

Brickworks Plant 2 Upgrade - 780 Wallgrove Road - Horsley Park

Biodiversity Development Assessment Report

Brickworks Land & Development

6 December 2019

Final



Report No. 18111RP1

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

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Approved by:	David Robertson
Position:	Director
Signed:	
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Glossary

Term / Abbreviation	Definition
AOBV	Area of Outstanding Biodiversity Value
Assessment area	Area of land within a 1500 m buffer around the outer boundary of the Subject Land
BAM	Biodiversity Assessment Method
BAMC	Biodiversity Assessment Method Calculator
BC Act	NSW Biodiversity Conservation Act 2016
BC Regulation	NSW Biodiversity Conservation Regulation 2017
BCT	Biodiversity Conservation Trust
BDAR	Biodiversity Development Assessment Report
BOAMS	Biodiversity Offsets and Agreement Management System
BOS	Biodiversity Offset Scheme
Development Site	The specific areas within the Subject Land in which in which construction and earthworks will be undertaken
DoEE	Commonwealth Department of the Environment and Energy
DPIE	Department of Planning, Industry and Environment
EEC	Endangered Ecological Community
EES	Environment, Energy and Science Group (Group of DPIE)
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
GIS	Geographic Information System
GPS	Global Positioning System
ha	Hectares
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
NSW	New South Wales
MNES	Matters of National Environmental Significance
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
the Project	Proposed upgrades to Brickworks Plant 2 within Lot 7 DP1059698
SAII	Serious and Irreversible Impact
SEPP	State Environmental Planning Policy
Subject Land	The entirety of Lot 7 DP1059698 which includes the Development Site (see Figure 1)
TEC	Threatened Ecological Community

1. Introduction

Cumberland Ecology was commissioned by Brickworks Land & Development to prepare a Biodiversity Development Assessment Report (BDAR) for the proposed upgrades to Plant 2 at the Horsley Park Brickworks site within Lot 7 DP1059698 (the 'project'). The project involves the demolition of parts of an existing factory and upgrades to existing buildings, and construction of new structures and hardstand areas. The project is classified as State Significant Development (SSD) under Clause 15 of Schedule 1 of State Environmental Planning Policy (State and Regional Development) 2011, as the Capital Investment Value of the project exceeds \$30 million. This BDAR will form part of the documentation to support an application for Development Consent for the Project.

1.1. Requirement for BDAR

Section 7.9 of the NSW *Biodiversity Conservation Act 2016* (BC Act) requires all Development Applications (DA) for State Significant Development to be accompanied by a BDAR unless both the Planning Agency Head and the Environment Agency Head determine that the proposed development is not likely to have any significant impact on biodiversity values. Accordingly, this BDAR has been prepared.

1.2. Purpose

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

- Identify the landscape features and site context (native vegetation cover) within the Subject Land and assessment area;
- Assess native vegetation extent, plant community types (PCTs), threatened ecological communities (TECs) and vegetation integrity (site condition) within the Subject Land;
- Assess habitat suitability for threatened species that can be predicted by habitat surrogates (ecosystem credits) and for threatened species that cannot be predicted by habitat surrogates (species credit species);
- Identify potential prescribed biodiversity impacts on threatened species;
- Describe measures to avoid and minimise impacts on biodiversity values and prescribed biodiversity impacts during project planning;
- Describe impacts to biodiversity values and prescribed biodiversity impacts and the measures to mitigate and manage such impacts;
- Identify the thresholds for the assessment and offsetting of impacts, including:
 - Impact assessment of potential entities of serious and irreversible impacts (SAII);
 - Impacts for which an offset is required;
 - Impacts for which no further assessment is required; and
- Describe the application of the no net loss standard, including the calculation of the offset requirement.

1.3. Project Description

1.3.1. Location

The project is located at 780 Wallgrove Road, Horsley Park, NSW, within part of Lot 7 DP1059698 (hereafter referred to as the Subject Land). The Subject Land is located within the City of Fairfield Local Government Area (LGA). The Subject Land is surrounded predominately by rural land and patches of forest/woodland and is located adjacent to the west of Prospect Reservoir. The Subject Land is bordered on the west by the Westlink M7 and on the east by Ferrers Road.

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

1.3.2. Project Overview

The project will include the following works:

1. Retention of part of existing factory to accommodate existing dryers and new kiln.
2. Demolition of part of existing factory and construction of new production building to accommodate brick extrusion and dehacking areas plus offices.
3. Construction of new footings for relocated clay bins and conveyor system.
4. New footings to allow the relocation of the existing clay bins from the front of the factory into the pit area.
5. New footings for a conveyor system to reduce dust associated with using the haul roads at the front of the property.
6. Construction of new footings for scrubber to be attached to the existing kiln stack.
7. Construction of booster assembly, hydrant water storage tanks, and hydrant booster pump room adjacent to existing car park.
8. Construction of new water tanks to south of existing production building.
9. Construction of new hardstand areas for fire access and forklift access.
10. Replacement of sheet metal roofing of existing areas of production building to be retained.

1.3.3. Identification of the Development Site Footprint

The layout of the project is shown in **Figure 3**. The Development Site footprint comprises the area of land directly impacted by the project excluding the existing building which will have sheet metal roof replaced and including accessways/new proposed hardstand areas. It is referred to within this BDAR as the Development Site.

1.3.4. General Description of the Subject Land

The Subject Land is likely to have historically been used for agriculture and was purchased by Brickworks in the 1950s. Construction of the existing brick plants within the Subject Land was undertaken in the 1960s. The Development Site is generally flat, and located variously between 60 and 69m Above Sea Level (ASL), though slopes occur in the far east and far south.

Eastern Creek and a tributary of Eastern Creek traverse the centre of the Subject Land parallel in a north to south direction. The majority of the Subject Land falls within the Blacktown soil landscape. This landscape is underlain by Wianamatta Group Ashfield Shale and Bringelly Shale formations, along with Minchinbury Sandstone. A strip through the centre of the Subject Land associated with Eastern Creek and its tributary, however, is mapped as South Creek Soil landscape. This landscape is underlain by quaternary alluvium derives from Wianamatta Group shales and Hawkesbury Sandstone.

The Subject Land currently contains buildings associated with Plant 1 and Plant 2, in the west and east respectively, small patches of degraded woodland, a forested riparian corridor, open grassland areas predominately in the far west, artificial water bodies, and areas of open earth consisting of quarry areas and access roads.

1.4. Information Sources

1.4.1. Databases

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

- Environment, Energy and Science (EES) BioNet Atlas;
- EES Threatened Biodiversity Data Collection;
- EES BioNet Vegetation Classification database;
- Commonwealth Department of the Environment and Energy (DoEE) Species Profile and Threat Database;
- DoEE Protected Matters Search Tool (PMST); and
- DoEE Directory of Important Wetlands in Australia.

1.4.2. Literature

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

- AT&L (2019) Brickworks Plant 2 Upgrade - 780 Wallgrove Road Horsley Park, Preliminary Bulk Earthworks Plan; and
- OEH (2013): Remnant Vegetation of the western Cumberland subregion, 2013 Update. VIS_ID 4207.

Other sources of information have been referenced throughout this BDAR.

1.4.3. Aerial Photography

The aerial imagery utilised in this BDAR is sourced from NearMap and is dated 18 January 2018. Additional aerial images available on NearMap and SixMaps were also consulted.

1.5. Authorship and Personnel

This document has been prepared by David Robertson (BAM Accredited Assessor No: 18095). This document, and associated field surveys and Geographic Information Systems (GIS) mapping, was prepared with the assistance of additional personnel as outlined in **Table 1**. Notwithstanding the assistance of the additional personnel, the assessment presented within this document is Bryan's.

Table 1 Personnel

Name	Tasks	Relevant Qualifications / Training	BAM Accredited Assessor No.
David Robertson	Document Preparation, Document Review	Doctor of Philosophy. Ecology, University of Melbourne, 1986 Bachelor of Science (Honours) in Ecology, University of Melbourne, 1980 BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS17027
Bryan Furchert	Document preparation, field surveys; credit calculations	Bachelor of Biodiversity and Conservation. Macquarie University, 2012 Diploma of Conservation and Land Management. TAFE NSW, 2008 BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS18095
Matthew Freeman	Field surveys	Bachelor of Natural Science (Nature Conservation). University of Western Sydney, 2012 BAM Accredited Assessor Training. Muddy Boots, 2018	
Timothy Playford	Document Review	Bachelor of Science (Honours) in Ecology, University of Adelaide, 2004 Bachelor of Environmental Management. Flinders University, 2003 BAM Accredited Assessor Training. Muddy Boots, 2018	
Jesse Luscombe	GIS mapping	Bachelor of Marine Science. Macquarie University, 2013	

		<p>Certificate III in Conservation and Land Management. TAFE NSW, 2016</p> <p>BAM Accredited Assessor Training. Muddy Boots, 2018</p>
Michael Davis	GIS mapping	<p>Bachelor of Biodiversity and Conservation. Macquarie University, 2016</p> <p>BAM Accredited Assessor Training. Muddy Boots, 2017</p>

2. Methodology

2.1. Review of Existing Data

Existing information on biodiversity values within the assessment area was reviewed, which includes:

- Survey data that is held in the BioNet Atlas;
- The following existing ecological reports, including vegetation mapping:
 - Cumberland Ecology : Brickworks – Horsley Park, Ecological Services (15164 RP1); and
 - OEH (2013): Remnant Vegetation of the western Cumberland subregion, 2013 Update. VIS_ID 4207.

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

2.2. Landscape Features

Landscape features requiring consideration were initially determined via desktop assessment. Field surveys undertaken on 15 August, 8 November and 10 December 2019, and sought to verify the following landscape features:

- Rivers, streams and estuaries;
- Important and local wetlands;
- Karsts, caves, crevices, cliffs and areas of geological significance; and
- NSW BioNet Landscapes.

No amendments were required to be made to any of these landscape features following field surveys.

2.3. Native Vegetation Survey

2.3.1. Vegetation Mapping

Several vegetation mapping studies have been undertaken across the Subject Land and surrounds, including the broad scale mapping of OEH (2013) and Tozer (2010).

Cumberland Ecology conducted additional vegetation surveys on 15 August and 10 December 2018, and November 2019 to revise and update the vegetation mapping of the Development Site. The vegetation within the Development Site was ground-truthed to examine and verify existing mapping of the condition and extent of the different plant communities. Mapping of plant communities within the Development Site was undertaken by random meander surveys throughout each patch of vegetation, noting key characteristics of areas in similar broad condition states such as similar tree cover, shrub cover, ground cover, weediness or combinations of these.

Records of plant community boundaries were made using a hand-held Global Positioning System (GPS) and mark-up of aerial photographs. The resultant information was synthesised using Geographical Information

Systems (GIS) to create a spatial database that was used to interpret and interpolate the data to produce a vegetation map of the Subject Land.

2.3.2. Vegetation Integrity Assessment

Vegetation integrity assessments were undertaken in the Subject Land generally in accordance with the BAM. BAM requires the establishment of a 20 m x 50 m plot with an internal 20 m x 20 m plot, however due to the configuration of the native vegetation within the Development Site and adjacent Subject Land, the following modifications were made to the plot dimensions of two of the plots:

- Plot 1 included establishment of a 10 m x 100 m plot, with a 10 m x 40 m floristic plot. The location of the floristic plot was chosen to be most representative of the vegetation zone, and the only area of the zone in which the whole floristic plot could fit within the Development Site. Some areas of the 10m x 100 m plot extend into hardstand areas; and
- Plot 3 included establishment of a 10 m x 100 m plot, with a 10 m x 40 m floristic plot. The location of the plot was chosen to be most representative of the vegetation zone, however due to the small areas of the zone within the Development Site, part of the floristic plot was undertaken in vegetation consistent with the zone adjacent within the Subject Land, and the majority of the 10m x 100 m plot was within an adjacent area of vegetation consistent with the zone. This configuration was selected due to the small nature of the vegetation zone within the Development Site, and to avoid, as far as practical including substantial areas of adjacent differing vegetation zones and hardstand areas.

The following data was collected within each of the plots:

- Composition for each growth form group by counting the number of native plant species recorded for each growth form group within a 10 m x 40 m or a 20 x 20 m floristic plot;
- Structure of each growth form group as the sum of all the individual projected foliage cover estimates of all native plant species recorded within each growth form group within a 10 m x 40 m or a 20 x 20 m floristic plot;
- Cover of 'High Threat Exotic' weed species within a 10 m x 40 m or a 20 x 20 m floristic plot;
- Assessment of function attributes within a 10 x 100 or 20 m x 50 m plot, including:
 - Count of number of large trees;
 - Tree stem size classes, measured as 'diameter at breast height over bark' (DBH);
 - Regeneration based on the presence of living trees with stems <5 cm DBH;
 - The total length in metres of fallen logs over 10 cm in diameter;
- Assessment of litter cover within five 1 m x 1 m plots evenly spread within the 10 x 100 or 20 m x 50 m plot; and
- Number of trees with hollows that are visible from the ground within the 10 x 100 or 20 m x 50 m plot.

