Cricket NSW Centre of Excellence, Wilson Park, Sydney Olympic Park

Biodiversity Development Assessment Report

COX Architecture

2 June 2020

Final

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Report No. 19017RP2

The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or commendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology.

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Approved by:	**David Robertson**
Position:	Director
Signed:	
Date:	2 June, 2020

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Glossary

Term/Acronym	Definition
Assessment Area	Area of land within a 1500 m buffer around the outer boundary of the subject property
AHD	Australian Height Datum
BAAS	Biodiversity Assessor Accreditation System
BAM	Biodiversity Assessment Method
BC Act	Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
°C	Degrees Celsius
CEEC	Critically Endangered Ecological Community
Development site	Areas directly impacted as part of the Project to which the BAM is applied
DoEE	Commonwealth Department of the Environment and Energy
DPIE	Department of Planning, Industry and Environment
EEC	Endangered Ecological Community
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
EP&A Act	NSW Environmental Planning and Assessment Act 1979
GIS	Geographic Information System
GPS	Global Positioning System
ha	Hectares
IBRA	Interim Biogeographic Regionalisation for Australia
ICC	International Cricket Council
IPZ	Inner Protection Zone
km	Kilometres
LGA	Local Government Area
Locality	Area within a 5 km radius of the subject property
NSW	New South Wales
m	Metres
MNES	Matters of National Environmental Significance
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
PMST	Commonwealth Protected Matter Search Tool
the Project	The proposed construction of a Cricket Centre of Excellence and associated infrastructure

Term/Acronym	Definition
RFS	NSW Rural Fire Service
SAII	Serious and Irreversible Impacts
SEPP	State Environmental Planning Policy
Subject property	The allotment of land subject to this BAM assessment. Lot C/-/ DP 421320.
TEC	Threatened Ecological Community

Executive Summary

S1 Introduction

Cumberland Ecology was commissioned by COX Architecture Pty Ltd (the 'proponent') on behalf of Cricket New South Wales (NSW) to prepare this Biodiversity Development Assessment Report (BDAR) for a proposed development at Wilson Park, Sydney Olympic Park, NSW (the 'Project). The Project involves the construction of a Cricket Centre of Excellence which consists of a cricket oval and associated infrastructure. This BDAR will form part of the required Environmental Impact Statement (EIS) to support an application for a State Significant Development (SSD) under Part 4, Division 4.7 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

S1.1 Project Description

The Project is located at Wilson Park, in the suburb of Sydney Olympic Park (hereafter referred to as the 'subject land'), within the Cumberland Local Government Area (LGA). It is situated at the north western corner of the Sydney Olympic Park (SOP) precinct.

The subject property is irregular in shape and comprises a single allotment of land with an area of 121,082 m^2 that is bounded by the Parramatta River to the north, Silverwater Correctional Complex to the east, a busway and industrial lands to the south and Silverwater Road to the west.

The proposal is a State Significant Development Application (SSDA) to facilitate the development of a Cricket Centre for Cricket NSW at the Wilson Park site. Specifically, the works that are proposed for the SSDA include:

- A two-storey cricket centre, including an internal atrium, gymnasium, community facilities, sports science and sports medicine facilities and business offices;
- An International Cricket Council (ICC) compliant oval 136 m long x 144 m wide (16,040 m^2) (Oval 1) and associated seating;
- A second oval (Oval 2) that complies with the Cricket Australia community guidelines for community club cricket (with a minimum diameter of 100 m (6365 m^2);
- Outdoor practice nets with 71 wickets;
- A double height (10.7 m) indoor training facility with 15 wickets;
- A single-storey shed for machinery;
- Associated car parking, landscaping and public domain works; and
- Extension and augmentation of services and infrastructure as required.

S2 Landscape Features

As the Project is being assessed as a site-based project, the assessment area comprises the area of land within a 1,500 m buffer around the outer boundary of the proposed development site. A summary of the landscape features identified in the assessment area are detailed below:

- Percentage native vegetation cover: 19%;
- Geographic constraints:
  - 4th order watercourse and associated riparian corridors on the northern boundary of subject property; and
  - Coastal Wetlands adjacent to the subject property.
- Some habitat connectivity exists within the subject property;
- No karsts, caves, crevices, cliffs or areas of geological significance were identified within the assessment area; and
- No Areas of Outstanding Biodiversity Value have been mapped within the assessment area.

S3 Native Vegetation Extent

The subject property has been subject to detailed surveys by Cumberland Ecology for the purpose of this BDAR. The native vegetation extent within the subject property was determined through aerial photograph interpretation and field surveys. The native vegetation extent within the subject property is shown in **Figure 7**. Native vegetation occupies approximately 2.53 ha, which represents approximately 37% of the subject property. The native vegetation extent within the subject property includes a suite of PCTs outlined below.

The remaining vegetation within the subject property comprises cultivated lawns (~37.03 ha) and exotic dominated landscaped vegetation (~5.74 ha). The subject property also contains cleared land (~0.22 ha) that includes artificial wetlands. In accordance with Section 5.1.1.5 of the BAM, these areas do not require further assessment, unless they provide habitat for species credit species.

S3.1 Plant Community Types

The original native vegetation on the subject property has been cleared and removed. The majority of vegetation that currently occurs in planted. However mangroves exist along the Paramatta River to the north, and patches of regrowth or replanted Swamp Oak occur in low lying areas on site.

Identification of the PCTs occurring within the subject property was guided by the results of the Cumberland Ecology surveys. The data collected during surveys of the subject property was analysed in conjunction with a review of the PCTs held within the BioNet Vegetation Classification Database.

The majority of native vegetation occurring within the subject property has been planted, often comprising of a stand of trees with a large proportion of non-endemic species. Such vegetation is not a naturally occurring

PCT. For such plantings, the following best-fit PCTs were assigned. Overall, in the subject property the following PCTs have been mapped:

- 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edge of the Cumberland Plain, Sydney Basin Bioregion in two broad condition states;
- 1183 - Smooth-barked Apple - Sydney Peppermint - Turpentine heathy open forest on plateaux areas of the Sydney Basin Bioregion;
- 1234 - Swamp Oak Floodplain Forest fringing estuaries, Sydney Basin Bioregion and South-East Corner Bioregion; and
- 920 - Mangrove Forests in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion.

S4 Threatened Species

The BAM Calculator generated a list of 30 ecosystem credit species and 45 species credit species. The following species were identified as candidate species credit species for further assessment:

- White-bellied Sea-Eagle (*Haliaeetus leucogaster*);
- Eastern Osprey (*Pandion cristatus*);
- Green and Golden Bell Frog (*Litoria aurea*); and
- Southern Myotis (*Myotis macropus)*.

Targeted surveys for the candidate species credit species for further assessment undertaken within the subject property are detailed in ***Section 2.4***. As a precautionary measure, additional targeted surveys were undertaken for threatened flora species credit species that required no further assessment due to survey periods aligning with the project timeline as described in ***Section 2.3***. A list of fauna species encountered within the subject property can be found in **Appendix B**.

None of the candidate species credit species with aligning survey periods were observed within the development site, although one species (Green and Golden Bell Frog) was detected within the subject property.

S5 Prescribed Impacts

Prescribed impacts are outlined within the NSW *Biodiversity Conservation Regulation 2017*.

The project is considered to result in the following prescribed impacts:

- Impacts on the connectivity of habitat that facilitates the movement of threatened species; and
- Impacts to water quality, water bodies and hydrological processes.

S6 Avoid and Minimise Impacts

Avoidance of impacts on native vegetation and habitat can be achieved to varying degrees by the modification of the design and location of a project. Furthermore, mitigation measures can further assist in minimising impacts to biodiversity values. The development of avoidance and mitigation measures for the project has considered the current condition of the vegetation and habitat within the subject property. Avoidance and mitigation measures relevant to the project are detailed below:

- Locating the development envelope predominantly in areas where there are lower biodiversity values such as previously cleared areas;
- Situating the development to avoid clearing of native vegetation where possible; and
- Locating the development in the south-western section of the subject property to reduce impacts to waterways.

Measures to avoid and minimise impacts to native vegetation and habitats have been incorporated into the design of the project. This has included:

- Locating the construction facilities within the operational footprint;
- Utilising existing access roads;
- Retaining existing planted trees within areas proposed for landscaping; and
- Lanscaping locally indigenous species where practicable.

Measures to avoid prescribed impacts have included:

- Retaining the stand of vegetation along the southern and eastern boundary such that the habitat connectivity and adequate foraging habitat for threatened species is maintained; and
- Avoiding the artificial wetlands located in the north-western corner of the subject property and designing and stormwater system that will prevent a direct impact to water quality and hydrological processes.

S7 Impact Assessment

S7.1 Direct Impacts

The primary and direct impact resulting from the proposed development is the loss of vegetation and associated habitat within the subject property. Impacts will occur within the following vegetation zones:

- Vegetation Zone 1: Total clearing. Within PCT 1395, 382 trees are proposed to be removed with a total area of ~1.3 ha; and
- Vegetation Zone 2: Total clearing. Within PCT 1183, 2 trees are proposed to be removed with a total area of ~0.02 ha.

S7.2 Indirect Impacts

The following indirect impacts to native vegetation and habitat may occur as a result of the Project:

- Inadvertent impacts on adjacent habitat or vegetation;
- Reduced viability of adjacent habitat due to noise, dust or light spill;
- Inadvertent impacts to hydrological processes; and
- Transport of weeds and pathogens from the site to adjacent vegetation.

S7.3 Prescribed Impacts

S7.3.1 Human-made Structure

The Project will result is the modification of the existing toilet building located in the north-eastern portion of the development site that may contain potential roosting habitat for the threatened Little Bent-winged Bat, Large Bent-winged Bat and Southern Myotis. Nevertheless, the human made structure to be modified for the proposed development is not considered to form significant roosting habitat for these species and they are not considered to be dependent on the structure for survival.

S7.3.2 Non-native Vegetation

Although the areas consisting of non-native vegetation may be utilised occasionally as foraging habitat, they are unlikely to be favoured over the adjoining reserve and wetland habitats. Hence, no significant impacts on threatened fauna species are expected from the removal of non-native vegetation within the development site.

S7.3.3 Connectivity of Different Areas of Habitat that Facilitates Movement Across a Species Range

Up to approximately 1.30 ha of treed habitat is proposed to be removed during the construction phase of the Project. The proposed removal of these small isolated areas of vegetation and habitat would very minimally contribute to the fragmentation of habitat further than current conditions. It is unlikely these highly fragmented areas would be solely relied upon by any threatened species to facilitate movements between habitats throughout their distribution.

S7.3.4 Movement of the Threatened Species that Maintain Their Lifecycle

Small patches of degraded and previously cleared vegetation will be removed in the south-western portion of the subject property as part of the Project. These areas may be used to a limited degree by the Green and Golden Bell Frog for dispersal and foraging, however it is considered unlikely that this species (or any other threatened fauna species) would be solely reliant on the degraded and modified habitat on the development site, instead favouring the adjacent wetlands and reserve.

S7.3.5 Water Quality, Water Bodies and Hydrological Processes

Construction activities associated with the Project have the potential to cause impacts to water quality arising from sedimentation, potentially impacting the artificial water quality treatment wetlands and the Parramatta River. These potential impacts will be managed with the implementation of an approved sedimentation and erosion control plan.

S7.4 Mitigation Measures

The following measures will be undertaken to mitigate impacts to native vegetation and habitat during and prior to construction:

S7.4.1 Construction Mitigation Measures:

The following mitigation measures are relevant to the construction phase of the Project:

- **Delineation of Clearing Areas:** Areas that require clearance will be clearly delineated by temporary fencing to ensure that no areas intended for retention will be inadvertently cleared during the construction process;
- **Tree Protection Measures:** Any trees in close proximity to trees to be removed or earthwork impacts will have tree protection measures implemented;
- **Pre-clearance Surveys:** In order to avoid impacts to fauna species during construction, pre-clearance surveys will be conducted in all treed areas that are required to be cleared. Additionally, pre-clearance surveys for the Green and Golden Bell Frog will be conducted after the erection of frog-proof fencing;
- **Clearing Supervision:** To minimise impacts to native fauna species, clearing will be undertaken under the supervision of a suitably qualified ecologist;
- **Weed Management:** In order to minimise the spread of weeds throughout the subject property and spread of weeds present in the subject property to areas outside of it, appropriate weed control activities will be undertaken in accordance with the relevant regional management plan; and
- **Sediment and Erosion Control:** Stormwater and sedimentation is proposed to be managed through the implementation of sediment fencing and sediment basins in addition to the management and appropriate location of stockpiles.

S7.4.2 Biodiversity Offsets:

The native vegetation within the development site comprises planted vegetation that does not readily conform to an existing PCT. Best-fit PCTs were utilised to assess planted native vegetation within the development site. PCTs 1395 and 1183 were used as surrogates for the occurrences of planted native vegetation within the development site, existing as one condition state. This assessment indicates that the removal of native vegetation within the development site requires a total of 21 ecosystem credits, 21 for PCT 1395. Following targeted threatened surveys, it was determined that a total of 35 species credits are required for the proposed development, 19 for the Southern Myotis and 16 for the Green and Golden Bell Frog.

S8 Conclusion

With the implementation of the proposed mitigation measures and the purchase of biodiversity credits, it is considered that the impacts of the Project on biodiversity will be minimal in the longer term and can be appropriately managed and mitigated.

1. Introduction

Cumberland Ecology was commissioned by COX Architecture Pty Ltd (the 'proponent') on behalf of Cricket New South Wales (NSW) to prepare a Biodiversity Development Assessment Report (BDAR) for a proposed development at Wilson Park, Sydney Olympic Park, NSW (the 'Project). The Project involves the construction of a Cricket Centre of Excellence that consists of a cricket oval and associated infrastructure. This BDAR will form part of the required Environmental Impact Statement (EIS) to support an application for a State Significant Development (SSD) under Part 4, Division 4.7 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.1. Requirement for BDAR

Under the *NSW Biodiversity Conservation Act 2016* (BC Act), all SSD that requires development consent under Part 4, Division 4.7 of the EP&A Act automatically enter into the Biodiversity Offset Scheme (BOS) and must be assessed using the Biodiversity Assessment Method (BAM) with the results presented in a BDAR, unless a waiver is granted by the Secretary and Chief of the Department of Planning, Industry and Environment (formerly the Department of Planning and Environment and the Office of Environment and Heritage). The Secretary's Environmental Assessment Requirements (SEARs) detail that the Project is likely to have a significant impact on biodiversity, in particular the Green and Golden Bell Frog (*Litoria aurea*), which renders the possibility of a waiver improbable, and therefore a BDAR has been prepared.

1.2. Purpose

The purpose of this BDAR is to document the findings of an assessment undertaken for the Project in accordance with Stage 1 (Biodiversity Assessment) and Stage 2 (Impact Assessment) of the BAM. Specifically, the objectives of this BDAR are to:

- Identify the landscape features and site context (native vegetation cover) within the land proposed to be developed (the 'subject property') and any areas considered to be indirectly impacted by the Project (the 'assessment area');
- Assess native vegetation extent, plant community types (PCTs), threatened ecological communities (TECs) and vegetation integrity (site condition) within the subject property;
- Assess habitat suitability for threatened species that can be predicted by habitat surrogates (ecosystem credits) and for threatened species that cannot be predicted by habitat surrogates (species credit species);
- Identify potential prescribed biodiversity impacts on threatened species;
- Describe measures to avoid and minimise impacts on biodiversity values and prescribed biodiversity impacts during Project planning;
- Describe impacts to biodiversity values and prescribed biodiversity impacts and the measures to mitigate and manage such impacts;
- Identify the thresholds for the assessment and offsetting of impacts, including:
    - Impact assessment of potential entities of serious and irreversible impacts (SAII);

- Impacts for which an offset is required; and
- Impacts for which no further assessment is required;

- Describe the application of the no net loss standard, including the calculation of the offset requirement.

1.3. Project Description

1.3.1. Location

The Project is located at Wilson Park, in the suburb of Sydney Olympic Park (hereafter referred to as the 'subject property'), within the Cumberland Local Government Area (LGA) and is situated at the north western corner of the Sydney Olympic Park (SOP) precinct.

The subject property is located in proximity to a number of regionally significant facilities and amenities including Sydney Olympic Park Railways Station, ANZ Stadium, Qudos Bank Arena and Sydney Showground, which are all approximately 2.5 km south east of the subject property. Further to this, the subject property is located approximately 2 km west of Wentworth Point.

The subject property is irregular in shape and comprises a single allotment of land with an area of 121,082 m^2 and a leased area where development will occur (hereafter referred to as the 'development site') with an area of 65,767 m^2. The development site excludes the portion of the Wilson Park site that is used for remediation purposes. The site is currently owned by the Sydney Olympic Park Authority (SOPA) and is legally described as LOT C in DP 421320. The site is bounded by the Parramatta River to the north, Silverwater Correctional Complex to the east, a busway and industrial lands to the south and Silverwater Road to the west.

A site map and location map have been prepared in accordance with the BAM and are presented in **Figure 1** and **Figure 2**, respectively.

1.3.2. Overview of Proposed Development

The proposal is a State Significant Development Application (SSDA) to facilitate the development of a Cricket Centre for Cricket NSW at the Wilson Park site. Specifically, the works that are proposed for the SSDA include:

- A two-storey cricket centre, including an internal atrium, gymnasium, community facilities, sports science and sports medicine facilities and business offices;
- An International Cricket Council (ICC) compliant oval 136 m long x 144 m wide (16,040 m^2) (Oval 1) and associated seating;
- A second oval (Oval 2) that complies with the Cricket Australia community guidelines for community club cricket (with a minimum diameter of 100 m (6365 m^2);
- Outdoor practice nets with 71 wickets;
- A double height (8 m) indoor training facility with 15 wickets;
- A single-storey shed for machinery;

- Associated car parking, landscaping and public domain works; and
- Extension and augmentation of services and infrastructure as required.

1.3.3. Identification of the Development Site Footprint

The layout of the Project is shown in **Figure 3**. The development site footprint comprises the area of land directly impacted by the Project and is hereafter referred to as the 'development site'. For the purpose of this assessment, the development site comprises both the construction footprint and the operational footprint of the Project which in this case are the same

1.3.4. General Description of the Development Site and Subject property

1.3.4.1. Historical and Present Land Use

The subject property has historically been cleared for use as farm land before it was developed into a petrochemical plant with sludge ponds that were subsequently covered, following the closure of the plant in the mid-1970s. It was then developed as a public recreational park and sports fields which had to be closed to the public for a decade to allow seeping tar waste to be appropriately contained. It was then re-opened to the public in the early 2000's since when it has been used as a public recreational park (Urban Design 2019). The subject property consists of a mixture of cleared land, garden vegetation, exotic lawns and planted native and exotic vegetation, including non-endemic species. Artificial wetlands bordering water quality treatment ponds are located in the north-eastern portion of the subject property, an area maintained as remediated land covering the previous tar pits and treatment ponds. All of the surrounding properties have been historically modified for residential, industrial and recreational purposes.

1.3.4.2. Topography and Soils

The subject property is generally flat ranging from 2 m in the north sloping gently to 4 m in the south-west, relative to the Australian Height Datum. The subject property is predominantly mapped as occurring within the Disturbed Terrain Soil Landscape (Chapman et al. 2005). This soil landscape is described as being extensively disturbed by human activity and is comprised of landfill containing soils, rocks, building and waste materials (Chapman et al. 2005). A small area within the south-east corner of the subject property is mapped as occurring within the Blacktown soil landscape, which contains shallow to moderately deep soils derived from Wianamatta Group Shale and Hawkesbury Shale geology (Chapman et al. 2005).

1.3.4.3. Hydrology

The subject property lies within the Parramatta River Catchment. The hydrology of the subject property and surrounding area has historically been modified as a result of residential, industrial and recreational land uses, including clearing of native vegetation altering surface water runoff patterns.

Although no mapped watercourses are present within the subject property, the Parramatta River, a 4th order watercourse, is present running eastward parallel to the northern boundary of the subject property. Three artificial wetlands are present in the north-eastern portion of the subject property and a mapped local Coastal Wetland mapped under the Coastland Management SEPP is present parallel to the eastern boundary (outside) of the subject property. One unmapped ephemeral drainage line is present within the subject property that is considered likely to be fed by runoff from the subject property and neighbouring properties.

1.3.4.4. Vegetation

The vegetation within the subject property is comprised mainly of exotic garden vegetation, exotic lawns and scattered planted native vegetation. The plantings include non-endemic, and exotic trees surrounding the sports fields and wetlands. plantings on site link or are close to mangroves in the north along the Paramatta River, outside the subject property. Some Swamp Oak (*Casuarina glauca*) has regenerated and/or been planted in low lying areas on site.

The native vegetation of the subject property has not currently been mapped by either the Department of Planning, Industry and Environment (DPIE) or the City of Parramatta Council.

Surveys and data analysis by Cumberland Ecology identified the vegetation of the subject property to conform to the following Plant Community Types (PCT):

- PCT 1395 – Narrow-leaved Ironbark – Broad leaved Ironbark – Grey Gum open forest of the edge of the Cumberland Plain;
- PCT 1183 – Smooth-barked Apple – Sydney Peppermint – Turpentine heathy forest on plateaux areas,
- PCT 1234 – Swamp Oak Floodplain Forest of the Sydney Basin Bioregion; and
- PCT 920 – Mangrove Forest in estuaries of the Sydney Basin Bioregion.

The original vegetation of the subject property has been cleared and removed historically, relating to the industrial and residential development common throughout the surrounding area. The vegetation now within the subject property was planted in the last two decades and coincides with the development of Sydney Olympic Park and the current use of the subject property as a recreational public park.

1.4. Information Sources

1.4.1. Databases

A number of databases were utilised during the preparation of this BDAR, including:

- DPIE BioNet Atlas (OEH 2019a);
- DPIE Threatened Biodiversity Data Collection (TBDC) (Bionet 2019);
- DPIE BioNet Vegetation Classification database (OEH 2019b);
- Commonwealth Department of the Environment and Energy (DoEE) Species Profile and Threat Database (DoEE 2017);
- DoEE Protected Matters Search Tool (PMST) (DoEE 2019); and
- DoEE Directory of Important Wetlands in Australia (DotE 2014).

