Biodiversity Development Assessment Report

Liverpool Health and Academic Precinct – Multi Storey Carpark

Report prepared for NSW Health Infrastructure

April 2020

NARLA
environmental

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Report Certification

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Document Control

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Glossary

Acronym/ Term	Definition
Accredited Biodiversity Assessor	Individuals accredited by the Department of Planning, Industry and Environment (DPIE) to apply the Biodiversity Assessment Method
BAM	The NSW Biodiversity Assessment Method
BAMC	The NSW Biodiversity Assessment Method Calculator
BC Act	New South Wales Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
Biodiversity credit report	The report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site
Biodiversity Offsets	Management actions that are undertaken to achieve a gain in biodiversity values on areas of land in order to compensate for losses to biodiversity from the impacts of development
Biodiversity values	The composition, structure and function of ecosystems, including threatened species, populations and ecological communities, and their habitats.
BOS	NSW Biodiversity Offset Scheme
DA	Development Application
DPIE	NSW Department of Planning, Industry and Environment (formerly OEH)
Ecosystem credit	A credit that relates to a vegetation type and the threatened species that are reliably predicted by that vegetation type (as a habitat surrogate).
EEC	Endangered Ecological Community
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ha	Hectare
HTE	High Threat Exotic
km	Kilometre
LGA	Local Government Area
Locality	The area within a 10km radius of the Subject Land. The same meaning when describing a local population of a species or local occurrence of an ecological community.
m	metres
MNES	Matters of National Environmental Significance
Native Vegetation	Means any of the following types of plants native to New South Wales:(a) trees (including any sapling or shrub or any scrub), (b) understorey plants, (c) groundcover (being any type of herbaceous vegetation), (d) plants occurring in a wetland.
NSW	The State of New South Wales
OEH	Office of Environment and Heritage (now DPIE)
PCT	NSW Plant Community Type
Priority weed	Priority weed in the Greater Sydney Region as per the *Biosecurity Act 2015*
Proposal	The development, activity or action proposed.
SAII	Serious and Irreversible Impacts
SAII entity	Species and ecological communities that are likely to be the subject of serious and irreversible impacts (SAIIs)
SEPP	State Environmental Planning Policy
Species credit	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.
SSD	State Significant Development
Study Area	The area that was subject to a site survey and assessed for direct or indirect impacts arising from construction and operation of the proposal.
Subject Land	The location of the proposed activity, the subject of this report.
Subject Property	Liverpool Health and Academic Precinct: Corner of Elizabeth Street and Goulburn Streets, Liverpool (Lot 501, DP1165217).
Threatened biota	Threatened species, populations or ecological communities listed under the BC Act and/or the EPBC Act.
Threatened species, populations and ecological communities	Species, populations and ecological communities specified in Schedules 1 and 2 of the BC Act 2016.Species, populations and ecological communities specified in Schedules 1, 1A and 2 and '*threatened species, population or ecological community*' means a species, population or ecological community specified in any of those Schedules.
TPZ	Tree Protection Zone: A specified area above and below ground and at a given distance from the trunk set aside for the protection of a tree's roots and crown to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development
VIS Plot	Vegetation Integrity Survey Plot

Executive Summary

NSW Health Infrastructure propose to construct a new multi storey carpark, with connections to the existing road works, and associated landscaping, at the Liverpool Health and Academic Precinct. As the proposed development is a State Significant Development (SSD-10388), the Secretary's Environmental Assessment Requirements (SEARs) issued for the Environmental Impact Statement (EIS) by the NSW Department of Planning, Industry and Environment (DPIE) requires a Biodiversity Development Assessment Report (BDAR) to be undertaken by an accredited assessor to assess the impacts of the proposed development. This BDAR has been prepared by Narla Environmental Pty Ltd to identify the potential impacts of the proposed development on biodiversity values within the Subject Land. This has been completed in accordance with the Biodiversity Assessment Method (BAM) and includes:

- Comprehensive literature review and desktop assessment to describe the historically recorded environment and landscape features of the Subject Land and to identify the suite of threatened biota potentially affected by the proposal;
- Site assessment to describe the biodiversity values of the Subject Land and to determine the likelihood of threatened biota and their habitats occurring within the proposed activity footprint;
- Discussion and recommendation of measures to avoid and minimise impacts to biodiversity values;
- Discussion on impacts to biodiversity values including Serious and Irreversible Impacts (SAII); and
- Quantifying the level of biodiversity impacts of the proposal following the implementation of measures to avoid and minimise impacts, and to determine the biodiversity credits that will need to be purchased and retired to offset the residual impacts of the proposal.

The Subject Land has been historically cleared and altered, and comprises existing buildings including the P2 carpark, as well as bitumen roads, car parking spaces and footpaths. Some vegetation exists in the form of established native and exotic gardens, and mowed lawn areas. Such areas of vegetation within the Subject Land have been previously assessed for removal in the Review of Environmental Factors prepared by Ethos Urban for the Civil Infrastructure Works at Liverpool Hospital. This was approved by NSW Health Infrastructure on the 6th November 2019 (NSW Health Infrastructure 2019). As a result, no native vegetation requires assessment under this BDAR. Therefore, no assessment under the BAM is required. No candidate ecosystem or species credit species will require offsetting under the Biodiversity Offset Scheme (BOS) as a result of the proposed development. No submission within the Biodiversity Assessment Method Calculator (BAMC) is required.

In order to avoid and minimise potential impacts of the proposal on local biodiversity values, a series of mitigation and management measures have been identified, which are to be implemented as part of any Construction Environmental Management Plan (CEMP) produced for the site. It is unlikely the proposed development will indirectly impact on adjacent fauna habitat or vegetation, considering the Subject Land and surrounded area is located within a highly developed and modified landscape.

1. Introduction

1.1 Overview

Narla Environmental Pty Ltd (Narla) was commissioned by Johnstaff Projects Pty Ltd on behalf of NSW Health Infrastructure ('the proponent') to prepare this BDAR as part of the SEARs for the Liverpool Hospital Multi Storey Car Park (SSD-10388) at the Liverpool Health and Academic Precinct (Lot 501 DP1165217; hereafter referred to as the 'Subject Property').

The Liverpool Hospital Multi Storey Car Park is a State Significant Development (SSD). Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) establishes the assessment framework for SSD's. The preparation of this BDAR is in response to Part 18 'Biodiversity Assessment' of the SEAR issued for the EIS by the NSW DPIE.

1.2 Site Location and Description

The Subject Property is situated within the Liverpool Central Business District (CBD), on the corner of Elizabeth Street and Goulburn Streets, Liverpool, within the Liverpool Local Government Area (LGA). The hospital campus includes land east and west of the Main Southern Railway, which forms an eastern campus (7.216 ha) and western campus (8.31 ha).

1.3 The Proposed Development

The Subject Land is located within the eastern extent of the western Liverpool Hospital campus, covering an area of approximately 1.50 ha (**Figure 1**). The Subject Land comprises existing buildings including the P2 carpark, as well as bitumen roads, car parking spaces and footpaths. The Subject Land contains vegetation in the form of established native and exotic gardens, and mowed lawn areas. Such areas of vegetation within the Subject Land have been previously assessed for removal in the Review of Environmental Factors prepared by Ethos Urban for the Civil Infrastructure Works at Liverpool Hospital. This was approved by NSW Health Infrastructure on the 6th November 2019 (NSW Health Infrastructure 2019).

The application seeks consent for the construction of a 7-storey car park, connections to the existing road work, and associated landscaping. For a detailed project description refer to the EIS prepared by Ethos Urban.

Narla have produced this report in order to assess any potential impacts associated with the SSD and recommend appropriate measures to mitigate any potential ecological impacts in line with the requirements of the Consent Authority, the Minister for Planning.