A total of three BAM plots were undertaken within the Development Site, and their locations are shown in **Figure 4**. BAM plots were undertaken within the Development Site on 15 August 2018 and 8 November 2019. **Table 2** summarises the plot requirements based on the size and number of vegetation zones in the Subject Land. As shown in this table, the minimum number of plots has been completed for each vegetation zone. An additional plot was undertaken in a non-native vegetation community to assess the condition of the grassland. The location of plots have sought to capture the environmental variation of the PCTs identified within the Development Site (see **Section 4.2**). However, it is noted that due to the small nature of vegetation zones within the Development Site, the options for location of plots were limited.

Table 2 BAM plot survey requirements

Vegetation Zone	PCT	Condition	Area (ha)	Minimum Number of Plots Required	Number of Plots Completed
1	849	Low	0.11	1	1
2	1232	Low	0.03	1	1

2.3.3. Random Meander Surveys

Random meander surveys were undertaken in addition to plot surveys to collect additional information on the species present within each Plant Community Type (PCT) within the Development Site and within areas of non-native vegetation in order to create a comprehensive flora species list. Identification and recording of vascular flora species present in the different vegetation communities was undertaken.

2.4. Threatened Flora Species Survey

2.4.1. Habitat Constraints

Desktop assessments and field surveys within the Development Site included assessment of habitat constraints and microhabitats for predicted species credit flora species.

2.4.2. Targeted Species Survey

Targeted threatened flora surveys were undertaken within the Development Site for species credit species that were assessed as candidate species credit species for further assessment (see **Section 5.3**). **Table 3** provides a summary of the flora species credit species surveyed for within the Development Site.

Table 3 Threatened flora survey dates and methods

Scientific Name	Common Name	Recommended Survey Period	Dates of Survey within Land	Survey Method
<i>Cynanchum elegans</i>		Jan-Dec	15 August 2018 10 December 2018 8 November 2019	Random meander, plot survey

<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i>	Native Pear	Jan-Feb, Nov-Dec	15 August 2018 10 December 2018 8 November 2019	Random meander, plot survey
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2.4.2.1. Random Meander

Target Species: *Cynanchum elegans* and *Marsdenia viridiflora* subsp. *viridiflora* (Native Pear).

Although habitat within the Development Site is degraded to the extent it is unlikely for candidate species credit species to persist, surveys were undertaken for these two species as they are small species in as juveniles and can be hidden in the ground layer vegetation.

Random Meander Surveys were undertaken to cover all ground within the Development Site on 15 August and 10 December 2018, and on 8 November 2019. Where vegetation width permitted such as in the exotic grassland in the south of the site Random Meander Surveys were done as parallel transects. Due to the small area of potential habitat within the Development Site, Random Meander Surveys were deemed appropriate for the survey, and were supplemented with the required plot surveys.

As described previously, detailed plot surveys were undertaken within the Development Site on 15 August and 10 December 2018, and the 8 November 2019. The random meander surveys and plot surveys were undertaken by a botanist and ecologist on the 15 August 2018 and by a botanist on the 10 December 2018 and 8 November 2019. The locations of the random meanders and plots within the Development Site are shown in **Figure 4**.

2.5. Threatened Fauna Species Survey

2.5.1. Habitat Constraints

Desktop assessments and field surveys within the Development Site included assessment of habitat constraints and microhabitats for predicted species credit fauna species. This included desktop assessment of proximity of the Development Site to features such as caves and waterways and field inspection of microhabitats including leaf litter, stick nests and hollowing-bearing trees.

2.5.2. Threatened Fauna Species Survey

Targeted threatened fauna surveys were undertaken within the Development Site for species credit species that were assessed as candidate species credit species for further assessment (see **Section 5.3**). **Table 4** provides a summary of the fauna species credit species surveyed for within the Development Site. Details of each survey method utilised within the Development Site are provided below.

Table 4 Threatened fauna survey dates and methods

Scientific Name	Common Name	Recommended Survey Period	Dates of Survey within Land	Survey Method
<i>Meridolum corneovirens</i>	Cumberland Plain Land Snail	Jan-Dec	10 December 2018 8 November 2019	Diurnal active search

2.5.2.1. Diurnal Active Search

Target Species: Cumberland Plain Land Snail (*Meridolum corneovirens*).

An active search was undertaken within the Development Site by an ecologist on 10 December 2018 and 8 November 2019. A total of nine searches were undertaken (**Figure 4**). Searches consisted of checking within 1 m of the base of all Eucalypts that had a diameter at breast height greater than 10 cm and had leaf litter present at the base. Searches included disturbance (via raking) of the fallen bark and/or leaf litter to search for live snails or snail shells.

2.6. Weather Conditions

Weather conditions during the field survey was appropriate for detection of target species credit species. A summary of weather conditions in the wider locality of the Subject Land (BOM Weather Station 067119 – Horsley Park Equestrian Centre during the field surveys are provided in **Table 5**.

In the month of the field survey in August 2018, the average daily temperatures were between 5.5-19°C, with a total of 4.8mm of rainfall. In the month of the field surveys in December 2018, the average daily temperatures were between 16.9-29.6 °C, with a total of 129.8 mm of rainfall. In the first 17 days of November 2019 the average daily temperatures were between 12.9-29.1°C, with a total of 16mm of rainfall.

Table 5 Weather conditions during field surveys

Date	Temperature Minimum (°C)	Temperature Maximum (°C)	Rainfall (mm)
15 August 2018	0.7	24.8	0
10 December 2018	19.9	27.4	0
8 November 2019	16.2	29.6	0

3. Landscape Features

3.1. Assessment Area

The Development Site is approximately 1.77 ha in size and is shown in **Figure 2**. As the project is being assessed as a site-based project, the assessment area comprises the area of land within a 1,500 m buffer around the outer boundary of the Development Site. The assessment area is approximately 841.39 ha in size and is shown in **Figure 2**.

3.2. Landscape Features

Landscape features identified within the Development Site and assessment area are outlined below. The extent of these features within the Subject Land is shown in **Figure 1** and the extent within the assessment area is shown in **Figure 2**.

3.2.1. IBRA Bioregions and IBRA Subregions

The Development Site and assessment area occurs within the Sydney Basin Bioregion and within the Cumberland Subregion.

3.2.2. Rivers, Streams and Estuaries

The Development Site and assessment area occurs within the Hawkesbury-Nepean River catchment. No mapped watercourses occur within the Development Site. 1st order, 2nd order, and 3rd order stream occur within the assessment area including Eastern Creek and a tributary of Eastern Creek which run in a north-south direction through the Subject Land.

3.2.3. Important and Local Wetlands

No important wetlands listed in the Directory of Important Wetlands in Australia are present in the Development Site and/or assessment area. No mapped areas of wetlands under the Coastal Management State Environmental Planning Policy are present in the Development Site and/or assessment area.

A substantial portion of Prospect Reservoir occurs within the assessment area, though is outside the Development Site.

3.2.4. Habitat Connectivity

The Development Site does not form part of a regional biodiversity corridor, flyway for migratory species, riparian buffer or estuary, or a local corridor identified by council.

The Development Site is located adjacent to the western extent of Prospect Reservoir which contains extensive areas of native vegetation and the riparian corridor of Eastern Creek and a tributary run through the Subject Land to the west of the development site. There is potential that small degraded areas of vegetation in the Development Site could aid in dispersal of threatened species between these areas. A more extensive area of native vegetation immediately to the south of the Development Site and planted trees and open grassland to the north of the Development Site are more likely to be utilised for dispersal due to vegetation within the Development Site generally being isolated by expanses of hardstand areas and buildings.

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

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

3.2.6. Areas of Outstanding Biodiversity Value

No Areas of Outstanding Biodiversity Value (AoBV) have been mapped within the Development Site and/or assessment area.

3.2.7. BioNet NSW Landscapes

The Development Site is located within the 'Mitchell' BioNet NSW Landscape. The assessment area comprises a combination of the 'Mitchell' and "Estuary/Water Added" and "Hawkesbury Nepean Channels and Floodplains" landscapes.

3.2.8. Soil Hazard Features

Moderate overall risk of salinity is identified within the Development Site and High and Very High overall risk of salinity are identified in hydrological landscape mapping in DPIE's eSPADE V2.0 (2019a). No soil hazard features have been identified within the Subject Land and/or assessment area based on Acid Sulfate Soils Risk Mapping (DPIE 2019a).

3.3. Native Vegetation Cover

The native vegetation cover was determined through the use of GIS. To map native vegetation cover within the Development Site and assessment area, this assessment utilised the detailed vegetation mapping prepared by Cumberland Ecology in conjunction with broadscale mapping by OEH (2013). The native vegetation cover within the assessment area is shown in **Figure 2**. The assessment area is approximately 841.39 ha in size, of which approximately 240.13 ha comprises native vegetation cover, which represents 28.54% of the assessment area. Therefore, the native vegetation cover value is assigned to the cover class of >10–30%.

4. Native Vegetation

4.1. Native Vegetation Extent

The Development Site has been subject to detailed surveys by Cumberland Ecology for the purpose of this BDAR. The native vegetation extent within the Development Site was determined through aerial photograph interpretation and field surveys. The native vegetation extent within the Development Site is shown in **Figure 5**. It occupies approximately 0.14 ha, which represents 8% of the Development Site. The native vegetation extent within the Development Site includes two native vegetation communities, with one of these consisting of plantings of native species, and not comprising remnant native vegetation.

The remaining land within the Development Site comprises cleared land, including exotic vegetation (approximately 0.49 ha), and hardstand areas or cleared dirt (1.14 ha), totalling an area of approximately 1.63 ha. In accordance with Section 5.1.1.5 of the BAM, the areas of cleared land do not require further assessment, unless they are proposed for restoration as part of an offset, or provide habitat for species credit species.

4.2. Plant Community Types

Identification of the PCTs occurring within the Development Site was guided by the results of the surveys undertaken by Cumberland Ecology. The data collected during surveys of the Development Site and surrounds was analysed in conjunction with a review of the PCTs held within the BioNet Vegetation Classification database. In selecting PCTs, consideration was given to the following:

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

The analysis determined that the native vegetation within the Development Site aligned with two PCTs held within the BioNet Vegetation Classification database. **Table 6** provides a summary of the PCTs identified within the Development Site. The distribution of these PCTs within the Development Site is shown in **Figure 6**. Detailed descriptions of these PCTs and the justification for PCT selection is provided in the sections below.

Table 6 Plant community types within the Subject Land

PCT #	PCT Name	Area (ha)
849	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	0.11
1232	1232-Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	0.03
Total		0.14

4.2.1. 849 -Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion

Vegetation Formation: Grassy Woodland

Vegetation Class: Coastal Valley Grassy Woodlands

Percent Cleared Value: 93

TEC Status: Critically Endangered Ecology Community (CEEC) – Cumberland Plain Woodland

4.2.1.1. General Description

This community is present as two small areas within the Development Site, one in the east and one in the south. Both areas are degraded regrowth forms of the community without old trees, and a ground layer dominated by exotic grass species. The eastern occurrence consists of small isolated patches on a western facing slope between two large concreted areas utilised by trucks and forklifts (**Photograph 1** and **2**). Canopy and sub-canopy species in this area include the Cumberland Plain Woodland species *Eucalyptus moluccana* (Grey Box), *Eucalyptus tereticornis* (Forest Red Gum), *Eucalyptus fibrosa* (Red Ironbark) and *Eucalyptus crebra* (Narrow-leaved Ironbark). At the southern extent of the patch two small trees of the locally native species *Eucalyptus punctata* (Grey Gum) are present, which are likely planted, along with a larger planted individual of the non-endemic native species *Eucalyptus blakelyi* (Blakeley's Red Gum). Other plantings within this patch include individuals of an exotic *Cupressus* species.

The shrub layer is mostly absent with the exception of several individuals of the exotic *Lycium ferocissimum* (African Boxthorn) and young *Olea europaea* subsp. *cuspidata* (African Olive), and a planted *Nerium oleander* (Oleander). The ground layer is dominated by the exotic grass species *Eragrostis curvula* (African Lovegrass). Exotic grass species occurring less commonly include *Cenchrus clandestinus* (Kikuyu), and *Paspalum dilatatum* (Paspalum), and exotic forbs are present and include *Sida rhombifolia* (Paddys Lucerne), *Plantago lanceolata* (Lamb's Tongues), and *Bidens pilosa* (Cobbler's Pegs). The most common native species in the ground-layer is the native grass *Cynodon dactylon* (Couch), which is likely introduced to the site and accounts for about five percent of the layer, and *Bothriochloa decipiens* var. *decipiens* (Redleg Grass) is present in lesser abundances. A small number of native forbs are present with a scattered distribution in the layer and include *Dichondra repens* (Kidney Weed), *Atriplex semibaccata* (Berry Saltbush), and *Einadia nutans* subsp. *nutans* (Climbing Saltbush).

