

Threatened Flora Species

A search of the Bionet Atlas of NSW Wildlife (NSW OEH 2014) was undertaken to identify records of threatened flora species located within 10km of the site. This allowed for a specific search for threatened flora to be undertaken determining if any threatened flora species were present within the subject site. Details on threatened flora species *TSC Act* (1995), *FM Act* (1994) and the *EPBC Act* (1999), with a known or possible occurrence within the local area are provided in Table 3.5.

TABLE 3.5 THREATENED FLORA SPECIES OF THE AREA					
Scientific Name	TSC Act	EPBC Act	Growth Form And Habitat Requirements	Bionet Atlas Records within 10 Km	Likelihood of Occurrence
<i>Acacia baueri</i> subsp. <i>aspera</i>	V	-	Shrub, Grows in low damp heath on rock outcrops in open habitats.	3	Not likely to occur.
<i>Acacia bynoeana</i>	E	V	Erect or spreading shrub to 0.3 m. Occurs mainly in heath and dry sclerophyll forest on very infertile and well-drained substrate of sand and sandy clay, often with ironstone gravels (NSW NPWS 1999).	2	Not likely to occur.
<i>Arthropteris palisotii</i>	E	-	Creeping fern. Occurs in rainforest mainly on tree trunks.	1	High likelihood of occurrence.
<i>Cynanchum elegans</i>	E	E	Climber or twiner to 1 m. Occurs mainly at the ecotone between dry subtropical rainforest and sclerophyll forest / woodland communities (NSW NPWS 2002).	55	High likelihood of occurrence.
<i>Daphnandra</i> sp. <i>C Illawarra</i>	E	E	Medium sized rainforest tree. Occupies gully slopes and rocky hillsides of the Illawarra lowlands, occasionally extending into the upper escarpment slopes. Occurs on loams and clay loams derived from volcanic or fertile sedimentary rocks (DEC 2004).	7	High likelihood of occurrence.
<i>Irenepharsus trypherus</i>	E	-	Herb. Inhabits steep rocky slopes in close proximity to cliff lines and ridgetops (NPWS 2004).	1	Low to moderate likelihood of occurrence.
<i>Leucopogon exolasius</i>	V	V	Grows in woodland on sandstone. Flowers August – September (OEH 2014).	1	Not likely to occur.
<i>Pimelea spicata</i>	E	E	Decumbent or erect shrub to 0.5m. Grows in Grey Box dry sclerophyll forest on Quaternary Alluviums.	4	Not likely to occur.
<i>Pterostylis gibbosa</i>	E	E	Terrestrial orchid. Occurs in open forest or woodland on flat or gently sloping land with poorly drained soils.	12	Not likely to occur.

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Scientific Name	TSC Act	EPBC Act	Growth Form And Habitat Requirements	Bionet Atlas Records within 10 Km	Likelihood of Occurrence
<i>Pultenaea aristata</i>	V	-	A prickly small shrub less than 40cm high. Grows in moist, dry sclerophyll woodland to heath on sandstone. Restricted to the Woronora Plateau, Helensburgh and Mt Kira (Plantnet 2014).	32	Not likely to occur.
<i>Senna acclinis</i>	E	-	Shrub to 3m tall. Grows in or adjacent to subtropical and dry rainforest.	1	High likelihood of occurrence.
<i>Solanum celatum</i>	E	-	Grows in rainforest clearings, or in wet sclerophyll forest (OEH 2014).	3	High likelihood of occurrence.
<i>Zieria granulata</i>	E	-	Tall shrub or small tree. Occurs in subtropical rainforest, Melaleuca armillaris scrub to tall shrubland, and <i>Eucalyptus tereticornis</i> open forest.	2	High likelihood of occurrence.
<p>Key to Likelihood of Occurrence</p> <p>Known to Occur: Species has been observed within the subject site, suitable habitat is present.</p> <p>High Likelihood of Occurrence: Species was not observed during surveys however the site provides suitable habitats for the species.</p> <p>Moderate to Low Likelihood of Occurrence: Species was not observed during surveys however the site provides sub-optimal habitats for the species.</p> <p>Not Likely to Occur: Site does not provide suitable habitat for the species.</p> <p>Key to TSC Act and EPBC Act Status</p> <p>Ext = Extinct P. Ext = Presumed Extinct CE = Critically Endangered E = Endangered V = Vulnerable Species * = Preliminary determination</p>					

No threatened flora species were observed within the subject site during surveys.

Two threatened flora species, *Cynanchum elegans* and *Zieria granulata*, have been recorded adjacent to the northern boundary of the subject site on the Bionet Atlas of NSW Wildlife (NSW OEH 2014). These species were not observed within the subject site during targeted surveys.

The threatened flora species which are considered to have suitable or sub-optimal habitat within the subject site are assessed under the 7-part test of significance in Section 6 of this report.

Threatened Fauna Species

A search of the Bionet Atlas of NSW Wildlife (NSW OEH 2014) was undertaken to identify records of threatened fauna species located within 10km of the site. These records are shown in Figures 2.2A, 2.2B and 2.2C.

This allowed for a specific search for threatened fauna to be undertaken determining if any threatened fauna species were present within the subject site. Details on threatened fauna species as listed in the *TSC Act* (1995), *FM Act* (1994) and the *EPBC Act* (1999) with a known or possible occurrence within the local area are provided in Table 3.6.

TABLE 3.6 THREATENED FAUNA SPECIES OF THE AREA					
Common Name <i>Scientific Name</i>	TSC Act	EPBC Act	Preferred Habitat	Bionet Atlas Records Within 10 Km	Likelihood of Occurrence
Giant Burrowing Frog <i>Heleioporus australiacus</i>	V	V	Prefer sandstone ridgetop habitats and broader upland valleys in habitats associated with small headwater creeklines in woodland, heath and hanging swamp habitats. (NSW NPWS 2001).	16	Not likely to occur.
Red-crowned Toadlet <i>Pseudophryne australis</i>	V	-	Inhabits open forests, mostly on Hawkesbury and Narrabeen Sandstones where it occurs in periodically wet drainage lines below sandstone ridges. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters (DECC 2005).	37	Not likely to occur.
Green and Golden Bell Frog <i>Litoria aurea</i>	E	V	Breeding habitat consists of shallow (<1m) ponds or slowly moving waterways which undergo disturbance regimes such as fluctuating water flow or inflow of saline water (White and Pyke 2010).	396	Moderate to low likelihood of occurrence.
Littlejohn's Tree Frog <i>Litoria littlejohni</i>	V	-	Inhabits permanent rocky streams with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops.	178	Not likely to occur.

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Common Name <i>Scientific Name</i>	TSC Act	EPBC Act	Preferred Habitat	Bionet Atlas Records Within 10 Km	Likelihood of Occurrence
Rosenberg's Goanna <i>Varanus rosenbergi</i>	V	-	Hawkesbury sandstone outcrop specialist. Inhabits woodlands, dry open forests and heathland sheltering in burrows, hollow logs, rock crevices and outcrops (Cogger 2000).	5	Not likely to occur.
Broad-headed Snake <i>Hoplocephalus bungaroides</i>	E	V	Prefers sandstone habitats with exposed outcrops and benching. Occurs in woodland, open woodland and heath habitats in tree hollows and rock crevices on exposed north-west facing ridges (NPWS 1999).	9	Not likely to occur.
Blue-billed Duck <i>Oxyura australis</i>	V	-	found on temperate, fresh to saline, terrestrial wetlands, including sewerage ponds, rivers, salt lakes and saltpans. They prefer deep, permanent open water, within or near dense vegetation (Marchant and Higgins 1998).	1	Not likely to occur.
Freckled Duck <i>Stictonetta naevosa</i>	V	-	Inhabits large, well vegetated permanent fresh-water swamps. In dry period's moves to fresh or saline permanent open lakes (Marchant and Higgins 1998).	7	Not likely to occur.
Wompoo Fruit-Dove <i>Ptilinopus magnificus</i>	V	-	Inhabits large undisturbed patches of tall tropical or subtropical evergreen rainforest (Higgins & Davies 1996).	1	Moderate to low likelihood of occurrence.

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Common Name <i>Scientific Name</i>	TSC Act	EPBC Act	Preferred Habitat	Bionet Atlas Records Within 10 Km	Likelihood of Occurrence
Rose-crowned Fruit-Dove <i>Ptilinopus regina</i>	V	-	Inhabits tall tropical and subtropical, evergreen or semi-deciduous rainforest, especially with dense growth of vines (Higgins & Davies 1996).	1	Moderate to low likelihood of occurrence.
Superb Fruit-Dove <i>Ptilinopus superbus</i>	V	-	Inhabits mostly closed forests, occasionally near streams or lakes within rainforest (Higgins & Davies 1996).	3	Moderate to low likelihood of occurrence.
Black-necked Stork <i>Ephippiorhynchus asiaticus</i>	E	-	Inhabits still and permanent, shallow freshwater floodplain habitats including wetlands, swamps, watercourses, farm dams and shallow floodwaters and adjacent areas of grasslands, heathlands, paddocks, and woodlands and edges of estuarine habitats (Marchant & Higgins 1990).	3	Moderate to low likelihood of occurrence.
Australasian Bittern <i>Botaurus poiciloptilus</i>	E	E	Inhabits shallow freshwater and brackish wetlands, ponds and streams, favouring those with tall dense beds of sedges, reeds or rushes (Marchant and Higgins 1998).	3	Not likely to occur.
Black Bittern <i>Ixobrychus flavicollis</i>	V	-	Inhabits permanent freshwater and estuarine wetlands, ponds and streams with tall dense vegetation. Also utilises adjacent habitats of flooded grassland, forest, woodland, rainforest and mangroves (Lindsey 1992).	14	Moderate to low likelihood of occurrence.

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Common Name <i>Scientific Name</i>	TSC Act	EPBC Act	Preferred Habitat	Bionet Atlas Records Within 10 Km	Likelihood of Occurrence
Square-tailed Kite <i>Lophoictinia isura</i>	V	-	Inhabits the coastal forested and wooded lands of tropical and temperate Australia (Marchant & Higgins 1993).	3	High likelihood of occurrence.
Little Eagle <i>Hieraaetus morphnoides</i>	V	-	Inhabits a variety of habitats including woodland open forest, partially cleared areas, along watercourses and around wetlands, avoiding large areas of dense forest (Marchant and Higgins 1993).	3	High likelihood of occurrence.
Eastern Osprey <i>Pandion cristatus</i>	V	-	Found in association with water bodies including coastal waters, inlets, lakes, estuaries, beaches, offshore islands and sometimes along inland rivers. May nest on the ground on sea cliffs, in large dead trees or structures in a prominent location (Olsen 1995).	1	Not likely to occur.
Sooty Oystercatcher <i>Haematopus fuliginosus</i>	V	-	Strictly marine coastal species, prefers rocky intertidal shorelines, reefs, mudflats and beaches (Marchant & Higgins 1993).	3	Not likely to occur.
Pied Oystercatcher <i>Haematopus longirostris</i>	E	-	Occurs on undisturbed beaches; sandpits and sandbars, tidal mudflats and estuaries, and coastal islands (Marchant and Higgins 1993).	11	Not likely to occur.
Hooded Plover <i>Thinornis rubricollis</i>	CE	-	Inhabits ocean beaches and coastal lakes.	2	Not likely to occur.

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Common Name <i>Scientific Name</i>	TSC Act	EPBC Act	Preferred Habitat	Bionet Atlas Records Within 10 Km	Likelihood of Occurrence
Australian Painted Snipe <i>Rostratula australis</i>	E	V	Inhabit terrestrial shallow freshwater, wetlands; ephemeral and permanent: lakes, swamps, clay pans, inundated or waterlogged grassland or saltmarsh (Marchant & Higgins 1993).	1	Moderate to low likelihood of occurrence.
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i>	V	-	Associated with a variety of woodland and forest habitats, and occasionally more open areas. Feeds on the seeds of native and exotic shrubs and trees and nests in hollows (Higgins 1999).	126	High likelihood of occurrence.
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>	V	-	Inhabits woodlands and open sclerophyll forests dominated by or with a middle stratum of Allocasuarina. Breeds in hollow trees or stumps usually in Eucalypts (Higgins 1999).	12	Moderate to low likelihood of occurrence.
Swift Parrot <i>Lathamus discolor</i>	E	E	Migratory species that breeds in Tasmania and its offshore islands in summer. In late March almost the entire population migrates to mainland Australia. Congregates where winter flowering eucalypts occur along the coast. (Saunders and Tzaros 2011).	26	Not likely to occur.
Turquoise Parrot <i>Neophema pulchella</i>	V	-	Sedentary species inhabiting the foothills of the Great Divide. Feeds on the ground on grass seeds usually beneath trees (Higgins 1999).	2	Moderate to low likelihood of occurrence.

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Common Name <i>Scientific Name</i>	TSC Act	EPBC Act	Preferred Habitat	Bionet Atlas Records Within 10 Km	Likelihood of Occurrence
Regent Parrot (eastern subspecies) <i>Polytelis anthopeplus monarchoides</i>	E	E	Found in temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts.	1	Not likely to occur.
Superb Parrot <i>Polytelis swainsonii</i>	V	V	Inhabits a range of habitats from the River Red Gum forests of the Murray Riverina area to the Forests and Woodlands of the south-west slopes containing White Box, Yellow Box and Blakely's Red Gum (Higgins 1999).	1	Not likely to occur.
Little Lorikeet <i>Glossopsitta pusilla</i>	V	-	Gregarious species, usually foraging in small flocks, often with other species of lorikeet. Feeds primarily on nectar and pollen in the tree canopy, particularly on profusely-flowering eucalypts, but also on a variety of other species including, melaleucas and mistletoes (Courtney & Debus 2006).	1	Moderate to low likelihood of occurrence.
Barking Owl <i>Ninox connivens</i>	V	-	Utilises dry sclerophyll forests and woodlands particularly those associated with watercourses, wetlands and forest edges. Nests in large hollows in live eucalypts (Higgins 1999).	2	Moderate to low likelihood of occurrence.
Powerful Owl <i>Ninox strenua</i>	V	-	Breeds in sclerophyll forests and woodlands. Nests in hollows in large old trees. Have large home ranges of about 1,000 hectares	20	Moderate to low likelihood of occurrence.

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Common Name <i>Scientific Name</i>	TSC Act	EPBC Act	Preferred Habitat	Bionet Atlas Records Within 10 Km	Likelihood of Occurrence
			within open eucalypt, and feed mainly on medium-sized arboreal marsupials (Higgins 1999).		
Masked Owl <i>Tyto novaehollandiae</i>	V	-	Inhabits forests and woodlands. Utilises forest margins and isolated stands of trees within agricultural land. Dependent upon hollow bearing trees for roosting and breeding sites (Higgins 1999).	6	Moderate to low likelihood of occurrence.
Sooty Owl <i>Tyto tenebricosa</i>	V	-	Inhabits tall old-growth montane forests, including temperate and subtropical rainforest. Requires large hollows or caves for nesting and roosting, and feeds on arboreal and terrestrial mammals and occasionally birds (Higgins 1999).	19	Moderate to low likelihood of occurrence.
Eastern Bristlebird <i>Dasyornis brachypterus</i>	E	E	Inhabits low dense vegetation in a wide range of habitats, including sedgeland, heathland, swampland, shrubland, sclerophyll forest and woodland and rainforest in temperate and sub-tropical regions (Higgins & Peter 2002).	1	Moderate to low likelihood of occurrence.
Regent Honeyeater <i>Anthochaera phrygia</i>	CE	E	Nomadic species which inhabits mostly dry eucalypt woodlands and forests dominated by box ironbark eucalypts on inland slopes of Great Divide. Also sporadically	2	Not likely to occur.

