



LOT 1 DP1181666 FLORA AND FAUNA REVIEW

Penrith Lakes Development Corporation - Environment and
Community





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1.0 INTRODUCTION

Penrith Lakes Development Corporation (PLDC) has prepared this Flora and Fauna assessment of the site known as Lot 1, DP1181666 (Lewis Lagoon) which is a portion of land within the PLDC Scheme area located between Wilchard Road West and Castlereagh Road in Castlereagh, NSW (see Figure 1).

The purpose of this Report is to identify any impacts arising from the positioning of building envelopes to allow the lot to be used as rural residential properties.

Lot 1 combined is approximately 5.79 hectares in size and has road access from Wilchard Road West and Castlereagh Road. The sites topography consists of land sloping away to the western boundary with an approximate 11 metre height differential to the New Castlereagh boundary.

The site was part of the early European settlement history of Castlereagh, cleared and used for an orchard and animal production from around the 1870's until it became incorporated within the Penrith Lakes Scheme. It was subsequently absorbed into PLDC ownership and leased as grazing lands until the southern portion was quarried under the Penrith Lakes Scheme - Development Approval No 4.

The vegetation within the proposed building envelope at Lot 1 consists of pasture and native grass lands along with a pocket of native vegetation containing an upper canopy and understorey.

1.1 AIMS OF THE REPORT

The aim of this document is to:

- Provide an assessment of the habitat available to flora and fauna at the Escarpment,
- Outline any legislative limitations for the site,
- Outline opportunities and constraints for the sites future proposed use, and
- Assess the impacts of any proposed development.

2.0 LEGISLATION

2.1 THREATENED SPECIES CONSERVATION ACT 1995

The Threatened Species Conservation Act 1995 (TSC Act) commenced on 1 January 1996 and replaced the Endangered Fauna (Interim Protection) Act 1991. The Office of Environment and Heritage (OEH) is responsible for administering the TSC Act, which aims to protect species, populations and ecological communities threatened with extinction in NSW.

The main objectives of the TSC Act are to

- conserve biological diversity and promote sustainable development;
- prevent the extinction of native plants and animals;
- protect habitat that is critical to the survival of endangered species;
- eliminate or manage threats to biodiversity;
- properly assess the impact of development on threatened species; and
- encourage cooperative management in the conservation of threatened species.

2.2 RURAL FIRES AMENDMENT (VEGETATION CLEARING) BILL 2014.

2.2.1 10/50 Vegetation Clearing Code of Practice

This Code of Practice is known as the 10/50 Vegetation Clearing Code of Practice for New South Wales (the 10/50 Code) and has been prepared in accordance with section 100Q of the Rural Fires Amendment (Vegetation Clearing) Bill 2014.

This 10/50 Code has been developed to provide for vegetation clearing work to be carried out in certain areas near residential accommodation or high-risk facilities to reduce the risk of bush fire.

The Code permits landowners in the 10/50 vegetation clearing entitlement area to clear on their own land, trees within 10 metres and underlying vegetation (other than trees) such as shrubs within 50 metres to an external wall of a building containing habitable rooms that comprises or is part of residential accommodation or a high-risk facility.

This Code applies to lands within Lot 1.

2.3 COMMONWEALTH ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (EPBC ACT)

The Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) commenced on 16 July 2000 and replaced the Environment Protection (Impact of Proposals) Act 1974, the Endangered Species Protection Act 1992, the National Parks and Wildlife Conservation Act 1975, World Heritage Properties Conservation Act 1983 and the Whale Protection Act 1980.

The Act enables the Commonwealth to join with the States (including Territories) in providing a truly national scheme of environmental protection and biodiversity conservation, recognising our responsibility to not only this generation, but also future generations. It does so by providing for Commonwealth leadership on the environment, while also recognising and respecting the responsibility of the States for delivering on-ground natural resource management.

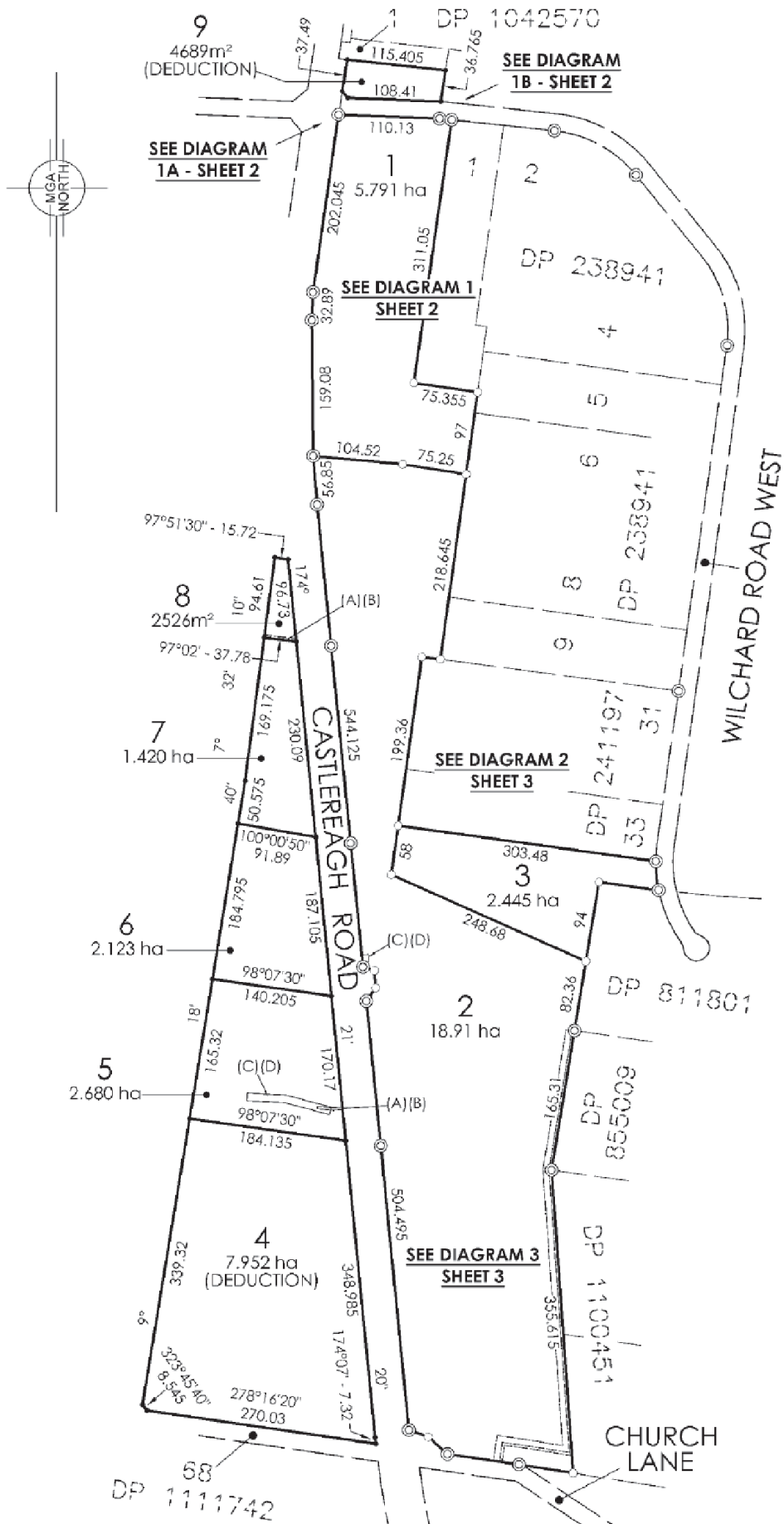


Figure 1: DP1181666 and its components.