The southern occurrence of the community within the Development Site (**Photograph 3**) is at the periphery of a much larger patch. This is a small area of the community that contains one reasonably mature, though not old, *Eucalyptus tereticornis*, and a sub-canopy of a number of younger, small tree sized individuals of this species along with a single young *Eucalyptus moluccana* containing *Amyema miquelii* (Box Mistletoe). *Eucalyptus tereticornis* also occurs as young regrowth individuals in the shrub layer, and several young *Acacia parramattensis* (Sydney Green Wattle) individuals are present in the layer.

The ground layer is dominated by exotic grasses such as *Eragrostis curvula*, *Cenchrus clandestinus*, and *Chloris gayana* (Rhodes Grass), occurring along with a number of other less abundant species such as *Melinis repens*

(Red Natal Grass), *Setaria parviflora* (Pigeon Grass), and *Briza subaristata*. Exotic forbs are common and include *Senecio madagascariensis* (Fireweed), *Bidens pilosa*, and *Lysimachia arvensis* (Scarlet Pimpernel). Native species are scattered in the ground layer, though none are abundant. Species present include the grasses, *Rytidosperma caespitosus*, which is the most commonly occurring, *Aristida vagans* (Threeawn Grass), and *Paspalidium distans*, the climber *Hardenbergia violacea* (False Sarsparilla), and the forb *Einadia nutans* subsp. *linifolia*.

The southern area of PCT 849 in the Development Site is contiguous with and part of a much larger patch in similar condition (**Photograph 4**), with a canopy of young regrowth trees, and a ground layer predominately dominated by exotic grass species. Much of the occurrence at this location appears to be growing from an artificially created mound/mountain (likely created as a result of quarrying activities) and the regrowth trees therefore are likely to have germinated from seed from a shifted soil seed bank.

The community also occurs in similar condition to the east of the Development Site, along the boundary of the property, and as small areas to the east of the eastern patch.

Photograph 1 Low Condition PCT 849 in the east of the Development Site



Photograph 2 Low Condition PCT 849 in the east of the Development Site



Photograph 3 Low condition PCT 849 in the south of the Development Site



Photograph 4 Large patch of degraded PCT 849 to the south of the Development Site



4.2.1.2. Condition States

Within the Subject Land, PCT 849 exists as one broad condition state. Although there were minor variations observed within this vegetation zone, including areas with planted vegetation in the understorey and canopy, one broad condition state has been mapped as these variations were small enough not to warrant a separate vegetation zone and all areas consisted of a native canopy/sub-canopy with a mostly absent midstorey and an exotic dominated ground layer.

4.2.1.3. Justification of PCT Selection

To assist in determining the selected PCT, the findings of the following documents were reviewed:

- OEH (2013), which mapped areas on similar topography in the Subject Land and surrounding areas as PCT 849.

The BioNet Vegetation Classification was consulted, with filters using canopy species and occurrence within the Cumberland IBRA subregion to determine a list of potential PCTs. A review was also undertaken of Tozer et al. (2010) and Tozer (Tozer 2003) and the final determination for Cumberland Plain Woodland (NSW Scientific Committee 2011a).

Based on the existing available information of the Subject Land and surrounds, it was determined that the vegetation within the Subject Land would most likely be associated with either PCT 849 or PCT 850. Of these PCTs only PCTs 849 is both are described as having a canopy of *Eucalyptus moluccana* and *Eucalyptus tereticornis*, however 850 is described as generally containing *Acacia implexa* which was absent from plots, and 849 is described as generally occurring on gentle topography at below 150m ASL. Aside from this the

vegetation within the Development Site shows affinities with midstorey and ground layer species of both PCT 849 or PCT 850, with both communities having overlapping species composition and soils – and both are considered to conform to the Cumberland Plain Woodland TEC.

Whilst the vegetation community has affinities with both PCTs, PCT 849 has been selected for this assessment based on the following:

- Absence of *Acacia implexa* – species is only listed in the BioNet Vegetation Classification for PCT 850; and
- The mapped occurrences of PCT 849 elsewhere in the Subject Land adjoining areas within the assessment area on similar topography.

4.2.1.4. Alignment with Threatened Ecological Communities

Within the BioNet Vegetation Classification, PCT is associated with Cumberland Plain Woodland in the Sydney Basin Bioregion, which is listed as a CEEC under the BC Act and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The vegetation within the Development Site has been assessed as conforming to Cumberland Plain Woodland TEC within this assessment.

4.2.2. 1232-Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion

Vegetation Formation: Forested Wetlands

Vegetation Class: Coastal Swamps

Percent Cleared Value: 95

TEC Status: Not Listed

4.2.2.1. General Description

This community occurs as small areas in the Development Site in the north, east, and west. The community occurs as planted native woody vegetation over an exotic dominated ground layer.

The northern occurrence consists of planted Eucalypts including the non-endemic species *Eucalyptus scoparia* (Wallangarra White Gum), and the locally native *Eucalyptus moluccana* and other native species such as *Melaleuca bracteata* (Black Tea-tree) (**Photograph 5**). The trees are planted in a straight line bordering a sloped cutting represented areas that were excavated to construct the Plant 2 factory. The eastern and largest occurrence of the community consists of planted *Casuarina glauca* (Swamp Oak) individuals on a slope between concrete surfaces (**Photograph 6**) with a ground layer dominated by exotic grasses similar to the composition of the degraded Cumberland Plain Woodland community described above, and the Exotic Dominated Grassland community described below. The western occurrence (**Photograph 7**) consists of a single individual of a cultivar of the non-endemic native species *Callistemon viminalis* (Weeping Bottlebrush) at the northern extent of a strip of planted cultivar *Callistemon viminalis* and *Callistemon citrinus* (Crimson Bottlebrush).

Photograph 5 Planted *Eucalyptus moluccana* and *Eucalyptus scoparia* in north of Development Site



Photograph 6 Planted *Casuarina glauca* in the east of the Development Site



Photograph 7 Planted *Callistemon* in the west of the Development Site



4.2.2.2. Condition States

Within the Development Site, PCT 1232 exists as one broad condition state. Although planted species vary between different areas of the site, this community consists entirely of planted native vegetation occurring over a ground layer dominated by exotic grass species.

4.2.2.3. Justification of PCT Selection

To assist in determining the selected PCT, the findings of the following documents were reviewed:

- Final Determination – Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (NSW Scientific Committee 2011b).

Due to the planted nature of the vegetation within the mapped area of this PCT, the vegetation is not considered to comprise a naturally occurring PCT. However, the largest patch of this planted vegetation in the east of the site has a canopy dominated exclusively by planted *Casuarina glauca* (Swamp oak). The only broad vegetation community in NSW which consists of a canopy almost exclusively of *Casuarina glauca* is the TEC Swamp Oak Floodplain Forest. Within Western Sydney on Shale occurrences of the TEC correspond with the PCT 1232, the Vegetation Description of which states the community occurs with lagoons associated with “poorly drained shale depressions on the Cumberland Plain”. The Development Site does not contain lagoons or poorly drained shale depressions, however as the soils are shale and the Development Site is within the Cumberland Plain, and the largest area of planted vegetation is dominated by *Casuarina glauca* PCT 1232 was chosen to represent the planted community.

4.2.2.4. Alignment with Threatened Ecological Communities

Although the PCT is associated with the Swamp Oak Floodplain Forest the occurrence of the PCT within the Development Site is not aligned with the TEC as it consists of planted vegetation that is not on a floodplain and does not occur on grey-black clay loam or sandy loam.

4.3. Threatened Ecological Communities

One PCT identified within the Subject Land has been assessed as being associated with a TEC. **Table 7** summarises the TEC identified within the Subject Land and its distribution is shown in **Figure 7**.

Table 7 Threatened ecological communities within the Subject Land

TEC Name	BC Act Status	Associated PCTs	Area (ha)
Cumberland Plain Woodland	CEEC	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	0.11

4.4. Vegetation Integrity Assessment

The native vegetation identified within the Development Site was assigned to a vegetation zone based on PCTs and broad condition state. Patch sizes were subsequently assigned for each vegetation zone. The extent of vegetation zones within the Development Site are shown in **Figure 8**.

Each vegetation zone was assessed using survey plots/transects (see **Section 2.3.2**) to determine the vegetation integrity score. Plot data utilised within the BAM Calculator (BAMC) to determine the vegetation integrity score is provided in **Appendix A**. Field data sheets are provided separately to this document.

Vegetation zones, patch sizes and vegetation integrity scores for the Development Site are summarised in **Table 8**.

Table 8 Vegetation zones within the Subject Land

Vegetation Zone	PCT #	PCT Name	Condition Name	Area (ha)	Patch Size Class	Vegetation Integrity Score
1	849	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Low	0.11	101 ha	29.2
2	1232	1232-Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	Low	0.03	101 ha	38

5. Threatened Species

5.1. Identifying Threatened Species for Assessment

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

- IBRA subregion: Cumberland;
- Associated PCTs: 849 and 1232;
- Percent native vegetation cover in the assessment area: 28.5%;
- Patch size: 101 ha; and
- Credit type: Ecosystem and/or species.

Based on the above variables, the BAM Calculator generated a list of 36 ecosystem credit species and 40 species credit species that require assessment. Ecosystem credit species and species credit species are assessed further in **Section 5.2** and **Section 5.3**, respectively.

5.2. Ecosystem Credit Species

Table 9 lists the predicted ecosystem credit species for the vegetation zones within the Development Site, and whether they have been retained within the assessment following consideration of habitat constraints, geographic limitations, vagrancy and quality of microhabitats. Ten species have been removed from the assessment, based on the absence of habitat constraints.

Table 9 Ecosystem credit species requiring further assessment

Scientific Name	Common Name	Relevant PCTs	Retained Assessment?	in	Justification if Not Retained
Fauna					
<i>Anthochaera phrygia</i>	Regent Honeyeater (Foraging)	849, 1232	Yes	-	
<i>Artamus cyanopterus</i>	Dusky Woodswallow	849	Yes	-	
<i>Botaurus poiciloptilus</i>	Australasian Bittern	1232	No		Habitat constraint absent from the Development Site – i.e. no waterbodies, or brackish or freshwater wetlands.
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	849	Yes	-	
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	1232	Yes	-	
<i>Chthonicola sagittata</i>	Speckled Warbler	849	Yes	-	
<i>Circus assimilis</i>	Spotted Harrier	849, 1232	Yes	-	
<i>Climacteris picumnus vitoriae</i>	Brown Treecreeper (eastern subspecies)	849	Yes	-	
<i>Daphoenositta chrysoptera</i>	Varied Sittella	849	Yes	-	
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	849, 1232	Yes	-	
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	849	Yes	-	
<i>Glossopsitta pusilla</i>	Little Lorikeet	849, 1232	Yes	-	
<i>Grantiella picta</i>	Painted Honeyeater	849	No		Habitat constraint absent from the Development Site – i.e. mistletoes not present at greater than 5 per hectare.
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle (Foraging)	849, 1232	Yes	-	

Scientific Name	Common Name	Relevant PCTs	Retained Assessment?	in	Justification if Not Retained
<i>Hieraaetus morphnoides</i>	Little Eagle (Foraging)	849, 1232	Yes	-	
<i>Ixobrychus flavicollis</i>	Black Bittern	1232	No		Habitat constraint absent from the Development Site – i.e. no waterbodies, or land within 40 m of freshwater and estuarine wetlands.
<i>Lathamus discolor</i>	Swift Parrot	849, 1232	Yes	-	
<i>Lophoictinia isura</i>	Square-tailed Kite	849, 1232	Yes	-	
<i>Melanodryas cucullata</i>	Hooded Robin (south-eastern form)	849	Yes	-	
<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat	849, 1232	Yes	-	
<i>Miniopterus australis</i>	Little Bent-winged Bat (Foraging)	1232	Yes	-	
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat (Foraging)	849, 1232	No		Habitat constraint absent from the Subject Land – i.e. caves, tunnels, mines, culverts or other structures known or suspected to be used for breeding present.
<i>Neophema pulchella</i>	Turquoise Parrot	849	Yes	-	
<i>Ninox connivens</i>	Barking Owl (Foraging)	849, 1232	Yes	-	
<i>Ninox strenua</i>	Powerful Owl (Foraging)	849, 1232	No		Habitat constraint absent from the Subject Land – i.e. living or dead trees with hollow greater than 20 cm diameter absent.
<i>Pandion cristatus</i>	Eastern Osprey (Foraging)	1232	No		Required habitat absent from the Development Site. No clear, open water for foraging and no trees present within one kilometre of the ocean.