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Common Name <i>Scientific Name</i>	TSC Act	EPBC Act	Preferred Habitat	Bionet Atlas Records Within 10 Km	Likelihood of Occurrence
			occupies coastal swamp forests and Spotted Gum forests during winter. (Higgins et al., 2001).		
White-fronted Chat <i>Epthianura albifrons</i>	V	-	Inhabits damp habitats near both saltwater and freshwater wetlands, in saltmarsh, surrounding grassland, among reeds and rushes, and shrubs (Higgins et al., 2001).	2	Moderate to low likelihood of occurrence.
Painted Honeyeater <i>Grantiella picta</i>	V	-	Nomadic species which inhabits dry forests and woodlands. Its primary food is the fruit of the mistletoes in the genus <i>Amyema</i> though it will also take nectar and insects (Higgins et al., 2001).	1	Not likely to occur.
Varied Sittella <i>Daphoenositta chrysoptera</i>	V	-	Inhabits eucalypt forests and woodlands, mallee and Acacia woodland (Higgins & Peter 2002).	2	High likelihood of occurrence.
Barred Cuckoo-shrike <i>Coracina lineata</i>	V	-	Inhabits rainforest, vine scrubs and margins; eucalypt watercourses; native figs, and other fruiting trees. Native and exotic fruits and insects are the primary source of food for this species. In NSW occurs from Cape York to the Manning River (Higgins et al., 2006).	1	Not likely to occur.
Olive Whistler <i>Pachycephala olivacea</i>	V	-	Tall wet forest, woodlands and alpine heaths.	2	Moderate to low likelihood of occurrence.

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Scarlet Robin <i>Petroica boodang</i>	V	-	Inhabits mainly dry eucalypt forest and woodlands with open shrubby and grassy understorey on ridges and slopes during the spring-summer breeding season, dispersing during autumn–winter into open habitats including urban areas (Higgins and Peter 2002).	6	Moderate to low likelihood of occurrence.
Flame Robin <i>Petroica phoenicea</i>	V	-	Inhabits upland wet to moist eucalypt forests and woodlands during the spring-summer breeding season. During the autumn to winter disperses to open lowland habitats (Higgins and Peter 2002).	1	Moderate to low likelihood of occurrence.
Pink Robin <i>Petroica rodinogaster</i>	V	-	Inhabits the dense shrub layer of damp or wet forests or rainforests moving to dense gully forest or cool-temperate rainforests during the breeding season (Higgins & Peter 2002).	2	Moderate to low likelihood of occurrence.
Spotted-tailed Quoll <i>Dasyurus maculatus</i>	V	E	Inhabits a range of habitat types across its range including rainforest, open forest, woodland, coastal heath and riparian forest from the coast to the snow line of mountainous areas, sheltering in hollow trees, caves, rock crevices and hollow logs (NSW NPWS 1999).	1	Moderate to low likelihood of occurrence.

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Common Name <i>Scientific Name</i>	TSC Act	EPBC Act	Preferred Habitat	Bionet Atlas Records Within 10 Km	Likelihood of Occurrence
Eastern Quoll <i>Dasyurus viverrinus</i>	E	-	Inhabits dry and moist sclerophyll forests containing hollow logs, rock caves, abandoned burrows or trees with open grazing land interspersed. Extinct on the mainland.	1	Not likely to occur.
Koala <i>Phascolarctos cinereus</i>	V	V	Inhabit forested areas with acceptable Eucalypt food trees, also utilising some other non-Eucalypt species as a food source. (Reed et al. 1991).	10	Not likely to occur.
Eastern Pygmy-possum <i>Cercartetus nanus</i>	V	-	Inhabits rainforest through to sclerophyll forest and tree heath. Banksia and myrtaceous shrubs and trees are favoured. (Turner & Ward 1995).	12	Not likely to occur.
Squirrel Glider <i>Petaurus norfolcensis</i>	V	-	Inhabits dry sclerophyll forest and woodland nesting in small tree hollows (Suckling 1995).	1	Moderate to low likelihood of occurrence.
Brush-tailed Rock-wallaby <i>Petrogale penicillata</i>	E	V	Inhabits areas containing steep rocky outcrops and cliffs with caves and crevices for sheltering. It occurs across a wide variety of habitats including rainforest gullies, wet and dry sclerophyll forest, open woodland and semi-arid country (Eldridge & Close 1995).	1	Not likely to occur.

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Common Name Scientific Name	TSC Act	EPBC Act	Preferred Habitat	Bionet Atlas Records Within 10 Km	Likelihood of Occurrence
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	V	V	Roost in camps during the day. This species inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and urbanised and agricultural areas. Camps are commonly formed in gullies, typically not far from water and usually in vegetation with a dense canopy or in trees in parkland areas (Tidemann 1995).	21	Known to occur / observed during surveys.
Yellow-bellied Sheath-tail-bat <i>Saccolaimus flaviventris</i>	V	-	Inhabits wet and dry sclerophyll forest, open woodland, shrubland, mallee, grassland and desert. Roosts in tree hollows (Churchill 2008).	1	High likelihood of occurrence.
Eastern Freetail-bat <i>Mormopterus norfolkensis</i>	V	-	Inhabits eucalypt forest and woodland on the coastal side of the Great Dividing Range. Roosts in tree hollows, under bark and in various man-made structures (Churchill 2008).	6	High likelihood of occurrence.
Large-eared Pied Bat <i>Chalinolobus dwyeri</i>	V	V	In the Sydney basing occurs in areas of high fertility soils in wet sclerophyll forest along the edges of sandstone escarpments. Roosts in fairy martin nests and on the ceilings of caves, crevices in cliffs and mines in twilight areas (Churchill 2008).	2	High likelihood of occurrence.

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Common Name <i>Scientific Name</i>	TSC Act	EPBC Act	Preferred Habitat	Bionet Atlas Records Within 10 Km	Likelihood of Occurrence
Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i>	V	-	Inhabits wet sclerophyll forest, open forest, rainforest and coastal mallee. Roosts mostly in roosts in hollow trunks of eucalypts but also in caves and man-made structures (Churchill 2008).	5	High likelihood of occurrence.
Eastern Bentwing- bat <i>Miniopterus schreibersii oceanensis</i>	V	-	Inhabits rainforest, wet and dry sclerophyll forest, open woodland, Melaleuca forests and open grassland. Roosts in caves and man-made structures (Churchill 2008).	63	High likelihood of occurrence.
Southern Myotis <i>Myotis macropus</i>	V	-	Roosts in caves, mines, tunnels, buildings, tree hollows and under bridges. Forages over open water (Churchill 2008).	5	High likelihood of occurrence.
Greater Broad- nosed Bat <i>Scoteanax rueppellii</i>	V	-	Inhabits moist gullies in mature coastal forest, rainforest, open woodland, Melaleuca swamp woodland, wet and dry sclerophyll forest, cleared areas with remnant trees and tree-lined creeks in open areas. Roosts in tree hollows, cracks and fissures in trunks and dead branches, under exfoliating bark, and in man-made structures (Churchill 2008).	6	High likelihood of occurrence.

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Common Name <i>Scientific Name</i>	TSC Act	EPBC Act	Preferred Habitat	Bionet Atlas Records Within 10 Km	Likelihood of Occurrence
<p>Key to Likelihood of Occurrence</p> <p>Known to Occur: Species has been observed within the subject site.</p> <p>High Likelihood of Occurrence: Species was not observed during surveys however the site provides suitable habitats for the species.</p> <p>Moderate to Low Likelihood of Occurrence: Species was not observed during surveys however the site provides sub-optimal habitats for the species.</p> <p>Not Likely to Occur: Site does not provide suitable habitat for the species.</p> <p>Key to TSC Act and EPBC Act Status</p> <p>Ext = Extinct P. Ext = Presumed Extinct CE = Critically Endangered E = Endangered V = Vulnerable Species * = Preliminary determination</p>					

The threatened fauna species known to occur or with suitable or sub-optimal habitat present within the subject site are assessed under the 7-part test of significance in Section 6 of this report.

Endangered Populations

The endangered populations known to occur within the local government area are:

- *Chorizema parviflorum* in the Wollongong and Shellharbour Local Government Areas;
- *Lespedeza juncea* subsp. *sericea* in the Wollongong Local Government Area; and
- Woronora Plateau population of *Callitris endlicheri*.

These species were not observed on the subject site. It is therefore considered that no endangered population is present on the subject site.

3.5 Critical Habitats

The subject site does not contain or adjoin an area classed as critical habitat within the provisions of the *Threatened Species Conservation Act* (1995).

3.6 Listed Migratory Species

A search of the EPBC Act Protected Matters Search Tool (AGDE 2014) was conducted for migratory fauna listed within the EPBC Act recorded within 10 km of the subject site. This revealed a number of threatened species that may be present in the area. Details on migratory fauna species with a known or possible occurrence within the local area are provided in Table 3.6.

TABLE 3.6 LISTED MIGRATORY TERRESTRIAL FAUNA SPECIES OF THE AREA		
Common Name <i>Scientific Name</i>	Preferred Habitat	Comments
Fork-tailed Swift (<i>Apus pacificus</i>)	Almost exclusively aerial.	High likelihood of occurrence.
Great Egret (<i>Ardea modesta</i>)	Wetland and estuarine habitats.	Moderate to low likelihood of occurrence.
Cattle Egret (<i>Ardea ibis</i>)	Grazing lands and wetland habitats.	High likelihood of occurrence.
White-bellied Sea-eagle (<i>Haliaeetus leucogaster</i>)	Coastal areas and inland rivers and water bodies.	Moderate to low likelihood of occurrence.
White-throated Needletail (<i>Hirundapus caudacutus</i>)	Almost exclusively aerial.	High likelihood of occurrence.

TABLE 3.6 LISTED MIGRATORY TERRESTRIAL FAUNA SPECIES OF THE AREA		
Common Name <i>Scientific Name</i>	Preferred Habitat	Comments
Rainbow Bee-eater (<i>Merops ornatus</i>)	Open, cleared or lightly timbered areas particularly in close proximity to water bodies.	High likelihood of occurrence.
Black-faced Monarch (<i>Monarcha melanopsis</i>)	Wet sclerophyll and rainforest vegetation.	High likelihood of occurrence. Observed during surveys.
Spectacled Monarch (<i>Monarcha trivirgatus</i>)	Inhabits rainforest, wet sclerophyll forest and mangrove vegetation. North distributional limit is Central Coast NSW.	Not likely to occur.
Satin Flycatcher (<i>Myiagra cyanoleuca</i>)	Heavily vegetated forests. When migrating may be found in more open coastal habitats.	High likelihood of occurrence.
Rufous Fantail (<i>Rhipidura rufifrons</i>)	Wet sclerophyll and rainforest vegetation.	High likelihood of occurrence.
Latham's Snipe (<i>Gallinago hardwickii</i>)	Low dense vegetation within and surrounding freshwater wetlands.	Moderate to low likelihood of occurrence.
Key to Likelihood of Occurrence Known to Occur: Species has been observed within the subject site. High Likelihood of Occurrence: Species was not observed during surveys however the site provides suitable habitats for the species. Moderate to Low Likelihood of Occurrence: Species was not observed during surveys however the site provides sub-optimal habitats for the species. Not Likely to Occur: Site does not provide suitable habitat for the species.		

The Black-faced Monarch (*Monarcha melanopsis*), was observed within the Disturbed Rainforest Habitats within the central northern areas of the site during surveys. This species is assessed in Section 6.1 in accordance with the AGDE (2013).

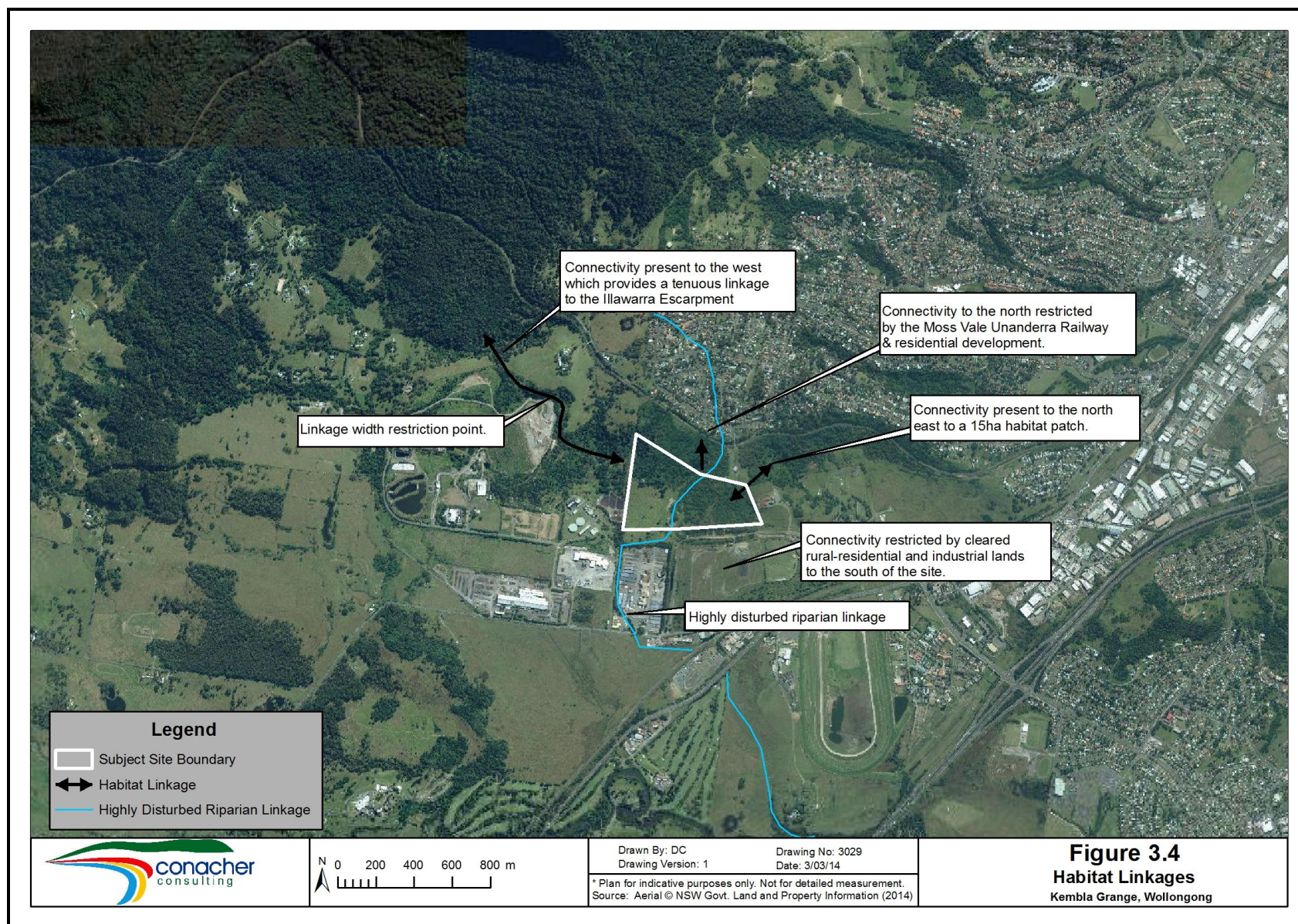
3.7 Habitat Linkages

Identified wildlife habitat linkages are shown in Figure 3.4. The Wollongong Draft Biodiversity Strategy has mapped an expansive biodiversity corridor known as the Escarpment Moist Forests Corridor along the escarpment range and immediately adjacent foothills within the locality. This site and adjoining vegetation however is not included within this area.

