Appendix H

Ecology Report

EMGA Mitchell McLennan

Ecology Report

Proposed Rezoning for the Goulburn Health Hub at 35 Ross Street, Bradfordville

Prepared for Cullingral Pty Ltd | 10 December 2014

Planning + Environment + Acoustics

Ecology Report

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Ecology Report

Final

Report J14085RP1 | Prepared for Cullingral Pty Ltd| 10 December 2014

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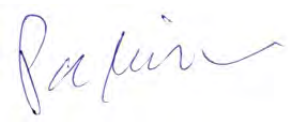
Signature		Signature	
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Table of Contents

1 Ecology

1.1 Method

1.1.1 Desktop review

Existing information and relevant databases were reviewed to determine the site's ecological values. Vegetation mapping completed by The Department of Environment, Climate Change and Water (DECCW) (now Office of Environment and Heritage (OEH)) indicates that the site occurs in a built up area characterised by modified or disturbed land, with no remnant vegetation remaining.

The review identified the potential for two threatened ecological communities (TECs) listed under the *Threatened Species Conservation Act 1995* (TSC Act) to occur, which have previously been recorded in the Monaro subregion of the Hawkesbury Nepean Catchment Area: White Box Yellow Box Blakely's Red Gum Woodland and Tablelands Snow Gum Black Sallee Candlebark and Ribbon Gum Grassy Woodland (OEH 2014a). A further two TECs listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are predicted to occur at the site: Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory and White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grasslands (DoE 2014).

The PlantNET spatial database has recorded six threatened flora species within 10km of the site. One threatened flora species, two threatened bird species and two threatened mammal species have been recorded within 10 km of the site on the Atlas of NSW Wildlife (OEH 2014a). Further, the protected matters search tool (DoE 2014a) predicts that five threatened plant species, five threatened bird species, one threatened fish species, one frog species, five mammal species, three threatened reptile species and ten migratory bird species may occur within 10 km of the site.

1.1.2 Site inspection

A site inspection was completed to verify the desktop review findings and identify any ecological values present. The inspection was completed on 17 July 2014 by an EMM senior ecologist when weather conditions were cold and windy (5.4-9°C, 63km/hr winds), with snow expected that evening.

The site inspection aimed to complete a high-level ecological constraints assessment that would inform the design process, and identify any further assessment requirements at the development application stage. Given the high level of disturbance, survey techniques were limited to identifying vegetation using the random meander technique (following Cropper 1993) and recording habitat features.

1.1.3 Aquatic habitat assessment

A desktop-based assessment of stream order and waterway classification was completed to provide a measure of aquatic habitat complexity and the potential for threatened fish to be present. Stream order for the river was assessed using the Strahler (1952) method (Figure 1.1), as adopted in Industry and Investment NSW (DPI 2009).

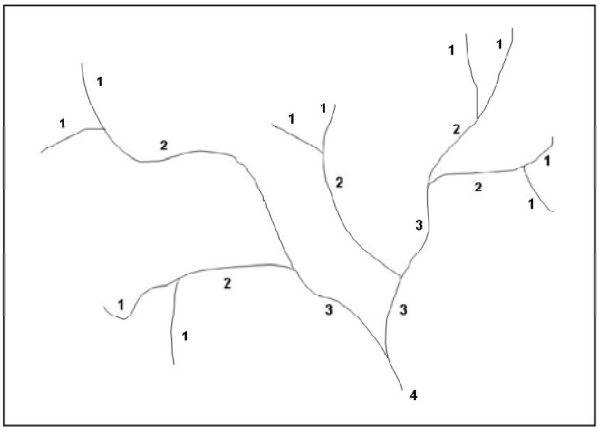

Figure 1.1 Stream ordering for a catchment using Strahler (1952) method

The river was also assessed using Fairfull and Witheridge's (2003) waterway classification to identify potential fish habitats at the site. This classification is presented below in Table 1.1.