1.4.2. Literature

This BDAR has utilised the results and/or spatial data from the following documents:

- Preliminary Constraints Analysis, Wilson Park, Silverwater, Cumberland Ecology (2019);
- Architecture and Urban Design Report, Wilson Park, Sydney Olympic Park, COX Architecture (2019);
- Arboricultural Impact Assessment, Wilson Park, Newington Road, Silverwater, New Leaf Arboricultural (2019);
- Acoustic Assessment, Cricket NSW Centre of Excellence, Sydney Olympic Park, Acoustic Logic (2019); and
- Landscape Plan, Cricket NSW Centre of Excellence, Sydney Olympic Park, Turf Landscape (2019).

1.4.3. Aerial Photography

The aerial imagery utilised in this BDAR is sourced from NearMap and is dated 04/03/2019.

1.5. Authorship and Personnel

This document has been authorised by Dr David Robertson (BAM Accredited Assessor No: BAAS17027). This document and associated field surveys and Geographic Information Systems (GIS) mapping, was prepared with the assistance of additional personnel as outlined in **Table 1**. Notwithstanding the assistance of the additional personnel, the assessment presented within this document is Dr Robertson's.

Table 1 Personnel

Name	Task	Relevant Qualifications/Training	BAM Accredited Assessor No.
Dr David Robertson	Document preparation, document review	Doctor of Philosophy, Ecology, University of Melbourne, 1986	BAAS17027
		Bachelor of Science (Honours) in Ecology, University of Melbourne, 1980	
		BAM Accredited Assessor Training. Muddy Boots, 2017	
Bryan Furchert	Field surveys	Bachelor of Biodiversity and Conservation, Macquarie University, 2012	BAAS17027
		Diploma of Conservation and Land Management, TAFE NSW, 2008	
		BAM Accredited Assessor Training. Muddy Boots, 2017	
Dr Rohan Mellick	Field surveys	Doctor of Philosophy, Evolutionary Ecology, University of Adelaide, 2012.	BAAS18075
		Bachelor of Applied Science (Honours) in Natural Resource Management, Southern Cross University, 2000	

		BAM Accredited Assessor Training. Muddy Boots, 2017	
Cecilia Eriksson	Document preparation, document review	Master of Science (Marine Biology and Management), University of Technology Sydney, 2013	
		Bachelor of Science (Honours) in Marine Biology, University of Technology, Sydney, 2008	
		BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS19052
Jesse Luscombe	Figure preparation, credit calculations	Bachelor of Marine Science, Macquarie University, 2013	
		Certificate III in Conservation and Land Management, TAFE NSW, 2016	
		BAM Accredited Assessor Training. Muddy Boots, 2018	-
Sally Dupont	Document preparation, field surveys	Master of Research (Marine Biology), Macquarie University, 2016	
		Bachelor of Science, Western Sydney University, 2012	
		BAM Accredited Assessor Training. Muddy Boots, 2019	-
Michael Davis	Document preparation, figure preparation	Bachelor of Biodiversity and Conservation, Macquarie University, 2016	
		BAM Accredited Assessor Training. Muddy Boots, 2018	-
Mikael Peck	Document review	Master of Marine Science and Management, Macquarie University, 2013	
		Bachelor of Science, Washington State University, 2005	
		BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS19002
Rebeca Violante	Field Surveys	Bachelor of Science in Biology, University Paulista, 2015	

2. Methods

2.1. Review of Existing Data

Existing information on biodiversity values within the assessment area were reviewed, including the following:

- Survey data held in the Flora Survey (BioNet) including DPIE Threatened Biodiversity Data Collection (Bionet 2019, OEH 2019a);
- Existing vegetation mapping, presented in the City of Parramatta Biodiversity Strategy (City of Parramatta 2015); and
- Preliminary Constraints Analysis Report for Wilson Park, Silverwater, Cumberland Ecology (2019).

The existing information was considered and included, where appropriate, into survey design, vegetation mapping and reporting.

2.2. Flora Surveys

Flora surveys were undertaken in the subject property by Cumberland Ecology on 4 April and 5 September 2019. These surveys included vegetation mapping, vegetation integrity assessment and threatened flora species surveys. Further details on each type of survey are provided below.

2.2.1. Vegetation Mapping

Vegetation mapping of the subject property was undertaken by random meander searches throughout each patch of vegetation, noting key characteristics of areas in similar broad condition states such as similar tree cover, shrub cover, ground cover, weediness or combinations of these.

2.2.2. Vegetation Integrity Assessment

Vegetation integrity assessments were undertaken in the subject property in accordance with the BAM. Surveys included establishment of a 20 x 50 m plot within which the following data was collected:

- Composition for each growth form group by counting the number of native plant species recorded for each growth form group within a 20 m x 20 m plot;
- Structure of each growth form group as the sum of all the individual Projected foliage cover estimates of all native plant species recorded within each growth form group within a 20 m x 20 m plot;
- Cover of 'High Threat Exotic' weed species;
- Assessment of function attributes within a 20 m x 50 m plot, including:
    - Count of number of large trees;
    - Tree stem size classes, measured as 'diameter at breast height over bark' (DBH);
    - Regeneration based on the presence of living trees with stems <5 cm DBH; and
    - The total length in metres of fallen logs over 10 cm in diameter;

- Assessment of litter cover within five 1 m x 1 m plots evenly spread within the 20 m x 50 m plot; and
- Number of trees with hollows that are visible from the ground within the 20 m x 50 m plot.

A total of eight BAM plots were undertaken within the subject property, with five performed within the development site. The location of BAM plots is shown in **Figure 4**. **Table 2** summarises the plot requirements based on the size and number of vegetation zones in the development site. The vegetation in the development site has been mapped as comprising two vegetation zones and as such, the minimum number of plots or greater have been completed for the relevant vegetation zones, in addition to plots completed throughout areas of exotic vegetation.

Table 2 Minimum plot survey requirements for the development site

Vegetation Zone	PCT	Condition	Approximate Area (ha)	Minimum Number of Plots Required	Number of Plots Completed
1	1395	Cleared	1.62	1	3
2	1183	Cleared	0.02	1	1

2.2.3. Threatened Flora Species Survey

Targeted threatened flora surveys were undertaken for species credit species that were assessed as candidate species credit species for further assessment (see **Section 5.3**). All targeted surveys were undertaken during flora field surveys in 2019 and include random meanders and parallel field traverses in accordance with the NSW Guide to Surveying Threatened Plants (OEH 2016). Land usage history and condition of the subject property was considered in the undertaking of targeted plant surveys, as well as habitat, ecology and detectability of each candidate species. The subject property is situated on actively used and managed land and the present-day landform is artificial in nature.

The subject property is considered sufficiently degraded and modified to rule out the potential presence of flora species credit species in accordance with Section 6.4.1.17 of the BAM. Nevertheless, random meander surveys and parallel traverses were performed as a precaution. **Figure 4** (see 'survey tracks') shows the locations of the targeted threatened flora surveys undertaken within the subject property, whilst **Table 3** provides a summary of the flora species credit species surveyed within the subject property.

Table 3 Threatened flora survey dates and methods

Scientific Name	Common Name	Recommended Survey Period	Dates of Surveys within Development Site	Survey Method
Acacia bynoeana	Bynoe's Wattle	Sep-Mar	5/09/2019	Parallel field traverses
Acacia pubescens	Downy Wattle	All Year	5/09/2019	Parallel field traverses
Caladenia tessellata	Thick Lip Spider Orchid	Sep-Oct	5/09/2019	Parallel field traverses

Scientific Name	Common Name	Recommended Survey Period	Dates of Surveys within Development Site	Survey Method
Callistemon linearifolius	Netted Bottle Brush	Sep-Mar	5/09/2019	Parallel field traverses
Cynanchum elegans	White-flowered Wax Plant	All Year	5/09/2019	Parallel field traverses
Dillwynia tenuifolia	-	All Year	5/09/2019	Parallel field traverses
Epacris purpurascens var. purpurascens	-	All Year	5/09/2019	Parallel field traverses
Eucalyptus camfieldii	Camfield's Stringybark	All Year	5/09/2019	Parallel field traverses
Eucalyptus sp. Cattai	-	All Year	5/09/2019	Parallel field traverses
Grevillea parviflora subsp. *parviflora*	Small-flower Grevillea	All Year	5/09/2019	Parallel field traverses
Grevillea parviflora subsp**.** *supplicans*	-	All Year	5/09/2019	Parallel field traverses
Gyrostemon thesioides	-	All Year	5/09/2019	Parallel field traverses
Haloragodendron lucasii	-	All Year	5/09/2019	Parallel field traverses
Hibbertia puberula	-	Sep-Feb	5/09/2019	Parallel field traverses
Hibbertia superans	-	Jul-Dec	5/09/2019	Parallel field traverses
Hibbertia spanantha	Julian's Hibbertia	Sep-Nov	5/09/2020	Parallel field traverses
Hygrocybe anomala var**.** *ianthinomarginata*	-	May-Aug	5/09/2019	Parallel field traverses
Leucopogon exolasius	Woronora Beard-heath	All Year	5/09/2019	Parallel field traverses
Leucopogon fletcheri subsp. *fletcheri*	-	All Year	5/09/2019	Parallel field traverses
Marsdenia viridiflora subsp. *viridiflora*	-	All Year	5/09/2019	Parallel field traverses
Melaleuca deanei	Deane's Paperbark	All Year	5/09/2020	Parallel field traverses

Scientific Name	Common Name	Recommended Survey Period	Dates of Surveys within Development Site	Survey Method
Persoonia bargoensis	Bargo Geebung	All Year	5/09/2020	Parallel field traverses
Persoonia hirsuta	Hairy Geebung	All Year	5/09/2020	Parallel field traverses
Persoonia mollis subsp. *maxima*	-	All Year	5/09/2019	Parallel field traverses
Persoonia nutans	Nodding Geebung	All Year	5/09/2019	Parallel field traverses
Pimelea curviflora var. *curviflora*	-	All Year	5/09/2019	Parallel field traverses
Pomaderris brunnea	Brown Pomaderris	All Year	5/09/2019	Parallel field traverses
Pterostylis saxicola	Sydney Plains Greenhood	Sep-Nov	5/09/2019	Parallel field traverses
Pultenaea pedunculata	Matted Bush-pea	Sep-Nov	5/09/2019	Parallel field traverses
Tetratheca glandulosa	-	Jul-Nov	5/09/2019	Parallel field traverses
Thesium australe	Austral Toadflax	Sep-Feb	5/09/2019	Parallel field traverses
Zieria involucrata	-	All Year	5/09/2019	Parallel field traverses

2.2.4. Flora Survey Effort

All surveys were undertaken during periods specified in the Threatened Biodiversity Data Collection for each species and according to survey guidelines. **Table 4** below shows the flora survey effort, including dates and personnel.

Table 4 Flora survey effort

Survey Detail	Date	Effort	Personnel
Vegetation integrity assessments	4/04/2019 5/09/2019	16 person hours	Bryan Furchert and Dr Rohan Mellick
Vegetation mapping	4/04/2019 5/09/2019	4 person hours	Bryan Furchert and Dr Rohan Mellick
Threatened flora searches	5/09/2019	4 person hours	Bryan Furchert and Dr Rohan Mellick

2.3. Fauna Survey

2.3.1. Threatened Fauna Species Survey

Targeted threatened fauna surveys were undertaken for species credit species that were assessed as candidate species credit species for further assessment (see **Section 5.3**). **Table 5** provides a summary of the fauna species credit species surveyed within the subject property. Due to the survey period for the Project not aligning with the suitable survey period for the Southern Myotis, as outlined within the TBDC, surveys were subsequently not undertaken for this candidate species.

Table 5 Threatened fauna survey dates and methods

Scientific Name	Common Name	Recommended Survey Period	Dates of Survey within the Development Site	Survey Method
Litoria aurea	Green and Golden Bell Frog	Nov-Mar	8-9/10/2019	Amphibian surveys (diurnal searches and spotlighting)
Haliaeetus leucogaster	White-bellied Sea-eagle	Jul-Dec	4/04/2019 5/09/2019 8-9/10/2019	Bird surveys, habitat assessments
Myotis macropus	Southern Myotis	Nov-Mar	-	-
Pandion cristatus	Eastern Osprey	Apr-Nov	4/04/2019 5/09/2019 8-9/10/2019	Bird surveys, habitat assessments

Fauna surveys were undertaken by Cumberland Ecology in 2019. Surveys included habitat assessment, amphibian surveys, bird surveys and incidental observations of fauna occurrence. The locations of fauna surveys undertaken within the subject property are shown in **Figure 4**. The survey design was guided by the following:

- NSW Government (2017): Biodiversity Assessment Method;
- DEC (NSW) (2004): Threatened Biodiversity Survey and Assessment Guidelines for Development Activities (Working Draft);
- Department of the Environment, Water, Heritage and the Arts (DEWHA 2010): Survey Guidelines for Australia's Threatened Birds; and
- Department of the Environment, Water, Heritage and the Arts (DEWHA 2009): Significant Impact Guidelines for the Vulnerable Green and Golden Bell Frog (*Litoria aurea*).

Detailed survey methods are described below.

2.3.2. Fauna Survey Methods

2.3.2.1. Habitat Assessment

Habitat assessments were undertaken in the subject property by Cumberland Ecology on 4 April, 5 September and 8-9 October 2019. These surveys identified any potential habitat features considered to be suitable for usage by native fauna such as significant rocky outcrops, bush rock, fallen logs, culverts, water bodies, decorticating bark, nests and hollow-bearing trees.

2.3.2.2. Amphibian Surveys

Due to the restricted access to the remediation area containing the artificial ponds in the north-eastern corner of the subject property (outside of the development site boundary), amphibian surveys were unable to be conducted in that area. However, after reviewing both current and historical survey data of the artificial ponds obtained from SOPA, Green and Golden Bell Frogs were assumed to be present. Survey efforts were therefore concentrated on establishing the use of the development site by the species, which will be directly impacted by the Project.

Consequently, adapted survey methods were used. Call playback was determined to be unnecessary since the presence of Green and Golden Bell Frogs in the area was already known. Instead, the vegetation around the development site was visually inspected for basking, foraging and sheltering individuals for an hour during daytime. This was followed by an hour of spotlighting once the sun had set. These surveys took place over two nights during the period between 8 and 9 October 2019.

The amphibian surveys were conducted after the region had experienced rainfall in the previous weeks and the reference Green and Golden Bell Frog population had started calling. Although outside of the recommended survey period in the TBDC (Nov- Mar), conditions were considered ideal for amphibian surveys, with minimum temperatures ranging from 10.7 to 15.1 °C and maximum temperatures ranging 18.6 to 24.4 °C.

This survey specifically targeted the Green and Golden Bell Frog.

2.3.2.3. Bird Surveys

Area searches of the entire development site was conducted, as well as surrounding areas including the Parramatta River. Approximately an hour each day was spent looking for large stick nests and suitable trees, whilst concurrently observing any birds in the vicinity. These surveys took place over two days during the period between 8 and 9 October.

This survey specifically targeted the White-bellied Sea-Eagle and Eastern Osprey.

2.3.2.4. Incidental Observations

Any incidental vertebrate fauna species that was observed, heard calling, or otherwise detected on the basis of tracks or signs were recorded and listed in the total species list for the subject property (**Appendix B**).

2.3.3. Fauna Survey Effort

All surveys were undertaken during periods specified in the TBDC for each species and according to survey guidelines with the exception of the Green and Golden Bell Frog. Out of season surveys were performed for

this species in the month prior to the specified survey period. However, since surveys were conducted after the reference Green and Golden Bell Frog population of Sydney Olympic Park had started calling, in optimal weather conditions, the surveys undertaken are considered valid to detect use of the development site for the species.

Table 6 below shows the fauna survey effort, including dates and personnel.

Table 6 Fauna survey effort

Survey Detail	Date	Effort	Personnel
Habitat Assessment	4/04/2019 5/09/2019 8/10/2019 9/10/2019	8-person hours	Sally Dupont, Dr Rohan Mellick and Rebeca Violante
Amphibian Survey	8/10/2019 9/10/2019	8-person hours	Sally Dupont and Rebeca Violante
Bird Survey	8/10/2019 9/10/2019	4-person hours	Sally Dupont and Rebeca Violante

2.4. Weather Conditions

Weather conditions were generally appropriate for flora and fauna surveys, including targeted surveys for species credit species. All weather condition data was sourced from the BOM weather station located at Sydney Olympic Park (Sydney Olympic Park AWS (Archery Centre) 06621). A summary of the weather conditions during the survey period are shown in **Table 7**.

Table 7 Weather conditions during surveys

Date	Temperature Minimum (°C)	Temperature Maximum (°C)	Rainfall (mm)
4/04/2019	15.1	23.4	0
5/09/2019	10.4	22.2	0
8/10/2019	15.1	24.4	0
9/10/2019	10.7	18.6	0

3. Landscape Features

3.1. Assessment Area

As the Project is being assessed as a site-based project, the assessment area comprises the area within a 1,500 m buffer around the outer boundary of the development site. The assessment area is approximately 882.79 ha in size and is shown in **Figure 2**.

3.2. Landscape Features

Landscape features identified within the development site and assessment area are outlined below. The extent of these features within the development site is shown in **Figure 1** and the extent within the assessment area is shown in **Figure 2**.

3.2.1. IBRA Bioregions and IBRA Subregions

The development site and assessment area occur within the Sydney Basin Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion and within the Cumberland IBRA Subregion.

3.2.2. Rivers, Streams and Estuaries

The development site and assessment area occur within the Parramatta River catchment. No mapped watercourses occur within the development site; however, the wider subject property is bounded by Parramatta River (a 4th order watercourse) to the north. In addition, a 3rd order watercourse, Duck River, is located across Silverwater Road, west of the development site, as shown in **Figure 2**. Other watercourses occurring within the assessment area include Haslam's Creek to the south-west of the development site, a 1st order stream which flows into a 3rd order watercourse prior to converging with Parramatta River.

3.2.3. Important and Local Wetlands

No important wetlands listed in the Directory of Important Wetlands in Australia are present in the development site (DotE 2014). The closest important wetlands identified by the Directory of Important Wetlands in Australia are Newington Wetlands located approximately 1 km to the east of the development site, within Sydney Olympic Park, and the Bicentennial Park Wetland located approximately 2 km to the south-east of the development site. The closest important wetland identified in the Coastal Management SEPP wetland forms part of Blaxland Riverside Park and runs directly parallel to the eastern boundary of the subject property.

Local wetlands occur scattered throughout the assessment area (**Figure 1**), including wetlands within Newington Nature Reserve to the east and bordering Duck River to west. These local wetlands are located within 1 km of the development site. The artificial wetlands found adjacent to the development site, within the wider subject property, are local wetlands that have also been identified by the SEARs as important landscape features for the Green and Golden Bell Frog population of Sydney Olympic Park (**Figure 1**).

3.2.4. Habitat Connectivity

The subject property is located in a developed urban environment which is currently used as public recreational parklands, industrial and residential development as well as correctional facilities. The vegetation within the subject property is connected to the parklands of Sydney Olympic Park, however does not connect to any

National Parks or other large native vegetation patches. The vegetation within the subject property exists in a matrix of planted native and exotic species in an otherwise cleared and highly modified area.

Some connectivity is present in the form of riparian corridors on the northern and eastern boundaries of the subject property with Parramatta River and local wetlands which extends throughout the assessment area.

3.2.5. Karsts, Caves, Crevices, Cliffs and Area of Geological Significance

No karsts, caves, crevices, cliffs or areas of geological significance have been identified within the assessment area based on searches of available aerial imagery from Near Maps.

3.2.6. Areas of Outstanding Biodiversity Value

No Areas of Outstanding Biodiversity Value have been mapped within the assessment area.

3.2.7. BioNet NSW Landscapes

The development site is located in the "Port Jackson Basin" BioNet NSW Landscape.

3.2.8. Soil Hazard Features

No soil hazard features have been identified within the development site based on the hydrological landscape and soil capability mapping in OEH's eSPADE and Acid Sulfate Soils Risk Mapping, due to its occurrence on a disturbed terrain soil landscape (OEH 2019c).

3.2.9. Native Vegetation Cover

The native vegetation cover was determined through the use of GIS. To map native vegetation cover within the development site and assessment area, this assessment utilised the detailed vegetation mapping prepared by Cumberland Ecology in conjunction with broad scale mapping by the OEH Vegetation Mapping of the Sydney Metropolitan Area (OEH 2016b). The assessment area is approximately 883ha, of which approximately 164 ha comprises native vegetation cover, which represents 19% of the assessment area. Therefore, the native vegetation cover value has been assigned to the cover class of 10-30%.

4. Native Vegetation

4.1. Native Vegetation Extent

The subject property and development site have been subject to detailed surveys by Cumberland Ecology for the purpose of this BDAR. The native vegetation extent within the subject property was determined through aerial photograph interpretation and field surveys. The native vegetation of the subject property occupies approximately 4.98 ha, which represents approximately 41% of the subject property.

The native vegetation extent within the development site is shown in **Figure 5**. It occupies approximately 2.53 ha, which represents approximately 37% of the development site. The native vegetation extent within the development site is comprised of planted native vegetation represented by two best-fit PCTs, both in one broad condition state.

4.2. Plant Community Types

4.2.1. Introduction

Identification of the PCTs occurring within the subject property was guided by the results of the Cumberland Ecology surveys. The data collected during surveys of the subject property was analysed in conjunction with a review of the PCTs held within the BioNet Vegetation Classification Database (OEH 2019b).

Aside from two areas, the native vegetation occurring within the subject property is entirely of planted origin, often comprising monospecific stands of trees and a large portion of non-endemic species, and as a result is not considered to comprise a naturally occurring PCT. Nevertheless, recent advice provided from DPIE regarding how to assess native vegetation that is not generally considered to conform to a vegetation community, is to still nominate a PCT based on the native species present. Therefore, for the purpose of this BDAR, the use of what is considered to be the best-fit PCT has been applied, as explained further in subsequent sections.

Consideration was given to the following:

- Occurrence within the Cumberland IBRA subregion;
- Vegetation formation;
- Alignment with TECs;
- Landscape position; and
- Upper, mid and ground strata species.

Table 8 provides a summary of the PCTs identified within the subject property. The distribution of these PCTs within the subject property is shown in **Figure 6**. Detailed descriptions of each PCTs and the justification for PCT selection is provided in the sections below. Note that the vegetation areas throughout this report refer to vegetation being removed as part of the Project, and that not all trees within the development site are being removed.

