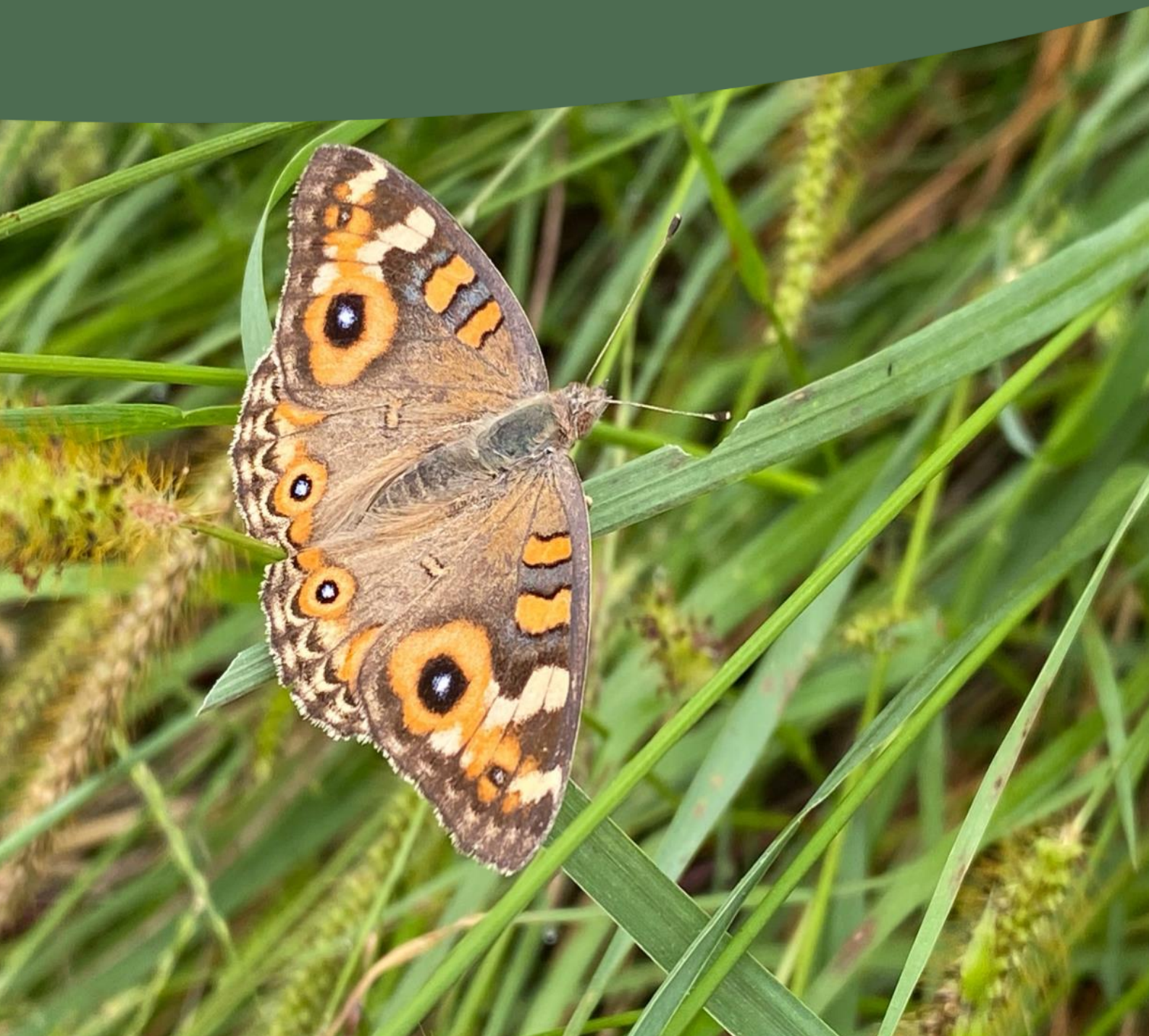
Ecological Consideration of the Masterplan for Wentworth Point Sydney

By Ecological Consultants Australia Pty Ltd TA
Kingfisher Urban Ecology and Wetlands

November 2018, updated May 2020



About this document

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Statement of Authorship

This study and report was undertaken by Ecological Consultants Australia PTY LTD at 30 Palmgrove Road Avalon. The author of the report is Geraldene Dalby-Ball with qualifications BSc. majoring in Ecology and Botany with over 20 years' experience in this field.

Limitations Statement

Information presented in this report is based on an objective study undertaken in response to the brief provided by the client. Any opinions expressed in this report are the professional, objective opinions of the authors and are not intended to advocate any particular proposal or pre-determined position.

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1 Summary of findings

Background

- This document provides ecological considerations and opportunities of the proposed MasterPlan for development at 14-16 HILL ROAD – WENTWORTH POINT.
- Currently the site is highly disturbed (cleared) however it is in close proximity to Newington Nature Reserve and rehabilitated lands including species from Sydney Turpentine Ironbark Forest (STIF).
- Great potential exists to bring green areas back to this site. A widening of the riparian area and integration of green spaces throughout the built forms will provide an increase in habitat links for urban species including wrens, butterflies and invertebrates. Longer-term the maturing of trees on the fore shore will provide food and roosting / nesting resources for other species including parrots, micro-bats and possibly owls.

Findings – environmental values

- Newington Reserve includes *mangroves* and *saltmarsh*.
- Subtropical and Temperate Coastal Saltmarsh is listed as a Vulnerable Community on the EPBC Act. http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=118
- The drainage line between the site and the buffer area to the reserve is partly tidal and contains mangroves.
- *Migratory birds* are known to utilize the reserve for food and high-tide roosting. Within the reserve Saltmarsh is the key feeding area of the migratory birds.
- A pair of *Sea Eagles* successfully breed in Newington Reserve most years and the Eagles are frequently seen in the area and on the Eagle Cam.
- The foreshore as an *intertidal area* of sandstone rip-rap that is currently utilized by oysters and other intertidal marine species.
- Narrow-leafed Wilsonia (*Wilsonia backhousei*), a saltmarsh species, listed as Vulnerable, that grows on the highest inundation level, is present in Newington Reserve. Wilsonia is not expected to be damaged directly or indirectly by the proposed development shown in the Masterplan. Known areas of Wilsonia are outside areas that are predicted to be shaded.
- *Sydney Turpentine Ironbark Forest* (STIF) has representative canopy species adjoining the site however the diversity of all species, relative to base-line for this community is poor. It could however be rehabilitated and becomes more representative of this Endangered Ecological Community. Turpentine-Ironbark Forest in the Sydney Basin Bioregion is listed as a Critically Endangered Community on the EPBC Act. http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=38

- Other threatened species such as green and Golden Bell Frogs (GGBF) and the Endangered Population of White Fronted Chats are recorded in the immediate vicinity of the site. Mapped locations of Threatened Species are included in this report along with a discussion of impacts. In summary no direct impacts are expected on Threatened Species and indirect impacts (such as an increase in the number of people in the area and the foreshore having increased lighting) can be managed.

Findings-considerations

- Key areas assessed are the shading of the reserve areas, wildlife collision with towers and indirect impacts associated with lighting, noise, additional people, increase use of the foreshore walkway and walking past the reserve and a general increase in companion animals.
- The impacts were also assessed against the *Guidelines for Development Adjoining Department of Environment and Climate Change Land*. Each part of the guideline is discussed in this report.
- Consideration was also given to the NSW Biodiversity Conservation 2016 Act (BC Act) and regulations and the Commonwealth EPBC Act as well as the environmental vision statements for the area by Sydney Olympic Park Authority (SOPA) and Parramatta Council. Also to the Coastal SEPP requirements.
- It is noted that the author of this report is an accredited biobanking assessor. The test of significance (5-part tests) questions were considered when assessing if there would be a significant impact on listed species, communities or populations. Significance tests (BC Act) have been conducted for Saltmarsh and Migratory Shorebirds.
- The proposal and associated impacts have been assessed in accordance with *Matters of National Environmental Significance Significant Impact Guidelines 1.1*, under the EPBC Act. Findings have concluded that there will be no significant impact upon Matters of National Environmental Significance.

Findings-summary impacts and opportunities

- In summary potential impacts raised in the DPIE Guidelines (for work adjoin DPIE lands) and considerations from the BC Act can be managed adequately on-site so as not to significantly impact Newington Nature Reserve ecological processes, flora or fauna there.

The key area of consideration is the shadowing of native vegetation particularly Saltmarsh (Newington Nature Reserve Wetlands)

Shadowing saltmarsh

From the model (Turner 2019) it can be seen that the Winter shadowing is in the early morning with ~80% of shadowing occurring before 9am and no saltmarsh in shadow after 11am and only a slight incursion at 10am.

In Summer less than 5% of the saltmarsh is in shade by 8am and shadowing is gone by.
In mid-winter less than 5% of the saltmarsh is shade by 10am and shadowing is gone by 11am. Ecologically the shading is deemed not significant to cause irreparable damage to the structure and function of Saltmarsh vegetation community. It may influence the distribution of the individual species within the community in shaded areas.

Overshadowing STIF

Shadow on the Sydney Turpentine Ironbark Forest (STIF) (Woo-La-Ra Landfill and Millennium Marker). In Summer there is no shading of this area. In Winter maximum shading is from 8-9am and an area ~5m wide at the northern most boundary of the site (adjoining the development area) has prolonged shade. This area requires ecological rehabilitation as the area is a degraded terrestrial area. Replanting can be with shade tolerant locally native species appropriate the conditions and plant community type (PCT).

While shading does constitute a change in conditions it is expected to be acceptable and not result in a degradation of quality rather a possible shift in species at a micro scale. The proposed includes on-site landscaping with locally native species and will see an overall increase in vegetation and habitat for native fauna particularly small birds and invertebrates and this will increase the resilience of the existing STIF.

White-bellied Sea-eagle

Development and timing of construction can be planned to not impact Sea-Eagle breeding time. It is noted that this pair generally starts nest building and other activities to prepare for egg laying in April and egg laying is usually late June or early July. The 2017 breeding season has not been successful however the pair is still using the river side roost tree and are expected to start nesting additions in April of 2018.

Stormwater Management

Effective stormwater management is possible on-site and details will continue to be developed. The ecologist is closely involved in both the stormwater management and landscaping to ensure both deliver ecological outcomes to the site as surrounds. A key consideration given the proximity of saltmarshes is ensure freshwater flows are not directed such that they could result in a change

in species composition to fresher tolerant species such as Typha or weed species.

SOPA's mosquito management program within Newington Nature Reserve

SOPA has conducted a mosquito management program within Newington Nature Reserve since 1998, targeting the saltwater mosquito *Aedes vigilax*. This program involves helicopter application of a bacterial larvicide to mosquito breeding habitats over the summer months. Post-treatment monitoring has shown that larval mosquito populations are generally reduced by 90% or more as a result of the program.

Considerations for on-going mosquito management is aircraft safety pertaining to helicopters and the area they can fly near buildings as they usually fly over the wetlands and turn within the surrounding lands. Mosquito management may require alterations based on impacts of the buildings to accessing all of the site aerially. There may be an increase in ground-based application of larvacide needed.

Impact on Migratory birds using the Newington Nature Reserve and Wetlands

It is expected that there will be no significant impact on migratory shorebirds. The proposed development will not directly remove habitat (foraging/roosting or other). The proposal will have a minor (to negligible) shading influence on the Saltmarsh and Mangroves. Thus, the shading will not significantly degrade areas of foraging/roosting or other habitat such that they lose their current habitat value.

Migratory and locally wading birds typically use areas for foraging and roosting where the birds have a clear sight line for at least 40m. The proposed tall buildings are not within 40m of the saltmarsh feeding areas however their height and bulk could result in birds that require open sightlines reducing, or stopping, use of areas near the buildings. Mangroves already impact most of the Saltmarsh areas (in terms of being visual barriers to long-sight lines) and the largest patches of Saltmarsh present are away from the proposed building areas and separated from them by mangroves. Information on impacts on the flight-lines and use of sites near tall built forms is not well understood. Most studies are in the US and involve small migratory birds, such as hummingbirds. The finding there is that buildings are best where non-glass material are used on the outside so birds do not collide with buildings. See discussion in the body of this assessment.

Direct (collision) and Indirect impacts associated with lighting, building towers, noise, additional people and increased use of the foreshore walkway will be managed throughout the detailed design stages of the development, with expert input from ecologists and adherence to national wildlife guidelines. Impacts on migratory shorebirds are expected to be negligible.

Impact on threatened species listed under the EPBC Act.

It is unlikely that threatened species listed under the EPBC Act species will be placed at increased risk of extinction as a result of the proposal. The proposed development will not directly remove foraging, roosting or other habitat for threatened species.

Direct (collision) and indirect impacts including artificial lighting, building towers, noise, additional people and increased use of the foreshore walkway are acknowledged and will be appropriate managed during the detailed design stage. It is unlikely that indirect impacts alone would cause significant detrimentally impacts upon Threatened species listed under the EPBC Act.

2 Scope

Ecological Consultants Australia (ECA) trading as Kingfisher Urban Ecology and Wetlands has been contracted by SEKISUI HOUSE AUSTRALIA PTY LTD to provide expert advice on ecological matters associated with the proposed MasterPlan at Wentworth Point adjoining Sydney Olympic Park. This report addresses the ecological aspects of the proposed masterplan both on-site and to the surrounding environment including Newington Nature Reserve and Wetlands. Key issues addressed are:

- possible direct impacts from development particularly shadowing of the reserve,
- possible impacts of development on the Sea Eagles and
- possible indirect impacts from development on migratory birds.
- *Consideration has been given to the Guidelines for Development adjoining Department of Environment and Climate Change Land* by DPIE

2.1 Site Aerial showing proximity to Newington Nature Reserve

See Figure 1 and 2 for aerial photographs of site location.

Figure 1. Site (yellow) with approximate property boundaries and surrounding landscape including Mangroves and Saltmarsh and known Migratory Bird habitats. Source: SixMaps, November 2017 reviewed June 2019.

Figure 2. Site (blue) and Newington Reserve showing Mangroves and Saltmarsh that are known Migratory Bird habitat. Source: SixMaps, November 2017 reviewed Oct 2018.

Figure 3. Yellow star – approximate location of proposed development and yellow outline – approximate location of Newington Nature Reserve. Source: SixMaps, November 2017 and reviewed Oct 2018.

3 Site Environmental Values

3.1 Matters of National Significance

Several guidelines and policies are applicable to this proposal under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). Findings and other relevant information specific to each policy, guideline or tool are referred to within the following section. Guidelines, policies, and tools used to guide this document are:

- EPBC Act Policy Statement 3.21—Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species, Commonwealth of Australia 2017.
- Matters of National Environmental Significance Significant Impact Guidelines 1.1 Environmental Protection and Biodiversity Conservation Act 1999, Commonwealth of Australia 2013.
- National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds, Commonwealth of Australia 2020.
- Protected Matters Search Tool - Matters of National Environmental Significance (MNES Search).

3.1.1 Nationally Important Wetlands

The Newington Nature reserve and Wetlands contain areas recognised as Nationally Important Wetlands. The areas mapped in aqua blue in Figure 3b are listed as Nationally Important Wetlands.

Figure 3b Nationally Important Wetlands. Source: http://www.environment.gov.au/webgis-framework/apps/pmst/pmst.jsf Accessed Oct 30th 2018

Figure 3.1 Directory of Important Wetlands Newington Wetlands – NSW085

A direct link to the listing (Newington Wetlands – NSW085) in the Directory of Important Wetlands is at: http://www.environment.gov.au/cgi-bin/wetlands/report.pl?smode=DOIW;doiw_refcodelist=NSW085

The listing describes the area as:
Wetland including adjoining Casuarina forest: 45 ha (McCallum, pers. comm., 1995); Wetland ponds: 26 ha (Fox and Assoc. 1986

Also defined as types A8 (Marine and Coastal Zone wetlands - Intertidal marshes; includes salt-marshes, salt meadows, saltings, raised salt marshes, tidal brackish and freshwater marshes),

B11 (Inland wetlands - Permanent saline/brackish marshes) and

B1 (Inland wetlands - Water storage areas; reservoirs, barrages, hydro-electric dams, impoundments (generally >8 ha)

See full description in the web link – summary excerpt included below (*direct information in italics).*

Physical features:
Quaternary alluvial formations consist of sand, silt and clay deposits in low river terraces and beneath marsh lands. Wianamatta shale is the youngest of the three rock deposits but because of folding in the Sydney district the rock generally outcrops at a lower geographic level than the Hawkesbury sandstone or older rocks. Swamps along the foreshore of the river consist of unconsolidated Quaternary sandy peats, peats and mud (Kachka 1993).

Hydrological features:
The site comprises mangrove woodland and saltmarsh communities surrounding four low-lying shallow saline and brackish ponds separated by low earth bunds.

Ecological features:
The site is bounded by the Parramatta River in the north and Casuarina woodland in the south, with grassland areas east and west (CHM Hill 1994). The saltmarsh communities are in good health and display a species composition uncommon in the Sydney region. The wetland provides feeding grounds for migratory birds and contains saltmarsh species which are biogeographically disjunct and uncommon in eastern Australia. The saltmarshes are dominated by a cover of Samphire (Sarcocornia quinqueflora), Seablite (Suaeda australis), Sand Couch Grass (Sporobolus virginicus), Sea Rush (Juncus kraussii), and the shrub Halosarcia pergranulata ssp. pergranulata. Mangrove woodland consists of Grey mangrove (Avicennia marina).

Significance:
Notable flora:
Plants of botanical interest found in the marsh include the largest remaining population of the biogeographically disjunct and uncommon (rare) plant Wilsonia (Wilsonia backhousei), Lampranthus (Lampranthus tegens), Chenopod Halosarcia pergranulata.

Notable fauna:
The Parramatta River is the eighth most important estuary for waders in NSW (Anon 1986a; Fox and Assoc. 1986). The saltmarsh and mangroves provide important habitat as feeding grounds to migratory wading birds and nursery to juvenile fish. Sixty-eight bird species have been recorded, 27 species were wetland birds. Eleven migratory birds are known to use the area, the principal species

include: Pacific Golden Plover (Pluvialis fulva), Latham's Snipe (Gallinago hardwickii), Bar-tailed Godwit (Limosa lapponica baueri), Sharp-tailed Sandpiper (Calidris acuminata), Curlew Sandpiper (Calidris ferruginea), Greenshank (Tringa nebularia). These bird species are protected under JAMBA and / or CAMBA. The endangered (Se) Green and Golden Bell Frog (Litoria aurea) has been recorded from the area (CHM Hill 1994).

Social and Cultural values:
The saltmarsh, Casuarina forest and the Eucalypt woodland provide a small intact system of pre-European vegetation no longer retained in the Sydney region. Within and adjacent to the site are numerous cultural resources reflecting the history of the area from early settlement in the late 18th century. Cultural relics include salt and lime works, an abattoir, tweed and blanket factory, the original farm site, and the current armaments depot. There are also reported to be Aboriginal carvings on Kurrajong trees within the site.

Land tenure:
On site: The site is in State government ownership. Surrounding area: Crown land, freehold.
Current land use:
On site: Olympic village. Surrounding area: mixed industrial, urban and vacant crown land.

Disturbance or threat:
Past/present: Water pollution along the Parramatta River poses the greatest threat to the ecosystem, while development in the form of landfill and seawalls reduce the area of mangrove and saltmarsh. Potential disturbance from the Homebush Bay Olympic village are currently under review by Olympic Co-ordination Authority and CSIRO.

Conservation measures taken:
The Newington wetlands are listed in the Register of the National Estate and with the NSW National Trust (Anon 1982; AHC 1992). The area has been recorded in the Sydney Regional Environmental Plan No. 24 (Anon 1994c). The NSW Government has developed a masterplan detailing conservation areas around the Homebush Bay area in co-ordination with the development of the Sydney Olympic Park (NSW Govt. 1994). The Olympic Co-ordination Authority contain, within development plans, proposals to enhance the conservation value of the site by improving the habitat of the site through remediation of adjacent land and improved water quality by increasing tidal flushing (McCallum, pers. comm., 1995).

Management authority and jurisdiction:
The area was managed by the Royal Australian Navy, Department of Defence. The southern part of the site has been transferred to be managed by the Olympic Co-ordination Authority. The entire site is in State government ownership. Jurisdiction: NSW State Government.