Table 1.1 Waterway classification

Classification	Characteristics of waterway type
Class 1 major fish habitat	Major permanently or intermittently flowing waterway (eg river or major creek); habitat of threatened fish species or 'critical habitat'.
Class 2 moderate fish habitat	Named permanent or intermittent stream, creek or waterway with clearly defined bed and banks with semi-permanent to permanent waters in pools or in connected wetland areas. Marine or freshwater aquatic vegetation is present. Known fish habitat and/or fish observed inhabiting the area.
Class 3 minimal fish habitat	Named or unnamed waterway with intermittent flow and potential refuge, breeding or feeding areas for some aquatic fauna (eg fish, yabbies). Semi-permanent pools form within the waterway or adjacent wetlands after a rain event. Otherwise, any minor waterway that interconnects with wetlands or recognised aquatic habitats.
Class 4 unlikely fish habitat	Named or unnamed waterway with intermittent flow following rain events only, little or no defined drainage channel, little or no flow or free standing water or pools after rain events (eg dry gullies or shallow floodplain depressions with no permanent aquatic flora present).

1.2 Existing environment

1.2.1 Vegetation communities and habitats

Much of the site is poorly drained and has deep clay soils, with very little native vegetation remaining. It is currently used for cattle grazing and was previously a golf course. A number of exotic shrubs and trees have been planted including Golden Cypress (*Cupressus macrocarpa*), Golden Deodar Cedar (*Cedrus deodara*) and Basket Willow (*Salix viminalis).* Windrows of Radiata Pine (*Pinus radiata*) are present along the southern and eastern site boundaries adjoining the Wollondilly River, which is dominated by exotics including Basket Willow and Large-leaved Privet (*Ligustrum lucidum*).

A tall grass layer to 1 m, dominated by the introduced Canary Grass (*Phalaris aquatica*), occurs across much of the site. Other exotics present include Serrated Tussock (*Nassella trichotoma*), Scotch Thistle (*Onopordum acanthium*), Patersons Curse (*Echium plantagineum*) and Blackberry (*Rubus fruticosis* spp. agg).

Small patches of isolated eucalypts Argyle Apple (*Eucalyptus cinerea*), Candlebark (*E. rubida*), Narrow-leaved Ironbark (*E. crebra*) and Mugga Ironbark (*E. sideroxylon*) are present in the northwest, west and south of the site. It is likely that some of these eucalypts have been planted, particularly the Narrow-leaved Ironbark as it does not occur locally. The Narrow-leaved Ironbark will be removed following the DA stage to facilitate development. It is not listed as a threatened flora species and it is not part of any threatened ecological community predicted to occur in the local area, therefore does not pose a constraint to development.

1.2.2 Aquatic habitats

A drainage line is present that runs from the eastern site boundary to an artificial lake (Figure 1.2 in the Planning Proposal). This flows into the Wollondilly River during large rain events. The area surrounding the drainage line has very poor drainage and is heavily disturbed by cattle with significant areas of bare soil present. Several Basket Willows have been planted around the artificial lake. A native sedge species, *Juncus usitatus,* occurs sparsely on the banks of the artificial lake.

The drainage line and artificial lake provide habitat for the Purple Swamphen (*Porphyrio porphyrio*), Masked Lapwing (*Vanellus miles*) and Common Eastern Froglet (*Crinia signifera*), which were observed (or heard) during the site inspection. A group of up to 30 Forest Ravens (*Corvus tasmanicus*) were also observed foraging at the site. The drainage line is a first order stream which would flow into the Wollondilly River following large rain events. The drainage line is considered to be a class 3 minimal fish habitat as it has intermittent flow and semi-permanent pools that would interconnect with the Wollondilly River following large rain events.