3.0 EXISTING FLORA AND FAUNA

Lot1 lies at the northern boundary of DP1181666. There is a wetland system approximately a hectare in size consisting of two bodies of open water connected by a shallow channel. Vegetation within the proposed disturbance area consists of native canopy species with an understorey containing a thin shrub layer and a ground stratum made up of a mix of native and exotic species. Lot 1 is identified as containing degraded Shale Plains Woodland in Map 11 of 16 of the NSW NPWS Native Vegetation of the Cumberland Plain, Western Sydney (2002).

The Wetlands were originally part of a chain of ponds running along the base of the escarpment. This riparian zone effectively divided the Sydney Coastal River-flat Forest of the Nepean river flood plain from the drier Castlereagh Ironbark Forest to the north. Remnant vegetation present on site is a transition between Alluvial Woodland (sub unit of Sydney Coastal River-flat Forest) and Castlereagh Ironbark Forest.

Cooks River/Castlereagh Ironbark Forest is listed as an endangered ecological community under the *Threatened Species Conservation Act* 1995. (NSW NPWS 2004a)

Vegetation on the hillside is consistent with that found in Alluvial Woodland and Castlereagh Ironbark Forest with areas of reasonably complete canopy of *Acacia parramattensis* and *Eucalyptus crebra* along with a specimen of *Melaleuca linarifolia*. The shrub stratum consists of scattered *Bursaria spinosa* and *Daviesia squarrosa* along with the non endemic Australian native *Geijera parviflora*. Amongst the thicker vegetation native grasses such as *Microlaena stipoides* and *Oplismenus aemulus* dominate though once in the open exotic pasture species dominate. Many other native species are scattered throughout the site including *Einadia hastata*.

A number of trees and shrubs have been planted along the shoreline of the open water body and have not been included in Table 1.

On the flat areas *Carex appressa* is the dominant native before making way for wetland species more capable of surviving inundation. Exotic pasture makes up the majority of cover on the lower flat areas.

Table 1 Native flora species of Lot 1 DP1181666

SCIENTIFIC NAME	COMMON NAME
Trees	
<i>Acacia deccurrens</i>	Golden Wattle
<i>Acacia parramattensis</i>	Parramatta Wattle
<i>Eucalyptus crebra</i>	narrow Leaf Ironbark
<i>Melaleuca linarifolia</i>	Snow in Summer
Shrubs	
<i>Amyema gaudichaudii</i>	Mistletoe
<i>Bursaria spinosa</i>	Blackthorn
<i>Daviesia squarrosa</i>	Bitter pea
Ground stratum	
<i>Carex appressa</i>	Sedge
<i>Comelina cyanea</i>	Creeping Christian
<i>Cotula australis</i>	Cotula
<i>Cynodon dactylon</i>	Couch
<i>Dianella revolutum</i>	Flax Lilly
<i>Dichondra repens</i>	Kidney Weed
<i>Einadia hastata</i>	Saloop
<i>Glycine tabacina</i>	Glycine
<i>Microlaena stipoides</i>	Weeping Meadow Grass
<i>Oplismenus aemulus</i>	Basket Grass

<i>Oxalis corniculata</i>	Yellow Sorrel
<i>Whalanbergia communis</i>	Bluebell
<i>Whalanbergia gracilis</i>	Bluebell
Ferns	
<i>Calochlaena dubia</i>	Soft Bracken Fern
Climbers	
<i>Glycine tabacina</i>	Variable Glycine
<i>Hardenbergia violacea</i>	Happy Wanderer

Forty four non endemic species primarily environmental weeds have been recorded from the site; these are identified in Table 2. Seven of these species are declared weeds under the NSW Noxious Weeds Act 1993.

Table 2 Non endemic flora species of Lot 1 DP1181666

SCIENTIFIC NAME	COMMON NAME	NOXIOUS WEED CATEGORY
<i>Anagallis arvensis</i>	Blue Pimpernel	
<i>Araujia hortorum</i>	Moth Vine	
<i>Bambusa sp</i>	Bamboo	
<i>Bidens pilosa</i>	Cobblers Pegs	
<i>Briza minor</i>	Shaking Grass	
<i>Bromus sp</i>	Brome grass	
<i>Bryophyllum delagoense</i>	Mother of Millions	3
<i>Cerastium fontanum</i>	Mouse Eared Chickweed	
<i>Cestrum parqui</i>	Green Cestrum	3
<i>Chloris gayana</i>	Rhodes Grass	
<i>Cirsium vulgare</i>	Spear Thistle	
<i>Conyza bonariensis</i>	Fleabane	
<i>Cyclospermum leptophyllum</i>	Slender Celery	
<i>Cyprus eragrostis</i>	Umbrella Sedge	
<i>Ehrharta erecta</i>	Panic Veldtgrass	
<i>Eleocharis parvula</i>	Hairgrass	
<i>Eragrostis curvula</i>	African Lovegrass	
<i>Freesia x hybrida</i>	Freesia	
<i>Fumaria muralis</i>	Smokeweed	
<i>Geijera parviflora</i>	Wilga	
<i>Gleditsia triacanthos</i>	Honey Locust	
<i>Hypochoeris radicata</i>	Cats Ears	
<i>Lactuca serriola</i>	Prickly Lettuce	
<i>Lantana camara</i>	Lantana	5
<i>Ligustrum lucidum</i>	Large Leaf Privet	4
<i>Lolium sp</i>	Rye Grass	
<i>Lonicera japonica</i>	Japanese Honeysuckle	
<i>Lotus corniculatus</i>	Birdsfoot Trefoil	
<i>Lycium ferocissimum</i>	African Box Thorn	4
<i>Lysimachia monelli</i>	Blue Pimpernel	
<i>Modiola carolinianensis</i>	Red Flowered Mallow	
<i>Paspalum dilatatum</i>	Paspalum	
<i>Pavonia hastate</i>	Pavonia	
<i>Pennisetum clandestinum</i>	Kikuyu	
<i>Phytolacca octandra</i>	Inkweed	
<i>Plantago lanceolatum</i>	Long Leaf Plantain	
<i>Pyrostegia venusta</i>	Orange Trumpet Vine	
<i>Rubus fruticosus</i>	Blackberry	4
<i>Rumex sp</i>	Dock	
<i>Senecio madagascariensis</i>	Fireweed	4
<i>Setaria sp</i>	Pigeon Grass	
<i>Sida rhombifolia</i>	Paddy's Lucerne	
<i>Solanum mauritianum</i>	Wild Tobacco Tree	

<i>Solanum jasminoides</i>	Potato Vine	
<i>Solanum nigrum</i>	Nightshade	
<i>Solanum pseudocapsicum</i>	Jerusalem Cherry	
<i>Soliva sessilis</i>	Bindii	
<i>Sonchus Oleraceus</i>	Sow Thistle	
<i>Sporobolus sp</i>	Rats Tail Grass	
<i>Tagetes minuta</i>	Stinking Roger	
<i>Tradescantia albifolia</i>	Wandering Jew	
<i>Trifolium repens</i>	White Clover	
<i>Verbena bonariensis</i>	Purple Tops	
<i>Vicia sativa</i>	Vetch	
<i>Vulpia sp</i>	Fescue	

Data from the BioNet Atlas of NSW Wildlife website, which holds records from a number of custodians, returned a total of 699 records of 31 species recorded since 01 Jan 2000 until 23 Sep 2015 which are considered to be threatened (listed on TSC Act 1995).