Scientific Name	Common Name	Relevant PCTs	Retained Assessment?	in	Justification if Not Retained
<i>Petroica boodang</i>	Scarlet Robin	849	Yes	-	
<i>Petroica phoenicea</i>	Flame Robin	849	Yes	-	
<i>Phascolarctos cinereus</i>	Koala (Foraging)	849	No		Species is a large, distinctive and well known mammal that requires large areas of habitat not present within the Development Site and there are no BioNet records within 10 km of the Development Site.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	1232	Yes	-	
<i>Rostratula australis</i>	Australian Painted Snipe	1232	No		Habitat required for the species on the fringe of swamps, dams, and nearby marshy areas is not present within the Development Site and no mudflats in shallow water present for foraging.
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	849, 1232	Yes	-	
<i>Stagonopleura guttata</i>	Diamond Firetail	849	Yes	-	
<i>Stictonetta naevosa</i>	Freckled Duck	1232	No		Habitat required for the species is not present within the Development Site - no inland waterbodies present for breeding and no coastal waterbodies present for foraging in non-breeding season.
<i>Tyto novaehollandiae</i>	Masked Owl	849, 1232	Yes	-	

Scientific Name	Common Name	Relevant PCTs	Retained Assessment?	in	Justification if Not Retained
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	1232	No		Habitat required for species, termite mounds, not present and associated PCT consists of planted vegetation.

5.3. Species Credit Species

Table 10 lists the predicted species credit species for the vegetation zones within the Development Site, and whether they have been retained within the assessment following consideration of habitat constraints, geographic limitations, vagrancy and quality of microhabitats.

A total of 17 flora species credit species and 23 fauna species credit species have been predicted for the Development Site. Of these, two flora species and one fauna species have been retained for further assessment and have been targeted during surveys outlined in **Section 2.4** and **Section 2.5**, respectively.

Table 10 Species credit species requiring further assessment

Scientific Name	Common Name	Retained in Assessment?	Justification if Not Retained
Flora			
<i>Acacia bynoeana</i>	Bynoe's Wattle	No	Species requires sandstone soils which are not present within the Development Site. Development Site is on Wianamatta derived shale clays.
<i>Acacia pubescens</i>	Downy Wattle	No	Species is a conspicuous shrub not located during surveys and habitat degraded to extent species not likely to occur, no native shrub layer present - ground layer nearly entirely dominated by exotic species.
<i>Caladenia tessellata</i>	Thick Lip Spider Orchid	No	No BioNet records within 10km of the Development Site. Species is only currently known to occur in Braidwood and Morton National Park.
<i>Cynanchum elegans</i>		Yes	-
<i>Dillwynia tenuifolia</i>	Dillwynia tenuifolia	No	Species is a conspicuous shrub not located during surveys and habitat degraded to extent species not likely to occur, no native shrub layer present - ground layer nearly entirely dominated by exotic species. No BioNet records within 10km of Development Site.
<i>Dillwynia tenuifolia</i> - endangered population	Dillwynia tenuifolia, Kemps Creek	No	Species is a conspicuous shrub not located during surveys and habitat degraded to extent species not likely to occur, no native shrub layer present - ground layer nearly entirely dominated by exotic species. No BioNet records within 10km of Development Site.

Scientific Name	Common Name	Retained in Assessment?	Justification if Not Retained
<i>Eucalyptus benthamii</i>	Camden White Gum	No	Species is a conspicuous tree not located during surveys. No BioNet records within 10km of Development Site. Species is only known to occur in a number of specific locations along the Nepean River and tributaries. The Development Site is not one of these locations.
<i>Grevillea juniperina</i> subsp. <i>juniperina</i>	Juniper-leaved Grevillea	No	Species is a conspicuous shrub not located during surveys and habitat degraded to extent species not likely to occur, no native shrub layer present - ground layer nearly entirely dominated by exotic species.
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i> - endangered population	Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	Yes	-
<i>Maundia triglochinos</i>	Maundia triglochinos	No	Habitat constraint absent from the Development Site - i.e. Development Site does not contain riparian areas/drainage lines or any waterbodies of any kind. No shallow swamps or waterbodies up to 1 m deep present.
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	No	Species is only known from Gosford-Wyong area and Jervis Bay.
<i>Persoonia bargoensis</i>	Bargo Geebung	No	Development Site is outside of the species known range.
<i>Pimelea curviflora</i> var. <i>curviflora</i>		No	Site is outside of the species' known range from North Sydney to Maroota and species is not associated with shale soils.

Scientific Name	Common Name	Retained in Assessment?	Justification if Not Retained
<i>Pimelea spicata</i>	Spiked Rice Flower	No	Species is a conspicuous sub-shrub not located during surveys and habitat degraded to extent species not likely to occur, no native shrub layer present - ground layer nearly entirely dominated by exotic species.
<i>Pterostylis saxicola</i>		No	Microhabitats within the Development Site are degraded, such that the species is unlikely to utilise the habitat. The species most common habitat type, pockets of soil in depressions on sandstone shelves above sandstone cliff lines is not present.
<i>Pultenaea pedunculata</i>	Matted Bush-pea	No	Species is a conspicuous sub-shrub not located during surveys and habitat degraded to extent species not likely to occur, no native shrub layer present - ground layer nearly entirely dominated by exotic species.
<i>Thesium australe</i>	Austral Toadflax	No	Development Site is substantially degraded to the extent that native grasses are mostly absent and most common host Themeda triandra is not present. No BioNet records within 10km of Development Site.
<u>Fauna</u>			
<i>Anthochaera phrygia</i>	Regent Honeyeater (Breeding)	No	Habitat constraint absent from the Development Site - i.e. Development Site does not occur within a mapped breeding area for the species which is only known to breed at three locations.
<i>Burhinus grallarius</i>	Bush Stone-curlew (Breeding)	No	Habitat constraint absent from the Development Site - i.e. Fallen/standing dead timber including logs not present.

Scientific Name	Common Name	Retained in Assessment?	Justification if Not Retained
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo (Breeding)	No	Habitat constraint absent from the Development Site - i.e. No hollow bearing trees, and no Eucalypt tree species within hollows greater than 9 cm diameter present.
<i>Calyptrorhynchus lathami</i>	Glossy Black-Cockatoo (Breeding)	No	Habitat constraint absent from the Development Site - i.e. No hollow bearing trees, and no living or dead trees with hollows greater than 15 cm diameter and greater than 5 m above ground present.
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	No	No BioNet records within 10km of the Development Site. Species has a preference for heathy habitats not present within the Development Site.
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	No	Habitat constraint absent from the Development Site - i.e. No Cliffs and not within 2 km of rocky areas containing caves, overhands, escarpments, outcrops, or crevices, or within 2 km of old tunnels or mines.
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle (Breeding)	No	No nests located within Development Site and no large trees present likely to be suitable for nesting by the species present.
<i>Hieraaetus morphnoides</i>	Little Eagle (Breeding)	No	Habitat constraint absent from the Development Site - i.e. No large trees within native vegetation present.
<i>Lathamus discolor</i>	Swift Parrot	No	Habitat constraint absent from the Development Site - i.e. Site is not within mapped breeding area
<i>Litoria aurea</i>	Green and Golden Bell Frog	No	Microhabitats within the Subject Land are degraded, such that the species is unlikely to utilise the habitat - there are no permanent or semi-permanent water bodies of any kind within the Development Site.

Scientific Name	Common Name	Retained in Assessment?	Justification if Not Retained
<i>Lophoictinia isura</i>	Square-tailed Kite	No	No nest trees located within Development Site.
<i>Meridolum corneovirens</i>	Cumberland Plain Land Snail	Yes	-
<i>Miniopterus australis</i>	Little Bent-winged Bat	No	Habitat constraint absent from the Development Site – i.e. caves, tunnels, mines, culverts or other known structures known or suspected to be used for breeding present.
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	No	Habitat constraint absent from the Subject Land – i.e. caves, tunnels, mines, culverts or other structures known or suspected to be used for breeding present.
<i>Myotis macropus</i>	Southern Myotis	No	Habitat constraint absent from the Development Site – i.e. no hollows trees, bridges, cave, or suitable artificial structures located within 200 m of riparian zone.
<i>Ninox connivens</i>	Barking Owl	No	Habitat constraint absent from the Subject Land – i.e. living or dead trees with hollow greater than 20 cm diameter absent.
<i>Ninox strenua</i>	Powerful Owl	No	Habitat constraint absent from the Development Site – i.e. no hollow bearing trees with hollows greater than 20 cm diameter and greater than 4 m above the ground.
<i>Pandion cristatus</i>	Eastern Osprey	No	No stick nests in living or dead trees or artificial structures within 100 m of a floodplain within Development Site.
<i>Petaurus norfolcensis</i>	Squirrel Glider	No	Species requires mature or old growth woodland or forest with abundant hollows for refuge and nest sites - these habitat features are not present within the Development Site.
<i>Phascolarctos cinereus</i>	Koala	No	Habitat constraint absent - Development Site does not contain abundant feed trees. No BioNet records within 10 km of Development Site.

Scientific Name	Common Name	Retained in Assessment?	Justification if Not Retained
<i>Pommerhelix duralensis</i>	Dural Land Snail	No	Habitat constraints absent from Development Site - No significant occurrences of leaf litter or bark and no rocky areas. Development Site is also outside of species' range.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	No	Habitat constraint absent from the Development Site- i.e. breeding camps absent.
<i>Tyto novaehollandiae</i>	Masked Owl	No	Habitat constraint absent from the development site. No hollow bearing trees or hollows greater than 20 cm diameter.

5.3.1. Presence of Candidate Species Credit Species

One planted threatened flora species, *Eucalyptus scoparia* (Wallangarra White Gum) was recorded within the Development Site during field surveys.

Eucalyptus scoparia is a candidate species credit species, and was recorded along the northern boundary of the Development Site in PCT 1232. In NSW it is known to naturally occur in only three locations near Tenterfield, including Bald Rock National Park (DPIE 2019b).

As this species is not endemic to the Development Site, and the individuals have been planted within a boundary strip of native plantings, they are not considered to be natural components of the landscape. Therefore, this species has not been considered further within this BDAR. The exclusion of this species follows previous advice provided by the then OEH for planted threatened species as they have not been planted for restoration or propagation purposes.

6. Prescribed Impacts

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

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

An assessment of the relevance of these prescribed impacts to the project is provided in **Table 11**.

Table 11 Relevance of prescribed impacts

Prescribed Impact	Relevance to the Project
Karst, caves, crevices, cliffs, rock outcrops and other geological features of significance	Not relevant. Features are not present within the Development Site.
Human-made structures	Not relevant. Buildings currently exist within the Development Site, and are to be upgraded, not removed. The factory to have roof removed and replaced was assessed as microbat habitat and determined not to be suitable due to open plan of ceiling lacking hidden areas and crevices in addition to the noisy operational environment .
Non-native vegetation	Not relevant. Whilst non-native vegetation occurs at scattered locations within the Development Site, it is not considered to comprise habitat for threatened species. Suitable habitat in the form of non-native vegetation will be retained within the Subject Land.
Habitat connectivity	The Development Site is located between Prospect Reservoir/Western Sydney Parklands and a vegetated riparian corridor associated with Eastern Creek and a tributary of Eastern Creek. The vegetation within the Development Site has some potential to form part of a corridor through the Subject Land, albeit potentially limited to flying birds and mammals due to vegetation patches generally being isolated by hard stand surfaces and heavily utilised roads.
Waterbodies, water quality and hydrological processes	Not relevant. Features not present within the Development Site. Riparian areas and dams are present within the Subject Land and the assessment area, however the Development Site is already developed and operating

	as a Brick Plant and the proposed development will be an upgrade to existing buildings. It is not expected therefore to affect water quality or hydrological processes assuming drainage plans are followed and legally required erosion control is used during construction.
Wind turbine strikes	Not relevant. Project does not comprise a wind farm development.
Vehicle strikes	Not relevant. Although the project includes the construction of an access driveway the site is already utilised as a Brick Plant and no significant changes to vehicle traffic will occur.

7. Avoid and Minimise Impacts

7.1. Avoid and Minimise Direct and Indirect Impacts on Native Vegetation and Habitat

7.1.1. Project Location

The development footprint has been situated within the Development Site to allow for the construction and operational requirements of the project while minimising impacts to areas containing biodiversity values.

Initial plans proposed positioning clay bins and new fuel and oil tanks further to the south outside of the current Development Site and potentially impacting a patch of Cumberland Plain Woodland at that location. In order to avoid and minimise potential impact on the TEC the clay bins and fuel and oil tanks were repositioned. This has avoided unnecessary impacts to native vegetation.

In determining the location of the Development Site, the project has sought to avoid and minimise direct impacts on native vegetation and habitat by:

- Locating the proposed extensions predominantly in areas comprising cleared land, exotic vegetation and planted vegetation where feasible;
- Upgrading existing accessway ramps to prevent excess damage to native vegetation by creation of new ramps;
- Locating fire access road in the west in a cleared/exotic grassland area avoiding further removal of planted native vegetation to the east and remnant trees to the west; and
- Maintaining connectivity by retaining strips of vegetation to the east and south of the Development Site, preventing loss of connectivity through the Subject Land.