The site occurs as part of a larger patch of vegetation which extends to the north, north-east and west. These habitat patches are fragmented from habitats further to the north by the Moss Vale Unanderra Railway and adjacent residential development at Farmbrough Heights and by cleared rural-residential and industrial lands to the south.

Tenuous connectivity is present to the Illawarra Escarpment, however the width of the vegetation linkage is constricted along the northern boundary of the landfill site which occurs to the west of the site. While the site is connected to larger areas of vegetation associated with the Illawarra Escarpment, the site does not provide a wildlife linkage between substantial habitat patches within the locality.

Riparian connectivity is facilitated by the un-named tributary of Gibsons Creek which intersects the site. This tributary is flanked by cleared land and highly disturbed vegetation, however is likely to provide some freshwater habitat connectivity to Gibsons Creek.



3.8 Aquatic and Riparian Habitats

3.8.1 Stream Order Classification

The site is intersected by an unnamed tributary of Gibsons Creek which constitutes a first order watercourse in accordance with the Strahler Stream Classification System (Strahler, 1952).

3.8.2 Riparian and Aquatic Vegetation

The watercourse intersects the Illawarra Subtropical Rainforest vegetation community within the northern section of the site and is flanked by Cleared Land Regrowth Acacia and Exotic Shrubs vegetation on the lower slopes of the site adjacent to the development footprint. The vegetation present has been described in Section 3.3 of this report and mapped in Figure 3.1.

Very low levels of in-stream aquatic vegetation occur within the site; aquatic species observed included *Typha orientalis* and *Persicaria decipiens*. High levels of exotic species including *Pennisetum clandestinum*, *Lantana camara* and *Ageratina adenophora* were observed.

3.8.3 Freshwater Fish Species within the Locality

The freshwater fish species identified by NSW DPI as having a potential distribution within the locality are listed in Table 3.7. One protected species, the Australian Grayling, has potential to occur within the locality, no threatened freshwater fish species listed within the *FM Act* (1994) have been identified as occurring within the locality.

Four fish species, the Long-finned Eel, Australian Smelt, Flathead Gudgeon and Striped Gudgeon were observed during fauna surveys.

TABLE 3.7 FRESHWATER FISH SPECIES IN THE LOCALITY	
Common Name	Scientific Name
Australian Bass	<i>Macquaria novemaculeata</i>
Australian Grayling ^P	<i>Prototroctes maranea</i>
Australian Smelt	<i>Retropinna semoni</i>
Bullrout	<i>Notesthes robusta</i>
Common Carp*	<i>Cyprinus carpio</i>
Common Jollytail	<i>Galaxias maculatus</i>
Cox's Gudgeon	<i>Gobiomorphus coxii</i>
Dwarf Flathead Gudgeon	<i>Philypnodon macrostomus</i>
Empire Gudgeon	<i>Hypseleotris compressa</i>
Firetail Gudgeon	<i>Hypseleotris galii</i>
Flathead Gudgeon	<i>Philypnodon grandiceps</i>
Freshwater Catfish	<i>Tandanus tandanus</i>
Freshwater Herring	<i>Potamalosa rishmodia</i>
Freshwater Mullet	<i>Myxus petardi</i>
Gambusia*	<i>Gambusia holbrooki</i>
Goldfish*	<i>Carassius auratus</i>
Long-finned Eel	<i>Anguilla reinhardtii</i>
Oriental Weatherloach*	<i>Misgurnus anguillicaudatus</i>
Sea Mullet	<i>Mugil cephalus</i>
Short-finned Eel	<i>Anguilla australis</i>
Southern Blue-eye	<i>Pseudomugil signifer</i>
Striped Gudgeon	<i>Gobiomorphus australis</i>
*= Introduced Species ^P = protected species	

3.8.4 Description of Aquatic Habitats and NSW DPI (2013) TYPE Classification

The watercourse present provides freshwater non-tidal habitats and is likely to provide intermittent or permanent flow. The substrate is rock in the northern section of the site and earth and natural and introduced rocks and gravel substrate within the lower sections of the site. No snags and low levels of in stream woody debris were observed. Upstream the watercourse flows through a residential development, under a railway line and over rock ledge before entering the site. Downstream the watercourse flows through industrial and cleared rural-residential areas and under West Dapto Road, the Illawarra Railway and the Princes Highway where it meets Gibsons Creek, which flows to a large permanent creek (Mullet Creek) and into Lake Illawarra.

The NSW DPI (2013) Policy and Guidelines for Fish Habitat Conservation and Management, provide a classification system for identifying key fish habitat and associated sensitivity class. The site contains freshwater habitats within very low levels of native aquatic plants. Technically due to the presence of low levels of aquatic vegetation, the watercourse would be classified as TYPE 1 – Highly Sensitive Key Fish Habitat. It is considered that under this classification system the majority of freshwater streams within the locality would be classified as TYPE 1 – Highly Sensitive Key Fish Habitat due to the presence of native aquatic plant species and that the watercourse present would more appropriately contain TYPE 3 Minimally sensitive fish habitat.

3.8.5 Description of Waterway Fish Habitat CLASS

The NSW DPI (2013) Policy and Guidelines for Fish Habitat Conservation and Management, provide a system for classifying the likely fish habitats provided by a watercourse based on watercourse characteristics. The watercourse present conforms to CLASS 2 moderate key fish habitat and Class 3 minimal key fish habitat.

3.9 Groundwater Dependent Ecosystems

New South Wales State Groundwater Dependent Ecosystems Policy

The Policy identifies five broad types of groundwater systems which support the groundwater dependant ecosystems (GDEs) which occur within NSW. The Policy outlines the management framework and five management principles for GDEs with procedures for implementation. A brief outline of the plan is provided below.

Groundwater Systems

The following five broad types of groundwater systems, each with associated dependent ecosystems, have been identified by NSW Department of Land and Water Conservation (2002) for NSW:

- 1) Deep Alluvial Groundwater Systems (occur under floodplains of major rivers);
- 2) Shallow Alluvial Groundwater Systems (associated with coastal rivers);
- 3) Fractured Rock Groundwater Systems (associated with outcropping and sub-cropping where water is transported between rock fractures, joints, bedding planes and faults);
- 4) Coastal Sand Bed Groundwater Systems (associated with highly permeable coastal sand beds)and;
- 5) Sedimentary Rock Groundwater Systems (sedimentary rock sub-artesian aquifers).

Groundwater Dependant Ecosystems

Groundwater dependant ecosystems can either be dependent on surface availability of groundwater or sub-surface availability of groundwater. The NSW Department of Land and Water Conservation (2002) have identified the following types of Groundwater Dependent Ecosystems in NSW:

Terrestrial Vegetation

Shallow groundwater supports terrestrial vegetation such as forests and woodlands either permanently or seasonally. Terrestrial groundwater dependent vegetation may also be supplemented by surface water flows from rainfall.

Base Flow in Streams

River flow which is maintained by groundwater which provides base flows long after a rainfall event. Base flows typically emerge as springs or diffuse flow from saturated sediments or rock underlying the stream and banks. Base flow streams may be crucial for in-stream and near-stream ecosystems.

Aquifer and Cave Ecosystems

Ecosystems that exist within aquifers and underground caves in conditions of total darkness,

Wetlands

Included in this category are upland and lowland wetlands and hanging swamps. Wetlands can develop in areas originally waterlogged due to the discharge of groundwater at the land surface, and have progressively become reliant on seepage (SCC 2011).

Occurrence of Groundwater Dependant Ecosystems

The site is located within the region covered by the Water Sharing Plan for the Greater Metropolitan Region Groundwater Source 2011. No high priority groundwater dependent ecosystems are identified within the plan as occurring within 5 km of the subject site.

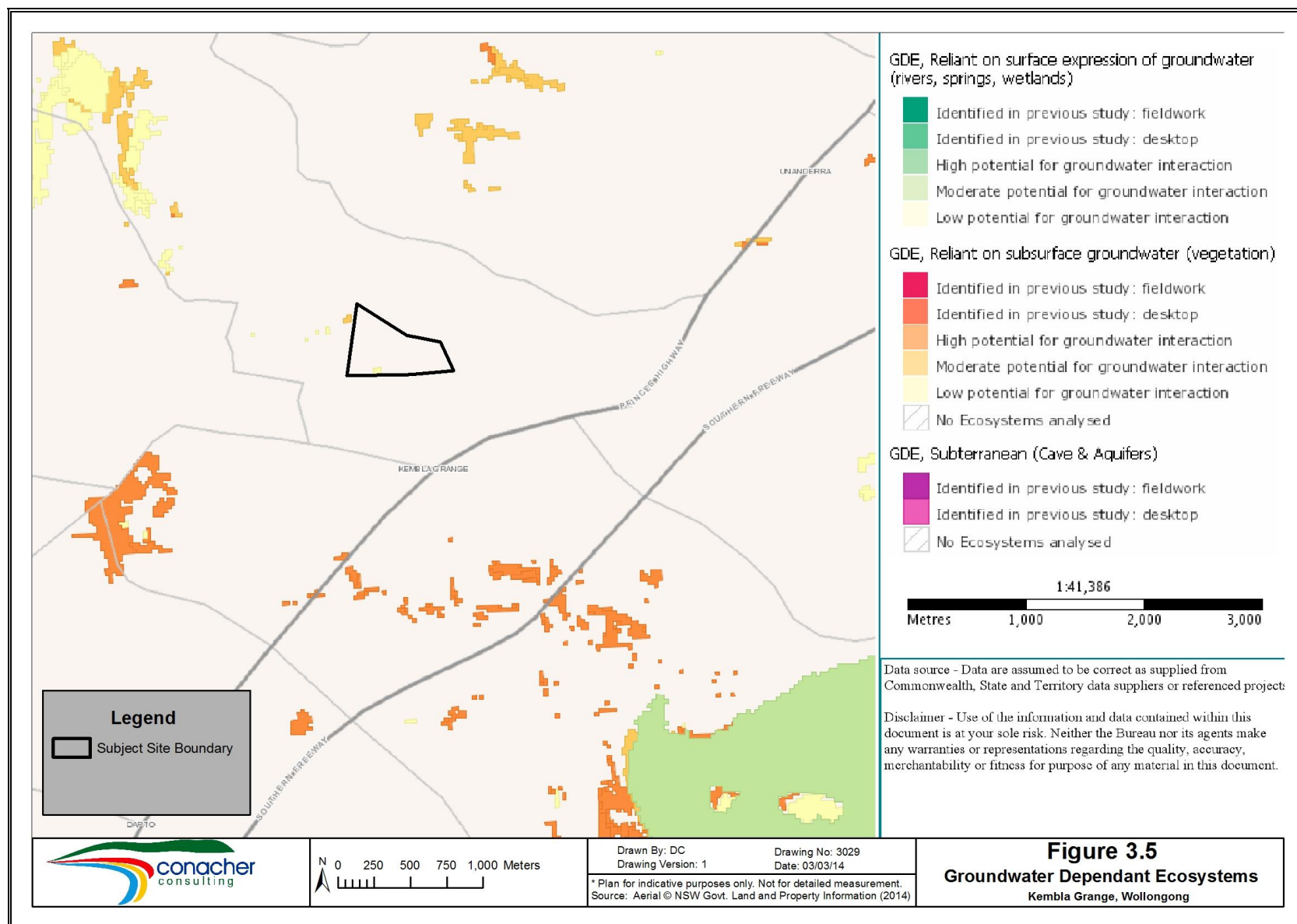
The following groundwater dependent ecosystem types have potential to occur within 5km of the site:

- Terrestrial vegetation dependant on shallow surface water flows;
- Base flow in streams; and
- Lowland wetlands reliant on groundwater seepage.

Groundwater investigations undertaken within the site identified that the minimum depth to groundwater within the site was approximately 5 metres within the vicinity of the watercourse which intersects the site.

Groundwater Dependant Ecosystems within and surrounding the subject site identified on the Groundwater Dependant Ecosystems Atlas (Australian Government Bureau of Meteorology 2014) are shown in Figure 3.5. The Australian Government Bureau of Meteorology (2014) include small patches of South Coast Grassy Woodlands vegetation, commensurate with the Disturbed Forest Red Gum vegetation type. These occur within and adjoining the northern section of the site and have a low to moderate potential for sub-surface groundwater interaction. It is also likely that the Disturbed Subtropical Rainforest community identified within the site has low to moderate potential for sub-surface groundwater interaction, as identified within areas further to the north of the site.

Areas of South Coast Lowland Swamp Woodland and Coastal Freshwater Lagoon / Floodplain Swamp Forest reliant on sub-surface groundwater and Wetlands reliant on surface expression of groundwater also exist further to the south of the site.



4. EVALUATION OF BIODIVERSITY IMPACTS

4.1 Loss of Vegetation/Habitats

The proposed development will occupy the existing disturbed areas of the site within areas which contain Cleared Land and a relatively small area of Regrowth Acacia with Exotic Shrub vegetation. The occurrences of Disturbed Subtropical Rainforest and Disturbed Red Gum Forest present will be retained within the site.

A summary of the proposed vegetation clearing is provided in Table 4.1 and the proposed development footprint area is shown in Figure 4.1.

TABLE 4.1 SUMMARY OF PROPOSED VEGETATION CLEARING				
Vegetation Community	Total Area	Area to be Cleared (ha)	TSC Act	EPBC Act
Disturbed Subtropical Rainforest	1.5	0	Illawarra Subtropical Rainforest in the Sydney Basin Bioregion	Not listed
Disturbed Red Gum Forest	0.5	0	Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion	Not listed
Regrowth Acacia and Exotic Shrubs	12.5	0.45	Not listed / NA	Not listed / NA
Cleared Land	7.3	N/A	Not listed / NA	Not listed / NA

4.2 Habitat Fragmentation and Isolation

It is considered that the proposal is not likely to significantly alter connectivity for wildlife within the subject site or locality as the development footprint will be located within mostly existing cleared areas. The existing level of connectivity along the watercourse which intersects the development site will be maintained and improved in accordance the Vegetation Management Plan prepared for the site by Southern Habitat (2013).

4.3 Fauna Injury and Mortality

There is potential for injury or mortality to fauna species to occur during site clearing and operation from collisions with vehicles and plant machinery.

Injury and mortality to fauna species during the site clearing phase will be minimised through the retention of hollow bearing trees within the site. Potential fauna injury and mortality impacts during the site operation phase are likely to be only minor and mostly unavoidable.

4.4 Exotic Flora Species

The site currently contains high levels of weed species. It is considered that the proposal is not likely to significantly increase the presence of distribution of weeds within the site, however there is potential for weeds to be spread by earth moving machinery entering and leaving the site during the construction / site clearing and site operational phases. Cleaning of plant machinery will be undertaken prior to entering or leaving the site.

Exotic flora will be management within the riparian areas of the site in accordance with the Vegetation Management Plan prepared for the site by Southern Habitat (2013).