The Wollondilly River is classified as a second order stream as it has one smaller tributary to the north, and flows into the larger Mulwaree River. The site drains to the Wollondilly River on its western boundary. The Wollondilly River is considered to be a major fish habitat (class 1 using Fairfull and Witheridge's (2003) waterway classification) as it is a major permanently flowing river. It is not known to contain threatened fish species habitat or critical habitat (DPI 2014), but is likely to be a dispersal corridor for common native fish species. A sediment and erosion control plan should be prepared at the DA stage to ensure that runoff from construction activities is contained within the site, and does not flow into the Wollondilly River prior to treatment.

1.2.3 Threatened species, populations and communities

No native vegetation communities occur at the site due to the high degree of disturbance. Vegetation recorded at the site was compared with the descriptions of the TECs recorded or predicted to occur, and was not found to meet the description of any for the following reasons:

- Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory: there are no native tussock grasses or native forbs in the grassy understorey (ESSC 2000).

- White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grasslands: none of the characteristic species of the community (White Box (*E.albens*), Blakely's Red Gum (*E. blakelyi*) or Yellow Box (*E. melliodora*)) occur at the site, and there is native understorey present (NSWSC 2002).

- Tablelands Snow Gum Black Sallee Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highland, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions: although scattered Candlebarks were recorded at the site, the native vegetation does not have the open forest, woodland or open woodland structure to be classified as this TEC. It also does not contain native forbs and grasses in the mid and understorey layers (NSWSC 2011).

An assessment of the likely occurrence of threatened flora species is included in Appendix A. The site does not contain suitable habitat for any of these species.

The site may contain habitat for some threatened fauna species on an infrequent basis including:

- artificial lake and surrounding grassland: the Cattle Egret (*Ardea ibis*) and Great Egret (*Ardea alba*) (listed as migratory species under the EPBC Act) may forage in these areas when inundated;
- scattered trees and shrubs: may provide occasional foraging habitat for listed threatened species the Gang-gang Cockatoo (*Callocephalon fimbriatum*) and Grey-headed Flying-fox (*Pteropus poliocephalus*); and
- Wollondilly River adjacent to the site: may provide occasional foraging habitat and a migration corridor for the migratory White-bellied Sea Eagle (*Haliaeetus leucogaster*), and potential hunting habitat for the threatened Little Eagle (*Hieraeetus morphnoides*).

However, the site does not contain core habitat for any migratory or threatened fauna species (ie important habitat for breeding, foraging, shelter or dispersal).

A number of noxious weeds were recorded at the site, comprising Blackberry, Patersons Curse, Serrated Tussock and Basket Willow. These are listed as Class 4 Noxious Weeds in the Goulburn-Mulwaree control area under the *Noxious Weeds Act 1993* (NW Act).

1.3 Ecological constraints

No immediate ecological constraints to development were identified during the desktop review and site inspection. However a number of issues have been identified that will require further consideration during the next stage of the development:

- further assessment would be required for threatened species considered likely to occur in accordance with Section 5a of the EP&A Act for TSC Act listed, and in line with the EPBC Act for matters of national environmental significance (ie migratory species);
- development of a noxious weeds control plan as the NW Act requires landowners to manage the growth of Class 4 Noxious Weeds in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed; and
- development of a sediment and erosion control plan to minimise risks of pollution from the development to the aquatic habitat in the adjacent Wollondilly River.

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Appendix A

Assessment criteria

Table A.1 Assessment criteria

Likelihood	Description	Further assessment required?
Recorded	The species was observed in the study area during the current survey.	Yes
High	It is highly likely that a species inhabits the study area due to the presence of suitable habitat, and has been recorded recently in the study area or the surrounding area.	Yes
Moderate	Potential habitat is present in the study area, although it has not been recorded recently in the study area and surrounds. The species is unlikely to be dependent (ie. for breeding) on habitat within the study area.	Yes
Low	It is unlikely that the species inhabits the study area, and may be an occasional visitor. Habitat similar to the study area is widely distributed in the local area, meaning that the species is not dependent (ie. for breeding) on it.	No
None	Suitable habitat is absent from the study area.	No

