WALLGROVE ROAD, EASTERN CREEK

Ecological Assessment - 75W Modification

For:

Frasers Property Australia

February 2016

Final

PO Box 2474
Carlingford Court 2118

Report No. **15206RP1**

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 recommendations 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:	David Robertson
Date:	3 February, 2016

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Glossary of Terms

CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
CPW	Cumberland Plain Woodland
EEC	Endangered Ecological Community
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
Ha	Hectare
Hanson	Hanson Heidelberg Cement Group
LGA	Local Government Area
Locality	The area within a 5km radius of the subject site
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
Subject site	Lot 5 DP 1145808 off Wallgrove Road, Eastern Creek (see **Figure 1.1**)
TEC	Threatened ecological community
TSC Act	NSW *Threatened Species Conservation Act 1995*
WoNS	Weed of National Significance
WSEA	Western Sydney Employment Area
WSEA SEPP 2009	*Western Sydney Employment Area State Environmental Policy 2009*

Chapter 1

Introduction

Cumberland Ecology has been commissioned by Fraser Property Australia to provide an ecological assessment for the proposed 75W modification (CP06_0025 MOD1) at the existing Hanson Heidelberg Cement Group (Hanson) concrete and asphalt facility off Wallgrove Road, Eastern Creek (hereafter referred to as the 'subject site'). This report will support an application for modification to CP06_0025 MOD1 under Section 75W the New South Wales (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act). The proposed 75W modification includes the relocation and reorientation of the approved onsite offset regeneration area.

1.1 Purpose

The purpose of this report is to provide an ecological assessment of the proposed 75W modification, relating to threatened species, populations and communities that are listed under the *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In particular, the specific objectives of this report are to:

- Verify the vegetation communities and overall condition within the subject site;
- Identify additional fauna habitats and fauna usage of the subject site;
- Identify any threatened species, populations or ecological communities (as listed under the TSC Act and/or EPBC Act) existing within the subject site;
- Assess the likelihood of occurrence of threatened species, populations or communities (as listed under the TSC Act and/or EPBC Act) within the subject site; and
- Where relevant, recommend mitigation measures to reduce the impacts of the proposed development on biodiversity values.

1.2 Background

1.2.1 Site Description

The subject site (Lot 5, DP 1145808) is approximately 24 ha and is located off Wallgrove Road, Eastern Creek within the Blacktown Council Local Government Area (LGA) (**Figure 1.1**). The subject land is zoned as 'General Industrial' under the *Western Sydney Employment Area State Environmental Policy 2009*. The Western Sydney Employment Area is a NSW Government initiative to provide approximately 57,000 jobs over the next 30 years and to allow businesses better access to roads and utility services close to the new future airport at Badgerys Creek (DoPE 2014).

The subject site is bound by a quarry void (now used as non-putrescible landfill site) to the north, industrial lots to the east and cleared pastures to the south and west. The subject site is also in close proximity to the M4 and M7 motorways. To the north-west of the subject site there is a small patch of vegetation adjacent to the M4 motorway and a larger portion of vegetation adjacent to Minchinbury Reservoir to the north-east. Ropes Creek flows north-south approximately 2 km to the east of the subject site.

The subject site currently contains an asphalt plant. On the southern section of the subject site, there is approximately 2 ha of vegetation (1.5 ha woodland vegetation and 0.5 ha of riparian vegetation) and a tributary of Ropes Creek. A previous flora study in 2008, classified the woodland vegetation as Swamp Oak (*Casuarina glauca*) – Forest Red Gum (*Eucalyptus tereticornis*) community (GCNRC 2008). No threatened species, populations or communities were found on site by previous surveys.

1.2.2 Previous Approvals

In 2010 the Deputy Director-General approved the Concept Plan and Project Application (06_0225) for the subject site. The approval included the removal and decommission of existing facilities, upgrading the remainder of the site with new production facilities and the consolidation operations. The approved plans focussed on the improvement of overall environmental performance of the existing facilities and included provisions for regional and local road infrastructure contributions and on-site stormwater management. Specifically, the Concept Plan approval allowed for the allocation of the southern portion of the site for 'future expansion'. In accordance with the Project Approval, by the end of 2012 Hanson had removed and decommissioned the remainder of the operations on site.

In June 2012, Hanson submitted an application to modify the Concept Plan and Project Approval under Section 75W of the EP&A Act. The application included the removal of 1.5 ha of vegetation in the southern portion of the subject site in order to maximise the net developable area from 10.7 ha to 24 ha. As a response to submissions, Hanson proposed to revegetate 1.85 ha of the subject site with Cumberland Plain Woodland, develop a management strategy for the enhancement of the riparian corridor vegetation in the south-west corner, conduct weed removal and maintain the riparian area in perpetuity through a positive public covenant (Hanson 2012a).

The Department of Planning considered these strategies appropriate and included these commitments as recommended conditions as part of the modified Project Approval. As an additional condition, Hanson is also required to implement a Construction Environment Management Plan (CEMP).

1.2.3 Proposed Modifications

Fraser Property Australia has purchased a portion of the subject site and is seeking to change the subdivision layout in order to maximise lot size. These modifications would require that the approved 1.85 ha revegetation area is relocated north-south along the western boundary of the subject site rather than the original east-west position located in the lower third of the subject site. The original location of the revegetation area and the current proposed location are shown in **Figure 1.2**.

Coordinate System: MGA Zone 56 (GDA 94)

Legend

Subject Site

Grid North

Image Source:
Image © 2015 Aerometrex
Image © 2015 Google
(dated 1-1-2014)

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I:\...\15206\Figures\RP1\20151216\Figure 1.1. Location_Subject Site

Figure 1.1. Location of the Subject Site

200 0 200 400 600 800 m

Coordinate System: MGA Zone 56 (GDA 94)

Legend

- Subject Site
- Proposed Revegetation Area
- Original Revegetation Area

Grid North

Image Source:
Image © 2015 Aerometrex
(dated 1-1-2014)

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I:\...\15206\Figures\RP1\20151216\Figure 1.2. Location_Revegetation Area

Figure 1.2. Location of Revegetation Area

50 0 50 100 150 200 m

Chapter 2

Methodology

2.1 Literature Review

A literature review was conducted of earlier reports and previous surveys of the subject site for the purpose of informing this ecological assessment and for comparing potential impacts that may be encountered as a result of the proposed modifications.

Specifically, the previous surveys and reports reviewed included:

- Geoff Cunningham Natural Resource Consultants Pty Ltd (GCNRC) (2008), 'Flora study of a section of land owned by Hanson Construction Materials Pty Ltd at the former Eastern Creek quarry site';
- Biosphere Environmental Consultants Pty Ltd (2012), 'Fauna assessment – Hanson Wallgrove quarry site Eastern Creek';
- NSW Planning and Infrastructure (2013), 'Assessment Report – Section 75W Modification Hanson Concrete and Asphalt Facility (06_0225 MOD 1);
- Hanson Heildelberg Cement Group (2012a) (dated 10 September 2012), 'Letter to Kerry Hamann from Andrew Driver' (RE: Response to Blacktown City Council);
- Hanson Heildelberg Cement Group (2012b), 'Wallgrove Redevelopment, Eastern Creek – Modified Concept/Project Approval';
- Hanson Heildelberg Cement Group (2012c), 'Wallgrove Redevelopment - Vegetation, Clearing and Grubbing Protocols';
- NSW Office of Environment and Heritage (31 July 2012), 'Letter to Mr Ritchie from Lou Ewins' (RE: Revised Environmental Assessment and vegetation communities).

In addition, the literature review also investigated any relevant legislative changes and newly listed species that may have become listed or had a change in status since the previous reports were prepared.