Table 8 Plant community types within the subject property and development site

PCT#	PCT Name	Development Site (ha)	Subject Property (ha)
1395	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edge of the Cumberland Plain, Sydney Basin Bioregion	1.62	3.40
1183	Smooth-barked Apple - Sydney Peppermint - Turpentine heathy open forest on plateaux areas of the Sydney Basin Bioregion	0.02	0.94
1234	Swamp Oak Floodplain Forest fringing estuaries, Sydney Basin Bioregion and South-East Corner Bioregion	0.00	0.38
920	Mangrove Forests in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion	0.00	0.05

4.2.2. Plant Community Types within the Subject property

4.2.2.1. 1395 – Narrow-leaved Ironbark – Broad-leaved Ironbark – Grey Gum open forest of the edge of the Cumberland Plain, Sydney Basin Bioregion

Vegetation Formation: Grassy Woodlands
Vegetation Class: Coastal Valley Grassy Woodlands
Area: 3.40 ha
Percent Cleared Value: 80%
TEC Status: Not a TEC

i. General Description

This community is a degraded form of PCT 1395 in the subject property that has been subject to clearing and subsequent planting and is present throughout the subject property. Some areas of the community have not been maintained and, as a result, have an understorey containing weeds and native species regrowing from the soil seed bank. Other areas of the community have been maintained and lack an understorey entirely. This community is neither listed under the BC Act nor the EPBC Act.

The community is characterised by mature native canopy species over an understory of mixed exotic and native vegetation. Canopy species include *Angophora subvelutina* (Broad-leaved Apple), *Eucalyptus fibrosa* (Broad-leaved Ironbark), *Eucalyptus punctata* (Grey Gum), *Casuarina glauca* (Swamp Oak), *Eucalyptus canaliculata* (Large-fruited Grey Gum), *Corymbia maculata* (Spotted Gum), *Eucalyptus crebra* (Narrow-leaved Ironbark), *Eucalyptus fibrosa* (Broad-leaved Ironbark), *Eucalyptus moluccana* (Grey Box), *Eucalyptus baueriana* (Blue Box), *Eucalyptus longifolia* (Woollybutt), *Eucalyptus microcorys* (Tallowood), *Melaleuca quinquenervia* (Broad-leaved Paperbark) and *Lophostemon confertus* (Brush Box) .

Native shrub species include *Melaleuca styphelioides* (Prickly-leaved Tea Tree), *Acacia floribunda* (White Sally), *Acacia parramattensis* (Parramatta Wattle), *Melia azedarach* (White Cedar), *Melaleuca decora*, *Melaleuca linifolia* (Flax-leaved Paperbark) and *Callistemon citrinus* (Crimson Bottlebrush). Other native species present include

Lomandra longifolia (Spiny-headed Mat-rush), *Microlaena stipoides* (Weeping Grass) and *Wahlenbergia gracilis* (Australian bluebell).

This community occurs as two broad condition states (cleared and regrowth) within the subject property, as stands of planted trees. PCT 1395 represents a best-fit PCT for the *E. crebra*, *E. fibrosa* and *E. mollucana* plantings established between 1983 and 2003. This community is shown in **Photograph 1**.

ii. Justification of PCT selection

PCTs were initially filtered using BioNet Vegetation Classification System with search criteria including IBRA Region Sydney Basin, vegetation formation Grassy Woodlands and the key canopy species *Eucalyptus crebra*, *Eucalyptus fibrosa*, or *Eucalyptus mollucana*. The resulting list was narrowed down based on landform, geology and additional lower stratum species. PCT 1395 was determined to be the best fit based on the number of key indicator species present recorded within the BAM plot surveys.

Species relied upon for identification include *Eucalyptus crebra*, *Eucalyptus fibrosa* and *Eucalyptus moluccana*.

Photograph 1 Narrow-leaved Ironbark – Broad-leaved Ironbark – Grey Gum open forest of the edge of the Cumberland Plain, Sydney Basin Bioregion within the subject property

4.2.2.2. 1183 – Smooth-barked Apple – Sydney Peppermint – Turpentine heathy open forest on plateaux areas of the Sydney Basin Bioregion

Vegetation Formation: Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation Class: Sydney Coastal Dry Sclerophyll Forests
Area: 0.94 ha
Percent Cleared Value: 30%
TEC Status: Not a TEC

i. General Description

This community is present on the subject property along the majority of the eastern and southern boundaries. The community is characterised by a mix of mature native and exotic canopy species with either a cleared maintained understorey or weedy understorey especially along the drainage line in the east.

Native canopy species include *Corymbia maculata* (Spotted Gum) and *Corymbia citriodora* (Lemon-scented Gum). Exotic canopy species include *Cinnamomum camphora* (Camphor Laurel) *Erythrina crista-galli* (Cockspur

Coral Tree), *Schinus molle* (Peppercorn Tree), *Phoenix canariensis* (Canary Island Date Palm) and *Ligustrum lucidum* (Large-leaved Privet). Other native species present include *Lomandra longifolia* (Spiny-headed Mat-rush), *Typha orientalis* (Broad-leaved Cumbungi), *Acacia maidenii* (Maiden's Wattle), *Melia azedarach* (White Cedar) and *Microlaena stipoides* (Weeping Grass). This community is shown in **Photograph 2**.

This community occurs in a single condition state within the subject property, as stands of planted trees. PCT 1183 represents a best-fit PCT for the mature *C. maculata* dominated plantings established between 1983 and 2003.

ii. Justification of PCT selection

PCTs were initially filtered using BioNet Vegetation Classification System with search criteria including IBRA Region Sydney Basin, vegetation formation Dry Sclerophyll Forest (Shrubby Sub-formation) and the key canopy species *Corymbia maculata*. The resulting list was narrowed down based on landform, geology and additional lower stratum species. PCT 1183 was determined to be the best fit based on the number of key indicator species present recorded within the BAM plot surveys.

Species relied upon for identification include *Corymbia maculata*.

Photograph 2 Planted Smooth-barked Apple – Sydney Peppermint – Turpentine heathy open forest on plateaux areas of the Sydney Basin Bioregion within the subject property

4.2.2.3. 1234 – Swamp Oak Floodplain Forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion

Vegetation Formation: Forested Wetlands
Vegetation Class: Coastal Floodplain Wetlands
Area: 0.38 ha
Percent Cleared Value: 90%
TEC Status: Endangered Ecological Community under both the BC Act and EPBC Act

i. General Description

This community is found in two stands on the northern boundary, one stand on the eastern and one stand on the southern boundary. The canopy is dominated by *Casuarina glauca* (Swamp Oak) with a sparse understorey mainly dominated by exotic weeds. The native ground layer is denser on the stands on the northern boundary. Native shrubs include *Acacia longifolia* subsp. *longifolia* (Sydney Golden Wattle) and *Pittosporum undulatum* (Sweet Pittosporum). Native forbs include *Suaeda australis*, *Tetragonia tetragonioides* (New Zealand Spinach) and *Portulaca oleracea* (Pigweed).

Native grasses include *Microlaena stipoides* (Weeping Grass) and the non-endemic species *Cynodon dactylon* (Couch). Exotic shrubs include *Lantana camara* (Lantana), *Olea europaea* subsp. *cuspidata* (African Olive), *Bidens pilosa* (Cobbler's Peg) and *Triadica sebifera* (Chinese Tallowood). Exotic forbs include *Conyza sumatrensis* (Tall Fleabane), *Brassica fruticulosa* (Twiggy Turnip), *Capsella bursa-pastoris* (Shepherd's Purse) and *Alternanthera philoxeroides* (Alligator Weed). The exotic grasses include *Ehrharta erecta* (Panic Veldtgrass), *Eragrostis curvula* (African Lovegrass), *Bromus catharticus* (Praire Grass) and *Urochloa panicoides* (Urochloa Grass). Exotic vines include *Anredera cordifolia* (Madeira Vine) and *Araujia sericifera* (Moth Vine). This community is shown in **Photograph 3**.

The occurrence of this community within the subject property conforms to the description of the EEC listed under the BC Act as species present within this community correspond to the diagnostic species listed in the SOFF Final Determination (NSW Scientific Committee 2014). Furthermore, this community corresponds to the EEC listing under the EPBC Act in accordance with the Approved Conservation Advice for SOFF (DOEE 2018).

This community occurs in a single condition state within the subject property, as stands of planted trees. PCT 1234 represents a best-fit PCT for the mature *C. glauca* dominated plantings established between 1983 and 2003.

ii. Justification of PCT selection

PCTs were initially filtered using BioNet Vegetation Classification System with search criteria including IBRA Region Sydney Basin, vegetation formation Forested Wetlands and the key canopy species *Casuarina glauca*. The resulting list was narrowed down based on landform, geology and additional lower stratum species. PCT 1234 was determined to be the best fit based on the number of key indicator species present recorded within the BAM plot surveys.

Species relied upon for identification include *Casuarina glauca*.

Photograph 3 Swamp Oak Floodplain Forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion within the subject property

4.2.2.4. PCT 920 – Mangrove Forests in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion

Vegetation Formation: Saline Wetlands
Vegetation Class: Mangrove Swamps
Area: 0.05 ha
Percent Cleared Value: 86%
TEC Status: Not a TEC, protected under the *NSW Fisheries Management Act 1994*

i. General Description

Stands of mangroves are found in the intertidal zone where they form a low closed to open forest on mudflats along the foreshore of saltwater estuaries. Stands of *Avicennia marina* (Grey Mangrove) are often encountered in pure stands and contain very few species other than the canopy, with the understorey mostly an open mudflat sometimes with scattered saltmarsh herbs. This community protects foreshores from erosive forces of

the ocean and provides a valuable ecological role in providing breeding habitat for many threatened birds, fish and crustaceans.

This community is represented by patches of trees along the northern boundary of the subject property. The mangroves occur below the seawall that is vegetated with exotic grassland adjacent to the pathway that runs the extent of the northern boundary. The total area that this plant community occupies in the subject property is 0.05 ha. The only canopy species within this community is *Avicennia marina* (Grey Mangrove). The understorey is this community is open mudflats or water (depending on the tide) and is occupied by seedlings of the canopy species together with root pneumatophores with sparse occurrences of *Suaeda australis* (Seablite). This community is shown in **Photograph 4**.

This community occurs in a single condition state on the northern boundary of the subject property with the Parramatta River, as stands of mature trees. PCT 920 represents the actual PCT for the remnant mature A. marina *C. maculata*.

ii. Justification of PCT selection

PCTs were initially filtered using BioNet Vegetation Classification System with search criteria including IBRA Region Sydney Basin, vegetation formation Saline Wetlands and the key canopy species *Avicennia marina*. The resulting list was narrowed down based on landform, geology and additional lower stratum species including *Suaeda australis*. PCT 920 was determined to be the best fit based on the number of key indicator species present recorded within the BAM plot surveys.

Species relied upon for identification include *Avicennia marina* and *Suaeda australis*.

Photograph 4 Mangrove Forests in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion within the subject property

4.2.3. Other Vegetation Types

The following locally defined vegetation types are areas of vegetation that occur in the subject property but are not associated with a PCT.

4.2.3.1. Artificial Wetlands

Artificial Wetlands occupy the vegetated areas around the three treatment ponds in the eastern portion of the subject property. The community is derived from freshwater inundation into artificial retention ponds and includes a mix of native and exotic species. Along the embankments surrounding the ponds, a sub-canopy of immature *Casuarina glauca* (Swamp Oak) is found over a sparse cover of *Lomandra longifolia* (spiny-headed mat-rush). Native species present in the inundated areas include the rush *Juncus usitatus, Bolboschoenus caldwellii* and the reed *Phragmites australis* (Common Reed). Exotic species in the inundated areas include the rush *Juncus acutus* (Spiny Rush) and sedge *Cyperus congestus*. This vegetation type is shown in **Photograph 5.**

Photograph 5 Artificial wetlands within the subject property

4.2.3.2. Landscaped Garden Beds

Landscaped garden beds have been constructed and planted in two small areas around existing infrastructure in the north-east area of the subject property. The community is characterised by landscaped features and retaining walls with planted native species. The native species present include *Cynodon dactylon* (Couch), *Juncus usitatus* and *Melaleuca thymifolia* (Thyme Honey-myrtle). This vegetation type is shown in **Photograph 6**.

Photograph 6 Landscaped garden beds within the north eastern area of the subject property

4.2.3.3. Exotic Grassland

Exotic Grassland is the dominant vegetation type throughout the subject property and is present as the playing surface for the sports fields and as mowed grass around sports fields. The community is characterised by levelled areas of exotic and non-endemic grass species. The native species present include the non-endemic *Cynodon dactylon* (Couch). Exotic grass species include *Cenchrus clandestinus* (Kikuyu), *Axonopus fissifolius* (Narrow-leafed Carpet Grass) and *Eleusine tristachya* (Goose Grass). This vegetation type is shown in **Photograph 7**.

Photograph 7 Exotic grassland/lawn within the subject property

4.2.4. Threatened Ecological Communities

4.2.4.1. PCT 1183

PCT 1183 is not associated with any TECs listed under the BC Act or EPBC Act.

4.2.4.2. PCT 1395

The occurrence of PCT 1395 within the subject property does not correspond to any TECs listed under the BC Act or EPBC Act. PCT 1395 is associated with Shale Sandstone Transition Forest in the Sydney Basin Bioregion which is listed as Critically Endangered under the BC Act and the EPBC Act. PCT 1395 has been conservatively assigned to the vegetation in question as a best-fit PCT for planted vegetation which floristically resembles Shale Sandstone Transition Forest due to heavy utilisation of *Eucalyptus crebra* (Narrow-leaved Ironbark) and *Eucalyptus fibrosa* (Broad-leaved Ironbark). However, Shale Sandstone Transition Forest typically occurs on soils overlying the transition between shale and sandstone geology. The subject property occurs over a disturbed terrain soil landscape.

A review of historical imagery (1945) shows that the subject property was previously completely cleared of vegetation with the current vegetation planted and established in recent decades. These plantings do not

include understorey species associated with Shale Sandstone Transition Forest. Due to the planted origin of the vegetation, a lack of associated understorey species and its position on a disturbed terrain soil landscape, the occurrence of PCT 1395 within the subject property is not considered to correspond to Shale Sandstone Transition Forest in the Sydney Basin Bioregion.

4.2.4.3. PCT 920

The occurrence of PCT 920 does not correspond to any TECs listed under the BC Act or EPBC Act. PCT 920 is associated with Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, listed as endangered under the BC Act and as vulnerable under the EPBC Act. The occurrence of PCT 920 within the subject property is characterised by near mono-specific stands of *Avicennia marina* (Grey Mangrove) interspersed with scattered *Suaeda australis* (Austral Seablite) individuals. Whilst scattered, mature *A. marina* individuals are mentioned in the final determination as occasionally occurring within the TEC, the vegetation within the subject property is dominated by stands of the *A. marina* and lacks the typical herbaceous floristic diversity of Coastal Saltmarsh. Subsequently, the PCT 920 vegetation within the subject property is not considered to conform to Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.

4.2.4.4. PCT 1234

The occurrence of PCT 1234 within the subject property is consistent with Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions which is listed as an EEC under both the BC Act and EPBC Act.

4.2.5. Vegetation Integrity Assessment

Four PCTs have been described and identified within the subject property. However, only PCTs 1395 and 1183 occur within the development site and will be directly impacted by the Project. Therefore, two vegetation zones were identified and utilised within the BAM Calculator.

A patch size was subsequently assigned for each vegetation zone. The extent of the vegetation zones and patch size class within the development site are shown in **Figure 7**.

The vegetation zones within the development site were assessed using survey plots (see **Section 2.2**) to determine the vegetation integrity score. Data collected from these plots were utilised within the BAM Calculator to determine the vegetation integrity score and are provided in **Appendix C**. A flora species list for the subject property is provided in **Appendix A**. Field data sheets and electronic copies of raw data are provided separately to this document.

Vegetation zone, patch size and vegetation integrity score for the development site are summarised in **Table 9**.

Table 9 Vegetation integrity of PCTs within the development site

Vegetation Zone	PCT #	PCT Name	Condition Name	Development Site Area (ha)	Patch Size Class	Vegetation Integrity Score
1	1395	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edge of the Cumberland Plain, Sydney Basin Bioregion	Cleared	1.62	8 ha	25.7
2	1183	Smooth-barked Apple - Sydney Peppermint - Turpentine heathy open forest on plateaux areas of the Sydney Basin Bioregion	Cleared	0.02	8 ha	15.5

5. Threatened Species

5.1. Threatened Species for Assessment

The BAM Calculator generates a list of threatened species requiring assessment utilising a number of variables. The following criteria have been utilised to predict the threatened species requiring further assessment:

- IBRA subregion: Cumberland;
- Geographic constraints:
  - 4th order watercourse on the northern boundary of the subject property; and
  - Local wetlands within the subject property.
- Associated PCTs: 1395, 1183
- Percent native vegetation cover in the assessment area: 19%;
- Patch size: PCT 1395: 8.37 ha, PCT 1183: 8.37 ha; and
- Credit type: Ecosystem and/or species.

Based on the above variables, the BAM Calculator generated a list of 31 ecosystem credit species and 5 species credit species.

5.2. Ecosystem Credit Species

Table 10 lists the predicted ecosystem credit species for the vegetation zones within the subject property. None of these species have been removed from consideration.

Table 10 Predicted Ecosystem Credit Species

Common Name	Scientific Name
Barking Owl	*Ninox connivens*
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*
Diamond Firetail	*Stagonopleura guttata*
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*
Eastern Freetail-bat	*Mormopterus norfolkensis*
Eastern Osprey	*Pandion cristatus*
Flame Robin	*Petroica phoenicea*
Gang-gang Cockatoo	*Callocephalon fimbriatum*
Glossy Black-Cockatoo	*Calyptorhynchus lathami*
Grey-headed Flying-fox	*Pteropus poliocephalus*
Hooded Robin (south-eastern form)	*Melanodryas cucullata cucullata*
Koala	*Phascolarctos cinereus*

Common Name	Scientific Name
Large Bent-winged Bat	*Miniopterus orianae oceanensis*
Little Bent-winged Bat	*Miniopterus australis*
Little Eagle	*Hieraaetus morphnoides*
Little Lorikeet	*Glossopsitta pusilla*
Masked Owl	*Tyto novaehollandiae*
Painted Honeyeater	*Grantiella picta*
Powerful Owl	*Ninox strenua*
Regent Honeyeater	*Anthochaera phrygia*
Rosenberg's Goanna	*Varanus rosenbergi*
Scarlet Robin	*Petroica boodang*
Speckled Warbler	*Chthonicola sagittata*
Spotted-tailed Quoll	*Dasyurus maculatus*
Square-tailed Kite	*Lophoictinia isura*
Swift Parrot	*Lathamus discolor*
Turquoise Parrot	*Neophema pulchella*
Varied Sittella	*Daphoenositta chrysoptera*
White-bellied Sea-Eagle	*Haliaeetus leucogaster*
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*

5.3. Species Credit Species

5.3.1. Assessment of Habitat Constraints and Microhabitats

Table 11 below lists the species credit species predicted by the BAM Calculator and details whether the species have been further assessed based on the presence or absence of habitat constraints within the subject property. Under Section 6.4.1.13 of the BAM, further species credit species can be excluded from further assessment if an assessment of habitat constraints and microhabitats determines that the habitat within the subject property is substantially degraded such that the species credit species is unlikely to occur.

Habitat assessments of the development site were undertaken as described in **Section 2.2.4**. The habitat assessments focussed on habitat features relevant to species credit species predicted to occur. This included determining the presence/absence of the habitat constraints identified for the predicted threatened species and the condition of these habitat constraints and other microhabitats.

The Regent Honeyeater and Swift Parrot have been excluded from further assessment after confirmation from OEH that no important breeding habitat occurs within the subject property for either species. Breeding habitat for both species is limited to specific areas that are not associated with, or in the vicinity of, the subject property, therefore since the species credit species component for both species is associated with breeding habitat only, both the Regent Honeyeater and Swift Parrot were excluded from further assessment.

The habitat assessment surveys completed on 4 April and 5 September 2019 focussed on determining if habitat for any potential species credit species (or relevant breeding component for dual credit species) was substantially degraded such that the species is unlikely to utilise the subject property or specific vegetation zone in accordance with the requirements of Step 3 (a) of Section 6.4 of the BAM.

The development site is predominantly cleared and is mostly comprised of planted scattered native trees, exotic trees, garden beds, exotic grassland and cleared areas. Despite the degraded nature of the habitat in the development site, the scattered native trees surrounding the existing sports fields were observed to contain habitat features including hollows. Additionally, the area of vegetation in the northern and eastern portions of the development site is within 100 m of the mapped 4th order watercourse and the coastal and artificial wetland within the subject property.

Based on the results of habitat surveys, a number of species were excluded from requiring further assessment as allowed under Section 6.4.1.13 of the BAM, as the habitat for these species is considered substantially degraded or otherwise unsuitable as described in **Table 11**.

5.3.2. Candidate Species for Further Assessment

The following species were identified as candidate species credit species for further assessment:

- Southern Myotis (*Myotis macropus*);
- Green and Golden Bell Frog (*Litoria aurea*);
- Eastern Osprey (*Pandion cristatus*) (breeding); and
- White-bellied Sea-eagle (*Haliaeetus leucogaster*) (breeding).

No flora candidate species credit species were identified as requiring further assessment, as justified in **Table 11**.

5.3.3. Presence of Candidate Species

Targeted surveys for the candidate species credit species for further assessment undertaken within the subject property are detailed in **Section 2.4**. As a precautionary measure, additional targeted surveys were undertaken for threatened flora species credit species that required no further assessment due to survey periods aligning with the Project timeline as described in **Section 2.3**. A list of fauna species encountered within the subject property can be found in **Appendix B**. None of the candidate species credit species with aligning survey periods were observed within the development site, although one species (Green and Golden Bell Frog) was detected in the artificial wetlands within the wider subject property. A summary of the species credit species surveyed within the development site, including whether they were present during surveys is shown in **Table 12** and further discussed in the following section.

