

Marsden Park Industrial Precinct Ecological Assessment

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Contents

EXECUTIVE SUMMARY	3
1. INTRODUCTION	4
1.1 DESCRIPTION OF PROJECT.....	4
1.2 STUDY AREA	5
1.3 METHODOLOGY OVERVIEW	5
1.4 STATUTORY FRAMEWORK	9
2. TERRESTRIAL BIODIVERSITY ASSESSMENT.....	10
2.1 METHODS.....	10
2.2 VEGETATION COMMUNITIES	10
2.3 FLORA.....	17
2.4 FAUNA	19
2.5 ECOLOGICAL CONSTRAINTS.....	21
2.6 IMPACT ASSESSMENT.....	23
3. AQUATIC AND GROUNDWATER DEPENDANT ECOSYSTEM ASSESSMENT.....	25
3.1 METHODS.....	25
3.2 RESULTS	25
3.3 DISCUSSION.....	29
3.4 URBAN DESIGN PRINCIPLES	30
4. RIPARIAN ASSESSMENT	31
4.1 METHODS.....	31
4.2 RESULTS	31
4.3 RIPARIAN VEGETATION MANAGEMENT STRATEGY	34
4.4 PLANNING CONTROLS FOR RIPARIAN LANDS.....	35
4.5 MANAGEMENT OF RIPARIAN PROTECTION AREAS.....	36
5. RECOMMENDATIONS.....	39
6. INDICATIVE LAYOUT PLAN ASSESSMENT.....	42
7. REFERENCES.....	44
APPENDIX A: FLORA LIKELIHOOD OF OCCURRENCE TABLE	45
APPENDIX B: FAUNA LIKELIHOOD OF OCCURRENCE TABLE.....	47
APPENDIX C: PREVIOUS REPORTS/ASSESSMENTS.....	51
APPENDIX D: DETAILED STATUTORY FRAMEWORK.....	54
APPENDIX E: DETAILED METHODOLOGY	60
APPENDIX F: FLORA LIST	75
APPENDIX G: FAUNA LIST	80
APPENDIX H: BIOCERTIFICATION CONDITIONS, SCHEDULE 3 ASSESSMENT	83
APPENDIX I: ASSESSMENTS OF SIGNIFICANCE – SPECIES PROTECTED UNDER THE EPBC ACT.....	87

Tables

Table 1 A summary of area occupied by vegetation communities and their condition.....	15
Table 2 Constraints summary of study area.....	21
Table 3 Vegetation Loss and Retention Calculations	24
Table 4 Weather conditions during field surveys	61
Table 5 Canopy and condition codes.....	62

Figures

Figure 1 Study Area	6
Figure 2 Marsden Park Industrial Precinct – Indicative Layout Plan – dated 2 January 2009	7
Figure 3 Extent of Previous Studies	8
Figure 4 Example of good condition Shale Plains Woodland.	11
Figure 5 Example of poor condition Shale Plains Woodland.....	11
Figure 6 Example of good condition Alluvial Woodland.....	12
Figure 7 Example of poor condition Alluvial Woodland.	12
Figure 8 Example of good condition Shale/Gravel Transition Forest.	13
Figure 9 Example of poor condition Shale/Gravel Transition Forest.....	13
Figure 10 Vegetation community and condition.....	16
Figure 11 Threatened flora locations within and surrounding the study area	18
Figure 12 NPWS Atlas Threatened fauna locations within and surrounding the study area.....	20
Figure 13 Ecological Constraints within the study area.	22
Figure 14. Good condition aquatic habitat.	25
Figure 15. Good condition aquatic habitat.	25
Figure 16. Moderate condition aquatic habitat.	26
Figure 17. Moderate condition aquatic habitat.	26
Figure 18. Poor condition aquatic habit.	27
Figure 19. Poor condition aquatic habitat.....	27
Figure 20. Aquatic habitat condition within the study area.....	28
Figure 21 Riparian Categories within the MPIP study area	33
Figure 22 Vegetation Prioritisation for use in Urban Design.....	41
Figure 23 Survey Types and Locations	65

Executive Summary

Eco Logical Australia Pty Ltd (ELA) has undertaken an Ecological Assessment of approximately 550ha that forms the Marsden Park Industrial Precinct (MPIP). The aim of the ecological constraints assessment is to inform the Master Planners for the MPIP on terrestrial, aquatic, groundwater ecosystems, and riparian values and assess the impact of the Indicative Layout Plan on the environment.

The site displays a number of ecological values that are protected under state and commonwealth legislation. Biodiversity Certification of the Growth Centres Conservation Plan strategically identifies a regional offsets package, effectively facilitating the strategic loss of ecological values on 'certified lands' without triggering further assessment under the TSC Act. 'Non-certified' lands which should be zoned environmental protection are associated with the RTA lands and Bells Creek. Two areas of 'deferred lands' are located on this site. It is recommended that the north-western remnant is 'smoothed' into a more viable management boundary by adding a riparian corridor to the southern end whilst the south-western remnant which overlays with a riparian area can be incorporated into stormwater controls.

Four vegetation communities were identified within the study area; Shale Plains Woodland (SPW) which is part of the Cumberland Plain Woodland Endangered Ecological Community, listed under the TSC and EPBC Acts, Cooks River Castlereagh Ironbark Forest, Alluvial Woodland and Shale/Gravel Transition Forest which are all endangered ecological communities listed on Schedule 1 of the TSC Act. During the field survey, three threatened flora species listed under the TSC or EPBC Acts were recorded, including juniper-leaved grevillea (*Grevillea juniperina* subsp. *juniperina*) (TSC Act only), *Pultenaea parviflora* (TSC and EPBC Act), and *Dillwynia tenuifolia* (TSC and EPBC Act). Opportunistic records during the field survey identified 106 fauna species, a small number of which are listed on the TSC Act and the EPBC Act.

Good aquatic habitat was found to occur along Bells Creek, and within a number of existing farm dams, particularly the large dam in the centre of the precinct that may also serve as habitat for migratory birds.

Riparian corridor assessment concluded that Bells Creek and a small tributary in the northwest corner which drains into Shane's Park should remain as category 1 watercourses with a 50m corridor either side of top of bank (40m core riparian zone and 10m vegetated buffer). The remainder of the watercourses were found to be in a significantly degraded and modified state and all but one small watercourse adjacent to Shane's Park in the southwest, and a watercourse through the Mosque in the south east corner have been recommended for engineered drainage. The two tributaries have been recommended to be treated as a Category 3 stream with a 10m riparian corridor either side of the top of bank.

From a rezoning perspective, the riparian corridors and non-certified lands are recommended to be zoned for environmental protection. The two deferred remnants are to be treated as outlined earlier in this summary. Open space areas, road easements, power easements and stormwater controls should be located in a manner that facilitates retention of vegetation across the site, as outlined in the Growth Centres Development Code.

1. Introduction

1.1 Description of Project

Eco Logical Australia Pty Ltd (ELA) was engaged by APP on behalf of Marsden Park Developments Pty Ltd to undertake an Ecological Assessment of approximately 550ha that forms the Marsden Park Industrial Precinct (MPIP). The aim of the ecological constraints assessment is to inform the Indicative Layout Plan (ILP) for the MPIP on terrestrial, aquatic, groundwater ecosystems, and riparian values.

Specific objectives of this project are to:

- Undertake a strategic biodiversity assessment including a flora and fauna study, an analysis of ecological values and identification and high-quality mapping of areas of high, moderate and low ecological value.
- Achieve innovative management frameworks for ecological and biodiversity issues which enable long term conservation and management, while facilitating the development outcomes for the precincts (as identified in the structure plan).
- Ensure the statutory requirements for the protection, restoration and enhancement of threatened species, populations, ecological communities and their habitats are met.
- Ensure protection of biodiversity values within areas identified by the Growth Centres SEPP.
- Ensure that precinct planning is consistent with the terms of any biodiversity certification granted to the SEPP.

This report demonstrates the objectives are achieved through;

1. Methodology that includes literature review of previous work, terrestrial aquatic and geomorphic field assessment, ecological constraints analysis, and riparian corridor delineation.
2. Analysis of values and input into urban design via this report and workshops
3. Consideration of statutory requirements in particular; Growth Centres Commission Development Code, Threatened Species Conservation Act (TSC Act), Environment Protection and Biodiversity Conservation Act (EPBC Act), TSC Act SEPP Biocertification, Water Management Act, Fisheries Management Act.
4. Identification of key areas that contribute to ecological outcomes and specification of objectives and controls for inclusion in the DCP and ongoing management frameworks.

1.2 Study Area

The MPIP is located within the North West Sydney growth centre in the suburb of Marsden Park, New South Wales. The Precinct is the first to be released under the NSW Government's Precinct Acceleration Protocol, which allows planning and development to proceed earlier than proposed by the Growth Centres Commission. The precinct falls within the Blacktown City Local Government Area (LGA). The study area is larger than the current precinct boundary as the precinct boundary is currently under review.

The study area includes approximately 550ha of land that is bounded to the north and west by South Street, Bells Creek to the east, Hassell Grove to the south. Figure 1 illustrates the broad location of the study area. The study area incorporates a number of landowners, including Marsden Park Developments Pty Ltd, private landowners, the Town and Country Caravan Park, Valad Property Group, the Ahmadiyya Muslim Association of Australia, Winten Property Group, the RTA and small businesses along Richmond Road.

The Marsden Park Industrial Precinct – Draft Indicative Layout has also been assessed as part of this report. Refer to Figure 2

1.3 Methodology Overview

An overview of the methodology is provided below, full details can be found in Appendix E;

- Literature review
- Database search for threatened species, populations and ecological communities under the TSC Act and Matters of National Environmental Significance (NES) under the EPBC Act
- Assessment of State and Federal statutory requirements
- Field validation of existing vegetation, threatened species and riparian corridor mapping and assessments
- Analysis and identification of ecological constraints
- Recommendations
- Management framework

Figure 1 Study Area

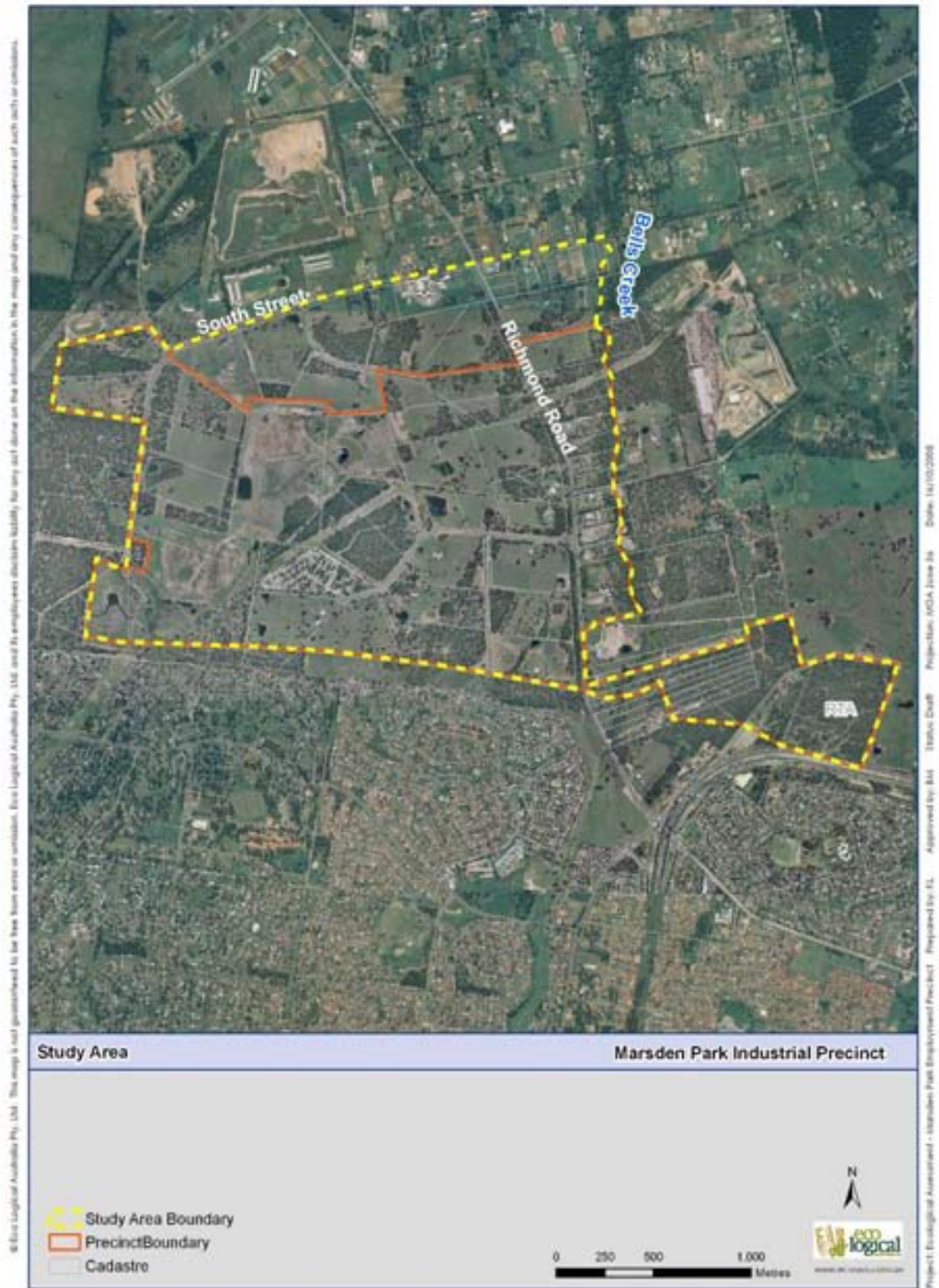


Figure 2 Marsden Park Industrial Precinct – Draft Indicative Layout Plan

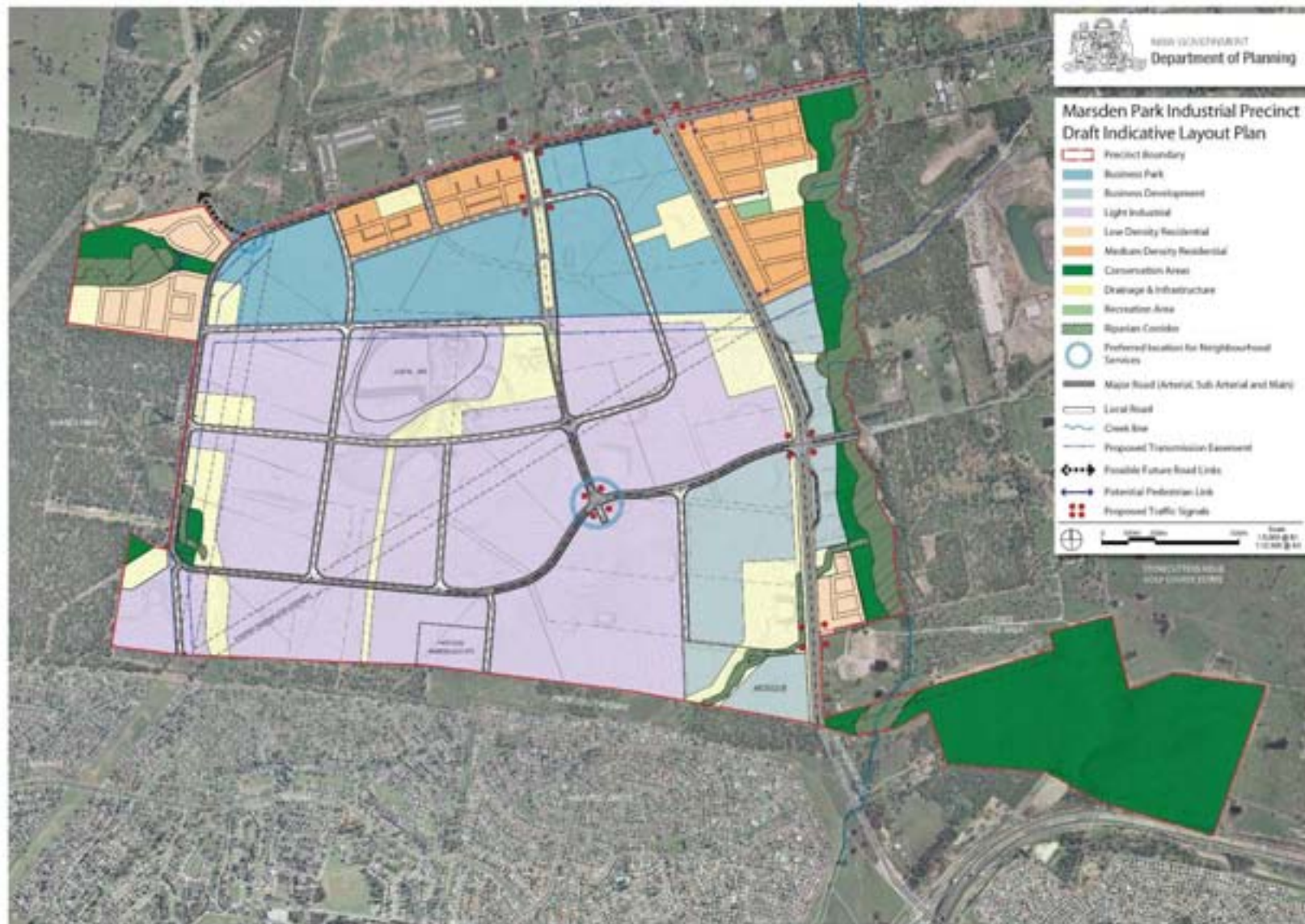
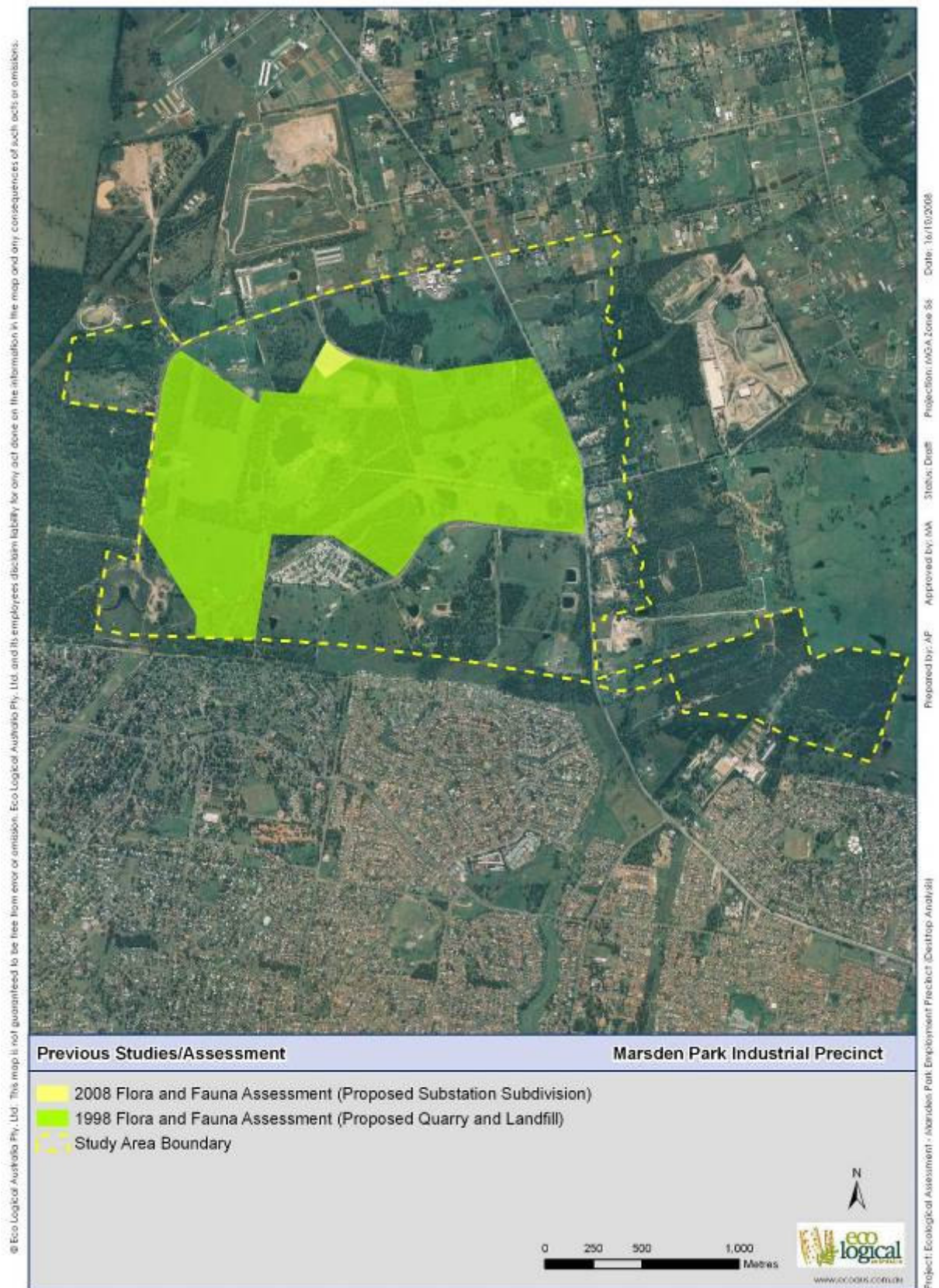


Figure 3 Extent of Previous Studies



1.4 Statutory Framework

A substantial array of legislation, policies and guidelines apply to the assessment, planning and management of ecological values within the study area. This information was reviewed and used to identify priority constraints and opportunities within the study area (Refer to Appendix D). Legislation and policies reviewed include:

International

- Japan – Australia Migratory Bird Agreement (JAMBA)
- China – Australia Migratory Bird Agreement (CAMBA)
- Republic of Korea – Australia Migratory Bird Agreement (ROKAMBA)

Commonwealth

- *Environment Protection & Biodiversity Conservation Act 1999 (EPBC Act)*

State

- *Environmental Planning and Assessment Act 1979 (EP&A Act)*
- *Threatened Species Conservation Act 1995 (TSC Act)*
- *State Environmental Planning Policy (Sydney Region Growth Centres) 2006 (Growth Centres SEPP)*
- *Threatened Species Conservation Amendment (Special Provisions) Act 2008*
- *Fisheries Management Act 1994 (FM Act)*
- *Water Management Act 2000 (WM Act)*
- *Noxious Weeds Act 1993*
- *Rural Fires Act 1997 (RF Act)*
- *Planning for Bushfire Protection 2006*
- *Protection of the Environment Operations Act 1997*
- *Catchment Management Act 1989*
- *Sydney Regional Environmental Plan No 20 – Hawkesbury-Nepean River (No 2 – 1997)*
- *State Environmental Planning Policy No.19 – Bushland in Urban Areas*
- *NSW Biodiversity Strategy 1999*
- *Growth Centres Development Code 2006*
- *Growth Centres Conservation Plan 2007*

Local

- *Blacktown City Council Local Environmental Plan 1988*

2. Terrestrial Biodiversity Assessment

2.1 Methods

A full floristic survey of the precinct was undertaken to confirm the vegetation communities present. Additional flora and fauna targeted surveys were also undertaken. Detailed methodology can be found in Appendix E

2.2 Vegetation Communities

Four vegetation communities were identified within the study area. The characteristics of each vegetation community, their conservation significance and ecological condition are summarised below and presented in Table 1 and Figure 10.

Shale Plains Woodland

Shale Plains Woodland (SPW) is part of the Cumberland Plain Woodland Endangered Ecological Community, listed under both the TSC and EPBC Acts. SPW is the most widely distributed community on the Cumberland Plain, predominantly occurring on soils derived from Wianamatta Shale. CPW, has recently been nominated for an elevation of status from endangered to critical under the EPBC Act, further assessment will be required if CPW becomes a Critically Endangered Ecological Community (CEEC).

SPW within the study area consists of a mixture of poor, moderate and good condition vegetation. The canopy is dominated by grey box (*Eucalyptus moluccana*) and forest red gum (*Eucalyptus tereticornis*), with narrow-leaved ironbark (*Eucalyptus crebra*), and woollybutt (*Eucalyptus longifolia*) occurring less frequently.

The shrub layer over a large proportion of the study area has been and is currently subject to under scrubbing and grazing. In areas of natural growth and regrowth, the shrub layer is dominated by native blackthorn (*Bursaria spinosa*), with juniper-leaved grevillea (*Grevillea juniperina* subsp. *juniperina*), *Dillwynia sieberi*, and forest nightshade (*Solanum prinophyllum*), occurring less frequently.

Groundcover vegetation is typically dominated by a mixture of native and exotic grasses and herbs. Native groundcover species include threeawn speargrass (*Aristida vagans*), weeping rye grass (*Microlaena stipoides*), two-colour panic (*Panicum simile*), and couch (*Cynodon dactylon*). Exotic groundcovers include Rhodes grass (*Chloris gayana*), slender pigeon grass (*Setaria gracilis*), fireweed (*Senecio madagascariensis*), and spear thistle (*Cirsium vulgare*).

The stands of SPW within the study area consists of approximately 104ha of good condition vegetation (ABC condition), and approximately 31ha of poor condition vegetation (TX Condition).



Figure 4 Example of good condition Shale Plains Woodland.



Figure 5 Example of poor condition Shale Plains Woodland.

Alluvial Woodland

The Alluvial Woodland (AW) within the study area comprises the endangered ecological community *River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions* (River-Flat Forest), which is listed on Schedule 1 of the TSC Act. AW occurs exclusively along, or in close proximity to Bells Creek, along the eastern boundary of the study area.

The most common canopy species found within AW is cabbage gum (*Eucalyptus amplifolia*), with forest red gum, rough-barked apple (*Angophora floribunda*), and grey box occurring less frequently.

The shrub layer is usually dominated by native blackthorn, and Parramatta wattle (*Acacia parramattensis*), with *Melaleuca decora*, white sally (*Acacia floribunda*), and juniper-leaved grevillea occurring less frequently.

Groundcover vegetation is typically dominated by a mixture of native and exotic grasses and herbs. Native groundcover species include threeawn speargrass, weeping rye grass, and couch. Exotic groundcovers include kikuyu, Rhodes grass, paddy's lucerne (*Sida rhombifolia*), fireweed, and lamb's tongues (*Plantago lanceolata*).

The stands of AW within the study area consists of approximately 3ha of good condition vegetation (ABC condition), and approximately 3.2ha of poor condition vegetation (TX Condition).



Figure 6 Example of good condition Alluvial Woodland.



Figure 7 Example of poor condition Alluvial Woodland.

