APPENDIX 2
Flora and fauna potential habitat tables

Potential threatened flora habitat

Table 18: Potential habitat and likelihood of occurrence for threatened flora within the study area.

Key: 1) Listed under the EPBC Act as Endangered (E), Critically Endangered (Z) or Vulnerable (V).
2) Listed under the TSC Act as Endangered (E1), Critically Endangered (C1) or Vulnerable (V).

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence**
Derwentia blakelyi	-	V	Restricted to the Central West, Hawkesbury/Nepean and Hunter/Central Rivers Catchments, specifically in western Blue Mountains, near Clarence, near Mt Horrible, on Nullo Mountain and in the Coricudgy Range (NPWS 2005b). Occurs in eucalypt forest, often in moist areas. Vegetation communities include: Dry and Wet Sclerophyll Forests, Grassy Woodlands, Heathlands (Sydney Montane Heaths) and Freshwater Wetlands (Coastal Heath Swamps). Flowers in summer (NPWS 2005b).	Considered to have a low likelihood of occurrence. Nearest and most recent record approximately 50 km to the north east in 1997.
Eucalyptus aggregata Black Gum	-	V	A moderately narrow distribution, found in the tablelands of central and southern NSW with isolated occurrences in Victoria and ACT. In NSW *E.aggregata* occurs in the South Eastern Highlands Bioregion and on the western fringe of the Sydney Basin Bioregion. *E.aggregata* occurs in the wetter, cooler and higher parts of the tablelands such as Blayney, Crookwell, Goulburn, Braidwood and Bungendore districts (DEC 2005d).	Considered to have a low likelihood of occurrence. Nearest and most recent record approximately 10 km to the south east in 1899. Species is conspicuous.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence**
Eucalyptus cannonii Cannon's Stringybark	V	V	*E. cannonii* is restricted to the western side of the Blue Mountains from Mount Piper in the south to the Mudgee area in the north. There are also populations to the west in Winburndale Nature Reserve and adjacent State Forests (NPWS 2000b). Catchment Regions include Central West, Hawkesbury/Nepean, and Central Rivers. *E. cannonii* occurs on a wide variety of geological types and soil substrates across a wide altitudinal range(NPWS 2000b). Associated species are similarly diverse: *E. viminalis, E. mannifera, E. polyanthemos, E. rossii, E. blakelyi, E. oblonga, E. sparsifolia, E. bridgesiana, E. dalrympleana, E. melliodora, E. dives* and *Angophora floribunda(NPWS 2005a)*. Hybrids with *E. macrorrhyncha, Eucalyptus sparsifolia/Eucalyptus tenella* have been collected(NPWS 2005a). Recorded from Tablelands Grassy Woodland Complex communities and Talus Slope Woodland, and in Winburndale Nature Reserve within woodland dominated by *E. macrorhyncha and E. goniocalyx (*NPWS 2005a*)*. Produces white flowers from January to April.	Considered to have a low likelihood of occurrence. Nearest and most recent record approximately 50 km to the north east in 1997.
Eucalyptus canobolensis Silver-Leaf Candlebark	E	V	Restricted to Mt Canobolas, which is of Tertiary volcanic origin. The landform consists of undulating low hills to steep hills. Soils are shallow skeletal sands and loams on steep slopes, with red earths, red podzolics and krasnozems on lower slopes. Alpine humus is found on crests. Vegetation is a sub-alpine woodland. Other trees co-occurring with *E. canobolensis include E. pauciflora, E. dalrympleana, E. viminalis, E. dives* and *E. saxicola.* Understorey species include *Poa sieberiana* and *Cassinia arctuata*. The species is common in all parts of Mt Canobolas SRA (NPWS 2005f).	Considered to have a low likelihood of occurrence as the species is restricted to Mt Canobolas. Sub Alpine Woodland habitat is not present in the current study area. Species is conspicuous.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence**
Eucalyptus pulverulenta Silver-leaved Gum	V	V	Scattered populations occur in grassy woodlands on relatively poor soils between Bathurst and Bombala(Harden 1991). Often found on rocky outcrops on hillsides(Fairley and Moore 2000). Grows in shallow soils as an understorey plant in open forest, typically dominated by Brittle Gum *(Eucalyptus mannifera)*, Red Stringybark (*E. macrorhyncha*), Broad-leafed Peppermint (*E. dives*), Silvertop Ash (*E. sieberi*) and Apple Box (*E. bridgesiana*)(DEC 2005i).	Considered to have a low likelihood of occurrence. Nearest and most recent record approximately 40 km to the southeast in 1918. Species is conspicuous.
Eucalyptus robertsonii ssp. hemisphaerica Robertson's Peppermint	V	V	Locally frequent in grassy or dry sclerophyll woodland or forest, on lighter soils and often on granite. Usually found in closed grassy woodlands in locally sheltered sites. Habitats include quartzite ridges, upper slopes and a slight rise of shallow clay over volcanics. Associated vegetation includes variously mixed woodlands of *Eucalyptus piperita, E. goniocalyx, E. dalrympleana, E. dives, E. mannifera* and *E. rossii*. Populations are usually highly localised, with trees recorded as frequent in populations (NPWS 2005e).	Considered to have a low likelihood of occurrence. Although nearest and most recent record is less than 10 km to the west in 2006 on Mullion Range populations are usually highly localised, with trees recorded as frequent in populations.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence**
Eucalyptus saxicola Mt Canobolas Box	-	E1	*Eucalyptus saxicola* is found at Mt Canobolas near Orange, and is restricted to a few scattered stands over a distance of approximately one kilometre. The species is known from within the Mt Canobolas State Conservation Area. Within this area, *E.saxicloa* is found on and around the margins of acid volcanic rock outcrops (NPWS 2005c).	Considered to have a low likelihood of occurrence. Although there is one record in Orange urban area the majority of records are at Mt Canobolas SCA 20 km southeast of the study area. The species is highly restricted in its distribution.
Euphrasia arguta	Z	C1	*Euphrasia arguta* is an erect, semi-parasitic annual herb that had not been found since 1904 until its rediscovery in 2008. The species is now known from six sites up to 25 km apart in the area of Nundle State Forest, south east of Tamworth, NSW. The recently discovered populations are in grassy forests or regrowth vegetation and the species has previously in grassy areas near rivers at elevations up to 700 m above sea level, with an annual rainfall of 600 mm (TSSC 2011).	Considered to have a low likelihood of occurrence. Nearest and most recent record over 100 km to the north east in 1892. Recently recorded populations over 250 km north east of the study area.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence**
Grevillea divaricata	-	E1	A rare species-only known from the Type collection made in 1823, north of Bathurst. Grows in dry open forests (DEC 2005k).	Considered to have a low likelihood of occurrence. Nearest and most recent record over 45 km to the east in 1823.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence**
Persoonia marginata Clandulla Geebung	V	V	Known from only four disjunct locations in the Central West, Hawkesbury/Nepean and Hunter Central Rivers catchment. Core of the species distribution is within Clandulla State Forest, west of Kandons. Disjunct populations occur; to the north at Dingo Creek and Mount Dangar; to the south within Ben Bullen State Forest; and north of Colo Heights within Parr State Recreation Area(DEC 2005r). *P. marginata* is found in dry woodland communities associated with Shoalhaven Group sediments. Soils are shallow hard setting sandy loams, generally with gravel or rocks, and the topography is flat(NPWS 2000a). The vegetation is part of the Tablelands Grassy Woodland Complex vegetation described by Benson and Keith (1990). The dominant tree species include *Eucalyptus punctata, E. sparsifolia, E. rossii , E. fibrosa* and *E. crebra*. The understorey generally comprises a shrub layer of medium density and a grassy ground layer of low to medium density. Common shrub species include *Acacia buxifolia, Exocarpos strictus, Acacia terminalis, Pultenaea microphylla, Acacia verniciflua, Dillwynia phylicoides, Platysace ericoides, Persoonia linearis* and *Grevillea ramosissima.* Ground layer species include *Chionochloa pallida, Lomandra filiformis var. coriacea, Dianella revoluta and Chrysocephalum apiculatum*. Potential habitat beyond known locations would include flat land with sandy soils on Shoalhaven Group sediments(NPWS 2000a). Recorded flowering period varies and includes December and Winter. Appears to respond well to disturbance, with greater densities found along the edges of tracks and in areas disturbed by forestry activities (DEC 2005r).	Considered to have a low likelihood of occurrence. Nearest and most recent record over 50 km to the east in 1882.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence**
Philotheca ericifolia	V	V	Grows chiefly in dry sclerophyll forest and heath on damp sandy flats and gullies. It has been collected from a variety of habitats including heath, open woodland, dry sandy creek beds, and rocky ridge and cliff tops. Associated species include *Melaleuca uncinata, Eucalyptus crebra, E. rossii, E. punctata, Corymbia trachyphloia, Acacia triptera, A. burrowii, Beyeria viscosa, Philotheca australis, Leucopogon muticus* and *Calytrix tetragona.* Noted as being a "moisture-loving plant", with plants common on the sides of a particular spur of the Hervey Ranges where soakage from the high background provides sufficient moisture for the plants. *P. ericicolia* has also been recorded growing in a recently burnt site (wildfire) and within a regeneration zone resulting from clearing(NPWS 2005d).	Considered to have a low likelihood of occurrence. Nearest and most recent record over 100 km to the east in 1973.
Swainsona sericea Silky Swainson-pea	-	V	Grassland and eucalypt grassy woodland, sometimes with Callitris species(Harden 2002; NSW Scientific Committee 2008d). Silky Swainson-pea has been recorded from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains. There is one isolated record from the far north-west of NSW. Its stronghold is on the Monaro. Also found in South Australia, Victoria and Queensland. Found in Natural Temperate Grassland and Snow Gum *Eucalyptus pauciflora* Woodland on the Monaro. Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes(DEC 2005x).	Considered to have a medium likelihood of occurrence based on the widely distributed grassland and woodland habitats of the study area and presence of specific associated tree species. Species is also inconspicuous.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence**
Thesium australe Austral Toad-flax	V	V	Found in very small to large populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. *Thesium australe* is a root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass(DEC 2005|). It is often found in damp sites in association with *Themeda australis*, but also found on other grass species at inland sites (G. Leonard pers. Obs.). Occurs on clay soils in grassy woodlands or coastal headlands (James *et al.* 1999).	Nearest and most recent record over 150 km to northeast in 1959. However considered to have a medium likelihood of occurrence based on the widely distributed grassland and woodland habitats of the study area and abundance of native grasses including *Themeda australis*. Species is also inconspicuous.
Zieria obcordata	E	E1	Grows in eucalypt woodland or shrubland dominated by species of Acacia on rocky hillsides. Also occurs in Eucalyptus and Callitris dominated woodland with an open, low shrub understorey, on moderately steep, west to north-facing slopes in sandy loam amongst granite boulders. The altitude range of sites is 500 to 830 metres. Soil types include shallow sandy loam and shallow brown gravely loam on granite substrates. In wild populations, plants tend to grow in crevices between granite boulders (NPWS 2005g).	Considered to have a low likelihood of occurrence due to the highly restricted known distribution of the species. Nearest and most recent record approximately 40 km to the south east in 2001.

Potential threatened fauna habitat

Table 19: Potential habitat and likelihood of occurrence for threatened and migratory fauna within the study area.

