Biodiversity Development Assessment Report for Lot 6 DP 229296 Garfield Road East, Rouse Hill NSW

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Revision	Details	Date	Amended By
A	BDAR	29/07/2021	John Whyte
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Date: ..... 3rd of August 2021

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Stage 1 - Biodiversity Assessment

1. Introduction

Enviro Ecology has been engaged by Mr Steven Johnstone of Orion Consulting C-/O Landen Property Group to prepare to carry out a Biodiversity Development Assessment Report (BDAR) over part of Lot 6 DP 229296 Garfield Road East, Riverstone NSW within Blacktown City LGA, hereafter referred to as the study area (Figure 1-1).

The proposed development is to subdivide the subject property in residential lots (Figure 1-2).

The greater majority of the subject property was bio certified within the Riverstone Precinct area. A small portion within the north-western corner of the subject property approximately 0.05ha remains uncertified. This report has been prepared specifically over the residual uncertified land hereafter referred to as the "Project Site". This report examines the terrestrial flora assemblages and faunal species and their habitats within the area of native vegetation subject to impact from the proposed development.

The report then determines the impacts of future clearing works upon local biodiversity. It summarises proposed mitigation measures as well as the assessment under the *Environmental Planning and Assessment Act 1979* and under the (Commonwealth) *Environment Protection and Biodiversity Conservation Act 1999*.

1.1 Definitions

The following terms are defined for the purposes of the Biodiversity Assessment Method (OEH, 2020b):

Accredited person: has the same meaning as in the BC Act, referred to in the Biodiversity Assessment Method as 'assessor'.

Ancillary rules: has the same meaning as set out in clause 6.5 of the NSW Biodiversity Conservation Regulation 2017.

Annual probability of decline in vegetation and habitat condition: an estimate of the average probability of decline of each attribute through clearing, stochastic factors or ongoing degrading actions (firewood removal, weed invasion, livestock grazing).

Areas of geological significance: geological features such as karst, caves, crevices, cliffs.

Assessment area surrounding the subject land: the area of land in the 1500m buffer zone around a development site, or land to be biodiversity certified or a biodiversity stewardship site, that is determined in accordance with Subsection 4.3.2 of the Biodiversity Assessment Method.

Assessor: the person accredited under the NSW Biodiversity Conservation Act 2016 referred to in Subsection 2.1.2 of the Biodiversity Assessment Method and who has been engaged by the proponent.

Averted loss: the gain in vegetation and habitat condition that arises from managing the proposed land as an offset compared to the probable future vegetation condition if the land was to be left unmanaged (see Annual probability of decline).

Avoid: measures taken by a proponent such as careful site selection or actions taken through the design, planning, construction and operational phases of the development to completely avoid impacts on biodiversity values, or certain areas of biodiversity. Refer to the Biodiversity Assessment Method for operational guidance.

BAM: the Biodiversity Assessment Method.

BC Act: the NSW Biodiversity Conservation Act 2016.

BC Regulation: the NSW Biodiversity Conservation Regulation 2017.

Benchmark data: for a PCT, vegetation class or vegetation formation benchmark data is contained in the BioNet Vegetation Classification. A local reference site may also be used to establish benchmark data for a PCT that may be used in a BAM assessment.

Benchmarks: the quantitative measures that represent the 'best-attainable' condition, which acknowledges that native vegetation within the contemporary landscape has been subject to both natural and human-induced disturbance. Benchmarks are defined for specified variables for each PCT. Vegetation with relatively little evidence of modification generally has minimal timber harvesting (few stumps, coppicing, cut logs), minimal firewood collection, minimal exotic weed cover, minimal grazing and trampling by introduced or overabundant native herbivores, minimal soil disturbance, minimal canopy dieback, no evidence of recent fire or flood, is not subject to high frequency burning, and has evidence of recruitment of native species.

Biodiversity Assessment Method (BAM): is established under section 6.7 of the NSW Biodiversity Conservation Act 2016 (BC Act) The BAM is established for the purpose of assessing certain impacts on threatened species and threatened ecological communities (TECs), and their habitats, and the impact on biodiversity values, where required under the BC Act, Local Land Services Act 2013 (LLS Act) or the State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017).

Biodiversity certification: has the same meaning as in the NSW Biodiversity Conservation Act 2016.

Biodiversity Certification Assessment Report (BCAR): has the same meaning as in the NSW Biodiversity Conservation Act 2016.

Biodiversity credit report: the report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.

Biodiversity Development Assessment Report (BDAR): has the same meaning as in the BC Act. Biodiversity offsets: management actions that are undertaken to achieve a gain in biodiversity values on areas of land in order to compensate for losses to biodiversity values from the impacts of development.

Biodiversity stewardship agreement: has the same meaning as in the NSW Biodiversity Conservation Act 2016.

Biodiversity stewardship site: has the same meaning as in the NSW Biodiversity Conservation Act 2016.

Biodiversity Stewardship Site Assessment Report (BSSAR): the report that must be prepared in accordance with the Biodiversity Assessment Method and submitted as part of an application for a biodiversity stewardship agreement.

Biodiversity values: has the same meaning as clause 1.5(2) of the NSW Biodiversity Conservation Act 2016.

Biodiversity values map: is established according to clause 7.3 of the NSW Biodiversity Conservation Regulation 2017. Development within an area identified on the map requires assessment using the BAM.

BioNet Atlas: the OEH database of flora and fauna records (formerly known as the NSW Wildlife Atlas). The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails listed under the TSC Act) and some fish.

Bionet Vegetation Classification: the master vegetation community-level classification for use in vegetation mapping programs and regulatory biodiversity impact assessment frameworks in NSW. The BioNet Vegetation Classification is published by OEH and available at www.environment.nsw.gov.au/research/Visclassification.htm.

Broad condition state: areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.

Certified more appropriate local data: has the same meaning as set out in Subsection 2.2.2 of the Biodiversity Assessment Method.

Change in vegetation integrity score for a biodiversity stewardship site: the difference (gain) between the estimated vegetation integrity score without management at a biodiversity stewardship site and the predicted future vegetation integrity score with management at a biodiversity stewardship site.

Class of biodiversity credit: as defined in Section 11.3 of the Biodiversity Assessment Method.

Clearing site: the site proposed to be cleared of native vegetation where approval is sought under Part 5A of the Local Land Services Act 2013 or the State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017.

Clonal species: flora species that propagate asexually at a site or have a limited degree of sexual reproduction, either within or between sites. Modes of asexual reproduction will include vegetative reproduction such as by rhizomes, root suckers or bulb replication.

Connectivity: the measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.

Credit Calculator: the computer program that provides decision support to assessors and proponents by applying the BAM, in particular by using the data required to be entered and the equations in Appendix 6 and Appendix 9 of the Biodiversity Assessment Method to calculate the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.

Critically endangered ecological community (CEEC): an ecological community specified as critically endangered in Schedule 2 of the BC Act and/or listed under Part 13, Division 1, Subdivision A of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

Crown cover: the vertical projection of the periphery of tree crowns within a designated area.

Derived vegetation: PCTs that have changed to an alternative stable state as a consequence of land management practices since European settlement. Derived communities can have one or more structural components of the vegetation entirely removed or severely reduced (e.g. over-storey of grassy woodland), or have developed new structural components where they were previously absent (e.g. shrubby mid-storey in an open woodland system).

Development site: an area of land that is subject to a proposed development application, application for approval, or activity within the meaning of Part 5 of the EP&A Act. The term development is also taken to include clearing, except where the reference is to a small area development or a major project development.

Development footprint: the area of land that is directly impacted on by a proposed development, including access roads, and areas used to store construction materials. The term development footprint is also taken to include clearing footprint except where the reference is to a small area development or a major project development.

Development site: an area of land that is subject to a proposed development that is under the EP&A Act. The term development site is also taken to include clearing site except where the reference is to a small area development or a major project development.

Ecosystem credits: a measurement of the value of threatened ecological communities, threatened species habitat for species that can be reliably predicted to occur with a PCT, and PCTs generally. Ecosystem credits measure the loss in biodiversity values at a development site and the gain in biodiversity values at a biodiversity stewardship site.

Endangered ecological community (EEC): an ecological community specified as endangered in Schedule 2 of the BC Act, or listed under the EPBC Act.

Environment Agency Head: has the same meaning as in the BC Act.

EP&A Act: the NSW Environmental Planning and Assessment Act 1979.

EPBC Act: the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

Ephemeral flora species: flora species where the abundance of the species above ground fluctuates in response to the plant life history in combination with environmental conditions and/or disturbance regimes. Fluctuations in abundance may be short-term (seasonal) or long-term (yearly to decadal). Many ephemeral species persist underground through unfavourable conditions via soil seed banks or dormant vegetative organs (bulbs, tubers, rootstocks).

Estuarine area: a semi-enclosed body of water having an open or intermittently open connection with the ocean, in which water levels do not vary with the ocean tide (when closed to the sea) or vary in a predictable, periodic way in response to the ocean tide at the entrance (when open to the sea).

Expert: a person who has the relevant experience and/or qualifications to provide expert opinion in relation to the biodiversity values to which an expert report relates.

Foliage cover: the percentage of a plot area that would be covered by a vertical projection of the foliage and branches and trunk of a plant, or plants or a growth form group. Foliage cover can also be referred to as percent foliage cover.

Gain: the gain in biodiversity values at a biodiversity stewardship site, over time from undertaking management actions at a biodiversity stewardship site. Gain in biodiversity values is the basis for creating biodiversity credits at the biodiversity stewardship site.

Grassland: native vegetation classified in the vegetation formation ‘Grasslands’ in Keith (2004)2. Grasslands are generally dominated by large perennial tussock grasses, lack of woody plants, the presence of broad-leaved herbs in inter-tussock spaces, and their ecological association with fertile, heavy clay soils on flat topography in regions with low to moderate rainfall.

Growth form: the form that is characteristic of a particular flora species at maturity. Growth forms are set out in Appendix 4.

Habitat: an area or areas occupied, or periodically or occasionally occupied, by a species or ecological community, including any biotic or abiotic component.

Habitat component: the component of habitat that is used by a threatened species for either breeding, foraging or shelter.

Habitat surrogates: measures of habitat that predict the occurrence of threatened species and communities: IBRA subregion, PCT, percent vegetation cover and vegetation condition.

Herbfield: native vegetation which predominantly does not contain an over-storey or midstorey and where the ground cover is dominated by non-grass species.

High threat exotic plant cover: plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species. Also referred to as high threat weeds.

Hollow bearing tree: a living or dead tree that has at least one hollow. A tree is considered to contain a hollow if:

(a) the entrance can be seen;

(b) the entrance width is at least 5cm;

(c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance);

(d) the hollow is at least 1m above the ground. Trees must be examined from all angles.

IBRA region: a bioregion identified under the Interim Biogeographic Regionalisation for Australia (IBRA) system3, which divides Australia into bioregions on the basis of their dominant landscape-scale attributes.

IBRA subregion: a subregion of a bioregion identified under the IBRA system.

Impact assessment: an assessment of the impact or likely impact of a development on biodiversity values which is prepared in accordance with the BAM.

Impacts on biodiversity values: loss in biodiversity values from direct or indirect impacts of development in accordance with Chapters 8, 1 and 10.

Important wetland means: a wetland that is listed in the Directory of Important Wetlands of Australia (DIWA) from time to time, and the actual location on the ground that corresponds to a SEPP 14 Coastal wetland.

Individual: in relation to organisms, a single, mature organism that is a threatened species, or any additional threatened species listed under Part 13 of the EPBC Act.

Intact vegetation: vegetation where all tree, shrub, grass and/or forb structural growth form groups expected for a plant community type are present.

Intrinsic rate of increase (ir): an estimate of the rate of gain for an attribute at a biodiversity stewardship site from actions undertaken as part of the management plan. The intrinsic rate of increase is specified for an attribute according to the formation of the PCT being assessed (see Appendix 8).

Landscape attributes: in relation to a development site or a biodiversity stewardship site, native vegetation cover, vegetation connectivity, patch size and the strategic location of a biodiversity stewardship site.

Large tree benchmark: is the largest stem size class for a PCT as determined by the benchmark for the PCT.

Life cycle: the series of stages of reproduction, growth, development, aging and death of an organism.

Life form: the form that is characteristic of a particular species at maturity. In the BAM, life form has the same meaning as growth form for flora species.

Linear shaped development: development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length.

Litter cover: the percentage ground cover of all plant material that has detached from a living plant, including leaves, seeds, twigs, branchlets and branches (<10cm in diameter).

Local population: the population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately.

Local wetland: any wetland that is not identified as an important wetland (refer to definition of Important wetland).

Loss of biodiversity: the loss of biodiversity values from a development site, native vegetation clearing site or land where biodiversity certification is conferred.

Major project: State Significant Development and State Significant Infrastructure.

Minimise: a process applied throughout the development planning and design life cycle which seeks to reduce the residual impacts of development on biodiversity values.

Mitchell landscape: landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.

Multiple fragmentation impact development: developments such as wind farms and coal seam gas extraction that require multiple extraction points (wells) or turbines and a network of associated development including roads, tracks, gathering systems/flow lines, transmission lines.

Native ground cover: all native vegetation below 1m in height, including all such species native to NSW (i.e. not confined to species indigenous to the area).

Native ground cover (grasses): native ground cover composed specifically of native grasses.

Native ground cover (other): native ground cover composed specifically of non-woody native vegetation (vascular plants only) <1m in height that is not grass (e.g. herbs, ferns).

Native ground cover (shrubs): native ground cover composed specifically of native woody vegetation <1m in height.

Native mid-storey cover: all vegetation between the over-storey stratum and a height of 1m (typically tall shrubs, under-storey trees and tree regeneration) and including all species native to NSW (i.e. native species not local to the area can contribute to mid-storey structure).

Native over-storey cover: the tallest woody stratum present (including emergent) above 1m and including all species native to NSW (i.e. native species not local to the area can contribute to over-storey structure). In a woodland community, the over-storey stratum is the tree layer, and in a shrubland community the over-storey stratum is the tallest shrub layer. Some vegetation types (e.g. grasslands) may not have an over-storey stratum.

Native plant species richness: the number of different native vascular plant species that are characteristic of a PCT.

Native vegetation: has the same meaning as in section 1.6 of the BC Act.

Native vegetation cover: the percentage of native vegetation cover on the subject land and the surrounding buffer area. Cover estimates are based on the cover of native woody and non-woody vegetation relative to the approximate benchmarks for the PCT, taking into account vegetation condition and extent. Native over-storey vegetation is used to determine the percent cover in woody vegetation types, and native ground cover is used to assess cover in non-woody vegetation types.

Number of trees with hollows: a count of the number of living and dead trees that are hollow bearing.

Offset rules: are those established by the BC Regulation.

Onsite measures: measures and strategies that are taken, or are proposed to be taken at a development site to avoid and minimise the direct and indirect impacts of the development on biodiversity values.

Operational Manual: the Operational Manual published from time to time by OEH, which is a guide to assist assessors when using the BAM.

Patch size: an area of intact native vegetation that:

a) occurs on the development site or biodiversity stewardship site, and

b) includes native vegetation that has a gap of less than 100m from the next area of moderate to good condition native vegetation (or ≤30m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or biodiversity stewardship site.

PCT classification system: the system of classifying native vegetation approved by the NSW Plant Community Type Control Panel and described in the BioNet Vegetation Classification.

Percent cleared value: the percentage of a PCT that has been cleared as a proportion of its pre-1750 extent, as identified in the BioNet Vegetation Classification.

Plant community type (PCT): a NSW plant community type identified using the PCT classification system.

Plot: an area within a vegetation zone in which site attributes are assessed.

Population: a group of organisms, all of the same species, occupying a particular area.

Probability of reaching benchmark: the probability of a specific attribute or growth form group reaching benchmark conditions in the vegetation zone at the end of the management timeframe.

Proponent: a person who intends to apply for consent or approval to carry out development, clearing, biodiversity certification or for approval for infrastructure.

Reference sites: the relatively unmodified sites that are assessed to obtain local benchmark information when benchmarks in the Vegetation Benchmarks Database are too broad or otherwise incorrect for the PCT and/or local situation. Benchmarks can also be obtained from published sources.

Regeneration: the proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height <5cm within a vegetation zone.

Residual impact: an impact on biodiversity values after all reasonable measures have been taken to avoid and minimise the impacts of development. Under the BAM, an offset requirement is calculated for the remaining impacts on biodiversity values.

Retirement of credits: the retirement of biodiversity credits from a biobank site or a biodiversity stewardship site secured by a biodiversity stewardship agreement.

Risk of extinction: the likelihood that the local population or CEEC or EEC will become extinct either in the short term or in the long term as a result of direct or indirect impacts on the viability of that population or CEEC or EEC.

SAII Entity: candidate species and communities that are sensitive to serious and irreversible impacts.

SEPP 14 Coastal wetland: a wetland to which State Environmental Planning Policy No 14 – Coastal Wetlands applies or an area that is identified as a coastal wetland within the meaning of the term coastal wetlands and littoral rainforests area for the purposes of Coastal Management Act 2016.

Site attributes: the matters assessed to determine vegetation integrity. They include: native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.

Site-based development: a development other than a linear shaped development, or a multiple fragmentation impact development.

Site context: the value given to landscape attributes of a development site or biodiversity stewardship site after an assessment undertaken in accordance with Section 4.3.

Species credit species: are threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for species credits.

Species credits: the class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.

State Significant Development: has the meaning given by Division 4.1 of Part 4 of the EP&A Act.

State Significant Infrastructure: has the meaning given by Part 5.1 of the EP&A Act.

Stream order: has the same meaning as in Appendix 3.

Subject land: is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land. It includes land that may be a development site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement.

Threat status class: the extent to which a species or ecological community is threatened with extinction, or the extent to which a PCT is estimated to have been cleared (see Percent cleared value).

Threatened Biodiversity Data Collection: part of the BioNet database, published by OEH and accessible from the BioNet website at www.bionet.nsw.gov.au.

Threatened ecological community (TEC): means a critically endangered ecological community, an endangered ecological community or a vulnerable ecological community listed in Schedule 2 of the BC Act.

Threatened species: critically endangered, endangered or vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as critically endangered, endangered or vulnerable.

Threatened species survey: a targeted survey for threatened species undertaken in accordance with Section 6.5.

Threatened species survey guidelines: survey methods or guidelines published by OEH from time to time at www.environment.nsw.gov.au/topics/animals-and-plants/threatenedspecies/about-threatened-species/surveys-and-assessments.

Total length of fallen logs: the total length of logs present in a vegetation zone that are at least 10cm in diameter and at least 0.5m long.

Transect: a line or narrow belt along which environmental data is collected.

Upland Swamp Policy: the document entitled Addendum to NSW Biodiversity Offsets Policy for Major Projects: Upland swamps impacted by longwall mining subsidence as in force on the day when the BAM is published until such time as the Environment Agency Head publishes any further document for the purpose of it being adopted by the BAM as the Upland Swamp Policy.

Vegetation Benchmarks Database: a database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is published by OEH and is part of the BioNet Vegetation Classification. It is available at www.environment.nsw.gov.au/research/Visclassification.htm.

Vegetation class: a level of classification of vegetation communities defined in Keith (2004). There are 99 vegetation classes in NSW.

Vegetation formation: a broad level of vegetation classification as defined in Keith (2004)4. There are 16 vegetation formations and sub-formations in NSW.

Vegetation integrity: the condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT.

Vegetation integrity score: the quantitative measure of vegetation condition calculated in accordance with Equation 15 or Equation 16.

Vegetation zone: a relatively homogenous area of native vegetation on a development site, land to be biodiversity certified or a biodiversity stewardship site that is the same PCT and broad condition state.

Viability: the capacity of a species to successfully complete each stage of its life cycle under normal conditions so as to retain long-term population densities.

Vulnerable ecological community (VEC): an ecological community specified as vulnerable in Schedule 2 of the BC Act and/or listed under Part 13, Division 1, Subdivision A of the EPBC Act.

Wetland: an area of land that is wet by surface water or ground water, or both, for long enough periods that the plants and animals in it are adapted to, and depend on, moist conditions for at least part of their life cycle. Wetlands may exhibit wet and dry phases and may be wet permanently, cyclically or intermittently with fresh, brackish or saline water (see also Important wetland and Local wetland).

Woody native vegetation: native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs.

1.2 The Project Site

The planning and cadastral details of the subject property are provided in (Table 1-1). The project site is bordered by Garfield Road to the north, east by Clarke Street and to the east and south by bio certified lands (Figure 1-1).

Table 1-1 Site details

Location	Lot 6 DP 229296 Garfield Road East, Rouse Hill
LGA	Blacktown City
Aspect	North-south
Vegetation	Cleared land with exotic pasture & remnant PCT 835-Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion

1.3 Development site footprint

The proposed development is for residential lots (Figure 1-2 & Figure 1-3).