Shale/Gravel Transition Forest

Shale/Gravel Transition Forest (SGTF) occurs primarily in areas where there are shallow deposits of tertiary alluvium overlying shale soils, but also in association with localised concentrations of iron-indurated gravel. SGTF is an endangered ecological community listed on Schedule 1 of the TSC Act. The listing of SGTF under the EPBC Act as an EEC is currently under debate. The CEEC nomination for CPW under the EPBC Act may or may not include SGTF, further clarification of the protection of SGTF under the EPBC Act will be forthcoming. For this report SGTF has not been considered as an EPBC listed community.

SGTF within the study area is dominated by red ironbark, with grey box and forest red gum occurring less frequently, but sometimes dominating in the absence of red ironbark. White feather honeymyrtle (*Melaleuca decora*) is frequently present within the sub-canopy.

The shrub layer over a large proportion of the study area has been subject to historical and current under scrubbing and grazing. In areas of natural growth and regrowth, the shrub layer is dominated by native blackthorn, with juniper-leaved grevillea, *Dillwynia sieberi*, *Melaleuca nodosa*, gorse bitter pea (*Daviesia ulicifolia*), and native cherry occurring less frequently.

Groundcover vegetation is typically dominated by a mixture of native and exotic grasses and herbs. Groundcover vegetation is typically dominated by a mixture of native and exotic grasses and herbs. Native groundcover species include threeawn speargrass, kangaroo grass (*Themeda australis*), two-colour panic, forest hedgehog grass (*Echinopogon ovatus*), and wattle matt-rush. Exotic groundcovers include kikuyu, Rhodes grass, slender pigeon grass, fireweed, and spear thistle.

The stands of SGTF within the study area consists of approximately 37ha of good condition vegetation (ABC condition), and approximately 21ha of poor condition vegetation (TX Condition).



Figure 8 Example of good condition Shale/Gravel Transition Forest.



Figure 9 Example of poor condition Shale/Gravel Transition Forest.

A large patch of regenerating Shale/Gravel Transition Forest is located within a property at the corner of Fulton St and South Rd. This patch has been subject to past clearing and no canopy currently exists. However, there is a significant number of regenerating native species, including the Juniper-leaved Grevillea.

Cooks River Castlereagh Ironbark Forest

Detailed quadrat survey revealed that a patch of Cooks River Castlereagh Ironbark Forest (CRCIF) exists within the RTA offset lands. Cooks River/Castlereagh Ironbark Forest mainly occurs on clay soils, derived from the alluvial deposits of ancient river systems (up to 65 million years old), or on shale soils of the Wianamatta Shales. CRCIF is an endangered ecological community listed on Schedule 1 of the TSC Act and is located within non-certified land.

The CRCIF within the study area is in its open forest form and remains in good condition, likely due to its location and relative absence of disturbance e.g. no grazing. The a canopy dominated by broad-leaved ironbark (*Eucalyptus fibrosa*) and paperbark (*Melaleuca decora*), It also contained woollybutt (*E. longifolia*).

Understory vegetation is dominated by a mixture of native and exotic grasses and herbs. The shrubby understorey characteristically consists of *Melaleuca nodosa* and peach heath (*Lissanthe strigosa*), with a range of 'pea' flower shrubs. The sparse ground layer is made of grasses and herbs, including kangaroo grass (*Themeda australis*), weeping meadow grass (*Microlaena stipoides var stipoides*) and *Entolasia stricta*.

Vegetation Community and Condition Assessment Area Calculations

Area calculations of each vegetation community within the study area are provided in Table 1. The study area is dominated by grassland (exotic dominated).

Approximately 42% or 228.68ha of the study area supports an EEC under the TSC Act, and 24.7% or 135.52ha of the study area supports an EEC under the EPBC Act. The majority of the Shale Plains Woodland was determined to be condition A or B, accounting for 19.01% of the study area or 104.33ha.

Alluvial Woodland, recorded within the eastern proximity of the study area, along Bells Creek occupies an area of approximately 15.29ha.

Shale Gravel Transition Forest within the study area consists of varying vegetation condition, with approximately 36.52ha of A and B condition vegetation occurring across the study area. This accounts for 6.7% of vegetation cover within the study area.

An additional 19.94ha of Cooks River Castlereagh Ironbark Forest was also found to occur within the RTA offset lands, all currently existing in good condition.

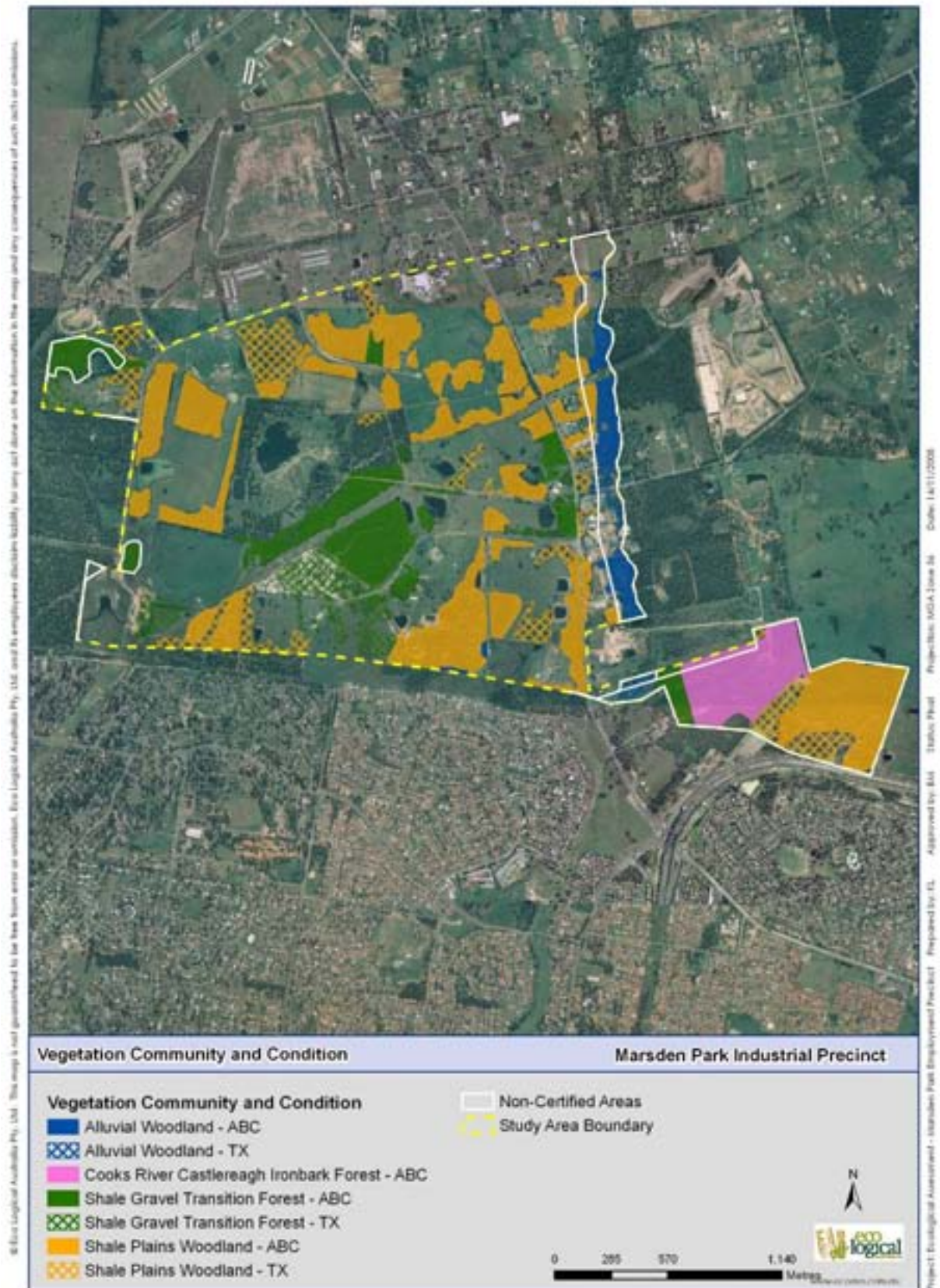
Table 1 A summary of area occupied by vegetation communities and their condition.

COMMUNITY	CONDITION	TOTAL (ha)	% of Study Area
Shale Plains Woodland	ABC (good)	104.33	19.01
	TX (poor)	31.19	5.68
	Total	135.52	24.70
Alluvial Woodland	ABC (good)	12.12	2.21
	TX (poor)	3.17	0.58
	Total	15.29	2.79
Shale Gravel Transition Forest	ABC (good)	36.52	6.66
	TX (poor)	21.37	3.89
	Total	57.89	10.55
Cooks River Castlereagh Ironbark Forest	ABC (good)	19.94	3.63
Total		228.64	41.69

NB. Table 1 provides an explanation of the condition codes assigned.

* Calculations exclude farm dams/artificial wetlands (14.6ha or 2.7% of study area)

Figure 10 Vegetation community and condition



2.3 Flora

The field survey undertaken within the study area, identified 227 flora species. These species included 157 native species and 70 exotic species. A flora list for the study area is presented in Appendix F. This is not a comprehensive list of flora species likely to be present within the study area.

A list of threatened flora species known to occur within a 10 km radius of the study area has been collated (Appendix A). During the field survey, three threatened flora species listed under the TSC or EPBC Acts were recorded, including juniper-leaved grevillea (*Grevillea juniperina* subsp. *juniperina*) (TSC Act only), *Pultenaea parviflora* (TSC and EPBC Act), and *Dillwynia tenuifolia* (TSC and EPBC Act). *Pultenaea parviflora* and *Dillwynia tenuifolia* were only found within the non-certified land to the south-east, within the RTA offset land. There are a number of other threatened flora species that have been previously recorded within or in close proximity to the study area (see Figure 11), including *Marsdenia viridiflora* subsp. *viridiflora*, *Micromyrtus minutiflora*, *Persoonia nutans*, *Pimelea curviflora* var. *curviflora*, and *Pimelea spicata*.

The juniper-leaved grevillea is the most abundant threatened species within the study area, as shown within Figure 11. Given the high number of specimens within the study area, an abundance rating of the juniper-leaved grevillea has been determined for each vegetation polygon within the study area.

The abundance rating of the juniper-leaved grevillea within the study area has identified six remnant patches of vegetation that contain greater than 100 specimens, of which three are located within the bio-certified areas.

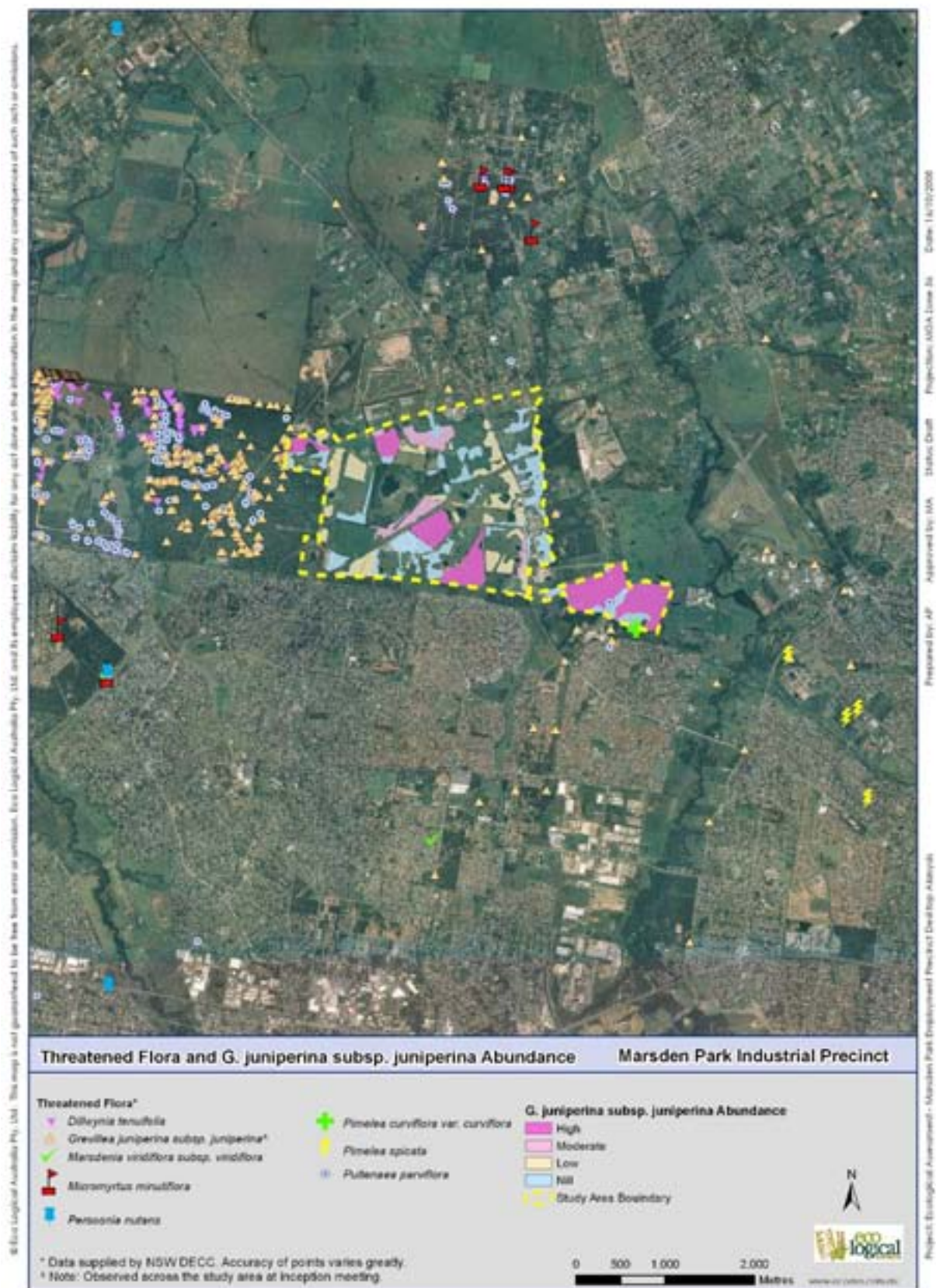
The abundance rating has been determined by utilising four ratings, based upon observations from the field survey;

- **High** – greater than 100 specimen's of juniper-leaved grevillea within a vegetation polygon.
- **Moderate** - between 20 and 100 specimen's of juniper-leaved grevillea within a vegetation polygon.
- **Low** – less than 20 specimen's of juniper-leaved grevillea within a vegetation polygon.
- **Nil** - no presence of juniper-leaved grevillea observed within the study area.

Seven plant species identified within the study area are listed as noxious weeds within the Blacktown Local Government Area. These noxious weeds include:

- African Boxthorn (*Lycium ferocissimum*) - Noxious Class 4
- Blackberry (*Rubus fruticosus* aggregate) - Noxious Class 4
- Bridal creeper (*Asparagus asparagoides*) - Noxious Class 5
- Broad-leaved Privet (*Ligustrum lucidum*) - Noxious Class 4
- Green Cestrum (*Cestrum parqui*) - Noxious Class 3
- Narrow-leaved Privet (*Ligustrum sinense*) - Noxious Class 4
- Prickly pear (*Opuntia* sp.) - Noxious Class 4

Figure 11 Threatened flora locations within and surrounding the study area .



2.4 Fauna

The field survey identified 106 fauna species. These species included 79 birds, 20 mammals, 5 amphibians, 1 reptile and 1 gastropod. A fauna list for the study area is presented in Appendix G.

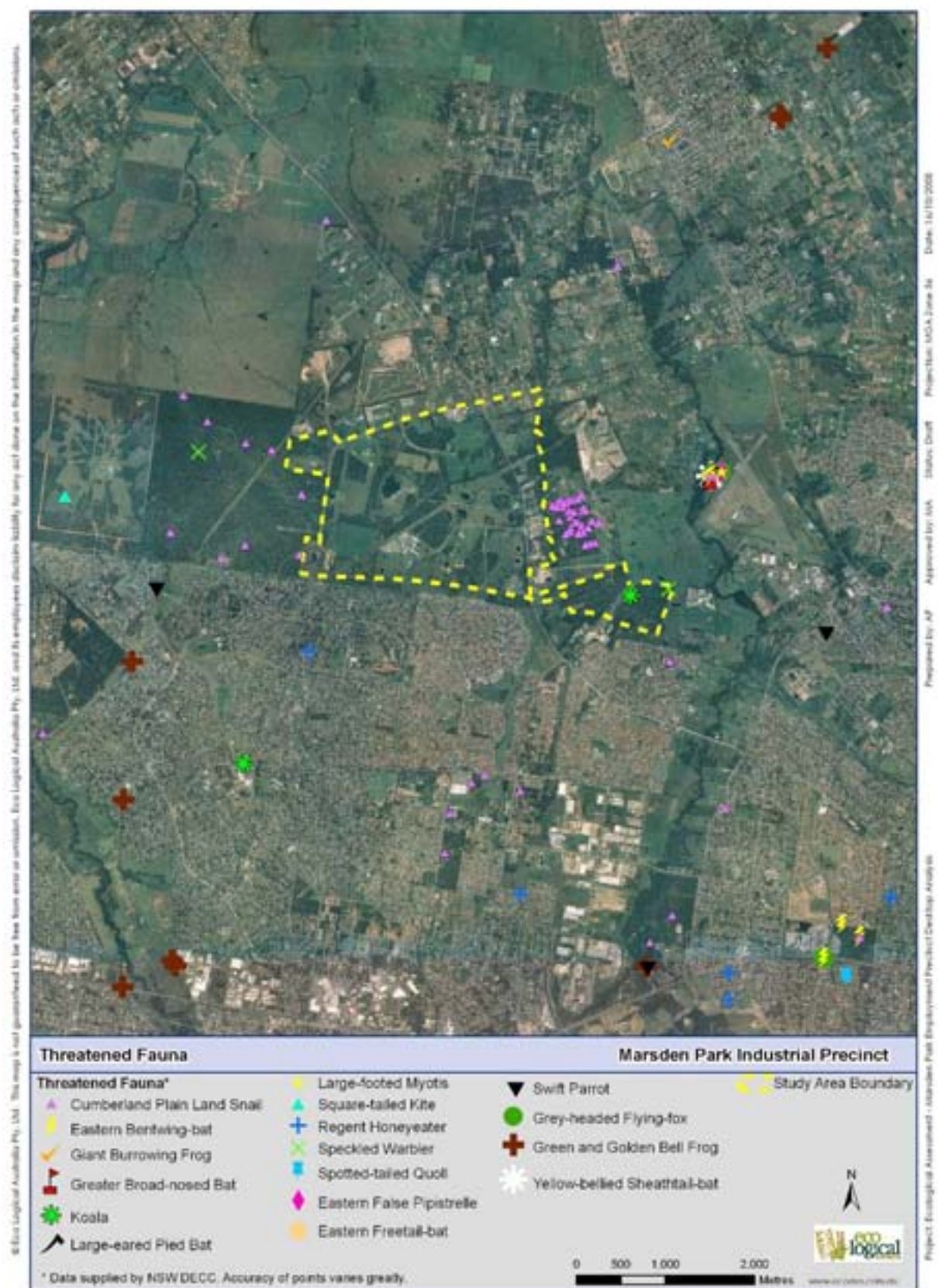
The field survey identified 7 species listed under either the TSC Act or the EPBC Act. These species included:

- Eastern bent-wing bat (*Miniopterus schreibersii oceanensis*) - (TSC Act);
- Eastern free-tail bat (*Mormopterus nofolkensis*) - (Act);
- Large-footed fishing bat (*Myotis adversus*) - (TSC Act);
- Yellow-bellied sheath-tail bat (*Saccolaimus flaviventris*) - (TSC Act);
- Greater broad-nosed bat (*Scoteanax rueppellii*) - (TSC Act);
- Grey-headed flying-fox (*Pteropus poliocephalus*) - (TSC and EPBC Act);
- Cattle egret (*Ardea ibis*) - (EPBC Act); and
- Great egret (*Ardea alba*) - (EPBC Act).

Based on the Appendix B the following threatened fauna species are known, likely or have the potential to occur on site;

Species	TSC Act	EPBC Act
• Green and golden bell frog (<i>Litoria aurea</i>);	x	x
• Giant burrowing frog (<i>Heleioparus australiacus</i>);	x	x
• Speckled warbler (<i>Pyrrholaemus sagittatus</i>);	x	
• Square-tailed kite (<i>Lophoictinia isura</i>);	x	x
• Regent honeyeater (<i>Xanthomyza phrygia</i>);	x	x
• Swift parrot (<i>Lathamus discolor</i>);	x	x
• Spotted-tailed quoll (<i>Dasyurus maculatus maculatus</i> (SE mainland population));	x	x
• Yellow-bellied Sheath-tail-bat (<i>Saccolaimus flaviventris</i>);	x	
• Eastern Freetail-bat (<i>Mormopterus norfolkensis</i>);	x	
• Koala (<i>Phascolarctos cinereus</i>);	x	
• Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>);	x	x
• Eastern false pipistrelle (<i>Falsistrellus tasmaniensis</i>);	x	
• Eastern Bentwing-bat (<i>Miniopterus schreibersii</i>);	x	
• Large-footed Myotis (<i>Myotis adversus</i>);	x	
• Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>);	x	x
• Greater Broad-nosed Bat (<i>Scoteanax rueppellii</i>); and	x	
• White-bellied Sea Eagle (<i>Haliaeetus leucogaster</i>).		x
• Hooded Robin (<i>Melanodryas cucullata</i>)	x	
• Cumberland Plain Land Snail (<i>Meridolum corneovirens</i>)	x	
• Great Egret (<i>Ardea alba</i>)		x
• Cattle Egret (<i>Ardea ibis</i>)		x
• Latham's Snipe (<i>Gallinago hardwickii</i>)		x
• Painted Snipe (<i>Rostratula benghalensis s. lat.</i>)		x
• Fork-tailed Swift (<i>Apus pacificus</i>)		x

Figure 12 NPWS Atlas Threatened fauna locations within and surrounding the study area.



2.5 Ecological Constraints

An ecological constraint ranking was derived applying an amended methodology that has been used elsewhere in Western Sydney (see Appendix E of this report) which combines size, condition, connectivity and recovery potential into a single ecological constraint value. The results of this analysis can be seen in Figure 13. Broadly the rankings are as follows:

- High constraint = relatively large areas of good quality, well connected vegetation;
- Moderate constraint = smaller areas of good quality vegetation or large areas of poorer quality vegetation;
- Low constraint = all other native vegetated areas, generally isolated and small in size, with a low recovery potential.

Table 2 Constraints summary of study area.

CSA Category	Area (ha)	% of Site
Core	113.37	20.66
Support for Core	33.09	6.03
Other Remnant Vegetation	76.69	15.15
Recovery Potential	Area (ha)	% of Site
High	123.84	22.57
Moderate	62.04	11.31
Low	43.7	7.97
Ecological Constraints	Area (ha)	% of Site
High	121.1	22.07
Moderate	88.53	16.13
Low	19.96	3.64

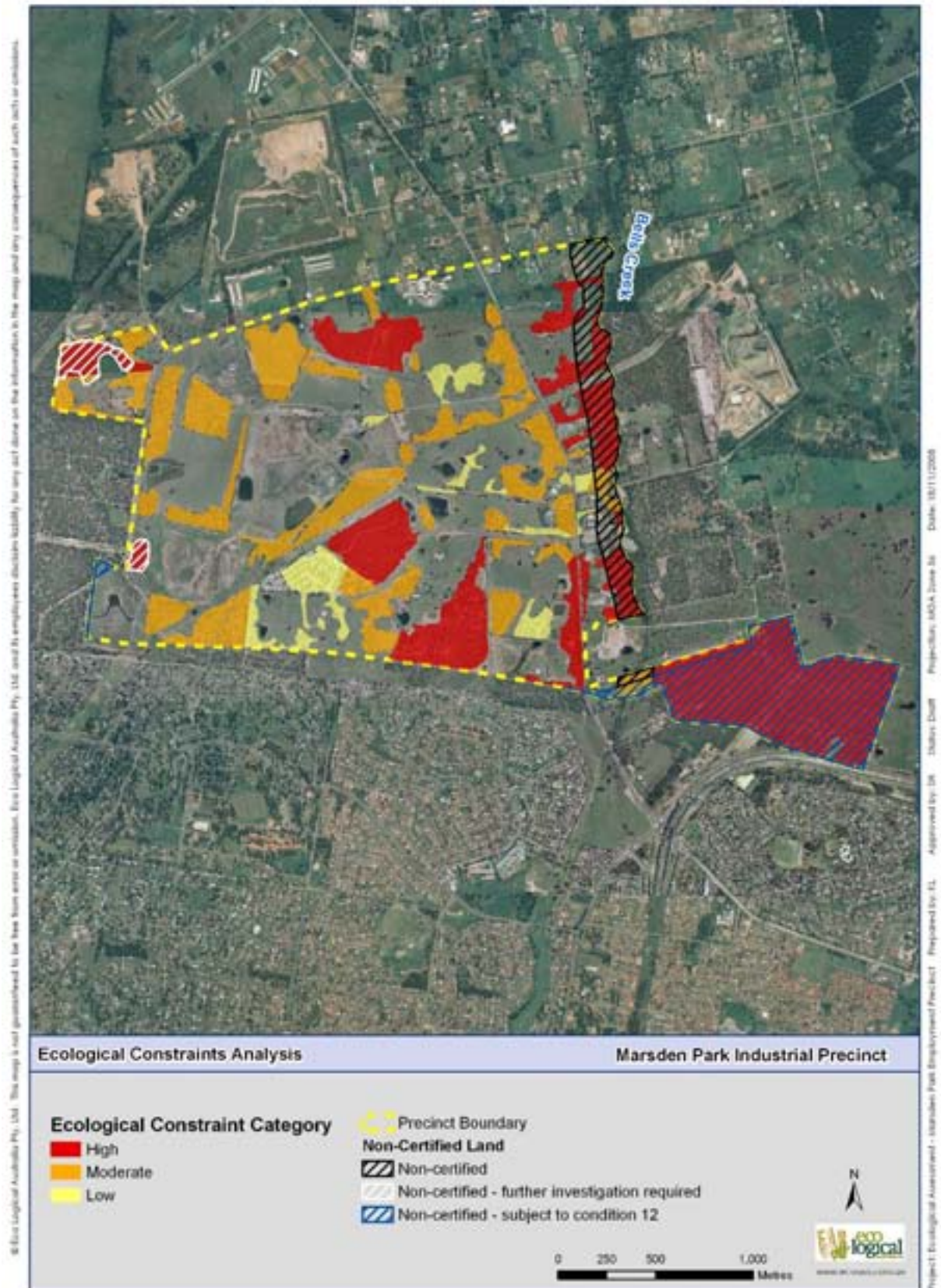
* Calculations exclude farm dams/artificial wetlands (14.6ha or 2.7% of study area)

Highly constrained areas occupy 22.07% of the study area. These areas represent bushland remnants of good condition and a high recovery potential. They also provide potential habitat for threatened flora and fauna species.