Key: 1) Listed under the EPBC Act as Endangered (E), Vulnerable (V) or covered under migratory provisions (M) of the Act.
2) Listed under the TSC Act as Endangered (E1), Critically Endangered (C1) or Vulnerable (V).

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Frogs				
Litoria aurea Green and Golden Bell Frog	V	E1	Most existing locations for the species occur as small, coastal, or near coastal populations, with records occurring between south of Grafton and northern VIC(NSW Government 2009). The species is found in marshes, dams and stream sides, particularly those containing bullrushes or spikerushes. Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area nearby and have diurnal sheltering sites nearby such as vegetation or rocks(NPWS 1999d; White and Pyke 1996), although the species has also been recorded from highly disturbed areas including disused industrial sites, brick pits, landfill areas and cleared land. Breeding usually occurs in summer. Tadpoles, which take approximately 10-12 weeks to develop(DECC 2008a), feed on algae and other vegetative matter. Adults eat insects as well as other frogs, including juveniles of their own species(DEC 2005j).	Low. Poor habitat opportunities within study area. No recent records in proximity to the study area. Closest records occur approximately 50 km south-east of the southern extent of the study area dating from the 1970s.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Litoria booroolongensis Booroolong Frog	E	E1	The species is restricted to NSW and north-eastern VIC, predominantly along the western-flowing streams of the Great Dividing Range. The most recent records occur on the south-west slopes of NSW(DEC 2005e). The species is found in upland rivers, montane creeks and lowland rivers and creeks, particularly in permanent rocky western-flowing streams and rivers on the slopes and tablelands of NSW(Barker *et al.* 1995; NSW Scientific Committee 2008b; Lintermans and Osborne 2002), with some fringing vegetation cover such as ferns, sedges or grasses(DEC 2005e). The Booroolong Frog is often found in daylight on rocks by the waters edge (Barker *et al.* 1995; NSW Scientific Committee 2008b) or sheltering under rocks or amongst vegetation. Breeding occurs in spring and early summer when eggs are laid in submerged rock crevices. Tadpoles develop in slow-flowing connected or isolated pools and metamorphose in late summer to early autumn(DEC 2005e).	Moderate. No records of this species occur within 50 km of the study area. Populations occurring north and south of the study area recorded in 2009. Suboptimal potential habitat occurs within creeklines crossing the study area.
Litoria castanea Yellow-spotted Tree Frog	E	E1	The Yellow-spotted Tree Frog has only recently (2010) been recorded in the wild again. Before this it had not been recorded in the wild since the 1970s(DEC 2005□). It has a disjunct distribution, being recorded on the New England Tableland and on the southern highlands from Lake George to Bombala. There are unconfirmed reports from near Bathurst and Orange. Found in large permanent ponds, lakes and dams with an abundance of bulrushes and other emergent vegetation. It shelters during autumn and winter under fallen timber, rocks, other debris or thick vegetation(Robinson 1998; DEC 2005□).	Low. Poor habitat opportunities within study area. No records within 100 km of the study area.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Crinia sloanei Sloane's Froglet	-	V	Sloane's Froglet is a cryptic species, usually found only after rain(Cogger 2000). This species has a widely scattered distribution throughout the floodplains of the Murray-Darling Basin in NSW and has been recorded mostly in the Darling Riverine Plains, NSW South Western Slopes, and the Riverina bioregions(Thackway and Cresswell 1995). It is typically associated with periodically inundated grassland, woodland and disturbed areas(NSW Scientific Committee 2008a; Cogger 2000).	Low. Not known or predicted to occur within Orange or Hill End CMA sub-regions. Closest record occurs approximately 65 km west of the Ophir and Lookout Roads intersection.
Birds				
Circus assimilis Spotted Harrier	-	V	The Spotted Harrier is found throughout Australia but rarely in densely forested and wooded habitat of the escarpment and coast(NSW Scientific Committee 2010a). Preferred habitat consists of open and wooded country with grassland nearby for hunting. Habitat types include open grasslands, acacia and mallee remnants, spinifex, open shrublands, saltbush, very open woodlands, crops and similar low vegetation(NSW Scientific Committee 2010a). The Spotted Harrier is more common in drier inland areas, nomadic part migratory and dispersive, with movements linked to the abundance of prey species. Nesting occurs in open or remnant woodland and unlike other harriers, the Spotted Harrier nests in trees(Marchant and Higgins 1993).	High. Potential habitat occurs within the open grassy woodlands. Several records occur within the Orange and Hill End CMA sub-regions. Closest record occurs approximately 20 km south-west of Suma Park Dam, dated 2002.
Haliaeetus leucogaster White-bellied Sea-eagle	M	-	A migratory species that is generally sedentary in Australia, although immature individuals and some adults are dispersive(Marchant and Higgins 1993). Found in terrestrial and coastal wetlands; favouring deep freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes. It hunts over open terrestrial habitats. Feeds on birds, reptiles, fish, mammals, crustaceans and carrion. Roosts and makes nest in trees(Marchant and Higgins 1993).	Moderate. Closest record occurs approximately 3 km north of the Offtake Point along the Macquarie River (Australian Museum record).