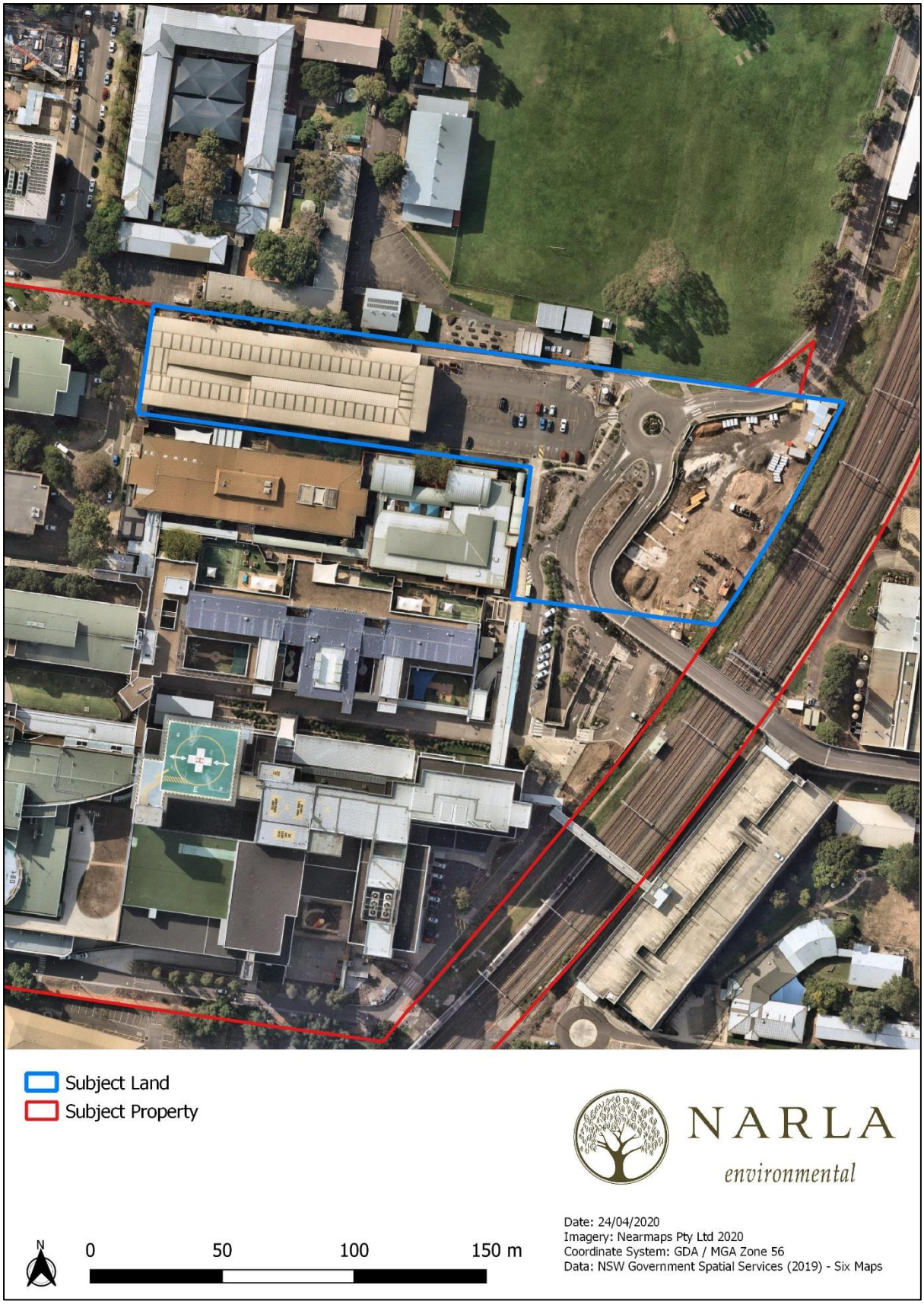

Figure 1. The location of the Subject Property and Subject Land.

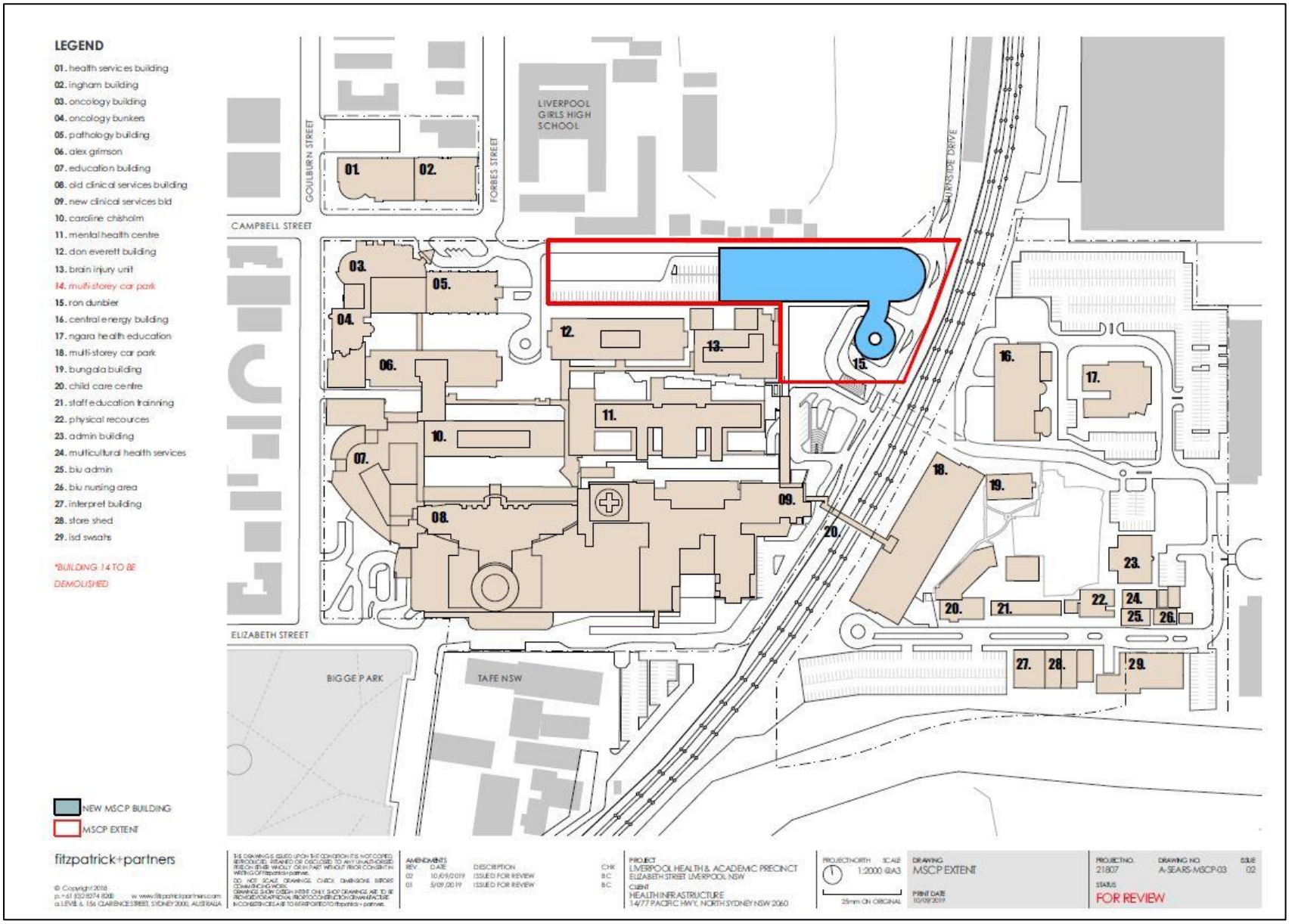

Figure 2. Proposed development within the Subject Land (Fitzpatrick & Partners 2019).

1.4 Sources of Information Used

A thorough literature review was undertaken to review the ecology within the locality and the Liverpool LGA. Relevant data and literature reviewed in preparation of this report included:

- Relevant State and Commonwealth Databases:
    - Atlas of Living Australia Spatial Portal (ALA 2019)
    - NSW BioNet. The website of the Atlas of NSW Wildlife (OEH 2019b)
    - Protected Matters Search Tool (DoEE 2019)
- Relevant State and Commonwealth Datasets:
    - NSW Government Spatial Services: Six Maps Clip & Ship
    - NSW State Environmental Planning Policy (Coastal Management)
    - NSW State Environmental Planning Policy No 19—Bushland in Urban Areas (SEPP 19)
    - NSW State Environmental Planning Policy No. 44 - Koala Habitat Protection (SEPP 44)
- Vegetation Mapping:
    - The Native Vegetation of the Sydney Metropolitan Area and Vegetation Information System (VIS) 3.1 (OEH 2016c)
- NSW State Guidelines:
    - Biodiversity Assessment Method Calculator Version 1.2.7.2 (DPIE 2019d)
    - BioNet Threatened Biodiversity Data Collection (OEH 2019c)
    - Guidance to assist a decision-maker to determine a serious and irreversible impact (DPIE 2019b)
    - Biodiversity Offsets and Agreement Management System (BOAMS)
- Council Documents:
    - Liverpool Development Control Plan (LDCP) (2008)
    - Liverpool Local Environmental Plan (LLEP) (2008)

Preparation of this BDAR also involved the review of the following accompanying project documents:

- Liverpool Health & Academic Precinct – MSCP Extent. Drawing No. A-SEARS-MSCP-03. Issue 02 (Fitzpatrick & Partners 2019)
- Liverpool Health and Academic Precinct – Civil Road Works – REF 2 (S19-011) (Clouston Associates 2019)
- Ethos Urban (2019) – SEARs Deliverables Requirements – Liverpool Hospital Multi Storey Car Park SSD

Online databases and literature reviews were used to gain an understanding of the natural environment and ecology of the Subject Land and its surrounds. Searches using NSW Wildlife Atlas (BioNet) and the Commonwealth Protected Matters Search Tool were conducted to identify current threatened flora and fauna, and migratory fauna records within a 100 km² search area centred on the Subject Land. These data were used to assist in establishing the presence or likelihood of any such ecological values as occurring on or adjacent to the Subject Land and helped inform our Ecologist of what to look for during the site assessment.

Soil landscape and geological mapping (Bannerman & Hazelton 1990) was examined to gain an understanding of the environment on the Subject Land and assist in determining whether any threatened flora or ecological communities may occur.

1.5 Aim and Approach

This report has been prepared in accordance with the BAM (OEH 2017a) and aims to:

- Describe the biodiversity values present within the Subject Land, including the extent of native vegetation, vegetation integrity and the presence of threatened ecological communities (TECs);
- Determine the habitat suitability within the Subject Land for candidate threatened species;
- Prepare an impact assessment in regard to potential impacts of the proposed development on biodiversity values, including potential prescribed impacts and serious and irreversible impacts (SAIIs) within the Subject Land;
- Discuss and recommend efforts to avoid and minimise impacts on biodiversity values; and
- Calculate the biodiversity credits (i.e. ecosystem credits and species credits) that measure potential impacts of the development on biodiversity values. This calculation will inform the decision maker (Minister for Planning) as to the number and class of offset credits required to be purchased and retired as a result of the proposed development.