Areas of moderate constraint occupy 16.13% of the study area. These areas represent bushland that is of moderate condition and recovery potential. They have moderate habitat value and are generally dominated by native species.

Areas of low constraint have little habitat value and are generally dominated by exotic grass species and are highly disturbed by current land use (grazing, horse/vehicle trails). These areas cover approximately 3.64% of the study area.

Figure 13 Ecological Constraints within the study area.



2.6 Impact Assessment

Due to the biocertification of the precinct, there is no further requirement under the TSC Act to carry out environmental impact assessment for works on certified areas. We recommend that the non-certified areas be protected and managed in accordance with the requirements of the biodiversity certification conditions.

Specifically, land uses surrounding non-certified areas will need to be carefully managed so as not to adversely impact on the ecological integrity of the protected area. It is recommended that a management plan be put in place for all areas to be retained for biodiversity conservation.

With respect to the EPBC Act, referrals to the Department of Environment, Water and Heritage (DEWH) are not required for rezoning applications. It is understood that a referral will not be made at this stage, rather GCC are in ongoing negotiations with DEWH regarding a Growth Centres Wide EPBC Act assessment / referral process similar to that undertaken for the Biodiversity Certification Order. Therefore at this stage a referral to DEWH is not required.

However, ELA acknowledged Blacktown City Councils' request for EPBC Act assessments of significance for those listed species or communities which have the potential to occur on site. These assessments can be found in Appendix I. The following species and communities were assessed.

- Regent Honeyeater (*Xanthomyza phrygia*) – Endangered
- Swift Parrot (*Lathamus discolor*) – Endangered
- Spotted-tailed quoll (*Dasyurus maculatus maculatus* (SE mainland population)) – Endangered
- Cumberland Plain Woodland (Shale Hills Woodland) – Endangered Ecological Community
- *Pultenaea parviflora* – Vulnerable
- Green and golden bell frog (*Litoria aurea*) – Vulnerable
- Giant burrowing frog (*Heleioparus australiacus*) – Vulnerable
- Grey-headed Flying-fox (*Pteropus poliocephalus*) – Vulnerable
- Large-eared Pied Bat (*Chalinolobus dwyeri*) – Vulnerable
- White-bellied Sea Eagle (*Haliaeetus leucogaster*) - Migratory
- Great Egret (*Ardea alba*) - Migratory
- Cattle Egret (*Ardea ibis*) - Migratory
- Latham's Snipe (*Gallinago hardwickii*) - Migratory
- Painted Snipe (*Rostratula benghalensis s. lat.*) - Migratory
- Fork-tailed Swift (*Apus pacificus*) - Migratory

Of these species and communities it was found that according to the proposed vegetation clearing within Marsden Park Industrial Precinct Draft Indicative Layout Plan, only Cumberland Plain Woodland (CPW) is likely to suffer significant adverse

impact and would require referral to DEWH (refer to Table 3 below for detailed areas of loss).

The specific referral requirements for CPW, will be dependant on the staging of DA's across the precinct and will need to be reviewed post rezoning of the site and in accordance with the ongoing negotiations between DWEH and GCC.

In light of the potential impact of CPW clearing across the site, it is recommended that all CPW be retained within non-certified areas and that CPW in certified areas also be retained and protected wherever possible. Priority for retention should be areas of CPW which are of high constraint (Figure 13) and good condition (Figure 10).

Table 3 Vegetation Loss and Retention Calculations

Vegetation Community and Condition	Status	Cleared* (Ha)	Protected** (Ha)
<i>Cumberland Plain Woodland</i> Shale Plains Woodland - ABC	<i>EEC TSC Act</i> <i>EEC EPBC Act</i>	81.20	23.11
Shale Plains Woodland - TX		22.85	8.19
Total		104.5	31.30
<i>River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions</i> Alluvial Woodland - ABC	<i>EEC TSC Act</i>	0.82	11.28
Alluvial Woodland - TX		0.39	2.76
Total		1.21	14.04
Cooks River Castlereagh Ironbark Forest - ABC	<i>EEC TSC Act</i>	0.00	19.91
Shale Gravel Transition Forest - ABC	<i>EEC TSC Act</i>	27.51	8.92
Shale Gravel Transition Forest - TX		20.82	0.51
Total		48.33	9.43
Cleared		301.05	23.96
Grand Total		454.63	98.64

*cleared includes all development and drainage zones

**protected includes non certified areas and riparian corridors

3. Aquatic and Groundwater Dependant Ecosystem Assessment

3.1 Methods

The presence and condition of aquatic habitat and groundwater dependent ecosystems within the study area was assessed using aerial photograph interpretation followed by on ground inspection during the field survey to validate the aquatic habitat condition and groundwater dependant ecosystem occurrence. Further detailed methodology can be found in Appendix E.

3.2 Results

3.2.1 Aquatic Ecosystems

Aquatic habitat within the MPIP consists of a number of small watercourses in the south-east and south-west of the study area, Bells Creek along the eastern precinct boundary and numerous farm dams/artificial wetlands. Figure 20, identifies the farm dams/artificial wetlands, and creeklines that have been assessed during the field survey, and there aquatic habitat rating.

Good Aquatic Habitat

There were a number of farm dams/artificial wetlands identified within the MPIP that were rated as having good aquatic habitat. These farm dams/artificial wetlands were identified as good habitat given that there was aquatic and terrestrial vegetation, there were mudflats, shallows and/or open water, the faunal diversity was high, and there were strong terrestrial linkages with areas of high ecological value. Bells Creek was also rated as having good aquatic habitat.

Figure 14 is one example of a farm dam/artificial wetland of good aquatic habitat. The farm dam/artificial wetland has terrestrial/aquatic vegetation present, and has a high fauna diversity, including migratory bird species protected under the EPBC Act.

Figure 15 is a representative section of Bells Creek. The aquatic habitat is good, given that there are mature trees along the banks, fallen timber, vegetated banks, a relatively natural flow, and terrestrial and aquatic habitat linkages.



Figure 14. Good condition aquatic habitat.



Figure 15. Good condition aquatic habitat.

Moderate Aquatic Habitat

There were a number of farm dams/artificial wetlands identified within the MPIP that were rated as having moderate aquatic habitat. These farm dams/artificial wetlands were identified as having moderate habitat given that a portion of their banks were vegetated, there was limited presence of shallows, mainly dominated by open water, the faunal diversity within the dam was moderate to high, and there were some terrestrial linkages with other areas of ecological value.

Figure 16 and Figure 17 below are examples of a farm dam/artificial wetland of moderate aquatic habitat. These dams/artificial wetlands have vegetation present within the water and along a portion of their banks, have large areas of open water, and have moderate to high fauna diversity.



Figure 16. Moderate condition aquatic habitat.



Figure 17. Moderate condition aquatic habitat.

Poor Aquatic Habitat

There were a number of farm dams/artificial wetlands identified that were rated as poor aquatic habitat. These farm dams/artificial wetlands were identified as having poor habitat given that there was little to no vegetation present, large amounts of open water, presence of livestock, and low presence of terrestrial linkages with other areas of ecological value. Two small watercourses to the south-east and south-west of the study area were also rated as having low aquatic habitat.

Figure 18 below is one example of a farm dam/artificial wetland of poor aquatic habitat. This dam/artificial wetland has limited vegetation present, large amounts of open water, and has been impacted by livestock.

Figure 19 below is a representative section of a small watercourse within the south-western part of the study area. The aquatic habitat is poor, given that there are limited mature trees along the banks, there is no fallen timber, and the stream flow is hindered by an access road.

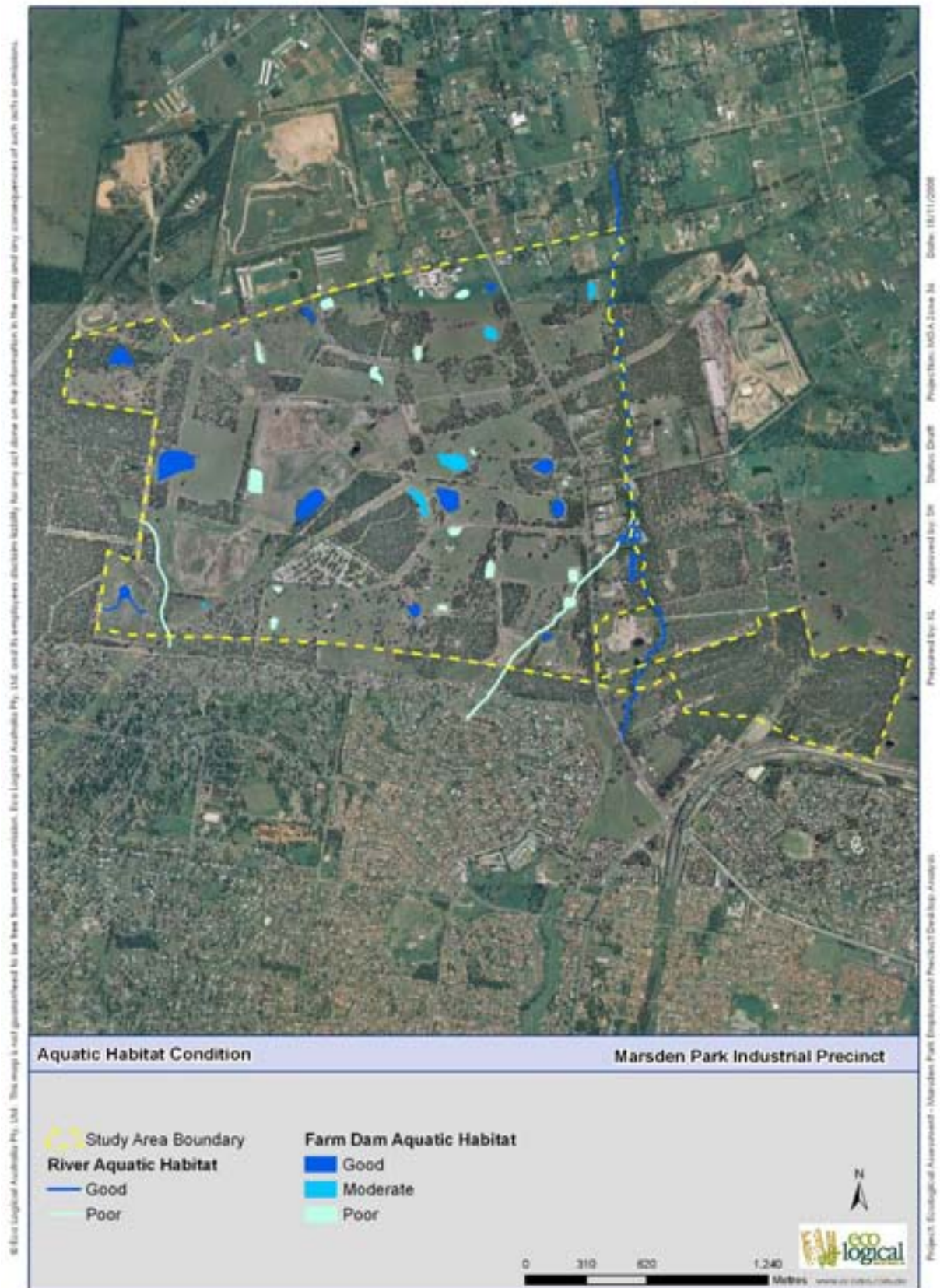


Figure 18. Poor condition aquatic habit.



Figure 19. Poor condition aquatic habitat.

Figure 20. Aquatic habitat condition within the study area.



3.2.2 *Groundwater Dependant Ecosystems*

Aerial photograph interpretation and field survey found that it is unlikely that the ecosystems existing within the precinct could be classified as groundwater dependant. There is potential for some of the large Eucalypts to utilise groundwater in times of low rainfall, however the degraded and dry nature of the study area indicated that the vegetation of other strata were not utilising groundwater, and therefore the species composition and ecological processes were not being shaped by groundwater.

The base flow of streams across the study area may be fed to some degree by groundwater, however the majority of the waterways across the precinct did not contain water at all, and no streams contained any visible flow.

There are no known aquifer or cave systems within the precinct.

No natural wetlands or swamps were encountered within or adjacent to the precinct. A number of farm dams providing an artificial form of wetland habitat were encountered, however the quality of this habitat is generally considered to be marginal.

3.3 Discussion

There are eleven farm dams/artificial wetlands across the study area, that have been rated as having good aquatic habitat. These farm dams/artificial wetlands provide habitat for a variety of bird species, including the great egret and cattle egret, which are protected migratory birds under the EPBC Act.

Under the EPBC Act, an action will be required for approval if it will have or is likely to have a significant impact on listed migratory species. Given that there are migratory birds occurring within some of the farm dams/artificial wetlands, the removal of such aquatic habitat may contribute to a significant impact.

The aquatic habitat of Bells Creek will be enhanced by the provision of a category 1 riparian corridor along its length and associated management and protection that this will provide for the in-stream habitat. Bed and bank stabilisation works will need to focus on minimising harm and maximising water quality and aquatic habitat condition. From an aquatic habitat perspective the remainder of the watercourses initially mapped across the precinct can be used for engineered drainage or stormwater treatment/containment so long as downstream impacts are not significant.

Within the Masterplanning process there are likely to be opportunities to include a number of the existing farm dams/artificial wetlands within open space areas. It is recommended that where possible the higher quality dams be retained, with particular focus on retained a wetland habitat function particularly for the large central dam on site. Retention of habitat for migratory EPBC listed species will also contribute to the ongoing referral negotiations.

3.4 Urban Design Principles

- Incorporate open space within areas of higher aquatic habitat quality where possible, or create new habitat to replace losses;
- Restore the aquatic habitat of Bells Creek as part of the riparian corridor management plan;
- Incorporate and enhance the existing good quality aquatic and migratory habitat currently provided by a number of farm dams within the site into WSUD and flooding treatments for the site;
- Use local provenance wetland species for detention basin design with specific consideration of establishing suitable habitat for the EPBC listed bird species both resident and migratory.

4. Riparian Assessment

4.1 Methods

The Riparian Category mapping has been based upon the requirements of the *Water Management Act 2000*, and those stated within the Growth Centres Development Code which are based on the now repealed *Rivers and Foreshores Improvement Act* (RFI Act). A desktop categorisation of riparian areas across the Growth Centres was undertaken by the former DNR as part of the Managing Sydney's Urban Growth project. Eco Logical Australia has used this as the basis for validating riparian categories at the site and refining these where appropriate, in consultation with GCC, DECC and DWE.

For full details of the methodology please refer to Appendix E

The outcome of the assessment is to classify streams that are to be retained into the categories identified below. Streams that are not classified are deemed to be of limited riparian value and are therefore suitable for engineered drainage solutions.

Table 5: DNR Riparian Categories and buffer specifications

Riparian Category	Minimum Riparian Width (measured from top of bank along either side of the watercourse)
Category 1	40m CRZ + 10 m VB Revegetate; any structures to be located outside CRZ
Category 2	20m CRZ + 10m VB Revegetate, any structures to be located outside CRZ
Category 3	10m CRZ (no VB) Revegetate, any structures to be located outside CRZ

*CRZ = Core Riparian Zone, VB = Vegetated Buffer

4.2 Results

The results of TOB mapping and analysis are provided in Figure 21. A number of changes were made to the original DWE mapping and categorisation, principally applying a lower category to streams that have little strategic value. The retention of Bells Creek and the North West watercourse as category 1 streams are key features that have been maintained. A number of smaller drainage lines to the east of the canal have been categorised as 'engineered drainage' recognising their context in a future urban environment.

The clear intent of the DWE classification is to provide a regional habitat along Bells Creek. This objective is supported.

There were a number of properties which were not accessible during the survey (refer to figure 25), the TOB was digitised from high resolution aerial imagery and contour data.

It was found that the smaller tributaries on site were heavily polluted, disturbed and weed infested and would take significant cost to rehabilitate. Therefore these were

considered as suitable to be removed or utilised as part of stormwater management for the site.

The small creek crossing South St, is not required as category 1 as it is not currently serving a corridor function into Shane's Park, it has been heavily altered and degraded and would require substantial works to reconstruct to the extent that complete reconstruction would not be an efficient approach. ELA would support re-alignment under the existing powerlines with the primary objective for this watercourse being for water quality treatment. It is worth noting that the water currently flowing directly from the adjacent urban area does not appear to be adequately treated and that existing farm dams are playing an active role in improving water quality downstream.

Bells Creek will be treated and managed as a full category 1 watercourse with an appropriate core riparian zone width of at least 40m either side of the TOB and 10m vegetated buffer. The precise riparian corridor boundaries are to be further negotiated with DWE, and will also be affected by the results of the flooding analysis and masterplan layout.

The tributary flowing into Shane's Park from within the north western corner of the site to the west of South Street, will be retained as a category 1 and incorporated into the management of the surrounding non-certified land. The existing dam will need to be made into an offline structure if it is to remain in its current location.

The results are further discussed with specific reference to ongoing management and planning implications for the rezoning of the site in the following sections.

Figure 21 Riparian Categories within the MPIP study area



4.3 Riparian Vegetation Management Strategy

As part of the precinct planning process, recognition of the need to specifically assess riparian corridor management in line with the GC Development code and WMA guidelines, has prompted the need for an initial preparation of a precinct wide vegetation management strategy (VMS) for the riparian corridors within the site.

This VMS will form the strategic framework for detailed riparian vegetation management plans, to be put together at later stages of the development process. This VMS has been based on the DWE WMA guidelines for vegetation management plans and has estimated the funding required and possible sources required to implement the tasks.

The VMS has been produced as a separate document based on the conservation areas and riparian corridor boundaries in the Draft Indicative Layout Plan.

4.4 Planning Controls for Riparian Lands

The following planning controls, have been based on the work carried out to date on the Oran Park and Turner Road Waterfront Land Strategies, the WM Act guidelines, the Growth Centres Development Code, Oran Park DCP and ELA's recent experience in similar riparian areas across western Sydney. Further review of these controls will need to be carried out by DWE, Blacktown City Council and the landowners in order to find a set of controls which is appropriate for each major stakeholder.

Application

These controls will apply to waterfront land within the Marsden Park Precinct. The riparian corridor mapping found earlier in this section will form the riparian protection areas (RPA's) and associated waterfront land boundaries to which the controls will apply (in a similar fashion to that of the RPA's defined in the GCC SEPP for the SW growth centres).

Development controls for land containing a riparian protection area

Note 2: The following objective and controls apply only to development of land where the Riparian Protection Area is not to be dedicated to Council. Where the land is to be dedicated to Council as part of proposed development, a Part B DCP will not be required.

Note 3: The preferred development outcome for land containing a Riparian Protection Area is the Riparian Protection Area being in Council ownership with a subsequent rezoning of this land to an Environmental Protection zone.

Objective

To ensure that development for subdivision and housing on land containing a Riparian Protection Area occurs in a coordinated manner to achieve a sustainable outcome.

Controls

- Where land containing a Riparian Protection Area is proposed to be subdivided into individual lots, a Part B DCP will be required prior to Council considering granting consent to development.
- Council shall not grant consent for any development on land containing a Riparian Protection Area, unless the development is for the purposes of minor works that, in the opinion of Council, do not predetermine an outcome on the land covered by the Part B amendment.
- To reduce fragmentation, new lots in the Riparian Protection Area must include the full width of the riparian corridor within the Precinct.
- Residential development on land containing a Riparian Protection Area is restricted to single detached dwellings on lots with a minimum area of 1000 m² and minimum frontage (width) of 20 metres.

- Dwellings are to be located wholly outside the Riparian Protection Area.

4.5 Management of Riparian Protection Areas

Environmental Objectives

The following environmental outcomes must be achieved for all riparian corridors within the precinct:

Category 1 watercourses

- To protect, maintain and restore continuous, vegetated riparian corridor for the movement of flora and fauna species through and beyond the catchment.
- To provide extensive habitat and connectivity between habitat nodes for both terrestrial and aquatic fauna.
- To maintain the viability of native riparian vegetation.
- To provide a continuous, viable Core Riparian Zone (CRZ) which emulates the native vegetation communities in the area to facilitate a stable watercourse.
- To provide a 10m Vegetated Buffer (VB) either side of the CRZ, to protect the environmental integrity of the CRZ from weed invasion, micro-climate changes, litter, trampling and pollution by emulating the native vegetation communities in the area.

Category 2 watercourses

- To maintain and restore the natural functions of a stream and its aquatic and terrestrial qualities.
- To maintain the viability of native riparian vegetation.
- To provide suitable habitat for local and terrestrial aquatic fauna.
- To provide a continuous, viable Core Riparian Zone (CRZ) which emulates the native vegetation communities in the area to facilitate a stable watercourse.
- To provide a 10m Vegetated Buffer (VB) either side of the CRZ, to protect the environmental integrity of the CRZ from weed invasion, micro-climate changes, litter, trampling and pollution by emulating the native vegetation communities in the area.

Category 3 watercourses

- To retain, maintain and restore where possible the natural functions of a stream including bed and bank stability to protect local water quality.
- To provide a continuous, viable Core Riparian Zone (CRZ) which emulates the native vegetation communities in the area to facilitate a stable watercourse.

Controls

- Development on land to which this strategy applies must meet the environmental objectives relevant to the watercourse category to which it is adjacent.
- The CRZ is to remain, or become vegetated, with native vegetation (trees, shrubs and groundcover species) according to the appropriate vegetation community.
- The VB is to remain or become vegetated with local native trees, shrub and groundcover species according to the appropriate vegetation community.
- Open space uses such as playing fields are not permitted within the CRZ or VB. Passive recreational uses are permitted within the VB only, and must demonstrate that the core function of the VB is not compromised and that there will be no adverse impact on the CRZ. Passive recreational uses are defined by Blacktown City Council LEP.
- The APZ, or any part of the APZ, must not be located within the CRZ or the VB. All APZ's should be incorporated into the development footprint.
- Measures employed to meet water quality or on-site detention targets must be located outside the core riparian zones. It must also be demonstrated that the impact on riparian functions is minimal and its integrity maintained.
- Development consisting of crossings of riparian protection areas or watercourses, includes but is not limited to roads, paths, cycleways and the laying of service utilities. Each of these activities must be minimised and designed and constructed in accordance with DWE guidelines.
- The location of access ways to and within a riparian protection area must not compromise the environmental objectives for that watercourse or stream bed and/or bed stability and also be consistent with NSW Stage Government Guidelines (e.g. protection of fish habitat, water quality, waterway stability).
- Where wetlands are proposed, a wetland management plan outlining, initial condition, maps, design specifications, monitoring, management and maintenance requirements, techniques, timelines, pest management, ownership, ongoing management, annual maintenance costs and initial development costs shall be submitted with any development application
- The impact of salinity on the landscape and watercourses shall be managed in accordance with the Western Sydney Salinity Code of Practice.
- A works plan (including a VMP) is to be submitted to Council as part of any DA's adjacent to a riparian corridor. DWE guidelines apply to all works and activities on riparian land as mapped in this document. The guidelines include;
 - Vegetation Management Plans
 - Watercourse Crossings
 - In Stream Works
 - Laying Pipes and Cables in Watercourses
 - Outlet Structures
- For all lands located within the riparian protection areas a VMP must be prepared and submitted with the development or subdivision application. The VMP must be consistent with the NSW State Government's How to Prepare a

Vegetation Management Plan Guideline (the most recent version). The plan must include a monitoring and maintenance strategy. A report on the monitoring and maintenance of the works must be submitted to council at six monthly intervals for the first year and then yearly intervals for the following year or for a period of time that is to the satisfaction of council.

5. Recommendations

Simply put, biodiversity certification removes the majority of ecological constraints from the site, with the exception of four non-certified areas, the latter 2 being 'deferred';

- RTA offset site
- Bells Creek
- Southwest remnant
- Northwest remnant

With regards to the 2 deferred sites, both exhibit ecological values that are worthy of retention. However due to their small size, future isolation and in the case of the northwest remnant poor management shape, their removal or alteration could be considered along the following lines:

- Southwest remnant
This remnant is small in size and lacks connectivity to proximal areas of vegetation. This is likely to be exacerbated in the future as surrounding areas developed. This site also corresponds with a creek line and a low point on the site, as such it is potentially a suitable location for stormwater detention. It would be supported if options for retention of this remnant that are integrated with water management requirements are considered. Any native vegetation removal will require a protection offset at a ratio of 1:1 like for like vegetation within the precinct or restoration/regeneration of vegetation at a ratio of 3 to 1 within the precinct and approval from DECC. Note that any offset cannot be located in an area covered by other regulatory requirements e.g. Water Management Act 2000.
- Northwest remnant
The western side of this remnant is well connected to Shanes Park. It tapers into a thin strip as it heads east. Future viability of the thin eastern section is low and as such the boundary of the adjacent riparian corridor can be utilised as a more effective management boundary with the surrounding residential areas. Any native vegetation removal will require a protection offset at a ratio of 1:1 like for like vegetation within the precinct or restoration/regeneration of vegetation at a ratio of 3 to 1 within the precinct and approval from DECC. Note that any offset cannot be located in an area covered by other regulatory requirements e.g. Water Management Act 2000.

Two (2) riparian zones have been identified that require retention:

- Bells Creek – Category 1
- Southwest Creek – Category 3
- North West Creek – Category 1

Consistent with biodiversity certification and the Growth Centres Development Code, open space areas and other sympathetic land uses (eg. Stormwater detention) should be located in a manner that optimises retention of native vegetation that would otherwise be suitable for clearing under Biodiversity

Certification. Figure 22 identifies the non-certified areas and prioritises certified areas that may be considered for retention.

Bells creek is a significant creekline that has been classified as a category 1 stream, requiring a 40m Core Riparian Zone (CRZ) and 10m Vegetated Buffer (VB). These are required to stretch from the 'Top of Bank' on either side of the stream (figure 2).

The southwest creek is significantly degraded and provides little habitat or connectivity. It is recommended to be retained as a Category 3 stream requiring a 10m CRZ either side. Consideration should be given to realigning a section of this stream to underneath the power easement.