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Hieraaetus morphnoides Little Eagle	-	V	The Little Eagle is most abundant in lightly timbered areas with open areas nearby providing an abundance of prey species(NSW Scientific Committee 2009b). It has often been recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. The Little Eagle nests in tall living trees within farmland, woodland and forests(Marchant and Higgins 1993).	High. Potential habitat occurs within the open grassy woodlands. Previously recorded 12 times within 10 km of the study area.
Lophoictinia isura Square-tailed Kite	-	V	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia(Marchant and Higgins 1993). In NSW it is often associated with ridge and gully forests dominated by *Eucalyptus longifolia*, *Corymbia maculata*, *E. elata*, or *E. smithii(NPWS 1999g)*. Individuals appear to occupy large hunting ranges of more than 100 km^2. They require large living trees for breeding, particularly near water with surrounding woodland/forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs(Marchant and Higgins 1993).	Moderate. Potential habitat occurs within the woodland and forest of the study area. Closest record occurs approximately 20 km east of the Oaky Lane/Long Point Road intersection.
Oxyura australis Blue-billed Duck	-	V	Almost wholly aquatic, preferring deep water in large, permanent wetlands with an abundant aquatic flora(Marchant and Higgins 1990).	Moderate. Previously recorded over 50 times within 10 km of the study area, predominantly within Spring Creek Reservoir to the south, as recently as 2011.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Stictonetta naevosa Freckled Duck	-	V	The Freckled Duck breeds in permanent fresh swamps that are heavily vegetated. Found in fresh or salty permanent open lakes, especially during drought. Often seen in groups on fallen trees and sand spits(Simpson and Day 1996).	Moderate. Previously recorded at least 10 times within 10 km of the study area, predominantly within Spring Creek Reservoir to the south, as recently as 2009.
Anseranas semipalmata Magpie Goose	-	V	Mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges. They are often seen walking and grazing on land; feeds on grasses, bulbs and rhizomes(DEC 2005p). Breeding can occur in both summer and winter dominated rainfall areas and is strongly influenced by water level. Nests are formed in trees over deep water; breeding is unlikely in south-eastern NSW(DEC 2005p). Often seen in trios or flocks on shallow wetlands, dry ephemeral swamps, wet grasslands and floodplains; roosts in tall vegetation(DEC 2005p).	Low. Poor habitat opportunities within study area. Closest record occurs approximately 46 km south-east of Suma Park Dam, recorded in 2000.
Apus pacificus Fork-tailed Swift	M	-	Almost exclusively aerial (foraging). The Fork-tailed Swift breeds in Asia but migrates to Australia from September to April(Higgins 1999). Individuals or flocks can be observed hawking for insects at varying heights from only a few metres from the ground and up to 300 metres high(Boehm 1944).	Low. Previously recorded once within 10 km of the study area. Sparse records outside 10 km search area. May fly high over the study area.
Hirundapus caudacutus White-throated Needletail	M	-	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges. Breeds in Asia(Pizzey and Knight 1997).	Low. Previously recorded twice within 10 km of the study area. Sparse records outside 10 km search area. May fly high over the study area.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Ardea alba Great Egret	M	-	Terrestrial wetlands, estuarine and littoral habitats and moist grasslands. Inland, prefer permanent waterbodies on floodplains; shallows of deep permanent lakes (either open or vegetated), semi-permanent swamps with tall emergent vegetation and herb dominated seasonal swamps with abundant aquatic flora. Also regularly use saline habitats including mangrove forests, estuarine mudflats, saltmarshes, bare saltpans, shallows of salt lakes, salt fields and offshore reefs. Breeding requires wetlands with fringing trees in which to build nests including mangrove forest, freshwater lakes or swamps and rivers(Marchant and Higgins 1990).	Low. Despite almost 20 records within 10 km south-west of Suma Park Dam, the study area provides limited habitat resources for this species.
Ardea ibis Cattle Egret	M	-	Occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands(Marchant and Higgins 1990).	Moderate. May forage within the grasslands of the study area. Previously recorded three times within 10 km of Suma Park Dam.
Botaurus poiciloptilus Australasian Bittern	E	E1	The Australasian Bittern is distributed across south-eastern Australia. Often found in terrestrial and estuarine wetlands, generally where there is permanent water with tall, dense vegetation including Typha spp. and Eleoacharis spp.(DEC 2005a; NPWS 1999a). Typically this bird forages at night on frogs, fish and invertebrates, and remains inconspicuous during the day. The breeding season extends from October to January with nests being built amongst dense vegetation on a flattened platform of reeds(DEC 2005a).	Low. Poor habitat opportunities within study area. Closest record occurs approximately 45 km west of Orange, recorded in 1976.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Ixobrychus flavicollis Black Bittern	-	V	The Black Bittern is found along the coastal plains within NSW, although individuals have rarely being recorded south of Sydney or inland. It inhabits terrestrial and estuarine wetlands such as flooded grasslands, forests, woodlands, rainforests and mangroves with permanent water and dense waterside vegetation(DEC 2005c; NPWS 1999b). The Black Bittern typically roosts on the ground or in trees during the day and forages at night on frogs, reptiles, fish and invertebrates(DEC 2005c). The breeding season extends from December to March. Nests are constructed of reeds and sticks in branches overhanging the water.	Low. One record from 1995 in Spring Creek Reservoir south of Suma Park Dam. Next closest record occurs approximately 74 km south-west of Orange, recorded in 1950.
Burhinus grallarius Bush Stone-curlew		E1	Lightly timbered open forest and woodland, or partly cleared farmland with remnants of woodland, with a ground cover of short sparse grass and few or no shrubs where fallen branches and leaf litter are present(Marchant and Higgins 1993).	Low. No recent records within 10 km of the study area. Closest records date from 1800s and early 1900s.
Callocephalon fimbriatum Gang-gang Cockatoo	-	V	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests(Higgins 1999). Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest(Forshaw and Cooper 1981). In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas(Shields and Crome 1992). It requires tree hollows in which to breed(Gibbons and Lindenmayer 1997).	Low. No records within 10 km of the study area. Closest record occurs approximately 40 km south-west of Orange, recorded in 2000.
Calyptorhynchus lathami Glossy Black-cockatoo	-	V	Inhabits forest with low nutrients, characteristically with key Allocasuarina species. Tends to prefer drier forest types(NPWS 1999c). Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead(Higgins 1999).	Low. No Allocasuarina spp. recorded within study area. Closest record occurs approximately 24 km north-west of Suma Park Dam.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Climacteris picumnus victoriae Brown Treecreeper (eastern subspecies)	-	V	Lives in eucalypt woodlands, especially areas of relatively flat open woodland typically lacking a dense shrub layer, with short grass or bare ground and with fallen logs or dead trees present(Traill and Duncan 2000).	High. Recorded during field surveys in woodland adjoining Macquarie River.
Myiagra cyanoleuca Satin Flycatcher	M	-	Migratory species that occurs in coastal forests, woodlands and scrubs during migration. Breeds in heavily vegetated gullies(Pizzey and Knight 1997).	Moderate. Limited preferred habitat availability within the study area. Previously recorded three times within 10 km of the study area.
Rhipidura rufifrons Rufous Fantail	M	-	Migratory species that prefers dense, moist undergrowth of tropical rainforests and scrubs. During migration it can stray into gardens and more open areas(Pizzey and Knight 1997).	High. Recorded during field surveys in riparian forest along Summer Hill Creek.
Grus rubicunda Brolga	-	V	The Brolga has been recorded on open wetlands, shallow swamps, floodplains, paddocks, farmland and salt flats(NPWS 1996). This species nest in shallow wetlands where there is shelter such as canegrass, lignum or sedge swamp. They feed in or near water and have often been observed foraging in grassland, dry wetlands and cultivated areas(NPWS 1996).	Low. Poor habitat opportunities within the study area. Closest record occurs approximately 30 km south-east of Suma Park Dam.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Anthochaera phrygia Regent Honeyeater	E	C1	A semi-nomadic species occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests (NPWS 1999e; Pizzey and Knight 1997). Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Also utilises: *E. microcarpa, E. punctata, E. polyanthemos, E. mollucana, Corymbia robusta, E. crebra, E. caleyi, C. maculata, E. mckieana, E. macrorhyncha, E. laevopinea* and *Angophora floribunda*. Nectar and fruit from the mistletoes *A. miquelii, A. pendula, A. cambagei* are also eaten during the breeding season(DEC 2005v). Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and sheoaks. Also nest in mistletoe haustoria. An open cup-shaped nest is constructed of bark, grass, twigs and wool by the female(DEC 2005v).	High. Key eucalypt species such as Yellow Box, Blakely's Red Gum and White Box are present, as well as abundant mistletoe. Previously recorded at least twice within 10 km of the study area.
Certhionyx variegatus Pied Honeyeater	-	V	Mainly inhabits shrublands, often dominated by or including Eremophila and grevilleas, and sometimes with an overstorey of eucalypt woodland (mallee or bloodwood) or mulga (Pizzey and Knight 1997; Higgins *et al.* 2001). They feed on nectar, predominately from Eremophila, but also from mistletoe and Brachysema and Grevillea shrubs(DEC 2005s). Additionally, they eat saltbush fruit, berries, seed, flowers and some insects.	Low. Study area does not provide preferred habitat. Previously recorded once, approximately 7 km south-west of Suma Park Dam. Otherwise, not known or predicted to occur within Orange or Hill End CMA sub-regions.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Grantiella picta Painted Honeyeater	-	V	Found mainly in dry open woodlands and forests, where it is strongly associated with mistletoe(Higgins *et al.* 2001). Often found on plains with scattered eucalypts and remnant trees on farmlands.	Low. Despite the presence of suitable habitat resources, only one recent record (year 2009) occurs within 50 km of the study area (the remainder of records dating from the 1800s, early to mid to late 1900s).
Melithreptus gularis gularis Black-chinned Honeyeater (eastern subspecies)	-	V	Found mostly in open forests and woodlands dominated by box and ironbark eucalypts(Higgins *et al.* 2001). It is rarely recorded east of the Great Dividing Range(Higgins *et al.* 2001).	Low. Despite the presence of suitable habitat resources, the closest record occurs approximately 33 km north-west of the Offtake Point, recorded in 1986. Other records immediately beyond this are also dated from the 1980s or earlier.
Merops ornatus Rainbow Bee-eater	M	-	Usually occurs in open or lightly timbered areas, often near water. Nest in embankments, including banks of creeks and rivers, in sand dunes, in quarries and in roadside cuttings. Breeding occurs from November to January. It has complex migratory movements in Australia. NSW populations migrate north for winter(Higgins 1999).	Moderate. Previously recorded at least six times within 10 km of the study area. Potential habitat occurs along waterways including the Macquarie River.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Acrocephalus australis Australian Reed-Warbler	M	-	This species lives singly or in pairs usually in wetlands with reeds. It feeds on insects(Blakers *et al.* 1984).	Moderate. Limited habitat occurs in waterways sustaining dense patches of rushes and reeds. Numerous records within the vicinity of Spring Creek Reservoir.
Daphoenositta chrysoptera Varied Sittella	-	V	The Varied Sittella is a sedentary species which inhabits a wide variety of dry eucalypt forests and woodlands, usually with either shrubby understorey or grassy ground cover or both, in all climatic zones of Australia. Usually inhabit areas with rough-barked trees, such as stringybarks or ironbarks, but also in mallee and acacia woodlands, paperbarks or mature Eucalypts(Higgins and Peter 2002; NSW Scientific Committee 2010b). The Varied Sittella feeds on arthropods gleaned from bark, small branches and twigs. It builds a cup-shaped nest of plant fibres and cobweb in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years(NSW Scientific Committee 2010b).	High. Previously recorded over 10 times within 10 km of the study area, including immediately adjacent to the study area at the northern end near the Macquarie River.
Chthonicola sagittata Speckled Warbler	-	V	This species occurs in eucalypt and cypress woodlands on the hills and tablelands of the Great Dividing Range. They prefer woodlands with a grassy understorey, often on ridges or gullies (Blakers *et al.* 1984; NSW Scientific Committee 2008c). The species is sedentary, living in pairs or trios and nests on the ground in grass tussocks, dense litter and fallen branches. They forage on the ground and in the understorey for arthropods and seeds (Blakers *et al.* 1984; NSW Scientific Committee 2008c). Home ranges vary from 6-12 hectares(NSW Scientific Committee 2008c).	High. Previously recorded over 10 times within 10 km of the study area, including immediately adjacent to the study area at the northern end near the Macquarie River.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Stagonopleura guttata Diamond Firetail	-	V	Found in a range of habitat types including open eucalypt forest, mallee and acacia scrubs(Pizzey and Knight 1997). Often occur in vegetation along watercourses(Higgins *et al.* 2006).	High. Recorded during field surveys in woodland adjoining Macquarie River, and adjacent to Oaky Creek.
Melanodryas cucullata cucullata Hooded Robin (south-eastern form)	-	V	This species lives in a wide range of temperate woodland habitats, and a range of woodlands and shrublands in semi-arid areas(Traill and Duncan 2000).	High. Previously recorded over 15 times within 10 km of the study area, including near the intersection of Oaky Lane and Long Point Road within the study area.
Petroica boodang Scarlet Robin	-	V	During the breeding season the Scarlet Robin is found in eucalypt forests and temperate woodlands, often on ridges and slopes. During autumn and winter it moves to more open and cleared areas. It has dispersive or locally migratory seasonal movements. The Scarlet Robin forages amongst logs and woody debris for insects which make up the majority of its diet(NSW Scientific Committee 2009c). The nest is an open cup of plant fibres and cobwebs, sited in the fork of a tree (often a dead branch in a live tree, or in a dead tree or shrub) which is usually more than 2 m above the ground(NSW Scientific Committee 2009c). It is conspicuous in open and suburban habitats (Morcombe 2003).	High. Previously recorded 20 times within 10 km of the study area, including near the intersection of Oaky Lane and Long Point Road within the study area, and along Ophir Road.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Petroica phoenicea Flame Robin	-	V	Flame Robins are found in a broad coastal band from southern Queensland to just west of the South Australian border(Australian Museum 2009). The species is also found in Tasmania. The preferred habitat in summer includes moist eucalyptus forests and open woodlands, whilst in winter prefers open woodlands and farmlands(NSW Scientific Committee 2009a). It is considered migratory. The Flame Robin breeds from about August to January (Morcombe 2003).	High. Previously recorded five times within 10 km of the study area, including along Ophir Road.
Pomatostomus temporalis temporalis Grey-crowned Babbler (eastern subsp)	-	V	The Grey-crowned Babbler is found in dry, open forests, scrubby woodlands, trees bordering roads and farmland with isolated trees(Simpson and Day 1996).	Low. Not previously recorded within 10 km of the study area. Closest, recent (2003) record, occurs 14 km south-west of Suma Park Dam.
Glossopsitta pusilla Little Lorikeet	-	V	Distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Mostly occur in dry, open eucalypt forests and woodlands. They feed primarily on nectar and pollen in the tree canopy. Nest hollows are located at heights of between 2 m and 15 m, mostly in living, smooth-barked eucalypts. Most breeding records come from the western slopes(NSW Scientific Committee 2008f).	High. Previously recorded at least five times within 10 km of the study area, from the Macquarie River end to Orange.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Lathamus discolor Swift Parrot	E	E1	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects(Forshaw and Cooper 1981). The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW(Shields and Crome 1992). Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. Commonly used lerp infested trees include Grey Box *E. microcarpa*, Grey Box *E. moluccana* and Blackbutt *E. pilularis(DEC 2005z)*. This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability(Pizzey and Knight 1997).	Moderate. One preferred foraging resource, White Box, occurs in the study area. However, the closest Swift Parrot record occurs over 20 km west of Suma Park Dam, recorded in 2000.
Neophema pulchella Turquoise Parrot	-	V	Occurs in open woodlands and eucalypt forests with a ground cover of grasses and understorey of low shrubs(Morris 1980). Generally found in the foothills of the Great Divide, including steep rocky ridges and gullies(Higgins 1999). Nest in hollow-bearing trees, either dead or alive; also in hollows in tree stumps. Prefer to breed in open grassy forests and woodlands, and gullies that are moist(Higgins 1999).	High. Previously recorded at least eight times within 10 km of the study area, including immediately adjacent to the study area in the northern end near the Macquarie River, and along Ophir Road.
Polytelis swainsonii Superb Parrot	V	V	Found mainly in open, tall riparian River Red Gum forest or woodland. Often found in farmland including grazing land with patches of remnant vegetation. Breeds in hollow branches of tall Eucalypt trees within 9 km of feeding areas(Higgins 1999).	High. Previously recorded several times within 10 km of the study area, including a large concentration of records in southern Orange.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Rostratula australis Australian Painted Snipe	VM	E1	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands, ephemeral or permanent, although they have been recorded in brackish waters(Marchant and Higgins 1993).	Low. No preferred habitat within the study area and no records of this species occur within 100 km of the study area.
Calidris acuminata Sharp-tailed Sandpiper	M	-	Inland waters, coastal(Simpson and Day 1996).	Low. No preferred habitat within the study area.
Gallinago hardwickii Latham's Snipe	M	-	Typically found on wet soft ground or shallow water with good cover of tussocks. Often found in wet paddocks, seepage areas below dams(Pizzey and Knight 1997).	Moderate. Limited habitat opportunities within study area. A cluster of six records within 2 km of study area.
Limosa limosa Black-tailed Godwit	M	V	Mainly coastal, usually in sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats(Higgins and Davies 1996).	Low. No preferred habitat within the study area and no records of this species occur within 10 km of the study area.
Ninox connivens Barking Owl	-	V	Generally found in open forests, woodlands, swamp woodlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country(Pizzey and Knight 1997). Territories are typically 2000 ha in NSW habitats(DEC 2005b).	Moderate. Previously recorded twice within 10 km of the study area.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Ninox strenua Powerful Owl	-	V	The Powerful Owl occupies wet and dry eucalypt forests and rainforests. It may inhabit both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas(Debus and Chafer 1994b; Debus and Chafer 1994a). Large mature trees with hollows at least 0.5 m deep are required for nesting(Garnett 1992). Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials(Gibbons and Lindenmayer 1997). Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm(Gibbons and Lindenmayer 1997). It has a large home range of between 450 and 1450 ha(DEC 2005u).	High. Recorded during field surveys. Heard from Ophir Road, estimated approximately 500 m from the study area, possibly in the vicinity of Summer Hill Creek.
Plegadis falcinellus Glossy Ibis	M		Terrestrial wetlands, and occasionally wet grasslands and sheltered marine habitats. Forage in shallow water over soft substrate or on grassy or muddy verges of wetlands, preferring those providing variety of water depths; avoid dry ground(Marchant and Higgins 1990).	Low. Closest record occurs 35 km north of study area, recorded in 1984. Poor habitat opportunities within the study area.
Tyto novaehollandiae Masked Owl	-	V	The Masked Owl may be found across a diverse range of wooded habitat that provide tall or dense mature trees with hollows suitable for nesting and roosting(Higgins 1999). It has mostly been recorded in open forests and woodlands adjacent to cleared lands. They nest in hollows, in trunks and in near vertical spouts or large trees, usually living but sometimes dead(Higgins 1999). The nest hollows are usually located within dense forests or woodlands(Gibbons and Lindenmayer 1997). Masked Owls prey upon hollow-dependent arboreal marsupials, but terrestrial mammals make up the largest proportion of the diet(Gibbons and Lindenmayer 1997; Higgins 1999). It has a large home range of between 500 and 1000 ha(DEC 2005q).	Low. The closest record occurs approximately 18 km east of Mullion Range State Forest, recorded in 2000. The next closest record is from 1947. This species may forage within woodland and grassland of the study area.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Insects				
Paralucia spinifera Bathurst Copper Butterfly	V	E1	Commonly found in open woodland or open forest with a sparse understorey dominated by Blackthorn (*Bursaria spinosa* ssp. *lasiophylla*). Found in locations above 900 m altitude and is associated with exposure to full day sun, often with a west to north aspect. Also associated with extremes of cold(NPWS 2001).	Low. The specific sub-species of Blackthorn (*Bursaria spinosa* ssp. *lasiophylla*) this species requires, not recorded within the study area. Closest record occurs 60 km from study area.
Mammals				
Cercartetus nanus Eastern Pygmy-possum	-	V	Patchily distributed from the coast to the Great Dividing Range, and as far as Pillaga, Dubbo, Parkes and Wagga Wagga on the western slopes. Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Soft fruits are eaten when flowers are unavailable and it also feeds on insects(DEC 2005h; Ward and Turner 2008). Will often nest in tree hollows, but can also construct its own nest(Turner and Ward 1995). Because of its small size it is able to utilise a range of hollow sizes including very small hollows(Gibbons and Lindenmayer 1997). Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest sites within a 0.5 ha area over a 5 month period(Ward 1990). It is mainly solitary, and each individual uses several nests. Home ranges of males are generally less than 0.75 ha, and those of females are smaller(Ward and Turner 2008).	Low. Closest record occurs approximately 60 km west of the intersection of Ophir and Lookout Roads, dated 1996. No Banksia spp. recorded in the study area.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Dasyurus maculatus maculatus Spotted-tailed Quoll (south-eastern mainland)	E	V	Occurs along the east coast of Australia and the Great Dividing Range(Belcher *et al.* 2008). Uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests(Dickman and Read 1992). Occasional sightings have been made in open country, grazing lands, rocky outcrops and other treeless areas (NPWS 1999k). Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and an area of intact vegetation in which to forage(Edgar and Belcher 1995). Seventy per cent of the diet is medium-sized mammals, and also feeds on invertebrates, reptiles and birds. Individuals require large areas of relatively intact vegetation through which to forage(NPWS 1999f). The home range of a female is between 180 and 1000 ha, while males have larger home ranges of between 2000 and 5000 ha. Breeding occurs from May to August(Belcher *et al.* 2008).	High. Potential habitat occurs throughout the study area particularly within the woodland where rock outcrops, hollow logs, large woody debris and tree hollows provide potential sheltering sites. Previously recorded in the study area along Ophir Road (and Oaky Lane according to MWH 2011).
Phascogale tapoatafa Brush-tailed Phascogale	-	V	The Brush-tailed Phascogale had a scattered distribution centred around the Great Dividing Range. It prefers open forests with a sparse ground cover, but also inhabits mallee and rainforests. It feeds on insects and nectar, particularly in rough-barked trees. The Brush-tailed Phascogale will nest and shelter in tree hollows, tree stumps and occasionally birds nests, and can use more than 40 nests in a year(Soderquist and Rhind 2008). Suitable tree hollows have entrances 25-40 mm wide(Soderquist 1995). Females have exclusive territories of approximately 20 - 60 ha, while males have overlapping territories of up to 100 ha. Breeding occurs from May to July, after which all the males die(Soderquist and Rhind 2008).	Low. The closest record occurs approximately 150 km east of Orange, recorded in 1982.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Saccolaimus flaviventris Yellow-bellied Sheathtail Bat	-	V	Found throughout NSW(Richards 2008). They have been reported from southern Australia between January and June(Churchill 1998). Reported from a wide range of habitats throughout eastern and northern Australia, including wet and dry sclerophyll forest, open woodland, acacia shrubland, mallee, grasslands and desert(Churchill 1998). They roost in tree hollows in colonies of up to 30 (but more usually two to six) and have also been observed roosting in animal burrows, abandoned Sugar Glider nests, cracks in dry clay, hanging from buildings and under slabs of rock. It is high-flying, making it difficult to detect. It forages above the canopy of eucalypt forests, but comes lower to the ground in mallee or open country(Churchill 2008; Richards 2008).	Moderate. Previously recorded three times within 15 km of the study area, to the east and south-west; records dated from 2000 to 2009. Species may nest within tree hollows in the study area.
Pseudomys fumeus Smoky Mouse	E	E1	Appears to prefer heathy ridgetops and slopes within sclerophyll forests, heathland and open forest from the coast to sub-alpine regions of up to 1800 m(Lee 1995).	Low. Limited habitat opportunities. Closest records of this species occur within the ACT.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Pseudomys novaehollandiae New Holland Mouse	V	-	The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes. The home range of the New Holland Mouse can range from 0.44 ha to 1.4 ha. The New Holland Mouse is a social animal, living predominantly in burrows shared with other individuals. The species is nocturnal and omnivorous, feeding on seeds, insects, leaves, flowers and fungi, and is therefore likely to play an important role in seed dispersal and fungal spore dispersal. It is likely that the species spends considerable time foraging above-ground for food, predisposing it to predation by native predators and introduced species. Breeding typically occurs between August and January, but can extend into autumn(Threatened Species Scientific Committee 2010).	Low. Closest record occurs approximately 60 km west of the study area (dated 1997), within the southern end of Goobang National Park.
Petaurus australis Yellow-bellied Glider	-	V	Restricted to tall native forests in regions of high rainfall along the coast of NSW. Preferred habitats are productive, tall open sclerophyll forests where mature trees provide shelter and nesting hollows. Critical elements of habitat include sap-site trees, winter flowering eucalypts, mature trees suitable for den sites and a mosaic of different forest types(NPWS 1999h). Live in family groups of 2-6 individuals which commonly share a number of tree hollows. Family groups are territorial with exclusive home ranges of 30-60 ha. Very large expanses of forest (>15,000 ha) are required to conserve viable populations (Goldingay 2008)	Low. One unconfirmed, undated record within the Orange LGA. Next closest record also uncertain, approximately 16 km south-west of Suma Park Dam, recorded in 1980.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Petaurus norfolcensis Squirrel Glider	-	V	Sparsely distributed along the east coast and immediate inland areas as far west as Coonabarabran in the northern part of the state (DEC 1999) and as far west as Tocumwal along the southern border of the state(NSW Government 2009). Generally occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Requires abundant hollow-bearing trees and a mix of eucalypts, banksias and acacias(Van der Ree and Suckling 2008). Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked(Menkhorst *et al.* 1988). They live in family groups of 2-10 individuals and maintain home ranges of 0.65 and 10.5 ha, varying according to habitat quality and food resource availability(Quin 1995; Goldingay and Jackson 2004). Family groups occupy multiple hollows over time(Van der Ree and Suckling 2008).	Low. No records within 10 km of the study area; closest record occurs approximately 24 km south-west of Suma Park Dam, recorded in 2002. Closest cluster of records occurs approximately 80 km north-west of the Offtake Point.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Phascolarctos cinereus Koala	V	V	In NSW the Koala mainly occurs on the central and north coasts with some populations in the western region(DEC 2005l). Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally(Martin *et al.* 2008). Primary feed trees include *Eucalyptus robusta, E. tereticornis, E. punctata, E. haemostoma* and *E. signata*, *E.albens*, *E. viminalis(DoP 1995)*. They are solitary with varying home ranges. In high quality habitat home ranges may be 1-2 ha and overlap, while in semi-arid country they are usually discrete and around 100 ha(Martin *et al.* 2008).	Moderate. Potential habitat occurs throughout the woodland communities within the study area. Preferred feed tree species listed under SEPP 44 which occur within the study area are White Box (common) and Ribbon Gum (occasional). However, no evidence of a population utilising Oaky Lane (as reported by MHW 2011) was recorded. Previously recorded once within 10 km of the study area.
Pteropus poliocephalus Grey-headed Flying-fox	V	V	Occurs along the NSW coast, extending further inland in the north. This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Roosts in large colonies (camps), commonly in dense riparian vegetation. Bats commute daily to foraging areas, usually within 15 km of the day roost (Tidemann 1995) although some individuals may travel up to 70 km(Augee and Ford 1999).	Moderate. Potential foraging resources occur in the form of flowering Eucalypts throughout the study area. No roost camps were detected or are known to occur within 10 km of the study area. Closest record occurs 40 km south-east of Suma Park Dam, recorded in 2006.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Chalinolobus dwyeri Large-eared Pied Bat	V	V	Occurs from the Queensland border to Ulladulla, with largest numbers from the sandstone escarpment country in the Sydney Basin and Hunter Valley(van dyck and Strahan 2008). Primarily found in dry sclerophyll forests and woodlands, but also found in rainforest fringes and subalpine woodlands(Churchill 2008; Hoye and Schulz 2008). Forages on small, flying insects below the forest canopy. Roosts in colonies of between three and 80 in caves, Fairy Martin nests and mines, and beneath rock overhangs, but usually less than 10 individuals. Likely that it hibernates during the cooler months(Churchill 2008). The only known existing maternity roost is in a sandstone cave near Coonabarabran(Pennay 2008).	High. Recorded on Anabat during field survey with 'definite' certainty. Foraging habitat occurs within the woodland vegetation throughout the study area. Potential roosting habitat occurs within rock outcrops.
Falsistrellus tasmaniensis Eastern False Pipistrelle	-	V	Distribution extending east of the Great Dividing Range throughout the coastal regions of NSW, from the Queensland border to the Victorian border. Prefers wet high-altitude sclerophyll and coastal mallee habitat, preferring wet forests with a dense understorey but being found in open forests at lower altitudes(Churchill 2008). Apparently hibernates in winter. Roosts in tree hollows and sometimes in buildings in colonies of between 3 and 80 individuals. Often change roosts every night. Forages for beetles, bugs and moths below or near the canopy in forests with an open structure, or along trails(Law *et al.* 2008). Has a large foraging range, up to 136 ha(Churchill 2008; Law *et al.* 2008). Records show movements of up to 12 km between roosting and foraging sites(Menkhorst and Lumsden 1995).	Moderate. Recorded on Anabat during field survey with 'probable' certainty. Limited preferred habitat within the study area but species still may forage and roost within study area. Next closest record occurs 55 km east of Suma Park Dam, recorded in 2002.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Miniopterus schreibersii oceanensis Eastern Bentwing-bat	-	V	Occurs from Victoria to Queensland, on both sides of the Great Dividing Range. Forms large maternity roosts (up to 100,000 individuals) in caves and mines in spring and summer. Individuals may fly several hundred kilometres to their wintering sites, where they roost in caves, culverts, buildings, and bridges. They occur in a broad range of habitats including rainforest, wet and dry sclerophyll forest, paperbark forest and open grasslands. Has a fast, direct flight and forages for flying insects (particularly moths) above the tree canopy and along waterways(Churchill 2008; Hoye and Hall 2008).	High. Recorded on Anabat during field survey with 'possible' certainty. Also previously recorded three times within 10 km of the study area from 2005 to 2008.
Mytois macropus Southern Myotis	-	V	Scattered, mainly coastal distribution extending to South Australia along the Murray River. Roosts in caves, mines or tunnels, under bridges, in buildings, tree hollows, and even in dense foliage. Colonies occur close to water bodies, ranging from rainforest streams to large lakes and reservoirs. They catch aquatic insects and small fish with their large hind claws, and also catch flying insects(Richards *et al.* 2008).	Low. Recorded on Anabat during field survey with 'possible' certainty. Closest record occurs 50 km south-east of Suma Park Dam, recorded in 1999.
Nyctophilus timoriensis Greater Long-eared Bat	V	V	Restricted to the Murray-Darling Basin and western slopes(Churchill 2008). Found in a range of habitats including tall Eucalypt forests, mallee, open savanna and Black Box woodland, preferring habitats with a distinct canopy and cluttered, dense understorey(Churchill 2008). Roost in tree hollows and fissures and under exfoliating bark(Churchill 2008).	High. Species difficult to detect, need to trap to identify. *Nyctophilus* sp. recorded on Anabat during field survey with 'definite' certainty. Potential habitat occurs within the woodland throughout the study area.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Scoteanax rueppellii Greater Broad-nosed Bat	-	V	Occurs along the Great Dividing Range, generally at 500 m but up to 1200 m, and in coastal areas. Occurs in woodland and rainforest, but prefers open habitats or natural or human-made openings in wetter forests. Often hunts along creeks or river corridors. Flies slowly and directly at a height of 30 m or so to catch beetles and other large, flying insects. Also known to eat other bats and spiders. Roosts in hollow tree trunks and branches(Churchill 2008; Richards *et al.* 2008).	Low. Limited preferred habitat options within study area. Closest record occurs approximately 70 km east of the Offtake Point, recorded in 2009.
Reptiles				
Hoplocephalus bungaroides Broad-headed Snake	V	E1	Mainly occurs in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they generally use rock crevices and exfoliating rock during the cooler months and tree hollows during summer(Webb 1996; Webb and Shine 1998).	Low. Limited habitat opportunities. No records of this species occur within 100 km of the study area.
Suta flagellum Little Whip Snake	-	V	Occurs in Natural Temperate Grassland, grassy woodland, and secondary grasslands derived from clearing of woodland. Found on well-drained hillsides, mostly associated with scattered loose rocks(DECC 2005).	Moderate. Closest record occurs approximately 45 km south-east of Suma Park Dam, recorded in 1985. Potential habitat occurs within grassland and woodland of the study area.