2.2 Database Analysis

A database analysis was conducted for the locality using both the NSW Office of Environment and Heritage (OEH) Atlas of NSW Wildlife (OEH, 2015a) and the Commonwealth Department of the Environment Protected Matters Search Tool (DoE, 2015). The locality is defined as the area within a 5 km radius of the subject site. The Atlas of NSW Wildlife Database search was used to generate post-1980 records of threatened flora and fauna species listed under the TSC Act within the locality. The Protected Matters Search Tool generated a list of Matters of National Environmental Significance listed under the EPBC Act potentially occurring within the locality. The lists generated from these databases were reviewed against available knowledge of the subject site, in conjunction with the abundance, distribution and age of records, to ascertain the likelihood of occurrence of threatened species within the subject site.

2.3 Site Inspection

A general site inspection was undertaken by a botanist and ecologist on 17 December 2015, which included verifying vegetation mapping, random meander transects and recording of notable habitat features.

2.3.1 Vegetation Mapping

Vegetation community boundaries were delineated using hand-held Global Positioning Systems and by marking-up aerial maps. Photographs were also taken at various locations to record the condition of the vegetation communities within the subject site. Vegetation mapping also included consideration of the threatened ecological communities (TECs) known from the locality.

2.3.2 Random Meander Transects

Random meander transect surveys were undertaken in both the riparian and woodland vegetation to obtain an overview of the species occurring within the vegetation communities across the subject site. Notes were made on whether plants were indigenous, planted or exotic. The locations of the random meander transects are shown in **Figure 2.1**.

2.3.3 General Habitat Assessment

The fauna habitat assessment included consideration of important indicators of habitat condition and complexity including the occurrence of microhabitats such as tree hollows, fallen logs, bush rock and wetland areas such as creeks and soaks. Structural features considered included the nature and extent of the understorey and ground stratum and extent of canopy. The survey also included an assessment of the presence of habitat features suitable for use by threatened fauna species known from the locality.

2.3.4 Incidental Observations

Any incidental fauna species that were observed, heard calling, or otherwise detected on the basis of tracks or signs, were recorded and listed in the total species list for the subject site.

2.4 Limitations

Vertebrate fauna and vascular flora of the locality are well known based upon a sizeable database of past records. The surveys by Cumberland Ecology added to the existing database and helped to provide a clear indication of the likelihood that various species occur, or are likely to occur within the subject site.

The weather conditions at the time of the flora surveys were generally favourable for plant growth and production of features required for identification of most species. However, it is expected that not all flora species present would have been recorded during the site inspection. Despite this, it is considered that sufficient information has been collected within the subject site to assess the conservation significance of the flora, condition and the likely impact of the proposed modifications on surrounding native vegetation. An assessment of the likelihood of occurrence of threatened flora species recorded within the locality of the subject site in the database searches was undertaken to supplement the flora survey.

No targeted fauna surveys were undertaken for this assessment, which relied solely on a database analysis and fauna habitat assessment. In general, opportunistic observations of fauna provide a "snapshot" of some of the fauna present on a site that were active during the time of the survey. An assessment of the likelihood of occurrence of threatened and migratory fauna species listed for the locality in the database searches was undertaken to supplement the fauna surveys. The combination of these techniques is considered appropriate for assessing the habitat values of the subject site for threatened fauna.

Coordinate System: MGA Zone 56 (GDA 94)

Legend

- Subject Site
- Random Meander Transect

Grid North

Image Source:
Image © 2015 Aerometrex
(dated 1-1-2014)

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I:\...\15206\Figures\RP1\20151216\Figure 2.1. Random Meander Transects

Figure 2.1. Location of random meander transects

50 0 50 100 150 200 m

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Chapter 3

Results

3.1 Vegetation Communities

The vegetation of the subject site exists primarily within the southern portion of the site as isolated patches. The surrounding areas are highly disturbed industrial sites or cleared pastures. A small strip of vegetation is present, adjacent to the western boundary of the subject site.

3.1.1 Existing Vegetation Mapping

Previous broad-scale mapping conducted by DECCW (2011) for the region indicates the presence of Cumberland Shale Hills Woodland and Cumberland River Flat Forest. However, a previous flora survey by GCNRC (2008) found that only one remnant vegetation community was present on site, being Swamp Oak (*Casuarina glauca*) – Forest Red Gum (*Eucalyptus tereticornis*) community. More recently, a fauna study of the subject site by Biosphere (2012) considered the riparian corridor in the southern corner of the subject site to be riparian vegetation with the presence of isolated Grey Box (*Eucalyptus moluccana*).

3.1.2 Current Vegetation Mapping

Cumberland Ecology refined the vegetation mapping within the subject site. Vegetation communities identified within the subject site are listed in **Table 3.1**. The distribution of these vegetation communities within the subject site is shown in **Figure 3.1**. A description of each of these communities is provided below.

Table 3.1 Vegetation communities within the subject site

Vegetation Community	TSC Act Status	EPBC Act Status	Area (ha)
Freshwater Wetland	-	-	0.54
Swamp Oak Forest (Mod/Good)	EEC	-	2.17
Swamp Oak Forest (Weedy)	EEC	-	0.18
Cumberland Plain Woodland	CEEC	-	0.11
Exotic Vegetation	-	-	0.06
Exotic Grassland	-	-	0.98
Total			**4.06**

TSC Act Status: EEC = Endangered Ecological Community, CEEC = Critically Endangered Ecological Community

3.1.3 Freshwater Wetland

TSC Act Status: Not listed

EPBC Act Status: Not listed

The freshwater wetlands are a located in the south-western portion of the subject site. This vegetation community is not considered to be a TEC under the TSC Act as it does not correspond to the final determination for 'Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions' which states that "Artificial wetlands created on previously dry land specifically for purposes such as sewerage treatment, stormwater management and farm production, are not regarded as part of this community" (OEH 2015b).

This vegetation community is dominated by Broadleaf Cumbungi (*Typha orientalis*) and rush species (*Juncus usitatus, Juncus actutus*). The ground cover of the wetland was predominately exotic with 15 weed species and five native species. This vegetation community may provide habitat for a number of fauna species. European Red Fox and macropod scats were found in this community.

An example of this community within the subject site is shown in **Photograph 3.1** and **Photograph 3.2**.

Photograph 3.1 Wetland vegetation on subject site

Photograph 3.2 Fringing vegetation around settling pond

3.1.4 Swamp Oak Floodplain Forest

TSC Act Status: EEC

EPBC Act Status: Not listed

The Swamp Oak Floodplain Forest on the subject site is a component of the 'Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions' vegetation community and is listed as an EEC under the TSC Act. This community is located along the western boundary of the subject site, along the Ropes Creek tributary in the south-western corner and across the southern-central portion of the subject site along a creek line.

Dominant canopy species within this vegetation community include Swamp Oak (*Casuarina glauca*) and scattered Forest Red Gum (*Eucalyptus tereticornis*). The shrub layer is predominately exotic shrub species including African Boxthorn (*Lycium ferocissimum*) and African Olive (*Olea europaea* subsp. *cuspidata*). A number of native species are also present such as Blackthorn (*Bursaria spinosa*). The ground layer is comprised of both native and exotic species, although there is not a large diversity of native species. The dominant ground cover species is Weeping Grass (*Microlaena stipoides*). Exotic species include Couch (*Cynodon dactylon*), Paspalum (*Paspalum dilatatum*) and *Briza subaristata*.

An example of this community along the western boundary is shown in **Photograph 3.3**. The condition of this vegetation improves from north to south, approaching the tributary.

Photograph 3.3 Swamp Oak Floodplain Forest vegetation along the western boundary of the subject site

An example of this vegetation community bordering the Ropes Creek tributary in the south-western corner of the subject site is shown in **Photograph 3.4**. This vegetation is in moderate to good condition, with a more diverse composition of native species, although weeds are still prevalent.