1.6 EIS Consultant Deliverables

Table 1. Secretary's Environmental Assessment Requirements.

Requirement	Relevant report section
The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the Biodiversity Assessment Method.	See **Section 5** and **Section 6**
The BDAR must include details of the measures proposed to address the offset obligation as follows:	
▪ The total number and classes of biodiversity credits required to be retired for the development/project	See **Section 6.4** – No Biodiversity Offsets are required.
▪ The number and classes of like-for-like biodiversity credits proposed to be retired	
▪ The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules	
▪ Any proposal to fund a biodiversity conservation action	
▪ Any proposal to make a payment to the Biodiversity Conservation Fund.	
If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits.	N/A
The BDAR must be submitted with all spatial data associated with the survey and assessment as per the BAM.	All spatial data to be submitted by the applicant.
The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the Biodiversity Assessment Method Order 2017 under s6.10 of the Biodiversity Conservation Act 2016.	See **p. 3 'Report Certification'**
Where a Biodiversity Assessment Report is not required, engage a suitably qualified person to assess and document the flora and fauna impacts related to the proposal.	N/A

2. Methodology

2.1 IBRA Bioregions and Subregions

The Subject Land occurs within the 'Sydney Basin' Interim Biogeographic Regionalisation (IBRA) 7 for Australia, specifically occurring within the 'Cumberland' IBRA 7 Subregion (**Table 2; Figure 3**).

2.2 Mitchell Landscapes

NSW Landscapes Mapping: Background and Methodology (Mitchell 2002) groups ecosystems into meso-ecosystems representing larger natural entities based on topography and geology. The naming of ecosystems and meso-ecosystems was standardised so that each name provided location information and a meaningful descriptive landscape term. The Subject Land occurs within two (2) Mitchell Landscape Ecosystems: Cumberland Plain and Georges River Alluvial Plain (**Table 2; Figure 4**).

Table 2. IBRA Bioregions, Subregions and NSW Mitchell Landscapes.

IBRA Bioregion	IBRA Subregion	NSW Mitchell Landscape Meso-Region	NSW Mitchell Landscape Ecosystem	Area on Subject Land (ha)
Sydney Basin	SYB08-Cumberland	Sydney Basin - Cumberland	Cumberland Plain	1.21 ha
			Georges River Alluvial Plain	0.29 ha

2.2.1 NSW Mitchell Landscape Ecosystems

Cumberland Plain

Low rolling hills and valleys in a rain shadow area between the Blue Mountains and the coast on horizontal Triassic shales and lithic sandstones forming a down-warped block on the coastal side of the Lapstone monocline. Intruded by a small number of volcanic vents and partly covered by Tertiary river gravels and sands (Hawkesbury-Nepean Terrace Gravels landscape). Quaternary alluvium along the mains streams. General elevation 30 to 120m, local relief 50m. Sometimes affected by salt in tributary valley floors. Pedal uniform red to brown clays on volcanic hills. Red and brown texture-contrast soils on crests grading to yellow harsh texture-contrast soils in valleys. Woodlands and open forest of grey box (*Eucalyptus moluccana*), forest red gum (*Eucalyptus tereticornis*), narrow-leaved ironbark (*Eucalyptus crebra*), thin-leaved stringybark (*Eucalyptus eugenioides*), cabbage gum (*Eucalyptus amplifolia*) and broad-leaved apple (*Angophora subvelutina*). Grassy to shrubby understorey often dominated by Australian boxthorn (*Bursaria spinosa*); and poorly drained valley floors, often salt affected with swamp oak (*Casuarina glauca)* and paperbark (*Melaleuca* sp.) (Mitchell 2002).

Georges River Alluvial Plain

Channel, floodplain and terraces of the Georges River on Quaternary and Tertiary alluvial sediments. Mostly clayey sand and sand with limited gravel on the highest terrace, general elevation 0 to 30m, and local relief 10m. Massive uniform or gradational profiles on yellow brown to orange clayey sand. Podsols with well-developed double pans on limited areas of deep quartz sand, stony, harsh, yellow, texture-contrast soils on higher terraces. Forest and woodland of cabbage gum (*Eucalyptus amplifolia*), rough-barked apple (*Angophora floribunda*), broad-leaved ironbark (*Eucalyptus fibrosa* ssp. *fibrosa*), scribbly gum (*Eucalyptus sclerophylla*) and narrow-leaved apple (*Angophora bakeri*). Extensive swamp oak (*Casuarina glauca*) along the riverbanks and in low-lying areas often with prickly-leaved tea-tree (*Leptospermum stypheliodes*). These extend to brackish estuarine swamps with grey mangrove (*Avicennia marina*) and limited saltmarsh.

2.3 Landscape Features

2.3.1 Topography, geology and soils

The Subject Land is mapped as occurring within the Blacktown Soil Landscape (Bannerman & Hazelton 1990). The Blacktown Soil Landscape is typically characterised by gently undulating rises on Wianamatta Group shales. This includes Ashfield Shale consisting of laminite and dark grey siltstone; Bringelly Shale which consists of shale with occasional calcareous claystone, laminite and infrequent coal; and Minchinbury Sandstone consisting of fine to medium-grained quartz lithic sandstone. Soils are shallow to moderately deep (>100 cm) hardsetting mottled texture contrast soils, with Red and Brown Podzolic Soils on crests grading to Yellow Podzolic Soils on lower slopes and in drainage lines. The Blacktown Soil Landscape occurs extensively on the Cumberland Lowlands, including within Blacktown, Mount Druitt, Glossodia and Leppington.

2.3.2 Hydrology

A fourth order watercourse has been identified approximately 220m south of the Subject Land (NSW Government Spatial Services 2019; **Figure 5**). This watercourse (the Georges River), and associated riparian corridor, does not intersect the Subject Land. No soaks or drainage lines were observed within the Subject Land by the Narla Ecologist during site assessment.

Table 3. Landscape features identified within the Subject Land and surrounding 1500m buffer.

Landscape Feature	Identification of Landscape Feature on Site
Rivers and Streams (classified according to stream order)	No mapped watercourses occur within the Subject Land (**Figure 5**). A number of mapped watercourses occur within the 1500m buffer of the Subject Land. The watercourses include 1st order streams and 2nd order streams that are tributaries that form part of the Georges River Catchment. The Georges River is also situated within the 1500m buffer (identified as a 4th order stream).
Wetlands (within, adjacent to and downstream of site)	The Subject Land does not contain any areas of native vegetation identified as 'Coastal Wetlands' as per the State Environmental Planning Policy (Coastal Management) 2018 (**Figure 5**). A number of mapped 'Coastal Wetlands' do however occur within the 1500m buffer of the Subject Land. This includes wetlands located along the Georges River, and within Lake Moore and Horseshoe Pond.
Areas of geological significance and soil hazard features	No areas of geological significance (karsts, caves, crevices or cliffs) were identified within the Subject Land. This was determined as a result of a comprehensive site-based assessment. The Subject Land is not mapped as occurring on Acid Sulfate Soils nor mapped as having risk/probability of exhibiting occurrence of Acid Sulfate Soils. Within the wider locality (1500m buffer zone), the potential for Acid Sulfate Soils were identified along the Georges River, Lake Moore and Horseshoe Pond (**Figure 6**).
Native vegetation extent in 1500m buffer area	The circular 1500m buffer zone covers an area of 567 ha. Within this circle native vegetation covers approximately 80 ha. This area of native vegetation represents 14% of the 1500m buffer zone. The native vegetation cover observed results in the assessment area being assigned to the >10-30% cover class (**Figure 7**).
Cleared area within 1500m buffer	The total area of cleared land within the assessment area surrounding the Subject Land is approximately 486 ha**.** This area of cleared land accounts for approximately 86% of the land within the 1500m buffer zone (**Figure 7**).
Connectivity features	The identified area of habitat connectivity within the 1500m buffer zone has the potential to provide habitat for a number of threatened species, endangered populations and migratory species (**Figure 7**). There is the potential that 'flyways' used by a suite of both terrestrial and migratory avian species encompass the Subject Land as well as a land within the 1500m buffer zone. The Subject Land is in close proximity to the Georges River, which provides habitat connectivity to the south and east of the Subject Land.