Due to the selected search area 10km search parameter [North: -33.61 West: 150.61 East: 150.71 South: -33.72], a number of these species are found in different habitats/plant communities to those found within Lot 1.

Fauna habitat on the hillside is provided in the form of areas of dense vegetation, logs and other debris on the ground. The condition of the understorey and ground habitat along the areas provides value for ground based fauna and care should be taken to conserve habitat to improve potential for threatened fauna species survival. Potential habitat exists on site for threatened and migratory species.

A frog survey was conducted in December 2010 by Arthur White. During this survey five frog species were found within DP1181666. All five species are locally abundant.

Table 3 Frogs observed within DP1181666.

WETLAND	TADPOLES FOUND	20 DEC. 2010	22 DEC. 2010
West Wilchard Wetland (North)	Nil	Litoria fallax Litoria tyleri	Litoria fallax Litoria tyleri Litoria peroni Limno. peroni
West Wilchard Wetland (South)	Nil	Litoria fallax	Litoria fallax Limno tasmaniensis
Lewis Lagoon	Limno. peroni	Limno. peroni	Limno. peroni

No surveys have been conducted for reptiles or mammals at this site and records are based on observations of trained and suitably qualified bush regenerators from Muru Mittigar Indigenous Rangers.

Although no Fauna species protected by the Environmental Protection and Biodiversity Conservation Act 1999 have been observed at Lot 1, a wide variety of fauna are present within the Lewis Lagoon and Wildlife Lake dedication precincts including 116 bird, 9 frog, and 3 reptile species.

All native birds, reptiles, amphibians and mammals, except the dingo, are protected in NSW by the National Parks and Wildlife Act 1974. Land-based invertebrate (insects, snails etc) species are not protected by law in NSW, unless they are listed as threatened.

Table 4 Reptiles observed within Lot 1.

SCIENTIFIC NAME	COMMON NAME	STATUS
<i>Tiliqua scinoides</i>	Eastern Blue Tongue Lizard	
<i>Pseudechis porphyriacus</i>	Red bellied Black Snake	

<i>Lampropholis guichenoti</i>	Garden Skinks	
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Table 5: Birds observed within the Lewis Lagoon and Wildlife Lake dedication precincts.

SCIENTIFIC NAME	COMMON NAME	STATUS
<i>Acanthiza chrysorrhoa</i>	Yellow rumped thornbill	
<i>Acanthiza nana</i>	Yellow thornbill	
<i>Accipiter fasciatus</i>	Brown goshawk	
<i>Accipiter novaehollandiae</i>	Grey goshawk	
<i>Acridotheres tristis</i>	Common Myna	Exotic
<i>Acrocephalus stentoreus</i>	Clamorous reed warbler	
<i>Anas castanea</i>	Chestnut teal	
<i>Anas gracilis</i>	Grey teal	
<i>Anas platyrhynchos</i>	Magpie lark	
<i>Anas rhynchotis</i>	Australian shoveller	
<i>Anas superciliosa</i>	Pacific black duck	
<i>Anthochaera carunculata</i>	Red wattlebird	
<i>Anthus novaeseelandiae</i>	Richards pipit	
<i>Aquila audax</i>	Wedge tail eagle	
<i>Ardea ibis</i>	Cattle egret	Migratory
<i>Ardea novaehollandiae</i>	White faced heron	
<i>Ardea pacifica</i>	White necked heron	
<i>Aythya australis</i>	Hardhead	
<i>Cacatua galerita</i>	Sulphur crested cockatoo	
<i>Cacatua roseicapilla</i>	Galah	
<i>Cacatua sanguinea</i>	Little Corella	
<i>Cacomantis flabelliformis</i>	Fan tailed cuckoo	
<i>Calyptorhynchus funereus</i>	Yellow tailed black cockatoo	
<i>Carduelis carduelis</i>	European goldfinch	Exotic
<i>Chenonetta jubata</i>	Australian woodduck	
<i>Chlidonias hybridus</i>	Whiskered Tern	
<i>Chrysococcyx basalis</i>	Horsefields bronze cuckoo	Migratory
<i>Circus assimilis</i>	Spotted harrier	Vulnerable NSW TSC Act
<i>Cisticola exilis</i>	Golden headed cisticola	
<i>Colluricincla harmonica</i>	Grey shrike thrush	
<i>Columba livia</i>	Rock dove	Exotic
<i>Coracina novaehollandiae</i>	Black faced cuckoo shrike	
<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>	Kookaburra	
<i>Daphoenositta chrysoptera</i>	Varied sitella	Vulnerable NSW TSC Act
<i>Dicaeum hirundinaceum</i>	Mistletoe bird	
<i>Egretta alba</i>	Great egret	Migratory
<i>Egretta garzetta</i>	Little egret	
<i>Egretta intermedia</i>	Intermediate egret	
<i>Elanus axillaris</i>	Black shouldered kite	
<i>Euseyornis melanops</i>	Black fronted dotteral	
<i>Eopsaltria australis</i>	Eastern yellow robin	
<i>Erythrogenys cinctus</i>	Red Kneed dotteral	
<i>Eudynamis scolopacea</i>	Common koel	Migratory
<i>Eurystomus orientalis</i>	Dollarbird	Migratory
<i>Falco berigora</i>	Brown falcon	
<i>Falco cenchroides</i>	Nankeen kestrel	
<i>Falco longipennis</i>	Hobby	
<i>Falco peregrinus</i>	Peregrine falcon	
<i>Fulica atra</i>	Eurasian coot	
<i>Gallinula tenebrosa</i>	Dusky moorhen	
<i>Geopelia humeralis</i>	Bar shouldered dove	
<i>Geopelia striata</i>	Peaceful dove	
<i>Gerygone olivacea</i>	White throated gerygone	Migratory
<i>Grallina cyanoleuca</i>	Long billed corella	
<i>Gymnorhina tibicen</i>	Magpie	
<i>Haliaeetus leucogaster</i>	Sea eagle	
<i>Himantopus himantopus</i>	Black winged stilt	
<i>Hirundo ariel</i>	Fairy martin	
<i>Hirundo neoxena</i>	Welcome swallow	
<i>Lichenostomus penicillatus</i>	White plumed honeyeater	
<i>Lonchura castaneothorax</i>	Chestnut breasted manikin	
<i>Lonchura punctulata</i>	Nutmeg manikin	Exotic
<i>Malacorhynchus membranaceus</i>	Pink eared duck	Nomadic
<i>Malurus cyaneus</i>	Superb fairy wren	
<i>Manorina melanocephala</i>	Noisy minor	
<i>Manorina melanophrys</i>	Bell minor	
<i>Meliphaga lewinii</i>	Lewins honeyeater	
<i>Merops ornatus</i>	Rainbow bee eater	Migratory