Table 11 Summary of species credit species surveyed in the development site

Species	Present	Method of Identification	Associated Habitat Component	Biodiversity Risk Weighting	SAII Entity
Flora					
Acacia bynoeana	No	Survey	N/A	High	No
Acacia pubescens	No	Survey	N/A	High	No
Caladenia tessellata	No	Survey	N/A	Very High	Yes
Callistemon linearifolius	No	Survey	N/A	Moderate	No
Cynanchum elegans	No	Survey	N/A	High	No
Dillwynia tenuifolia	No	Survey	N/A	High	No
Epacris purpurascens var. *purpurascens*	No	Survey	N/A	Moderate	No
Eucalyptus camfieldii	No	Survey	N/A	High	No
Eucalyptus sp. Cattai	No	Survey	N/A	Very High	Yes
Grevillea parviflora subsp. *parviflora*	No	Survey	N/A	High	No
Grevillea parviflora subsp. *supplicans*	No	Survey	N/A	High	No
Gyrostemon thesioides	No	Survey	N/A	Very High	Yes
Haloragodendron lucasii	No	Survey	N/A	Very High	Yes
Hygrocybe anomala var. ianthinomarginata	No	Survey	N/A	Very High	Yes
Hibbertia puberula	No	Survey	N/A	High	No
Hibbertia spanantha	No	Survey	N/A	Very High	Yes
Hibbertia superans	No	Survey	N/A	High	No
Leucopogon exolasius	No	Survey	N/A	High	No
Leucopogon fletcheri subsp. *fletcheri*	No	Survey	N/A	High	No
Marsdenia viridiflora subsp. *viridiflora* - endangered population	No	Survey	N/A	High	No
Persoonia bargoensis	No	Survey	N/A	High	No
Persoonia hirsuta	No	Survey	N/A	Very High	Yes
Persoonia nutans	No	Survey	N/A	High	No
Persoonia mollis subsp. maxima	No	Survey	N/A	High	No

Species	Present	Method of Identification	Associated Habitat Component	Biodiversity Risk Weighting	SAII Entity
Pimelea curviflora var. curviflora	No	Survey	N/A	High	No
Pomaderris brunnea	No	Survey	N/A	High	No
Pterostylis saxicola	No	Survey	N/A	High	No
Pultenaea pedunculata	No	Survey	N/A	High	No
Tetratheca glandulosa	No	Survey	N/A	High	No
Ziera involucrata	No	Surevy	N/A	High	No
Fauna					
White-bellied Sea-Eagle	No	Survey	N/A	High	No
Eastern Osprey	No	Survey	Dead or living trees in cleared and riparian areas	Moderate	No
Green and Golden Bell Frog	Yes	Survey	Semi-permanent/ephemeral wet areas, within 1 km of wet areas/swamps/waterbodies	High	No
Southern Myotis	Yes	Assumed Present	PCTs on subject land within 200 m of waterbodies	High	No

5.3.4. Species Polygons

5.3.4.1. Southern Myotis

Surveys were not performed for the Southern Myotis as the targeted threatened species surveys for the Project were conducted outside of the survey season for the species. However due to the presence of hollow-bearing trees and man-made structures within 200 m of the riparian zone surrounding the Parramatta River, as well as the proximity of the development site to Silverwater Bridge, the development site is considered to comprise potential foraging and breeding habitat for the Southern Myotis. Therefore, this species cannot be excluded from further assessment and must be assumed present within the development site.

As the Southern Myotis has been assumed present within the development site, a species polygon has been created for the purpose of calculating the impacts on the Southern Myotis in terms of credit species (see **Figure 9**). The species polygon for the Southern Myotis was created in accordance with the document 'Species credit

threatened bats and their habitats (OEH 2018b) and includes forest PCTs on the development site that are within 200 m of waterbodies.

5.3.4.2. Green and Golden Bell Frog

Although no Green and Golden Bell Frogs were encountered on the development site during targeted surveys, individuals were recorded within the artificial wetlands in the north-western corner of the subject property. GGBF are often found in human-disturbed or artificial sites (Pyke and White, 2001). Considering this observation combined with previous records from SOPA, Green and Golden Bell Frogs are known to inhabit the wetlands. Consequently, a 100 m buffer around the artificial wetlands has been assumed as foraging habitat for the species, As the Green and Golden Bell Frog has been assumed present within the development site, a species polygon has been created for the purpose of calculating the impacts on the Green and Golden Bell Frog in terms of credit species (see **Figure 9**). The polygon comprises vegetation areas (including exotic grassland) in the development site that is within 100 m of the artificial wetlands.

Table 12 Consideration of species credit species

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
Flora				
Acacia bynoeana	Bynoe's Wattle	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Acacia pubescens	Downy Wattle	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Caladenia tessellata	Thick Lip Spider Orchid	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Callistemon linearifolius	Netted Bottle Brush	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Cynanchum elegans	White-flowered Wax Plant	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Dillwynia tenuifolia	-	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
				and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Dillwynia tenuifolia - endangered population, Kemps Creek	-	-	Yes	The subject property is located outside of the specified geographic area as it does not occur in Kemps Creek.
Epacris purpurascens var. *purpurascens*	-	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Eucalyptus camfieldii	Camfield's Strngybark	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Eucalyptus sp. Cattai	-	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Grevillea parviflora subsp. *parviflora*	Small-flower Grevillea	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Grevillea parviflora subsp. *supplicans*	-	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
				and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Gyrostemon thesioides	-	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Haloragodendron lucasii	-	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Hibbertia puberula	-	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Hibbertia spanantha	Julian's Hibbertia	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Hibbertia superans	-	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Hygrocybe anomala var. ianthinomarginata	-	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
				and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Leucopogon exolasius	Woronora Bear-breath	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Leucopogon fletcheri subsp. *fletcheri*	-	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Marsdenia viridiflora subsp. *viridiflora* - endangered population	*Marsdenia viridiflora R. Br. subsp. viridiflora* population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith LGAs	Yes	The subject property is located outside of the specified geographic area as it does not occur in the Bankstown, Blacktown, Camden, Holroyd, Liverpool or Penrith LGAs.
Melaleuca deanei	Deane's Paperbark	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
				and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Persoonia bargoensis	Bargo Geebung	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Persoonia hirsuta	Hairy Geebung	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Persoonia mollis subsp. maxima	-	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Persoonia nutans	Nodding Geebung	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Pimelea curviflora var. *curviflora*	-	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Pomaderris brunnea	Brown Pomaderris	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
				and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Pterostylis saxicola	Sydney Plains Greenhood	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Pultenaea pedunculata	Matted Bush-pea	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Tetratheca glandulosa	-	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Thesium australe	Austral Toadflax	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.
Zieria involucrata	-	-	Yes	The development site is not considered to comprise habitat for the species as it occurs on modified soils and consists of planted native and exotic vegetation. Additionally, the species was not observed during floristic surveys.

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
Fauna				
Anthochaera phrygia	Regent Honeyeater (breeding)	-	Yes	The subject property does not contain areas of important mapped habitat according to OEH.
Burhinus grallarius	Bush Stone-curlew	Fallen/standing dead timber including logs	Yes	The subject property does not contain potential habitat for this species due to the lack of dead timber, including logs, due to the highly modified and cleared understorey of the vegetation. Additionally, there are no records of the species since 1980 within a 5 km radius of the subject property (OEH 2019a) .
Callocephalon fimbriatum	Gang-gang Cockatoo (breeding)	-	Yes	The subject property is not considered to contain potential breeding habitat for the species as the last known breeding population in the Sydney Metropolitan Area is bounded by the Hornsby and Ku-ring-gai LGAs (DEC (NSW) 2005c). Additionally, they require hollows of at least 10 cm which are not present within the development site (OEH 2017).
Calyptorhynchus lathami	Glossy Black-Cockatoo (breeding)	-	Yes	The Glossy Black-Cockatoo is known to nest in hollows approximately 26 cm wide and up to 1.4 m deep (OEH 2019a). The subject property does not contain suitable nesting habitat features.
Cercartetus nanus	Eastern Pygmy-possum	-	Yes	The subject property is not considered to contain potential habitat for the species as it is located outside of known localities occurrence. There are only six localities from which the species has been recorded, including the Pilliga area, the New England Tablelands, Barren Grounds Nature Reserve-Budderoo National Park, Royal and Heathcote National Parks, Kioloa State Forest and the Eden area (NSW Scientific Committee 2004b). Additionally, there are no records of the species since 1980 within a 5 km radius according to the Database of Threatened Biodiversity (OEH 2019a).

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
Chalinolobus dwyeri	Large-eared Pied Bat	Cliffs, within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops or crevices, or within two kilometres of old mines, concrete buildings, culverts and tunnels.	Yes	The subject property is not considered to contain breeding habitat as no caves or sandstone overhangs occur. Rocky areas containing cliffs, caves, overhangs or escarpments do not occur within two kilometres of the development site. Whilst the locality may contain concrete buildings, culverts or tunnels, it would be unlikely that these features would be utilised as breeding habitat as there are no records of the species since 1980 within a 5km radius of the subject property (OEH 2019a). Subsequently, the development site is not considered to contain Large-eared Pied Bat habitat.
Haliaeetus leucogaster	White-bellied Sea-Eagle (breeding)	Live, large old trees with 1 km of rivers, lakes, large dams and creeks, wetlands and coastlines AND the presence of a large stick nest with tree canopy.	No	The development site may contain potential breeding habitat for the species due to the presence of trees in proximity to large open water (OEH 2018e). Over 200 records of the species are found within the locality (OEH 2019a). However no stick nests were observed during the multiple surveys of the subject property conducted by Cumberland Ecology.
Hieraaetus morphnoides	Little Eagle (breeding)	-	Yes	The subject property does not contain potential breeding habitat which is characterised by tall trees within a remnant patch of vegetation. The vegetation within the subject property consists entirely of exposed patches of trees and shrubs planted approximately 20 years ago and is not part of a remnant patch of vegetation. Additionally, no stick nests were observed during the multiple surveys of the subject property conducted by Cumberland Ecology.
Lathamus discolor	Swift Parrot (breeding)	-	Yes	The subject property does not contain areas of important mapped habitat according to OEH.

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
Litoria aurea	Green and Golden Bell Frog	Semi-permanent/ephemeral wet areas, within 1 km of wet areas/swamps/waterbodies	No	The subject property is considered to contain known habitat for the species as it occurs within the vicinity of one of the eight key populations, Homebush Bay (DEC (NSW) 2005b). In addition, the artificial wetlands located within the subject property are considered potential habitat for the species. They are also known to favour terrestrial habitats with extensive grassy areas, such as the ones located within the development site (DEC (NSW) 2005b).
Lophoictinia isura	Square-tailed Kite (breeding)	-	Yes	The subject property contains limited potential habitat for the species due to the degraded nature of the subject property. Additionally, no stick nests were observed during the multiple surveys of the subject property conducted by Cumberland Ecology and no records of the species within 10km of the subject property exist since 1980.
Meridolum corneovirens	Cumberland Plain Land Snail	Restricted primarily to Cumberland Plain Woodland (CPW), Shale Gravel Transition Forests, Castlereagh Swamp Woodlands or River-flat Eucalypt Forest (RFEF), Shale Gravel Sandstone Transition Forest (SGSTF) (DPIE 2019)	Yes	Subject property does not contain naturally occurring Cumberland Plain Woodland, River-flat Eucalypt Forest or SGSTF. Additionally, the subject property does not have sufficient connectivity to suitable habitat.
Miniopterus australis	Little Bent-winged-Bat (breeding)	Maternal caves with specific temperature and humidity regimes	Yes	The subject property does not contain potential breeding habitat for the species due the lack of caves suitable to support a maternal colony. Additionally, only five maternal colonies are known in Australia (OEH

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
				2019a), located in Northern Australia including Mt Etna (Rockhampton) (Menkhorst and Knight 2004).
Miniopterus orianae oceanensis	Large Bent-winged Bat (breeding)	Maternal caves with specific temperature and humidity regimes	Yes	The subject property does not contain potential breeding habitat for the species due to the lack of caves suitable to support a maternal colony. The development site may contain suitable foraging and roosting habitat due to the presence of buildings and native vegetation.
Myotis macropus	Southern Myotis	Hollow-bearing trees within 200 m of riparian zone; bridges, caves and artificial structures within 200 m of riparian zone.	No	The subject property may contain potential habitat as it contains hollow-bearing trees and artificial structures within 200 m of a waterbody (both Parramatta River and the artificial wetlands). In addition, Silverwater Bridge is located less than 200 m from the subject property and within 200 m of a waterbody.
Ninox connivens	Barking Owl (breeding)	-	Yes	The subject property is not considered to contain potential breeding habitat for the species as it does not contain trees bearing hollows with an entrance diameter of 20-46 cm (NSW NPWS 2003b).
Ninox strenua	Powerful Owl (breeding)	-	Yes	The subject property is not considered to contain potential breeding habitat for the species as it does not contain trees bearing hollows with an entrance diameter of >45 cm (DEC (NSW) 2006).
Pandion cristatus	Eastern Osprey	Dead or living trees in cleared and riparian areas.	No	The development site may contain potential breeding habitat for the species due to the presence of trees in proximity to large open water (OEH 2018e). However no stick nests were observed during the multiple surveys of the subject property conducted by Cumberland Ecology.
Petaurus norfolcensis	Squirrel Glider	-	Yes	The subject property is not considered potential habitat for the species as it does not contain trees with suitable hollows. In addition, no

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
				records of the species since 1980 within a 5 km radius. Closest record is from 20 years ago, approximately 25 km away with no connectivity to the subject property.
Phascolarctos cinereus	Koala (breeding)	-	Yes	The subject property is not considered to contain potential Koala habitat due to the lack of connectivity to suitable habitat. Additionally, no records exist within the locality since 1980.
Pommerhelix duralensis	Dural Woodland Snail	-	Yes	Subject property contains limited potential habitat as it does not contain rocks and very limited leaf litter. Additionally, no records exist within the locality since 1980. The closest record is located approximately 10km from the subject property, in Parramatta Reserve.
Pseudophryne australis	Red-crowned Toadlet	Dense vegetation and leaf litter over sandstone	Yes	The subject property is not considered to contain potential habitat for this species due to the absence of sandstone and dense vegetation. Additionally, no records of the species in the locality exist since 1980.
Pteropus poliocephalus	Grey-headed Flying-fox (breeding)	-	Yes	The subject property is not considered to contain potential habitat for the species as a Grey-headed Flying-fox breeding camp does not occur.
Tyto novaehollandiae	Masked Owl (breeding)	-	Yes	The subject property is not considered to contain potential breeding habitat for the species as it does not contain trees bearing hollows with an entrance diameter of >40 cm (OEH 2018d).

6. Prescribed Impacts

6.1. Prescribed Impacts

Prescribed impacts are outlined in Clause 6.1 within the NSW *Biodiversity Conservation Regulation 2017*. Prescribed impacts are those that are additional to the clearing of native vegetation and associated habitat. These include:

- Development on the habitat of threatened species or ecological communities associated with:
  - karst, caves, crevices, cliffs, rock outcrops and other geological features of significance;
  - human-made structures;
  - non-native vegetation;
- Development on areas connecting threatened species habitat, such as movement corridors
- Development on water quality, water bodies and hydrological processes that sustain threatened species and TECs (including from subsidence or upsidence from underground mining)
- Wind turbine strikes on protected animals
- Vehicle strikes on threatened species or on animals that are part of a TEC.

An assessment of the relevance of these prescribed impacts to the Project is provided in **Table 13**.

Table 13 Prescribed impacts of the Project

Feature	Present	Feature Characteristics and Location	Potential Impact	Threatened Species or Community Using or Dependent on Feature	Section of BDAR where addressed
Karst, caves, crevices, cliffs or other geologically significant feature	No	N/A	Feature not present in subject property.	N/A	N/A
Rocks	No	N/A	Feature not present within subject property	N/A	N/A
Human-made structure	Yes	Existing change-rooms and toilet facilities located in the northern and eastern area of the subject property.	Destruction/modification of structures may result in the loss of roosting habitat for native species.	Microchiropteran bats (ecosystem credit species),	7.1.3.1, 8.2.1, 8.4.1

Feature	Present	Feature Characteristics and Location	Potential Impact	Threatened Species or Community Using or Dependent on Feature	Section of BDAR where addressed
				Southern Myotis.	
Non-native vegetation	Yes	Exotic trees and shrubs throughout the subject property.	Removal of non-native vegetation may result in loss of potential foraging and roosting habitat for native species.	Grey-headed Flying-fox, Green and Golden Bell Frog, Woodland birds (ecosystem credit species).	7.3.1.2. 8.2.2, 8.4.2
Connectivity of different areas of habitat that facilitates movement across a species' range	Yes	Planted vegetation throughout the subject property.	A reduction in "stepping stone" habitat for highly mobile and aerial threatened species moving between foraging sites throughout the locality.	Microchiropteran bats (ecosystem credit species), Grey-headed Flying Fox, Green and Golden Bell Frog	7.1.3.3, 8.2.3, 8.4.3
Movement of threatened species that maintain their lifecycle	Yes	native and exotic vegetation throughout the subject property,	Potential reduction in movement and suitable breeding and foraging habitat.	Green and Golden Bell Frog	7.1.3.4, 8.2.4, 8.4.4
Water quality, water bodies and hydrological processes	Yes	Artificial wetlands in the north-eastern corner of the subject property and the Parramatta River.	Potential changes to hydrological regimes and water quality impacts as a result of construction activities, impacts to vegetation and future increased impervious surfaces within the development site.	Green and Golden Bell Frog, Southern Myotis.	7.1.3.5, 8.2.5, 8.4.5

Feature	Present	Feature Characteristics and Location	Potential Impact	Threatened Species or Community Using or Dependent on Feature	Section of BDAR where addressed
Wind turbine strikes	No	N/A	N/A	N/A	N/A
Vehicle strikes	No	N/A	Traffic may moderately increase throughout the carpark, however impacts to biodiversity are unlikely in this area.	N/A	N/A
Other	No	N/A	N/A	N/A	N/A

7. Avoid and Minimise Impacts

7.1. Avoid and Minimise Impacts on Native Vegetation and Habitat

Due to the nature of the project and requirement to be situated within the existing extent of the current golf course, there is limited scope to readily avoid impacts on native vegetation and habitat. However, avoidance can be achieved to varying degrees by the modification of the design and location of a project. Furthermore, mitigation measures can further assist in minimising impacts to biodiversity values. The development of avoidance and mitigation measures for the Project has considered the current condition of the vegetation and habitat within the subject property. Avoidance and mitigation measures relevant to the project are detailed below.

7.1.1. Project Location

The development site has been situated within the subject property to allow for the operational requirements of the Project while minimising impacts to areas containing biodiversity values. The development envelope has been positioned within the south-western portion of the subject property to avoid impacts to native vegetation where possible, including retaining the majority of trees surrounding the sports fields. Direct impacts have been completely avoided throughout the 0.38 ha area of Swamp Oak Floodplain Forest, the 0.22 ha artificial wetlands and the 0.05 ha of Mangrove Forest which are located outside of the development site within the northern and north-eastern portion of the subject property.

The development envelope is positioned over an area within the subject property containing the lowest biodiversity values, consisting predominantly of exotic grassland, exotic trees and some scattered native trees, including some non-endemic native species. In doing so, the Project has considered the biodiversity values of the vegetation within the subject property and has demonstrated reasonable steps to avoid and minimise impacts based upon the Project location within the subject property.

The Project will avoid and minimise direct impacts on clearing of native vegetation and habitat by:

- Locating the development envelope predominantly in areas where there are lower biodiversity values such as previously cleared areas;
- Situating the development to avoid clearing of native vegetation where possible; and
- Locating the development in the south-western section of the subject property to reduce impacts to waterways.

7.1.2. Consideration of Project Design

Measures to avoid and minimise impacts to native vegetation and habitats have been incorporated into the design of the project. This has included:

- Locating the construction facilities within the operational footprint;
- Utilising existing access roads;
- Retaining existing planted trees within areas proposed for landscaping; and

- Area of landscaping to incorporate locally indigenous species, including those conforming with the TEC of SOFF such as *Casuarina glauca* and *Acmena smithii* (Turf Landscape, 2019).

7.1.3. Avoid and Minimise Prescribed Impacts

Measures to avoid and minimise prescribed impacts identified in **Section 6.1** are outlined below.

7.1.3.1. Human-made Structures

One existing old building in the eastern corner of the development site which is planned to be extensively modified as part of the Project could potentially provide roosting habitat for the threatened Little Bent-winged Bat, Large Bent-winged Bat and Southern Myotis. Given the limited area of land within the subject property on which the Project is located, impacts to these structures are not able to be avoided as part of the development.

This small human-made structure is not considered to be essential for the survival of the Little Bent-winged Bat, Large Bent-winged Bat or Southern Myotis as better-quality habitat is found in the adjacent areas surrounding the subject property. Adequate mitigation measures (as discussed in **Chapter 8**) will be implemented to minimise the impact to fauna (if any) that may utilise the existing human-made structures for roosting.

7.1.3.2. Non-native Vegetation

The location of the Project and the development design have been focused on avoiding areas of native vegetation, with a specific focus on avoiding areas of TECs. As a result, most of the development site contains non-native vegetation, in the form of exotic grassland and other planted exotic vegetation which will be cleared as part of the development. Hence, impacts to the areas of non-native vegetation are not able to be avoided as part of the Project.

The non-native vegetation is found in different forms throughout the subject property, from garden plantings to sporadic plantings amongst the native plantings surrounding the exotic mowed grassland which encompasses the sports fields. Due to the nature of the subject property as a highly modified recreational park which has historically been cleared, the non-native vegetation offers very limited habitat for threatened species.

Although the areas consisting of non-native vegetation may be utilised occasionally as foraging habitat for the GGBF, they are unlikely to be favoured over the adjoining reserve and wetland habitats.

7.1.3.3. Connectivity of Different Areas of Habitat that Facilitates Movement

Native vegetation that may contribute to the movement of native fauna throughout different areas of habitat is proposed to be removed by the Project. The treed habitat within the development site is considered to constitute "stepping stone" habitat, facilitating the movement of highly mobile and aerial fauna throughout the surrounding fragmented urban landscape. The vegetation within the development site is likely to facilitate the movement of Microchiropteran bats (ecosystem credit species), the Grey-headed Flying-fox (foraging) and the Green and Golden Bell Frog as they move between foraging sites within the locality.

The Project has demonstrated reasonable steps to avoid habitat that facilitates connectivity within the locality with the retention of a 4.76 ha area of predominantly native, treed habitat within the subject property. Notably, the stand of planted native vegetation occurring along the southern and eastern boundaries of the subject

property is proposed to be fully retained, maintaining habitat connectivity in a north-south and east-west orientation. The retention of these areas of habitat are anticipated to maintain an adequate degree of habitat connectivity throughout the subject property and the broader locality offering connectivity of different areas of habitat that facilitates the movement of threatened species.

The project is not expected to signigicantly impact the connectivity of the GGBF population found within the subject property with the local Duck River, Camellia and Silverwater populations. These populations are located to the west of the subject property and are already extensively disconnected by Silverwater Road running north-south, as well as the carpark located between Silverwater Road and the sports fields in the north-western corner. The small strip of grassland connecting the subject property to Silverwater Park (and further Duck River and Camellia) along the Parramatta River is not being impacted by the proposed development and will remain to provide existing connectivity between GGBF populations.