Table A.2 Likelihood of occurrence for threatened species previously recorded or predicted to occur within 10 km of the site

Species	Source	Status		Record details and habitat requirements	Likelihood of occurrence	Further assessment required?
		TSC Act	EPBC Act			
FLORA						
Button Wrinklewort *Rutidosis leptorrhynchoides*	PlantNET	E	E	Recorded in 1999 5km south of the site. Occurs in Box-Gum Woodland, secondary grassland derived from Box-Gum Woodland or in Natural Temperate Grassland; and often in the ecotone between the two communities. Grows on soils that are usually shallow, stony red-brown clay loams; tends to occupy areas where there is relatively less competition from herbaceous species (either due to the shallow nature of the soils, or at some sites due to the competitive effect of woodland trees). Exhibits an ability to colonise disturbed areas (eg. vehicle tracks, bulldozer scrapings and areas of soil erosion).	None	No
Few-seeded Bossiaea *Bossiaea oligosperma*	PlantNET	V	V	Not recorded within 10km of the site. Occurs on stony slopes or ridges on sandstone in the Yerranderie area. Occurs in low woodland on loamy soil in the Windellama area. Nothing is known about its ecology but it probably has hard-coated seeds that respond well to fire and soil disturbance.	None	No

Table A.2 Likelihood of occurrence for threatened species previously recorded or predicted to occur within 10 km of the site

Species	Source	Status		Record details and habitat requirements	Likelihood of occurrence	Further assessment required?
		TSC Act	EPBC Act			
Buttercup Doubletail *Diuris aequalis*	PlantNET	E	V	Last recorded 4km south of the site in 1904. Recorded in forest, low open woodland with grassy understorey and secondary grassland on the higher parts of the Southern and Central Tablelands, especially on the Great Dividing Range.	None	No
Delicate Pomaderris *Pomaderris delicata*	PlantNET	CE	-	Not recorded within 10km of the site. At both known sites the Delicate Pomaderris grows in dry open forest dominated by *Eucalyptus sieberi* with a dense she-oak understorey. Soils are shallow and derived from sandstone and siltstone. Nothing is known about the response of the species to fire and other disturbance.	None	No
Hoary Sunray *Leucochrysum albicans* var. *tricolor*	NPWS Atlas	-	E	Recorded in 2009, 2km west of the site and several records exist west of this along Addison Street, Goulburn In NSW, the Hoary Sunray is found in native grasslands and grassy woodlands. It is usually found in association with Yellow Box (*Eucalyptus melliodora*), Blakely's Red Gum (*E. blakelyi*), Red Box (*E. polyanthemos*), Brittle Gum (*E. mannifera*) or Snow Gum (*E. pauciflora*).	None	No
Basalt Peppercress *Lepidium hyssopifolium*	SPRAT	-	E	Not recorded within 10km of the site. This species is only known from three populations in NSW, one population in Bathurst and two in Bungendore. Generally, the Basalt Pepper-cress is known to establish on open, bare ground with limited competition from other plants. The Basalt Pepper-cress was previously recorded from Eucalypt woodland with a grassy ground cover, low open Casuarina woodland with a grassy ground cover and tussock grassland (Leigh et al. 1984). Recently recorded localities have predominantly been in weed-infested areas of heavy modification, high degradation and high soil disturbance such as road and rail verges, on the fringes of developed agricultural land or within small reserves in agricultural land. Many populations are now generally found amongst exotic pasture grasses and beneath exotic trees such as the Radiata Pine and Monterey Cypress (*Cupressus macrocarpus*), often associated with other species of *Lepidium.*	Low	No

Table A.2 Likelihood of occurrence for threatened species previously recorded or predicted to occur within 10 km of the site