Scientific Name **Common Name**	**EPBC Act[1]**	**TSC Act[2]**	**Habitat**	**Likelihood of Occurrence?**
Aprasia parapulchella Pink-tailed Worm-lizard	V	V	Fossorial species, which lives beneath surface rocks and occupies ant burrows. It feed on ants, particularly their eggs and larvae (Osborne and Jones 1995). Thought to lay eggs within the ant nests under rocks that it uses as a source of food and shelter(DEC 2005t). Key habitat features are a cover of native grasses, particularly Kangaroo Grass (*Themeda australis*), sparse or no tree cover, little or no leaf litter, and scattered small rock with shallow embedment in the soil surface(Osborne and Jones 1995).	Moderate. Closest record occurs approximately 50 km east of the study area. Potential habitat occurs within the Box Gum Woodland and native grassland where loose scattered surface rock is present.
Varanus rosenbergi Rosenberg's Goanna	-	V	This species is a Hawkesbury/Narrabeen sandstone outcrop specialist(Wellington and Wells 1985). Occurs in coastal heaths, humid woodlands and both wet and dry sclerophyll forests(Cogger 1992). Termite mounds are a critical habitat component (DEC 2005w).	Low. Closest record occurs approximately 33 km south-west of Suma Park Dam, recorded in 2005. Termite mounds sparsely scattered within study area.