<i>Microeca fascinans</i>	Jacky Winter	
<i>Neochmia temporalis</i>	Red browed finch	
<i>Ocyphaps lophotes</i>	Crested pigeon	
<i>Oriolus sagittatus</i>	Olive backed oriole	
<i>Pachycephala pectoralis</i>	Golden whistler	
<i>Pachycephala rufiventris</i>	Rufous whistler	
<i>Pardalotus punctatus</i>	Spotted pardalote	
<i>Passer domesticus</i>	House sparrow	Exotic
<i>Pelecanus conspicillatus</i>	Pelican	
<i>Phalacrocorax carbo</i>	Great cormorant	
<i>Phalacrocorax melanoleucos</i>	Little pied cormorant	
<i>Phalacrocorax sulcirostris</i>	Little black cormorant	
<i>Phalacrocorax varius</i>	Pied cormorant	
<i>Philemon corniculatus</i>	Noisy friarbird	
<i>Phylidonyris novaehollandiae</i>	New holland honeyeater	
<i>Platalea flavipes</i>	yellow billed spoonbill	
<i>Platalea regia</i>	royal spoonbill	
<i>Platycercus eximius</i>	Eastern rosella	
<i>Plegadis falcinellus</i>	Glossy Ibis	Migratory
<i>Podiceps cristatus</i>	Great crested grebe	
<i>Poliiocephalus poliocephalus</i>	Hoary headed grebe	
<i>Porphyrio porphyrio</i>	Purple swamphen	
<i>Porzana pusilla</i>	Baillons crane	
<i>Porzana tabuensis</i>	Spotless crane	
<i>Psephotus haematonotus</i>	Red rumped parrot	
<i>Psophodes olivaceus</i>	Eastern whipbird	
<i>Pycnonotus jocosus</i>	Red whiskered bulbul	Exotic
<i>Rhipidura fuliginosa</i>	Grey fantail	
<i>Rhipidura leucophrys</i>	Willie wagtail	
<i>Scythrops novaehollandiae</i>	Channel billed cuckoo	Migratory
<i>Sericornis frontalis</i>	White browed scrubwren	
<i>Smicrornis brevirostris</i>	Weebill	
<i>Strepera graculina</i>	Pied currawong	
<i>Streptopelia chinensis</i>	Spotted turtle dove	Exotic
<i>Sturnus vulgaris</i>	Starling	Exotic
<i>Tachybaptus novaehollandiae</i>	Australasian grebe	
<i>Taeniopygia bichenovii</i>	Double barred finch	
<i>Taeniopygia guttata</i>	Zebra finch	

<i>Threskiornis molucca</i>	White ibis	
<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	

4.0 IMPACT ASSESSMENT

Generally speaking the building envelope has been designed to take advantage of the open area which formerly contained a large clump of bamboo as a potential building location. The lot layout, cut and fill area and indicative building envelope for the proposed lot can be seen in Figure 4.

Due to the presence of listed species in the region, the habitat quality of the site and the connection to larger areas of native vegetation in the surrounding area, there is the potential to impact upon Endangered Ecological Communities and threatened species through the development of this site. Seven Part tests have been conducted and can be found in Appendix A. Actions to prevent impacts are outlined below.

4.1 ON-SITE SEWAGE MANAGEMENT

Envirotech Pty Ltd was engaged by PLDC to undertake an onsite sewage management (OSM) study to investigate the relevant site, soil, public health and economic factors that can impact on the selection, location and design of an on-site wastewater management system should residential development occur in the future. The study was prepared in accordance with:

- Australian Standard AS1547: 2012 "On-site Domestic Wastewater Management"
- Dept. Local Government 1998, On-site Sewage Management for Single Households,
- Relevant Council Development Control Policies

Based on soil analysis and the assumption that there is only one house with up to 6 residents, a NSW Health accredited (or equivalent) Aerated Wastewater Treatment System (AWTS) consisting of a conventional piped absorption trench 0.6m wide and 30m long (2 trenches at 15 m long each spaced 1m apart), will be required to produce a high quality effluent produced suitable for irrigation purposes.

4.1 BUILDING ENVELOPES AND APZ'S

The proposed Asset Protection Zone and Building Envelope in Lot 1 have been positioned within a degraded position of the site previously occupied by bamboo. In order to install a suitable platform to position a house approximately 2812m of *Acacia parramattensis* and the non endemic *Geijera parviflora* will need to be cleared. The revegetation works along the shoreline are outside the proposed works area and as such will remain in situ.

In order to prevent sedimentation of the wetland/pond area ecoberm/sed fence will be placed as per figure 3 consistent those outlined in the 'Blue Book' (Managing Urban Stormwater Soils and Construction) by Landcom, Fourth Edition (2004).

There are no threatened species present within Lot 1 and as such the fill area and driveways could be installed without having to destroy any.

Treating Lot 1 in this manner will result in the retention of the mature Eucalyptus trees in the north eastern corner of the site. As such the development will have minimal impact upon Endangered Ecological Communities and threatened species.

