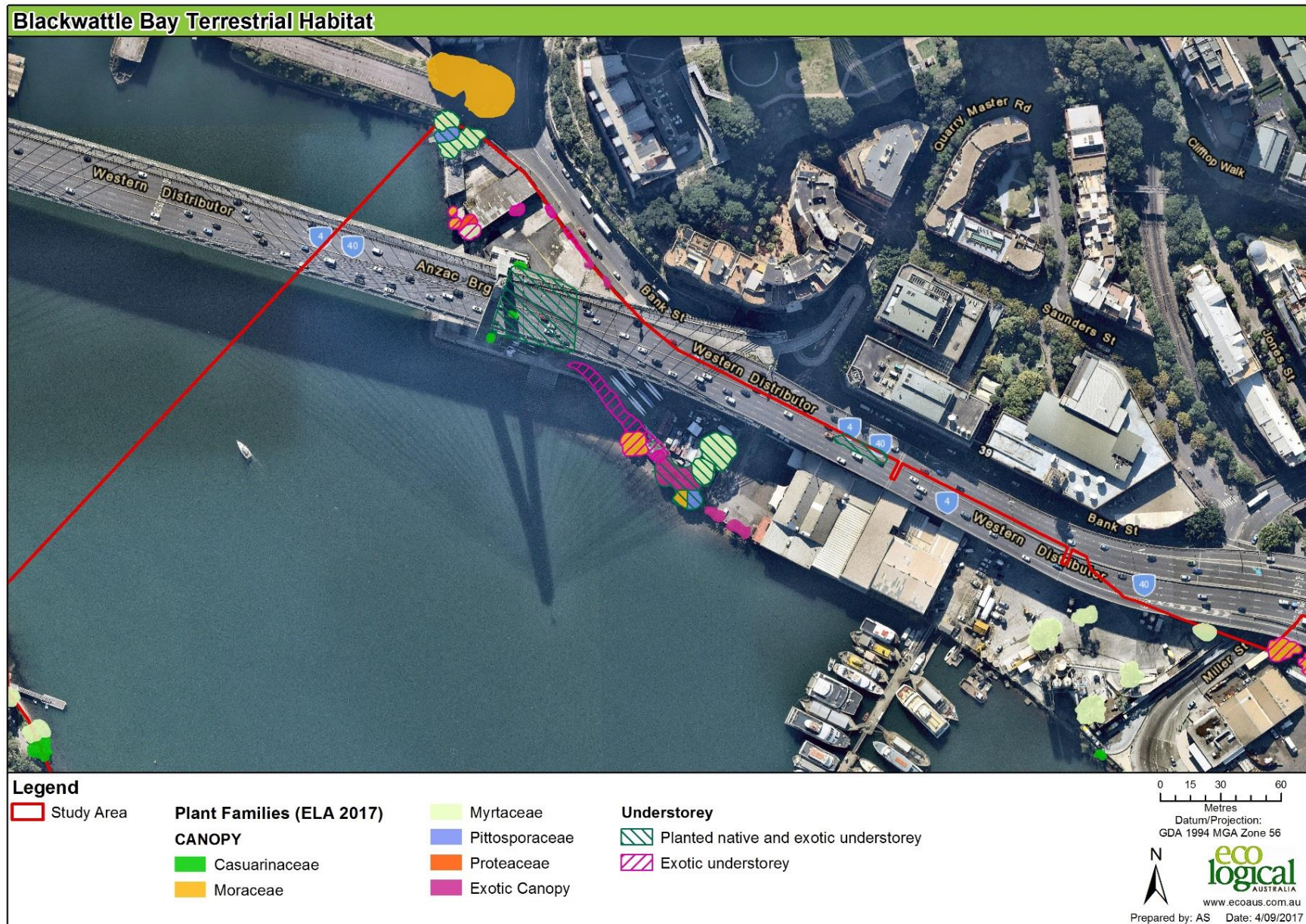


Figure 12: Terrestrial habitat in the northern portion of the Blackwattle Bay study area

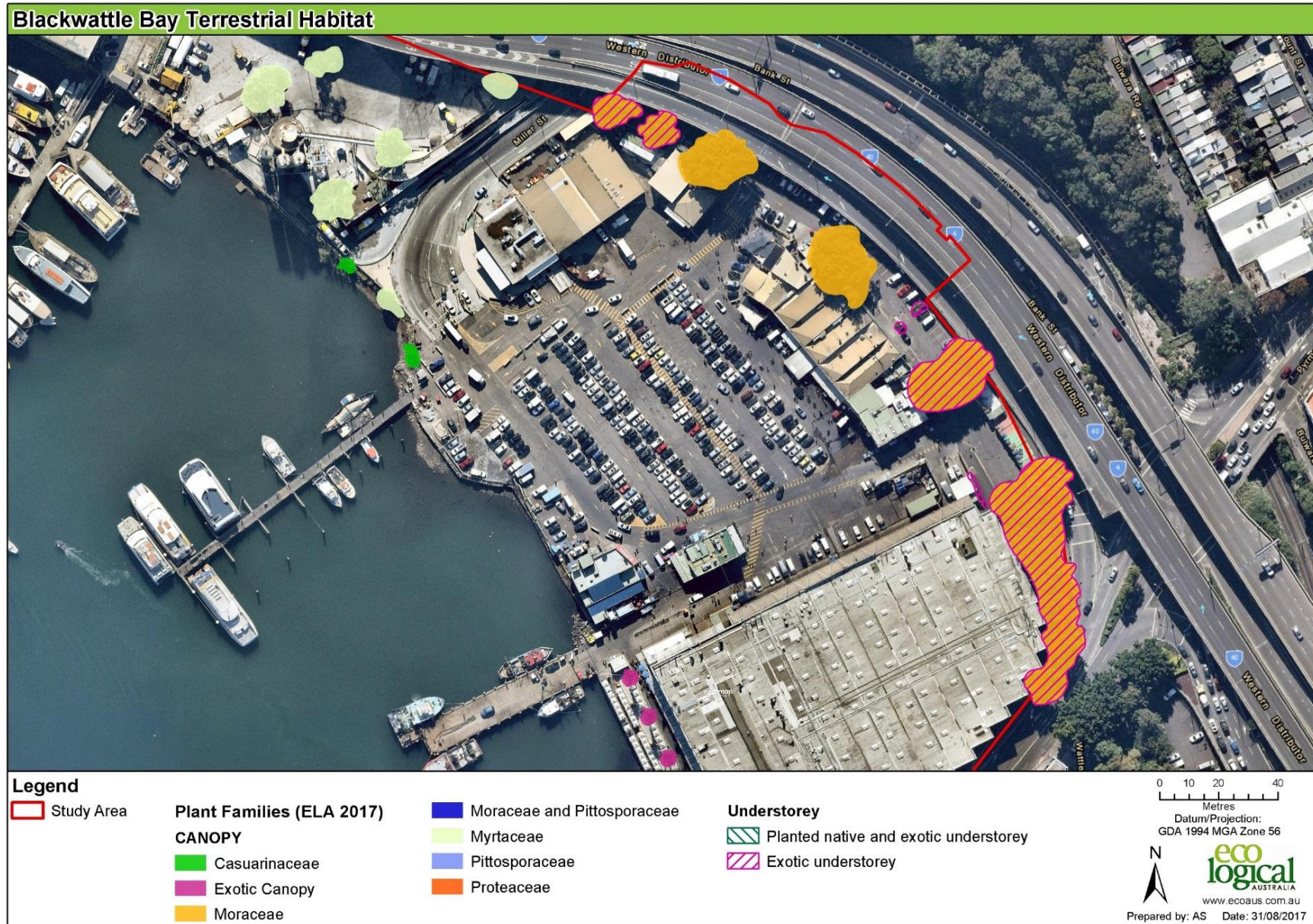


Figure 13: Terrestrial habitat in the eastern portion of the Blackwattle Bay study area

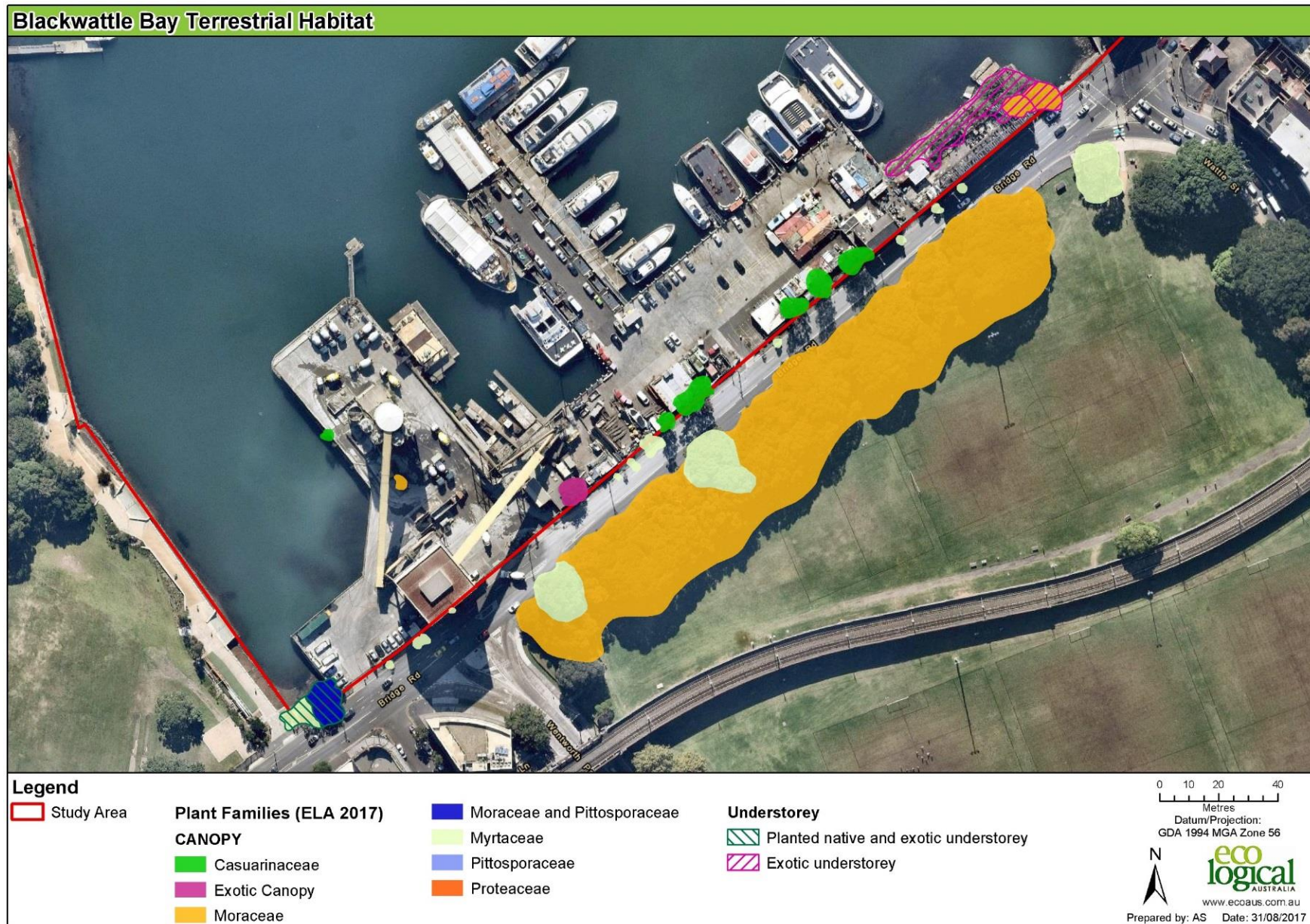


Figure 14: Terrestrial habitat in the southern portion of the Blackwattle Bay study area



Figure 15: Terrestrial habitat in the western portion of the Blackwattle Bay study area