References:
Anon (1982); Anon (1986a); Anon (1986b); Anon (1990); Anon (1994c); Australian Heritage Commission (1992); CHM Hill (1994); Clarke, P. & Benson, D. (1988); Fox and Associates (1986); Kachka, A. M. (1993); NSW Government (1994); Taylor, I & Hutchings, P. (1994); Thackway, R. & Cresswell, I. D. (1995). See NSW Reference List

Compiler & date:

Philip Hodgson, C/- Wetlands and Migratory Wildlife Unit, Australian Nature Conservation Agency, 1995. Revised, Tania Laity, NSW National Parks & Wildlife Service, 1998. Minor revisions, Geoff Larmour, Wetlands Section, EA, Dec 2000.

3.1.2 Matters of National Significance - Summary of findings

Following is the summary of findings and commentary on how this relates to the proposed development. See Full Report in Appendix I.

The 10 listed Threatened Ecological Communities are listed under this table. The three likely to be on-site or adjoining the site are:

- Turpentine-Ironbark Forest of the Sydney Basin (Critically endangered),
- Subtropical and Temperate Coastal Saltmarsh (Vulnerable) and
- Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community.

World Heritage Properties:	2
National Heritage Places:	2
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	10
Listed Threatened Species:	80
Listed Migratory Species:	64

The 8 triggered in the search are included below.

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Blue Gum High Forest of the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area
Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion	Endangered	Community may occur within area
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area
Coastal Upland Swamps in the Sydney Basin Bioregion	Endangered	Community likely to occur within area
Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	Critically Endangered	Community likely to occur within area
Shale Sandstone Transition Forest of the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area
Turpentine-Ironbark Forest of the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area
Western Sydney Dry Rainforest and Moist Woodland on Shale	Critically Endangered	Community likely to occur within area

The 80 Threatened Species have been considered in this assessment – these include:

- 4 frog species (GGBF, RCT, Giant Burrowing Frog and Stuttering Frog),

- 3 fish species,
- 5 marine turtles,
- 1 reptile
- 2 other (Shark and Snail)
- 8 mammals – of which only the Large-eared Pied bat and the Grey Headed Flying-fox could occur on site.
- 23 plants – all with habitat that is different to that on-site and immediate surrounds.
- The remainder are bird species (33) that are also listed within the Migratory Species. 13 bird species listed are known migratory wetland species. The possible impacts on these species have been considered – it is noted that not all occur at the site / surrounds. All are listed as *Species or species habitat known to occur within the area* and saltmarsh is the key trigger for this.
- The full report in Appendix I has the listed species link. All species have been considered.

3.1.3 Other Matter Protected by EPBC Act

Commonwealth Land:	31
Commonwealth Heritage Places:	3
Listed Marine Species:	69
Whales and Other Cetaceans:	4
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

The Commonwealth Land triggered is that of Newington and is outside of the proposed development area.

The listed Marine Species includes bird and turtle species. All bird species were considered in this assessment. Some include migratory and wading birds that are known to visit, feed and or breed in the area.

3.1.4 Policy and Guidelines.

Matters of National Environmental Significance Significant Impact Guidelines 1.1.

The proposal and associated impacts have been assessed in accordance with Matters of National Environmental Significance Significant Impact Guidelines 1.1, see appendices 7.3. The, *EPBC Act Policy Statement 3.21—Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species*, was used a guiding document for ecologists when undertaking the significant impact assessment.

Newington Wetlands are identified as nationally important wetlands due to their habitat value for migratory shorebirds. Studies have recorded a decrease in migratory shorebirds population and species diversity at the site within the last decade. Primarily because of habitat disturbance along the East Asian–Australasian Flyway. Daytime studies at Newington Wetlands have recorded approximately 20 individuals and night studies recording up too 220 birds (O'Meara and

Darcovich, 2015). These numbers are below 0.1% of the total flyway population for most species. Irrespective of this finding ecologists have still applied the EPBC Significant Impact Guidelines, see section 7.3.

Findings

It is expected that there will be no significant impact on threatened species or migratory shorebirds as listed under the EPBC Act. The proposed development will not directly remove habitat (foraging/roosting or other). The proposed development will have a minor (to negligible) shading influence on the Saltmarsh and Mangroves. Thus, the shading will not significantly degrade areas of foraging/roosting or other habitat such that they lose their current habitat value. Direct (collision) and indirect impacts associated with the proposal are expected to be negligible.

Direct (collision) and Indirect impacts associated with lighting, building towers, noise, additional people and increased use of the foreshore walkway will be managed throughout the detailed design stages of the development, with expert input from ecologists and adherence to national wildlife guidelines.

It is acknowledged the that the tower height and bulk could result in birds that require open sightlines reducing, or stopping, use of areas near the buildings. However, mangroves already impact most of the Saltmarsh areas (in terms of being visual barriers to long-sight lines) and the largest patches of Saltmarsh present are away from the proposed building areas and separated from them by mangroves. Therefore, the towers will not significantly impact upon site access for birds using the site.

Indirect impacts listed above can be appropriately managed during the design and construction stage. Ecologists will work in close consultation with the design team through the following phases of building design, to ensure all materials used are optimised to reduce bird-strike. Including design features such as non-reflective glass, glazing design (UV marking) and building/landscape design. Impacts arising from artificial lighting are not fully understood for each species. This is noted in the guiding document National Light Pollution Guidelines for Wildlife. Lighting designs will follow Best Practice Lighting Design as outlined in the National Light Pollution Guidelines for Wildlife (Migratory Shorebirds). Impacts on threatened species listed under the EPBC Act are expected to be negligible.

National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds.

As per the guidelines, an Environmental Impact Assessment (EIA) will accompany the next level of detailed design to assess the impact of artificial lighting. During the design stage, artificial lighting onsite will follow Best Practice Lighting Design as outlined in the guidelines, see appendix A.

Lighting design/management and the EIA process should be undertaken by appropriately qualified personnel. Light management plans should be developed and reviewed by appropriately qualified lighting practitioners who should consult with an appropriately qualified marine biologist or ecologist.

3.2 NSW Biodiversity Conservation Act – Flora

3.2.1 Threatened Species

3.2.1.1 Narrow-leafed Wilsonia

Wilsonia backhousei Narrow-leafed Wilsonia is known to be growing Newington nature reserve – generally on the higher areas which are infrequently tidally inundated, yet the soil retains high salinity levels. A 5-part test for Wilsonia has been conducted. No Wilsonia was observed or expected in the proposed development areas.

Disclaimer from Bionet: data from the BioNet holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Location accuracy varies. Copyright the State of NSW through the Office of Environment and Heritage.

Figure 3.1 Extract from Fire management plan showing spot points of specific flora conservation FL and fauna. Source: Bushfire Risk Management Strategy. NB: no information was available on the specific species at each point.

Table 1. Threatened and Culturally Significant Plant Species observed in Newington Nature Reserve – or within 10km (Wilsonia also listed in Bionet). Known locations are throughout SOPA lands including Newington Nature Reserve.

Scientific Name	Common Name	NSW status	Comm. status
Wilsonia backhousei	Narrow-leafed Wilsonia	V	Not listed
Tecticomia pergranulata	Blackseed Samphire (Culturally Significant)	na	na
Lampranthus tegans	Pigface (Culturally Significant)	na	na

Key to NSW Status
V = Vulnerable (Threatened Species Conservation Act 1995)

3.2.2 Endangered Ecological Communities

3.2.2.1 Saltmarsh

At the federal level (EPBC Act) Subtropical and Temperate Coastal Saltmarsh is listed as Vulnerable.
At the NSW state level *Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* has the conservation status: Endangered Ecological Community.
Gazetted date: 04 Jun 2004. Profile last updated: 19 Oct 2017
As an EEC and the test of significance (5-part-test) has been applied to this community.

Saltmarsh and mangroves have been shown to decline in health when shaded for prolonged periods. Shadow diagrams demonstrate that the saltmarsh and Mangroves will be out of shade by 9am in high summer and 11am in winter. Shadow diagrams have been provided in this report.

Plate Saltmarsh patch in Newington Reserve with Casuarinas and Mangroves

3.2.2.2 Sydney Turpentine Ironbark Forest

Sydney Turpentine-Ironbark Forest (as described in the determination of the Scientific Committee under the BC Act) is listed as a Critically Endangered Ecological Community (BC Act 2016). It is also listed as Endangered under the Environment Protection and Biodiversity Conservation Act 1999.

Currently this community may not meet the definition of the Scientific Committee. It is assumed it would. Currently the condition of the STIF is poor to very poor. The trees appear suppressed, possibly due to sallow soils over contaminated lands. Mid and understory is planned or not present. Rehabilitation works could occur in this community to increase its diversity and resilience. A 5-part has been included for this community. At this stage, the only impact is shading of <10% with shadowing gone by 10am or 12am in mid-winter.

3.1 On-site findings - Flora

Within the boundary of the proposed development site the ground and mid-story is bare ground (over 80%) or exotic species, annual weeds or turf as can be seen in plates 2, 3 and 4.

Vegetation is largely confined to the perimeter of the site and includes the public access ways see plates 5 to 8 and foreshore see plates 9-13. Small birds, particularly wrens, are abundant in this area.
A list of native flora on-site was compiled all were canopy species, as listed below.

Species Name	Common Name
Eucalyptus robusta	Swamp Mahogany
Casuarina cunninghamiana	River Oak
Angophora costata	Angophora

Native mid and understory species were only outside the fenced section of the site and were principally in planted areas along access ways. A detailed species list was not collated. Key species were listed and notes of growth form, health and indicators of habitat suitability were recorded. The Turpentine Trees to the west of the site were examined.

Plate 1: Entrance off Hill Road

Plate 2: Central Cleared Area

Plate 3: Existing accessways on-site showing bare earth

Plate 4: Existing hardstand on-site and rear shows development on Hill Road

Plate 5: Community Pathway along foreshore

Plate 6: Community Pathway between the site and the Mangroves and Saltmarsh of Newington Reserve

Plate 7: Community Pathway through planted Woodland area

Plate 8: Community pathway to Ferry Wharf along Hill Road

Plate 9: Foreshore public place

Plate 10: Oysters and Barnacles with natural recruitment along the foreshore

Plate 11: Existing waterfront ferry stop

Plate 12: Existing waterfront vegetation (planted)

Plate 13: Existing waterfront vegetation (planted)

Plate 14 Woodland Birds living in the bushland areas

Plate 15: Fenced Saltmarsh, Mangroves and Migratory Bird habitat

Plate 16: Saltmarsh and Mangroves Newington Nature Reserve Wetlands

4 Fauna

4.1 Threatened fauna

A total of 49 threatened fauna species have been recorded within 10km of the study site according to BioNet records.

Table 4. Threatened fauna listed in Bionet within a 10x10km area centre on the site
Data from the BioNet BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1Â°; ^^ rounded to 0.01Â°). Copyright the State of NSW through the Office of Environment and Heritage. Search criteria.
Search criteria: Public Report of all Valid Records of Threatened (listed on TSC Act 1995) or Commonwealth listed Entities in selected area [North: -33.77 West: 151.02 East: 151.12 South: -33.87] recorded since 01 Jan 1970 until 15 Apr 2020 returned a total of 18,198 records of 59 species. Report generated on 15/04/2020 11:38 AM.

Scientific Name	Common Name	NSW status	Comm. status	Records
Pseudophryne australis	Red-crowned Toadlet	V,P		1
Litoria aurea	Green and Golden Bell Frog	E1,P	V	15986
Stictonetta naevosa	Freckled Duck	V,P		1
Ptilinopus superbus	Superb Fruit-Dove	V,P		2
Hirundapus caudacutus	White-throated Needletail	P	V,C,J,K	25
Botaurus poiciloptilus	Australasian Bittern	E1,P	E	8
Ixobrychus flavicollis	Black Bittern	V,P		3
Circus assimilis	Spotted Harrier	V,P		4
Haliaeetus leucogaster	White-bellied Sea-Eagle	V,P	C	338
Hieraaetus morphnoides	Little Eagle	V,P		6
^^Pandion cristatus	Eastern Osprey	V,P,3		5
Falco subniger	Black Falcon	V,P		1
Charadrius leschenaultii	Greater Sand-plover	V,P	V,C,J,K	1
Rostratula australis	Australian Painted Snipe	E1,P	E	3
Calidris canutus	Red Knot	P	E,C,J,K	15
Calidris ferruginea	Curlew Sandpiper	E1,P	CE,C,J,K	351
Calidris tenuirostris	Great Knot	V,P	CE,C,J,K	2
Limicola falcinellus	Broad-billed Sandpiper	V,P	C,J,K	2

Scientific Name	Common Name	NSW status	Comm. status	Records
Limosa limosa	Black-tailed Godwit	V,P	C,J,K	14
Numenius madagascariensis	Eastern Curlew	P	CE,C,J,K	29
Xenus cinereus	Terek Sandpiper	V,P	C,J,K	1
Sternula albifrons	Little Tern	E1,P	C,J,K	7
^^Callocephalon fimbriatum	Gang-gang Cockatoo population in the Hornsby and Ku-ring-gai Local Government Areas	E2,V,P,3		2
^^Callocephalon fimbriatum	Gang-gang Cockatoo	V,P,3		2
^Calyptorhynchus lathami	Glossy Black-Cockatoo	V,P,2		1
Glossopsitta pusilla	Little Lorikeet	V,P		10
^^Lathamus discolor	Swift Parrot	E1,P,3	CE	10
^^Neophema pulchella	Turquoise Parrot	V,P,3		2
^^Ninox connivens	Barking Owl	V,P,3		4
^^Ninox strenua	Powerful Owl	V,P,3		111
^^Tyto longimembris	Eastern Grass Owl	V,P,3		2
^^Tyto novaehollandiae	Masked Owl	V,P,3		1
Anthochaera phrygia	Regent Honeyeater	E4A,P	CE	5
Epthianura albifrons	White-fronted Chat	V,P		254
Epthianura albifrons	White-fronted Chat population in the Sydney Metropolitan Catchment Management Area	E2,V,P		254
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V,P		19
Petroica boodang	Scarlet Robin	V,P		2
Petroica phoenicea	Flame Robin	V,P		1
Dasyurus maculatus	Spotted-tailed Quoll	V,P	E	2
Phascolarctos cinereus	Koala	V,P	V	3
Pteropus poliocephalus	Grey-headed Flying-fox	V,P	V	436
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V,P		10
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V,P		4
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V,P		2

Scientific Name	Common Name	NSW status	Comm. status	Records
Myotis macropus	Southern Myotis	V,P		28
Scoteanax rueppellii	Greater Broad-nosed Bat	V,P		2
Pommerhelix duralensis	Dural Land Snail	E1	E	13
Miniopterus australis	Little Bent-winged Bat	V,P		2
Miniopterus orianae oceanensis	Large Bent-winged Bat	V,P		89

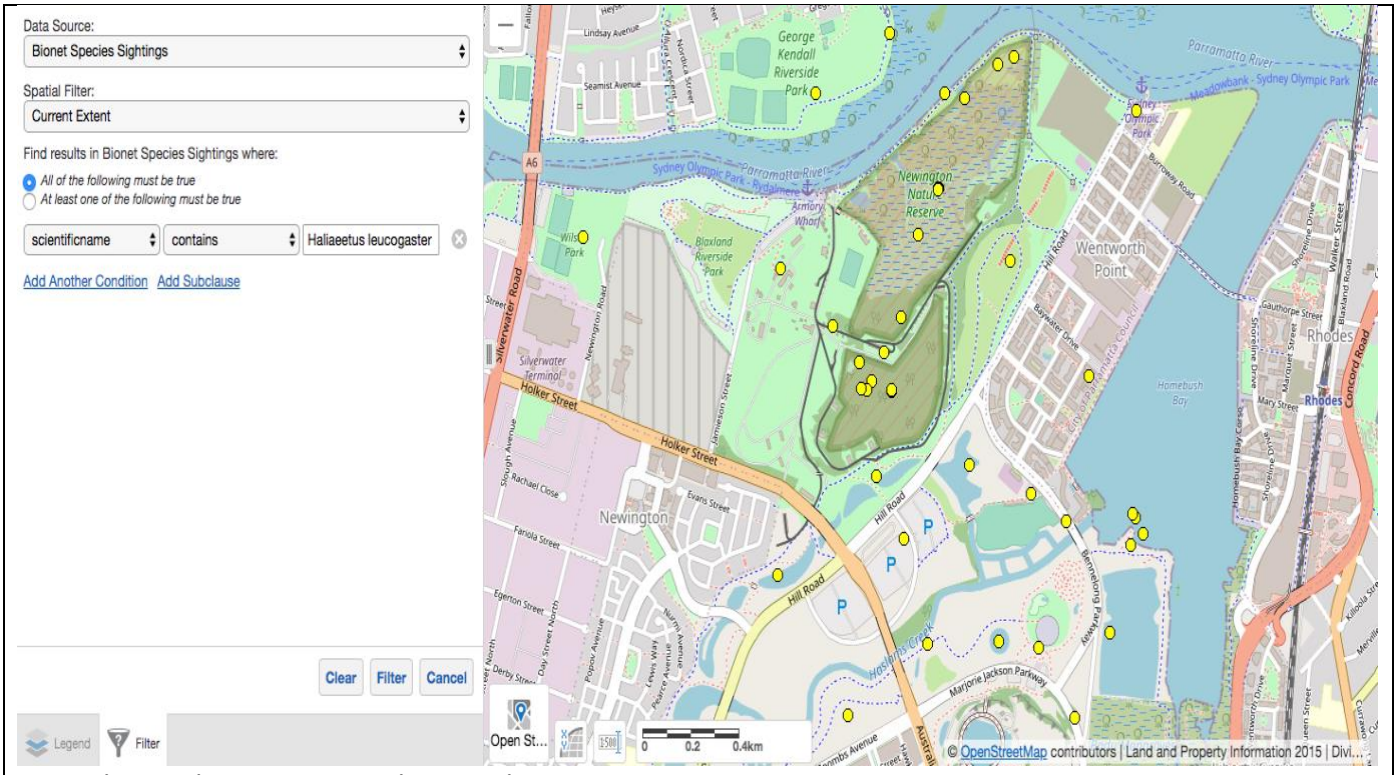
Key to NSW Status
V = Vulnerable (Threatened Species Conservation Act 1995)
P = Protected
E1 = Endangered (Threatened Species Conservation Act 1995)

Key to Commonwealth Status
V = Vulnerable (*Commonwealth EPBC Act 1999)*
C = Listed on China Australia Migratory Bird Agreement
K = Listed on Korea Australia Migratory Bird Agreement
J = Listed on Japan Australia Migratory Bird Agreement

4.2 White Bellied Sea Eagle

Breeding time:
April nest building and other activities to prepare for egg laying and egg laying is usually late June or early July. Sea Eagles are sensitive to nest disturbance, strict protocols will be implemented to reduce disturbance during early nest renovation, incubation and early nestling stages. This will be detailed in future ecological reports and linked directly to building schedules.

More information is required regarding the continued use of nesting sites where high-rise buildings come close to nest sites. In other parts of the world there are raptors within the city scape however data is not readily available on how raptors respond where the high-rise come close to their nesting sites as opposed to raptors choosing to nest in urban high-rise areas. Currently there are electrical towers that exceed the height of proposed buildings and appear not to disturb the Eagles.



Data obtained via SEED portal 15 April 2020.

4.3 Migratory Wading Birds

Impacts on migratory birds directly at the site could include the following and it is noted that methods to reduce these possible impacts are being included in the design phase:

- Saltmarsh shading – however the shadow diagrams shows that saltmarsh is out of shade before or at latest by 9am (Summer) or 10am (winter). Large areas of saltmarsh are not shaded in summer when the birds are here.
- Direct disturbance – increase numbers of people and companion animals in close proximity to the reserve – pathways around the reserve.
- Disturbance to the flight path into the reserve – studies ongoing.
- Disturbance from blocked line-of-site (min 40m).
- Increased noise and increased lighting.

Most migratory bird species keep at least 40m back from the mangrove areas and any high vegetation (or structures) that precluded clear site for at least 40m of feeding/roosting area. Proposed buildings on the site will add to the existing visual impact however none are closer than 100m to existing open saltmarsh.

Work on migratory birds and the saltmarsh recreation projects at Penrhyn Estuary (Port Botany) assist in providing data about the levels of tolerance of these migratory bird species to vertical encroachment, changes in flight path, noise and light. Local studies are confounded however by the global impacts on migratory birds with populations declining largely due to mass habitat reclamation – particularly in the South China Sea.