7.1.2. Project Design

In determining the design of the development footprint, the project has sought to avoid and minimise direct impacts on native vegetation and habitat by:

- Design of building upgrades and accessway upgrades to retain as much as possible of PCT 849 in the east of the Development Site;
- Ensuring the accessway drains naturally to the street frontage minimising stormwater runoff through TEC vegetation and North Rocks Park;
- Providing shared services corridors to Lots 2 and 3 to minimise disturbance;
- Relocating proposed fuel and oil tanks and clay bins to reduce potential impacts on Cumberland Plain Woodland TEC ;
- Utilising existing accessways and upgrading to prevent further for upgrades and ;
- Engineering retaining wall in the south to be situated in existing batter vegetated with exotic grasslands and prevent impacts to Cumberland Plain Woodland TEC to the south of the Development Site.

In designing the upgrades any further reduction to impacts on PCT 849 in the east of the Development Site were not possible (pers. comm., M. Kublins, 27/11/2019) as:

- The production process of the brick factory results in the finished products exiting the building on the eastern side. This process does not change with the extension;
- The building extension is required to increase kiln car storage to allow the bricks to air dry. This saves energy and reduces manufacturing costs and environmental impact of the plant;
- The kiln car storage can only be increased near the end of the brick manufacturing process, which occurs on the eastern side; and
- Once the building is extended to the east, there is insufficient room for the forklifts to drive around the building and access the existing hardstand area, which is on the western side of the building. The existing retaining wall and batter (containing PCT 849) has thus been moved further to the east to create the forklift access area.

7.2. Avoid and Minimise Prescribed Impacts

Habitat connectivity has been identified as a prescribed impact for the project. In determining the location and design of the development footprint, the project has sought to avoid and minimise direct impacts to habitat connectivity by:

- Retaining areas of native vegetation in the Subject Land surrounding the Development Site, including a linear patch of Cumberland Plain Woodland (PCT 849) to the south of the site, a linear patch of planted native vegetation to the north of the site, and Cumberland Plain Woodland trees to the east of the site; and
- Maintaining existing hydrological characteristics to retained vegetation on the Subject Land to prevent dieback or riparian vegetation in corridor.

8. Assessment of Impacts

8.1. Impacts on Native Vegetation and Habitat

8.1.1. Direct Impacts

The direct impact resulting from the proposed development is the loss of vegetation and associated habitat within the Development Site. **Table 12** identifies the extent of the proposed impacts to vegetation within the Development Site.

Table 12 Extent of vegetation impacts within the Subject Land

Vegetation Zone	PCT #	PCT Name	BC Act Status	Area (ha)
1	849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	CEEC	0.11
2	1232	Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	-	0.03
Total				0.14

8.1.2. Change in Vegetation Integrity Score

Table 13 details the change in vegetation integrity score for each vegetation zone and management zone. The direct impacts of the project only involve one management zone, being the total clearing of vegetation within the Development Site.

Table 13 Change in vegetation integrity score

Vegetation Zone	PCT #	PCT Name	Management Zone	Current VI Score	Future VI Score	Change in VI Score
1	849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	1_Clearing	29.2	0	-29.2
2	1232	Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	1_Clearing	38	0	-38

8.1.3. Indirect Impacts

Table 14 outlines the indirect impacts to native vegetation and habitat that will occur due to the proposed development. These are only likely to occur to the vegetation being retained to the south of the Development Footprint as the northern patch of vegetation to be removed is surrounded by cleared land and roads. Due to the existing highly modified nature of the vegetation both within and adjacent to the Subject Land, the indirect impacts of the project are not considered to be significant.

Table 14 Indirect impacts of the Project

Indirect Impact	Nature	Extent	Duration	Threatened Entities Likely Affected	Consequences
Inadvertent impacts on adjacent habitat or vegetation	Construction activities may result in inadvertent impacts on retained vegetation, such as increased sedimentation.	Retained vegetation within adjacent areas of Subject Land	Short term (during construction)	Cumberland Woodland Swamp Oak Floodplain Forest River-flat Eucalypt Forest	Reduced condition of the adjoining TEC and riparian vegetation.
Reduced viability of adjacent habitat due to edge effects	Modification of vegetation extent within the Development Site may increase edge effects.	Retained vegetation within adjacent areas of Subject Land.	Potential long-term	Cumberland Woodland	Reduced condition of the adjoining TEC.
Reduced viability of adjacent habitat due to noise, dust or light spill	The construction activities associated with the project are likely to increase the noise, dust and light above current levels within the Development Site and Subject Land.	Retained vegetation within Subject Land.	Short term (during construction)	Ecosystem credit species	Short term disruption of fauna habitat usage during construction.
Transport of weeds and pathogens from the site to adjacent vegetation and offsite vegetation	A number of high threat exotic weeds are known to occur within the Subject Land and may be inadvertently spread to retained vegetation and elsewhere in the locality.	Retained vegetation within Subject Land and assessment area.	Potential long-term	Cumberland Woodland Swamp Oak Floodplain Forest River-flat Eucalypt Forest	Reduced condition of the adjoining TEC and other TECs within Subject Land and assessment area.

8.2. Prescribed Impacts

The project has been assessed as resulting in one prescribed impact, habitat connectivity (see **Chapter 6**). An assessment of this prescribed impact is provided below.

8.2.1. Habitat Connectivity

8.2.1.1. Nature

The Development Site is located adjacent to the western edge of Prospect Reservoir/Western Sydney Parklands, which contains remnant native vegetation. The Subject Land contains a vegetated riparian corridor associated with Eastern Creek and one of its tributaries. The vegetation within the Development Site is surrounded by cleared land and is not connected to either of these areas of native vegetation. That notwithstanding, it provides some connectivity between these two areas in the form of a “stepping stone” and subsequently is part of a patch of vegetation greater than 100 ha in size.

8.2.1.2. Extent

Habitat connectivity will be marginally reduced by the removal of 0.14 ha of habitat within vegetation zones 1 and 2, which forms part of a connected patch of greater than 100 ha.

8.2.1.3. Duration

The reduction of habitat connectivity is considered to be a long-term impact.

8.2.1.4. Threatened Entities Affected

The habitat provided by the Development Site may provide connectivity for highly mobile ecosystem species, such as the Grey-headed Flying-fox and microchiropteran bats that can fly over disturbed areas to access new habitats.

8.2.1.5. Consequences

The project will result in the reduction in connectivity by 0.14 ha. The reduction of this small area of habitat is not considered likely to significantly impact the movement of mobile fauna species as connective vegetation will remain around all sides of the Development Site including treed vegetation to the north, south, and east. For example, the Grey-headed Flying-fox forages opportunistically, often at distances up to 30 km from camps, and occasionally up to 60-70 km per night, in response to patchy food resources (NSW Scientific Committee 2004). It is considered unlikely that any native fauna species would be solely reliant on the habitat within the Development Site.

8.3. Mitigation of Impacts to Native Vegetation and Habitat

A range of mitigation measures have been developed for the project to mitigate the impacts to native vegetation and habitat that are unable to be avoided. These include a range of measures to be undertaken before and during construction to limit the impact of the project. Each mitigation measure is discussed in detail below, and a summary is provided in **Table 15**.

8.3.1. Weed Management

In order to minimise the spread of weeds throughout the Subject Land and adjoining areas, appropriate weed control activities will be undertaken prior to vegetation clearing in accordance with the Greater Sydney Local Land Services Area and is subject to the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022 (LLS: Greater Sydney 2019) under the NSW *Biosecurity Act 2015*.

The *Biosecurity Act 2015* and regulations provide specific legal requirements for state level priority weeds and high risk activities, as provided in the Appendices of the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022 (LLS: Greater Sydney 2019). In order to comply with the objectives of the Greater Sydney Regional Strategic Weed Management Plan, it is recommended the following measures be implemented as part of weed management for the Development Site during .

i. Prevention

Appropriate construction site hygiene measures will be implemented to prevent entry of new weeds to the area such as the cleaning of equipment prior to entering the Subject Land.

ii. Containment

Follow-up monitoring and maintenance weeding will be undertaken in the Development Site following vegetation clearing activities, to contain any re-emergence of weed species.

8.3.2. Delineation of Clearing Limits

The limits of clearing will be marked either by high visibility tape on trees or metal/wooden pickets, fencing or an equivalent boundary marker that will be installed prior to clearing. To avoid unnecessary or inadvertent vegetation and habitat removal or impacts on fauna, disturbance must be restricted to the delineated area and no stockpiling of equipment, machinery, soil or vegetation will occur beyond this boundary.

8.3.3. Tree Protection Measures

Trees retained immediately adjacent to the Development Site will be subject to tree protection measures. This includes:

- Installation of fences around specified tree protection zones; and
- All tree work is to be carried out by a suitably qualified and insured Arborist.

8.3.4. Pre-clearance Surveys

In order to minimise impacts to fauna species during construction, pre-clearance surveys will be conducted in all areas of vegetation that are required to be cleared. Pre-clearing surveys will be undertaken within one week of clearing activities by a qualified ecologist.

Habitat features to be identified include:

- Hollow-bearing trees;
- Hollow-bearing logs; and

- Nests within tree canopy or shrubs.

Such features have the potential to contain native species. All habitat features will be identified, recorded and flagged with fluorescent marking tape and trees will have an "H" spray painted with marking paint on two sides of the tree.

8.3.5. Staging of Clearing

The clearing will be conducted using a two-stage clearing process as follows:

Stage 1: Clearing will commence following the identification of potential habitat features by a qualified ecologist. Hollow-bearing trees marked during pre-clearing will not be cleared during the first stage; however all vegetation around these trees will be cleared to enable isolation of the feature. Other habitat features, such as hollow-bearing logs, can be removed during Stage 1 only if done under supervision by a qualified ecologist. Identified hollow-bearing trees will be left at a minimum overnight after Stage 1 clearing to allow resident fauna to voluntarily move from the area.

Stage 2: After hollow-bearing trees have been left overnight, the trees will be cleared using the following protocols:

- Trees marked as containing hollows will be shaken by machinery prior to clearing to encourage any animals remaining to leave the hollows and move on;
- Use a bulldozer or excavator to start pushing the tree over. Move the bulldozer over the roots and continue gently pushing the tree over;
- Remove branches with hollows and sections of trunk and set aside for immediate transfer to a storage area for placement within retained vegetation; and
- All hollows will be investigated by an ecologist for the presence of fauna following felling of the tree.

The felled habitat tree will be left overnight to allow any remaining fauna time to leave the hollows and move on.

The two-stage clearing process enables fauna to feel secure whilst clearing occurs around their tree, and allows them a chance to self-relocate upon nightfall, when foraging typically occurs. Fauna are not likely to re-inhabit trees, as they are not likely to feel secure in their tree with all trees around it cleared.

Provisions will be made to protect any native fauna during clearing activities by the following means:

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

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

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

8.3.6. Sedimentation Control Measures

The project may result in erosion and transport of sediments as a result of soil disturbance during construction. In order to prevent this impact, construction activities will be undertaken in accordance with "The Blue Book" (Landcom 2004). These include implementation of the following measures:

- Installation of sediment control fences;
- Covering soil stockpiles; and
- Avoiding soil disturbance prior to heavy rainfall.

Table 15 Summary of mitigation measures for impacts to native vegetation and habitat

Mitigation Measure	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Risk and Consequences of Residual Impacts
Weed management	Appropriate weed control activities will be undertaken in accordance with the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022 (LLS: Greater Sydney 2019).	Construction	Prior to construction, following vegetation clearing	Contractor	High	Spread of weeds throughout the Subject Land and assessment area.
Delineation of clearing limits	Clearing limits marked either by high visibility tape on trees of metal/wooden pickets, fencing or an equivalent boundary marker. Disturbance, including stockpiling, restricted to clearing limits.	Construction	Once	Contractor	High	Unnecessary damage to trees to be retained.
Tree protection measures	Installation of fences around specified tree protection zones. All tree work is to be carried out by a suitably qualified and insured Arborist.	Construction	Throughout construction period	Contractor	High	Unnecessary damage to trees to be retained.
Pre-clearance survey	Pre-clearance surveys will be conducted in all areas of vegetation that are required to be cleared.	Construction	Once	Contractor	Moderate	Increased and unnecessary mortality of native fauna.

	Pre-clearing surveys will be undertaken within one week of clearing. Habitat features will be marked during the pre-clearing survey.					
Staging of clearing	Vegetation clearing will be conducted using a two-stage clearing process. Animals disturbed or dislodged during the clearance but not injured will be assisted to move to adjacent bushland or other specified locations If animals are injured during the vegetation clearance, appropriate steps will be taken to humanely treat the animal (either taken to the nearest veterinary clinic for treatment, or if the animal is unlikely to survive, it will be humanely euthanized)	Construction	Once	Contractor	High	Increased and unnecessary mortality of native fauna.
Sedimentation control measures	Construction activities will be undertaken in accordance with "The Blue Book" (Landcom 2004). These include implementation of the following measures: Installation of sediment control fences;	Construction	Throughout construction period	Contractor	High	Sedimentation into retained and adjoining vegetation.