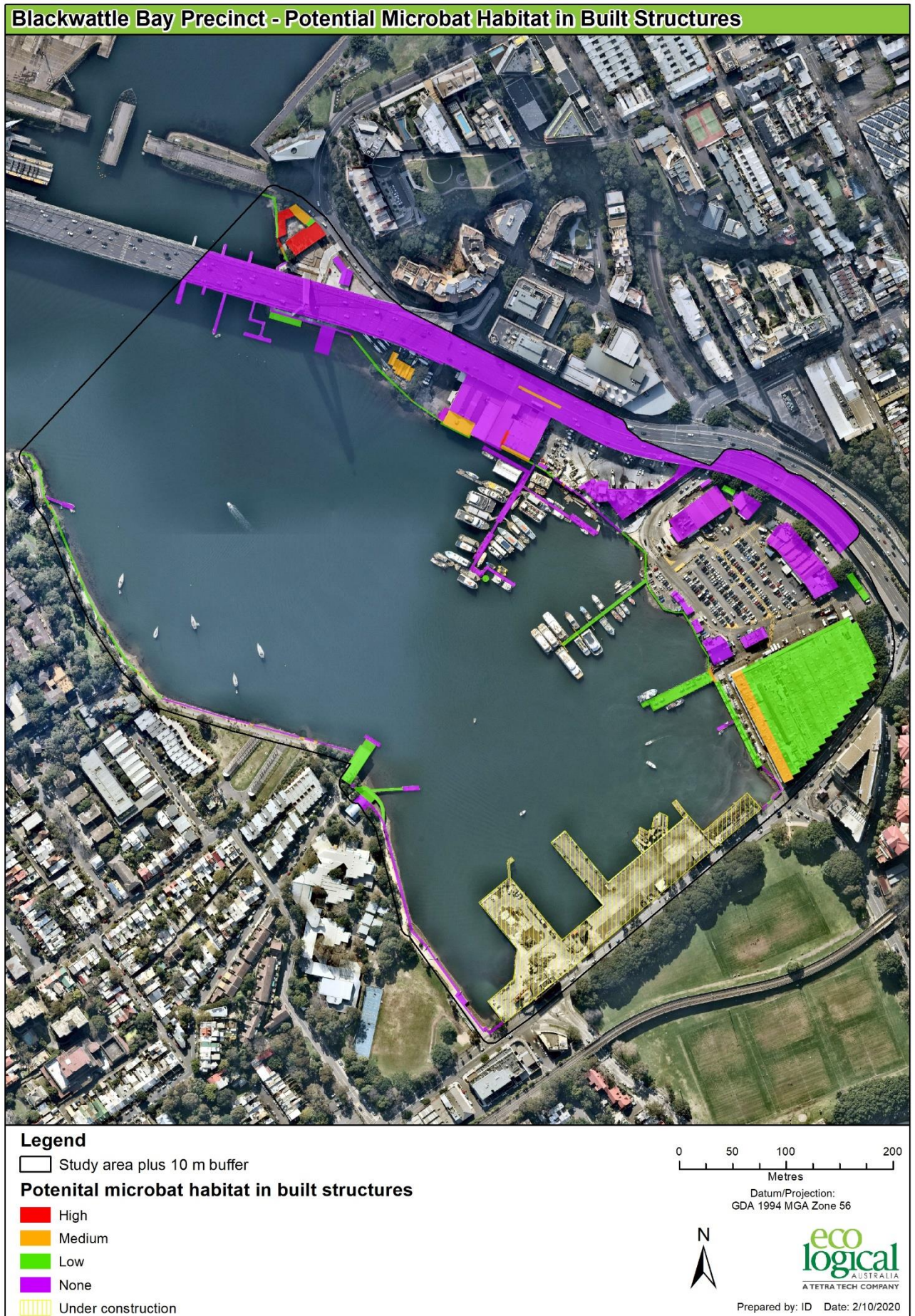


Figure 16: Potential microbat habitat in built structures (surveyed 22 September 2020)



Figure 17: Potential habitat for the threatened Grey-Headed Flying-fox (GHFF) in the Blackwattle Bay study area

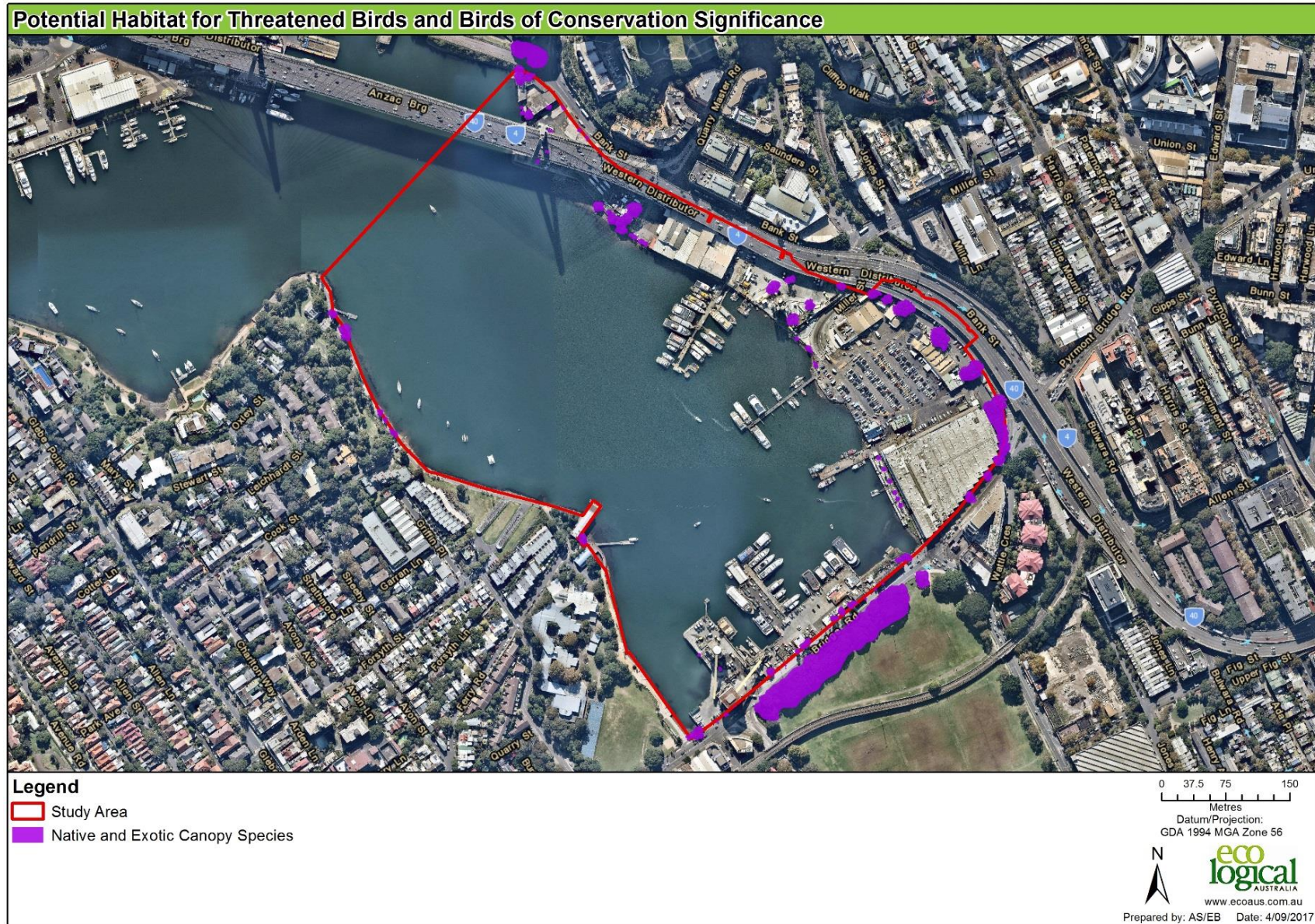


Figure 18: Potential habitat for threatened birds of conserving significance in the Blackwattle Bay study area

6. Opportunities

6.1 Aquatic habitat opportunities

This section identifies habitat improvement opportunities presented by future development in the Blackwattle Bay study area. It is recommended that during the detailed design phase of the development, an overarching Aquatic Biota Management Plan (ABMP) be prepared to guide design and installation of specific habitat elements. The ABMP should have a monitoring period of at least five years to determine the extent to which the habitat enhancements have been successful – and therefore provide lessons for future harbour infrastructure.

Comparison of marine invertebrates on natural habitat and artificial structures shows there is a distinct reduction in diversity on surfaces that lack microhabitats (cracks and crevices) and when water-retaining features are absent (rockpools) (Browne and Chapman 2014, Chapman and Blockley 2009). In Blackwattle Bay, Bugnot et al. (2016) found no mobile invertebrates in the subtidal zone of hard structures. Bugnot comments that this is fairly common for artificial hard structures, but natural subtidal reefs tend to support a range of snails, sea stars and chitons, which are important grazers and predators (Marzinelli et al. 2014, Johnston et al. 2015). Therefore, habitat enhancement opportunities should aim to replicate natural elements, such as cracks, crevices and pools.

Opportunities to enhance or create new habitat in the Blackwattle Bay study area should aim to increase the abundance and diversity of sessile and less-mobile marine organisms that support a localised food web and improve ecological complexity, such as:

- filter-feeders (bivalves, barnacles and sponges)
- algal grazers (gastropods and chitons)
- macroalgae (e.g. turfing algae and large brown algae)
- colonial organisms (bryzoans).

Following establishment of low-trophic organisms, larger more mobile fauna would pass through and utilise the area, such as:

- Crustaceans (bugs, shrimp, crabs)
- Fish.

Species known to occur nearby in Sydney Harbour, but not found in Blackwattle Bay could colonise the bay if habitat conditions are suitable, and connectivity of neighbouring habitats support migration. Potential native species that would increase biodiversity in Blackwattle Bay are listed in Table 4. Future occurrence of any of these species may indicate successful habitat improvements in the bay, noting that baseline studies aren't inclusive of all taxa across every habitat and season. Habitat enhancement should aim to emulate the natural environment, creating habitats for native species and providing natural dissipation of wash and waves. An increase in colonisation of native species reduces the resources and opportunity for invasive species to establish.

A healthy balance of species across the food web is desirable. This could largely be achieved through habitat creation, but other indirect impacts from foreshore development could disrupt the desired

balance. For example, artificial lighting has the potential to alter fish communities within urban estuarine ecosystems by creating optimal conditions for predators (Becker et al 2013). This is due to the increased abundance of small shoaling fish foraging in artificially lit areas, which in turn attract larger visual predators that consume smaller fish that would usually be hidden in the dark. To reduce potential impact to fish communities, the preference for low-wattage, low-spill lights should be considered, preferably of a warmer colour temperature so light doesn't penetrate to deeper water. Alternatively, impact could be minimised by positioning the light towards shallower water where there is less physical space for fish.

Table 4: Marine species absent from baseline surveys in Blackwattle Bay, but present in nearby areas of Sydney Harbour (Bugnot et al. 2016).

Habitat and type	Group	Scientific name	Common name
Intertidal fauna	Mollusc	<i>Chiton pelliserpentis</i>	Snake-skin Chiton
	Mollusc	<i>Chthamalus antennatus</i>	Six-plated Barnacle
	Mollusc	<i>Morula marginalba</i>	Mulberry Whelk
	Mollusc	<i>Patelloida alticostata</i>	Tall-ribbed Limpet
Intertidal flora	Red seaweed	<i>Corallina officinalis</i>	Coralline Seaweed
	Red seaweed	<i>Hydrolithon</i> sp.	-
Subtidal fauna	Bryozoan	<i>Celleporaria nodulosa</i>	-
	Bryozoan	<i>Fenestrulina mutabilis</i>	-
	Bristle worm	<i>Galeolaria caespitosa</i>	Galeolaria Worm
Subtidal flora	Brown seaweed	<i>Ecklonia radiata</i>	Leather Kelp
	Brown seaweed	<i>Padina elegans</i>	Pandina
	Red seaweed	<i>Champia compressa</i>	Iridescent Algae
	Red seaweed	<i>Corallina officinalis</i>	Coralline Seaweed
Mobile fauna	Fish	<i>Apogon</i> sp.	Cardinalfish
	Fish	<i>Arripis trutta</i>	Australian salmon
	Fish	<i>Blenniidae</i>	Belenny
	Fish	<i>Brachaluteres jacksonianus</i>	Pygmy leatherjacket
	Fish	<i>Bramidae</i>	Pomfret
	Fish	<i>Carangidae</i>	Trevally
	Fish	<i>Decapoda</i>	Prawns
	Fish	<i>Mugilidae</i>	Mullet
	Fish	<i>Parupeneus spilurus</i>	Black spot goatfish
	Fish	<i>Pseudocaranx georgianus</i>	Silver trevally
	Fish	<i>Tetractenos glaber</i>	Smooth toadfish
	Fish	<i>Upeneichthys vlamingii</i>	Blue spot goatfish

To achieve greater abundance and diversity of marine biota, several techniques are available as described in *Guiding Principles for Marine Foreshore Developments* (Dafforn et al. 2016). Potential

options suited to existing conditions in the Blackwattle Bay study area are presented in Table 5 below, based on the following discussion.

Seawalls – The current seawall is a mix of vertical and sloped concrete and sandstone surfaces. Naturally, the intertidal zone would be a slow transition from subtidal to terrestrial consisting of microhabitats which support flora (macroalgae) and fauna (sponges and molluscs). These species provide food for higher order species including crustaceans and fish. The seawalls steepens this transition, reducing the habitat complexity in this area. Where the vertical seawall would be retained, its habitat complexity can be increased by adding artificial habitat features including pots, crevices or panels. This adds texture, water retaining features and crevices which allows flora and fauna to establish. As additional structures on the seawall may create shade, it is important not to shade any existing vegetation and position pot plants in areas of least sensitivity to disturbance (type 3 KFH). A trial study in Blackwattle Bay retrofitted complex ridged tiles and flowerpots to mono-textured seawalls to increase surface area and introduce microhabitats (Strain et al. 2017). An increase in settlement was recorded on the textured tiles. There was an 80% increase in biodiversity of the seawall, with the use of flowerpots. Starfish, fish and sponges were some of the fauna using the pots as habitat. Although these features were retrofitted, it is suggested that water-retaining features are better to be incorporated into a seawall or pile at the planning stage. A seawall at McMahons Point, Sydney Harbour, is an example of this. The sandstone seawall was purposely built to include pools for structural habitat and features rock boulders at its toe for additional transitioning habitat.