Flyways

Data on migratory bird flyways at the site is being continually collated and investigations are ongoing throughout all stages of this proposal. Overall, there is little background and historical data on migratory bird flyways at Newington Wetlands and SOPA lands. The preliminary data collated during site investigations have found that there is no significant migratory bird flyway in the aerial space where the buildings will be constructed.

Birds which access the site would currently navigate areas of high-rise development from all directions, due to the central urbanized location of the habitat. This is with the expectation of the flyway along Parramatta River. The river provides a flyway corridor which is expected to be used by migratory birds accessing habitat throughout the estuary, including Newington Wetlands and SOPA lands. Site access from the river for migratory birds will remain primarily unaffected by this proposal. It is expected that the proposal will not create a barrier which severely limits site access for avifauna.

Previous daytime studies at Newington Wetlands have recorded approximately 20 individual shorebirds and night studies recording up too 220 birds (O'Meara and Darcovich, 2015). These numbers are below 0.1% of the total flyway population for most species. Irrespective of this finding ecologists have still applied the EPBC Significant Impact Guidelines, see section 7.3.

As such, it is unlikely that the proposal would affect a significant proportion of migratory shorebirds or their respective flyways at the site. Investigations at the site are going and data is

being updated within each stage of this proposal. At this stage, it appears that the proposal will not significantly impact flyways or significantly restrict site access for avifauna.

Line of sight and obstructions

As discussed in subsection 3.07 of the Sydney Olympic Park (SOPA) Wetland Education and Training (WET) workshop manual, shorebirds prefer to forage and roost in areas with an unobscured line of sight. The publication references a figure (fig 4. below) by *Lawler, 1996* which identifies the distance from obstructions in which shorebirds feed or roost. Project ecologists concluded a more conservative estimate – minimum 40m line of sight - following years of experience managing saltmarsh and estuarine habitat.

Whilst the SOPA publication and the project ecologists have stated slightly different minimum distances from vegetation for shorebirds, both estimates result in the towers being beyond a distance which would cause a significant obstruction to the sight line of migratory shorebirds at Newington Wetlands and SOPA lands. The proposed buildings will be at least 100m from significant migratory shorebird foraging/roosting habitat, thus, impacts on visual obstruction for shorebirds will be minimal.

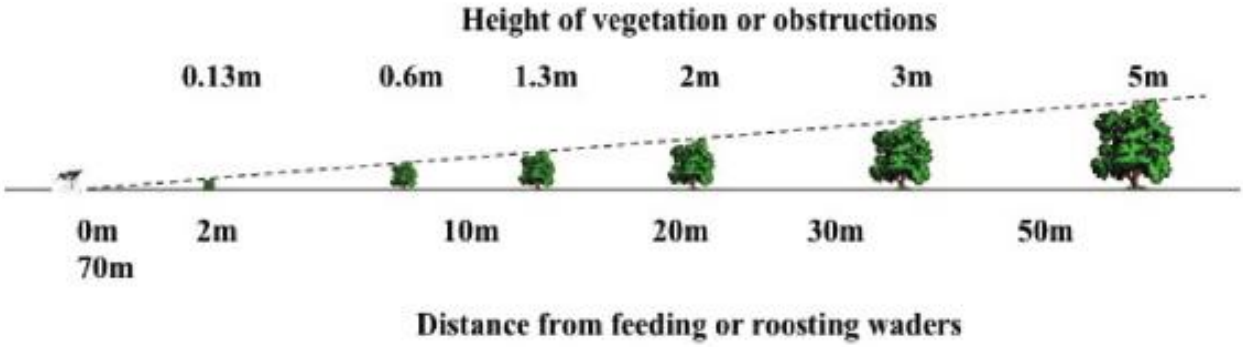
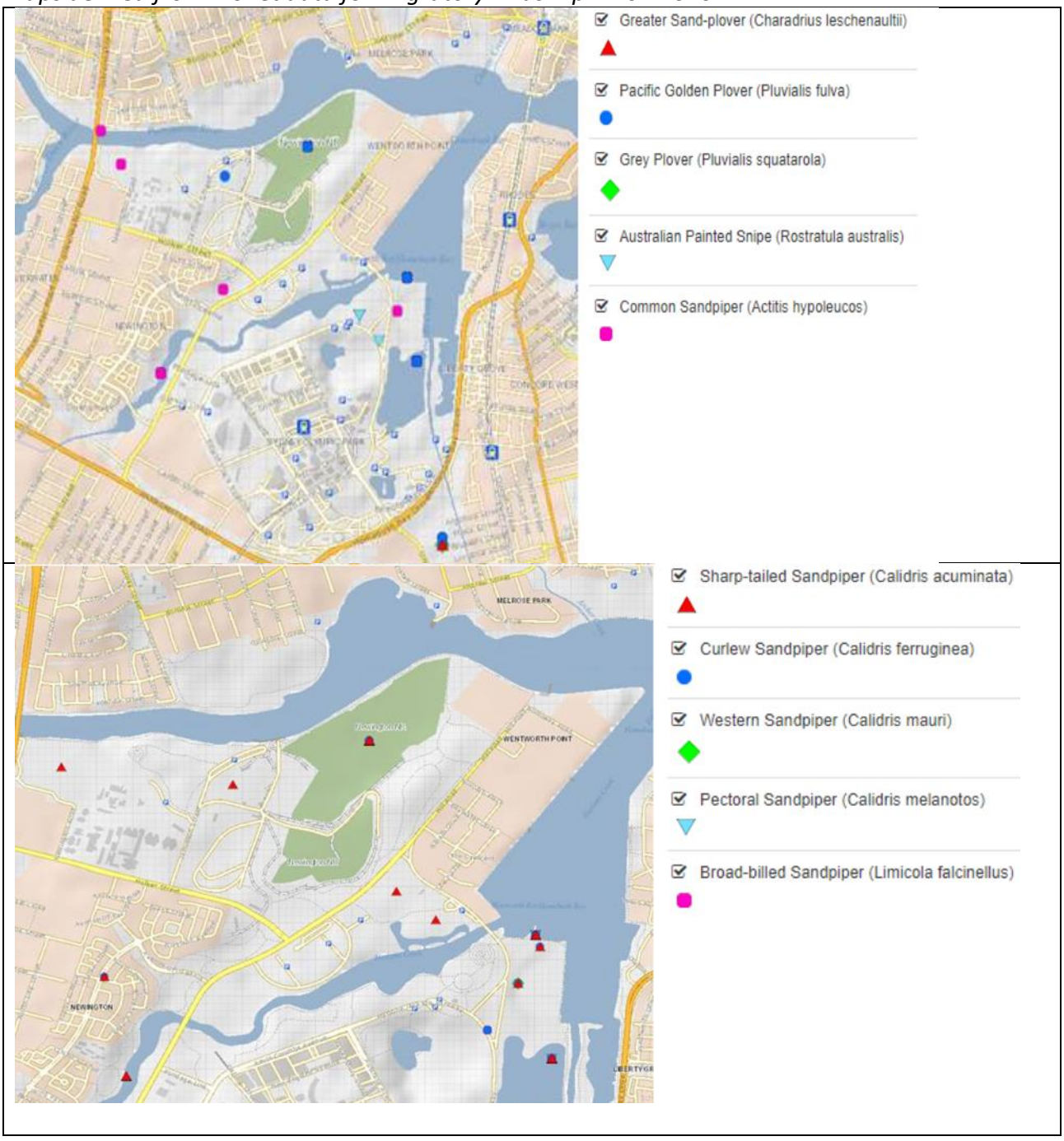
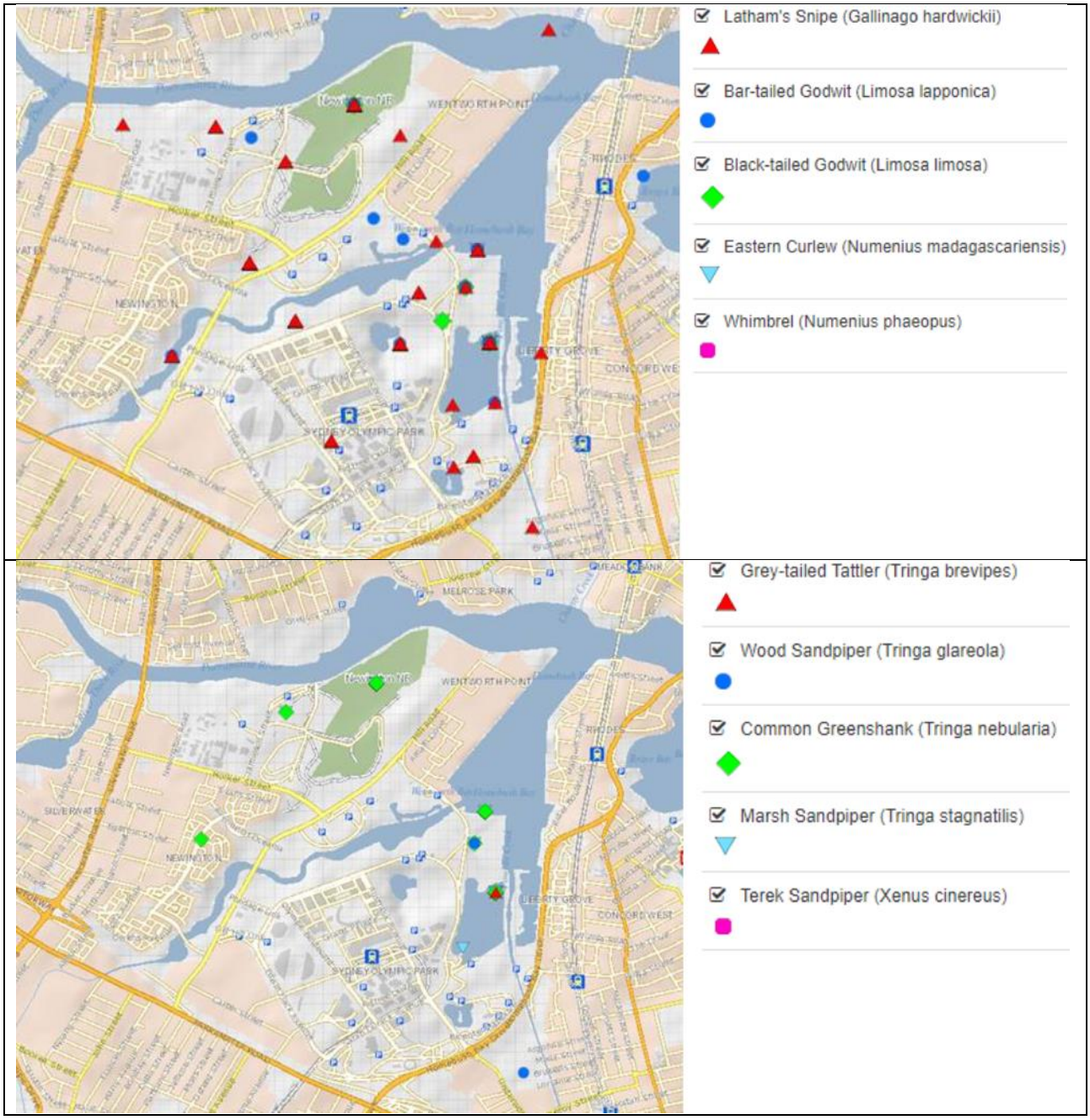


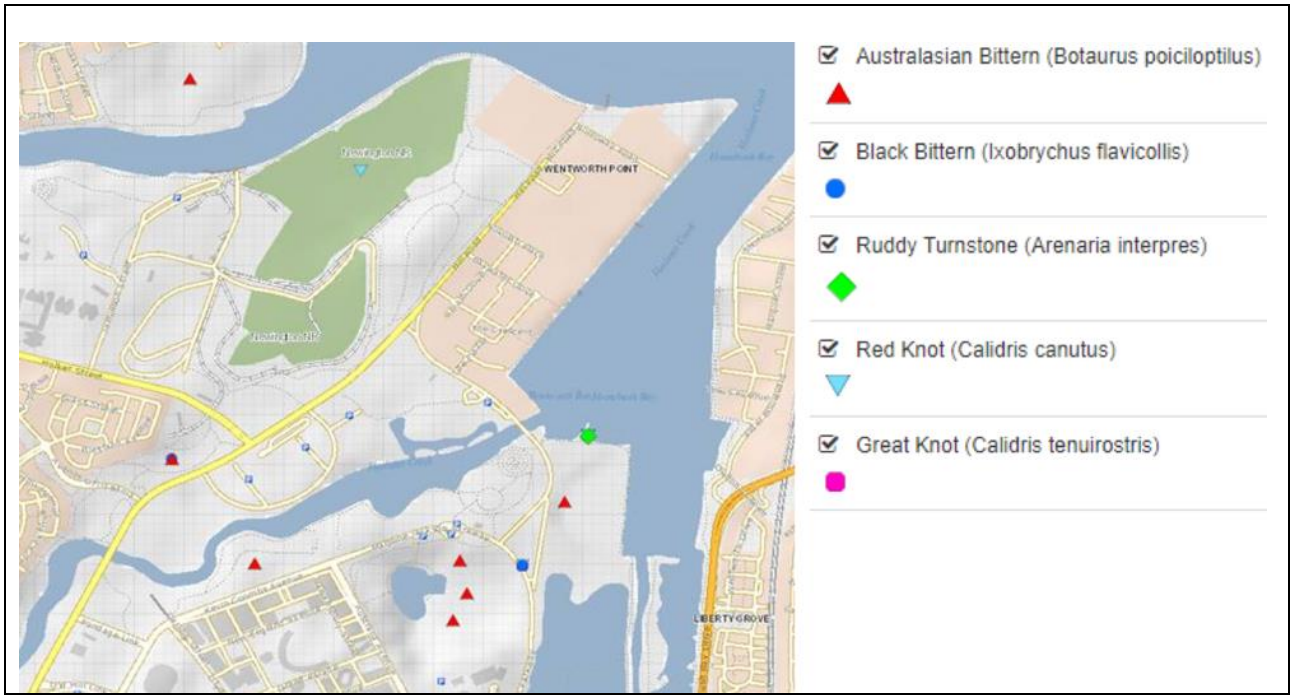
Figure 3.7.1. Shorebirds avoid tall vegetation when feeding but more particularly when roosting at high tide (after Lawler 1996).

Figure 4. Extract from SOPA WET eBook. Subsection 3.07. - https://www.sopa.nsw.gov.au/Resource-Centre/WET-eBook-Workbook-for-Managing-Urban-Wetlands-in-Australia.

Maps derived from Bionet data for Migratory Birds April 10th 2020.




Latham's Snipe (Gallinago hardwickii)
Bar-tailed Godwit (Limosa lapponica)
Black-tailed Godwit (Limosa limosa)
Eastern Curlew (Numenius madagascariensis)
Whimbrel (Numenius phaeopus)
Grey-tailed Tattler (Tringa brevipes)
Wood Sandpiper (Tringa glareola)
Common Greenshank (Tringa nebularia)
Marsh Sandpiper (Tringa stagnatilis)
Terek Sandpiper (Xenus cinereus)


WENTWORTH POINT
LIBERTY GROVE
Australasian Bittern (Botaurus poiciloptilus)
Black Bittern (Ixobrychus flavicollis)
Ruddy Turnstone (Arenaria interpres)
Red Knot (Calidris canutus)
Great Knot (Calidris tenuirostris)

4.4 Green and Golden Bell Frogs

Currently there is no habitat on site for GGBF breeding. Kikuyu grass at the western end of the site near the drainage canal could be used as dispersal habitat for GGBF however is not considered prime habitat. A riparian plan will be developed with the later stages of the design and GGBF habitat will be included in this area. The map below shows the GGBF sightings. The author of this report has worked on GGBF habitat projects and is familiar with their requirements.

Find results in Bionet Species Sightings where:

All of the following must be true
At least one of the following must be true

scientificnan | contains | Litoria aurea

GGBF location of sightings since 1st January 1970. Source: Bionet accessed 14th April 2020

4.5 Microbats and Flying Foxes

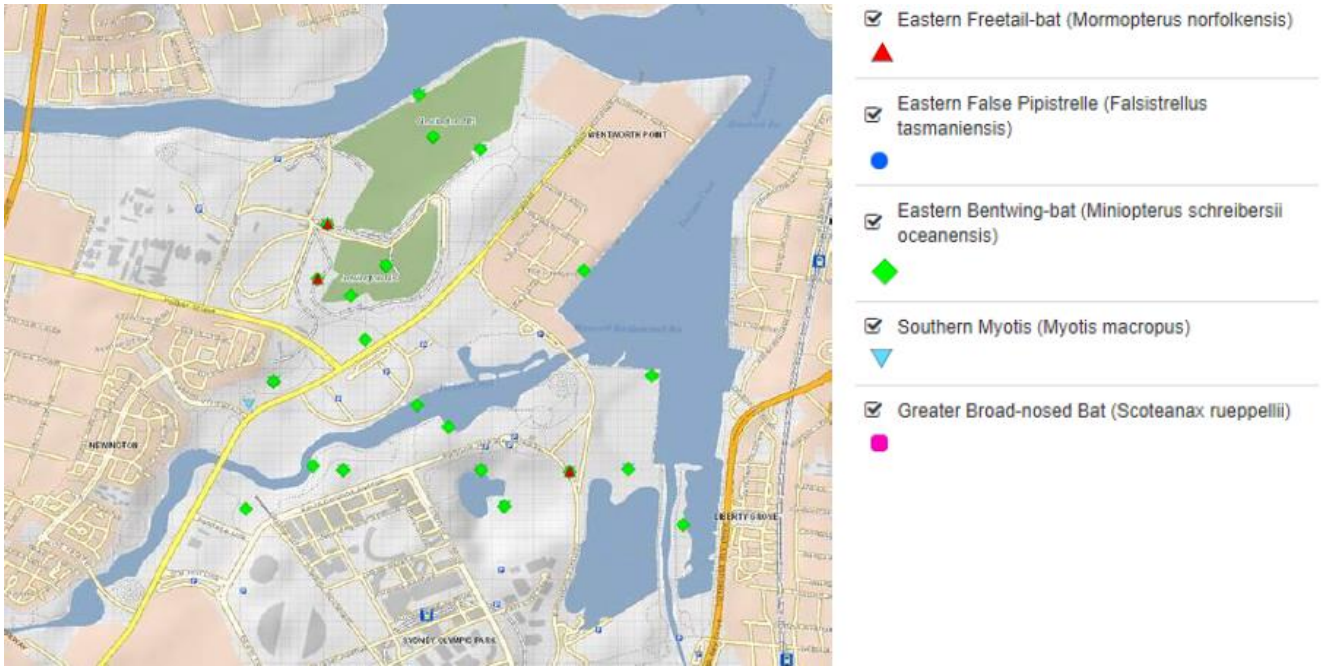
Several species of Microbat and the Grey-headed Flying-fox (GHFF) have been previously recorded within 10km^2 of the study site (Bionet, 2020). Microbats and the GHFF may use the aerial space above the study site and in the surrounding area when accessing foraging resources in the area. It is noted that both the Microbats and GHFF would fly at heights below the proposed tower height. Thus, buildings could potentially influence the movement of species in the area.

However, the buildings are not expected to not cause significant fragmentation to the landscape. The area is already high-urbanised and fragmented, the local populations currently navigate between existing high-rises and development. Microbats and the GHFF are both highly mobile aerial species and it is expected that they would access foraging resources in the area occasionally and opportunistically. It is unlikely that the local populations are exclusively dependent upon foraging resources within immediate vicinity the proposed development site.

The flyway corridor along the Parramatta River will remain unaffected and the species can use this space to access nearby foraging resources. The proposed building towers do not create a significant barrier for either Microbats and the GHFF such that foraging habitat or accessibility to habitat will be significantly altered. Lights from the proposed buildings may increase insect abundance in the area and therefore increase foraging habitat for insectivore species.

Direct and Indirect impacts associated with lighting, building towers, noise, additional people and increased use of the foreshore walkway will be managed throughout the detailed design stages of the development. Ensuring that impacts upon wildlife and their habitat are minimised.

In conclusion, Microbats and Flying Foxes are highly mobile species and the proposal will a have a negligible impact on the species. No suitable roosting habitat is within the development area or the adjoining Wetland. The proposal will not cause significant fragmentation to the existing highly-urbanised landscape



4.6 Endangered populations

Four endangered populations have been recorded to occur within 10km of the site. Table 7 shows species listings. Impact on these populations are expected to negligible.

Table 7. Endangered Populations within a 10km radius of the area. Source NSW DPIE Bionet 2020.