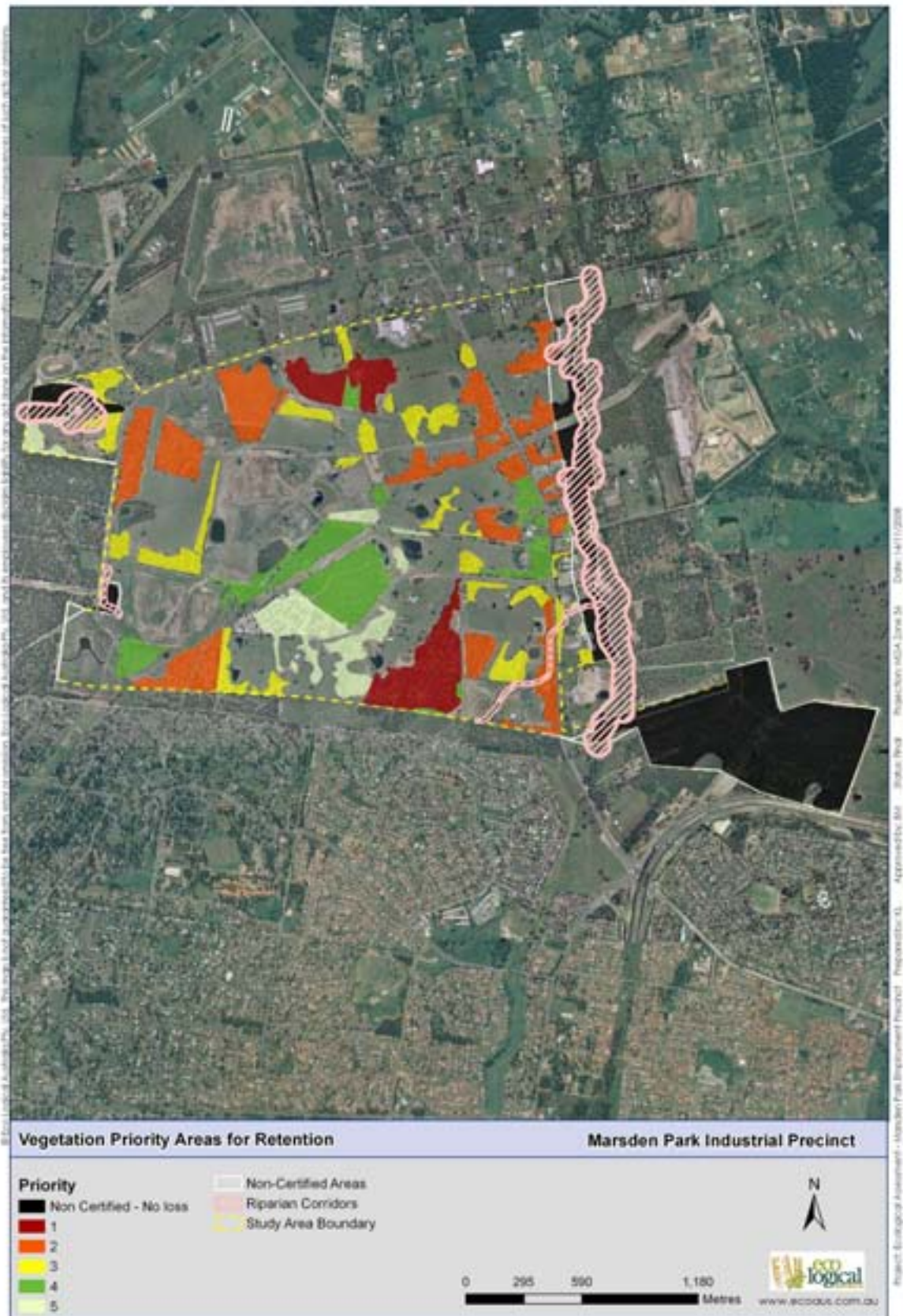
The northwest creek drains directly into Shane's Park and is located adjacent to the non-certified remnant. It is proposed that the dam be remain as a wetland habitat, however become an offline structure. It is recommended that the creek be given a 40m CRZ and additional 10m VB, and extend the riparian area out and around the dam to create a continuous buffer around the southern edge of the non-certified area to further protect the parcel from encroachment and disturbance from the adjacent residential areas.

Consultation with the Department of Water and Energy (DWE) has been initiated, and mare ongoing.

There are a number of farm dams on the site, that exhibit ecological values that are worthy of retention. Where possible, it is recommended that dams/wetlands of good quality are integrated with stormwater detention and water quality treatment, with an emphasis on retaining their habitat value (Figure 20). Of particular interest for retention is the central dam, and the dam in northwest corner.

The above information should form the basis of urban design and rezoning of the site, from an ecological perspective.

Figure 22 Vegetation Prioritisation for use in Urban Design



6. Indicative Layout Plan Assessment

The zoning layout for the Marsden Park Industrial Precinct Draft Indicative Layout Plan (herein referred to as the ILP), can be seen in Figure 2.

The ILP in its current form will conform to the biodiversity certification order, through the retention of the non-certified areas. However the ILP does not propose any significant onsite retention or protection of Cumberland Plain Woodland, and is likely to cause significant adverse impact to this EPBC Act listed community.

It is understood that the GCC are currently in negotiations with DEWH regarding a growth centres wide EPBC impact assessment with the aim of pulling together an EPBC Act sign-off similar to the biodiversity certification under the TSC Act. This would remove the referral requirements from future complying DA's. Any DA's which are to be lodged prior to the conclusion of these negotiations and require clearing of CPW, will likely require referral to DEWH.

The ILP currently proposes that the RTA offset lands, the Bells Creek non-certified area and the non-certified remnant adjacent to Shane's Park be retained as conservation. It is recommended that the riparian corridors be designated as riparian protection areas in the SEPP as part of the rezoning, similar to that for other previously released precincts which will ensure that these areas gain specific protection and DA assessment requirements.

There are a number of major road crossings proposed over Bells Creek, the design of these crossings will need to be in accordance with the required Category 1 crossing requirements as specified in the latest DWE guidelines.

It is noted that the central dam is not going to be retained as a drainage basin, it would be recommended that the wetland habitat value of this waterbody be recreated within other drainage areas accross the site, as this dam was found to have good aquatic habitat and be a potential habitat area for EPBC listed migratory bird species. Similarly the dam in the northwestern corner of the site, should be taken offline to protect the downstream water quality of the creek line and managed as a wetland habitat. Stormwater and drainage infrastructure such as dams, if managed correctly can be used to replace some of the aquatic habitat that will be lost across the site.

In redesigning and taking the northwestern dam off line, this will provide and opportunity to realign the boundary of the riparian corridor around it to create a smoother management boundary around the adjacent non-certified area.

DECC has expressed their concern for the long term viability of the northwestern non-certified remnant and the threat of edge effects from the surrounding residential areas. Future planning of this area will require careful management to ensure that there will be no adverse impacts on the area or the adjacent Shane's Park conservation reserve. The ILP has effectively rounded out this non-certified area by combining it with the riparian corridor extending out from Shane's Park. The ILP has

proposed a more sustainable conservation area layout which will be easier and more cost effective to manage and protect from surrounding land uses.

With respect to the number of drainage basins on site, it is understood that the majority of these will be dry basins. Dry basins offer a good opportunity to increase the biodiversity onsite, it would be recommended that these dry basins be placed in such a manner as to maximise vegetation retention, particularly in areas of CPW and that they be planted out with native species to reflect the native vegetation communities.

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Appendix A: Flora Likelihood of Occurrence Table

Scientific Name	Common Name	Habitat	TSC Status	EPBC Status	Likelihood of Occurrence
Flora Species					
<i>Allocasuarina glareicola</i>		It grows in clay soils derived from alluvial gravels in woodland. Responds to fire by coppicing densely from a lignotuber.	E1	E	No
<i>Hibbertia superans</i>		Flowering time is July to December. The species occurs on sandstone ridgetops often near the shale/sandstone boundary. Occurs in both open woodland and heathland, and appears to prefer open disturbed areas, such as track sides.	E1	-	No
<i>Epacris purpurascens</i> var <i>purpurascens</i>		Restricted to coastal zone around Sydney where it is uncommon. The species inhabits damp forest and grows on sands, shales or rocky sites.	V	-	No
<i>Leucopogon fletcheri</i> subsp. <i>fletcheri</i>		Occurs in dry eucalypt woodland or in shrubland on clayey lateritic soils, generally on flat to gently sloping terrain along ridges and spurs.	E1	-	Unlikely
<i>Dillwynia tenuifolia</i>		Castlereagh Ironbark Forest to Castlereagh Scribbly Gum Woodland.	V	V	Likely
<i>Pultenaea parviflora</i>		May be locally abundant, particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays.	E1	V	Yes
<i>Acacia bynoeana</i>	Bynoe's Wattle	Grows in sandy clay soils often containing ironstone gravels in open forest and shrubland, usually on ridgetops.	E1	V	Unlikely
<i>Acacia pubescens</i>	Downy Wattle	Scattered throughout the Cumberland plain where it grows on clay and clay-shale soils.	V	V	Unlikely
<i>Pilularia novae-hollandiae</i>	Austral Pillwort	Austral Pillwort grows in shallow swamps and waterways, often among grasses and sedges. It is most often recorded in drying mud as this is when it is most conspicuous.	E1	-	Unlikely
<i>Darwinia biflora</i>		Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. The vegetation structure is usually woodland, open forest or scrub-heath.	V	V	Unlikely
<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint	Grows in dry grassy woodland, on shallow and infertile soils, mainly on granite.	V	V	Unlikely
<i>Micromyrtus minutiflora</i>		Grows in Castlereagh Scribbly Gum Woodland, Ironbark Forest, Shale/Gravel Transition Forest, open forest on tertiary alluvium and consolidated river sediments.	E1	V	Potential
<i>Pterostylis saxicola</i>	Sydney Plains Greenhood	Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where <i>Pterostylis saxicola</i> occurs are sclerophyll forest or woodland on shale/sandstone transition soils or shale soils.	E1	E	No
<i>Grevillea juniperina</i> subsp. <i>juniperina</i>	Juniper-leaved Grevillea	Grows on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium (often with shale influence), typically containing lateritic gravels.	V	-	Yes
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	Small-flower Grevillea	Grows in sandy or light clay soils usually over thin shales. Occurs in a range of vegetation types from heath and shrubby woodland to open	V	V	Unlikely

Scientific Name	Common Name	Habitat	TSC Status	EPBC Status	Likelihood of Occurrence
		forest. Found over a range of altitudes from flat, low-lying areas to upper slopes and ridge crests often in open, slightly disturbed sites such as along tracks.			
<i>Persoonia hirsuta</i>	Hairy Geebung	Is found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	E1	E	Unlikely
<i>Persoonia hirsuta</i> subsp. <i>hirsute/evoluta</i>		Sporadically distributed in the Putty, Glen Davis and Hill Top districts.	E1	-	No
<i>Persoonia nutans</i>		Is found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	E1	E	Unlikely
<i>Lasiopetalum joyceae</i>		Grows in heath on sandstone	V	V	Unlikely
<i>Pimelea curviflora</i> var. <i>curviflora</i>		Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands.	V	V	Likely
<i>Pimelea spicata</i>		Occurs on undulating topography on substrates derived from Wianamatta Shale in areas of Cumberland Plain Woodland Vegetation Community.	E1	E	Potential
Populations					
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i>	Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	Grows in vine thickets and open shale woodland.	E2	-	No
<i>Dillwynia tenuifolia</i>	Dillwynia tenuifolia Sieber ex D.C. in the Baulkham Hills local government area	Occurs in vegetation similar to Cumberland Plain Woodland, on Wianamatta Shale soils.	E2	-	No
Ecological Communities					
Cumberland Plain Woodland		Woodland community occurring on shale derived soils throughout low rainfall areas of western Sydney.	EEC	E	Yes
Shale/Gravel Transition Forest		Has an open forest structure and occurs primarily where shallow deposits from ancient river systems overlay shale soils, but also associated with localised concentrations of iron-hardened gravel. A transitional plant community which grades into Cumberland Plain Woodland where the influence of gravel soil declines, and grades into Cooks River/Castlereagh Ironbark Forest or Castlereagh Scribbly Gum Woodland where gravel deposits are thick.	EEC	tbc	Yes
River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions		Occurs exclusively along or close to minor watercourses draining soils derived from Wianamatta Shale. Common on soils of recent alluvial deposits and is found on the floodplains of the Hawkesbury-Nepean River.	EEC	-	Yes

Appendix B: Fauna Likelihood of Occurrence Table

Scientific Name	Common Name	Habitat	TSC Status	EPBC Status	Likelihood of Occurrence
Fauna Species					
<i>Litoria aurea</i>	Green and Golden Bell Frog	Large permanent freshwater wetlands, with dense stands of reeds.	E1	V	Potential
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	Found in heath, woodland and open forest with sandy soils and will travel several hundred metres to creeks to breed.	V	V	Potential
<i>Mixophyes iteratus</i>	Giant Barred Frog	Forage and live amongst deep, damp leaf litter in rainforests, moist eucalypt forest and nearby dry eucalypt forest, at elevations below 1000 m.	E1	E	Unlikely
<i>Pyrholaemus sagittatus</i>	Speckled Warbler	Lives in a wide range of eucalypt dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy.	V	-	Potential
<i>Lophoictinia isura</i>	Square-tailed Kite	Diverse habitats from woodlands to timbered watercourses.	V	M	Potential
<i>Oxyura australis</i>	Blue-billed Duck	Well vegetated freshwater swamps, large dams, lakes. In winter more open waters.	V	M	Unlikely
<i>Botaurus poiciloptilus</i>	Australasian Bittern	Boggy marsh, wetland margins.	V	-	Unlikely
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	Occurs within a variety of forest and woodland types.	V	-	Unlikely
<i>Calyptrorhynchus lathamii</i>	Glossy Black-Cockatoo	She-oaks in forests, woodlands, timbered watercourses.	V	-	Unlikely
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	Coastal wetlands, mangroves, tidal mudflats, floodplains, open woodlands.	E1	-	Unlikely
<i>Climacteris picumnus</i>	Brown Treecreeper	Drier forests, woodlands, scrubs with fallen branches.	V	-	Unlikely
<i>Grantiella picta</i>	Painted Honeyeater	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	V	-	Unlikely
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	Drier eucalypt forests, woodlands, timber on water courses, often no understorey, scrubs. Favours ironbark woodlands on w. slopes.	V	-	Unlikely
<i>Xanthomyza phrygia</i>	Regent Honeyeater	Densely timbered woodlands and forests, particularly ironbark, yellow box, yellow gum.	E1	E, M	Potential
<i>Melanodryas cucullata</i>	Hooded Robin	Drier eucalypt forests, woodlands and scrubs with fallen logs and debris.	V	-	Potential

Scientific Name	Common Name	Habitat	TSC Status	EPBC Status	Likelihood of Occurrence
<i>Lathamus discolor</i>	Swift Parrot	Breeds in Tasmania, but winters on mainland in diverse timbered habitats, including forests, woodlands, plantations, banksias, street trees and gardens.	E1	E	Potential
<i>Neophema pulchella</i>	Turquoise Parrot	Open grassy woodland, with dead trees, near permanent water and forested hills.	V	-	Unlikely
<i>Rostratula benghalensis australis</i>	Australian Painted Snipe	Well-vegetated shallows and margins of wetlands, dams, sewerage ponds, wet pastures, marshy areas, open timber.	E1	V	Unlikely
<i>Ninox connivens</i>	Barking Owl	Open forests, woodlands, dense scrubs, other large trees near watercourses. Nest in tree hollow.	V	-	Unlikely
<i>Ninox strenua</i>	Powerful Owl	Pairs occupy large, probably permanent home ranges in forests to woodlands. Nest in large hollow.	V	-	Unlikely
<i>Meridolum corneovirens</i>	Cumberland Plain Land Snail	Primarily inhabits Cumberland Plain Woodland (an endangered ecological community). This community is a grassy, open woodland with occasional dense patches of shrubs.	E1	-	Potential
<i>Dasyurus maculatus maculatus</i> (SE mainland population)	Spotted-tailed Quoll	Occurs in wide variety of habitats in large remnants. Dens in tree hollows, hollow log or rock crevice.	V	E	Potential
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	In almost all habitats from wet and dry sclerophyll forests, open woodland, Acacia shrubland, mallee, grasslands and desert.	V	-	Potential
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	Evidence suggests that the species depends on hollows and tree fissures for roosting sites.	V	-	Potential
<i>Petaurus australis</i>	Yellow-bellied Glider	Patchily distributed in wet sclerophyll forest.	V	-	Unlikely
<i>Petaurus norfolcensis</i>	Squirrel Glider	Mostly in dry sclerophyll forest on inland slopes and nearby riverine corridors. Also in damp coastal eucalypt/banksia forest and woodland.	V	V	Unlikely
<i>Phascolarctos cinereus</i>	Koala	Swamp Mahogany and Tallowwood are of primary importance to this Koala population. Other local native tree species used by Koalas include Broad-leaved Paperbark, Blackbutt, Red Bloodwood, Flooded Gum and Smooth-barked Apple	V	-	Potential
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Roosts in large camps in Botanic Gardens.	V	V	Potential
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	Usually roosts in tree hollows in the higher rainfall forests within its range.	V	-	Potential
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	Forages above the canopy and eats mostly moths. Roosts in caves, old mines, road culverts.	V	-	Potential
<i>Myotis adversus</i>	Large-footed Myotis	A range of habitats close to water from lakes, small creeks to large lakes and mangrove lined estuaries.	V	-	Potential
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Uncommon but observed in wet and dry eucalypt forests.	V	V	Potential
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	Moist gullies in mature coastal forests or rainforests. Roosts in	V	-	Potential

Scientific Name	Common Name	Habitat	TSC Status	EPBC Status	Likelihood of Occurrence
		hollow tree trunks and branches.			
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	Rocky areas of sclerophyll forest of inland and subcoastal southeastern Australia.	E1	V	Unlikely
<i>Potorous tridactylus tridactylus</i>	Long-nosed Potoroo (SE mainland)	Known from coastal heathy woodland but also occurs in rainforest, wet sclerophyll and coastal wallum. Dense cover for shelter adjacent to open areas for foraging.	V	V	Unlikely
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	Occur under large exfoliating slabs of sandstone and rock crevices in areas of undisturbed bushland, usually on tops of cliffs.	E1	V	Unlikely
<i>Macquaria australasica</i>	Macquarie Perch	The natural geographical range of the Macquarie Perch is thought to have been confined to the Murray Darling R. system, north of the Great Divide, including Vic., NSW and the ACT (there are no confirmed records from Qld or SA). They also occur in some coastal rivers of NSW, including the Shoalhaven and Hawkesbury Rivers and also in some of Sydney's water supply dams.		E	Unlikely
<i>Prototroctes maraena</i>	Australian Grayling	On mainland Australia, this species has been recorded from rivers flowing E and S of the main dividing ranges. It is absent from the inland Murray-Darling system. It occurs widely in Tas. and is known from the northern, eastern and southern coastal river drainages with occasional reports from the W coast.		V	Unlikely
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Established pairs usually maintain a territory in coastal areas or flooded inland swamps, lagoons and floodplains. Also often occur far inland along major rivers.	-	M	Yes
<i>Hirundapus caudacutus</i>	White-throated Needletail	Occupy high open spaces of sky above a variety of habitats including oceans. Often fly ahead of unsettled weather preceding thunderstorms.		M	Unlikely
<i>Merops ornatus</i>	Rainbow Bee-eater	Occurs in open country in a variety of habitat including open woodland, open forest, semi-arid scrub, grasslands, clearings in more wooded areas and farmland. Nests within tunnels dug into loamy soil in clearings, paddocks or road cuttings.		M	Unlikely
<i>Monarcha melanopsis</i>	Black-faced Monarch	Occurs in a range of habitats including rainforests, mangroves, forests and woodlands. A summer migrant to the south.		M	Unlikely
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	Favors dense wet sclerophyll forest during the breeding season and mangrove, coastal heath, woodland and forests outside of the breeding season. A summer breeding migrant to south eastern Australia		M	Unlikely
<i>Rhipidura rufifrons</i>	Rufous Fantail	A summer breeding migrant in the south east of Australia. Occurs in rainforest as well as dense wet eucalypt forest, paperbark forests, mangrove swamps and riverside vegetation. Occupies open country during summer migration.		M	Unlikely

Scientific Name	Common Name	Habitat	TSC Status	EPBC Status	Likelihood of Occurrence
<i>Ardea alba</i>	Great Egret	A common and widespread species that utilises any suitable permanent or temporary habitat. Inhabits wetlands and flooded pastures, dams, estuarine mudflats, mangroves and reefs.		M	Yes
<i>Ardea ibis</i>	Cattle Egret	Forages in moist pasture with tall grass as well as shallow open wetlands and margins. Also utilises mudflats.		M	Yes
<i>Gallinago hardwickii</i>	Latham's Snipe	Occupies low vegetation around wetlands in shallows, sedges, reeds, heaths salt marsh and irrigated crops.		M	Potential
<i>Rostratula benghalensis s. lat.</i>	Painted Snipe	Well-vegetated shallows and margins of wetlands, dams, sewerage ponds, wet pastures, marshy areas, open timber.		M	Potential
<i>Apus pacificus</i>	Fork-tailed Swift	Utilises low to very high airspace over varied habitat from rainforest to semi-desert. Foragers ahead of summer storms.		M	Potential

Appendix C: Previous Reports/Assessments

Proposed Quarry and Landfill Flora and Fauna Assessment Report, prepared by Gunninah Environmental Consultants (1998)

In 1998, a flora and fauna assessment was undertaken by Gunninah Environmental Consultants to determine the impacts that may potentially occur on flora and fauna from the establishment of a landfill in a disused quarry. The flora and fauna study was undertaken over an approximate 142ha area, bounded by Hollinsworth Road to the south, Fulton Street to the north, South Street to the west, and Richmond Road to the west.

The methodologies undertaken to complete this study included:

- Flora - vegetation community validation was undertaken, recording floristics and structural characteristics.
- Fauna - surveys undertaken within the study area included spotlighting, call playback, harp trapping, Anabat detection devices, bird surveys, and habitat searches for reptiles, amphibians, and molluscs.

The field survey identified five principal communities within the area surveyed, with reference to vegetation community descriptions and mapping by Benson 1992, and NPWS 1997. These communities include:

- Grey Box Woodland – occurs over the majority of the surveyed study area, with the canopy being dominated by grey box (*Eucalyptus moluccana*), and forest red gum (*Eucalyptus tereticornis*).
- Grey Box/Ironbark Woodland – occurs along the South Street boundary of the study area, with the canopy being dominated by forest red gum, narrow-leaved ironbark (*Eucalyptus crebra*), and grey box.
- Shale-Gravel Transition Forest – occurs in the eastern portion of the surveyed study area, with the canopy being dominated by forest red gum, thin-leaved Stringybark (*Eucalyptus eugenioides*), and Woollybutt (*Eucalyptus longifolia*).
- Wetland/Artificial Dam – scattered throughout the surveyed study area, varying in size, condition and habitat value. There were a number of wetlands that supported riparian and aquatic vegetation, including a dam south of quarry (identified as No. 4), a dam to the east of the quarry (identified as No. 5), and a dam to the south-east of the quarry (identified as No. 6).
- Disturbed/cleared areas – occurs throughout the study area within powerline easements and along tracks and roads.

The report identified that the Grey Box and Grey Box/Ironbark Woodland communities were considered characteristic of the Endangered Ecological Community (EEC) Cumberland Plain Woodland (CPW).

There were no threatened flora species recorded within the study area; however the report lists the potential occurrence of nine threatened flora species as indicated by the Atlas of NSW Wildlife database search performed at the time of survey, in 1998. These species that may potentially occur as indicated by the report include:

- | | |
|-----------------------------------|----------------------------------|
| • <i>Allocasuarina glareicola</i> | • <i>Darwinia biflora</i> |
| • <i>Dillwynia tenuifolia</i> | • <i>Micromyrtus minutiflora</i> |

- *Pultenaea parviflora*
- Bynoe's Wattle (*Acacia bynoeana*)
- Downy Wattle (*Acacia pubescens*)
- Hairy Geebung (*Persoonia nutans*)
- *Pimelea spicata*

There were twenty two flora species recorded during the survey that are considered to be of conservation significance in the Western Sydney Region. These species of regional significance as indicated by the report included:

- Coast Myall (*Acacia binervia*)
- Paper-bark Mistletoe (*Amyema gaudichaudii*)
- *Arthropodium minus*
- Half-berried Salt-bush (*Atriplex semibaccata*)
- White Daisy Burr (*Calotis dentex*)
- Forest Clematis (*Clematis glycinoides*)
- *Cyperus polystachyos*
- Wallaby Grass (*Danthonia linkii* var. *linkii*)
- Smooth-flowered Wallaby Grass (*Danthonia pilosa*)
- *Einadia polygonoides*
- *Eleocharis cylindostachys*
- Woollybutt (*Eucalyptus longifolia*)
- *Glycine microphylla*
- Prickly Spider-flower (*Grevillea juniperina*)
- Branching Rush (*Juncus prismatocarpus*)
- Yellow Marshwort (*Nymphoides geminata*)
- Basket Grass (*Oplismenus aemulus*)
- *Phyllanthus virgatus*
- Floating Pondweed (*Potamogeton tricarinatus*)
- *Pultenaea microphylla*
- *Senecio hispidulus* var. *dissectus*
- *Senecio hispidulus* var. *hispidulus*

The study area surveyed in 1998 was found to contain three main habitat types, including remnant and regrowth woodland, farm dams/wetlands, and cleared pasture areas. The woodland remnants provide nesting, perching, feeding sources, hollow-bearing trees, and tree-debris for a range of fauna species. The farm dams/wetlands provide food, shelter, breeding and foraging habitat. The cleared pasture areas mainly provide foraging habitat.

The survey conducted in 1998 recorded a total of 78 fauna species, including 54 birds, 5 amphibians, 4 reptiles, and 15 mammals. There were four threatened fauna species recorded within the study area, including the large-bentwing bat (recorded within the western portion of the study area), eastern freetail-bat (recorded within the open woodland to the north of the old quarry), large-footed myotis (tentatively recorded at dam No. 1 and No. 4), and greater broad-nosed bat (tentatively recorded to the north and west of the old quarry).