Where the seawall would be replaced, creating a sloping transition from the water to the land would increase the surface area that is tidally inundated. Rock revetments provide large tidal surface areas and trap water during the low tide to create microhabitats. The inclusion of flat areas within the rock revetment can create additional habitat and allow the accumulation of sediment and establishment of natural vegetation (mangroves and saltmarsh). There are current examples of this onsite, with three mangrove seedlings growing in an artificial area located in front of a vertical seawall. Materials including coir or timber logs can be used as a barrier to wash while the mangrove seedlings establish. These logs would decompose slowly, and offer additional habitat and nutrient cycling in the process. A naturally vegetated shoreline has benefits to the aquatic environment including supplying food and habitat for fish and trapping contaminants/nutrients/gross pollution from the land before they enter the water.




Wharves, piles and pontoons – Pontoons can create habitat by creating texture in the intertidal and subtidal zones. Complex panels fitted to the wetted side of the pontoon would increase habitat complexity and provide a greater surface area for flora and fauna to colonise. Installing textured piles, as opposed to piles with smooth surfaces, would also increase habitat availability. Wharves are preferable to pontoons, as the use of a solid structure means that light penetrating materials can be used. Mesh decking, Perspex or glass can all be used to reducing shading on the benthic habitat below. Increased light allows for the establishment of vegetation, e.g. macroalgae, which are primary producers and an important food source for secondary produces, e.g. invertebrates. This habitat opportunity also allows pedestrians of these structures to observe the aquatic biodiversity below the structure. Increasing the height of the structure above the water also maximises light availability under the structure. Artificial hanging structures, similar in shape to milk crates, can be hung below wharves or pontoons at varying depths to create another habitat opportunity.





Subtidal sand – Subtidal sand can be enhanced by installing features such as artificial reefs. Artificial structures are designed to deflect currents and create nutrient upwellings around them. This, in turn, attracts fish. The hard structures also allow for encrusting organisms to establish. The reef structure must be made of environmentally friendly material, and free of all noxious substances that may leech into the water. They must not become navigational hazards. Planting of native macroalgae on rubble amongst subtidal sand that is less than 2 m deep would also improve that habitat on site. Transplanting habitat-forming species such as *Ecklonia radiata*, that is native to the region, has previously been successful within Sydney Harbour.

Other measures to improve marine habitat can be activated on the land, such as vegetation works discussed in Section 6.2, and water quality controls to trap sediments and litter, and reduce nutrient loads and contaminants from entering the bay. By having cleaner inflowing water, dominant invertebrates (especially barnacles and bivalves), can have a greater positive impact on the marine ecology by natural filtering harbour water. Options to incorporate water sensitive urban design should be explored by the water engineers and designers during the next stage of master planning and detailed design.




Table 5: Aquatic habitat improvement techniques applied from Guiding Principles for Marine Foreshore Developments (Daffon et al. 2016)

Habitat type on site	Example habitat on site	Habitat improvement opportunity	Example habitat improvement
(Figure 8)			
Subtidal sand (>2 m depth)		Deploy hard structures (oyster reefs) onto soft sediment. Need to consider navigable waters by boats and loss of bare sand habitat.	 



Habitat type on site	Example habitat on site	Habitat improvement opportunity	Example habitat improvement
(Figure 8) Subtidal sand (1-2 m depth)		Place scattered rubble in shallow water to support natural colonisation of macroalgae. Plant/transplant native species (macroalgae) to new rocky substrate or use transplant mats in sandy subtidal zones. Need to consider loss of bare sand habitat.	
Macroalgae (<i>Sargassum linearifolium</i>)		Plant/transplant native macroalgae and/or increase rocky rubble to improve continuity and width.	

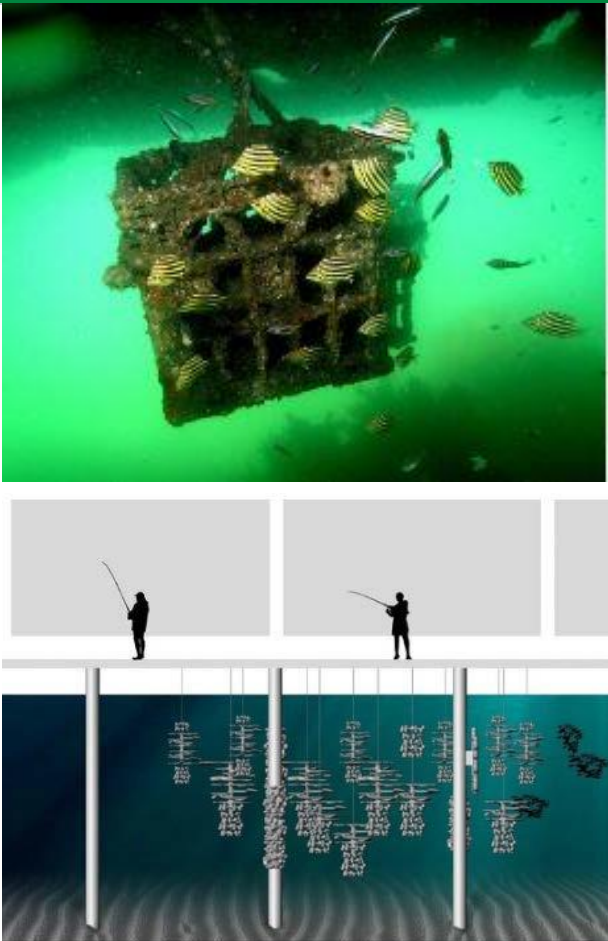
Habitat type on site	Example habitat on site	Habitat improvement opportunity	Example habitat improvement
(Figure 8)			
Intertidal rocky rubble seawalls		<p>Construct water retaining features and increase structural complexity of intertidal or subtidal zones of seawalls.</p> <p>Increase rocky rubble in shallow unvegetated substrate to allow natural recruitment of macroalgae.</p> <p>Plant/transplant native species (macroalgae) to rocky substrate or use transplant mats in sandy subtidal zones.</p>	
Vertical smooth seawalls		<p>New seawalls should have a gentle slope, or add horizontal surfaces to vertical walls (e.g. flowerpots), or retrofit with complex habitat surface.</p>	

Habitat type on site	Example habitat on site	Habitat improvement opportunity	Example habitat improvement
Vertical seawalls (Figure 8)	rough	Provides some habitat features already, but if retained can be enhanced by adding water retaining features like flowerpots.	
Sloped seawalls	stepped	Plant/transplant native macroalgae to subtidal hard substrate. Increase rocky rubble to improve connectivity of suitable habitat.	




Habitat type on site	Example habitat on site	Habitat improvement opportunity	Example habitat improvement
<p>(Figure 8)</p> <p>Sloped smooth seawalls</p> <p>(left part of example photo)</p>		<p>Improvements could include water retaining features, complex rock structures and/or retrofit with complex habitat surface.</p>	 

Habitat type on site	Example habitat on site	Habitat improvement opportunity	Example habitat improvement
(Figure 8)			<div></div> <div><p>https://www.sims.org.au/page/130/living-seawalls-landing</p><div><div>Honeycomb</div><div>Rockpool</div><div>Swimthrough</div><div>Crevice</div></div><div></div><div>Current designs of the Living Seawalls habitat panels.</div></div>

Habitat type on site	Example habitat on site	Habitat improvement opportunity	Example habitat improvement
(Figure 8)			
Future boardwalks, wharves and jetties		<p>Where new suspended surfaces are proposed, design should consider ways to allow light to penetrate, e.g. integrated glass panel, metal grills, mesh decking.</p> <p>Hanging structures can be suspend from wharves to create additional habitat. These can act as fish aggregation devices.</p>	 

Habitat type on site	Example habitat on site	Habitat improvement opportunity	Example habitat improvement
(Figure 8)			

<https://www.reefdesignlab.com/hangingfloating>

Habitat type on site	Example habitat on site	Habitat improvement opportunity	Example habitat improvement
(Figure 8)			
Future floating boardwalks (e.g. temporary structure(s) around the land outside of State Government ownership)		<p>Fish may use shaded areas beneath the floating boardwalk for shelter, especially if moving between habitats. Additional habitat elements could be placed either side of the floating boardwalk to enhance this space, such as:</p> <ul style="list-style-type: none">• Shallow zone between boardwalk and seawall – place rubble for macroalgae• Deeper zone waterside of boardwalk - place rubble or oyster reefs (see above in ‘subtidal sand’ item).	
Piles		<p>Increase surface roughness of piles through material selection and/or installation of complex material (similar to transplant mats wrapped around piles in strips, or complex cross beams). This would provide an attachment surface for larger macroalgae.</p>	

6.2 Terrestrial habitat opportunities

There are numerous possibilities of local habitat improvements in an urban context. For detailed examples of terrestrial habitat improvements see *Urban ecology: theory, policy and practice in New South Wales, Australia* (Davies et al. 2017), such as indigenous vegetation planting in landscaping works, creation of roof-top gardens, green walls, artificial wetlands and water-sensitive urban design to provide frog habitat etc. Incorporating such features into the master planning and detailed design of future development provides an opportunity to increase the biodiversity value of the area. The following opportunities should also be explored during the design phase:

- Give preference to planting locally native species for landscaping and open spaces. The use of deciduous trees should be avoided, as excessive leaf litter blowing/washing into the harbour can impact marine habitat. Leaves from exotic trees decompose rapidly (unlike native trees), so they don't provide a stable food resource for aquatic detritivores (e.g. some crabs and other marine invertebrates). Deciduous leaves often accumulate during a short period (unlike native species that shed leaves slowly all-year round), and large amounts of organic material deposited in the water can cause anoxic benthic conditions. In Blackwater Bay, there are limited flushing processes due to the shape of the bay and multitude of subtidal structures, so organic material has less opportunity to disperse. Therefore, large amounts of leaves from deciduous trees could potentially build up near stormwater outlets and close to shore, resulting in poorer quality marine habitat.
- Incorporate trees into the master plan with the aim to shade pavement. This will help reduce the temperature of open-space and prevent surface flows from warming before draining to the harbour. Warm water can favour exotic marine species.
- Incorporate trees and garden beds into the master plan to improve potential future connection of patches of vegetation identified as 'supporting habitats' on the Biodiversity Corridor Map (Figure 10). This will help with fauna passage, foraging and breeding opportunities, and dispersal and exchange of genetic material. Habitat connectivity should include all strata if possible (trees, shrubs and groundcovers) plus complexity (unmown grass, large logs, boulders, bark, etc). This may be achieved through strategic placement of habitat nodes or linear connections as illustrated in the Urban Forest Strategy (Figure 19 and Figure 20), noting limitations given the narrow site and anticipated activity. Habitat improvements and proximity to existing trees in Wentworth Park would also help connect the adjacent western shore that forms part of the Glebe Foreshore Walk East (one of six high-priority sites listed in the City's UESAP). Also, due to the known presence of microbats in the area, creation of habitat structures should be considered. This could include microbat boxes or inbuilt cavities beneath large over-water structures.
- Consider the use of pervious surfaces for open-space areas. This may be a mix of grass and tiered pavements/gardens and/or permeable hard surfaces to allow water to soak into the soil rather than flow off quickly to the harbour.
- Select low-spill lighting near habitat vegetation to reduce disturbance to nocturnal animals. Lighting options should be also designed for safety requirements, therefore, lighting design should select different types for specific areas. For example, the adjacent western shore is a notable area of existing vegetation where more nocturnal animals could be expected and would be more sensitive to lighting impacts from the adjacent precinct. Therefore, high-spill lighting

should not aim at this area, and low-spill lighting should be used along its boundary with the precinct and any proposed vegetation.

The UESAP 2014 lists three categories with six objectives and targets to achieve the City's vision. Table 6 evaluates how the master plan aligns with each category (response column).