4.5 Pests and Pathogens

Introduction of pests and pathogens is not likely to occur as a direct result of the proposed development. If pests or pathogens are inadvertently introduced to the site the will be management in accordance with industry best practice guidelines.

4.6 Hydrology and Aquatic Habitats

Without suitable management measures the proposal has potential to result in the following impacts to the existing hydrological conditions and associated aquatic habitats:

- Increased sedimentation of aquatic habitats;
- Contamination and pollution of aquatic habitats; and
- Modification of the existing water flow regimes.

These impacts are proposed to be managed through rapid revegetation and/or stabilisation of disturbed areas, compaction of the works areas, diversion of stormwater and runoff from the processing and stockpile areas of the site to a water quality / recycling pond and provision of chemical spill kits to prevent and minimise pollutants contaminating aquatic habitats. A 10 metre vegetated riparian corridor will also be retained and managed as a buffer between the development and the watercourse which intersects the site.

4.7 Groundwater Dependent Ecosystems

The Groundwater Dependant Ecosystems Atlas (Australian Government Bureau of Meteorology 2014) has identified that small patches of South Coast Grassy Woodlands vegetation, commensurate with the Disturbed Forest Red Gum vegetation type observed within and adjoining the northern section of the site has low potential for sub-surface groundwater interaction. Areas of South Coast Lowland Swamp Woodland and Coastal Freshwater Lagoon / Floodplain Swamp Forest reliant on sub-surface groundwater and Wetlands reliant on surface expression of groundwater also exist further to the south of the site.

Groundwater investigations undertaken identified that the minimum depth to groundwater within the site was approximately 5 metres within the vicinity of the watercourse which intersects the site.

The proposal will not require direct clearing of groundwater dependant ecosystems and is not likely to result in extraction or contamination of available groundwater. To prevent potential infiltration of groundwater with contaminants, the works area will consist of a base of compacted road base over compacted clay and chemical spill kits will also be utilised on the site.

4.8 Noise, Vibration and Light

The site and surrounding area is currently subject to noise and vibration associated with the current use of the site as a resource recovery facility. These impacts will continue to be managed through the use of machinery that complies with noise and / or vibration standards and restriction of works to standard working hours. Light impacts are likely to be limited to existing highly disturbed edge habitat areas. Light impacts from vehicles will generally be restricted to working hours.

4.9 Dust and Pollution

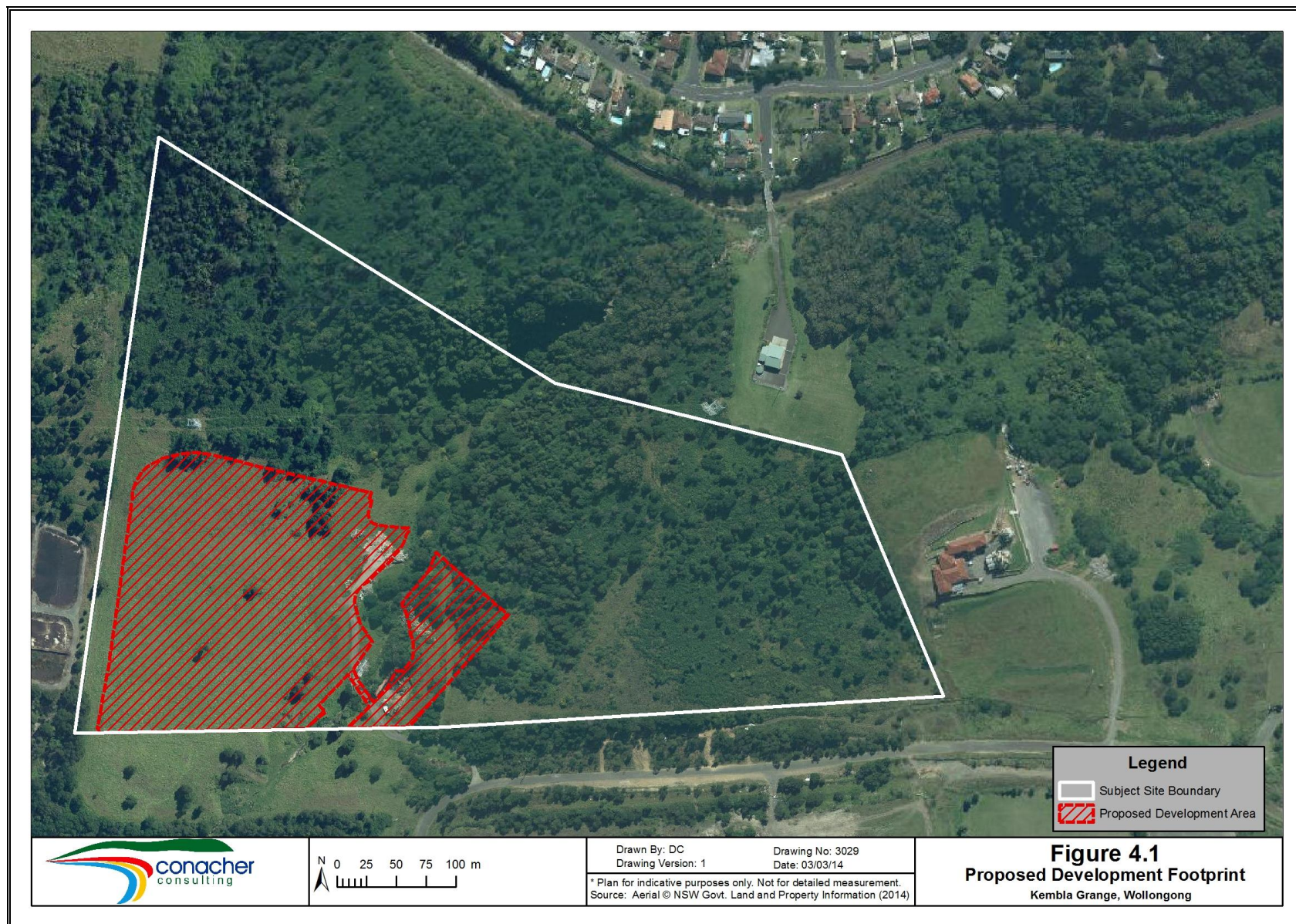
The generation of dust and pollution has potential to affect the metabolic function of native vegetation and suitability of the habitats for and health of fauna species present. There is potential for dust and pollution generation during the construction and operational stages of the proposed development.

Dust and pollution impacts will be limited by suppressing raised dust through compaction of the works area surface and installation of a sprinkler system to dampen and suppress dust. Revegetation and/or stabilisation of disturbed areas following construction and the maintenance of all machinery to meet emission standards will also be undertaken.

There is also potential for the contamination and degradation of natural areas of the site with gross pollutants and liquid pollutants during the construction / site clearing phase and the operation phase of the proposed development. Suitable management measures such as the provision of spill kits and prevention and removal of wind-blown rubbish will be undertaken.

4.10 Cumulative Impacts

The proposal is likely to have a minor contribution to the cumulative loss and/or modification of vegetation and fauna habitats within the local area, however the site is currently utilised as a resource recovery facility, and the expansion of these activities within the site is considered not likely to have a substantial cumulative impact within the region or locality.



5. AMELIORATION MEASURES

The amelioration measures outlined in Table 5.1 will be implemented to mitigate potential impacts associated with the proposed development.

TABLE 5.1 AMELIORATION MEASURES		
Potential Impact	Environmental Safeguard / amelioration measure	Time
Loss of vegetation and habitats	Retention of remnant intact native vegetation / endangered ecological communities Retention of identified hollow bearing tree Installation of protective fencing for retained vegetation Retention of 10m wide vegetated riparian corridor to protect aquatic habitats Revegetation of disturbed batters and landscape areas with native flora species.	Construction and operation phases.
Injury and/or mortality to fauna species	Retention of identified hollow bearing tree	Construction and operation phases.
Invasion and spread of exotic flora species	Undertake weed management in accordance with the requirements of the <i>Noxious Weeds Act</i> (1993) Remove vegetative matter from earth moving machinery prior to entering and leaving the site. Undertaken weed management of the vegetated riparian buffer area in accordance with the Vegetation Management Plan prepared by Southern Habitat (2013)	Construction and operation phases.
Impacts to existing hydrology and aquatic habitats	Rapid revegetation and/or stabilisation of disturbed areas Diversion of stormwater and runoff from the processing and stockpile areas of the site to a water quality / recycling pond Provision of chemical spill kits Retention and management of a 10 metre wide vegetation riparian corridor as a buffer between the development and the watercourse which intersects the site	Construction and operation phases.
Groundwater Dependant Ecosystems (Indirect Impacts)	The works area will consist of a base of compacted road base over compacted clay	Construction and operation phases.

TABLE 5.1 AMELIORATION MEASURES		
Potential Impact	Environmental Safeguard / amelioration measure	Time
	Provision and use of chemical spill kits	
Noise, Vibration and Light	Maintain machinery to comply with noise and/or vibration standards Adherence to approved hours of operation / works.	Construction and operation phases.
Dust and Pollution	Suppression of raised dust through dampening Provision of hard stand surfaces where appropriate Rapid revegetation and/or stabilisation of disturbed Maintenance of all machinery to meet emission standards. Provision of chemical spill kits Prevention and removal of wind-blown rubbish	Construction and operation phases.

6. SIGNIFICANCE ASSESSMENTS

6.1 EPBC Act Assessment

The *Environment Protection and Biodiversity Conservation Act*, (1999) requires that Commonwealth approval be obtained for certain actions. The Act provides an assessment and approvals systems for actions that have a significant impact on matters of National Environment Significance (NES). These may include:-

- Wetlands protected by international treaty (the Ramsar Convention);
- Nationally listed threatened species and ecological communities;
- Nationally listed migratory species.

Actions are projects, developments, undertakings, activities, series of activities or alteration of any of these. An action that needs Commonwealth approval is known as a controlled action. A controlled action needs approval where the Commonwealth decides the action would have a significant effect on a NES matter.

Where a proposed activity is located in an area identified to be of NES, or such that it is likely to significantly affect threatened species, ecological communities, migratory species or their habitats, the matter needs to be referred to the Australian Government Department of the Environment (AGDE).

i. Are there any Matters of National Environmental Significance located in the area of the proposed action?

Threatened Species

The following threatened flora and fauna species listed under the *EPBC Act* (1999), identified on the protected matters search (AGDE 2014), have suitable habitat present within the subject site:

Flora

- *Cynanchum elegans*;
- *Daphnandra* sp. C Illawarra;

Fauna

- Green and Golden Bell Frog;
- Australian Painted Snipe;
- Eastern Bristlebird;
- Spotted-tailed Quoll;
- Grey-headed Flying-fox; and
- Large-eared Pied Bat.

The threatened fauna species, Grey-headed Flying-fox, as listed within the *EPBC Act* (1999), was observed within or adjoining the subject site during surveys.

Nationally Listed Threatened Ecological Communities

No threatened ecological communities, listed within the *EPBC Act* (1999), were observed within or adjoining the subject site during surveys.

Nationally Listed Migratory Species

The following migratory species (excluding marine species), listed under the *EPBC Act* (1999), identified on the protected matters search, have suitable habitat present within the subject site:

- Fork-tailed Swift (*Apus pacificus*);
- Great Egret (*Ardea modesta*);
- Cattle Egret (*Ardea ibis*);
- White-bellied Sea-eagle (*Haliaeetus leucogaster*);
- White-throated Needletail (*Hirundapus caudacutus*);
- Rainbow Bee-eater (*Merops ornatus*);
- Black-faced Monarch (*Monarcha melanopsis*);

- Satin Flycatcher (*Myiagra cyanoleuca*);
- Rufous Fantail (*Rhipidura rufifrons*); and
- Latham's Snipe (*Gallinago hardwickii*).

The EPBC Act (1999) listed migratory species, Black-faced Monarch (*Monarcha melanopsis*), was observed within the subject site during surveys.

Ramsar Wetlands of International Importance

No Ramsar Wetlands, were recorded within 10km of the subject site on the EPBC Act Protected Matters Search Report (AGDE 2014).

The Commonwealth Marine Environment

No Commonwealth marine areas, as listed within the *EPBC Act* (1999), were observed within the subject site or recorded within 10km of the subject site on the EPBC Act Protected Matters Search Report (AGDE 2014).

Listed World Heritage Properties

No world heritage properties, as listed within the *EPBC Act* (1999), were observed within the subject site or recorded within 10km of the subject site on the EPBC Act Protected Matters Search Report (AGDE 2014).

Listed National Heritage Places

No national heritage places listed within the *EPBC Act* (1999) were observed within the subject site or recorded within 10km of the subject site on the EPBC Act Protected Matters Search Report (AGDE 2014).

The Great Barrier Reef Marine Park

The subject site is not located within 10km of the Great Barrier Reef Marine Park.

Nuclear Actions

The proposal is not a type of action classed as a nuclear action.

ii. Considering the proposed action at its broadest scope, is there potential for impacts on Matters of National Environmental Significance?

The proposal will require the removal of a relatively small area of suitable habitats for nomadic nationally listed threatened and migratory fauna species, including the Grey-headed Flying-fox and Black-faced Monarch which were observed during surveys.

iii. Are there any proposed measures to avoid or reduce impacts on Matters of National Environmental Significance?

Amelioration measures are outlined in detail within Section 5 of this report.

iv. Are any impacts of the proposed action on Matters of National Environmental Significance likely to be significant impacts?

No. Assessments in accordance with the EP&BC Act Policy Statement 1.1 *Significant Impact Guidelines* (AGDE 2013) are provided in Appendix 2 for nationally listed threatened and migratory species observed within the site.

These assessments have concluded that the proposal is not likely to have a significant impact on the threatened or migratory species listed within the *EP&BC Act* (1999) which were observed.

It is further considered that the proposal is not likely to have a significant impact on nationally listed threatened or migratory species which were not detected during surveys due to the availability of larger areas of higher quality habitats within the surrounding areas.

CONCLUSION

It is considered that a referral of this project to the Australian Government Department of the Environment is not required as the proposed action is not likely to have a significant impact on a matter of National Environmental Significance.

6.2 Environmental Planning and Assessment Act (1979) - Assessment of Significance

As identified in Section 5(A) of the *EP&A Act* 1979 the following matters need to be addressed to determine whether or not a significant effect on threatened species, populations or ecological communities or their habitats listed within the TSC Act (1995) or the FM Act (1994), is likely to result from the proposed development. The following assessments have been undertaken for those threatened species, populations and ecological communities observed during surveys or identified as having suitable habitat contained within the subject site.

For the purposes of the following assessments the definitions of specific terminology and interpretations of the key terms used are as per the DECC (2007) Threatened species assessment guidelines. Further clarification is also provided where deemed appropriate.

- 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,***

FLORA

Arthropteris palisotii

This species is a creeping fern which grows in rainforest vegetation communities mainly on tree trunks.

It is considered that suitable habitat is present for this species within the areas of the site containing Disturbed Subtropical Rainforest shown in Figure 3.1. This species was not observed within the subject site during surveys and the majority of areas of suitable habitat present for this species are not likely to be removed or modified as a result of the proposed development. It is therefore considered that the action proposed is not 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.

Cynanchum elegans

This species is a climber or twiner with stems becoming corky. It occurs mainly at the ecotone between dry subtropical rainforest and sclerophyll forest/woodland communities.