There were eight fauna species recorded during the survey that are considered to be of regional conservation significance in the Western Sydney Region. These species of regional conservation significance as indicated by the report include:

- Peregrine Falcon
- White-bellied Sea Eagle
- Whistling Kite
- White-winged Cough
- Common Bronzewing
- Nankeen Night Heron
- Great Crested Grebe
- Great Egret

Proposed Subdivision for new Marsden Park Zone Substation Flora and Fauna Assessment, prepared by Eco Logical Australia (2008)

In 2008, a flora and fauna assessment was undertaken by Eco Logical Australia to determine the impacts that a subdivision of land to construct a new zone substation will have on the flora and fauna on site. The flora and fauna assessment was undertaken over an approximately 1.1ha, along the southern side of Fulton Road.

The field survey undertaken during this assessment consisted of identifying vegetation communities and condition, opportunistic fauna observations, habitat assessment, and targeted threatened flora searches.

The field survey identified the presence of one native vegetation community within the site, Shale Plains Woodland (SPW), which is a sub community of Cumberland Plain Woodland. The SPW within the site is dominated by grey box. Broad-leafed Ironbark (*Eucalyptus fibrosa*) and forest red gum occur infrequently.

A total of seventy eight flora species were identified within the site during the field survey, including forty six native flora species, and thirty two exotic flora species. During the targeted threatened species searches conducted within the site, one threatened flora species was identified within the study area - Juniper-leaved Grevillea (*Grevillea juniperina* subsp. *juniperina*).

Nine fauna species were recorded during the field survey, of which eight were common woodland birds of Western Sydney and one exotic mammal (rabbit). No threatened fauna species were observed during the field survey.

Appendix D: Detailed Statutory Framework

Commonwealth

Environment Protection & Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act) establishes a process for assessing the environmental impact of activities and developments where 'matters of national environmental significance' (MNES) may be affected. The EPBC Act lists endangered ecological communities, threatened and migratory species that have the potential to occur, or are known to occur on a site.

Given the presence of MNES (in particular Cumberland Plain Woodland) within the MPIP, it is expected that the action would normally require assessment and referral under the EPBC Act. In this instance, however, there are a number of factors that suggest an alternative course of action may be available. It is understood that the Growth Centre Commission (GCC) and other relevant NSW Government agencies are currently in discussions with the Federal Department of the Environment, Water, Heritage and the Arts (DEWHA) regarding the possibility of a strategic assessment of the Growth Centres SEPP.

The strategic assessment should remove the need for individual referrals under the EPBC Act for agreed development areas within the Growth Centres. If a strategic assessment is not undertaken then referral of the MPIP development will be necessary, this should be initiated at the master planning stage.

At this time it is recommended that a decision on when to refer the development to the Federal Government be delayed until it is clear what Federal Government assessment and approval process is to occur for the Growth Centres SEPP.

State

Environmental Planning and Assessment Act 1979 (EP&A Act)

The NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principal planning legislation for the state, providing a framework for the overall environmental planning and assessment of development proposals. Various legislative instruments, such as the NSW *Threatened Species Conservation Act 1995* (TSC Act), are integrated with EP&A Act and have been reviewed separately.

In determining a development application, the consent authority is required to take into consideration the matters listed under Section 79C of the EP&A Act that are relevant to the application. Key considerations include:

- Any environmental planning instrument, including drafts
- The likely impacts of the development
- The suitability of the site for the development
- Any submissions made in accordance with the EP&A Act or regulations
- The public interest

Threatened Species Conservation Act 1995 (TSC Act)

The *Threatened Species Conservation Act 1995* (TSC Act) aims to protect and encourage the recovery of threatened species, populations and communities listed under the Act. The TSC Act is integrated with the EP&A Act and requires consideration of whether a development (Part 4 of the EP&A Act 1974) or an activity (Part 5 of the EP&A Act) is likely to significantly affect threatened species, populations and ecological communities or their habitat.

The schedules of the Act list species, populations and communities as endangered or vulnerable. New species, populations and communities are continually being added to the schedules of the TSC Act. All developments, land use changes or activities need to be assessed to determine if they will have the potential to significantly impact on species, populations or communities listed under the Act.

Bio-certification was introduced under the TSC Act (s.126G) to confer certification on an environmental planning instrument if the Minister is satisfied that it will lead to the overall improvement or maintenance of biodiversity values – typically at a landscape scale. The effect of granting certification is that any development or activity requiring consent (Under Part 4 and 5 of the EP&A Act respectively) is automatically - development that is not likely to significantly affect threatened species. This certification removes the need to address threatened species considerations and the assessment of significance or seven part tests (s.5A of the EP&A Act), including the prepare species impact statements (SIS).

Where Parts 3A, 4 or 5 are not applicable, a licence under s.91 of the TSC Act from Department of Environment and Climate Change (DECC) must be obtained for actions (such as bush regeneration) that have the potential impact on threatened species.

The Growth Centres SEPP (see below) impacts the application of the TSC Act within the MPIP, which is discussed further below.

State Environmental Planning Policy (Sydney Region Growth Centres) 2006 (Growth Centres SEPP)

The Growth Centres State Environmental Planning Policy (SEPP) (referred to as the 'Growth Centres SEPP') establishes an additional planning consideration in relation to threatened species for the MPIP.

The Growth Centres SEPP has been 'bio-certified' by the Minister for the Environment under s.126G of the TSC Act. The mechanism for achieving this is outlined in the *Growth Centres Conservation Plan* (Eco Logical Australia, 2007) and the conditions for bio-certification are documented in the Ministers order for consent¹. Bio-certification negates the requirement for impact assessment under s.5A of the *Environmental Planning and Assessment Act, 1979* thus turning off the requirements for seven part tests or species impact statements.

¹ <http://www.environment.nsw.gov.au/resources/nature/biocertordwsgcentres.pdf>

Threatened Species Conservation Amendment (Special Provisions) Act 2008

This Act passed by NSW Parliament on 24 June 2008 confirms bio-certification of the Growth Centres SEPP by amending the TSC Act. The Act also amends the Local Government Act 1993 with respect to rates payable on land subject to conservation agreements within the Growth Centres.

Fisheries Management Act 1994 (FM Act)

The *Fisheries Management Act 1994* (FM Act) aims to conserve, develop and share the fishery resources of NSW for the benefit of present and future generations. The FM Act defines 'fish' as any marine, estuarine or freshwater fish or other aquatic animal life at any stage of their life history. This includes insects, molluscs (eg. oysters), crustaceans, echinoderms, and aquatic polychaetes (eg. beachworms), but does not include whales, mammals, reptiles, birds, amphibians or species specifically excluded (eg. some dragonflies are protected under the TSC Act instead of the FM Act). Under this act, if any activity occurs that will block fish passage, then a permit under this Act will be required.

Water Management Act 2000

The NSW *Water Management Act 2000* has replaced the provisions of the *Rivers and Foreshores Improvement Act 1948*. The *Water Management Act 2000* and *Water Act 1912* control the extraction of water, the use of water, the construction of works such as dams and weirs and the carrying out of activities in or near water sources in New South Wales. 'Water sources' are defined very broadly and include any river, lake, estuary, place where water occurs naturally on or below the surface of the ground and coastal waters.

If a 'controlled activity' is proposed on 'waterfront land', an approval is required under the Water Management Act (s91). 'Controlled activities' include:

- the construction of buildings or carrying out of works;
- the removal of material or vegetation from land by excavation or any other means;
- the deposition of material on land by landfill or otherwise; or
- any activity that affects the quantity or flow of water in a water source.

'Waterfront land' is defined as the bed of any river or lake, and any land lying between the river or lake and a line drawn parallel to and forty metres (40m) inland from either the highest bank or shore (in relation to non-tidal waters) or the mean high water mark (in relation to tidal waters). It is an offence to carry out a controlled activity on waterfront land except in accordance with an approval.

Guidelines have been provided for the protection of core riparian areas (CRZs) under the Act as illustrated in Table below.

Water Management Act CRZ Widths

Types of Watercourses	CRZ Width
Any first order ¹ watercourse and where there is a defined channel where water flows intermittently	10 metres
Any permanent flowing first order watercourse, or any second order ¹ watercourse where there is a defined channel where water flows intermittently or permanently	20 metres
Any third order ¹ or greater watercourse and where there is a defined channel where water flows intermittently or permanently. Includes estuaries, wetlands and any parts of rivers influenced by tidal waters.	20 – 40 metres ²

¹ as classified under the Strahler System of ordering watercourses and based on current 1:25,000 topographic maps.

² merit assessment based on riparian functionality of the river, lake or estuary, the site and long-term land use.

This application for riparian areas under the WM Act replaces the former Department of Infrastructure Planning and Natural Resources (DIPNR) categorisation of watercourses (ie: Category 1, 2 and 3 which was based on the Riparian Corridor Management Study (DIPNR, March 2004) produced for the Wollongong LGA and Calderwood Valley in the Shellharbour LGA).

Similar to biodiversity certification, it is the intention that an 'order' under the RFI Act will be obtained for the precinct that exempts or streamlines future development assessment under Part 3A, providing the development is consistent with the strategic framework and planning controls identified through this study. The riparian corridors that exist within the MPIP have been mapped according to there watercourse classification and are discussed further in Section 4.

Noxious Weed Act 1993

The objectives of the NSW Noxious Weeds Act 1993 are to identify which noxious weeds require control measures, identify control measures suitable to those species and to specify the responsibilities of both public and private landholders for noxious weed control.

Rural Fires Act 1997

The objectives of the NSW Rural Fires Act 1997 (RF Act) are to provide for:

- The prevention, mitigation and suppression of fires
- Coordination of bushfire fighting and prevention
- Protection of people and property from fires
- Protection of the environment

Section 100B of the RF Act provides for the Commissioner to issue a bushfire safety authority for subdivision of bushfire prone land that could lawfully be used for residential or rural residential purposes or for development of bushfire prone land for a special fire protection purpose.

A Bushfire Safety Authority permits development to the extent that it complies with bushfire protection standards. Application for a Bushfire Safety Authority must be lodged as part of the development application process and must demonstrate compliance with the Planning for Bushfire Protection Guidelines (RFS 2006).

The RF Act also outlines the responsibilities of land owners to manage their land for bushfire protection and provides a mechanism for the approval of hazard reduction works, through the issue of a bushfire hazard reduction certificate.

For the purposes of bushfire constraints, an initial indicative APZ will be provided once field validation of the vegetation communities within the precinct has been completed.

Rural Fires and Environmental Assessment Legislation Amendment Act 2002

The NSW Rural Fires and Environmental Assessment Legislation Amendment Act 2002 amends the RF Act and the EP&A Act with respect to bushfire prone lands, bushfire hazards and bushfire emergencies.

Planning for Bushfire Protection 2006

This guide (Planning for Bushfire Protection: a Guide for Councils, Planners, Fire Authorities, Developers and Home Owners, NSW Rural Fire Service 2006) is the key bushfire planning document for the state. The document identifies requirements and strategies for new developments to help protect from bushfire hazards. It details the location and depth of asset protection zones, fire trails and perimeter roads, water supply and building standards in bushfire risk areas. This document is given legal force through the *Rural Fires and Environmental Assessment Legislation Amendment Act 2002*.

State Environmental Planning Policy No.19 – Bushland In Urban Areas

This NSW State Environmental Planning Policy (SEPP) aims to protect and preserve bushland within selected local government areas. The policy recognises the recreational, educational and scientific significance of such bushland and aims to protect the flora, fauna, significant geological features, landforms and archaeological relics in such areas. It encourages management to protect and enhance the quality of the bushland and facilitate public enjoyment, compatible with its conservation. The policy states that a person shall not disturb bushland zoned or reserved for public open space purposes without the consent of the council.

Development Code

The Growth Centres Development Code was produced by the Growth Centres Commission (GCC) in 2006. The Development Code was produced to guide the planning and urban design in the North West and South West Growth Centres.

The Development Code includes objectives and provisions that support the retention of as much native vegetation, habitat and riparian areas within the precinct through incorporation into land use planning outcomes such as lower density development in these areas, subdivision patterns, road design, local parks, and other areas required

to be set aside for community uses without adversely affecting the development yield of areas.

A requirement under the Development Code, the MPIP will need to demonstrate how the biodiversity and other values of areas identified by the SEPP will be protected, maintained and enhanced. Key issues will include boundary management (eg. buffers to surrounding development), bush fire and water sensitive urban design (WSUD) (GCC 2006).

Conservation Plan

Under the GCC Conservation Plan (January 2007), the vegetation within the MPIP has been identified as 'Lower Long Term Management Viability (LMV)' and have already been considered for offset as part of the Improve or Maintain test (i.e. is not designated for conservation as part of the larger regional plan for Western Sydney). It should be noted however that while the Improve or Maintain test has already been considered, it can and should be supplemented by other relevant considerations as recommended by the Conservation Plan. By applying the precautionary principle, the Conservation Plan recommends that some residual areas identified as LMV should be further examined and addressed, for any potential for habitat conservation to contribute to the broader habitat values of the area at the planning stage.

Appendix E: Detailed Methodology

Literature Review

A desktop literature review was undertaken by ELA to determine the location and extent of previous surveys, identify the representative spectrum of flora and fauna within the study area and identify the presence of any threatened species, populations and ecological communities listed under the *TSC Act* and the Commonwealth *EPBC Act* that could potentially occur within the study area. To this end, the following documentation and mapping was reviewed:

- Topographic maps and aerial photography of the study area;
- A search of the NSW DECC Wildlife Atlas database (July 2008 - Selected area for Flora and Fauna coordinates 150.7214, -33.62455, 150.94161, -33.80859);
- EPBC online Protected Matters Database Search (July 2008- Point Search, coordinates -33.71464,150.834951 buffered at 10km);
- 'Proposed Quarry and Landfill Flora and Fauna Assessment Report' prepared by Gunninah Environmental Consultants (1998);
- 'Proposed Subdivision for new Marsden Park Zone Substation Flora and Fauna Assessment' prepared by Eco Logical Australia (2008);
- 'Growth Centres Conservation Plan' prepared by Eco Logical Australia (2007) for NSW Growth Centres Commission;
- Western Sydney Vegetation Mapping (NPWS 2002a); and
- Western Sydney Condition and Conservation Significance Mapping (NPWS 2002b).

Likelihood of Occurrence

Appendix A and B identify the threatened species returned by the NSW DECC Wildlife Atlas database and EPBC online Protected Matters database searches (based on a 10km radius from the study area) together with an assessment of the likelihood of occurrence for each species. Each species likely occurrence was determined by records in the area, habitat availability and knowledge of the species' ecology.

Five terms for the likelihood of occurrence of species are used in this report. The terms for likelihood of occurrence are defined below:

- "yes" = the species was or has been observed on the site.
- "likely" = a medium to high probability that a species uses the site.
- "potential" = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur.
- "unlikely" = a very low to low probability that a species uses the site.
- "no" = habitat on site and in the vicinity is unsuitable for the species.

Field survey across the study area was conducted on the 28th and 29th August 2008. Field survey consisted of validating vegetation communities and their condition, and opportunistic fauna sightings. The field survey was undertaken by Bruce Mullins and Daniel Magdi of Eco Logical Australia. Approximately 32 person hours were utilised in completing the survey. A vegetation community and condition assessment as well as an ecological constraints analysis was carried out.

Terrestrial Biodiversity Assessment

Methods

Field survey across the study area was conducted on the 28th and 29th August 2008. Field survey consisted of validating vegetation communities and their condition, and opportunistic fauna sightings. The field survey was undertaken by Bruce Mullins and Daniel Magdi of Eco Logical Australia. Approximately 32 person hours were utilised in completing the survey.

An additional field survey of the study area was conducted on the 7th, 8th, 9th, 10th, 13th, 14th, 15th, 16th and 17th October, 2008. Matters of National Environmental Significance (MNES) listed under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC). The entire study area was inspected to assess the broad range of vegetation and habitat types occurring within the study area. The assessment was undertaken by Liz Norris, Daniel Magdi and Brian Towle of Eco Logical Australia. Approximately 200 person hours were utilised in completing the survey.

Table 4 Weather conditions during field surveys

Date	Min Temp (°C)	Max Temp (°C)	Rainfall (mm)
7 th October 2008	4.6	21.5	0.2
8 th October 2008	4.9	20.3	0.2
9 th October 2008	4.2	21.8	0
10 th October 2008	7.3	24.7	0
13 th October 2008	9.3	29	0
14 th October 2008	15	20.3	6.4
15 th October 2008	13	17.6	18.2
16 th October 2008	7.7	22.1	0
17 th October 2008	8.1	26.6	0.2

Weather observations were taken from Richmond (www.bom.gov.au)

The survey involved validating vegetation communities, and searching for threatened flora and fauna. Six survey techniques were used during the field surveys. These techniques included:

1. Floristic quadrats
2. Random meander targeted flora searches
3. Morning and Evening Bird Census
4. Anabat detection; and
5. Frog census and Spotlighting.

The survey techniques were based on those outlined within the *Threatened Biodiversity Survey and Assessment: Guidelines for Development and Activities (Working Draft)* by DEC (2004).

The figure over the page illustrates the types and locations of the additional detailed survey work.

Vegetation Community and Condition Assessment

Using a combination of the NPWS Western Sydney Mapping Project and aerial photograph interpretation, vegetation community information, canopy density and understorey condition were assigned to each vegetation polygon. Field surveys were carried out to assess the accuracy of the mapped boundaries and attributed information.

Table below outlines the classification rules used to determine canopy and understorey condition. This table is a modification of Table 4 in the Interpretation Guidelines for the Native Vegetation Maps of the Cumberland Plain, Western Sydney (NPWS 2002). Each area of remnant vegetation was given a condition rating according to the rule-set identified in the table below.

Table 5 Canopy and condition codes.

Code	Canopy Density	Description
A	>10%	Relatively intact native tree canopy
B	<10%	Larger areas of remnant vegetation with a low or discontinuous canopy. Often found on the disturbed edges of larger remnants.
C	<10%	Areas of native vegetation that do not have a Eucalypt canopy cover.
TX	<10%	Areas of native trees with very discontinuous canopy cover.
TXr	<10%	Areas of Tx (as above) located in areas where there is a combination of urban and rural activities such as rural residential development.
TXu	<10%	Areas of Tx (as above) located where the dominant land use is urban (residential/industrial etc).

Source: Table 4 in the Interpretation Guidelines for the Native Vegetation Maps of the Cumberland Plain Western Sydney (NPWS 2002).

Floristic quadrats (20m x 20m) were conducted within vegetation community remnants identified from the NSW National Parks and Wildlife Service (NPWS) Cumberland Plain Vegetation Mapping Project (2002), were visited during the field survey.

Vegetation community remnants were targeted to validate and determine the floristic structure of the vegetation community. A full floristic list was compiled within each quadrat (Appendix A). Floristic quadrat locations are shown in Figure 23.

For each quadrat, diagnostic species for each community were identified and compared against the minimum number of diagnostic species expected to occur in a 20 x 20m quadrat for that community. Consideration was also given to those more

disturbed sites where weed species were common and native species were low in abundance making the classification process more difficult as those sites containing fewer native species are less likely to contain high numbers of diagnostic species.

The separation of communities into SPW and SGTF was in part difficult to assess as a number of sites had low native species numbers. According to Tozer, Shale Plains Woodland and Shale Gravel Transition Forest are closely related communities sharing many species, and intermediate forms of these communities are likely to occur as well (Tozer pers comm.). For these communities, the methodology as described in Tozer (2003) was applied, together with a consideration of the floristic structure of each particular site in order to best classify each polygon based on the quadrat data.

Threatened Flora Surveys

Random meander surveys were conducted within the vegetation communities located within the site, and other areas of potential habitat for threatened flora species. MNES flora species that were targeted during the field survey included:

- *Acacia bynoeana*
- *Acacia pubescens*
- *Allocasuarina glareicola*
- *Dillwynia tenuifolia*
- *Micromyrtus minutiflora*
- *Persoonia nutans*
- *Pimelea curviflora* var. *curviflora*
- *Pimelea spicata*
- *Pultenaea parviflora*

Threatened Fauna Surveys

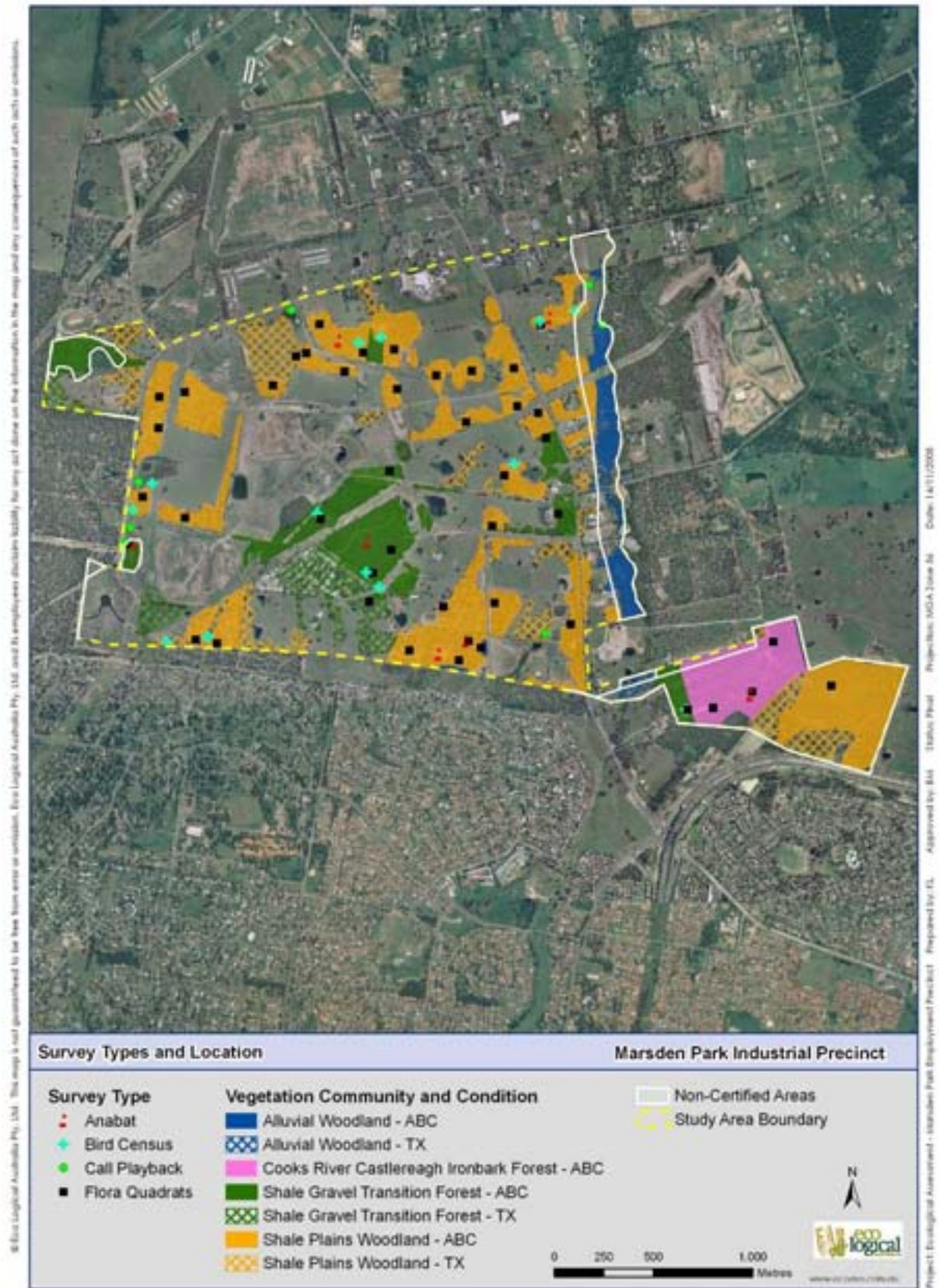
Threatened fauna surveys were undertaken within the study area to determine whether any MNES species were found within the MPIP. Three methods were utilised during the surveys, including:

- **Bird Census** - A bird census was undertaken at dawn and dusk within the MPIP to target MNES woodland birds and migratory bird species. The census was conducted for a 1 hour period over four consecutive mornings and five consecutive evenings. The morning census was undertaken between 0700hrs and 0800hrs, and the afternoon census was undertaken between 1830hrs and 1930hrs. All birds were identified either by sight or call recognition and were recorded. The location of the wetland bird census is presented in Figure 23.
- **Anabat Detection** - An Anabat detector equipped with ZCAIM recording device was used to record resident microchiropteran bat species on four consecutive nights. On each night of survey the Anabat was tuned to record from 1900hours to 0800 the following morning. Anabat calls were downloaded and sent to Alicia Lyon of Eco Logical Australia and Glen Hoyer of Fly By Night Bat Surveys Pty Ltd for identification. Anabat locations are

presented in *Figure 23*. Certainty of bat identifications are recorded confident (C), probable (P) and possible (Po).

- **Call Playback and Spotlighting** - Call play back and census techniques were used to undertake targeted surveys for Green and Golden Bell Frogs. These surveys were undertaken at a number of reed-filled bodies of water, and creek lines within the MPIP. Water body side census was undertaken at four sites where suitable habitat for green and golden bell frog existed. This survey method involved listening for calls for a period of 10 minutes. Call playback was then utilised at these sites to attract response from the species. The green and golden bell frog call was played for a period of 5 minutes followed by a period of 5 minutes listening, then by 10min of spotlighting. Green and golden bell frog survey locations are presented in *Figure 23*. Spotlighting was also undertaken to identify megachiropteran bat species within the study area over four consecutive nights.

