Melrose Park South Planning Proposal – Ecological Assessment

Holdmark NSW Pty Ltd

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Template 2.8.1

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Abbreviations

Abbreviation	Description
BAM	Biodiversity Assessment Methodology
BC Act	Biodiversity Conservation Act 2016
BC Regulation	Biodiversity Conservation Regulation 2017
BCF	Biodiversity Conservation Fund
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme
CEEC	Critically Endangered Ecological Community
EEC	Endangered Ecological Community
ELA	Eco logical Australia
EP&A Act	*Environmental Protection and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FM Act	*Fisheries Management Act 1994*
GIS	Geographic Information System
GPS	Global Positioning System

Abbreviation	Description
KFH	Key Fish Habitat
MNES	Matters of National Environmental Significance
PCT	Plant Community Type
SAII	Serious and Irreversible Impact
TEC	Threatened Ecological Community
WM Act	*Water Management Act 2000*

Executive Summary

Eco Logical Australia Pty Ltd was commissioned by Holdmark NSW Pty Ltd to prepare an ecological assessment as part of a planning proposal for the Holdmark NSW Pty Ltd properties within the Melrose Park South Precinct (the study area).

A site inspection was undertaken by an ecologist on 19 October 2016, 1 April 2020 and 22 April 2022 to identify ecological values and potential ecological impacts within and adjacent to the study area. The landward part of the study area consists of scattered native and exotic landscape plantings with weedy patches. A continuous stand of Estuarine Mangrove Forest lines the northern bank of the Parramatta River to the south of the study area. This is known as the Ermington Bay Wetlands. Estuarine Mangrove Forest occupies mudflats in coastal estuaries subject to frequent tidal inundation, with populations scattered along the NSW coast.

The Ermington Bay Wetlands are of high ecological significance comprising one the last significant remnants of wetland habitat along Parramatta River. These wetlands provide important habitat for:

- migratory species listed under the Japan Australia Migratory Birds Agreement (JAMBA), China Australia Migratory Birds Agreement (CAMBA) and Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).
- *Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Coastal Saltmarsh) forms part of this wetland area and is listed as an endangered ecological community under the NSW *Biodiversity Conservation Act 2016* (BC Act) and Subtropical and Temperate Coastal Saltmarsh is listed vulnerable under the Commonwealth *Environment Protection Biodiversity Conservation Act 1999*.
- Estuarine Mangrove Forest partly associated with the TECs: *Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin* and *South East Corner Bioregions, Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregion*, both listed as endangered under the BC Act.
- *Wilsonia backhousei* (listed as vulnerable under the NSW *Biodiversity Conservation Act 2016*) is also previously recorded within Ermington Bay.

An ecological constraints analysis identified vegetated areas within the foreshore area as being of medium to high ecological constraint. Outside the foreshore area, the study area is comprised of medium to low ecological constraint areas.

The planning process facilitates future development, and is a medium to low constraint, and any native vegetation clearing is further considered at development application (DA) stage.

Solar access was modelled for the built structures of the Melrose South Precinct Plan to consider the shading impacts of the proposal on Coastal Saltmarsh across seasons. Saltmarsh communities are extremely sensitive area to changes in microclimate and shading would potentially result in dieback and/or changes in species composition. From the solar access modelling, the worst impact on Coastal Saltmarsh in the study area would be 2 hours less sunlight between 9am – 3pm during winter. No shading impacts would occur during other seasons. The shading impact from the proposal on Coastal Saltmarsh could be considered to be minimal.

Shading impact of the proposal for Estuarine Mangrove Forest in the study area was also considered. Solar access modelling indicates that the worst-case impact from the proposal is 4 hours of shading of Estuarine Mangrove Forest in the study area between 9am-3pm during winter. This level of shading would only impact 0.005% of the total Estuarine Mangrove Forest in the study area. There would also be shading impacts of 2 hours in Autumn and Spring, but these would only impact 0.2% and 0.1% of the mangrove forest. This increase in shading throughout the year is unlikely to have a significant impact on this community.

Redevelopment and management within the foreshore buffer area must align with biodiversity protection aims and objectives identified in relevant planning documents. It is believed increased protection and management access within the foreshore buffer could be achieved by providing an integrated management approach by protecting existing revegetated areas, providing additional revegetated areas where identified and providing additional managed open space with appropriate native urban landscape plantings.

It is concluded that, from an ecological perspective, the proposed planning proposal meets the strategic merit test required under the Department of Planning and Environment Local Plan Making Guidelines. However, at the development application (DA) stage, the following biodiversity matter from Part 10.19 of the *State Environmental Planning Policy (Biodiversity and Conservation) 2021* is an important consideration of the proposal:

(b) development should protect and enhance terrestrial and aquatic species, populations and ecological communities and, in particular, should avoid physical damage and shading of aquatic vegetation (such as seagrass, saltmarsh and algal and mangrove communities).

The future development facilitated by the rezoning recommended by the planning proposal, will need to be assessed and considered by consent authorities before granting consent to a future development under Part 4 of the *Environmental Planning and Assessment Act 1979*.

1. Introduction

Eco Logical Australia Pty Ltd (ELA) was commissioned by Holdmark NSW Pty Ltd to prepare an ecological assessment as part of a planning proposal for the Holdmark NSW Pty Ltd properties within the Melrose Park South Precinct area (the study area, **Figure 1**). This ecological assessment will be used to guide planning for these parcels of land within the future Melrose Park South Precinct.

1.1 Study area

The study area is approximately 9 hectares in size and is located within the City of Parramatta local government area (LGA). The land is currently zoned as IN1 - General Industrial in the *Parramatta Local Environment Plan 2011*(LEP). The planning proposal process will seek to rezone the existing areas from their current zoning to a mixed use zoning of residential and employment areas.

The study area comprises two separated areas within the precinct and contains the following lots:

- Lot 3 DP 602080 – 82 Hughes Avenue, Ermington
- Lot 1 DP519737 – 32 Waratah Street, Melrose Park
- Lot 1 DP 127049 – 112 Wharf Road, Melrose Park
- Lot 2 DP127049 – 112 Wharf Road , Melrose Park
- Lot 3 DP 127049 – 112 Wharf Road, Melrose Park

Lot 3 DP 602080 is the western part of the study area and is bounded by Hughes Road to the east, industrial development to the north, and Atkins Road to the west. The eastern part of the study area comprises the remaining lots and is bounded by Wharf Road to the east, Waratah Street to the west and south, and Mary Street to the north. Both areas presently comprise industrial warehouses and offices.

To the south of the study area is a public area, comprising a multi-use access path, grassed areas, parking boat ramp and wharf facilities. This area also contains revegetated bushland management areas and remnant/rehabilitated Coastal Saltmarsh and a large stand of Estuarine Mangrove Forest forming part of the Ermington Bay Wetland.

The Ermington Bay Wetlands are of high ecological significance comprising one the last significant remnants of wetlands along Parramatta River. These wetlands provide important habitat for migratory species listed under the Japan Australia Migratory Birds Agreement (JAMBA), China Australia Migratory Birds Agreement (CAMBA) and Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA). *Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions* found within the wetlands, is listed as an endangered ecological community under the NSW *Biodiversity Conservation Act 2016* (BC Act) and vulnerable under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act) (known are Subtropical and Temperate Coastal Saltmarsh under the EPBC Act).

As the study area directly abuts wetlands and foreshore land it is therefore subject to assessment and protection measures under legislation and planning policies as discussed in section 2.1.1 below.

1.2 The Planning Proposal

Holdmark NSW Pty Ltd seeks an amendment of Parramatta LEP to rezone the study area to a mixed use zoning of residential and employment areas.

A masterplan has been prepared that shows how Holdmark Pty Ltd intends to develop the site. This is displayed in **Figure 2**.

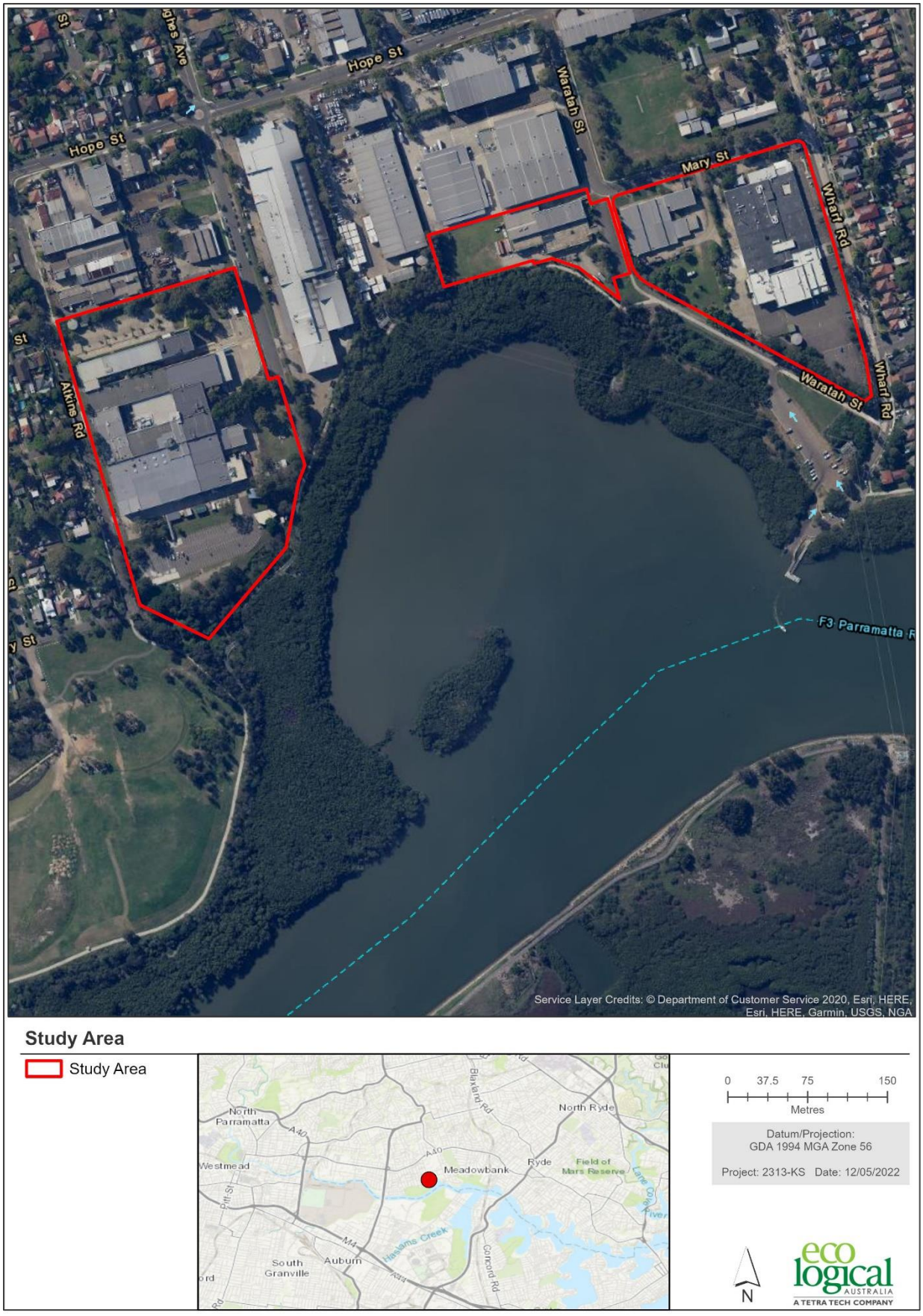

Figure 1: Study area

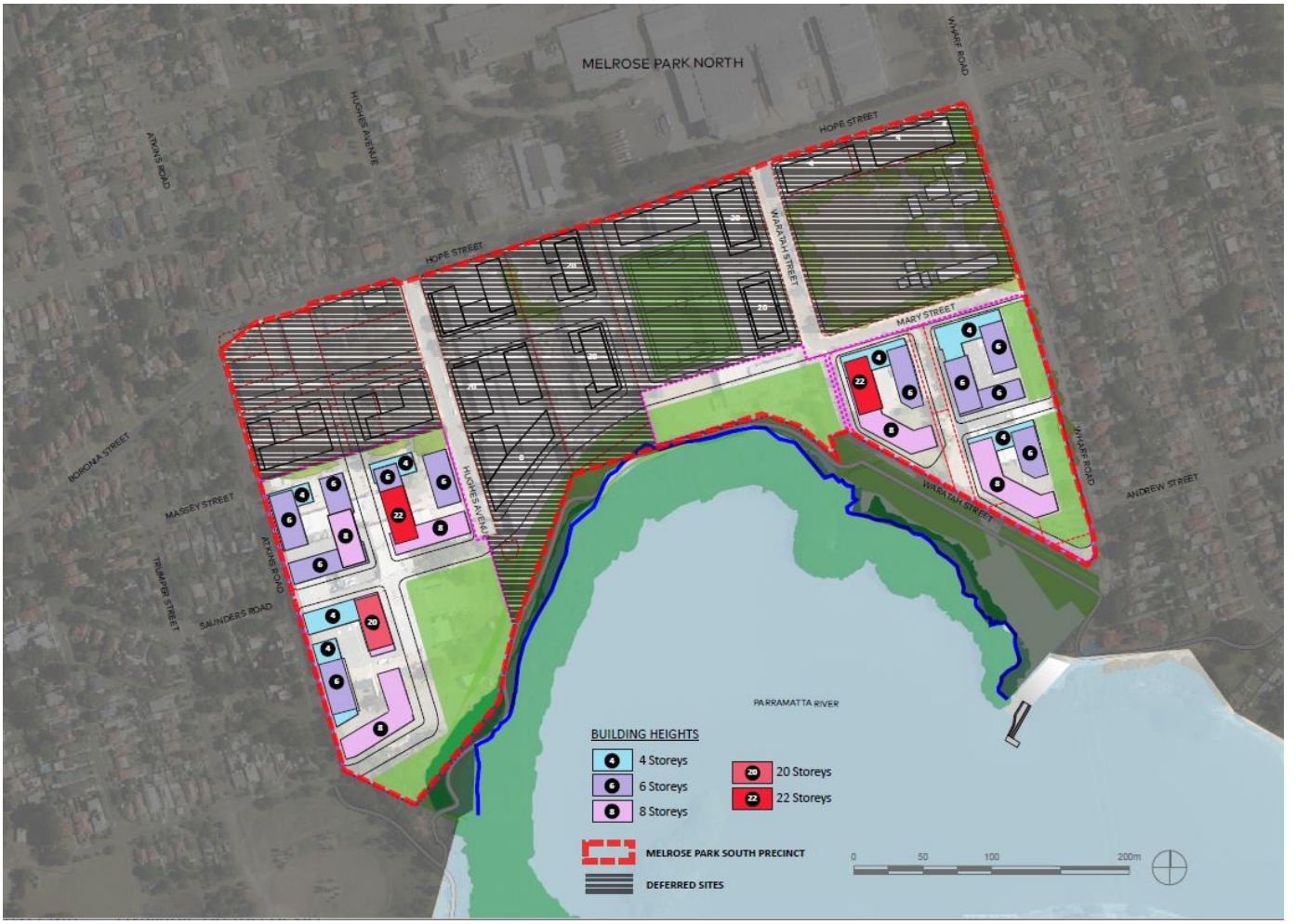

Figure 2: Draft masterplan

2. Methods

2.1 Data audit and literature review

2.1.1 Legislative context

Commonwealth and state legislation and policies, as well as local planning regulations apply to this planning proposal. A brief outline of the relevant Commonwealth and State Acts and policies, and local regulations are provided below in **Error! Reference source not found.**.