It is considered that suitable habitat for this species is present within the areas of the site containing Disturbed Subtropical Rainforest and Disturbed Red Gum Forest vegetation communities shown in Figure 3.1. This species was not observed within the subject site during targeted quadrat and meander search surveys and the majority of areas of suitable habitat present for this species are not likely to be removed or modified as a result of the proposed development. It is therefore considered that the action proposed is not 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.

***Daphnandra* sp. C Illawarra**

This species is a tree to 20 metres tall. It occurs on rock hillsides and gully slopes of the Illawarra lowlands, occasionally extending into the upper escarpment slopes. It is associated with subtropical rainforest and moist Eucalypt forest communities.

It is considered that suitable habitat for this species is present within and at the edges of the Disturbed Subtropical Rainforest vegetation community shown in Figure 3.1. This species was not observed within the subject site during surveys and the majority of areas of suitable habitat present for this species are not likely to be removed or modified as a result of the proposed development. It is therefore considered that the action proposed is not 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.

Irenepharsus trypherus

This species frequently occurs where bands of laterite outcropping occur between the Budging Sandstone and/or the Illawarra Coal Measures on steep rocky slopes and cliff lines at elevations between 85 and 400 m. It has been recorded from moist sclerophyll open forest and woodland, grassy woodland, closed forests and subtropical rainforest communities (NSW OEH 2014).

It is considered that suitable habitat for this species is present within the upper slope areas of the site containing Disturbed Subtropical Rainforest and Disturbed Red Gum Forest vegetation communities shown in Figure 3.1. This species was not observed within the subject site during surveys and the areas of suitable habitat present for this species are not likely to be removed or modified as a result of the proposed development. It is therefore considered that the action proposed is not 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.

Senna acclinis

This species is a sprawling shrub to 3m high that grows in subtropical and dry rainforest from Queensland to the Illawarra, on the coast and adjacent tablelands (NSW OEH 2014).

It is considered that suitable habitat for this species is present within and at the edges of the Disturbed Subtropical Rainforest vegetation community shown in Figure 3.1. This species was not observed within the subject site during surveys and the majority of areas of suitable habitat present for this species are not likely to be removed or modified as a result of the proposed development. It is therefore considered that the action proposed is not 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.

Solanum celatum

This species is a shrub which grows between 1 to 2.5 metres high on hills and slopes in rainforest clearings or in wet sclerophyll forest with Eucalyptus. It has been recorded from a restricted area from Wollongong to a little south of Nowra and west to Bungonia Nature Reserve.

It is considered that suitable habitat for this species is present within the areas of the site containing Disturbed Subtropical Rainforest and Disturbed Red Gum Forest vegetation communities shown in Figure 3.1. This species was not observed within the subject site during surveys and the majority of areas of suitable habitat present for this species are not likely to be removed or modified as a result of the proposed development. It is therefore considered that the action proposed is not 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.

Zieria granulata

This species is a tall shrub or small tree which is found growing on dry ridge tops and rocky outcrops with shallow, volcanic soils. This species is less frequently found on the moist slopes of the Illawarra escarpment and in low-lying areas on Quaternary sediments. Vegetation types typically associated with this species include subtropical rainforest, *Melaleuca armillaris* (Bracelet Honey-myrtle) scrub to tall shrubland, and *Eucalyptus tereticornis* (Forest Red Gum) open forest (NSW OEH 2014).

It is considered that suitable habitat for this species is present within the areas of the site containing Disturbed Subtropical Rainforest and Disturbed Red Gum Forest vegetation communities shown in Figure 3.1. This species was not observed within the subject site during surveys and the majority of areas of suitable habitat present for this species are not likely to be removed or modified as a result of the proposed development. It is therefore considered that the action proposed is not 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.

FAUNA

Green and Golden Bell Frog (*Litoria aurea*)

The Green and Golden Bell Frog is largely aquatic and is found among vegetation within or at the edges of permanent water. The males call mainly after rain from spring to autumn while afloat among vegetation, usually in larger permanent dams, swamps and lagoons. Breeding often peaks after heavy rains in January to February (NSW NPWS 1999).

It is considered that highly disturbed suitable habitats are present for this species within the riparian areas of the site, however this species was not observed within the subject site during surveys. The riparian areas present within the site will be retained and managed as part of the proposed development. It is therefore considered that the action proposed is not 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.

Wompoo Fruit-dove (*Ptilinopus magnificus*)

The Wompoo Fruit-dove mainly inhabits large undisturbed patches of tall tropical or subtropical evergreen rainforest. It is an obligate frugivore, taking fruits of many species of rainforest trees, palms, vines and epiphytes, feeding mostly in the canopy (Higgins & Davies 1996).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Rose-crowned Fruit-dove (*Ptilinopus regina*)

The Rose-crowned Fruit-dove inhabits tall tropical and subtropical, evergreen or semi-deciduous rainforest, especially with dense growth of vines. In NSW this species is widespread in north-east, in Northern Rivers, Northern Tablelands, and Mid-North Coast Regions. This species is frugivorous, taking fruits of many species of rainforest trees, palms, and vines, feeding mainly in the canopy but also in low trees and undergrowth (Higgins & Davies 1996).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Superb Fruit-dove (*Ptilinopus superbus*)

This species inhabits mostly closed forests, occasionally near streams or lakes within rainforest. Breeding most commonly occurs within dense forests. They are a regular autumn and winter migrant to the Hunter, Sydney, Illawarra and South Coast regions. This species is frugivorous, taking fruits of many species of rainforest trees, vines and palms (Higgins & Davies 1996).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Black-necked Stork (*Ephippiorhynchus asiaticus*)

This species prefers still and permanent, shallow freshwater floodplain habitats including wetlands, swamps, watercourses, farm dams and shallow floodwaters and adjacent areas of grasslands, heathlands, paddocks, and woodlands. This species also forages around estuaries and along intertidal shorelines (Marchant & Higgins 1990).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Black Bittern (*Ixobrychus flavicollis*)

This species primarily inhabits permanent freshwater and estuarine wetlands, ponds and streams with tall dense vegetation. It also utilises adjacent habitats of flooded grassland, forest, woodland, rainforest and mangroves (Lindsey 1992).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Square-tailed Kite (*Limosa limosa*)

The Square-tailed Kite inhabits the coastal forested and wooded lands of tropical and temperate Australia. The Square-tailed Kite is a specialist hunter of passerines, especially honeyeaters, and insects in the tree canopy, picking most prey items from the outer foliage (Marchant & Higgins 1993).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Little Eagle (*Hieraaetus morphnoides*)

This species forages in a variety of habitats including woodland open forest, partially cleared areas, along watercourses and around wetlands, avoiding large areas of dense forest. This species nests in mature living trees in open forest, woodland and remnant areas including farmland and areas close to urban development (Marchant and Higgins 1993).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Painted Snipe (*Rostratula benghalensis*)

Painted Snipe's inhabit terrestrial shallow freshwater, wetlands; ephemeral and permanent: lakes, swamps, clay pans, inundated or waterlogged grassland or saltmarsh. Generally uncommon, this species is scattered east of a line between Eyre Peninsular Karumba, Qld, and the Murray-Darling Basin of NSW (Marchant & Higgins 1993).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Gang-gang Cockatoo (*Callocephalon fimbriatum*)

The Gang-gang Cockatoo is associated with a variety of woodland and forest habitats, and occasionally more open areas in south-eastern New South Wales and Victoria. This species utilises eucalypt forests and exotic trees, and is known to feed on the seeds of native shrubs and trees, in addition to some exotic species such as the Hawthorn and Cupressus species (Higgins 1999).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Glossy Black-Cockatoo (*Calyptrorhynchus lathamii*)

The Glossy Black-Cockatoo inhabits woodlands and open sclerophyll forests dominated by or with a middle stratum of *Allocasuarina*. They choose trees with larger cone crops, concentrating foraging in trees with a high ratio of total seed weight to cone weight. They breed in hollow trees or stumps usually in Eucalypts (Higgins 1999).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Turquoise Parrot (*Neophema pulchella*)

The Turquoise Parrot is a sedentary species inhabiting the foothills of the Great Divide, including steep rocky ridges and gullies, rolling hills, valleys and river-flats and nearby plains. This species feeds on the ground on grass seeds usually beneath trees. This species is endemic to eastern Australia, and is known from south-east Queensland through eastern New South Wales to north-east Victoria (Higgins 1999).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Little Lorikeet (*Glossopsitta pusilla*)

Little Lorikeets are distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Lorikeets are gregarious, usually foraging in small flocks, often with other species of lorikeet. They feed primarily on nectar and pollen in the tree canopy, particularly on profusely-flowering eucalypts, but also on a variety of other species including, melaleucas and mistletoes (Courtney & Debus 2006).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Barking Owl (*Ninox connivens*)

The Barking Owl utilises dry sclerophyll forests and woodlands of tropical, temperate and semi-arid zones, particularly those associated with watercourses, wetlands and forest edges. Nests in large hollows in live eucalypts, often near open country (Higgins 1999).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Powerful Owl (*Ninox strenua*)

The Powerful Owl breeds in open or closed sclerophyll forests and woodlands, including wet sclerophyll forest and dry sclerophyll forest and woodlands. They nest in hollows in large old trees; usually living Eucalyptus, within or below canopy in stumps or broken-off trunks. Powerful Owls are sedentary within home ranges of about 1,000 hectares within open eucalypt, casuarina or *Callitris* pine forest and woodlands, though they often roost in denser vegetation, including rainforest or exotic pine plantations. Powerful Owls feed mainly on medium-sized arboreal marsupials (Higgins 1999).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Masked Owl (*Tyto novaehollandiae*)

The Masked Owl is widespread through forests and woodlands. The Masked Owl is known to utilise forest margins and isolated stands of trees within agricultural land. This species is often found in heavily disturbed forest where its prey of small and medium sized mammals can be readily obtained. The Masked Owl is dependent upon hollow bearing trees all year round requiring old mature trees with large hollows for breeding and as diurnal roosting sites (Higgins 1999).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Sooty Owl (*Tyto tenebricosa*)

The Sooty Owls habitat is often tall old-growth montane forests, including temperate and subtropical rainforest. This species occurs mostly in uplands in gullies and on slopes of valleys but rarely on ridges. Optimal habitat contains tall eucalypts with large hollows suitable for nesting and roosting, but also a range of hollows that provide shelter for prey. The same nest is used repeatedly, and the owls also roost and occasionally nest in caves. The Sooty Owl preys on arboreal and terrestrial mammals and occasionally birds (Higgins 1999).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Eastern Bristlebird (*Dasyornis brachypterus*)

This Eastern Bristlebird inhabits low dense vegetation in a wide range of habitats, including sedgeland, heathland, swampland, shrubland, sclerophyll forest and woodland and rainforest in temperate and sub-tropical regions. The Eastern Bristlebird forages mainly on insects and seeds (Higgins & Peter 2002).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

White-fronted Chat (*Epthianura albifrons*)

The White-fronted Chat inhabits damp habitats near both saltwater and freshwater wetlands, in saltmarsh, surrounding grassland, among reeds and rushes, and shrubs. This species has also been recorded in sand-dune vegetation and on sandy beaches and at the edges of mangroves (Higgins et al., 2001).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Varied Sittella (*Daphoenositta chrysoptera*)

This species inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland (Higgins & Peter 2002).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Olive Whistler (*Pachycephala olivacea*)

This species inhabits wet forest habitats. It has a disjunct distribution around Barrington Tops and the MacPherson Ranges in the north and from Illawarra to Victoria in the south. The northern population inhabits rainforests above 500 m to 1500 m, and the southern population inhabits eucalypt forests, rainforests, paperbarks, alpine forests and coastal scrubs and heathlands (Higgins and Peter 2002).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Scarlet Robin (*Petroica boodang*)

This species inhabits mainly dry eucalypt forest and woodlands with open shrubby and grassy understorey on ridges and slopes during the spring-summer breeding season, dispersing during autumn–winter into open habitats including urban areas (Higgins and Peter 2002).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Flame Robin (*Petroica phoenicea*)

This species inhabits upland wet to moist eucalypt forests and woodlands with an open understorey, often on ridges and slopes to 1800m above sea level during the spring-summer breeding season. During the autumn to winter non breeding season this species disperses to open lowland habitats including grasslands, farmland dry sclerophyll forests and woodlands (Higgins and Peter 2002).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Pink Robin (*Petroica rodinogaster*)

The Pink Robin inhabits the dense shrub layer of damp or wet forests or rainforests moving to dense gully forest or cool-temperate rainforests during the breeding season which usually occurs from September to March. The Pink Robin is insectivorous and considered to be partly resident to partly migratory or dispersive in autumn to winter (Higgins & Peter 2002).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Spotted-tailed Quoll (*Dasyurus maculatus*)

The Spotted-tailed Quoll inhabits a range of forest communities including wet and dry open forest and rainforest. It appears to prefer moist forest types and riparian habitat. It has been recorded from dry sclerophyll forest, open woodland and coastal heathland, and despite its occurrence in inland riparian areas, it also ranges over dry ridges (NSW NPWS 1999).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

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

Grey-headed Flying-foxes roost in camps during the day, which may contain tens of thousands of individuals, and then disperse to surrounding areas to forage at night. This species inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and urbanised and agricultural areas. Camps are commonly formed in gullies, typically not far from water and usually in vegetation with a dense canopy. Camps may also be formed in urban parkland areas (Tidemann 1995).

One Grey-headed Flying-fox was observed foraging within an exotic palm tree (*Phoenix canariensis*) adjacent to the creek crossing during nocturnal surveys on 27 February 2014. Several other individuals were also observed flying over the site. No roost or camp sites were observed.

Due to the presence of larger areas of suitable habitat for this species within the locality, and the retention of the majority of the areas of suitable habitat for this species within the site, it is considered that the action proposed is not 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.

Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*)

The Yellow-bellied Sheath-tail-bat inhabits a wide variety of habitats from wet and dry sclerophyll forest, to open woodland, shrubland, mallee, grassland and desert. They fly fast and straight usually over the canopy, and lower over open spaces and at forest edges. This species roosts in large tree hollows (Churchill 2008).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Eastern Freetail Bat (*Mormopterus norfolkensis*)

The Eastern Freetail-bat utilises dry eucalypt forest and woodland on the coastal side of the Great Dividing Range. They show a preference for open spaces in woodland or forest, and are more active in the upper slopes of forest areas rather than in riparian zones. They also forage over large waterways. This species roosts in hollow trees (usually in hollow spouts), under exfoliating bark and in various man-made structures (Churchill 2008).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Large-eared Pied Bat (*Chalinolobus dwyeri*)

In the Sydney Basin this species is most commonly recorded in areas of high fertility soils in wet sclerophyll forest along the edges of sandstone escarpments. This species is also recorded in dry sclerophyll forest and woodlands, sub-alpine woodland, at the edges of rainforest, Callitris forest and within sandstone outcrop country. Large-eared Pied Bats roost in clusters in fairy martin nests and on the ceilings of caves, crevices in cliffs and mines in twilight areas (Churchill 2008).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)

The Eastern False Pipistrelle inhabits wet sclerophyll forest, open forest, rainforest and coastal mallee. They generally prefer tall and wet forests where the trees are more than 20 metres high and the understorey is dense. This species predominantly roosts in hollow trunks of eucalypts, however have also been reported to roost in caves and old buildings (Churchill 2008).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)

Preferred habitats for this species include rainforest, wet and dry sclerophyll forest, open woodland, Melaleuca forests and open grassland. The Eastern Bentwing-bat forages high in forested areas from just above canopy height to many times canopy height. In more open areas such as grasslands, flight may be within a few metres of the ground. Eastern Bentwing-bats are cave dwellers, but will also roost in man-made structures such as road culverts and mines (Churchill 2008).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Southern Myotis (*Myotis macropus*)

The Large-footed Myotis has a strong association with streams and permanent waterways, most commonly within vegetated areas at lower elevations and in flat undulating country. This species forages over water for small insects, fish and invertebrates and have a preference for large pools rather than flowing streams. Roost habitats for this species are near water and include caves, tree hollows, abandoned fairy martin nests, among vegetation, in clumps of Pandanus, and man-made structures including under bridges, in mines, tunnels, road culverts and stormwater drains (Churchill 2008).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

Greater Broad-nosed Bat (*Scoteanax rueppellii*)

A wide variety of habitats are utilised by this species including moist gullies in mature coastal forest, rainforest, open woodland, Melaleuca swamp woodland, wet and dry sclerophyll forest, cleared areas with remnant trees and tree-lined creeks in open areas. The Greater Broad-nosed Bat forages about 5m from the edge of isolated trees, forest remnants or along forest crowns with a slow direct flight pattern. This species is known to roost in tree hollows, cracks and fissures in trunks and dead branches, under exfoliating bark, as well as in man-made structures including roofs of old buildings (Churchill 2008).