Table 6: Urban Ecology Strategic Action Plan objectives and targets

Category	Objectives	Targets	Response
Locally indigenous vegetation	Protect, expand and improve condition of naturally occurring locally indigenous vegetation, including possible remnants	Area of naturally occurring vegetation maintained or increased from 2012 baseline of 2.7 hectares by 2023. Naturally occurring vegetation in good condition by 2023	The Urban Forest Strategy Plan (Figure 19) applies minimum tree canopy cover (% cover) for indicative zones: streets, laneways, promenades, parks, reserves and open space. Spatially, the plan would result in a net gain of native vegetation cover compared to the current situation (Figure 11).
	Increase the extent of bush restoration sites across the LGA, and maintain sites in good condition	Area of bush restoration sites increased by 100 per cent from 2012 baseline of 4.2 hectares by 2023. Bush restoration sites characterised by well-established, structurally complex vegetation, free of weeds by 2023	Bush regeneration sites occur adjacent to the study area. No suitable bush regeneration sites occur in the study area.
	Re-establish representative patches of the likely original vegetation communities	Representative patches of at least three likely original vegetation communities established by 2024	No part of the study area is suitable to re-establish a fully structured vegetation community to a scale that would satisfy a representative patch.
Fauna	Protect and enhance sites that provide habitat for priority fauna species	Indigenous fauna species diversity maintained or increased by 2023 based on 2012 baseline	The study area currently provides habitat for several priority fauna species. During staged development, their habitat would be incrementally removed and replaced by similar functioning habitat via implementation of the Urban Forest Strategy Plan (Figure 19). DA Conditions would identify the need for pre-clearance surveys and fauna relocation.
	Increase the distribution and abundance of priority fauna species across the LGA	Priority fauna species recorded from greater number of locations and in higher numbers compared to 2012 baseline by 2023	Tree cover proposed in the Urban Forest Strategy Plan (Figure 19) would improve connectivity and contribute to expanded fauna movement.
Habitat connectivity	Improve habitat connectivity across the LGA, particularly between priority sites, and	Progressive increase in number of habitat features for priority fauna species	Figure 17 of the UESAP marks the land parallel to, but outside of the study area, as a potential habitat linkage. Section 3.6 of the UESAP acknowledges that while it is unlikely that continuous habitat

Category	Objectives	Targets	Response
	between identified habitat areas in adjoining LGAs	established potential linkages by 2023	<p>along habitat 'corridors' can be created along their full length, there is considerable potential to at least create 'stepping stones' of habitat along or in the vicinity of these potential habitat linkages to facilitate the movement of more mobile species across the landscape. The Urban Forest Strategy Plan (Figure 19) would allow mobile species to move between canopies and extend their movement range compared to the current conditions. Of the priority fauna species listed in section 3.5 of the UESAP, those using tree canopies for foraging, roosting or navigation are Grey-headed Flying Fox, Powerful Owl, microbats and small birds.</p> <p>The remainder of the priority species are unlikely suited to this area, with the exception of small reptiles that may colonise planting beds and other landscaped features.</p>

/urban forest strategy plan

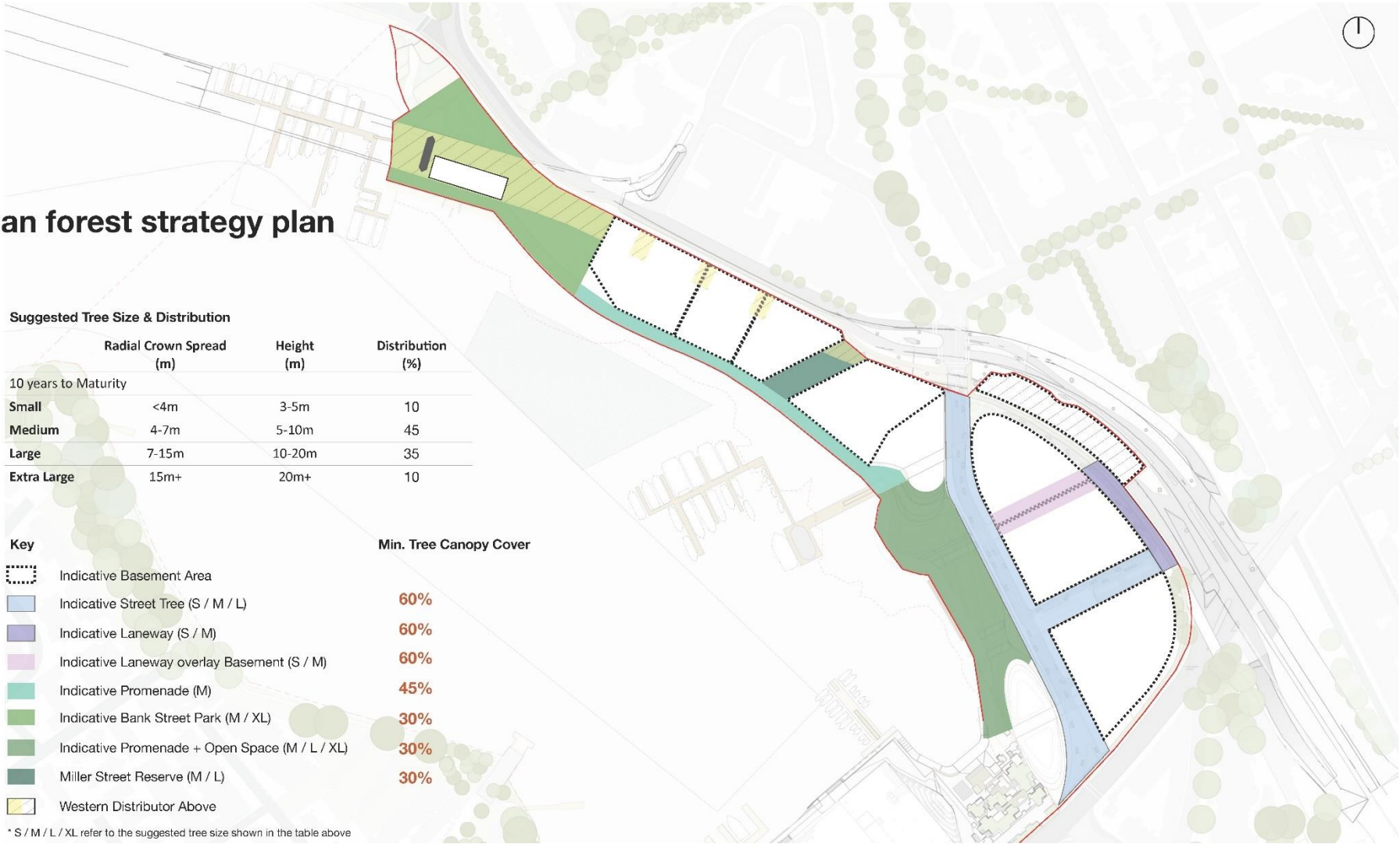


Figure 19: Urban Forest Strategy Plan

Source: FJMT

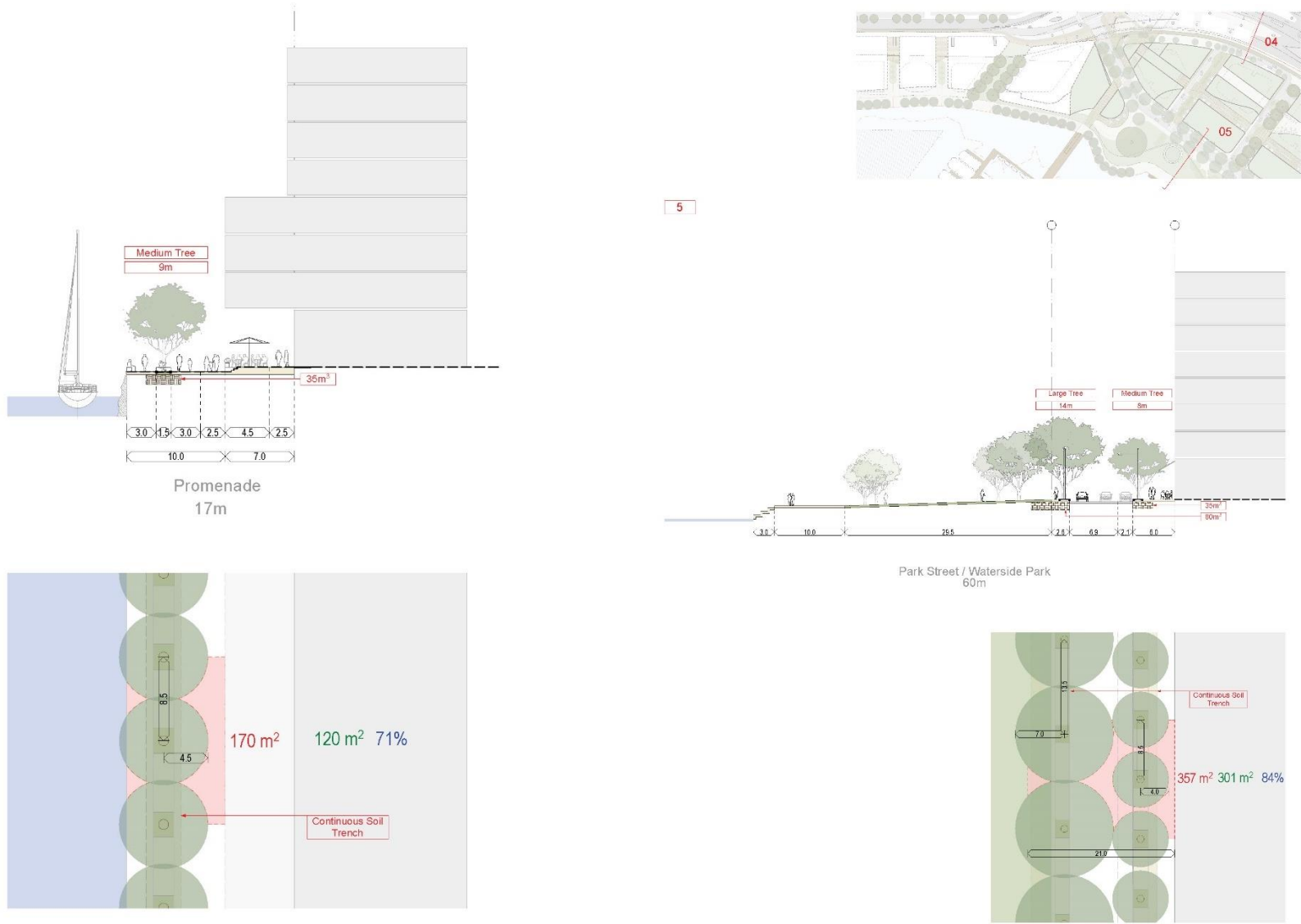


Figure 20: Indicative tree canopy spacing along Waterfront Promenade (left) and Waterside Park (right)

Source: FJMT

7. Recommendations

There are few major ecological constraints to the proposed rezoning and future development which should be addressed during ongoing design. However, there are also several opportunities to enhance the terrestrial and marine ecology with reasonably simple considerations in design and habitat connectivity. To ensure the full suite of opportunities are explored during future master planning and detailed design, the following recommendations should be adopted:

1. This report is an existing environmental report and provides an opportunities and constraints assessment. A future impact assessment is required to support any future development application. This would trigger a BDAR to measure loss and calculate biodiversity offsets (if any), and an Aquatic Ecology Impact Assessment to calculate loss/gain of key fish habitat types.
2. For enhancing marine habitat, key design features should aim to increase structural complexity of the intertidal and subtidal zones. This could be achieved through a combination of new gentle-sloped seawalls, retrofitting existing hard structures, adding rocky rubble and deploying artificial reefs to promote macroalgae growth and colonisation by marine fauna. Selection of areas to enhance should consider opportunities to improve habitat connectivity and width, and be at a scale that does not cause the significant loss of another habitat type, plus avoid creating navigational hazards.
3. Develop an overarching Aquatic Biota Management Plan (ABMP) to guide design and installation of specific marine habitat elements. The ABMP should consider a monitoring period of at least five years to determine the extent to which the habitat enhancements have been successful – and therefore provide lessons for future harbour infrastructure.
4. Incorporate terrestrial habitat features into landscape plans and building designs. This should aim to provide both micro-habitats, stratified habitats and improve connectivity along existing or broken habitat corridors. Due to the known presence of microbats in the area, creation of habitat structures should be considered. This could include microbat boxes or inbuilt cavities beneath large over-water structures.

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Appendix A – Threatened species likelihood of occurrence and impact

An assessment of likelihood of occurrence was made for threatened species, migratory species, and species of local conservation significance (referred to in UESAP and SSROC CCB), as identified from the literature review. The literature review included records from the BioNet Search (OEH 2017b) and EPBC Act Protected Matters Search (DotEE 2017a). Five terms for the likelihood of occurrence of species are used in this report. This assessment was based on database or other records, presence or absence of suitable habitat, features of the proposal site, results of the site inspection and professional judgement. Some Migratory or Marine species identified from the Commonwealth database search have been excluded from the assessment, due to lack of habitat. The terms for likelihood of occurrence are defined below:

- “known” = the species was or has been observed on the site
- “likely” = a medium to high probability that a species uses the site
- “potential” = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur
- “unlikely” = a very low to low probability that a species uses the site
- “no” = habitat on site and in the vicinity is unsuitable for the species.