Photograph 3.4 Swamp Oak Forest near tributary of Ropes Creek in south-west corner

An example of this vegetation community in the southern-central portion of the subject site is shown in **Photograph 3.5**. This community is in moderate condition with a dominant Weeping Grass (*Microlaena stipoides*) ground layer. This vegetation community is adjacent to a very weedy section of swamp oak forest bordering a creek line dominated by Large-leaved Privet (Ligustrum lucidum) and Castor Oil Plant (*Ricinus communis*), shown in **Photograph 3.6**.

Photograph 3.5 Swamp Oak Forest in the southern-central portion of the subject site

Photograph 3.6 Weedy Swamp Oak Forest bordering the creek line

3.1.5 Cumberland Plain Woodland

TSC Act Status: CEEC

EPBC Act Status: Not listed

The Cumberland Plain Woodland vegetation on the subject site is confined to two very small patches containing only a few canopy trees. Although Cumberland Plain Woodland is listed as a CEEC under both the TSC Act and EPBC Act, the extent of this community within the subject site only conforms to the TSC Act listing of the community. It does not conform to the EPBC Act listing as the community is less than 0.5 ha in size and due to the overall condition of the patch size.

The two very small patches are highly isolated and fragmented with only a few mature trees in each location. The two canopy species are Forest Red Gum (*Eucalyptus tereticornis*) and Grey Box (*Eucalyptus moluccana*). Shrub species include Blackthorn (*Bursaria spinosa*) and African Olive (*Olea europaea* subsp. *cuspidata*).The dominant ground layer species in Weeping Grass (*Microlaena stipoides*) and Purple Wiregrass (*Aristida ramosa*).

An example of this community within the subject site is shown in **Photograph 3.7** and **Photograph 3.8**.

Photograph 3.7 Patch of Cumberland Plain Woodland containing Forest Red Gum (*Eucalyptus tereticornis*)

Photograph 3.8 Patch of Cumberland Plain Woodland containing Grey Box (*Eucalyptus moluccana*)

3.1.6 Exotic Grassland

TSC Act Status: Not listed

EPBC Act Status: Not listed

The majority of the open grasslands within the subject site are dominated by exotic ground species, particularly Couch (*Cynodon dactylon*). The exotic grasslands also contain some Swamp Oak (*Casuarina glauca*) shrubs. The ground layer is also comprised of other weed species including African Lovegrass (*Eragrostis curvula*), *Senecio pterophorus* and Tall Fleabane (*Conyza sumatrensis*).

An example of this community within the subject site is shown in **Photograph 3.8** and **Photograph 3.9**.

Photograph 3.9 Exotic Grasslands

Photograph 3.10 Ground cover of exotic grasslands

3.2 Flora Species

3.2.1 General Species

A total of 108 flora species were recorded within the subject site during the site inspection. The dominant plant families encountered within the subject site are represented by the Asteraceae and Poaceae families. Species present within the subject site consists of a mix of exotic species (50%) and native species (50%).

Overall, these findings correspond with data collected during the 2008 flora. The native vegetation communities on the subject site comprise a low diversity of native species and contain a high abundance of weed species. However, the ground layer of the native vegetation communities on the subject site is dominated by native grasses.

The list of flora species recorded during the site inspection within the subject site is provided in **Appendix A**.

3.2.2 Threatened Species

No threatened flora species were recorded within the subject site during the site inspection. Similarly, there have been no threatened flora records from the previous 2008 and 2012 surveys or in post-1980 Atlas records.

Although no threatened species have been recorded within the subject site, a number of threatened flora species are known or are predicted to occur within the locality. An analysis of the likelihood of occurrence within the subject site for each threatened flora species recorded or predicted to occur within the locality is provided in **Appendix B**. Due to the results of previous surveys, highly modified natural landscape, small isolated patch size and overall low vegetation condition, it is unlikely that threatened flora species occur within the subject site.

3.2.3 Noxious Weeds

Seven of the 54 exotic flora species recorded within the subject site are listed as Declared Noxious Weeds under the NSW *Noxious Weeds Act 1993* in the Blacktown Council control area. Six of the seven species are classified as Control Class 4 – 'Locally Controlled Weeds' and Pampas Grass (*Cortaderia selloana*) is classified as Class 3 – 'Regionally Controlled Weed'. Three of the seven species are also listed as Weeds of National Significance (WoNS). Noxious weeds and WoNS identified within the subject site are listed in **Table 3.1**).

Table 3.2 Noxious weeds and WoNS within subject site

Scientific Name	Common Name	NW (Class)	WoNS
Asparagus asparagoides	Bridal Creeper	4	X
Asparagus officinalis	Asparagus	4	
Cortaderia selloana	Pampas Grass	3	

Table 3.2 Noxious weeds and WoNS within subject site

Scientific Name	Common Name	NW (Class)	WoNS
Ligustrum lucidum	Large-leaved Privet	4	
Lycium ferocissimum	African Boxthorn	4	X
Olea europaea subsp. cuspidata	African Olive	4	
Senecio madagascariensis	Fireweed	4	X

3.3 Fauna

3.3.1 Fauna Habitat

The vegetation of the subject site provides some potential habitat for native fauna known to occur in the locality, including threatened species. Terrestrial microhabitats are present within the subject site, including fallen logs and rocks. No hollow-bearing trees were found during the site inspection although they may be present in some of the scattered Forest Red Gum (*Eucalyptus tereticornis*) individuals. Aquatic microhabitats are also present within the subject site including the three settling ponds (example shown in **Photograph 3.2**), a bulrush (*Typha orientalis)* wetland (**Photograph 3.1**) and the Ropes Creek tributary (**Photograph 3.4**).

In addition to the microhabitats, many exotic flora species are present on the subject site that can provide potential foraging resources for nectivorous mammals and birds that may use the subject site on occasion as part of a larger foraging range.

3.3.2 General Species

A total of 19 fauna species were recorded during the site inspection, including 16 bird species and three mammals. Four of the species were introduced or feral species including the European Red Fox, Feral Rabbit, Common Myna and Spotted Dove.

A suite of other native species also have the potential to utilise the fauna habitats within the subject site. The list of fauna species recorded during the site inspection within the subject site, as well as during the previous 2012 fauna survey by Biosphere (2012) is provided in **Appendix C**.

3.3.3 Threatened Species

No threatened fauna species were recorded within the subject site during the site inspection. Similarly, there have been no threatened flora records from the previous 2008 and 2012 surveys or in post-1980 Atlas records.

Although no threatened species have been recorded within the subject site, a number of threatened fauna species are known or are predicted to occur within the locality. An analysis of the likelihood of occurrence within the subject site for each threatened fauna species

recorded or predicted to occur within the locality is provided in **Appendix D**. This assessment concluded that five threatened vertebrate fauna species and three migratory species have the potential to occur within the subject site. **Table 3.2** lists the threatened fauna species considered to have the potential to occur within the subject site. However, due to the highly degraded and isolated nature of the site, it is unlikely that this vegetation would support critical habitat for these threatened fauna species.