Table 1: Legislative context

Name	Relevance to the project
Commonwealth	
***Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)**	The Commonwealth *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act) establishes a process for assessing the environmental impact of activities and developments where 'matters of national environmental significance' (MNES) may be affected. MNES that may be relevant to the study area include threatened species, ecological communities and migratory species that are listed under the EPBC Act. Under the Act, any action which "has, will have, or is likely to have a significant impact on a MNES" is defined as a "controlled action", and requires approval from the Commonwealth Department of the Environment which is responsible for administering the EPBC Act. Actions that may have a significant impact on one or more matters of MNES need to be referred to Department of the Environment under the EPBC Act. Planning proposals are not considered an 'action' however it is prudent to assess the likely impacts to MNES at this stage. Matters of National Environmental Significance (MNES) have been identified on and directly adjacent to the study area. These include the threatened ecological community Subtropical and Temperate Coastal Saltmarsh, and *Pteropus poliocephalus* (Grey-headed Flying – fox), both listed as vulnerable under the Act. An assessment of impact to MNES would be detailed in a Flora and Fauna Assessment or Biodiversity Development Assessment Report.
State	
***Environmental Planning and Assessment Act 1979* (EP&A Act)**	The *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principal planning legislation for NSW, providing a framework for the overall environmental planning and assessment of development proposals. The planning proposal would be assessed under section 3 of the EP&A Act. At the development application stage the EP&A Act places a duty on the determining authority to adequately address a range of environmental matters including maintenance of biodiversity and the likely impact to threatened species, populations or ecological communities (under the B*iodiversity Conservation Act 2016* – refer below).
***Biodiversity Conservation Act 2016* (BC Act)**	In November 2016 the NSW parliament passed the *Biodiversity Conservation Act 2016* (BC Act). This new legislation replaced the *Threatened Species Conservation Act 1997* and took effect on 25 August 2017. In relation to development and impact assessment, the BC Act provides an updated methodology for the assessment of biodiversity values within a proposed development site. It is prudent to consider the likely impacts on threatened species at the planning proposal stage. This report provides a preliminary assessment of the potential impacts on threatened species, ecological communities and populations and their habitats. For any future assessments of development under Part 4 of the EP&A Act, the Biodiversity Offset Scheme (BOS) thresholds under the BC Act may apply and a Biodiversity Development Assessment Report (BDAR) may be required if BOS thresholds are triggered. These thresholds are as follows:

Name	Relevance to the project
	• Area clearing threshold – exceeding the area clearing threshold associated with the minimum lot size for the property will trigger entry into the BOS. No minimum lots size is set for the study area, therefore the actual lot size is used to determine the area clearing threshold. The lots range in size from 500 m^2 to 6.5 ha, therefore the area clearing threshold defaults to the smallest lot, which is 0.25 ha of native vegetation. • Whether the impacts occur on an area mapped on the NSW Government Biodiversity Value Map (BV Map). The wetlands (including Estuarine Mangrove Forest and Coastal Saltmarsh) are mapped on the BV map (accessed 17 April 2020). Therefore, any impact to this vegetation will trigger entry into the BOS. • Impacting on an area of Outstanding Biodiversity Value (AOBV). No AOBVs are located within the study area. • Have a significant impact on biodiversity values in accordance with Section 7.3 of the BC Act (i.e. 5-part test).
Biosecurity Act 2015	Under this Act, priority weeds have been identified for local government areas and assigned strategies to contain, remove or manage. Occupiers of land (this includes owners of land) have responsibility for taking appropriate action for priority weeds on the land they occupy. The field survey identified several weeds. Further mapping and identification of Priority Weeds would be required once a development footprint is established in line with the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022 (revised 2021) which was developed under this Act.
Coastal Management Act 2016	The *Coastal Management Act 2016* (CM Act) aims to ensure coordinated planning and management of coastal areas and support public participation in these activities. The CM Act divides the coastal zone into four coastal management areas. These are defined under the CM Act as: • coastal wetlands and littoral rainforests area • coastal vulnerability area • coastal environment area • coastal use area The area defined as "coastal wetlands and littoral rainforests area" is relevant to this planning proposal. According to section 6(1) of the CM Act *"the land identified by a State environmental planning policy to be the coastal wetlands and littoral rainforests area for the purposes of this Act, being land which displays the hydrological and floristic characteristics of coastal wetlands or littoral rainforests and land adjoining those features".* The CM Act also lists the following management objectives for "coastal wetlands and littoral rainforests area under Section 6 (2) of the Act. These are as follows: *(a) to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity,* *(b) to promote the rehabilitation and restoration of degraded coastal wetlands and littoral rainforests,* *(c) to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change, including opportunities for migration,* *(d) to support the social and cultural values of coastal wetlands and littoral rainforests,* *(e) to promote the objectives of State policies and programs for wetlands or littoral rainforest management.* Given the proposed increased setbacks and buffer areas from the wetland, the proposal is capable of being consistent with the above objectives, subject to further investigation undertaken at development application stage.
***Fisheries Management Act 1994* (FM Act)**	The *Fisheries Management Act 1994* (FM Act) governs the management of fish and their habitat in NSW. The Schedules of the Act list key threatening processes and threatened species. The FM Act regulates the provision of permits required in relation to harm to protected marine vegetation (seagrass, macroalgae, mangroves and saltmarsh), dredging, reclamation or obstruction of fish passage on or adjacent to Key Fish Habitat (KFH). This includes direct and indirect impacts, whether temporary or permanent.

Name	Relevance to the project
	The section of the Parramatta River adjacent to the study area is mapped as KFH. A part of the saltmarsh extends into the study area in the west and this could be considered to be KFH and therefore protected under the FM Act. If at the development application stage, works involve harm to this potential KFH, such as harm to marine vegetation, dredging, reclamation or obstruction of fish passage a permit or consultation under the FM Act would be required.
Local Land Services Amendment Act 2016 **(LLS Act)**	The LLS Act does not apply to areas of the state to which the Vegetation SEPP applies. The Vegetation SEPP applies to the City of Parramatta Council local government area. Refer to Vegetation SEPP section below.
Water Management Act 2000 **(WM Act)**	A controlled activity approval under the Water Management Act 2000 (WM Act) is required for certain types of developments and activities that are carried out in or within 40m of a river, lake or estuary. This legislation is identified here as it is likely to be relevant at the development application stage.
State and Local Environmental Planning Instruments	
Vegetation in Non-Rural Areas SEPP 2017 (Vegetation SEPP)	Chapter 2 of the SEPP applies to development in urban areas and environmental conservation zones that does not require consent. As this planning proposal will requires consent under the *Environmental Planning and Assessment 1979* at the development application stage, the Vegetation SEPP does not apply
State Environmental Planning Policy (Resilience and Hazards) 2021	Chapter 2 of the SEPP will ensure future coastal development is appropriate to the coastal areas, ensuring ongoing and improved public access and environmental protection. Under the SEPP the south part of the site, including the Ermington Wetlands and adjoining area 100m landward of the mean high water mark, has been classified as a 'coastal environment area' and is subject to the SEPP. Development controls have been identified to minimise impacts on water quality, native vegetation and flora and fauna and their habitats. The Ermington Wetlands is classified as "coastal wetlands" in accordance with the SEPP. No development is proposed within this area and is therefore consistent with the SEPP. Parts of the precinct, which have been identified for development, have been identified as a "proximity area", "coastal environment area" and "coastal use" area. The SEPP outlines criteria to manage development within these areas, including minimising ecological, stormwater, heritage and visual impacts. From an ecological perspective, given the setback from the Ermington Wetlands and the minimal overshadowing associated, the proposed structure plan is capable of being consistent with this draft SEPP, subject to further detail being provided at development application stage. The following sections of the draft SEPP are relevant to this planning proposal, although it is important to note that the consent requirements apply to a Development Application, not the Planning Proposal: ***Division 1 Coastal wetlands and littoral rainforests area*** ***Part 2.7 Development of coastal wetlands or littoral rainforest land*** *(1) The following may be carried out on land wholly or partly identified as "coastal wetlands" or "littoral rainforest" on the Coastal Wetlands and Littoral Rainforests Area Map only with development consent:* *(a) the damage or removal of native vegetation within the meaning of the Native Vegetation Act 2003,* *(b) the damage or removal of marine vegetation,* *(c) the carrying out of any of the following works:* *(i) earthworks (including filling of land or the depositing of material on land),* *(ii) levees,*

Name	Relevance to the project
	(iii) drainage works, *(iv) environmental protection works,* *(d) any other development.* *(2) Development for which consent is required by subclause (1), other than development for the purpose of environmental protection works, is declared to be designated development for the purposes of the Act.* *(4) A consent authority must not grant consent for development referred to in subclause (1) unless the consent authority is satisfied that sufficient measures have been, or will be, made to protect the biophysical, hydrological and ecological integrity of the coastal wetland or littoral rainforest.* ***12 Development on land in proximity to coastal wetlands or littoral rainforest land*** *(1) Development consent must not be granted to development on land wholly or partly identified as "proximity area for coastal wetlands" or "proximity area for littoral rainforest" on the Coastal Wetlands and Littoral Rainforests Area Map unless the consent authority is satisfied that the proposed development will not significantly impact on:* *(a) the biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest, or* *(b) the quantity and quality of surface and ground water flows to the adjacent coastal wetland or littoral rainforest if the development is on land within the catchment of the coastal wetland or littoral rainforest.* ***Division 3 Coastal environment area*** ***14 Development on land within the coastal environment area*** *(1) Development consent must not be granted to development on land that is wholly or partly within the coastal environment area unless the consent authority is satisfied that the proposed development:* *(a) is not likely to cause adverse impacts on the biophysical, hydrological (surface and groundwater) and ecological environment, and* *(b) is not likely to significantly impact on geological and geomorphological coastal processes and features or be significantly impacted by those processes and features, and* *(c) is not likely to have an adverse impact on the water quality of the marine estate (within the meaning of the Marine Estate Management Act 2014), in particular, having regard to the cumulative impacts of the proposed development on the marine estate including sensitive coastal lakes, and* *(d) is not likely to have an adverse impact on native vegetation and fauna and their habitats, undeveloped headlands and rock platforms, and* *(e) will not adversely impact Aboriginal cultural heritage and places, and* *(f) incorporates water sensitive design, including consideration of effluent and stormwater management, and* *(g) will not adversely impact on the use of the surf zone.*
State Environmental Planning Policy (Biodiversity and Conservation) 2021	The Sydney Harbour Catchment comprises the area adjacent to the harbour and its waterways, including the Ermington Wetland at Melrose Park. Chapter 10 of the *State Environmental Planning Policy (Biodiversity and Conservation) 2021* aims to recognise, protect, enhance and maintain the Sydney Harbour Catchment foreshores and waterways and their ecological values. Chapter 10 also aims to *"ensure the protection, maintenance and rehabilitation of watercourses, wetlands, riparian lands, remnant vegetation and ecological connectivity".* Importantly, a key principle of this SEPP is the *"protection of the natural assets of Sydney Harbour has precedence over all other interests*". Part 10.2 of this SEPP contains planning principles to be considered when preparing environmental planning instruments such as this Planning Proposal: The planning principles for land within the Foreshores and Waterways Area are as follows— (a) development should protect, maintain and enhance the natural assets and unique environmental qualities of Sydney Harbour and its islands and foreshores,

Name	Relevance to the project
	(b) public access to and along the foreshore should be increased, maintained and improved, while minimising its impact on watercourses, wetlands, riparian lands and remnant vegetation, (c) access to and from the waterways should be increased, maintained and improved for public recreational purposes (such as swimming, fishing and boating), while minimising its impact on watercourses, wetlands, riparian lands and remnant vegetation, (d) development along the foreshore and waterways should maintain, protect and enhance the unique visual qualities of Sydney Harbour and its islands and foreshores, (e) adequate provision should be made for the retention of foreshore land to meet existing and future demand for working harbour uses, (f) public access along foreshore land should be provided on land used for industrial or commercial maritime purposes where such access does not interfere with the use of the land for those purposes, (g) the use of foreshore land adjacent to land used for industrial or commercial maritime purposes should be compatible with those purposes, (h) water-based public transport (such as ferries) should be encouraged to link with land-based public transport (such as buses and trains) at appropriate public spaces along the waterfront, (i) the provision and use of public boating facilities along the waterfront should be encouraged. Also, to be considered at this stage of the proposal is the zoning of the proposal in the Foreshores and Waterways Area. The foreshore area of the study area is zoned as Zone No W2 Environment Protection. The objectives of this zone are as follows— (a) to protect the natural and cultural values of waters in this zone, (b) to prevent damage or the possibility of longer-term detrimental impacts to the natural and cultural values of waters in this zone and adjoining foreshores, (c) to give preference to enhancing and rehabilitating the natural and cultural values of waters in this zone and adjoining foreshores, (d) to provide for the long-term management of the natural and cultural values of waters in this zone and adjoining foreshores. At the stage of DA, Part 10.19 lists the following Matters of Consideration for biodiversity relevant to the proposal: (b) development should protect and enhance terrestrial and aquatic species, populations and ecological communities and, in particular, should avoid physical damage and shading of aquatic vegetation (such as seagrass, saltmarsh and algal and mangrove communities).
Sydney Harbour Foreshores and Waterways Area Development Control Plan 2005 (DCP)	This DCP provides performance-based criteria and guidelines in relation to matters such as foreshore access and natural environments for areas covered by the SREP. The DCP needs to be taken into consideration during the development application process. In relation to biodiversity the general aim is to conserve biological diversity within and around Sydney Harbour and its tributaries. Criteria has been developed to ensure that: • ecological communities, particularly those which form wildlife habitats, are protected and where feasible enhanced • development is sited to retain native vegetation, wetlands and natural foreshores • development is accompanied by revegetation and rehabilitation of degraded foreshores, where appropriate • development does not impact adversely on water quality. This has been displayed below in Figure 3.