An assessment of significance was conducted for threatened species or ecological communities that were recorded within the Development Site or had a higher likelihood of occurring and were not recorded during the site visit. It is noted that some threatened fauna species that are highly mobile, wide ranging and vagrant may use portions of the Development Site intermittently for foraging.

Information provided in the habitat associations’ column has primarily been extracted (and modified) from the Commonwealth Species Profile and Threats Database (DotEE 2017b), the NSW Threatened Species Profiles (OEH. 2017b), the Atlas of Living Australia (ALA 2017), and BirdLife Australia (BLA 2017).

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
Amphibians						
Amphibians (As a general group identified by the UESAP. Non-threatened species recorded within 10 km of the site)		-	-	Swamps, marshes, streams, rivers, ponds, inundations, drainage lines and generally moist areas.	Potential	No, there is no specific potential habitat located within the Development Site
<i>Crinia tinnula</i>	Wallum Froglet	V		Acidic swamps on coastal sand plains (typically in sedgelands and wet heathlands), drainage lines, and swamp sclerophyll forests.	No. No suitable habitat on or near the Development Site	No
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	Heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	No. No suitable habitat on or near the Development Site	No
<i>Litoria aurea</i>	Green and Golden Bell Frog	E1	V	Marshes, dams and stream-sides, particularly those containing Typha spp. (bullrushes) or Eleocharis spp. (spikerushes). Some populations occur in highly disturbed areas.	No. No suitable habitat on or near the Development Site	No
<i>Litoria fallax</i> *	Eastern Dwarf Tree Frog	-	-	Coastal wetlands, swamps, dams and streams, and can also be found in urban areas.	Potential	No
<i>Litoria peronii</i> *	Peron's Tree Frog	-	-	Most forest habitats, but will also forage open grassland and other open areas.	Potential	No
<i>Mixophyes balbus</i>	Stuttering Frog	E1	V	Rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	No.	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
					No suitable habitat on or near the Development Site	
<i>Pseudophryne australis</i>	Red-crowned Toadlet	V		Open forests, mostly on Hawkesbury and Narrabeen Sandstones.	No. No suitable habitat on or near the Development Site	No
Birds						
Small birds (As a general group identified by the UESAP. Non-threatened species recorded within 10 km of the site)		-	-	A variety of vegetated habitats, dependant on the species.	Potential. Suitable potential habitat occurs within the Development Site	Yes
Freshwater wetland birds (As a general group identified by the UESAP. Non-threatened species recorded within 10 km of the site)		-	-	Coastal and inland wetlands, pond, inundations, dense sedge sand reeds.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Acanthiza nana</i> *	Yellow Thornbill	-	-	Found in open forests, woodlands and shrublands which are dominated by Casuarinas, Acacias or paperbarks rather than eucalypts. Often seen in parks and gardens, preferring more established areas.	Potential. Suitable potential habitat occurs within the Development Site	Yes
<i>Actitis hypoleucos</i>	Common Sandpiper		M	Coastal wetlands and some inland wetlands, especially muddy margins or rocky shores. Also estuaries and deltas, lakes, pools, billabongs, reservoirs, dams and claypans, mangroves.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Acrocephalus australis</i> *	Australian warbler	Reed-	-	A freshwater wetland species of local conservation significance. Prefers dense vegetation alongside water, especially thick reed beds, as well as tall crops, bamboo thickets and lantana.	Potential. Suitable potential habitat	Yes

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
					occurs within the Development Site	
<i>Anous stolidus</i>	Common Noddy		M	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Anseranas semipalmata</i>	Magpie Goose	V		Shallow wetlands, floodplains, grasslands, pastures, dams and crops.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Anthochaera phrygia</i>	Regent Honeyeater	E4A	CE	Eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of <i>Casuarina cunninghamiana</i> (River Oak).	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Apus pacificus</i>	Fork-tailed Swift		M	Riparian woodland, swamps, low scrub, heathland, saltmarsh, grassland, Spinifex sandplains, open farmland and inland and coastal sand-dunes.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Ardenna carneipes</i>	Flesh-footed Shearwater	V	M	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Ardenna pacificus</i>	Wedge-tailed Shearwater		M	Islands, offshore.	Unlikely. Marginal suitable habitat on or near	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
					the Development Site.	
<i>Ardenna tenuirostris</i>	Short-tailed Shearwater		M	Islands, offshore.	Marginal suitable habitat on or near the Development Site	No
<i>Arenaria interpres</i>	Ruddy Turnstone		M	Tidal reefs and pools; pebbly, shelly and sandy shores; mudflats; inland shallow waters; sewage ponds, saltfields; ploughed ground.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Artamus cyanopterus</i>	Dusky Woodswallow	V		Woodlands and dry open sclerophyll forest, usually eucalypts and mallee associations. Also have recordings in shrub and heathlands and various modified habitats, including regenerating forests. In western NSW, this species is primarily associated with River Red Gum/Black Box/Coolabah open forest/woodland and associated with larger river/creek systems.	Unlikely	No
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E1	E	Permanent freshwater wetlands with tall, dense vegetation, particularly Typha spp. (bullrushes) and Eleocharis spp. (spikerushes).	No	No
<i>Burhinus grallarius</i>	Bush Stone-curlew	E1		In NSW, it occurs in lowland grassy woodland and open forest.	No	No
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper		M	Shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	Unlikely. Marginal suitable habitat on or near the Development Site	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
<i>Calidris alba</i>	Sanderling	V	M	Coastal areas on low beaches of firm sand, near reefs and inlets, along tidal mudflats and lagoons; rarely recorded in near-coastal wetlands.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Calidris bairdii</i>	Baird's Sandpiper		M	Sandy beaches, mudflats, saltponds, sewage ponds and shores of lakes and lagoons.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Calidris canutus</i>	Red Knot		E, M	Intertidal mudflats, sandflats sheltered sandy beaches, estuaries, bays, inlets, lagoons, harbours, sandy ocean beaches, rock platforms, coral reefs, terrestrial saline wetlands near the coast, sewage ponds and saltworks. Rarely inland lakes or swamps.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Calidris ferruginea</i>	Curlew Sandpiper	E1	CE, M	"Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland."	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Calidris melanotos</i>	Pectoral Sandpiper		M	Shallow fresh to saline wetlands, including coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Calidris ruficollis</i>	Red-necked Stint		M	Tidal mudflats, saltmarshes, sandy and shelly beaches, saline and freshwater wetlands, saltfields, sewage ponds.	Unlikely. Marginal suitable habitat on or near	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
					the Development Site	
<i>Calidris subminuta</i>	Long-toed Stint		M	Coastal and inland shallow wetlands, sewage ponds, tidelines, tidal mudflats.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Calidris tenuirostris</i>	Great Knot	V	CE, M	Intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Calonectris leucomelas</i>	Streaked Shearwater		M	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Calyptrorhynchus lathamii</i>	Glossy Black-Cockatoo	V		Open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Charadrius bicinctus</i>	Double-banded Plover		M	Beaches, bays and inlets, exposed reefs and rock platforms, harbours, margins of fresh or saline terrestrial wetlands such as lakes, lagoons and swamps; shallow estuaries, rivers, saltmarsh, grasslands, pasture. Sometimes associated with coastal lagoons, inland saltlakes, saltworks, seagrass beds, kelp beds.	Unlikely. Marginal suitable habitat on or near the Development Site	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
<i>Charadrius leschenaultii</i>	Greater Sand-plover	V	V, M	Almost entirely restricted to coastal areas in NSW, mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Charadrius mongolus</i>	Lesser Sand-plover	V	E, M	Almost entirely coastal in NSW, using sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats, sandy beaches, coral reefs and rock platforms.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Charadrius ruficapillus</i>	Red-capped Plover		Mar	Occurs on sandy beaches, coastal lagoons, estuaries, bays and inland saline wetlands.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Charadrius veredus</i>	Oriental Plover		M	Open plains, ploughed land, inland swamps, tidal mudflats, claypans, coastal marshes, grassy airfields, playing fields, lawns.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Charadrius veredus</i>	Oriental Plover		M	Open plains, ploughed land, inland swamps, tidal mudflats, claypans, coastal marshes, grassy airfields, playing fields, lawns.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Chlidonias leucopterus</i>	White-winged Tern	Black	M	Large coastal and inland wetlands, saltfields, tidal estuaries, lagoons, grassy swamps, and sewage ponds.	Unlikely. Marginal suitable habitat on	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
					or near the Development Site	
<i>Cuculus saturatus</i>	Oriental Cuckoo			Occupies rainforests, monsoon forests and vine thickets with dense vegetation and closed canopies	No. No suitable habitat on or near the Development Site	No
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		Inhabits eucalypt forests and woodlands, mallee and Acacia woodland.	Unlikely	No
<i>Dasyornis brachypterus</i>	Eastern Bristlebird	E1	E	Central and southern populations inhabit heath and open woodland with a heathy understorey. In northern NSW, habitat comprises open forest with dense tussocky grass understorey.	No	No
<i>Diomedea antipodensis</i>	Antipodean Albatross	V	V	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Diomedea antipodensis gibsoni</i>	Antipodean Albatross	V	V	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Diomedea epomophora</i>	Southern Albatross	Royal	Mar	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Diomedea exulans</i>	Wandering Albatross	E1	V, M	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
<i>Diomedea gibsoni</i>	Gibson's Albatross	V	V	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Diomedea sanfordi</i>	Northern Albatross	Royal	Mar	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Egretta sacra</i>	Eastern Reef Egret			Beaches, rocky shores, tidal rivers and inlets, mangroves, and exposed coral reefs.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Euseyornis melanops</i> *	Black-fronted Dotterel	-	-	A freshwater wetland species of local conservation significance. Found in the shallow margins of wetlands, lakes, rivers, sewage farms, storm drains and marshes. It is normally always near freshwater and is not often seen on the coast.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Epthianura albifrons</i>	White-fronted Chat population in the Sydney Metropolitan Catchment Management Area	E2		"Saltmarsh of Newington Nature Reserve and in grassland on the northern bank of the Parramatta River. Saltmarsh and on the sandy shoreline of a small island of Towra Point Nature Reserve."	No. No suitable habitat on or near the Development Site	No
<i>Epthianura albifrons</i>	White-fronted Chat	V		Saltmarsh vegetation, open grasslands and sometimes low shrubs bordering wetland areas.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Erythroriorchis radiatus</i>	Red Goshawk	E4A	V	Open woodland and forest, often along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical	Unlikely	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
				rainforest, Melaleuca swamp forest and coastal riparian Eucalyptus forest.		
<i>Falco subniger</i>	Black Falcon	V		Woodland, shrubland and grassland, especially riparian woodland and agricultural land. Often associated with streams or wetlands.	Unlikely	No
<i>Fregata ariel</i>	Lesser Frigatebird		M	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Fregata minor</i>	Great Frigatebird		M	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Fregetta grallaria</i>	White-bellied Storm-Petrel	V	V	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Gallinago hardwickii</i>	Latham's Snipe		M	Freshwater, saline or brackish wetlands up to 2000 m above sea-level; usually freshwater swamps, flooded grasslands or heathlands.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Gallinago megala</i>	Swinhoe's Snipe		M	Breeds in Siberia and Mongolia. In Australia found around edges of fresh and brackish wetlands. This includes swamps, billabongs, river pools, small streams and sewage ponds. They are also found in drying claypans and inundated plains.	Unlikely. Marginal suitable habitat on or near the Development Site	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
<i>Gallinago stenura</i>	Pin-tailed Snipe		M	Breeds in Siberia. Habitat specific to Australia includes dense clumps of grass and rushes round the edges of fresh and brackish wetlands. This includes swamps, billabongs, river pools, small streams and sewage ponds. During non-breeding period occurs most often in or at the edges of shallow freshwater swamps, ponds and lakes with emergent, sparse to dense cover of grass/sedge or other vegetation. Also found in drier, more open wetlands such as claypans, inundated with plains pitted with crab holes and also commonly seen at sewage ponds; not normally in saline or inter-tidal wetlands.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Gallirallus philippensis</i> *	Buff-banded Rail	-	-	A freshwater wetland species of local conservation significance. Seen singly or in pairs in dense reeds and vegetation bordering many types of wetlands or crops. It makes widespread use of artificial wetlands like sewage ponds and drainage channels.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Glossopsitta pusilla</i>	Little Lorikeet	V		Dry, open eucalypt forests and woodlands, including remnant woodland patches and roadside vegetation.	Unlikely	No
<i>Grantiella picta</i>	Painted Honeyeater	V	V	Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	No	No
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	V		Rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Haematopus longirostris</i>	Pied Oystercatcher	E1		Intertidal flats of inlets and bays, open beaches and sandbanks.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Haliaeetus leucogaster</i>	White-bellied Eagle	Sea-V		Freshwater swamps, rivers, lakes, reservoirs, billabongs, saltmarsh and sewage ponds and coastal waters. Terrestrial	Unlikely. Marginal suitable habitat on	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
				habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest and urban areas.	or near the Development Site	
<i>Hieraaetus morphnoides</i>	Little Eagle	V		Open eucalypt forest, woodland or open woodland, including sheoak or Acacia woodlands and riparian woodlands of interior NSW.	Unlikely	No
<i>Himantopus</i>	Black-winged Stilt	-	Mar	A freshwater wetland species of local conservation significance. A social species, and is usually found in small groups. Black-winged Stilts prefer freshwater and saltwater marshes, mudflats, and the shallow edges of lakes and rivers.	No	No
<i>Hirundapus caudacutus</i>	White-throated Needletail		M	Occur most often over open forest and rainforest, as well as heathland, and remnant vegetation in farmland.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Hydroprogne caspia</i>	Caspian Tern		M	Coastal offshore waters, beaches, mudflats, estuaries, rivers, lakes.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Ixobrychus flavicollis</i>	Black Bittern	V		Terrestrial and estuarine wetlands. Also flooded grassland, forest, woodland, rainforest and mangroves where permanent water is present.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Lathamus discolor</i>	Swift Parrot	E1	CE	Box-ironbark forests and woodlands.	No	No
<i>Limicola falcinellus</i>	Broad-billed Sandpiper	V	M	Sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs.	Unlikely. Marginal suitable habitat on or near the Development Site	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
<i>Limosa lapponica</i>	Bar-tailed Godwit		M	Intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons, bays, seagrass beds, saltmarsh, sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. Rarely inland wetlands, paddocks and airstrips.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Limosa limosa</i>	Black-tailed Godwit	V	M	"Usually sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. Further inland, it can also be found around muddy lakes and swamps."	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Lophochroa leadbeateri</i>	Major Mitchell's Cockatoo	V		Wide range of treed and treeless inland habitats, always within easy reach of water.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Lophoictinia isura</i>	Square-tailed Kite	V		Timbered habitats including dry woodlands and open forests, particularly timbered watercourses.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Macronectes giganteus</i>	Southern Giant Petrel	E1	E, M	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Macronectes halli</i>	Northern Giant-Petrel	V	V, M	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Malurus cyaneus</i> *	Superb Fairy-wren	-	-	A species of local conservation significance. Seen in most habitat types where suitable dense cover and low shrubs occur. They are common in urban parks and gardens, and can be seen in small	Potential. Suitable habitat	Yes