Endangered Population	Scientific Name	NSW Status	Comth. Status
Gang-gang Cockatoo population in the Hornsby and Ku-ring-gai Local Government Areas	*Callocephalon fimbriatum*	Vulnerable and Endangered Population in Sydney (E2,V,P,3).	Not Listed
White-fronted Chat population in the Sydney Metropolitan Catchment Management Area	*Epthianura albifrons*	Vulnerable and Endangered Population in Sydney (E2,V,P).	

Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield	*Wahlenbergia multicaulis*	Endangered Population (E2)	
P. prunifolia in the Parramatta, Auburn, Strathfield and Bankstown Local Government Areas	*Pomaderris prunifolia*	Endangered Population (E2)	

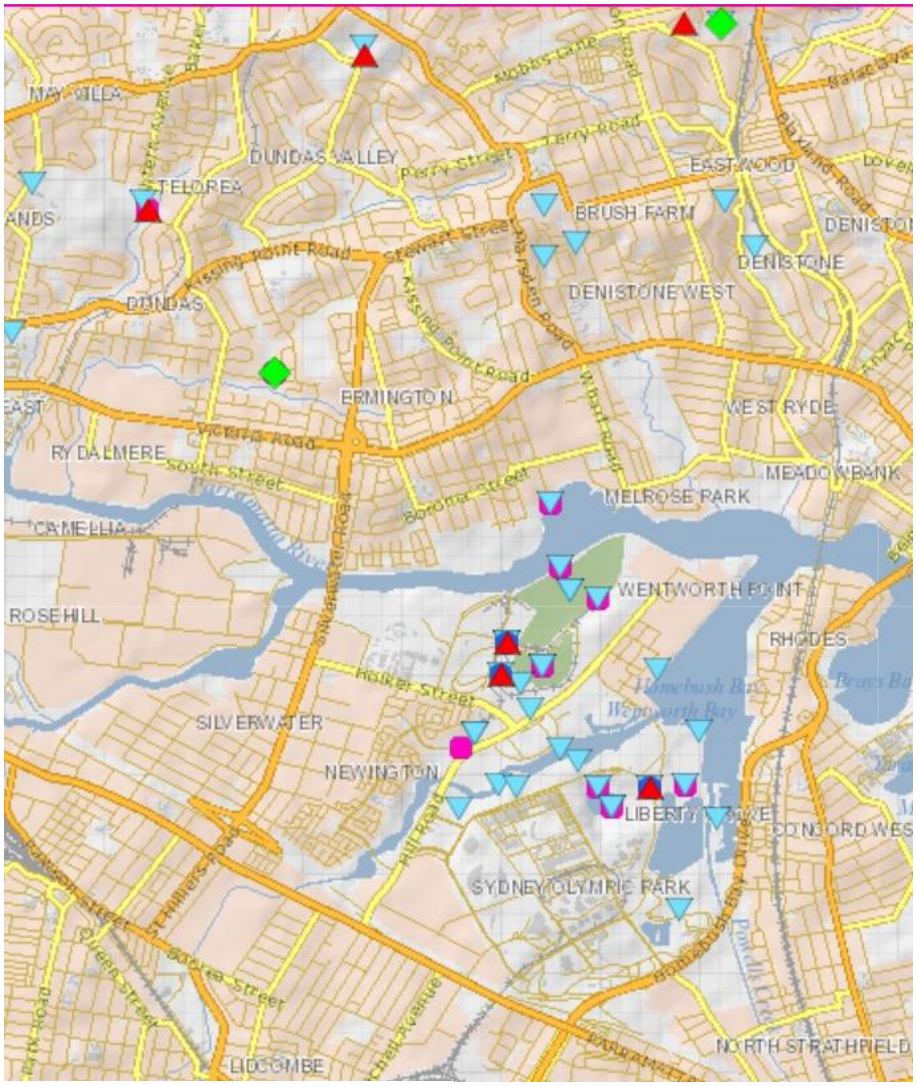
White-fronted Chat population in the Sydney Metropolitan Catchment Management Area

White-fronted Chat habitat is Saltmarsh – there will be no direct impact on habitat. NB the morning shading of the northern part of the saltmarsh is not considered a threat to this species or population. With the reserve being fenced it is expected that any increase in human activity around the reserve will not direct impact White-fronted Chats. No endangered populations will be significantly impacted by this development.

4.7 Flora

4.7.1 Threatened Flora – NSW (BC Act) and Federal (EPBC Act)

Following are maps derived from Bionet data for Flora that were list at NSW or Federal Level as being threatened or endangered. The areas (proposed development area and areas that could be impacted by shading. No Wilsonia was observed (or mapped) in the areas that are predicted to be shaded by the buildings. *Wahlenbergia multicaulis* is known in the area although will remain unaffected by the proposal.



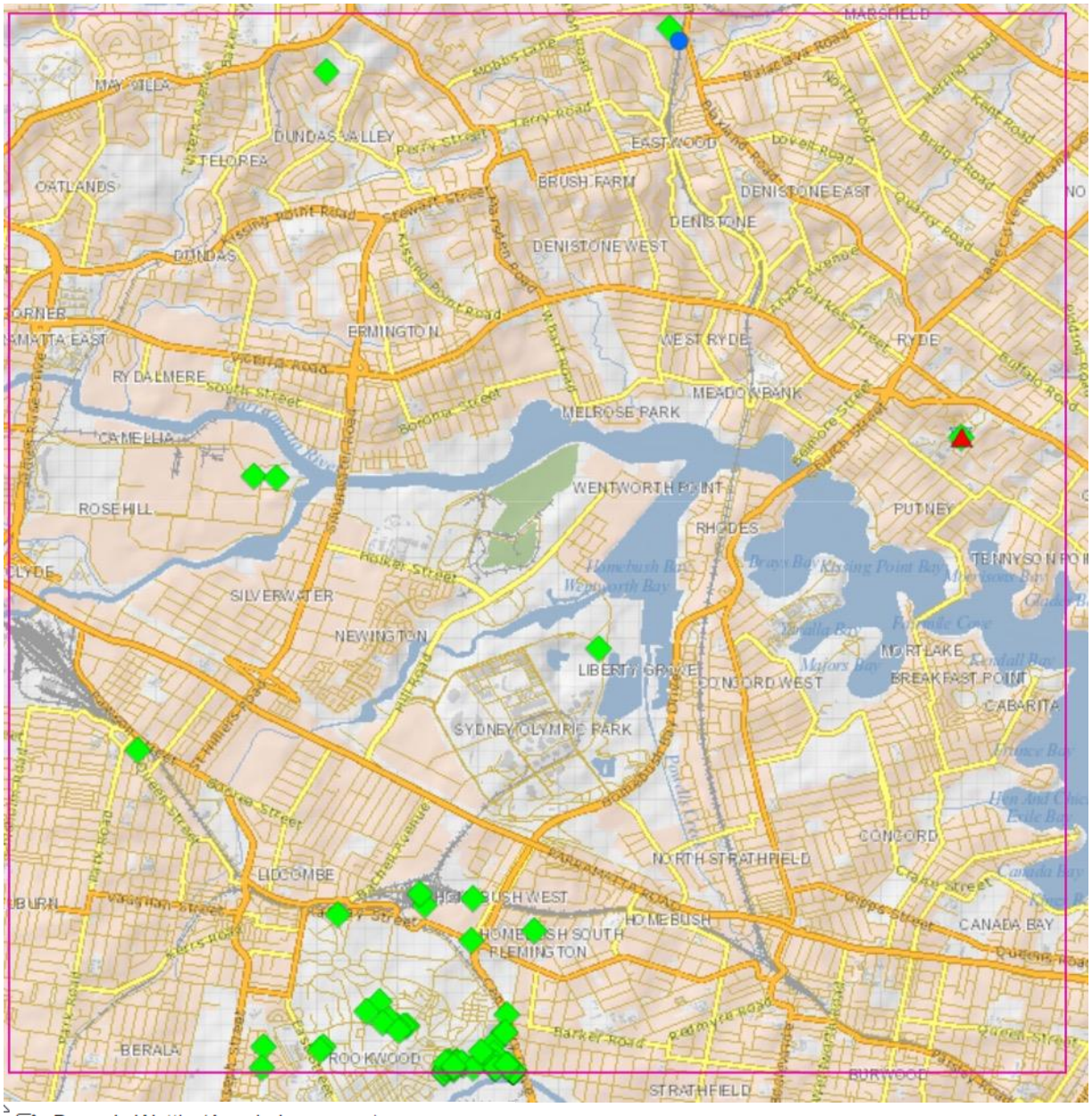
Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield

Narrow-leafed Wilsonia (Wilsonia backhousei)

Tetratheca glandulosa

Epacris purpurascens var. purpurascens

Dillwynia tenuifolia



- [x] Bynoe's Wattle (Acacia bynoeana)

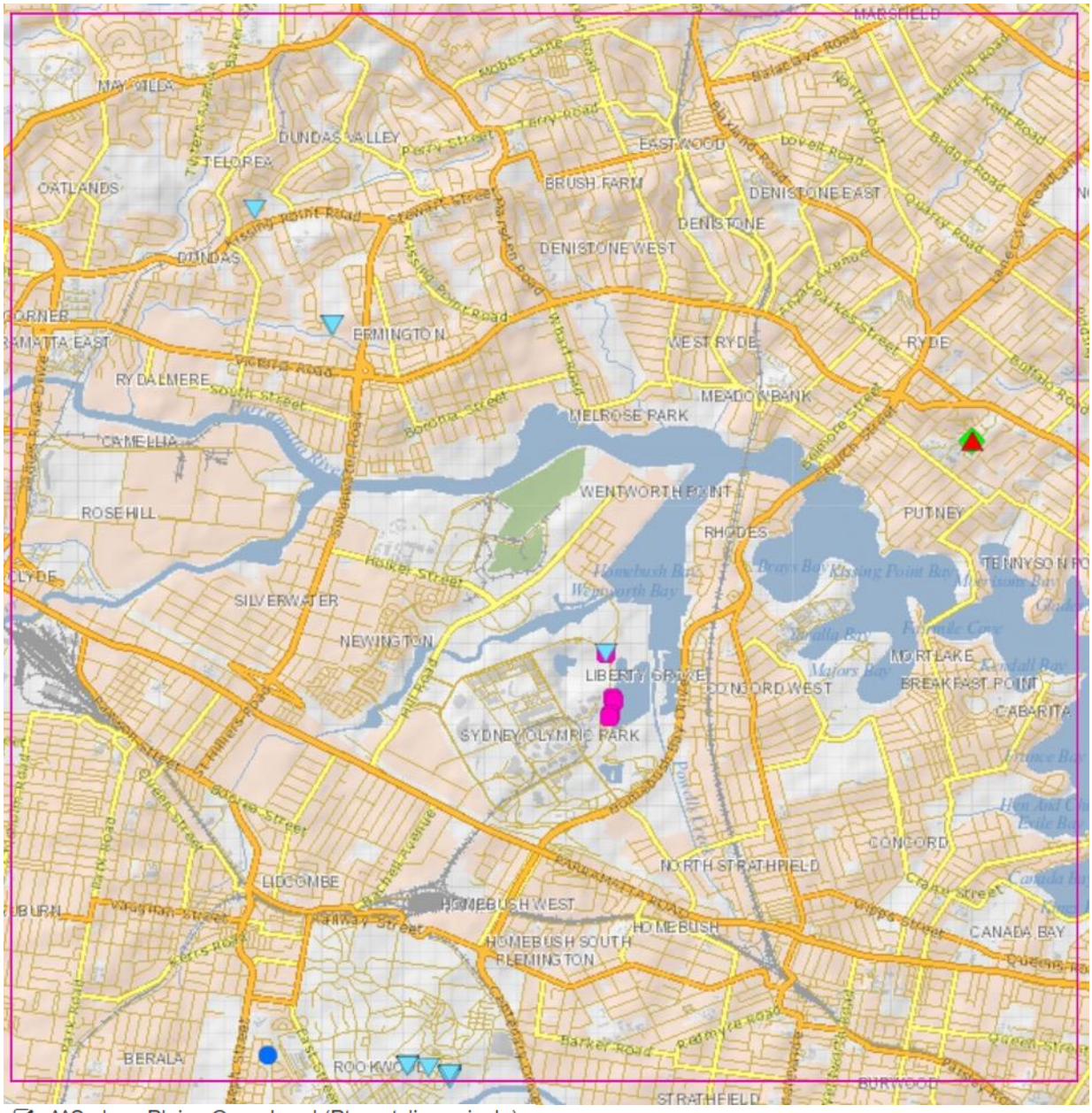
- [x] Kanangra Wattle (Acacia clunies-rossiae)

- [x] Downy Wattle (Acacia pubescens)

- [x] Seaforth Mintbush (Prostanthera marifolia)

- [x] Netted Bottle Brush (Callistemon linearifolius)

None of these species will be impacted by the proposed development.



☑ ^^Sydney Plains Greenhood (Pterostylis saxicola)

▲

☑ Beadle's Grevillea (Grevillea beadleana)

●

☑ Hairy Geebung (Persoonia hirsuta)

◆

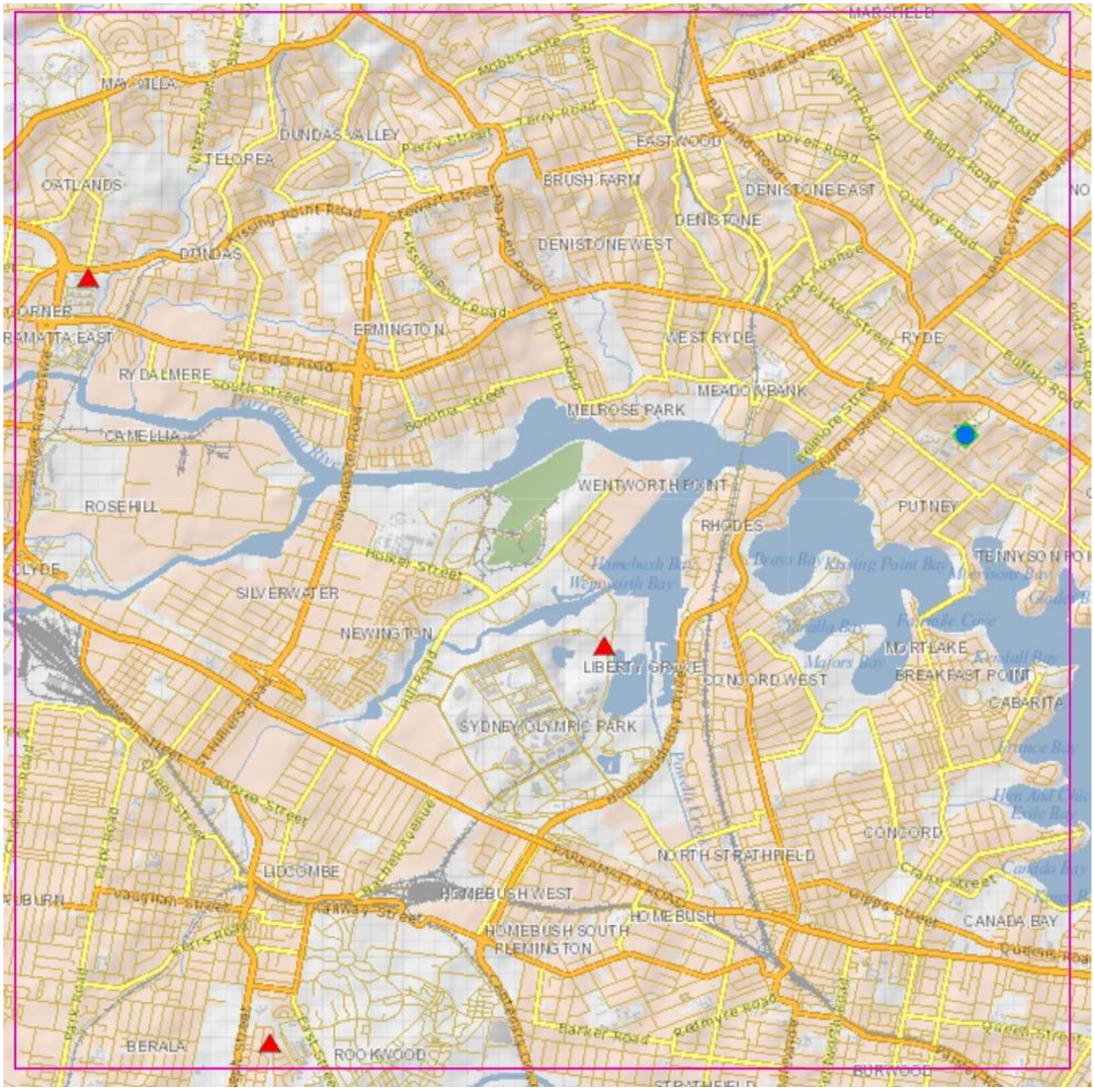
☑ P. prunifolia in the Parramatta, Auburn, Strathfield and Bankstown Local Government Areas

▽

☑ Zannichellia palustris

■

None of these species will be impacted by the proposed development.



☑ Magenta Lilly Pilly (Syzygium paniculatum)

▲

☑ ^^Bauer's Midge Orchid (Genoplesium baueri)

●

☑ ^^Sydney Plains Greenhood (Pterostylis saxicola)

◆

☑ Pimelea curviflora var. curviflora

▽

None of these species will be impacted by the proposed development.

5 Proposed Works and Potential Impacts

See detail in MasterPlan submitted (October 2018 reviewed Feb 2019) with the DA for detail and overview below.

5.1 Potential Impacts of Proposed works on adjoining DPIE land (Newington Nature Reserve).

Newington Nature Reserve is 48ha and its proximity to the site is shown in Figure 3
The following areas addressed each of the areas for consideration as presented in the *Guidelines for developments adjoining land managed by DPIE* (2013).

- erosion and sediment control
- stormwater runoff
- wastewater
- management implications relating to pests
- weeds and edge effects
- fire and the location of asset protection zones
- boundary encroachments and access through DPIE lands
- visual, odour, noise, vibration, air quality and amenity impacts
- threats to ecological connectivity and groundwater dependent ecosystems
- cultural heritage.

The above matters are addressed in this and other submissions. This submission focuses on the potential impacts to the surrounding lands. Following is the summary of issues and potential impacts from each factor. Shading and flight-path disturbance has also been added to the list and is discussed in this report. Current park management documents for Newington Nature Reserve were also consulted (see Reference section).

5.1.1 Erosion and sediment control

The next stage of planning will include details regarding erosion and sediment control. From the Masterplan perspective it can be confirmed that adequate on-site management will be in place to halt erosion and manage sediment such that is does not enter surrounding properties particularly the Saltmarsh and Mangroves and drainage lines.

5.1.2 Stormwater runoff

See concept plans for stormwater on-site retention, reuse and treatment as well as stormwater entry and exit points.

A key ecological consideration, that is influencing the storm water management design, is ensuring stormwater doesn't enter the saltmarsh in a way that results in increased freshwater flows and subsequent changes in species composition. Freshwater inflows from stormwater are known to favour the growth of Common Reed (Phragmites) over the saltmarsh species with the consequent loss of the Endangered Ecological Community of Saltmarsh and Vulnerable species such as Wilsonia.

The saltmarsh or mangroves will not receive stormwater unless it is proven to be of benefit to these communities and has prior approval from DPIE and DPI Fisheries. This would only be known at the more detailed planning stage. In other areas the option to release stormwater to saltmarsh as an ecological aid (during prolonged dry times in summer) to assist in establishment of saltmarsh species seedlings.

From the Masterplan perspective it will been confirmed that on-site management of stormwater will not result in negative impacts to the saltmarsh or mangroves.

DPIE's recommended are the guiding principles in the detail stages of design. These being:

- Development proposals for areas adjacent to DPIE land should incorporate stormwater detention and water quality systems (with appropriately managed buffer areas) within the development site.
- Stormwater should be diverted to council stormwater systems or to infiltration and subsurface discharge systems within the development site.
- The discharge of stormwater to DPIE land, where the quantity and quality of stormwater differs from natural levels, must be avoided.

5.1.3 Wastewater

No wastewater will be entering DPIE land. At this time is can be confirmed that wastewater can be kept out of the sensitive communities.

5.1.4 Management implications relating to pests

The management of companion animals, such as cats and dogs, is required and the DPIE recommendations of investigating all available options for minimising the risks from domestic pets that may arise from new development. The ecologist working on the team for this project is very aware of this issue for on-site and for the potential increase in numbers of people and dogs being walked near areas with migratory birds. The detail design phase will include methods for keeping companion animals out of DPIE lands and other areas used by sensitive species particularly migratory birds.