APPENDIX 3

Assessments of impact according to Part 3A guidelines for threatened species assessment

Euphrasia arguta

Euphrasia arguta is an erect, semi-parasitic annual herb growing up to 45 cm high flowering mainly from October to January. The species had not been found since 1904 until its rediscovery in 2008. The species is now known from six sites up to 25 km apart in the area of Nundle State Forest, south east of Tamworth, NSW (TSSC 2011). Plants from the Nundle area have been reported from eucalypt forest with a mixed grass and shrub understorey and concentrated in an open disturbed area and along the roadside, indicating the species had regenerated following disturbance. Habitat for the species has also been described grassy areas near rivers by Benson and McDougall (2001a).

Euphrasia arguta is listed as critically endangered under both the TSC and EPBC Acts. The species was not recorded in the study area during the current surveys; however marginal habitat for the species exists within Riparian Forest/Woodland vegetation of the study area.

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

Although the biology of *Euphrasia arguta* is poorly known the species is a semi parasitic annual herb flowering mainly from October to January. The species occurs in eucalypt forest with a mixed grass and shrub understorey, grassy areas near rivers. *Euphrasia arguta* has established in disturbed areas of these habitats and the largest known population of the species in Nundle State Forest followed mechanical clearing for a firebreak. Additionally it has been suggested that due to the volume of seed production there is 'potential for rapid population growth under good conditions' (TSSC 2011).

Important lifecycle elements for the species such as the suitability of the subject site to support habitat for pollinators (invertebrate and vertebrate), seed dispersal mechanisms and germination triggers would be affected by the direct impact of vegetation clearing. Indirect impacts that may affect the types and condition of the marginal habitat for the species that may operate in the study area include weed invasion and altered disturbance regimes as a result of ongoing operation and maintenance. However despite the known direct impact and potential indirect impacts on habitat for the species, pollinators dispersal mechanisms and pathways and germination triggers would persist in the locality and fully structured preferred vegetation types on preferred soil types would remain in both private and public lands in the study area and locality. In the study area this includes public lands with environmental protection zoning that extend from the study area into the locality. Conservation reserves in the locality where riparian vegetation would be unaffected and the full range of features and conditions essential for the species lifecycle would continue to be present are Mullion Range State Conservation Area and Girralang Nature Reserve.

The project would not result in the direct loss of the species from known sites. Additionally there would not be an adverse effect on the life cycle of the species, including reproduction success and mode of dispersal such that a viable local population is placed at risk of extinction.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

Euphrasia arguta occurs in eucalypt forest with a mixed grass and shrub understorey, has been previously recorded in grassy areas near rivers and the largest and most recently know population is in an area subject to mechanical disturbance (TSSC 2011). The majority of vegetation that would be disturbed as part of the project is woodland and derived grasslands on low rolling hills and broad alluvial terraces. Marginal habitat for the species is considered to be limited to Riparian Forest/Woodland vegetation located at Summer Hill Creek Fourth Crossing, Oaky Creek and on the Macquarie River, totalling 1.15 ha. This accounts for a relatively small percentage (0.8) of the total potential habitat for this species within the locality which is estimated at 146.97 ha.

Important habitat for the species is present in Nundle State Forest over 250 km north-east of the study area. The habitat of the species largest known population would not be disturbed as result of the current project. The project is not likely to have a significant effect on the habitat of the species in the locality.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

Historically, *Euphrasia arguta* has been recorded from relatively few places within an area extending from Sydney west to Bathurst, north to Walcha and east near the Hastings River. The current extent of occurrence of *Euphrasia arguta* is less than 100 square kilometres and that its known area of occupancy in 2009 was approximately 0.03 km^2 (TSSC 2011).

Euphrasia arguta was not recorded during field surveys and the project would not affect the most recent known population of the species at Nundle State Forest over 250 km away.

How is the proposal likely to affect current disturbance regimes?

The main current disturbance regime is the agricultural land use of the locality resulting weed invasion to native vegetation, grazing by livestock and stream bank erosion in areas of potential habitat for this species. Disturbance regimes such as recreation activities are also in operation also these are likely to result in less impacts to potential habitats for this species. The project is unlikely to intensify the major and minor disturbance regimes to adversely affect the marginal habitat for the species in the study area or locality.

How is the proposal likely to affect habitat connectivity?

Marginal habitat for *Euphrasia arguta* is present within Riparian Forest/Woodland vegetation occurring on Summer Hill Creek, Oaky Creek and the Macquarie River. Riparian vegetation on Summer Hill Creek at Fourth Crossing has been subject to a minor level of fragmentation due to Ophir Road and this would be increased by approximately 0.2 ha. The Riparian Forest/Woodland at Oaky Creek that would be disturbed has a high level of connectivity to similar vegetation extending to the south-west with riparian vegetation extending north more fragmented and isolated as a result of vegetation clearing for agriculture. The project would result in the clearing of approximately 0.05 ha of Riparian Forest/Woodland on the Macquarie River which has a high level of connectivity to similar vegetation to the north and in an easterly direction. Although clearing

would occur to Riparian Forest/Woodland as a result of the project, at a locality scale this additional fragmentation is not considered significant and existing vegetation (physical) connectivity and functional (lifecycle processes) in the riparian zone would be substantially retained in all three drainage lines.

No marginal potential habitats for the species in the study area have vegetation connectivity to the nearest previous or most recent known locations of the species.

How is the proposal likely to affect critical habitat?

Under the TSC Act, the Director-General of Office of Environment and Heritage maintains a Register of Critical Habitat. To date, no critical habitat has been declared for *Euphrasia arguta*.

The project would not have an adverse effect on critical habitat (directly or indirectly).

Conclusion

Euphrasia arguta was not recorded in the study area during the current surveys. In consideration of the above assessment, the project is not likely to impose a significant impact on *Euphrasia arguta* as the project:

- Would not compromise the viability of a local population through direct or indirect impact on the species or its habitat.
- Would not have an adverse effect on the lifecycle of the species including reproduction success and mode of dispersal.
- Is unlikely to significantly affect habitat for this species.
- Is unlikely to intensify the disturbance regimes to adversely affect the potential habitat for the species in the study area or locality.