Covering soil stockpiles; and
Avoiding soil disturbance prior to
heavy rainfall

8.4. Mitigation of Prescribed Impacts

The following mitigation measures, described previously in **Section 8.3**, are relevant to the prescribed impact of habitat connectivity and retaining adjacent connective habitat:

- Delineation of clearing limits;
- Pre-clearance survey; and
- Staging of clearing.

No additional mitigation measures are proposed for prescribed impacts.

8.5. Adaptive Management for Uncertain Impacts

The project is considered unlikely to result in any uncertain impacts that require adaptive management.

8.6. Use of Biodiversity Credits to Mitigate or Offset Indirect or Prescribed Impacts

Due to the small scale of indirect and prescribed impacts, the project does not propose to use additional biodiversity credits to mitigate or offset indirect or prescribed impacts.

9. Thresholds for Assessment

9.1. Introduction

The assessment thresholds that must be considered include the following:

- Impacts on an entity that is at risk of a serious and irreversible impact;
- Impacts for which the assessor is required to determine an offset requirement;
- Impacts for which the assessor is not required to determine an offset requirement; and
- Impacts that do not require further assessment by the assessor.

The following sections outline these assessment thresholds and their relevance to the project.

9.2. Impacts on Serious and Irreversible Impact Entities

One SAI entity, Cumberland Plain Woodland, will be impacted by the project. The location of the Cumberland Plain Woodland in relation to the Development Site is shown in **Figure 7**. Approximately 0.11 ha of Cumberland Plain Woodland will be removed within the Development Site.

Section 10.2.2 of the BAM requires the provision of additional information regarding SAI entities that are TECs. The additional information is required to assist the consent authority to evaluate the nature of an impact on an entity at potential risk of a serious and irreversible impact. The additional information requirements are shown as italicised text below, with responses supplied beneath in plain text. The information presented below indicates that the project is unlikely to result in a significant and irreversible impact to the TEC.

(a) the action and measures taken to avoid the direct and indirect impact on the potential entity for an SAI

The actions and measures taken to avoid impacts to Cumberland Plain Woodland include amendments to the location of construction footprints, amending the design of construction footprints and wholly containing disturbance to within the development footprint or cleared land. Mitigation measures proposed to be undertaken during construction have also been designed to minimise indirect impacts to the retained area of Cumberland Plain Woodland within the Subject Land.

(b) the area (ha) and condition of the TEC to be impacted directly and indirectly by the proposed development. The condition of the TEC is to be represented by the vegetation integrity score for each vegetation zone

Approximately 0.11 ha of Cumberland Plain Woodland will be directly impacted within the Development Footprint. Approximately 0.7 ha of Cumberland Plain Woodland occurs adjacent to the southern and eastern boundary of the Development Site and has potential to be indirectly impacted. Within the Development Site, the Cumberland Plain Woodland has a current vegetation integrity score of 29.2. As the adjoining vegetation was observed to have a similar exotic dominated ground-layer it is likely the vegetation with potential to be indirectly impacted is in similar condition to that to be directly impacted.

(c) a description of the extent to which the impact exceeds the threshold for the potential entity that is specified in the Guidance to assist a decision-maker to determine a serious and irreversible impact

There is currently no defined threshold for this SAI entity. No thresholds are currently defined for TECs within the Sydney Basin IBRA bioregion and Cumberland Ecology understands that the EES does not intend to determine any of these thresholds at the current time.

(d) the extent and overall condition of the potential TEC within an area of 1000ha, and then 10,000ha, surrounding the proposed development footprint

Within an area of 1,000 ha surrounding the Subject Land, approximately 266 ha of Cumberland Plain Woodland is mapped as occurring. This was derived using the broad scale vegetation mapping for the Sydney Metropolitan Area mapped by OEH (2016) in conjunction with the remnant vegetation mapping of the Cumberland Plain (OEH 2013) and the finer scale mapping of the Development Site by Cumberland Ecology for this BDAR. The condition of Cumberland Plain Woodland within an area of 1,000 ha surrounding the Subject Land is expected to be in a similar condition, or much better in the case of substantial patches within Prospect Reservoir and Western Sydney Parklands, to that within the Development Site.

Within an area of 10,000 ha surrounding the Subject Land, approximately 1,547 ha of Cumberland Plain Woodland has been mapped. This was derived using several mapping projects for a number of different broad scale vegetation mapping projects clipped to include a 10,000 ha area surrounding the Development Site. These mapping units included those used to obtain the area within the 1,000 ha area as well as the remnant vegetation mapping of the Cumberland Plain (OEH 2013) and vegetation mapping for the Sydney Metropolitan Area mapped by OEH (2016). The condition of Cumberland Plain Woodland within an area of 10,000 ha surrounding the Subject Land is variable and large patches such as those within Prospect Reservoir and Western Sydney Parklands are expected to be in good condition. The extent of Cumberland Plain Woodland within an area of 10,000 ha surrounding the Subject Land is shown in **Figure 9**.

(e) an estimate of the extant area and overall condition of the potential TEC remaining in the IBRA subregion before and after the impact of the proposed development has been taken into consideration

Approximately 29,813 ha of Cumberland Plain Woodland is mapped as occurring within the Cumberland IBRA subregion. This value is derived from mapped areas included within OEH (2016), OEH (2013), and Tozer et al. (2010). The project will result in the removal of approximately 0.11 ha of Cumberland Plain Woodland within the Development Site, which represents 0.0003% of the extent within the Cumberland IBRA subregion. The current extent of Cumberland Plain Woodland amounts to less than 8% of the original distribution (NSW Scientific Committee 2011a).

The current distribution of Cumberland Plain Woodland is severely fragmented, with more than half of the remaining tree cover mapped by Tozer (2003) occurring in patches of less than 80 ha and half of all mapped patches being smaller than 3 ha (NSW Scientific Committee 2011a). The overall condition of Cumberland Plain Woodland across the Sydney Basin bioregion is unlikely to change as a result of the project, as the condition present within the Development Site is highly modified and is an extremely small area and much larger patches of the community in better condition will remain, with some of these patches occurring in conservation reserves such as Scheyville National Park and Wianamatta Regional Park.

(f) an estimate of the area of the potential TEC that is in the reserve system within the IBRA region and the IBRA subregion

A total of approximately 29813 ha of Cumberland Plain Woodland occurs within the Cumberland IBRA subregion, of which approximately 1409.33 ha occurs in the reserve system.

A total of approximately 30615 ha of Cumberland Plain Woodland occurs within the Sydney Basin IBRA bioregion, of which approximately 1421.02 ha occurs in the reserve system.

(g) the development, clearing or biodiversity certification proposal's impact on:

(i) abiotic factors critical to the long-term survival of the potential TEC; for example, how much the impact will lead to a reduction of groundwater levels or the substantial alteration of surface water patterns

The project will not involve changes to groundwater levels, surface water patterns and soil disturbance that would impact the Cumberland Plain Woodland that will be retained within the Subject Land. The project is unlikely to have any impact on abiotic factors critical to the long-term survival of the TEC, within the Subject Land.

(ii) characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of understorey species or harvesting of plants

The project will result in the removal of 0.11 ha of Cumberland Plain Woodland, comprising an area of canopy trees above with an absent midstorey and dominated almost exclusively by exotic grass species. Within the Development Site, a substantial change will occur to the composition of the community, as it will be entirely removed.

(iii) the quality and integrity of an occurrence of the potential TEC through threats and indirect impacts including, but not limited to, assisting invasive flora and fauna species to become established or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants which may harm or inhibit growth of species in the potential TEC

The Cumberland Plain Woodland within the Development Site has previously been modified as a result of previous clearing and ongoing operational activities. A suite of invasive flora species, including high threat exotics, are known to occur within this community within the Development Site, and there is little potential for an increase of such species in areas of retained Cumberland Plain Woodland within the Subject Land due to already being in poor condition. The project is considered unlikely to result in the regular mobilisation of fertilisers, herbicides or other chemicals or pollutants which may harm or inhibit growth of species in areas of retained Cumberland Plain Woodland as the project consists of an upgrade to existing buildings of an operation Brick Plant and land use changes are not predicted to occur. The quality and integrity of the remaining areas of the TEC surrounding the Development Site, is unlikely to be significantly impacted, due to the modified nature of the surrounding vegetation.

(h) direct or indirect fragmentation and isolation of an important area of the potential TEC

Cumberland Plain Woodland is considered to be severely fragmented, due to past agricultural clearing and current urban development (NSW Scientific Committee 2011a). The removal of 0.11 ha of Cumberland Plain Woodland will not significantly increase fragmentation or isolation of an important area of the TEC, as it requires clearing of already isolated patches within a Brick Plant grounds. Although the project will increase

the amount of overall fragmentation on a small scale, it will not result in the isolation of important areas of habitat. Larger, more intact areas of the community within the Subject Land providing habitat connectivity will be retained.

(i) the measures proposed to contribute to the recovery of the potential TEC in the IBRA subregion.

Mitigation measures to be implemented for the project will assist in minimising potential impacts to retained Cumberland Plain Woodland within the Subject Land. Biodiversity offsets as determined by the BAM are proposed to be purchased within the IBRA subregion or surrounding subregions, in accordance with the offsetting rules under the BAM, that will contribute to the recovery of Cumberland Plain Woodland in the surrounding landscape.

9.3. Impacts that Require an Offset

9.3.1. Native Vegetation

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

- A vegetation zone that has a vegetation integrity score ≥ 15 where the PCT is representative of an EEC or CEEC; and
- A vegetation zone that has a vegetation integrity score of ≥ 17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or is representative of a vulnerable ecological community.

The PCTs and vegetation zones requiring offsets are documented in **Table 16**. These areas are mapped in **Figure 10**.

It is noted that the Department of Planning, Industry and Environment published a revised version of the BAM that was on public exhibition until 16 October 2019, which included a module to assess planted native vegetation. Application of this module to the planted vegetation within the Subject Land would result in the vegetation being assessed for species credits only (i.e. no calculation of ecosystem credits). As the revised version of the BAM has not been finalised, this BDAR has been based on the current advice for planted vegetation, which is to assign to a best-fit PCT.

Table 16 Summary of impacts to native vegetation requiring an offset

Vegetation Zone	PCT #	PCT Name	Condition Name	Area (ha)	Patch Size Class	Vegetation Integrity Score
1	849	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Low	0.11	>100 ha	29.2

2	1232	1232-Swamp Oak floodplain Low	0.03	>100 ha	38
		swamp forest, Sydney Basin Bioregion and South East Corner Bioregion			

9.3.2. Threatened Species

No species credit species have been identified as requiring an offset.

9.4. Impacts that do not Require Further Assessment

All areas identified as 'Exotic Dominated Grassland' that occur within the Development Site do not require an offset. These areas comprise approximately 0.49 ha, as shown on **Figure 10**.

9.5. Application of the No Net Loss Standard

The BAM sets a standard that will result in no net loss of biodiversity values where the impacts on biodiversity values are avoided, minimised and mitigation, and all residual impacts are offset by retirement of the required number of biodiversity credits.

The ecosystem credit requirement for the project is summarised in **Table 17**, whilst the 'like for like' offsetting options for the ecosystem credits are provided in **Table 18** (PCT 849) and **Table 19** (PCT 1232).

A credit summary report from the BAMC has been included in **Appendix B**.

Table 17. Summary of ecosystem credit liability

PCT #	PCT Name	TEC	Area (ha)	Credits Required
849	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Cumberland Plain Woodland in the Sydney Basin Bioregion	0.11	2
1232	1232-Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	Not a TEC	0.03	1

Table 18. Like for like offsetting options for PCT 849

Any PCT with the below TEC	Containing Hollow-bearing Trees?	In the below IBRA Subregions
Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850	No	Cumberland , Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.

Table 19 Like for like options for PCT 1232

Any PCT in the below Class	And in any of below trading groups	Containing Hollow-bearing Trees?	In the below IBRA Subregions
Coastal Swamp Forests This includes PCT's: 1232, 1723	Coastal Swamp Forests - \geq 90% cleared group (including Tier 2 or higher	No	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.