Table 3.3 Threatened fauna species with a potential to occur within subject site

Scientific Name	Common Name	TSC Act	EPBC Act	Likelihood of Occurrence
Aves				
Hieraaetus morphnoides	Little Eagle	V	-	Possible
Mammalia				
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	Possible
Gastropoda				
Meridolum corneovirens	Cumberland Plain Land Snail	E	-	Possible
Migratory				
Ardea ibis	Cattle Egret	-	M	Possible
Gallinago hardwickii	Latham's Snipe	-	M	Possible

TSC Act / EPBC Act Status: V = Vulnerable, E = Endangered, M = Migratory

Coordinate System: MGA Zone 56 (GDA 94)

Legend

- Subject Site
- Proposed Revegetation Area

Vegetation Community

- Cumberland Plain Woodland
- Swamp Oak Forest - Moderate/ good condition
- Swamp Oak Forest - Weedy
- Wetland Vegetation
- Exotic Vegetation
- Exotic Grassland

N
Grid North

Image Source:
Image © 2015 Aerometrex
(dated 1-1-2014)

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I:\...\15206\Figures\RP1\20160115\Figure 3.1. Vegetation Mapping_Subject Site

Figure 3.1. Vegetation mapping of the Subject Site

25 0 25 50 75 100 m

Chapter 4

Impact Assessment & Recommendations

4.1 Impacts to Vegetation Communities and Habitat

4.1.1 Vegetation Removal

In providing an ecological assessment as to the impact of the proposed relocation and re-orientation of the approved revegetation area, the vegetation communities and boundaries needed to be verified. Following the site inspection and review of previous studies, it is agreed that the vegetation community is predominately Swamp Oak Floodplain Forest in moderate condition. There is also a very isolated patch of Cumberland Plain Woodland and weedy Swamp Oak Forest.

This vegetation to be removed is unlikely to contain any threatened species as it is highly disturbed and has a high prevalence of exotic flora species. The remnant vegetation within the subject site is surrounded by encroaching development and the connectivity to other remnant vegetation is poor.

4.1.2 Habitat Loss

The patch of vegetation to be removed does not possess a large number of habitat features and the overall complexity was low. Seven of the eight threatened fauna species with a potential to occur are migratory or mobile fauna species that could relocate to better quality vegetation to the north-east of the subject site adjacent to Minchinbury Reservoir. The potential of the Cumberland Plain Land Snail is possible although unlikely as extensive targeted searches in 2012 were unable to locate any individuals and the presence of Swamp Oaks (*Casuarina glauca*) does not provide much habitat as leaf-mats suppress native ground vegetation and there is little decaying ground matter. The isolation of the vegetation patch and industrial location would also act as a major deterrent for woodland bats and birds.

4.2 Relocation and Re-orientation of Approved Revegetation Area

Given the highly degraded nature of the vegetation, the approved revegetation of 1.85 ha of Cumberland Plain Woodland vegetation is deemed sufficient as a biodiversity offset and with additional measures such as weed removal and the enhancement of the riparian corridor vegetation will produce an overall positive conservation outcome.

The relocation and re-orientation of the approved revegetation area as a 75W Modification is unlikely to have a negative impact on the overall conservation outcome. The proposed relocation and re-orientation is actually preferred as the revegetation area will be position alongside and within existing vegetation. There is currently approximately 0.83ha of vegetation within the proposed revegetation zone which should facilitate the success of plantings.

By assuming a north-south orientation the revegetation area will also be positioned adjacent to future development, as opposed to through it. This would subject the revegetation area to less edge effects and would more suitably acts as a wildlife corridor.

4.3 Recommendations

4.3.1 Revegetation

Where feasible, seeds and plants should be obtained locally for replanting in the revegetation area. Canopy, midstorey and ground species should all be planted in order to allow the vegetation community to become complex and representative of remnant vegetation in the future. Planting and maintenance should be carried out by an adequately trained personnel or bush regenerators that have knowledge of the local area

4.3.2 Fencing

Fencing installation and maintenance is a critical part of establishing the revegetation area and protecting the riparian vegetation. A perimeter fence is required around area to exclude grazing by herbivores and trampling by feral animals and humans. Fencing improves the chance of survivorship for seedlings, reduces the chance of weed invasion from trampling and increases the chance of success for each vegetation area.

4.3.3 Weed Control

Weeds can have significant detrimental effects on native remnant vegetation and have the potential to compromise revegetation efforts. A weed control strategy is required for the both the riparian vegetation and the revegetation area. By reducing weed densities native plantings will have a higher chance of success. Weed control should be conducted by a qualified bush regenerators or adequately trained personnel.

Chapter 5

Conclusion

The subject site is located within a highly modified and industrial landscape. Under the current approval, 1.5ha of native vegetation is to be removed and an onsite offset of 1.85ha will be revegetated. The vegetation to be removed is disturbed Swamp Oak Floodplain Forest and two very small patches of Cumberland Plain Woodlands.

No threatened flora or fauna species were recorded on site, or have been recorded in previous studies, and none are predicted to make significant use of the site. This vegetation may provide limited foraging resources to common, robust species that are able to tolerate higher levels of human disturbance. However, given the degraded nature and overall low complexity it is unlikely for this vegetation patch to support threatened flora or fauna species.

As part of the approval, the riparian Swamp Oak Floodplain Forest vegetation in the south-western corner of the subject site will be enhanced and weeds will be strategically removed. A Construction Environmental Management Plan (CEMP) will be devised and implemented and the riparian vegetation fenced off during construction. The riparian area will also be maintained in perpetuity through a positive public covenant. These strategies are expected to improve the overall biodiversity and conservation potential on the subject site.

The proposed modification would result in the approved 1.85ha revegetation area to be relocated to the western boundary in a north-south orientation, as opposed to the original east-south orientation. The proposed modification is desirable as the revegetation area will no longer be positioned in the centre of the future development and so will likely to be less affected by edge effects.

It is recommended that the revegetation area is fenced off from future development in order to limit human disturbance and weed strategy is implemented.

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Appendix A

Flora List

Table A.1 Flora species recorded within the subject site

Family	*	Scientific Name	Common Name	Freshwater Wetland RMT1	Swamp Oak Forest RMT2	Swamp Oak Forest RMT3	Regrowth CPW RMT4	Regrowth CPW RMT5	Swamp Oak Forest RMT6	Exotic Grassland RMT7
Canopy										
Casuarinaceae		Casuarina glauca	Swamp Oak		X	X			X	
Myrtaceae		Eucalyptus moluccana	Grey Box					X	X	
Myrtaceae		Eucalyptus tereticornis	Forest Red Gum		X	X	X		X	
Sub-Canopy										
Casuarinaceae		Casuarina glauca	Swamp Oak		X					
Myrtaceae		Eucalyptus moluccana	Grey Box						X	
Myrtaceae		Eucalyptus tereticornis	Forest Red Gum		X		X			
Salicaceae	*	Salix babylonica	Weeping Willow						X	
Shrubs										
Casuarinaceae		Casuarina glauca	Swamp Oak	X					X	X
Euphorbiaceae	*	Ricinus communis	Castor Oil Plant						X	
Fabaceae		Acacia falcata	Hickory Wattle							X
Meliaceae		Melia azedarach	White Cedar		X					
Myrtaceae		Eucalyptus tereticornis	Forest Red Gum				X			
Oleaceae	*	Ligustrum lucidum	Large-leaved Privet		X				X	
Oleaceae	*	Olea europaea subsp. cuspidata	African Olive		X	X	X			

Table A.1 Flora species recorded within the subject site

Family	*	Scientific Name	Common Name	Freshwater Wetland RMT1	Swamp Oak Forest RMT2	Swamp Oak Forest RMT3	Regrowth CPW RMT4	Regrowth CPW RMT5	Swamp Oak Forest RMT6	Exotic Grassland RMT7
Pittosporaceae		Bursaria spinosa	Blackthorn				X	X		
Rosaceae	*	Rosa rubiginosa	Sweet Briar		X					
Solanaceae	*	Lycium ferocissimum	African Boxthorn		X	X			X	
Herb - Dicots										
Acanthaceae		Brunoniella australis	Blue Trumpet		X	X		X	X	
Apiaceae		Centella asiatica	Indian Pennywort		X				X	
Apiaceae	*	Cyclospermum leptophyllum	Slender Celery	X	X		X		X	
Apiaceae	*	Hydrocotyle bonariensis	-	X	X				X	
Asteraceae	*	Ageratina adenophora	Cotton Weed	X	X				X	
Asteraceae	*	Bidens pilosa	Cobblers Pegs		X	X	X		X	
Asteraceae	*	Cirsium vulgare	Spear Thistle	X	X	X		X	X	
Asteraceae	*	Conyza sumatrensis	Tall Fleabane	X	X					X
Asteraceae	*	Hypochaeris radicata	Catsear		X		X		X	
Asteraceae	*	Lactuca saligna	Willow-leaved Lettuce	X						
Asteraceae	*	Lactuca serriola	Prickly Lettuce		X				X	
Asteraceae	*	Senecio madagascariensis	Fireweed	X		X				
Asteraceae	*	Senecio pterophorus	-	X	X	X	X	X	X	X