It is considered that suitable habitat for this species is present on the subject site, however this species was not observed within the subject site during surveys. It is considered that the action proposed is not 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.

- 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,***

The endangered populations known to occur within the local government area are:

- *Chorizema parviflorum* in the Wollongong and Shellharbour Local Government Areas;
- *Lespedeza juncea* subsp. *sericea* in the Wollongong Local Government Area; and
- Woronora Plateau population of *Callitris endlicheri*.

No flora or fauna specimens belonging to any endangered population were observed within the subject site.

The proposed action will not have an adverse effect on the life cycle of any species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

c) *In the case of a critically endangered or 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*

The endangered ecological communities (EEC), Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion (ILGW) and Illawarra Subtropical Rainforest in the Sydney Basin Bioregion (ISR) occur within the subject site.

Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion

The ILGW EEC corresponds to the Disturbed Red Gum Forest vegetation community shown in Figure 3.1.

The proposed development is located downslope approximately 130 metres from areas of ILGW EEC vegetation and will not result in a direct or indirect adverse effect on the extent of this EEC.

It is therefore considered that the proposed development is not likely to have an adverse effect on the extent of the ILGW EEC such that its local occurrence is likely to be placed at risk of extinction.

Illawarra Subtropical Rainforest in the Sydney Basin Bioregion

The ISR EEC corresponds to the Disturbed Red Gum – Disturbed Subtropical Rainforest vegetation community shown in Figure 3.1.

Three patches of this EEC occur within the site. Two larger patches are present within the northern sections of the site. These patches are upslope of the proposed development location and the proposal is not likely to have a direct or indirect adverse effect on the extent of these areas.

The third patch consists of 0.07 hectares of vegetation surrounding a large Moreton Bay Fig Tree (*Ficus macrophylla*). This patch is proposed to be retained within the proposed development footprint.

It is therefore considered that the proposed development is not likely to have an adverse effect on the extent of the ISR EEC such that its local occurrence is likely to be placed at risk of extinction.

ii. *Is likely to substantially and adversely modify the composition such that its local occurrence is likely to be placed at risk of extinction,*

The endangered ecological communities (EEC), Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion (ILGW) and Illawarra Subtropical Rainforest in the Sydney Basin Bioregion (ISR) occur within the subject site.

Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion

The ILGW EEC corresponds to the Disturbed Red Gum Forest vegetation community shown in Figure 3.1.

The development footprint is located downslope approximately 130 metres from areas of ILGW EEC vegetation and as such the proposal is not likely to substantially and adversely modify the composition of the ILGW EEC such that its local occurrence is likely to be placed at risk of extinction.

Illawarra Subtropical Rainforest in the Sydney Basin Bioregion

The ISR EEC corresponds to the Disturbed Subtropical Rainforest vegetation community shown in Figure 3.1.

Three patches of this EEC occur within the site. Two larger patches are present within the northern sections of the site. These patches are upslope of the proposed development location and the proposal is not likely to have a direct or indirect adverse effect on the extent of these areas.

The third patch consists of 0.07 hectares of vegetation surrounding a large Moreton Bay Fig Tree (*Ficus macrophylla*). This patch is proposed to be retained within the proposed development footprint. This patch is currently surrounded by highly disturbed and cleared land and will be retained as part of the proposal. Suitable tree protection zones will be implemented to prevent potential impacts associated with the proposed development to this patch of ISR EEC vegetation.

It is therefore considered that the proposal is not likely to substantially and adversely modify the composition of the ISR EEC such that its local occurrence is likely to be placed at risk of extinction.

d) In relation to the habitat of threatened species, populations or ecological community:

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

The proposed development is mostly situated within areas of existing cleared land within the site. The proposed development will occupy 4.9 hectares of Cleared Land and will require the removal of approximately 0.45 hectares of Regrowth Acacia and Exotic Shrubs vegetation.

A summary of the areas of vegetation removal and retention is provided in Table 6.1.

TABLE 6.1 APPROXIMATE VEGETATION COMMUNITY REMOVAL AND RETENTION AREAS		
Vegetation Communities	Retained (ha)	Removed (ha)
Disturbed Subtropical Rainforest	1.5	0
Disturbed Red Gum Forest	0.5	0
Regrowth Acacia and Exotic Shrubs	12.05	0.45
Cleared Land	2.4	4.9
Total	16.45	5.35

The proposed development is not likely to require the removal or modification of habitats for threatened populations or endangered ecological communities.

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

Identified habitat linkages are shown in Figure 3.4. The Wollongong Draft Biodiversity Strategy has mapped an expansive biodiversity corridor known as the Escarpment Moist Forests Corridor along the escarpment range and immediately adjacent foothills within the locality. This site and adjoining vegetation however is not included within this area.

The site occurs as part of a larger patch of vegetation which extends to the north and west. This patch is fragmented from habitats further to the north by the Moss Vale Unanderra Railway and adjacent residential development at Farmbrough Heights and by cleared rural-residential and industrial lands to the south and east. Tenuous connectivity is present to the Illawarra Escarpment; however the width of the vegetation linkage is constricted along the northern boundary of the landfill site which occurs to the west of the subject site. While the site is connected to larger areas of vegetation associated with the Illawarra Escarpment, the site does not provide a wildlife linkage between substantial habitat patches within the locality.

Riparian connectivity is facilitated by the un-named tributary of Gibsons Creek which intersects the site. This tributary is flanked by cleared land and highly disturbed vegetation, however is likely to provide some freshwater habitat connectivity to Gibsons Creek.

The proposed development footprint is situated mostly within existing cleared and highly disturbed areas of the site and the existing vehicle crossing over the watercourse and a 10 metre vegetated buffer will be retained. It is therefore considered that the proposed development is not likely to fragment or isolate an area of habitat from other areas of habitat as a result of the proposed development.

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*

The proposed development is not likely to result in the fragmentation or isolation of habitats for threatened species, populations or ecological communities. The proposal is also not likely to result in the removal or adverse modification of an area of habitat for an endangered ecological community. The proposal will however require the removal and adverse modification of highly disturbed habitats for threatened species, particularly nomadic type threatened fauna species which are capable of utilising highly disturbed habitats.

Due to the presence of larger areas of higher quality habitats in the locality contained within areas managed for long term conservation such as the Illawarra State Conservation Area, the proposal is considered not likely to significantly affect the stages of the species' life cycles and reproductive success in the locality.

It is therefore considered that the habitat to be removed, modified, fragmented or isolated is not of significant importance to the long-term survival of the species, population or ecological community in the locality.

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

The subject site has not been classed as critical habitat within the provisions of the *Threatened Species Conservation Act* (1995). Therefore it is considered that the proposed development will not have an adverse effect on critical habitat either directly or indirectly.

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

There are final or draft recovery plans for the following threatened species with potential habitat within the subject site:

- *Daphnandra* sp. C Illawarra;
- *Irenepharsus trypherus*
- *Zieria granulata*
- Green and Golden Bell Frog;
- Barking Owl;
- Large Forest Owls (Powerful Owl and Masked Owl);
- Eastern Bristlebird
- Grey-headed Flying-fox; and
- Large-eared Pied Bat.

There are currently no listed threat abatement plans or priorities action statements of direct relevance to the proposed development.

It is considered that the proposed development is not inconsistent with the broader recovery or threat abatement objectives or actions identified.

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.

An assessment of the likely impact of the proposal on Key Threatening Processes is provided in Table 6.2.

TABLE 6.2 ASSESSMENT OF KEY THREATENING PROCESSES			
Key Threatening Processes Listed under the <i>TSC Act</i> (1995) and <i>FM Act</i> (1994)	Likely to Occur as a Result of the Proposal	Mitigation / Avoidance or Management proposed	Comments
TSC Act (1995)			
Alteration of habitat following subsidence due to long wall mining	No	No	-
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	No	No	-
Anthropogenic climate change	No	No	-
Bush rock removal	No	No	-
Clearing of native vegetation	Yes	Yes	EEC vegetation will be retained, native flora species will be utilised in landscape plantings, will retain the riparian corridor and is situated substantially within existing cleared areas.
Competition and grazing by the feral European rabbit (<i>Oryctolagus cuniculus</i>)	No	No	-
Competition and habitat degradation by feral goats (<i>Capra hircus</i>)	No	No	-
Competition from feral honey bees (<i>Apis mellifera</i>)	No	No	-
Death or injury to marine species following capture in shark control programs on ocean beaches	No	No	-
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments	No	No	-
Forest Eucalypt dieback associated with over-abundant psyllids and bell miners	No	No	-
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	No	No	-

TABLE 6.2 ASSESSMENT OF KEY THREATENING PROCESSES			
Key Threatening Processes Listed under the <i>TSC Act (1995)</i> and <i>FM Act (1994)</i>	Likely to Occur as a Result of the Proposal	Mitigation / Avoidance or Management proposed	Comments
Herbivory and environmental degradation caused by feral deer	No	No	-
Importation of red imported fire ants (<i>Solenopsis invicta</i>)	No	No	-
Infection by psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations	No	No	-
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	No	No	-
Infection of native plants by <i>Phytophthora cinnamomi</i>	No	No	-
Introduction and Establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae	No	No	-
Introduction of the large earth bumblebee (<i>Bombus terrestris</i>)	No	No	-
Invasion and establishment of exotic vines and scramblers	No	No	-
Invasion and establishment of Scotch broom (<i>Cytisus scoparius</i>)	No	No	-
Invasion and establishment of the cane toad (<i>Bufo marinus</i>)	No	No	-
Invasion, establishment and spread of <i>Lantana camara</i>	No	No	-
Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed)	No	No	-
Invasion of native plant communities by exotic perennial grasses	No	No	-
Invasion of the yellow crazy ant (<i>Anoplolepis gracilipes</i> (Fr. Smith)) into NSW	No	No	-
Loss of hollow-bearing trees	No	No	-
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants including aquatic plants	No	No	-
Loss or degradation (or both) of sites used for hill-topping by butterflies	No	No	-
Predation and hybridisation of feral dogs (<i>Canis lupus familiaris</i>)	No	No	-
Predation by the European red fox (<i>Vulpes vulpes</i>)	No	No	-
Predation by the feral cat (<i>Felis catus</i>)	No	No	-
Predation by <i>Gambusia holbrooki</i> (plague minnow or mosquito fish)	No	No	-
Predation by the ship rat (<i>Rattus rattus</i>) on Lord Howe Island	No	No	-

TABLE 6.2 ASSESSMENT OF KEY THREATENING PROCESSES			
Key Threatening Processes Listed under the <i>TSC Act</i> (1995) and <i>FM Act</i> (1994)	Likely to Occur as a Result of the Proposal	Mitigation / Avoidance or Management proposed	Comments
Predation, habitat degradation, competition and disease transmission by feral pigs (<i>Sus scrofa</i>)	No	No	-
Removal of dead wood and dead trees	Yes	Yes	Re-use of woody debris as ground habitat
FM Act (1994)			
Current shark meshing program in NSW Waters	No	No	-
Hook and line fishing in areas important for the survival of threatened fish species	No	No	-
Human-caused climate change	No	No	-
The introduction of fish to fresh waters within a river catchment outside their natural range	No	No	-
The removal of large woody debris from NSW rivers and streams	No	No	-
The degradation of native riparian vegetation along NSW Watercourses	No	Yes	A 10m wide vegetated riparian corridor area will be retained and subject to management in accordance with the Vegetation Management Plan prepared by Southern Habitat (2013).
Instream structures and other mechanisms that alter natural flow	No	No	-
Introduction of non-indigenous fish and marine vegetation to the coastal waters of NSW	No	No	-

The proposal is likely to increase the impact of the key threatening process '*clearing of native vegetation*', and '*removal of dead wood and dead trees*'. It is considered that the proposal is not likely to increase the operation of the identified key threatening processes to the extent that a significant effect on threatened biodiversity will occur.

The following measures will be implemented to mitigate potential impacts associated with the proposal:

- Retention of all EEC vegetation and habitats;
- Retention of a 10m wide vegetated riparian corridor area;
- Use of native flora species in landscape plantings; and
- Re-use of woody debris as ground habitat.

CONCLUSION

Based on the ecological surveys completed and assessment undertaken above it is concluded that:

- The proposed development is not likely to have a significant effect on threatened species, populations or ecological communities or their habitats;

- ii. A Species Impact Statement is not required for the proposed development.

6.3 State Environmental Planning Policies

6.3.1 State Environmental Planning Policy 14 – Coastal Wetlands

The subject site is not included within an area mapped as a wetland in SEPP 14.

6.3.2 State Environmental Planning Policy 19 – Bushland in Urban Areas

Assessment and consideration of SEPP 19 is not required for the proposed development.

6.3.3 State Environmental Planning Policy 26 – Littoral Rainforest

The subject site is not included within any area, or located within 100 metres of an area mapped as a littoral rainforest in SEPP 26.

6.3.4 State Environmental Planning Policy 44 – Koala Habitat Protection

The subject site was assessed for activity by Koalas using the following methods:

- i. A search of the BioNet Atlas of NSW Wildlife (NSW Government OEH 2014) was undertaken to identify records of Koalas in the area;
- ii. The site was surveyed on foot with any species of Koala food trees being inspected for signs of Koala usage. Trees were inspected and identified for presence of Koalas, scratch and claw marks on the trunk and scats around the base of each tree. The proportion of any trees showing signs of Koala use was calculated for the whole of the site. Additionally the location and density of droppings if found were documented;
- iii. Koalas were also targeted during spotlight surveys;
- iv. Identification and assessment of the density of tree species listed as Koala food trees in State Environmental Planning Policy No. 44 - Koala Habitat Protection was undertaken across the site.