The following recommendations from the DPIE Guidelines (as summarised below) are part of the detail design phase considerations.

DPIE also encourages consideration of an appropriate buffer, vegetated where possible, or set-back between any development and DPIE land. Where managed effectively, a buffer may minimise the impact to the natural and cultural values of DPIE land, and increase the resilience of the area to counter potential impacts of climate change. Given the differences between sites and development types, it is not possible to specify a standard buffer; each development will need to be assessed on its merits. Developments that are designed to be sympathetic to adjoining lands, and to integrate with the landscape, are likely to require less need for buffers or set-backs.

5.1.5 Weeds and edge effects

Currently the site cleared and has been industrial use land. Vegetation is absent or poor. Exotic Kikuyu Grass is present along the boundary with the drainage line. Weeds will be managed on site until construction and landscaping. In the long term the proposed landscaping includes bring back bushland on-site and will include an intensive management plan for vegetation on-site and this will result in no weed spread for site to surrounds.

The riparian zones is dominated by weeds (Lantana and Privet) a Vegetation Management Plan is being prepared for this narrow strip to maximize the ecological values of the waterway. This will include retain bird habitat while works are occurring (through time).
The ecological communities currently on site are summarised in this map (Figure 4) from DPIE.

Figure 4 Vegetation Communities Newington Nature Reserve. Source: Fire planning DPIE (2016)
http://www.environment.nsw.gov.au/resources/firemanagement/final/newington-nature-reserve-fire-management-strategy-160694.pdf

5.1.6 Boundary encroachments and access through DPIE lands

Existing pathways assist in clearly demarcating DPIE land for other land. This can be formalized in the next stages of detail design. Fencing is also in place around Newington Reserve Mangroves and Saltmarsh and that boundary is clear. There unknowns related to the possible light-rail bridge crossing are yet to be determined and are not part of this MasterPlan, though the implications of a bridge and rail line in this area have been taken into consideration during land ownership demarcation and retaining and protecting saltmarsh.

5.1.7 Fire and the location of asset protection zones

No asset protection zones are currently proposed on the site or land adjoining the site and the hazard is low. The follow screenshot (Figure 5) shows areas of identified land management zones (green) and asset protection zones (red). For a large scale copy of this plan and clear detail see http://www.environment.nsw.gov.au/resources/firemanagement/final/newington-nature-reserve-fire-management-strategy-160694.pdf

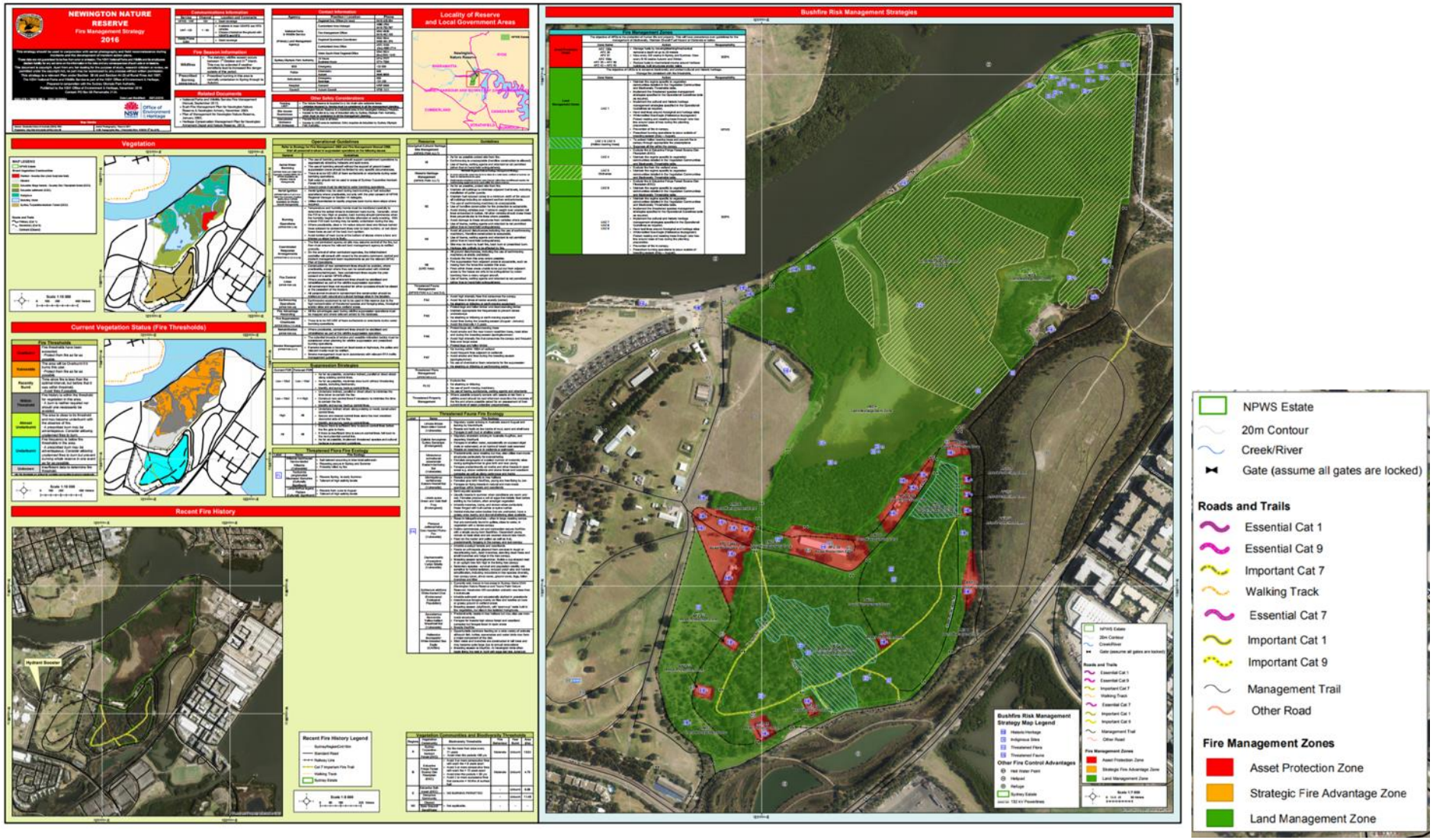
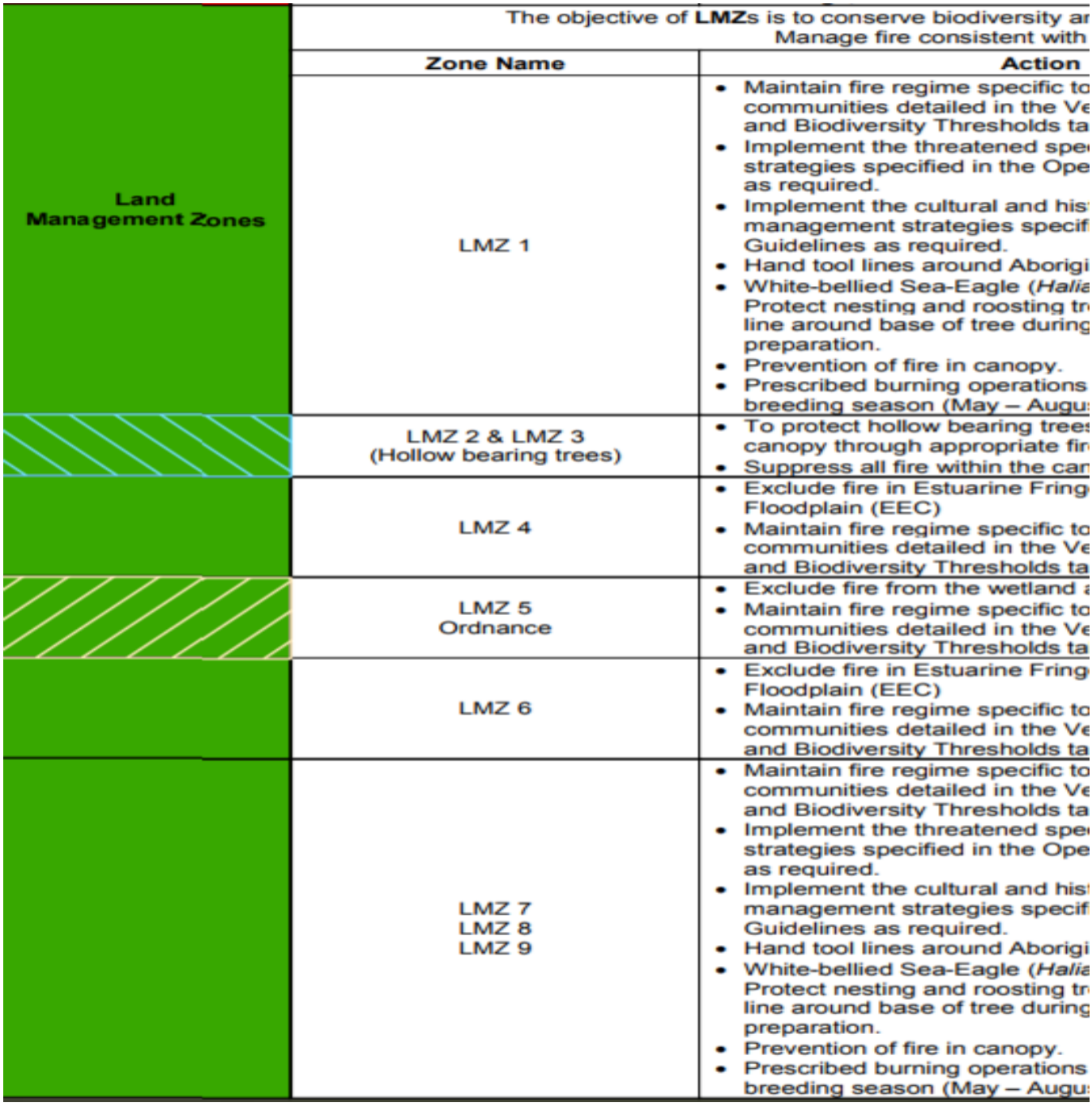


Figure 5. Areas of identified land management zones (Source: http://www.environment.nsw.gov.au/resources/firemanagement/final/newington-nature-reserve-fire-management-strategy



Land Management Zones	The objective of **LMZ**s is to conserve biodiversity ar Manage fire consistent with
	Zone Name	**Action**
	LMZ 1	• Maintain fire regime specific to communities detailed in the Ve and Biodiversity Thresholds ta • Implement the threatened spe strategies specified in the Ope as required. • Implement the cultural and hist management strategies specif Guidelines as required. • Hand tool lines around Aborigi • White-bellied Sea-Eagle (*Halia* Protect nesting and roosting tr line around base of tree during preparation. • Prevention of fire in canopy. • Prescribed burning operations breeding season (May – Augus
	LMZ 2 & LMZ 3 (Hollow bearing trees)	• To protect hollow bearing trees canopy through appropriate fir • Suppress all fire within the can
	LMZ 4	• Exclude fire in Estuarine Fring Floodplain (EEC) • Maintain fire regime specific to communities detailed in the Ve and Biodiversity Thresholds ta
	LMZ 5 Ordnance	• Exclude fire from the wetland a • Maintain fire regime specific to communities detailed in the Ve and Biodiversity Thresholds ta
	LMZ 6	• Exclude fire in Estuarine Fring Floodplain (EEC) • Maintain fire regime specific to communities detailed in the Ve and Biodiversity Thresholds ta
	LMZ 7 LMZ 8 LMZ 9	• Maintain fire regime specific to communities detailed in the Ve and Biodiversity Thresholds ta • Implement the threatened spe strategies specified in the Ope as required. • Implement the cultural and hist management strategies specif Guidelines as required. • Hand tool lines around Aborigi • White-bellied Sea-Eagle (*Halia* Protect nesting and roosting tr line around base of tree during preparation. • Prevention of fire in canopy. • Prescribed burning operations breeding season (May – Augus

Figure 5b – extract from newington-nature-reserve-fire-management

5.1.8 Visual, odour, noise, vibration, air quality (shading added) and amenity impacts

It is known that native fauna species can be affected by noise, vibration and lighting. They may also adversely affect the use and public enjoyment of open spaces and tracks particularly if with a dog.

It is also noted that the Sea-Eagles nest in Newington Reserve and migratory Wading birds that feed and roost in the salt marsh could use the site as part of their fly-way and the impacts of high-rise building nearby has to be taken into consideration. Sea-Eagles and Migratory Birds are addressed in the Fauna section of this document.

A detailed site-specific management plan will accompany the next level of detailed design to show how each of these are being managed. There will be impacts from noise and lighting and these will have to be managed to have least effect on the sites surrounding ecology. The detailed plan will address '*Landscaping with local native plant species, implementing buffer areas, limiting hours of operation, and use of appropriate colours, building material, lighting…" extract from DPIE Guidelines.*

5.1.1 Shading

Following are diagrams showing the expected shading at key times throughout the year these are extracts and original diagrams can be seen in the *Shadow Analysis* by Turner (2019) submitted with this DA. An aerial from SixMaps is also included to aid in visualising the vegetation types that will be shaded at some time.

The Turner *Shadow Analysis* also shows the comparison of the proposed Masterplan with the Previous Urban Growth Plan. It is noted from these that the difference in the shading of saltmarsh is negligible and that the shade is more into the STIF.

From an ecological perspective the Saltmarsh is the most important community to maximise light too. The STIF, particularly the mid and understory species are found growing in shaded areas. Shade in STIF area will occur until around 12am and then the area will have full afternoon sun. While for species, including turf grasses, it's know that morning sun promotes growth more than afternoon sun the same is not known for saltmarsh and areas with morning shade (until ~ 10am) have been visited and the saltmarsh is growing well (alive, with >80% ground cover).

Saltmarsh and Mangroves (Newington Nature Reserve Wetlands).
From the model (Turner February 2019) it can be seen that in Summer less than 5% (<300m2) of the saltmarsh is in shade at 8am and shadowing is gone by 9am.

Winter shadowing is in the early morning with shadowing largely on Mangroves with only 145m2 on Saltmarsh and 95% full sun on these communities by 10am. The vegetated areas of the Nature Reserve are in full sun from 11am.

The maximum amount of shading will occur in mid-winter at 8am, approximately 23,000m2 (2.3 Ha) of Saltmarsh will be shaded (figure 6c). By 9am, approximately 1,400m2 (0.14 Ha) will be shaded by the buildings with less than 5% of the saltmarsh in shade by 10am and shadowing is gone by 11am.

Ecologically the shading is deemed not significant to cause irreparable damage to the structure and function of Saltmarsh vegetation community. It may influence the distribution of the individual species within the community in shaded areas.

Other Vegetation including possible STIF (Woo-la-ra Landfill and Millenium Marker)
In Summer there is no shading of this area.
In Winter maximum shading is from 8-9am and an area ~5m wide at the northern most boundary of the site (adjoining the development area) has prolonged shade. This area requires ecological

rehabilitation as the area is a degraded terrestrial area. Replanting can be with shade tolerant locally native species appropriate the conditions and plant community type (PCT). Extracts from the Shade Diagrams (Turner February 2019) are included below, see figure 7a.

Figure 6a. Dark green are mangroves while the reddish colour is saltmarsh. SixMaps. NB aligned to be similar to the shadow diagrams.

Shadow diagrams 8am to 4pm Summer. Source Turner 11th Feb 2019

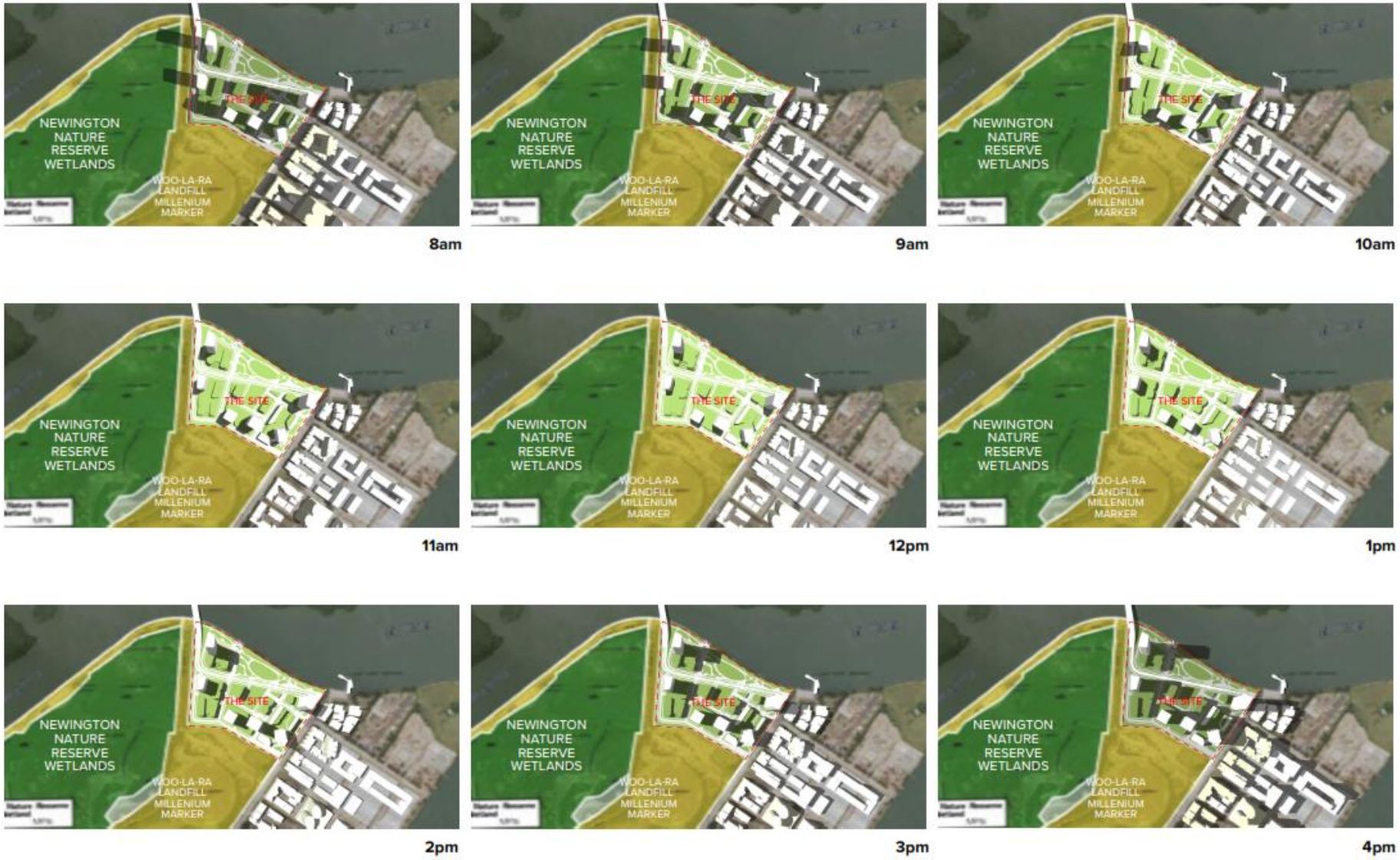


Figure 7a: Summer Solstice Shadow diagrams. Source Turner Feb 2019)