Thesium australe	**Austral Toadflax**

Austral Toadflax *Thesium australe* is listed as Vulnerable under the TSC and EPBC Acts.

Thesium australe is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. The species occurs on clay soils in grassland, grassy woodland or coastal headland heaths and flowering occurs in spring/summer (DEC 2005|).

Thesium australe is a small, straggling herb often hidden amongst grasses and herbs but may also be found on other grass species at inland sites (DEC 2005|). The species is parasitic on roots of other plants and although Benson and McDougall (2001b) suggests it is not selective of hosts, DEC (2005|) note that it has a strong association with *Themeda australis* Kangaroo Grass.

Longevity of plants is reportedly 2 to 3 years. Seed can remain dormant for at least 12 months and exposure to heat of fire or hot summers may stimulate mass germination, with land use and weather conditions in the following summer critical to survival. Although the species has good reproductive vigour, germination is very erratic in the wild. Plants are probably killed by fire. Although the species is known to germinate in response to fire it may also germinate in the absence of fire (Benson and McDougall 2001b).

The species has not been previously recorded in the locality and was not recorded within the study area during the current field survey. However based on the remnant and regrowth native vegetation types of the locality the study area provides potential habitat for the species.

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

Thesium australe is a perennial herb and is likely to be pollinated by a range of invertebrates. The species is parasitic on roots of other plants and has a strong association with *Themeda australis*. The species is known to germinate in response to fire but also in the absence of fire.

The species has not been previously recorded in the locality and was not recorded within the study area during the current field survey. The nearest record of the species is over 150 km to the north east of the subject site.

Important lifecycle elements such as the suitability of the subject site to support habitat for the species, pollination and dispersal mechanisms and germination triggers would be affected by the direct impact of vegetation clearing. Indirect impacts that may affect the types and condition of the marginal habitat for the species that may operate in the study area include weed invasion and altered disturbance regimes as a result of ongoing operation and maintenance. However despite the know direct impact and potential indirect impacts on habitat for the species, pollinators dispersal mechanisms and pathways and germination triggers would persist in the locality and fully structured preferred vegetation types on preferred soil types would remain in both private and public lands in the study area and locality. In the study area this includes public lands with environmental protection zoning that extend from the study area into the locality. Conservation reserves in the locality where grassy woodland would be unaffected and the full range of features and conditions essential for the species lifecycle would continue to be present are Mullion Range State Conservation Area and Girralang Nature Reserve.

Consequently, the project is considered unlikely to have an adverse effect on the lifecycle of the species including reproduction success and mode of dispersal.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

Vegetation within the study area that is considered potential habitat includes derived grasslands and poor to good condition regrowth and remnant woodland.

Approximately 18,851 ha of potential habitat for *Thesium australe* exists within the locality including grassland and woodland vegetation. The project would involve the permanent direct loss of approximately 51.09 ha of these vegetation types and the temporary loss/disturbance of approximately 14.67 ha. The total area of direct impact constitutes 0.35% of the potential habitat for *Thesium australe* available in the locality.

Given the area of potential habitat for the species in the locality including in local conservation reserves, current threats such as grazing and roadside vegetation management, the relative importance of habitat within the study area for the long-term survival of the species is considered low. Consequently, it is unlikely that the project would significantly affect habitat for this species.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

Thesium australe is found in small scattered populations across eastern NSW, along the coast and the Northern and Southern Tablelands. The species was not recorded in the current surveys and is not considered at the limit of its known distribution.

How is the proposal likely to affect current disturbance regimes?

The main current disturbance regime is the agricultural land use of the locality resulting weed invasion to native vegetation, pasture improvement and grazing by livestock in areas of potential habitat for this species. The project is unlikely to intensify the disturbance regimes to adversely affect the potential habitat for the species in the study area or locality.

How is the proposal likely to affect habitat connectivity?

The potential habitat for *Thesium australe* includes grasslands and woodland that combined form a continuous habitat unit throughout the locality. It is considered unlikely that the project would affect physical and functional habitat connectivity for this species.

How is the proposal likely to affect critical habitat?

Under the TSC Act, the Director-General maintains a Register of Critical Habitat. To date, no critical habitat has been declared for *Thesium australe*.

Conclusion

Thesium australe was not recorded in the study area during the current surveys. In consideration of the above assessment, the project is not likely to impose a significant impact on *Thesium australe* as the project:

- Would not compromise the viability of a local population through direct or indirect impact on the species or its habitat.

- Would not have an adverse effect on the lifecycle of the species including reproduction success and mode of dispersal.
- Is unlikely to significantly affect habitat for this species.
- Is unlikely to intensify the disturbance regimes to adversely affect the potential habitat for the species in the study area or locality.

Swainsona sericea

Swainsona sericea is listed as Vulnerable under the TSC and EPBC Acts.

Swainsona sericea is a prostrate or low growing perennial to c. 10 cm high with stems densely pubescent. The species grows in grassland and eucalypt woodland, sometimes with Callitris species. The species is recorded from the northern tablelands to the southern tablelands and Monaro region and further inland in the slopes and plains. The species occurs outside NSW in Victoria and South Australia where it is considered to be threatened. Many collections are from the 1800s or early 1900s and recent collections indicate that the species has declined significantly across its former range. Extensive surveys in the northern wheatbelt and southern box woodlands have failed to find the species, whilst is has been found very rarely in surveys of the northern tablelands and Riverina areas.

At least 80 geographically distinct populations are represented in NSW, with the actual number likely to be in the vicinity of 100 or more.

Swainsona species are largely renascent perennials, resprouting in suitable conditions from a persistent rootstock. Vegetative reproduction appears to be the most common method of reproduction in *Swainsona sericea*, at least in mallee populations in Victoria. Copious flowers and abundant quantities of seed can be produced under favourable conditions. Little is known of its reproductive biology, however the species is believed to regenerate from seed after fire. Fire is likely to play an essential role in seedling regeneration by breaking the dormancy of the hard-coated seed.

Swainsona sericea is a seasonal perennial, responding to winter-spring rainfall and possibly fire events, resulting in population numbers and abundances that appear to be relatively unstable from year to year. Populations may also persist unseen during adverse conditions as soil-stored seed, requiring cool-season rains or a fire event to release dormancy (NSW Scientific Committee 2008g).

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The species is a prostrate or low growing perennial to c. 10 cm high growing in grassland and eucalypt woodland, sometimes with Callitris species. Vegetative reproduction from persistent rootstock appears to be the most common method of reproduction in *Swainsona sericea*. Copious flowers and abundant quantities of seed can be also produced under favourable conditions. Little is known of its reproductive biology, however the species is believed to regenerate from seed after fire. Fire is likely to play an essential role in seedling regeneration by breaking the dormancy of the

hard-coated seed. In addition to fire events the species responds to winter and spring rainfall, resulting in population numbers and abundances that appear to be relatively unstable from year to year. Populations may also persist unseen during adverse conditions as soil-stored seed, requiring cool-season rains or a fire event to release dormancy.

Important lifecycle elements such as the suitability of the subject site to support habitat for the species, pollination and dispersal mechanisms and germination triggers would be affected by the direct impact of vegetation clearing. Indirect impacts that may affect the types and condition of the marginal habitat for the species that may operate in the study area include weed invasion and altered disturbance regimes as a result of ongoing operation and maintenance. However despite the know direct impact and potential indirect impacts on habitat for the species, pollinators, dispersal mechanisms and pathways and germination triggers would persist in the locality and fully structured preferred vegetation types on preferred soil types would remain in both private and public lands in the study area and locality. In the study area this includes public lands with environmental protection zoning that extend from the study area into the locality. Conservation reserves in the locality where grassland and grassy woodland would be unaffected and the full range of features and conditions essential for the species lifecycle would continue to be present are Mullion Range State Conservation Area and Girralang Nature Reserve.

Consequently, the Project is considered unlikely to have an adverse effect on the lifecycle of the species including reproduction success and mode of dispersal.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

Vegetation within the study area that is considered potential habitat includes derived grasslands and poor to good condition regrowth and remnant woodland.

Approximately 18,851 ha of potential habitat for *Swainsona sericea* exists within the locality including grassland and woodland vegetation. The project would involve the permanent direct loss of approximately 51.09 ha of these vegetation types and the temporary loss/disturbance of approximately 14.67 ha. The total area of direct impact constitutes 0.35% of the potential habitat for *Swainsona sericea* available in the locality.

Given the area of potential habitat for the species in the locality including in local conservation reserves, current threats such as grazing and roadside vegetation management, the relative importance of habitat within the study area for the long-term survival of the species is considered low. Consequently, it is unlikely that the project would significantly affect habitat for this species.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

Swainsona sericea is recorded from the northern tablelands to the southern tablelands and Monaro region and further inland in the slopes and plains. The species occurs outside NSW in Victoria and

South Australia. At least 80 geographically distinct populations are represented in NSW, with the actual number likely to be in the vicinity of 100 or more.

The species was not recorded in the current surveys and is not considered at the limit of its known distribution.

How is the proposal likely to affect current disturbance regimes?

The main current disturbance regime is the agricultural land use of the locality resulting weed invasion to native vegetation, pasture improvement and grazing by livestock in areas of potential habitat for this species. The project is unlikely to intensify the disturbance regimes to adversely affect the potential habitat for the species in the study area or locality.

How is the proposal likely to affect habitat connectivity?

The potential habitat for *Swainsona sericea* includes grasslands and woodland that combined form a continuous habitat unit throughout the locality. It is considered unlikely that the project would affect physical and functional habitat connectivity for this species.

How is the proposal likely to affect critical habitat?

Under the TSC Act, the Director-General maintains a Register of Critical Habitat. To date, no critical habitat has been declared for *Swainsona sericea*.

Conclusion

Swainsona sericea was not recorded in the study area during the current surveys. In consideration of the above assessment, the project is not likely to impose a significant impact on *Swainsona sericea* as the project:

- Would not compromise the viability of a local population through direct or indirect impact on the species or its habitat.
- Would not have an adverse effect on the lifecycle of the species including reproduction success and mode of dispersal.
- Is unlikely to significantly affect habitat for this species.
- Is unlikely to intensify the disturbance regimes to adversely affect the potential habitat for the species in the study area or locality.

Box Gum Woodland

Box Gum Woodland is listed as an Endangered Ecological Community under the TSC Act and Critically Endangered Ecological Community under the EPBC Act.

Vegetation mapping in the current surveys has identified 22.83 ha of TSC Act listed box gum woodland in the study area including a derived native grassland form of the community. Vegetation mapping by DEC (2006) has estimated 4306.2 ha of BVTs equivalent to box gum woodland in the locality. The location of TSC Act-listed box gum woodland is shown in Figures 6.1 to 6.12 with the DEC (2006) mapping presented in Figures 5.1 to 5.12. Generally the community throughout the study area is in a moderate condition.

How is the project likely to affect the lifecycle of a threatened species and/or population?

Not applicable, box gum woodland is not a species or population.

How is the project likely to affect the habitat of a threatened species, population or ecological community?