TABLE 6.3 SEPP-44 KOALA FEED TREE SPECIES (From SEPP-44 Schedule 2)			
Scientific Name	Common Name	Observed On Site	Percentage within survey plots
<i>Eucalyptus tereticornis</i>	Forest Red Gum	Yes	<15%
<i>Eucalyptus microcorys</i>	Tallowwood	No	0%
<i>Eucalyptus punctata</i>	Grey Gum	No	0%
<i>Eucalyptus viminalis</i>	Ribbon or Manna Gum	No	0%
<i>Eucalyptus camaldulensis</i>	River Red Gum	No	0%
<i>Eucalyptus haemastoma</i>	Broad-leaved Scribbly Gum	No	0%
<i>Eucalyptus signata</i>	Scribbly Gum	No	0%
<i>Eucalyptus albens</i>	White Box	No	0%
<i>Eucalyptus populnea</i>	Bimble Box or Poplar Box	No	0%
<i>Eucalyptus robusta</i>	Swamp Mahogany	No	0%

One Koala feed tree species, *Eucalyptus tereticornis*, as listed on Schedule 2 of State Environmental Planning Policy No. 44 - Koala Habitat Protection (SEPP 44) was observed within the subject site.

The occurrence of koala feed tree species is less than 15% therefore the site does not form potential koala habitat.

No Koalas were observed during the fauna survey and no evidence of Koala habitation, such as scats, claw and scratch marks, were located on the site. Therefore the subject site is considered to not form core koala habitat as defined by SEPP 44.

6.4 Native Vegetation Impact Assessment

Key Threshold Assessment

An assessment of the potential impacts of the proposal on native vegetation has been undertaken through the application of a modified assessment of the key thresholds considerations provided by DEC & DPI (2005).

i. Whether or not the proposal will substantially adversely affect habitat for a native vegetation community;

The proposed development will occupy the existing disturbed areas of the site within areas which contain Cleared Land and a relatively small area of Regrowth Acacia with Exotic Shrub vegetation. The Regrowth Acacia with Exotic Shrub vegetation community predominantly consists of tall native shrub species mixed with high levels of weeds which have opportunistically regrown following historical clearing of naturally vegetation types.

Areas of intact native vegetation communities including endangered ecological communities will be retained.

It is therefore considered that the proposal is not likely to substantially adversely affect habitat for a native vegetation community.

ii. Whether or not the proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts will maintain or improve biodiversity values of native vegetation;

The proposed development will occupy the existing disturbed areas of the site within areas which contain Cleared Land and a relatively small area of Regrowth Acacia with Exotic Shrub vegetation. Areas of intact native vegetation communities including endangered ecological communities will be retained in order to maintain the biodiversity values of the site. The riparian areas of the site currently contain Regrowth Acacia with Exotic Shrubs and will be subject to revegetation and management works in accordance with the Vegetation Management Plan prepared by Southern Habitat for the site and native flora species will also be utilised for revegetation of disturbed batters.

It is therefore considered that the proposal is likely to maintain and improve the biodiversity values of the native vegetation present.

iii. Whether or not the proposal is likely to reduce the long-term viability of a local occurrence of a native vegetation community; and

The proposed development will occupy the existing disturbed areas of the site within areas which contain Cleared Land and a relatively small area of Regrowth Acacia with Exotic Shrub vegetation. Areas of intact native vegetation communities including endangered ecological communities will be retained in order to maintain the biodiversity values of the site.

It is therefore considered that the proposal will not reduce the long-term viability of a local occurrence of a native vegetation community.

iv. Whether or not the proposal is likely to accelerate the extinction of a native vegetation community or place it at risk of extinction.

The proposed development will occupy the existing disturbed areas of the site which contain Cleared Land and a relatively small area of Regrowth Acacia with Exotic Shrub vegetation. Areas of intact native vegetation communities including endangered ecological communities will be retained in order to maintain the biodiversity values of the site.

It is therefore considered that the proposal is not likely to accelerate the extinction of a native vegetation community or place it at risk of extinction.

6.5 Aquatic Habitat Impact Assessment

Key Threshold Assessment

An assessment of the potential impacts of the proposal on aquatic habitats has been undertaken through the application of a modified assessment of the key thresholds considerations provided by DEC & DPI (2005). It is considered that the following assessment addresses considerations of impacts and impact avoidance, minimisation and offsetting outlined in Section 3 of the NSW DPI (2013) Policy and guidelines for fish habitat conservation and management.

i. Whether or not the proposal will adversely affect aquatic habitats;

The aquatic habitats present within the site will be retained and managed within a 10 metre wide vegetated riparian corridor. The proposal is therefore not likely to adversely affect aquatic habitats.

ii. Whether or not the proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts will maintain or improve biodiversity values of aquatic habitats;

The aquatic habitats present within the site will be retained and managed within a 10 metre wide vegetated riparian corridor. The biodiversity values of the vegetated riparian corridor will be improved through the implementation of the vegetation management plan prepared by Southern Habitat.

iii. Whether or not the proposal is likely to reduce the long-term viability of the local occurrence of aquatic habitats; and

The aquatic habitats present within the site will be retained and managed within a 10 metre wide vegetated riparian corridor. The vegetated riparian corridor area within the site will be subject to ongoing management in accordance with the vegetation management plan prepared by Southern Habitat. Potential water quality impacts to downstream areas of aquatic habitats will be mitigated through the implementation of a water quality control pond.

It is therefore considered not likely that the proposal will reduce the long-term viability of the local occurrence of aquatic habitats.

iv. Whether or not the proposal is likely to accelerate the extinction of aquatic habitats present or place them at risk of extinction.

The aquatic habitats present within the site will be retained and managed within a 10 metre wide vegetated riparian corridor. The vegetated riparian corridor area within the site will be subject to ongoing management in accordance with the vegetation management plan prepared by Southern Habitat. It is therefore not likely that the proposal will accelerate the extinction of the aquatic habitats present or place them at risk of extinction.

6.6 Groundwater Dependant Ecosystem Impact Assessment

Assessment in accordance with the NSW Groundwater Dependant Ecosystem Policy Principles

The New South Wales State Groundwater Dependent Ecosystems Policy provides five principles for the management of Groundwater Dependant Ecosystems within NSW. The five principles are listed below in bold font with proceeding assessment of how the proposal achieves the objectives identified.

Principle 1 The scientific, ecological, aesthetic and economic values of groundwater-dependent ecosystems, and how threats to them may be avoided, should be identified and action taken to ensure that the most vulnerable and the most valuable ecosystems are protected.

No groundwater dependant ecosystems occur within or adjoining the subject site. The proposal will not require the extraction of groundwater and in order to prevent potential infiltration of groundwater with contaminants, the works area will consist of a base of compacted road base over compacted clay and chemical spill kits will be utilised on the site.

Principle 2 Groundwater extractions should be managed within the sustainable yields of aquifer systems, so that the ecological processes and biodiversity of their dependent ecosystems are maintained and/or restored. Management may involve establishment of threshold levels that are critical for ecosystem health, and controls on extraction in the proximity of groundwater dependent ecosystems.

The proposed development is not likely to result in the extraction of groundwater.

Principle 3 Priority should be given to ensuring that sufficient groundwater of suitable quality is available at the times when it is needed:

- **For protecting ecosystems which are known to be, or are most likely to be, groundwater dependent; and**
- **For groundwater dependent ecosystems which are under immediate or high degree of threat from groundwater-related activities.**

The proposal will not require the extraction of groundwater. In order to prevent potential infiltration of groundwater with contaminants, the works area will consist of a base of compacted road base over compacted clay and chemical spill kits will be utilised on the site. It is therefore considered that the proposal is not likely to affect the quantity or quality available for groundwater dependant ecosystems.

Principle 4 Where scientific knowledge is lacking, The Precautionary Principle should be applied to protect groundwater dependent ecosystems. The development of adaptive management systems and research to improve understanding of these ecosystems is essential to their management.

No groundwater dependant ecosystems have been identified within or adjoining the site. The proposal will not require the extraction of groundwater. In order to prevent potential infiltration of groundwater with contaminants, the works area will consist of a base of compacted road base over compacted clay and chemical spill kits will be utilised on the site.

Principle 5 Planning, approval and management of developments and land use activities should aim to minimise adverse impacts on groundwater dependent ecosystems by:

- **Maintaining, where possible, natural patterns of groundwater flow and not disrupting groundwater levels that are critical for ecosystems;**
- **Not polluting or causing adverse changes in groundwater quality; and**
- **Rehabilitation of degraded groundwater systems where practical.**

The proposed development is not a type of development likely to require the extraction of groundwater and is therefore not likely to influence patterns of groundwater flow or disrupt groundwater levels that are critical for ecosystems.

In order to prevent potential infiltration of groundwater with contaminants, the works area will consist of a base of compacted road base over compacted clay and chemical spill kits will be utilised on the site.

Key Threshold Assessment

An assessment of the potential impacts of the proposal on groundwater dependant ecosystems has been undertaken through the application of a modified assessment of the key thresholds considerations provided by DEC & DPI (2005).

- i. **Whether or not the proposal will adversely affect habitat for a groundwater dependant ecosystem;**

No groundwater dependant ecosystems occur within or adjoining the subject site. The proposal will not require the extraction of groundwater. In order to prevent potential infiltration of groundwater with contaminants, the works area will consist of a base of compacted road base over compacted clay and chemical spill kits will be utilised on the site.

It is therefore considered that the proposal is not likely to adversely affect habitat for a groundwater dependent ecosystem.

ii. Whether or not the proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts will maintain or improve biodiversity values of groundwater dependant ecosystems;

No groundwater dependant ecosystems occur within or adjoining the subject site. The proposal will not require the extraction of groundwater. In order to prevent potential infiltration of groundwater with contaminants, the works area will consist of a base of compacted road base over compacted clay and chemical spill kits will be utilised on the site.

It is therefore considered that the proposal will not impact the maintenance of the biodiversity values of locally occurring groundwater dependant ecosystems.

iii. Whether or not the proposal is likely to reduce the long-term viability of a local occurrence of a groundwater dependant ecosystem; and

No groundwater dependant ecosystems occur within or adjoining the subject site. The proposal will not require the extraction of groundwater. In order to prevent potential infiltration of groundwater with contaminants, the works area will consist of a base of compacted road base over compacted clay and chemical spill kits will be utilised on the site.

It is therefore considered that the proposal is not likely to reduce the long-term viability of a local occurrence of a groundwater dependant ecosystem.

iv. Whether or not the proposal is likely to accelerate the extinction of a groundwater dependent ecosystem or place it at risk of extinction.

No groundwater dependant ecosystems occur within or adjoining the subject site. The proposal will not require the extraction of groundwater. In order to prevent potential infiltration of groundwater with contaminants, the works area will consist of a base of compacted road base over compacted clay and chemical spill kits will be utilised on the site.

It is therefore considered that the proposal is not likely to accelerate the extinction of a groundwater dependant ecosystem or place it at risk of extinct.

7. CONCLUSIONS

Based on the detailed field survey and information provided in this report it is concluded that:

- i. No threatened flora species, listed within the *TSC Act* (1995) or the *EPBC Act* (1999), were observed within the subject site;
- ii. The Threatened fauna species, Grey-headed Flying-fox, as listed within the *EPBC Act* (1999) and the *TSC Act* (1995) was observed within the subject site during surveys.
- iii. No endangered populations listed within the *TSC Act* or the *FM Act* (1994) were observed within the subject site;
- iv. The *EPBC Act* (1999) listed migratory species, Black-faced Monarch, was observed within the subject site;
- v. The endangered ecological community, Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion as listed within the *TSC Act* (1995) was observed within the subject site;
- vi. The endangered ecological community, Illawarra Subtropical Rainforest in the Sydney Basin Bioregion as listed within the *TSC Act* (1995) was observed within the subject site;
- vii. No threatened ecological communities listed within the *FM Act* (1994) or the *EPBC Act* (1999) were observed within the subject site;
- viii. The proposed development is not likely to have a significant effect on threatened species, populations or ecological communities or their habitats;
- ix. A Species Impact Statement is not required for the proposed development;
- x. A referral to the Australian Government Department of the Environment is considered unnecessary;
- xi. The proposed development would maintain or improve biodiversity values within the site and locality through the avoidance of impacts to areas of high biodiversity value, the retention and management of the riparian corridor which intersects the site and the implementation of the amelioration measures proposed.

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APPENDIX 1

WEATHER CONDITIONS DURING SURVEY PERIODS

The following weather observations from the nearest Bureau of Meteorology Weather Station (Albion Park) are provided for the survey periods undertaken.

Albion Park, New South Wales
April 2013 Daily Weather Observations



Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am									3pm								
		Min °C	Max °C				Dirn	Spd km/h	Time local	Temp °C	RH %	Cld eighths	Dirn	Spd km/h	MSLP hPa	Temp °C	RH %	Cld eighths	Dirn	Spd km/h	MSLP hPa						
1	Mo	15.4	22.8	2.6			E	28	13:40	16.7	96		W	9	1018.3	21.7	72		SE	19	1015.7						
2	Tu	10.6	24.7	0.4			ESE	30	13:32	19.0	66		ENE	4	1015.6	23.4	57		SE	19	1014.0						
3	We	13.2	20.0	9.4			SW	48	09:21	16.7	80		SSW	13	1021.9	19.4	61		SSW	22	1022.4						
4	Th	14.8	20.4	4.0			ENE	26	16:57	15.3	98		WSW	11	1029.1	19.4	73		S	15	1028.2						
5	Fr	12.8	20.6	3.6			WSW	20	14:53	15.8	95		W	9	1031.1	19.6	76		WSW	15	1029.3						
6	Sa	12.8	22.1	2.2			ENE	24	10:38	17.1	94		SSE	2	1028.1	21.8	68		SE	11	1025.1						
7	Su	11.4	23.0	10.0			E	24	12:32	17.4	92		WNW	7	1024.6	21.9	67		ENE	19	1021.6						
8	Mo	10.9	23.5	0			ESE	26	13:18	19.2	77		W	6	1025.1	22.2	59		SE	13	1024.3						
9	Tu	13.1	23.6	3.8			E	28	15:25	21.1	74		SSW	9	1026.8	22.1	68		SE	15	1024.2						
10	We	9.1	24.2	0			ENE	31	15:58	20.4	73		Calm		1024.3	23.6	64		ENE	22	1020.7						
11	Th	10.2	26.4	0			ENE	22	13:26	20.6	69		E	7	1022.6	24.6	60		ENE	17	1021.5						
12	Fr	12.6	24.4	0			ENE	28	14:42	21.3	73		NNW	6	1026.0	23.8	62		ENE	22	1022.5						
13	Sa	10.6	26.0	0			NE	39	16:04	21.7	64		N	22	1021.0	23.9	60		ENE	26	1015.3						
14	Su	10.4	27.9	0			ENE	24	12:57	22.2	63		NE	6	1013.4	26.4	46		ENE	11	1010.5						
15	Mo	11.2	26.5	0			S	35	16:32	21.1	71		SSE	6	1009.3	23.4	75		SSE	17	1007.8						
16	Tu	15.9	20.3	8.0			SSW	41	01:40	17.8	81		SW	17	1015.4	18.1	79		S	15	1014.6						
17	We	10.8	22.3	0			SE	26	13:46	19.4	73		W	13	1016.8	20.4	69		ESE	11	1014.6						
18	Th	10.9	22.4	0			SSW	43	12:46	20.2	74		ENE	6	1014.8	20.4	64		S	20	1013.2						
19	Fr	10.8	19.3	0.6			SSW	70	21:08	15.3	54		SSW	31	1015.0	18.4	46		SW	31	1013.9						
20	Sa	12.9	18.6	44.2			WSW	61	01:07	15.0	99		S	24	1015.5	16.5	80		SW	22	1015.6						
21	Su	10.1	20.1	15.4			SSW	31	09:31	16.3	65		W	7	1016.0	18.8	63		SE	9	1012.4						
22	Mo	10.4	23.3	0.4			WNW	41	15:47	16.3	74		WSW	4	1010.1	22.4	43		W	26	1007.2						
23	Tu	10.9	24.2	0			W	56	00:48	19.2	50		WNW	11	1012.3	23.8	41		WSW	17	1011.6						
24	We	7.4	22.2	0			WNW	26	09:08	18.5	54		WNW	19	1018.4	20.7	55		SE	11	1016.0						
25	Th	7.7	21.3	0			W	50	23:59	16.5	60		W	17	1021.5	19.3	53		ENE	17	1019.4						
26	Fr	9.0	25.8	0			W	59	00:17	21.2	44		WSW	9	1022.0	23.1	38		ENE	19	1019.0						
27	Sa	8.0	23.4	0			ENE	22	12:51	19.8	64		ENE	4	1021.3	22.3	63		ENE	17	1017.0						
28	Su	10.2	28.9	0			WNW	56	10:32	20.5	55		NNW	9	1018.1	28.6	26		WNW	20	1014.8						
29	Mo	8.9	23.7	0			ENE	20	13:06	19.6	66		S	6	1022.3	22.5	75		ENE	15	1021.1						
30	Tu	17.0	21.6	0.2			SW	28	04:58	18.3	84		WSW	11	1026.1	19.0	81		SSE	13	1022.7						
Statistics for April 2013																											
Mean		11.3	23.1							18.6	72				10	1020.1	21.7	61				17	1017.9				
Lowest		7.4	18.6							15.0	44				Calm	1009.3	16.5	26		SE	9	1007.2					
Highest		17.0	28.9	44.2			SSW	70		22.2	99		SSW	31	1031.1	28.6	81		SW	31	1029.3						
Total				104.8																							

Observations were drawn from Albion Park (Wollongong Airport) [station 088241]

The closest station with sunshine and evaporation observations is at Sydney Airport, about 77 km to the north. The closest station with cloud observations is at Wollongong, about 30 km to the north.