Shadow diagrams 8am to 4pm Winter. Source Turner 11th Feb 2019

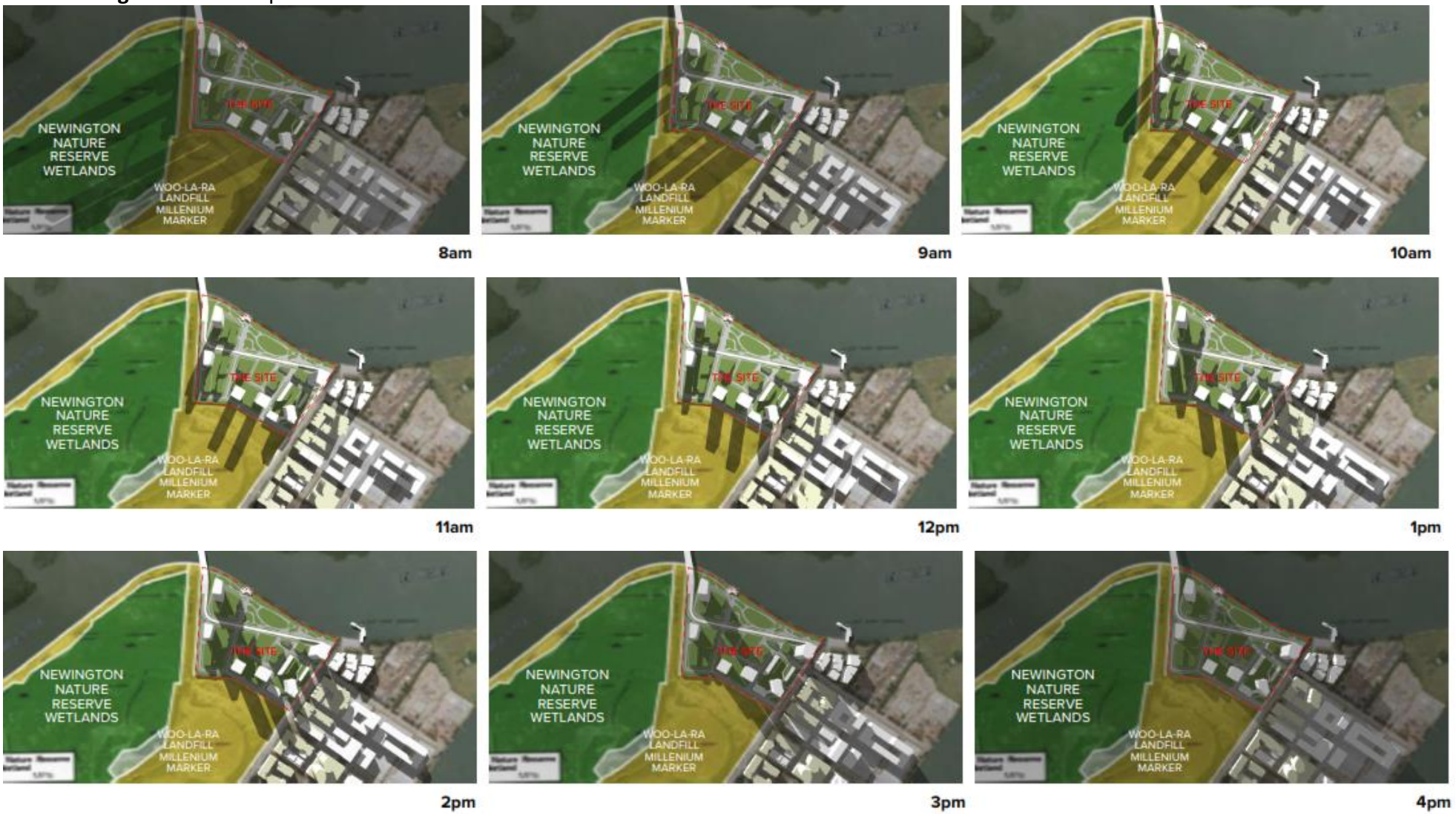


Figure 7b: Winter Solstice Shadow diagrams. Source Turner Feb 2019)

While shading does constitute a change in conditions for STIF vegetation it is expected to be acceptable and not result in a degradation of quality rather a possible shift in species at a micro scale. The proposed includes on-site landscaping with locally native species and will see an overall increase in vegetation and habitat for native fauna particularly small birds and invertebrates.

The following is from SOPA
Sydney Olympic Park Authority has specific statutory responsibilities for Newington Nature Reserve and the lands adjoining the Reserve. The Sydney Olympic Park Authority Act 2001 requires the Authority to manage the lands adjoining the Reserve in sympathy with the Reserve. (s30(5)). To this end, the Authority has established a vegetated buffer zone around the Reserve, including between the eastern edge of the Reserve and the western boundary of the development site. This provides screening as well as providing wildlife habitat, and will become increasingly important as the development proceeds.

This buffer will not be removed or reduced due to the development.

5.1.2 Threats to ecological connectivity and groundwater dependent ecosystems

Ecological Connectivity is to be retained.

Green links along public pathways are being retained or improved – locally native plant species will be used along these green corridors and there will be a focus on connecting habitat areas.

It is known that the aim is to have native vegetation and other flora and fauna habitats that provide a linkage, buffer, home range or refuge role on land that is adjacent to reserves are maintained and enhanced, where possible. Groundwater-dependent ecosystems in DPIE land are protected.

Recommended approach from DPIE guidelines are summarised below and are the basis of the landscaping design between the interface of the site and the surrounding lands.

DPIE recommends that ecological connectivity should be retained, protected and, where necessary, rehabilitated. corridor values, or connective importance, of any vegetation (not only trees) and waterways or water bodies and possible impacts from the proposed development.

Groundwater – is separated from any site interface due to the contaminated status of sub-surface soils.

See the proposed MasterPlan. Source: Turner Studio (2018-19) included in DA submission.

5.2 Recommendations for building and landscape design.

Preliminary recommendations and mitigation measures associated with direct (collision) and indirect impacts; lighting, building design, noise, additional people, increase use of the foreshore walkway are included below. It is noted that the impacts and subsequent mitigation measures will be addressed in detail and included in future detailed design reports for the proposal.

5.2.1 Direct impacts - Bird-strike (collision)

Bird-strike with buildings is poorly studied and there is a lack definitive best practice design. Ecologists will work in close consultation with the design team through the following phases of building design, to ensure all materials used are optimised to reduce bird-strike.

Design features such as;

- Glazing design
    - UV markings
    - Non-reflective glass
    - Patterns
    - Films
    - Screens and netting
- Building façade
    - Architectural features
- Landscape design
    - Location of green space
    - Native species

Should be investigated during the detailed design phase and incorporated into the building and landscape design where possible. Mitigation measures should be investigated by an ecologist and discussed with the design team to ensure implemented designs are best practice for wildlife.

5.2.2 Indirect impacts – Lighting, building design, noise, additional human activity,

Impacts arising from artificial lighting are not fully understood for all species, especially for Migratory Shorebirds. This is noted in the guiding document National Light Pollution Guidelines for Wildlife (Migratory Shorebirds).

Lighting designs will follow Best Practice Lighting Design as outlined in the National Light Pollution Guidelines for Wildlife (Migratory Shorebirds). Lighting design/management should be undertaken by appropriately qualified personnel. Light management plans should be developed and reviewed by appropriately qualified lighting practitioners who should consult with an appropriately qualified marine biologist or ecologist.

Management practices outlined in National Light Pollution Guidelines for Wildlife (Migratory Shorebirds) Best Practice Lighting Design – Appendix A include;

- Start with natural darkness and only add light for specific purposes.
- Use adaptive light controls to manage light timing, intensity and colour.
- Light only the object or area intended – keep lights close to the ground, directed and shielded to avoid light spill.
- Use the lowest intensity lighting appropriate for the task.
- Use non-reflective, dark-coloured surfaces.
- Use lights with reduced or filtered blue, violet and ultra-violet wavelengths.

Other indirect impacts including noise and additional human activity in the area can be managed and mitigated using appropriate building and landscape design. Noise can be reduced by using appropriate construction materials on building and landscape surfaces. Integrating green walls, gardens and greenspaces with strategic building design can reduce acoustic disturbance to local wildlife populations.

Such features can also be considered when designing the site for human movement. By creating spaces which will direct human movement and create barriers between areas of wildlife habitat. Gardens and screen plantings are two appropriate options to be considered.

All mitigations measures should be investigated during the next design phase and included for council comment in the following design reports.

6 Background documents

6.1 Site Specific

- Guidelines for developments adjoining land managed by the Office of Environment and Heritage, Office of Environment and Heritage published June 2010 revised copy of March 2013
- National Parks and Wildlife Service Fire Management Manual, September2013. Bush Fire Management Plan for Newington Nature Reserve &Newington Armory, November 2003.
- Plan of Management for Newington Nature Reserve, January 2003.
- Heritage Conservation Management Plan for Newington Armament Depot and Nature Reserve, 2013

6.2 References

- EPBC Act Policy Statement 3.21—Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species, Commonwealth of Australia 2017.
- Hansen, B.D., Fuller, R.A., Watkins, D., Rogers, D.I., Clemens, R.S., Newman, M., Woehler, E.J. and Weller, D.R. (2016) Revision of the East Asian-Australasian Flyway Population

Estimates for 37 listed Migratory Shorebird Species. Unpublished report for the Department of the Environment. BirdLife Australia, Melbourne.

- Jennifer O'Meara Kerry Darcovich.(2015) .Twelve years on: Ecological restoration and rehabilitation at Sydney Olympic Park. Ecological Management & Restoration © 2015 Ecological Society of Australia and Wiley Publishing Asia Pty Ltd.
- Matters of National Environmental Significance Significant Impact Guidelines 1.1 Environmental Protection and Biodiversity Conservation Act 1999, Commonwealth of Australia 2013.
- National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds, Commonwealth of Australia 2020.
- Protected Matters Search Tool - Matters of National Environmental Significance (MNES Search).

7 Appendices

7.1 5-part test for Migratory Wading Birds

Test of significance – excerpt from section 7.3 of the Biodiversity Conservation Act

The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

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

Species of Migratory Birds including those known to use the area, such as: Pacific Golden Plover (*Pluvialis fulva*), Latham's Snipe (*Gallinago hardwickii*), Bar-tailed Godwit (*Limosa lapponica baueri*), Sharp-tailed Sandpiper (*Calidris acuminata*), Curlew Sandpiper (*Calidris ferruginea*), Greenshank (*Tringa nebularia*) are protected under JAMBA and / or CAMBA agreements and NSW and or Federal Conservation Legislation. Local populations for international migratory birds can be defined on a number of scales. For this project the local population is being considered as those birds using Newington Wetlands and other Saltmarsh Wetlands within SOPA lands.

The proposed development will not directly remove habitat (foraging/roosting or other). The proposed development will have a minor (to negligible) shading influence on the Saltmarsh and Mangroves. The impact from the presence of the buildings is not fully understood in terms of possible impacts on flight paths or retaining a wide viewing area from the ground – it is noted that Mangroves are already blocking much of the visual scope for wading birds that would be feeding/roosting in the Saltmarsh. The impact is not expected to *adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.*

b. in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: i.is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

not an endangered community

or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

not an endangered community

i. in relation to the habitat of a threatened species or ecological community: the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

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

Habitat will not be directly lost.
Indirect impacts on habitat are from shading is not expected to impact Saltmarsh or Mangroves as the shaded area is small and present pre 9am in Summer and 10am in Winter.
The influence of the impact of tall buildings on flight paths is not known however the birds are likely to come in from over the water. If they cover over the land they will already have had to travel through high-rise (existing development).

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

Habitat is not being removed directly. Indirect impacts may come from a birds perceiving the buildings within the flight area. It's noted that birds have not been observed using the flight way over the existing development (and thus over the proposed development). Entry to the wetland is more via the open water-side (the River). The high-rise buildings do not remove habitat and are not expected to result in the fragmentation or isolation of habitat (any more than it already is) and not directly impact the long-term survival of the species or ecological community in the locality.

c. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

None declared in this area.

d. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

Loss of habitat is a KTP for migratory birds. No habitat will be directly lost.

A full assessment for each species of Migratory Bird has been completed to come to this conclusion. The area of Saltmarsh proposed to be impacted is less than the trigger value for requiring and BioBanking off-setting.

7.2 5-part test for Saltmarsh

Test of significance – excerpt from section 7.3 of the Biodiversity Conservation Act

The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

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

Not a Threatened Species

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

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

While there is no direct impact there will be shading of the Saltmarsh albeit briefly and shadow is past in summer by 9am and winter by 11am. The area of impact is <300m^2 within a larger complex of Saltmarsh (<5%). The local occurrence will not be impacted by the proposed development.

Or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

not an endangered community

c. in relation to the habitat of a threatened species or ecological community:

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

The area of potential impact from shading is <300m^2 within a larger complex of Saltmarsh (less than <5%).

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

Habitat will not be directly lost.
Indirect impacts on habitat are from shading is not expected to impact Saltmarsh or Mangroves as the shaded area is small and present pre 9am in Summer and 10am in Winter.

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

Habitat is not being removed directly. Indirect impacts may come from a shading – the Saltmarsh habitat is of high importance intrinsically and as habitat for fauna including threatened species.

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

None declared in this area.

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

Shading is not listed as a KTP.

7.3 Matters of National Environmental Significance Significant Impact Guidelines 1.1.

7.3.1 Threatened species

This subsection assesses threatened species under the *Matters of National Environmental Significance Significant Impact Guidelines 1.1.* Potential impacts (building strikes, shading of foraging habitat, artificial lighting, noise, increased human activity) were considered when assessing impacts on threatened species which may occur in the area. All species in the following subsection (7.3.1) are threatened under the EPBC Act and all were identified in the MNES search for the site.

Several species have been grouped by habitat requirements and feeding habits. This method satisfies requirements under the MNES *Significant Impact Guidelines 1.1* by successfully assessing the relevant threatened species for the site. Impacts on each species has been individually considered, although for the purposes of the report, species are grouped.

The *EPBC Act Policy Statement 3.21—Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species*, was used a guiding document for ecologists when undertaking the significant impact assessment in section 7.3.

7.3.1.1 Critically endangered and endangered species

Critically endangered and endangered species are assessed using the same impact criterion outlined in the *MNES Significant Impact Guidelines 1.1 – page 9.* Significant impact criterion for critically endangered and endangered species is listed below in **bold**.

The species listed below are known to occur in the area and would find habitat within Newington Wetlands and other Saltmarsh Wetlands within SOPA lands. Therefore, they have been assessed together. Impacts on each species has been individually considered, although for the purposes of the report, species are grouped.

Shorebirds birds and Wetland birds; Sandpipers (*Scolopacidae*), Plovers (*Charadriidae*), *Rostratulidae*. Herons (*Ardeidae*)

Family	Scientific Name	Common Name	Comm. status
Scolopacidae	Calidris canutus	Red Knot	Endangered
Scolopacidae	Calidris ferruginea	Curlew Sandpiper	Critically Endangered
Scolopacidae	Calidris tenuirostris	Great Knot	Critically Endangered
Scolopacidae	Numenius madagascariensis	Eastern Curlew	Critically Endangered
Scolopacidae	Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit	Critically Endangered
Charadriidae	Charadrius mongolus	Lesser Sand Plover	Endangered

Family	Scientific Name	Common Name	Comm. status
Rostratulidae	Rostratula australis	Australian Painted Snipe	Endangered
Ardeidae	*Botaurus poiciloptilus*	Australasian Bittern	Endangered

As per *Matters of National Environmental Significance Significant Impact Guidelines 1.1* an action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

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

The local population of shorebirds and wetland birds is being considered as those birds using Newington Wetlands and other Saltmarsh Wetlands within SOPA lands.

The proposed development will not directly remove habitat (foraging/roosting or other). The proposed development will have a minor (to negligible) shading influence on the Saltmarsh and Mangroves.

These impacts are expected not to lead to a long-term decrease in the size of the population of shorebirds and wetland birds using the Newington Wetlands and other Saltmarsh Wetlands within SOPA lands. The development will not directly affect shorebird habitat. Other direct (collision) and indirect impacts will be managed by best practice design.

- **reduce the area of occupancy of the species**

The proposed development will not directly remove habitat (foraging/roosting or other). The proposed development will have a minor (to negligible) shading influence on the Saltmarsh and Mangroves.

- **fragment an existing population into two or more populations**

The proposed development will not fragment the existing population of shorebirds and wetland birds using the Newington Wetlands and other Saltmarsh Wetlands within SOPA lands. Other direct (collision) and indirect impacts arising from lighting and building design will be managed by best practice design.

Daytime studies at Newington Wetlands have recorded approximately 20 individuals and night studies recording up too 220 birds (O'Meara and Darcovich, 2015). These numbers are below 0.1% of the total flyway population for most species. As such, it is unlikely that the development would cause fragmentation to a significant populations of shorebirds.

Indirect impacts may come from a birds perceiving the buildings within the flight area. It's noted that birds have not been observed using the flight way over the existing development (and thus over the proposed development). Entry to the wetland is more via the open water-side (the River). The proposed tall buildings are not within 40m of the saltmarsh feeding areas. Although, the tower height and bulk could result in birds that require open sightlines reducing, or stopping, use of areas near the buildings. Mangroves already impact most of the Saltmarsh areas (in terms of

being visual barriers to long-sight lines) and the largest patches of Saltmarsh present are away from the proposed building areas and separated from them by mangroves.

The high-rise buildings do not remove habitat and are not expected to result in the fragmentation or isolation of habitat. If birds access the site over the land they will already have had to travel through the existing significant high-rise developments and sight lines from the saltmarsh are currently obscured by Mangroves. The towers will not significantly impact upon site access for birds using the site.

- **adversely affect habitat critical to the survival of a species**

No habitat will be directly removed (foraging/roosting or other). The proposed development will have a minor (to negligible) shading influence on the Saltmarsh and Mangroves.

- **disrupt the breeding cycle of a population**

No habitat will be directly removed (foraging/roosting or other). The Newington Wetlands and other Saltmarsh Wetlands within SOPA lands will retain their current habitat values post development.

Indirect impacts are expected to be negligible. Building and landscape design will incorporate expert advice to ensure its design not cause a significant disruption to the lifecycles of shorebirds and wetland birds using the Newington Wetlands and other Saltmarsh Wetlands within SOPA lands.

The open flyway along the river will remain unaffected by the proposal. If birds access the site over the land they will already have had to travel through the existing significant high-rise developments. The proposal is not expected to significantly disrupt the breeding lifecycle of shorebirds and wetland birds.

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

The proposed development will not directly remove habitat (foraging/roosting or other). The proposed development will have a minor (to negligible) shading influence on the Saltmarsh and Mangroves. The shading will not significantly modify, destroy, remove, isolate or decrease the availability or quality of habitat. The maximum amount of shading will occur pre 9am in Summer and 10am in Winter.

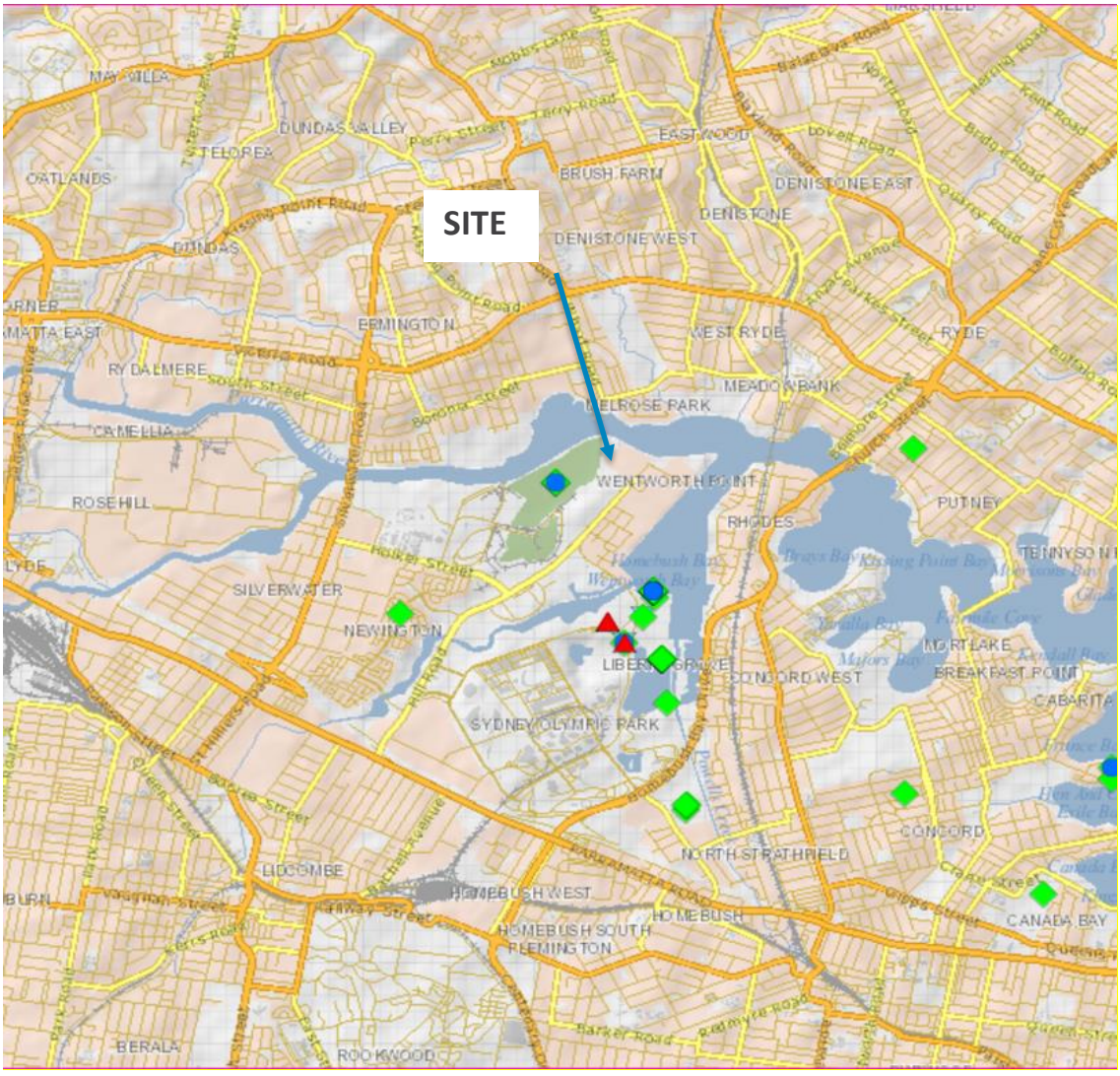
- **result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat**

It is unlikely that the development will result in an invasive species becoming established within areas of important habitat for migratory wetland birds. The proposal and any direct impacts will remain outside of important habitat for migratory wetland birds. An existing vegetated buffer between the proposed development site and the adjoining wetlands will remain in-situ post-development. This buffer is expected to reduce the likelihood of people and domestic animals entering the site and therefore reducing the likelihood that invasive species will be introduced.