Figure 23 Survey Types and Locations



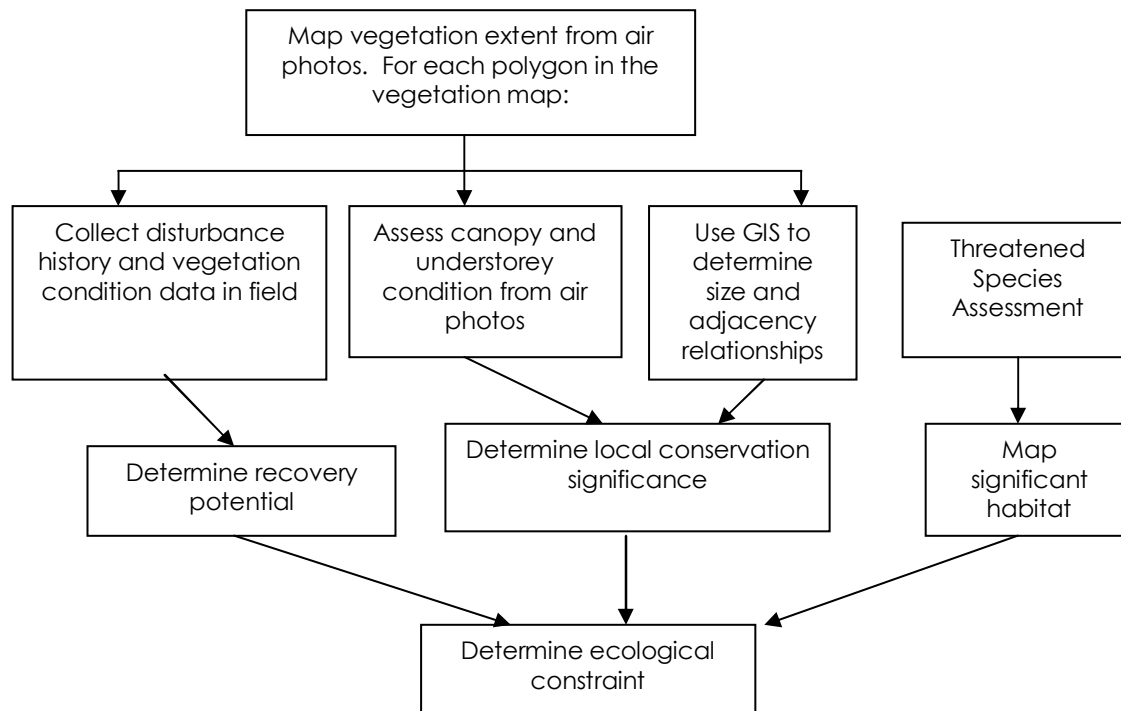
Ecological Constraints

An ecological constraints analysis, based on a methodology used elsewhere in Western Sydney (Eco Logical Australia 2003) was applied across the study area. An ecological constraints analysis is a stepped analysis of the environmental values of an area. It provides a combined measure of ecological values, and is increasingly used as a basis for negotiations over locations, types and densities of land development. It includes measurement of:

- the conservation significance of vegetation communities (including legislative status);
- the structural condition of vegetation remnants;
- type and severity of disturbance and associated recovery potential;
- connectivity between remnants on and off site;
- the size of the vegetation remnant; and
- the value of the remnant as threatened species habitat.

The steps involved in this type of ecological constraints analysis are illustrated in the flowchart in the Figure below. Vegetation mapping is combined with field survey work, threatened species assessment, recovery potential and the NPWS (2002) conservation significance assessment methodology to determine the relative level of ecological value or constraint across a site.

Ecological Constraints Flowchart

*Recovery Potential*

Using information collected in the field 'recovery potential' is determined for each area of vegetation. This is defined as "...the anticipated capacity of (an) area to recover to a state representative of its condition prior to the most recent disturbance event" (IPC & AES, 2002).

The table over the page outlines the decision rules used in this step, resulting in a ranking of High, Moderate, Low or Very Low recovery potential for each vegetation remnant.

Conservation Significance

As part of the recovery planning process for Cumberland Plain vegetation communities, NPWS (2001) have classified remnant vegetation across the Plain into significance categories to assist Councils and other land use planners in making decisions about land use. Remnant woodland and forest vegetation has been ranked as one of four categories:

- 'Core Habitat'; defined as "areas that constitute the backbone of a viable conservation network across the landscape; or areas where the endangered ecological communities are at imminent risk of extinction"
- 'Support for Core Habitat'; "areas that provide a range of support values to the Core Habitat, including increasing remnant size, buffering from edge effects, and providing corridor connections"
- 'Other Remnant Vegetation'; "all native vegetation that does not fall within the above significance categories"

These decision criteria are outlined in the tables over the page.

NPWS (2002) conservation significance attribute information was assigned to the vegetation polygons mapped on Oran Park / Turner Road sites. Where the classification no longer matched, changes were made.

Threatened Species Assessment

Threatened species information and field observations of habitat value were then collated for the study area and used to determine significant threatened species habitat. Each remnant vegetation patch is classed as having either Known, Likely or Nil chance of supporting threatened species.

The following criteria were adopted for categorisation;

- Known/High
 - Known occurrence of threatened flora or fauna
 - Known occurrence of Cumberland Plain Land Snail
 - Known breeding habitat for wide ranging threatened species (e.g. bats and birds with large home ranges)
- Likely/Moderate
 - Likely occurrence of threatened flora or fauna
 - Likely occurrence of Cumberland Plain Land Snail
 - Likely breeding habitat for wide ranging threatened species (e.g. bats and birds with large home ranges)
- Nil/Low
 - Foraging habitat only, for wide ranging species (e.g. bats and birds with large home ranges)

Ecological Constraint

Information derived from the recovery potential, conservation significance and threatened species calculations are combined to determine ecological constraint. The tables on the following pages show the process for combining this information.

Recovery potential matrix

Source: Eco Logical Australia (2003).

Current condition and land use	Past land use and disturbance	Soil Condition	Vegetation	Recovery Potential
Cleared (no woodland canopy). Includes <i>Bursaria</i> thickets in grassland	Recently cleared (<2 years)	Unmodified or largely natural. Uncultivated.	Native dominated	High
			Exotic dominated	Moderate
	Historically cleared (>2 years) and consistently managed as cleared.	Modified. Heavily cultivated and/or pasture improved. Imported material.	Either	Low
		Unmodified or largely natural. Uncultivated.	Native dominated	Moderate
			Exotic dominated	Low
		Modified. Heavily cultivated and/or pasture improved. Imported material.	Either	Very Low
Wooded/Native Canopy present or regenerating	No recent clearing of understorey	Unmodified or largely natural. Uncultivated.	Native understorey relatively intact or in advanced state of regeneration. Native dominated.	High
			Native understorey significantly structurally modified, absent or largely absent. Includes areas dominated by African Olive.	Moderate
			<u>Exotic dominated</u>	<u>Low</u>
		<u>Moderately modified by long term grazing or mowing.</u>	<u>Native dominated</u>	<u>Low</u>
		Modified. Heavily cultivated and/or pasture improved. Imported material.	Native understorey significantly structurally modified, absent or largely absent. Includes areas dominated by African Olive.	Very Low
			Native understorey present. Heavily weed invaded.	Low
	<u>Understorey patchily intact</u>	<u>Disturbed</u>	<u>Native dominated</u>	<u>Moderate</u>
			<u>Exotic dominated</u>	<u>Low</u>
	Recent clearing of understorey and or native understorey significantly structurally modified due to existing land use (eg. Mowing, grazing)	Unmodified or largely natural. Uncultivated.	Native dominated. If no vegetation present, assume native dominated.	High
			Exotic dominated	Moderate
		Modified. Heavily cultivated and/or pasture improved. Imported material.	Native dominated	Low
			Exotic dominated	Very Low

Conservation significance matrix

Source: NSW NPWS (2002)

Community type	Condition Code*	Patch Size	Connectivity	Code	Conservation Significance
Endangered Ecological Community (Critically endangered) ("CEEC")	ABC, TX or Txr	Any	Any	C3	Core
	Txu	Any	Any	URT	Urban remnant trees (critically endangered communities)
Endangered Ecological Community ("EEC")	ABC (with Understorey in good or moderate condition)	> 10 ha	Any	C1	Core
		< 10 ha	Adjacent to C1 or CEEC	C2	Core
			Adjacent to S1	S2	Support for core
			None	O	Other remnant vegetation
	TX or Txr, ABC (with poor Understorey condition)	Any	Adjacent to any Core	S1	Support for core
			None	O	Other remnant vegetation
	Txu	Any	Any	O	Other remnant vegetation

Decision matrix step 1:

This step combines the recovery potential and conservation significance maps (ELA 2003).

	Recovery Potential				
Conservation Significance		High	Moderate	Low	Very Low
	Core	High	High	High	High
	Support for core	High	Moderate	Moderate	Low
	Other	Moderate	Moderate	Low	Low

Decision matrix step 2:

This step combines results from the above table with the threatened species layer to determine overall ecological value (ELA 2003).

	Combined Recovery Potential and Conservation Significance (result of Table above)			
Threatened Species Assessment		High	Moderate	Low
	Known (High)	High	High	High
	Likely (Moderate)	High	Moderate	Moderate
	Nil (Low)	High	Moderate	Low

Aquatic Habitat and Groundwater Dependant Ecosystem Assessment

Methods

A condition rating of the aquatic habitat was applied to the farm dams/artificial wetlands and creeklines within the study area. The aquatic habitat was assessed by examining characteristics such as native vegetation, connectivity, disturbance and barriers to natural stream flow along the creeklines. The following criterion within the table below was used to rate the condition of aquatic habitats.

Aquatic habitat rating criterion.

Rating	River Aquatic Habitat	Farm Dam/Artificial Wetland Aquatic Habitat
Good	Aquatic habitat components are usually all present (for example, mature trees, fallen timber, vegetated banks, unaltered stream flow, diverse instream habitat, unrestricted riparian zones and terrestrial/aquatic habitat linkages) and habitat linkages to other remnant ecosystems in the landscape.	Aquatic habitat components are usually all present (for example, vegetated banks, mudflats, diverse habitat (open water, vegetated), and terrestrial habitat linkages.
Moderate	Some aquatic habitat components are missing, but natural flow is not significantly affected (eg. Weir) and linkages with other remnant habitats in the landscape are usually intact, although often degraded.	Some aquatic habitat components are often missing (for example mudflats), however there are still vegetated banks, and terrestrial habitat linkages.
Poor	Many aquatic habitat elements have been lost, including mature trees and native aquatic vegetation. Stream flow is often altered and restrictions to the natural movement of water and aquatic organisms. Habitat linkages in the landscape have been compromised by extensive past clearing.	Many aquatic habitat elements have been lost, and no potential habitat exists, apart from open water. Often with heavy livestock influences, and terrestrial habitat linkages.

Groundwater dependant ecosystems are ecosystems which have their species composition and their natural ecological processes determined by ground water (ARMCANZ & ANZECC, 1996). A wide variety of flora and fauna depend directly or indirectly upon groundwater. Groundwater dependant ecosystems are recognised as falling into 1 of 4 types;

- Terrestrial vegetation
- Base flows in streams
- Aquifer and cave ecosystems
- Wetlands

Based on the guidelines and definitions found in (DLWC 2002) any groundwater dependent ecosystems were identified, mapped and recorded.

Riparian Corridors Assessment and Planning

Methods

The Riparian Category mapping has been based upon the requirements of the *Water Management Act 2000*, and those stated within the Growth Centres Development Code which are based on the now repealed *Rivers and Foreshores Improvement Act* (RFI Act). The three streams within the study area were tagged and assigned a value from 1 to 3 that reflect their relative riparian importance within the catchment. The three riparian categories are;

Category 1 – key environmental corridor

Category 2 – terrestrial and aquatic habitat

Category 3 – bed and bank stability/water quality

The table below outlines the buffer specifications for each riparian category.

DNR Riparian Categories and buffer specifications

Riparian Category	Minimum Riparian Width (measured from top of bank along either side of the watercourse)
Category 1	40m CRZ + 10 m VB Revegetate; any structures to be located outside CRZ
Category 2	20m CRZ + 10m VB Revegetate, any structures to be located outside CRZ
Category 3	10m CRZ (no VB) Revegetate, any structures to be located outside CRZ

*CRZ = Core Riparian Zone, VB = Vegetated Buffer

Validation of all watercourse classifications as mapped by DWE for the GCC in 2006, was undertaken to determine if the order of stream mapped is correct, and to potentially incorporate areas of remnant vegetation outside the prescribed core riparian area, as considered within the GCC Development Code.

The streams and their riparian corridors within the study area were re-classified into the three categories based on the following features that reflect the relative importance as riparian zones:

- The connectivity and continuity of riparian corridors and natural bushland
- The continuity of open/natural stream channels
- Relative length and location of piped sections
- Current and likely future development
- Potential for riparian corridor maintenance, re-instatement or restoration
- Native vegetation condition, as reflected by the conservation significance assessment carried out as part of this study
- Aquatic and terrestrial habitat value
- Presence of threatened species, populations or communities

A fourth category was created for this assessment, "Engineered Drainage". The new class is for drainage lines which were highly modified, no longer followed any natural channel and ELA, believe would be suitable to become engineered drainage.

A survey of the geomorphic top of bank (TOB) for the DWE mapped watercourses was conducted by a geomorphologist with a differential GPS (accuracy 50cm-70cm). This TOB was mapped and used as the basis for the riparian buffer delineation and riparian corridor boundaries.

In conjunction with the GHD Flooding studies a typical "section" of the category 1 stream (Bells Creek) will be identified and plan views and cross sections will be prepared identifying required treatments as the flooding studies progress. A further two cross-sections will be prepared for inclusion in the vegetation management plan as the master planning process progresses.

Appendix F: Flora List

Scientific Name	Common Name
<i>Acacia falcata</i>	
<i>Acacia floribunda</i>	White Sally
<i>Acacia parramattensis</i>	Parramatta Wattle
<i>Acacia spp.</i>	
<i>Acacia ulicifolia</i>	Prickly Moses
<i>Ajuga australis</i>	Austral Bugle
<i>Allocasuarina littoralis</i>	Black She-Oak
<i>Alternanthera denticulata</i>	Lesser Joyweed
<i>Amyema gaudichaudii</i> *	Scarlet/Blue Pimpernel
<i>Anagallis arvensis</i> *	
<i>Angophora floribunda</i>	Rough-barked Apple
<i>Angophora subvelutina</i>	Broad-leaved Apple
<i>Araujia sericifera</i> *	Moth Vine
<i>Aristida ramosa</i>	Purple Wiregrass
<i>Aristida ramosa var. ramosa</i>	
<i>Aristida vagans</i>	Threeawn Speargrass
<i>Arthropodium milleflorum</i>	Pale Vanilla-lily
<i>Asparagus aethiopicus</i> *	Asparagus Fern
<i>Asparagus asparagoides</i> *	Bridal Creeper
<i>Asperula conferta</i>	Common Woodruff
<i>Aster subulatus</i> *	Wild Aster
<i>Astroloma humifusum</i>	Native Cranberry
<i>Austrodanthonia racemosa</i>	
<i>Austrodanthonia racemosa var. racemosa</i>	
<i>Austrostipa ramosissima</i>	Stout Bamboo Grass
<i>Axonopus fissifolius</i> *	Narrow-leafed Carpet Grass
<i>Bidens pilosa</i> *	Cobbler's Pegs
<i>Billardiera scandens</i>	Appleberry
<i>Bossiaea prostrata</i>	
<i>Briza minor</i> *	Shivery Grass
<i>Briza subaristata</i> *	
<i>Bromus catharticus</i> *	Prairie Grass
<i>Brunoniella australis</i>	Blue Trumpet
<i>Bryophyllum delagoense</i> *	Mother of millions
<i>Bursaria spinosa</i>	Native Blackthorn
<i>Caesia parviflora</i>	Pale Grass-lily
<i>Caesia parviflora var. vittata</i>	
<i>Calotis cuneifolia</i>	Purple Burr-Daisy
<i>Calotis lappulacea</i>	Yellow Burr-daisy
<i>Carex inversa</i>	Knob Sedge
<i>Carronia multiseppalea</i>	
<i>Cassytha pubescens</i>	
<i>Casuarina glauca</i>	Swamp Oak
<i>Centaurium spicatum</i>	Spike Centaury
<i>Centella asiatica</i>	Indian Pennywort
<i>Centipeda spp.</i>	
<i>Cestrum parqui</i> *	Green Cestrum

<i>Cheilanthes sieberi</i>	
<i>Cheilanthes sieberi subsp. sieberi</i>	
<i>Chloris divaricata</i> var. <i>divaricata</i>	Slender Chloris
<i>Chloris gayana</i> *	Rhodes Grass
<i>Chloris</i> spp.	
<i>Chloris truncata</i>	Windmill Grass
<i>Chloris ventricosa</i>	Tall Chloris
<i>Chorizema parviflorum</i>	Eastern Flame Pea
<i>Cirsium vulgare</i> *	Spear Thistle
<i>Commelina cyanea</i>	Native Wandering Jew
<i>Conyza</i> spp.	
<i>Conyza sumatrensis</i> *	Tall fleabane
<i>Coronopus didymus</i> *	Lesser Swinecress
<i>Cotula australis</i>	Common Cotula
<i>Crassula sieberiana</i>	Australian Stonecrop
<i>Cryptandra amara</i>	Bitter cryptandra
<i>Cryptandra spinescens</i>	
<i>Cyclospermum leptophyllum</i> *	Slender Celery
<i>Cymbonotus lawsonianus</i>	Bear's Ear
<i>Cymbopogon refractus</i>	Barbed Wire Grass
<i>Cynodon dactylon</i>	Common Couch
<i>Cyperus gracilis</i>	Slender Flat-sedge
<i>Cyperus</i> spp.	
<i>Daviesia ulicifolia</i>	Gorse Bitter Pea
<i>Daviesia ulicifolia subsp. ulicifolia</i>	
<i>Desmodium varians</i>	Slender Tick-trefoil
<i>Dianella longifolia</i>	
<i>Dianella revoluta</i>	Blue Flax-Lily
<i>Dichelachne micrantha</i>	Shorthair Plumegrass
<i>Dichondra repens</i>	Kidney Weed
<i>Digitaria</i> sp.	
<i>Dillwynia sieberi</i>	
<i>Dillwynia tenuifolia</i>	
<i>Dodonaea viscosa subsp. angustifolia</i>	
<i>Dodonaea viscosa subsp. cuneata</i>	
<i>Echinopogon caespitosus</i>	Bushy Hedgehog-grass
<i>Echinopogon ovatus</i>	Forest Hedgehog Grass
<i>Ehrharta erecta</i> *	Panic Veldtgrass
<i>Einadia hastata</i>	Berry Saltbush
<i>Einadia nutans</i>	Climbing Saltbush
<i>Einadia trigonos</i>	Fishweed
<i>Entolasia stricta</i>	Wiry Panic
<i>Eragrostis brownii</i>	Brown's Lovegrass
<i>Eragrostis curvula</i> *	African Lovegrass
<i>Eragrostis leptostachya</i>	Paddock Lovegrass
<i>Eremophila debilis</i>	Amulla
<i>Eucalyptus amplifolia</i>	Cabbage Gum
<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark
<i>Eucalyptus eugenioides</i>	Thin-leaved Stringybark
<i>Eucalyptus fibrosa</i>	Red Ironbark

<i>Eucalyptus longifolia</i>	Woollybutt
<i>Eucalyptus moluccana</i>	Grey Box
<i>Eucalyptus tereticornis</i>	Forest Red Gum
<i>Euchiton gymnocephalus</i> *	Creeping Cudweed
<i>Euchiton sphaericus</i>	
<i>Exocarpos cupressiformis</i>	Native Cherry
<i>Facelis retusa</i> *	
<i>Gamochaeta calviceps</i> *	Cudweed
<i>Gamochaeta spicata</i> *	
<i>Glycine clandestina</i>	
<i>Glycine tabacina</i>	Glycine
<i>Gomphocarpus fruticosus</i> *	Narrow-leaved Cotton Bush
<i>Goodenia bellidifolia</i> subsp. <i>bellidifolia</i>	
<i>Goodenia hederacea</i>	Ivy Goodenia
<i>Grevillea juniperina</i> subsp. <i>juniperina</i>	Juniper-leaved Grevillea
<i>Hardenbergia violacea</i>	False Sarsaparilla
<i>Hibbertia diffusa</i>	
<i>Hypericum gramineum</i>	Small St John's Wort
<i>Hypochaeris microcephala</i> var. <i>albiflora</i> *	White Flatweed
<i>Hypochaeris radicata</i> *	Catsear
<i>Indigofera australis</i>	Australian Indigo
<i>Juncus usitatus</i>	
<i>Lachnagrostis filiformis</i>	
<i>Lagenophora stipitata</i>	Common Lagenophora
<i>Laxmannia gracilis</i>	Slender Wire Lily
<i>Lepidium africanum</i> *	
<i>Lepidium bonariense</i> *	
<i>Lepidium densiflorum</i> *	Common Pepperweed
<i>Lepidium pseudohyssopifolium</i>	Peppercress
<i>Lepidosperma laterale</i>	
<i>Leucopogon</i> spp.	
<i>Ligustrum lucidum</i> *	Broad-leaved Privet
<i>Ligustrum sinense</i> *	Small-leaved Privet
<i>Lissanthe strigosa</i>	Peach Heath
<i>Lolium</i> spp.*	
<i>Lomandra filiformis</i>	Wattle Matt-rush
<i>Lomandra filiformis</i> subsp. <i>coriacea</i>	
<i>Lomandra filiformis</i> subsp. <i>filiformis</i>	
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush
<i>Lomandra multiflora</i> subsp. <i>multiflora</i>	Many-flowered Mat-rush
<i>Lotus angustissimus</i> *	Slender Birds-foot Trefoil
<i>Lotus</i> spp.	
<i>Lycium ferocissimum</i> *	African Boxthorn
<i>Lythrum hyssopifolia</i>	Hyssop Loosestrife
<i>Macrozamia spiralis</i>	
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i>	Native Pear
<i>Medicago polymorpha</i> *	Burr Medic
<i>Medicago</i> spp.	
<i>Melaleuca decora</i>	
<i>Melaleuca nodosa</i>	

<i>Melaleuca styphelioides</i>	Prickly-leaved Tea Tree
<i>Microlaena stipoides</i>	
<i>Modiola caroliniana</i> *	Red-flowered Mallow
<i>Murdannia graminea</i>	
<i>Olearia microphylla</i>	
<i>Opercularia diphylla</i>	
<i>Opercularia hispida</i>	Hairy Stinkweed
<i>Opuntia</i> spp.*	
<i>Oxalis exilis</i>	
<i>Oxalis perennans</i>	
<i>Ozothamnus diosmifolius</i>	White Dogwood
<i>Panicum effusum</i>	Hairy Panic
<i>Panicum simile</i>	Two-colour Panic
<i>Paronychia brasiliensis</i> *	Chilean Whitlow Wort
<i>Paspalidium</i> spp.	
<i>Paspalum dilatatum</i> *	Paspalum
<i>Paspalum</i> spp.	
<i>Pennisetum clandestinum</i> *	Kikuyu Grass
<i>Persoonia linearis</i>	Narrow-leaved Geebung
<i>Petrophile pulchella</i>	Conesticks
<i>Phyllanthus hirtellus</i>	
<i>Phytolacca octandra</i> *	Inkweed
<i>Pimelea linifolia</i> subsp. <i>linifolia</i>	
<i>Plantago debilis</i>	
<i>Plantago gaudichaudii</i>	
<i>Plantago lanceolata</i> *	Lamb's Tongues
<i>Plantago myosuroides</i> subsp. <i>myosuroides</i> *	
<i>Plectranthus</i> spp.	
<i>Polycarpon tetraphyllum</i> *	Four-leaved Allseed
<i>Polygonum aviculare</i> *	Wireweed
<i>Polymeria calycina</i>	
<i>Pomax umbellata</i>	
<i>Poranthera microphylla</i>	
<i>Pratia purpurascens</i>	Whiteroot
<i>Pseuderanthemum variabile</i>	Pastel Flower
<i>Pseudognaphalium luteoalbum</i>	Jersey Cudweed
<i>Pultenaea microphylla</i>	
<i>Pultenaea parviflora</i>	
<i>Richardia stellaris</i> *	
<i>Rorippa laciniata</i>	
<i>Rubus fruticosus</i> agg.*	Blackberry Complex
<i>Rumex crispus</i> *	Curled Dock
<i>Rumex</i> spp.*	
<i>Scaevola albida</i>	Pale Fan-flower
<i>Senecio madagascariensis</i> *	Fireweed
<i>Setaria distans</i>	
<i>Setaria gracilis</i> *	Slender Pigeon Grass
<i>Sida rhombifolia</i> *	Paddy's Lucerne
<i>Sigesbeckia australiensis</i>	
<i>Sisymbrium</i> spp.*	

<i>Sisyrinchium</i> spp.*	
<i>Solanum linearifolium</i>	Mountain Kangaroo Apple
<i>Solanum linnaeanum</i> *	Apple of Sodom
<i>Solanum nigrum</i> *	Black-berry Nightshade
<i>Solanum prinophyllum</i>	Forest Nightshade
<i>Solanum pseudocapsicum</i> *	Madeira Winter Cherry
<i>Solanum seafortianum</i> *	Brazilian Nightshade
<i>Solanum</i> spp.	
<i>Soliva sessilis</i> *	Bindyi
<i>Sonchus oleraceus</i> *	Common Sowthistle
<i>Sporobolus creber</i>	Slender Rat's Tail Grass
<i>Stackhousia</i> spp.	
<i>Stackhousia viminea</i>	Slender Stackhousia
<i>Taraxacum officinale</i> *	Dandelion
<i>Themeda australis</i>	Kangaroo Grass
<i>Tradescantia fluminensis</i> *	Wandering Jew
<i>Trifolium cernuum</i> *	Nodding Clover
<i>Trifolium dubium</i> *	Yellow Suckling Clover
<i>Trifolium repens</i> *	White Clover
<i>Urtica incisa</i> *	Stinging Nettle
<i>Utricularia uliginosa</i>	
<i>Verbascum virgatum</i> *	Twiggy Mullein
<i>Verbena bonariensis</i> *	Purpletop
<i>Verbena rigida</i> var. <i>rigida</i> *	Veined Verbena
<i>Verbena</i> spp.	
<i>Vernonia cinerea</i>	
<i>Veronica plebeia</i>	Trailing Speedwell
<i>Vittadinia cuneata</i> var. <i>cuneata</i>	
<i>Vittadinia</i> spp.	
<i>Wahlenbergia gracilis</i>	Sprawling Bluebell