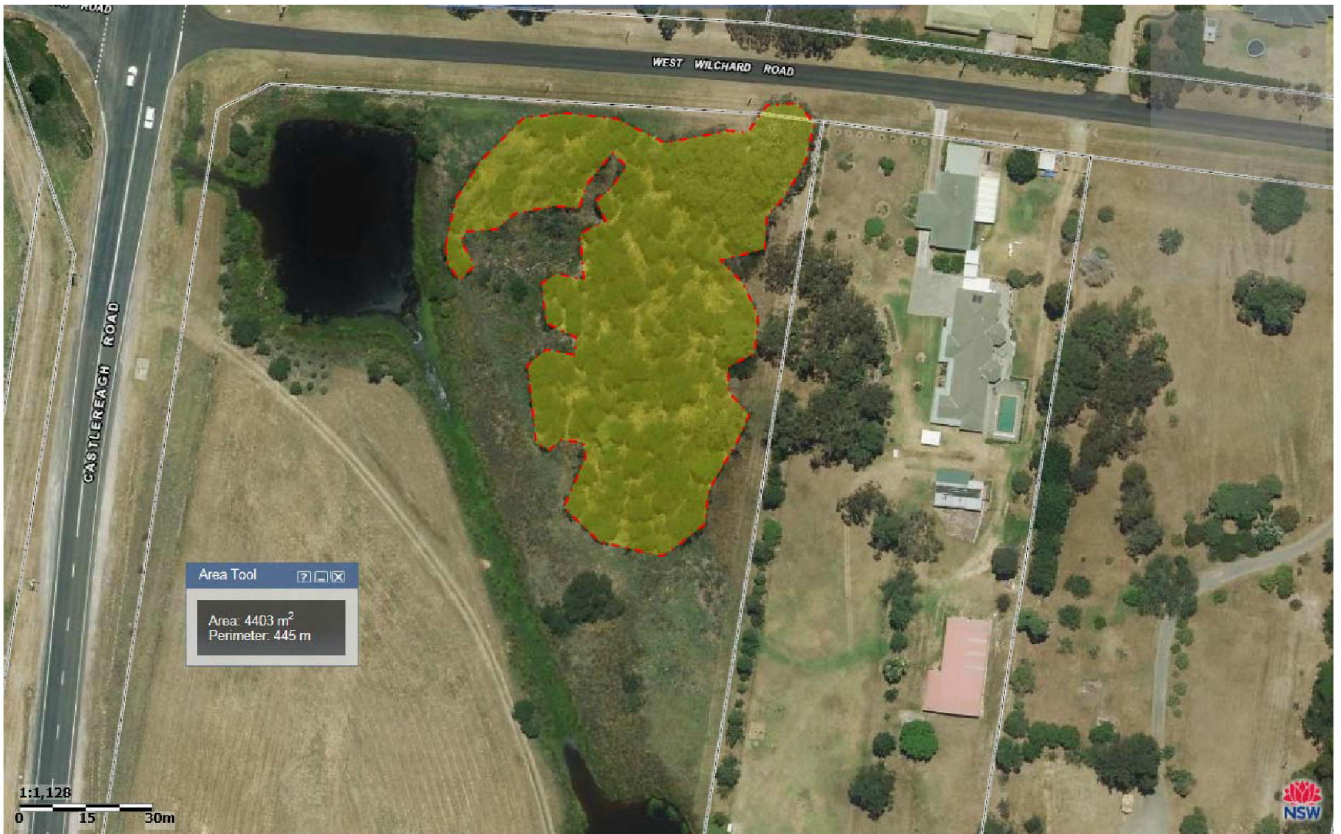


Figure 2: Native Vegetation within Lot 1. Image sourced Six Maps.

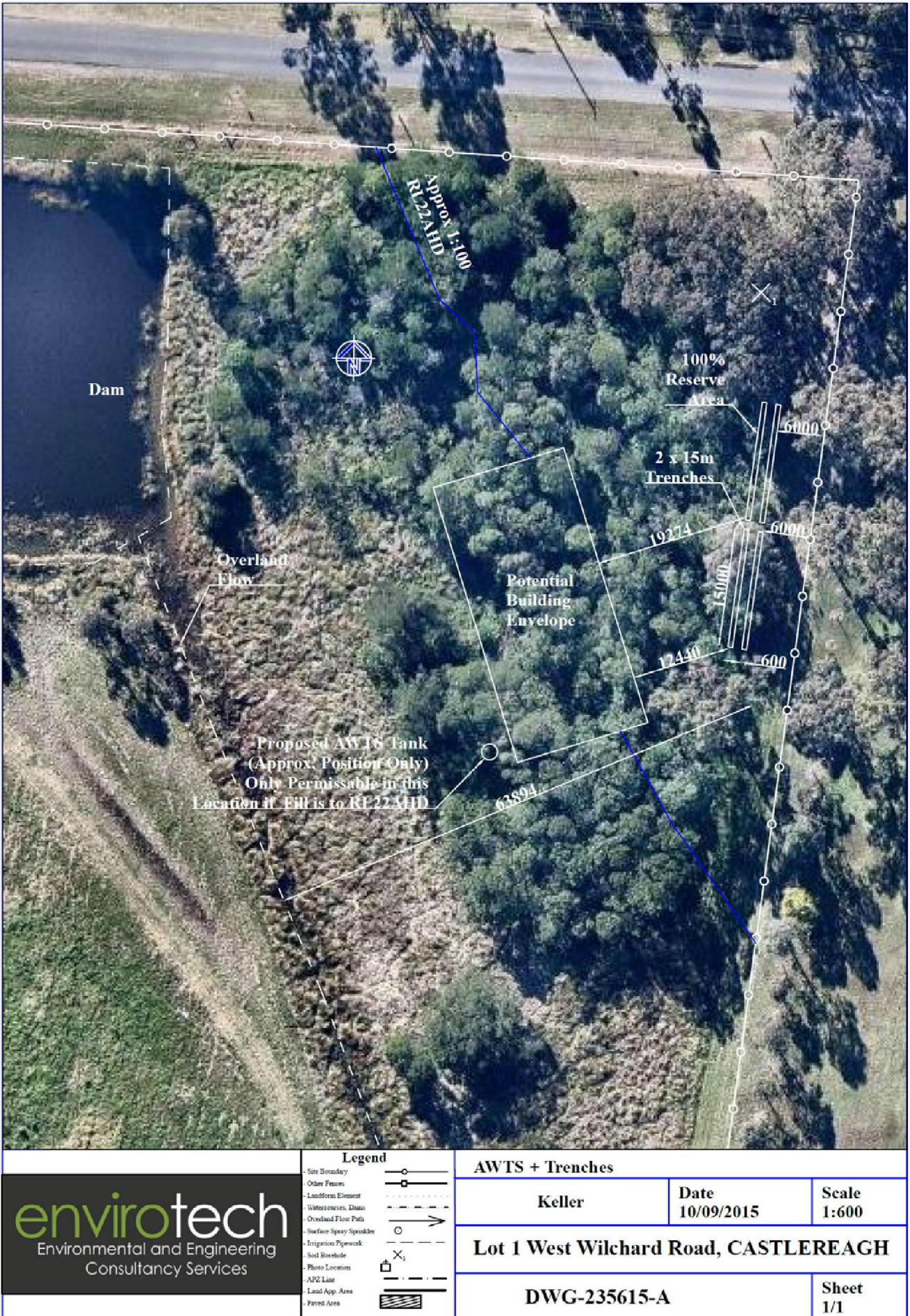


Figure 3: On site wastewater management system design.