Species	Source	Status		Record details and habitat requirements	Likelihood of occurrence	Further assessment required?
		TSC Act	EPBC Act			
Omeo's Storksbill *Pelargonium* sp. *striatellum*	SPRAT	-	E	Not recorded within 10km of the site. *Pelargonium sp. Striatellum* (G.W.Carr 10345) is known to occur in habitat usually located just above the high water level of irregularly inundated or ephemeral lakes. During dry periods, the species is known to colonise exposed lake beds. It is not known if the species' rhizomes and soil seedbank persist through prolonged inundation or drought.	Low	No
Austral Toadflax *Thesium australe*	SPRAT	V	V	Not recorded within 10km of the site. Occurs in native grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (*Themeda australis*).	None	No
FAUNA - Birds						
Australasian Bittern *Botaurus poiciloptilus*	SPRAT	E	E	Not recorded within 10km of the site. Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. They favour permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.). They hide during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails.	None	No
Australian Painted Snipe *Rostratula australis*	SPRAT	E	E, Mi	Not recorded within 10km of the site. The Australian Painted Snipe prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. The Australian Painted Snipe nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	None	No
Black-faced Monarch *Monarcha melanopsis*	SPRAT	-	Mi	Not recorded within 10km of the site. The Black-faced Monarch occurs mainly in rainforest ecosystems but sometimes is found in nearby open eucalypt forests in gullies with a dense, shrubby, or patchy understorey.	None	No

Table A.2 Likelihood of occurrence for threatened species previously recorded or predicted to occur within 10 km of the site

Species	Source	Status		Record details and habitat requirements	Likelihood of occurrence	Further assessment required?
		TSC Act	EPBC Act			
Black-necked Stork *Ephippiorhynchus asiaticus*	NPWS Atlas	E	-	Recorded 5km south of the site in 1998. In Australia, Black-necked Storks are widespread in coastal and subcoastal northern and eastern Australia, as far south as central NSW (although vagrants may occur further south or inland, well away from breeding areas). In NSW, the species becomes increasingly uncommon south of the Clarence Valley, and rarely occurs south of Sydney. This species occurs in floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW for the Black-necked Stork. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries.	Low	No
Cattle Egret *Ardea ibis*	SPRAT	-	Mi	Not recorded within 10km of the site. The Cattle Egret occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. It has occasionally been seen in arid and semi-arid regions however this is extremely rare. High numbers have been observed in moist, low-lying poorly drained pastures with an abundance of high grass; it avoids low grass pastures. It has been recorded on earthen dam walls and ploughed fields. It is commonly associated with the habitats of farm animals, particularly cattle, but also pigs, sheep, horses and deer.	**Moderate**	**Yes**
Gang-gang Cockatoo *Callocephalon fimbriatum*	NPWS Atlas	V	-	Recorded 2km north of the site. In summer, it is generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, it occurs at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas. It is regularly recorded in gardens in Canberra.	**Moderate**	**Yes**
Great Egret *Ardea alba*	SPRAT	-	Mi	Not recorded within 10km of the site. The Eastern Great Egret has been reported in a wide range of wetland habitats These include swamps and marshes,margins of rivers and lakes; damp or flooded grasslands, pastures or agricultural lands, reservoirs, sewage treatment ponds and drainage channels. The species usually frequents shallow waters. The Eastern Great Egret may retreat to permanent wetlands or coastal areas when other wetlands are dry. This may occur annually in some regions with regular wet and dry seasons or erratically where the availability of wetland habitat is also erratic.	**Moderate**	**Yes**

Table A.2 Likelihood of occurrence for threatened species previously recorded or predicted to occur within 10 km of the site