Table A.1 Flora species recorded within the subject site

Family	*	Scientific Name	Common Name	Freshwater Wetland RMT1	Swamp Oak Forest RMT2	Swamp Oak Forest RMT3	Regrowth CPW RMT4	Regrowth CPW RMT5	Swamp Oak Forest RMT6	Exotic Grassland RMT7
Asteraceae	*	Tragopogon porrifolius	Oyster Plant				X			
Boraginaceae		Cynoglossum australe	-		X					
Brassicaceae	*	Lepidium africanum	-			X				
Brassicaceae	*	Lepidium bonariense	-		X					
Campanulaceae		Wahlenbergia communis	Tufted Bluebell					X		
Campanulaceae		Wahlenbergia gracilis	Sprawling Bluebell		X		X			
Chenopodiaceae		Atriplex semibaccata	Creeping Saltbush		X	X				
Chenopodiaceae		Einadia nutans subsp. nutans	Climbing Saltbush		X	X				
Chenopodiaceae		Einadia trigonos	Fishweed		X	X				
Convolvulaceae		Dichondra repens	Kidney Weed				X	X	X	
Convolvulaceae		Dichondra sp. A	-		X	X	X		X	
Euphorbiaceae		Chamaesyce drummondii	Caustic Weed	X						
Fabaceae	*	Melilotus indicus	Hexham Scent	X						
Gentianaceae	*	Centaurium tenuiflorum	-	X		X		X		X
Lamiaceae		Mentha satureioides	Creeping Mint					X	X	
Malvaceae	*	Modiola caroliniana	Red-flowered Mallow		X			X		
Malvaceae	*	Sida rhombifolia	Paddy's Lucerne		X	X		X	X	

Table A.1 Flora species recorded within the subject site

Family	*	Scientific Name	Common Name	Freshwater Wetland RMT1	Swamp Oak Forest RMT2	Swamp Oak Forest RMT3	Regrowth CPW RMT4	Regrowth CPW RMT5	Swamp Oak Forest RMT6	Exotic Grassland RMT7
Myrsinaceae	*	Anagallis arvensis	Scarlet Pimpernel						X	
Oxalidaceae		Oxalis perennans	-		X		X	X		
Phyllanthaceae		Phyllanthus virgatus	-				X			
Phytolaccaceae	*	Phytolacca octandra	Inkweed		X					
Plantaginaceae		Plantago debilis	-						X	
Plantaginaceae		Plantago gaudichaudii	Narrow Plantain					X		
Plantaginaceae	*	Plantago lanceolata	Lamb's Tongue			X	X		X	
Plantaginaceae		Veronica plebeia	Trailing Speedwell				X			
Polygonaceae	*	Rumex conglomeratus	Clustered Dock		X					
Rubiaceae		Asperula conferta	Common Woodruff				X		X	
Scrophulariaceae		Eremophila debilis	Winter Apple						X	
Solanaceae	*	Solanum chenopodioides	Whitetip Nightshade		X					
Solanaceae	*	Solanum nigrum	Black-berry Nightshade	X						
Solanaceae		Solanum prinophyllum	Forest Nightshade		X			X	X	
Solanaceae	*	Solanum pseudocapsicum	Madeira Winter		X				X	
Solanaceae	*	Solanum sisymbriifolium	-		X	X				
Verbenaceae	*	Verbena bonariensis	Purpletop		X		X		X	X

Table A.1 Flora species recorded within the subject site

Family	*	Scientific Name	Common Name	Freshwater Wetland RMT1	Swamp Oak Forest RMT2	Swamp Oak Forest RMT3	Regrowth CPW RMT4	Regrowth CPW RMT5	Swamp Oak Forest RMT6	Exotic Grassland RMT7
Herbs - Monocots										
Commelinaceae		Commelina cyanea	Native Wandering Jew		X	X			X	
Cyperaceae		Carex inversa	-			X		X		
Cyperaceae	*	Cyperus eragrostis	Umbrella Sedge		X	X		X		
Cyperaceae		Cyperus gracilis	Slender Flat-sedge			X	X	X		
Cyperaceae		Schoenoplectus validus	-	X						
Iridaceae	*	Romulea rosea	Onion Grass				X	X		
Juncaceae	*	Juncus acutus	Sharp Rush	X	X				X	X
Juncaceae		Juncus usitatus	-	X						
Lomandraceae		Lomandra filiformis	Wattle Mat-rush		X		X	X		
Lomandraceae		Lomandra multiflora	Many-flowered Mat-rush				X		X	
Phormiaceae		Dianella longifolia	Blueberry Lily				X		X	
Typhaceae		Typha orientalis	Broadleaf Cumbungi	X	X				X	
Grasses										
Poaceae	*	Anthoxanthum odoratum	Sweet Vernal Grass		X					
Poaceae		Aristida ramosa	Purple Wiregrass				X	X	X	
Poaceae		Bothriochloa macra	Red Grass				X			

Table A.1 Flora species recorded within the subject site

Family	*	Scientific Name	Common Name	Freshwater Wetland RMT1	Swamp Oak Forest RMT2	Swamp Oak Forest RMT3	Regrowth CPW RMT4	Regrowth CPW RMT5	Swamp Oak Forest RMT6	Exotic Grassland RMT7
Poaceae	*	Briza subaristata	-		X		X	X	X	X
Poaceae	*	Bromus catharticus	Prairie Grass		X					
Poaceae	*	Chloris gayana	Rhodes Grass		X					X
Poaceae		Chloris ventricosa	Plump Windmill Grass			X	X	X		
Poaceae	*	Cortaderia selloana	Pampas Grass	X	X				X	
Poaceae	*	Cynodon dactylon	Couch	X	X	X	X	X	X	X
Poaceae		Dichelachne micrantha	Shorthair Plumegrass					X		
Poaceae	*	Ehrharta erecta	Panic Veldtgrass		X	X			X	
Poaceae	*	Eragrostis curvula	African Lovegrass							X
Poaceae		Eragrostis leptostachya	Paddock Lovegrass		X	X	X		X	
Poaceae		Eriochloa pseudoacrotricha	Early Spring Grass			X				
Poaceae		Lachnagrostis filiformis	-	X						
Poaceae	*	Lolium perenne	Perennial Ryegrass		X	X				
Poaceae		Microlaena stipoides	Weeping Grass		X	X	X	X	X	
Poaceae		Paspalidium distans	-		X					
Poaceae	*	Paspalum dilatatum	Paspalum		X	X	X	X	X	X
Poaceae	*	Pennisetum clandestinum	Kikuyu Grass		X					