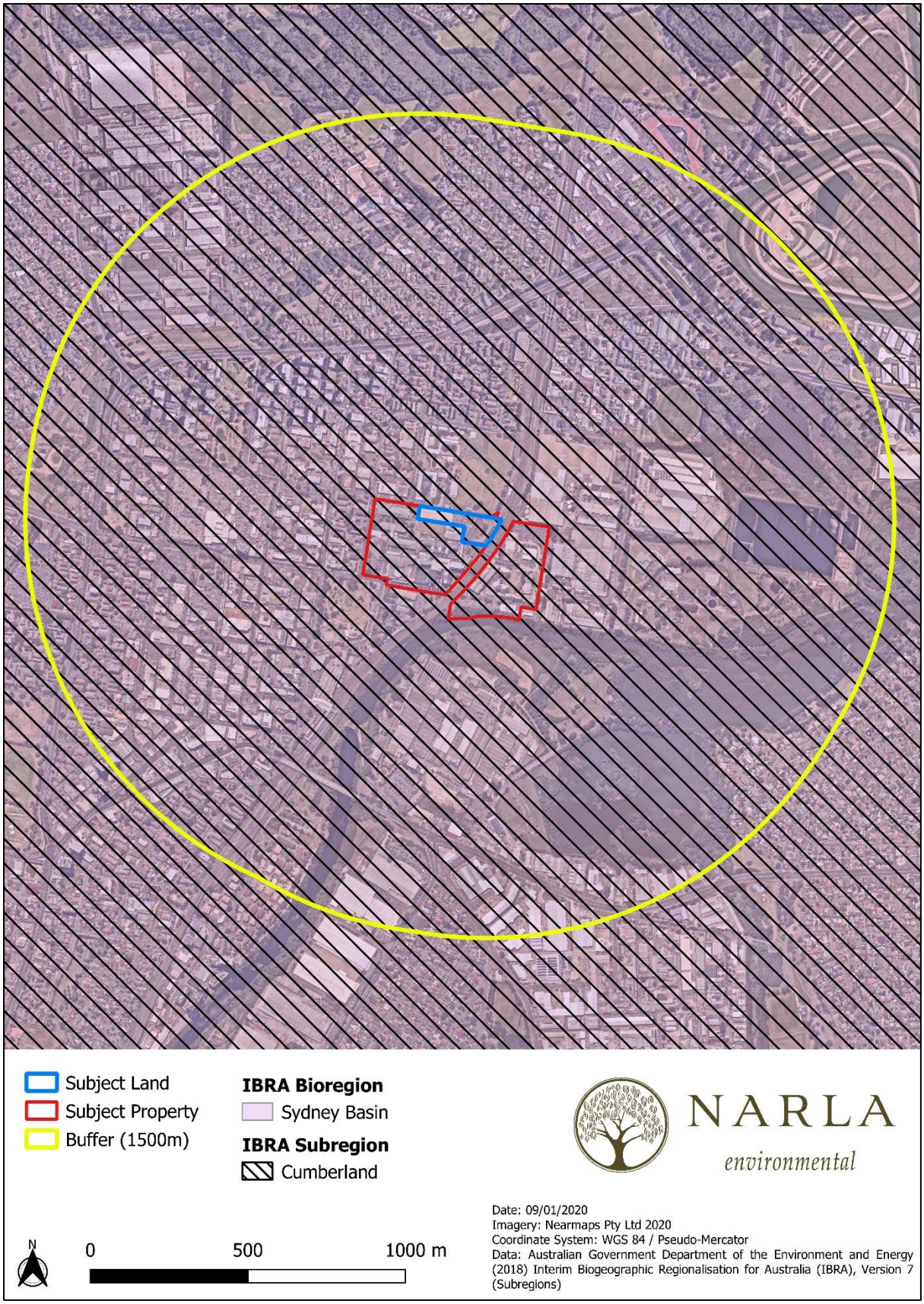

Figure 3. IBRA Bioregion and Subregion of the Subject Property, and within a 1500m buffer.

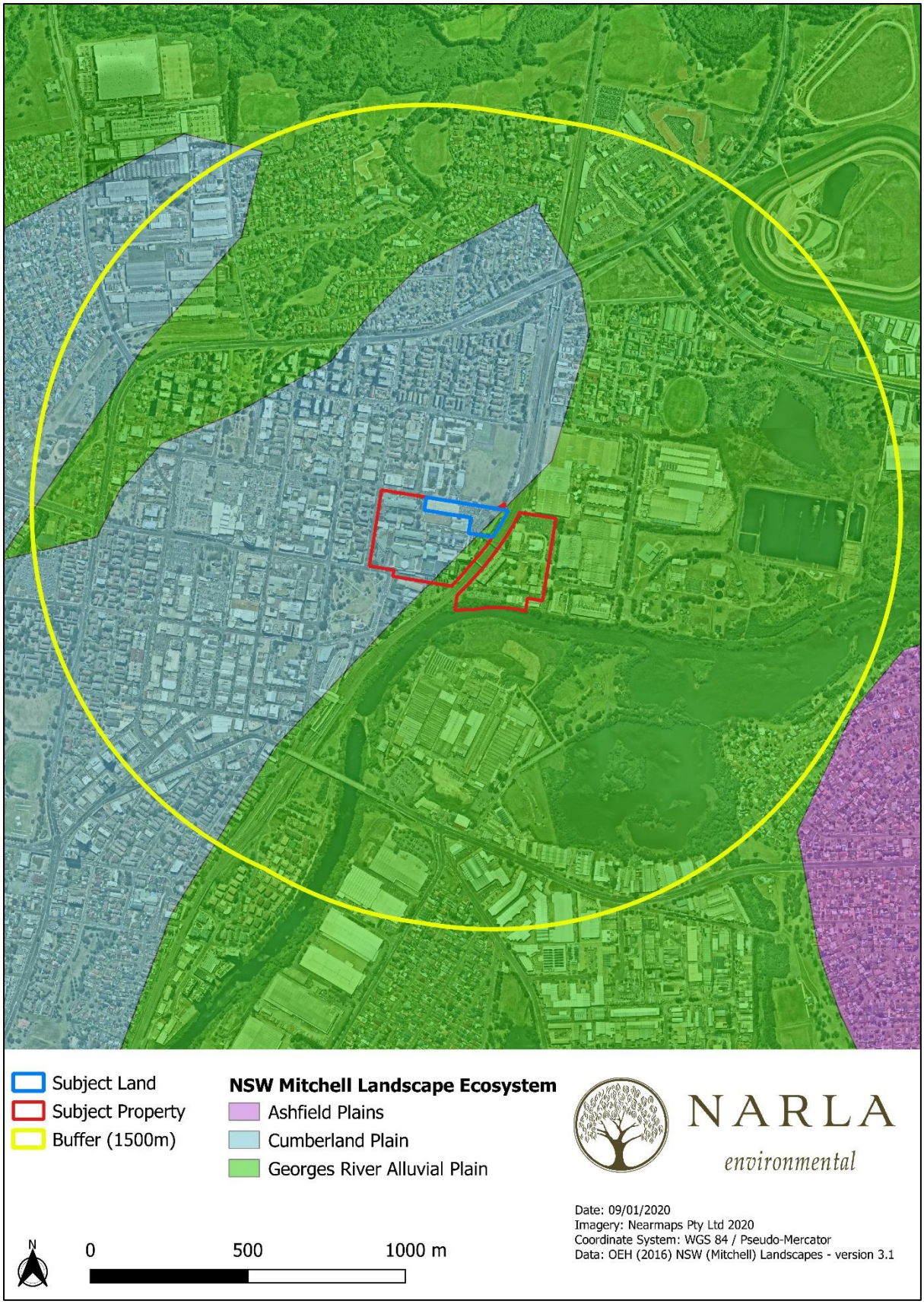

Figure 4. NSW Mitchell Landscape Ecosystem of the Subject Property and within a 1500m buffer.