IDCJDW201201304 Prepared at 16:00 UTC on 16 Jun 2013

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Albion Park, New South Wales
February 2014 Daily Weather Observations



Date	Day	Temps		Rain mm	Evap mm	Sun hours	Max wind gust			9am							3pm										
		Min °C	Max °C				Dirn	Spd km/h	Time local	Temp °C	RH %	Cld eighths	Dirn	Spd km/h	MSLP hPa	Temp °C	RH %	Cld eighths	Dirn	Spd km/h	MSLP hPa						
1	Sa	19.6	27.3	0			ENE	28	15:17	24.1	68		SSW	11	1015.5	25.9	66		ENE	19	1012.8						
2	Su	18.8	28.1	0			NE	48	12:44	24.7	70		NNE	17	1015.5	27.0	56		ENE	35	1013.9						
3	Mo	17.3	27.7	0			ENE	50	12:58	24.5	60		N	20	1015.3	25.9	57		ENE	30	1011.5						
4	Tu	17.3	23.3	0			SSW	48	09:52	20.7	83		S	22	1018.8	18.6	86		S	24	1021.2						
5	We	15.3	22.4	0.6			ESE	39	14:22	19.5	54		SSW	11	1024.7	21.9	59		SE	20	1022.8						
6	Th	15.5	23.8	0.2			E	30	16:39	19.2	69		W	9	1020.7	22.5	53		ENE	17	1017.8						
7	Fr	9.7	25.4	0			NE	39	16:17	21.0	62		N	13	1017.5	24.3	62		ENE	28	1015.0						
8	Sa	12.1	27.6	0			ENE	41	13:46	22.0	74		NNE	6	1017.9	27.0	54		ENE	26	1016.0						
9	Su	13.5	27.6	0			ENE	39	13:18	22.9	75		NNE	7	1018.8	27.2	60		ENE	28	1015.5						
10	Mo	16.8	25.3	0			SW	61	01:51	22.2	66		SSW	19	1020.2	23.6	62		SE	17	1018.1						
11	Tu	18.6	22.8	0			ENE	17	11:40	21.2	77		SSW	6	1018.4	22.6	77		E	9	1015.4						
12	We	20.5	23.8	5.2			ENE	26	15:26	21.1	100		WSW	6	1017.2	23.3	80		ENE	17	1016.1						
13	Th	19.2	27.1	0.2			ENE	37	12:30	22.7	87		E	7	1015.0	25.8	71		ENE	24	1011.4						
14	Fr	19.2	25.4	0			NE	31	20:04	20.8	91		W	6	1008.4	24.1	73		NE	20	1006.2						
15	Sa	20.5	25.2	5.4			NNW	35	11:02	21.6	98		NE	6	1002.7	23.3	88		NE	13	998.7						
16	Su	21.4	23.8	6.6			S	39	19:57	23.5	91		SSW	7	999.3	22.2	84		SSE	15	1002.7						
17	Mo	16.9	23.6	23.0			S	28	08:05	20.4	81		SSW	15	1014.0	21.4	75		N	2	1013.8						
18	Tu	14.5	25.1	0.8			E	33	15:42	19.3	87		W	6	1013.4	24.3	72		ENE	26	1009.4						
19	We	18.5	27.8	0			N	39	13:11	23.9	81		N	9	1004.3	24.6	86		SW	9	1002.0						
20	Th	18.6	28.1	4.6			NW	54	10:56	20.8	46		W	15	1008.2	27.5	27		WNW	31	1008.3						
21	Fr	13.8	25.0	0			W	39	23:57	21.2	34		W	15	1016.0	23.9	54		ESE	22	1016.1						
22	Sa	17.2	22.6	1.8			SSE	24	14:42	18.4	89		WNW	7	1021.1	21.3	67		SE	15	1019.9						
23	Su	17.4	24.6	0.4			SE	35	13:03	20.2	71		SSW	11	1024.2	23.2	68		E	22	1022.2						
24	Mo	12.6	25.8	0			ENE	31	11:20	21.5	71		N	6	1020.8	25.3	68		ENE	19	1018.3						
25	Tu	14.1	27.4	0			NE	46	15:45	23.0	68		N	15	1017.5	26.1	62		ENE	31	1012.9						
26	We	15.5	29.3	0			W	41	13:46	21.1	86			Calm	1011.4	27.4	48		W	22	1011.4						
27	Th	16.0	20.8	1.6			S	31	14:35	20.4	89		SSW	9	1018.4	19.6	87		S	19	1020.3						
28	Fr	17.1	20.7	0.6			SSW	30	10:22	17.8	94		S	11	1024.4	20.1	72		S	15	1023.7						
Statistics for February 2014																											
Mean		16.7	25.3							21.4	75				10	1015.7	23.9	66			20	1014.1					
Lowest		9.7	20.7							17.8	34				Calm	999.3	18.6	27		N	2	998.7					
Highest		21.4	29.3				SW	61		24.7	100		S	22	1024.7	27.5	88		ENE	35	1023.7						
Total				51.0																							

APPENDIX 2

EPBC ACT (1999) SIGNIFICANT IMPACT ASSESSMENT

ENVIRONMENT PROTECTION & BIODIVERSITY CONSERVATION ACT (1999) SIGNIFICANT IMPACT ASSESSMENT

Criteria identified within the EPBC Act Policy Statement 1.1 *Significant Impact Guidelines* (AGDE 2013), have been addressed below to determine whether there is a real chance or possibility, that the proposed action is likely to have a significant impact on threatened species, migratory species and/or threatened ecological communities.

1.1 EPBC Act Listed Threatened Species

The following threatened fauna species, listed within the *EPBC Act* (1999), were observed within the study area:

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

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

With regard to this nationally listed vulnerable species observed within the site, several criteria must be assessed to satisfy the requirements of the *EPBC Act* (1999). Criteria identified within the EPBC Act Policy Statement 1.1 *Significant Impact Guidelines* (AGDE 2009), is required to determine whether there is a real chance or possibility, that the proposed action is likely to have a significant impact on a vulnerable species.

Vulnerable Species Important Population Criteria

For the purposes of assessment of a threatened species under the *EPBC Act* (1999) an assessment as to whether the species comprises an important population is required.

An “important population” is one that is necessary for a species’ long-term survival and recovery. Questions (**in bold**) to determine whether a population is an “important population” are as follows:

Whether the population has been identified within a recovery plan

A draft recovery plan exists for this species at state level (DECCW 2009). An important population of this species has not been identified as occurring within the subject site within any recovery plan.

Whether the population constitutes a key source population for breeding or dispersal

No Grey-headed Flying Fox roost or camp sites were observed within the subject site. It is considered that while the specimens observed foraging within the locality may be part of a larger population, they do not alone constitute a key source population for breeding or dispersal.

Whether the population constitutes a population necessary for maintaining genetic diversity

No Grey-headed Flying Fox roost or camp sites were observed within the subject site. It is considered that while the specimens observed foraging within the locality may be part of a larger population, they do not alone constitute a population necessary for maintaining genetic diversity.

Whether the population is at the limit of its known distribution

The Grey-headed Flying-fox is known to occupy the coastal lowlands and slopes of south-eastern Australia from Bundaberg to Geelong and are usually found at altitudes < 200 m. Areas of repeated occupation extend inland to the tablelands and western slopes in northern New South Wales and the tablelands in southern Queensland. Sightings in inland areas of southern New South Wales and Victoria are uncommon. There are rare records of individuals or small groups west to Adelaide, north to Gladstone and south to Flinders Island (DECCW 2009).

This species is therefore not at the limit of its distribution within the subject site.

From the above information and details it is considered that the Grey-headed Flying-fox observed during surveys is not:

- Identified in a recovery plan for this species;
- A key source population for breeding or dispersal;
- A population necessary for maintaining genetic diversity;
- A population which is near this species range.

Therefore it is considered that the threatened species observed does not satisfy the criteria of an important population as identified by the AGDE (2009) guidelines.

Notwithstanding the above conclusions if the precautionary approach is adopted, further consideration as to whether the proposed action is likely to have a significant impact on this species needs to assess the significant impact criteria (AGDE 2009) for a vulnerable species.

Questions (in bold) to determine whether the proposal is likely to have a significant impact on an important population of a vulnerable species are as follows:

Lead to a long-term decrease in the size of an important population of a species;

This species utilises rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops (DECC 2005).

While the proposal may result in a small reduction in forging habitat within the subject site, there are larger areas of suitable habitat for this species within the locality.

It is therefore considered that the proposal is not likely to lead to the long-term decrease in the size of an important population of the Grey-headed Flying-fox.

Reduce the area of occupancy of an important population;

The proposed development may require the removal of some potential habitat for this species, however there are larger areas of suitable habitat for this species within the locality.

It is therefore considered that the proposal is not likely to reduce the area of occupancy of an important population.

Fragment an existing important population into two or more populations;

Due to the mobile nature of this species and the fact that it is nomadic and migratory it is considered that the proposed development is not of a type that is likely to result in the fragmentation an existing important population into two or more populations.

Adversely affect habitat critical to the survival of a species;

There has currently been no critical habitat for this species declared under the *EPBC Act* (1999) or listed within a recovery plan for this species.

Due to the presence of larger areas of suitable habitat for this species present within the locality it is considered that the subject site does not contain habitat necessary for foraging, breeding, roosting, or dispersal.

Furthermore the proposal is not likely to adversely affect an area necessary for the long term maintenance of the species essential to the survival of the species or an area necessary to maintain genetic diversity and long term evolutionary development or an area necessary for the reintroduction of populations or recovery of the species, critical to the survival of the species.

Therefore the proposed action is not likely to adversely affect habitat critical to the survival of this species.

Disrupt the breeding cycle of an important population;

No Grey-headed Flying Fox roost or camp sites were observed within the subject site.

It is therefore considered that the proposal will not disrupt the breeding cycle of an important population of this species.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that a species is likely to decline;

There are larger areas of many different suitable habitat types that support this species within the locality. It is therefore considered not likely that the proposed action will modify, destroy, remove or

isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;

The proposed development is not of a type that is likely to result in the establishment in invasive species that are harmful to this species, becoming established in this species habitat.

Introduce disease that may cause the species to decline; or

The proposed development is not of a type that is likely to introduce disease that may cause this species to decline.

Interferes substantially with recovery of the species

It is considered that the proposed action is not likely to interfere substantially with the recovery of the species.

It is therefore considered that the proposal is not likely to have a significant impact on the Grey-headed Flying-fox.

1.2 EPBC Act Listed Threatened Ecological Communities

No threatened ecological communities, listed within the EPBC Act (1999), were observed within the subject site.

The proposal is not likely to have a significant impact on threatened ecological communities listed within the *EPBC Act* (1999).

1.3 EPBC Act Listed Migratory Species

The following migratory fauna species, listed within the *EPBC Act* (1999), were observed within the subject site:

Black-faced Monarch (*Monarcha melanopsis*)

Determining Important Habitat for a Migratory Species

For the purposes of assessment of a migratory species under the EPBC Act (1999) an assessment as to whether the site provides an area of important habitat is required. Questions (in bold) to determine whether the site provides an area of "important habitat" are as follows:

Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or

Due to the presence of larger areas of suitable habitat within adjoining lands it is considered that the subject site does not support an ecologically significant proportion of the population of the species.

Habitat that is of critical importance to the species at particular life-cycle stages; and/or

The subject site is considered to provide foraging and breeding habitat for this species. The subject site has not been registered as critical habitat for this species within the provisions of the *EPBC Act* (1999). Larger areas of suitable foraging habitat and breeding for this species are present within the adjoining areas and therefore the subject site is considered to not be habitat that is of critical importance to the species at particular life-cycle stages.

Habitat utilised by a migratory species which is at the limit of the species range;

This species is widespread along the eastern coast of Australia from Queensland to Victoria (Higgins *et al* 2006). Therefore the subject site is considered to not contain habitat utilised by a migratory species which is at the limit of the species range.

Habitat within an area where the species is declining.

There is no information available that would suggest that this species is declining within the habitats in the local area.

From the above information and details it is considered that the habitats for this species within the subject site are not:

- Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or
- Habitat that is of critical importance to the species at particular life-cycle stages; and/or
- Habitat utilised by a migratory species which is at the limit of the species range; or
- Habitat within an area where the species is declining.

Therefore it is considered that the habitat within the subject site for this migratory species does not satisfy the criteria of “*important habitat*” as identified by the AGDE (2009).

Notwithstanding the above conclusions if the precautionary approach is adopted, further consideration as to whether the proposed action is likely to have a significant impact on this species needs to assess the significant impact criteria (AGDE 2009) for a migratory species.

Significant impact Criteria

Questions (**in bold**) to determine whether the proposal is likely to have a significant impact on important habitat for a migratory species are as follows:

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate and area of important habitat for a migratory species;

While the proposal may result in a small reduction in suitable habitat for this species within the subject site, there are larger areas of suitable habitat for this species within the locality. The majority of suitable habitats for this species will be retained. Therefore it is considered that the proposed action is not likely to substantially modify, destroy or isolate and area of important habitat for this species.

Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or

The proposed action is not of a type of development that is likely to result in the establishment of an invasive species that is harmful to this species becoming established in an area of important habitat for this species.

Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

It is considered that the subject site and adjoining areas do not contain an ecologically significant proportion of the population of this species. It is therefore considered that the proposed development is not likely to seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

It is therefore considered that the proposal is not likely to have a significant impact on the Black-faced Monarch within the meaning of the *EPBC Act* (1999).