7.1.3.4. Movement of Threatened Species that Maintain Their Lifecycle

Small patches of degraded and previously cleared vegetation will be removed in the south-western portion of the subject property as part of the Project. These areas may be used to a limited degree by the Green and Golden Bell Frog for dispersal and foraging, however it is considered unlikely that this species (or any other threatened fauna species) would be solely reliant on the degraded and modified habitat on the development site, instead favouring the adjacent wetlands and reserve.

7.1.3.5. Water Quality, Water Bodies and Hydrological Processes

The Project may indirectly impact two waterbodies that form potential foraging and/or breeding habitat: the Parramatta River and the three artificial wetlands located within the subject property. These waterbodies are likely utilised by the Southern Myotis and Green and Golden Bell Frog respectively.

The Project has demonstrated reasonable steps to avoid impacts to water quality, water bodies and hydrological processes that sustain the habitat of threatened species. The development site has been situated in the south-west portion of the subject property to avoid direct impacts to the Parramatta River located adjacent to the northern edge of the subject property and the water quality treatment ponds in the north-east of the subject property.

Furthermore, the proposed design of the stormwater system will capture and treat the water from the development site before being discharged into existing culverts draining into the Parramatta River (TTW, 2019). The stormwater runoff will be tested and treated to meet the water quality standards set by Parramatta City Council (TTW, 2019). Additionally, sediment basins will be used throughout the construction phase of the Project to ensure all water from the development site is properly treated before entering local watercourses (TTW, 2019). By implementing these measures, the water quality entering the existing waterbodies within the subject property (the Parramatta River and artificial wetlands) will be of equal or better standard than that is currently being discharged into these watercourses and the current hydrological processes are not anticipated to be significantly impacted. It is worth noting that Green and Golden Bell Frogs can tolerate a wide range of physical and chemical properties (Pyke and White, 2001). Notwithstanding, the Project is not likely to have a significant impact on the water quality of an waterbodies or hydrological processes that would result in a significant impact to the species.

8. Impact Assessment

8.1. Assessment of Impacts to Native Vegetation and Habitat

8.1.1. Direct Impacts

The primary and direct impact resulting from the Project is the loss of vegetation and associated habitat within the subject property.

8.1.1.1. Impacts on Vegetation Communities

Table 14 identifies the areas of each PCT to be impacted within the subject property. Impacts will occur within the following vegetation zone:

- Vegetation Zone 1: Total clearing. Within PCT 1395, 382 trees are proposed to be removed with a total area of approximately 1.62 ha ; and
- Vegetation Zone 2: Total clearing. Within PCT 1183, 2 trees are proposed to be removed with a total area of ~0.02 ha.

The remainder of the vegetation to be removed within the development site consists of non-native vegetation (exotic plantings and exotic cultivated lawns) that do not constitute a PCT.

Table 14 Proposed impacts to vegetation within the subject property

PCT/Vegetation Type	Subject property (ha)	Development Site (ha)
Native Vegetation		
1395 – Narrow-leaved Ironbark – Broad-leaved Ironbark – Grey Gum open forest of the edge of the Cumberland Plain, Sydney Basin Bioregion	3.40	1.62
1234 – Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion	0.38	0.02
1183 – Smooth-barked Apple – Sydney Peppermint – Turpentine heathy open forest on plateaux areas of the Sydney Basin Bioregion	0.94	0.00
920 – Mangrove Forests in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion	0.05	0.00
Subtotal	**4.76**	**1.64**
Exotic Vegetation / Cleared Land		
Artificial Wetland	0.22	0.00
Garden Beds	0.07	0.01
Exotic Grassland	5.67	3.63
Subtotal	**5.95**	**3.64**

8.1.1.2. Loss of Specific Habitat Features

The main habitat for native fauna in the subject property is in the areas of native vegetation. In addition to native vegetation, specific habitat features identified within the subject property include, hollow-bearing trees and the artificial wetlands. These habitat features are displayed in **Figure 10.** The Project will result in the loss of some habitat features within the development site, comprising three hollow-bearing trees. The remaining habitat features within the subject property will be retained.

Overall, the removal of these specific habitat features is considered to have only minor implications for native fauna species due to the modified ecological context within which the majority of the development site occurs, and the high mobility of the species likely to utilise these habitats. Additionally, the trees indicated for removal only contain small to medium sized hollows and do not currently provide habitat for threatened large forest owls or mammals. These hollows would most likely be utilised as refuge habitat for ecosystem credit species Microchiropteran bats. Nevertheless, the installation of nests boxes is proposed in the vegetation being retained to offset the hollows being removed. Details of the nest boxes to be installed will comply with SOPA's comprehensive artificial nest box and roost box programme and include ongoing monitoring If suitable, hollow sections of trees being removed can also be considered for re-use within the vegetation being retained.

8.1.1.3. Change in Vegetation Integrity Score

The changes in vegetation integrity scores as a result of clearing are documented for each vegetation zone in **Table 15** below.

Vegetation Zone 1 represents the area within the development site where complete clearance of trees and any associated ground layer vegetation will occur. Subsequently, all variables within the BAM Calculator have been reduced to 0 in this vegetation zone.

Table 15 Change in Vegetation Integrity Score

Vegetation Zone	Name	Approx. Area (ha)	Current Vegetation Integrity Score	Future Vegetation Integrity Score	Change in Vegetation Integrity Score
1	1395_cleared	1.62	25.7	0	-25.7
2	1183_cleared	0.02	15.5	0	-15.5

8.1.2. Indirect Impacts

The following indirect impacts to native vegetation and habitat may occur as a result of the Project:

- Inadvertent impacts on adjacent habitat or vegetation;
- Reduced viability of adjacent habitat due to edge effects;
- Reduced viability of adjacent habitat due to noise, dust, light spill or vibration; and
- Inadvertent impacts to hydrological processes.

A detailed assessment for each of the above impacts is provided in the following sections.

8.1.2.1. Inadvertent Impacts on Adjacent Habitat or Vegetation

i. Nature and Extent

The vegetation throughout the entire subject property has previously been heavily modified through the complete clearance and replanting of trees, and the complete removal of the original midstorey and ground layer vegetation. The entire subject property (except the north-eastern portion) exists within a matrix of residential land and roadways, exhibiting limited connectivity of vegetation and habitat. Furthermore, the majority of the trees present within the subject property are proposed to be retained. Inadvertent impacts on adjacent habitat or vegetation is unlikely throughout this area provided tree protection and fencing measures are followed.

The vegetation throughout the north-eastern portion of the subject property forms part of a larger, contiguous patch of native vegetation extending outside of the subject property into Blaxland Riverside Park. This portion of vegetation does not form part of the development site and will therefore remain untouched as part of the Project. Consequently, the Project will not further fragment vegetation or habitat in the short or long term. Rather, the Project will only result is a small decrease in the overall size of the current vegetation within the subject property.

ii. Duration

Any impact on adjacent habitat or vegetation is likely to be long term, commencing with greatest intensity in the construction phase and continuing throughout the operation phase of the Project.

iii. Likely Affected Threatened Entities

There is the potential for foraging habitat for the following threatened fauna species to be marginally affected by increased edge effects:

- Microchiropteran bats;
- Southern Myotis;
- Green and Golden Bell Frog;
- Grey-headed Flying Fox;
- Woodland birds; and
- Migratory birds.

iv. Consequences

The Project will result in the complete removal of approximately 1.64 ha of planted native vegetation. This area of vegetation has differing degrees of connectivity to adjacent vegetation, with vegetation in the south-eastern portion of the development site more connected than that of the north-western portion. Subsequently, impacts to these areas have the potential to cause inadvertent impacts to adjacent vegetation. However, inadvertent impacts to adjacent vegetation can be appropriately managed if tree protection measures and management actions implemented are followed diligently.

8.1.2.2. Reduced Viability of Adjacent Habitat Due to Noise, Dust, Light Spill or Vibration

i. Nature and Extent

The construction activities and ongoing operational activities associated with the Project are likely to increase the noise, dust, light and vibration above current levels within the subject property. Increases in dust, noise, light spill and vibration are likely to be at greatest intensity during the construction phase of the Project. However, the construction activities associated with the Project are not expected to exceed the typical levels of noise, dust, light and vibration generated by construction Projects permissible within the zoning of the subject property. The operational phase of the Project may generate marginally increased levels of noise and light due to the intended use of the subject property as a sports centre. Crowds of people, cricket games and increased vehicle access of the site are anticipated to contribute to increases in noise during the operational phase of the Project. Operational increases in noise and light are likely to be a minor impact upon the biodiversity values of the subject property as most native fauna species would be expected to habituate to the periodic noise and light disturbance.

ii. Duration

Increases in noise, dust, light spill and vibration are likely to be temporary and constrained to the construction phase of the Project. The operational phase of the Project may result in a marginal increase in noise and light over the long term due to the intended land use.

iii. Likely Affected Threatened Entities

There is the potential for foraging habitat for the following threatened fauna species to be marginally affected by increased dust, noise and light:

- Microchiropteran bats;
- Southern Myotis;
- Green and Golden Bell Frog;
- Grey-headed Flying Fox;
- Woodland birds; and
- Migratory birds.

iv. Consequences

The potential increase in noise, dust, light and vibration from the proposed development is unlikely to result in significant negative consequences for any potentially affected species within the subject property. The area of vegetation is already subject to the significant levels of noise, dust, light and vibration from the current use of the park as sports fields, the traffic from Silverwater Road and the surrounding industrial land use. The minor increase in light, noise, dust and vibration from the Project is unlikely to be significant such that it would reduce the viability of the adjacent habitats surrounding the subject property.

Additionally, a number of species actively utilising the habitat subject property are likely to be hardy urban species that can tolerate indirect impacts such as increased noise, dust, light and vibration. The adjacent

vegetation has survived despite the indirect impacts that it is currently subject to, and this minor area of disturbance will likely have minimal impact on the viability of the adjacent habitat and vegetation in the long term.

a. Dust

Construction activities of the Project have the ability to generate dust, which may result in negative consequences on the remaining ecological values of the subject property. Dust pollution can lead to a decrease in habitat quality which has the potential to extend the area of impact beyond the area directly disturbed by the Project. With regard to the remaining habitats within the subject property, dust generated by the Project may impact native woody vegetation, resulting in the loss of health of individuals along the edge of the development site.

In turn, this may result in potential impacts to foraging resources for native fauna within the retained area of vegetation. However, these impacts are unlikely to result in significant negative consequences to the biodiversity values of the subject property, as the majority of the vegetation surrounding the development envelope offers marginal ecological value. Additionally, dust suppression measures such as the utilisation of water carts as well as dust monitoring of the development site during construction are proposed to be implemented in an attempt to minimise the impact of dust on both flora and fauna located within the subject property (TTW, 2019). Due to the aquatic nature of the Green and Golden Bell Frog breeding habitat, as well as its location within the subject property, the indirect impact of dust on this species will likely be minimal.

b. Noise

Noise can affect animal physiology and behaviour, and if it becomes an ongoing stress, can be injurious to an animal's energy budget, reproductive success and long-term survival. This may lead to habitat loss through avoidance and retreat away from favourable habitats (AMEC 2005). It is likely that most native fauna species will habituate to the periodic noise disturbance associated with the construction and operational phases of the Project (AMEC 2005).

The operation of the Project as an ICC cricket field is unlikely to constitute a substantial increase in noise from the levels currently encountered by the present use of subject property as a recreational and regularly-used sport field. Additionally, substantial increases in noise are likely to be temporary and restricted to periods of high activity. Acoustic Logic (2019) have assessed in their report the ambient noise of on the eastern boundary of the subject property (where the Green and Golden Bell Frog breeding habitat is located) to be a maximum of 51 dB. The conservative maximum noise level for an outdoor cricket game was 56 dB for a small oval and 60 dB for a large oval (Acoustic Logic, 2019). Since this was measured 2 m from the oval line, the noise level surrounding the artificial wetlands located approximately 100 m from the small and large fields will further be reduced. Subsequently, the impacts from noise emissions are likely to be localised and are not likely to have a significant, long-term, impact on native fauna populations, including the Green and Golden Bell Frog.

c. Light

The Project has the potential to increase the level of artificial light in the natural environment. Increased light levels may adversely impact wildlife by direct glare, chronic or periodic increased illumination and temporary unexpected fluctuations in light levels (Saleh 2007, Longcore and Rich 2010). Research into impacts from

altered lighting indicates that it can trigger behavioural and physiological responses. The ongoing increase in light associated with the operational phase of the Project will be localised and is unlikely to result in significant, long-term negative consequences on native fauna populations.

The Project will avoid the direct illumination of sensitive areas including the Parramatta River and artificial wetlands and minimise the indirect light spill in the 50 m and 100 m buffer around those respective areas (LCI 2019). Glare shields are also proposed to be used where practical to further reduce the indirect impact of light spill on habitat within the subject property (LCI 2019). Warm spectrum (3000k) lighting is proposed to be utilised in accordance with SOPA's 'Parklands Element Design Manual' to reduce the impact on nocturnal animals such as microchiropteran bats and the Green and Golden Bell Frog (LCI 2019). Artificial lighting of the same spectrum is currently being used to illuminate the existing sports fields, car parks and buildings. Consequently, the Project is unlikely to increase both direct and indirect impacts from light spill on adjoining habitat and ecology, including the Parramatta River and nearby wetlands and resident fauna such as the Green and Golden Bell Frog.

d. Vibration

The Project has the potential to produce a vibration impact during the construction phase through the use of heavy machinery and trenching works. The exact vibration impact of the Project on native fauna and its habitat are difficult to assess as vibration data is not yet available. Furthermore, little information is available on the sensitivity of the Green and Golden Bell Frog to vibration. However, it is estimated that significant vibration impacts will be limited to the construction phase of the Project and will only result in a temporary increase in vibration levels to the subject property and surrounding habitat. In addition, vibration levels will be monitored throughout the construction duration. Vibration levels can be minimised by selecting the type of machinery used in the proximity of sensitive areas such as the artificial wetlands and restricting the duration of its use. By creating a buffer between the vibration source and its habitat, the vibration on the Green and Golden Bell Frog is unlikely to have a significant impact on the species.

8.1.2.3. Inadvertent Impacts to Hydrological Processes

i. Nature and Extent

The location and design of the Project has been situated so that it avoids direct impacts upon the artificial wetlands located within the north-eastern portion of the subject property. Nevertheless, there is the potential for the Project to result in inadvertent alterations to hydrological processes within the subject property. This may result from the partial clearance of vegetation within the development envelope and the projected increase of impervious surfaces within the subject property. All of these factors may result in changes to overland flow regimes within the subject property.

ii. Duration

Impacts to hydrological processes are expected to primarily be short term and constrained to the construction phase of the Project, however changes to vegetation and impervious surfaces may result in longer term changes to hydrological regimes.

iii. Likely Affected Threatened Entities

There is the potential for foraging habitat for the following threatened fauna species to be marginally affected by inadvertent impacts to hydrological processes:

- Southern Myotis;
- Green and Golden Bell Frog.

iv. Consequences

The potential changes to hydrological processes are unlikely to result in negative consequences for the Southern Myotis as they would likely only utilise the watercourse habitat as part of a broader foraging range. Any change to the hydrology of the subject property is likely to be extremely minor and is unlikely to substantially alter the vegetation or habitat including artificial wetland such that it would become unsuitable for use by potentially affected species such as the Southern Myotis and Green and Golden Bell Frog. Flood modelling has indicated that the proposed development will reduce upstream flood levels, resulting in reduced overland flows (TTW 2019).

8.2. Assessment of Prescribed Impacts

The following prescribed impacts are potentially relevant to the proposal:

- Human-made structures;
- Non-native vegetation;
- Connectivity of different areas of habitat that facilitates movement;
- Movement of threatened species that maintain their lifecycle; and
- Water quality, water bodies and hydrological processes.

These are discussed in detail in subsequent sections.

8.2.1. Human-made Structures

The Project will result is the modification of the existing toilet building located in the north-eastern portion of the development site which may contain potential roosting habitat for the threatened Little Bent-winged Bat, Large Bent-winged Bat and Southern Myotis. Given the limited area of land on which the development occurs, as well as the consideration to avoid impacts to native vegetation to the greatest extent possible, impacts to this structure is not able to be avoided as part of the Project.

Nevertheless, this human made structure to be modified for the proposed development are not considered to form significant roosting habitat for these species and therefore not considered to be dependent on for survival for the Large Bent-winged Bat or Little Bent-winged Bat. Hence, no significant impacts to these species are expected from the removal of the human made structures on the subject land.

8.2.2. Non-native Vegetation

As the development design have been focused on avoiding areas of native vegetation and locating the development within areas cleared or existing of non-native/ exotic vegetation, the majority of areas of non-native vegetation will be cleared as a result of the Project. Although considered as areas of low ecological integrity, the clearing of non-native vegetation has the potential to reduce foraging habitat for some fauna species such as the GGBF.

Although the areas consisting of non-native vegetation may be utilised occasionally as foraging habitat, they are unlikely to be favoured over the adjoining reserve and wetland habitats. Hence, no significant impacts on threatened fauna species are expected from the removal of non-native vegetation within the development site.

8.2.3. Connectivity of Different Areas of Habitat that Facilitates Movement

The Project is likely to result in a marginal decrease in connectivity of different areas of habitat that facilitates movement of native fauna throughout the fragmented urban landscape. This will result from the clearance of a 1.62 ha area of native vegetation within the development site.

The vegetation to be removed consists of small, fragmented patches of planted vegetation surrounded by cultivated lawns and more broadly, residential land. The proposed removal of these small isolated areas of vegetation and habitat would very minimally contribute to the fragmentation of habitat further than current conditions. The habitat within the subject property currently offers very limited connectivity due to numerous existing hostile gaps throughout the subject property. The existing habitat may provide "stepping stone" habitat for the movement of highly mobile and aerial threatened fauna. However, it is unlikely these highly fragmented areas would be solely relied upon by any threatened species to facilitate movements between habitats throughout their distribution.

8.2.4. Movement of Threatened Species that Maintain Their Lifecycle

The Project design has aimed to reduce the development footprint where feasible and the current layout will allow for the retention of the majority of high condition native vegetation within the wider subject property, which includes the artificial wetlands and one TEC. These retained areas will provide for any movement of threatened species required to maintain their lifecycle such as the Green and Golden Bell Frog which is known to breed in the artificial wetlands and will continue to contribute to the larger corridor of habitat mapped across the north-eastern extent of the subject property into adjacent Blaxland Riverside Park. Hence, no significant impacts on the movement of threatened species that maintains their lifecycle is likely to result from the Project.

8.2.5. Water Quality, Water Bodies and Hydrological Processes

As the Parramatta River is a large 4th order watercourse where it adjoins the subject property, the hydrological conditions of the subject property are unlikely to be influential upon the hydrology of the watercourse. Similarly, the water quality treatment ponds in the north-east of the subject property are artificial waterbodies and are not fed by naturally occurring overland or groundwater flows and are highly unlikely to be impacted by the hydrological conditions of the subject property. A flood impact assessment has been prepared for the

Project which has determined that no negative impacts are expected with a reduction in the upstream flood level by 100mm (TTW 2019).

However, the construction activities associated with the Project have the potential to cause impacts to water quality arising from sedimentation, potentially impacting the artificial water quality treatment ponds and the Parramatta River. The creation of additional impervious surfaces in addition to the removal of vegetation may result in altered hydrological conditions continuing through to the operational phase of the Project, potentially contributing to erosion, sedimentation and nutrient transport into adjacent habitat and waterbodies. These potential impacts will be managed with the implementation of an approved sedimentation and erosion control plan.

8.3. Assessment of Impacts to Coastal Wetlands

8.3.1. Mapped Coastal Wetlands

Land mapped as Coastal Wetlands under the Coastal Management SEPP occurs in the subject property, as shown in **Figure 2**; however, none occurs in the subject land. Additional areas of Coastal Wetlands occur outside the subject property along Duck River to the west and Blaxland Riverside Park to the north-east.

No area of SEPP Coastal Wetland will be removed by the Project, and none is located within the development site. There is the potential for some indirect impacts to occur to the Coastal Wetland within the subject property, through erosion and sedimentation caused by construction works or runoff of stormwater and inappropriate disposal of waste water, however these potential impacts will be managed through the implementation of appropriate mitigation measures, such as erosion and sedimentation control measures, a detailed stormwater design, and a comprehensive wastewater management system (TTW 2019). These measures are described in more detail in the Wastewater Management Plan (TTW 2019) and the Concept Stormwater Management Plan (TTW 2019. With the implementation of these measures, negative impacts on the nearby areas of Coastal Wetlands are unlikely to occur.

8.3.2. Mapped Proximity Area to Coastal Wetlands

The subject land includes land mapped as 'Proximity Area' to the Coastal Wetlands, which acts effectively as a buffer area to the Coastal Wetland. The majority of the proposed development is contained outside of the Proximity Area, although parts of the Junior Cricket Field and practice wickets are contained in the Proximity Area, in the eastern portion of the development site.

Under the Coastal Management SEPP, development can be carried out in areas mapped "proximity area for coastal wetlands" if the consent authority is satisfied that the proposed development will not significantly impact on the biophysical, hydrological and ecological integrity of the coastal wetland or the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland.

The clearing of vegetation within the proximity areas in the subject land is not expected to significantly impact the ecological integrity of the Coastal Wetland beyond current conditions, as these areas have previously been heavily modified during the construction of the existing park facilities.

The quality of water entering the wetlands is expected to be equal or improved beyond current conditions, due to the improved active management of stormwater run-off and wastewater management proposed as part of the Project (TTW 2019). This will ensure that although some works are proposed in the Proximity Area, indirect impacts on Coastal Wetlands will not be exacerbated. As a result, no significant impact on the hydrological integrity is expected on the Coastal Wetland.

Furthermore, the proposed development is not expected to have any impacts on the groundwater, hence changes to the ground water table or the quantity and quality of groundwater, as a result of the Project, and associated potential impacts on the Coastal Wetland, are considered unlikely to occur.

8.4. Mitigation Measures for Impacts to Native Vegetation and Habitat

A range of mitigation measures have been developed for this Project to mitigate the impacts that are unable to be avoided using the measures outlined previously. These include a range of measures to be undertaken before and during construction to limit the impact of construction, and measures to manage weed control.

A summary of the mitigation measures proposed for the Project are included in **Table 16** below, whilst each of the proposed mitigation measures are discussed in more detail below.