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
				social groups. These groups normally consist of one male and several females and young birds.	occurs within the Development Site	
<i>Monarcha melanopsis</i>	Black-faced Monarch		M	Rainforest, open eucalypt forests, dry sclerophyll forests and woodlands, gullies in mountain areas or coastal foothills, Brigalow scrub, coastal scrub, mangroves, parks and gardens.	No	No
<i>Motacilla flava</i>	Yellow Wagtail		M	Swamp margins, sewage ponds, saltmarshes, playing fields, airfields, ploughed land, lawns.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Myiagra cyanoleuca</i>	Satin Flycatcher		M	Eucalypt-dominated forests, especially near wetlands, watercourses, and heavily-vegetated gullies.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Neophema chrysogaster</i>	Orange-bellied Parrot	E4A	CE	Winter habitat is mostly within 3 km of the coast in sheltered bays, lagoons, estuaries, coastal dunes and saltmarshes. Also small islands and peninsulas, saltworks, golf courses, low samphire herbland and taller coastal shrubland.	No	No
<i>Neophema pulchella</i>	Turquoise Parrot	V		Eucalypt and cypress pine open forests and woodlands, ecotones between woodland and grassland, or coastal forest and heath.	No	No
<i>Nettapus coromandelianus</i>	Cotton Pygmy-Goose	E1		Freshwater lakes, lagoons, swamps and dams.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Ninox connivens</i>	Barking Owl	V		Woodland and open forest, including fragmented remnants and partly cleared farmland, wetland and riverine forest.	Unlikely	No
<i>Ninox strenua</i>	Powerful Owl	V		Woodland, open sclerophyll forest, tall open wet forest and rainforest.	Unlikely	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
<i>Numenius madagascariensis</i>	Eastern Curlew		CE, M	Estuaries, bays, harbours, inlets and coastal lagoons, intertidal mudflats or sandflats, ocean beaches, coral reefs, rock platforms, saltmarsh, mangroves, freshwater/brackish lakes, saltworks and sewage farms.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Numenius minutus</i>	Little Curlew		M	Dry grasslands, open woodlands, floodplains, margins of drying swamps, tidal mudflats, airfields, playing fields, crops, saltfields, sewage ponds.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Numenius phaeopus</i>	Whimbrel		M	Estuaries, mangroves, tidal flats, coral cays, exposed reefs, flooded paddocks, sewage ponds, grasslands, sports fields, lawns.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Onychoprion fuscatus</i>	Sooty Tern	V		Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Pandion cristatus</i>	Eastern Osprey	V		Rocky shorelines, islands, reefs, mouths of large rivers, lagoons and lakes.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Pandion haliaetus</i>	Osprey		M	Coastal areas near shallow waters.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Pachyptila turtur subantarctica</i>	Fairy Prion		V	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
<i>Pardalotus punctatus</i> *	Spotted Pardalote	-	-	A species of local conservation significance. The Spotted Pardalote is mostly found in eucalypt forests and woodlands but occurs in parks and gardens with well-established eucalypt canopy.	Potential. Suitable habitat occurs within the Development Site	Yes
<i>Petroica boodang</i>	Scarlet Robin	V		Dry eucalypt forests and woodlands, and occasionally in mallee, wet forest, wetlands and tea-tree swamps.	Unlikely	No
<i>Petroica phoenicea</i>	Flame Robin	V		Breeds in upland tall moist eucalypt forests and woodlands. In winter uses dry forests, open woodlands, heathlands, pastures and native grasslands. Occasionally occurs in temperate rainforest, herbfields, heathlands, shrublands and sedgeland at high altitudes.	Unlikely	No
<i>Phaethon lepturus</i>	White-tailed Tropicbird		M	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Philomachus pugnax</i>	Ruff		M	Terrestrial wetlands including lakes, swamps, pools, lagoons, tidal rivers, swampy fields and floodlands. Occasionally harbours, estuaries, seashores, sewage farms and saltworks.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Phoebastria fusca</i>	Sooty Albatross	V	V	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
<i>Phylidonyris novaehollandiae</i> *	New Holland Honeyeater	-	-	A species of local conservation significance. Common in heath, forests, woodland and gardens, mainly where grevilleas and banksias are found. It is inquisitive and approaches humans. It also mixes with other types of honeyeaters.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Phoebastria fusca</i>	Sooty Albatross	V	V, M	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Platalea regia</i> *	Royal Spoonbill	-	-	A freshwater wetland species of local conservation significance. Found in shallow freshwater and saltwater wetlands, intertidal mud flats and wet grasslands. Both permanent and temporary inland waters are used when available in the arid zone. Will also use artificial wetlands such as sewage lagoons, saltfields, dams and reservoirs.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Pluvialis fulva</i>	Pacific Golden Plover		M	Estuaries, mudflats, saltmarshes, mangroves, rocky reefs, inland swamps, ocean shores, paddocks, sewage ponds, ploughed land, airfields, playing fields.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Pluvialis squatarola</i>	Grey Plover		M	Mudflats, saltmarsh, tidal reefs and estuaries.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Pterodroma leucoptera</i>	Gould's Petrel	V	E	"Marine. Nesting habitat is located within steeply sloping rock scree gullies with a canopy of Cabbage Tree Palms."	Unlikely. Marginal suitable habitat on or near the Development Site	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
<i>Pterodroma neglecta</i>	Kermadec Petrel (west Pacific subspecies)	V	V	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Ptilinopus superbus</i>	Superb Fruit-Dove	V		Rainforest and closed forests. May also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	No	No
<i>Puffinus carneipes</i>	Flesh-footed Shearwater		M, Mar	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Recurvirostra novaehollandiae</i>	Red-necked Avocet			Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Rhipidura rufifrons</i>	Rufous Fantail		M	Wet sclerophyll forests, subtropical and temperate rainforests. Sometimes drier sclerophyll forests and woodlands.	Unlikely	No
<i>Rostratula australis</i>	Australian Painted Snipe	E1	E	Swamps, dams and nearby marshy areas.	No	No
<i>Stagonopleura guttata</i>	Diamond Firetail	V		"Grassy eucalypt woodlands, open forest, mallee, Natural Temperate Grassland, secondary derived grassland, riparian areas and lightly wooded farmland."	No	No
<i>Stercorarius longicaudus</i>	Long-tailed Jaeger		M	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Stercorarius parasiticus</i>	Arctic Jaeger		M	Marine.	Unlikely. Marginal suitable habitat on	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
					or near the Development Site	
<i>Stercorarius pomarinus</i>	Pomarine Jaeger		M	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Sterna albifrons</i>	Little Tern		M, Mar	The Little Tern is mainly coastal, being found on beaches, sheltered inlets, estuaries, lakes, sewage farms, lagoons, river mouths and deltas	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Sterna hirundo</i>	Common Tern		M	Offshore waters, ocean beaches, estuaries, large lakes. Less commonly freshwater swamps, floodwaters, sewage farms and brackish and saline lakes.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Sternula albifrons</i>	Little Tern	E1	M	Sheltered coastal environments, harbours, inlets and rivers.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Sternula nereis nereis</i>	Australian Fairy Tern		V	Embayments of a variety of habitats including offshore, estuarine or lake islands, wetlands and mainland coastline. Nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Stictonetta naevosa</i>	Freckled Duck	V		Freshwater swamps and creeks, lakes, reservoirs, farm dams and sewage ponds.	No	No
<i>Sula dactylatra</i>	Masked Booby	V		Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
<i>Thalassarche bulleri</i>	Buller's Albatross		V	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Thalassarche cauta</i>	Shy Albatross	V	V	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Thalassarche chrysostoma</i>	Grey-headed Albatross		E	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Thalassarche eremita</i>	Chatham Albatross		E	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Thalassarche impavida</i>	Campbell Albatross		V	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Thalassarche melanophris</i>	Black-browed Albatross	V	V	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Thalassarche salvini</i>	Salvin's Albatross	V		Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
<i>Thalassarche steadi</i>	White-capped Albatross		V	Marine.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Tringa brevipes</i> (also listed as <i>Heteroscelus brevipes</i>)	Grey-tailed Tattler		M	"Sheltered coasts with reefs and rock platforms or intertidal mudflats; intertidal rocky, coral or stony reefs; shores of rock, shingle, gravel or shells; embayments, estuaries and coastal lagoons; lagoons and lakes; and ponds in sewage farms and saltworks.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Tringa glareola</i>	Wood Sandpiper		M	Well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes; inundated grasslands; floodplains; irrigated crops; sewage ponds; reservoirs; large farm dams; bore drains; rarely brackish wetlands and saltmarsh.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Tringa incana</i> (also listed as <i>Heteroscelus incanus</i>)	Wandering Tattler		M	Rocky coasts with reefs and platforms, offshore islands, shingle beaches or beds; occasionally coral reefs or beaches.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Tringa nebularia</i>	Common Greenshank		M	Terrestrial wetlands (swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans, saltflats, sewage farms and saltworks dams, inundated rice crops and bores) and sheltered coastal habitats (mudflats, saltmarsh, mangroves, embayments, harbours, river estuaries, deltas, lagoons, tidal pools, rock-flats and rock platforms).	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Tringa stagnatilis</i>	Marsh Sandpiper		M	Swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, intertidal mudflats, sewage farms and saltworks, reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes.	Unlikely. Marginal suitable habitat on or near the Development Site	No

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<i>Tryngites subruficollis</i>	Buff-breasted Sandpiper	-	M	Short grasslands, freshwater or saline wetlands, tidal mudflats.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Tyto novaehollandiae</i>	Masked Owl	V		Dry eucalypt forests and woodlands from sea level to 1100 m.	No	No
<i>Tyto tenebricosa</i>	Sooty Owl	V		Dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests.	No	No
<i>Xenus cinereus</i>	Terek Sandpiper	V	M	Mudbanks and sandbanks near mangroves, rocky pools and reefs, and occasionally up to 10 km inland around brackish pools.	Unlikely. Marginal suitable habitat on or near the Development Site	No
<i>Zosterops lateralis*</i>	Silvereye	-	-	A species of local conservation significance. Coastal heath, shrublands, forests, farms, and urban areas.	Potential. Suitable habitat occurs within the Development Site	Yes
Mammals (excluding bats)						
<i>Arctocephalus forsteri</i>	New Zealand Fur-seal	V		Prefers rocky parts of islands with jumbled terrain and boulders.	No. No suitable habitat on or near the Development Site	No
<i>Arctocephalus pusillus doriferus</i>	Australian Fur-seal	V		Rocky parts of islands with flat, open terrain.	No. No suitable habitat on or near the Development Site	No