Species	Source	Status		Record details and habitat requirements	Likelihood of occurrence	Further assessment required?
		TSC Act	EPBC Act			
Latham's Snipe *Gallinago hardwickii*	SPRAT	-	Mi	Not recorded within 10km of the site. In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity.	Low	No
Little Eagle *Hieraeetus morphnoides*	NPWS Atlas	V	-	Recorded 5km east of the site along the Wollondilly River. The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. This species occupies open eucalypt forest, woodland or open woodland. Sheoak or *Acacia* woodlands and riparian woodlands of interior NSW are also used.	**Moderate**	**Yes**
Rainbow Bee-eater *Merops ornatus*	SPRAT	-	Mi	Not recorded within 10km of the site. The Rainbow Bee-eater is distributed across much of mainland Australia, and occurs on several near-shore islands. It is not found in Tasmania, and is thinly distributed in the most arid regions of central and Western Australia. It usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water. The Rainbow Bee-eater is also common in cleared and semi-cleared habitats ie farmland.	Low	No
Regent Honeyeater *Anthochaera phrygia*	NPWS Atlas	CE	E	Last recorded 5km south of the site in 2000. The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. These birds are also found in drier coastal woodlands and forests in some years. Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany (*Eucalyptus robusta*) and Spotted Gum (*Corymbia maculata*) forests, particularly on the central coast and occasionally on the upper north coast. Birds are occasionally seen on the south coast.	Low	No
Rufous Fantail *Rhipidura rufifrons*	SPRAT	-	Mi	Not recorded within 10km of the site. In east and south-east Australia, the Rufous Fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as Tallow-wood (*Eucalyptus microcorys*), Mountain Grey Gum (*E. cypellocarpa*), Narrow-leaved Peppermint (*E. radiata*), Mountain Ash (*E. regnans*), Alpine Ash (*E. delegatensis*), Blackbutt (*E. pilularis*) or Red Mahogany (*E. resinifera*); usually with a dense shrubby understorey often including ferns.	None	No

Table A.2 Likelihood of occurrence for threatened species previously recorded or predicted to occur within 10 km of the site

Species	Source	Status		Record details and habitat requirements	Likelihood of occurrence	Further assessment required?
		TSC Act	EPBC Act			
Satin Flycatcher *Myiagra cyanoleuca)*	SPRAT	-	Mi	Not recorded within 10km of the site. The Satin Flycatcher is widespread in eastern Australia and vagrant to New Zealand. Satin Flycatchers inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests.	None	No
Superb Parrot *Polytelis swainsonii*	SPRAT	E	E	Not recorded within 10km of the site. Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest.	None	No
Swift Parrot *Lathamus discolor*	SPRAT	E	E	Not recorded within 10km of the site. The Swift Parrot migrates to the Australian south-east mainland between March and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations.	Low	No
Varied Sittella *Daphoenositta chyrstoptera*	NPWS Atlas	V	-	Recorded in 1981, 6km northwest of the site. The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. The Varied Sittella Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy.	Low	No
White-bellied Sea Eagle *Haliaeetus leucogaster*	SPRAT	-	Mi	Last recorded in 1985, 5km southwest of the site. The White-bellied Sea-Eagle is found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. The habitats occupied by the sea-eagle are characterised by the presence of large areas of open water (larger rivers, swamps, lakes and the sea).	**Moderate**	**Yes**
White-throated Needletail *Hirundapus caudacutus*	SPRAT	-	Mi	Not recorded within 10km of the site. The White-throated Needletail occurs in open forest, rainforest, heathland, grassland and swamps. The species breeds in wooded lowlands and sparsely vegetated hills, as well as mountains covered with coniferous forests. This species rarely, if ever, comes to the ground.	None	No

Table A.2 Likelihood of occurrence for threatened species previously recorded or predicted to occur within 10 km of the site