8.4.1. Construction Mitigation Measures

8.4.1.1. Timing of Construction Works

In order to minimise impacts to threatened fauna species that may utilise the hollow-bearing trees and rocky habitat within the development site, removal of these will be undertaken after a pre-clearance inspection by a qualified ecologist and all hollow-bearing tree removal and rocky habitat disturbance will be supervised by an appropriately qualified and experienced ecologist. It is also recommended that construction take into consideration the active phase of the Green and Golden Bell Frogs during the summer months and restrict construction works to the period of the year where the species is least active (April – October).

8.4.1.2. Delineation of Clearing Areas

Areas that require clearance will be flagged and clearly delineated to ensure that no areas intended for conservation will be inadvertently cleared during the construction process. No machinery will be parked on areas beyond the temporary fencing and no access will be allowed during construction. Ancillary facilities such as stockpile sites, site compounds and construction zones will not be located beyond the limits of clearing.

8.4.1.3. Tree Protection Measures

In order to minimise impacts on trees proposed to be retained, any trees in close proximity (within 10m) to trees to be removed will have tree protection measures implemented. Appropriate tree protection measures have been developed by the Project's arborist and detailed in the arboricultural assessment (Newleaf Arboriculture, 2019).

8.4.1.4. Exclusion Fencing of the Development Site

Temporary frog-proof fencing is recommended to be installed around the outer boundary of the development site to reduce the likelihood of Green and Golden Bell Frogs from entering the site during the construction period. The fencing should remain installed for the duration of construction activities and be checked after

periods of heavy rain to ensure that it remains intact. It is recommended that the frog-proof fencing be erected at a time of the year where the Green and Golden Bell Frogs are least active (April – October) to further minimise the impact of the Project on the species.

8.4.1.5. Pre-clearance Surveys

i. General Pre-clearance Surveys

In order to avoid impacts to fauna species during construction, pre-clearance surveys will be conducted in all areas of vegetation that are required to be cleared or altered. Pre-clearing surveys will be undertaken ahead of clearing, to limit fauna injury and mortality and to identify habitat features to be relocated. Pre-clearance surveys will be conducted by suitably qualified and experienced ecologists, and all fauna found during these surveys will be encouraged to move on or relocated by the ecologists in areas of similar habitat nearby that will not be impacted.

Pre-clearing surveys will be undertaken by a suitably qualified ecologist. Pre-clearing surveys will include:

- Demarcation of key habitat features, such as hollow-bearing trees;
- Checking trees for the presence of bird nests and arboreal mammals, such as possums and bats, prior to felling;
- Checking plant litter, groundcover vegetation and habitat for the presence of native fauna such as amphibians, reptiles and invertebrates prior to earthworks or relocation; and
- Animals found to be occupying trees and habitat will be safely removed before the clearing of trees and relocated into nearby wooded habitat.

To minimise impacts to native fauna species, clearing will be undertaken in the following two-stage process under the supervision of a suitably qualified ecologist:

- The initial phase of clearing will involve clearing around identified habitat features and leaving the features overnight; and
- The second stage will involve clearing of the habitat features left overnight followed by an inspection.

An ecologist will investigate all felled trees for the presence of hollows not detected prior to clearing. Inspections will be undertaken of these hollows for native fauna.

An ecologist will be present while clearing to rescue animals injured during the clearance operation. Provisions will be made to protect any native fauna during clearing activities by the following means:

- All staff working on the vegetation clearing will be briefed about the possible fauna present and should avoid injuring any present;
- Animals disturbed or dislodged during the clearance but not injured will be assisted to move to adjacent bushland or other specified locations; and

- If animals are injured during the vegetation clearance, appropriate steps will be taken to humanely treat the animal (either taken to the nearest veterinary clinic for treatment, or if the animal is unlikely to survive, it will be humanely euthanized).

Provision of a report following the completion of clearing works will be provided detailing the total number and species of individuals recorded and details of their release/health.

ii. Green and Golden Bell-frog Pre-clearance Surveys

Targeted Green and Golden Bell Frog pre-clearance surveys will be undertaken just prior to the commencement of construction activities after frog-proof fencing has been installed. Surveys will include two days of diurnal searches and two nights of spotlighting within the development site to ensure all individuals are relocated outside of the construction area and excluded from re-entry by the frog-proof fencing. Spawn/tadpoles searches will also be undertaken if any freshwater soaks are recorded within the development footprint. If individuals are recorded during the pre-clearance surveys, they will be relocated into adjacent suitable habitat identified prior to construction works. Where relocation is required, frogs will be handled according to the Hygiene Protocol for the Control of Diseases in Frogs (NPWS 2008).

8.4.1.6. Clearing Supervision

To minimise impacts to native fauna species, clearing will be undertaken in the following two-stage process under the supervision of a suitably qualified ecologist:

- The initial phase of clearing will involve clearing around identified habitat features and leaving the features overnight; and
- The second stage will involve clearing of the habitat features left overnight followed by an inspection.

An ecologist will investigate all felled trees for the presence of hollows not detected prior to clearing. Inspections will be undertaken of these hollows for native fauna.

An ecologist will be present while clearing to rescue animals injured during the clearance operation. Provisions will be made to protect any native fauna during clearing activities by the following means:

- All staff working on the vegetation clearing will be briefed about the possible fauna present and should avoid injuring any present;
- Animals disturbed or dislodged during the clearance but not injured will be assisted to move to adjacent bushland or other specified locations; and
- If animals are injured during the vegetation clearance, appropriate steps will be taken to humanely treat the animal (either taken to the nearest veterinary clinic for treatment, or if the animal is unlikely to survive, it will be humanely euthanized).

Provision of a report following the completion of clearing works will be provided detailing the total number and species of individuals recorded and details of their release/health.

8.4.1.7. Weed Management

In order to minimise the spread of weeds throughout the subject property and spread of weeds present in the subject property to areas outside of it, appropriate weed control activities will be undertaken in accordance with all state, regional and local weed management plans. The subject property lies within the Greater Sydney Local Land Services Area and is subject to the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022 (LLS: Greater Sydney 2017) under the NSW *Biosecurity Act 2015*.

The *Biosecurity Act 2015* and regulations provide specific legal requirements for state level priority weeds and high-risk activities, as provided in the Appendices of the North West Regional Strategic Weed Management Plan. In order to comply with the objectives of the Greater Sydney Regional Strategic Weed Management Plan, it is recommended the following measures be implemented as part of a management plan for the subject property.

i. Prevention

Appropriate construction site hygiene measures will be implemented to prevent entry of new weeds to the area such as the use of wash bays.

ii. Eradication

Initial weed management will be carried out over the development site according to best-practice methods under the direction of a suitably qualified bush regenerator. The targeted species will be those listed under Appendices 1 and 2 of the Greater Sydney Regional Strategic Weed Management Plan. Initial weed treatment will include eliminating woody species and targeting large dominant infestations of exotic herbs. This may be achieved via a combination of manual weed removal and herbicide use.

Best-practice bush regeneration should undertake measures to avoid adverse impacts to retained vegetation within the development site, including not over clearing (remove only targeted species), employment of minimal disturbance techniques to avoid soil and surrounding vegetation disturbance, and replacement of disturbed mulch/leaf-litter.

iii. Containment

Follow-up monitoring and maintenance should be undertaken in areas of the development site that have received past primary weeding treatments in the following months, to contain any re-emergence of weed species.

iv. Minimisation

Minimisation of weed species that cannot be effectively controlled on the site, such as exotic grasses, will be prevented from further spread through construction and operational phase site hygiene procedures.

8.4.1.8. Sedimentation Control Measures

The Project may result in erosion and transport of sediments as a result of soil disturbance during construction. Stormwater and sedimentation are proposed to be managed through the implementation of sediment fencing, sediment basins, in addition to appropriate location of stockpiles. The erosion and sediment control plan for the project will ensure that adequate erosion and sediment control measures are applied prior to and

throughout construction (TTW 2019). Additionally, site runoff will be treated in accordance with Parramatta City Council requirements (TTW 2019).

Table 16 Mitigation Measures Summary

Mitigation Measure	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Risk and Consequences of Residual Impacts
Construction mitigation measures for impacts to native vegetation and habitat						
Timing of construction works	Removal of habitat trees will be undertaken after a pre-clearance inspection by a qualified ecologist and will also be supervised by the qualified ecologist. Construction is recommended to be conducted at a time of the year where the Green and Golden Bell Frog is least active (Apr-Oct).	Construction	Once	Contractor	Moderate	Unnecessary damage to trees to be retained; and increased and unnecessary mortality of native fauna.
Delineation of clearing areas	Areas to be cleared will be flagged and clearly delineated including temporary frog-proof fencing to ensure that no areas intended for conservation will be inadvertently cleared during the construction process.	Construction	Once	Contractor	High	Unnecessary damage to trees to be retained; and increased and unnecessary mortality of native fauna.

Mitigation Measure	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Risk and Consequences of Residual Impacts
Erection of frog-proof fencing	Temporary frog-proof fencing will be installed around the perimeter of the construction area and checked periodically for gaps/damage. A pre-clearance survey will be conducted by an ecologist after the erection of the fencing to ensure its adequacy and that no frogs are trapped within the construction area. The erection of the frog-fencing is recommended to be conducted at a time of the year where the Green and Golden Bell Frog is least active (Apr-Oct).	Construction	Once	Contractor	High	Unecessary mortality of native fauna, including the Green and Golden Bell Frog
Tree protection measures	Trees in close proximity (10 m) to vegetation proposed to be removed will have tree protection measures implemented to reduce inadvertent damage during clearing works.	Construction	Once	Contractor	High	Unnecessary damage to trees to be retained; and increased and unnecessary mortality of native fauna.

Mitigation Measure	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Risk and Consequences of Residual Impacts
Pre-clearance survey	Pre-clearance surveys will be conducted in all areas of vegetation, rocky or aquatic habitat that are required to be cleared or altered. Pre-clearing surveys will be undertaken within one week of clearing, to limit fauna injury and mortality and to identify habitat features to be relocated.	Construction	Once	Contractor	High	Unnecessary damage to trees to be retained; and increased and unnecessary mortality of native fauna.
Weed Management	Appropriate weed control activities will be undertaken in accordance with all state, regional and local weed management plans.	Construction	Throughout construction period	Contractor	High	Spread of weeds throughout the subject property and surrounding areas.
Sedimentation control	Construction activities will be undertaken in accordance with 'The Blue Book' (Landcom 2004). These include the implementation of the following measures:	Construction	Throughout construction period	Contractor	High	Sedimentation into nearby wetlands and watercourses.
	installation of sediment control fences;					
	Covering stockpiles; and					
	Avoiding soil disturbance prior to heavy rainfall.					

Mitigation Measure	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Risk and Consequences of Residual Impacts
Mitigation measures for prescribed impacts						
Measures for the connectivity of habitat that facilitates movement	Majority of planted trees within the development site will be retained;	Construction	Throughout construction period	Contractor	Moderate	Reduced connectivity within the subject property over time.
	Understorey planting is proposed for the landscaped areas of the development envelope	Post-Construction	Once	Contractor	Low	Reduced habitat within the subject property over time.
Measures of water quality, water bodies and hydrological processes	Sedimentation control	Construction	Throughout construction period		Moderate	Sedimentation into nearby wetlands and watercourses.

8.5. Mitigation Measures for Prescribed Impacts

8.5.1. Human-made Structures

As mentioned within **Section 8.3.1.5,** pre-clearance surveys are proposed to be implemented in order to avoid impacts to fauna species during construction. The pre-clearance surveys will also extend to the existing human-made structures, to identify habitat features or fauna needed to be relocated.

Pre-clearance surveys will be conducted by suitably qualified ecologists ahead of the demolishing of the buildings, and all fauna found during these surveys will be encouraged to move on or relocated by the ecologists in areas of similar habitat nearby that will not be impacted.

8.5.2. Non-native Vegetation

Although the areas consisting of non-native vegetation may be utilised occasionally as foraging habitat, they are unlikely to be favoured over the adjoining reserve and wetland habitats. Hence, no fauna species or habitat features are expected to be present in these areas. Nevertheless, the pre-clearance surveys will be extended to include areas of non-native vegetation, where considered appropriate, and will be conducted in accordance with the information outlined in **Section 8.3.1.5.**

8.5.3. Connectivity of Different Areas of Habitat that Facilitates Movement

Impacts to a minor loss of connectivity between small areas of habitat within the subject property will be mitigated with the establishment of additional dense planting buffers between the roads and buildings, and areas of tree and understorey planting. These plantings will enhance the remaining habitat connectivity of the subject property.

8.5.4. Movement of Species that Maintain Their Lifecycle

The Project design has aimed to reduce the development footprint where feasible and the current layout will allow for the retention of the majority of high condition native vegetation within the wider subject property, which includes the artificial wetlands and one TEC. These retained areas will provide for movement of threatened species required to maintain their lifecycle such as the Green and Golden Bell Frog which is known to breed in the artificial wetlands and will continue to contribute to the larger corridor of habitat mapped across the north-eastern extent of the subject property into adjacent Blaxland Riverside Park. Hence, no significant impacts on the movement of threatened species that maintains their lifecycle is likely to result from the Project.

8.5.5. Water Quality, Water Bodies and Hydrological Processes

Impacts to water quality, water bodies and hydrological processes that sustain the habitat of threatened species are to be mitigated with the implementation of an approved sedimentation control plan as described in **Section 7.3.1.6**.

8.6. Adaptive Management of Uncertain Impacts

The Project is considered unlikely to result in any uncertain impacts that require adaptive management as listed in Section 9.4.2 of the BAM.

8.7. Assessment Thresholds

The unavoidable impacts of the Project have been considered and a determination made of the assessment thresholds. The following sections outline the assessment thresholds and their relevance to the Project.

8.7.1. Impacts to Potential Serious and Irreversible Impact Entities

No potential serious and irreversible impact entities are considered to be impacted by the Project.

8.7.2. Impacts that Require an Offset

8.7.2.1. Native Vegetation

In accordance with the BAM, the Project requires offsets for the clearing of native vegetation as the following criteria is met:

- A vegetation zone that has a vegetation integrity score of ≥17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or is representative of a vulnerable ecological community.

i. Vegetation Management Zones

A single vegetation management zone has been defined for calculating the offset requirement based on the predicted management of the vegetation this zone. The details for this vegetation zone are provided below:

- Development Site: the area occupied by the construction footprint for the Project and associated landscaping where complete removal of vegetation will occur.

ii. Credit Liability

The PCT and associated vegetation zone requiring offsets for each zone, are documented in **Table 17.** These areas are mapped in **Figure 11.**

Table 17 Summary of impacts to native vegetation requiring an offset

Vegetation Zone	TEC	Development Site (ha)	Vegetation Integrity Score	Change in Vegetation Integrity Score
1395_Cleared	Not a TEC	1.62	25.7	-25.7

8.7.3. Impacts that do not Require an Offset

In accordance with the BAM, the project does not require offsets for the clearing of native vegetation if the following criteria is met:

- A vegetation zone that has a vegetation integrity score of <17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or is representative of a vulnerable ecological community.

Accordingly, the removal of 0.02 ha PCT 1183 does not require an offset as its vegetation integrity score is 15.5. This area is mapped in **Figure 12**.

8.7.4. Impacts that do not Require Further Assessment

All areas identified as exotic grassland and exotic garden bed vegetation within the development site do not require further assessment. These areas comprise approximately 5.74 ha. However 3.12 ha of these exotic grassland areas have been included in the species polygon for the calculation of credits for the GGBF (**Figure 9**). As such, only 0.55 ha of exotic grassland does not require further assessment and is shown in **Figure 13**.

All areas identified as 'Cleared' that occur within the development site do not require further assessment, in accordance with the BAM. These areas comprise approximately 0.54 ha and shown in **Figure 13**.

8.8. Summary of Offset Credits Required

The ecosystem credit requirement for the Project is summarised in **Table 18**, whilst the 'like for like' offsetting options for the ecosystem credits are provided in **Table 19**.

Two fauna species have been assessed as requiring an offset, the Southern Myotis and Green and Golden Bell Frog. The species credit requirement for the Project is summarised in **Table 20**, whilst the 'like for like' offsetting options for the ecosystem credits are provided in **Table 21.**

A credit report from the BAM calculator has been included in **Appendix C.**

Table 18 Summary of ecosystem credit liability

Vegetation Zone	TEC	Development Site (ha)	Credits Required
1395_Cleared	Not a TEC	1.62	21

Table 19 'Like for like' options of PCTs

Original PCT to be offset	Any PCT in the below class	And in any of below trading groups	Containing HBT	In the below IBRA subregions
1395	Coastal Valley Grassy Woodlands. This includes PCT's: 116, 618, 760, 761, 762, 830, 834, 838, 849, 850, 1326, 1395, 1603, 1604, 1691	Coastal Valley Grassy Woodlands - ≥ 70% - <90% cleared group (including Tier 4 or higher).	Yes	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.

Table 20 Summary of species credit liability

Species	Approximate Area (ha)	Credits Required
Litoria aurea / Green and Golden Bell Frog	1.26	16
Myotis macropus / Southern Myotis	1.52	19
Total	-	**35**

Table 21 'Like for like' options for species credits

Species	In the below IBRA subregions
Litoria aurea / Green and Golden Bell Frog	Any in NSW
Myotis macropus / Southern Myotis	Any in NSW

9. Conclusion

The Project involves the construction of a Cricket NSW Centre of Excellence and associated infrastructure (the development envelope) within the development site, which has been historically cleared and replanted as parkland and sportsfields. An assessment was undertaken to examine the impacts of the Project on the biodiversity values of the subject property. This BDAR has been prepared to document the findings of an ecological investigation undertaken within the subject property in accordance with the BAM.

The biodiversity values of the south-western portion of the subject property are limited, due to the historical vegetation clearance and current use of the land as sports fields and recreational areas. The original vegetation of the subject land has been cleared, but four PCTs (1395, 1183, 1234 and 920) have been identified within the subject property. Other areas of the subject property are occupied by three artificial wetlands, exotic planted vegetation, exotic grassland and cleared areas. The subject property contains several fauna habitat features, including three hollow-bearing trees and three artificial wetlands. There is some connectivity between native vegetation within the north-eastern portion of the subject property and the native vegetation of the adjacent Blaxland Riverside Park.

Measures to avoid and minimise impacts to the biodiversity values of the subject property have been implemented and included consideration of the Project location and design. The development site is positioned over an area within the subject property containing the lowest biodiversity values, consisting predominantly of exotic grassland and scattered native trees, including non-endemic native species. In doing so, the Project has considered the biodiversity values of the vegetation within the subject property and has demonstrated reasonable steps to avoid and minimise impacts based upon the Project location within the subject property, including avoiding all potential breeding habitat for the Green and Golden Bell Frog.

Nevertheless, the Project will result in some residual impacts to biodiversity including the clearance of approximately 1.64 ha, including 1.62 ha of 1395 – Narrow-leaved Ironbark – Broad-leaved Ironbark – Grey Gum open forest and 0.02 ha of 1183 – Smooth-barked Apple- Sydney Turpentine heathy open forest within the development site. Subsequently, at least three hollow-bearing trees will be removed. Potential indirect impacts of the Project include inadvertent impacts on hydrological processes and adjacent habitat, and prescribed impacts such as habitat removal that facilitates movement of native fauna and prescribed impacts on hydrological processes have been considered. A suite of mitigation measures has been proposed to minimise the direct, indirect and prescribed impacts of the Project, such as construction mitigation measures, tree protection measures, weed management and pre-clearance surveys.

As the Project includes removal and modification of areas of native vegetation, offsets are required in the form of ecosystem credits and species credits. This assessment indicated that the removal and modification of the native vegetation within the subject property requires a total of 21 ecosystem credits, comprising PCT 1395 and a total of 35 species credits for the Green and Golden Bell Frog and the Southern Myotis. With the implementation of the proposed mitigation measures and the purchase of biodiversity credits described previously, it is considered that the impacts of the Project on biodiversity will be minimal and can be appropriately managed.