Table A.1 Flora species recorded within the subject site

Family	*	Scientific Name	Common Name	Freshwater Wetland RMT1	Swamp Oak Forest RMT2	Swamp Oak Forest RMT3	Regrowth CPW RMT4	Regrowth CPW RMT5	Swamp Oak Forest RMT6	Exotic Grassland RMT7
Poaceae	*	Pennisetum setaceum	Fountain Grass		X					
Poaceae	*	Phalaris aquatica	Phalaris		X					
Poaceae		Rytidosperma bipartitum	Wallaby Grass		X					
Poaceae		Rytidosperma fulvum	Wallaby Grass					X		
Poaceae		Rytidosperma racemosum	-					X	X	
Poaceae	*	Setaria parviflora	-		X			X		
Poaceae		Themeda triandra	Kangaroo Grass		X		X	X	X	
Climbers/Vines										
Apocynaceae	*	Araujia sericifera	Moth Vine		X	X		X	X	
Asparagaceae	*	Asparagus asparagoides	Bridal Creeper		X					
Asparagaceae	*	Asparagus officinalis	Asparagus		X					
Convolvulaceae	*	Ipomoea indica	Mourning Glory	X						
Fabaceae		Desmodium varians	Slender Tick-trefoil						X	
Fabaceae		Glycine microphylla	Small-leaf Glycine		X		X		X	
Fabaceae		Glycine tabacina	-		X	X	X		X	
Ranunculaceae		Clematis glycinoides	Headache Vine		X					

Table A.1 Flora species recorded within the subject site

Family	* Scientific Name	Common Name	Freshwater Wetland RMT1	Swamp Oak Forest RMT2	Swamp Oak Forest RMT3	Regrowth CPW RMT4	Regrowth CPW RMT5	Swamp Oak Forest RMT6	Exotic Grassland RMT7
Ferns									
Pteridaceae	Pellaea falcata	Sickle Fern						X	
		Native sp.	6	24	15	21	19	25	2
		Weed sp.	15	40	17	12	12	24	10
		Total	21	64	32	33	31	49	12

** Exotic*

Appendix B

Threatened Flora Likelihood of Occurrence

Table B.1 Likelihood of occurrence of threatened flora to occur within the subject site

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Apocynaceae	*Marsdenia viridiflora subsp. viridiflora*	Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith LGA	E	-	8	Found as scattered plants in remnant vegetation, including open shale woodland and vine thickets.	Unlikely. No suitable habitat on site.
Asclepiadaceae	*Cynanchum elegans*	White-flowered Wax Plant	E	E	0	Found in a variety of soil types and altitudes but mainly found in the ecotone between dry subtropical rainforest and sclerophyll forest/woodland communities. Found in small isolated remnant patches of dry rainforest in the Illawarra region and Cumberland Plain.	Unlikely. No suitable habitat on site.
Casuarinaceae	*Allocasuarina glareicola*	-	E	E	0	Found in open woodland with parramattensis, Eucalyptus fibrosa, Angophora bakeri, Eucalyptus sclerophylla and Melaleuca decora on lateritic soil.	Unlikely. No suitable habitat on site, no lateritic soil.
Fabaceae (Faboideae)	*Dillwynia tenuifolia*	-	V	-	57	Common within scrubby/dry heath areas on tertiary alluvium or laterised	Unlikely. Records demonstrate a localised

Table B.1 Likelihood of occurrence of threatened flora to occur within the subject site

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						clays. Generally associated with Castlereagh Ironbark Forest, Shale Gravel Transition Forest and other transitional ecotones.	population on the western site of Ropes Creek, 3km away from the subject site.
Fabaceae (Faboideae)	*Pultenaea parviflora*	-	E	V	21	Endemic to the Cumberland Plain. Core distribution is from Windsor to Penrith and east to Dean Park. Found in scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays and in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland.	Unlikely. No suitable habitat on site.
Fabaceae (Mimosoideae)	*Acacia pubescens*	Downy Wattle	V	V	8	Found in open woodland and forest on alluviums, shales and shale/sandstone intergrades. Soils are characteristically gravely.	Unlikely. No suitable habitat on site.
Haloragaceae	*Haloragis exalata subsp. exalata*	Wingless Raspwort	V	V	0	Occurs in riparian habitats that are protected, shaded and damp.	Unlikely. Suitable habitat is present on site near wetlands but there are no past records within the locality.

Table B.1 Likelihood of occurrence of threatened flora to occur within the subject site

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Lobeliaceae	*Hypsela sessiliflora*	-	E	X	7	Grows in damp habitats such as freshwater wetlands, alluvial woodland and Cumberland Plain Woodland ecotones. Potentially out competed by species such as Cynodon dactylon.	Unlikely. No suitable habitat on site and the site has a high occurrence of exotic groundcover.
Myrtaceae	*Micromyrtus minutiflora*	-	E	V	0	Highly fragmented populations found in dry sclerophyll forest in the western Cumberland Plain.	Unlikely. No suitable habitat on site.
Orchidaceae	*Genoplesium baueri*	Yellow Gnat-orchid	E	E	0	Grows in dry sclerophyll forest and moss gardens over sandstone.	Unlikely. No suitable habitat on site.
Orchidaceae	*Pterostylis gibbosa*	Illawarra Greenhood	E	E	0	All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage.	Unlikely. No suitable habitat on site.
Orchidaceae	*Pterostylis saxicola*	Sydney Plains Greenhood	E	E	0	Found in sclerophyll forests or woodland on shale/sandstone transition soils or shale soils.	Unlikely. No suitable habitat on site.
Proteaceae	*Grevillea juniperina subsp. juniperina*	Juniper-leaved Grevillea	V	-	129	Found on red sandy to clay soils and often occurs as small, localised populations. Occurs in Cumberland Plain Woodland and Castlereagh Woodland.	Unlikely. Found in small localised populations in the locality, no individuals have been recorded on site. Closest population is

Table B.1 Likelihood of occurrence of threatened flora to occur within the subject site

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
							approximately 2km.
Proteaceae	*Grevillea parviflora subsp. parviflora*	Small-flower Grevillea	V	V	0	Found in a number of vegetation types from heath and shrubby woodland to open forest, in sandy or light clay soils over thin shales. Found in Shale Sandstone Transition Forest, Kurri Sand Swamp Woodland, Corymbia maculata - Angophora costata open forest, Sydney Sandstone Ridgetop Woodland and Cooks River/Castlereagh Ironbark Forest. Also found in slightly disturbed environment such as along tracks.	Unlikely. No suitable habitat on site.
Proteaceae	*Persoonia nutans*	Nodding Geebung	E	E	1	Restricted to aeolian and alluvial sediments and altitudes below 60m. Can be found in a number of vegetation types including Agnes Banks Woodland, Castlereagh Scribbly Gum Woodland, Cooks River/Castlereagh Ironbark Forest and Shale Sandstone Transition Forest. Associated species include Eucalyptus sclerophylla, Eucalyptus	Unlikely. No suitable habitat on site.

Table B.1 Likelihood of occurrence of threatened flora to occur within the subject site

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						parramattensis subsp. parramattensis and Angophora bakeri.	
Rhamnaceae	*Pomaderris brunnea*	Rufous Pomaderris	E	V	0	Associated with moist woodland or forest on clay and alluvial soils of floodplains and creek lines.	Unlikely. Suitable habitat is present on site near wetlands but there are no past records within the locality.
Santalaceae	*Thesium australe*	Austral Toadflax	V	V	0	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast.	Unlikely. No suitable habitat on site.
Thymelaeaceae	*Pimelea curviflora var. curviflora*	-	V	V	0	Occurs in woodlands on shaley/lateritic soils and shale/sandstone transition soils on ridgetops and upper slopes. Often cryptic amongst dense grasses and sedges.	Unlikely. No suitable habitat on site.
Thymelaeaceae	*Pimelea spicata*	Spiked Rice-flower	E	E	13	Occurs in open woodlands and grasslands on undulating/hilly country in remnant bushland on Wianamatta shales.	Unlikely. No suitable habitat on site.