Species	Source	Status		Record details and habitat requirements	Likelihood of occurrence	Further assessment required?
		TSC Act	EPBC Act			
FAUNA - Frogs						
Littlejohns Tree Frog *Littoria littlejohni*	SPRAT	V	V	Not recorded within 10km of the site. The Littlejohn's Tree Frog has a distribution that includes the plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest (90 km north of Sydney) south to Buchan in Victoria. Non-breeding habitat is heath based forests and woodlands where it shelters under leaf litter and low vegetation, and hunts for invertebrate prey either in shrubs or on the ground.	None	No
FAUNA - Mammals						
Brush-tailed Rock Wallaby *Petrogale penicillata*	NPWS Atlas	E	V	Not recorded within 10km of the site. In NSW the Brush-tailed Rock Wallaby occurs from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. This species occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. The Brush-tailed Rock Wallaby browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees.	None	No
Eastern Bentwing Bat *Miniopterus schreibersii oceanensis*	NPWS Atlas	V	-	Not recorded within 10km of the site. Eastern Bentwing Bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat for this species, but they also use derelict mines, storm-water tunnels, buildings and other man-made structures. The Eastern Bentwing Bat forms discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young.	Low	No
Eastern False Pipistrelle *Falsistrellus tasmaniensis*	NPWS Atlas	V	-	Not recorded within 10km of the site. The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. This species prefers moist habitats, with trees taller than 20 m, generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings.	None	No
Grey-headed Flying-fox *Pteropus poliocephalus*	NPWS Atlas	V	V	Not recorded within 10km of the site. Grey-headed Flying foxes occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	**Moderate**	**Yes**

Table A.2 Likelihood of occurrence for threatened species previously recorded or predicted to occur within 10 km of the site

Species	Source	Status		Record details and habitat requirements	Likelihood of occurrence	Further assessment required?
		TSC Act	EPBC Act			
Koala *Phascolarctos cinereus*	NPWS Atlas	V	V	Not recorded within 10km of the site. In NSW, the koala mainly occurs on the central and north coast with some populations in the west of the Great Dividing Range. The Koala inhabits eucalypt woodlands and forests. They feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.	None	No
Large-eared Pied Bat *Chalinolobus dwyeri*	NPWS Atlas	V	V	Not recorded within 10km of the site. The Large-eared Pied Bat roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features.	None	No
Spotted-tailed Quoll *Dasyurus maculatus*	NPWS Atlas	V	E	Not recorded within 10km of the site. The Spotted-tailed Quoll inhabits a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites.	None	No
FAUNA - Reptiles						
Broad-headed Snake *Hoplocephalus bungaroides*	SPRAT	E	V	Not recorded within 10km of the site. The Broad-headed Snake is largely confined to Triassic and Permian sandstones, including the Hawkesbury, Narrabeen and Shoalhaven groups, within the coast and ranges in an area within approximately 250 km of Sydney. It shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring.	None	No
Pink-tailed Legless Lizard *Aprasia parapulchella*	SPRAT		V	Not recorded within 10km of the site. Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass. Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks.	None	No
Striped Legless Lizard *Delma impar*	SPRAT		V	Recorded in 1997 5km south of the site. Found mainly in Natural Temperate Grassland but has also been captured in grasslands that have a high exotic component. Also found in secondary grassland near Natural Temperate Grassland and occasionally in open Box-Gum Woodland.	Low. Possible occurrence given exotic grasslands, however there is no nearby source population or native vegetation, so very unlikely.	No

Table A.2 Likelihood of occurrence for threatened species previously recorded or predicted to occur within 10 km of the site

Species	Source	Status		Record details and habitat requirements	Likelihood of occurrence	Further assessment required?
		TSC Act	EPBC Act			
FAUNA – FISH						
Macquarie Perch *Macquaria australasica*	SPRAT	-	E	Not recorded within 10km of the site. Populations exist in the Cataract Dam in the Nepean River catchment, as well as a 2008 record from Georges River near Campbelltown, the first record from the river since 1894 (NSW DPI 2008a). The Macquarie Perch is a riverine, schooling species. It prefers clear water and deep, rocky holes with lots of cover. As well as aquatic vegetation, additional cover may comprise of large boulders, debris and overhanging banks	None	No

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