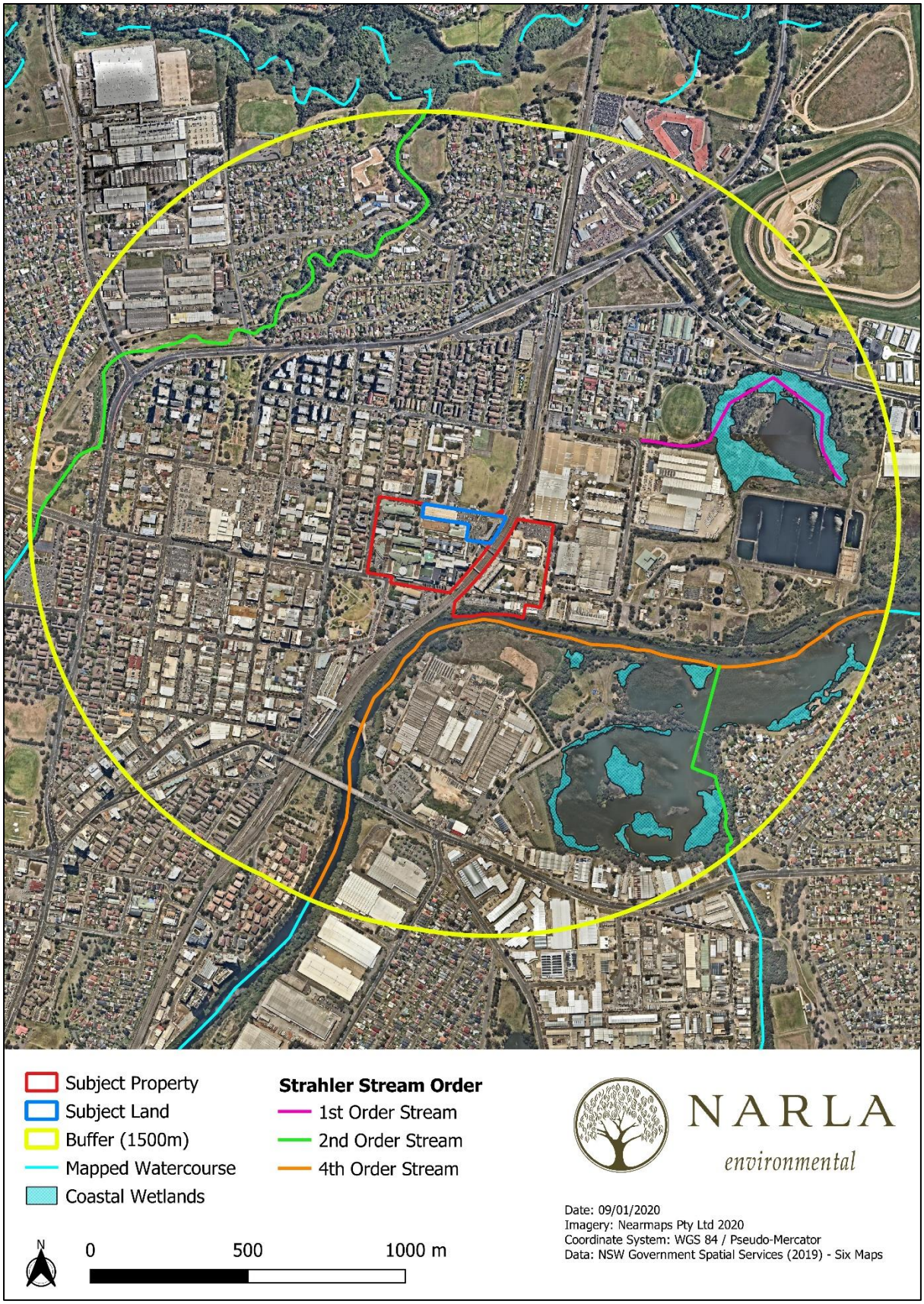

Figure 5. Rivers, streams and coastal wetlands occurring within the 1500m buffer.

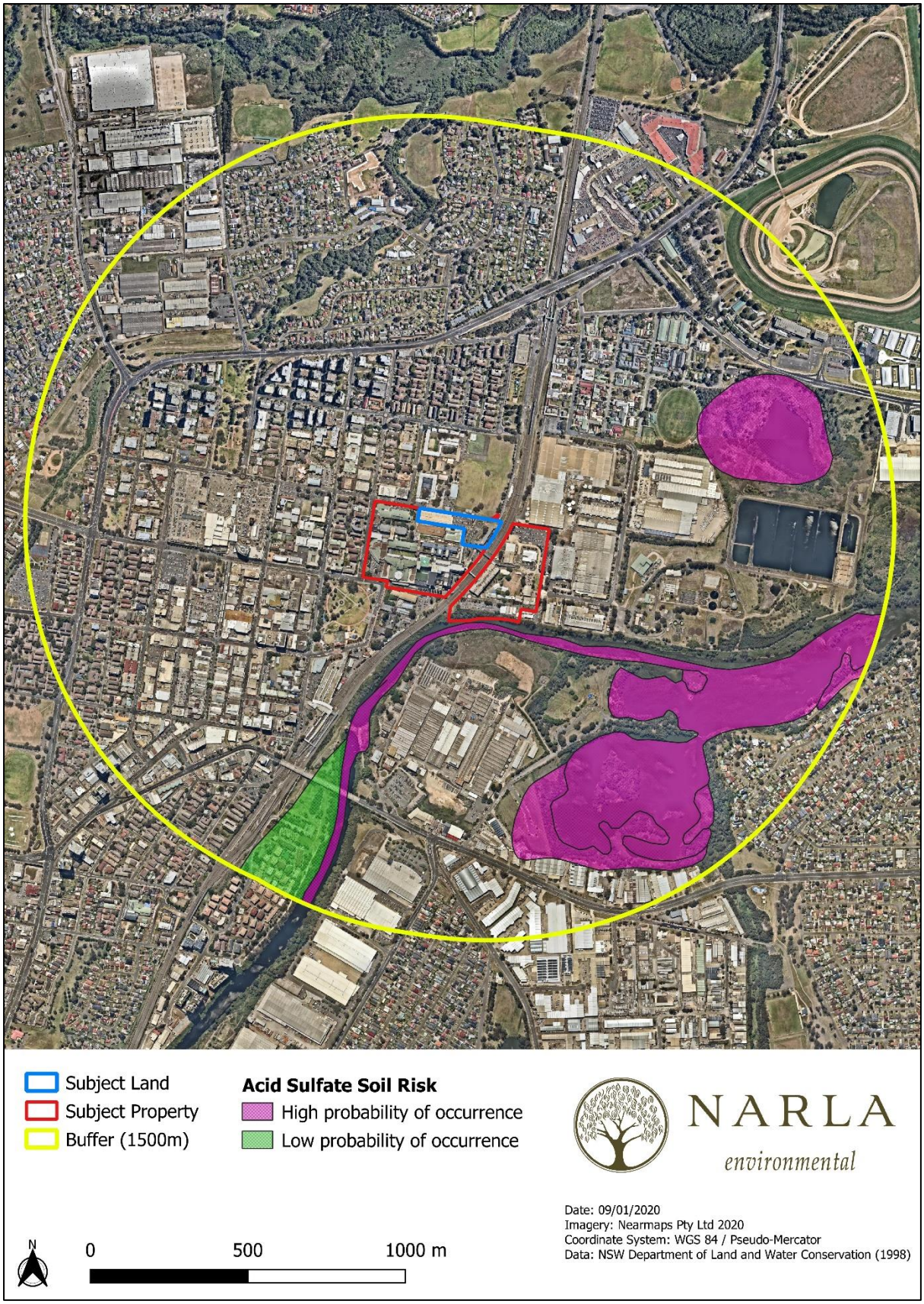

Figure 6. Acid Sulfate soil risk occurring within the 1500m buffer.

3. Native Vegetation

3.1 Assessing Native Vegetation Cover

Native vegetation cover and patch size have been assessed in accordance with Section 4.3 of the BAM (OEH 2017a). Components of the site context will be used in order to assess the suitability of habitat for threatened species within the Subject Land.

A buffer area of 1500m surrounding the outside edge of the boundary of the Subject Land was prepared in order to determine the extent of native vegetation within the surrounding locality. Native vegetation was considered to cover approximately 80 ha within the buffer circle and was assigned the >10-30% class (**Figure 7**).

3.2 Assessing Patch Size

Patch size is defined by the BAM as 'an area of native vegetation that:

- occurs on the development site or biodiversity stewardship site, and
- includes native vegetation that has a gap of less than 100m from the next area of moderate to good condition native vegetation (or ≤30m for non-woody ecosystems)

Patch size may extend onto adjoining land that is not part of the development site or biodiversity stewardship site' (OEH 2017a).

Patch size was calculated according to the above guidelines, and equated to 1.5 ha.

3.3 Historically Mapped Vegetation Communities

The Office of Environment and Heritage NSW 'Native Vegetation of the Sydney Metropolitan Area' mapping (OEH 2016c) indicated that no vegetation communities exist within the Subject Land. Two (2) native vegetation communities are situated within 300m of the Subject Land: 'Cumberland Shale Plains Woodland (S_GW03)' and 'Cumberland Riverflat Forest (S_FoW06)' (**Figure 8**).

3.4 Plant Community Types (PCT) Identified within Subject Land

No native vegetation requires assessment under this BDAR. All native vegetation within the Subject Land has been assessed and approved for removal under the Review of Environmental Factors prepared by Ethos Urban for the Civil Infrastructure Works at Liverpool Hospital (NSW Health Infrastructure 2019; **Figure 9**).

Figure 7. The extent of native vegetation and habitat connectivity occurring within the 1500m buffer.

Figure 8. Historically mapped vegetation surrounding the Subject Land (OEH 2016c).