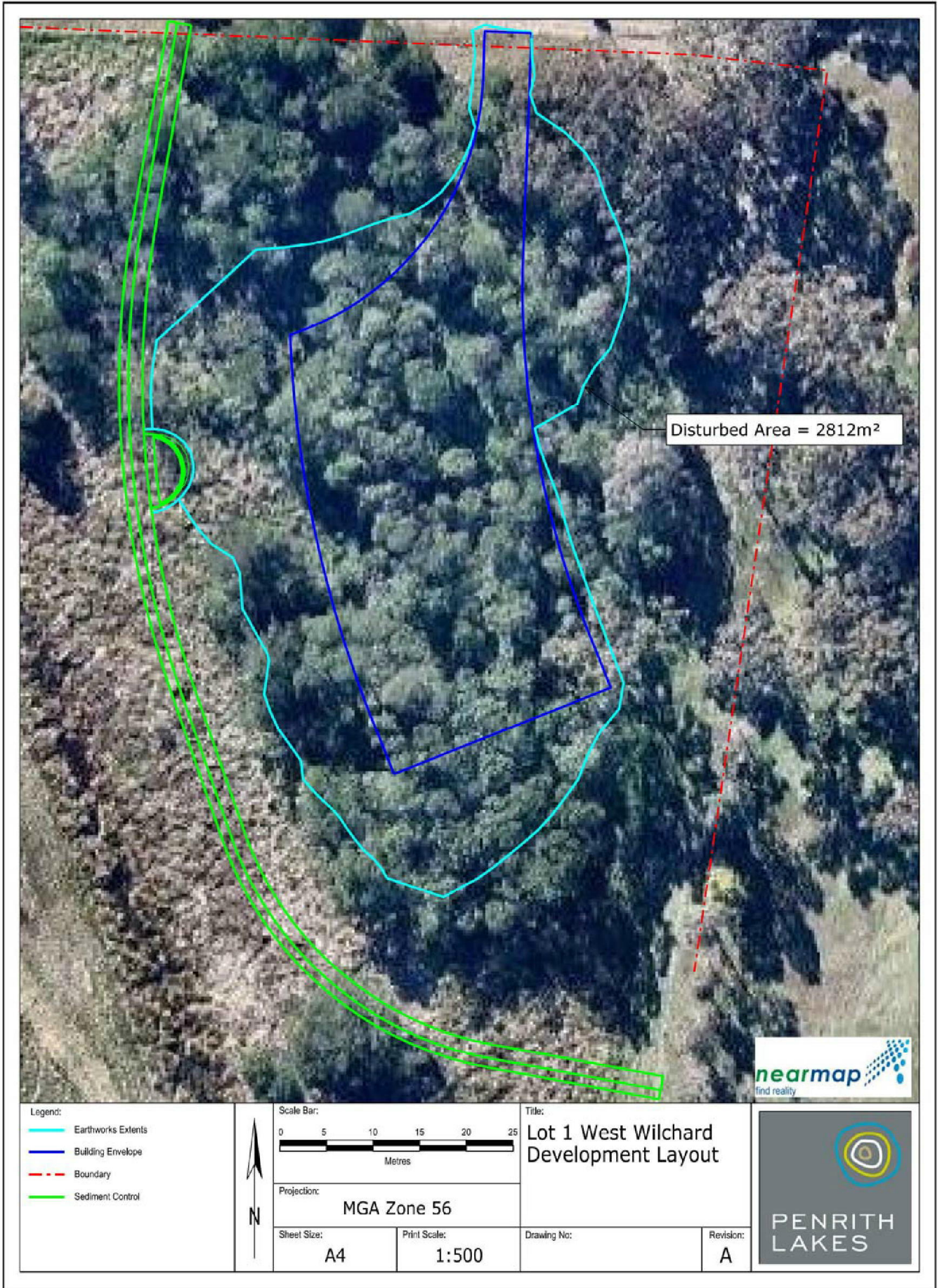


Figure 4: Proposed fill/impact area .



Figure 5: Bamboo regrowth within proposed fill area



Figure 6: An area where Freesias are dominating the ground stratum



Figure 7: Lower slope containing scattered *Acacia parramattensis*.



Figure 8: The proposed cut and fill area dominated by *Acacia parramattensis*.

5.0 RECOMENDATIONS

Opportunities exist for limited rural development of this site.

Future development plans should consider the use of native species to be visually consistent with the surrounding environment.

Future development is to take into consideration the presence of threatened species and be limited to grassland area.

Effluent application areas are to be located >40m away from surface water such as dams, Lagoons or overland flow paths.

Effluent application areas are to consist of an AWTs with at least 30 lineal metres of absorption trench.

Measures are to be taken consistent those outlined in the 'Blue Book' (Managing Urban Stormwater Soils and Construction) by Landcom, Fourth Edition (2004) to prevent sedimentation and/or degradation of the wetland and pond areas.

6.0 APPENDIX A

INTRODUCTION

The Seven-Part Test is a standard set of questions devised by the Scientific Committee established under the *Threatened Species Conservation Amendment Act 2002*. The Test should be applied individually to all threatened species, populations and ecological communities and their habitats that are to be, or likely to be, on the site to be developed. The results of a Seven-Part Test help determine the nature and significance of impacts of the proposed development or activity on threatened species, populations or ecological communities, or their habitats, and whether the preparation of *Species Impact Statement* (SIS) is required. An SIS provides a more detailed assessment of threatened biota issues and proposes measures to manage and mitigate adverse impacts on the threatened species, populations or ecological communities, or their habitats, resulting from the proposal.

Appendix A provides a Seven-part test for the following threatened biota in relation to the proposed development:

Threatened Ecological Communities

- Cumberland Plain Woodland
- Shale Sandstone Transition Forest

Threatened Plant Species

- Juniper Leaved Grevillea (*Grevillea juniperina sub juniperina*)

Threatened Bird Species

- Varied Sittella (*Dapheonositta chrysoptera*).
- Spotted Harrier (*Circus assimilis*)
- Little Lorikeet (*Glossopsitta pusilla*)

6.1 THREATENED ECOLOGICAL COMMUNITIES

6.1.1 Cumberland Plain Woodland

Cumberland Plain Woodland is listed as a Critically-endangered Ecological Community under the schedules of both the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) and NSW *Threatened Species Conservation Act, 1995* (TSC Act). It comprises the Spotted Gum (*Corymbia maculata*) Forest (Map Unit 9b), Grey Box (*Eucalyptus moluccana*) Woodland (Map Unit 10c) and Grey Box-Ironbark Woodland (Map Unit 10d) that were described in the natural vegetation 1:100,000 map sheets of Penrith (Benson 1992) and Sydney (Benson & Howell 1994).

NPWS (2000) identified and mapped two forms of CPW: Shale Plains Woodland (SPW) and Shale Hills Woodland (SHW). Shale Hills Woodland occurs mainly on the elevated and sloping southern half of the Cumberland Plain and Shale Plain Woodland occurs on other parts of the Cumberland Plain and is thus more widely distributed.

The dominant canopy trees of SHW include Grey Box (*Eucalyptus moluccana*), Forest Red Gum (*E. tereticornis*) and Narrow-leaved Ironbark (*E. crebra*). It has a shrub layer dominated by Blackthorn (*Bursaria spinosa*), with other shrubs, such as *Acacia implexa*, *Indigofera australis* and *Dodonaea viscosa* ssp. *cuneata*.

Bursaria spinosa is the dominant shrub species of SPW and there are canopy trees such as Grey Box (*E. moluccana*), Forest Red Gum (*E. tereticornis*), Spotted Gum (*Corymbia maculata*) and Thin-leaved Stringybark (*E. eugenoides*).

The diverse understorey layer is similar for both forms of CPW. It is common to find grasses, such as Kangaroo Grass (*Themeda australis*), Weeping Meadow Grass (*Microlaena stipoides* var. *stipoides*) and herbs such as Kidney Weed (*Dichondra repens*), Blue Trumpet (*Brunoniella australis*) and *Desmodium varians*.

Before European settlement, CPW was extensive across western Sydney, covering 122,000 ha. Today, there is only 8% of the original extent, with a further 13% remaining as scattered trees across the landscape. It occurs on well structure clay soils that are derived from the Wianamatta Shale.

There are bushland remnants of CPW in an area bounded by Scheyville (north), Penrith (west), Parramatta (east) and Thirlmere (south). CPW occurs in Auburn, Bankstown, Baulkham Hills, Blacktown, Camden, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith and Wollondilly local government areas.