The key locations where box gum woodland would be permanently and temporarily affected by the project including disturbance of vegetation and the soil profile are in the northern section of the study area near the Macquarie River and on Oaky Lane. The permanently impacted area of box gum woodland including for construction and operation of the project is estimated at 7.77 ha equating to approximately 0.18% of the estimated extent of the community in the locality. The temporarily impacted area of box gum woodland during construction of the project is estimated at 12.80 ha equating to 0.30% of the estimated extent of the community in the locality.

Does the project affect any threatened species or populations that are at the limit of its known distribution?

Not applicable, box gum woodland is not a species or population.

How is the project likely to affect current disturbance regimes?

The main disturbances affecting box gum woodland in locality include vegetation clearing, establishment of exotic flora and modification of the soil profile during agricultural practices and roadside maintenance and occasional fire. Of these the project would contribute to the clearing of the community and modification of the soil profile.

How is the project likely to affect habitat connectivity?

Figures 5.1 to 5.12 show the distribution of box gum woodland mapped in the current surveys in relation to other vegetation types extending over the locality. Box gum woodland of the study area on Oaky Lane generally occurs on the edge of the extensive vegetation cover and potential habitat

for the community to a highly modified landscape extending to the east. At the northern end of the study area box gum woodland will remain relatively continuous with the retained adjoining vegetation.

How is the project likely to affect critical habitat?

Under the TSC Act, the Director-General of OEH maintains a Register of Critical Habitat. To date, no critical habitat has been declared for box gum woodland. However, the draft national recovery plan for the community (DECCW 2010b) states that 'in very broad terms, habitat critical to the survival of Box-Gum Grassy Woodland is on the moderate to highly fertile soils of the western slopes of NSW and Queensland, the northern slopes of Victoria, and the tablelands of the Great Dividing Range from southern Queensland through NSW and the ACT.' Further DECCW (2010b) suggest that given the currently highly fragmented and degraded state of the community all areas of Box-Gum Grassy Woodland which meet the minimum condition criteria 'should be considered critical to the survival of this ecological community.'

Conclusion

The project would directly impact on up to 0.48% of the estimated extent of the community in the locality with the main impacts being exacerbation of disturbance regimes and residual impacts to box gum woodland considered 'critical to the survival of this ecological community' in the draft recovery plan (DECCW 2010b). This assessment considers the project will likely result in a residual impact to box gum woodland resulting in a loss of biodiversity values.

Australian Painted Snipe	***Rostratula australis***

The Australian Painted Snipe is listed as Endangered under Schedule 1 of the TSC Act. The species is also listed under the EPBC Act. The Australian Painted Snipe is usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands, ephemeral or permanent, although they have been recorded in brackish waters (Marchant and Higgins 1993).

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The Australian Painted Snipe requires tall vegetation (such as grasses or reeds) and standing water for nesting, it will often nest on a small island of tussocks or reeds within a wetland area (DECC 2005b). The species forages nocturnally on mud-flats and in shallow water for worms, molluscs, insects and some plant-matter.

The Australian Painted Snipe has not been recorded within the study area previously. No records of this species occur within 100 km of the study area. The study area supports marginal potential habitat for the Australian Painted Snipe in the form of farm dams and within inundated paddocks when rainfall is high.

Approximately 29% of the pipeline route would occur within existing road reserves and approximately 71% would traverse private properties. Where possible, the route would avoid

impacts to farm dams. However, the project would impact areas of grassland that are inundated at times, and has the potential to indirectly impact farm dams (e.g. noise and disturbance during construction). The habitat available within the study area is considered marginal only and impacts would be temporary. All areas of grassland would be reinstated to their prior state following installation of the underground pipeline. Given this, the project is considered unlikely to affect the lifecycle of the Australian Painted Snipe due to the lack of preferred breeding and foraging habitat resources, and that any impacts would be temporary.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The Australian Painted Snipe occurs in both coastal and inland shallow freshwater wetlands. Preferring fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber, it can also inhabit brackish wetlands (Marchant and Higgins 1993). Foraging takes place on mudflats or vegetated wetlands and has also been recorded under clumps of tea trees. The species' diet includes vegetation, seeds, and terrestrial invertebrates as well as freshwater/estuarine invertebrates gleaned from water or mudflats (Marchant and Higgins 1993). Emergent grasses or reeds within standing water are required for breeding.

The study area provides marginal potential habitat for the Australian Painted Snipe in the form of farm dams and paddocks which may occasionally become inundated. The project avoids farm dams, and areas of inundated grasslands may vary depending on rainfall. As such, it is difficult to quantify the area of potential habitat that may be impacted by the project. However, given the species' high mobility, that only a narrow corridor of grassland vegetation would be removed (leaving vast areas of similar grassland vegetation either side), and that the removed grassland would be replaced as per the PC&RMP, the project is unlikely to permanently affect potential habitat for the Australian Painted Snipe.

Does the proposal affect any threatened species that are at the limit of its known distribution?

The Australian Painted Snipe occurs throughout mainland Australia and has been historically recorded within Tasmania. Given this, the study area does not occur at or near the limit of distribution of the Australian Painted Snipe.

How is the proposal likely to affect the current disturbance regimes?

The study area has been subject to disturbances associated with the existing road corridors and electricity easements which follow the majority of the pipeline route. Much of the land the study area traverses has been subject to grazing and farming pressures. Where intensive farming practices have ensued and pasture improvements have been applied, rock outcrops and fallen timber have been removed and exotic grasses dominate the understory. Disturbance regimes currently observed at various locations throughout the study area include weed infestations, disturbance associated with the existing road reserves, and the presence of feral fauna including rabbits, foxes, cats, deer and goats. The project would involve the clearing of vegetation to install the pipeline underground, establish pumping stations and electricity services. The current disturbances (spread of weeds, roadside edge effects, past vegetation removal) may be exacerbated as a result of the project.

How is the proposal likely to affect habitat connectivity?

The proposed pipeline route primarily occurs within cleared paddocks within private properties or the existing road reserve. Where possible all efforts have been made to select a route that would avoid farm dams. The most intact area of habitat for the Australian Painted Snipe occurs as scattered farm dams within open paddocks within the agricultural lands either side of Ophir and Long Point Roads. Generally speaking, some individuals of Australian Painted Snipe appear to be resident in areas of habitat whereas other individuals appear to be nomadic, temporarily occupying areas where suitable habitat exists (DEWHA 2003). Given the species' high mobility, that only a narrow corridor of grassland vegetation would be removed (leaving vast areas of similar grassland vegetation either side), and that the removed grassland would be replaced as per the PC&RMP, the project is unlikely to fragment or isolate patches of potential habitat for the Australian Painted Snipe.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Australian Painted Snipe (DECC 2008).

Conclusion

Based on the above assessment the project is unlikely to have a significant impact on the Australian Painted Snipe.

For an assessment of potential impacts to Australian Painted Snipe habitat within the Ramsar wetland Macquarie Marshes refer to *The Macquarie River to Orange Pipeline Project. Aquatic Ecology Assessment* (Cardno Ecology Lab 2012).

Brown Treecreeper	***Climacteris picumnus victoriae***

The Brown Treecreeper (eastern subspecies) is listed as Vulnerable under Schedule 2 of the TSC Act. The species is found in Eucalypt woodlands (mainly dominated by stringybarks or other rough-barked Eucalypts) and dry open forest, usually with an open grassy understorey, although sometimes with one or more shrub species (DEC 2005f). This species was recorded in the study area during the current surveys in open woodland.

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

Two Brown Treecreepers were recorded during the field surveys undertaken in December 2011 within open woodland habitat within the study area. The Brown Treecreeper is known to nest in hollows, usually in dead branches or spouts, but also in trunks of living or dead trees. The species breeds in pairs or co-operatively in territories, which range in size between approximately one and 11 ha (generally around 4 ha) (DEC 2005f).

The study area provides both foraging and essential breeding habitat for this species in the form of hollow-bearing trees. Approximately 250 hollow-bearing trees were recorded within the study area and a subset of these would be removed by the project.

Approximately 29% of the pipeline route would occur within existing road reserves and approximately 71% would traverse private properties. Where possible, the route would avoid treed areas and traverse predominantly cleared grassland and/or be trenched beneath the existing roads. The habitat to be removed exists as narrow strips along existing road reserves and as contiguous patches from the Offtake Point at the Macquarie River until where the route joins Long Point Road. A number of hollow-bearing trees would be removed as a result of the project. Consequently the project is likely to have an impact on the lifecycle of the Brown Treecreeper in the area through the removal of potential breeding resources. Whilst the project would impact potential breeding resources and foraging habitat within an area known to support Brown Treecreepers, not all hollow-bearing trees within the study area would be removed. Further, the potential habitat for the Brown Treecreeper within the study area is contiguous with similar quality habitat that would not be disturbed.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The Brown Treecreeper lives in Eucalypt woodlands and dry open forests, usually dominated by stringy barks or other rough-barked Eucalypts, especially in areas of relatively flat open woodland, and which lack a dense shrub layer, contain short grass or bare ground and have fallen logs or dead trees present (DEC 2005f; Traill and Duncan 2000). The species forages within trees and on the ground.

The Brown Treecreeper is almost entirely insectivorous, but would occasionally take nectar. It forages for ants, beetles and larvae in trees and on the ground. In trees, the species mostly forages among crevices and holes on trunks and larger limbs, preferring rough-barked Eucalypts. On the ground the species forages on fallen logs and under bark, at the base of grass tussocks and amongst leaf litter and other debris (DEC 2005f).

The study area provides potential habitat for the Brown Treecreeper in the form of woodland vegetation and hollow-bearing trees. Approximately 51.09 ha of potential habitat would be removed and/or directly disturbed by the project. This represents approximately 0.27 % of the potential habitat available in the locality (18,726.04 ha). Conservation reserves in the locality where Brown Treecreeper habitat would be unaffected are Mullion Range State Conservation Area and Girralang Nature Reserve. Given the species' high mobility, and the narrow corridor of vegetation to be removed, the project is unlikely to fragment or isolate patches of potential habitat for the Brown Treecreeper.

Does the proposal affect any threatened species that are at the limit of its known distribution?

The eastern subspecies of Brown Treecreeper (*Climacteris picumnus victoriae*) occurs from the western slopes to the coastal watersheds of the Great Dividing Range, south of the Bunya Mountains in south-eastern Queensland through NSW and Victoria and west to the Grampians (Higgins et al. 2001). The study area does not occur at or near the limit of distribution of the Brown Treecreeper.

How is the proposal likely to affect the current disturbance regimes?

The study area has been subject to disturbances associated with the existing road corridors and electricity easements which follow the majority of the pipeline route. Much of the land the study area traverses has been subject to grazing and farming pressures. Where intensive farming practices have ensued and pasture improvements have been applied, rock outcrops and fallen timber have been removed and exotic grasses dominate the understory. Disturbance regimes currently observed at various locations throughout the study area include weed infestations, disturbance associated with the existing road reserves, and the presence of feral fauna including rabbits, foxes, cats, deer and goats. The project would involve the clearing of vegetation to install the pipeline underground, establish pumping stations and electricity services. The current disturbances (spread of weeds, roadside edge effects, past vegetation removal) may be exacerbated as a result of the project.

How is the proposal likely to affect habitat connectivity?

The proposed pipeline route primarily occurs within cleared paddocks within private properties or the existing road reserve. Where possible all efforts have been made to select a route that would require minimal removal of native vegetation and hollow-bearing trees. The pumping station locations, electricity supply to service the pipeline, and construction compounds have also been proposed where minimal native vegetation clearance would be required.