Figure 1-1 Subject property, Study area & Project Site

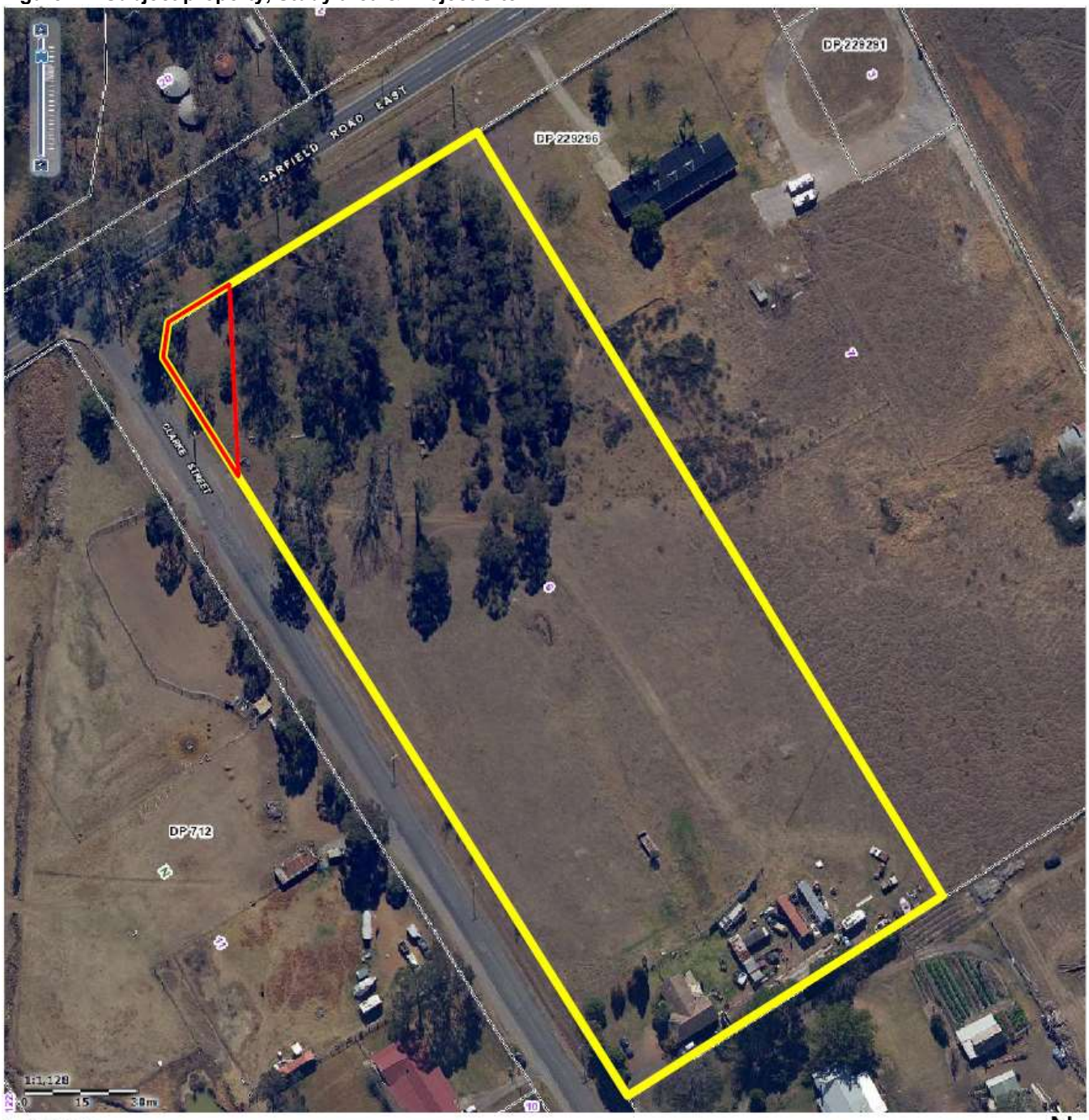


Figure 1-2 Proposed development

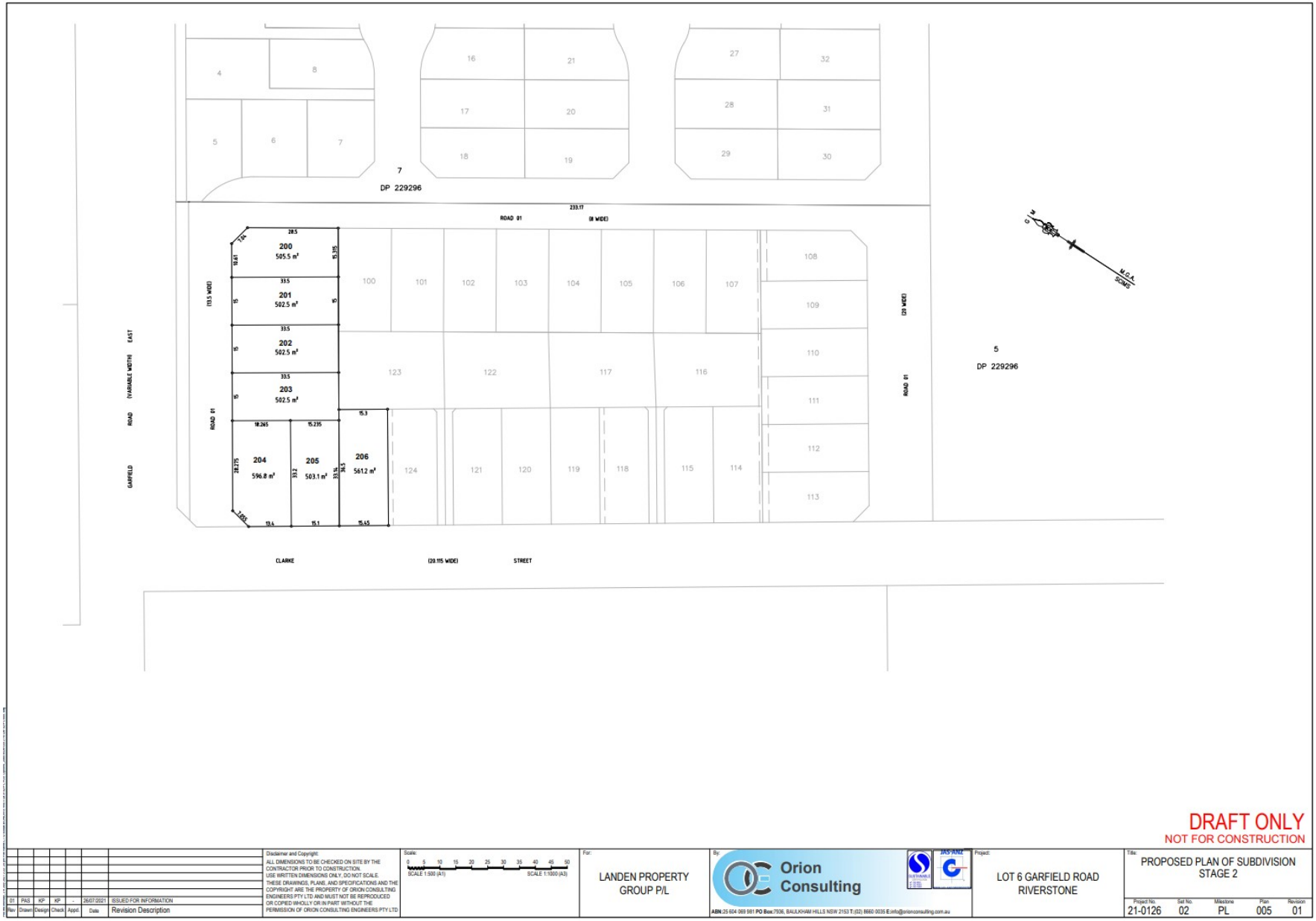


Figure 1-3 Proposed development

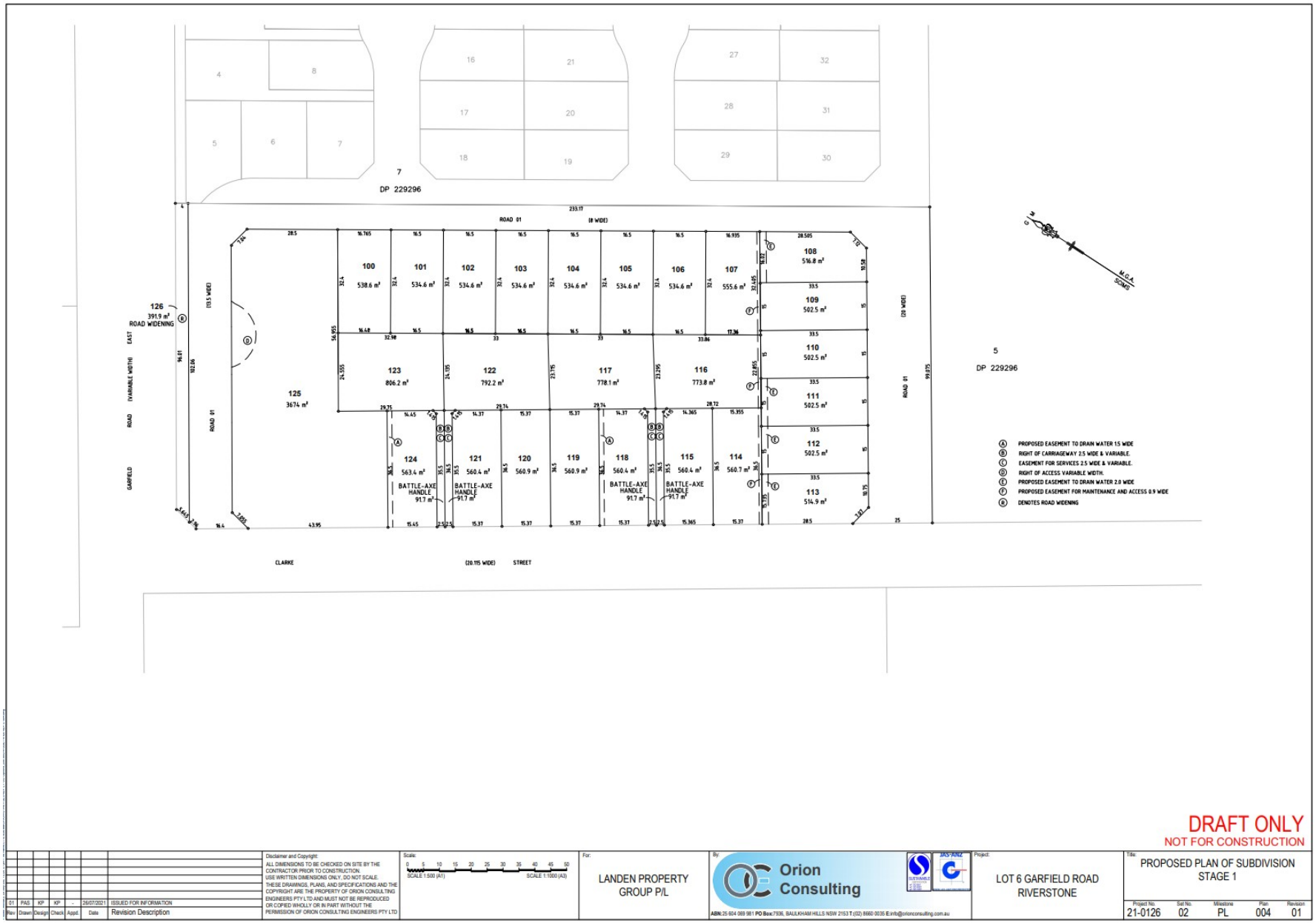


Figure 1-4 Location Map 1.5km buffer

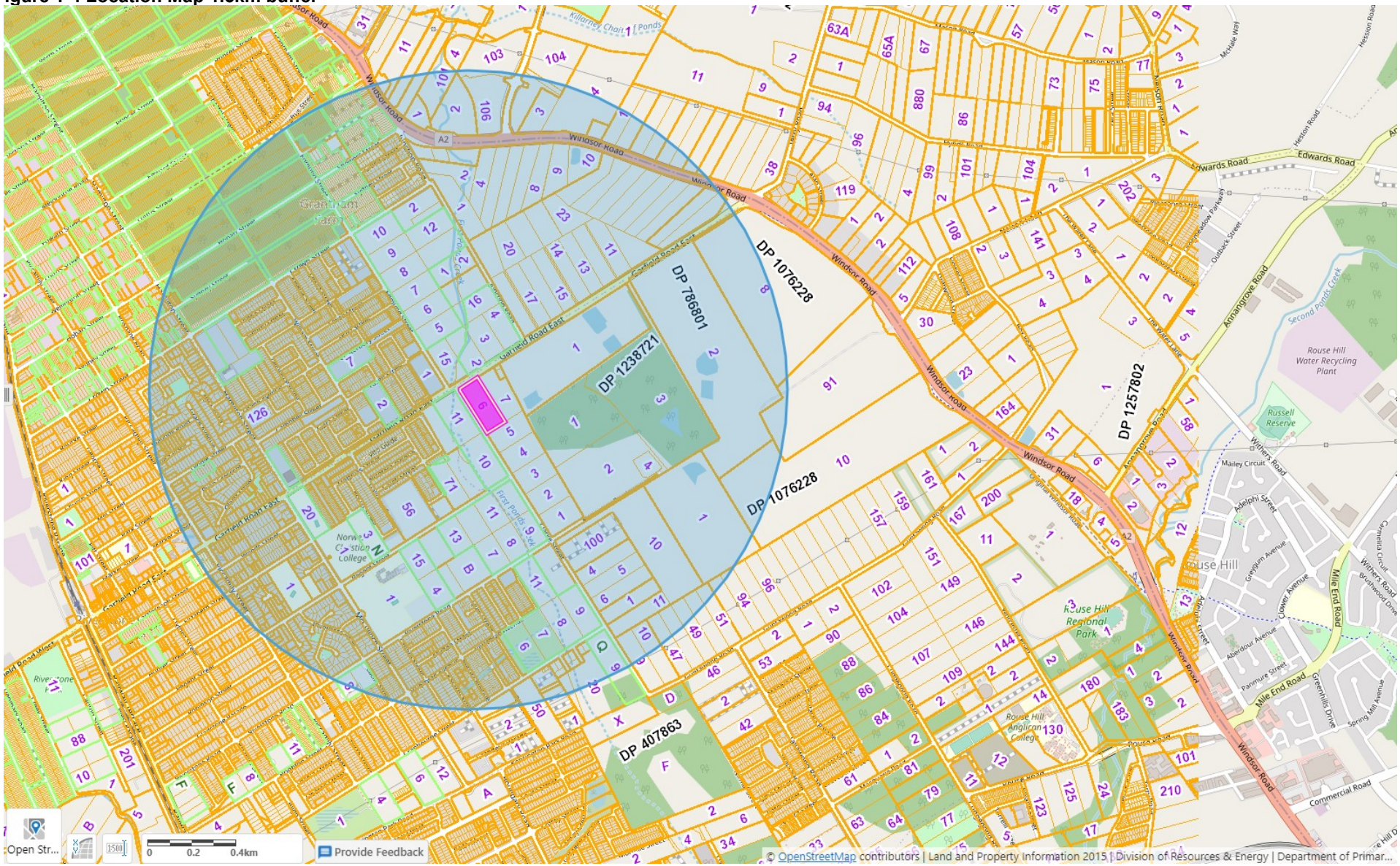


Figure 1-5 Topographic Location Map 1.5km buffer

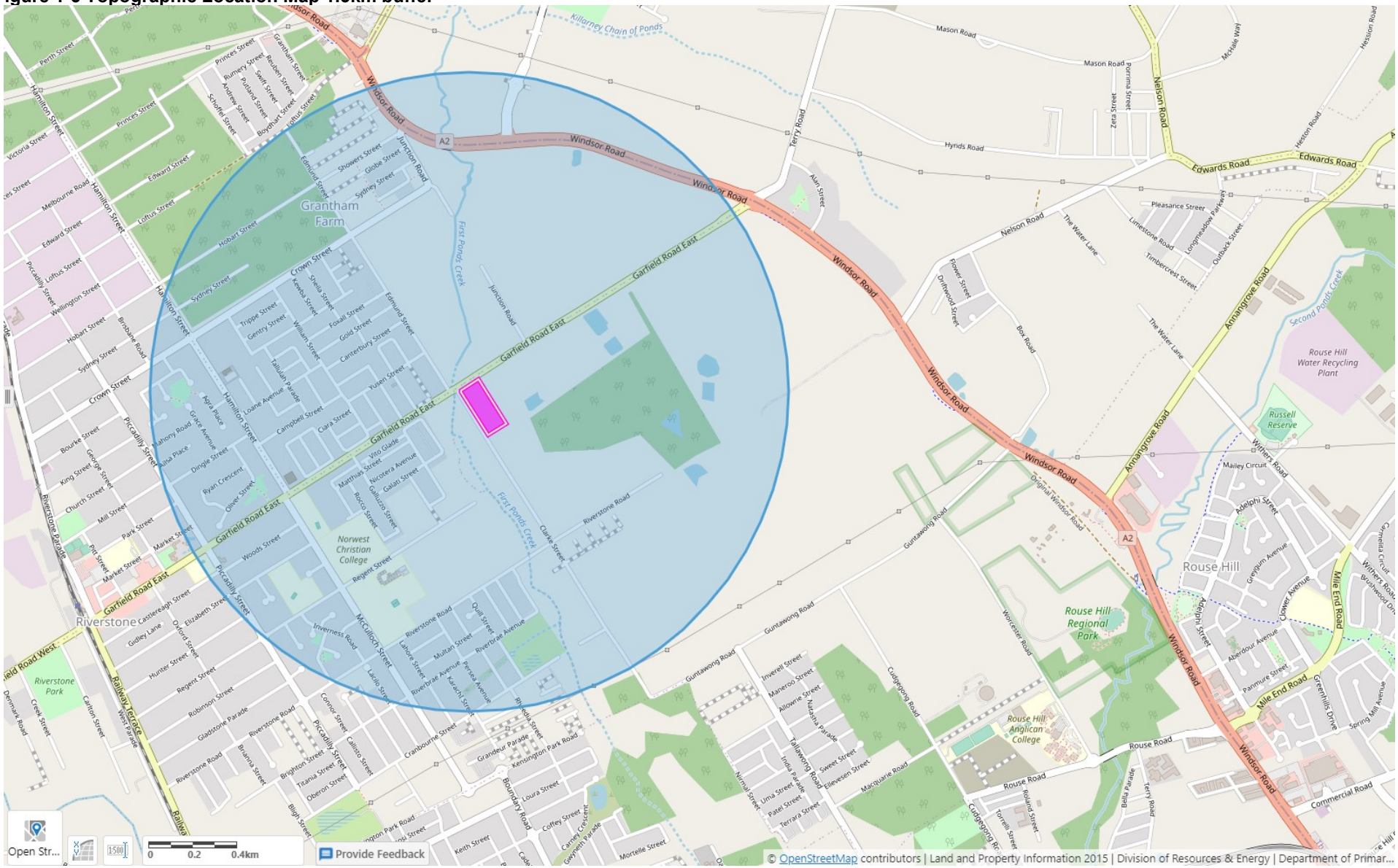


Figure 1-6 IBRA Region map

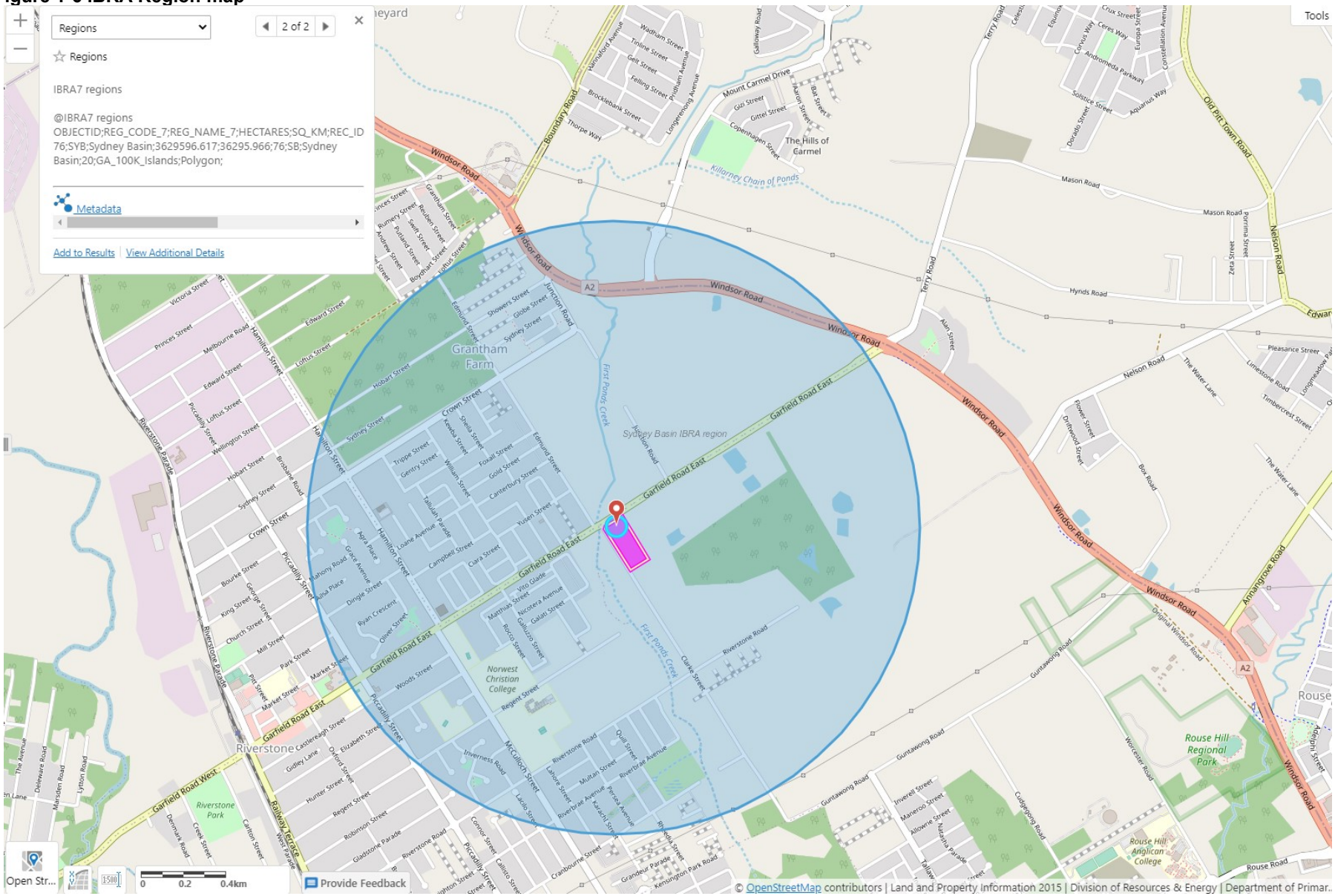


Figure 1-7 IBRA Sub Region map

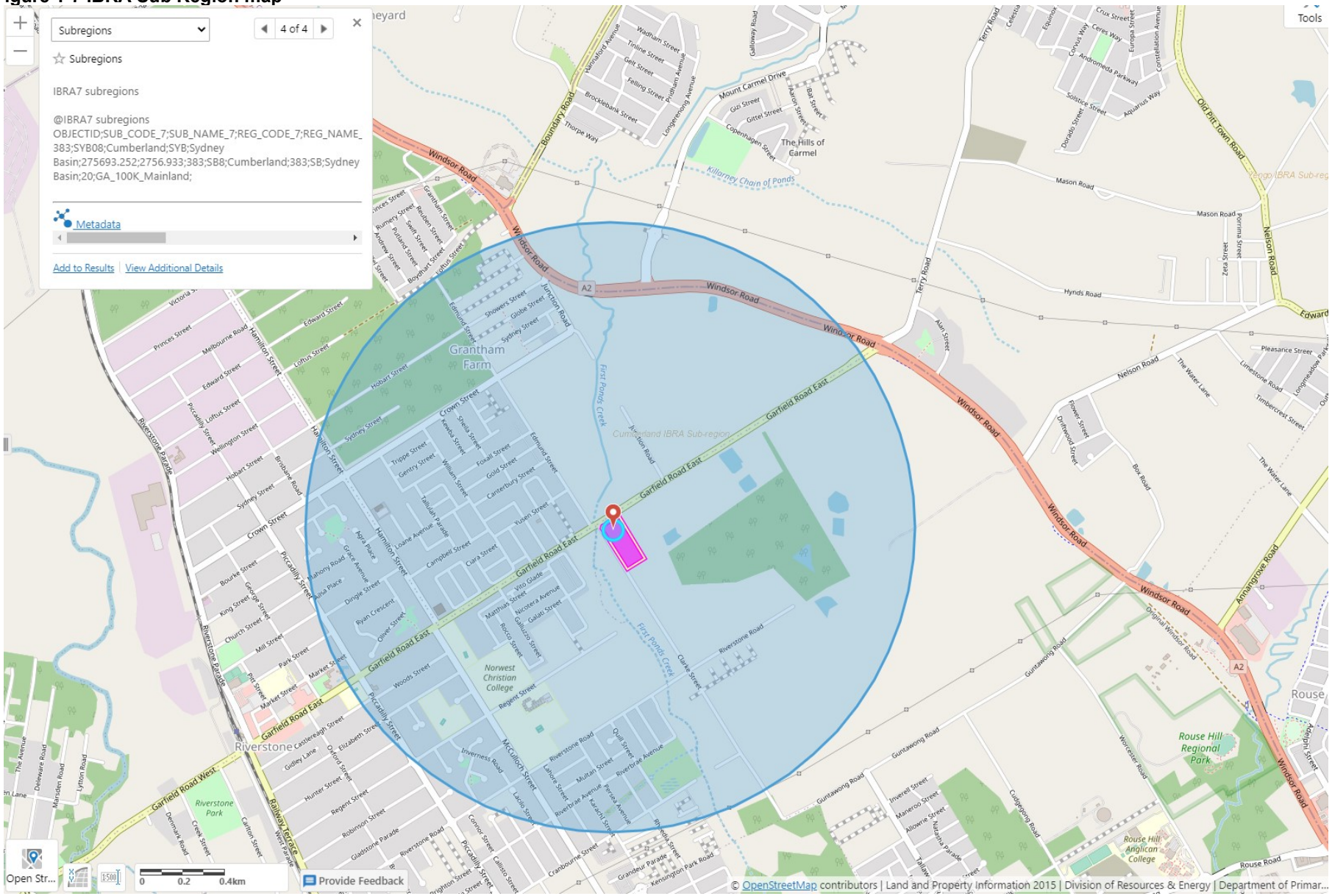


Figure 1-8 Stream order classifications within 1.5km buffer

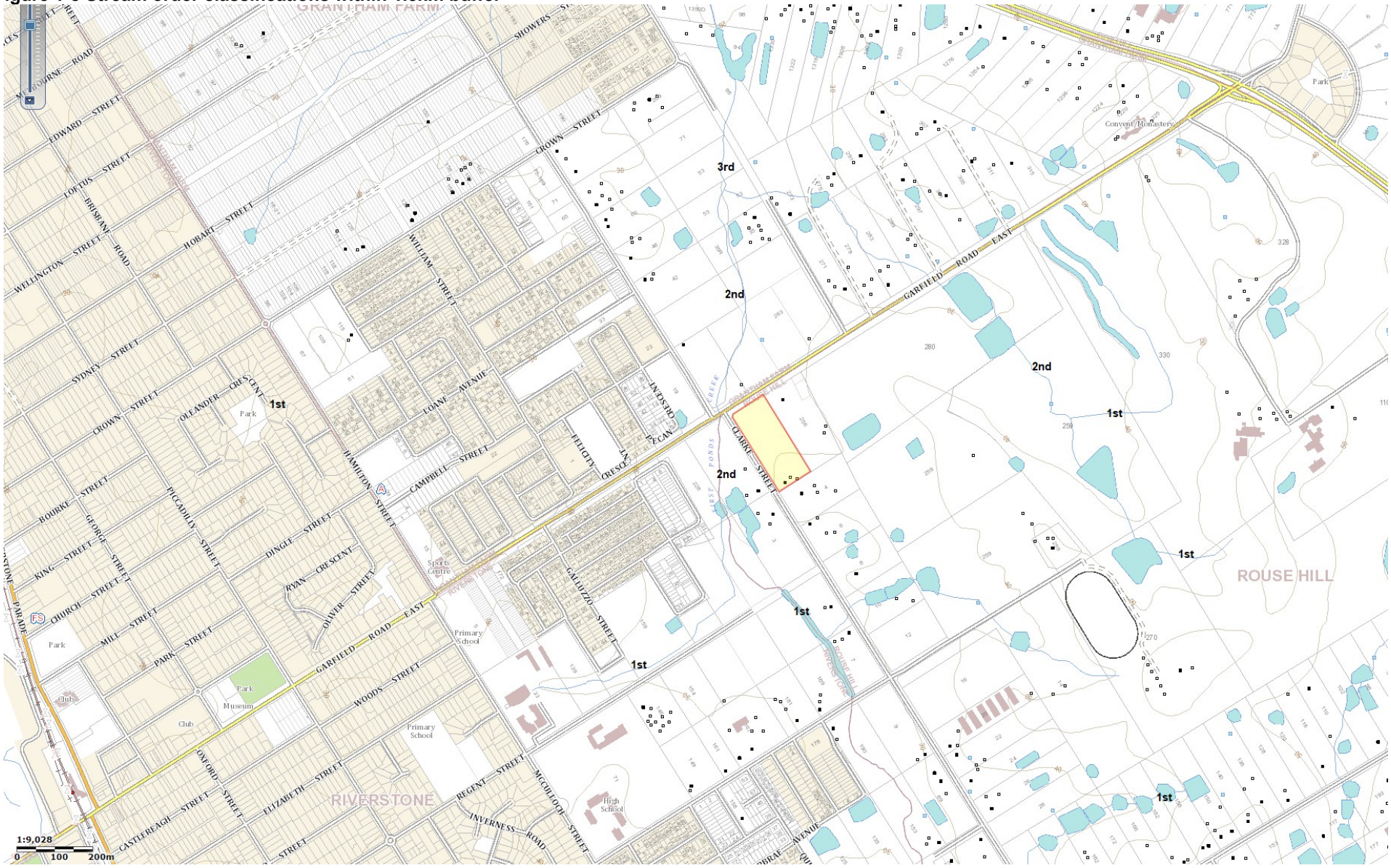


Figure 1-9 Biodiversity Values Map

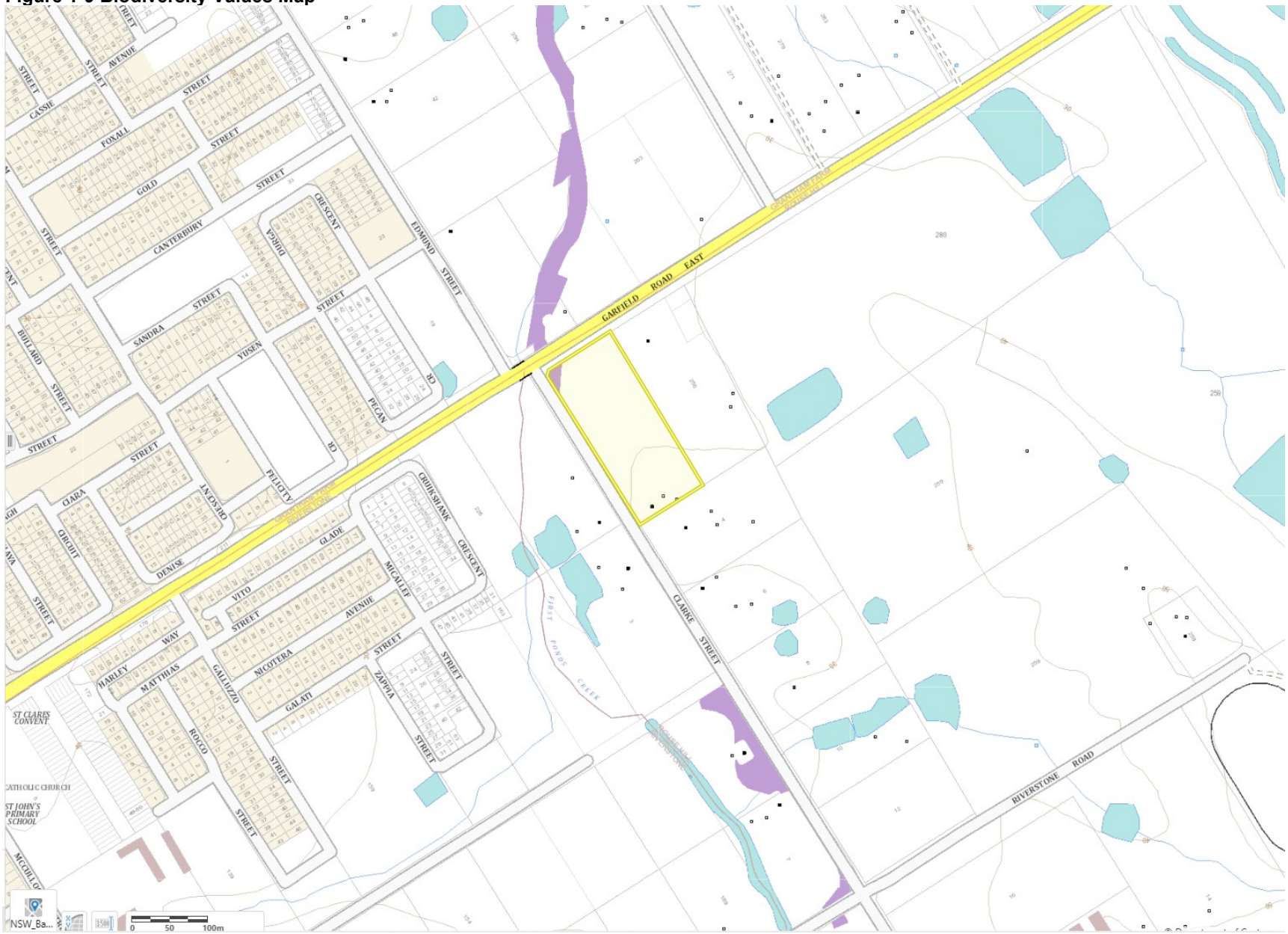
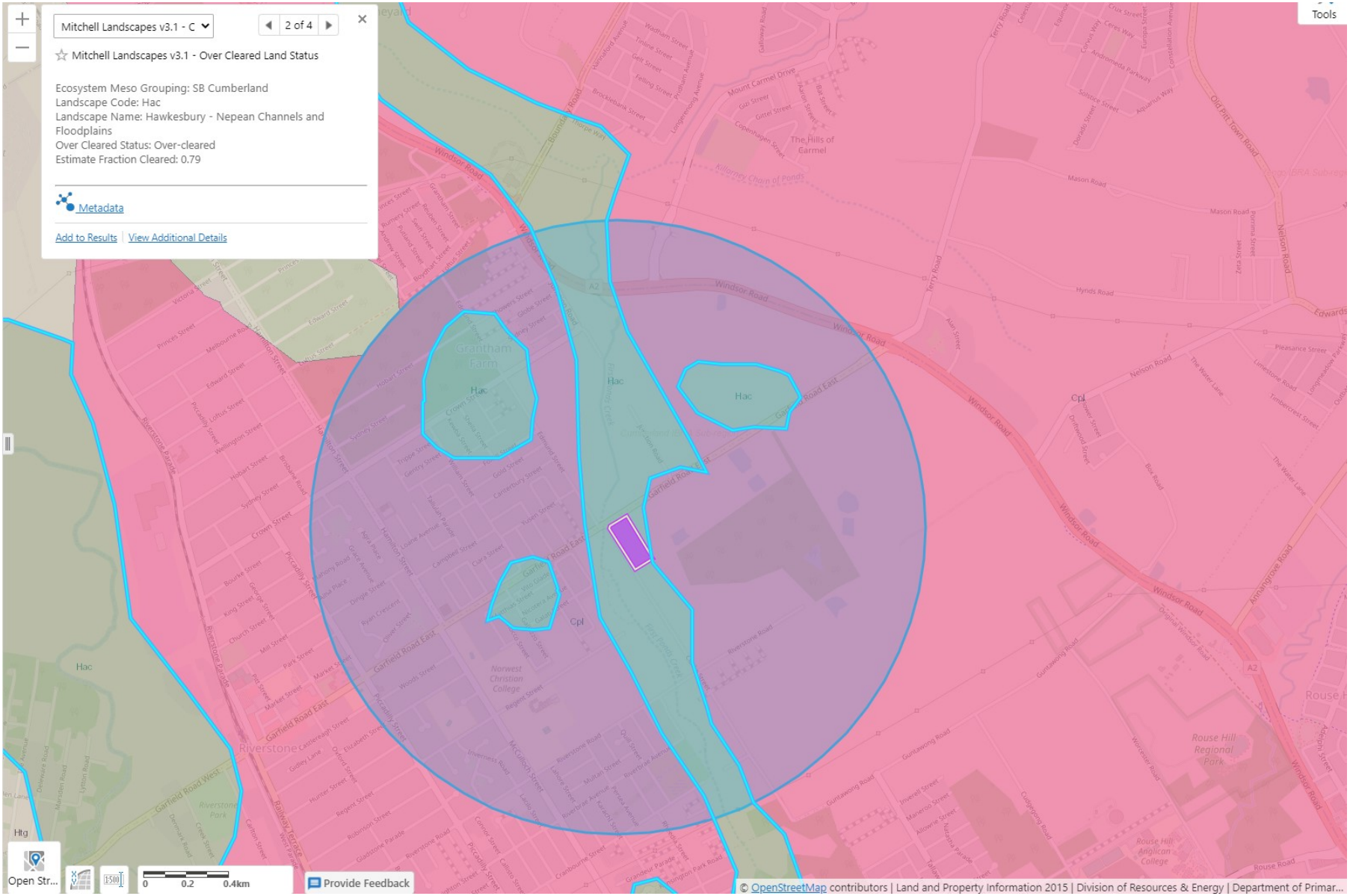


Figure 1-10 Mitchell Landscapes



1.4 Report Objectives

1.4.1 Biodiversity Assessment Method

The Biodiversity Assessment Methodology (BAM) comprises two stages that set out the biodiversity assessment requirements:

- Stage 1 – Biodiversity assessment requirements and survey methods that must be undertaken by the proponent to correctly identify, map and describe the native plant community types (PCTs), threatened species and threatened species habitat on the Project Site.
- Stage 2 – Impact assessment requirements for demonstrating how any impacts on biodiversity values have been avoided and minimised at the planning, construction and operational phases of the proposed development.
- Stage 2 - Measures the loss to biodiversity caused by the remaining direct and indirect impacts of the development. The assessment quantifies the loss and gain in biodiversity values through the determination of biodiversity credits. The loss of biodiversity values caused by the project is expressed as a biodiversity credit requirement (i.e. the number and type of biodiversity credits that would be required to offset the impact of development).

Both Stage 1 and Stage 2 are documented in this BDAR.

1.5 Key Acts and Policies

1.5.1 NSW Environmental Planning and Assessment Act 1979

The Environmental Planning and Assessment Act 1979 (NSW EP&A Act) forms the legal and policy platform for proposal assessment and approval in NSW and aims to 'encourage the proper management, development and conservation of natural and artificial resources'. All development in NSW is assessed in accordance with the provisions of the EP&A Act and EP&A Regulation 2000.

1.5.2 NSW Biodiversity Conservation Act 2016

The NSW Biodiversity Conservation Act 2016 (BC Act), the NSW Biodiversity Conservation Regulation 2017 (BC Regulation) and amendments to the Local Land Services Act 2013 (LLS Act) commenced on 25 August 2017. The legislation aims to deliver "a strategic approach to conservation in NSW whilst supporting improved farm productivity and sustainable development". The BC Act repeals several pre-existing Acts, most notably the Threatened Species Conservation Act 1995, the Nature Conservation Trust Act 2001 and the Native Vegetation Act 2003. Relevant provisions from each of the repealed Acts has been saved and incorporated into the new legislative framework. Transitional arrangements are in place to ensure a smooth transition from the repealed legislation to the BC Act.

In accordance with the BC Act, the BAM (OEH, 2020b) and entry into the Biodiversity Offsets Scheme (BOS) is applicable to certain development activities based on specific criteria. Preparation of a BDAR is required for Part 5 development activities under the NSW Environmental Planning and Assessment Act 1979 (EP&A Act).

1.5.3 NSW Biodiversity Values Map

Preparation of a BDAR is required for activities that impact areas identified as having high biodiversity value by the NSW Biodiversity Values Map (BV Map) (OEH, 2021d). EE reviewed the NSW Biodiversity Values Map (BC Map) on 29th of July 2021 found that the subject property is mapped as containing areas of high biodiversity value within the Project Site.

1.5.4 NSW Biosecurity Act 2015

The NSW Biosecurity Act 2015 provides a streamlined statutory framework to protect the NSW economy, environment and community from the negative impact of pests, diseases and weeds. The primary object of the Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers. In NSW, all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

Priority weeds recorded within the Project Site are addressed in this report.