Clearing for agriculture and urban development is the greatest threat to CPW. Because it presently exists only as isolated fragments, CPW is vulnerable to disturbances, such as weed invasion, increased soil nutrients, rubbish dumping and fire. Weeds such as African Lovegrass, African Olive Bridal Veil Creeper and Rhodes Grass are a major threat.

6.2 THREATENED SPECIES

6.2.1 Juniper Leaved Grevillea (*Grevillea juniperina* sub *juniperina*)

Description

A broadly spreading to erect shrub to 2.5 m high. The leaves are prickly, narrow, often bright green, to 22 mm long and clustered along short lateral branches. Flowers are "spider-like", 2.5 - 3.5 cm long and may be red to pinkish, yellow, pale orange or greenish.

Distribution

Endemic to Western Sydney, centred on an area bounded by Blacktown, Erskine Park, Londonderry and Windsor with outlier populations at Kemps Creek and Pitt Town.

Habitat and ecology

- Grows on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium (often with shale influence), typically containing lateritic gravels.

- Recorded from Cumberland Plain Woodland, Castlereagh Ironbark Woodland, Castlereagh Scribbly Gum Woodland and Shale/Gravel Transition Forest.
- Associated canopy species within Cumberland Plain Woodland and Shale/Gravel Transition Forest include *Eucalyptus tereticornis*, *E. moluccana*, *E. crebra*, *E. fibrosa* and *E. eugenioides*. Understorey species include *Bursaria spinosa*, *Dillwynia sieberi*, *Ozothamnus diosmifolius*, *Daviesia ulicifolia*, *Acacia falcata*, *Acacia parramattensis*, *Themeda australis*, *Aristida ramosa*, *Cymbopogon refractus*, *Eragrostis brownii*, *Cheilanthes sieberi*, *Dianella revoluta* and *Goodenia hederacea*.
- In Castlereagh Woodland on more sandy soils the dominant canopy species are *Eucalyptus fibrosa*, *E. sclerophylla*, *Angophora bakeri* and *Melaleuca decora*. Understorey species include *Melaleuca nodosa*, *Hakea sericea*, *Cryptandra spinescens*, *Acacia elongata*, *Gonocarpus teucroides*, *Lomandra longifolia* and the threatened species *Dillwynia tenuifolia*, *Pultenaea parviflora*, *Micromyrtus minutiflora* and *Allocasuarina glareicola*.
- Flowering may occur sporadically throughout the year, but particularly between July and October. Flowers are reported to be bird pollinated although bees have also been observed visiting flowers.
- Plants are killed by fire with regeneration solely from soil-stored seed. Fire leads to a sudden increase in the recruitment of seedlings. Germination experiments show that germination rates are improved by exposure to both smoke and heat. The frequency of fire is likely to be an important factor. If fires are too frequent there may be insufficient time to build up seed in the soil to replace plants killed in the fire.
- Physical disturbance of the soil appears to result in an increase in seedling recruitment. Has a tendency to colonise mechanically disturbed areas
- Dense growth of blackthorn (*Bursaria*) can limit the ability of the species to spread.
- Most prolific seeding occurs on plants more than 1m high.

Observations

Juniper Leaved Grevillea are present in increasingly larger numbers as you move further to the south and east along the escarpment. This is most likely based on their preference for shale derived soil types and historic land clearing of the surrounding area for urban and agricultural purposes. Soils at lot 3 are influenced by the sand based soils found in the nearby populations of the Agnes Banks and Castlereagh woodlands.

6.2.2 Varied Sittella (*Dapheonositta chrysoptera*).

Discription

The Varied Sittella is a small (10 cm) songbird with a sharp, slightly upturned bill, short tail, barred undertail, and yellow eyes and feet. In flight the orange wing-bar and white rump are prominent. In NSW most individuals have a grey head and are streaked with dark brown, but in the extreme north-east they have a white head, and in the extreme south-west a black cap. Varied Sittellas are more active and acrobatic among branches than the larger treecreepers. They fly into the heads of trees, typically working their way down branches and trunk with constant motion.

Distribution

The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. The Varied Sittella's population size in NSW is uncertain but is believed to have undergone a moderate reduction over the past several decades.

Habitat and ecology

- Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and *Acacia* woodland.
- Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy.
- Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.
- Generation length is estimated to be 5 years.

Observations

Varied *Sitella* have been observed on 15 occasions since 2008 at the PLDC owned property in Church Lane Castlereagh approximately 2km away. The last recorded sighting was the 19th December 2013. Based on their preference for mature smooth barked species or rough barked species and their habit of nesting in the same vicinity each year it is possible that Lot 1 is on the fringes of their range and that their core habitat is within the dense woodland and areas of Castlereagh Ironbark Forest to the east.

6.2.3 Spotted Harrier (*Circus assimilis*)

Description

The Spotted Harrier is a medium-sized, slender bird of prey having an owl-like facial ruff that creates the appearance of a short, broad head, and long bare yellow legs. The upperparts are blue-grey with dark barring, and the wingtips are black. The face, innerwing patch, and underparts are chestnut. The long tail is boldly banded, with a wedge-shaped tip. Juveniles are mottled and streaked ginger and brown, with prominent ginger shoulders, fawn rump and banded tail.

Distribution

The Spotted Harrier occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population.

Habitat and ecology

- Occurs in grassy open woodland including *Acacia* and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.
- Builds a stick nest in a tree and lays eggs in spring (or sometimes autumn), with young remaining in the nest for several months.
- Preys on terrestrial mammals (eg bandicoots, bettongs, and rodents), birds and reptile, occasionally insects and rarely carrion.

Observations

A lone Spotted Harrier has been observed on a number of occasions in the neighbouring Wildlife Lake Precinct since observations commenced in 2008. It is likely that this is the same bird which is often seen in the nearby Escarpment and Lake B precincts of the Lakes Scheme.

6.2.4 Little Eagle (*Aquila morphnoides*)

Description

The Little Eagle is a medium-sized bird of prey that occurs in two colour forms: either pale brown with an obscure underwing pattern, or dark brown on the upperparts and pale underneath, with a rusty head and a distinctive underwing pattern of rufous leading edge, pale 'M' marking and black-barred wingtips. Both forms have a black-streaked head with a slight crest, a pale shoulder band on the upperwings, a rather short and square-tipped barred tail, and feathered legs.

Distribution

The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW.

Habitat and ecology

- Occupies open eucalypt forest, woodland or open woodland. Sheoak or *Acacia* woodlands and riparian woodlands of interior NSW are also used.
- Nests in tall living rees within a remnant patch, where pairs build a large stick nest in winter.
- Lays two or three eggs during spring, and young fledge in early summer.
- Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.

Observations

A Little Eagle has been observed on one occasion at the PLDC owned property in Church Lane Castlereagh approximately 2km away since observations started in 2008. The first and last recorded sighting was the 28th November 2013.