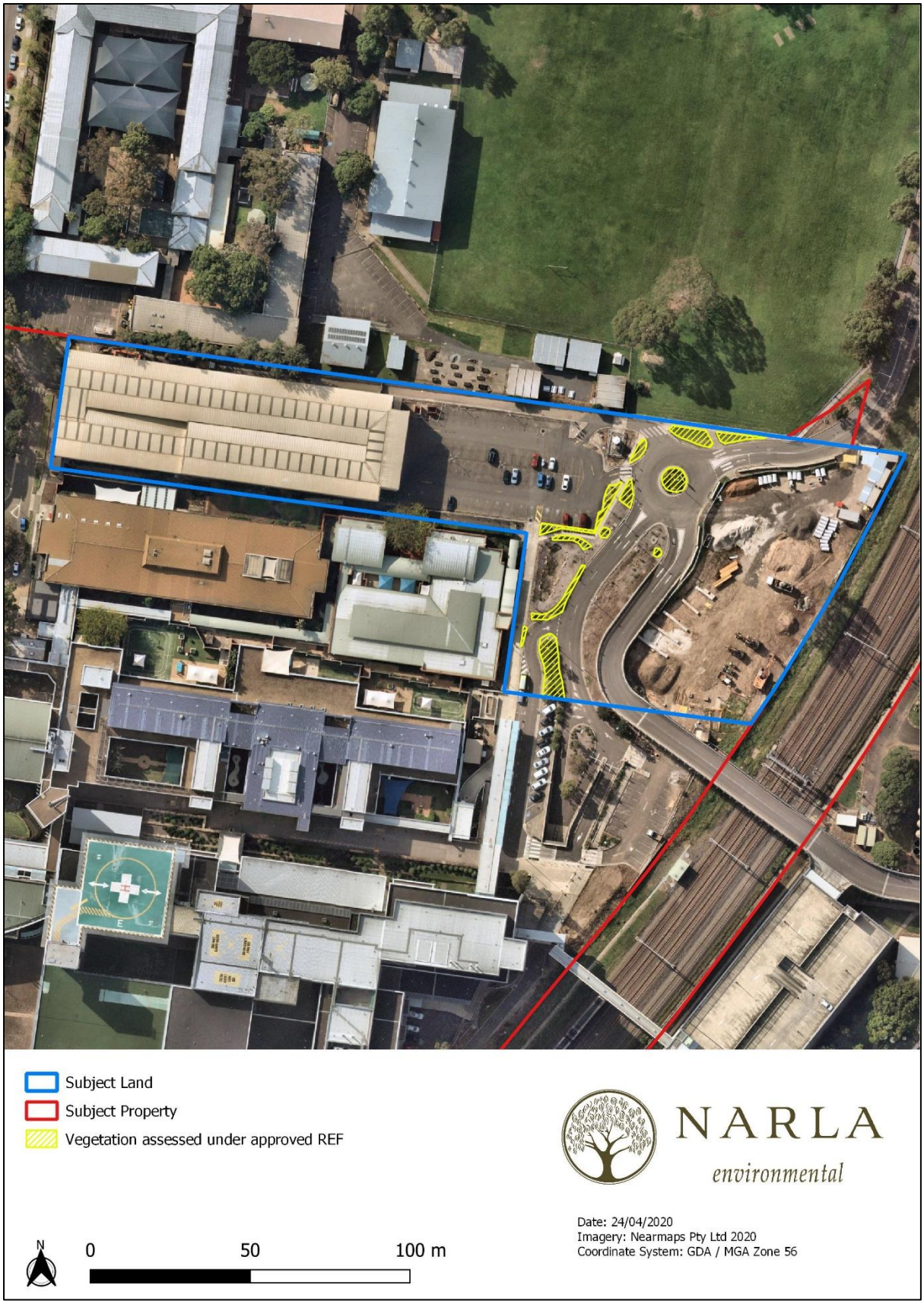

Figure 9. Narla field validated vegetation mapping within the Subject Land.

4. Threatened Species

4.1 Candidate Ecosystem Credit Species

The Subject Land did not contain any native vegetation that is to be assessed under this BDAR. Therefore, no BAM assessment is required, and no ecosystem credit species apply to the proposed development.

4.1 Candidate Species Credit Species

This section provides a summary of the candidate species credit fauna and fauna species for the Subject Land derived within a 100km^2 BioNet Atlas Search (OEH 2019b). A summary of the targeted survey effort applied to each species is provided along with the results of the survey effort, specifically whether or not the species credit needs to be offset through retiring of Biodiversity Offset Credits (**Table 4**; **Table 5**).

Table 4. Candidate Fauna Credit Species predicted to occur within the Subject Land

Scientific Name	BC Act listing status	Included in Assessment?	Targeted Survey Conducted?	Biodiversity Risk Weighting	Biodiversity Offset Credits Required?
Anthochaera phrygia Regent Honeyeater (Breeding)	Critically Endangered	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land, particularly considering the positioning of the Subject Land within an urbanised environment.	Very High – 3	No
Callocephalon fimbriatum Gang-gang Cockatoo (Breeding)	Vulnerable	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species requires eucalypt trees with hollows >9cm for breeding. Such breeding habitat does not occur on the Subject Land.	High - 2	No
Calyptorhynchus lathami Glossy Black- Cockatoo (Breeding)	Vulnerable	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species requires living or dead trees with hollows greater than 15cm diameter and greater than 5m above ground for breeding. Such breeding habitat does not occur on the Subject Land.	High - 2	No
Cercartetus nanus Eastern Pygmy-possum	Vulnerable	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land, particularly due to the location of the Subject Land in a highly urbanised environment. This species also prefers to inhabit woodlands and heath. Such habitat does not occur within the Subject Land.	High - 2	No
Chalinolobus dwyeri Large-eared Pied Bat	Vulnerable	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species typically roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin. It is also typically found in well-timbered areas containing gullies. Such habitat does not occur on the Subject Land.	Very High - 3	No
Haliaeetus leucogaster White-bellied Sea-Eagle (Breeding)	Vulnerable	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. The breeding habitat of this species consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Such habitat does not occur on the Subject Land.	High - 2	No

Scientific Name	BC Act listing status	Included in Assessment?	Targeted Survey Conducted?	Biodiversity Risk Weighting	Biodiversity Offset Credits Required?
Hieraaetus morphnoides Little Eagle (Breeding)	Vulnerable	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species nests in tall living trees within a remnant patch. Such habitat does not occur on the Subject Land.	Moderate - 1.5	No
Lathamus discolour Swift Parrot (Breeding)	Endangered	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species also does not breed on mainland Australia.	Very High - 3	No
Litoria aurea Green and Golden Bell Frog	Endangered	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. Whilst the Subject Land falls within 1km of a waterbody, the vegetation and habitat within the Subject Land is not suitable to support this species. This species requires marshes, dams and stream-sides, particularly those containing bulrushes (*Typha* spp.) or spikerushes (*Eleocharis* spp.). Such habitat does not occur within the Subject Land.	High - 2	No
Lophoictinia isura Square-tailed Kite (Breeding)	Vulnerable	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. The nesting habitat of this species consists of large trees along or near watercourses, in a fork or on large horizontal limbs. Such habitat does not occur on the Subject Land.	Moderate - 1.5	No
Meridolum corneovirens Cumberland Plain Land Snail	Endangered	No	No – after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species primarily inhabits Cumberland Plain Woodland, Shale Gravel Transition Forests, Castlereagh Swamp Woodlands and the margins of River-flat Eucalypt Forest. Such habitat does not occur on the Subject Land.	High - 2	No
Miniopterus australis Little Bent-winged Bat (Breeding)	Vulnerable	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species typically breeds in caves, but can also use derelict mines and storm-water tunnels. It also generally inhabits well-timbered areas. Such habitat does not occur on the Subject Land. Considering such factors, it is highly unlikely that this species would utilise the buildings within the Subject Land for roosting. Breeding only occurs in maternity caves.	Very High - 3	No

Scientific Name	BC Act listing status	Included in Assessment?	Targeted Survey Conducted?	Biodiversity Risk Weighting	Biodiversity Offset Credits Required?
Miniopterus orianae oceanensis Large Bent-winged Bat (Breeding)	Vulnerable	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species typically breeds in caves, but can also use derelict mines and storm-water tunnels. This species also hunts in forested areas. Such habitat does not occur on the Subject Land. Considering such factors, it is highly unlikely that this species would utilise the buildings within the Subject Land for roosting. Breeding only occurs in maternity caves.	Very High - 3	No
Myotis Macropus Southern Myotis	Vulnerable	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species requires hollow bearing trees within 200 m of a riparian zone or water body. Such habitat does not occur on the Subject Land.	High – 2	No
Ninox connivens Barking Owl (Breeding)	Vulnerable	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species requires living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground for breeding. Such habitat does not occur on the Subject Land.	High – 2	No
Ninox strenua Powerful Owl (Breeding)	Vulnerable	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species requires living or dead trees with hollows greater than 20 cm diameter for breeding. Such habitat does not occur on the Subject Land.	High - 2	No
Petaurus norfolcensis Squirrel Glider	Vulnerable	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species inhabits mature or old growth forest, and requires abundant tree hollows for refuge and nest sites. Such habitat does not occur on the Subject Land.	High – 2	No
Phascolarctos cinereus Koala (Breeding)	Vulnerable	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land, particularly considering the positioning of the Subject Land within a highly urbanised environment.	High - 2	No

Scientific Name	BC Act listing status	Included in Assessment?	Targeted Survey Conducted?	Biodiversity Risk Weighting	Biodiversity Offset Credits Required?
Pteropus poliocephalus Grey-headed Flying-fox (Breeding)	Vulnerable	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. There was no active breeding colony located on the Subject Land.	High – 2	No

Table 5. Candidate Flora Credit Species predicted to occur within the Subject Land

Scientific Name	NSW BC Act (2016) listing status	Included in Assessment?	Targeted Survey Conducted?	Biodiversity Risk Weighting	Biodiversity Offset Credits Required?
Acacia bynoeana Bynoe's Wattle	Endangered	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species occurs in heath or dry sclerophyll forest on sandy soils. Such habitat does not occur on the Subject Land.	High - 2	No
Acacia pubescens Downy Wattle	Vulnerable	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species occurs in open woodlands and forest, in a variety of plant communities, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Such habitat does not occur on the Subject Land.	High - 2	No
Allocasuarina diminuta subsp. mimica – endangered population in the Sutherland Shire and Liverpool City Local Government Areas	Endangered Population	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species occurs in heathy and low open woodlands. Such habitat does not occur on the Subject Land.	High – 2	No
Callistemon linearifolius Netted Bottle Brush	Vulnerable	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species grown in dry sclerophyll forest. Such habitat does not occur on the Subject Land. Furthermore, recent records of this species are limited to the Hornsby Plateau area near the Hawkesbury River.	Moderate - 1.5	No
Diuris aequalis	Endangered	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species is found in forest, low open woodland with grassy understorey and secondary grassland on the higher parts of the Southern and Central Tablelands (especially on the Great Dividing Range). Such habitat does not occur on the Subject Land.	High – 2	No
Epacris purpurascens var. purpurascens	Vulnerable	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species grows in sclerophyll forest, scrubs and swamps on sandstone. Such habitat does not occur on the Subject Land.	Moderate - 1.5	No