1.5.5 NSW Water Management Act

Controlled activities carried out in, on or under waterfront land are regulated by the NSW Water Management Act 2000 (WM Act). The NSW Office of Water (known as DPI Water) administers the WM Act and is required to assess the impact of any proposed controlled activity to ensure that no more than minimal harm will be done to waterfront land as a consequence of carrying out the controlled activity. Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 metres of the highest bank of the river, lake or estuary. This means that a controlled activity approval must be obtained from the Office of Water before commencing the controlled activity.

No mapped waterways occur within the project Site. The proposed development is located within 40m of 2nd order Water course to the west which constitutes waterfront land. The proposal is likely to be deemed a controlled activity and approval from the NSW Office of Water is likely to be required.

1.5.6 Environment Protection and Biodiversity Conservation Act 1999

The purpose of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) is to ensure that actions likely to cause a significant impact on 'matters of national environmental significance' undergo an assessment and approval process. Under the EPBC Act, an action includes a proposal, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things. An action that 'has, will have or is likely to have a significant impact on a matter of national environmental significance' is deemed to be a 'controlled action' and may not be undertaken without prior approval from the Australian Minister for the Environment.

The EPBC Act identifies matters of NES as:

- World heritage properties
- National heritage places
- Wetlands of international importance (Ramsar Wetlands)
- Threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- A water resource, in relation to coal seam gas development and large coal mining development..

As part of the current investigation, matters of national environmental significance (and their habitats) that are predicted to occur within the locality (applying a 10 kilometre buffer) were obtained from the on-line Protected Matters Search Tool (DoEE, 2021a). These records are discussed in Section 3.6.11. The EPBC Act has been further addressed in this assessment through:

- Targeted field surveys for EPBC listed threatened biota and migratory species;
- Assessment of potential impacts on EPBC listed threatened species and migratory biota;
- Identification of suitable impact mitigation and environmental management measures for EPBC listed threatened species and migratory biota; and
- Identification of the need for an EPBC referral based on the EPBC Significant Impact Guidelines (DEWHA, 2013)

2. Stage 1 - Biodiversity Assessment Methodology

This chapter described the methods undertaken to identify biodiversity values within the Project Site in accordance with Stage 1 of the BAM.

2.1 Personnel

Table 2-1 Staff Roles and Qualifications

Staff Name	Project Role	Qualifications
Mr John Whyte Principal Ecologist	Project management and report review.	Bachelor of Biological Sciences, La Trobe University, Melbourne, Victoria. BioBanking accredited assessor (0113) BAM accredited assessor (BAAS17110)

2.2 Sources of information used

The following data sources were reviewed as part of this report:

- Biodiversity Assessment Methodology Calculator
- BioNet Vegetation Classification
- Bionet / Atlas of NSW Wildlife 10 km database search (OEH 2021a)
- EPBC Act Protected Matters Search Tool 10 km database search (DotEE 2021)
- A review of Revised Native Vegetation Maps of the Cumberland Plain - Western Sydney (Department of Planning, Industry & Environment 2015) & the revised *Native Vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands. Version 12*, Department of Environment and Climate Change, Hurstville (Tozer, Turner et al. 2016)
- Aerial mapping (SIXMaps) • Additional GIS datasets including soil, topography, geology and drainage
- Department of the Environment and Energy (DoEE, 2021b). *Species Profile and Threats Database* (SPRAT);
- The NSW Office of Environment and Heritage (OEH, 2021f) *Threatened Species Profiles*; and
- Relevant published literature on threatened biota

2.3 Database searches and literature review

This assessment included a review of:

- Topographic maps
- Aerial photographs
- A review of Revised Native Vegetation Maps of the Cumberland Plain - Western Sydney (Department of Planning, Industry & Environment 2015) & the revised *Native Vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands. Version 12*, Department of Environment and Climate Change, Hurstville (Tozer, Turner et al. 2016).
- Database searches, as summarised in Table 2-2.

Table 2-2 Database searches

Database	Search date	Area searched	Reference
Bionet Atlas of NSW Wildlife	23rd of May 2021	Locality (10 km)	(Office of Environement & Heritage 2021)
PlantNet Database	23rd of May 2021	Locality (10 km)	(Royal Botanic Gardens 2021)
Protected Matters Search Tool	29th of July 2021	Locality (10 km)	(Department of Sustainability, Environment, Water, Population and Communities 2021)

2.4 Field Assessment

Inspections of the site were undertaken by Mr John Whyte on Inspections of the site were undertaken on the 8th and 22nd of May, 22nd & 23rd of July 2021. Methods utilised during the field surveys are described in the following sections. The assessment was undertaken in accordance with the BAM (OEH, 2020b) and with reference to the NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)(DEC, 2004). Limitations of the survey are discussed in the latter of this report.

This included:

- One BAM Plot & a random meander survey recording all species of plant encountered
- Searching for specialised fauna habitat resources such as roosting/nesting hollows, whitewash, foraging resources e.g. feed trees
- Targeted surveys for flora and fauna (Section 2.5)
- Opportunistic fauna surveys during the flora survey

2.5 Vegetation Mapping

All plant species detected within the Project Site were identified to species level (Appendix A). Native vegetation types were identified based on dominant flora species present within each structural layer (i.e. canopy, shrub and ground layers). Exotic or highly modified native vegetation was defined based on structure and species composition. Boundaries of vegetation types and communities were marked with a hand-held GPS and mapped using geographical information system (GIS) software.

Vegetation types within the Project Site were assessed against identification criteria for State and Commonwealth listed threatened ecological communities (DoEE, 2021b; OEH, 2020f). Vegetation and habitats were compared with descriptions provided in the Bionet Vegetation Information System (OEH, 2021e) to identify Plant Community Types (PCTs).

The vegetation condition of each PCT was defined as either ‘moderate to good’ or ‘low’ based on the definitions presented in Table 2-3. Vegetation condition was then used to delineate vegetation zones as required by the BAM (OEH, 2020b).

Table 2-3 Vegetation Condition Definitions

Vegetation Condition	Definition
Moderate	Vegetation retaining the species complement and structural characteristics of the pre-European equivalent. Such vegetation has changed very little over time and displays resilience to weed invasion due to intact groundcover, shrub and canopy layers.
Low	Vegetation retaining a native canopy with a modified understorey due to disturbance. This condition class may also contain weed incursions.

2.5.1 Targeted Flora survey

Targeted threatened flora surveys were conducted in accordance with the NSW Guide to Surveying Threatened Plants (OEH, 2016) over two days 8th and 22nd of May 2021. The survey effort coincided with detectability for all threatened flora with a moderate likelihood of occurrence within the Project Site, (Appendix C).

Threatened flora surveys consisted of a random meander followed by parallel field traverses (i.e. 5 m apart). This methodology is consistent with the survey effort required to adequately detect threatened herb, shrubs and trees in open forest according to (OEH, 2016).

2.5.2 Vegetation Survey Plots (BAM Plots)

Following delineation of vegetation zones within the Project Site, 400m² floristic plot/transects (BAM Plots) were sampled. Plot/ transects were positioned to sample areas that were most representative of the floristic characteristics of each PCT vegetation zone. The number of plot/transects sampled in each vegetation zone was based on the requirements of the BAM (OEH, 2020b), which are presented in Table 2-4.

Table 2-4 Minimum number of plots and transects required per zone area

Vegetation Zone Area (ha)	Minimum number of plots/transects
<2	**1 plot/transect**
>2-5	2 plot/transect
>5-20	3 plot/transect
>20-50	4 plot/transect
>50-100	5 plot/transect
>100-250	6 plot/transect
>250-1000	7 plot/transect
>1000	8 plot/transect

Vegetation integrity was determined using data collected from vegetation survey plot/ transects (BAM Plots) by examining the vegetation composition, structure and function attributes as follows:

- The assessment of vegetation composition was based on the number of native plant species (richness) observed within the 400m² plot/transect (standard 20m x 20m BAM Plot);
- The assessment of vegetation structure was based on the % of foliage cover for each plant growth form group within the 400m² plot (standard 20m x 20m BAM plot); and
- The assessment of vegetation function was based on an assessment of the following attributes within the 1000m² plot (20m x 50m BAM Plot):
- Number of large trees
- Tree regeneration
- Tree stem size class
- Total length of fallen logs
- Litter cover (i.e. assessed using five 1m² quadrats along the 50m transect)
- High threat exotic vegetation cover
- Hollow bearing trees

For a more detailed description of how vegetation integrity was calculated, refer to the BAM (OEH, 2020b).

2.5.1 Plant Identification and nomenclature

Plant identification and nomenclature was based on species descriptions presented within The Flora of New South Wales Volumes 1 to 4 (Harden, 1993) and the taxonomic updates in PlantNET - The Plant Information Network System of Botanic Gardens Trust, Sydney, Australia (Botanic Gardens Trust, 2021).

2.5.1 Threatened Species Surveys (Fauna)

Threatened Species Surveys for fauna were undertaken over four days 8th and 22nd of May, 22nd & 23rd of July 2021 to assess and map the presence of candidate species credit species in accordance with Section 5 of the BAM (OEH, 2020b). All fauna species detected were identified to species level (Appendix B).

In identifying threatened species survey requirements, the following key guidelines were considered:

- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities, for threatened species (excluding frogs) listed under the BC Act (DEC, 2004);
- Amphibians - Threatened species survey and assessment guidelines: field survey methods for fauna – Amphibians (DECCW, 2009);
- Threatened bats - Survey Guidelines for Australia's Threatened Bats, Commonwealth of Australia (DEWHA, 2010a);
- Threatened birds - Survey Guidelines for Australia's Threatened Birds, Commonwealth of Australia (DEWHA, 2010b);
- Threatened reptiles - Survey Guidelines for Australia's Threatened Reptiles, Commonwealth of Australia (DEWHA, 2011b);
- Survey guidelines for Australia's threatened frogs: Guidelines for detecting frogs listed as threatened under the EPBC Act(DEWHA, 2010c); and
- Threatened mammals - Survey Guidelines for Australia's Threatened Mammals, Commonwealth of Australia (DEWHA, 2011a).

2.5.2 Habitat Suitability for Threatened Species (Fauna)

In accordance with 5.2 of the BAM (OEH, 2020b), the locations of important habitat features, such as breeding or roosting habitat for threatened fauna species were captured with a handheld GPS unit and photographed where appropriate. Searches for potential habitat for threatened fauna species included but were not limited to:

- Foraging trees for threatened birds;
- Habitat trees;
- Potential roosts for threatened microchiropteran bats;
- Vegetated ponds, riparian vegetation and drainage lines for threatened frogs and waterbirds; and
- Woody debris and logs.

2.5.3 Diurnal Opportunistic Threatened Fauna Surveys

Diurnal opportunistic and incidental observations of fauna species were recorded at all times during field surveys. These included opportunistic observation of fauna activity such as scats, tracks, burrows or other traces. Fauna species that were observed were recorded and identified to species level.

2.5.4 Threatened Bird & Amphibian Surveys

Dawn bird surveys were completed on foot using binoculars for a 30min period on four separate morning/afternoons: 8th and 22nd of May, 22nd & 23rd of July 2021. Bird species that were detected were recorded and identified to species level (Appendix B). Threatened Amphibian and Reptile Surveys

Amphibians were searched for during nocturnal and diurnal fauna surveys on four separate days: 8th and 22nd of May, 22nd & 23rd of July 2021. Reptiles were surveyed for during diurnal opportunistic fauna surveys (see Section 2.5.3).

2.5.5 Nocturnal Spotlighting and Fauna Call Playback

Spotlighting was completed after dusk following the targeted nocturnal search transects for 2 hours on two separate nights: 22nd & 23rd of July 2021. Nocturnal spotlighting surveys were completed on foot using high-powered spotlights. Spotlighting was used to target arboreal, flying and ground dwelling mammals, nocturnal birds, reptiles and amphibians and the following threatened mammal species:

- Grey-headed Flying-fox (*Pteropus poliocephalus*);

Fauna call playback was conducted using best practise methods (Debus, 1995; Debus & Rose, 1994). This involved broadcasting the calls of specific species through a megaphone to attract individuals or incite a response allowing identification. Recorded calls of each threatened species were played through a megaphone after dusk on the nights: 22nd & 23rd of July 2021. An initial listening period of 15 minutes was followed by a spotlighting search.

Fauna call playback was used to survey for the following threatened fauna species:

- Barking Owl (*Ninox connivens*);
- Sooty Owl (*Tyto tenebricosa*);
- Masked Owl (*Tyto novaehollandiae*); and
- Powerful Owl (*Ninox strenua*)

Figure 2-1 Fauna Survey Locations within the subject property

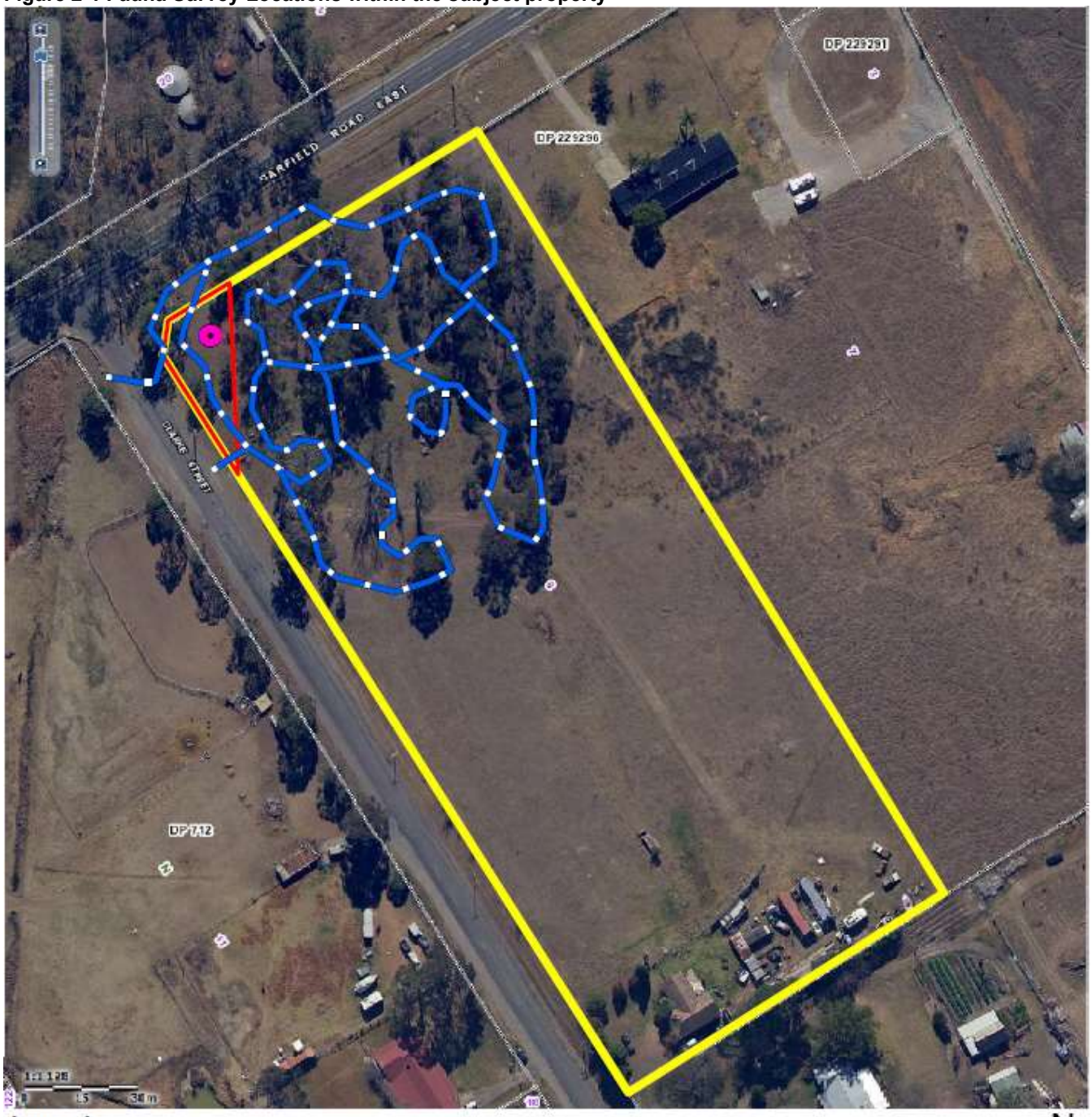
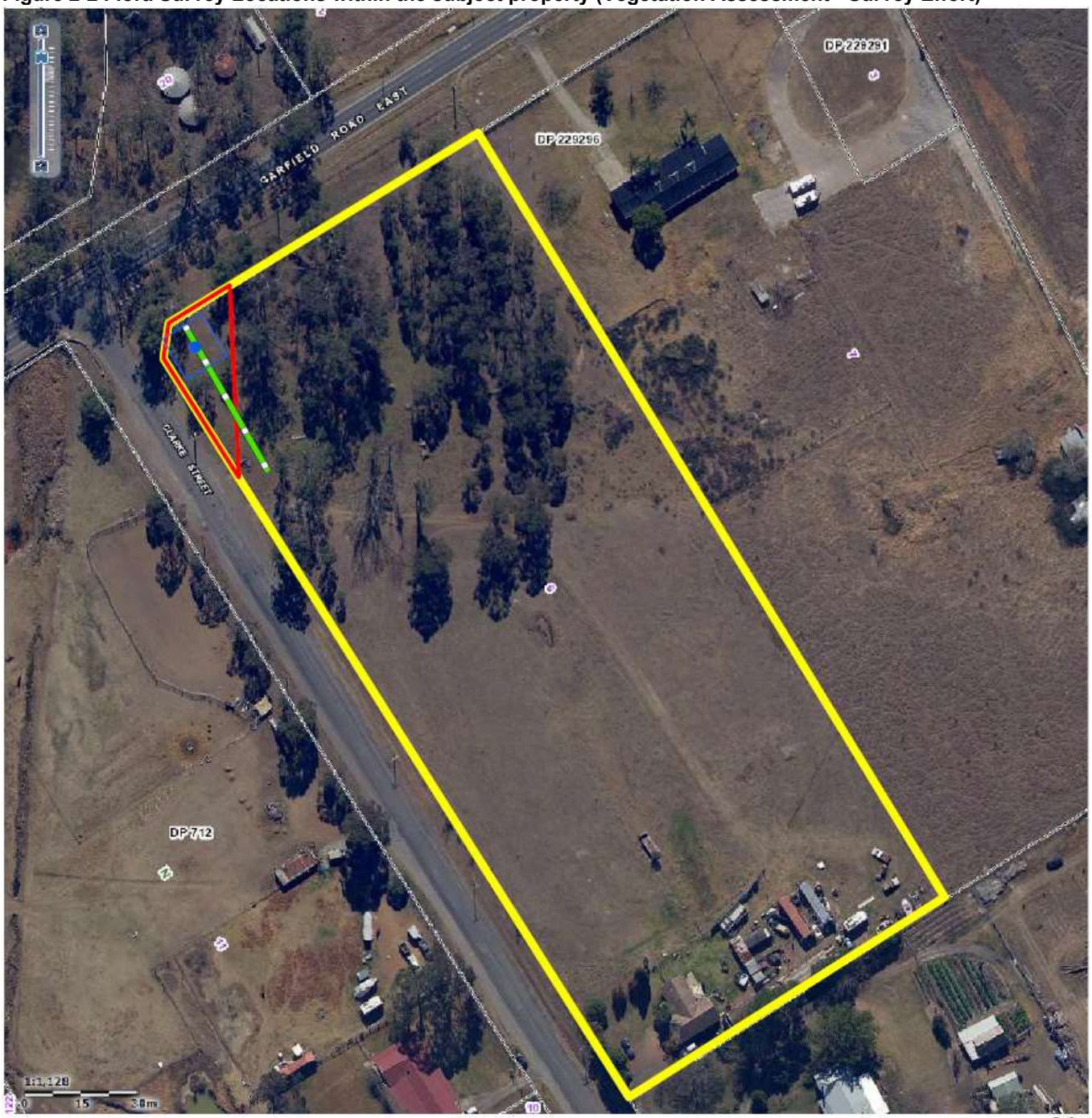


Figure 2-2 Flora Survey Locations within the subject property (Vegetation Assessment - Survey Effort)



2.5.6 Weather Conditions

A summary of the weather conditions prior to and during the survey period are presented in Table 2-6. Although no rainfall was received during the survey period, the temperatures were considered to be conducive to fauna activity within the Project Site including target threatened fauna species.

Table 2-5 Weather Conditions during the Survey Period

Date	Daily Rainfall (mm)	Daily Minimum Temp (°C)	Daily Maximum Temp (°C)
8-05-2021	4.0	11.4	26.6
22-05-2021	1.0	4.5	20.1
22-07-2021	0	-2.1	17.8
23-02-2021	0	3.7	16.3

Weather conditions sourced from Bureau of Meteorology Weatherzone application. Weather Station: 067104 Box Hill (Mcall Gardens) 3.6km away AWS for rainfall data. Richmond RAFF Campden Airport AWS NSW 8.7km away. Station: 067105 for temperature data.

2.5.7 Fauna Survey Effort Summary

A summary of the flora and fauna survey effort is presented in Table 2-7.

Table 2-6 Flora and Fauna Survey Effort Summary

Field Survey Technique	Target Species	Survey Effort	No. units	Dates	Time
Threatened Flora Surveys	All flora (Appendix C)	5 days	-	8th and 22nd of May, 22nd & 23rd of July 2021	10.30am-4.30pm
Flora quadrats	As above	1	1	8th of May 2021	10.30am-12.30pm
Flora Survey Plot/Transects	As above	1 days	1 Plot	8th of May 2021	10.30am-4.30pm
Fauna Habitat Assessment	All fauna species	3 days	-	8th and 22nd of May, 22nd & 23rd of July 2021	10.30am-4.30pm
Diurnal Opportunistic Fauna Surveys	All fauna species	3 days	-	8th and 22nd of May, 22nd & 23rd of July 2021	10.30am-4.30pm
Dawn Bird Surveys	All birds including the following threatened bird species	4 Mornings	-	8th and 22nd of May, 22nd & 23rd of July 2021	8.00am-9.30pm
Amphibian Survey	All amphibians.	2 nights	-	22nd & 23rd of July 2021	6.00pm-8.00pm
Reptile Survey	All reptiles.	4 days	-	8th and 22nd of May, 22nd & 23rd of July 2021	10.30am-8.00pm
Nocturnal Spotlighting	Nocturnal fauna species and the following threatened species: • Grey-headed Flying-fox (*Pteropus poliocephalus*)	2 nights	-	22nd & 23rd of July 2021	6.00pm-8.00pm

2.6 Likelihood of occurrence

Following collation of database records and species and community profiles, as returned by the Bionet Atlas of NSW (OEH, 2021a) and the EPBC Protected Matters Search Tool (DoEE, 2021a), a 'likelihood of occurrence' assessment was prepared with reference to the broad habitats contained within the Project Site (Appendicies C & D). Likelihood of occurrence was based on species distribution and habitat preferences, and the quality of potential habitat present, as defined in Table 2-8.

Table 2-7 Key to Likelihood of Occurrence for Threatened Species

Likelihood	Criteria
Present	The species was observed in the proposal site during the current survey.
High	It is highly likely that a species inhabits the proposal site and is dependent on identified suitable habitat (ie for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10 km) and is known or likely to maintain resident populations in the proposal site. Also includes species known or likely to visit the proposal site during regular seasonal movements or migration.
Moderate	Potential habitat is present in the proposal site. Species unlikely to maintain sedentary populations; however, may seasonally use resources within the proposal site opportunistically or during migration. The species is unlikely to be dependent (ie for breeding or important life cycle periods such as winter flowering resources) on habitat within the proposal site, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	It is unlikely that the species inhabits the proposal site and has not been recorded recently in the locality (10 km). It may be an occasional visitor, but habitat similar to the proposal site is widely distributed in the local area, meaning that the species is not dependent (ie for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the proposal site or the species are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.
None	Suitable habitat is absent within the Project Site.

The Protected Matters Search Report (PMSR) is also presented in Appendix G.

2.7 Biodiversity Credit Calculations

The BC Act, together with the BC Regulation, outlines the framework for addressing impacts on biodiversity from development and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme.

In accordance with Section 3.2 of the BAM 'Where the subject land contains intact native vegetation.

Biodiversity credits required to offset impacts of the proposal were calculated using:

• Full BAM Calculator (Case No: 00026934) assessment ID 00026934/BAAS17110/21/00026935/Revision 0 for impacts to mapped native vegetation zones.

Latest version of the calculator was used with BAM data last updated 10/06/2021– (Version: 1.3.0.00), available at https://www.lmbc.nsw.gov.au/bamcalc in accordance with the Biodiversity Offsets Scheme. These calculations were performed by EE Principal Ecologist – Mr John Whyte (BAM Accredited Assessor - BAAS17110) on 03/08/2021.

2.7.1 Ecosystem Credit Species and Candidate Threatened Species

'Ecosystem credit species' and 'candidate threatened species' as returned by the BAM (OEH, 2020b) are discussed in Section 5.2 Relevant habitat information for these species is presented in Appendices C & D. All BAM output reports are presented in Appendix I.

2.8 Survey Limitations and Assumptions

The current survey was designed to provide an overall assessment of the ecological values within the Project Site and fulfil the requirements of the BAM (OEH, 2020b). Given the duration and timing of the field survey, it is likely that some of the species that may occur within the Project Site (i.e. permanently, seasonally or transiently) were not detected during the survey. However, the survey timing coincided with the appropriate season with favourable weather conditions for the majority of threatened species with a moderate or higher likelihood of occurrence (section 2.5) and data presented in Appendices C & D.

Site conditions (including the presence of threatened species of flora and/or fauna) may change after the date of this report. EE does not accept responsibility arising from, or in connection with, any change to the site conditions. EE is also not responsible for updating this report if the site conditions change.

3. Stage 1 - Biodiversity Assessment Results

This chapter describes the biodiversity values of the site, in accordance with Stage 1 of the BAM.

3.1 Landscape Features

3.1.1 Project Site - Key Features

Site specific landscape information relevant to this assessment is presented in the tables below.

Table 3-1 Site specific landscape Information

Landscape	Site Specific Information
Interim Biogeographic Regionalisation for Australia (IBRA)	NSW Sydney Basin
IBRA Sub Region	Sydney Basin
NSW (Mitchell) Landscape(DECC, 2002)	Hac Hawkesbury - Nepean Channels and Floodplains
Native vegetation extent – Project Site	0.05ha
Native vegetation extent -- 1500 Buffer	35%
Cleared area -- 1500 Buffer	65%
Rivers, streams, wetlands and estuaries	None
Habitat connectivity	246ha
Soil Type and Geology	Soil-South Creek (sc) soil landscape occurs along drainage depressions. Geology_Wianamatta Group—Ashfield Shale consisting of laminite and dark grey siltstone, Bringelly Shale which consists of shale with occasional calcareous claystone, laminite and infrequent coal, and Minchinbury Sandstone consisting of fine to medium-grained quartz lithic sandstone.
Karst, caves, crevices, cliffs and areas of geological significance	None
Areas of outstanding biodiversity value	Yes
Additional features in SEARs	None

3.2 Landscape Features

3.2.1 Mitchell Landscapes

The development site falls within the Hawkesbury-Nepean Terrace Gravels as outlined in Table 3-1.

Table 3-2 Mitchell Landscapes

Mitchell landscape	Description	Area within Development Site (ha)
Hac Hawkesbury - Nepean Channels and Floodplains	Cpl Cumberland Plain SB Meandering channel and moderately wide floodplain of the Hawkesbury and Nepean rivers on Quaternary sand and gravel. Sand is dominant upstream of the Warragamba River junction, general elevation 0 to 20m, local relief <10m. Undifferentiated alluvial sand to poorly structured gradation profiles of sandy loam or clay loam. Forests on the river flats include blue box (Eucalyptus baueriana), broad-leaved apple (Angophora subvelutina), manna gum (Eucalyptus viminalis), river peppermint (Eucalyptus elata) in upstream sectors and dominated by	Entire Property

Mitchell landscape	Description	Area within Development Site (ha)
	river oak (Casuarina cunninghamiana) possibly originally with rainforest species such as white cedar (Melia azedarach) in the lower sectors. Common reed (Phragmites australis), cumbungi (Typha orientalis) and other aquatic plants are found in the river. Deep organic loams and loamy sands on floodplain with river flat forest of Sydney blue gum (Eucalyptus saligna), round-leaved gum (Eucalyptus deanei), forest red gum (Eucalyptus tereticornis), cabbage gum (Eucalyptus amplifolia), broad-leaved apple, rough-barked apple (Angophora floribunda) and river oak. Water gum (Tristaniopsis laurina) in protected channel sections. Large swamps and lagoons on the floodplain and in tributary streams below Richmond dammed by levees on the main stream support tall spike rush (Eleocharis sphacelata), Juncus sp., Melaleuca sp., and Lepidosperma sp. Below Pitt Town the river is tidal and swamp oak (Casuarina glauca), common reed, river mangrove (Aegiceras corniculatum), grey mangrove (Avicennia marina) and limited salt marsh are found on the muddy sands of the inter-tidal zone.	

3.2.1 Landscape Description

Geology

Wianamatta Group—Ashfield Shale consisting of laminite and dark grey siltstone, Bringelly Shale which consists of shale with occasional calcareous claystone, laminite and infrequent coal, and Minchinbury Sandstone consisting of fine to medium-grained quartz lithic sandstone.

Topography

Gently undulating rises on Wianamatta Shale with local relief 10–30 m and slopes generally >5% but occasionally up to 10%. Crests and ridges are broad (200–600 m) and rounded with convex upper slopes grading into concave lower slopes. Outcrops of shale do not occur naturally on the surface. They may occur, however, where soils have been removed

3.2.2 Rivers and streams

No rivers or streams were recorded from the project site. The site is located to the east of First Ponds Creek a 2nd order watercourse.

3.2.3 Wetlands

The development site does not contain any wetlands.

3.2.4 Connectivity features

Connectivity from the site is limited across the local landscape, separated by urban development and roads. The existing connectivity to large tracts of habitat is considered suitable only for mobile species such as birds and bats, however connectivity is limited for less mobile species including mammals and reptiles.