Name	Relevance to the project
Parramatta Local Environment Plan 2011 (LEP)	The wetlands are mapped as a heritage item under the LEP. Whilst no direct works will be undertaken within the wetland, the objectives of 5.10 Heritage Conservation must be taken in consideration. The relevant objectives of this clause are as follows: *(a) to conserve the environmental heritage of Parramatta* *(b) to conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views.* *Clause 6.4 Biodiversity protection and Clause 6.5 Water Protection* A narrow area of land along the foreshore is mapped as "biodiversity" and "riparian land and waterways". The majority of this area is within the identified buffer area. *Clause 6.7 Foreshore Building Line* The objective of this clause in the LEP is to ensure that development in the foreshore area will not impact on natural foreshore processes or affect the significance and amenity of the area.
Employment Lands Strategy 2016	The *Employment Lands Strategy 2016* (ELS) is a City of Parramatta Council document which provides future guidance for the development of Parramatta's 21 Employment Lands Precincts. Melrose Park is identified as one of these precincts in the ELS. The ELS provides structure planning principles specific to Melrose Park and identifies foreshore protection as a key guiding principle. These principles have been identified to ensure the precinct is developed in a coordinated manner. The key principle relating to the wetland area is as follows: *"Foreshore treatment – A 30 m-40 m river foreshore buffer zone is required to protect and reinforce the ecologically significant Ermington Bay wetland"*

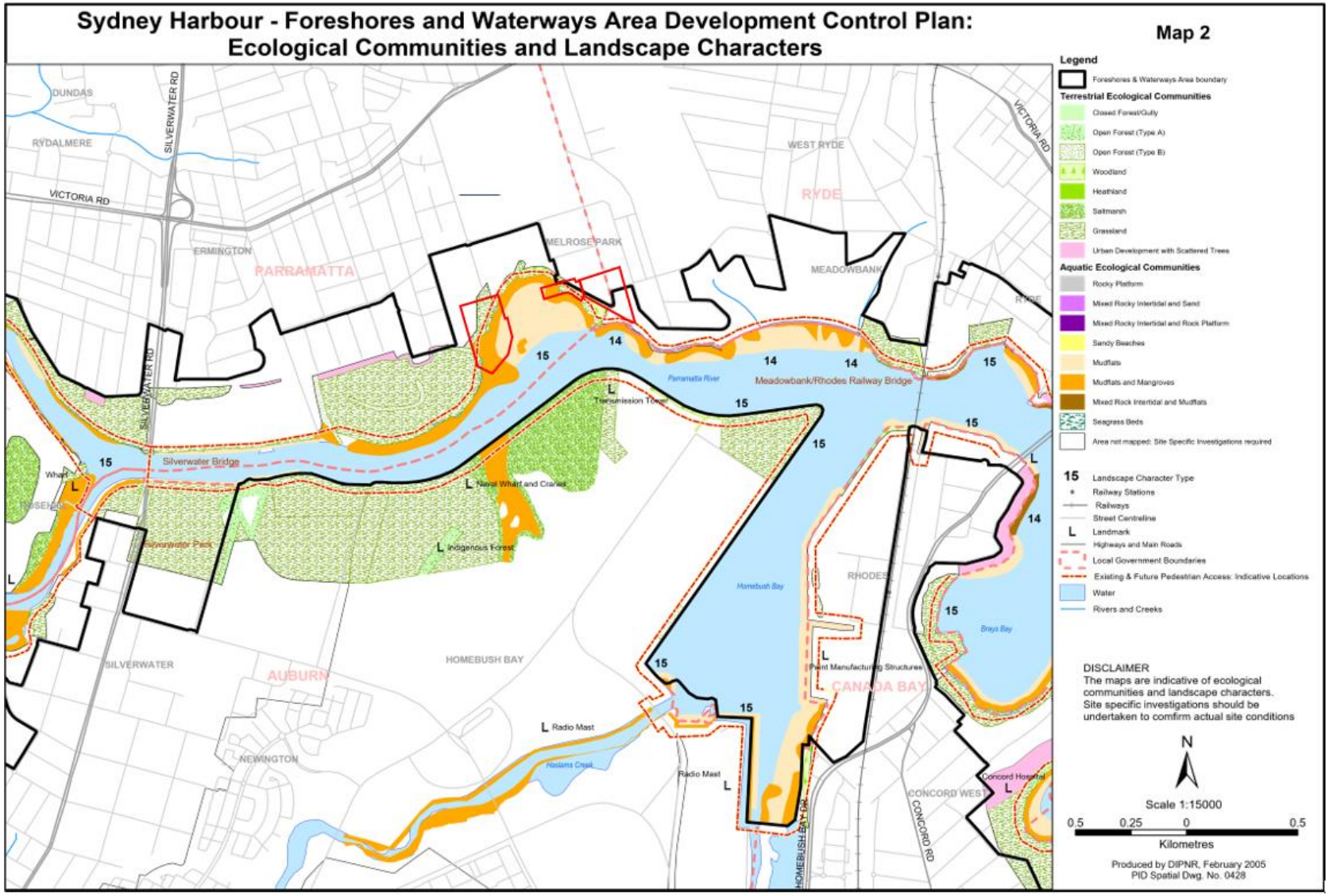

Figure 3: Foreshore and waterways map (Sydney Harbour Foreshores and Waterways DCP 2005)

2.1.2 Literature, mapping and database searches

Database records and relevant literature pertaining to the ecology of the study area and surrounding environs were reviewed. The material reviewed included:

- BioNet (Atlas of NSW Wildlife) database search (5km) for threatened species, populations and migratory species listed under the NSW BC Act (Department of Planning and Environment (DPE) 2022a)
- EPBC Act Protected Matters Search Tool (5km) for species listed under the Commonwealth EPBC Act (Department of Agriculture, Water and the Environment (DAWE) 2022)
- DPE Threatened Species Profiles (DPIE 2022b)
- Aerial mapping and vegetation mapping, to assess the extent of vegetation including mapped threatened ecological communities (TECs) listed under the BC or EPBC Act.

Species from both NSW BioNet searches and searches for EPBC Act Matters of National Environmental Significance (MNES) were combined to produce a list of threatened species that may occur within the study area ("subject species"). Likelihood of occurrences for threatened species, endangered populations and communities in the study area were then made based on location of database records, the likely presence or absence of suitable habitat within the study area, and knowledge of the species' ecology. A list of potentially "affected species" was then identified (those that were defined as "yes", "likely" or having "potential" to occur in the study area).

Five terms for the likelihood of occurrence of species are used in this report, defined as follows:

- "yes" = the species was or has been observed in the study area
- "likely" = a medium to high probability that a species uses the study area
- "potential" = suitable habitat for a species occurs in the study area, 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 study area, and
- "no" = habitat in the study area and in its vicinity is unsuitable for the species.

Note that assessments for the likelihood of occurrence were made both prior to field survey and following field survey. The pre-survey assessments were performed to determine which species were "affected species", and hence determine which types of habitat to search for during the field survey. The post-survey assessments to determine final "affected species" were made after observing the available habitat in the study area. The likelihood of occurrence table is provided in Appendix A.

2.2 Site inspection of ecological values

A site inspection was undertaken in the study area by ecologist Nicole McVicar on 19 October 2016 and 1 April 2020. The boundary of the study area and surrounding areas were traversed, with a focus on the foreshore area. Areas of saltmarsh and Estuarine Mangrove Forest were reassessed by ecologist Tim Maher on 22 April 2022. Private properties and businesses were not entered as vegetation was visible from public areas.

On 19 October 2016 weather conditions during the survey were clear and sunny, with the minimum and maximum temperatures recorded as 13.3°C and 23.7°C, respectively. On 1 April 2020 the weather was wet with the minimum and maximum temperatures recorded as 17.4°C and 24.2°C, (recordings taken from the nearest weather station to the study area; BOM 2020). On 22 April 2022, weather was wet

with the minimum and maximum temperatures recorded as 14.1°C and 20.0 °C (recordings taken from the nearest weather station to the study area; BOM 2022).

The site inspection validated the vegetation communities present within and adjacent to the study area and, in particular, the presence of threatened ecological communities listed under the BC Act and / or EPBC Act.

The presence of threatened flora and fauna species identified as having the potential to occur within and adjacent to the study area was determined through a habitat assessment. Where threatened species or important habitat features were observed, such as hollow-bearing trees, potential nesting or roosting sites, their locations were recorded. The locations of all important habitat features (e.g. rock outcrops, significant logs and habitat/foraging trees) were observed were also recorded. Opportunistic sightings of all fauna present within the study area were recorded. No targeted flora or fauna surveys were conducted as part of this inspection.

3. Results

3.1 Flora species

The database search identified a total of 25 threatened flora species listed under the BC or EPBC Acts, within a 5 km radius of the study area.

A total of 146 flora species were identified within the study area comprising of:

- 46 native flora species (including restoration planting and remnant vegetation)
- 22 urban landscape plantings
- 18 exotic landscape plantings
- 60 weed species were identified in and around the study area

These are detailed in Appendix B and displayed in **Figure 4**.

The threatened plant *Wilsonia backhousei* had been identified in the *George Kendall Riverside Park Master Plan 2012* as occurring in the Coastal Saltmarsh located at the western end of study area. This species was not recorded within the study area on the Atlas of NSW Wildlife. The plant was not observed during the site inspection however appropriate habitat is present and it is assumed this species does still occur here. Subsequently, further investigation during the development/rezoning application stage will be required.

No threatened flora species were recorded within the study area during the field surveys.

3.2 Fauna and habitat

The database search identified a total of 96 threatened fauna species (three amphibians, 73 birds, 12 mammals, six reptiles, one fish, and one invertebrate) listed under the BC or EPBC Act, within a 5 km radius of the study area. These are displayed in **Figure 5**

A total of 14 native and two introduced species were recorded during the site inspection (Appendix B). No threatened fauna species were recorded during the site survey. *Melaleuca quinquenervia* (Broad-

leafed Melaleuca) and *Ficus microcarpa var. hillii* (Hill's Weeping Fig) were both recorded in study area and are considered foraging habitat for Grey-headed Flying-fox (*Pteropus poliocephalus*), listed as vulnerable under the BC Act and EPBC Act. It is considered likely that the mangrove habitat and adjacent Parramatta River would be utilised by *Myotis macropus* (Southern Myotis) (listed as vulnerable under the BC Act) for foraging purposes.

3.3 Vegetation communities

The southern part of the study area comprises the Ermington Wetland which forms part of the northern bank of the Parramatta River. This area comprises Estuarine Mangrove Forest, Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions, native and exotic plantings, and bushland rehabilitation areas and extends from Wharf Road to Atkins Road, continuing on west of the study area into George Kendall Riverside Park. Powerline infrastructure is present within the foreshore area; overhead powerlines extend over the eastern half of the wetlands with two large transmission towers located with the foreshore area.

The rehabilitation and revegetation areas are located on the disturbed landward batters adjacent to the mangrove and saltmarsh communities. These batters vary in size and condition along the foreshore area. In some areas no batter exists and the saltmarsh directly abuts the developed industrial area. The location of the vegetation communities are displayed in **Figure 6**.

3.3.1 Native and exotic plantings

The industrial complexes within the study area comprised developed urban landscapes. All vegetation observed was a combination of native and exotic landscape plantings such as *Eucalyptus microcorys* (Tallowwood), *Eucalyptus saligna* (Sydney Blue Gum), *Ficus microcarpa var. hillii*, *Photinia* sp., *Melaleuca quinquenervia* (Broad-leaved Paperbark), *Casuarina cunninghamiana* (River Oak) *Liquidambar styraciflua* (Liquidambar), *Callistemon salignus, Elaeocarpus reticulatus* (Blueberry Ash),and *Acer palmatum* (Japanese Maple). This vegetation does not conform to any naturally occurring native vegetation community, however for the purpose of future assessments for any development application, this vegetation has been assigned to Plant Community Type (PCT) 1778 *Smooth-barked Apple – Coast Banksia/Cheese Tree open forest on sandstone slopes of the foreshores of the drowned river valleys of Sydney*. The area of this vegetation within the study area is approximately 0.43 ha. An example is shown in photo 1 below.

3.3.2 Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions

Occurring in the intertidal zone along the NSW coast, this TEC is listed as endangered under the BC Act and vulnerable under the Commonwealth EPBC Act.

Coastal Saltmarsh, TEC 1126 *Saltmarsh in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion*, occupies the intertidal zone on the shores of estuaries and lagoons that are permanently or intermittently open to the sea. The community is frequently found on the landward side of mangrove stands.

Characteristic species include *Baumea juncea*, *Juncus kraussii* subsp. *australiensis* (Sea Rush), *Sarcocornia quinqueflora* subsp. *quinqueflora* (Samphire), *Sporobolus virginicus* (Marine Couch), *Triglochin striata* (Streaked Arrowgrass), *Ficinia nodosa* (Knobby Club-rush), *Samolus repens* (Creeping

Brookweed), *Selliera radicans* (Swamp Weed), *Suaeda australis* (Seablite) and *Zoysia macrantha* (Prickly Couch).

The Coastal Saltmarsh recorded during the survey, located landward of the mangroves and south of developed areas, was generally represented by *Juncus kraussii* (Sea Rush), *Suaeda australis* (Seablite) and *Zoysia macrantha* (Prickly Couch). This TEC occurred in a patchy distribution surrounded by mangroves, native plantings, and weeds and varies in condition and it occurs within the south west part of the study area. There was also considerable evidence of weed management and bush regeneration within and adjacent to the Coastal Saltmarsh. The area of Coastal Saltmarsh within the study area is approximately 0.44 ha. An example of the Coastal Saltmarsh within and adjacent to the study area is shown below in photos 2 and 3.

3.3.3 Estuarine Mangrove Forest

Estuarine Mangrove Forest, PCT 916 *Mangrove-Grey Mangrove low closed forest of the NSW Coastal Bioregion,* occupies mudflats in coastal estuaries subject to frequent tidal inundation, with populations scattered along the NSW coast. Mangrove Forest often occur in monospecific stands in areas of higher tidal fluctuation (Office of Environment and Heritage 2020c). It is partly associated with the TECs: *Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*, *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregion,* listed as endangered under the BC Act.

A continuous stand of Estuarine Mangrove Forest (5.55 ha), consisting of *Avicenna marina* (Grey Mangrove) lines the northern back of the Parramatta River to the south of the study area. An example of this is displayed below in photo 4.

3.3.4 Bush Regeneration/revegetated areas

Restoration areas of various condition and size are located within the foreshore area outside of the study area. These areas generally form a barrier between public areas/private property and the wetland vegetation. In the south eastern end of the foreshore area, a weedy degraded batter forms a barrier between the wetland and the park. This batter is dominated by the weed species: *Lantana camara , Olea europaea* subsp. *cuspidata* (African Olive), *Anredera cordifolia* (Madeira Vine) and *Tradescantia fluminensis* (Trad), which require management under the Biosecurity Act 2015.

Continuing west is a large native restoration area of mixed native plantings/regrowth including species such as *Acacia longifolia* (Sydney Golden Wattle) *Casuarina glauca* (Swamp Oak), *Eucalyptus robusta* (Swamp Mahogany) *Imperata cylindrica* (Blady Grass), *Melaleuca linariifolia* Flax-leaved Paperbark*, Leptospermum polygalifolium*, *Kennedia rubicunda*, *Themeda triandra* (Kangaroo Grass), *Bursaria spinosa*, *Indigofera australis* and *Acacia decurrens*. This restoration area is bounded by an access track for powerline infrastructure.

West of the access track, extending towards Hughes Avenue, the revegetation areas become narrower, and in general occur along a batter foreshore side of the multi-use track. Revegetation in these areas is typically dominated by *Eucalyptus robusta* (Swamp Mahogany), *Acacia longifolia* (Sydney Golden Wattle) *Casuarina glauca* (Swamp Oak) and *Imperata cylindrica* (Blady Grass). In this area open space and urban native and exotic plantings are present within the adjacent industrial area, providing some additional vegetation buffering on the northern side of the access path. There is also a small area of

Swamp Oak regrowth and plantings of *Eucalyptus robusta,* and *Melaleuca decora* adjacent to a transmission tower.

From the transmission tower to Hughes Avenue and beyond, the buffer between private land and the wetland narrows. The multi-use path turns into a boardwalk over the wetlands and in some areas the Coastal Saltmarsh directly abuts the boundary of the industrial area (and extends into the study area as discussed). A drainage line enters the wetland at Hughes Avenue and Atkins Road and there is evidence of considerable disturbance. Invasive weed species are abundant in this area and include *Cinnamomum camphora* (Camphor Laurel), *Ligustrum lucidum* (Large-leaf Privet) and *Lantana camara.* The drainage lines and proximity to the adjacent industrial estate has resulted in considerable disturbance to the existing Coastal Saltmarsh.