TSC Act / EPBC Act Status: V = Vulnerable, E = Endangered, X = Extinct

Appendix C

Fauna List

Table C.1 Fauna species recorded within the subject site

Family	*	*Scientific Name*	Common Name	CE (2015)	Biosphere (2012)
Amphibia					
Hylidae		*Litoria peronii*	Peron's Tree Frog		X
Hylidae		*Litoria verreauxii*	Verreaux's Frog		X
Myobatrachidae		*Crinia signifera*	Common Eastern Froglet		X
Myobatrachidae		*Limnodynastes peronii*	Striped Marsh Frog		X
Aves					
Corvidae		*Corvus coronoides*	Australian Raven	X	X
Anatidae		*Anas superciliosa*	Pacific Black Duck	X	X
Anatidae		*Chenonetta jubata*	Australian Wood Duck	X	X
Ardeidae		*Egretta novaehollandiae*	White-faced Heron	X	
Artamidae		*Cracticus tibicen*	Australian Magpie	X	X
Artamidae		*Cracticus torquatus*	Grey Butcherbird		X
Artamidae		*Strepera graculina*	Pied Currawong	X	
Cacatuidae		*Cacatua galerita*	Sulphur-crested Cockatoo	X	
Cacatuidae		*Cacatua roseicapilla*	Galah		X
Charadriidae		*Vanellus miles*	Masked Lapwing		X
Columbidae	*	*Spilopelia chinensis*	Spotted Turtle-dove	X	
Cuculidae		*Chrysococcyx basalis*	Horsfield's Bronze Cuckoo	X	
Halcyonidae		*Dacelo novaeguineae*	Laughing Kookaburra	X	
Hirundinidae		*Hirundo neoxena*	Welcome Swallow	X	X
Maluridae		*Malurus cyaneus*	Superb Fairywren	X	X
Monarchidae		*Grallina cyanoleuca*	Magpielark	X	X
Pardalotidae		*Pardalotus punctatus*	Spotted Pardalote		X
Psittaculidae		*Platycercus eximius*	Eastern Rosella		X
Psittaculidae		*Psephotus haematonotus*	Red-rumped Parrot		X
Psittaculidae		*Trichoglossus moluccanus*	Rainbow Lorikeet	X	
Rhipiduridae		*Rhipidura leucophrys*	Willie Wagtail	X	
Sturnidae	*	*Acridotheres tristis*	Common Myna	X	X
Sturnidae	*	*Sturnus vulgaris*	Common Starling		X
Mammalia					
Vespertilionidae		*Chalinolobus gouldii*	Gould's Wattled Bat		X

Table C.1 Fauna species recorded within the subject site

Family	*	*Scientific Name*	Common Name	CE (2015)	Biosphere (2012)
Canidae	*	*Vulpes vulpes*	Fox	X	X
Leporidae	*	*Oryctolagus cuniculus*	European Rabbit	X	X
Macropodidae		*Macropus giganteus*	Eastern Grey Kangaroo	X	X
Vespertilionidae		*Vespadelus vulturnus*	Little Forest Bat		X
Reptilia					
Chelidae		*Chelodina longicollis*	Eastern Long-necked Turtle		X
Elapidae		*Pseudechis porphyriacus*	Red-bellied Black Snake		X
Scincidae		*Cryptoblepharus virgata*	Wall Skink		X
Scincidae		*Lampropholis delicate*	Grass Skink		X

** Exotic*

Appendix D

Threatened Fauna Likelihood of Occurrence

Table D.1 Likelihood of occurrence of threatened fauna to occur within the subject site

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Amphibia							
Hylidae	Litoria aurea	Green and Golden Bell Frog	E	V	8	Inhabits a wide range of water bodies, particularly ephemeral ponds for breeding, with the exception of fast-flowing streams. Terrestrial habitat includes grassy low vegetation and diurnal shelter sites. In NSW, this species is commonly found in disturbed areas although vegetation diversity is positively associated with presence.	Unlikely. No favourable waterbodies present on the subject site. Previous surveys in 2012 executed GGBF call-playback surveys and did not record any individuals. Records in locality are located near St Marys.
Myobatrachidae	Heleioporus australiacus	Giant Burrowing Frog	V	V	0	Distribution is dependent on areas with native vegetation. Found in various vegetation communities including heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Associated with hanging swamps and perennial creeks in the northern portion of its range, and forest communities in the southern portion. Uses wet habitats for breeding.	Unlikely. No suitable habitat on site or records in the locality.

Table D.1 Likelihood of occurrence of threatened fauna to occur within the subject site

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Aves							
Accipitridae	^^Lophoictinia isura	Square-tailed Kite	V	-	1	Commonly found around timbered watercourses in dry woodlands and open forests. Forages over large distances feeding on passerines. Often encountered in habitats with open acacia scrub, low open eucalypt woodland and grassy groundcover.	Unlikely. No suitable habitat on site. Only one record approximately 2km from site.
Accipitridae	Haliaeetus leucogaster	White-bellied Sea-Eagle	-	Ma	1	Found in coastal and terrestrial habitats along the coast of Australia characterised by large areas of open water such as large rivers, swamps and lakes used for foraging. Also known to occur near the sea or sea-shore around bays, lakes, billabongs, beaches etc. Recorded in terrestrial habitats including coastal dunes, grassland, heathland, woodland, forest and even urban areas.	Unlikely. No suitable habitat on site. Only one record approximately 3km from site.
Accipitridae	Hieraaetus morphnoides	Little Eagle	V	-	5	Occurs in open eucalypt, Sheoak or Acacia forest, woodland and open woodlands. Also encountered in riparian woodlands. Requires	Possible. Marginal suitable foraging habitat present with riparian vegetation

Table D.1 Likelihood of occurrence of threatened fauna to occur within the subject site

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						tall living trees for nesting.	and She-oak woodland.
Accipitridae	Pandion cristatus	Eastern Osprey	V	-	0	Forages over open water. Often found in coastal areas at the mouths of large rivers, lagoons and lakes.	Unlikely. No suitable habitat on site or records in the locality.
Apodidae	Apus pacificus	Fork-tailed Swift	-	Ma, Mi	2	Almost exclusively aerial, often found over inland plains, foothills or in coastal areas. Generally occur over dry or open habitats, including riparian woodland, swamps, low scrub, heathland or saltmarsh.	Unlikely. Highly mobile, aerial species that may pass over the subject site but unlikely to utilise it directly.
Apodidae	Hirundapus caudacutus	White-throated Needletail	-	Ma, Mi	0	Almost exclusively aerial, often found over wooded areas, including open forest, heathland and rainforest. Less frequently observed above woodland or treeless habitat.	Unlikely. No suitable habitat on site or records in the locality.
Ardeidae	Ardea alba	Great Egret	-	Ma, Mi	0	Tend to forage in pasture, marsh, grassy road verges, rain puddles and croplands.	Unlikely. No suitable habitat on site or records in the locality.
Ardeidae	Ardea ibis	Cattle Egret	-	Ma, Mi	30	Widespread distribution occurring in tropical and temperate grasslands, woodlands and	Possible. Highly mobile, nomadic species

Table D.1 Likelihood of occurrence of threatened fauna to occur within the subject site

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						terrestrial wetlands. Often observed in moist, low-lying poorly drained pastures with a very grassy understorey.	that have a number of records in the locality. Although not recorded on site, may utilise wetland and tributary on site.
Ardeidae	Botaurus poiciloptilus	Australasian Bittern	E	E	0	Occurs in permanent freshwater wetlands with tall, dense vegetation.	Unlikely. No suitable habitat on site or records in the locality.
Cuculidae	Cuculus optatus	Oriental Cuckoo, Horsfield's Cuckoo	-	Ma, Mi	0	Mainly inhabits forests, occurring in a variety of vegetation types.	Unlikely. No suitable habitat on site or records in the locality.
Dicruridae	Monarcha melanopsis	Black-faced Monarch	-	Ma, Mi	0	Found in a variety of rainforest habitat, from dry (monsoon) to cool temperate to tropical rainforests. Also includes semi-deciduous vine-thickets as well as near open eucalypt forest that have a dense, shrubby understorey.	Unlikely. No suitable habitat on site or records in the locality.
Dicruridae	Myiagra cyanoleuca	Satin Flycatcher	-	Ma, Mi	0	Found in rainforest, dense wet eucalypt and monsoon forests, paperbark and mangrove swamps and riverside vegetation.	Unlikely. No suitable habitat on site or records in the locality.