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APPENDIX A :
Flora Survey Data

Table 22 Flora species list recorded within the subject property

Family	Scientific Name	Common Name	Exotic (*)
Acanthaceae	*Avicennia marina subsp. australasica*	Grey Mangrove	
Aizoaceae	*Tetragonia tetragonioides*	New Zealand Spinach	
Amaranthaceae	*Alternanthera denticulata*	Lesser Joyweed	
Amaranthaceae	*Alternanthera philoxeroides*	Alligator Weed	*
Amaranthaceae	*Alternanthera pungens*	Khaki Weed	*
Amaranthaceae	*Amaranthus viridis*	Green Amaranth	*
Amaranthaceae	*Gomphrena celosioides*	Gomphrena Weed	*
Anacardiaceae	*Schinus areira*	Pepper Tree	*
Apiaceae	*Centella asiatica*	Indian Pennywort	
Apocynaceae	*Araujia sericifera*	Moth Vine	*
Arecaceae	*Phoenix canariensis*	Canary Island Date Palm	*
Arecaceae	*Syagrus romanzoffiana*	Cocos Palm	*
Asteraceae	*Arctotheca calendula*	Capeweed	*
Asteraceae	*Bidens pilosa*	Cobbler's Pegs	*
Asteraceae	*Bidens subalternans*	Greater Beggar's Ticks	*
Asteraceae	*Cirsium vulgare*	Spear Thistle	*
Asteraceae	*Conyza bonariensis*	Flaxleaf Fleabane	*
Asteraceae	*Conyza sumatrensis*	Tall fleabane	*
Asteraceae	*Cotula australis*	Common Cotula	
Asteraceae	*Gamochaeta americana*	Cudweed	*
Asteraceae	*Gamochaeta pensylvanica*	Cudweed	*
Asteraceae	*Hypochaeris microcephala* var. *albiflora*	White Flatweed	*
Asteraceae	*Hypochaeris radicata*	Catsear	*
Asteraceae	*Lactuca serriola*	Prickly Lettuce	*
Asteraceae	*Senecio madagascariensis*	Fireweed	*
Asteraceae	*Soliva sessilis*	Bindyi	*
Asteraceae	*Sonchus asper*	Prickly Sowthistle	*
Asteraceae	*Sonchus oleraceus*	Common Sowthistle	*
Asteraceae	*Taraxacum officinale*	Dandelion	*
Basellaceae	*Anredera cordifolia*	Madeira Vine	*
Brassicaceae	*Brassica fruticulosa*	Twiggy Turnip	*
Brassicaceae	*Brassica rapa* subsp. *campestris*	Turnip	*
Brassicaceae	*Capsella bursa-pastoris*	Shepherd's Purse	*

Brassicaceae	*Lepidium africanum*	Common Peppercress	*
Campanulaceae	*Wahlenbergia gracilenta*	Annual Bluebell	
Caryophyllaceae	*Cerastium glomeratum*	Mouse-ear Chickweed	*
Caryophyllaceae	*Paronychia brasiliana*	Chilean Whitlow Wort, Brazilian Whitlow	*
Caryophyllaceae	*Polycarpon tetraphyllum*	Four-leaved Allseed	*
Caryophyllaceae	*Stellaria media*	Common Chickweed	*
Casuarinaceae	*Allocasuarina littoralis*	Black She-Oak	
Casuarinaceae	*Casuarina cunninghamiana* subsp. *cunninghamiana*	River Oak	
Casuarinaceae	*Casuarina glauca*	Swamp Oak	
Chenopodiaceae	*Atriplex prostrata*	-	*
Chenopodiaceae	*Dysphania pumilio*	Small Crumbweed	
Chenopodiaceae	*Einadia trigonos*	Fishweed	
Chenopodiaceae	*Suaeda australis*	-	
Convolvulaceae	*Dichondra repens*	Kidney Weed	
Cupressaceae	*Cupressus sempervirens*	Italian Cypress	*
Cyperaceae	*Carex inversa*	Knob Sedge	
Cyperaceae	*Cyperus eragrostis*	Umbrella Sedge	*
Cyperaceae	*Cyperus gracilis*	Slender Flat-sedge	
Cyperaceae	*Cyperus papyrus*	-	*
Euphorbiaceae	*Chamaesyce prostrata*	Red Caustic Weed	*
Euphorbiaceae	*Triadica sebifera*	Chinese Tallowood	*
Fabaceae (Faboideae)	*Erythrina crista-galli*	Cockspur Coral Tree	*
Fabaceae (Faboideae)	*Medicago polymorpha*	Burr Medic	*
Fabaceae (Faboideae)	*Trifolium micranthum*		*
Fabaceae (Faboideae)	*Trifolium repens*	White Clover	*
Fabaceae (Mimosoideae)	*Acacia floribunda*	White Sally	
Fabaceae (Mimosoideae)	*Acacia longifolia subsp. longifolia*	Sydney Golden Wattle	
Fabaceae (Mimosoideae)	*Acacia maidenii*	Maiden's Wattle	

Fabaceae (Mimosoideae)	*Acacia parramattensis*	Parramatta Wattle	
Juncaceae	*Juncus acutiflorus*	-	*
Juncaceae	*Juncus usitatus*	-	
Lamiaceae	*Stachys arvensis*	Stagger Weed	*
Lauraceae	*Cinnamomum camphora*	Camphor Laurel	*
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush	
Loranthaceae	*Amyema cambagei*	Needle-leaf Mistletoe	
Malvaceae	*Malva parviflora*	Small-flowered Mallow	*
Malvaceae	*Modiola caroliniana*	Red-flowered Mallow	*
Malvaceae	*Sida rhombifolia*	Paddy's Lucerne	*
Meliaceae	*Melia azedarach*	White Cedar	
Myrtaceae	*Angophora subvelutina*	Broad-leaved Apple	
Myrtaceae	*Callistemon citrinus*	Crimson Bottlebrush	
Myrtaceae	*Callistemon viminalis*	Weeping Bottlebrush	
Myrtaceae	*Corymbia citriodora*	Lemon-scented Gum	*
Myrtaceae	*Corymbia maculata*	Spotted Gum	
Myrtaceae	*Eucalyptus amplifolia*	Cabbage Gum	
Myrtaceae	*Eucalyptus baueriana*	Blue Box	
Myrtaceae	*Eucalyptus canaliculata*	Large-fruited Grey Gum	
Myrtaceae	*Eucalyptus cladocalyx*	Sugar Gum	*
Myrtaceae	*Eucalyptus crebra*	Narrow-leaved Ironbark	
Myrtaceae	*Eucalyptus fibrosa*	Red Ironbark	
Myrtaceae	*Eucalyptus globoidea*	White Stringybark	
Myrtaceae	*Eucalyptus longifolia*	Woollybutt	
Myrtaceae	*Eucalyptus microcarpa*	Western Grey Box	
Myrtaceae	*Eucalyptus moluccana*	Grey Box	
Myrtaceae	*Eucalyptus punctata*	Grey Gum	
Myrtaceae	*Eucalyptus robusta*	Swamp Mahogany	
Myrtaceae	*Eucalyptus siderophloia*	Grey Ironbark	
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum	
Myrtaceae	*Leptospermum laevigatum*	Coast Teatree	
Myrtaceae	*Lophostemon confertus*	Brush Box	
Myrtaceae	*Melaleuca armillaris subsp. armillaris*	Bracelet Honey-myrtle	
Myrtaceae	*Melaleuca decora*	-	
Myrtaceae	*Melaleuca linariifolia*	Flax-leaved Paperbark	

Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved Paperbark	
Myrtaceae	*Melaleuca styphelioides*	Prickly-leaved Tea Tree	
Myrtaceae	*Melaleuca styphelioides*	Prickly-leaved Tea Tree	
Oleaceae	*Ligustrum lucidum*	Large-leaved Privet	*
Oleaceae	*Olea europaea* subsp. *cuspidata*	African Olive	*
Oxalidaceae	*Oxalis corniculata*	Creeping Oxalis	*
Passifloraceae	*Passiflora edulis*	Common Passionfruit	*
Phormiaceae	*Dianella caerulea*	Blue Flax-lily	
Phormiaceae	*Dianella caerulea* var. *producta*	-	
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	
Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues	*
Plantaginaceae	*Plantago major*	Large Plantain	*
Plantaginaceae	*Veronica arvensis*	Wall Speedwell	*
Poaceae	*Axonopus fissifolius*	Narrow-leafed Carpet Grass	*
Poaceae	*Bromus catharticus*	Praire Grass	*
Poaceae	*Cenchrus clandestinus*	Kikuyu Grass	*
Poaceae	*Chloris gayana*	Rhodes Grass	*
Poaceae	*Cynodon dactylon*	Common Couch	
Poaceae	*Ehrharta erecta*	Panic Veldtgrass	*
Poaceae	*Eleusine tristachya*	Goose Grass	*
Poaceae	*Eragrostis curvula*	African Lovegrass	*
Poaceae	*Eragrostis leptocarpa*	Drooping Lovegrass	
Poaceae	*Microlaena stipoides*	Weeping Grass	
Poaceae	*Paspalum dilatatum*	Paspalum	*
Poaceae	*Poa annua*	Winter Grass	*
Poaceae	*Setaria parviflora*	-	*
Poaceae	*Sporobolus fertilis*	Giant Parramatta Grass	*
Poaceae	*Stenotaphrum secundatum*	Buffalo Grass	*
Poaceae	*Urochloa panicoides*	Urochloa Grass	*
Polygonaceae	*Rumex brownii*	Swamp Dock	
Portulacaceae	*Portulaca oleracea*	Pigweed	
Primulaceae	*Lysimachia arvensis*	Scarlet Pimpernel	*
Proteaceae	*Grevillea robusta*	Silky Oak	
Rubiaceae	*Richardia stellaris*	-	*
Solanaceae	*Solanum capsicoides*	Devil's Apple	*
Solanaceae	*Solanum nigrum*	Black-berry Nightshade	*

Solanaceae	*Solanum seaforthianum*	Climbing Nightshade	*
Solanaceae	*Solanum sisymbriifolium*	-	*
Typhaceae	*Typha orientalis*	Broad-leaved Cumbungi	
Verbenaceae	*Lantana camara*	Lantana	*
Verbenaceae	*Verbena bonariensis*	Purpletop	*

Table 23 BAM plot data

Family	Scientific Name	Common Name	Exotic (*)	Cover (%)	Abundance
Plot 1					
Apocynaceae	*Araujia sericifera*	Moth Vine	*	0.4	10
Arecaceae	*Syagrus romanzoffiana*	Cocos Palm	*	0.1	1
Asteraceae	*Bidens pilosa*	Cobbler's Pegs	*	3.0	300
Asteraceae	*Bidens subalternans*	Greater Beggar's Ticks	*	0.5	50
Asteraceae	*Conyza bonariensis*	Flaxleaf Fleabane	*	0.2	20
Asteraceae	*Conyza sumatrensis*	Tall fleabane	*	0.2	20
Asteraceae	*Cotula australis*	Common Cotula		0.1	20
Asteraceae	*Soliva sessilis*	Bindyi	*	0.1	20
Brassicaceae	*Brassica fruticulosa*	Twiggy Turnip	*	0.1	1
Caryophyllaceae	*Stellaria media*	Common Chickweed	*	0.1	35
Casuarinaceae	*Casuarina glauca*	Swamp Oak		1.0	1
Fabaceae (Mimosoideae)	*Acacia floribunda*	White Sally		2.0	3
Lamiaceae	*Stachys arvensis*	Stagger Weed	*	0.2	10
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush		2.0	10
Malvaceae	*Modiola caroliniana*	Red-flowered Mallow	*	0.3	25
Meliaceae	*Melia azedarach*	White Cedar		0.2	1
Myrtaceae	*Angophora subvelutina*	Broad-leaved Apple		40.0	10
Myrtaceae	*Eucalyptus canaliculata*	Large-fruited Grey Gum		1.0	1
Myrtaceae	*Eucalyptus fibrosa*	Red Ironbark		4.0	2
Myrtaceae	*Eucalyptus punctata*	Grey Gum		2.0	1
Myrtaceae	*Leptospermum laevigatum*	Coast Teatree		0.4	1
Myrtaceae	*Melaleuca styphelioides*	Prickly-leaved Tea Tree		15.0	10
Oleaceae	*Olea europaea* subsp. *cuspidata*	African Olive	*	0.5	4
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum		5.0	5
Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues	*	0.5	50
Poaceae	*Chloris gayana*	Rhodes Grass	*	0.5	50
Poaceae	*Cynodon dactylon*	Common Couch		2.0	200
Poaceae	*Ehrharta erecta*	Panic Veldtgrass	*	2.0	200
Poaceae	*Eragrostis curvula*	African Lovegrass	*	0.5	25

Poaceae	*Setaria parviflora*		*	1.0	100
Poaceae	*Urochloa panicoides*	Urochloa Grass	*	0.1	5
Proteaceae	*Grevillea robusta*	Silky Oak		1.0	1
Solanaceae	*Solanum capsicoides*	Devil's Apple	*	0.5	3
Solanaceae	*Solanum nigrum*	Black-berry Nightshade	*	0.2	3
Plot 2					
Amaranthaceae	*Alternanthera philoxeroides*	Alligator Weed	*	0.2	20
Apocynaceae	*Araujia sericifera*	Moth Vine	*	0.5	35
Arecaceae	*Phoenix canariensis*	Canary Island Date Palm	*	5.0	2
Asteraceae	*Bidens pilosa*	Cobbler's Pegs	*	5.0	500
Asteraceae	*Cirsium vulgare*	Spear Thistle	*	0.5	10
Asteraceae	*Conyza sumatrensis*	Tall fleabane	*	0.2	10
Brassicaceae	*Brassica fruticulosa*	Twiggy Turnip	*	1.0	50
Campanulaceae	*Wahlenbergia gracilenta*	Annual Bluebell		0.1	20
Casuarinaceae	*Casuarina glauca*	Swamp Oak		35.0	11
Cyperaceae	*Cyperus eragrostis*	Umbrella Sedge	*	0.5	10
Cyperaceae	*Cyperus gracilis*	Slender Flat-sedge		1.0	100
Cyperaceae	*Cyperus papyrus*		*	2.0	20
Euphorbiaceae	*Triadica sebifera*	Chinese Tallowood	*	0.5	2
Fabaceae (Faboideae)	*Erythrina crista-galli*	Cockspur Coral Tree	*	1.0	1
Loranthaceae	*Amyema cambagei*	Needle-leaf Mistletoe		0.2	5
Malvaceae	*Modiola caroliniana*	Red-flowered Mallow	*	0.5	50
Malvaceae	*Sida rhombifolia*	Paddy's Lucerne	*	10.0	200
Myrtaceae	*Corymbia maculata*	Spotted Gum		15.0	5
Poaceae	*Bromus catharticus*	Praire Grass	*	0.2	25
Poaceae	*Ehrharta erecta*	Panic Veldtgrass	*	15.0	1,500
Typhaceae	*Typha orientalis*	Broad-leaved Cumbungi		2.0	25
Verbenaceae	*Lantana camara*	Lantana	*	1.0	10
Verbenaceae	*Verbena bonariensis*	Purpletop	*	0.1	1
Plot 3					
Amaranthaceae	*Alternanthera pungens*	Khaki Weed	*	0.2	30
Amaranthaceae	*Amaranthus viridis*	Green Amaranth	*	0.1	5
Asteraceae	*Bidens pilosa*	Cobbler's Pegs	*	0.1	10

Asteraceae	*Cirsium vulgare*	Spear Thistle	*	0.1	2
Asteraceae	*Cotula australis*	Common Cotula		1.0	100
Asteraceae	*Soliva sessilis*	Bindyi	*	0.5	50
Asteraceae	*Taraxacum officinale*	Dandelion	*	0.5	50
Caryophyllaceae	*Paronychia brasiliana*	Chilean Whitlow Wort, Brazilian Whitlow	*	1.0	100
Caryophyllaceae	*Stellaria media*	Common Chickweed	*	1.0	200
Casuarinaceae	*Allocasuarina littoralis*	Black She-Oak		30.0	11
Convolvulaceae	*Dichondra repens*	Kidney Weed		2.0	200
Euphorbiaceae	*Chamaesyce prostrata*	Red Caustic Weed	*	1.0	100
Fabaceae (Faboideae)	*Trifolium repens*	White Clover	*	0.5	50
Malvaceae	*Modiola caroliniana*	Red-flowered Mallow	*	5.0	500
Myrtaceae	*Callistemon viminalis*	Weeping Bottlebrush		4.0	3
Myrtaceae	*Corymbia maculata*	Spotted Gum		4.0	1
Myrtaceae	*Eucalyptus fibrosa*	Red Ironbark		2.0	2
Oxalidaceae	*Oxalis corniculata*	Creeping Oxalis	*	2.0	200
Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues	*	0.5	50
Poaceae	*Axonopus fissifolius*	Narrow-leafed Carpet Grass	*	0.5	50
Poaceae	*Cenchrus clandestinus*	Kikuyu Grass	*	0.5	30
Poaceae	*Cynodon dactylon*	Common Couch		3.0	300
Poaceae	*Ehrharta erecta*	Panic Veldtgrass	*	5.0	500
Poaceae	*Eleusine tristachya*	Goose Grass	*	0.2	25
Poaceae	*Paspalum dilatatum*	Paspalum	*	0.2	15
Poaceae	*Stenotaphrum secundatum*	Buffalo Grass	*	2.0	200
Poaceae	*Urochloa panicoides*	Urochloa Grass	*	0.2	20
Polygonaceae	*Rumex brownii*	Swamp Dock		0.1	5
Portulacaceae	*Portulaca oleracea*	Pigweed		0.1	10
Plot 4					
Poaceae	*Axonopus fissifolius*	Narrow-leafed Carpet Grass	*	0.5	25
Poaceae	*Cenchrus clandestinus*	Kikuyu Grass	*	95.0	9,500
Poaceae	*Cynodon dactylon*	Common Couch		0.5	50
Poaceae	*Eleusine tristachya*	Goose Grass	*	0.5	35
Plot 5					
Apocynaceae	*Araujia sericifera*	Moth Vine	*	0.1	3

Asteraceae	*Bidens pilosa*	Cobbler's Pegs	*	0.1	10
Asteraceae	*Conyza sumatrensis*	Tall fleabane	*	0.1	3
Asteraceae	*Cotula australis*	Common Cotula		0.1	500
Asteraceae	*Gamochaeta americana*	Cudweed	*	0.1	10
Asteraceae	*Gamochaeta pensylvanica*	Cudweed	*	0.1	5
Asteraceae	*Hypochaeris microcephala var. albiflora*	White Flatweed	*	0.1	10
Asteraceae	*Soliva sessilis*	Bindyi	*	0.1	500
Asteraceae	*Taraxacum officinale*	Dandelion	*	0.1	2
Brassicaceae	*Capsella bursa-pastoris*	Shepherd's Purse	*	0.1	5
Caryophyllaceae	*Paronychia brasiliana*	Chilean Whitlow Wort, Brazilian Whitlow	*	0.1	50
Caryophyllaceae	*Polycarpon tetraphyllum*	Four-leaved Allseed	*	0.2	500
Caryophyllaceae	*Stellaria media*	Common Chickweed	*	0.5	1,000
Casuarinaceae	*Casuarina cunninghamiana subsp. cunninghamiana*	River Oak		4.0	1
Chenopodiaceae	*Einadia trigonos*	Fishweed		0.1	2
Convolvulaceae	*Dichondra repens*	Kidney Weed		0.1	50
Cyperaceae	*Carex inversa*	Knob Sedge		0.1	5
Malvaceae	*Modiola caroliniana*	Red-flowered Mallow	*	0.2	20
Malvaceae	*Sida rhombifolia*	Paddy's Lucerne	*	0.1	10
Myrtaceae	*Eucalyptus canaliculata*	Large-fruited Grey Gum		20.0	24
Myrtaceae	*Eucalyptus crebra*	Narrow-leaved Ironbark		5.0	1
Myrtaceae	*Eucalyptus globoidea*	White Stringybark		1.0	1
Myrtaceae	*Eucalyptus longifolia*	Woollybutt		4.0	1
Myrtaceae	*Eucalyptus moluccana*	Grey Box		3.0	1
Myrtaceae	*Eucalyptus siderophloia*	Grey Ironbark		10.0	2
Poaceae	*Bromus catharticus*	Praire Grass	*	0.5	500
Poaceae	*Cenchrus clandestinus*	Kikuyu Grass	*	0.5	200
Poaceae	*Cynodon dactylon*	Common Couch		5.0	500
Poaceae	*Poa annua*	Winter Grass	*	0.1	20
Primulaceae	*Lysimachia arvensis*	Scarlet Pimpernel	*	0.1	500
Verbenaceae	*Verbena bonariensis*	Purpletop	*	0.1	1
Plot 6					
Asteraceae	*Arctotheca calendula*	Capeweed	*	0.1	2

Asteraceae	*Bidens pilosa*	Cobbler's Pegs	*	0.1	5
Asteraceae	*Conyza bonariensis*	Flaxleaf Fleabane	*	0.1	1
Asteraceae	*Conyza sumatrensis*	Tall fleabane	*	0.1	5
Asteraceae	*Cotula australis*	Common Cotula		1.0	2,000
Asteraceae	*Gamochaeta americana*	Cudweed	*	0.1	10
Asteraceae	*Gamochaeta pensylvanica*	Cudweed	*	0.1	50
Asteraceae	*Hypochaeris microcephala* var. *albiflora*	White Flatweed	*	0.1	10
Asteraceae	*Hypochaeris radicata*	Catsear	*	0.1	5
Asteraceae	*Sonchus asper*	Prickly Sowthistle	*	0.1	3
Asteraceae	*Taraxacum officinale*	Dandelion	*	0.1	10
Brassicaceae	*Capsella bursa-pastoris*	Shepherd's Purse	*	0.1	20
Caryophyllaceae	*Cerastium glomeratum*	Mouse-ear Chickweed	*	0.1	10
Caryophyllaceae	*Paronychia brasiliana*	Chilean Whitlow Wort, Brazilian Whitlow	*	1.0	2,000
Caryophyllaceae	*Polycarpon tetraphyllum*	Four-leaved Allseed	*	0.2	100
Caryophyllaceae	*Stellaria media*	Common Chickweed	*	0.1	10
Casuarinaceae	*Casuarina cunninghamiana* subsp. *cunninghamiana*	River Oak		15.0	5
Fabaceae (Faboideae)	*Medicago polymorpha*	Burr Medic	*	0.2	100
Malvaceae	*Malva parviflora*	Small-flowered Mallow	*	0.1	5
Malvaceae	*Modiola caroliniana*	Red-flowered Mallow	*	0.3	50
Myrtaceae	*Corymbia maculata*	Spotted Gum		15.0	3
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum		15.0	4
Oxalidaceae	*Oxalis corniculata*	Creeping Oxalis	*	0.1	5
Plantaginaceae	*Veronica arvensis*	Wall Speedwell	*	0.1	20
Poaceae	*Bromus catharticus*	Praire Grass	*	1.0	100
Poaceae	*Cenchrus clandestinus*	Kikuyu Grass	*	10.0	1,000
Poaceae	*Cynodon dactylon*	Common Couch		30.0	3,000
Poaceae	*Ehrharta erecta*	Panic Veldtgrass	*	1.0	100
Poaceae	*Poa annua*	Winter Grass	*	0.5	200
Primulaceae	*Lysimachia arvensis*	Scarlet Pimpernel	*	0.1	50
Plot 7					
Aizoaceae	*Tetragonia tetragonioides*	New Zealand Spinach		10.0	500
Apocynaceae	*Araujia sericifera*	Moth Vine	*	0.1	2

Arecaceae	*Phoenix canariensis*	Canary Island Date Palm	*	0.2	2
Asteraceae	*Bidens pilosa*	Cobbler's Pegs	*	0.1	20
Asteraceae	*Sonchus asper*	Prickly Sowthistle	*	0.1	1
Casuarinaceae	*Casuarina cunninghamiana subsp. cunninghamiana*	River Oak		3.0	1
Casuarinaceae	*Casuarina glauca*	Swamp Oak		10.0	9
Fabaceae (Mimosoideae)	*Acacia parramattensis*	Parramatta Wattle		0.3	2
Malvaceae	*Sida rhombifolia*	Paddy's Lucerne	*	0.1	10
Myrtaceae	*Corymbia citriodora*	Lemon-scented Gum	*	10.0	2
Myrtaceae	*Corymbia maculata*	Spotted Gum		5.0	4
Myrtaceae	*Eucalyptus cladocalyx*	Sugar Gum	*	20.0	3
Phormiaceae	*Dianella caerulea var. producta*			0.3	10
Poaceae	*Ehrharta erecta*	Panic Veldtgrass	*	80.0	8,000
Solanaceae	*Solanum nigrum*	Black-berry Nightshade	*	0.1	2
Plot 8					
Arecaceae	*Phoenix canariensis*	Canary Island Date Palm	*	0.2	1
Asteraceae	*Bidens pilosa*	Cobbler's Pegs	*	0.1	10
Asteraceae	*Senecio madagascariensis*	Fireweed	*	0.1	1
Asteraceae	*Sonchus oleraceus*	Common Sowthistle	*	0.1	2
Brassicaceae	*Brassica rapa subsp. campestris*	Turnip	*	1.0	20
Casuarinaceae	*Casuarina cunninghamiana subsp. cunninghamiana*	River Oak		25.0	10
Casuarinaceae	*Casuarina glauca*	Swamp Oak		25.0	14
Myrtaceae	*Corymbia citriodora*	Lemon-scented Gum	*	10.0	3
Poaceae	*Ehrharta erecta*	Panic Veldtgrass	*	15.0	2,000

APPENDIX B :
Fauna Species List

Table 24 Fauna species list recorded within the subject property

Scientific Name	Common Name	Exotic	BC Act status	EPBC Act status	Observation Type
Corvus coronoides	Australian Raven				O
Cracticus tibicen	Australian Magpie				O
Threskiornis moluccus	Australian White Ibis				O
Trichosurus vulpecula	Common Brushtail Possum				O
Acridotheres tristis	Common Myna	*			O
Ocyphaps lophotes	Crested Pigeon				O
Gallinula tenebrosa	Dusky Moorhen				O
Litoria fallax	Eastern Dwarf Tree Frog				W
Oryctolagus cuniculus	European Rabbit	*			O
Eolophus roseicapilla	Galah				O
Litoria aurea	Green and Golden Bell Frog		E	V	W
Rhipidura albiscapa	Grey Fantail				O
Grallina cyanoleuca	Magpie-Lark				O
Vanellus miles	Masked Lapwing				O
Manorina melanocephala	Noisy Miner				O
Litoria peronii	Peron's Tree Frog				W
Trichoglossus moluccanus	Rainbow Lorikeet				O
Limnodynastes peronii	Striped Marsh Frog				W
Hirundo neoxena	Welcome Swallow				O
Rhipidura leucophrys	Willie Wagtail				O
Egretta novaehollandiae	White-faced Heron				O
Calyptorhynchus funereus	Yellow-tailed Black Cockatoo				W

Key: O = observed, W = heard, V = vulnerable, E = endangered

APPENDIX C :

EPBC Act Assessment of Significance

The Green and Golden Bell Frog has been identified as a Matters of National Environmental Significance (MNES) entity under the EPBC Act. An assessment of significance has therefore been prepared according to the *Matters of National Environmental Significance Impact Guidelines 1.1* of the EBPC Act.