It is considered that these restoration and weedy area would conform to a planted form of PCT 1795 *Swamp Mahogany/Cabbage Tree Palm – Cheese Tree – Swamp Oak tall open forest on poorly drained coastal alluvium in the Sydney Basin*. This PCT, when naturally occurring, does conform to the TEC *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions*. In this case, due to the fact that it is planted, it is considered that the vegetation does not conform to the TEC. The area of this vegetation community within the study area is approximately 0.97 ha. An example of this is displayed below in photo 5.

Photo 1: Planted native vegetation within the study area

Photo 2 and 3: Coastal Saltmarsh adjacent to the study area

Photo 4: Estuarine Mangrove Forest within Ermington Bay Wetlands

Photo 5: Revegetation site within the foreshore buffer area

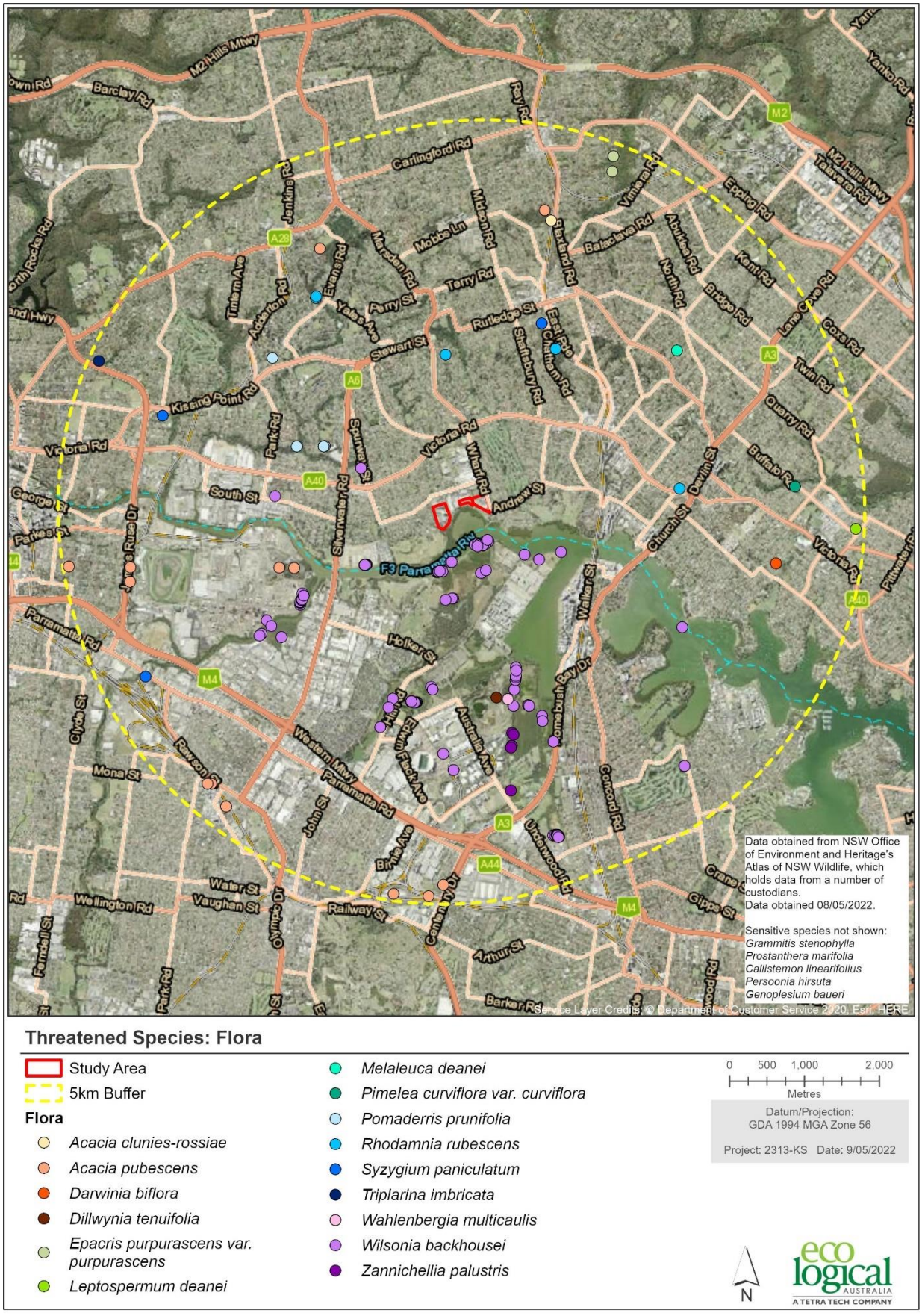

Figure 4: Threatened flora BioNet records

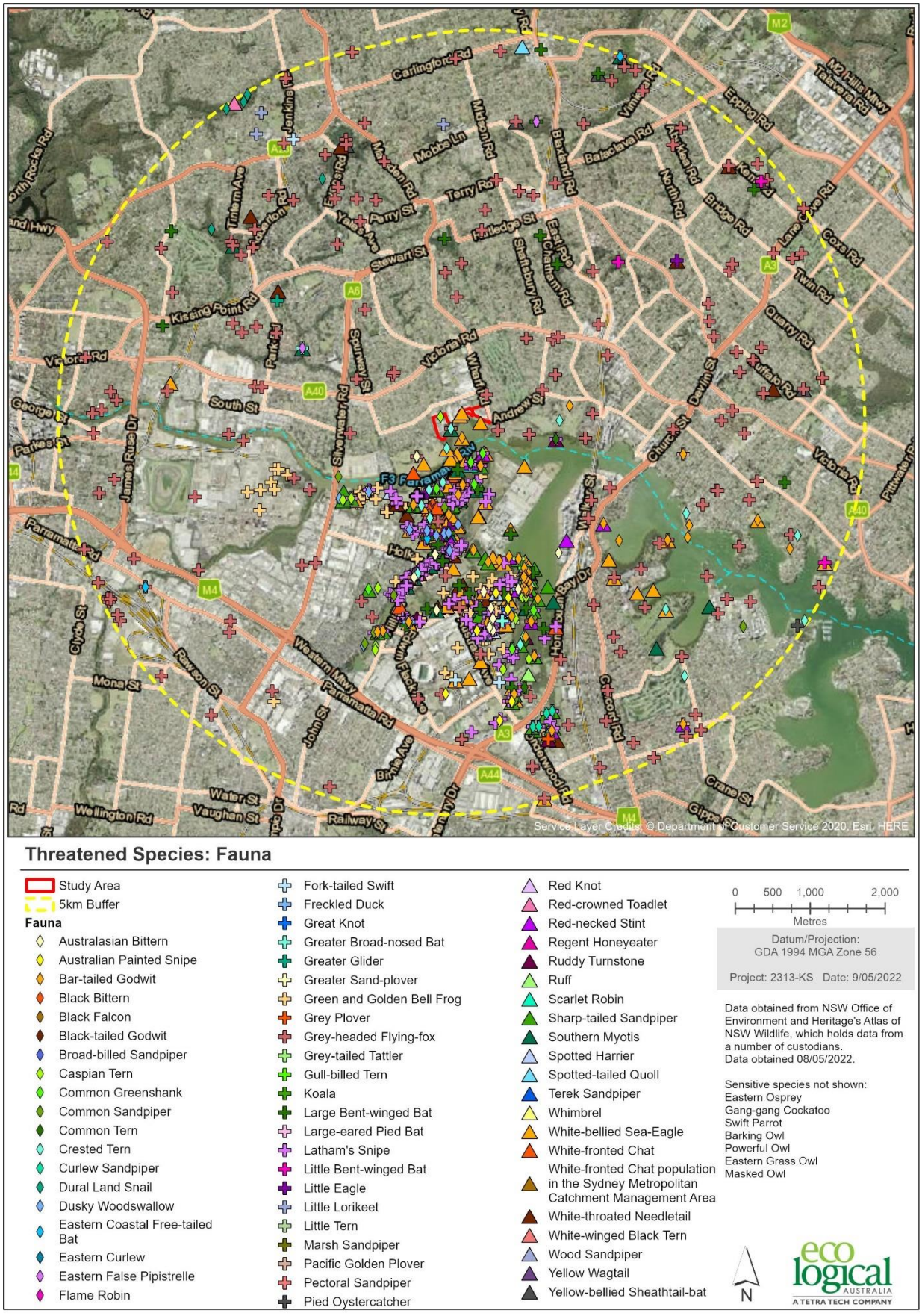

Figure 5: Threatened fauna BioNet records

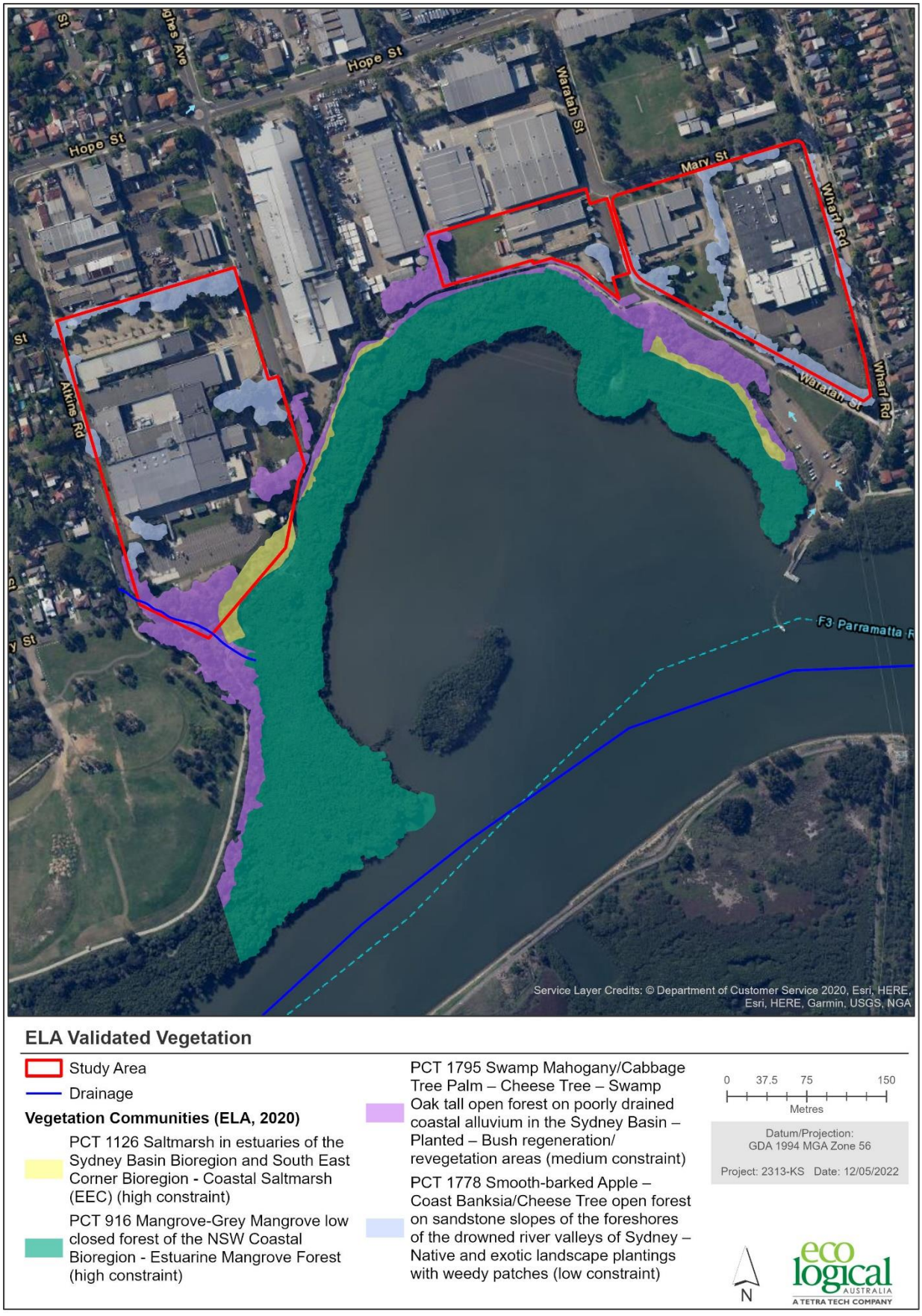

Figure 6: Validated vegetation communities

3.4 Ecological constraints

An ecological constraints assessment comprises of vegetation mapping combined with site inspection data (such as on the potential for ecological recovery of sites) and threatened species information. Other data, such as riparian zones, or areas identified for ecological connectivity, may also be combined into an ecological constraints assessment to determine the relative level of ecological value or constraint at a site.

Three categories of conservation significance were used to represent the relative ecological constraints across the site; high ecological value, moderate ecological value and nil ecological value. The ecological constraints are shown on 7.

Ecological assessment and constraints mapping was based on:

- mapped vegetation communities and their legislative status
- records of threatened flora species
- data recorded during field survey.

3.4.1 High constraint

Areas of *high* ecological value are mapped within the study area due to the following characteristics:

- High biodiversity value habitat comprising of Coastal Saltmarsh TEC and Estuarine Mangrove Forest. Habitat for the threatened plant *Wilsonia backhousei*.

3.4.2 Medium constraint

Areas of *medium* constraint are mapped within the study area due to the following characteristics:

- Mixture of native re-vegetation, regrowth and weeds within foreshore area located adjacent to habitat with high biodiversity values, i.e. adjacent to Coastal Saltmarsh TEC and Estuarine Mangrove Forest.

3.4.3 Low constraint

Areas of *low* ecological value are mapped within the study area due to the following characteristics:

- mixed native and exotic landscape planting with patches of weeds
- weedy areas identified outside the foreshore area.

Figure 7 below shows the ecological constraints and indicative foreshore buffer lines of 20 m (in one key location) 30 m and 40 m.

The Employment Land Strategy does not clearly state where the 30 - 40 m buffer is to be measured from, however the Office of Water Guidelines for riparian corridors on waterfront land identify the 40 m revegetated zone to be measured from the top of the high bank on each side of a watercourse.

We have provided an indicative vegetative buffer from the landward edge of the saltmarsh, and landward edge of the mangroves where saltmarsh is not present.