3.2.5 Areas of geological significance and soil hazard features

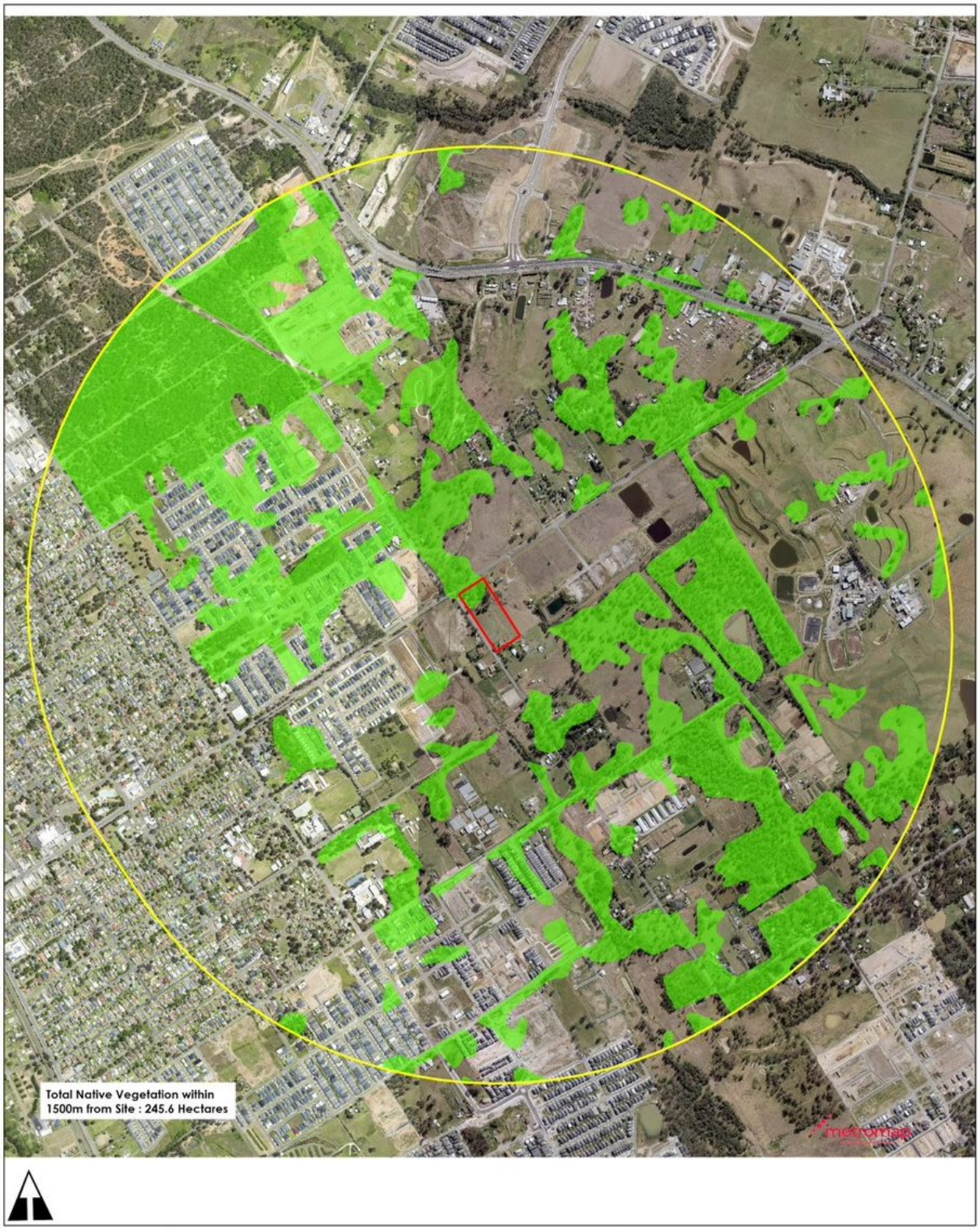
The development site does not contain areas of geological significance and soil hazard features.

3.2.6 Native Vegetation Extent

Vegetation clearing has occurred within the Project site for housing/landscape gardens. The remaining native vegetation consists of patches of native woodland.

It is estimated that the area of woody vegetation extent within the 1500m buffer is 246 ha. The percentage of native vegetation extent is 35%.

Figure 3-1 Native Vegetation Extent 1.5KM Buffer



3.2.7 Other Notable Landscape Features

The Project Site contains no other notable landscape features relevant to the assessment. These include those listed below:

- Karst, caves, crevices, cliffs or areas of geological significance; or
- Areas of Outstanding Biodiversity Value (AOBV) as listed under the BC Act.

3.3 Vegetation Assessment

3.3.1 Vegetation mapping

Two vegetation mapping projects have mapped vegetation within & adjacent to the project site, these are: A Revised Classification and Map for the Coast and Eastern Tablelands. Revised Native Vegetation Maps of the Cumberland Plain - Western Sydney (Department of Planning, Industry & Environment 2015) & The Revised Classification and Map for the Coast and Eastern Tablelands vegetation (Tozer, Turner et al. 2010).

The subject property was mapped as containing plant community type (PCT) 724 Broad-leaved Ironbark - Grey Box - Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion (Figure 3-2) & PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Figure 3-3). PCT 849 was observed outside of the study area within certified lands however PCT 724 was absent from the subject property.

The Revised Native Vegetation Maps of the Cumberland Plain - Western Sydney (Department of Planning, Industry & Environment 2015) vegetation mapping project was found to be the most accurate mapping project. The vegetation was not mapped under the Revised Classification and Map for the Coast and Eastern Tablelands vegetation (Tozer, Turner et al. 2010).

3.3.2 Flora Diversity and Composition

A total of thirty (30) species of plant was recorded from the project site, of which eight (8) were native (Appendix A).

Twenty-seven (27) species of weed were recorded from the study area (Appendix A). Of the exotic species, six of these species are High Threat Exotics (HTEs) as determined by the OEH high threat weeds list (OEH, 2021b).

3.3.3 Plant Community Types

An analysis of the floristic structure and species composition of the vegetation using the Bionet Vegetation Information System (OEH 2021b) determined that one Plant Community Type (PCTs) is present within the Project Site:

- **835 –** PCT Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion

Table 3-3 Vegetation Community Characteristics – PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (Low Condition)

Vegetation Community	Floristic Structure and Composition
Vegetation Formation (Keith, 2004)	Forested Wetlands
Vegetation Class (Keith, 2004)	Coastal Floodplain Wetlands
PCT Equivalent (PCT Code) (OEH, 2021e)	835 - Cumberland riverflat forest
PCT Scientific Name (OEH, 2021e)	*Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion*
Conservation Status (BC Act and EPBC Act)	Listed as an endangered ecological community
Cleared Status (OEH, 2021e)	93%
Approximate area (ha) within the Project Site	Approximately 0.05 hectares of the community occurs within the Project Site.
General Vegetation Structure	The community has a woodland structure absent shrub layer and a sparse groundcover dominated by exotic species of grass and herb.
Floristic Composition	See Appendix H (Plot 1)
Soil Type and Geology	Soil-South Creek (sc) soil landscape occurs along drainage depressions. Geology_Wianamatta Group—Ashfield Shale consisting of laminite and dark grey siltstone, Bringelly Shale which consists of shale with occasional calcareous claystone, laminite and infrequent coal, and Minchinbury Sandstone consisting of fine to medium-grained quartz lithic sandstone.
Evidence of Disturbance	Major weed occurrences
Vegetation Zones	Low
BAM Plots/transects	P1

3.3.1 Plant Community Type Justification

One PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion with one condition (Low) was recorded from the project site.

3.3.2 PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion

PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion community was the dominate vegetation type identified from within the project site (Figure 3-1).

The canopy was dominated by *Casuarina glauca* (Swamp Oak) & *Eucalyptus amplifolia* (Cabbage Gum). Canopy trees ranged in height from approximately 8-13m. The projected foliage cover (PFC) of the canopy ranged from >5-20%.

No native shrubs were recorded from this community.

The groundcover was dominated by the following exotic species: *Pennisetum clandestinum* (Kikuyu Grass), *Ehrharta erecta* (Panic Veldtgrass), *Gamochaeta americana* (American Cudweed), Plantago lanceolata (Lamb's Tongues), *Onopordum acanthium* and *Verbena bonariensis* (Purpletop). Exotic ground layer was to a height of 0.1-.0.4m with a PFC of <80%.

Native groundcover species were primarily absent from this community with the following species recorded: *Cynodon dactylon* (Common Couch), *Dichondra repens* (Kidney Weed), *Oxalis perennans, Poranthera microphylla, Dichondra repens* & *Viola hederacea* (Native Violet). Native ground layer was to a height of 0.1-0.2m with a PFC of <20%.

Two exotic climbing species *Araujia sericifera* (Moth Vine) & *Asparagus aethiopicus* (Asparagus Fern) were recorded from the northern fence line adjacent to Garfield Road East.

Photograph 3-1 PCT 835 from the project site

Photograph 3-2 PCT 835 from the Project site

Photograph 3-3 PCT 835 from the Project site

3.3.3 Vegetation Zone Mapping

Vegetation communities were delineated and mapped based on species composition, structure and condition assessments following the methods described in **Section 2.5**. A revised vegetation map based on this assessment is presented in Figure 3-1. The condition assessment determined that one vegetation zone occurs within the Project Site as follows:

- PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion

3.3.4 Vegetation Integrity Assessment and Patch Size

The vegetation integrity assessment was conducted in accordance with the BAM (OEH 2020c) for each of the vegetation zones as presented in Table 3-4 below. In accordance with the BAM, patch size was assigned to each vegetation zone as a class, being < 5ha, 5–24 ha, 25–100 ha or ≥ 100 ha.

Table 3-4 Vegetation Integrity Calculations

Veg Zone Name	Area within the Development Footprint	Patch Size (Ha)	Composition Condition Score	Structure Condition Score	Function Condition Score	Vegetation Integrity Score
PCT 835_Low	0.05	246	18	30.1	51.9	30.4

3.3.1 Priority Weeds and High Threat Exotics

A complete list of all flora species identified within the Project Site is presented in Appendix A. A total of 27 exotic plant species were detected.

Seven of these species are considered to be High Threat Exotics (HTE) according to the OEH High Threat Exotic species list (OEH 2021f):

- *Ehrharta erecta*
- *Senecio madgarensis*
- *Araujia sericifera*
- *Aspargus aeithopicus*
- *Ligustrum lucindum*
- *Paspalum dialatum*
- *Pennisetum clandestinum*

These exotic plant species were found in moderate-high abundance throughout the Project Site.

Figure 3-2 Field verified vegetation communities recorded from the project site

Figure 3-3 PCT 724 extent mapped with the subject property Vegetation mapping (Department of Planning, Industry & Environment 2015)

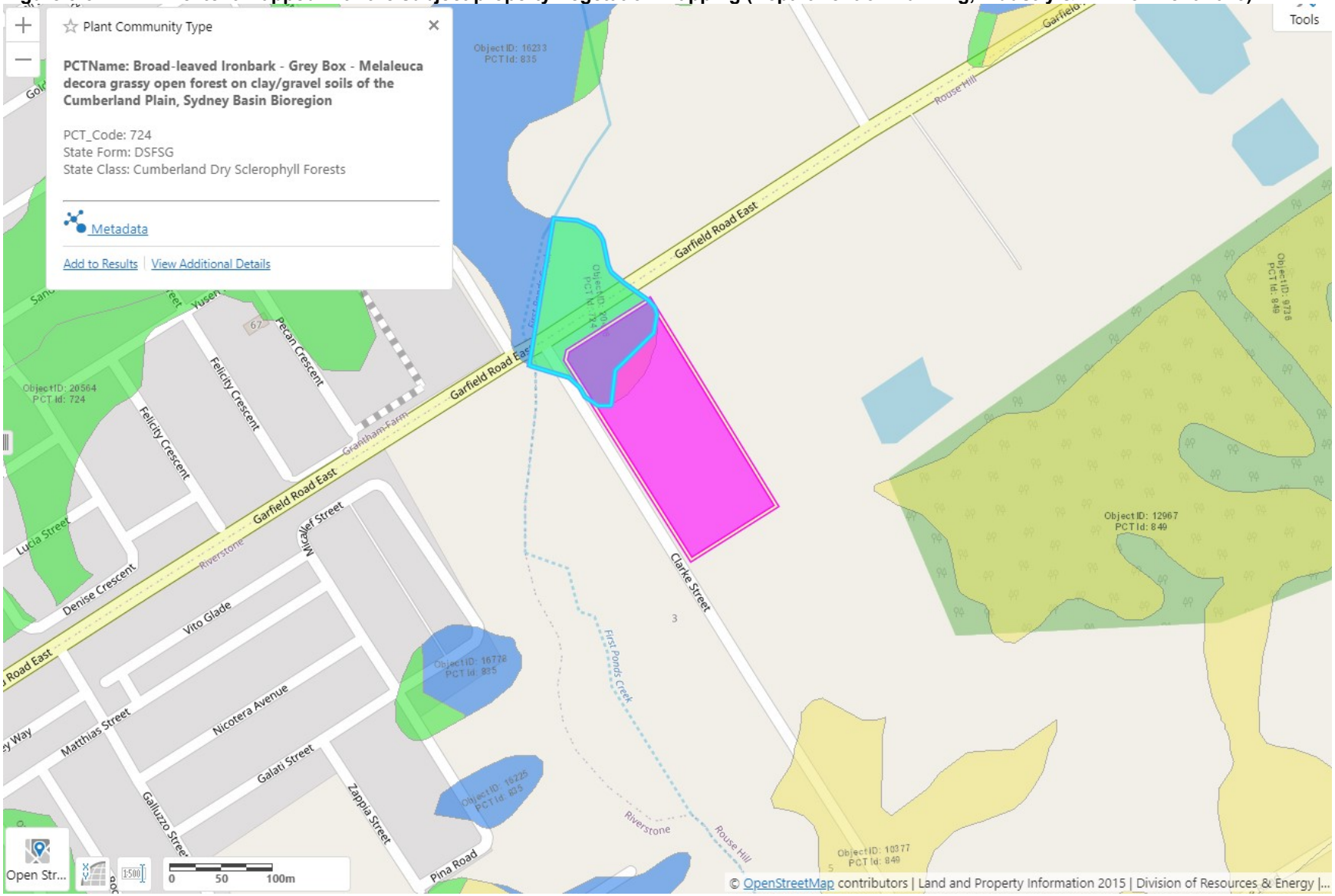
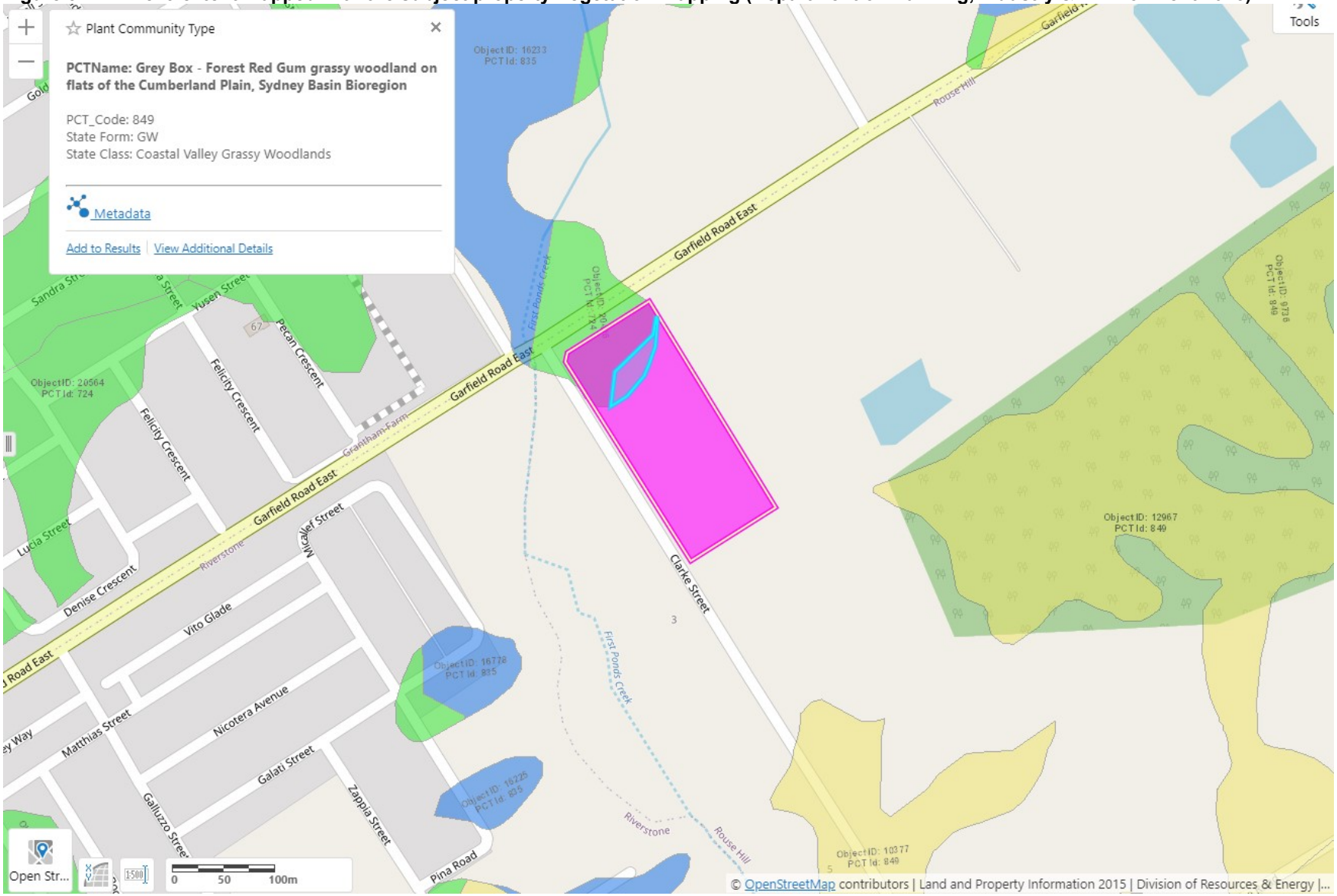


Figure 3-4 PCT 849 extent mapped with the subject property Vegetation mapping (Department of Planning, Industry & Environment 2015)



3.4 Species of animal

3.4.1 Amphibians

One common species of frog: Common Eastern Froglet (*Crinia signifera*) was recorded calling outside of the study area on western side of Clarke Street in association with First Ponds Creek No suitable amphibious breeding habitats were identified from the study area.

No threatened frogs listed under the BC or EPBC Acts were identified within the study area, the habitat within the study area was not suitable for any threatened frogs species listed under both the BC & EPBC Acts.

3.4.2 Reptiles

Two common species of reptile the Garden Skink (*Lampropholis guichenoti*) & the Eastern Water Skink (*Eulamprus quoyii*) were recorded within the project site. No other reptile species were identified during the site inspections.

3.4.3 Birds

Nineteen species of bird were identified within the study area (Appendix B). The vegetation within the study area provides a range of foraging opportunities for birds. The lack of diversity of tree and shrub species within the vegetation community provided limited nectar resources to maintain bird populations throughout the year.

No Glossy Black-cockatoo (*Calyptorhynchus lathami*) or Gang-gang Cockatoo (*Callocephalon fimbriatum*). No Glossy-black or Gang-gang Cockatoos were identified from the study area despite targeted surveys being undertaken.

3.4.4 Mammals

Habitat for mammals was limited within the project site were limited with remnant trees providing marginal foraging habitat. Common species likely to utilise the remnant trees are those species adapted to urban/rural development e.g. the Brush-tailed Possum and the Common Ring-tail Possum. Habitats for threatened mammals were limited within the project site.

The blossoms of the juvenile canopy trees within the study area were not of maturity to provide suitable foraging resources for the Grey-headed Flying-fox (*Pteropus poliocephalus*); this species was not recorded from the study area during the site inspections.

No suitable caves for threatened cave dwelling bats were recorded from the study area. No hollow-bearing trees were identified during the fauna surveys which would provide a suitable roosting site for hollow-dependent microbats species to utilise within the project site.

3.4.5 Fauna habitat types

The suitability, size and configuration of the terrestrial fauna habitats were found to correlate broadly with the structure, floristics, connectivity and quality of the local vegetation community described above. These habitats mostly comprised of PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion.

The condition class of the habitats within PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion was assessed as being in a poor containing some fauna habitat components e.g. feeding and roosting resources.

3.4.6 Fauna microhabitat features

Tree hollows

Hollows develop in *Eucalypts* when the tree is under some form of stress, heartwood decay is present and the tree is sufficiently large to persist when decayed (Gibbons and Lindenmayer 2002). As such, hollows are more likely to occur in older and larger trees; however the abundance and size of hollows may vary within and between species.

Tree hollows typically provide den and nesting habitat for a range of common birds and arboreal mammal species (Gibbons and Lindenmayer 2002), including providing potential habitat for a number of Threatened species including microchiropteran bats and large forest owls. Whether or not tree hollows are used by animals, and which species use them, depends on a number of factors, including hollow characteristics (diameter, height, depth), the number of hollows in a tree, tree health, size, location and spacing (Gibbons and Lindenmayer 2002). No hollow-bearing trees were recorded from the project site however hollows were identified within bio-certified lands. Mitigation measures are proposed below to address removal of hollow-bearing trees as a result of the proposal.

Feeding resources

Fauna occurring in the project locality are likely to use a range of foraging resources including both native and exotic species. Floral feeding resources were limited within the study area notwithstanding Casuarina/Eucalypts provide some seasonal foraging resources for mobile species to utilise when in flower

3.4.7 State Environmental Planning Policy (Koala Habitat Protection) 2021

The subject property is not mapped on the Koala Development Application Map. The subject property does not form part of an approved Koala plan of management.

PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion contains one Koala feed tree species: *Eucalyptus amplifolia* (Cabbage Gum*)* listed on Schedule 2 of State Environmental Planning Policy (Koala Habitat Protection) 2021.

No Koalas were observed during the fauna survey and there was no evidence (Scats or scratches) of previous Koala habitation in the area. The study area is also not considered to be 'Core Koala Habitat' as defined by State Environmental Planning Policy (Koala Habitat Protection) 2021.

As no Koalas or evidence of Koalas were detected within the study area no further assessment under this Policy is required.

3.5 Threatened biodiversity

This section details the threatened biodiversity recorded or likely to occur within the study area. This is based on those species recorded or predicted to occur within the locality from database searches (Table 2-2) and the nature of the habitats observed within the vicinity of the proposed works during field surveys (Appendices C and D).

No flora species were considered to have medium or high likelihood of occurrence within the study area; as such no significance assessment has been prepared.

3.5.1 Threatened ecological communities

Eighteen endangered ecological communities were identified from desktop review to occur within the locality of the study area (Table 3-5).

Table 3-5 Endangered Ecological Communities known from the Locality

Scientific Name	Common Name	BC Act	EPBC Act
Agnes Banks Woodland in the Sydney Basin Bioregion	Agnes Banks Woodland in the Sydney Basin Bioregion	E4B	E
Blue Gum High Forest in the Sydney Basin Bioregion	Blue Gum High Forest in the Sydney Basin Bioregion	E4B	CE
Blue Mountains Shale Cap Forest in the Sydney Basin Bioregion	Blue Mountains Shale Cap Forest in the Sydney Basin Bioregion	E3	CE
Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion	Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion	V2	E
Castlereagh Swamp Woodland Community	Castlereagh Swamp Woodland Community	E3	
Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion	Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion	E3	CE
Cumberland Plain Woodland in the Sydney Basin Bioregion	Cumberland Plain Woodland in the Sydney Basin Bioregion	E4B	CE
Elderslie Banksia Scrub Forest	Elderslie Banksia Scrub Forest	E4B	CE
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	

Scientific Name	Common Name	BC Act	EPBC Act
Moist Shale Woodland in the Sydney Basin Bioregion	Moist Shale Woodland in the Sydney Basin Bioregion	E3	CE
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	CE
Shale Gravel Transition Forest in the Sydney Basin Bioregion	Shale Gravel Transition Forest in the Sydney Basin Bioregion	E3	CE
Shale Sandstone Transition Forest in the Sydney Basin Bioregion	Shale Sandstone Transition Forest in the Sydney Basin Bioregion	E4B	CE
Southern Sydney sheltered forest on transitional sandstone soils in the Sydney Basin Bioregion	Southern Sydney sheltered forest on transitional sandstone soils in the Sydney Basin Bioregion	E3	
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	E
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	
Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion	Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion	E4B	CE
Western Sydney Dry Rainforest in the Sydney Basin Bioregion	Western Sydney Dry Rainforest in the Sydney Basin Bioregion	E3	CE

One threatened Endangered Ecological Community (EEC) was recorded within the study area. PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion corresponds with the EEC known as River-Flat Eucalypt Forest on Coastal Floodplains (RFEFCF) (Figure 3-1), which is listed under the *BC Act*.

An impact assessment (5-part test) has been prepared in accordance with Section 7.3 of the *BC Act* to determine *w*hether the proposal would be likely to have a significant impact upon the River-Flat Eucalypt Forest on Coastal Floodplains community (refer Appendix E).

An assessment of significance under the EPBC Act was not required as the River-Flat Eucalypt Forest on Coastal Floodplains within the site does not meet the EPBC assessment criteria to be considered to be representative of this community.

3.5.2 Endangered populations

Two threatened populations were identified from the desktop review to occur within the locality of the study area:

- *Marsdenia viridiflora subsp. viridiflora* - endangered population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas; and
- *Dillwynia tenuifolia* - endangered population (Kemps Creek)

No endangered populations were identified within the study area despite suitable habitat being recorded from the study area

3.5.3 Threatened Flora

Forty-four threatened species of plant listed under the *BC Act* and/or *EPBC Act* were predicted to occur within the locality of the study area based on database searches (refer Appendix C).

Based on targeted surveys within the study area none are considered to have suitable habitat within the study area. No further consideration is required for threatened flora species.

3.5.4 Threatened fauna

Fifty threatened fauna species were identified as a result of the database searches as occurring or having potential to occur within the locality of the study area (Appendix D).

Based on the habitat assessment and targeted surveys there is potential habitat within the study area for seven threatened fauna species that may be impacted through the removal of foraging habitat (Appendix D). Impact assessments have been prepared for these species (Appendices E & F).

3.5.5 Migratory species

Migratory species are protected under the international agreement to which Australia is a signatory, including the Japan-Australia Migratory Bird Agreement, the China-Australia Migratory Bird Agreement and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Migratory species are considered Matters of National Environmental Significance and are protected under the *Environment Protection and Biodiversity Conservation Act 1999*.

Eleven migratory species were identified from the Department of Sustainability and Environment (Department of Sustainability and Environment 2021) within the locality (Appendix D). None were recorded during the site inspections. Two migratory species were considered to have suitable habitat within the study area (Table 3-6).

Table 3-6 Migratory Species considered to have suitable habitat within the study area

Scientific Name	Common Name	EPBC Act
Birds		
Monarcha melanopsis	Black-faced Monarch	M
Rhipidura rufifrons	Rufous Fantail	M

The study area is not considered to be important habitat for any Migratory species in accordance with the EPBC Act.

3.6 Biodiversity Risk Weighting

The BAM uses a biodiversity risk weighting to evaluate the ecological risks of threatened entities from the biodiversity offsets scheme. The biodiversity risk weighting is comprised of two components:

- ‘Sensitivity to loss’ – this considers the increased threat posed to an entity from offsetting the loss of habitat or population, and
- ‘Sensitivity to potential gain’ – this considers the ability of a species to respond to improvements in habitat condition at an offset site.

The biodiversity risk weightings of threatened biota, which are relevant to this assessment, are presented in Appendix I.

3.6.1 Predicted Species (BAM Credit Calculator)

The predicted occurrence of these threatened species in the BAM Credit Calculator is based on several factors, including PCTs mapped within the Project Site, IBRA subregion, distributional range of each species, the condition of the vegetation and patch size (as per Section 6 of the BAM). A total of twenty-five (33) threatened species is predicted to occur within the Project Site by the BAM Credit Calculator (3rd of August 2021). These comprise the following:

Common Name	**Species Name**
Austral Pillwort	*Pilularia novae-hollandiae*
Barking Owl	*Ninox connivens*
Brown Pomaderris	*Pomaderris brunnea*
Bush Stone-curlew	*Burhinus grallarius*
Camden White Gum	*Eucalyptus benthamii*
Cumberland Plain Land Snail	*Meridolum corneovirens*
Eastern Osprey	*Pandion cristatus*
Eastern Pygmy-possum	*Cercartetus nanus*
Gang-gang Cockatoo	*Callocephalon fimbriatum*
Greater Glider	*Petauroides volans*
Green and Golden Bell Frog	*Litoria aurea*
Grey-headed Flying-fox	*Pteropus poliocephalus*
Hairy Geebung	*Persoonia hirsuta*
Hibbertia sp. Bankstown	*Hibbertia sp. Bankstown*
Koala	*Phascolarctos cinereus*
Large Bent-winged Bat	*Miniopterus orianae oceanensis*
Large-eared Pied Bat	*Chalinolobus dwyeri*
Little Bent-winged Bat	*Miniopterus australis*
Little Eagle	*Hieraaetus morphnoides*
Marsdenia viridiflora R. Br. subsp. viridiflora	*Marsdenia viridiflora subsp. viridiflora – endangered population*
Masked Owl	*Tyto novaehollandiae*
Netted Bottle Brush	*Callistemon linearifolius*
Powerful Owl	*Ninox strenua*
Regent Honeyeater	*Anthochaera phrygia (Foraging)*
Southern Myotis	*Myotis macropus*
Square-tailed Kite	*Lophoictinia isura*
Squirrel Glider	*Petaurus norfolcensis*
Swift Parrot	*Lathamus discolor*
Tadgell's Bluebell	*Wahlenbergia multicaulis - endangered population*
Tall Knotweed	*Persicaria elatior*
White-bellied Sea-Eagle	*Haliaeetus leucogaster*
White-flowered Wax Plant	*Cynanchum elegans*

No ecosystem credit species were excluded from the BAM Credit Calculator to determine the offset obligation. The habitat requirements of each 'Predicted Species' is presented in Appendix I. Additionally, a 'Predicted Threatened Species Report' derived from the BAM Credit Calculator is provided in Appendix I (vegetation removal).

3.6.2 Candidate Species (BAM Credit Calculator)

No candidate species credit species have been determined to be relevant to the Project Site according to the BAM Credit Calculator.

3.6.3 Threatened Species Polygons

In accordance with section 6.4.1.33 of the BAM (OEH, 2017b), species polygons must be mapped for each species credit species identified within the Project Site. No species credit species were recorded on the Project Site and therefore no species polygons have been mapped for the assessment.

3.6.4 Prescribed Biodiversity Values

With reference to Section 6.7 of the BAM, the Project Site does not contain any of the 'prescribed biodiversity values' identified in that section, as follows:

- Karst, caves, crevices and cliffs;
- Occurrences of rock;
- Human made structures (deemed to be habitat for a threatened species or ecological community);
- Watercourses or hydrological processes that interact with rivers and streams; and
- The proposed development is not for a wind farm.

3.6.5 EPBC Act Protected Matters

No EPBC listed TECs were identified from the project site.

No threatened or migratory species listed under the EPBC Act were detected during the assessment.

No other matters of national environmental significance listed under the EPBC Act are relevant to the Project Site.

4. Impact Assessment

4.1 Avoidance Measures

Consideration has been given to avoiding and minimising impacts to biodiversity throughout each phase of the project to date. Site selection options have been assessed against key environmental, social and economic criteria.