Another key ecological consideration, is the influence of storm water management. The ecologist is closely involved in both the stormwater management and landscaping. A key consideration given the proximity of saltmarshes is ensure freshwater flows are not directed such that they could result in a change in specie composition to fresher tolerant species such as Typha or weed species. Suitable and effective stormwater management is possible on-site and details will continue to be developed.

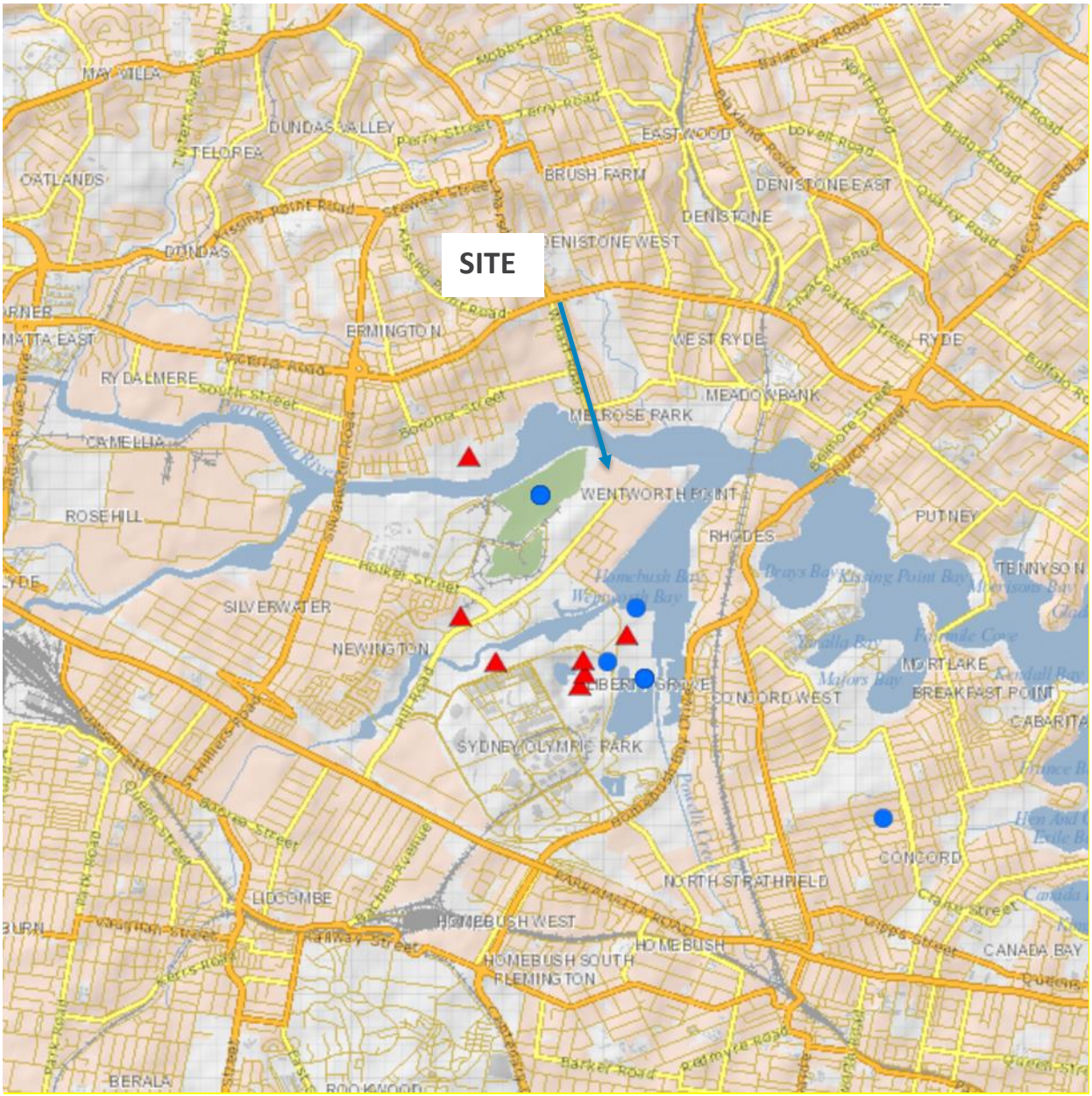
- **introduce disease that may cause the species to decline, or interfere with the recovery of the species.**

It is unlikely that the proposal would introduce disease that may cause the species to decline. The proposal will remain outside areas of habitat for shorebirds and wetland birds. The use of the existing buffer and stormwater management will further reduce the any potential impact on the population.



- ☑ Australian Painted Snipe (Rostratula australis)
- ☑ Red Knot (Calidris canutus)
- ☑ Curlew Sandpiper (Calidris ferruginea)
- ☑ Great Knot (Calidris tenuirostris)

Figure 8a. Recorded locations of commonwealth *CE* and E, Shorebirds birds and Wetland birds; Sandpipers (*Scolopacidae*), Plovers (*Charadriidae*), *Rostratulidae*. Herons (*Ardeidae*) as per Bionet recordings.



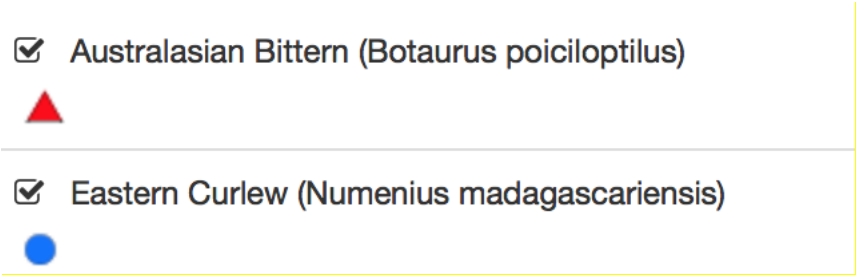


Figure 8b. Recorded locations of commonwealth *CE* and E, Shorebirds birds and Wetland birds; Sandpipers (*Scolopacidae*), Plovers (*Charadriidae*), *Rostratulidae*. Herons (*Ardeidae*) as per Bionet recordings.

NB. Species sightings for the species listed as threatened under the EPBC Act and recorded via Bionet since 1970 have been included under each subsection. Note – not all species listed within each subsection have been recorded in the 10km2 area.

Marine birds – Albatross (*Diomedeidae*)

Family	Scientific Name	Common Name	Comm. status
Diomedeidae	Diomedea sanfordi	Northern Royal Albatross	Endangered
Diomedeidae	Thalassarche eremita	Chatham Albatross	Endangered
Procellariidae	Macronectes giganteus	Southern Giant-Petrel,	Endangered

As per *Matters of National Environmental Significance Significant Impact Guidelines 1.1* an action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

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

There is a low likelihood of occurrence for the species of Albatross (*Diomedeidae*). Optimal foraging and breeding habitat is not present within the immediate vicinity of the proposed development area.

Additionally the species was never been recorded on Bionet within 10km of the proposed development area. It is unlikely that the development would cause a decrease in population of Albatross (*Diomedeidae*).

- **reduce the area of occupancy of the species**

The proposed development will not directly remove habitat (foraging/roosting or other). Albatross are not expected to occupy areas within immediate vicinity to the proposed development area.

- **fragment an existing population into two or more populations**

It is unlikely that a population would be affected and/or fragmented by the proposed development. The building is not proposed in known flyways for the Albatross, as it primarily found in marine environments.

- **adversely affect habitat critical to the survival of a species**

No habitat will be directly removed (foraging/roosting or other). Impacts for Albatross are expected the be negligible.

- **disrupt the breeding cycle of a population**

Breeding populations are unlikely to occur within immediate vicinity to the proposed development area. The Albatross are primarily found in marine environments and impacts on the species are expected the be negligible.

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

No habitat will be removed, modified, destroyed, removed, isolated or decreased (foraging/roosting or other). Albatross are primarily found in marine environments and impacts on the species are expected the be negligible.

- **result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat**

The proposal will not affect areas of habitat for the species. Therefore, the proposal will not introduce invasive species that are harmful to Albatross species.

- **introduce disease that may cause the species to decline, or interfere with the recovery of the species.**

It is unlikely that the proposal would introduce disease that may cause the species to decline. The Albatross are primarily found in marine environments and impacts on the species are expected the be negligible.

Granivorous, Nectarivorous, Insectivorous avifauna

Family	Scientific Name	Common Name	Comm. status
Meliphagidae	*Anthochaera phrygia*	Regent Honeyeater	Critically Endangered
Dasyornithidae	*Dasyornis brachypterus*	Eastern Bristlebird	Endangered
Psittaculidae	*Lathamus discolor*	Swift Parrot	Critically Endangered

As per *Matters of National Environmental Significance Significant Impact Guidelines 1.1* an action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

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

The likelihood of occurrence for Granivorous, Nectarivorous and Insectivorous avifauna is low – moderate. The birds would be expected to find marginal foraging habitat in the area surrounding the proposed development site. However, no critical habitat will be impacted such that a long-term decrease in size of local populations is caused.

Indirect impacts from artificial lighting and bird-strike are not expected to cause a significant long-term decrease in size of local populations. Local populations of Granivorous, Nectarivorous and Insectivorous birds currently forage within areas of significant artificial light and high rise developments. The proposal will not contribute towards the degradation or modification of critical habitat for Granivorous, Nectarivorous and Insectivorous birds. Impacts are expected the be negligible and local populations to remain unaffected.

Ecologists will work in close consultation with the design team through the following phases of building design, to ensure all materials used are optimised to reduce bird-strike. Including design features such as non-reflective glass, glazing design and building design. As previously discussed lighting designs will follow Best Practice Lighting Design as outlined in the National Light Pollution Guidelines for Wildlife. An Environmental Impact Assessment (EIA) will accompany the next level of detailed design to assess the impact of artificial lighting.

- **reduce the area of occupancy of the species**

The proposed development will not directly remove habitat (foraging/roosting or other). The proposed development is expected not the impact areas of critical habitat for Granivorous, Nectarivorous and Insectivorous birds. Critical habitat for the species is not present within the impact area. Thus, the proposal will not reduce areas of occupancy.

- **fragment an existing population into two or more populations**

The proposal occurs within a highly-urbanised landscape. The proposal is not expected to fragment local populations of Granivorous, Nectarivorous and Insectivorous birds. No critical habitat or breeding populations will be significantly affected such that they become fragmented.

Local populations are unlikely to be dependent upon the area for breeding or foraging purposes due to unsuitable habitat onsite. Thus, it is highly unlikely that local populations would become fragmented.

- **adversely affect habitat critical to the survival of a species**

The proposed development will not directly remove habitat (foraging/roosting or other). Local populations are unlikely to be dependent upon the area for breeding or foraging purposes due to unsuitable habitat onsite. Impacts on Granivorous, Nectarivorous and Insectivorous birds are expected to be negligible.

- **disrupt the breeding cycle of a population**

The proposal does not remove or modify areas of critical habitat for Granivorous, Nectarivorous and Insectivorous birds and therefore it is unlikely that breeding cycles of these birds would be disrupted.

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

The proposed development will not directly remove habitat (foraging/roosting or other). The proposed development will have a negligible Granivorous, Nectarivorous and Insectivorous birds. Marginal foraging habitat for these birds may be present within the adjoining nature reserve and SOPA lands. However, these areas will remain unaffected by the proposal and habitat values are expected to remain the same post development. Current habitat values of the site (proposed development area) are low.

Through best practice building design and appropriate landscaping of the area, foraging habitat values of the area may increase post development. Landscaping with locally native species and known browse trees for Granivorous, Nectarivorous and Insectivorous birds should increase foraging habitat value.

- **result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat**

No areas of breeding habitat are known to occur in the area for Granivorous, Nectarivorous and Insectivorous birds and therefore it is unlikely that the proposal would result in an invasive species becoming established in such areas.

Foraging habitat values are currently marginal and are expected to remain unaffected by the proposal. It is unlikely that the proposal would introduce invasive species which would affect the lifecycle of Granivorous, Nectarivorous and Insectivorous birds.

- **introduce disease that may cause the species to decline, or interfere with the recovery of the species.**

The proposal will not directly influence areas of habitat (foraging/roosting or other) for Granivorous, Nectarivorous and Insectivorous birds. Therefore, it is unlikely that the proposal would introduce disease that may cause the species to decline.

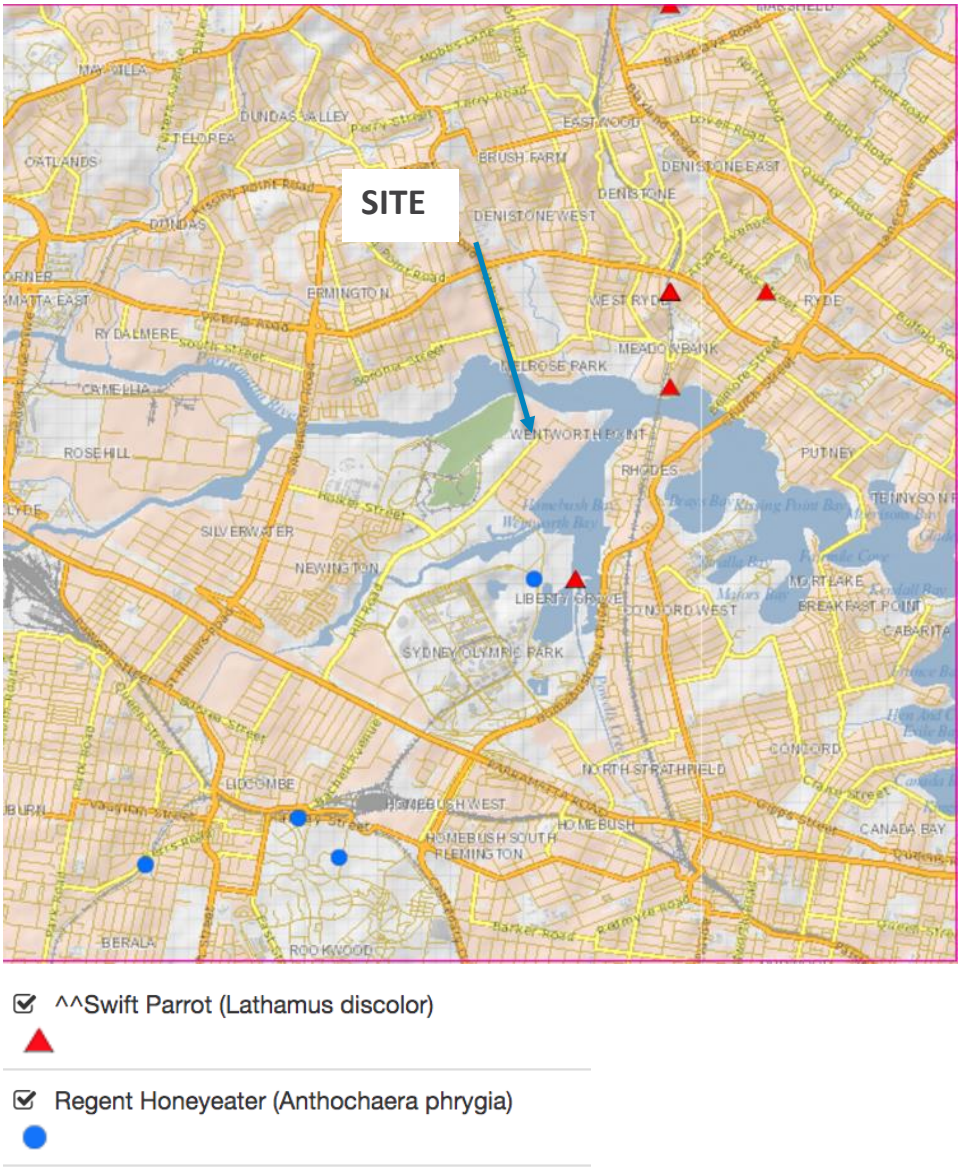


Figure 9. Recorded locations of commonwealth *CE* and *E.* Granivorous, Nectarivorous and Insectivorous avifauna. Source Bionet 2020.

NB. Species sightings for the species listed as threatened under the EPBC Act and recorded via Bionet since 1970 have been included under each subsection. Note – not all species listed within each subsection have been recorded in the 10km2 area.

7.3.1.2 Vulnerable species

Vulnerable species impact criterion is outlined in the *MNES Significant Impact Guidelines 1.1 – page 9.* Significant impact criterion for Vulnerable species is listed below in **bold**.

The species listed below are known to occur in the area and would find habitat within Newington Wetlands and other Saltmarsh Wetlands within SOPA lands. Therefore, they have been assessed together. Impacts on each species has been individually considered, although for the purposes of the report, species are grouped.

Shorebirds birds; Sandpipers (*Scolopacidae*) and Plovers (*Charadriidae*) and Laridae

Family	Scientific Name	Common Name	Comm. status
Scolopacidae	*Charadrius leschenaultii*	Greater Sand Plover	Vulnerable
Scolopacidae	*Thinornis rubricollis rubricollis*	Hooded Plover (eastern)	Vulnerable
Charadriidae	*Limosa lapponica baueri*	Bar-tailed Godwit (baueri)	Vulnerable
Laridae	*Sternula nereis nereis*	Australian Fairy Tern	Vulnerable

As per *Matters of National Environmental Significance Significant Impact Guidelines 1.1* an action is likely to have a significant impact on a Vulnerable species if there is a real chance or possibility that it will:

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

The local population of shorebirds is being considered as those birds using Newington Wetlands and other Saltmarsh Wetlands within SOPA lands.

The proposed development will not directly remove habitat (foraging/roosting or other). The proposed development will have a minor (to negligible) shading influence on the Saltmarsh and Mangroves.

These impacts are expected not to lead to a long-term decrease in the size of the population of shorebirds using the Newington Wetlands and other Saltmarsh Wetlands within SOPA lands. The development will not directly affect shorebird habitat. Other direct (collision) and indirect impacts will be managed by best practice design.

- **reduce the area of occupancy of an important population**

The proposed development will not directly remove habitat (foraging/roosting or other). The proposed development will have a minor (to negligible) shading influence on the Saltmarsh and Mangroves.

- **fragment an existing important population into two or more populations**

The proposed development will not fragment the existing population of shorebirds and wetland birds using the Newington Wetlands and other Saltmarsh Wetlands within SOPA lands. Impacts arising from lighting and building design will be managed by best practice design.

Daytime studies at Newington Wetlands have recorded approximately 20 individuals and night studies recording up too 220 birds (O'Meara and Darcovich, 2015). These numbers are below 0.1% of the total flyway population for most species. As such, it is unlikely that the development would cause fragmentation to a significant populations of shorebirds.

Indirect impacts may come from a birds perceiving the buildings within the flight area. It's noted that birds have not been observed using the flight way over the existing development (and thus over the proposed development). Entry to the wetland is more via the open water-side (the River). The proposed tall buildings are not within 40m of the saltmarsh feeding areas. Although, the tower height and bulk could result in birds that require open sightlines reducing, or stopping, use of areas near the buildings. Mangroves already impact most of the Saltmarsh areas (in terms of being visual barriers to long-sight lines) and the largest patches of Saltmarsh present are away from the proposed building areas and separated from them by mangroves.