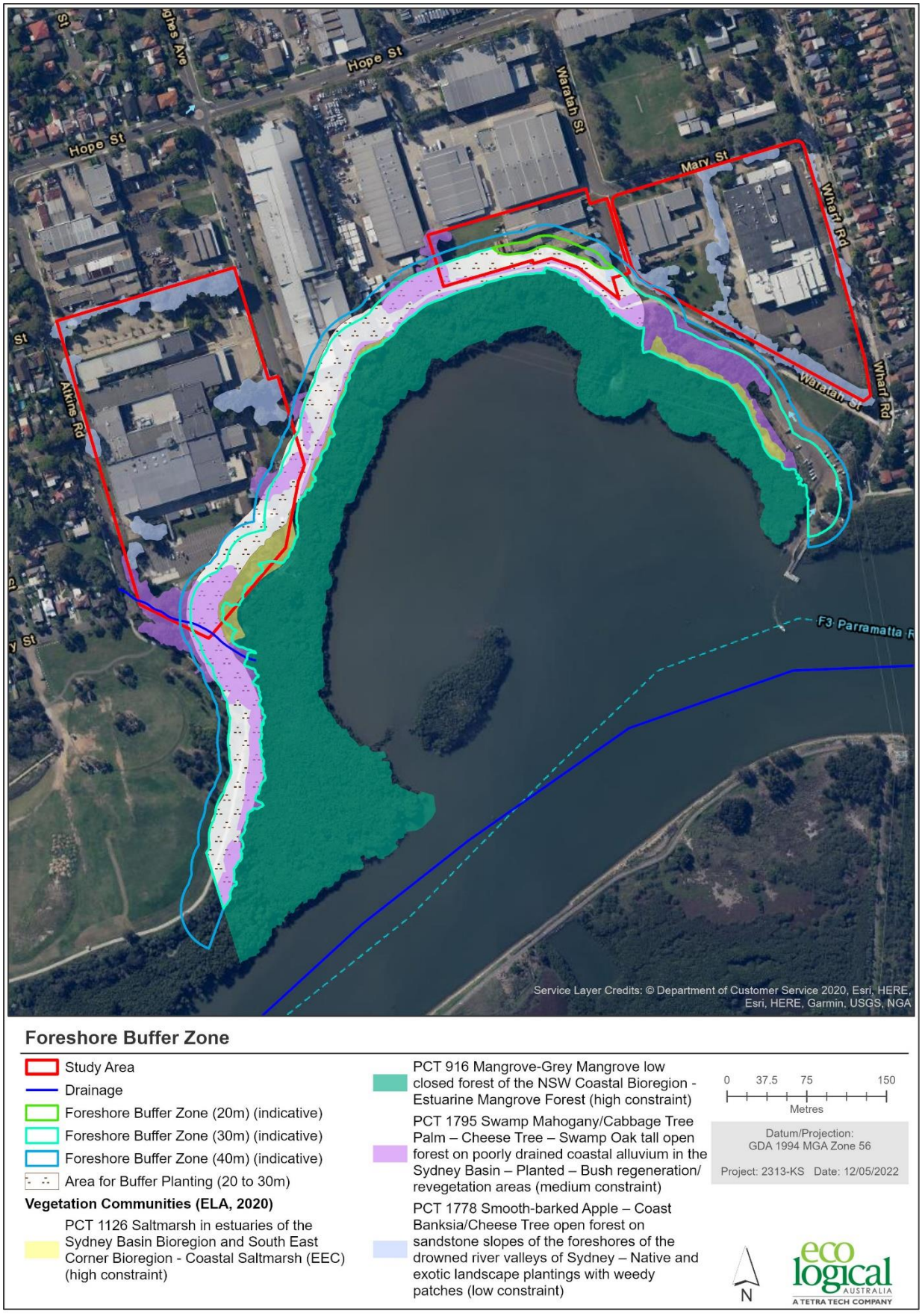

Figure 7 Ecological constraints and foreshore buffer zones

3.5 Impacts

3.5.1 Solar access and artificial shadowing of coastal saltmarsh and **Estuarine Mangrove Forest**

A solar study based on the proposed building layout from the Melrose South Structure Plan was prepared to model solar access from built structures. The modelling of available sunlight hours was undertaken for the following dates between 9am and 3pm: Winter Solstice (June 21), Summer Solstice (December 21), Spring Equinox (September 23), Autumn Equinox (March 20) to assess shading impact on saltmarsh and Estuarine Mangrove Forest throughout the year (Figure 8-11). The period of 9am to 3pm (6 hours of sunlight) was chosen, because it represents the most intense photoperiod of the day. The amount of sunlight the saltmarsh would receive on these dates throughout the year, despite shading from the from the proposal, is shown in Table 2.

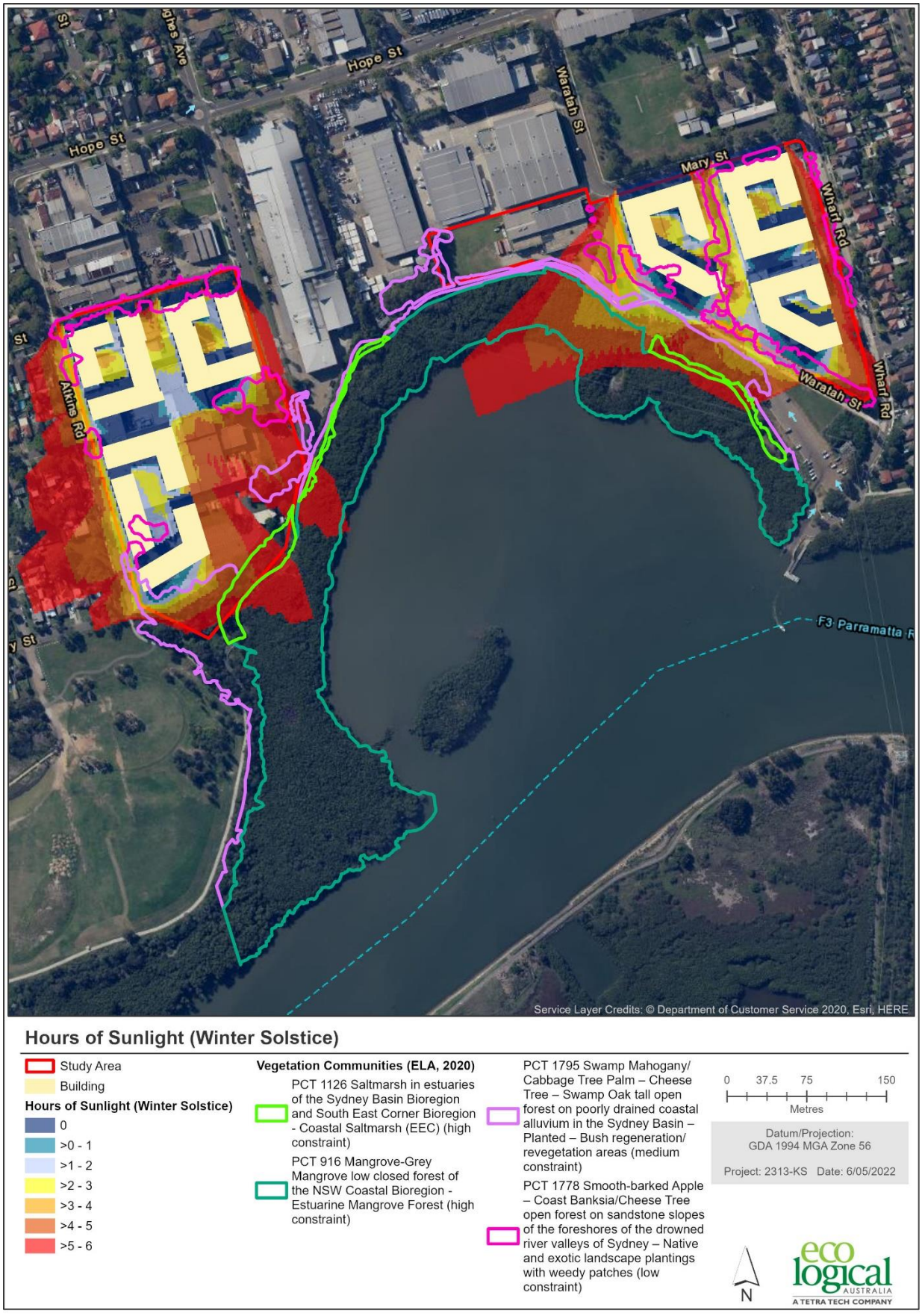

Figure 8 Solar study from Melrose South Structure Plan on Winter Solstice.

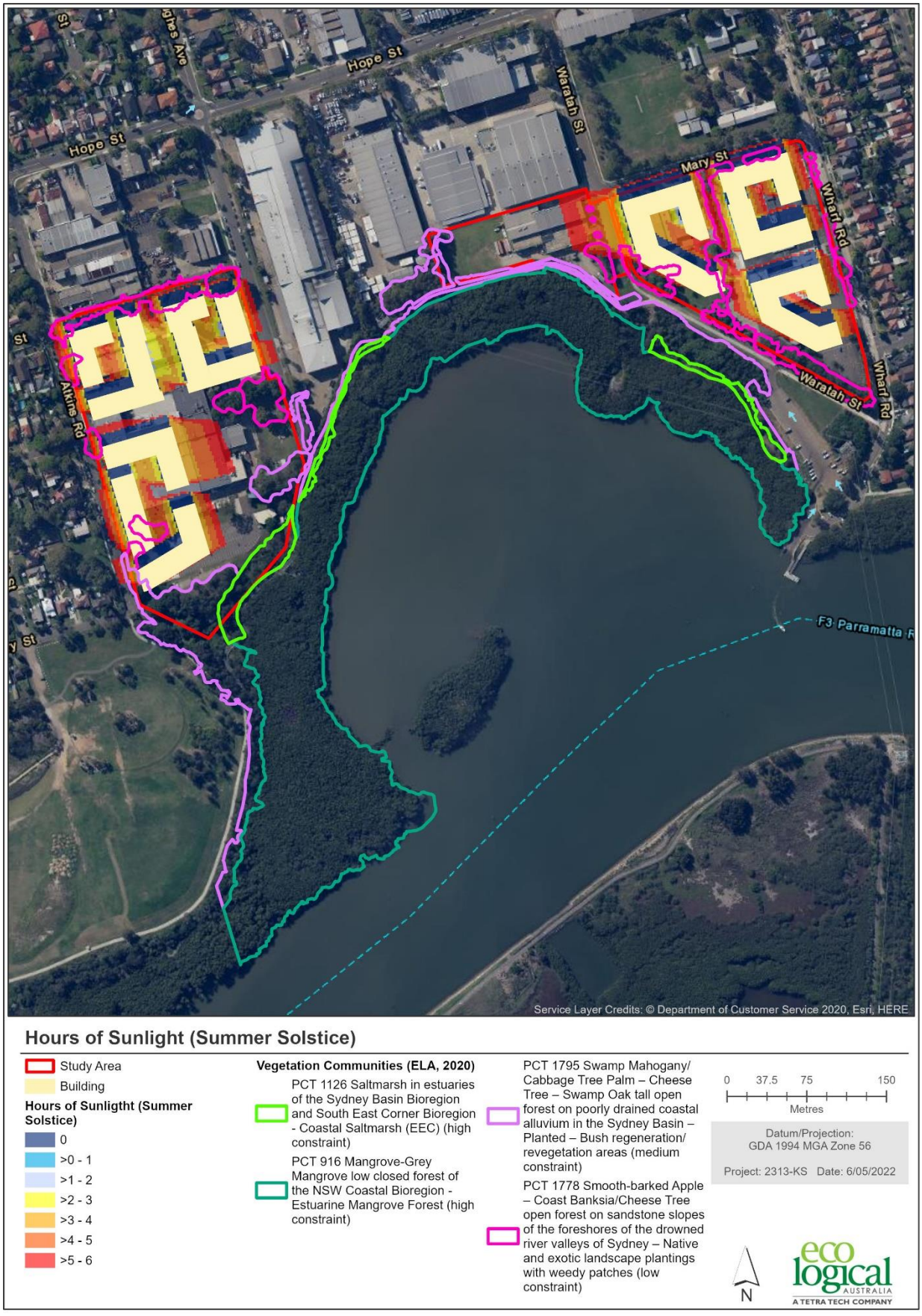

Figure 9 Solar study from Melrose South Structure Plan on Summer Solstice.

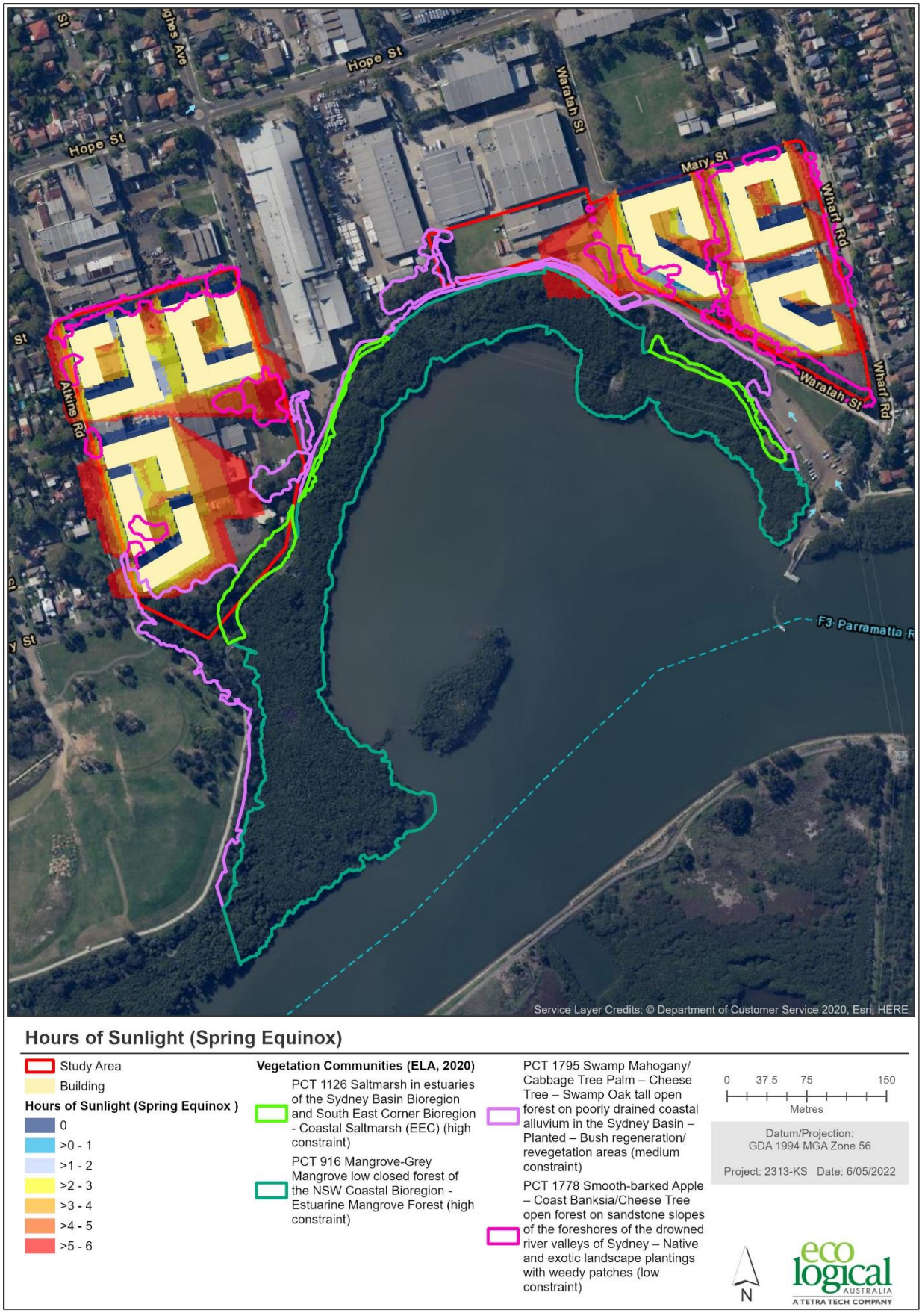

Figure 10: Solar study from Melrose South Structure Plan on Spring Equinox.