4.2 Habitat Tree Removal

No hollow-bearing trees were recorded from project site.

No suitable sized Large Forest Owl Hollow-bearing trees are proposed to be removed as a result of the proposed works. Mitigation measures are presented in Section 5 to reduce potential direct and indirect impacts.

4.3 Removal of Mapped Native Vegetation

Approximately 0.05 ha of native vegetation (low condition) will require direct removal for the proposed development installation of the road and services. All of this vegetation lies within the Project Site.

4.4 Serious and Irreversible Impacts

According to the Guidance to assist a decision-maker to determine a serious and irreversible impact (OEH, 2017c), the vegetation within the Project Site is not identified as a serious and irreversible impact (SAII) Entity.

No SAII were identified from the project site.

4.5 Indirect Impacts on Biodiversity Values

In accordance with Section 9.1.4 of the BAM, an assessment of potential indirect impacts on native vegetation and habitat is provided in this section.

4.5.1 Vegetation and Habitat

Potential indirect impacts to native vegetation and habitat may occur during the construction and operational phase of the project. Such impacts may include the following:

- Increased traffic and visitation within the Project Site may facilitate the spread of weeds that could further degrade native vegetation;
- Pollution such as chemical spills from construction machinery may have adverse effects on native vegetation, fauna;
- Introduction of weeds and feral animals that could degrade and modify the habitat to be retained within the Project Site;
- Ground disturbance by machinery during the construction phase may create dust and facilitate the movement of water-borne sediment. Sedimentation could adversely affect the surrounding vegetation.

Mitigation measures are presented in Sections 5.2 & 5.3 to reduce the potential for these impacts.

4.5.2 Fauna species

Potential indirect impacts on locally occurring fauna and their habitats (including threatened biota) may occur during the construction and operational phase of the project. Such impacts may include the following:

- Several studies have shown that fences of various design can cause injury to mobile fauna species such as birds, microbats and other fauna species (Hopkins, 2015; Lloyd, Law, & Goldingay, 2006; Zimpfer & Bonaccorso, 2010).
- Light spill from artificial lighting within the Project site may adversely affect the natural behaviour of nocturnal fauna species such as arboreal mammals, large forest owls and foraging microbats;
- Increased traffic within the Project site may facilitate the encroachment of plant weeds that could further degrade the retained areas of native woodland; and
- Increased visitation of the Project site may disturb resident fauna and disrupt their natural behaviour.

Mitigation measures are presented in Section 5 to reduce the potential for these impacts.

4.6 Cumulative Impacts

Cumulative impacts arise from the interaction of individual elements within the proposal and the additive effects of other external projects. At the time of writing, no other projects have been identified close to the Project Site.

4.7 Offset Requirements

4.7.1 Impacts Requiring an Offset

The BAM Calculator was used on 03/08/2021 to determine the offset obligation for the removal of native vegetation within the project site.

The offset calculations determined that the purchase and retirement of 1 ecosystem credits would be required to meet the offset obligation, as presented in Table 4-1 (vegetation removal). Purchase and retirement of ecosystem credits for the development must be conducted in accordance with the 'Ancillary rules: Reasonable steps to seek like-for-like biodiversity credits' (OEH 2020a). A variations options report is presented in Appendix I.

Offset obligations can also be met by purchase and retirement of the credits listed in direct payment of $24,307.14 (incl GST) into the Biodiversity Conservation Fund. Calculations to determine this final credit price are based on ecosystem credits required for removal of native vegetation within the project site.

Table 4-1 Ecosystem credits for plant community types (PCT), ecological communities & threatened species habitat

Zone	Vegetation Zone Name	Vegetation Integrity Loss	Area (hectares)	Constant	Species sensitivity to gain class	Biodiversity Risk weighting	Candidate SAII	Ecosystem Credits
Zone 1	835 (Low condition)	30.4	0.05	0	N/A	2	True	1
								Total: 1 Ecosystem Credits

Table 4-2 Biodiversity Payment Summary: Ecosystem Credits and Credit Pricing

Plant Community Type	Baseline Price	Risk Premium	Administrative Cost	Method Adjustment Factor	Price per Credit	No. Ecosystem Credits	Final credit price
835 - Cumberland riverflat forest	$22,097.40	15.82%	$737.69	0.9941	$22,097.40	1	$22,097.40
							Subtotal excluding GST: $22,097.40 GST: $2,209.74 Subtotal Including GST: $24,307.14

5. Management of Impacts on Biodiversity

5.1 Avoidance Measures

Avoidance measures to reduce potential impacts to biodiversity values within the Project Site include modifying the layout of allotments to avoid the removal of habitat.

5.2 Mitigation Measures – Construction Phase

The proposal will directly remove/ modify 0.05 hectares of habitat for flora and fauna species. There is also potential to impact on habitats outside the Project Site indirectly through sedimentation during construction. The following prescribed mitigation measures are recommended to minimise such impacts.

5.2.1 Erosion Control

Mitigation measures to reduce soil erosion and pollutant run-off during construction activities should include:

- Installation of erosion and sediment control measures prior to any works;
- Regular inspection of erosion and sediment control measures, particularly following rainfall events, to ensure their ongoing functionality; and
- The immediate removal offsite of excavated materials.
- Measures that should be adopted during stockpiling of materials should include:
- Avoid stockpiling of materials adjacent to native vegetation, but instead use areas that are already cleared/ disturbed.
- Undertake maintenance of silt fences and other mitigation measures to isolate runoff;

5.2.2 Dust Control

Specific measures to minimise the generation of dust and associated impacts on adjacent natural environments should include:

- Setting maximum speed limits for all traffic within the study area to limit dust generation;
- Use of a water tanker or similar to spray unpaved access tracks during the construction phase where required; and
- Application of dust suppressants or covers on soil stockpiles.

5.2.3 Chemical Spill Control

Specific measures to minimise the potential for chemical spills and associated impacts on adjacent natural environments should include the following:

- All chemicals must be kept in clearly marked bunded areas.
- Regularly inspect vehicles and mechanical plant for leakage of fuel or oil.
- No re-fuelling of vehicles, washing of vehicles or maintenance of vehicles and plant to be undertaken within 20 m of natural drainage lines.

5.2.4 Pre-clearance Surveys

Pre-clearing surveys are be undertaken by a Project Ecologist prior to commencement of any vegetation clearing activities within the Project Site. The Project Ecologist will conduct pre-clearing surveys to identify:

- Fauna species likely to be encountered during construction and potential impacts to fauna during vegetation clearing;
- Potential fauna habitat in the Project Site; and
- Preferred locations to relocate fauna species and habitat features that can be retained following construction.

Pre-clearing surveys will take place 1-2 weeks prior to the commencement of vegetation clearing. The Project Ecologist will mark all potential fauna habitat (e.g. habitat trees, nest trees, burrows, etc.) in the development footprint with high visibility tape (e.g. trees, large woody debris and nests).

5.2.5 Vegetation Clearing Protocols

The following vegetation clearing protocols are to be implemented during vegetation clearing:

- A Project Ecologist is to be present on site during all vegetation clearing operations;
- Areas of vegetation outside the development footprint are to be clearly demarcated with high visibility tape to prevent accidental clearing during the construction phase;
- All habitat trees should be retained during vegetation clearing and felled three weeks after the initial vegetation clearing phase;
- Vegetation should be cleared in a way that will allow fauna species living in or near the clearing site enough time to move out of the area without additional human intervention;
- No clearing should occur during the early evening or at night, as this is when fauna species are most likely to be on the move and are more vulnerable to injury;
- Habitat links must be maintained during clearing to allow fauna species to move safely from the site to adjacent areas;
- Clearing should begin in the area that is furthest from vegetation to be retained;
- The direction of clearing should also ensure that fauna species are directed away from threats such as roads, developed areas or disturbed areas (e.g. residential areas or cleared spaces > 100m); and

5.2.6 Management of Displaced Fauna

The following recommendations apply to the management of any displaced fauna species during vegetation clearing activities:

- All handling of fauna species should be conducted by the Project Ecologist;
- In the event that arboreal animals do not move or they cannot be captured because the tree hollow to be removed is too large, too high or its recovery would breach OH&S requirements then the tree will be felled (i.e. in the direction of other tree debris if possible) and animals recovered and relocated to suitable adjacent habitat;
- Animals are to be removed and relocated to the adjacent bushland/nest boxes prior to felling or the tree shall be sectioned and dismantled under the supervision of the Project Ecologist before relocating the animals;
- Nocturnal fauna species, such as microbats, are to be 'soft released' using bat boxes placed in adjacent habitat;
- Nocturnal fauna species, such as gliders and possums, are to secured in suitable enclosures and kept in a quiet, dark and cool environment until they can be released into suitable habitat after dark; and
- If any injured fauna species are found during the construction period, construction must stop immediately so that the injured animal can be taken to a vet or wildlife carer.

5.2.7 Weed Management

High threat weed species were identified within the Project Site (see Section 3.3.1). Measures to prevent the spread of weeds should include the following weed hygiene procedures:

- Induction materials containing detailed information pertaining to the identification of high threat weeds should be prepared by a suitably trained ecologist or bush regenerator. These materials should be provided to contractors who will carry out construction works within the Project Site.
- All vehicles, equipment, footwear and clothing should be clean and free of weed propagules prior to entering the Project Site.
- Any weeds that are removed during the construction phase should be disposed of via an appropriate waste facility.

5.2.8 Truck and machine wash down areas

Vehicles and other equipment to be used in clearing works (such as excavators, bull dozer, chipper etc) are to be received completely free of soil, seeds and plant material before entering the subject property to prevent the introduction of exotic plant species and pathogens e.g. (*Phytophthora cinnamomi*) which is a key threatening process. Equipment failing inspection should be sent away for cleaning. Appropriate records of inspections shall be maintained.

Build ups of mud, soil and organic matter present on vehicles during wet and muddy conditions shall be manually removed prior to vehicles entering/leaving the project site.

5.3 Mitigation Measures – Operational Phase

5.3.1 Artificial Lighting

Artificial lighting has the potential to disrupt the natural behaviour of nocturnal fauna species such as arboreal mammals, large forest owls and microbats. To reduce impacts to these species, including the microbats, artificial lighting should be reduced where possible within the Project Site. Lights should be turned off at night and any essential lighting should be directed away from fauna habitats such as woodland areas.

5.4 Adaptive Management

Section 9.4 of the BAM states that adaptive management such as monitoring programs are required for projects where uncertain impacts such as impacts to karst, caves, crevices, cliffs, subsidence or wind turbine strikes may occur. No uncertain impacts have been identified for the proposed development that would require implementation of an adaptive management strategy.

6. References

Anstis, M. (2002). Tadpoles of South-eastern Australia: a Guide with Keys. Sydney, New Holland Publishers.

Australian Museum (2003). Great Egret factsheet, Australian Museum.

Bell S (2002). The Natural Vegetation of the Wyong Local Government Area, Central Coast, New South Wales Unpublished report to Gosford City Council, East Coast Flora Survey.

Building Code Bushfire Solutuions (2012) Bushfire Assessment for Lot 4 DP 247539 Woods Road, Jilliby

Bishop, T. (2000). Field guide to the orchids of New South Wales and Victoria. Sydney, University of New South Wales Press Ltd. Pty.

Brooker, M. I. H. and D. A. Kleinig (1999). Field guide to Eucalypts, Volume 1: South-eastern Australia. Hawthorn, Australia, Blooming Books.

Churchill, S. (1998). Australian Bats. Sydney, Reed New Holland.

Churchill, S. (2008). Australian Bats. Sydney, Allen & Unwin.

Clarke, D. J., K. A. Pearce, et al. (2006). "Powerline corridors: degraded ecosystems or wildlife havens?" Wildlife Research **33**(8): 615-626.

Cogger, H. G. (2000). Reptiles and Amphibians of Australia. Sydney, Reed Books.

Cropper, S. C. (1993). Management of Endangered Plants. Melbourne, CSIRO Australia.

Crowley, G. M. and S. T. Garnett (2001). "Food value and tree selection by Glossy Black-Cockatoos *Calyptorhynchus lathami*." EMU **26**: 116-126.

Department of Environment and Climate Change (2007). Threatened species assessment guidelines. The assessment of significance. Hurstville, Department of Environment and Climate Change.

DECC. (2002). Descriptions for NSW (Mitchell) Landscapes Version 2. Based on the descriptions by Dr. Peter Mitchell.

DEWHA. (2010a). Threatened bats – Survey Guidelines for Australia's Threatened Bats. Commonwealth of Australia. .

DEWHA. (2010b). Threatened birds – Survey Guidelines for Australia's Threatened Birds.: Commonwealth of Australia.

Department of Environment and Climate Change. (2008). "Threatened species, populations and ecological communities." 2008, from http://www.threatenedspecies.environment.nsw.gov.au/index.aspx.

Department of Environment and Climate Change. (2009). "Threatened species, populations and ecological communities." 2009, from http://www.threatenedspecies.environment.nsw.gov.au/index.aspx.

Department of Environment and Conservation (2004). Green and Golden Bell Frog environmental impact assessment guidelines Hurstville, Department of Environment and Conservation (NSW).

Department of Environment and Conservation (2004). Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft). Hurstville, Department of Environment and Conservation.

Department of Environment and Conservation (2005). Draft Recovery Plan for the Green and Golden Bell Frog (*Litoria aurea*). Hurstville, NSW, Department of Environment and Conservation (NSW).

Department of Environment and Conservation (2005). Draft recovery plan for the large forest owls: Powerful Owl, Sooty Owl and Masked Owl. Sydney South, Department of Environment and Conservation.

Department of Environment and Conservation. (2005). "Threatened species, populations and ecological communities." 2006, from http://www.threatenedspecies.environment.nsw.gov.au/index.aspx.

Department of the Environment and Heritage (2005). EPBC Act - Principal Significant Impact Guidelines 1.1. Matters of National Environmental Significance. Canberra, Department of the Environment and Heritage.

Department of the Environment and Heritage (2006). EPBC Act Policy Statement 1.1 Significant Impact Guidelines. Canberra, Department of the Environment and Heritage.

Department of the Environment Water Heritage and the Arts. (2009). "Protected Matters Search Tool." from http://www.deh.gov.au/erin/ert/epbc/index.html

Department of Sustainability, Environment, Water, Population and Communities (2012). Census of Australian Vertebrates. Canberra, Department of Environment and Heritage.

Fairley, A. and P. Moore (2002). Native plants of the Sydney district. An identification guide. Sydney, Kangaroo Press.

Garnett, S. T. and G. M. Crowley (2000). The Action Plan for Australian Birds. Canberra, Environment Australia.

Gibbons, P. and D. Lindenmayer (2002). Tree Hollows and Wildlife Conservation in Australia. Canberra, CSIRO Publishing.

Goldingay, R. L. and R. J. Whelan (1997). "Powerline Easements: Do They Promote Edge Effects in Eucalypt Forest for Small Mammals?" Wildlife Research **24**(6): 737-744.

Gunninah Environmental Consultants (2003). Wyong ground orchid survey, Wyong Shire. Crows Nest, NSW, prepared for Wyong Shire Council.

Harden, G. (1992). Flora of New South Wales Volume 3. Kensington, University of New South Wales Press Ltd.

Harden, G. (1993). Flora of New South Wales Volume 4. Kensington, University of New South Wales Press Ltd.

Harden, G. (2000). Flora of New South Wales Volume 1 (Revised Edition). Kensington, University of New South Wales Press Ltd.

Harden, G. (2002). Flora of New South Wales Volume 2 (Revised Edition). Kensington, University of New South Wales Press Ltd.

Higgins, P. J., Ed. (1999). Handbook of Australian, New Zealand and Antarctic Birds Volume 4: Parrots to Dollarbirds. Volume 4: Parrots to Dollarbird. Melbourne, Oxford University Press.

Higgins, P. J. and J. M. Peter, Eds. (2002). Handbook of Australian, New Zealand and Antarctic Birds. Volume 6: Pardalotes to Shrike-thrushes. Melbourne, Oxford University Press.

Hoye, G. A. and P. D. Dwyer (1998). Large-eared Pied Bat. The Mammals of Australia. R. Strahan. Sydney, New Holland Publishers.

Johnston, P. G. (1995). Long-nosed Potoroo. The Mammals of Australia. R. Strahan. Sydney, Reed New Holland**:** 301-302.

Jones, D. L. (2006). A complete guide to to native orchids of Australia including island Territories. Sydney, Reed New Holland.

Lower Hunter and Central Coast Regional Environmental Management Strategy (2000). Vegetation Survey, Classification and Mapping - Lower Hunter and Central Coast Regional Environment Management Strategy Sydney, Lower Hunter and Central Coast Regional Environment Management Strategy (LHCCREMS).

Marchant, S. and P. J. Higgins, Eds. (1993). Handbook of Australian, New Zealand and Antarctic Birds Volume 2: Raptors to Lapwings. Volume 2: Raptors to Lapwings. Melbourne, Oxford University Press.

McAlpine, C. A., S. Heyenga, et al. (2007). "Regional planning in Queensland's rangelands: Challenges and prospects for biodiversity conservation." Geographical Research **45**(1): 27-42.

McKilligan, N. (2005). Herons, egrets and bitterns: their biology and conservation in Australia. Collingwood, Victoria, CSIRO Publishing.

Menkhorst, P., N. Schedvin, et al. (1999). Regent Honeyeater (Xanthomyza phrygia) Recovery Plan 1999-2003. Canberra, Department of Natural Resources and Environment.

Morcombe, M. (2003). Field guide to Australian birds. Archerfield, Queensland, Steve Parish Publishing.

NSW Department of Environment and Conservation (2006). Caladenia porphyrea - endangered species listing. Hurstville, NSW Department of Environment and Conservation.

NSW National Parks and Wildlife Service (1999). *Acacia bynoeana* threatened species information. Hurstville, NSW National Parks and Wildlife Service.

NSW National Parks and Wildlife Service (1999). Broad-billed Sandpiper threatened species information. Hurstville, NSW National Parks and Wildlife Service.

NSW National Parks and Wildlife Service (1999). Glossy Black-cockatoo threatened species information. Hurstville, NSW National Parks and Wildlife Service.

NSW National Parks and Wildlife Service (1999). Koala threatened species information. Hurstville, NSW National Parks and Wildlife Service.

NSW National Parks and Wildlife Service (1999). Southern Brown Bandicoot threatened species information. Hurstville, NSW National Parks and Wildlife Service.

NSW National Parks and Wildlife Service (1999). Spotted-tailed Quoll threatened species information. Hurstville, NSW National Parks and Wildlife Service.

NSW National Parks and Wildlife Service (1999). Squirrel Glider threatened species information. Hurstville, NSW National Parks and Wildlife Service.

NSW National Parks and Wildlife Service (1999). Terms of licence under the Threatened Species Conservation Act 1995. Appendix B of the Integrated Forestry Operations Approval for the Upper North East Region.

NSW National Parks and Wildlife Service (1999). Yellow-bellied Glider threatened species information. Hurstville, NSW National Parks and Wildlife Service.

NSW National Parks and Wildlife Service (2001). Giant Burrowing Frog threatened species information. Hurstville, NSW National Parks and Wildlife Service.

NSW National Parks and Wildlife Service (2001). Grey-headed Flying Fox threatened species information. Hurstville, NSW National Parks and Wildlife Service.

NSW National Parks and Wildlife Service (2002). Threatened Species of the Upper North Coast of New South Wales - Fauna. Coffs Harbour, NSW National Parks and Wildlife Service, Northern Directorate.

NSW National Parks and Wildlife Service (2003). Brush-tailed Rock Wallaby Warrumbungles endangered population threatened species information. Hurstville, NSW National Parks and Wildlife Service.

NSW National Parks and Wildlife Service (2003). Draft recovery plan for the Barking Owl Hurstville, NSW National Parks and Wildlife Service.

NSW National Parks and Wildlife Service (2003). Draft Recovery Plan for the Koala. Hurstville, NSW National Parks and Wildlife Service.

NSW National Parks and Wildlife Service (2003). Invasion of native plant communities by exotic perennial grasses as a key threatening process- an overview. Hurstville, NSW National Parks and Wildlife Service.

NSW National Parks and Wildlife Service (2003). Recovery Plan for the Yellow-bellied Glider (*Petaurus australis*). Hurstville, NSW National Parks and Wildlife Service.

NSW Scientific Committee (1998). Final determination to list *Angophora inopina* as a vulnerable species. Hurstville, NSW National Parks and Wildlife Service.

NSW Scientific Committee (1998). Final determination to list *Grevillea parvilfora* ssp. *parviflora* as a vulnerable species. Hurstville, NSW National Parks and Wildlife Service.

NSW Scientific Committee (1998). Final determination to list *Melaleuca biconvexa* as a vulnerable species. Hurstville, NSW National Parks and Wildlife Service.

NSW Scientific Committee (1998). Final determination to list *Prostanthera askania* as an endangered species. Hurstville, NSW National Parks and Wildlife Service.

NSW Scientific Committee (1999). Final determination to list *Callistemon linearifolius* as a vulnerable species. Hurstville, NSW National Parks and Wildlife Service.

NSW Scientific Committee (1999). Final determination to list the Giant Barred Frog as an endangered species. Hurstville, NSW National Parks and Wildlife Service.

NSW Scientific Committee (2000). Final determination to list Littlejohn's tree Frog as a vulnerable species. Hurstville, NSW National Parks and Wildlife Service.

NSW Scientific Committee (2002). Final determination to list *Caladenia tessellata* as an endangered species. Hurstville, NSW National Parks and Wildlife Service.

NSW Scientific Committee (2003). Final determination to list the Stuttering Frog as an endangered species. Hurstville, NSW National Parks and Wildlife Service.

OEH. (2016). NSW Guide to Surveying Threatened Plants. 59 Goulbourn Street Sydney NSW 2000.

OEH. (2017a). Ancillary rules: Reasonable steps to seek like-for-like biodiversity credits for the purpose of applying the variation rules, published under clause 6.5 of the Biodiversity Conservation Regulation 2017.

OEH. (2020b). Biodiversity Assessment Method. NSW Office of Environment and Heritage Retrieved from https://www.environment.nsw.gov.au/biodiversity/assessmentmethod.htm.

OEH. (2017c). Guidance to assist a decision-maker to determine a serious and irreversible impact.Pizzey, G. and F. Knight (1997). Field Guide to the Birds of Australia. Sydney, Angus and Robertson.

OEH. (2021a). Bionet Atlas of NSW. Retrieved from https://www.environment.nsw.gov.au/atlaspublicapp/UI_Modules/ATLAS_/AtlasSearch.aspx.

OEH. (2021b). High Threat Exotic Species List. Retrieved from https://www.lmbc.nsw.gov.au/bamcalc.

OEH. (2021d). The NSW Biodiversity Values Map. Retrieved from https://www.environment.nsw.gov.au/biodiversity/biodiversity-values-map.htm.

OEH. (2021e). NSW Bionet Vegetation Information System. Retrieved from http://www.environment.nsw.gov.au/NSWVCA20PRapp/LoginPR.aspx.

OEH. (2021f). Threatened Species Profile Database. Retrieved from https://www.environment.nsw.gov.au/threatenedSpeciesApp/. Transmitting Station.

Pennay, M., Law, B., & Reinhold, L. (2004). Bat calls of New South Wales: Region based guide to the echolocation calls of Microchiropteran bats. Hurstville.

Quin, D. G. (1995). "Population ecology of the Squirrel Glider (*Petaurus norfolcensis*) and the Sugar Glider (*P. breviceps*) (Maruspialia : Petauridae) at Limeburners Creek, on the central north coast of New South Wales " Wildlife Research **22**(4): 471 - 505

Robinson, L. (1994). Field guide to the native plants of Sydney. Sydney, Kangaroo Press.

Royal Botanic Gardens. (2007). "PlantNet - The Plant Information Network System of Botanic Gardens Trust (version 2.0)." from http://plantnet.rbgsyd.nsw.gov.au/.

Royal Botanic Gardens. (2009). "PlantNet - The Plant Information Network System of Botanic Gardens Trust (version 2.0)." from http://plantnet.rbgsyd.nsw.gov.au/.

Royal Botanic Gardens. (2016). "PlantNet - The Plant Information Network System of Botanic Gardens Trust (version 2.0)." from http://plantnet.rbgsyd.nsw.gov.au/.

Saunders, D. L. and R. Heinsohn (2008). "Winter habitat use by the endangered, migratorty Swift Parrot (*Lathamus discolor*) in New South Wales." Emu **108**: 81-89.

Schultz, M., R. Coles, et al. (1999). Large-eared Pied Bat Chalinolobus dwyeri. The Action Plan for Australian Bats. A. Duncan, G. Baker and M. N. Canberra, Environment Australia**:** 39-41.

Specht, R. L. (1981). Major vegetation formation in Australia. Ecological Biogeography of Australia. A. Keast. The Hague, Junk**:** 163-298.

Strahan, R. (1995). The Mammals of Australia. Sydney, Reed New Holland.

Swift Parrot Recovery Team (2001). Swift Parrot Recovery Plan. Department of Primary Industries, Water and Environment (Tasmania),. Hobart, Department of Primary Industries, Water and Environment.

The “Blue Book” Landcom (2004) Managing Urban Stormwater: Soils and Construction, 4th edition.

Webb, J. K. and R. Shine (1994). Habitat use by the broad-headed snake, *Hoplocephalus bungaroides*. Canberra, Environment Australia.

Webb, J. K. and R. Shine (1998). "Ecological characteristic of an endangered snake species *Hoplocephalus bungaroides* (Serpentes: Elapidae)." Animal Conservation **1**: 185-193.

Appendix A

Species of flora recorded within the project site

Table 6-1 Flora species recorded from the project site

Family Name	Scientific Name	Common Name	Native
Asclepiadaceae			
	Araujia sericifera	Moth Vine	N
Asparagaceae			
	Asparagus aethiopicus	Asparagus Fern	N
Asteraceae			
	Bidens pilosa	Cobbler's Pegs	N
	Cirsium vulgare	Spear Thistle	N
	Conyza albida	Tall Fleabane	N
	Conyza bonariensis	Flaxleaf Fleabane	N
	Gamochaeta americana	American Cudweed	N
	Onopordum acanthium		N
	Senecio madagascariensis	Fireweed	N
	Sonchus oleraceus	Common Sowthistle	N
	Vittadinia cuneata	Fuzzweed	Y
Casuarinaceae			
	Casuarina glauca	Swamp Oak	Y
Convolvulaceae			
	Dichondra repens	Kidney Weed	Y
Euphorbiaceae			
	Poranthera microphylla		Y
Fabaceae (Faboideae)			
	Trifolium repens	White Clover	N
Malvaceae			
	Sida corrugata	Vaiable Sida	Y
	Sida rhombifolia	Paddy's Lucerne	N
Myrtaceae			
	Eucalyptus amplifolia	Cabbage Gum	Y
Oleaceae			
	Ligustrum lucidum	Large-leaved Privet	N
Oxalidaceae			
	Oxalis perennans		Y
Plantaginaceae			
	Plantago lanceolata	Lamb's Tongues	N
Poaceae			
	Cynodon dactylon	Common Couch	Y
	Ehrharta erecta	Panic Veldtgrass	N
	Paspalum dilatatum	Paspalum	N
	Pennisetum clandestinum	Kikuyu Grass	N
	Setaria gracilis	Slender Pigeon Grass	N
Polygonaceae			
	Rumex crispus	Curled Dock	N
Primulaceae			
	Anagallis arvensis	Scarlet/Blue Pimpernel	N
Solanaceae			
	Solanum linnaeanum	Apple of Sodom	N
Verbenaceae			
	Verbena rigida	Veined Verbena	N

Appendix B

Species of animal recorded within the study area

Table 6-2 Fauna species recorded within the study area

Family Name	Common Name	Scientific Name	Observation Type
Amphibians			
Myobatrachidae	Common Eastern Froglet	*Crinia signifera*	C
Reptiles			
Scincidae	Eastern Water Skink	*Eulamprus quoyii*	O
Scincidae	Garden Skink	*Lampropholis guichenoti*	O
Birds			
Anatidae	Australian Wood Duck	*Chenonetta jubata*	O, C
Anatidae	Grey Teal	*Anas gracilis*	Fl
Artamidae	Australian Magpie	*Gymnorhina tibicen*	O, C
Artamidae	Pied Butcherbird	*Cracticus nigrogularis*	O
Artamidae	Grey Butcherbird	*Cracticus torquatus*	O
Cacatuidae	Galah	*Cacatua roseicapilla*	O, C
Cacatuidae	Sulphur Crested -Cockatoo	*Cacatua galerita*	O
Columbidae	Spotted Turtle-Dove	*Streptopelia chinensis*	O
Dicruridae	Magpie-lark	*Grallina cyanoleuca*	O, C
Dicruridae	Willie Wagtail	*Rhipidura leucophrys*	O
Halcyonidae	Laughing Kookaburra	*Dacelo novaeguineae*	O,F
Meliphagidae	Noisy Miner	*Manorina melanocephala*	O
Meliphagidae	Red Wattlebird	*Anthochaera carunculata*	O
Meliphagidae	White-eared Honeyeater	*Lichenostomus leucotis*	O
Passeridae	House Sparrow	*Passer domesticus*	O
Psittacidae	Australian King-Parrot	*Alisterus scapularis*	O
Psittacidae	Crimson Rosella	*Platycercus elegans*	O
Psittacidae	Rainbow Lorikeet	*Trichoglossus haematodus*	O, C
Sturnidae	Common Myna	*Acridotheres tristis*	O
Mammals			
Petauridae	Common Ringtail Possum	*Pseudocheirus peregrinus*	Sc
Phalangeridae	Common Brushtail Possum	*Trichosurus vulpecula*	Sc

Key:

A - Anabat	C	-	Call Identification
O - Observation	P	-	Call Playback Response
F - Feather	S	-	Habitat Search
Sp - Spotlight	Sc	-	Scat, Track
D - Diggings			

Appendix C

Threatened flora species recorded in the locality

Appendix C Threatened Flora species recorded in the locality

This appendix details the Threatened species of plant that have either been recorded in the local area based on records the Bionet *Atlas of NSW Wildlife* Department of Planning, Industry and Environment, 2021, data received 29th of July 2021 and records from the Royal Botanical Gardens. Threatened species with habitat likely to occur in the locality were also considered based on records from the *EPBC Protected Matters Search Tool* Department of Sustainability, Environment, Water, Population and Communities 2021, data received 23rd of May 2021.