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<i>Aepyprymnus rufescens</i>	Rufous Bettong	V		From tall wet sclerophyll forests on the coast to the dry forests and open woodlands west of the Great Dividing Range.	No	No
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V		Rainforest, sclerophyll forest (including Box-Ironbark), woodland and heath.	No	No
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	No	No
<i>Dasyurus maculatus</i> (SE mainland population)	Spotted-tailed Quoll	V	E	Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	No	No
<i>Dasyurus viverrinus</i>	Eastern Quoll	E1	E	Dry sclerophyll forest, scrub, heathland and cultivated land.	No	No
<i>Isoodon obesulus</i>	Southern Brown Bandicoot (eastern)	E1	E	Heath or open forest with a heathy understorey on sandy or friable soils.	No	No
<i>Perameles nasuta</i>	Long-nosed Bandicoot, North Head	E2		Occupies a variety of habitats on North Head.	No	No
<i>Perameles nasuta</i>	Long-nosed Bandicoot population in inner western Sydney	E2		Backyards, parkland.	No	No
<i>Petaurus australis</i>	Yellow-bellied Glider			The habitat on the Bago Plateau consists of tall wet sclerophyll forest dominated by <i>Eucalyptus delegatensis</i> (Alpine Ash), <i>E. dalrympleana</i> (Mountain Gum), <i>E. radiata</i> (Narrow-leaved Peppermint), and <i>E. rubida</i> (Candlebark).	No	No
<i>Petauroides volans</i>	Greater Glider population in the Eurobodalla local government area	E2	V	Eucalypt forests and woodlands.	No	No
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E1	V	Rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges.	No	No

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<i>Phascolarctos cinereus</i>	Koala	V	V	Eucalypt woodlands and forests.	No	No
<i>Pseudomys novaehollandiae</i>	New Holland Mouse		V	Open heathlands, woodlands and forests with a heathland understorey, vegetated sand dunes.	No	No
Microbats and Fruit Bats						
Microbats (As a general group identified by the UESAP. Non-threatened species recorded within 10 km of the site)		-	-	Occur in a variety of habitat from forested areas, particularly containing hollows, to caves and cliff lines, along with urban features such as culverts and bridges.	Likely, potential habitat mapped in old structures	Yes
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country.	Unlikely	No
<i>Chalinolobus gouldii</i> *	Gould's Wattled Bat	-	-	A priority fauna species under EUSAP. Utilises a wide variety of habitats including rainforests, eucalypt forest and woodlands, grasslands, desert, and urban areas. Roosts commonly in tree hollows, but may also utilise buildings.	Potential	No. There was no specific roosting habitat identified for this generalist widespread species.
<i>Falsistrellus tasmaniensis</i>	Eastern Pipistrelle	False V		Tall (greater than 20m) moist habitats.	No	No
<i>Miniopterus australis</i>	Little Bentwing-bat	V		Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub.	Unlikely	No
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	V		Rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland.	Potential	Yes

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<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V		Dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range.	Unlikely	No
<i>Myotis macropus</i>	Southern Myotis	V		Foraging habitat is waterbodies (including streams, or lakes or reservoirs) and fringing areas of vegetation up to 20m.	Likely. A roost was excluded from the wharves for the new Sydney Fish Market construction. Potential habitat mapped in other old structures.	Yes
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Likely. Suitable potential habitat occurs within the Development Site	Yes
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat	V		Almost all habitats, including wet and dry sclerophyll forest, open woodland, open country, mallee, rainforests, heathland and waterbodies.	Potential	Yes
<i>Vespadelus troungtoni</i>	Eastern Cave Bat	V		A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs.	Potential	Yes
<i>Vespadelus vulturnus</i> *	Little Forest Bat	-	-	A priority fauna species under EUSAP. Wet and dry sclerophyll forests and woodland, often in riverine habitats. Roosts in tree hollows.	No. No potential habitat was identified in the Development Site	No
Reptiles						
Reptiles (As a general group identified by the UESAP. Non-threatened species recorded within 10 km of the site)		-	-	A wide variety of urban and rural habitats which contain shelters such as cracks, crevices, hollows, and dappled to full exposure of sunlight.	Unlikely. The Development Site does not contain	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
					any specific potential habitat for this general group	
<i>Amphibolurus* muricatus</i>	Jacky Lizard	-	-	A species of local conservation significance. Sclerophyll forests, coastal woodlands, usually in areas with some native vegetation.	Unlikely. Development does not contain any specific potential habitat for this species	No
<i>Chelonia mydas</i>	Green Turtle	V	V	Marine. Nesting occurs on beaches.	Unlikely. Suitable habitat on or near the Development Site	No
<i>Dermochelys coriacea</i>	Leatherback Turtle	E1	M	Marine. Nesting occurs on beaches.	Unlikely. Suitable habitat on or near the Development Site	No
<i>Eulamprus tenuis*</i>	Bar-sided Skink	-	-	A species of local conservation significance. Forest and woodland areas.	Unlikely. Development does not contain any specific potential habitat for this species	No
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E1	V	Dry and wet sclerophyll forests, riverine forests, coastal heath swamps, rocky outcrops, heaths, grassy woodlands.	No. No suitable habitat on or near the Development Site	No
<i>Saproscinus spectabilis*</i>	Gully Skink	-	-	A species of local conservation significance. Cool shaded gullies with rocky outcrops, ground cover, and rocky cracks.	Unlikely. Development	The Site No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
					does not contain any specific potential habitat for this species	
<i>Tiliqua scincoides</i> <i>scincoides*</i>	Eastern Blue-tongue	-	-	A species of local conservation significance. This species inhabits semi-desert, mixed woodland, and scrubland areas of Australia, New Guinea, and Tasmania.	Unlikely. Development does not contain any specific potential habitat for this species	The Site No
Invertebrates						
<i>Pommerhelix duralensis</i>	Dural Land Snail		E	The Dural Land Snail is endemic to NSW and is confined to the northwest fringes of the Cumberland Plain. The snail has a strong preference for dry shale-influenced transitional landscapes. Associated with open eucalypt forests, particularly Shale-Sandstone Transition Forest and Sydney Turpentine – Ironbark Forest. Found under fallen logs, debris and in bark and leaf litter around the trunk of gum trees (particularly <i>Eucalyptus punctata</i>) or burrowing in loose soil around clumps of grass.	No	No
Fish						
<i>Epinephelus daemeli</i>	Black Rockcod	V	V	Marine, rock overhangs, crevices or caves	No suitable habitat present.	No
<i>Hippocampus whitei</i>	White's Seahorse	E proposed		Marine, dense macroalgae and seagrass	Potential macroalgae beds to the west	No, in habitat won't be harmed

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<i>Macquaria australasica</i>	Macquarie Perch	E1	E	Freshwater	No records in catchment	No
<i>Prototroctes maraena</i>	Australian Grayling	E	V	Marine-freshwater	No records in catchment	No
Shark						
<i>Carcharias taurus</i>	Grey Nurse Shark	E4A	CE	Marine, rock caves, deep water	No suitable habitat	No
<i>Carcharodon carcharias</i>	Great White Shark	V	V	Marine, deep water	No suitable habitat	No
<i>Lamna nasus</i>	Porbeagle, Mackerel Shark		Bonn	Marine, deep water	No suitable habitat	No
<i>Rhincodon typus</i>	Whale Shark		V,Bonn	Marine, deep water	No suitable habitat	No
Ray						
<i>Manta alfredi</i>	Reef Manta Ray		Bonn	Marine, benthic	No recent records in harbour, unlikely to regularly visit area	No
<i>Manta birostris</i>	Giant Manta Ray		Bonn	Marine, benthic	No recent records in harbour, unlikely to regularly visit area	No
<i>Pristis zijsron</i>	Green Sawfish	E4	V	Presumed extinct in NSW	Unlikely	No
Whale						

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood Occurrence	of	Impact Assessment Required
<i>Balaenoptera edeni</i>	Bryde's Whale		Bonn	Marine, deep water	Unlikely shore	close to	No
<i>Balaenoptera musculus</i>	Blue Whale	E1	E	Marine, deep water	Unlikely shore	close to	No
<i>Balaenoptera borealis</i>	Sei Whale		V,Bonn	Marine, deep water	Unlikely shore	close to	No
<i>Balaenoptera physalus</i>	Fin Whale		V,Bonn	Marine, deep water	Unlikely shore	close to	No
<i>Caperea marginata</i>	Pygmy Right Whale		Bonn	Marine, deep water	Unlikely shore	close to	No
<i>Eubalaena australis</i>	Southern Right Whale	E1	E	Marine, deep water	Unlikely shore	close to	No
<i>Megaptera novaeangliae</i>	Humpback Whale	V	V	Marine, deep water	No suitable habitat		No
<i>Physeter macrocephalus</i>	Sperm Whale	V		Marine, deep water	No suitable habitat		No
Dolphin							
<i>Lagenorhynchus obscurus</i>	Dusky Dolphin		Bonn	Marine, deep water	Unlikely shore	close to	No
<i>Orcinus orca</i>	Killer Whale, Orca		Bonn	Marine, deep water	Unlikely shore	close to	No
<i>Sousa chinensis</i>	Indo-Pacific Humpback Dolphin		Bonn	Marine, deep water	Unlikely shore	close to	No
Marine mammal							

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<i>Dugong dugon</i>	Dugong	E1	Bonn	Marine, seagrass beds	Unlikely, no suitable habitat	No
Seal						
<i>Arctocephalus forsteri</i>	New Zealand Fur-seal	V		Marine, rock platforms	Unlikely, no records west of Sydney Harbour Bridge	No
<i>Arctocephalus pusillus doriferus</i>	Australian Fur-seal	V		Marine, rock platforms	Unlikely, no records west of Sydney Harbour Bridge	No
Flora						
<i>Acacia bynoeana</i>	Bynoe's Wattle	E1	V	Heath or dry sclerophyll forest on sandy soils.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Acacia gordonii</i>		E1	E	Sclerophyll forest and heathlands amongst or within rock platforms on sandstone outcrops.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Acacia pubescens</i>	Downy Wattle	V	V	Open woodland and forest, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Occurs on alluviums, shales and at the intergrade between shales and sandstones.	No. The site is located on land which has been cut and filled. It was not	No

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					identified during field survey.	
<i>Acacia terminalis</i> subsp. <i>terminalis</i>	Sunshine Wattle	E1	E	Coastal scrub and dry sclerophyll woodland on sandy soils.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Allocasuarina glareicola</i>	-	E1	E	Castlereagh woodland on lateritic soil. Found in open woodland with <i>Eucalyptus parramattensis</i> , <i>Eucalyptus fibrosa</i> , <i>Angophora bakeri</i> , <i>Eucalyptus sclerophylla</i> and <i>Melaleuca decora</i> .	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Allocasuarina portuensis</i>	Nielsen Park She-oak	E1	E	The original habitat is tall closed woodland, above a sandstone shelf approximately 20 m above the harbour. Soils are shallow and sandy; plantings have occurred on similar soils.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Amperea xiphoclada</i> var. <i>pedicellata</i>	-	E4		Heath, woodland and forest in low-fertility, sandy soils. Known only from the type specimen collected in 1892 from Sydney. Has not been observed since and is presumed extinct.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Asterolasia buxifolia</i>	-	E1		Restricted to dense riparian scrub along rocky watercourses with a granitic substrate.	No. The site is located on land which has been cut	No

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					and filled. It was not identified during field survey.	
<i>Asterolasia elegans</i>	-	E1	E	"Hawkesbury sandstone. Found in sheltered forests on mid- to lower slopes and valleys."	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Caladenia tessellata</i>	Thick Lip Spider Orchid	E1	V	Grassy sclerophyll woodland on clay loam or sandy soils, or low woodland with stony soil.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Callistemon linearifolius</i>	Netted Bottle Brush	V		Dry sclerophyll forest.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid	V	V	"Coastal heathlands, margins of coastal swamps and sedgeland, coastal forest, dry woodland, and lowland forest."	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No

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<i>Darwinia biflora</i>	-	V	V	Woodland, open forest or scrub-heath on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Deyeuxia appressa</i>	-	E1	E	Moist conditions.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Dichanthium setosum</i>	Bluegrass	V	V	Cleared woodland, grassy roadside remnants and highly disturbed pasture, on heavy basaltic black soils and red-brown loams with clay subsoil.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Dillwynia tenuifolia</i>	-	V		Scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest, transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland, and disturbed escarpment woodland on Narrabeen sandstone.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Diuris arenaria</i>	Sand Doubletail	E1		"Coastal heath and dry grassy eucalypt forest.	No. The site is located on land which has been cut and filled. It was not	No