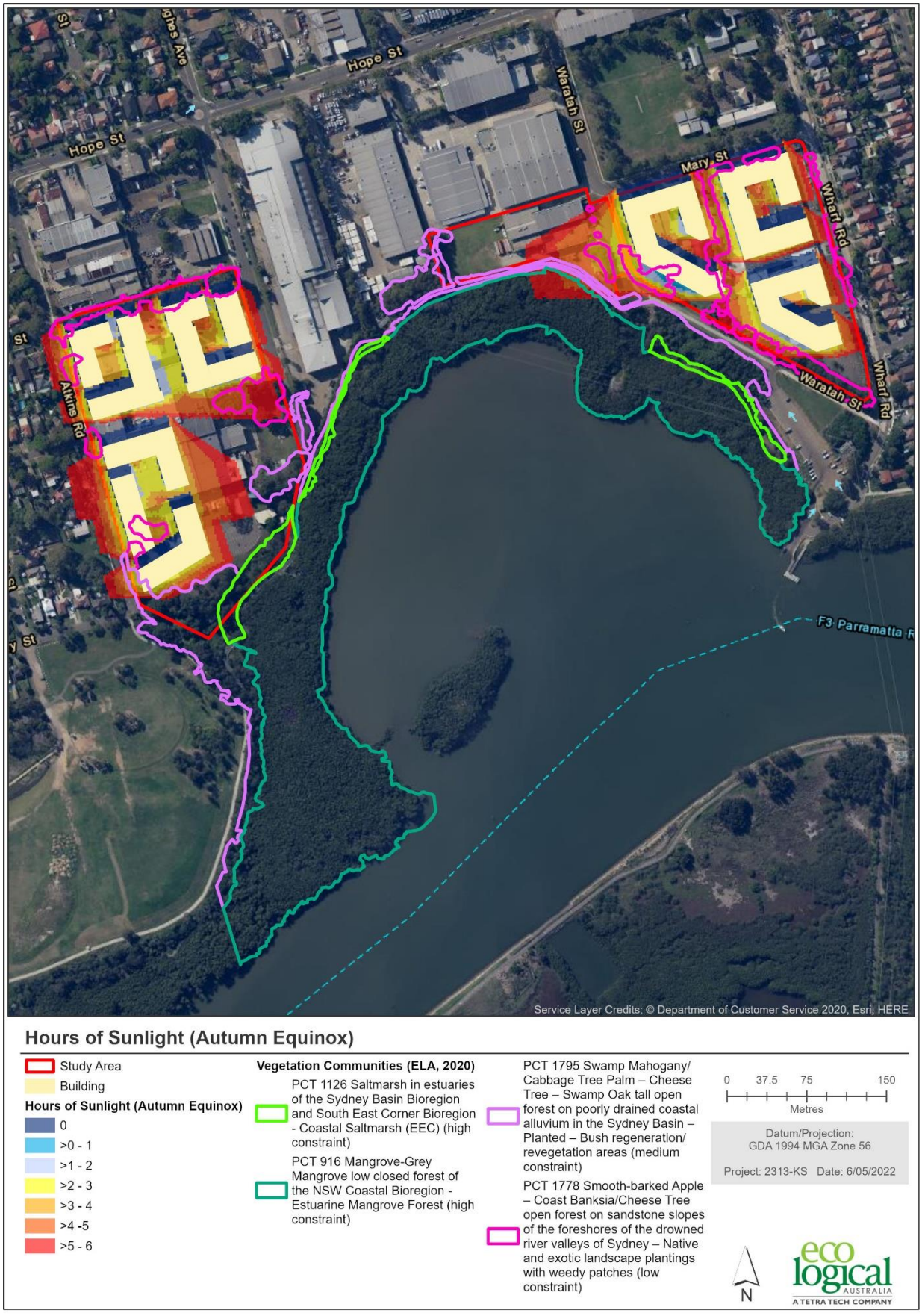

Figure 11: Solar study from Melrose South Structure Plan on Autumn Equinox.

Table 2 Reduction is sunlight hours by proposal across seasons for saltmarsh and Estuarine Mangrove Forest

Time of year modelled	Hours of sunlight between 9 am and 3 pm	Area of saltmarsh (m²)	Area of saltmarsh (as % of total)	Area of Estuarine Mangrove Forest (m²)	Area of Estuarine Mangrove Forest (as % of total)
Winter solstice	0	0		0	
	>0 - 1	0		0	
	>1 - 2	0		0	
	>2 - 3	0		3	0.005%
	>3 - 4	6		1118	2%
	>4 - 5	764	17%	3124	5%
	>5 - 6	1909	43%	7839	12%
	No impact	1728	39%	55464	82%
Autumn equinox	0	0		0	
	>0 - 1	0		0	
	>1 - 2	0		0	
	>2 - 3	0		0	
	>3 - 4	0		0	
	>4 - 5	0		162	0.2%
	> 5 - 6	0		1001	1%
	No impact	4406	100%	66385	98%
Spring equinox	0	0			
	>0 - 1	0			
	>1 - 2	0			
	>2 - 3	0			
	>3 - 4	0			
	>4 - 5	0		53	0.1%
	>5 - 6	0		782	1%
	No impact	4406	100%	66714	99%
Summer solstice	0	0		0	
	>0 - 1	0		0	
	>1 - 2	0		0	
	>2 - 3	0		0	
	>3 - 4	0		0	
	>4 - 5	0		0	
	> 5 - 6	0		0	
	No impact	4406	100%	67549	100%

The solar access modelling indicates that the worst-case impact from the proposal is 2 hours of shading of saltmarsh in the study area between 9 am-3 pm during winter. This level of shading would impact 17% of the total saltmarsh in the study area. However, no shading would be received by saltmarsh for the other seasons.

The solar access modelling indicates that the worst-case impact from the proposal is 4 hours of shading of Estuarine Mangrove Forest in the study area between 9 am-3 pm during winter. This level of shading would only impact 0.005% of the total Estuarine Mangrove Forest in the study area. There would also be shading impacts of 2 hours in Autumn and Spring, but these would only impact 0.2% and 0.1% of the mangrove forest.

3.5.2 Literature review on shading impacts on saltmarsh

A literature review was conducted on shading impacts on saltmarsh in Australia. No relevant literature discussing shading impacts on Australian saltmarsh was found. The most relevant literature found on the topic is in relation to shading impacts of docks on saltmarsh in the US. The following relevant articles were reviewed.

- Sanger, D. M., Holland, A. F., & Gainey, C. (2004). Cumulative impacts of dock shading on Spartina alterniflora in South Carolina estuaries. *Environmental Management*, *33*(5), 741-748.
- Logan, J., Davis, A., & Ford, K. (2015). Environmental impacts of docks and piers on salt marsh vegetation across Massachusetts estuaries-a quantitative field survey approach. *Boston, Massachusetts: Marine Fisheries Commonwealth of Massachusetts, 44p*.
- Logan, J. M., Davis, A., Markos, C., & Ford, K. H. (2018). Effects of docks on salt marsh vegetation: an evaluation of ecological impacts and the efficacy of current design standards. *Estuaries and coasts*, *41*(3), 661-675.
- Logan, J., Voss, S., & Ford, K. (2014). Shading Impacts of Small Docks and Piers on Salt Marsh Vegetation in Massachusetts Estuaries.

The articles conclude that shading from docks, which are typically 1-2 m above the ground, results in dieback and/or changes in species composition of saltmarsh. However, this assumes long periods of shading and is not comparable to a maximum of 3 hours shading during winter, which is the worst-case scenario for the current proposal. The threshold or degree of shading that it takes before these negative impacts on saltmarsh occur is not known from the literature.

3.5.3 Shading impacts on saltmarsh

Although the literature does not indicate a period of shading before saltmarsh starts to decline, it exists under full sun conditions naturally is sensitive areas changes in microclimate. Considering this, 2-hours of shading from the proposal during winter may affect the saltmarsh in the study area over time. However, because the saltmarsh has access to full sun during the other seasons of the year, the shading impact from the proposal could be considered to be minimal and non-significant. However, there is no available framework or regulation available by which to assess shading impacts on saltmarsh in Australia and therefore nothing can be said with certainty on the impact of this increased shading on saltmarsh in the study area.

3.5.4 Shading impacts on Estuarine Mangrove Forest

Mangroves are known to be able to withstand periods of shade, because they form a closed canopy and seedlings are able to continue to grow under these conditions. Additionally, good condition sections of Estuarine Mangrove Forest within the study area are fully shaded fully at times by adjacent stands of *Casuarina glauca*. Considering this, a maximum of 4 hours of increased shading of a small proportion of the Estuarine Mangrove Forest in the study area during winter and for 2 hours of shading during autumn and spring is unlikely to be a significant impact on this community.

3.6 Biodiversity Offset Scheme

The BC Act requires development applications to be accompanied by a Biodiversity Development Assessment Report (BDAR) if the Biodiversity Offset Scheme BOS is triggered. This does not apply to the planning proposal, but is relevant for a future DA.

For a local development under Part 4 of the EP&A Act, the BOS may be triggered by the following means:

- Area clearing threshold – exceeding the area clearing threshold associated with the minimum lot size for the property will trigger entry into the BOS (Table 3).
- Whether the impacts occur on an area mapped on the NSW Government Biodiversity Value Map
- Impacting on an area of Outstanding Biodiversity Value.
- Have a significant impact on biodiversity values in accordance with Section 7.3 of the BC Act (i.e. 5-part test).

3.6.1 Area Clearing Threshold

The area clearing threshold is triggered when an area of native vegetation* to be cleared reaches the thresholds for the relevant minimum lot size (Table 3). No minimum lot size is set for the study area, therefore the actual lot size is used to determine the area clearing threshold. The lots range in size from 500 m^2 to 6.5 ha, therefore the area clearing threshold defaults to the smallest lot, which is 0.25 ha of native vegetation. If all vegetation within the study area (1.4 ha not including the Coastal Saltmarsh) is proposed for clearing under a future DA then the BOS will be triggered and a BDAR would need to be prepared.

Table 3: Area clearing threshold

Minimum lot size associated with the property	Threshold for clearing native vegetation, above which the BAM and offsets scheme apply
Less than 1 ha	0.25 ha or more
1 ha to less than 40 ha	0.5 ha or more
40 ha to less than 1000 ha	1 ha or more
1000 ha or more	2 ha or more

* Note: native vegetation is defined in Section 1.6 of the BC Act 2016 (and has the same meaning as in Part 5A of the *Local Land Services Act 2013*); essentially encompasses any species native to NSW and does not necessarily conform to a Plant Community Type.

3.6.2 Biodiversity Values Land Map (BV Map)

The BV Map identifies land considered to have high biodiversity value as defined by the *Biodiversity Conservation Regulation 2017.* The wetlands (including Estuarine Mangrove Forest and Coastal

Saltmarsh) are mapped on the BV map (accessed 6 May 2022). Therefore, any impact to this vegetation in a future DA will trigger entry into the BOS.

3.7 Discussion

The planning proposal aligns with key planning principles identified in this document**.** The key principles relevant to the planning proposal are summarised briefly below:

- The EPBC Act consideration of MNES that may be relevant to the study area which may include threatened species, ecological communities and migratory species that are listed under the EPBC Act.
- The BC Act assessment of threatened species, populations, ecological communities or their habitats. The planning proposal has given preliminary consideration to the likely impacts on threatened species and the triggers for Biodiversity Offset Scheme for any proposed development.
- The study area outside the foreshore area has been primarily classified as containing medium and low ecological constraints, with one patch of high ecological constraint (Coastal Saltmarsh) located in the south west part of the study area. It is understood that this area is to be avoided by the proposed masterplan and any subsequent development.
- The key principle of *State Environmental Planning Policy (Biodiversity and Conservation) 2021 "protection of the natural assets of Sydney Harbour has precedence over all other interests*" plus aims to *"ensure the protection, maintenance and rehabilitation of watercourses, wetlands, riparian lands, remnant vegetation and ecological connectivity" .*
    - At this planning proposal stage, the planning principles for land within the Foreshores and Waterways Area are as follows—

        (a) development should protect, maintain and enhance the natural assets and unique environmental qualities of Sydney Harbour and its islands and foreshores,
    - At the DA stage, the following biodiversity matter (Part 10.19) is to be taken into consideration by consent authorities before granting consent to development under Part 4 of the Act:

        (b) development should protect and enhance terrestrial and aquatic species, populations and ecological communities and, in particular, should avoid physical damage and shading of aquatic vegetation (such as seagrass, saltmarsh and algal and mangrove communities).

- The Employment Lands Strategy provides precinct structure planning principles specific to Melrose Park and identifies foreshore protection as a key guiding principle: *Foreshore treatment – A 30 m-40 m river foreshore buffer zone is required to protect and reinforce the ecologically significant Ermington Bay wetland.*
- The Sydney Harbour Foreshores DCP has a general aim that development is accompanied by revegetation and rehabilitation of degraded foreshores, where appropriate. The DCP also provides performance criteria specific to development adjoining high conservation vegetation communities such as the saltmarsh mangrove vegetation identified in the study area. These are as follows:
    - vegetation clearance is minimised
    - severance of vegetation corridors is minimised
    - mature trees containing hollows are preserved

  - Disturbance in adjacent areas is temporary and rehabilitation occurs
  - tree canopy linkages to adjoining communities are maintained
  - stands of significant vegetation (mangroves and remnant rainforest) are protected
  - natural watercourses and any special natural features such as cliff faces and rock outcrops are protected
  - the incremental and cumulative effects of development are considered having regard to the above performance criteria
  - introduction of exotic species is minimised and existing native vegetation within the site landscaping is generally retained
- Shading of the saltmarsh will be kept to 2 hours during winter between 9am and 3pm mid-winter.
- It is understood the planning proposal will not have a direct impact on foreshore lands or vegetation other than the planted native and exotic trees outside of the wetland and revegetated areas in the south of the study area. Additional recommendations have been provided to facilitate additional protection. With these recommendations, plus addressing the indirect impacts though implementing recommended mitigation measures, the planning proposal will be consistent, from a biodiversity perspective, with the principles identified above in the relevant planning documents.
- It is it assumed there will be no direct removal of wetland vegetation or existing revegetation/regrowth areas within the foreshore areas and the vegetation removed would be native and exotic landscape plantings only. The removal of vegetation from the site would therefore not result in any direct impacts to any TECs or threatened flora and fauna species.
- Development within the precinct has potential to have indirect impacts on Coastal Saltmarsh and Estuarine Mangrove Forest through sediment run off and introduction of exotic species brought in from other works. Mitigation measures to avoid indirect impacts from the potential works on adjoining ecological values are outlined below.
- In relation to future infrastructure works associated with the precinct's development, works such stormwater/culvert upgrades would requirement habitat/impact assessment for threatened microbat species.

4. Recommendations and Mitigation Measures

The following measures are recommended to avoid impacts to adjoining high conservation value areas. The ameliorative measures have been designed in consideration of relevant legislation and guidelines.

- Ensure future development applications establish vegetative and open space buffers in foreshore areas to 20 - 30 m from the edge of the Ermington Wetlands.
- Clearly identify/demarcate the construction footprint area to staff undertaking the works to ensure direct impacts to vegetation are confined to the assessed footprint.
- Develop and implement a Sediment Control Plan for the proposed works. The Sediment Control Plan should control sediment and stormwater runoff within the works site, and prevent detrimental impacts from occurring on adjacent land, in particular areas of the TEC Coastal Saltmarsh, and areas of Estuarine Mangrove Forest. The Sediment and Erosion Control Plan should also identify locations for any stockpiles, and vehicle areas, and appropriate controls for these.
- Use native species for landscaping as part of any proposed works. The Sydney Harbour Foreshore and Waterways DCP provides guidance for planting such as the use of endemic species and those found in the local landscape.
- Key locations have been identified where additional buffer planting is recommended. Figure 7 shows the location of these areas. It has been recommended that the proposed foreshore buffer area encompasses a mix of existing revegetated areas, additional revegetated areas and managed open space with appropriate native urban landscape plantings. This will provide an adequate protection and management access to the existing vegetation communities.