10. References

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APPENDIX A :

BAM Plot Data and Flora Survey Data

Table 20 Flora Survey Data

BAM GFG	Family	Scientific Name	Common Name	BC Act	EPBC Act	Nat.	Exot.	HTW	P1 C	P1 A	P2 C	P2 A	P3 C	P3 A	RMS 1	RMS 2	RMS 3	RMS 4	RMS 5	RMS 6	RMS 7
Tree (TG)	Casuarinaceae	Casuarina cunninghamiana subsp. cunninghamiana	River Oak			YES							4.0	1							
Tree (TG)	Casuarinaceae	Casuarina glauca	Swamp Oak			YES									X						
Tree (TG)	Fabaceae (Mimosoideae)	Acacia parramattensis	Parramatta Wattle			YES												X	X		
Tree (TG)	Myrtaceae	Eucalyptus blakelyi	Blakely's Red Gum			YES			4	1											
Tree (TG)	Myrtaceae	Eucalyptus cinerea	Argyle Apple			YES							4.0	1							
Tree (TG)	Myrtaceae	Eucalyptus crebra	Narrow-leaved Ironbark			YES			3	1											
Tree (TG)	Myrtaceae	Eucalyptus fibrosa	Red Ironbark			YES			5	2											
Tree (TG)	Myrtaceae	Eucalyptus moluccana	Grey Box			YES			15	5			15.0	16							
Tree (TG)	Myrtaceae	Eucalyptus punctata	Grey Gum			YES			2	2											
Tree (TG)	Myrtaceae	Eucalyptus scoparia	Wallangarra White Gum	E	V	YES							10.0	2		X					
Tree (TG)	Myrtaceae	Eucalyptus tereticornis	Forest Red Gum			YES			10	3	0.25	1			X		X		X	X	
Tree (TG)	Proteaceae	Grevillea robusta	Silky Oak			YES										X					
Shrub (SG)	Chenopodiaceae	Atriplex semibaccata	Creeping Saltbush			YES			0.1	2			0.1	1		X		X			
Shrub (SG)	Chenopodiaceae	Salsola australis				YES										X					
Shrub (SG)	Fabaceae (Mimosoideae)	Acacia fimbriata	Fringed Wattle			YES												X			
Shrub (SG)	Myrtaceae	Melaleuca bracteata	Black Tea-tree			YES							1.0	2							
Shrub (SG)	Pittosporaceae	Bursaria spinosa	Native Blackthorn			YES													X		
Other (OG)	Convolvulaceae	Convolvulus erubescens	Pink Bindweed			YES												X			
Other (OG)	Fabaceae (Faboideae)	Glycine microphylla	Small-leaf Glycine			YES							0.1	10				X		X	
Other (OG)	Fabaceae (Faboideae)	Glycine tabacina	Variable Glycine			YES			0.1	50									X		X
Other (OG)	Fabaceae (Faboideae)	Hardenbergia violacea	False Sarsaparilla			YES													X		
Other (OG)	Loranthaceae	Amyema miquelii	Box Mistletoe			YES													X		
Other (OG)	Ranunculaceae	Clematis glycinoides	Headache Vine			YES												X			
Grass & grasslike (GG)	Cyperaceae	Cyperus gracilis	Slender Flat-sedge			YES			0.1	10											
Grass & grasslike (GG)	Poaceae	Aristida vagans	Threeawn Speargrass			YES													X		
Grass & grasslike (GG)	Poaceae	Bothriochloa decipiens var. decipiens	Pitted Bluegrass			YES			3	300			0.1	50							
Grass & grasslike (GG)	Poaceae	Bothriochloa macra	Red Grass			YES													X		X

BAM GFG	Family	Scientific Name	Common Name	BC Act	EPBC Act	Nat.	Exot.	HTW	P1 C	P1 A	P2 C	P2 A	P3 C	P3 A	RMS 1	RMS 2	RMS 3	RMS 4	RMS 5	RMS 6	RMS 7
Grass & grasslike (GG)	Poaceae	<i>Chloris truncata</i>	Windmill Grass			YES										X					
Grass & grasslike (GG)	Poaceae	<i>Cynodon dactylon</i>	Common Couch			YES			5	200	20	200 0	20. 0	2,00 0		X		X		X	X
Grass & grasslike (GG)	Poaceae	<i>Eriochloa pseudoacrotricha</i>	Early Spring Grass			YES											X				X
Grass & grasslike (GG)	Poaceae	<i>Lachnagrostis filiformis</i>				YES											X				
Grass & grasslike (GG)	Poaceae	<i>Paspalidium distans</i>				YES													X		
Grass & grasslike (GG)	Poaceae	<i>Rytidosperma caespitosum</i>	Ringed Wallaby Grass			YES							0.5	50			X	X			
Grass & grasslike (GG)	Poaceae	<i>Sporobolus creber</i>	Slender Rat's Tail Grass			YES					0.5	20					X				
Forb (FG)	Asteraceae	<i>Cotula australis</i>	Common Cotula			YES										X					
Forb (FG)	Asteraceae	<i>Senecio quadridentatus</i>	Cotton Fireweed			YES												X			
Forb (FG)	Asteraceae	<i>Vittadinia cuneata</i>	A Fuzzweed			YES												X			
Forb (FG)	Campanulaceae	<i>Wahlenbergia gracilis</i>	Sprawling Bluebell			YES							0.1	1							X
Forb (FG)	Chenopodiaceae	<i>Einadia nutans</i> subsp. <i>linifolia</i>	Climbing Saltbush			YES			0.3	20	0.1	1					X	X			
Forb (FG)	Chenopodiaceae	<i>Einadia nutans</i> subsp. <i>nutans</i>	Climbing Saltbush			YES							0.1	5							
Forb (FG)	Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed			YES			0.1	50			0.1	50			X				
Forb (FG)	Oxalidaceae	<i>Oxalis perennans</i>				YES							0.1	5							
Forb (FG)	Phormiaceae	<i>Dianella longifolia</i>	Blueberry Lily			YES							0.1	1							
Forb (FG)	Portulacaceae	<i>Portulaca oleracea</i>	Pigweed			YES															X
	Alliaceae	<i>Nothoscordum gracile</i>	Onion Weed				YES												X	X	
	Amaranthaceae	<i>Gomphrena celosioides</i>	Gomphrena Weed				YES														X
	Apiaceae	<i>Cyclospermum leptophyllum</i>	Slender Celery			YES					0.1	50	0.1	10		X			X		
	Apocynaceae	<i>Araujia sericifera</i>	Moth Vine			YES	YES											X			
	Apocynaceae	<i>Gomphocarpus fruticosus</i>	Narrow-leaved Cotton Bush			YES											X	X			
	Apocynaceae	<i>Nerium oleander</i>	Oleander			YES			1	1											
	Asteraceae	<i>Ageratina adenophora</i>	Crofton Weed			YES	YES										X	X		X	
	Asteraceae	<i>Arctotheca calendula</i>	Capeweed			YES															X
	Asteraceae	<i>Bidens pilosa</i>	Cobbler's Pegs			YES	YES		0.1	10			0.1	10		X	X	X	X	X	
	Asteraceae	<i>Bidens subalternans</i>	Greater Beggar's Ticks			YES	YES											X			
	Asteraceae	<i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i>	Boneseed			YES	YES											X		X	

BAM GFG	Family	Scientific Name	Common Name	BC Act	EPBC Act	Nat.	Exot.	HTW	P1 C	P1 A	P2 C	P2 A	P3 C	P3 A	RMS 1	RMS 2	RMS 3	RMS 4	RMS 5	RMS 6	RMS 7
	Asteraceae	<i>Cirsium vulgare</i>	Spear Thistle				YES						0.1	1			X	X		X	
	Asteraceae	<i>Conyza sumatrensis</i>	Tall fleabane				YES						0.1	3				X			
	Asteraceae	<i>Gamochaeta americana</i>	Purple Cudweed				YES						0.1	5							
	Asteraceae	<i>Hypochaeris radicata</i>	Catsear				YES				0.1	10	0.1	10							
	Asteraceae	<i>Lactuca saligna</i>	Willow-leaved Lettuce				YES									X				X	
	Asteraceae	<i>Lactuca serriola</i>	Prickly Lettuce				YES						0.1	1				X			
	Asteraceae	<i>Senecio madagascariensis</i>	Fireweed				YES	YES			0.1	10	0.1	10		X		X	X		
	Asteraceae	<i>Senecio pterophorus</i>					YES				0.1	1									
	Asteraceae	<i>Sonchus asper</i>	Prickly Sowthistle				YES				0.2	100			X	X		X		X	X
	Asteraceae	<i>Taraxacum officinale</i>	Dandelion				YES						0.1	5						X	
	Asteraceae	<i>Tragopogon porrifolius</i> subsp. <i>porrifolius</i>	Salsify				YES				0.1	3				X				X	
	Brassicaceae	<i>Brassica fruticulosa</i>	Twiggy Turnip				YES											X	X		
	Brassicaceae	<i>Lepidium africanum</i>	Common Peppergrass				YES									X					X
	Caryophyllaceae	<i>Paronychia brasiliensis</i>	Chilean Whitlow Wort, Brazilian Whitlow				YES						0.1	20		X					X
	Convolvulaceae	<i>Convolvulus arvensis</i>	Field Bindweed				YES									X					
	Cupressaceae	<i>Cupressus</i> sp.					YES		4	4											
	Euphorbiaceae	<i>Euphorbia prostrata</i>	Red Caustic Weed				YES									X		X	X	X	
	Euphorbiaceae	<i>Ricinus communis</i>	Castor Oil Plant				YES	YES												X	
	Fabaceae (Faboideae)	<i>Lotus uliginosus</i>	Birds-foot Trefoil				YES				0.1	50				X		X			
	Fabaceae (Faboideae)	<i>Medicago polymorpha</i>	Burr Medic				YES				0.2	200	0.1	1		X					X
	Fabaceae (Faboideae)	<i>Melilotus indicus</i>	Hexham Scent				YES											X			
	Fabaceae (Faboideae)	<i>Trifolium repens</i>	White Clover				YES										X	X			X
	Fabaceae (Faboideae)	<i>Vicia sativa</i>	Common vetch				YES				0.2	20				X	X	X			
	Gentianaceae	<i>Centaurium tenuiflorum</i>	Branched Centaury, Slender centaury				YES						0.1	2				X			
	Linaceae	<i>Linum trigynum</i>	French Flax				YES				0.2	200	0.1	5			X	X			X
	Malvaceae	<i>Malva parviflora</i>	Small-flowered Mallow				YES								X	X					
	Malvaceae	<i>Modiola caroliniana</i>	Red-flowered Mallow				YES				0.1	5	0.1	10	X			X		X	X
	Malvaceae	<i>Sida rhombifolia</i>	Paddy's Lucerne				YES		0.2	5			0.1	2				X		X	X
	Oleaceae	<i>Olea europaea</i> subsp. <i>cuspidata</i>	African Olive				YES		0.2	2			0.2	2		X		X			
	Oxalidaceae	<i>Oxalis corniculata</i>	Creeping Oxalis				YES											X			

BAM GFG	Family	Scientific Name	Common Name	BC Act	EPBC Act	Nat.	Exot.	HTW	P1 C	P1 A	P2 C	P2 A	P3 C	P3 A	RMS 1	RMS 2	RMS 3	RMS 4	RMS 5	RMS 6	RMS 7
	Plantaginaceae	<i>Plantago lanceolata</i>	Lamb's Tongues				YES		0.2	100	1	1000				X		X	X	X	X
	Poaceae	<i>Avena barbata</i>	Bearded Oats				YES						1.0	100				X	X	X	
	Poaceae	<i>Axonopus fissifolius</i>	Narrow-leafed Carpet Grass				YES	YES													X
	Poaceae	<i>Briza subaristata</i>					YES	YES			1	100	50.0	5,000				X	X	X	
	Poaceae	<i>Bromus catharticus</i>	Praire Grass				YES						0.1	20		X					X
	Poaceae	<i>Cenchrus clandestinus</i>	Kikuyu Grass				YES	YES	1	50			5.0	500		X	X	X	X	X	X
	Poaceae	<i>Chloris gayana</i>	Rhodes Grass				YES	YES			20	2000	1.0	100	X	X		X	X		X
	Poaceae	<i>Ehrharta erecta</i>	Panic Veldtgrass				YES	YES													X
	Poaceae	<i>Eleusine tristachya</i>	Goose Grass				YES														X
	Poaceae	<i>Eragrostis curvula</i>	African Lovegrass				YES	YES	70	5000	10	1000	20.0	2,000				X	X	X	X
	Poaceae	<i>Eragrostis tenuifolia</i>	Elastic Grass				YES						0.1	20							
	Poaceae	<i>Festuca pratensis</i>	Meadow Fescue				YES										X			X	
	Poaceae	<i>Lolium perenne</i>	Perennial Ryegrass				YES				0.5	100					X				
	Poaceae	<i>Melinis repens</i>	Red Natal Grass				YES											X	X		
	Poaceae	<i>Paspalum dilatatum</i>	Paspalum				YES	YES	1	100	1	100	1.0	100		X		X	X		X
	Poaceae	<i>Poa annua</i>	Winter Grass				YES									X					
	Poaceae	<i>Setaria parviflora</i>					YES				0.1	20						X	X		X
	Poaceae	<i>Setaria parviflora</i>					YES										X				
	Poaceae	<i>Sporobolus africanus</i>	Parramatta Grass				YES									X					X
	Polygonaceae	<i>Polygonum aviculare</i>	Wireweed				YES									X		X			
	Polygonaceae	<i>Rumex crispus</i>	Curled Dock				YES													X	
	Primulaceae	<i>Lysimachia arvensis</i>	Scarlet Pimpernel				YES				0.1	50	0.1	5				X	X		
	Rubiaceae	<i>Richardia brasiliensis</i>	Mexican Clover				YES						0.1	10							
	Rubiaceae	<i>Richardia stellaris</i>					YES														X
	Solanaceae	<i>Lycium ferocissimum</i>	African Boxthorn				YES	YES	0.5	3								X			
	Solanaceae	<i>Solanum nigrum</i>	Black-berry Nightshade				YES									X					
	Verbenaceae	<i>Lantana montevidensis</i>	Trailing Lantana				YES								X						
	Verbenaceae	<i>Verbena bonariensis</i>	Purpletop				YES											X			
	Verbenaceae	<i>Verbena officinalis</i>	Common Verbena				YES				0.3	10	0.1	3						X	
	Asteraceae	<i>Hypochaeris albiflora</i>	White Flatweed				YES				0.1	2	0.1	3		X			X		X

Table Key: GFG = Growth Form Group, Nat. = Native, Exot. = Exotic, E = Endangered, V = Vulnerable, P = Plot, C = Cover, A = Abundance, RMS = Random Meander Survey, X = Species presence in RMS.