The high-rise buildings do not remove habitat and are not expected to result in the fragmentation or isolation of habitat. If birds access the site over the land they will already have had to travel through the existing significant high-rise developments and sight lines from the saltmarsh are currently obscured by Mangroves. The towers will not significantly impact upon site access for birds using the site.

- **adversely affect habitat critical to the survival of a species**

No habitat will be directly removed (foraging/roosting or other). The proposed development will have a minor (to negligible) shading influence on the Saltmarsh and Mangroves

- **disrupt the breeding cycle of an important population**

No habitat will be directly removed (foraging/roosting or other). The Newington Wetlands and other Saltmarsh Wetlands within SOPA lands will retain their current habitat values post development.

Indirect impacts are expected to be negligible. Building design will incorporate expert advice to ensure its design not cause a significant disruption to the lifecycles of shorebirds using the Newington Wetlands and other Saltmarsh Wetlands within SOPA lands.

The open flyway along the river will remain unaffected by the proposal. If birds access the site over the land they will already have had to travel through the existing significant high-rise developments. The proposal is not expected to significantly disrupt the breeding lifecycle of shorebirds.

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

The proposed development will not directly remove habitat (foraging/roosting or other). The proposed development will have a minor (to negligible) shading influence on the Saltmarsh and Mangroves. The shading will not significantly modify, destroy, remove, isolate or decrease the availability or quality of habitat. The maximum amount of shading will occur pre 9am in Summer and 10am in Winter.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat**

It is unlikely that the development will result in an invasive species becoming established within areas of important habitat for migratory wetland birds. The proposal and any direct impacts will remain outside of important habitat for migratory wetland birds. An existing vegetated buffer between the proposed development site and the adjoining wetlands will remain in-situ post-development. This buffer is expected to reduce the likelihood of people and domestic animals entering the site and therefore reducing the likelihood that invasive species will be introduced.

Another key ecological consideration, is the influence of storm water management. The ecologist is closely involved in both the stormwater management and landscaping. A key consideration given the proximity of saltmarshes is ensure freshwater flows are not directed such that they could result in a change in specie composition to fresher tolerant species such as Typha or weed species. Suitable and effective stormwater management is possible on-site and details will continue to be developed.

- **introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species.**

It is unlikely that the proposal would introduce disease that may cause the species to decline. The proposal will remain outside areas of habitat for shorebirds. The use of the existing buffer and stormwater management will further reduce the any potential impact on the population.

Figure 10. Recorded locations of commonwealth *Vulnerable*, Shorebirds birds; Sandpipers (*Scolopacidae*), Plovers (*Charadriidae*), *Rostratulidae* as per Bionet recordings.

NB. Species sightings for the species listed as threatened under the EPBC Act and recorded via Bionet since 1970 have been included under each subsection. Note – not all species listed within each subsection have been recorded in the 10km2 area.

Marine birds; Albatross (*Diomedeidae*) and *Procellariidae*

Family	Scientific Name	Common Name	Comm. status
Diomedeidae	*Diomedea antipodensis*	Antipodean Albatross	Vulnerable
Diomedeidae	*Diomedea antipodensis gibsoni*	Gibson's Albatross	Vulnerable
Diomedeidae	*Diomedea epomophora*	Southern Royal Albatross	Vulnerable
Diomedeidae	*Diomedea exulans*	Wandering Albatross	Vulnerable
Diomedeidae	*Thalassarche bulleri*	Buller's Albatross	Vulnerable
Diomedeidae	*Thalassarche bulleri platei*	Northern Buller's Albatross	Vulnerable
Diomedeidae	*Thalassarche cauta cauta*	Shy Albatross	Vulnerable
Diomedeidae	*Thalassarche cauta steadi*	White-capped Albatross	Vulnerable
Diomedeidae	*Thalassarche impavida*	Campbell Albatross	Vulnerable
Diomedeidae	*Thalassarche melanophris*	Black-browed Albatross	Vulnerable
Diomedeidae	*Thalassarche salvini*	Salvin's Albatross	Vulnerable
Procellariidae	*Macronectes halli*	Northern Giant Petrel	Vulnerable
Procellariidae	*Pachyptila turtur subantarctica*	Fairy Prion (southern)	Vulnerable

As per *Matters of National Environmental Significance Significant Impact Guidelines 1.1* an action is likely to have a significant impact on a Vulnerable species if there is a real chance or possibility that it will:

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

There is a low likelihood of occurrence for the species of Marine birds (*Diomedeidae and Procellariidae*). Optimal foraging and breeding habitat is not present within the immediate vicinity of the proposed development area.

Additionally, the species listed above have never been recorded on Bionet within 10km of the proposed development area. It is unlikely that the development would cause a decrease in population of Marine birds (*Diomedeidae and Procellariidae*).

- **reduce the area of occupancy of the species**

The proposed development will not directly remove habitat (foraging/roosting or other). Marine birds (*Diomedeidae and Procellariidae*) are not expected to occupy areas within immediate vicinity to the proposed development area.

- **fragment an existing population into two or more populations**

It is unlikely that a population would be affected and/or fragmented by the proposed development. The building is not proposed in known flyways for Marine birds (*Diomedeidae and Procellariidae*), as they primarily found in marine environments.

- **adversely affect habitat critical to the survival of a species**

No habitat will be directly removed (foraging/roosting or other). Impacts for Marine birds (*Diomedeidae and Procellariidae*) are expected the be negligible.

- **disrupt the breeding cycle of a population**

Known breeding populations are unlikely to occur within immediate vicinity to the proposed development area. The Marine birds (*Diomedeidae and Procellariidae*) are primarily found in marine environments and impacts on the species are expected the be negligible.

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

No habitat will be removed, modified, destroyed, removed, isolated or decreased (foraging/roosting or other). Marine birds (*Diomedeidae and Procellariidae*) are primarily found in marine environments and impacts on the species are expected the be negligible.

- **result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat**

The proposal will not affect areas of habitat for the species. Therefore, the proposal will not introduce invasive species that are harmful to Marine bird (*Diomedeidae and Procellariidae*). species.

- **introduce disease that may cause the species to decline, or interfere with the recovery of the species.**

It is unlikely that the proposal would introduce disease that may cause the species to decline. The Marine birds (*Diomedeidae and Procellariidae*) are primarily found in marine environments and impacts on the species are expected the be negligible.

Granivorous, Nectarivorous, Insectivorous avifauna

Family	Scientific Name	Common Name	Comm. status
Meliphagidae	*Grantiella picta*	Painted Honeyeater	Vulnerable
Apodidae	*Hirundapus caudacutus*	White-throated Needletail	Vulnerable

As per *Matters of National Environmental Significance Significant Impact Guidelines 1.1* an action is likely to have a significant impact on a Vulnerable species if there is a real chance or possibility that it will:

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

The likelihood of occurrence for Granivorous, Nectarivorous and Insectivorous avifauna is low – moderate. The birds would be expected to find marginal foraging habitat in the area surrounding the proposed development site. However, no critical habitat will be impacted such that a long-term decrease in size of local populations is caused.

Direct (collision) and Indirect impacts from artificial lighting and bird-strike are not expected to cause a significant long-term decrease in size of local populations. Local populations of Granivorous, Nectarivorous and Insectivorous birds currently forage within areas of significant artificial light and high rise developments. The proposal will not contribute towards the degradation or modification of critical habitat for Granivorous, Nectarivorous and Insectivorous birds. Impacts are expected the be negligible and local populations to remain unaffected.

Ecologists will work in close consultation with the design team through the following phases of building design, to ensure all materials used are optimised to reduce bird-strike. Including design features such as non-reflective glass, glazing design and building design. As previously discussed lighting designs will follow Best Practice Lighting Design as outlined in the National Light Pollution Guidelines for Wildlife. An Environmental Impact Assessment (EIA) will accompany the next level of detailed design to assess the impact of artificial lighting.

- **reduce the area of occupancy of the species**

The proposed development will not directly remove habitat (foraging/roosting or other). The proposed development is expected not the impact areas of critical habitat for Granivorous, Nectarivorous and Insectivorous birds. Critical habitat for the species is not present within the impact area. Thus, the proposal will not reduce areas of occupancy.

- **fragment an existing population into two or more populations**

The proposal occurs within a highly-urbanised landscape. The proposal is not expected to fragment local populations of Granivorous, Nectarivorous and Insectivorous birds. No critical habitat or breeding populations will be significantly affected such that they become fragmented. Local populations are unlikely to be dependent upon the area for breeding or foraging purposes due to unsuitable habitat onsite. Thus, it is highly unlikely that local populations would become fragmented.

- **adversely affect habitat critical to the survival of a species**

The proposed development will not directly remove habitat (foraging/roosting or other). Local populations are unlikely to be dependent upon the area for breeding or foraging purposes due to unsuitable habitat onsite. Impacts on Granivorous, Nectarivorous and Insectivorous birds are expected to be negligible.

- **disrupt the breeding cycle of a population**

The proposal does not remove or modify areas of critical habitat for Granivorous, Nectarivorous and Insectivorous birds and therefore it is unlikely that breeding cycles of these birds would be disrupted.

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

The proposed development will not directly remove habitat (foraging/roosting or other). The proposed development will have a negligible Granivorous, Nectarivorous and Insectivorous birds. Marginal foraging habitat for these birds may be present within the adjoining nature reserve and SOPA lands. However, these areas will remain unaffected by the proposal and habitat values are expected to remain the same post development. Current habitat values of the site (proposed development area) are very low.

Through best practice building design and appropriate landscaping of the area, foraging habitat values of the area may increase post development. Landscaping with locally native species and known browse trees for Granivorous, Nectarivorous and Insectivorous birds should increase foraging habitat value.

- **result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat**

No areas of breeding habitat are known to occur in the area for Granivorous, Nectarivorous and Insectivorous birds and therefore it is unlikely that the proposal would result in an invasive species becoming established in such areas.

Foraging habitat values are currently marginal and are expected to remain unaffected by the proposal. It is unlikely that the proposal would introduce invasive species which would affect the lifecycle of Granivorous, Nectarivorous and Insectivorous birds.

- **introduce disease that may cause the species to decline, or interfere with the recovery of the species.**

The proposal will not directly influence areas of habitat (foraging/roosting or other) for Granivorous, Nectarivorous and Insectivorous birds. Therefore, it is unlikely that the proposal would introduce disease that may cause the species to decline.

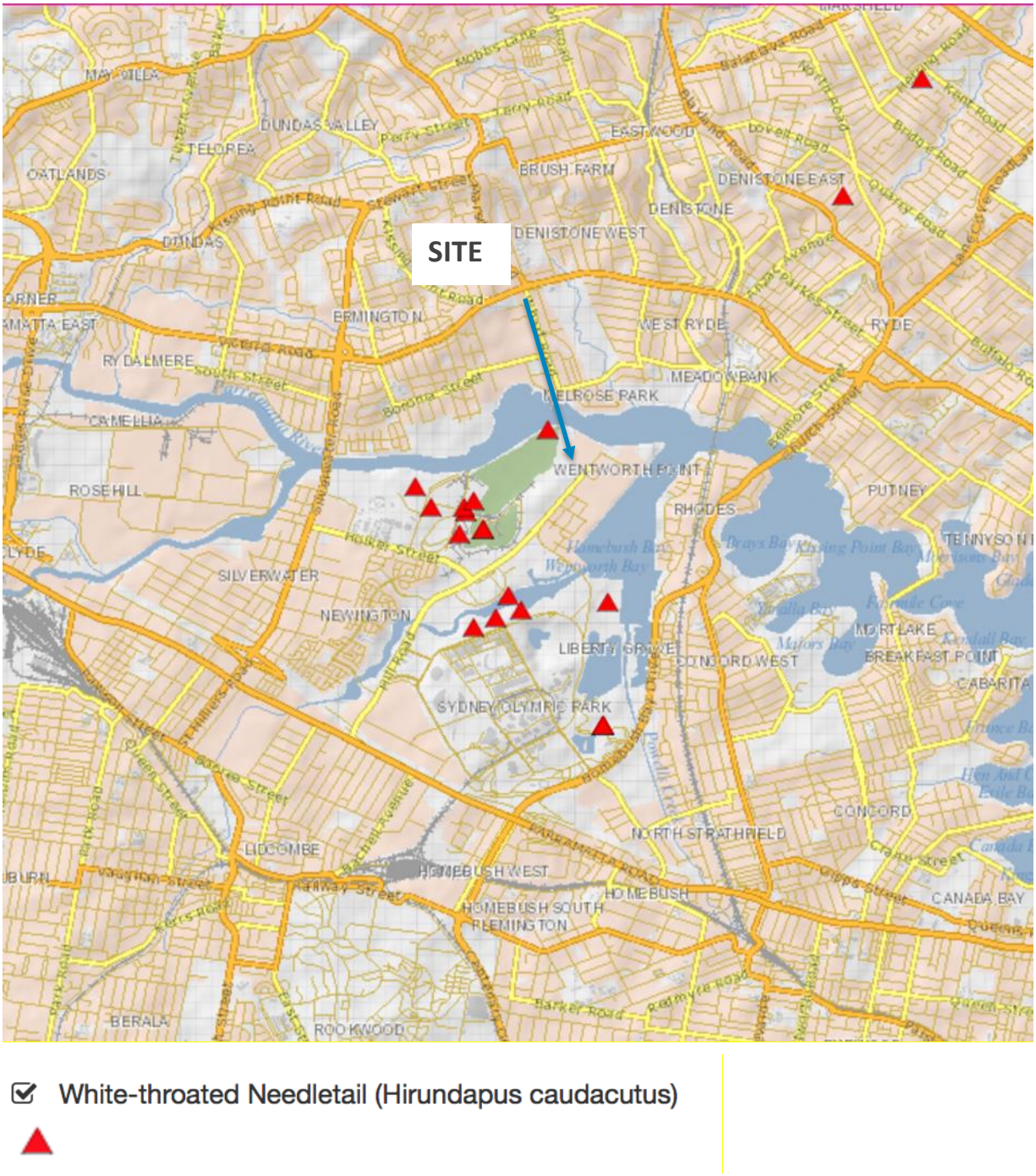


Figure 11. Recorded locations of commonwealth *Vulnerable* Granivorous, Nectarivorous and Insectivorous avifauna. Source Bionet 2020.

NB. Species sightings for the species listed as threatened under the EPBC Act and recorded via Bionet since 1970 have been included under each subsection. Note – not all species listed within each subsection have been recorded in the 10km2 area.

7.3.2 Migratory species

The following species have been assessed under the *Matters of National Environmental Significance Significant Impact Guidelines 1.1.* The following species are listed as migratory wetland birds as per the Matters of National Environmental Significance (MNES Search). They are believed to have a moderate to high likelihood of occurrence onsite and/or in the adjoining Newington Wetlands and other Saltmarsh Wetlands within SOPA lands.

Not all the migratory wetland birds within the following section are commonwealth threatened species. However, the predominant potential impact associated with the proposal is shading of saltmarsh, which is important habitat for several species of migratory wetland birds. Therefore, all migratory wetland birds in MNES have been assessed to gauge the significance of impacts.

Other listed migratory species including non-threatened migratory marine species and non-threatened migratory terrestrial species have not been assessed as they are believed the have a low likelihood of occurrence onsite and in the adjoining wetland. Impacts on these species are expected to be negligible. Threatened species with a moderate to high likelihood of occurrence are assessed above in section 7.3.1.

7.3.2.1 Migratory wetland birds

Migratory wetland birds as per the MNES search and assessed in this subsection are included in table 11 below.

Table 11. Migratory wetland birds as per the MNES search and assessed in this subsection assessment.

Scientific Name	Common Name	Comm. status
Sandpipers (Scolopacidae)		
Actitis hypoleucos	Common Sandpiper	
Arenaria interpres	Ruddy Turnstone	
Calidris acuminata	Sharp-tailed Sandpiper	
Calidris canutus	Red Knot	Endangered
Calidris ferruginea	Curlew Sandpiper	Critically Endangered
Calidris melanotos	Pectoral Sandpiper	
Calidris ruficollis	Red-necked Stint	
Calidris tenuirostris	Great Knot	Critically Endangered
Gallinago hardwickii	Latham's Snipe	
Gallinago megala	Swinhoe's Snipe	
Gallinago stenura	Pin-tailed Snipe	
Limosa lapponica	Bar-tailed Godwit	

Scientific Name	Common Name	Comm. status
Limosa limosa	Black-tailed Godwit	
Numenius madagascariensis	Eastern Curlew	Critically Endangered
Numenius minutus	Little Curlew, Little Whimbrel	
Numenius phaeopus	Whimbrel	
Philomachus pugnax	Ruff (Reeve)	
Tringa stagnatilis	Marsh Sandpiper	
Plovers (Charadriidae)		
Charadrius bicinctus	Double-banded Plover	
Charadrius leschenaultii	Greater Sand Plover	Vulnerable
Charadrius mongolus	Lesser Sand Plover	Endangered
Pluvialis fulva	Pacific Golden Plover	
Tringa brevipes	Grey-tailed Tattler	
Tringa nebularia	Common Greenshank, Greenshank	
Birds of prey (Pandionidae)		
Pandion haliaetus	Osprey	

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

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

The proposed development will not directly remove habitat (foraging/roosting or other). The proposed development will have a minor (to negligible) shading influence on the Saltmarsh and Mangroves.

Shading is not expected to substantially modify Saltmarsh or Mangroves as the shaded area is small and present pre 9am in Summer and 10am in Winter.

Other Indirect impacts may come from a birds perceiving the buildings within the flight area. It's noted that birds have not been observed using the flight way over the existing development (and thus over the proposed development). Entry to the wetland is more via the open water-side (the River). The high-rise buildings do not remove habitat and are not expected to result in the fragmentation or isolation of habitat (any more than it already is) and not directly impact the long-term survival of the species or ecological community in the locality. The influence of the impact of tall buildings on flight paths is not known however the birds are likely to come in from over the water. If they cover over the land they will already have had to travel through high-rise (existing development).

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

It is unlikely that the development will result in an invasive species becoming established within areas of important habitat for migratory wetland birds.

The proposal and any direct impacts will remain outside of important habitat for migratory wetland birds. An existing vegetated buffer between the proposed development site and the adjoining wetlands will remain in-situ post-development. This buffer is expected to reduce the likelihood of people and domestic animals entering the site and therefore reducing the likelihood that invasive species will be introduced.

Another key ecological consideration, is the influence of storm water management. The ecologist is closely involved in both the stormwater management and landscaping. A key consideration given the proximity of saltmarshes is ensure freshwater flows are not directed such that they could result in a change in specie composition to fresher tolerant species such as Typha or weed species. Suitable and effective stormwater management is possible on-site and details will continue to be developed.

3. **seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.**

The proposed development will not directly remove habitat (foraging/roosting or other). The proposed development will have a minor (to negligible) shading influence on the Saltmarsh and Mangroves. This shading will not significantly alter community composition of the saltmarsh. Therefore, it is expected that shading will not seriously disrupt the lifecycle of migratory wetland birds. Direct (collision) and indirect impacts associated with lighting, building design, noise, additional people, increase use of the foreshore walkway can be appropriately managed during the following design stages. The identified direct (collision) and indirect impacts are not expected to seriously disrupt the lifecycle of migratory wetland birds.

Ecologists will work in close consultation with the design team through the following phases of building design, to ensure all materials used are optimised to reduce bird-strike. Including design features such as non-reflective glass, glazing design (UV Markings) and building design. Impacts arising from artificial lighting are not fully understood for each species. This is noted in the guiding document National Light Pollution Guidelines for Wildlife (Migratory Shorebirds). As previously discussed lighting designs will follow Best Practice Lighting Design as outlined in the National Light Pollution Guidelines for Wildlife (Migratory Shorebirds). Impacts associated with noise and increased human activity in the areas can be managed by appropriate landscape design.

Migratory birds typically use areas for foraging and roosting where the birds have a clear sight line for at least 40m. The proposed tall buildings are not within 40m of the saltmarsh feeding areas. Although, the tower height and bulk could result in birds that require open sightlines reducing, or stopping, use of areas near the buildings. Mangroves already impact most of the Saltmarsh areas (in terms of being visual barriers to long-sight lines) and the largest patches of Saltmarsh present are away from the proposed building areas and separated from them by mangroves.

For any questions relating to this report please contact:

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