6.2.5 Little Lorikeet (*Glossopsitta pusilla*)

Description

The Little Lorikeet is a small (16-19 cm; 40 g) bright green parrot, with a red face surrounding its black bill and extending to the eye. The undertail is olive-yellow with a partly concealed red base, and the underwing coverts are bright green. The mantle is imbued with light brown. The call in flight is diagnostically different from other lorikeets, being a shrill and rolling screech: 'zit-zit' or 'zzet'. Although difficult to observe while foraging high in treetops, a flock's constantly chattering contact calls give it away. Flight is fast, direct and through or above the canopy.

Distribution

The Little Lorikeet is distributed widely across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia. NSW provides a large portion of the species' core habitat, with lorikeets found westward as far as Dubbo and Albury. Nomadic movements are common, influenced by season and food availability, although some areas retain residents for much of the year and 'locally nomadic' movements are suspected of breeding pairs.

Habitat and ecology

- Forages primarily in the canopy of open *Eucalyptus* forest and woodland, yet also finds food in *Angophora*, *Melaleuca* and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity.
- Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species.
- Feeds mostly on nectar and pollen, occasionally on native fruits such as mistletoe, and only rarely in orchards
- Gregarious, travelling and feeding in small flocks (<10), though often with other lorikeets. Flocks numbering hundreds are still occasionally observed and may have been the norm in past centuries.
- Roosts in treetops, often distant from feeding areas.
- Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts. Entrance is small (3 cm) and usually high above the ground (2–15 m). These nest sites are often used repeatedly for decades, suggesting that preferred sites are limited. Riparian trees often chosen, including species like *Allocasuarina*.
- Nesting season extends from May to September. In years when flowering is prolific, Little Lorikeet pairs can breed twice, producing 3-4 young per attempt. However, the survival rate of fledglings is unknown.

Observations

A Little Lorikeet has been observed on one occasion at the PLDC owned property in Church Lane Castlereagh approximately 2km away since observations started in 2008. The first and last recorded sighting was the 26th July 2012.

6.3 SEVEN-PART TEST

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

Woodland areas on the subject site provide potential foraging and wildlife corridor habitat for local populations of threatened species. Tree canopies and understorey vegetation provide potential nesting habitat. However, the amount of woodland to be cleared is a negligible amount of habitat that is available in the locality and broader geographical region and there are no trees bearing hollows at Lot 1. Large areas of higher-quality breeding habitat for each of these species occurs in conservation areas in the locality.

The proposed development would remove a negligible amount of potential foraging habitat for threatened species. The local wildlife corridor will not be significantly narrowed, fragmented or isolated as a result of the proposed subdivision.

Therefore, it is considered unlikely that the proposed development would adversely affect the life cycle of threatened woodland species to the extent that it would place viable local populations of these species at risk of extinction.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations are present at or will be affected by the proposed action.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

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

(i) The proposed subdivision will result in the removal of 0.2 ha of regrowth CPW. This remnant is isolated from other CPW remnants. Approximately 10,612 ha of CPW occur on the Cumberland Plain (DECCW 2011) and 2,067 ha occur in the Penrith LGA (NPWS 2000). Therefore, the proposed development would result in the removal of only 0.001% of the total area of CPW on the Cumberland Plain and 0.009% of CPW that occurs in the Penrith LGA. Consequently, it is unlikely that the proposed development would adversely affect CPW to the extent that its local occurrence would be placed at risk of extinction.

The proposed development would not result in the removal of Alluvial Woodland because it occurs along the bottom of the site where no development is proposed.

(ii) No CPW or Alluvial Woodland species will disappear from the Penrith LGA or have a significantly elevated risk of becoming locally extinct, as a result of the proposed development.

(d) In relation to a habitat of a threatened species, population or ecological community:

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

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

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

(i) A negligible amount of potential habitat for threatened species or ecological communities will be cleared or modified as a result of the proposed rezoning and development. No endangered populations are present at, or will be affected by, the proposed action

(ii) The proposed development will not result in fragmentation or isolation of habitat.

(iii) The CPW on the subject site is a regenerating vegetation community on land that was formerly cleared. This vegetation potentially contributes to the genetic diversity of more intact local remnants of both CPW by exchanging pollen with individual plants in these remnants through dispersal by wind, insect, bird and arboreal vectors, and stormwater runoff. However, these trees are a negligible proportion of the total gene pool for CPW. Therefore, the removal of up 0.2 ha of CPW habitat for the subdivision is unlikely to significantly impact on the genetic diversity of local occurrences of this ecological community.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat occurs in the locality.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

OEH has identified the following priority actions to help in the recovery CPW and Alluvial Woodland in NSW:

1. Management of EECs is to be included in school environmental management plans where the school land contains EECs.
2. Management of EECs to be included in the conditions for Crown land trusts, lease and licence holders.
3. Prepare and implement community awareness, education and involvement strategy.
4. Support community conservation by providing nursery or other facilities, for regeneration activities.
5. Local Govt prepare plans of management in accordance with the Local Government Act for reserves containing EECs, which have conservation as a primary objective, or where conservation is compatible.
6. Promote best practice management guidelines.
7. Incorporate consideration of EEC protection in regional open space planning.
8. Encourage planning authorities to address EECs in development of environmental planning instruments and, where possible, seek biodiversity certification.
9. Manage, to best practice standards, areas of EECs which have conservation as a primary objective, or where conservation is compatible. Priorities are to be based on DEC conservation significance assessment.
10. Encourage and promote best-practice management of EECs on private land.
11. Ensure the consideration of impacts on EECs when enforcing noxious weed or pest species control in EECs.
12. Develop and implement Cumberland Plain Reservation Strategy and create a protected bushland network through targeted land acquisition as land becomes available.
13. Public authorities will promote management agreements to landholders through their ongoing land use planning activities.
14. Investigate the preparation of a recommendation for the declaration of critical habitat.
15. Investigate the development of a regular monitoring program to assess the change in extent of vegetation across the Cumberland Plain.
16. Finalise the multi-EEC recovery plan as a State priority in accordance with contractual obligations with DEH, by July 2007.
17. Liaise with institutions to facilitate research relevant to the recovery of Cumberland Plain EECs.

The proposed development is consistent with the priority actions listed above for protecting CPW and Alluvial Woodland in NSW.

There are no species specific recovery plans or threat abatement plans under the Threatened Species Conservation Act 1995 for:

- Juniper Leaved Grevillea (*Grevillea juniperina* sub *juniperina*)
- Varied Sittella (*Dapheonositta chrysoptera*)
- Scarlet Robin (*Petroica boodang*)
- Spotted Harrier (*Circus assimilis*)
- Little Eagle (*Aquila morphnoides*)
- Little Lorikeet (*Glossopsitta pusilla*)

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

"Clearing of Native Vegetation" is a Key Threatening Process listed in Schedule 3 of the *Threatened Species Conservation Act, 1995*. However, the area of CPW to be cleared is relatively small. The proposed subdivision will not result in the loss of CPW species from the locality, and is unlikely to result in a significant loss of genetic diversity within CPW, either at a local or broader geographical level.

No Alluvial Woodland (River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin & South East Bioregions) would be removed as a result of the proposed development.

CONCLUSION

The proposed development of the subject site will not significantly impact on the status of CPW or its habitats. Therefore, a Species Impact Statement is NOT required for this threatened ecological community in relation to the proposed development.

7.0 REFERENCES.

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