Scientific Name	NSW BC Act (2016) listing status	Included in Assessment?	Targeted Survey Conducted?	Biodiversity Risk Weighting	Biodiversity Offset Credits Required?
Grevillea parviflora subsp. parviflora Small-flower Grevillea	Vulnerable	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species occurs in a range of vegetation types from heath and shrubby woodland to open forest. Such habitat does not occur on the Subject Land.	High - 2	No
Hibbertia fumana	Endangered	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species is generally found in areas of woodland with a more open understorey, in a long intergrade between Castlereagh Scribbly Gum Woodland and Castlereagh Ironbark Forest. Such habitat does not occur on the Subject Land. Furthermore, the only known extant population is a single population in Moorebank.	Very High – 3	No
Hibbertia puberula	Endangered	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species is usually associated with dry sclerophyll woodland communities, although heaths are also occupied. Such habitat does not occur on the Subject Land.	High - 2	No
Hibbertia sp. *Bankstown*	Critically Endangered	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species is only known to occur within Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion, with the only population located at Bankstown Airport. Such habitat does not occur on the Subject Land.	Very High – 3	No
Leucopogon exolasius	Vulnerable	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species occurs in woodland on sandstone. Such habitat does not occur on the Subject Land.	High - 2	No
Marsdenia viridiflora subsp. viridiflora – endangered population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith Local Government Areas	Endangered Population	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species grows in vine thickets and open shale woodland. Such habitat does not occur on the Subject Land.	High - 2	No

Scientific Name	NSW BC Act (2016) listing status	Included in Assessment?	Targeted Survey Conducted?	Biodiversity Risk Weighting	Biodiversity Offset Credits Required?
Persoonia hirsuta Hairy Geebung	Endangered	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species is found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. Such habitat does not occur on the Subject Land.	Very High – 3	No
Persoonia nutans Nodding Geebung	Endangered	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species is known to occur in Agnes Banks Woodland, Castlereagh Scribbly Gum Woodland, Cooks River / Castlereagh Ironbark Forests and shale sandstone transitional communities. Such habitat does not occur on the Subject Land.	High - 2	No
Pimelea spicata Spiked Rice-flower	Endangered	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species is associated with Grey Box communities (particularly Cumberland Plain Woodland variants and Moist Shale Woodland) and in areas of ironbark. Such habitat does not occur on the Subject Land.	High - 2	No
Pultenaea pedunculata Matted Bush-pea	Endangered	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species is associated with Cumberland Plain Woodlands, the shale-soil form of Shale Sandstone Transition Forests and Cooks River/Castlereagh Ironbark Forest. Such habitat does not occur on the Subject Land.	High - 2	No
Syzygium paniculatum Magenta Lilly Pilly	Endangered	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species is known to occur on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. Such habitat does not occur within the Subject Land.	High - 2	No
Wahlenbergia multicaulis - endangered population Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield	Endangered Population	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species grows in a variety of habitats including forest, woodland, scrub, grassland and the edges of watercourses and wetlands. Such habitat does not occur on the Subject Land.	High - 2	No

Scientific Name	NSW BC Act (2016) listing status	Included in Assessment?	Targeted Survey Conducted?	Biodiversity Risk Weighting	Biodiversity Offset Credits Required?
Wilsonia backhousei Narrow-leafed Wilsonia	Vulnerable	No	No - after carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land. This species grows on the margins of salt marshes and lakes. Such habitat does not occur on the Subject Land.	High - 2	No

4.2 Targeted Species Credit Surveys

4.2.1 Fauna and Flora Species Credit Surveys

A total of nineteen (19) threatened fauna species and nineteen (19) threatened flora species were identified within historical records (OEH 2019b) as having the potential to occur within the Subject Land. None of the species identified were surveyed for due to the following:

- The habitat within the Subject Land was considered to be 'substantially degraded such that the species is unlikely to utilise the Subject Land' in accordance with Section 6.4.1.17(a) of the BAM (OEH 2017a). As per Section 6.4.1.18 of the BAM, 'A candidate species credit species that is not considered to have suitable habitat on the Subject Land (or specific vegetation zones) in accordance with Paragraph 6.4.1.17 does not require further assessment on the Subject Land (or specific vegetation zones)' (OEH 2017a)

4.3 Species Polygons

No species credit species were assumed to be present within the Subject Land. Therefore, no species polygons were assigned.

5. Avoid and Minimise Impacts

5.1 Impact Mitigation and Minimisation Measures

This section details the measures to be implemented before, during and post construction to avoid and minimise the impacts of the project (**Table 6**).

Table 6. Table of measures to be implemented before, during and after construction to avoid and minimise the impacts of the project.

Action	Outcome	Timing	Responsibility
Avoid and Minimise Impact - Project Location, Design and Planning	As the proposed development comprises of a new multi storey carpark within the already built-up Liverpool Health and Academic Precinct, there is minimal scope for alternative locations and design to minimise impacts to biodiversity. Nonetheless, the proposed development is already located in a highly urbanised area that contains minimal biodiversity. Furthermore, no vegetation is to be removed under this proposal.	Pre-construction phase	▪ Proponent
Preparation of a Construction Environmental Management Plan (CEMP)	A Construction Environmental Management Plan (CEMP) will be required for the construction phase of the project, and will be prepared prior to issue of the Construction Certificate. The CEMP would include, as a minimum, industry-standard measures for the management of soil, surface water, weeds and pollutants, as well as site-specific measures, including the procedures outlined below. The proposed mitigation measures would include environmental safeguards for protection of neighbouring properties and nearby waterways in accordance with relevant policy documentation and Government guidelines. In order to address the potential impacts of the proposal on biodiversity, the mitigation and management measures outlined within this table would be implemented as part of the CEMP for the site.	Pre-construction phase	▪ Proponent ▪ Project Ecologist ▪ Construction Contractor
Tree Protections	Australian Standard 4970 (2009) Protection of Trees on Development Sites (AS-4970) outlines that a Tree Protection Zone (TPZ) is the principal means of protecting trees on construction sites. It is an area isolated from construction disturbance so that the tree remains viable. Ideally, works should be avoided within the TPZ. A Minor Encroachment is less than 10% of the TPZ and is outside the SRZ. A Minor Encroachment is considered acceptable by AS-4970 when it is compensated for elsewhere and contiguous within the TPZ.	Pre-construction phase	▪ Proponent ▪ Arborist

Action	Outcome	Timing	Responsibility
	A Major Encroachment is greater than 10% of the TPZ or inside the SRZ. Major Encroachments generally require root investigations undertaken by non-destructive methods or the use of tree sensitive construction methods.		
Erosion and Sedimentation	Appropriate erosion and sediment control must be erected and maintained at all times during construction in order to avoid the potential of incurring indirect impacts on biodiversity values. As a minimum, such measures should comply with the relevant industry guidelines such as 'the Blue Book' (Landcom 2004).	Construction phase	▪ Proponent ▪ Construction Contractor
Storage and Stockpiling (Soil and Materials)	Allocate all storage, stockpile and laydown sites away from any native vegetation that is planned to be retained surrounding the Subject Land. Avoid importing any soil from outside the site as this can introduce weeds and pathogens to the site in order to avoid the potential of incurring indirect impacts on biodiversity values.	Construction phase	▪ Construction Contractors
Stormwater	Potential impacts relating to stormwater and runoff will be managed during construction and operation phases. The CEMP will guide stormwater management during the construction phase of development.	Post-construction phase	▪ Proponent ▪ Construction Contractors/ Architect

6. Impact Summary

6.1 Impacts on Biodiversity Values

6.1.1 Native Vegetation Clearance Requiring Offsetting

All native vegetation within the Subject Land has been approved for removal under the Review of Environmental Factors prepared by Ethos Urban for the Civil Infrastructure Works at Liverpool Hospital (NSW Health Infrastructure 2019). Therefore, no native vegetation requires offsetting.

6.2 Other Impacts

6.2.1 Indirect Impacts

Indirect impacts occur when the proposal or activities relating to the construction or operation of the proposal affect native vegetation, threatened ecological communities and threatened species habitat beyond the Subject Land. Impacts may also result from changes to land-use patterns, such as an increase in vehicular access and human activity on native vegetation, threatened ecological communities and threatened species habitat. The indirect impacts of this proposed development are outlined in **Table 7**.

Table 7. Indirect Impacts.