Table 6-3 Threatened flora species recorded in the locality

Family Name	Scientific Name	Common Name	BC Act[1]	EPBC Act[3]	ROTAP[2]	Habitat	Likelihood of occurrence within the study area
Asclepiadaceae	*Cynanchum elegans*	White-flowered Wax Plant	E1	E	3Ei	Occurs from the Gloucester district to the Wollongong area and inland to Mt Dangar where it grows in rainforest gullies, scrub and scree slopes {Harden, 1992 #3}. This species typically occurs at the ecotone between dry subtropical forest/woodland communities {NSW National Parks and Wildlife Service, 2002 #70; James, 1997 #69}.	**Low** No suitable habitat exists from the study area for this species.
Asteraceae	*Olearia cordata*		V	V	2Ra	Occurs chiefly from Wiseman's Ferry to Wollombi where it grows on sandstone in dry sclerophyll forest and open shrubland {Harden, 1992 #3}. Specifically this species occurs on exposed Hawkesbury Sandstone ridges in shallow or skeletal soils. Occurs on Gymea and Hawkesbury soil types and may be associated with shale. Associated species include Angophora costata, A. bakeri, Eucalyptus punctata and Corymbia eximia with understorey including Allocasuarina torulosa, Acacia linifolia, Persoonia linearis, Leucopogon muticus and grasses. Also been recorded with E.eugenioides or near Wollemi with E. oblonga, E. notabilis and Leptospermum trinervium. Corymbia gummifera and Angophora euryphylla also noted in northern areas {NSW National Parks and Wildlife Service, 2000 #277}.	**Low** No suitable habitat exists from the study area for this species.
Asclepiadaceae	*Marsdenia viridiflora ssp. viridiflora*	Native Pear				Occurs in subcoastal and southern Queensland but rarely in NSW with a disjunct occurrence near Sydney. It occurs as scattered plants in remnant woodland and scrub {NSW Scientific Committee, 2000 #80; Harden, 2002 #5}.	**Low** Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species.
Casuarinaceae	*Allocasuarina glareicola*		E1	E		Restricted to the Sydney basin where it occurs north east of Penrith in or near Castlereagh State Forest. Grows on lateritic soil in open forest {Harden, 2000 #2}.	**Low** No suitable habitat exists from the study area for this species.
Epacridaceae	*Epacris purpurascens var. purpurascens*		V		2K	Occurs in Gosford and Sydney districts where it grows in sclerophyll forest, scrub and swamps {Harden, 1992 #3}. Usually found in sites with a strong shale influence {NSW National Parks and Wildlife Service, 2002 #67}.	**Low** No suitable habitat exists from the study area for this species..

Family Name	Scientific Name	Common Name	BC Act[1]	EPBC Act[3]	ROTAP[2]	Habitat	Likelihood of occurrence within the study area
Fabaceae (Faboideae)	*Dillwynia tenuifolia*		V	V	2Vi	Occurs on the Cumberland Plain from the Blue Mountains to Howes Valley area where it grows in dry sclerophyll woodland on sandstone, shale or laterite {Harden, 2002 #5}. Specifically, occurs within Castlereagh woodlands, particularly in shale gravel transition forest. Associated species include *Eucalyptus fibrosa, E. sclerophylla, Melaleuca decora, Daviesia ulicifolia, Dillwynia juniperina* and *Allocasuarina littoralis* {James, 1997 #69}.	**Low** No suitable habitat exists from the study area for this species.
Epacridaceae	*Leucopogon fletcheri ssp. fletcheri*		E1		2R	Grows in dry eucalypt woodland or in shrubland on clay, lateritic soils or Hawkesbury sandstone {Fairley, 2004 #523}. Found on sandstone ridges and upper slopes in heath or woodland, sometimes in or below sandstone-shale ecotone; often associated with lateritic soils with some clay influence {James, 1999 #68; James, 1997 #521}.	**Low** No suitable habitat exists from the study area for this species.
Fabaceae (Faboideae)	*Pultenaea parviflora*		E1	V	2E	Restricted to the Cumberland Plain where it grows in dry sclerophyll forest on Wiannamatta shale, laterite or alluvium {Harden, 2002 #5}. Locally abundant within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. Also occurs in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland {NSW National Parks and Wildlife Service, 2002 #82; James, 1997 #69}.	**Low** Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species.
Fabaceae (Mimosoideae)	*Acacia bynoeana*	Bynoe's Wattle	E1	V	3V	Occurs south of Dora Creek-Morisset area to Berrima and the Illawarra region and west to the Blue Mountains. It grows mainly in heath and dry sclerophyll forest on sandy soils {Harden, 2002 #5}. Seems to prefer open, sometimes disturbed sites such as trail margins and recently burnt areas. Typically occurs in association with *Corymbia gummifera, Eucalyptus haemastoma, E. gummifera, E. parramattensis, E. sclerophylla, Banksia serrata* and *Angophora bakeri* {NSW National Parks and Wildlife Service, 1999 #61}.	**Low** Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species.
Fabaceae (Mimosoideae)	*Acacia gordonii*		E1	E	2K	Occurs in the lower Blue Mountains from Bilpin to Faulconbridge and also in the Glenorie district. Grows on sandstone outcrops and amongst rock platforms in dry sclerophyll forest and heath {Harden, 2002 #5; NSW Scientific Committee, 1997 #298}. Specifically this species occurs in Sydney Sandstone Ridgetop Communities {James, 1997 #69}.	**Low** No suitable habitat exists from the study area for this species.

Family Name	Scientific Name	Common Name	BC Act[1]	EPBC Act[3]	ROTAP[2]	Habitat	Likelihood of occurrence within the study area
Fabaceae (Mimosoideae)	*Acacia pubescens*	Downy Wattle	V	V	3Va	Restricted to the Sydney Region from Bilpin to the Georges River and also at Woodford where it usually grows in open sclerophyll forest and woodland on clay soils. Typically it occurs at the intergrade between shales and sandstones in gravely soils often with ironstones {Harden, 2002 #5;NSW National Parks and Wildlife Service, 2003 #14}.	**Low** Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species.
Haloragaceae	*Haloragis exalata ssp. exalata*		V	V	3Va	Found in the south coast, central coast and north west slopes botanical regions where it appears to require protected and shaded damp situations in riparian habitats {Harden, 2002 #5; Department of Environment and Climate Change, 2008 #1913}.	**Low** No suitable habitat exists from the study area for this species.
Haloragaceae	*Haloragodendron lucasii*		E1	E	2Ea	Confined to the Sydney area where it grows in dry sclerophyll open forest on sheltered slopes near creeks on sandstone {Harden, 2002 #5}. Reported to grow in moist sandy loam soils in sheltered aspects, and on gentle slopes below cliff-lines near creeks in low open woodland. Associated with high soil moisture and relatively high soil-phosphorus levels {Department of Environment and Conservation, 2005 #762}.	**Low** No suitable habitat exists from the study area for this species.
Myrtaceae	*Darwinia biflora*		V	V	2Va	Occurs from Cheltenham to Hawkesbury River where it grows in heath on sandstone or in the understorey of woodland on shale-capped ridges {Harden, 2002 #5}. Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. Associated over-storey species include *Eucalyptus haemastoma, Corymbia gummifera* and/or *E. squamosa.* The vegetation structure is usually woodland, open forest or scrub-heath {Department of Environment and Climate Change, 2008 #1913}.	**Low** No suitable habitat exists from the study area for this species.
Myrtaceae	*Eucalyptus camfieldii*	Heart-leaved Stringybark	V	V	2Vi	Occurs from Tomago to the Royal National Park where it grows in coastal shrub heath in sandy soils on sandstone {Harden, 2002 #5}.	**Low** No suitable habitat exists from the study area for this species.
Myrtaceae	*Eucalyptus nicholii*	Narrow-leaved Black Peppermint	V	V	3V	Occurs from Niangala to Glenn Innes where it grows in grassy sclerophyll woodland on shallow relatively infertile soils on shales and slates (Harden, 1991; DLWC, 2001). Endemic on the NSW Northern Tablelands, of limited occurrence, particularly in the area from Walcha to Glen Innes; often on porphyry or granite (Brooker and Kleinig 1999).	**Low** No suitable habitat exists from the study area for this species.
Myrtaceae	*Eucalyptus scoparia*		E1	V	2Vi	Occurs in Queensland and reaches its southern limit in NSW. In NSW it is known from three locations all near Tenterfield in the far northern New England Tableland Bioregion where it grows on well drained granitic hilltops, slopes and outcrops, often as scattered trees in open forest and woodland {Royal Botanic Gardens, 2004 #9}.	**Low** No suitable habitat exists from the study area for this species.

Family Name	Scientific Name	Common Name	BC Act[1]	EPBC Act[3]	ROTAP[2]	Habitat	Likelihood of occurrence within the study area
Myrtaceae	*Eucalyptus sp. Cattai*		E1			Occurs in the area between Colo Heights and Castle Hill, historic records include the Royal Botanic Gardens, Sydney. It grows as an emergent tree in scrub, heath and low woodland on sandy soils, generally on flat ridge tops. It usually occurs as isolated individuals or occasionally in small clustered groups {Harden, 2002 #5}.	**Low** Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species
Myrtaceae	*Leptospermum deanei*		V	V	2V	Only occurs near the watershed of Lane Cove River where it grows on forested slopes {Harden, 2002 #5}.Woodland on lower hills and slopes or near creeks, sandy alluvial soil or sand over sandstone. Occurs in Riparian Scrub- e.g. *Tristaniopsis laurina, Baechea myrtifolia*, Woodland- e.g. *Eucalyptus haemstoma* and Open Forest - e.g. *Angophora costata, Leptospermum trinervium* and *Banksia ercifolia*.	**Low** No suitable habitat exists from the study area for this species.
Myrtaceae	*Melaleuca biconvexa*	Biconvex Paperbark	V	V		Occurs as disjunct populations in coastal New South Wales from Jervis Bay to Port Macquarie, with the main concentration of records is in the Gosford/Wyong area {NSW Scientific Committee, 1998 #145}. Grows in damp places, often near streams, or low-lying areas on alluvial soils of low slopes or sheltered aspects {Harden, 2002 #5; Department of Environment and Climate Change, 2008 #1913}.	**Low** No suitable habitat exists from the study area for this species.
Myrtaceae	*Melaleuca deanei*		V	V	3R	Occurs in coastal districts, including western Sydney (e.g. Baulkham Hills, Liverpool shires) from Berowra to Nowra where it grows in wet heath on sandstone and shallow/skeletal soils near streams or perched swamps {James, 1997 #69; Harden, 2002 #5}.	**Low** No suitable habitat exists from the study area for this species.
Myrtaceae	*Micromyrtus minutiflora*		E1	V	2V	Occurs in the western part of the Cumberland Plain between Richmond and Penrith where it grows on Tertiary sediments in dry sclerophyll forest {NSW Scientific Committee, 2002 #98; Harden, 2002 #5}.	**Low** No suitable habitat exists from the study area for this species.
Myrtaceae	*Syzygium paniculatum*	Magenta Lilly Pilly	V	V	3Ri	Occurs between Buladelah and St Georges Basin where it grows in subtropical and littoral rainforest on sandy soils or stabilized dunes near the sea {Harden, 2002 #5}. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities {Department of Environment and Climate Change, 2008 #1913}.	**Low** No suitable habitat exists from the study area for this species.
Myrtaceae	*Rhodamnia rubescens*	Scrub Turpentine	CE			Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	**Low** No suitable habitat exists from the study area for this species.

Family Name	Scientific Name	Common Name	BC Act[1]	EPBC Act[3]	ROTAP[2]	Habitat	Likelihood of occurrence within the study area
Myrtaceae	*Rhodomyrtus psidioides*	Native Guava	CE			Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. This species is characterised being extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	**Low** No suitable habitat exists from the study area for this species.
Orchidaceae	*Cryptostylis hunteriana*	Leafless Tongue Orchid	V	V	3V	Occurs south from the Gibraltar Range, chiefly in coastal districts but also extends on to tablelands. Grows in swamp-heath and drier forest on sandy soils on granite & sandstone. Occurs in small, localised colonies most often on the flat plains close to the coast but also known from some mountainous areas growing in moist depressions and swampy habitats {Harden, 1993 #4; NSW National Parks and Wildlife Service, 1999 #502}.	**Low** No suitable habitat exists from the study area for this species.
Orchidaceae	*Genoplesium baueri*		V		3R	Grows in sparse sclerophyll forest and moss gardens over sandstone; from the Hunter Valley to Nowra district {Royal Botanic Gardens, 2004 #9}.	**Low** No suitable habitat exists from the study area for this species.
Orchidaceae	*Rhizanthella slateri*	Eastern Australian Underground Orchid	V	E	3K	Highly cryptic as only the flowers may occur above ground. It is more frequent in areas of soil disturbance, but further habitat characteristics or associated vegetation types are poorly known, possibly occuring in sclerophyll forests (Department of Environment and Climate Change 2008).	**Low** No suitable habitat exists from the study area for this species.
Orchidaceae	*Pterostylis gibbosa*		E1	E	2E	Occurs in the southern part of the Central Coast region with a disjunct population in the Hunter Valley. Grows among grass in sclerophyll forest {Harden, 2002 #5}. In the Illawarra it grows in Coastal Grassy Red Gum Forest and in Lowland Woolybutt-Melaleuca forest {NSW National Parks and Wildlife Service, 2003 #73}.	**Low** No suitable habitat exists from the study area for this species.
Orchidaceae	*Pterostylis saxicola*	Sydney Plains Greenhood	E1	E		Known now only from Freemans Reach to Picton district. Grows in Sydney Sandstone Gully Forest in shallow or skeletal soils over sandstone shelves, often near streams {Harden, 1993 #4; James, 1997 #69; Department of Environment and Climate Change, 2007 #1653}	**Low** No suitable habitat exists from the study area for this species.
Polygonaceae	*Persicaria elatior*	Tall Knotweed	V	V	3V	Occurs infrequently in coastal regions where it grows in damp places especially beside streams and lakes. Also occasionally occurs in swamp forest or associated with disturbance {Department of Environment and Conservation, 2005 #762; Harden, 2000 #2}.	**Low** No suitable habitat exists from the study area for this species.
Proteaceae	*Grevillea juniperina ssp. juniperina*		V			Restricted to western Cumberland Plain, Marsden Park, Rooty Hill, Riverstone, Plumpton, Castlereagh NR, Blacktown, Penrith and north to Pitt Town, where it grows in open dry sclerophyll (eucalypt-dominated) forest or woodland, at altitudes of less than about 50 m, in sandy to clay-loam soils and red pseudolateritic or sandy gravels {Royal Botanic Gardens, 2005 #404; Fairley, 2004 #523}. More specifically it grows in Cumberland Plain Woodland and Castlereagh Woodland, typically in moist sites, often beside creeks on acidic soils and often recorded on road verges. Restricted to red sandy to clay soils (often lateritic) on Wianamatta Shale and Tertiary Alluvium {NSW Scientific Committee, 2000 #582}.	**Low** Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species.

Family Name	Scientific Name	Common Name	BC Act[1]	EPBC Act[3]	ROTAP[2]	Habitat	Likelihood of occurrence within the study area
Proteaceae	*Grevillea parviflora ssp. parviflora*	Small-flower Grevillea	V	V		Mainly known from the Prospect area (but now extinct there) and lower Georges River to Camden, Appin and Cordeaux Dam areas, with a disjunct populations near Putty, Cessnock and Cooranbong. Grows in heath or shrubby woodland in sandy or light clay soils usually over thin shales {NSW Scientific Committee, 1998 #78; Harden, 2002 #5}.	**Low** Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species.
Proteaceae	*Persoonia hirsuta*		E1	E	3Ki	Occurs in central coast and central tableland districts where it grows in woodland to dry sclerophyll forest on sandstone {Harden, 2002 #5} and rarely shale {NSW Scientific Committee, 1998 #64}. Often occurs in areas with clay influence, in the ecotone between shale and sandstone {James, 1997 #69}.	**Low** No suitable habitat exists from the study area for this species.
Proteaceae	*Persoonia mollis ssp. maxima*		E1	E	2E	Restricted to the Hornsby Heights, Mt Colah area north of Sydney. It occurs on sheltered upper hillsides of narrow gullies of Hawkesbury sandstone characterised his by steep side slopes, rocky benches and broken scarps, with creeks fed by small streams and intermittent drainage depressions. It grows in moist, tall forest (*Angophora costata, Eucalyptus piperita, Corymbia gummifera*), often with warm temperate rainforest influences (*Syncarpia glomulifera, Ceratopetalum apetalum, Callicoma serratifolia*). Sometimes recorded in low densities on the dry upper-hillsides of gullies and in more exposed aspects in association *with E. haemastoma* and *E. punctata* {NSW National Parks and Wildlife Service, 2000 #19}.	**Low** No suitable habitat exists from the study area for this species.
Proteaceae	*Persoonia nutans*	Nodding Geebung	E1	E	2Ei	Confined to the Cumberland Plain where it grows in Castlereagh Scribbly Gum Woodlands and Agnes Banks Woodlands {NSW National Parks and Wildlife Service, 2001 #77; Harden, 2002 #5; James, 1997 #69}.	**Low** Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species.
Rhamnaceae	*Pomaderris brunnea*		V	V	2V	Confined to the Colo and Upper Nepean Rivers where it grows in open forest {Harden, 2000 #2}; in western Sydney (Camden to Picton area) known from sandy alluvium on levee and creek banks {James, 1997 #69}.	**Low** No suitable habitat exists from the study area for this species.
Rutaceae	*Asterolasia elegans*		E1	E	2Ea	Only known to occur in one locality, north of Maroota, where it grows in wet sclerophyll forest on moist hillsides {Harden, 2002 #5}.	**Low** No suitable habitat exists from the study area for this species.

Family Name	Scientific Name	Common Name	BC Act[1]	EPBC Act[3]	ROTAP[2]	Habitat	Likelihood of occurrence within the study area
Rutaceae	*Zieria involucrata*		E1	V	2Va	Occurs in the Blue Mountains where it grows in wet sclerophyll forest {Harden, 2002 #5}. Occurs primarily on Hawkesbury sandstone. Also occurs on Narrabeen Group sandstone and on Quaternary alluvium. Found primarily in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest, although some populations extend upslope into drier vegetation. Also known from at least two atypical ridgetop locations. The canopy typically includes Syncarpia glomulifera subsp. glomulifera (Turpentine), Angophora costata (Smooth-barked Apple), Eucalyptus agglomerata (Blue-leaved Stringybark) and Allocasuarina torulosa (Forest Oak) {Department of Environment and Climate Change, 2008 #1913}.	**Low** No suitable habitat exists from the study area for this species.
Sterculiaceae	*Lasiopetalum joyceae*		V	V	2R	Occurs on lateritic to shaley ridgetops of the Hornsby Plateau where it grows in heath and open woodland in sandy soils on sandstone {NSW Scientific Committee, 1999 #18;Harden, 2000 #2;Fairley, 2002 #15}.	**Low** No suitable habitat exists from the study area for this species.
Santalaceae	*Thesium australe*	Austral Toadflax	V	V	3Vi	Grows in grassland or woodland often in damp sites. It is a semi-parasitic herb and hosts are likely to be Themeda australis and Poa spp. {Harden, 1992 #3; Department of Environment and Climate Change, 2008 #1913}.	**Low** No suitable habitat exists from the study area for this species.
Thymelaeaceae	*Pimelea curviflora var. curviflora*		V	V		Confined to coastal areas around Sydney where it grows on sandstone and laterite soils. It is found between South Maroota, Cowan, Narrabeen, Allambie Heights, Northmead and Kellyville, but its former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. Usually occurs in woodland in the transition between shale and sandstone, often on Lucas Heights soil landscape {NSW Scientific Committee, 1998 #65; James, 1997 #69; James, 1999 #68; Harden, 2000 #2}.	**Low** No suitable habitat exists from the study area for this species.
Thymelaeaceae	*Pimelea spicata*		E1	E	3Ei	This species occurs in two disjunct areas: in coastal districts from Lansdowne to Shellharbour, and in Cumberland Plain Woodland inland to Penrith. In western Sydney it grows on Wianamatta Shales in Greybox - Ironbark Woodland with *Bursaria spinosa* and *Themeda australis*. In the Illawarra, it occurs on well structured clay soils in grassland or open woodland {NSW National Parks and Wildlife Service, 2000 #75; Harden, 2000 #2; James, 1997 #69}.	**Low** Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species.

Family Name	Scientific Name	Common Name	BC Act[1]	EPBC Act[3]	ROTAP[2]	Habitat	Likelihood of occurrence within the study area
Tremandraceae	*Tetratheca glandulosa*		V	V	2V	Occurs from Mangrove Mountain to the Blue Mountains where it grows in sandy or rocky heath or scrub {Harden, 1992 #3}. Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone, with associated soil landscapes such as Lucas Heights, Gymea, Lambert and Faulconbridge. Topographically, the plant occupies ridge tops, upper-slopes and to a lesser extent mid-slope sandstone benches. Soils are generally shallow, consisting of a yellow, clayey/sandy loam. Stony lateritic fragments are also common in the soil profile on many of these ridgetops. Vegetation structure varies from heaths and scrub to woodlands/open woodlands, and open forest. Vegetation communities correspond broadly to Benson & Howell's Sydney Sandstone Ridge top Woodland (Map Unit 10ar). Common woodland tree species include: *Corymbia gummifera, C. eximia, Eucalyptus haemastoma, E. punctata, E. racemosa,* and/or *E. sparsifolia*, with an understorey dominated by species from the families Proteaceae, Fabaceae, and Epacridaceae {Department of Environment and Climate Change, 2008 #1913}.	**Low** No suitable habitat exists from the study area for this species.

1) V= Vulnerable, E1 = Endangered (BC Act) E2= Endangered Population **2)** ROTAP (Rare or Threatened Australian Plants, Briggs and Leigh 1996) is a conservation rating for Australian plants. 1 = Species only known from one collection. 2 = Species with a geographic range of less than 100km in Australia. 3 = Species with a geographic range of more than 100km in Australia, X = Species presumed extinct; no new collections for at least 50 years. E = Endangered species at risk of disappearing from the wild state if present land use and other causal factors continue to operate, V = Vulnerable species at risk of long-term disappearance through continued depletion. R = Rare, but not currently considered to be endangered. K = Poorly known species that are suspected to be threatened. C = Known to be represented within a conserved area. a = At least 1,000 plants are known to occur within a conservation reserve(s). i = Less than 1,000 plants are known to occur within a conservation reserve(s). The reserved population size is unknown. t = The total known population is reserved. + = The species has a natural occurrence overseas. **3)** V = Vulnerable, E = Endangered *(Environment Protection and Biodiversity Conservation Act 1999*).

Appendix D

Threatened fauna species recorded in the locality

Appendix D Threatened fauna species recorded in the locality

This appendix details the Threatened species of plant that have either been recorded in the local area based on records the *Atlas of NSW Wildlife* Department of Environment & Heritage, 2021, data received 23rd of May 2021 and records from the Royal Botanical Gardens. Threatened species with habitat likely to occur in the locality were also considered based on records from the *EPBC Protected Matters Search Tool* Department of Sustainability, Environment, Water, Population and Communities 2020, data received 29th of July 2021.

Table 6-4 Threatened fauna species recorded in the locality

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
Amphibians					
Heleioporus australiacus	Giant Burrowing Frog	V	V	Appears to exist as two distinct populations: a northern population largely confined to the sandstone geology of the Sydney Basin, from Wollemi National Park in the north and extending south to Jervis Bay; and a southern population occurring in disjunct pockets from about Narooma south into eastern Victoria. In the northern population there is a marked preference for sandstone ridge-top habitat and broader upland valleys. In these locations the frog is associated with small headwater creek-lines and along slow flowing to intermittent creek-lines. The vegetation is typically woodland, open woodland and heath and may be associated with 'hanging swamp' seepage lines and where small pools form from the collected water. They have also been observed occupying artificial ponded structures such as fire dams, gravel 'borrows', detention basins and box drains that have naturalised over time and are still surrounded by other undisturbed habitat. In the southern population, records from Narooma, Bega, Bombala and eastern Victoria appear to be associated with Devonian igneous and sedimentary formations and Ordovician metamorphics and are generally from more heavily timbered areas. However, again there appears to be an association with ridge-tops, headwaters and slow flowing streams. Do not appear to inhabit areas that have been cleared for agriculture or for urban development. Breed in summer and autumn in burrows in the banks of small creeks. Often spends significant periods of time underground during unfavourable conditions and to avoid detection during the day. (Cogger 2000; NSW National Parks and Wildlife Service 2001).	**Low** No suitable habitat was recorded from the study area for this species.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
Litoria aurea	Green and Golden Bell Frog	E1	V	Has a fragmented distribution of mainly near coastal locations from Lakes Entrance (Victoria) to south of the NSW-Queensland border;as far west as Bathurst in the more elevated southern tablelands and central slopes of NSW. Various types of habitat utilised has been documented. For breeding utilises a wide range of waterbodies, including both natural and man-made structures, such as marshes, dams and stream sides, and ephemeral locations that are more often dry than wet. Is found in various small pockets of habitat in otherwise developed areas and has the tendency of often turning up in highly disturbed sites. Lotic situations such as fast flowing streams appear to be one of the few water bodies not utilised, at least for breeding purposes. Habitat attributes associated with the various waterbodies occupied by the GGBF, and that appear to make such habitat more likely to be occupied, include that the water body is shallow, still or slow flowing, ephemeral and/or widely fluctuating, unpolluted and without heavy shading. Permanent waterbodies are also known to be used and there is historical evidence of occupation of large, often deep and permanent bodies of water. There is a clear preference shown by GGBF for sites with a complexity of vegetation structure and associated terrestrial habitat attributes that appear to favour the species include extensive grassy areas and an abundance of shelter sites such as rocks, logs, tussock forming vegetation and other cover, considered to be used for foraging and shelter. Over-wintering sites may be adjacent to or some distance away from breeding sites; such sites include the bases of dense vegetation tussocks, beneath rocks, timber, within logs or beneath ground debris, including human refuse such as sheet iron, but the full range of possible habitat used for this purpose is not yet well understood {Department of Environment and Conservation, 2004 #397; Department of Environment and Conservation, 2005 #398} .	**Low** No suitable habitat was recorded from the study area for this species.
Litoria littlejohni	Heath Frog	V	V	Distributed along the eastern slopes of the Great Dividing Range from Watagan State Forest near Wyong, south to Buchan in north-eastern Victoria. It appears to be restricted to sandstone woodland and heath communities at mid to high altitude. It forages both in the tree canopy and on the ground, and it has been observed sheltering under rocks on high exposed ridges during summer. It is not known from coastal habitats (NSW Scientific Committee 2000).	**Low** No suitable habitat was recorded from the study area for this species.
Mixophyes balbus	Stuttering Frog	E1	V	Terrestrial species, found in rainforest, Antarctic beech forest or wet sclerophyll forest. The species depends on freshwater streams and riparian vegetation for breeding and habitation. No records are known from riparian habitat that has been disturbed (Cogger 2000; NSW Scientific Committee 2003).	**Low** No suitable habitat was recorded from the study area for this species.
Mixophyes iteratus	Giant Barred Frog	E1	E	Terrestrial species which occurs in rainforests, antarctic beech or wet sclerophyll forests. Feeds on insects and smaller frogs (Cogger 2000). The species is associated with permanent flowing drainages, from shallow rocky rainforest streams to slow-moving rivers in lowland open forest. It is not known to utilise still water areas (NSW Scientific Committee 1999). More prevalent at lower altitudes and in larger streams than its congeners, although has been recorded up to 1000 metres asl. (NSW National Parks and Wildlife Service 1999).	**Low** No suitable habitat was recorded from the study area for this species.
Fish					