* denotes exotic species

Appendix G: Fauna List

	Scientific Name	Common Name
Amphibian	<i>Crinia signifera</i>	Common Eastern Froglet
	<i>Litoria fallax</i>	Eastern Dwarf Tree Frog
	<i>Litoria peronii</i>	Peron's Tree Frog
	<i>Litoria verreauxii</i>	Verreaux's Frog
	<i>Limnodynastes peronii</i>	Brown-striped Frog
Aves	<i>Acanthiza nana</i>	Yellow Thornbill
	<i>Acanthiza reguloides</i>	Buff-rumped Thornbill
	<i>Acanthorhynchus tenuirostris</i>	Eastern Spinebill
	<i>Acridotheres tristis</i> *	Common Myna
	<i>Alcedo azurea</i>	Azure Kingfisher
	<i>Anas gracilis</i>	Grey Teal
	<i>Anas superciliosa</i>	Pacific Black Duck
	<i>Anthochaera carunculata</i>	Red Wattlebird
	<i>Ardea ibis</i>	Cattle Egret
	<i>Ardea alba</i>	Great Egret
	<i>Artamus cyanopterus</i>	Dusky Woodswallow
	<i>Aythya australis</i>	Hardhead
	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo
	<i>Cacatua sanguinea</i>	Little Corella
	<i>Calyptorhynchus funereus</i>	Yellow-tailed Black-Cockatoo
	<i>Chalcites lucidus</i>	Shining Bronze-Cuckoo
	<i>Chenonetta jubata</i>	Australian Wood Duck
	<i>Colluricincla harmonica</i>	Grey Shrike-thrush
	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike
	<i>Corcorax melanorhamphos</i>	White-winged Chough
	<i>Corvus coronoides</i>	Australian Raven
	<i>Coturnix ypsilophora</i>	Brown Quail
	<i>Cracticus torquatus</i>	Grey Butcherbird
	<i>Cygnus atratus</i>	Black Swan
	<i>Dacelo novaeguineae</i>	Laughing Kookaburra
	<i>Daphoenositta chrysoptera</i>	Varied Sittella
	<i>Egretta novaehollandiae</i>	White-faced Heron
	<i>Elanus axillaris</i>	Black-shouldered Kite
	<i>Elseyonis melanops</i>	Black-fronted Dotterel
	<i>Eolophus roseicapillus</i>	Galah
	<i>Eopsaltria australis</i>	Eastern Yellow Robin
	<i>Falco longipennis</i>	Australian Hobby
	<i>Fulica atra</i>	Eurasian Coot
	<i>Gallinula tenebrosa</i>	Dusky Moorhen
	<i>Gallinula ventralis</i>	Black-tailed Native-hen
	<i>Geopelia placida</i>	Peaceful Dove
	<i>Gerygone olivacea</i>	White-throated Gerygone
	<i>Glossopsitta concinna</i>	Musk Lorikeet
	<i>Grallina cyanoleuca</i>	Magpie-lark
	<i>Gymnorhina tibicen</i>	Australian Magpie
	<i>Himantopus himantopus</i>	Black-winged Stilt
	<i>Hirundo neoxena</i>	Welcome Swallow

	<i>Lichenostomus chrysops</i>	Yellow-faced Honeyeater
	<i>Lichenostomus leucotis</i>	White-eared Honeyeater
	<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater
	<i>Malurus cyaneus</i>	Superb Fairy-wren
	<i>Malurus lamberti</i>	Variegated Fairy-wren
	<i>Manorina melanocephala</i>	Noisy Miner
	<i>Megalurus gramineus</i>	Little Grassbird
	<i>Myiagra inquieta</i>	Restless Flycatcher
	<i>Myzomela sanguinolenta</i>	Scarlet Honeyeater
	<i>Neochmia temporalis</i>	Red-browed Finch
	<i>Ocyphaps lophotes</i>	Crested Pigeon
	<i>Pachycephala pectoralis</i>	Golden Whistler
	<i>Pachycephala rufiventris</i>	Rufous Whistler
	<i>Pardalotus punctatus</i>	Spotted Pardalote
	<i>Petrochelidon nigricans</i>	Tree Martin
	<i>Phalacrocorax melanoleucos</i>	Little Pied Cormorant
	<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant
	<i>Phaps chalcoptera</i>	Common Bronzewing
	<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater
	<i>Platalea flavipes</i>	Yellow-billed Spoonbill
	<i>Platycercus adscitus eximius</i>	Eastern Rosella
	<i>Porphyrio porphyrio</i>	Purple Swamphen
	<i>Psephotus haematonotus</i>	Red-rumped Parrot
	<i>Pycnonotus jocosus</i> *	Red-whiskered Bulbul
	<i>Rhipidura albiscapa</i>	Grey Fantail
	<i>Rhipidura leucophrys</i>	Willie Wagtail
	<i>Smicronis brevirostris</i>	Weebill
	<i>Strepera graculina</i>	Pied Currawong
	<i>Streptopelia chinensis</i> *	Spotted Turtle-Dove
	<i>Streptopelia senegalensis</i> *	Laughing Turtle-Dove
	<i>Tachybaptus novaehollandiae</i>	Australasian Grebe
	<i>Taeniopygia bichenovii</i>	Double-barred Finch
	<i>Threskiornis spinicollis</i>	Straw-necked Ibis
	<i>Todiramphus sanctus</i>	Sacred Kingfisher
	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet
	<i>Vanellus miles</i>	Masked Lapwing
	<i>Zosterops lateralis</i>	Silvereye
Mammalia	<i>Lepus capensis</i> *	Brown Hare
	<i>Oryctolagus cuniculus</i> *	Rabbit
	<i>Macropus giganteus</i>	Eastern Grey Kangaroo
	<i>Wallabia bicolor</i>	Swamp Wallaby
	<i>Rattus rattus</i> *	Black Rat
	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox
	<i>Chalinolobus gouldii</i>	Gould's wattled bat
	<i>Chalinolobus morio</i>	Chocolate wattled bat
	<i>Myotis adversus</i>	Large-footed fishing bat
	<i>Miniopterus australis</i>	Little bentwing bat
	<i>Mormopterus norkolkensis</i>	Eastern free-tail bat
	<i>Miniopterus schreibersii oceanensis</i>	Eastern bent-wing bat
	<i>Mormopterus sp.2</i>	Little free-tail bat

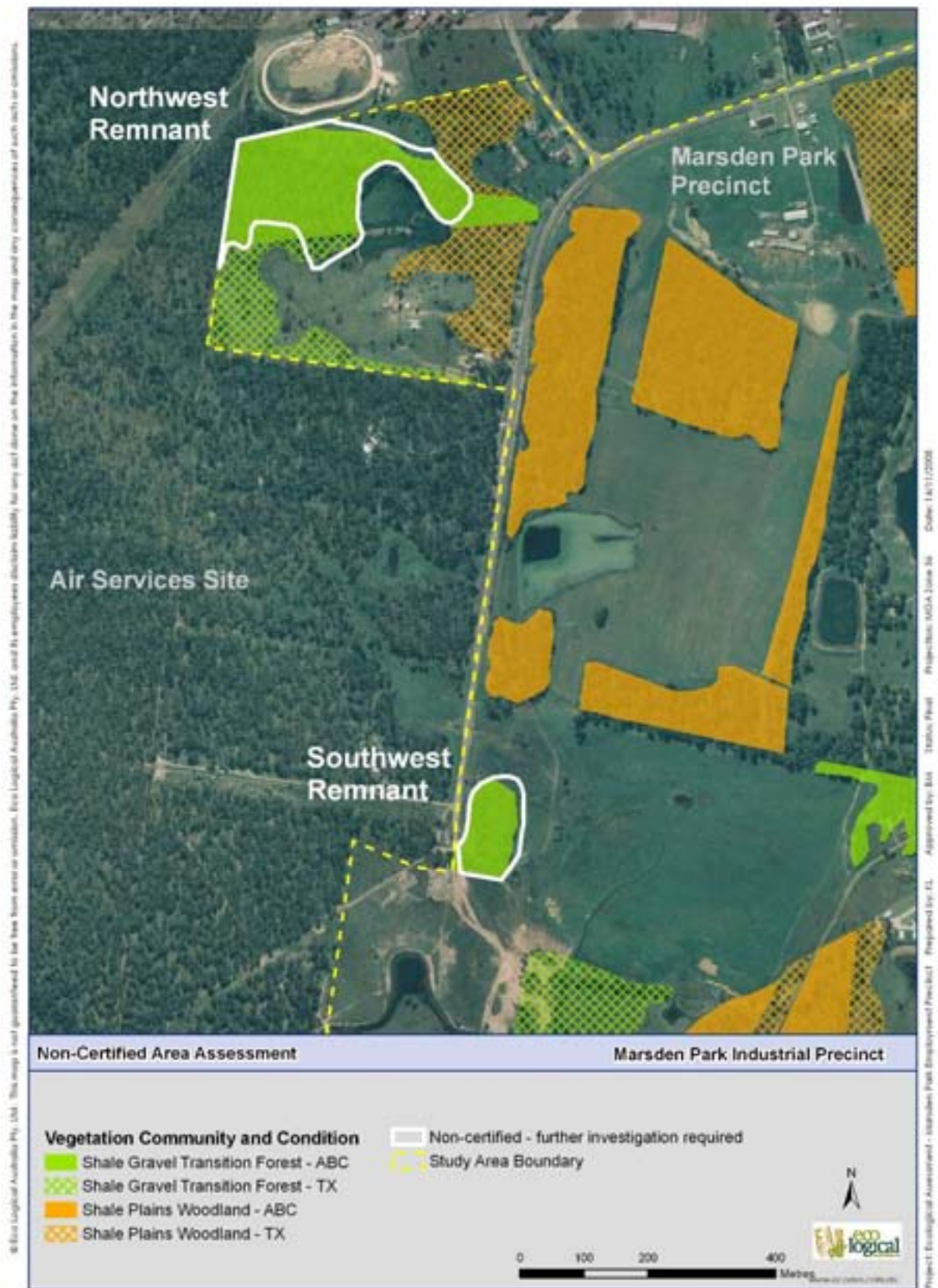
	<i>Nyctophylus sp.</i>	Unidentified Long-eared bat
	<i>Saccolaimus flaviventris</i>	Yellow-bellied sheath-tail bat
	<i>Scotorepens orion</i>	Eastern Broad-nosed bat
	<i>Scoteanax rueppellii</i>	Greater Broad-nosed bat
	<i>Tadarida australis</i>	White-striped freetail bat
	<i>Vespadelus pumilus</i>	Eastern forest bat
	<i>Vespadelus vultumus</i>	Little forest bat
Reptilia	<i>Pseudechis porphyriacus</i>	Red-bellied black snake
Gastropod	<i>Meridolum corneovirens</i>	Cumberland Plain Land Snail

* denotes exotic species

Appendix H: Biocertification Conditions, Schedule 3 Assessment

The following are schedule 1 criteria assessment is required condition 14 and 15 of the Biodiversity Certification Order. The following assessment is based on a further detailed assessment as part of the precinct planning process for Marsden Park Industrial Precinct and is undertaken for the areas adjoining or proximate to the Shane's Park Air Services Australia site marked in black hatching on the biodiversity certification maps. Based on the outcome of the assessment the DECC shall provide advice to the Minister on whether the areas should be included within the certified or non-certified areas shown on the biodiversity certification maps.

There are two areas of non-certified areas subject to Condition 14 of the Biodiversity Certification Order within the Marsden Park Site. These areas are referred to in this assessment as the Northwest and Southwest Remnants (refer to figure over the page)



Schedule 3 Criteria Assessments

Northwest Remnant

(a) Does the area contain an endangered ecological community as listed under the Act;

Yes, this remnant contains Shale Gravel Transition Forest, which is listed as an EEC under the Act.

(b) Does the area exist as contiguous with the existing native vegetation on the Air Services Site;

Yes, this remnant is contiguous with the vegetation on the Air Services Site.

(c) is the area equal or greater to 4 hectares;

Yes, this area is equal to 4.7 hectares

(d) does the area have greater than 10% canopy cover

Yes the vegetation within this area is considered to be of A condition and therefore has >10% canopy cover.

(e) does this patch have 30% or greater vegetation cover within;

i) a 0.55 km radius – yes, the vegetation cover exists within the Shane's park site

ii) 1.75km radius - yes, the vegetation cover exists within the Shane's park site

(f) does the area, as measured from the approximate centre point of each area;

(g) have a perimeter to area ratio that is conducive to on-going conservation management

The perimeter to ratio area for this remnant is 0.03. This ratio is extremely low, and indicates that this remnant will be significantly impacted by edge effects and in its current configuration will not be conducive to on-going conservation management.

(h) whether after applying a 50 metre disturbance buffer to the edge of each area (where the edge is likely to be made available for future urban development as identified in the SEPP), the overall size of the area then falls below 4 hectares

Yes, applying the 50m buffer to the edges proposed for future urban development, the area of this remnant falls below 4 hectares.

Southwest Remnant

(a) Does the area contain an endangered ecological community as listed under the Act;

Yes, this remnant contains Shale Gravel Transition Forest, which is listed as an EEC under the Act.

(b) Does the area exist as contiguous with the existing native vegetation on the Air Services Site;

No, this remnant is divided from the vegetation on the Air Services Site by a formed road.

(c) is the area equal or greater to 4 hectares;

No, this area is equal to 1.3 hectares

(d) does the area have greater than 10% canopy cover

Yes the vegetation within this area is considered to be of A condition and therefore has >10% canopy cover.

(e) does this patch have 30% or greater vegetation cover within;

i) a 0.55 km radius – yes, the vegetation cover exists within the Shane's park site

ii) 1.75km radius - yes, the vegetation cover exists within the Shane's park site

(f) does the area, as measured from the approximate centre point of each area;

(g) have a perimeter to area ratio that is conducive to on-going conservation management

The perimeter to ratio area for this remnant is 0.04. This ratio is extremely low, and indicates that this remnant will be significantly impacted by edge effects and in its current configuration will not be conducive to on-going conservation management.

(h) whether after applying a 50 metre disturbance buffer to the edge of each area (where the edge is likely to be made available for future urban development as identified in the SEPP), the overall size of the area then falls below 4 hectares

Yes, applying the 50m buffer to the edges proposed for future urban development, the area of this remnant falls below 4 hectares.

Appendix I: Assessments of Significance – Species Protected under the EPBC Act

The *EPBC Act* Administrative Guidelines on Significance set out ‘**Significant Impact Criteria**’ that are to be used to assist in determining whether a proposed action is likely to have a significant impact on matters of national environmental significance. Matters listed under the *EPBC Act* as being of national environmental significance include:

- Listed threatened species and ecological communities
- Listed Migratory species
- Wetlands of International Importance
- The Commonwealth marine environment
- World Heritage properties
- National Heritage places
- Nuclear actions

Specific ‘**Significant Impact Criteria**’ are provided for each matter of national environmental significance, except for threatened species and ecological communities, in which case separate criteria are provided for species listed as endangered and vulnerable under the *EPBC Act*.

Threatened and migratory species listed only under the *EPBC Act* that are considered likely or potentially to occur within the study area are:

- Green and golden bell frog (*Litoria aurea*)
- Giant burrowing frog (*Heleioparus australiacus*)
- Square-tailed kite (*Lophoictinia isura*)
- Regent honeyeater (*Xanthomyza phrygia*)
- Swift parrot (*Lathamus discolor*)
- Spotted-tailed quoll (*Dasyurus maculatus maculatus* (SE mainland population))
- Grey-headed Flying-fox (*Pteropus poliocephalus*)
- Large-eared Pied Bat (*Chalinolobus dwyeri*)
- White-bellied Sea Eagle (*Haliaeetus leucogaster*)
- Great Egret (*Ardea alba*)
- Cattle Egret (*Ardea ibis*)
- Latham's Snipe (*Gallinago hardwickii*)
- Painted Snipe (*Rostratula benghalensis s. lat.*)

The relevant Significant Impact Criteria have been applied to these threatened and migratory species to determine the significance of impact of the proposed works.

Matters to be addressed	Impact (Commonwealth Legislation)
(a) any environmental impact on a World Heritage Property;	No. There are no World Heritage Areas within the study area.
(b) any environmental impact on Wetlands of International Importance;	No. There are no Wetlands of International Importance within the study area.
(c) any environmental impact on Commonwealth Listed Threatened Species and Ecological Communities;	Yes. The listed species that have the potential to be impacted by the proposed MPIP layout plan include; • Regent Honeyeater (<i>Xanthomyza phrygia</i>) – Endangered • Swift Parrot (<i>Lathamus discolor</i>) – Endangered • Spotted-tailed quoll (<i>Dasyurus maculatus maculatus</i> (SE mainland population)) – Endangered • Cumberland Plain Woodland (Shale Hills Woodland) – Endangered Ecological Community • <i>Pultenaea parviflora</i> – Vulnerable • Green and golden bell frog (<i>Litoria aurea</i>) – Vulnerable • Giant burrowing frog (<i>Heleioparus australiacus</i>) – Vulnerable • Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>) – Vulnerable • Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>) – Vulnerable

Endangered Species

Regent Honeyeater (*Xanthomyza phrygia*)

The regent honeyeater was not recorded within the study area during the field survey, and historical records indicate that no sightings have occurred within the study area. This species commonly inhabits dry open forest and woodland, and riparian forests of river sheoak. Flocks of regent honeyeater are occasionally seen foraging in flowering coastal swamp mahogany (*Eucalyptus robusta*) and spotted gum (*Eucalyptus maculata*) forests (DECC 2009a). The regent honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes (DECC 2009a).

Potential habitat for the regent honeyeater to pass through exists within the areas of Cumberland Plain Woodland, Shale Gravel Transition Forest, and Alluvial Woodland within the study area.

a. lead to a long-term decrease in the size of a population of a species, or

The MPIP study area provides potential foraging habitat for the regent honeyeater, consisting of a potential food tree of grey box (*Eucalyptus moluccana*). Potential habitat offering similar foraging habitat is common within adjacent areas including Shane's Park, the RTA offset lands adjacent to the M7 Motorway, and the Bells Creek Riparian Corridor

Given that greater foraging habitat for the regent honeyeater occurs adjacent to the study area, the proposed layout plan and subsequent actions will not lead to a long-term decrease in the size of the population within the locality.

Matters to be addressed	Impact (Commonwealth Legislation)
	<i>b. reduce the area of occupancy of a population, or</i> The proposed MPIP layout plan may impact upon the area of potential foraging habitat for the regent honeyeater within the study area, but it is unlikely to significantly affect the overall area of occupancy of the species within the locality. The amount of vegetation that will be impacted by the proposed action is relatively moderate (150ha) in comparison to better quality habitat for the regent honeyeater within the locality, including Shane's Park (475ha), the RTA offset lands adjacent to the M7 Motorway (56ha), and the Bells Creek Riparian Corridor (11ha). <i>c. fragment an existing population into two or more populations, or</i> The proposed MPIP layout plan will not fragment an existing population of the regent honeyeater into two or more populations. There have been no previous recordings of a regent honeyeater population within the proposed impacted area, and furthermore the habitat to be impacted is of relatively moderate quality, being potentially used as foraging habitat. Higher quality habitat for the regent honeyeater exists within Shane's Park (475ha), the RTA offset lands adjacent to the M7 Motorway (56ha), and the Bells Creek Riparian Corridor (11ha). <i>d. adversely affect habitat critical to the survival of a species, or</i> This species commonly inhabits dry open forest and woodland, and riparian forests of river she-oak. The regent honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes. The study area provides relatively moderate habitat potential for the regent honeyeater, given the fragmented nature of the remnants. The clearing of the potential habitat within the study area will not adversely affect habitat critical to the survival of the species in the locality, and will not significantly affect the overall survival of the species. The greatest potential habitat for the regent honeyeater within the areas of the MPIP that will be retained and incorporated within the Bells Creek Riparian Creek and conservation lands. <i>e. disrupt the breeding cycle of a population, or</i> The study area does not provide potential habitat for breeding, and therefore the proposed action will not disrupt the breeding cycle of a population. <i>f. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or</i> The proposed MPIP layout plan will remove approximately 150ha of remnant vegetation that potentially provides foraging habitat for the regent honeyeater. The removal of this vegetation is not likely to cause the decline of the species in the locality by reducing the availability of habitat, and is unlikely to cause an overall decline in the species. <i>g. result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*, or</i> The proposed MPIP layout plan is unlikely to result in invasive species that are harmful to the regent honeyeater becoming established in the remaining habitat in the locality.

Matters to be addressed	Impact (Commonwealth Legislation)
	<i>h. interfere with the recovery of the species.</i> The proposed MPIP layout plan will clear areas of potential habitat that may be valuable to the regent honeyeater for foraging, but it will be unlikely to interfere substantially with the overall recovery of the species. Areas of greatest potential habitat within the study area will be retained as either the riparian corridor or conservation lands. <u>Swift Parrot (<i>Lathamus discolor</i>)</u> Swift parrots are winter migrants to the south-eastern Australia mainland from Tasmania, where they feed on winter flowering eucalypts, such as forest red gum (<i>Eucalyptus tereticornis</i>) (DECC 2009b). The Swift Parrot is a highly mobile species able to utilise a variety of nectar sources over large areas (DECC 2009b). Potential habitat for the swift parrot to pass through or forage exists within the areas of Cumberland Plain Woodland, Shale Gravel Transition Forest, and Alluvial Woodland within the study area. <i>a. lead to a long-term decrease in the size of a population of a species, or</i> The MPIP study area provides potential foraging habitat for the swift parrot, winter flowering eucalypts, such as forest red gum (<i>Eucalyptus tereticornis</i>). Potential habitat offering similar foraging habitat is common within adjacent areas including Shane's Park, the RTA offset lands adjacent to the M7 Motorway, and the Bells Creek Riparian Corridor. Given that greater foraging habitat for the swift parrot occurs adjacent to the study area, the proposed layout plan and subsequent actions will not lead to a long-term decrease in the size of the population within the locality. <i>b. reduce the area of occupancy of a population, or</i> The proposed MPIP layout plan may impact upon the area of potential foraging habitat for the swift parrot within the study area, but it is unlikely to significantly affect the overall area of occupancy of the species within the locality. The amount of vegetation that will be impacted by the proposed action is relatively moderate (150ha) in comparison to better quality habitat for the swift parrot within the locality, including Shane's Park (475ha), the RTA offset lands adjacent to the M7 Motorway (56ha), and the Bells Creek Riparian Corridor (11ha). <i>c. fragment an existing population into two or more populations, or</i> The proposed MPIP layout plan will not fragment an existing population of the swift parrot into two or more populations. There have been no previous recordings of a swift parrot population within the proposed impacted area, and furthermore the habitat to be impacted is of relatively moderate quality, being potentially used as foraging habitat. Higher quality habitat for the swift parrot exists within Shane's Park (475ha), the RTA offset lands adjacent to the M7 Motorway (56ha), and the Bells Creek Riparian Corridor (11ha). <i>d. adversely affect habitat critical to the survival of a species, or</i> This species commonly inhabits south-eastern Australian forest and woodland in winter, foraging upon winter flowering eucalypt species.

Matters to be addressed	Impact (Commonwealth Legislation)
	The study area provides relatively moderate habitat potential for the swift parrot, given the fragmented nature of the remnants. The clearing of the potential habitat within the study area will not adversely affect habitat critical to the survival of the species in the locality, and will not significantly affect the overall survival of the species. The greatest potential habitat for the swift parrot within the study will be retained within the RTA offset lands adjacent to the M7 Motorway. <i>e. disrupt the breeding cycle of a population, or</i> The study area does not provide potential habitat for breeding, and therefore the proposed action will not disrupt the breeding cycle of a population. <i>f. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or</i> The proposed MPIP layout plan will remove approximately 150ha of remnant vegetation that potentially provides foraging habitat for the swift parrot. The removal of this vegetation is not likely to cause the decline of the species in the locality by reducing the availability of habitat, and is unlikely to cause an overall decline in the species. <i>g. result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*, or</i> The proposed MPIP layout plan is unlikely to result in invasive species that are harmful to the swift parrot becoming established in the remaining habitat in the locality. <i>h. interfere with the recovery of the species.</i> The proposed MPIP layout plan will clear areas of potential habitat that may be valuable to the swift parrot for foraging, but it will be unlikely to interfere substantially with the overall recovery of the species. Areas of greatest potential habitat within the study area will be retained as either the riparian corridor or conservation lands. <u>Spotted-tailed Quoll (<i>Dasyurus maculatus maculatus</i> (SE mainland population))</u> The spotted-tailed quoll has been 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 (DECC 2009c). Potential habitat for the spotted-tailed quoll to forage exists within the areas of Cumberland Plain Woodland, Shale Gravel Transition Forest, and Alluvial Woodland within the study area. <i>a. lead to a long-term decrease in the size of a population of a species, or</i> The proposed MPIP layout plan will remove vegetation that could be potentially used by the spotted-tailed quoll for foraging within the study area. Potential habitat offering similar foraging habitat is common within adjacent areas including Shane's Park, the RTA offset lands adjacent to the M7

Matters to be addressed	Impact (Commonwealth Legislation)
	Motorway, and the Bells Creek Riparian Corridor. Given that greater foraging habitat for the spotted-tailed quoll occurs adjacent to the study area, the proposed layout plan and subsequent actions will not lead to a long-term decrease in the size of the population within the locality. <i>b. reduce the area of occupancy of a population, or</i> The proposed MPIP layout plan may impact upon the area of potential foraging habitat by the spotted-tailed quoll within the study area, but it is unlikely to significantly affect the overall area of potential foraging habitat within the locality. The amount of vegetation that will be impacted by the proposed action is relatively moderate (150ha) in comparison to better quality habitat for the spotted-tailed quoll within the locality, including Shane's Park (475ha), the RTA offset lands adjacent to the M7 Motorway (56ha), and the Bells Creek Riparian Corridor (11ha). <i>c. fragment an existing population into two or more populations, or</i> The proposed MPIP layout plan will not fragment an existing population of the spotted-tailed quoll into two or more populations. There have been no previous recordings of a spotted-tailed quoll population within the proposed impacted area, and furthermore the habitat to be impacted is of relatively moderate quality, being potentially utilised for foraging. Greater quality habitat for the spotted-tailed quoll exists within Shane's Park (475ha), the RTA offset lands adjacent to the M7 Motorway (56ha), and the Bells Creek Riparian Corridor (11ha). <i>d. adversely affect habitat critical to the survival of a species, or</i> This species commonly inhabits range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. The study area provides potential habitat for the spotted-tailed quoll that has been subject to past and ongoing land uses that would disrupt any potential foraging habitat. The clearing of the potential habitat within the study area will not adversely affect habitat critical to the survival of the species in the locality, and will not significantly affect the overall survival of the species. The greatest potential habitat for the spotted-tailed quoll within the study will be retained within the RTA offset lands adjacent to the M7 Motorway. <i>e. disrupt the breeding cycle of a population, or</i> The study area does not provide potential habitat for breeding, given the lack of potential den sites including hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields, and rock-cliff faces. Therefore the proposed MPIP layout plan will not disrupt the breeding cycle of a population. <i>f. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or</i> The proposed MPIP layout plan will remove approximately 150ha of remnant vegetation that provides potential foraging habitat for the spotted-tailed quoll. The removal of this vegetation is not likely to cause the decline of the species