C.1. Green and Golden Bell Frog

EPBC Act Status: Vulnerable

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

C.1.1. Lead to a long-term decrease in the size of an important population of a species

The Green and Golden Bell Frogs (GGBF) that occur within the subject property form part of the known GGBF key population of Sydney Olympic Park and are therefore considered an important population.

The Wilson Park sub-population of the GGBF is located in the treatment wetlands on the north-western corner of the subject property, with movement to the drainage line along the eastern boundary with Silverwater Correctional Facility and to the adjacent wetlands located to the east in Blaxland Riverside Park. Based on previous records, the most suitable breeding habitat for the GGBF is located within or surrounding those treatment wetlands.

The Project does not involve a direct impact to the wetlands or surrounding vegetation, which are located in a fenced-off exclusion area outside the development site. The vegetation being removed within the development site is considered low potential foraging habitat and does not constitute movement corridors for the species. The Project does not impact the movement corridors for the species between the wetlands located in the north-western corner and the drainage line along the eastern boundary of the subject property and the movement of the species into Blaxland Riverside Park.

No wetland habitat is being removed. Consequently, the Project is deemed unlikely to lead to a long-term decrease in the size of an important population of a species.

C.1.2. Reduce the area of occupancy of an important population

The Project will not directly remove or otherwise impact the wetlands and surrounding vegetation identified as known quality breeding habitat. The small area of vegetation being removed within the development site is considered low potential foraging habitat and is therefore not considered to reduce the area of occupancy of an important GGBF population.

C.1.3. Fragment an existing population into two or more populations

The existing GGBF sub-population found within the treatment wetlands forms part of the Sydney Olympic Park population, the remainder species of which are located in Blaxland Riverside Park (north-east of the subject property) and the area of Sydney Olympic Park located to the east of Silverwater Correctional Facility. The development site excludes the area surrounding the wetlands and is located in the south-western corner of the subject property, away from the main movement corridors. The Project will therefore not fragment the existing GGBF population into two or more populations.

C.1.4. Adversely affect habitat critical to the survival of a species

GGBF inhabits marshes, dams and streams, particularly those containing bullrushes and spikerushes. They are often found in highly disturbed area, and prefer waterbodies that are unshaded, have a nearby grassy area and sheltering sites available (OEH, 2017).

Habitat critical to the survival of the key population would include the wetlands of Sydney Olympic Park, including the artificial wetlands located in the north-eastern portion of the subject site.

The Project will not directly impact those wetlands or surrounding vegetation which are located outside the development site. Consequently, the Project is unlikely to adversely affect habitat critical to the survival of the GGBF species.

C.1.5. Disrupt the breeding cycle of an important population

The known breeding habitat for the GGBF is located surrounding the artificial wetlands located in the north-eastern corner of subject property. This area is excluded from the development site which is located in the south-western portion of the subject property and therefore the Project will not have a direct impact on breeding habitat.

The vegetation being removed as part of the Project encompasses only low potential foraging habitat. GGBF found in the artificial wetlands are more likely to use the movement corridors to access the wetlands found in Blaxland Riverside Park, north-east of the subject property, to breed than areas within the development site which do not provide suitable breeding habitat. The Project will not impact those movement corridors and is consequently unlikely to disrupt the breeding cycle of an important population.

C.1.6. Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Project will only remove minimal potential foraging habitat and will not directly impact the quality breeding habitat surrounding the wetlands located within the subject property. Furthermore, by locating the development site in the south-western portion of the subject property, the Project further avoids an impact to movement corridors between the artificial wetlands within the subject property and other habitat located in the adjacent area. Sediment fencing and temporary frog-proof fencing are proposed to be installed to minimise indirect impacts during construction. The Project will therefore no modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

C.1.7. Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Although located in a public park, the Project is located in an industrial area which has been heavily modified over the years. The area already contains exotic species. The Project is unlikely to result in additional invasive species that are harmful to the GGBF becoming established in its habitat.

C.1.8. Introduce disease that may cause the species to decline

Although the Project has the potential to spread Chytrid fungus (*Batrachochytrium dendrobatidis*) throughout the subject property through contaminated vehicles and equipment, Chytrid fungus has been recorded in the Sydney Olympic Park population in the past (Department of the Environment and Climate Change, 2008) and it is therefore unlikely that the project would result in the novel introduction of the disease. The persistence of the key GGBF population in the Sydney Olympic Park area is most likely attributable to biotic factors such as temperature and UV levels (Department of the Environment and Climate Change, 2008) will not be impacted by the Project. Nevertheless, by following prescribed hygiene and handling protocols, as well as complete washdown and decontamination of equipment prior to the commencement of works, it is unlikely that the Project will introduce disease that may cause the species to decline.

C.1.9. Interfere substantially with the recovery of the species

The main objectives of the *Saving Our Species* recovery strategy for the GGBF population of Sydney Olympic Park are to secure the species at the site and ensure the population's long-term viability (OEH, 2019). Specifically, the tree main recovery objectives are to:

- Restore or supplement habitat or habitat features;
- Minimise threat; and
- Track species abundance/condition over time.

The project will result in the clearing, and therefore loss, of a small area of low potential foraging habitat. It will not directly impact the artificial wetlands or movement corridors to adjacent breeding habitat which currently form part of the recovery strategy for the species. Management measures such as the installation of frog-proof fencing are proposed to implemented to reduce the indirect impacts of the Project. Consequently, the Project is unlikely to interfere substantially with the recovery of the GGBF.

C.1.10. Conclusion

The Project is unlikely to have a significant impact on the GGBF as:

- The development site has been located in the area of lowest value to the GGBF, avoiding direct impacts to the artificial wetlands located in the north-east corner of the subject property which are known to be quality breeding area;
- There would be no direct impact on good quality breeding habitat for the Sydney Olympic Park key population;
- Direct impacts are limited to low potential foraging habitat;
- Mitigation measures are proposed to be implemented to prevent GGBF from entering the development site during construction; and

- The movement corridors between the artificial wetlands within the subject property and adjacent quality habitat will not be impacted. The current GGBF population will therefore not become fragmented, or the dispersal of the species adversely disrupted.

APPENDIX D :
Credit Report

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00017409/BAAS17027/19/00017410	19017 - Cricket Australia	05/05/2020
Assessor Name	Report Created	BAM Data version *
	02/06/2020	26
Assessor Number	BAM Case Status	Date Finalised
	Finalised	02/06/2020
Assessment Revision	Assessment Type	
3	Major Projects	

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

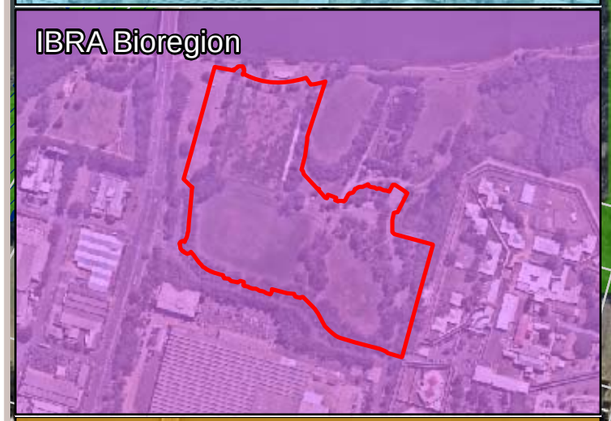
Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion								
1	1395_Cleared	25.7	1.6	0.25	High Sensitivity to Potential Gain	2.00		21
							Subtotal	**21**

Smooth-barked Apple - Sydney Peppermint - Turpentine heathy open forest on plateaux areas of the Sydney Basin Bioregion							
2	1183_Cleared	15.5	0.0	0.25	High Sensitivity to Potential Gain	1.50	0
						Subtotal	**0**
						Total	**21**

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAII	Species credits
Litoria aurea / Green and Golden Bell Frog (Fauna)						
1395_Cleared	25.7	1.24	0.25	2	False	16
1183_Cleared	15.5	0.02	0.25	2	False	0
					Subtotal	**16**
Myotis macropus / Southern Myotis (Fauna)						
1395_Cleared	25.7	1.5	0.25	2	False	19
1183_Cleared	15.5	0.02	0.25	2	False	0
					Subtotal	**19**

FIGURES



Legend

- Development Site
- Subject Property
- Cadastre
- Native Vegetation Cover

Wetland

- Important Wetland (40 m Buffer)
- Local Wetland (20 m Buffer)

Watercourse

- 3rd Order (30 m Buffer)
- 4th Order (40 m Buffer)

Bionet NSW Landscapes

- Port Jackson Basin

IBRA Bioregions

- Sydney Basin

IBRA Subregion

- Cumberland

Acid Sulfate Soils Risk Mapping

- High probability of occurrence

Image Source:
Image © NearMap 2019
Dated: 04/03/2019

Data Source:
State Environmental Planning Policy (Coastal Management) 2018
© Department of Finances, Sercives and Innovation 2017

DECCW (2008). Landscapes (Mitchell) of NSW - Version 3.

DSEWPaC (2012). Interim Biogeographic Regionalisation for Australia (IBRA) - Version 7.

Naylor, SD, Chapman, GA, Atkinson, G, Murphy CL, Tulau MJ, Flewin TC, Milford HB, Morand DT, (1998), Guidleines for the Use of Acide Sulfate Soil Risk Maps, 2nd ed., Department of Land and Water Conservation, Sydney.

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 20 40 60 80 m

I:\...\19017\Figures\RP2\20200531\Figure 1. Site Map

Figure 1. Site Map

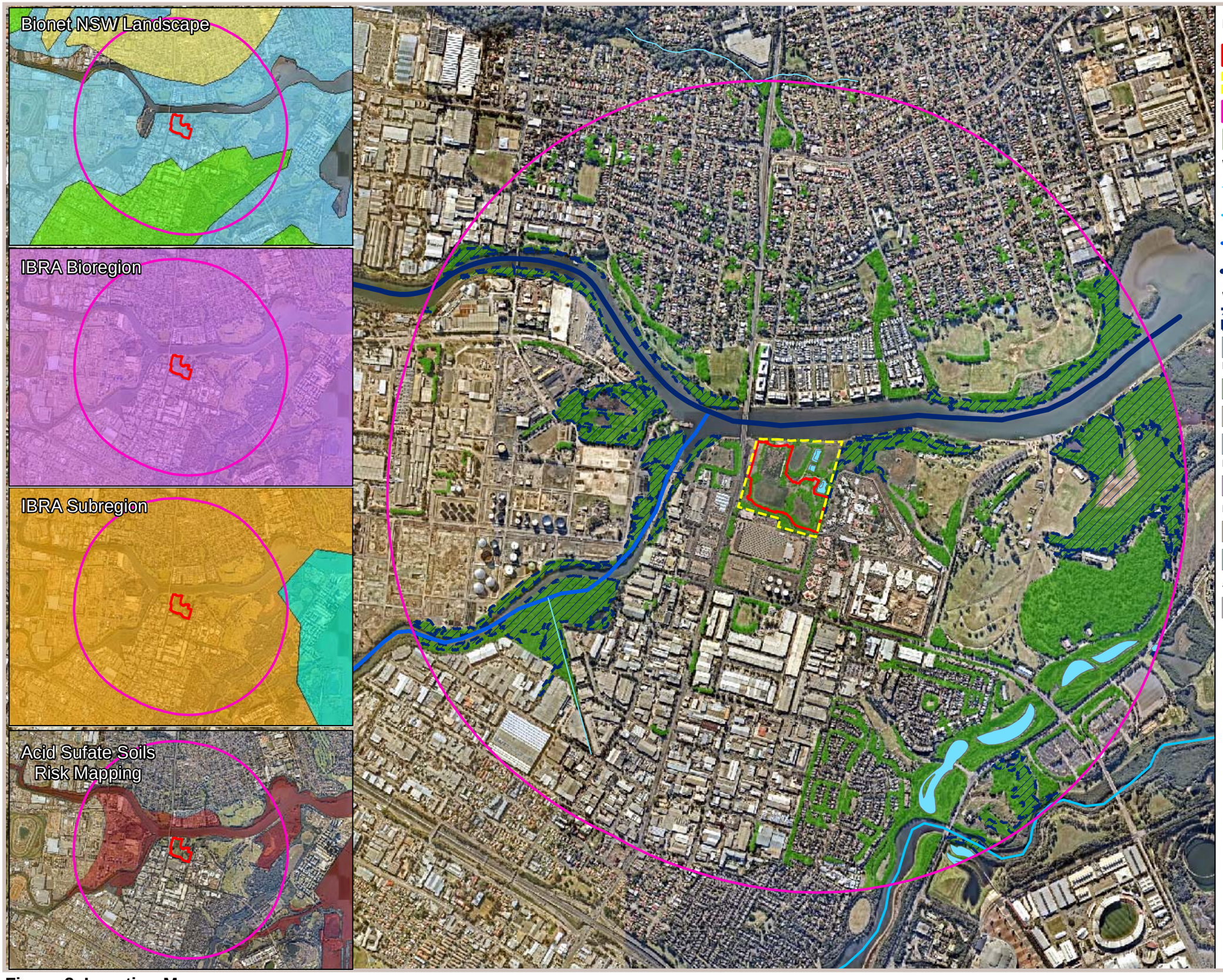
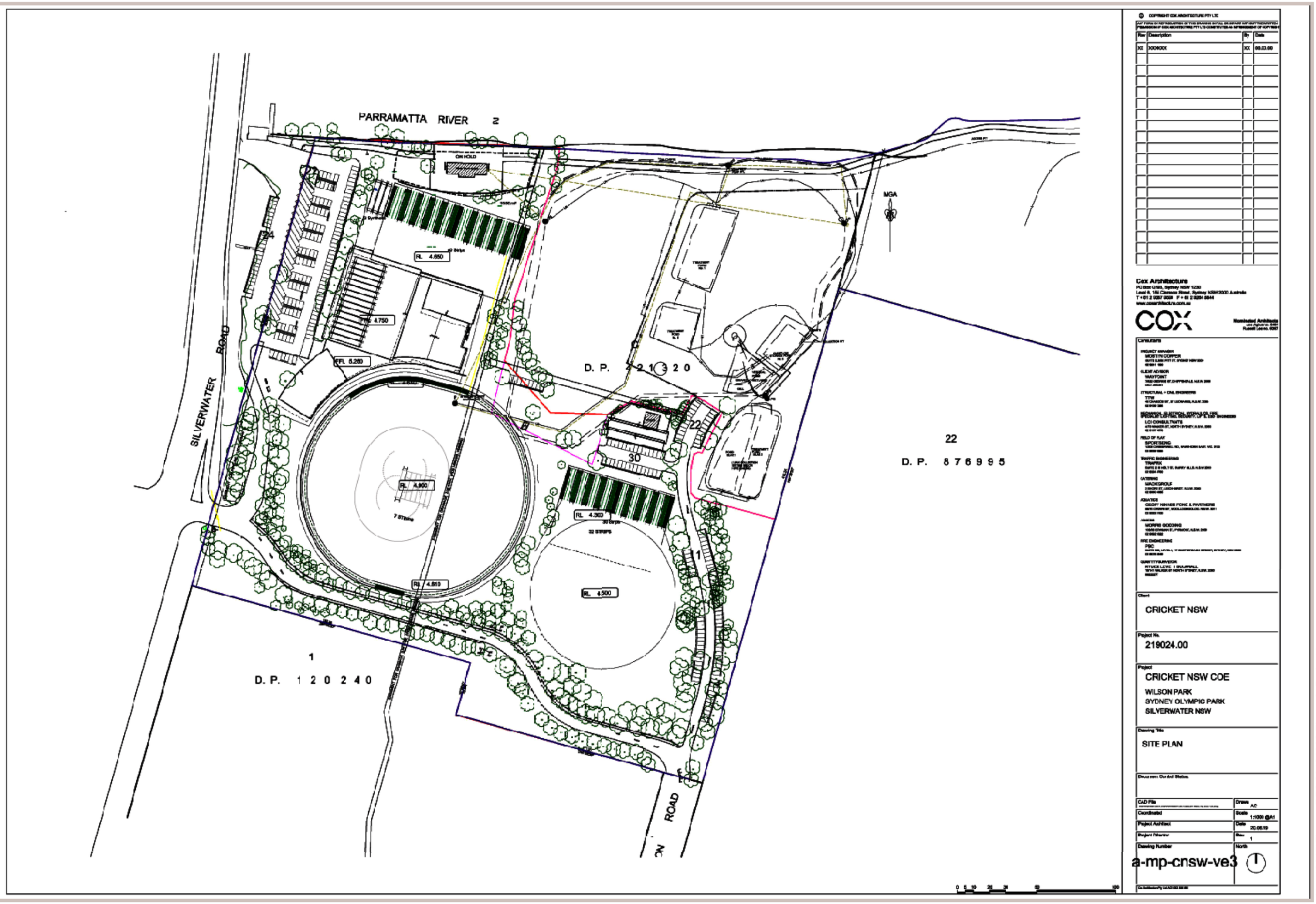


Figure 2. Location Map



I:\...\19017\Figures\RP2\20191008\Figure 3. Project Layout

Figure 3. Project Layout

Image Source: COX Architecture (2019)

Legend

- Development Site
- Subject Property
- BAM Plot Locations
- Survey Tracks
- Threatened Flora Search
- Threatened Fauna Search

Plant Community Type

- 1395 – Narrow-leaved Ironbark – Broad-leaved Ironbark – Grey Gum open forest of the edge of the Cumberland Plain, Sydney Basin Bioregion
- 1183 – Smooth-barked Apple – Sydney Peppermint – Turpentine heathy open forest on pleateaux areas of the Sydney Basin Bioregion
- 1234 – Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion
- 920 – Mangrove Forests in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion

Image Source:
Image © NearMap 2019
Dated: 04/03/2019

Coordinate System: MGA Zone 56 (GDA 94)

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I:\...\19017\Figures\RP2\20200531\Figure 4. Survey Locations

Figure 4. Survey Locations

Figure 5. Native Vegetation Extent

Legend

Development Site

Subject Property

Plant Community Type

1395 – Narrow-leaved Ironbark – Broad-leaved Ironbark – Grey Gum open forest of the edge of the Cumberland Plain, Sydney Basin Bioregion

1183 – Smooth-barked Apple – Sydney Peppermint – Turpentine heathy open forest on pleateaux areas of the Sydney Basin Bioregion

1234 – Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion

920 – Mangrove Forests in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion

Image Source:
Image © NearMap 2019
Dated: 04/03/2019

Coordinate System: MGA Zone 56 (GDA 94)

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I:\...\19017\Figures\RP2\20200531\Figure 6. Plant Community Types

Figure 6. Plant Community Types

Figure 7. Vegetation Zones

Legend

Development Site

Subject Property

Threatened Species Habitat

Green and Golden Bell Frog (Litoria aurea)

Image Source:
Image © NearMap 2019
Dated: 04/03/2019

Coordinate System: MGA Zone 56 (GDA 94)

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I:\...\19017\Figures\RP2\20200531\Figure 8. Threatened species_Subject property

Figure 8. Threatened species within the subject property

Figure 9. Species polygons

Legend

- Development Site
- Subject Property
- Habitat Feature

Image Source:
Image © NearMap 2019
Dated: 04/03/2019

Coordinate System: MGA Zone 56 (GDA 94)

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I:\...\19017\Figures\RP2\20200531\Figure 10. Habitat features_Subject property

Figure 10. Habitat features on the subject property

Legend

- Development Site
- Subject Property

Impacts that require an offset

- 1395_cleared

Image Source:
Image © NearMap 2019
Dated: 04/03/2019

Coordinate System: MGA Zone 56 (GDA 94)

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0 20 40 60 80 m

I:\...\19017\Figures\RP2\20200531\Figure 11. Impacts_Offset

Figure 11. Impacts that require an offset

Figure 12. Impacts that do not require an offset

Legend

- Development Site
- Subject Property

Impacts not requiring further assessment

- Cleared land
- Exotic Grassland

Image Source:
Image © NearMap 2019
Dated: 04/03/2019

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 20 40 60 80 m

I:\...\19017\Figures\RP2\20200531\Figure 13. Impacts_NoAssessment

Figure 13. Impacts that do not require further assessment