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
Macquaria australasica	Macquarie Perch		E	The natural range of Macquarie Perch included the upper and middle reaches of the Murray-Darling basin as well as the Shoalhaven and Hawkesbury Rivers. However, this species has recently been sighted in only a few localities within these river systems. Preferred habitat is deep holes covered with rocks, and spawning occurs above shallow running water. Macquarie Perch is a schooling species (Department of the Environment and Water Resources, 2007).	**Low** No suitable habitat was recorded from the study area for this species.
Prototroctes maraena	Australian Grayling		V	It is a mid-water, freshwater species that occurs most commonly in clear, gravely streams with a moderate flow. Prefers deep, slow flowing pools (NSW Fisheries 2004).	**Low** No suitable habitat was recorded from the study area for this species.
Invertebrates					
Petalura gigantea	Giant Dragonfly	E1		Found in permanent wetlands, both coastal and upland from moss Vale northwards to southern Queensland (Department of Environment and Conservation 2005).	**Low** No suitable habitat was recorded from the study area for this species.
Birds					
Apus pacificus	Fork-tailed Swift		M	Breeds from central Siberia eastwards through Asia, and is migratory, wintering south to Australia. Individuals never settle voluntarily on the ground and spend most of their lives in the air, living on the insects they catch in their beaks (Higgins 1999).	**Low** No suitable habitat was recorded from the study area for this species.
Ardea alba	Great Egret		M	Great Egrets occur throughout most of the world. They are common throughout Australia, with the exception of the most arid areas. Great Egrets prefer shallow water, particularly when flowing, but may be seen on any watered area, including damp grasslands. Great Egrets can be seen alone or in small flocks, often with other egret species, and roost at night in groups. In Australia, the breeding season of the Great Egret is normally October to December in the south and March to May in the north. This species breeds in colonies, and often in association with cormorants, ibises and other egrets. (Australian Museum 2003).	**Low** No suitable habitat was recorded from the study area for this species.
Ardea ibis	Cattle Egret		M	*Subsepecies A. i. coromanda* is found across the Indian subcontinent and Asia as far north as Korea and Japan, and in South-east Asia, Papua New Guinea and Australia (McKilligan 2005).	**Low** No suitable habitat was recorded from the study area for this species.
Callocephalon fimbriatum	Gang-gang Cockatoo	V		Occurs in wetter forests and woodland from sea level to an altitude over 2000 metres, timbered foothills and valleys, coastal scrubs, farmlands and suburban gardens (Pizzey and Knight 1997).	**Low** No suitable habitat was recorded from the study area for this species.
Calyptorhynchus lathami	Glossy Black-Cockatoo	V		Occurs in eucalypt woodland and forest with Casuarina/Allocasuarina spp. Characteristically inhabits forests on sites with low soil nutrient status, reflecting the distribution of key Allocasuarina species. The drier forest types with intact and less rugged landscapes are preferred by the species. Nests in tree hollows (NSW National Parks and Wildlife Service 1999; Garnett and Crowley 2000).	**Low** No suitable habitat was recorded from the study area for this species.
Climacteris picumnus	Brown Treecreeper	V		Occurs in eucalypt woodland and adjoining vegetation. Feeds on ants, beetles and larvae on trees and from fallen timber and leaf litter. Usually nests in hollows (Garnett and Crowley 2000).	**Low** No suitable habitat was recorded from the study area for this species.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
Hieraaetus morphnoides	Little Eagle	V		The little eagle is a medium sized bird, the Little Eagle occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia Woodlands of interior NSW are also used. Nest in tall living trees within a remnant patch, where pairs build a large nest stick nest in winter.	**Low** No suitable habitat was recorded from the study area for this species.
Artamus cyanopterus	Dusky Woodswallow	V		Habitat; woodlands and dry open sclerophyll forest usually dominated by eucalypts including mallee associations. It has been recorded from shrublands and heathlands and various forms of modified habitat including regenerating forest and very occasionally in moist forest and rainforests.	**Low** No suitable habitat was recorded from the study area for this species.
Botaurus poiciloptilus	Australasian Bittern	V		Occurs in shallow, vegetated freshwater or brackish swamps. Requires permanent wetlands with tall dense vegetation, particularly bulrushes and spikerushes. When breeding, pairs are found in areas with a mixture of tall and short sedges but will also feed in more open territory. {Garnett, 2000 #21; NSW National Parks and Wildlife Service, 2002 #320}.	**Low** No suitable habitat was recorded from the study area for this species.
Ninox strenua	Powerful Owl	V		A sedentary species with a home range of approximately 1000 hectares it occurs within open eucalypt, casuarina or callitris pine forest and woodland. It often roosts in denser vegetation including rainforest of exotic pine plantations. Generally feeds on medium-sized mammals such as possums and gliders but will also eat birds, flying-foxes, rats and insects. Prey are generally hollow dwelling and require a shrub layer and owls are more often found in areas with more old trees and hollows than average stands (Garnett and Crowley 2000).	**Low** No suitable habitat was recorded from the study area for this species.
Lophoictinia isura	Square-tailed Kite	V		This species hunts primarily over open forest, woodland and mallee communities as well as over adjacent heaths and other low scrubby habitats in wooded towns. It feeds on small birds, their eggs and nestlings as well as insects. Seems to prefer structurally diverse landscapes {Garnett, 2000 #21}.	**Low** No suitable habitat was recorded from the subject site for this species.
Melithreptus gularis gularis	Black-chinned Honeyeater	V		Found in dry eucalypt woodland particularly those containing ironbark and box. Occurs within areas of annual rainfall between 400-700 mm. Feed on insects, nectar and lerps {Garnett, 2000 #21}.	**Low** No suitable habitat was recorded from the subject site for this species
Neophema pulchella	Turquoise Parrot	V		Occurs in the foothills of the great dividing range in eucalypt woodlands and forests with a grassy or sparsely shrubby understorey. Nests in hollows in trees, stumps or even fence posts. It feeds on seeds of both native and introduced grass and herb species {Garnett, 2000 #21}.	**Low** No suitable habitat was recorded from the subject site for this species
Oxyura australis	Blue-billed Duck	V		Relatively sparse throughout species range. Regularly found breeding in south-east Queensland, north-east South Australia and throughout New South Wales. Found on temperate, fresh to saline, terrestrial wetlands, and occupies artifical wetlands. Prefers deep permanent open water, within or near dense vegetation. Nest in rushes, sedge, Lignum Muehlenbeckia cunnighamii and paperbark Melaleuca {Garnett, 2000 #21}.	**Low** No suitable habitat was recorded from the subject site for this species.
Burhinus grallarius	Bush Stone-curlew	E1		Require sparsely grassed, lightly timbered, open forest of woodland. In southern Australia they often occur where there is a well structured litter layer and fallen timber debris. Feed on a range of invertebrates and small vertebrates, as well as seeds and shoots {NSW National Parks and Wildlife Service, 1999 #53; NSW National Parks and Wildlife Service, 2003 #54}.	**Low** No suitable habitat was recorded from the study area for this species.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
Petroica phoenicea	Flame Robin	V		Breeds in upland tall moist eucalypt forest and woodland often on ridges and slopes. Prefers clearing or areas with open understorey. The groundlayer of breeding habitat is dominated by native grasses and shrub layer may be either sparse or dense. Occasionally occurs in temperate rainforest and also in herb fields heathlands shrublands and sedgeland in high altitudes.	**Low** No suitable habitat was recorded from the study area for this species.
Calidris ferruginea	Curlew Sandpiper		M	Occurs in inter-tidal mudflats of estuaries, lagoons, mangrove channels and also around lakes, dams, floodwaters and flooded saltbush surrounding inland lakes {Morcombe, 2003 #992}.	**Low** No suitable habitat was recorded from the study area for this species.
Daphoenositta chrysoptera	Varied Sittella	V		Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy.	**Low** No suitable habitat was recorded from the study area for this species.
Falco subniger	Black Falcon	V		The Black Falcon is widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. Some reports of 'Black Falcons' on the tablelands and coast of New South Wales are likely to be referable to the Brown Falcon. In New South Wales there is assumed to be a single population that is continuous with a broader continental population, given that falcons are highly mobile, commonly travelling hundreds of kilometres (Marchant & Higgins 1993). The Black Falcon occurs as solitary individuals, in pairs, or in family groups of parents and offspring.	**Low** No suitable habitat was recorded from the study area for this species.
Falco hypoleucos	Grey Falcon	V		Generally centred on inland drainage systems where the average rainfall is less than 500 millimetres. It is found in timbered lowland plains that are crossed by tree-lined water courses. Nests in the old nests of other birds, particularly raptors {Garnett, 2000 #21}.	**Low** No suitable habitat was recorded from the study area for this species.
Glossopsitta pusilla	Little Lorikeet	V		Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophoras, Melaleucas and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species. Feeds mostly on nectar and pollen, occasionally on native fruits such as mistletoe, and only rarely in orchards	**Low** No suitable habitat was recorded from the study area for this species.
Grantiella picta	Painted Honeyeater	V		Lives in dry forests and woodlands. Primary food is the mistletoes in the genus Amyema, though it will take some nectar and insects. Its breeding distribution is dictated by presence of mistletoes which are largely restricted to older trees. Less likely to be found in in strips of remnant box-ironbark woodlands, such as occur along roadsides and in windbreaks, than in wider blocks {Garnett, 2000 #21}.	**Low** No suitable habitat was recorded from the study area for this species.
Haliaeetus leucogaster	White-bellied Sea-Eagle		M	Occurs in coastal areas including islands, estuaries, inlets, large rivers, inland lakes and reservoirs. Builds a huge nest of sticks in tall trees near water, on the ground on islands or on remote coastal cliffs (Pizzey and Knight 1997).	**Low** No suitable habitat was recorded from the study area for this species.
Hirundapus caudacutus	White-throated Needletail		M	Occurs in airspace over forests, woodlands, farmlands, plains, lakes, coasts and towns. Breeds in the northern hemisphere and migrates to Australia in October-April (Pizzey and Knight 1997).	**Low** No suitable habitat was recorded from the study area for this species.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
Lathamus discolor	Swift Parrot	E1	E	Breeding occurs in Tasmania, majority migrates to mainland Australia in autumn, over-wintering, particularly in Victoria and central and eastern NSW, but also south-eastern Queensland as far north as Duaringa. Until recently it was believed that in New South Wales, swift parrots forage mostly in the western slopes region along the inland slopes of the Great Dividing Range but are patchily distributed along the north and south coasts including the Sydney region, but new evidence indicates that the forests on the coastal plains from southern to northern NSW are also extremely important. In mainland Australia is semi-nomadic, foraging in flowering eucalypts in eucalypt associations, particularly box-ironbark forests and woodlands. Preference for sites with highly fertile soils where large trees have high nectar production, including along drainage lines and isolated rural or urban remnants, and for sites with flowering *Acacia pycnantha*, is indicated. Sites used vary from year to year. (Garnett and Crowley 2000),(Swift Parrot Recovery Team 2001).	**Low** No suitable habitat was recorded from the study area for this species.
Merops ornatus	Rainbow Bee-eater		M	Usually occur in open or lightly timbered areas, often near water. Breed in open areas with friable, often sandy soil, good visibility, convenient perches and often near wetlands. Nests in embankments including creeks, rivers and sand dunes. Insectivorous, most foraging is aerial, in clearings (Higgins 1999).	**Low** No suitable habitat was recorded from the study area for this species.
Monarcha melanopsis	Black-faced Monarch		M	Occurs in rainforests, eucalypt woodlands, coastal scrubs, damp gullies in rainforest, eucalypt forest and in more open woodland when migrating (Pizzey and Knight 1997).	**Low/Medium** A targeted survey was undertaken for this species which failed to detect this species within the study area.
Myiagra cyanoleuca	Satin Flycatcher		M	Occurs in heavily vegetated gullies, in forests and taller woodlands. During migration it is found in coastal forests, woodlands, mangroves, trees in open country and gardens (Pizzey and Knight 1997).	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area.
Stagonopleura guttata	Diamond Firetail	V		Occurs in a range of eucalypt dominated communities with a grassy understorey including woodland, forest and mallee. Most populations occur on the inland slopes of the dividing range. Feed on seeds, mostly of grasses {Garnett, 2000 #21}.	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area
Pyrrholaemus sagittatus	Speckled Warbler	V		Occurs in a wide range of eucalypt dominated vegetation with a grassy understorey and is often found on rocky ridges or in gullies. It feeds on seeds and insects and builds domed nests on the ground {Garnett, 2000 #21}.	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
Petroica boodang	Scarlet Robin	V		The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat.	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area.
Rhipidura rufifrons	Rufous Fantail		M	Occurs in a range of habitats including the undergrowth of rainforests/wetter eucalypt forests/gullies, monsoon forests paperbarks, sub-inland and coastal scrubs, mangroves, watercourses, parks and gardens. When migrating they may also be recorded on farms, streets and buildings. Migrates to SE Australia in October-April to breed, mostly in or on the coastal side of the Great Dividing Range (Pizzey and Knight 1997).	**Low/Medium** A targeted survey was undertaken for this species which failed to detect this species within the study area.
Melanodryas cucullata	Hooded Robin	V		Found in south-eastern Australia, generally east of the Great Dividing Range. Found in eucalypt woodland and mallee and acacia shrubland. This is one of a suite of species that has declined in woodland areas in south-eastern Australia {Traill, 2000 #42; Garnett, 2000 #21}.	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area
Xanthomyza phrygia	Regent Honeyeater	E1	EM	Occurs mostly in box-ironbark forests and woodland and prefers the wet, fertile sites such as along creek flats, broad river valleys and foothills. Riparian forests with *Casuarina cunninghamiana* and *Amyema cambagei* are important for feeding and breeding. Important food trees include *Eucalyptus sideroxylon* (Mugga Ironbark), *E. albens* (White Box) , *E. melliodora* (Yellow Box) and *E. leucoxylon* (Yellow Gum) (Garnett and Crowley 2000).	**Low** No suitable habitat was recorded from the study area for this species.
Invertebrates					
Meridolum corneovirens	Cumberland Plain Land Snail	E1		Restricted to the Cumberland Plain and Castlereagh Woodlands of Western Sydney and also along the fringes of River Flat Forest, especially where it meets Cumberland Plain Woodland. It is typically found under logs and other debris, amongst leaf litter and bark around bases of trees. It is also sometimes found under grass clumps and where possible it will burrow into loose soil {NSW National Parks and Wildlife Service, 1999 #41}.	**Low** Targeted survey was undertaken for this species which failed to detect this species from the study area for this species.
Pommerhelix duralensis	Dural Land Snail	E1	E	The species has a strong affinity for communities in the interface region between shale-derived and sandstone-derived soils, with forested habitats that have good native cover and woody debris. It favours sheltering under rocks or inside curled-up bark. It does not burrow nor climb. The species has also been observed resting in exposed areas, such as on exposed rock or leaf litter, however it will also shelter beneath leaves, rocks and light woody debris. Migration and dispersal is limited, with overnight straight-line distances of under 1 metre identified in the literature and studies. The species is active from approximately one hour after dusk until dawn and no confirmed diurnal activity is reported. It exhibits no roost-site behaviour.	**Low** No suitable habitat was recorded from the study area for this species.
Mammals					

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
Bettongia gaimardi	Tasmanian Bettong	E4	X	*Bettongia gaimardi* is found in terrestrial, temperate habitats including grasslands, grassy woodlands, dry eucalyptus forests, and sclerophyll forests (i.e., forests containing plants with hard, short and usually spiky leaves). This species is found from sea level to elevations around 1,000 m.	**Low** No suitable habitat was recorded from the study area for this species.
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Occurs in moderately wooded habitats and roosts in caves, mine tunnels and the abandoned, bottle-shaped mud nests of Fairy Martins. Thought to forage below the forest canopy for small flying insects (Churchill 1998).	**Low/Medium** Suitable habitat for this species was recorded from the study area. An Impact Assessment has been prepared for this species (Appendix E).
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Occurs from the Bundaberg area in south-east Queensland, south through NSW to western Victoria and Tasmania. In NSW, it occurs on both sides of the Great Dividing Range and north-east NSW represents a national stronghold (NSW National Parks and Wildlife Service 1999). Occurs in wide range of forest types, although appears to prefer moist sclerophyll and rainforest forest types, and riparian habitat. Most common in large un-fragmented patches of forest. It has also been recorded from dry sclerophyll forest, open woodland and coastal heathland, and despite its occurrence in riparian areas, it also ranges over dry ridges. Nests in rock caves and hollow logs or trees. Feeds on a variety of prey including birds, terrestrial and arboreal mammals, small macropods, reptiles and arthropods (NSW National Parks and Wildlife Service 1999; NSW National Parks and Wildlife Service 1999).	**Low** No suitable habitat was recorded from the study area for this species.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V		Usually roosts in tree hollows in higher rainfall forests. Sometimes found in caves (Jenolan area) and abandoned buildings. Forages within the canopy of dry sclerophyll forest. It prefers wet habitats where trees are more than 20 metres high (Churchill 1998).	**Low/Medium** Suitable habitat for this species was recorded from the study area. An Impact Assessment has been prepared for this species (Appendix E).
Isoodon obesulus	Southern Brown Bandicoot	E1	E	Occurs in a variety of habitats in south-eastern Australia, including heathland, shrubland, dry sclerophyll forest with heathy understorey, sedgeland and woodland. Many of the habitats are prone to fire (NSW National Parks and Wildlife Service 1999).	**Low** No suitable habitat was recorded from the study area for this species.
Miniopterus schreibersii	Eastern Bent-wing Bat	V		Usually found in well timbered valleys where it forages on small insects above the canopy. Roosts in caves, old mines, stormwater channels and sometimes buildings and often return to a particular nursery cave each year (Churchill 1998).	**Low/Medium** Suitable habitat for this species was recorded from the study area. An Impact Assessment has been prepared for this species (Appendix E).
Petrogale penicillata	Brush-tailed Rock-wallaby	E1	V	Occurs in inland and sub-coastal south eastern Australia where it inhabits rock slopes. It has a preference for rocks which receive sunlight for a considerable part of the day. Windblown caves, rock cracks or tumbled boulders are used for shelter. Occur in small groups or "colonies" each usually separated by hundreds of metres (NSW National Parks and Wildlife Service 2003).	**Low** No suitable habitat was recorded from the study area for this species.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
Phascolarctos cinereus	Koala	V		Found in sclerophyll forest. Throughout New South Wales, Koalas have been observed to feed on the leaves of approximately 70 species of eucalypt and 30 non-eucalypt species. However, in any one area, Koalas will feed almost exclusively on a small number of preferred species. The preferred tree species vary widely on a regional and local basis. Some preferred species in NSW include Forest Red Gum *Eucalyptus tereticornis*, Grey Gum *E. punctata*, Monkey Gum *E. cypellocarpa* and Ribbon Gum *E. viminalis*. In coastal areas, Tallowwood *E. microcorys* and Swamp Mahogany *E. robusta* are important food species, while in inland areas White Box *E. albens*, Bimble Box *E. populnea* and River Red Gum *E. camaldulensis* are favoured (NSW National Parks and Wildlife Service 1999; NSW National Parks and Wildlife Service 2003).	**Low** Not located with Koala development application area.
Potorous tridactylus	Long-nosed Potoroo	V	V	Disjunct distribution along coastal south-east Australia from near Gladstone in Queensland, to south-west Victoria and in Tasmania. Found from sea level up to 1500 metres in altitude generally in areas with rainfall greater than 760 millimetres. In NSW, it is found throughout coastal and sub-coastal areas. Occurs in a range of habitats: coastal forest and woodland with a moderately dense heathy understorey, dense coastal scrubs or heath, wet and dry sclerophyll forest and sub-tropical, warm temperate and cool temperate rainforest of the eastern slopes and highlands. Often associated with gullies and forest ecotones. Open areas are used for foraging while areas of dense groundcover or understorey provide areas for shelter and protection from predators. Relatively thick ground cover is a major habitat requirement and it seems to prefer areas with light sandy soils. Feeds at dusk on roots, tubers, fungi, insects and their larvae and other soft bodied animals in the soil. Moves up and down slope as food resources become seasonally available (Johnston 1995; NSW National Parks and Wildlife Service 1999).	**Low** No suitable habitat was recorded from the study area for this species.
Pseudomys fumeus	Smoky Mouse	E1	E	The Smoky Mouse is currently limited to a small number of sites in western, southern and eastern Victoria, south-east NSW and the ACT. In NSW there are 3 records from Kosciuszko National Park and 2 records adjacent to the park in Bondo and Ingbyra State Forests; the remainder are centred around Mt Poole, Nullica State Forest and the adjoining S. E. Forests National Park. The Smoky Mouse appears to prefer heath habitat on ridge tops and slopes in sclerophyll forest, heathland and open-forest from the coast (in Victoria) to sub-alpine regions of up to 1800 metres, but sometimes occurs in ferny gullies. Seeds and fruits from leguminous shrubs form the main summer and autumn diet, with some invertebrates, e.g., Bogong Moths in the high country. Hypogeal (truffle-like) fungi dominate in winter and spring, with some flowers, seeds and soil invertebrates. May occur singly, as pairs or small communal groups based around patches of heath, sometimes comprising a male and up to five females sharing a burrow system. Breeding is in spring with one or two litters produced of up to four young. Nesting burrows have been found in rocky localities among tree roots and under the skirts of Grass Trees *Xanthorrhoea spp*. The persistence of colonies appears to be very ephemeral. It is not known how much this is due to natural fluctuations in food availability, but predation from feral carnivores appears to be implicated.	**Low** No suitable habitat was recorded from the study area for this species.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps. Urban gardens and cultivated fruit crops also provide habitat for this species. Feeds on the flowers and nectar of eucalypts and native fruits including lilly pillies. It roosts in the branches of large trees in forests or mangroves (Churchill 1998; NSW National Parks and Wildlife Service 2001).	**Low/Medium** Suitable habitat for this species was recorded from the study area. An Impact Assessment has been prepared for this species (Appendix E).
Mormopterus norfolkensis	Eastern Freetail-bat	V		Thought to live in sclerophyll forest and woodland. Small colonies have been found in tree hollows or under loose bark. It feeds on insects above the forest canopy or in clearings at the forest edge (Churchill 1998).	**Low/Medium** Suitable habitat for this species was recorded from the study area. An Impact Assessment has been prepared for this species (Appendix E).
Myotis adversus	Large-footed Myotis	V		Colonies occur in caves, mines, tunnels, under bridges and buildings. Colonies always occur close to bodies of water where this species feeds on aquatic insects (Churchill 1998).	**Low/Medium** Suitable habitat for this species was recorded from the study area. An Impact Assessment has been prepared for this species (Appendix E).
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	V		Occurs in eucalypt forest where it feeds above the canopy and in mallee or open country where it feeds closer to the ground. Generally a solitary species but sometimes found in colonies of up to 10. It roosts in tree hollows. Thought to be a migratory species (Churchill 1998).	**Low/Medium** Suitable habitat for this species was recorded from the study area. An Impact Assessment has been prepared for this species (Appendix E).
Scoteanax rueppellii	Greater Broad-nosed Bat	V		The preferred hunting areas of this species include tree-lined creeks and the ecotone of woodlands and cleared paddocks but it may also forage in rainforest. Typically it forages at a height of 3-6 metres but may fly as low as one metre above the surface of a creek. It feeds on beetles, other large, slow-flying insects and small vertebrates. It generally roosts in tree hollows but has also been found in the roof spaces of old buildings (Churchill 1998).	**Low/Medium** Suitable habitat for this species was recorded from the study area. An Impact Assessment has been prepared for this species (Appendix E).
Reptiles					
Hoplocephalus bungaroides	Broad-headed Snake	E1	V	A nocturnal species that occurs in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they generally use rock crevices and exfoliating rock during the cooler months and tree hollows during summer (Webb and Shine 1994; Webb and Shine 1998).	**Low** No suitable habitat was recorded from the study area for this species.

1) V= Vulnerable, E1 = Endangered (BC Act) E2= Endangered Population 2) ROTAP (Rare or Threatened Australian Plants, Briggs and Leigh 1996) is a conservation rating for Australian plants. 1 = Species only known from one collection. 2 = Species with a geographic range of less than 100km in Australia. 3 = Species with a geographic range of more than 100km in Australia, X = Species presumed extinct; no new collections for at least 50 years. E = Endangered species at risk of disappearing from the wild state if present land use and other causal factors continue to operate, V =

Vulnerable species at risk of long-term disappearance through continued depletion. R = Rare, but not currently considered to be endangered. K = Poorly known species that are suspected to be threatened. C = Known to be represented within a conserved area. a = At least 1,000 plants are known to occur within a conservation reserve(s). i = Less than 1,000 plants are known to occur within a conservation reserve(s). The reserved population size is unknown. t = The total known population is reserved. + = The species has a natural occurrence overseas. **3)** V = Vulnerable, E = Endangered *(Environment Protection and Biodiversity Conservation Act 1999*).

Appendix E

BC Act Assessments of Significance

The threatened species test of significance is used to determine if a development or activity is likely to significantly affect threatened species or ecological communities, or their habitats. It is applied as part of the Biodiversity Offsets Scheme entry requirements and for Part 5 activities under the *Environmental Planning and Assessment Act 1979*.

The test of significance is set out in s.7.3 of *the Biodiversity Conservation Act 2016*.

If the activity is likely to have a significant impact, or will be carried out in a declared area of outstanding biodiversity value, the proponent must either apply the Biodiversity Offsets Scheme or prepare a species impact statement (SIS).

The environmental impact of activities that will not have a significant impact on threatened species will continue to be assessed under s.111 of the Environmental Planning and Assessment Act 1979.

If a proposed activity will have a significant impact or will be carried out in an area of outstanding biodiversity value, and the proponent does not opt in to the Biodiversity Offsets Scheme, a SIS must be prepared and agreement sought from the Chief Executive of Office of Environment and Heritage.

The requirements of an SIS are set out in s.7.6 of the Biodiversity Conservation Regulation 2017. The proponent must also seek and comply with the Office of Environment and Heritage Chief Executive's requirements for SIS preparation.

The "subject site" is defined as the area directly affected by the proposal.

The "study area" is the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly. The study area extends as far as is necessary to take all potential impacts into account.

The "local occurrence" of a community is that which occurs in the study area or beyond to include those areas where the movement of individuals and genetic exchange can be demonstrated

The "risk of extinction" is the likelihood that the local occurrence of the community will become extinct in either the short or long term as a result of direct or indirect impacts arising from the proposal.

The "composition" of the community includes both plant and animal species as well as its physical structure

The following 5 part test of significance relies on the ecological assessment provided in Sections 2 & 3, & Appendices C & D above and should be read as such. It is considered that the study area provides potential habitat for the following threatened species and will be assessed accordingly in the following five-part test:

Species Name		**Conservation Status**	
		State [1]	**National [2]**
Endangered Ecological Communities			
River-flat Eucalypt Forest on Coastal Floodplains	River-flat Eucalypt Forest on Coastal Floodplains	E	-
Threatened Fauna			
Mammals			
Chalinolobus dwyeri	Large-eared Pied Bat	V	V
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	

Species Name		Conservation Status	
		State [1]	National [2]
Miniopterus schreibersii	Eastern Bent-wing Bat	V	
Pteropus poliocephalus	Grey-headed Flying-fox	V	V
Mormopterus norfolkensis	Eastern Freetail-bat	V	
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	V	
Scoteanax rueppellii	Greater Broad-nosed Bat	V	

The '5 part test of significance' is as follows.

7.3 Test for determining whether proposed development or activity likely to significantly affect threatened species or ecological communities, or their habitats

The '5 part test of significance' is as follows.

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

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

Detailed flora investigations of the study area, together with habitat assessments and targeted surveys, have resulted in the identification of potential habitat for a variety of threatened species. An assessment of these species is as follows:

***Chalinolobus dwyeri* (Large-eared Pied Bat)**

It is probable that the Large-eared Pied Bat forages for insects below the forest canopy. During the day these bats may roost in caves, mine tunnels and the abandoned nests of Fairy Martins (Hoye and Dwyer 1998). The Large-eared Pied Bat may also utilise tree hollows (Schultz, Coles et al. 1999). The Large-eared Pied Bat is mainly found in drier habitat including dry sclerophyll and woodland, east and west of the Great Dividing Ranges. However Hoye (Hoye and Dwyer 1998) suggest that from records of the species in subalpine woodland, moist eucalypt forest and near rainforest, it may tolerate a greater range of habitats. The distribution of this bat ranges from inland and south-eastern QLD to central-eastern and north-eastern NSW. It is considered that the study area provides potential foraging habitat for this species. Despite the presence of potential habitat within the study area, the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

***Falsistrellus tasmaniensis* (Eastern False Pipistrelle)**

The Eastern False Pipistrelle usually roosts in tree hollows in higher rainfall forests. Sometimes found in caves (Jenolan area) and abandoned buildings. Forages within the canopy of dry sclerophyll forest. It prefers wet habitats where trees are more than 20 metres high. It is considered that the study area provides potential foraging habitat for this species. Despite the presence of potential habitat within the study area, the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

***Miniopterus schreibersii* (Eastern Bent-wing Bat)**

The Eastern Bentwing-bat is confined to areas where there are caves with potential temperature, humidity and physical dimensions to permit breeding. This species occupies a range of habitats, mainly near the coast and utilises caves, old mines, stormwater channels, under bridges and occasionally buildings for roosting. It is considered that the study area provides potential foraging habitat for this species. Despite the presence of potential habitat within the study area, the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

***Pteropus poliocephalus* (Grey-headed Flying-fox)**

The Grey-headed Flying-fox is found in a variety of habitats including rainforest, mangroves, paperbark swamps, wet and dry sclerophyll forests and cultivated areas (Churchill 2008). Grey-headed Flying Foxes congregate in large camps of up to 200,000 individuals, depending on availability of surrounding blossoming plants, from early until late summer (Churchill 2008). Camps are commonly formed in gullies, typically not far from water and in vegetation with a dense canopy. Roost sites are an important resource where mating, birth and rearing of young occurs as well as providing refuge (Strahan 1995) These bats eat the fruit or blossoms of more than 80 species of plants. Their major food source is eucalypt blossom and native fruits from a variety of tree species. Native figs (*Ficus spp*) account for a large percentage of the fruit eaten. They are also known to rain orchids of cultivated fruit. The Grey headed Flying-fox has a nightly feeding range of 20 to 50km from their camp (Churchill 2008).

The proposed development will retain all foraging habitat for this highly mobile species. As such it is considered that the proposal is unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

***Mormopterus norfolkensis* (Eastern Freetail-bat)**

The Eastern Freetail-bat forages above and within the canopy of open forests and woodlands, feeding on small insects. The Eastern Freetail-bat is thought to roost predominantly in tree hollows and occasionally in buildings. It is considered that the study area provides potential foraging habitat for this species. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

***Saccolaimus flaviventris* (Yellow-bellied Sheathtail Bat)**

The Yellow-bellied Sheathtail-bat inhabits open country, mallee, eucalypt forests, rainforests, heathland and water bodies. The Yellow-bellied Sheathtail-bat roosts in tree hollows and has been found inhabiting the abandoned nests of Sugar Gliders. It is considered that the study area provides potential foraging habitat for this species. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

***Scoteanax rueppellii* (Greater Broad-nosed Bat)**

The Greater Broad-nosed Bat inhabits open forests and woodlands, foraging throughout these forest types and also along creeks and small river systems. This species roosts in tree hollows and occasionally old buildings. Despite the presence of potential habitat within the study area, the proposal is unlikely to

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

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

Response:

One threatened Endangered Ecological Communities (EEC) was recorded within the study area. PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion community corresponds with the EEC known as River-Flat Eucalypt Forest on Coastal Floodplains.

This response requires an exploration of the definition of the local occurrence of the community.

Although the extent of a community is technically and fully described by all of its components (including soil microbes and soil seedbanks), it is only the above-ground parts that can be seen by normal and standard survey practices. It is for this reason that mapping of vegetation types by all scientific authorities in NSW is restricted to visible above ground vegetation and sometimes restricted further to the appearance and presence of canopy trees. This is also the case for vegetation mapping undertaken and relied upon by Council.

However, the local occurrence of this community extends beyond the boundaries of the site and includes by definition those trees beyond the site that probably exchange genetic material with trees within the site. This includes native canopy trees within the flying distances of known pollinators that are likely to visit the trees of the subject site, including pollen and nectar feeders such as the Grey-headed Flying Fox and many birds such as Rainbow Lorikeets.

Southerton et al. (2004) demonstrated that pollen- and / or nectar-feeding lorikeets and bats make a unique contribution to eucalypt population structure because of their capacity to move viable pollen large distances. Birds and bats may travel upwards of 50 kilometres per day during feeding, and further during migration or feeding bouts over several days.

For example, Rainbow Lorikeet roosts are frequently 35 kilometres distant from their feeding areas, particularly during their non-breeding phase over summer and autumn when most of the tree species of the subject site are in flower. Scouting parties frequently move distances of 5–10 kilometres and feeding flocks may travel up to 10 kilometres between feeding and mid-day rest areas (Southerton et al. 2004).

Radio-tracking studies have revealed that Grey-headed Flying-foxes may travel more than 45 kilometres to feeding areas and over 80 kilometres during the night whilst foraging for nectar. They are highly mobile during the night, moving between several trees within a stand, and between flowering stands separated by many kilometres (Southerton et al. 2004).

The effect of pollen transfer by birds and bats on the genetic structure of widespread eucalypt species is potentially greatest in fragmented forests where these animals can traverse gaps of several kilometres between discontinuous stands (Southerton et al. 2004). In the fragmented urban landscape, this means that all patches across these large distances are functionally connected and form part of the local occurrence of the vegetation community.

The site has been managed for greater than 70 years as a rural residential property. Given that qualification, the River-Flat Eucalypt Forest on Coastal Floodplains community on site is largely restricted to those areas that support locally-native species of plants and these are in turn largely restricted to the areas of canopy trees and residual understorey species at the bases of remnant trees.

In many situations, the conspicuous trees are the only elements of the community that remain in urban situations and so this restrictive definition denies the reality of the functional connection of these trees with each other and with other larger and intact remnants afforded by their mobile pollinators.

The remnant River-Flat Eucalypt Forest on Coastal Floodplains community is continuous with vegetation within Garfield East Road outside of the subject property. The canopy is highly fragmented in a north-southerly direction. The proposal will result in the removal of native trees which comprises part of River-Flat Eucalypt Forest on Coastal Floodplains.

The proposed development will result in the loss of approximately 500m2 or 0.05ha of EEC River-Flat Eucalypt Forest on Coastal Floodplains. Despite the loss of 0.05ha or 500m2 of River-Flat Eucalypt Forest on Coastal Floodplains, large stand of this community is located on the northern side of Garfield Road East in association with First Ponds Creek to the north and is to be retained, it is therefore considered that the proposed development is unlikely to have an adverse effect on the extent of this ecological community such that its local occurrence is likely to be placed at risk of extinction.