Matters to be addressed	Impact (Commonwealth Legislation)
	in the locality by reducing the availability of habitat, and is unlikely to cause an overall decline in the species. <i>g. result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*, or</i> The proposed MPIP layout plan is unlikely to result in invasive species that are harmful to the spotted-tailed quoll becoming established in the remaining habitat in the locality. <i>h. interfere with the recovery of the species.</i> The proposed MPIP layout plan will clear areas of potential foraging habitat that may be valuable to the spotted-tailed quoll, but it will be unlikely to interfere substantially with the overall recovery of the species. Areas of greatest potential habitat within the study area will be retained as either the riparian corridor or conservation lands. Endangered Ecological Communities <u>Cumberland Plain Woodland</u> Cumberland Plain Woodland (CPW) is an Endangered Ecological Community (EEC) that occurs from soils derived from Wianamatta Shale. This EEC can be found throughout the drier parts of the Sydney Basin (DECC 2009d). Shale Plains Woodland and Shale Hills Woodland are the two sub-communities of CPW. The Shale Plains Woodland form is the most widely spread of the two sub-communities and both can be found as small, isolated stands on well structured soils (DECC 2009d). CPW supports threatened endemic flora and endemic and migratory fauna species. Tree hollows are commonly found in the old growth canopy species, and are of high conservation value (DECC 2009d). <i>a. reduce the extent of the community, or</i> The proposed MPIP layout plan will remove vegetation associated with CPW from across the study area. The proposed MPIP layout plan will reduce the extent of CPW by 104ha, of which 81ha is of good condition and 23ha poor condition. The MPIP layout plan will also incorporate 31ha of CPW into a riparian corridor and conservation lands. The proposed MPIP layout plan will reduce the extent of CPW from within the study area by 104ha or 76%. <i>b. fragment or increase fragmentation of the community, for example by clearing vegetation for roads or transmission lines; or</i> The proposed MPIP layout plan will remove vegetation associated with CPW from across the study area. The proposed MPIP layout plan will reduce the extent of Cumberland Plain Woodland by 104ha, of which 81ha is of good condition and 23ha poor condition. The MPIP layout plan will also incorporate 31ha of CPW into a riparian corridor, recreational open space and conservation lands. The proposed MPIP layout plan will increase the fragmentation of CPW

Matters to be addressed	Impact (Commonwealth Legislation)
	remnants across the study area. The removal of CPW from within the study area will remove the linkages from remnant vegetation within Shan's Park to other areas within the study area, specifically the riparian corridor and the RTA offset lands adjacent to the M7 Motorway. <i>c. adversely affect habitat critical to the survival of an ecological community which consists of, or includes, fauna species; or</i> The proposed MPIP layout plan will remove vegetation associated with CPW from across the study area. The proposed MPIP layout plan will reduce the extent of Cumberland Plain Woodland by 104ha, of which 81ha is of good condition and 23ha poor condition. The MPIP layout plan will also incorporate 31ha of CPW into a riparian corridor, recreational open space and conservation lands. The proposed MPIP layout plan will affect habitat critical to the survival of CPW and associated faunal species, however large areas (31ha) of CPW will be retained as a riparian corridor, recreational open space and conservation lands under the proposed MPIP layout plan. The greatest faunal habitat potential of CPW remnants within the study area exists within the RTA offset lands adjacent to the M7 Motorway and will be retained. <i>d. modify or destroy abiotic (non-living) factors (such as water, nutrients or soil) necessary for the community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns; or</i> The proposed MPIP layout plan will impact upon 150ha of land within the study area. The drainage lines within the study area will be retained and enhanced. The proposed MPIP layout will not modify or destroy abiotic factors that are necessary to the retained CPW stands survival within the study area. <i>e. cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting; or</i> The proposed MPIP layout plan will remove approximately 104ha of CPW from within the study area. The majority of CPW that will be removed from the study has been impacted by historic and current land uses, which has lead to changes in the structural composition of the CPW. The remnants that will be retained as part of the MPIP layout will not be impacted and the species composition will be retained. <i>f. cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:</i> <i>• assisting invasive species, that are harmful to the listed ecological community, to become established; and</i> <i>• causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community; or</i> The proposed MPIP layout plan will impact upon CPW (104ha), however the areas that will be retained are unlikely to be impacted by invasive species that are harmful to the CPW, given the location of the remnants and ongoing management works as part of the riparian lands Vegetation Management Strategy. <i>g. interfere with the recovery of an ecological community.</i> The proposed MPIP layout plan will clear large areas of CPW from within the

Matters to be addressed	Impact (Commonwealth Legislation)
	study area, which will interfere substantially with the overall recovery of the ecological community within the locality. Vegetation remnants within the lands to be retained as a riparian corridor or conservation lands do not contain large amounts of CPW. However, these remnants contain areas of greatest potential recovery within the study area, given that have been restricted from current land uses within the study area. Vulnerable Species <u>Pultenaea parviflora</u> <i>Pultenaea parviflora</i> is an endemic flora species to the Cumberland Plain. This species may be locally abundant, particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. Flowering may occur between August and November depending on environmental conditions (DECC 2009e). Potential habitat for the <i>Pultenaea parviflora</i> exists within the areas of Shale Gravel Transition Forest within the study area. a. lead to a long-term decrease in the size of a population of a species, or This species has been recorded with the study area, within the RTA offset lands adjacent to the M7 Motorway. The proposed MPIP layout plan will remove vegetation that could potentially provide habitat for the <i>Pultenaea parviflora</i>. Potential habitat is common within adjacent areas including Shane's Park, and the RTA offset lands adjacent to the M7 Motorway. Given that greater habitat for the <i>Pultenaea parviflora</i> occurs adjacent to the study area, the proposed layout plan and subsequent actions will not lead to a long-term decrease in the size of the population within the locality. b. reduce the area of occupancy of a population, or The proposed MPIP layout plan may impact upon the area of potential habitat for the <i>Pultenaea parviflora</i> within the study area, but it is unlikely to significantly affect the overall area of potential habitat within the locality. The amount of vegetation that will be impacted by the proposed action is relatively small (48ha) in comparison to better quality habitat for the <i>Pultenaea parviflora</i> within the locality, including Shane's Park (280ha), and the RTA offset lands adjacent to the M7 Motorway (3.1ha). c. fragment an existing population into two or more populations, or The proposed MPIP layout plan will not fragment an existing population of the <i>Pultenaea parviflora</i> into two or more populations. There have been previous recordings of <i>Pultenaea parviflora</i> within the study area, however the proposed MPIP layout plan will not impact the areas of <i>Pultenaea parviflora</i>. Greater quality habitat for the <i>Pultenaea parviflora</i> exists within Shane's Park (280ha), and the RTA offset lands adjacent to the M7 Motorway (3.1ha). d. adversely affect habitat critical to the survival of a species, or This species is an endemic flora species to the Cumberland Plain. This species may be locally abundant, particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest. The

Matters to be addressed	Impact (Commonwealth Legislation)
	study area provides potential habitat for the <i>Pultenaea parviflora</i> that has been subject to past and ongoing land uses that would disrupt any potential habitat. The clearing of the potential habitat within the study area will not adversely affect habitat critical to the survival of the species in the locality, and will not significantly affect the overall survival of the species. The greatest potential habitat for the <i>Pultenaea parviflora</i> within the study will be retained within the RTA offset lands adjacent to the M7 Motorway. <i>e. disrupt the breeding cycle of a population, or</i> The study area does provide potential habitat for the <i>Pultenaea parviflora</i>, however the area to be impacted by the proposed MPIP layout plan has been previously impacted by various past and present land uses, where despite targeted searches for the <i>Pultenaea parviflora</i>, no specimens were identified. Therefore the proposed MPIP layout plan will not disrupt the breeding cycle of a population. <i>f. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or</i> The proposed MPIP layout plan will remove approximately 48ha of remnant vegetation that provides potential habitat for the <i>Pultenaea parviflora</i>. The removal of this vegetation is not likely to cause the decline of the species in the locality by reducing the availability of habitat, and is unlikely to cause an overall decline in the species. <i>g. result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*, or</i> The proposed MPIP layout plan is unlikely to result in invasive species that are harmful to the <i>Pultenaea parviflora</i> becoming established in the remaining habitat in the locality. <i>h. interfere with the recovery of the species.</i> The proposed MPIP layout plan is unlikely to interfere substantially with the recovery of the species. <u>Green and Golden Bell Frog (<i>Litoria aurea</i>)</u> Green and golden bell frogs are found in marshes, dams and stream-sides and their optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (<i>Gambusia holbrooki</i>), and have a grassy area nearby and diurnal sheltering sites available (DECC 2209f). Potential habitat for the green and golden bell frog to exist within the study area occurs within the farm dams and adjacent vegetation, and the alluvial Woodland. <i>a. lead to a long-term decrease in the size of a population of a species, or</i> This species has not been recorded with the study area. Potential habitat for the species exists within the study area and large proportion of potential habitat will be retained within the Bells Creek Riparian corridor, and other associated riparian areas. There are a number of dams within the study area that offer poor quality habitat that will be removed as a result of the proposed MPIP layout plan.

Matters to be addressed	Impact (Commonwealth Legislation)
	The retention of potential habitat within the riparian corridor and implementation of a riparian vegetation management strategy suggest that the proposal is unlikely to lead to a decrease in the size of an important population of the green and golden bell frog at the locality. <i>b. reduce the area of occupancy of a population, or</i> The proposed MPIP layout plan will remove a number of farm dams which currently do not appear to offer important habitat for the species. The retention and restoration of the riparian areas within the study area will lessen the impact of removing the farm dams on any local population. <i>c. fragment an existing population into two or more populations, or</i> The proposed MPIP layout plan is unlikely to fragment an existing important population into two or more populations <i>d. adversely affect habitat critical to the survival of a species, or</i> The proposed MPIP layout plan will impact a number of farm dams offering low quality habitat within the study area but will retain the riparian areas of which appear to offer good quality habitat for the species. As such, habitat affected is not considered critical to the survival of the species at the study area. <i>e. disrupt the breeding cycle of a population, or</i> The removal of farm dams within the study area has the potential to interrupt the breeding cycle of some individuals of the species, however, the retention of the riparian areas, offering the best quality habitat within the study area suggests that the breeding cycle of a population, if present, will not be significantly disrupted. <i>f. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or</i> The proposed MPIP layout plan will remove some low quality potential habitat; however, this is unlikely to result in the decline of the species within the study area or more broadly across the region. <i>g. result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*, or</i> The proposed MPIP layout plan will maintain and potentially improve green and golden bell frog habitat within the study area and is not likely to result in invasive species becoming established in the species habitat. The proposed MPIP layout plan may increase the probability of domestic cats occurring within the study area which would present a risk to green and golden bell frogs within the study area. All efforts must be made to exclude cats and dogs from the study area. <i>h. interfere with the recovery of the species.</i> The proposed MPIP layout plan is unlikely to interfere substantially with the recovery of the species. <u>Giant Burrowing Frog (<i>Heleioparus australiacus</i>)</u> The giant burrowing frog is a large, slow-moving frog that grows to about 10 cm long. It occurs from the NSW Central Coast to eastern Victoria, but is most common on Sydney sandstone. It has been found from the coast to the Great Dividing Range. The Giant Burrowing Frog can be found in heath, woodland

Matters to be addressed	Impact (Commonwealth Legislation)
	and open forest with sandy soils. It generally lives in heath or forest and will travel several hundred metres to creeks to breed (DECC 2009g). The giant burrowing frog is a burrowing species and often spends significant periods of time underground during unfavourable conditions and to avoid detection from predators during the day. Potential habitat for the green and golden bell frog to exist within the study area occurs within the farm dams and adjacent vegetation, and the alluvial Woodland. a. lead to a long-term decrease in the size of a population of a species, or The giant burrowing frog occurs in heaths, woodlands and forests with sandy soils, sometimes several hundred metres from water. After heavy rain, the species emerges from burrows to feed and breed. The species may potentially occur within the MPIP, although none have been recorded. The proposed MPIP layout plan will impact an area of potential habitat for the species and may inadvertently destroy individuals, but potential habitat within Shane's Park, the RTA offset lands adjacent to the M7 Motorway, and the Bells Creek Riparian Corridor will be not be impacted by the proposed MPIP layout plan. The species is not known to occur on study area, therefore it is unlikely that the proposed MPIP layout plan will lead to a long-term decrease in the size of an important population. b. reduce the area of occupancy of a population, or The proposed MPIP layout plan will remove area vegetation that do not appear to offer important habitat for the species. The retention and restoration of the riparian areas and the RTA offset lands adjacent to the M7 Motorway within the study area will lessen the impact of removing vegetation and farm dams from within the study area. c. fragment an existing population into two or more populations, or The proposed MPIP layout plan is unlikely to fragment an existing important population into two or more populations d. adversely affect habitat critical to the survival of a species, or The proposed MPIP layout plan will impact areas offering low quality potential habitat within the study area but will retain the riparian areas and the RTA offset lands adjacent to the M7 Motorway, of which appear to offer good quality habitat for the species. As such, habitat affected is not considered critical to the survival of the species at the study area. e. disrupt the breeding cycle of a population, or The proposal may remove potential habitat or individuals of this species. Surveys of the area did not identify the species. The species, should it occur, may require more rain for it to emerge from its burrows. Construction during the breeding season may disrupt resident frogs, but given that no frogs have been recorded within the study area, it could not be construed as an important population. However, the retention of the riparian areas and the RTA offset lands adjacent to the M7 Motorway, offering the best quality habitat within the study area suggests that the breeding cycle of a population, if present, will not be significantly disrupted.

Matters to be addressed	Impact (Commonwealth Legislation)
	<i>f. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or</i> The proposed MPIP layout plan will remove some low quality potential habitat; however, this is unlikely to result in the decline of the species within the study area or more broadly across the region. <i>g. result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*, or</i> The proposed MPIP layout plan will not result in the establishment of an invasive species that is harmful to the giant burrowing frog. <i>h. interfere with the recovery of the species.</i> The proposed MPIP layout plan is unlikely to interfere substantially with the recovery of the species. <u>Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>)</u> The grey-headed flying-fox was not recorded within the study area during the field survey. The grey-headed flying-fox utilises a wide variety of habitats (including disturbed areas) for foraging, and are recorded as travelling long distances on feeding forays (Churchill 1998). Potential habitat for the grey-headed flying-fox to forage, or pass through, exists across the entire study area. <i>a. lead to a long-term decrease in the size of a population of a species, or</i> The proposed MPIP layout plan will remove vegetation that could be potentially used by the grey-headed flying-fox as habitat to forage or pass through. Potential habitat offering similar foraging habitat is common within adjacent areas including Shane's Park, the RTA offset lands adjacent to the M7 Motorway, and the Bells Creek Riparian Corridor. Given that greater foraging habitat for the grey-headed flying fox occurs adjacent to the study area, the proposed layout plan and subsequent actions will not lead to a long-term decrease in the size of the population within the locality. <i>b. reduce the area of occupancy of a population, or</i> The proposed MPIP layout plan may affect the area of occupancy by the grey-headed flying-fox within the study area, but it is unlikely to significantly affect the overall area of occupancy of the species. The amount of vegetation that will be impacted by the proposed MPIP layout plan is relatively moderate (150ha) in comparison to better quality habitat for the grey-headed flying-fox within the locality. The better quality habitat within the locality includes Shane's Park (475ha), the RTA offset lands adjacent to the M7 Motorway (56ha), and the Bells Creek Riparian Corridor (32ha). <i>c. fragment an existing population into two or more populations, or</i> The proposed MPIP layout plan will not fragment an existing population of the grey-headed flying-fox into two or more populations. The grey-headed flying-fox can travel up to 50 km during nightly feeding forays and can migrate up to 750 km during winter migrations (Churchill 1998). Given the high mobility of this species it is unlikely that areas of habitat will be fragmented or isolated.

Matters to be addressed	Impact (Commonwealth Legislation)
	There have been no previous recordings of a grey-headed flying-fox population camping within the proposed MPIP layout plan, and furthermore the habitat to be impacted is of relatively low quality, being utilised for foraging or to pass through. <i>d. adversely affect habitat critical to the survival of a species, or</i> This species commonly forages on fruits and flowering plants of a wide variety of species are the main food source. The study area provides relatively low habitat potential for the grey-headed flying-fox, given the fragmented nature of the remnants. The clearing of the potential habitat within the study area will not adversely affect habitat critical to the survival of the species in the locality, and will not significantly affect the overall survival of the species. Furthermore, greater quality habitat for foraging purposes exists within the locality, including Shane's Park (475ha), the RTA offset lands adjacent to the M7 Motorway (56ha), and the Bells Creek Riparian Corridor (32ha). <i>e. disrupt the breeding cycle of a population, or</i> The study area does not provide potential habitat for breeding, given that this species roosts in large 'camps' of up to 200 000 individuals, and that camps are usually formed close to water and along gullies however the species has been known to form camps in urban areas (Churchill 1998). Therefore, the proposed MPIP layout plan will not disrupt the breeding cycle of a population. <i>f. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or</i> The proposed MPIP layout plan will remove approximately 150ha of remnant vegetation that potentially provides habitat for the grey-headed flying-fox to pass through or forage. The removal of this vegetation is not likely to cause the decline of the species in the locality by reducing the availability of habitat, and is unlikely to cause an overall decline in the species. <i>g. result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*, or</i> The proposed MPIP layout plan is unlikely to result in invasive species that are harmful to the grey-headed flying-fox becoming established in the remaining habitat in the locality. <i>h. interfere with the recovery of the species.</i> The proposed MPIP layout plan will clear an area of low quality habitat that may be valuable to the grey-headed flying-fox to pass through, but it will be unlikely to interfere substantially with the overall recovery of the species. <u>Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>)</u> Large-eared Pied-bats are found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW (DECC 2009). Potential habitat for the large-eared pied-bat to forage, or pass through, exists

Matters to be addressed	Impact (Commonwealth Legislation)
	across the entire study area. a. lead to a long-term decrease in the size of a population of a species, or The proposed MPIP layout plan will remove vegetation that could be used by the large-eared pied-bat as potential habitat to foraging or to pass through the study area. Potential habitat offering similar foraging habitat is common within adjacent areas including Shane's Park, the RTA offset lands adjacent to the M7 Motorway, and the Bells Creek Riparian Corridor. Given that greater foraging habitat for the large-eared pied-bat occurs adjacent to the study area, the proposed layout plan and subsequent actions will not lead to a long-term decrease in the size of the population within the locality. b. reduce the area of occupancy of a population, or The proposed MPIP layout plan may affect the area of occupancy by the large-eared pied-bat within the study area, but it is unlikely to significantly affect the overall area of occupancy of the species. The amount of vegetation that will be impacted by the proposed MPIP layout plan is relatively moderate (150ha) in comparison to better quality habitat for the large-eared pied bat within the locality. The better quality habitat within the locality includes Shane's Park (475ha), the RTA offset lands adjacent to the M7 Motorway (56ha), and the Bells Creek Riparian Corridor (32ha). c. fragment an existing population into two or more populations, or The proposed MPIP layout plan will not fragment an existing population of the large-eared pied-bat into two or more populations. Given the high mobility of this species it is unlikely that areas of habitat will be fragmented or isolated. There have been no previous recordings of a large-eared pied-bat population within the proposed MPIP layout plan, and furthermore the habitat to be impacted is of relatively low quality, being utilised for foraging or to pass through. d. adversely affect habitat critical to the survival of a species, or This species is commonly found in well-timbered areas containing gullies and probably forage for small, flying insects below the forest canopy (DECC 2009h). The study area provides relatively moderate habitat potential for the large-eared pied-bat, given the fragmented nature of the remnants. The clearing of the potential habitat within the study area will not adversely affect habitat critical to the survival of the species in the locality, and will not significantly affect the overall survival of the species. Furthermore, greater quality habitat for foraging purposes exists within the locality, including Shane's Park (475ha), the RTA offset lands adjacent to the M7 Motorway (56ha), and the Bells Creek Riparian Corridor (32ha). e. disrupt the breeding cycle of a population, or This species roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (<i>Hirundo ariel</i>), frequenting low to mid-elevation dry open forest and woodland close to these features (DECC 2009c). The study area does not provide potential habitat for roosting, and therefore

Matters to be addressed	Impact (Commonwealth Legislation)
	the proposed action will not disrupt the breeding cycle of a population. <i>f. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or</i> The proposed MPIP layout plan will remove approximately 150ha of remnant vegetation that potentially provides habitat for the large-eared pied-bat to pass through or forage. The removal of this vegetation is not likely to cause the decline of the species in the locality by reducing the availability of habitat, and is unlikely to cause an overall decline in the species. <i>g. result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*, or</i> The proposed action is unlikely to result in invasive species that are harmful to the large-eared pied-bat becoming established in the remaining habitat in the locality. <i>h. interfere with the recovery of the species.</i> The proposed action will impact an area of low quality habitat that may be valuable to the large-eared pied-bat to forage or pass through, but it will be unlikely to interfere substantially with the overall recovery of the species.
(c) any environmental impact on Commonwealth Listed Migratory Species;	Yes, but impact will be minor and not result in significant impacts to these species. Six Commonwealth listed migratory species are considered to potentially occur within the study area, including: • White-bellied Sea Eagle (<i>Haliaeetus leucogaster</i>) • Great Egret (<i>Ardea alba</i>) • Cattle Egret (<i>Ardea ibis</i>) • Latham's Snipe (<i>Gallinago hardwickii</i>) • Painted Snipe (<i>Rostratula benghalensis s. lat.</i>) • Fork-tailed Swift (<i>Apus pacificus</i>) <u>White-bellied Sea Eagle (<i>Haliaeetus leucogaster</i>)</u> <i>a. Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.</i> Established pairs of the white-bellied sea eagle can be usually found maintaining a territory in coastal areas or flooded inland swamps, lagoons and floodplains. This species also often occurs far inland along major rivers. The proposed MPIP layout plan will not significantly modify habitat for this species, therefore it is not considered likely that the works will modify, destroy or isolate a substantial area of habitat. <i>b. Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.</i> The current proposed MPIP layout plan will not result in the establishment of an invasive species that is harmful to the white-bellied sea-eagle.

Matters to be addressed	Impact (Commonwealth Legislation)
	<i>c. Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.</i> The proposed MPIP layout plan occurs will impact upon potential habitat for the white-bellied sea-eagle, however given the potential habitat to be impacted and the potential habitat to be retained as either the riparian corridor or conservation lands, there should not disruption to the lifecycle of the white-bellied sea eagle. <u>Great Egret (<i>Ardea alba</i>)</u> <i>a. Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.</i> Great egrets occur throughout most of the world. They are common throughout Australia, with the exception of the most arid areas. This species prefers shallow water, particularly when flowing, but may be seen on any watered area, including damp grasslands. The proposed MPIP layout plan will not significantly modify habitat for this species, therefore it is not considered likely that the works will modify, destroy or isolate a substantial area of habitat. <i>b. Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.</i> The current proposed MPIP layout plan will not result in the establishment of an invasive species that is harmful to the great egret. <i>c. Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.</i> The proposed MPIP layout plan occurs will impact upon potential habitat for the great egret, however given the potential habitat to be impacted and the potential habitat to be retained as either the riparian corridor or conservation lands, there should not disruption to the lifecycle of the great egret. <u>Cattle Egret (<i>Ardea ibis</i>)</u> <i>a. Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.</i> The cattle egret, forages in moist pasture with tall grass as well as shallow open wetlands and margins. This species also utilises mudflats. The proposed MPIP layout plan will not significantly modify habitat for this species, therefore it is not considered likely that the works will modify, destroy or isolate a substantial area of habitat. <i>b. Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.</i> The proposed MPIP layout plan will not result in the establishment of an invasive species that is harmful to the cattle egret. <i>c. Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the</i>

Matters to be addressed	Impact (Commonwealth Legislation)
	<i>population of a migratory species.</i> The proposed MPIP layout plan occurs will impact upon potential habitat for the cattle egret, however given the potential habitat to be impacted and the potential habitat to be retained as either the riparian corridor or conservation lands, there should not disruption to the lifecycle of the cattle egret. <u>Latham's Snipe (<i>Gallinago hardwickii</i>)</u> <i>a. Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.</i> The Latham's Snipe is a non-breeding migrant to the south east Australia. This species are seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration. The proposed MPIP layout plan will not significantly modify habitat for this species, therefore it is not considered likely that the works will modify, destroy or isolate a substantial area of habitat. <i>b. Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.</i> The proposed MPIP layout plan will not result in the establishment of an invasive species that is harmful to the latham's snipe. <i>c. Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.</i> The proposed MPIP layout plan occurs will impact upon potential habitat for the latham's snipe, however given the potential habitat to be impacted and the potential habitat to be retained as either the riparian corridor or conservation lands, there should not disruption to the lifecycle of the latham's snipe. <u>Painted Snipe (<i>Rostratula benghalensis s. lat.</i>)</u> <i>a. Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.</i> The Painted Snipe has a scattered distribution in Australia, primarily occurring along the east coast. This species inhabits inland and coastal shallow freshwater wetlands, occurring in both ephemeral and permanent wetlands, particularly where there is grass. Individuals have been spotted in artificial dams, sewage ponds and waterlogged grasslands. The proposed MPIP layout plan will not significantly modify habitat for this species, therefore it is not considered likely that the works will modify, destroy or isolate a substantial area of habitat. <i>b. Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.</i> The proposed MPIP layout plan will not result in the establishment of an invasive species that is harmful to the painted snipe. <i>c. Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the</i>

Matters to be addressed	Impact (Commonwealth Legislation)
	<i>population of a migratory species.</i> The proposed MPIP layout plan occurs will impact upon potential habitat for the painted snipe, however given the potential habitat to be impacted and the potential habitat to be retained as either the riparian corridor or conservation lands, there should not disruption to the lifecycle of the painted snipe. <u>Fork-tailed Swift (<i>Apus pacificus</i>)</u> <i>a. Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.</i> The fork-tailed swift utilises low to very high airspace over varied habitat from rainforest to semi-desert. It is most active ahead of summer storms. This species stays on the wing day and night, sleeping in high circling flocks, often scooping water from inland lakes and pools. The proposed MPIP layout plan will not significantly modify habitat for this species, therefore it is not considered likely that the works will modify, destroy or isolate a substantial area of habitat. <i>b. Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.</i> The proposed MPIP layout plan will not result in the establishment of an invasive species that is harmful to the fork-tailed swift. <i>c. Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.</i> Due to the large home and habitat range of this species, and the small amount of potential habitat within Western Sydney of habitat disturbance this proposal may create the lifecycle of the fork-tailed swift should not be disrupted.
(d) does any part of the Proposal involve a Nuclear Action;	No. The project does not include a Nuclear Action.
(e) any environmental impact on a Commonwealth Marine Area;	No. There are no Commonwealth Marine Areas within the study area.
In addition, any direct or indirect effect on Commonwealth land.	No. The project does not directly or indirectly affect Commonwealth land.