5. Conclusion

Eco Logical Australia Pty Ltd was commissioned by Holdmark NSW Pty Ltd to prepare a biodiversity assessment as part of a planning proposal for part of the Melrose Park South Precinct (the study area)

The study area outside the foreshore area has been primarily classified as containing medium and low ecological constraints, with one patch of high ecological constraint (Coastal Saltmarsh) located in the south west part of the study area. If this area is avoided and clearing of native vegetation is kept to under 0.25 ha, the use of the study area for 'mixed use' development will not trigger the BOS.

Removal of vegetation identified as moderate and low constraint, and outside the existing vegetated foreshore areas and Ermington Bay wetlands will not result in a significant ecological impact.

Saltmarsh communities are extremely sensitive area to changes in microclimate and it is understood that shading of these areas is likely to have an impact, potentially resulting in dieback and/or changes in species composition. Solar study across seasons based on the proposed building layout were prepared for the Holdmark sites to model solar access from built structures.

The solar access modelling indicates that the worst-case impact from the proposal is 2 hours of shading to saltmarsh in the study area between 9am-3pm during winter. This level of shading would impact 17% of the total saltmarsh in the study area. However, Coastal Saltmarsh would receive full sun access throughout the rest of the year. Because the saltmarsh has access to full sun during the other seasons of the year, the shading impact from the proposal could be considered to be minimal and non-significant.

The solar access modelling indicates that the worst-case impact from the proposal is 4 hours of shading of Estuarine Mangrove Forest in the study area between 9am-3pm during winter. This level of shading would only impact 0.005% of the total Estuarine Mangrove Forest in the study area. There would also be shading impacts of 2 hours in Autumn and Spring, but these would only impact 0.2% and 0.1% of the mangrove forest. This increase in shading throughout the year is unlikely to have a significant impact on this community.

At the DA stage, the following biodiversity matter from Part 10.19 of the *State Environmental Planning Policy (Biodiversity and Conservation) 2021* is an important consideration of the proposal:

(b) development should protect and enhance terrestrial and aquatic species, populations and ecological communities and, in particular, should avoid physical damage and shading of aquatic vegetation (such as seagrass, saltmarsh and algal and mangrove communities).

This will be considered by consent authorities before granting consent to development under Part 4 of the Act.

Redevelopment and management within the foreshore buffer area must align with biodiversity protection aims and objectives identified in the relevant planning documents. It is believed increased protection and management access within the foreshore buffer could be achieved as part of this planning proposal by providing an integrated management approach by protecting existing revegetated

areas, providing additional revegetated areas where identified and providing additional managed open space with appropriate native urban landscape plantings.

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Appendix A Likelihood of occurrence

Vegetation Communities

Name	BC Act Status	BC Act Status	Habitat Associations	Likelihood of Occurrence	Likely Impact Assessment Required
Coastal Saltmarsh	**EEC**	**-**	**Occupies the intertidal zone on the shores of estuaries and lagoons that are permanently or intermittently open to the sea. Frequently found as a zone on the landward side of mangrove stands.**	**Yes. Saltmarsh is located within the study area.**	**Yes – due to direct and indirect impacts of potential development on adjacent land**

Flora

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
Acacia bynoeana	Bynoe's Wattle	E1	V	Heath or dry sclerophyll forest on sandy soils.	No. Suitable habitat not found within the study area.	No
Acacia clunies-rossiae	Kanangra Wattle	V		Dry sclerophyll forest on skeletal soils on rocky slopes, or on alluvium along creeks.	No. Suitable habitat not found within the study area.	No
Acacia pubescens	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. Suitable habitat not found within the study area.	No

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
Caladenia tessellata	Thick Lip Spider Orchid	E1	V	Grassy sclerophyll woodland on clay loam or sandy soils, or low woodland with stony soil.	No. Suitable habitat not found within the study area.	No
Callistemon linearifolius	Netted Bottle Brush	V		Dry sclerophyll forest.	No. Suitable habitat not found within the study area.	No
Darwinia biflora		V	V	Woodland, open forest or scrub-heath on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone.	No. Suitable habitat not found within the study area.	No
Dillwynia tenuifolia		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. Suitable habitat not found within the study area.	No
Epacris purpurascens var. *purpurascens*		V		Sclerophyll forest, scrubs and swamps. Most habitats have a strong shale soil influence.	No. Suitable habitat not found within the study area.	No
Eucalyptus camfieldii	Camfield's Stringybark	V	V	"Coastal heath on shallow sandy soils overlying Hawkesbury sandstone, mostly on exposed sandy ridges.	No. Suitable habitat not found within the study area.	No
Genoplesium baueri	Bauer's Midge Orchid	E1	E	Dry sclerophyll forest and moss gardens over sandstone.	No. Suitable habitat not found within the study area.	No
Grammitis stenophylla	Narrow-leaf Finger Fern	E1		Damp areas, near streams, rainforest, in trees or on rocks.	No. Suitable habitat not found within the study area.	No

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
Hypsela sessiliflora		E1	X	Damp places on the Cumberland Plain, including freshwater wetland, grassland/alluvial woodland, and alluvial woodland/shale plains woodland.	No. Suitable habitat not found within the study area.	No
Leptospermum deanei		V	V	Very rare. Woodland, riparian scrub and open forest on lower hill slopes or near creeks, on sand or sandy alluvial soil.	No. Suitable habitat not found within the study area.	No
Melaleuca deanei	Deane's Paperbark	V	V	Heath on sandstone.	No. Suitable habitat not found within the study area.	No
Persoonia hirsuta	Hairy Geebung	E1	E	Sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	No. Suitable habitat not found within the study area.	No
Pimelea curviflora var. *curviflora*		V	V	Woodland, mostly on shale/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes.	No. Suitable habitat not found within the study area.	No
Pimelea spicata	Spiked Rice-flower	E1	E	Found on well-structured clay soils. *Eucalyptus moluccana* (Grey Box) communities and in areas of ironbark on the Cumberland Plain.	No. Suitable habitat not found within the study area.	No
Pomaderris prunifolia	*P. prunifolia* in the Parramatta, Auburn, Strathfield and Bankstown LGAs	E2		Known from only three sites within the listed local government areas, at Rydalmere, within Rookwood Cemetery and at The Crest of Bankstown. At Rydalmere it occurs among grass species on sandstone near a creek.	No. Suitable habitat not found within the study area.	No

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
Prostanthera marifolia	Seaforth Mintbush	E4A	CE	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. Suitable habitat not found within the study area.	No
Pterostylis saxicola	Sydney Plains Greenhood	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. Suitable habitat not found within the study area.	No
Tetratheca glandulosa		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. Suitable habitat not found within the study area.	No
Triplarina imbricata	Creek Triplarina	E1	E	Habitat is along watercourses in low open forest or in montane bogs. Found only in several locations within ranges of north-east NSW. Previously recorded in Parramatta though no longer thought to occur in this area.	No. Suitable habitat not found within the study area.	No
Wahlenbergia multicaulis	Tadgell's Bluebell population in the local government areas of Auburn, Bankstown, Baulkham Hill, Canterbury, Hornsby, Parramatta and Strathfield LGAs	E2		This Endangered Population of *Wahlenbergia multicaulis* occurs at a number of locations in western and northern Sydney on the Central Coast. It usually occurs in damp, disturbed sites and is found in a variety of habitats including forest, woodland, scrub, grassland and the edges of watercourses and wetland	Unlikely. Very limited habitat available and very unlikely to occur.	No

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
Wilsonia backhousei	Narrow-leafed Wilsonia	V		Margins of salt marshes and lakes	Known habitat within saltmarsh areas	Yes – due to direct and indirect and impacts of potential development on adjacent land
Zannichellia palustris		E1		A submerged aquatic annual or perennial plant. Found in fresh or slightly saline stationary or slowly flowing water.	No. Suitable habitat not found within the study area.	No

Fauna

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
Amphibians						
Heleioporus australiacus	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
Litoria aurea	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.	Unlikely	No

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
Mixophyes balbus	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
Aves						
Actitis hypoleucos	Common Sandpiper	P	C,J,K	Coastal wetlands and some inland wetlands, especially muddy margins or rocky shores. Also estuaries and deltas, lakes, pools, billabongs, reservoirs, dams and claypans, mangroves.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Anthochaera phrygia	Regent Honeyeater	E4A	E	Eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of *Casuarina cunninghamiana* (River Oak).	Unlikely	No
Apus pacificus	Fork-tailed Swift	P	C,J,K, Mar	Riparian woodland, swamps, low scrub, heathland, saltmarsh, grassland, Spinifex sandplains, open	Potential habitat in mangroves, however negligible or nil habitat on study area.	No

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
				farmland and inland and coastal sand-dunes.		
Ardea alba	Great Egret	P	C, J, Mar	Swamps and marshes, grasslands, margins of rivers and lakes, salt pans, estuarine mudflats and other wetland habitats.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Ardea ibis	Cattle Egret	P	C,J, Mar	Grasslands, wooded lands and terrestrial wetlands.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Arenaria interpres	Ruddy Turnstone	P	C,J,K	Tidal reefs and pools; pebbly, shelly and sandy shores; mudflats; inland shallow waters; sewage ponds, saltfields; ploughed ground.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Botaurus poiciloptilus	Australasian Bittern	E1	E	Permanent freshwater wetlands with tall, dense vegetation, particularly *Typha spp*. (bullrushes) and *Eleocharis spp*. (spikerushes).	No	No
Calidris acuminata	Sharp-tailed Sandpiper	P	C,J,K	Shallow fresh or brackish wetlands, with inundated or emergent	Unlikely	No

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
				sedges, grass, saltmarsh or other low vegetation.		
Calidris canutus	Red Knot	P	C,J,K	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.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Calidris ferruginea	Curlew Sandpiper	E1	C,J,K	"Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland."	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Calidris mauri	Western Sandpiper	P	J	Tidal mudflats and sandflats in sheltered lagoons, river deltas and estuaries; salt-evaporation ponds; terrestrial wetlands, such as the margins of lakes and ponds.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Calidris melanotos	Pectoral Sandpiper	P	J,K	Shallow fresh to saline wetlands, including coastal lagoons,	Potential habitat in mangroves, however	No

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
				estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	negligible or nil habitat on study area.	
Calidris ruficollis	Red-necked Stint	P	C,J,K	Tidal mudflats, saltmarshes, sandy and shelly beaches, saline and freshwater wetlands, saltfields, sewage ponds.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Calidris tenuirostris	Great Knot	V	C,J,K	Intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Charadrius leschenaultii	Greater Sand-plover	V	C,J,K	Almost entirely restricted to coastal areas in NSW, mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Charadrius mongolus	Lesser Sand-plover	V	C,J,K	Almost entirely coastal in NSW, using sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats, sandy	Potential habitat in mangroves, however negligible or nil habitat on study area.	No

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
				beaches, coral reefs and rock platforms.		
Chlidonias leucopterus	White-winged Black Tern	P	C,J,K	Large coastal and inland wetlands, saltfields, tidal estuaries, lagoons, grassy swamps, and sewage ponds.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Circus assimilis	Spotted Harrier	V		Grassy open woodland, inland riparian woodland, grassland, shrub steppe, agricultural land and edges of inland wetlands.	Unlikely	No
Cuculus optatus	Oriental Cuckoo		C,J,K,Mar	Wooded lands.	Unlikely	No
Dasyornis brachypterus	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.	Unlikely	No
Diomedea antipodensis	Antipodean Albatross	V	V	Marine.	Unlikely	No
Diomedea gibsoni	Gibson's Albatross	V	V	Marine.	Unlikely	No
Diomedea sanfordi	Northern Royal Albatross		E, Mar	Marine.	Unlikely	No
Epthianura albifrons	White-fronted Chat population in the	E2		"Saltmarsh of Newington Nature	Potential habitat near mangroves, however	No

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
	Sydney Metropolitan Catchment Management Area			Reserve and in grassland on the northern bank of the Parramatta River."	negligible or nil habitat on study area.	
Falco subniger	Black Falcon	V		Woodland, shrubland and grassland, especially riparian woodland and agricultural land. Often associated with streams or wetlands.	Unlikely	No
Gallinago hardwickii	Latham's Snipe	P	C,J,R, Mar	Freshwater, saline or brackish wetlands up to 2000 m above sea-level; usually freshwater swamps, flooded grasslands or heathlands.	Unlikely	No
Glossopsitta pusilla	Little Lorikeet	V		Dry, open eucalypt forests and woodlands, including remnant woodland patches and roadside vegetation.	Unlikely	No
Grantiella picta	Painted Honeyeater	V		Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	Unlikely	No
Haliaeetus leucogaster	White-bellied Sea-Eagle	P	C	Freshwater swamps, rivers, lakes, reservoirs, billabongs, saltmarsh and sewage ponds and	Potential habitat in mangroves, however negligible or nil habitat on study area.	No

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
				coastal waters. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest and urban areas.		
Hieraaetus morphnoides	Little Eagle	V		Open eucalypt forest, woodland or open woodland, including sheoak or *Acacia* woodlands and riparian woodlands of interior NSW.	Unlikely	No
Hirundapus caudacutus	White-throated Needletail	P	C,J,K	Occur most often over open forest and rainforest, as well as heathland, and remnant vegetation in farmland.	Unlikely	No
Hydroprogne caspia	Caspian Tern	P	C,J	Coastal offshore waters, beaches, mudflats, estuaries, rivers, lakes.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Lathamus discolor	Swift Parrot	E1	E	Box-ironbark forests and woodlands.	No	No
Limicola falcinellus	Broad-billed Sandpiper	V	C,J,K	Sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
Limosa lapponica	Bar-tailed Godwit	P	C,J,K	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.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Limosa	Black-tailed Godwit	V	C,J,K	"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."	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Macronectes giganteus	Southern Giant Petrel	E1	E	Marine.	Unlikely	No
Macronectes halli	Northern Giant-Petrel	V	V	Marine.	Unlikely	No
Merops ornatus	Rainbow Bee-eater	P	J	Open forests and woodlands, shrublands, farmland, areas of human habitation, inland and coastal sand dune systems, heathland, sedgeland,	Unlikely	No

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
				and vine forest and vine thicket.		
Monarcha melanopsis	Black-faced Monarch	P	Bonn, Mar	Rainforest, open eucalypt forests, dry sclerophyll forests and woodlands, gullies in mountain areas or coastal foothills, Brigalow scrub, coastal scrub, mangroves, parks and gardens.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Monarcha trivirgatus	Spectacled Monarch	P	Bonn, Mar	Mountain/lowland rainforest, wooded gullies, riparian vegetation including mangroves.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Motacilla flava	Yellow Wagtail	P	C,J,K	Swamp margins, sewage ponds, saltmarshes, playing fields, airfields, ploughed land, lawns.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Myiagra cyanoleuca	Satin Flycatcher	P	Bonn, Mar	Eucalypt-dominated forests, especially near wetlands, watercourses, and heavily-vegetated gullies.	Unlikely	No
Ninox connivens	Barking Owl	V		Woodland and open forest, including fragmented remnants and partly cleared	Unlikely	No