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

Response:

The proposed development will result in the loss of 0.05ha of EEC River-Flat Eucalypt Forest on Coastal Floodplains.

Despite the loss of 0.05ha of River-Flat Eucalypt Forest on Coastal Floodplains, approximately 22+ha of River-Flat Eucalypt Forest on Coastal Floodplains will remain within then locality (1.5km) of the study area adjacent to First Ponds Creek.

The proposal will entail the removal of 0.05ha of River-Flat Eucalypt Forest on Coastal Floodplains which comprises poor habitat for the aforementioned threatened species known from the locality, as such it is considered that the proposal is unlikely to create an important impact on the long-term survival of threatened species in the locality and is not considered to be significant.

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

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

Response:

i.) The proposal will entail the disturbance/modification of 0.05ha of River-Flat Eucalypt Forest on Coastal Floodplains which provides limited foraging habitat for threatened fauna species.

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

Response:

The proposal will remove approximately 0.05ha of River-Flat Eucalypt Forest on Coastal Floodplains which provides poor habitat for aforementioned threatened fauna species. Despite this the proposal will not fragment or isolate currently connected areas of habitat. Connectivity of vegetation across the study area will remain connected to surrounding lands. All threatened fauna species which are potentially to be impacted upon are highly mobile and capable of flight and movement across large distances and would not utilise the habitats within the study area exclusively.

Therefore, it is considered that known habitat for a threatened species within the local area and the region are unlikely to become isolated or fragmented as a result of the proposal.

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

Response:

The habitat to be removed is of poor quality due to its small size, location within a rural front yard, highly modified understorey and many of the trees are in poor condition it cannot of itself be considered to be important to the long term survival of the community in the local area.

However, it is part of an Endangered Ecological Community and is part of a remnant patch in the immediate area that occupies at greater than 12 hectares. Thus the remnant trees/ native vegetation on site is an important area in that it contributes to the long term viability of other areas. The loss of a small number of trees however is unlikely to threaten the long term survival of the community in the local area.

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

Response:

The proposed development or activity is not likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly) within the provisions of the *BC Act* (1995).

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

Response:

The proposal is likely to entail or perpetuate the following key threatening process under the *BC Act* within the site.

- Clearing of native vegetation.
- Infection of native plants by *Phytophthora cinnamomi*.
- Human Caused Climate Change.

Conclusion

The proposal will modify/remove approximately 0.05ha of River-Flat Eucalypt Forest on Coastal Floodplains which provides poor (habitat) for threatened species.

The loss of 0.05ha from the onsite River-Flat Eucalypt Forest on Coastal Floodplains EEC is unlikely to have an adverse effect on the extent of this ecological community such that its local occurrence is likely to be placed at risk of extinction.

Critical habitat will not be affected and the proposal will not interfere with the recovery actions for threatened species. The impact to habitats for threatened species, endangered populations & endangered ecological communities from the locality is not considered to be significant.

Appendix F

EPBC Significance Assessment

EPBC Assessment of Significance (Grey-headed Flying-fox)

Under the *Environment Protection and Biodiversity Conservation Act 1999*, an action is likely to have a significant impact on a vulnerable species if it affects an important population of the species. Under the Principle Significant Impact Guidelines (Department of the Environment and Heritage 2006) an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations identified in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity
- populations that are near the limit of the species range.

The animals that may use the site are not considered to be part of an important population.

Will the action lead to a long-term decrease in the size of an important population of a species?

Grey-headed Flying-fox utilising the study area would not constitute an important population. The proposal will entail the direct removal of 0.05ha of PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion which provides foraging habitat for this species. Modification of this small area represents a small loss of the local extent of similar habitat. Clearing of this small area of habitat represents a small loss of the local extent of similar habitat. No Grey-headed Flying-fox camps will be affected by the proposal. As such, the proposal is unlikely to lead to a long-term decrease in the size of the local population.

Will the action reduce the area of occupancy of an important population?

Grey-headed Flying-fox utilising the site would not be part of an important population. The Grey-headed Flying-fox is a highly mobile and it may travel up to 50 km each night to forage. Therefore, the local population would not be restricted to habitat resources within the site only.

Will the action fragment an existing important population into two or more populations?

Grey-headed Flying-foxes using the site for foraging purposes would not be part of an important population.

Will the action adversely affect habitat critical to the survival of a species?

No critical habitat has been listed for Grey-headed Flying-fox under the *Environment Protection and Biodiversity Conservation Act 1999*. Known Grey-headed Flying-fox camps may however be considered critical to the survival of local populations. No camps were identified within or near the study area.

Will the action disrupt the breeding cycle of an important population?

Grey-headed Flying-foxes using the study area would not be part of an important population.

Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The study area contains suitable foraging resources for Grey-headed Flying-fox. The action is unlikely to significantly decrease the availability of foraging habitat in the locality. The proposal will entail the direct removal of 0.05ha of PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion which provides foraging habitat for this species. Modification of this small area represents a small loss of the local extent of similar habitat. The large home range of this species allows offsite foraging resources to be accessed and isolation of habitat would not result from the development.

It is unlikely that the development would isolate and decrease the availability of quality habitat to the extent that the species is likely to decline.

Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species´ habitat?

It is highly unlikely that invasive species (such as introduced predators) that are harmful to the Grey-headed Flying-fox would become more established as a result of the action.

Will the action introduce disease that may cause the species to decline?

The proposal would not increase the likelihood of a disease becoming established or proliferating in the local population that would result in a decline of the species.

Will the action interfere with the recovery of the species?

No recovery or threat abatement plans have been prepared for this species. Therefore it is considered that the proposal is unlikely to interfere within the recovery of the Grey-headed Flying-fox.

Conclusion

The Grey-headed Flying-fox is unlikely to be significantly affected by the proposal.

EPBC Assessment of Significance (Large-eared Pied Bat)

Under the *Environment Protection and Biodiversity Conservation Act 1999*, an action is likely to have a significant impact on a vulnerable species if it affects an important population of the species. Under the Principle Significant Impact Guidelines (Department of the Environment and Heritage 2006) an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations identified in recovery plans, and/or that are:

key source populations either for breeding or dispersal
populations that are necessary for maintaining genetic diversity
populations that are near the limit of the species range.
The animals that may use the site are not considered to be part of an important population.

Will the action lead to a long-term decrease in the size of an important population of a species?

Large-eared Pied Bats utilising the site would not constitute an important population. The proposal will entail the direct removal of 0.05ha of PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion which provides foraging habitat for this species. Modification of this small area represents a small loss of the local extent of similar habitat. represents a small loss of the local extent of similar habitat. No Large-eared Pied Bat roosting sites will be affected by the proposal. As such, the proposal is unlikely to lead to a long-term decrease in the size of the local population.

Will the action reduce the area of occupancy of an important population?

Large-eared Pied Bats utilising the site would not be part of an important population. Development of the study area will remove suitable foraging habitat for this species. The Large-eared Pied Bat is a highly mobile species. Therefore, the local population would not be restricted to habitat resources within the site only.

Will the action fragment an existing important population into two or more populations?

Large-eared Pied Bat utilising the foraging resources within the study area would not be part of an important population.

Will the action adversely affect habitat critical to the survival of a species?

No critical habitat has been listed for Large-eared Pied Bat under the *Environment Protection and Biodiversity Conservation Act 1999*. Known Large-eared Pied Bat maternity caves may however be considered critical to the survival of local populations. No maternity caves were identified within or near the study area.

Will the action disrupt the breeding cycle of an important population?

Large-eared Pied Bats using the study area would not be part of an important population. The breeding patterns of the Large-eared Pied Bat are not likely to be disrupted as this species breeds within a maternity caves, which were absent from the study area. As such it is considered that the proposal is unlikely to disrupt the breeding cycle of an important population of Large-eared Pied Bats.

Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The study area contains foraging resources for Large-eared Pied Bat. The action is unlikely to significantly decrease the availability of foraging habitat in the locality despite the direct removal of 0.05ha of PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion which provides foraging habitat for this species. The large-eared Pied Bat has a large home range as such this species would not feed exclusively within the study area.

It is unlikely that the development would isolate and decrease the availability of quality habitat to the extent that the species is likely to decline.

Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species´ habitat?

It is highly unlikely that invasive species (such as introduced predators) that are harmful to the Large-eared Pied Bat would become more established as a result of the action.

Will the action introduce disease that may cause the species to decline?

The proposal would not increase the likelihood of a disease becoming established or proliferating in the local population that would result in a decline of the species.

Will the action interfere with the recovery of the species?

No recovery or threat abatement plans have been prepared for this species. Therefore it is considered that the proposal is unlikely to interfere within the recovery of the Large-eared Pied Bat.

Conclusion

The Large-eared Pied Bat is unlikely to be significantly affected by the proposal.

Appendix G

EPBC Protected Matters Search

Australian Government
Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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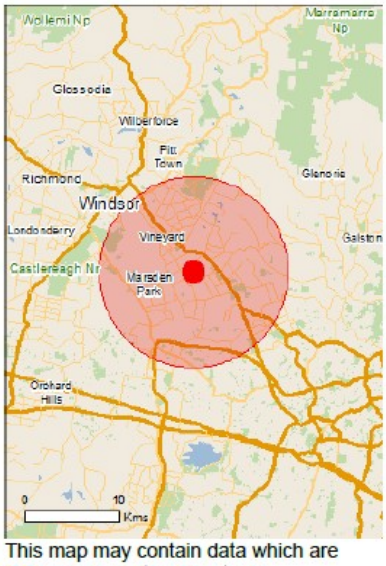

This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

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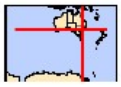

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	8
Listed Threatened Species:	57
Listed Migratory Species:	17

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	11
Commonwealth Heritage Places:	1
Listed Marine Species:	24
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	4
Regional Forest Agreements:	None
Invasive Species:	52
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion	Endangered	Community likely to occur within area
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community may occur within area
Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	Critically Endangered	Community likely to occur within area
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Community likely to occur within area
Shale Sandstone Transition Forest of the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area
Turpentine-Ironbark Forest of the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area
Western Sydney Dry Rainforest and Moist Woodland on Shale	Critically Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area
Thinornis cucullatus cucullatus Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat may occur within area
Fish		
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat may occur within area
Frogs		
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat known to occur within area
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat likely to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or

Name	Status	Type of Presence
		related behaviour known to occur within area
Other		
Pommerhelix duralensis Dural Land Snail [85268]	Endangered	Species or species habitat known to occur within area
Plants		
Acacia bynoeana Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat known to occur within area
Acacia gordonii [5031]	Endangered	Species or species habitat likely to occur within area
Acacia pubescens Downy Wattle, Hairy Stemmed Wattle [18800]	Vulnerable	Species or species habitat known to occur within area
Allocasuarina glareicola [21932]	Endangered	Species or species habitat likely to occur within area
Asterolasia elegans [56780]	Endangered	Species or species habitat may occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area
Darwinia biflora [14619]	Vulnerable	Species or species habitat known to occur within area
Eucalyptus sp. Cattai (Gregson s.n., 28 Aug 1954) [89499]	Critically Endangered	Species or species habitat known to occur within area
Genoplesium baueri Yellow Gnat-orchid, Bauer's Midge Orchid, Brittle Midge Orchid [7528]	Endangered	Species or species habitat likely to occur within area
Haloragis exalata subsp. exalata Wingless Raspwort, Square Raspwort [24636]	Vulnerable	Species or species habitat may occur within area
Haloragodendron lucasii Hal [6480]	Endangered	Species or species habitat may occur within area
Lasiopetalum joyceae [20311]	Vulnerable	Species or species habitat known to occur within area
Melaleuca deanei Deane's Melaleuca [5818]	Vulnerable	Species or species habitat known to occur within area
Micromyrtus minutiflora [11485]	Vulnerable	Species or species habitat known to occur within area
Olearia cordata [6710]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area
Persoonia hirsuta Hairy Geebung, Hairy Persoonia [19006]	Endangered	Species or species habitat known to occur within area
Persoonia nutans Nodding Geebung [18119]	Endangered	Species or species habitat known to occur within area
Pimelea curviflora var. curviflora [4182]	Vulnerable	Species or species habitat known to occur within area
Pimelea spicata Spiked Rice-flower [20834]	Endangered	Species or species habitat known to occur within area
Pomaderris brunnea Rufous Pomaderris, Brown Pomaderris [16845]	Vulnerable	Species or species habitat likely to occur within area
Pterostylis gibbosa Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat may occur within area
Pterostylis saxicola Sydney Plains Greenhood [64537]	Endangered	Species or species habitat likely to occur within area
Pultenaea parviflora [19380]	Vulnerable	Species or species habitat known to occur within area
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area
Rhodamnia rubescens Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat likely to occur within area
Rhodomyrtus psidioides Native Guava [19162]	Critically Endangered	Species or species habitat may occur within area
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat known to occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
Zieria involucrata [3087]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur

Name	Threatened	Type of Presence within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Appendix H

BAM PLOT DATA

BAM Site – Field Survey Form

Site Sheet no: 1 of 2

Survey Name	Plot Identifier	Recorders
Garfield Road East	001	John Whyte

Date	08 / 05/ 2021	IBRA region	Sydney Basin	Zone ID	56
Zone 56	Datum GDA (94)	Dimensions	20m x 20m (0.04 ha)	Orientation of midline	South 165 Degrees
Easting 303371	Northing 6272387				

Vegetation Class	Coastal Floodplain Wetlands		Confidence: H M L
Plant Community Type	835 - Cumberland riverflat forest	EEC: YES	Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Native Richness of	Trees	2
	Shrubs	0
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Native Cover of	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed cover		

BAM Attribute (20 x 50 m plot)		# Tree Stems Count	
dbh	Euc*	Non Euc	Hollows†
Mark large tree threshold for Euc* & Non Euc.	80 + cm	0 -	No. of Hollows:
50 – 79 cm		--	
30 – 49 cm	4 Cg,	-	
20 – 29 cm	9 Cg,	-	
10 – 19 cm	3stems, 1 Eg,	-	
5 – 9 cm		-	
< 5 cm	1	-	
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Tally space		Total 11m

Record number of **living** eucalypt* (Euc*) and **living** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30..., 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	3 2 3 1 3	4 8 0 0 0	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	12	2.4	0	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional – the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	3	-	
Cultivation (inc. pasture)	-	-	
Soil erosion	-	-	
Firewood collection	3	-	
Grazing	3	-	
Fire damage			
Storm damage	-	-	
Weediness	3	-	
Other	-	-	

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet 2 of 2

Survey Name	Plot Identifier	Recorders
Garfield Road East	001	John Whyte

Date: 08/ 05/ 2021

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
TG	*Casuarina glauca*			15			
TG	*Eucalyptus amplifolia*			2			
HTE	*Ehrharta erecta*			20			
E	*Solanum linnaeanum*			1			
E	*Sida corrugata*			5			
E	*Onopordum acanthium*			3			
FG	*Dichondra repens*			7			
FG	*Oxalis perennans*			5			
E	*Sida rhombifolia*			2			
E	*Plantago lanceolata*			7			
E	*Conyza albida*			2			
E	*Gamochaeta americana*			10			
FG	*Vittadinia cuneata*			1			
E	*Trifolium repens*			2			
HTE	*Senecio madagarensis*			.2			
HTE	*Araujia sericifera*			.3			
HTE	*Asparagus aethiopicus*			.1			
E	*Rumex crispus*			.1			
HTE	*Ligustrum lucindum*			.1			
E	*Verbena rigida*			.1			
HTE	*Paspalum dilatatum*			10			
GG	*Cynodon dactylon*			20			
E	*Setaria gracillis*			5			
HTE	*Pennisetum clandestinum*			15			
E	*Conyza bonariensis*			.1			

, 25% = 10 x 10 m

Appendix I

BAM Calculation Output Reports (Vegetation Clearing)

BAM Vegetation Zones Report

Proposal Details

Assessment Id	Assessment name	BAM data last updated *
00026934/BAAS17110/21/00026935	Lot 6 DP 229296 Garfield Road East Rouse Hill	10/06/2021
Assessor Name	**Report Created**	**BAM Data version ***
John Strachan Whyte	03/08/2021	45
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS17110	Part 4 Developments (General)	Finalised
Assessment Revision	**Date Finalised**	**BOS entry trigger**
0	03/08/2021	BOS Threshold: Biodiversity Values Map

* 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.

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones
1	835_Low	835-Cumberland riverflat forest	Low	0.05	1	

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00026934/BAAS17110/21/00026935

Proposal Name
Lot 6 DP 229296 Garfield Road East Rouse Hill

BAM data last updated *
10/06/2021

Assessor Name
John Strachan Whyte

Assessor Number
BAAS17110

BAM Data version *
45

Proponent Name(s)
Shane Harding

Report Created
03/08/2021

BAM Case Status
Finalised

Assessment Revision
0

Assessment Type
Part 4 Developments (General)

Date Finalised
03/08/2021

BOS entry trigger
BOS Threshold: Biodiversity Values Map

* 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.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

BAM Biodiversity Credit Report (Variations)

Name
Botaurus poiciloptilus / Australasian Bittern
Climacteris picumnus victoriae / Brown Treecreeper (eastern subspecies)
Dasyurus maculatus / Spotted-tailed Quoll
Callocephalon fimbriatum / Gang-gang Cockatoo
Petroica phoenicea / Flame Robin
Petroica boodang / Scarlet Robin
Hieraaetus morphnoides / Little Eagle
Daphoenositta chrysoptera / Varied Sittella
Artamus cyanopterus cyanopterus / Dusky Woodswallow
Haliaeetus leucogaster / White-bellied Sea-Eagle
Lathamus discolor / Swift Parrot
Lophoictinia isura / Square-tailed Kite
Melanodryas cucullata cucullata / Hooded Robin (south-eastern form)
Melithreptus gularis gularis / Black-chinned Honeyeater (eastern subspecies)
Miniopterus australis / Little Bent-winged Bat
Miniopterus orianae oceanensis / Large Bent-winged Bat
Micronomus norfolkensis / Eastern Coastal Free-tailed Bat
Neophema pulchella / Turquoise Parrot
Ninox connivens / Barking Owl
Ninox strenua / Powerful Owl
Pandion cristatus / Eastern Osprey
Phascolarctos cinereus / Koala
Pteropus poliocephalus / Grey-headed Flying-fox

Chthonicola sagittata / Speckled Warbler
Stagonopleura guttata / Diamond Firetail
Tyto novaehollandiae / Masked Owl
Anthochaera phrygia / Regent Honeyeater

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
835-Cumberland riverflat forest	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.1	0	1	1.00

835-Cumberland riverflat forest

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 686, 828, 835, 941, 1108, 1109, 1212, 1228, 1293, 1318, 1326, 1386, 1504, 1556, 1594, 1618, 1720, 1794	-	835_Low	No	1	Cumberland,Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region

	Forested Wetlands	Tier 1	835_Low	No	1	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

Credit Retirement Options

Like-for-like options

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00026934/BAAS17110/21/00026935

Proposal Name
Lot 6 DP 229296 Garfield Road East Rouse Hill

BAM data last updated *
10/06/2021

Assessor Name
John Strachan Whyte

Assessor Number
BAAS17110

BAM Data version *
45

Proponent Names
Shane Harding

Report Created
03/08/2021

BAM Case Status
Finalised

Assessment Revision
0

Assessment Type
Part 4 Developments (General)

Date Finalised
03/08/2021

BOS entry trigger
BOS Threshold: Biodiversity Values Map

* 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.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

BAM Biodiversity Credit Report (Like for like)

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Botaurus poiciloptilus / Australasian Bittern
Climacteris picumnus victoriae / Brown Treecreeper (eastern subspecies)
Dasyurus maculatus / Spotted-tailed Quoll
Callocephalon fimbriatum / Gang-gang Cockatoo
Petroica phoenicea / Flame Robin
Petroica boodang / Scarlet Robin
Hieraaetus morphnoides / Little Eagle
Daphoenositta chrysoptera / Varied Sittella
Artamus cyanopterus cyanopterus / Dusky Woodswallow
Haliaeetus leucogaster / White-bellied Sea-Eagle
Lathamus discolor / Swift Parrot
Lophoictinia isura / Square-tailed Kite
Melanodryas cucullata cucullata / Hooded Robin (south-eastern form)
Melithreptus gularis gularis / Black-chinned Honeyeater (eastern subspecies)
Miniopterus australis / Little Bent-winged Bat

Miniopterus orianae oceanensis / Large Bent-winged Bat
Micronomus norfolkensis / Eastern Coastal Free-tailed Bat
Neophema pulchella / Turquoise Parrot
Ninox connivens / Barking Owl
Ninox strenua / Powerful Owl
Pandion cristatus / Eastern Osprey
Phascolarctos cinereus / Koala
Pteropus poliocephalus / Grey-headed Flying-fox
Chthonicola sagittata / Speckled Warbler
Stagonopleura guttata / Diamond Firetail
Tyto novaehollandiae / Masked Owl
Anthochaera phrygia / Regent Honeyeater

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
835-Cumberland riverflat forest	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.1	0	1	1

BAM Biodiversity Credit Report (Like for like)

835-Cumberland riverflat forest

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 686, 828, 835, 941, 1108, 1109, 1212, 1228, 1293, 1318, 1326, 1386, 1504, 1556, 1594, 1618, 1720, 1794	-	835_Low	No	1	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

Credit Retirement Options

Like-for-like credit retirement options

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00026934/BAAS17110/21/00026935	Lot 6 DP 229296 Garfield Road East Rouse Hill	10/06/2021
Assessor Name	**Report Created**	**BAM Data version ***
John Strachan Whyte	03/08/2021	45
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS17110	Part 4 Developments (General)	Finalised
Assessment Revision	**BOS entry trigger**	**Date Finalised**
0	BOS Threshold: Biodiversity Values Map	03/08/2021

* 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.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Black Bittern	Ixobrychus flavicollis	835-Cumberland riverflat forest
Eastern False Pipistrelle	Falsistrellus tasmaniensis	835-Cumberland riverflat forest
Greater Broad-nosed Bat	Scoteanax rueppellii	835-Cumberland riverflat forest
Little Lorikeet	Glossopsitta pusilla	835-Cumberland riverflat forest
Painted Honeyeater	Grantiella picta	835-Cumberland riverflat forest
White-throated Needletail	Hirundapus caudacutus	835-Cumberland riverflat forest
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	835-Cumberland riverflat forest

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Common Name	Scientific Name	Plant Community Type(s)
Australasian Bittern	Botaurus poiciloptilus	835-Cumberland riverflat forest
Barking Owl	Ninox connivens	835-Cumberland riverflat forest

Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	835-Cumberland riverflat forest
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	835-Cumberland riverflat forest
Diamond Firetail	Stagonopleura guttata	835-Cumberland riverflat forest
Dusky Woodswallow	Artamus cyanopterus cyanopterus	835-Cumberland riverflat forest
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	835-Cumberland riverflat forest
Eastern Osprey	Pandion cristatus	835-Cumberland riverflat forest
Flame Robin	Petroica phoenicea	835-Cumberland riverflat forest
Gang-gang Cockatoo	Callocephalon fimbriatum	835-Cumberland riverflat forest
Grey-headed Flying-fox	Pteropus poliocephalus	835-Cumberland riverflat forest
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	835-Cumberland riverflat forest
Koala	Phascolarctos cinereus	835-Cumberland riverflat forest
Large Bent-winged Bat	Miniopterus orianae oceanensis	835-Cumberland riverflat forest
Little Bent-winged Bat	Miniopterus australis	835-Cumberland riverflat forest
Little Eagle	Hieraaetus morphnoides	835-Cumberland riverflat forest
Masked Owl	Tyto novaehollandiae	835-Cumberland riverflat forest
Powerful Owl	Ninox strenua	835-Cumberland riverflat forest
Regent Honeyeater	Anthochaera phrygia	835-Cumberland riverflat forest
Scarlet Robin	Petroica boodang	835-Cumberland riverflat forest
Speckled Warbler	Chthonicola sagittata	835-Cumberland riverflat forest
Spotted-tailed Quoll	Dasyurus maculatus	835-Cumberland riverflat forest
Square-tailed Kite	Lophoictinia isura	835-Cumberland riverflat forest
Swift Parrot	Lathamus discolor	835-Cumberland riverflat forest
Turquoise Parrot	Neophema pulchella	835-Cumberland riverflat forest

Varied Sittella	Daphoenositta chrysoptera	835-Cumberland riverflat forest
White-bellied Sea-Eagle	Haliaeetus leucogaster	835-Cumberland riverflat forest

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C
Australasian Bittern	Botaurus poiciloptilus	Refer to BAR
Barking Owl	Ninox connivens	Refer to BAR
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	Refer to BAR
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	Refer to BAR
Diamond Firetail	Stagonopleura guttata	Refer to BAR
Dusky Woodswallow	Artamus cyanopterus cyanopterus	Refer to BAR
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	Refer to BAR
Eastern Osprey	Pandion cristatus	Refer to BAR
Flame Robin	Petroica phoenicea	Refer to BAR
Gang-gang Cockatoo	Callocephalon fimbriatum	Refer to BAR
Grey-headed Flying-fox	Pteropus poliocephalus	Refer to BAR
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	Refer to BAR
Koala	Phascolarctos cinereus	Refer to BAR
Large Bent-winged Bat	Miniopterus orianae oceanensis	Refer to BAR
Little Bent-winged Bat	Miniopterus australis	Refer to BAR
Little Eagle	Hieraaetus morphnoides	Refer to BAR
Masked Owl	Tyto novaehollandiae	Refer to BAR
Powerful Owl	Ninox strenua	Refer to BAR
Regent Honeyeater	Anthochaera phrygia	Refer to BAR
Scarlet Robin	Petroica boodang	Refer to BAR
Speckled Warbler	Chthonicola sagittata	Refer to BAR
Spotted-tailed Quoll	Dasyurus maculatus	Refer to BAR
Square-tailed Kite	Lophoictinia isura	Refer to BAR
Swift Parrot	Lathamus discolor	Refer to BAR

Turquoise Parrot	Neophema pulchella	Refer to BAR
Varied Sittella	Daphoenositta chrysoptera	Refer to BAR
White-bellied Sea-Eagle	Haliaeetus leucogaster	Refer to BAR

BAM Candidate Species Report

Proposal Details

Assessment Id 00026934/BAAS17110/21/00026935	Proposal Name Lot 6 DP 229296 Garfield Road East Rouse Hill	BAM data last updated * 10/06/2021
Assessor Name John Strachan Whyte	Report Created 03/08/2021	BAM Data version * 45
Assessor Number BAAS17110	Assessment Type Part 4 Developments (General)	BAM Case Status Finalised
Assessment Revision 0	Date Finalised 03/08/2021	BOS entry trigger BOS Threshold: Biodiversity Values Map

* 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.

List of Species Requiring Survey

Name	Presence	Survey Months

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Austral Pillwort	Pilularia novae-hollandiae	Refer to BAR
Barking Owl	Ninox connivens	Refer to BAR
Brown Pomaderris	Pomaderris brunnea	Refer to BAR
Bush Stone-curlew	Burhinus grallarius	Refer to BAR
Camden White Gum	Eucalyptus benthamii	Refer to BAR
Cumberland Plain Land Snail	Meridolum corneovirens	Refer to BAR
Eastern Osprey	Pandion cristatus	Refer to BAR
Eastern Pygmy-possum	Cercartetus nanus	Refer to BAR
Gang-gang Cockatoo	Callocephalon fimbriatum	Refer to BAR
Greater Glider	Petauroides volans	Refer to BAR
Green and Golden Bell Frog	Litoria aurea	Refer to BAR

Grey-headed Flying-fox	Pteropus poliocephalus	Refer to BAR
Hairy Geebung	Persoonia hirsuta	Refer to BAR
Hibbertia sp. Bankstown	Hibbertia sp. Bankstown	Refer to BAR
Koala	Phascolarctos cinereus	Refer to BAR
Large Bent-winged Bat	Miniopterus orianae oceanensis	Refer to BAR
Large-eared Pied Bat	Chalinolobus dwyeri	Refer to BAR
Little Bent-winged Bat	Miniopterus australis	Refer to BAR
Little Eagle	Hieraaetus morphnoides	Refer to BAR
Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	Marsdenia viridiflora subsp. viridiflora - endangered population	Geographic limitations
Masked Owl	Tyto novaehollandiae	Refer to BAR
Netted Bottle Brush	Callistemon linearifolius	Refer to BAR
Powerful Owl	Ninox strenua	Refer to BAR
Regent Honeyeater	Anthochaera phrygia	Refer to BAR
Southern Myotis	Myotis macropus	Refer to BAR
Square-tailed Kite	Lophoictinia isura	Refer to BAR
Squirrel Glider	Petaurus norfolcensis	Refer to BAR
Swift Parrot	Lathamus discolor	Refer to BAR
Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield	Wahlenbergia multicaulis - endangered population	Geographic limitations
Tall Knotweed	Persicaria elatior	Refer to BAR
White-bellied Sea-Eagle	Haliaeetus leucogaster	Refer to BAR
White-flowered Wax Plant	Cynanchum elegans	Refer to BAR

Biodiversity payment summary report

Assessment Id	Payment data version	Assessment Revision	Report created
00026934/BAAS17110/21/00026935		0	03/08/2021

Assessor Name	Assessor Number	Proposal Name	BAM Case Status
John Strachan Whyte	BAAS17110	Lot 6 DP 229296 Garfield Road East Rouse Hill	Finalised

Assessment Type	Date Finalised	BOS entry trigger
Part 4 Developments (General)	03/08/2021	BOS Threshold: Biodiversity Values Map

PCT list

Price calculated	PCT common name	Credits
Yes	**835 -** Cumberland riverflat forest	1

Species list

Price calculated	Species	Credits

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

Biodiversity payment summary report

IBRA sub region	PCT common name	Threat status	Offset trading group	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Cumberland	**835 -** Cumberland riverflat forest	Yes	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	15.82%	$737.69	2.3979	$ 22,097.40	1	$22,097.40

Subtotal (excl. GST)	**$22,097.40**
GST	**$2,209.74**
Total ecosystem credits (incl. GST)	**$24,307.14**

Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price

Biodiversity payment summary report

No species available

	Grand total	**$24,307.14**

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00026934/BAAS17110/21/00026935	Lot 6 DP 229296 Garfield Road East Rouse Hill	10/06/2021
Assessor Name	Report Created	BAM Data version *
John Strachan Whyte	03/08/2021	45
Assessor Number	BAM Case Status	Date Finalised
BAAS17110	Finalised	03/08/2021
Assessment Revision	Assessment Type	BOS entry trigger
0	Part 4 Developments (General)	BOS Threshold: Biodiversity Values Map

* 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	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	BC Act Listing status	EPBC Act listing status	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits

Cumberland riverflat forest											
1	835_Low	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	30.4	30.4	0.05	Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.00		1
										Subtotal	**1**
										Total	**1**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Species credits