Table D.1 Likelihood of occurrence of threatened fauna to occur within the subject site

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Dicruridae	Rhipidura rufifrons	Rufous Fantail	-	Ma, Mi	0	Occurs in open country, chiefly at suitable breeding places in areas of sandy or loamy soil: sand-ridges, riverbanks, sandpits, occasionally coastal cliffs.	Unlikely. No suitable habitat on site or records in the locality.
Meliphagidae	Anthochaera phrygia	Regent Honeyeater	CE	CE	0	Generally occurs in temperate woodlands and open forests particularly Box-Ironbark woodland and River Sheoak riparian forests but also known to occur in drier coastal woodlands.	Unlikely. No records in the locality and riparian vegetation is highly degraded and isolated.
Meliphagidae	Grantiella picta	Painted Honeyeater	V	V	0	Feeds on mistletoes in Boree, Brigalow and Box-Gum woodlands and Box-Ironbark forests.	Unlikely. No suitable habitat on site or records in the locality.
Meliphagidae	Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	-	1	Occurs in the upper levels of dry open forests and woodlands, dominated by box and ironbark eucalypts. Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks and tea-trees.	Unlikely. Some suitable habitat on subject site, however only one record approximately 2.5km from site.
Meropidae	Merops ornatus	Rainbow Bee-eater	-	Ma, Mi	0	Distributed across mainland Australia inhabiting open forests and woodlands, shrublands and semi-cleared areas that are often dominated by	Unlikely. No suitable habitat on site or

Table D.1 Likelihood of occurrence of threatened fauna to occur within the subject site

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						eucalypts. Observed in lightly-timbered or cleared areas that are in close proximity to permanent water.	records in the locality.
Motacillidae	Motacilla flava	Yellow Wagtail	-	Ma, Mi	0	Extremely large range. Occurs in damp or wet habitats with low vegetation, such as meadows, hay fields and marshes.	Unlikely. No suitable habitat on site or records in the locality.
Neosittidae	Daphoenositta chrysoptera	Varied Sittella	V,P	-	4	Eucalypt forest and woodlands, especially with rough barked species, smooth-barks with dead branches, mallee and acacia. Nests in living trees and feeds off insects in dead trees	Unlikely. No suitable habitat on site.
Petroicidae	Petroica boodang	Scarlet Robin	V,P	-	2	Occurs in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Habitat usually contains abundant logs and fallen timber. Nests are often found in a dead branch in a live tree, or in a dead tree or	Unlikely. No suitable habitat on site. Records located approximately 5km from site.

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Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						shrub.	
Petroicidae	Petroica phoenicea	Flame Robin	V	-	1	Generally found in clearings and open vegetation types but occasionally temperate rainforests, heathlands and sedgelands at higher altitudes. This species breeds in upland tall moist eucalypt forests that are dominated by native grasses.	Unlikely. No suitable habitat on site.
Psittacidae	^^Lathamus discolor	Swift Parrot	E	E, Ma	1	Semi-nomadic species foraging in dry box-ironbark forest and woodlands, but also the coastal plains forest. Widespread along the south-eastern coast of Australia, however demonstrate high site fidelity.	Unlikely. No suitable habitat on site.
Rostratulidae	Rostratula australis	Australian Painted Snipe	E	E, Ma	0	Occurs around swamps, dams and other freshwater wetland or waterlogged habitat where there is groundcover present such as grasses or low scrub.	Unlikely. No suitable habitat on site or records in the locality.
Scolopacidae	Gallinago hardwickii	Latham's Snipe	-	Ma, Mi	2	Generally inhabits open, freshwater wetlands (permanent and ephemeral) with low, dense vegetation however known to occur in saline or	Possible. Highly mobile, nomadic species that have a number of records in

Table D.1 Likelihood of occurrence of threatened fauna to occur within the subject site

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						brackish water in modified or artificial habitats.	the locality. Although not recorded on site, may utilise wetlands on site.
Scolopacidae	Tringa nebularia	Common Greenshank	-	Ma, Mi	0	Found in sheltered coastal areas and inland habitats of varying salinity. Use both permanent and ephemeral terrestrial wetlands often on mud or clay.	Unlikely. No suitable habitat on site or records in the locality.
Strigidae	^^Ninox strenua	Powerful Owl	V	-	1	Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. Also occurs in fragmented habitats.	Unlikely. No suitable habitat on site.
Gastropoda							
Camaenidae	Meridolum corneovirens	Cumberland Plain Land Snail	E	-	153	Associated with Cumberland Plain Woodlands, grassy open woodland, although it is also known to occur in Shale Gravel Transition Forests, Castlereagh Swamp Forests and River-flat Eucalypt forests. Often found under litter, bark and logs.	Possible but unlikely. Previous 2012 study conducted targeted surveys were unable to locate individuals. Not enough leaf litter from She-oaks or decaying material for species.

Table D.1 Likelihood of occurrence of threatened fauna to occur within the subject site

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Mammalia							
Dasyuridae	Dasyurus maculatus	Spotted-tailed Quoll	V	E	0	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares; usually traverse their ranges along densely vegetated creek lines.	Unlikely. No suitable habitat on site or records in the locality.
Emballonuridae	Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	1	Roosts in tree hollows and buildings and forages over most habitats, with or without trees, in its very wide range.	Unlikely. No suitable habitat on site
Molossidae	Mormopterus norfolkensis	Eastern Freetail-bat	V	-	4	Occur in dry sclerophyll forest and woodland east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures.	Unlikely. No suitable habitat on site.

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Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Muridae	Pseudomys novaehollandiae	New Holland Mouse	-	V	0	Inhabits coastal areas up to 100km inland and up to 900m ASL in areas with deeper top soils and softer substrates.	Unlikely. No suitable habitat on site or records in the locality.
Phascolarctidae	Phascolarctos cinereus	Koala	V	V	1	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.	Unlikely. No suitable habitats on site, majority of trees are She-oaks. Only one 1990 record approximately 5km from site.
Pteropodidae	Pteropus poliocephalus	Grey-headed Flying-fox	V	V	9	Roosts in large camps located close to a regular food source, often in gullies with a dense canopy near water. Habits include temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps.	Unlikely. No suitable habitat on site.
Vespertilionidae	Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	3	Prefers moist habitats, with trees taller than 20m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings.	Unlikely. No suitable habitat on site.

Table D.1 Likelihood of occurrence of threatened fauna to occur within the subject site

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Vespertilionidae	Miniopterus australis	Little Bentwing-bat	V	-	1	Moist eucalypt forest, rainforest or dense coastal banksia scrub. Little Bentwing-bats roost in caves, tunnels and sometimes tree hollows during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	Unlikely. No suitable habitat on site.
Vespertilionidae	Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	12	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Hunt in forested areas, catching moths and other flying insects above the tree tops.	Possible. Records approximately 1km from the site. May occasionally forage in or fly over subject site, but site is unlikely to support a population.
Vespertilionidae	Myotis macropus	Southern Myotis	V	-	8	Forages over streams and pools to catch insects and small fish. Roosts in small groups in caves, hollow-bearing trees, buildings close to water.	Unlikely. No suitable habitat on site.
Vespertilionidae	Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	3	More commonly found in tall wet forest but also occurs in dry eucalypt forest. Roosts in tree hollows and buildings. Forages along creek and river corridors.	Unlikely. No suitable habitat on site.

TSC Act / EPBC Act Status: V = Vulnerable, E = Endangered, Ma = Marine, Mi = Migratory