APPENDIX B :

BAMC Summary Credit Report

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00018277/BAAS17027/19/00018278	Horsley Park Brickworks Plant 2 Upgrade	26/11/2019
Assessor Name	Report Created	BAM Data version *
	06/12/2019	22
Assessor Number	BAM Case Status	Date Finalised
	Finalised	06/12/2019
Assessment Revision	Assessment Type	
0	Major Projects	

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

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

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAIL	Ecosystem credits
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion								
1	849_Low	29.2	0.1	0.25	High Sensitivity to Potential Gain	2.50	TRUE	2
							Subtotal	2

BAM Credit Summary Report

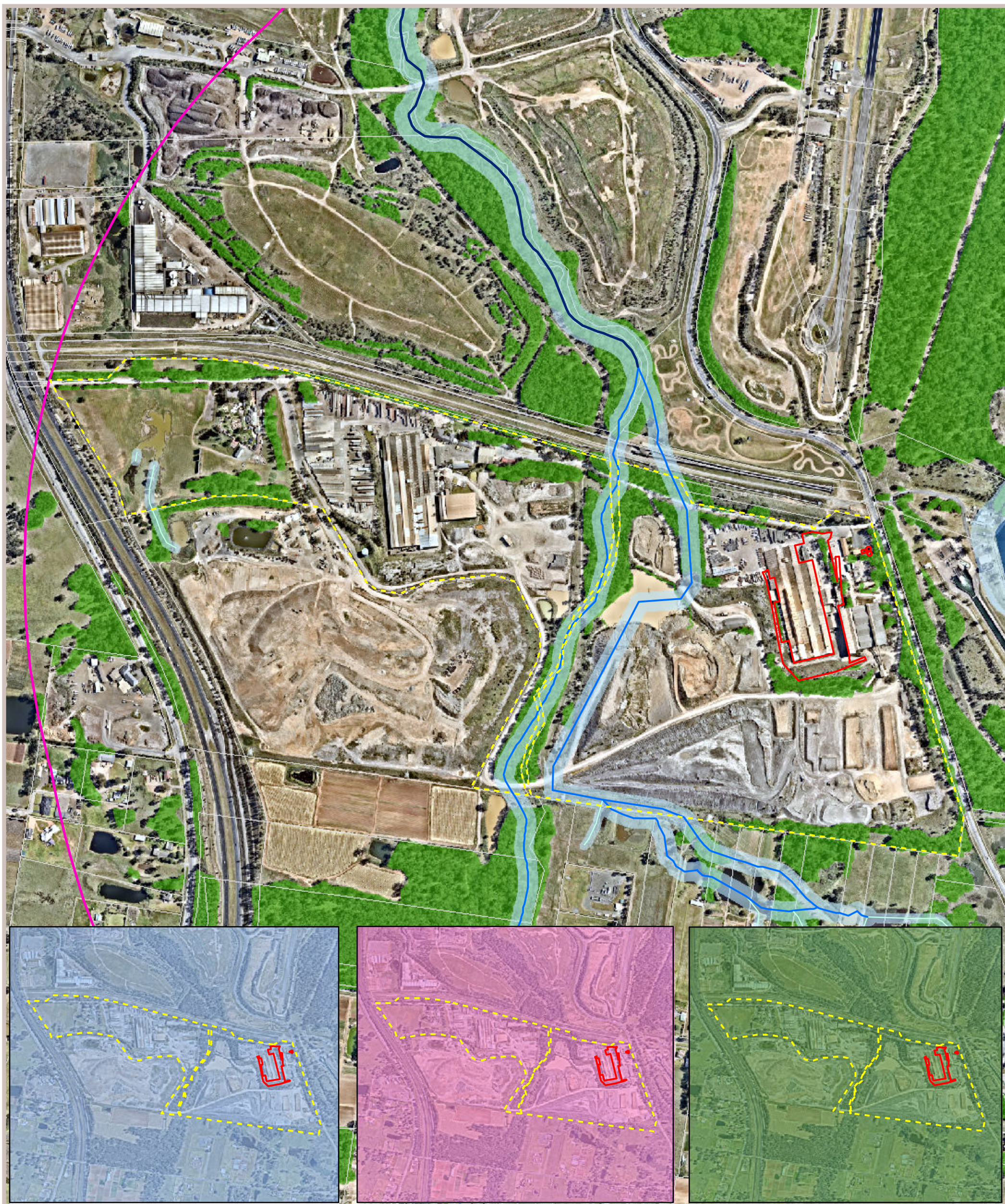
Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion							
2	1232_Low	38.0	0.0	0.25	High Sensitivity to Potential Gain	2.50	1
						Subtotal	1
						Total	3

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAI	Species credits
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FIGURES





Legend

- Development Site
- Subject Land
- Assessment Area
- Cadastre
- Native Vegetation Cover
- Riparian Corridor
- Prospect Reservoir
- Watercourses**
- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream

IBRA Region

- Sydney Basin

IBRA Subregion

- Cumberland

Mitchell Landscape

- Cumberland Plain

Coordinate System: MGA Zone 56 (GDA 94)



Image Source:
Image © NearMap 2019
Dated: 27/10/2019

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
Hornsby Shire LGA

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

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

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Figure 1. Site map

0 50 100 150 200 m



Legend

- Development Site
- Subject Land
- Assessment Area
- Cadastre
- Native Vegetation Cover
- Riparian Corridor
- Prospect Reservoir
- Watercourses**
- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream

IBRA Region

- Sydney Basin

IBRA Subregion

- Cumberland

Mitchell Landscape

- Cumberland Plain
- Estuary/Water Added
- Hawkesbury - Nepean Channels and Floodplains

Coordinate System: MGA Zone 56 (GDA 94)



Image Source:
Image © NearMap 2019
Dated: 27/10/2019

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
Hornsby Shire LGA

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

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

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Figure 2. Location map

0 150 300 450 600 m

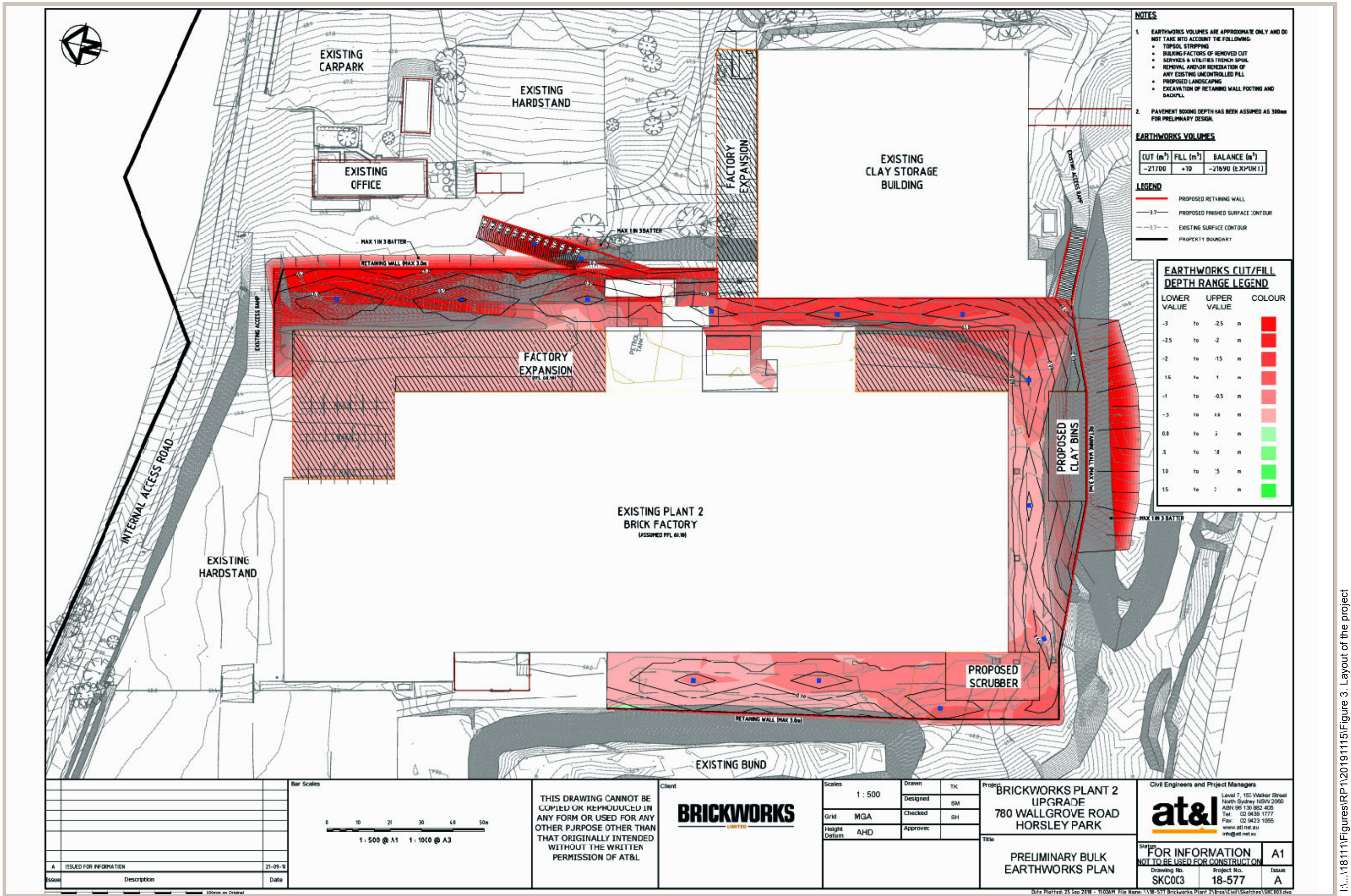


Figure 3. Layout of the project



Legend

Development Site

Fauna Survey Locations

Cumberland Plain Land Snail Search

Flora Survey Locations

BAM Plot Locations

Random Meander Search Locations

Survey Tracks - 15 August 2018

Survey Tracks - 10 December 2018

Survey Tracks - 8 November 2019

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2018
Dated: 18/1/2018

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Figure 4. Field survey locations

0 40 m



Legend

- Development Site
- Native Vegetation Extent**
 - Native
 - Exotic

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2018
Dated: 18/1/2018



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Figure 5. Native vegetation extent

0 40 m



Legend

Development Site

Plant Community Type

849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion

1232 - Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion

Coordinate System: MGA Zone 56 (GDA 94)



Image Source:
Image © NearMap 2018
Dated: 18/1/2019

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Figure 6. Plant community types within the development site

0 40 m



Legend

- Development Site
- Threatened Ecological Community**
- Cumberland Plain Woodland

Coordinate System: MGA Zone 56 (GDA 94)



Image Source:
Image © NearMap 2018
Dated: 18/1/2018

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Figure 7. Threatened ecological communities within the development site

0 40 m



Legend

Development Site

Vegetation Zone

Zone 1: 849_Low

Zone 2: 1232_Low

Coordinate System: MGA Zone 56 (GDA 94)



Image Source:
Image © NearMap 2018
Dated: 18/1/2018

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Figure 8. Vegetation zones within the development site

0 40 m



Legend

- Development Site
- 1000 ha Area
- 10,000 ha Area
- Cumberland Plain Woodland

Coordinate System: MGA Zone 56 (GDA 94)








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Figure 9. Extent of Cumberland Plain Woodland within the 1,000 ha and 10,000 ha localities

0 450 900 1,350 1,800 m



Legend

- | | | |
|---|---------------------------|---|
|  | Development Site | Areas Requiring an Offset |
|  | Cumberland Plain Woodland |  Zone 1: 849_Low |
|  | | Zone 2: 1232_Low |
|  | | Areas Not Requiring Further Assessment |
| | | Exotic Dominated Grassland |

Coordinate System: MGA Zone 56 (GDA 94)



Image Source:
Image © NearMap 2018
Dated: 18/1/2018

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Figure 10. Thresholds of Assessment

0 40 m