Indirect Impact	Extent and duration	Threatened species, threatened ecological communities and their habitats likely to be affected.	Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats.
(a) inadvertent impacts on adjacent habitat or vegetation	It is unlikely that the proposed development will impact adjacent habitat or vegetation considering the Subject Land and surrounding area is highly developed and modified. Vegetation is only present in the form of native garden beds and mowed areas surrounded by roads and buildings.	N/A	N/A
(b) reduced viability of adjacent habitat due to edge effects	It is unlikely the proposed development will reduce viability of adjacent habitat due to edge effects, as the adjacent vegetation is only in the form of native garden beds and mowed area in a highly developed and modified area.	N/A	N/A
(c) reduced viability of adjacent habitat due to noise, dust or light spill	Construction works may increase noise and dust exposure to adjacent habitat. However, given the vegetation is located in a heavily urbanised and disturbed area, such issues are already present within and surrounding the Subject Land. It is therefore unlikely the proposed works will significantly exacerbate any of these issues.	N/A	N/A

Indirect Impact	Extent and duration	Threatened species, threatened ecological communities and their habitats likely to be affected.	Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats.
(d) transport of weeds and pathogens from the site to adjacent vegetation	It is unlikely the proposed development will increase weeds and pathogens into adjacent vegetation, considering such vegetation is heavily degraded and already exposed to such issues.	N/A	N/A
(e) increased risk of starvation, exposure and loss of shade or shelter	It is unlikely that any threatened fauna relies on habitat within the Subject Land, such that the proposed impacts will lead to increased risks from starvation, exposure, shade and shelter. Canopy trees that provide habitat resources within the wider area will continue to be retained.	N/A	N/A
(f) loss of breeding habitats	The proposed development will not remove any important breeding habitats as the site is already highly disturbed and developed.	N/A	N/A
(g) trampling of threatened flora species	No locally threatened flora species were identified within the Subject Land. It is therefore not expected that the trampling of threatened flora species will occur.	N/A	N/A
(h) inhibition of nitrogen fixation and increased soil salinity	It is unlikely that these issues affect the Subject Land.	N/A	N/A
(i) fertiliser drift	This issue is not likely to affect the vegetation on the Subject Land.	N/A	N/A
(j) rubbish dumping	This issue was not observed within the Subject Land and is not expected to be exacerbated as a result of the proposed development.	N/A	N/A
(k) wood collection	This issue is not likely to affect the vegetation on the Subject Land.	N/A	N/A
(l) bush rock removal and disturbance	This issue is not relevant to the Subject Land as there is no bush rock.	N/A	N/A
(m) increase in predatory species populations	It is unlikely that the proposed works will influence or alter predatory species populations.	N/A	N/A
(n) increase in pest animal populations	It is unlikely that the proposed works will influence or alter pest animal populations.	N/A	N/A

Indirect Impact	Extent and duration	Threatened species, threatened ecological communities and their habitats likely to be affected.	Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats.
(o) increased risk of fire	The proposed development is not situated in bushfire prone land and has been assessed as being low risk.	N/A	N/A
(p) disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	The proposed development will not result in the removal of any important breeding or foraging habitat for threatened species.	N/A	N/A

6.2.2 Prescribed and Uncertain Impacts

This list of impacts includes all of those impacts on biodiversity values not caused by direct vegetation clearing or development that have been prescribed by the Biodiversity Conservation Regulation 2017.

Prescribed biodiversity impacts require an assessment of the impacts of development on the habitat of threatened species or ecological communities associated with karst, caves, crevices, cliffs and other features of geological significance. This is discussed in **Table 8** below.

Table 8. Prescribed and Uncertain Impacts.

Will there be impacts on any of the following	Yes/No	If Yes, Address all of the assessment questions from section 9.2.1 of the BAM
Species or ecological communities associated with karst, caves, crevices, cliffs and other features of geological significance	No	There is no karst, caves, crevices, cliffs and other features of geological significance on or near the Subject Land.
Habitat of threatened species or ecological communities associated with rocks	No	No threatened species or ecological communities associated with rocks were situated on the Subject Land.
Habitat of threatened species or ecological communities associated with human made structures	No	There are no threatened species or ecological communities located within the Subject Land that are associated with human made structures. It is not expected that threatened bats that utilise human made structures would inhabit buildings on the Subject Land given the degraded and highly urbanised nature of the site.
Habitat of threatened species or ecological communities associated with non-native vegetation	No	Ornamental gardens and trees surrounding the Subject Land may provide intermittent, temporary foraging habitat for Grey-headed Flying-fox when trees are in flower or fruit, however, this habitat is not important for the survival of this mobile species.
Connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	No	It is unlikely the proposed development will interrupt connectivity for any threatened fauna or flora species. The Subject Land is situated in an already highly fragmented landscape.

Will there be impacts on any of the following	Yes/No	If Yes, Address all of the assessment questions from section 9.2.1 of the BAM
Movement of threatened species that maintains their life cycle	No	It is unlikely that threatened species would utilise the Subject Land considering its location in a heavily urbanised and altered landscape.
Water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including subsidence or upsidence resulting from underground mining or other development)	No	There are no threatened species and ecological communities within the Subject Land that are sustained by water bodies and hydrological processes.
Wind turbine strikes on protected animals	No	There are no wind turbines proposed on the Subject Land.
Vehicle strikes on threatened species of animals or on animals that are part of a TEC	No	There is no potential habitat within the Subject Land that supports threatened species as outlined in this report, therefore it is unlikely that vehicle strikes will be an issue.

6.3 Other relevant Legislation or Planning Policies Requiring Address

6.3.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

No EPBC Act threatened species or ecological communities were located within the Subject Land.

6.3.2 Groundwater Dependent Ecosystems

The Australian Government Atlas of Groundwater Dependent Ecosystems (GDE; BOM 2019a) was reviewed and it was identified that the Subject Land does not contain a GDE. During on-ground surveys no GDE were evident.

6.3.3 NSW Fisheries Management Act 1994

The Georges River, which is located approximately 200m from the Subject Land, is mapped as Key Fish Habitat within the Sydney Area (DPI 2019a). It is however not expected that the proposed development will impact upon any habitat for threatened fish as listed under the NSW Fisheries Management Act 1994, neither will the development impact upon any Key Fish Habitat.

6.3.4 State Environmental Planning Policy (Koala Habitat Protection) 2019

This SEPP seeks to address the declining status of koalas in NSW through better conservation and management of koala habitat as part of the planning and assessment process. The overarching aim of the SEPP is to "… encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline" (DPIE 2020).

This SEPP applies to local government areas that are listed in Schedule 1 'Local government areas' of the SEPP. As Liverpool LGA is included in Schedule 1, this SEPP applies to the Subject Site. Liverpool LGA forms part of the Central Coast Koala Management Area. As such, the development control provisions of the SEPP apply to development applications relating to the land:

1. Where there is an approved Koala Plan of Management (KPoM) for the land

    a) The development application must be consistent with the approved Koala Plan of Management that applies to the land.

2. Where there is no approved Koala Plan of Management for the land, if the land

    a) Is identified on the Koala Development Application Map; and

    b) Has an area of more than 1 hectare; or

    c) Has, together with any adjoining land in the same ownership, an area of more than 1 hectare, whether or not the development application applies to the whole, or only part, of the land.

The development control provisions of the SEPP therefore relate to the Subject Land as:

- There is no approved Koala Plan of Management for the land.
- The Subject Property has been identified on the Koala Development Application Map.
- The Subject Property has an area of more than 1 ha.

Due to the degraded and fragmented nature of the Subject Land, the 'Koala Development Application Map' will not be utilised. In this instance, the procedures outlined in 'Appendix C: Survey Methods for Core Koala Habitat' of the Koala Habitat Protection Guideline (DPIE 2020b) were followed to determine

if the area meets the definition of core koala habitat in the SEPP. No koalas were present during the site assessment, and there have been no koala records within the Subject Property within the previous 18 years. However, there are 7 koala records (OEH 2020) within 2.5km of the Subject Site. On closer examination, such records have a low level of GPS accuracy and are located within unsuitable habitat. Careful examination of the broader landscape revealed that the Subject Land does not occur within an area of contiguous habitat or between areas of habitat with connectivity. It is located in a highly fragmented landscape. The Subject Land therefore does not meet the definition of 'core koala habitat'. No further assessment under the SEPP is required.

6.3.5 State Environmental Planning Policy No 19—Bushland in Urban Areas

Clause 9 of SEPP 19 – Bushland in Urban Areas, applies to land which adjoins bushland zoned or reserved for public open space purposes. As the Subject Land is not situated adjacent to bushland zoned or reserved for public open space purposes, SEPP 19 does not apply.

6.3.6 State Environmental Planning Policy (Coastal Management) 2018

State Environmental Planning Policy (Coastal Management) 2018 applies to land within the coastal zone. The coastal zone means the area of land comprised of the following coastal management areas:

- the coastal wetlands and littoral rainforests area;
- the coastal vulnerability area;
- the coastal environment area; or
- the coastal use area.

As the Subject Land does not occur within any of these listed areas, this SEPP does not apply.

6.4 Biodiversity Offset Credit Requirements

No candidate ecosystem or species credit species will require offsetting under the BOS as a result of the proposed development.

7. References

Atlas of Living Australia (ALA) (2019) Atlas of Living Australia. Spatial Portal http://spatial.ala.org.au/

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Biodiversity Conservation Act (2016) https://legislation.nsw.gov.au/#/view/act/2016/63/full

Clouston Associates (2019) Liverpool Health and Academic Precinct – Civil Road Works – REF 2 (S19-011)

Department for Land and Water Conservation (DLWC) (2002). The NSW State Groundwater Dependent Ecosystem policy: A component policy of the NSW State Groundwater Policy Framework Document. NSW Department for Land and Water Conservation.

Department of Primary Industries (DPI) (2019a) Key Fish Habitat, LGAs in Sydney Area https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/634354/Sydney_updated.pdf

Department of Primary Industries (DPI) (2019b) Priority Weeds for Greater Sydney, NSW Weeds Wise https://weeds.dpi.nsw.gov.au/

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