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
				farmland, wetland and riverine forest.		
Ninox strenua	Powerful Owl	V		Woodland, open sclerophyll forest, tall open wet forest and rainforest.	Unlikely	No
Numenius madagascariensis	Eastern Curlew	P	C,J,K	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.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Numenius minutus	Little Curlew	P	C,J,K	Dry grasslands, open woodlands, floodplains, margins of drying swamps, tidal mudflats, airfields, playing fields, crops, saltfields, sewage ponds.	Unlikely	No
Numenius phaeopus	Whimbrel	P	C,J,K	Estuaries, mangroves, tidal flats, coral cays, exposed reefs, flooded paddocks, sewage ponds, grasslands, sports fields, lawns.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
Pachyptila turtur	Fairy Prion		V	Marine. Breed colonially on small islands.	Unlikely	No
Pandion cristatus	Eastern Osprey	V		Rocky shorelines, islands, reefs, mouths of large rivers, lagoons and lakes.	Unlikely	No
Philomachus pugnax	Ruff	P	C,J,K	Terrestrial wetlands including lakes, swamps, pools, lagoons, tidal rivers, swampy fields and floodlands. Occasionally harbours, estuaries, seashores, sewage farms and saltworks.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Plegadis falcinellus	Glossy Ibis	P	C	Edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. Occasionally estuaries, deltas, saltmarshes and coastal lagoons.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Pluvialis fulva	Pacific Golden Plover	P	C,J,K	Estuaries, mudflats, saltmarshes, mangroves, rocky reefs, inland swamps, ocean shores, paddocks, sewage ponds,	Potential habitat in mangroves, however negligible or nil habitat on study area.	No

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
				ploughed land, airfields, playing fields.		
Pluvialis squatarola	Grey Plover	P	C,J,K	Mudflats, saltmarsh, tidal reefs and estuaries.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Rhipidura rufifrons	Rufous Fantail	P	Bonn, Mar	Wet sclerophyll forests, subtropical and temperate rainforests. Sometimes drier sclerophyll forests and woodlands.	Unlikely	No
Rostratula australis	Australian Painted Snipe	E1	E, Mar	Swamps, dams and nearby marshy areas.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Sterna hirundo	Common Tern	P	C,J,K	Offshore waters, ocean beaches, estuaries, large lakes. Less commonly freshwater swamps, floodwaters, sewage farms and brackish and saline lakes.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Sternula albifrons	Little Tern	E1	C,J,K	Sheltered coastal environments, harbours, inlets and rivers.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Sternula nereis	Fairy Tern		V	Marine. Nests on sandy beaches.	Unlikely	No

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
Stictonetta naevosa	Freckled Duck	V		Freshwater swamps and creeks, lakes, reservoirs, farm dams and sewage ponds.	Unlikely	No
Thalassarche bulleri	Buller's Albatross		V,Mar,Bonn	Marine.	Unlikely	No
Thalassarche cauta	Shy Albatross		V,Mar,Bonn	Marine.	Unlikely	No
Thalassarche cauta steadi	White-capped Albatross		V,Mar,Bonn	Marine.	Unlikely	No
Thalassarche eremita	Chatham Albatross		E,Mar,Bonn	Marine.	Unlikely	No
Thalassarche impavida	Campbell Albatross		V,Mar,Bonn	Marine	Unlikely	No
Thalassarche melanophris	Black-browed Albatross	V	V	Marine	Unlikely	No
Thalassarche salvini	Salvin's Albatross		V,Mar,Bonn	Marine	Unlikely	No
Tringa brevipes	Grey-tailed Tattler	P	C,J,K	"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.	Potential habitat in mangroves, however negligible or nil habitat in north of study area.	No
Tringa glareola	Wood Sandpiper	P	C,J,K	Well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs,	Unlikely	No

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
				lakes, pools and waterholes; inundated grasslands; floodplains; irrigated crops; sewage ponds; reservoirs; large farm dams; bore drains; rarely brackish wetlands and saltmarsh.		
Tringa nebularia	Common Greenshank	P	C,J,K	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).	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Tringa stagnatilis	Marsh Sandpiper	P	C,J,K	Swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, intertidal mudflats, sewage farms	Potential habitat in mangroves, however negligible or nil habitat on study area.	No

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
				and saltworks, reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes.		
Tyto longimembris	Eastern Grass Owl	V		Areas of tall grass, including grass tussocks, swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains.	Unlikely	No
Xenus cinereus	Terek Sandpiper	V	C,J,K	Mudbanks and sandbanks near mangroves, rocky pools and reefs, and occasionally up to 10 km inland around brackish pools.	Potential habitat in mangroves, however negligible or nil habitat on study area.	No
Fish						
Epinephelus daemelii	Black Rockcod	V	V	Caves, gutters and beneath bomboras on rocky reefs. Small juveniles are often found in coastal rock pools, and larger juveniles around rocky shores in estuaries.	Unlikely	No
Invertebrates						

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
Pommerhelix duralensis	Dural Land Snail		E	Prefers forested habitats with good native cover and woody debris.	Unlikely	No
Mammals						
Chalinolobus dwyeri	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 – potential roosting habitat within stormwater infrastructure	No
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	Unlikely	No
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V		Tall (greater than 20 m) moist habitats.	Unlikely – potential habitat within stormwater infrastructure, or buildings	Potential
Isoodon obesulus	Southern Brown Bandicoot (eastern)	E1	E	Heath or open forest with a heathy understorey on sandy or friable soils.	Unlikely	No

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V		Rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland.	Unlikely – potential habitat within stormwater infrastructure and buildings	Potential
Mormopterus norfolkensis	Eastern Freetail-bat	V		Dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range.	Potential foraging habitat in mangroves, however limited habitat potential in north of study area.	Potential
Myotis macropus	**Southern Myotis**	**V**		**Foraging habitat is waterbodies (including streams, or lakes or reservoirs) and fringing areas of vegetation up to 20 m.**	**Unlikely – potential habitat within stormwater infrastructure Potential foraging habitat in mangroves.**	**Yes**
Pteropus poliocephalus	**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.**	**Potential – potential marginal foraging habitat with flowering landscape plantings**	**Yes**
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V		Almost all habitats, including wet and dry sclerophyll forest, open woodland, open country, mallee, rainforests, heathland and waterbodies.	Unlikely - potential habitat within stormwater infrastructure or buildings	Potential

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Likely Impact Assessment Required
Reptiles						
Caretta	Loggerhead Turtle	E1	E	Marine. Nesting occurs on beaches.	Unlikely	No
Chelonia mydas	Green Turtle	V	V	Marine. Nesting occurs on beaches.	Unlikely	No
Eretmochelys imbricata	Hawksbill Turtle		Bonn,V,Mar		Unlikely	No
Natator depressus	Flatback Turtle		V,Mar,Bonn	Marine.	Unlikely	No
Dermochelys coriacea	Leatherback Turtle	E1	E	Marine. Nesting occurs on beaches.	Unlikely	No
Hoplocephalus bungaroides	Broad-headed Snake	E1	V	Dry and wet sclerophyll forests, riverine forests, coastal heath swamps, rocky outcrops, heaths, grassy woodlands.	No	No

Appendix B Species list

Flora species recorded from the site inspection 19 October 2016.

Species Name	Common Name	Weed	Native Remnant or Restoration Planting	Urban Native Planting	urban Exotic Planting
Acacia decurrens			y		
Acacia falcata			y		
Acacia floribunda			y		
Acacia linifolia			y		
Acacia longifolia	Sydney Golden Wattle		y		
Acacia parramattensis			y		
Acacia saligna *		y			
Acer palmatum	Japanese Maple				y
*Acetosa sagittata**	Turkey rhubarb	y			
Ageratina adenophora *	Crofton Weed	y			
Agonis flexuosa	West Australian Willow Myrtle			y	
Allocasuarina littoralis			y		
Lysimachia avensis *	Scarlet Pimpernel	y			
Angophora costata	Sydney Red Gum			y	
Anredera cordifolia *	Madeira Vine	y			
Araucaria heterophylla	Norfolk Island Pine			y	
*Araujia sericifera**	Moth Vine	y			
Asparagus aethiopicus *	Asparagus Fern	y			
Asparagus asparagoides *	Bridal Creeper	y			
Atriplex prostrata *		y			
Avicennia marina	Grey Mangrove		y		
Bidens pilosa *	Cobblers Peg	y			
Bolboscoenus caldwellii			y		
Bothriochloa macra			y		
Briza minor *	Lesser quaking grass	y			
Bromus catharticus *	Prairie Grass	y			
Bursaria spinosa			y		
Callistemon citrinus			y		
Callistemon salignus				y	
Callistemon sp.				y	

Species Name	Common Name	Weed	Native Remnant or Restoration Planting	Urban Native Planting	urban Exotic Planting
Callistemon viminalis	Weeping Bottlebrush			y	
Calochlaena dubia	Soft Bracken		y		
Camellia sp.					y
Camphor laurel *	Camphor Laurel				y
Carex appressa			y		
Casuarina cunninghamiana	Forest Oak			y	
Casuarina glauca	Swamp Oak		y		
Cayratia clematidea	Native Grape		y		
*Cestrum parqui**		y			
Cirsium vulgare *	Spear Thistle	y			
Conyza bonariensis *	Fleabane	y			
Cotoneaster sp. *	Contoneaster	y			
Cynodon dactylon *		y			
Cypressus sp.	Cypress				y
Delairea odorata *	Cape Ivy	y			
Dianella caerulea			y		
Dichondra repens			y		
Dietes sp.					y
Dodonea triquetra	Hop Bush		y		
Eleocarpus reticulatus	Blueberry Ash			y	
Ehrharta erecta *		y			
Erythrina crista-galli *	Coral Tree	y			
Eucalyptus haemastoma	Scribbly Gum			y	
Eucalyptus microcorys	Tallowood			y	
Eucalyptus robusta	Swamp Mahogany			y	
Eucalyptus saligna	Blue Gum			y	
Eucalyptus sp.				y	
Ficus microcarpa var. *hillii*	Hill's Weeping Fig			y	
Ficus rubiginosa	Port Jackson Fig		y		
Foeniculum vulgare *	Fennel	y			
Fumaria officinalis *	Fumitory	y			
Gahnia sp.			y		
Gardenia sp.	Gardenia				y
Gazania sp.	Gazania				y

Species Name	Common Name	Weed	Native Remnant or Restoration Planting	Urban Native Planting	urban Exotic Planting
Genista monspessulana *	-	y			
Geranium sp.			y		
Grevillea robusta	Silky Oak			y	
Grevillea sp. Cultivar				y	
Hakea sericea			y		
Hardenbergia violacea	False Sarsaparilla	y			
Hedera helix *	English Ivy	y			
Homolanthus populifolius			y		
Hyparrhenia hirta *	Coolatai Grass	y			
Imperata cylindrica	Blady Grass	y			
Indigofera australis			y		
Ipomoea cairica *	Coastal Morning Glory	y			
Jacaranda mimosifolia	Jacaranda				y
Juncus kraussii	Sea Rush	y			
Juncus usitatus			y		
Kennedia rubicunda			y		
Kunzea ambigua			y		
Lagerstroemia archeriana	Crepe Myrtle				y
Lagunaria patersonia *	Norfolk Island Hibiscus	y			
*Lantana camara**	Lantana	y			
Leptospermum polygalifolium			y		
Ligustrum lucidum *	Large Privet	y			
Ligustrum sinense *	Small Privet	y			
Liquidambar styraciflua *	Liquid Amber	y			
Lolium perenne *	Rye Grass	y			
Lomandra longifolia			y		
Lomandra sp.cultivar	Lomandra			y	
*Lonicera japonica**	Honeysuckle	y			
Lophostemon confertus	Brushbox			y	
Medicago polymorpha *	Burr Medic	y			
Melaleuca armillaris	Bracelet Honey-myrtle			y	
Melaleuca decora			y		
Melaleuca nodosa			y		
Melaleuca quinquenervia	Broad-leaved Paperbark			y	

Species Name	Common Name	Weed	Native Remnant or Restoration Planting	Urban Native Planting	urban Exotic Planting
Melaleuca styphelioides	Prickly-leaved Tea Tree		y		
Melaleuca stypheloides			y		
Murraya paniculata	Mock Orange				y
*Olea europaea**	African Olive	y			
*Oxalis corniculata **		y			
Ozothamnus diosmifolius			y		
*Parietaria judaica **	Asthma Weed	y			
*Paspalum dilatatum **		y			
*Pennisetum alopecuroides **	Fountain Grass	y			
*Cenchrus clandestinus **	Kikuyu	y			
*Phoenix canariensis **	Phoenix Palm	y			
Photinia sp.	Photinia				y
Pittosporum undulatum	Native Daphne		y		
*Plantago lanceolata **	Common Plantain	y			
Plectranthus parviflorus			y		
Plumbago sp.	Plumbago				y
*Populus sp. **	Poplars	y			
*Rhaphiolepis indica **	Indian Hawthorn	y			
Robinia pseudoacacia	Black Locust				y
*Rubus fruticosus **	Blackberry	y			
*Rumex sp.**		y			
Samolus repens			y		
Sarcocornia quinqueflora	Glasswort		y		
Schefflera actinophylla	Umbrella Tree				y
Schinus sp.	Pepper Tree				y
Senna pendula var. *glabrata**		y			
*Sida rhombifolia**	Paddy's Lucerne	y			
*Sisymbrium orientale **	Indian Hedge Mustard	y			
*Solanum mauritianum **	Wild Tobacco	y			
*Solanum nigrum **	Blackberry Nightshade	y			
*Sonchus oleraceus **	Sow Thistle	y			
*Stellaria media **	Chickweed	y			
Stenocarpus sinuatus	Red Firewheel Tree			y	
Strelitzia sp.	Bird of Paradise				y

Species Name	Common Name	Weed	Native Remnant or Restoration Planting	Urban Native Planting	urban Exotic Planting
Suaeda australis	Seablite		y		
Syncarpia glomulifera	Turpentine		y		
Syzygium sp.	Lilly Pilly			y	
Tetragonia tetragonioides	Native Spinach		y		
Themeda triandra			y		
Tibouchina sp.	Glory Bush				y
Toxicodendrum succedaneum *	Rhus Tree	y			
Tradescantia fluminensis *	Wandering Jew	y			
Typha sp.			y		
Verbena bonariensis *	Purpletop	y			
Vicia sp. *	Vetch	y			
Viola hederacaea	Native Violet		y		
Wisteria sp.	Wisteria				y
Zoysia macrantha	Prickly couch		y		

** denotes weed species*

Fauna species recorded from site inspection 19 October 2016.

Species Name	Common Name
*Acridotheres tristis**	Indian Myna
Anthochaera carunculata	Red Wattlebird
Cacatua sanguinea	Little Corella
Chroicocephalus novaehollandiae	Silver Gull
Corvus coronoides	Australian Raven
Cracticus tibicen	Australian Magpie
Eolophus roseicapilla	Galah
Grallina cyanoleuca	Magpie Lark
Manorina melanocephala	Noisy Miner
Ocyphaps lophotes	Crested Pigeon
*Oryctolagus cuniculus**	European Rabbit
Rhipidura leucophrys	Willy Wagtail
Sericornis frontalis	White-browed Scrubwren
Strepera graculina	Pied Currawong
Trichoglossus moluccanus	Rainbow lorikeet

Species Name	Common Name
Vanellus miles	Masked Lapwing

** denotes introduced species*

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