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					identified during field survey.	
<i>Doryanthes palmeri</i>	Giant Spear Lily	V		"Exposed rocky outcrops, cliff-tops and on steep cliff-faces in montane heath next to subtropical rainforest, warm temperate rainforest or wet eucalypt forest."	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Epacris purpurascens</i> - var. <i>purpurascens</i>		V		Sclerophyll forest, scrubs and swamps. Most habitats have a strong shale soil influence.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Eucalyptus camfieldii</i>	Camfield's Stringybark	V	V	"Coastal heath on shallow sandy soils overlying Hawkesbury sandstone, mostly on exposed sandy ridges."	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Eucalyptus fracta</i>	Broken Back Ironbark	V		Dry eucalypt woodland in shallow soils along the upper escarpment of a steep sandstone range.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Eucalyptus leucoxylon</i> subsp. <i>pruinosa</i>	Boland Yellow Gum	V		In NSW, occurs at the bases of sandy rises and on loamy clay flats on the floodplains of the Murray River and its tributaries.	No. The site is located on land which has been cut	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
						and filled. It was not identified during field survey.
<i>Eucalyptus nicholii</i>	Narrow-leaved Peppermint	Black	V	V	Dry grassy woodland, on shallow soils of slopes and ridges.	No. The site is located on land which has been cut and filled. It was not identified during field survey.
<i>Eucalyptus pulverulenta</i>	Silver-leafed Gum		V	V	Open forest typically dominated by <i>Eucalyptus mannifera</i> (Brittle Gum), <i>E. macrorhynca</i> (Red Stringybark), <i>E. dives</i> (Broad-leaved Peppermint), <i>E. sieberi</i> (Silvertop Ash) and <i>E. bridgesiana</i> (Apple Box), on shallow soils.	No. The site is located on land which has been cut and filled. It was not identified during field survey.
<i>Eucalyptus scoparia</i>	Wallangarra Gum	White	E1	V	"Open eucalypt forest, woodland and heaths on well-drained granite/rhyolite hilltops, slopes and rocky outcrops, typically at high altitudes.	No. The site is located on land which has been cut and filled. It was not identified during field survey.
<i>Genoplesium baueri</i>	Bauer's Midge Orchid		E1	E	Dry sclerophyll forest and moss gardens over sandstone.	No. The site is located on land which has been cut and filled. It was not identified during field survey.
<i>Grammitis stenophylla</i>	Narrow-leaf Fern	Finger	E1		Rainforest and moist eucalypt forest, usually near streams, on rocks or in trees.	No. The site is located on land

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
					which has been cut and filled. It was not identified during field survey.	
<i>Grevillea caleyi</i>	Caley's Grevillea	E4A	E	Open forest, generally dominated by <i>Eucalyptus sieberi</i> and <i>E. gummifera</i> on a ridgetop, in association with laterite soils.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Hibbertia puberula</i>		E1		Low heath, dry sclerophyll woodland, upland swamps, on sandy soils or clay.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Hibbertia spanantha</i>	Julian's Hibbertia	E4A		Endemic to the Sydney Basin bioregion. Grows in forest with canopy species including <i>Eucalyptus pilularis</i> , <i>E. resinifera</i> , <i>Corymbia gummifera</i> and <i>Angophora costata</i> . The understorey is open with species of Poaceae, Orchidaceae, Fabaceae and Liliaceae. Soil identifies as light clay occurring on shale sandstone soil transition.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Lasiopetalum joyceae</i>	-	V		Heath on lateritic to shaley ridgetops over sandstone.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
<i>Leptospermum deanei</i>		V	V	Woodland, riparian scrub and open forest on lower hill slopes or near creeks, on sand or sandy alluvial soil.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Macadamia tetraphylla</i>	Rough-shelled Nut	Bush V		Subtropical rainforest, usually near the coast.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	V	Damp places, often near streams or low-lying areas on alluvial soils.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	V	Damp places, often near streams or low-lying areas on alluvial soils.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Melaleuca deanei</i>	Deane's Paperbark	V	V	Heath on sandstone.	No. The site is located on land which has been cut and filled. It was not	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
					identified during field survey.	
<i>Microtis angusii</i>	Angus's Onion Orchid			"Ingleside location is highly disturbed and dominated by the introduced weeds Coolatai grass (<i>Hyparrhenia hirta</i>) and <i>Acacia saligna</i> . The area is likely to have originally supported the Duffys Forest Vegetation Community, which ranges from open forest to low open forest and woodland."	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Pelargonium striatellum</i>	sp. Omeo Storksbill	E1	E	Irregularly inundated or ephemeral lakes, in the transition zone between surrounding grasslands or pasture and wetland or aquatic communities.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Persoonia hirsuta</i>	Hairy Geebung	E1	E	Sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Persoonia nutans</i>	Nodding Geebung	E1	E	Northern populations: sclerophyll forest and woodland (Agnes Banks Woodland, Castlereagh Scribbly Gum Woodland and Cooks River / Castlereagh Ironbark Forest) on aeolian and alluvial sediments. Southern populations: tertiary alluvium, shale sandstone transition communities and Cooks River / Castlereagh Ironbark Forest.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Pimelea curviflora</i> var. <i>curviflora</i>		V	V	Woodland, mostly on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes.	No. The site is located on land which has been cut	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
					and filled. It was not identified during field survey.	
<i>Pimelea spicata</i>	Spiked Rice-flower	E1	E	"Well-structured clay soils. <i>Eucalyptus moluccana</i> (Grey Box) communities and in areas of ironbark on the Cumberland Plain. Coast Banksia open woodland or coastal grassland in the Illawarra."	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Posidonia australis</i> - Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie populations	Posidonia australis	E2		Estuarine, shallow soft substrate	No plants observed	No
<i>Posidonia australis</i> seagrass meadows of the Manning-Hawkesbury ecoregion	Posidonia australis		E	Estuarine, shallow soft substrate	No plants observed	No
<i>Prasophyllum fuscum</i>	Slaty Leek Orchid	E4A	V	Moist heath, often along seepage lines	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Prostanthera marifolia</i>	Seaforth Mintbush	E4A		In or in close proximity to the endangered Duffys Forest ecological community, on deeply weathered clay-loam soils associated with ironstone and scattered shale lenses.	No. The site is located on land which has been cut and filled. It was not	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required	
					identified during field survey.		
<i>Pterostylis saxicola</i>	Sydney Greenhood	Plains	E1	E	Small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines, adjacent to sclerophyll forest or woodland on shale/sandstone transition soils or shale soils.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Pultenaea parviflora</i>			E1	V	"Dry sclerophyll forest, especially Castlereagh Ironbark Forest, Shale Gravel Transition Forest and transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland."	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Sarcophilus hartmannii</i>	Hartman's Sarcophilus		V		On volcanic rocks, in sclerophyll forest or exposed sites, from 500 to 1000 m. Rarely on bases of trees.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly		E1	V	"Subtropical and littoral rainforest on gravels, sands, silts and clays.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Tetratheca glandulosa</i>			V		"Heath, scrub, woodlands and open forest on upper-slopes and mid-slope sandstone benches. Soils generally shallow, consisting of a yellow, clayey/sandy loam.	No. The site is located on land which has been cut	No

Scientific Name	Common Name	BC / FM Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Impact Assessment Required
					and filled. It was not identified during field survey.	
<i>Tetradlea juncea</i>	Black-eyed Susan	V	V	Low open forest/woodland, heathland and moist forest, mainly on low nutrient soils associated with the Awaba Soil Landscape.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Thesium australe</i>	Austral Toadflax	V	V	Grassland on coastal headlands or grassland and grassy woodland away from the coast.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Triplarina imbricata</i>	Creek Triplarina	E1	E	Along watercourses in low open forest with <i>Tristaniaopsis laurina</i> (Water Gum).	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No
<i>Wilsonia backhousei</i>	Narrow-leafed Wilsonia	V		Margins of salt marshes and lakes.	No. The site is located on land which has been cut and filled. It was not identified during field survey.	No

BC Act: E1 = Endangered, E2 = Endangered Population, E4 = Extinct, E4A = Critically Endangered, V = Vulnerable

FM Act: E1 = Endangered, E2 = Endangered Population, E4 = Extinct, E4A = Critically Endangered, V = Vulnerable

EPBC Act: Bonn = Listed migratory species under Bonn Convention, CD = Conservation Dependent, CE = Critically Endangered, E = Endangered, V = Vulnerable, X = Extinct

Appendix B – Status of study requirements

This report reviews the current environment conditions within the study area and offers an analysis of opportunities and constraints. Several of the study requirements discussed in Section 2.4 were unable to be addressed at this stage. To cover those requirements, detailed designs are needed at the development application stage. This report provides the baseline requirements to build on for future detailed biodiversity impact assessment/s.

Study Requirement		Response	Location in report
1. Vision, Strategic Context and Justification	1.4. Consideration of City of Sydney planning documents, strategies and policies including, but not limited to:	Relevant documents were considered, especially those addressing habitat corridors and provision of various habitat types.	Sections 5.4-5.5 on pages 32-43
	<ul style="list-style-type: none"> UrbanGrowth NSW – Guiding Principles for Marine Foreshore Developments – February 2016 City of Sydney Urban Ecology Strategic Action Plan 2014 Connected Corridors for Biodiversity: Guide to regulatory tools, financial incentives and other mechanisms for promoting biodiversity conservation on private property (December 2016) Greater Sydney LLS – Biodiversity Corridor Mapping https://trade.maps.arcgis.com/apps/webappviewer/index.html?id=3afa804b96ac4d69a74e9b1ed9780328 Urban Ecology Renewal Investigation Project Report – due for release early 2017 		and Section 6.2 on pages 57-59 and Section 7 on page 62
7. Biodiversity	7.1. Assess and document biodiversity impacts in accordance with the Framework for Biodiversity Assessment, unless otherwise agreed by OEH, by a person accredited in accordance with s142B(1)(c) of the Threatened Species Conservation Act 1995.	The Framework for Biodiversity Assessment no longer exists and has been replaced by the Biodiversity Assessment Method (BAM). The BAM requires the preparation of a Biodiversity Development Assessment Report (BDAR) in order to measure loss and calculate biodiversity offsets (if any). To run the BAM calculator and complete a	To be completed for future DA stages.

Study Requirement	Response	Location in report
	BDAR, a Development Application is required. This report is an existing environmental report and provides an opportunities and constraints assessment. A future impact assessment (likely a BDAR) is required to support the environmental impact statement (EIS).	
<p>14. Urban and Marine Ecology</p> <p>14.1. Prepare an ecological assessment by a suitably qualified ecologist. Include species and communities of local conservation significance, as identified in the City's Urban Ecology Strategic Action Plan (UESAP), as well as, listed threatened species and ecological communities. Include in the assessment:</p> <ul style="list-style-type: none"> • identify any species that are of particular conservation significance (including threatened species and locally-significant species identified in the City's UESAP), • determine the nature and extent of impacts to the urban vegetation and fauna and marine habitats, particularly those of conservation significance (if present), that are likely to result from each stage of the development, • outline the mitigation measures that will be employed to avoid or minimise such impacts, including: <ul style="list-style-type: none"> o clearing and relocating of any onsite indigenous flora and fauna prior to works commencing, o protecting of any significant habitat features, • restoration/creation of compensatory habitat for any important habitat features removed/disturbed as a result of the development • provide recommendations and identify opportunities to create habitat features that will benefit urban terrestrial biodiversity. This report should identify, but not be limited to, 	<p>As above regarding future impact assessment/s.</p> <p>However, baseline data was collected in terms of vegetation mapping, threatened species occurrence and locally-significant species.</p> <p>Opportunities for habitat improvement is discussed.</p>	<p>Sections 5.4-5.5 on pages 32-43</p> <p>and</p> <p>Section 6.2 on pages 57-59</p> <p>and</p> <p>Section 7 on page 62</p>

Study Requirement	Response	Location in report
what habitat features are to be retained, species to be planted, and other habitat features are to be created.		
14.2. Demonstrate that the findings of 'Guiding Principles for Marine Foreshore Developments' developed by the Sydney Institute of Marine Science and the University of Sydney have been considered in the proposed planning controls.	Opportunities discussed.	Section 6.1 on pages 44-56 and Section 7 on page 61
14.3. Ensure possibilities for the mitigation and restoration/creation of marine habitat are investigated.	Opportunities discussed.	Section 6.1 on pages 44-56 and Section 7 on page 62
14.4. Integrate the findings of other urban biodiversity/ecology parts of this study and demonstrate how these have shaped the plan for the site and how they contribute to meeting the City's Urban Ecology requirements and targets.	Report has been updated to reflect findings of the new Sydney Fish Market DA. Report incorporates the Urban Forest Strategy Plan. A future Aquatic Biota Management Plan will be prepared for the new Sydney Fish Market construction phase, which can be further developed to extend across the Blackwattle Bay Precinct at a later stage. City's objectives and targets are reviewed against the master plan	Section 5 on pages 22-43 and Section 6 on pages 44-61 and Section 7 on page 62