The most intact area of habitat for the Brown Treecreeper occurs within the open woodland adjoining the Macquarie River at the Offtake Point and through to Long Point Road, and within the box-gum woodland which occurs throughout Mullion Range State Conservation Area adjoining Oaky Lane. The proposed pipeline is closely aligned with Oaky Lane on the opposite (eastern) side to the State Conservation Area, and would traverse predominantly cleared grassland and areas of open woodland. The Brown Treecreeper forages in wooded areas, requiring large relatively intact areas of habitat to persist. However, given the species' high mobility, and the narrow corridor of vegetation to be removed, the project is unlikely to fragment or isolate patches of potential habitat for the Brown Treecreeper.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Brown Treecreeper (DECC 2008b).

However the project would have an impact on known habitat for this species through the removal of hollow-bearing trees which this species relies on for breeding. Although not listed as critical habitat, tree hollows are an essential requirement for breeding and are a limited habitat resource for this species.

Conclusion

The main impact for the species will be the loss of some potential breeding habitat. However not all hollow-bearing trees within the study area would be removed. The species has a high degree of mobility and the project is unlikely to fragment or isolate the most preferential patches of potential habitat for the Brown Treecreeper. Further, the potential habitat for the Brown Treecreeper within the study area is contiguous with similar quality habitat that would not be disturbed. In view of these factors the project is unlikely to have a significant impact on the Brown Treecreeper.

Diamond Firetail	***Stagonopleura guttata***

The Diamond Firetail is listed as Vulnerable under Schedule 2 of the TSC Act. The species is found in grassy eucalypt woodlands, open forest, mallee, Natural Temperate Grassland, and in secondary grasslands derived from other communities. The species is often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland (DEC 2005g). This species was recorded in the study area during the current surveys at Oaky Lane and within woodland adjoining the Macquarie River.

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The Diamond Firetail builds nests in shrubs, mistletoe and trees often closely associated with waterbodies and riparian vegetation. During the field investigations a pair of Diamond Firetails was observed to be nesting immediately adjacent to Oaky Lane, approximately 30 m from where Oaky Creek crosses the dirt track, in a eucalypt sapling. Another individual was observed near the Macquarie River within the study area.

Approximately 29% of the pipeline corridor would occur within existing road reserves and approximately 71% would traverse private properties. Where possible, the route would avoid treed areas and traverse predominantly cleared grassland and/or be trenched beneath the existing roads. The habitat to be removed exists as narrow strips along existing road reserves and as contiguous patches from the Offtake Point at the Macquarie River until where the route joins Long Point Road.

The pipeline corridor and associated infrastructure would require the removal of vegetation that is known habitat for the Diamond Firetail. Although habitat would be removed by the project, the Diamond Firetail is not restrained by where it can build its nest. Whilst the project would impact potential breeding and foraging habitat within an area known to support Diamond Firetails, not all vegetation within the study area would be removed. Further, the potential habitat for the Diamond Firetail within the study area is contiguous with similar quality habitat that would not be disturbed.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The Diamond Firetail feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season) (DEC 2005g). The project would involve the removal of known habitat from the study area in the form of woodlands with grassy understoreys and riparian vegetation. Approximately 51.09 ha of potential habitat would be removed and/or directly disturbed by the project. This represents approximately 0.27 % of the potential habitat available in the locality (18,726.04 ha). Large areas of habitat occur for this species within the greater locality within Mullion Range State Conservation Area and Girralang Nature Reserve which would remain unaffected by the project. Given the species' high mobility, and the narrow corridor of vegetation to be removed, the project is unlikely to fragment or isolate patches of potential habitat for the Diamond Firetail.

Does the proposal affect any threatened species that are at the limit of its known distribution?

The range of the Diamond Firetail extends along the south-east of Australia from central Queensland to South Australia. It is found throughout NSW, with records concentrated at the Northern, Central and Southern Tablelands, the Northern, Central and South Western Slopes and the North West Plains and Riverina. This species is uncommon west of the Darling River. The study area does not occur at or near the limit of distribution of the Diamond Firetail.

How is the proposal likely to affect the current disturbance regimes?

The study area has been subject to disturbances associated with the existing road corridors and electricity easements which follow the majority of the pipeline route. Much of the land the study area traverses has been subject to grazing and farming pressures. Where intensive farming practices have ensued and pasture improvements have been applied, rock outcrops and fallen timber have been removed and exotic grasses dominate the understory. Disturbance regimes currently observed at various locations throughout the study area include weed infestations, disturbance associated with the existing road reserves, and the presence of feral fauna including rabbits, foxes, cats, deer and goats. The project would involve the clearing of vegetation to install the pipeline underground, establish pumping stations and electricity services. The current disturbances (spread of weeds, roadside edge effects, past vegetation removal) may be exacerbated as a result of the project.

How is the proposal likely to affect habitat connectivity?

The proposed pipeline corridor primarily occurs within cleared paddocks within private properties or the existing road reserve. Where possible all efforts have been made to select a route that would require minimal removal of native vegetation. The pumping station locations, electricity supply to service the pipeline, and construction compounds have also been proposed where minimal native vegetation clearance would be required.

The Diamond Firetail inhabits riparian and grassy, lightly wooded areas in proximity to watercourses. These habitats are found throughout the study area, primarily extending from the Macquarie River at the Offtake Point and through to Long Point Road and within the box-gum woodland which occurs throughout Mullion Range State Conservation Area adjoining Oaky Lane. The proposed pipeline is closely aligned with Oaky Lane on the opposite (eastern) side to the State Conservation Area, and would traverse predominantly cleared grassland and areas of open woodland. Although this species requires large relatively intact areas of habitat to persist, the clearing of a narrow corridor of vegetation is unlikely to fragment or isolate patches of potential habitat for the Diamond Firetail.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Diamond Firetail (DECC 2008b).

Conclusion

The project would involve the removal of foraging and breeding habitat in the study area. The species has a high mobility and the project is unlikely to fragment or isolate patches of potential habitat for the Diamond Firetail. The potential habitat for the Diamond Firetail within the study area is contiguous with similar quality habitat that would not be disturbed such as Mullion Range State Conservation Area. Other large areas of potential habitat such as Girralang Nature Reserve would

remain unaffected by the project. In view of these factors the project is unlikely to have a significant impact on the Diamond Firetail.

Little Lorikeet	***Glossopsitta pusilla***
Superb Parrot	***Polytelis swainsonii***
Swift Parrot	***Lathamus discolor***
Turquoise Parrot	***Neophema pulchella***

The Little Lorikeet, Superb Parrot and Turquoise Parrot are listed as Vulnerable under Schedule 2 of the TSC Act. The Swift Parrot is listed as Endangered under Schedule 1 of the TSC Act. Both the Swift and Superb Parrots are also listed under the EPBC Act.

These parrot species have been considered together based on their similar habitat requirements, in particular, their preference for woodland and reliance on hollow-bearing trees.

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The Superb Parrot has been recorded over 50 times within 10 km of the study area with a high density of records occurring south-west of the southern extent of the pipeline corridor near the city of Orange. Superb Parrots occur in box-gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forests. They nest in the hollows of large trees (dead or alive) in open box-gum woodland or isolated paddock trees. Tree species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. Potential breeding and foraging habitat for the Superb Parrot occurs throughout the box-gum woodlands which occur within the study area.

The Turquoise Parrot has been recorded eight times within 10 km of the study area, including immediately adjacent to the study area in the northern end near the Macquarie River, and along Ophir Road. Turquoise Parrots occur in open woodlands and eucalypt forests with a ground cover of grasses and understorey of low shrubs (Morris 1980). The species is found in the foothills of the Great Divide, including steep rocky ridges and gullies (Higgins 1999). The Turquoise Parrot is usually seen in pairs or small, possibly family, groups and has also been reported in flocks of up to thirty individuals. It nests in hollow-bearing trees or hollows in tree stumps and prefers to breed in open grassy forests and woodlands, and gullies which are moist (Higgins 1999). Potential breeding and foraging habitat occurs within the box-gum woodland communities of the study area.

The Little Lorikeet has been recorded on at least five occasions within 10 km of the study area. These records are spread to the north-eastern and south-western extents of the study area. Little Lorikeets occur in dry, open eucalypt forests and woodlands. They are gregarious, usually foraging in small flocks, often with other species of lorikeet. Little is known of the breeding requirement of the Little Lorikeet; however there are observations of nesting at heights between 2 m and 15 m, in small hollows in mostly smooth-barked eucalypts (NSW Scientific Committee 2008f). Potential breeding and foraging habitat occurs within the box-gum woodland communities of the study area.

The Swift Parrot has not been recorded within 10 km of the study area however the Swift Parrot is nomadic moving across the landscape utilising foraging resources seasonally so may forage within the study area on occasion (Higgins 1999). It is often recorded in New South Wales between May and August and breeds in Tasmania during the warmer seasons (Higgins 1999). Potential foraging habitat occurs within the box-gum woodland communities of the study area.

The study area provides potential breeding habitat for each of these parrot species (except for the Swift Parrot which migrates to Tasmania to breed), within the box-gum woodland communities that occur within the study area.

Approximately 29% of the pipeline corridor would occur within existing road reserves and approximately 71% would traverse private properties. Where possible, the corridor would avoid treed areas and traverse predominantly cleared grassland and/or be trenched beneath the existing roads. The habitat to be removed exists as narrow strips along existing road reserves and as contiguous patches from the Offtake Point at the Macquarie River until where the route joins Long Point Road. A number of hollow-bearing trees (up to 250 supporting a range of number and sized hollows) would potentially be removed as a result of the project. Consequently the project may have an impact on the lifecycle of the Superb Parrot, Turquoise Parrot and Little Lorikeet in the area through the removal of potential breeding resources.

Whilst the project would impact potential breeding resources and foraging habitat within an area known to support the Superb Parrot, Little Lorikeet and Turquoise Parrot, not all hollow-bearing trees within the study area would be removed. Further, the potential habitat for these parrots within the study area is contiguous with similar quality habitat that would not be disturbed.

Given the prevalence of habitat the project is unlikely to significantly impact on the lifecycle of the Little Lorikeet, Turquoise Parrot and Swift Parrot. However, given the numerous records for the Superb Parrot in the locality, the likelihood that this population constitutes a key source population for the species, and the removal of up to 250 hollows that may provide breeding habitat for this species, the project is likely to impact on the lifecycle for the Superb Parrot.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The Turquoise Parrot feeds in the shade of trees and spends most of the day on the ground searching for the seeds of grasses and herbaceous plants, or browsing on vegetable matter (DEC 2005}).

While on the mainland, Swift Parrots occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter-flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon* and White Box *E. albens*. Commonly used lerp-infested trees include Grey Box *E. microcarpa*, Grey Box *E. moluccana* and Blackbutt *E. pilularis* (DEC 2005z).

Little Lorikeets feed primarily on nectar and pollen in the tree canopy (flowering eucalypts), but also on a variety of other species including melaleucas and mistletoes. In coastal regions they have been known to forage on melaleucas, *Eucalyptus pilularis* (Blackbutt) and *E .robusta* (Swamp Mahogany), the latter two being particularly important food sources for pollen and nectar respectively (NSW Scientific Committee 2008f). Little Lorikeets are generally considered to be nomadic, and move in response to food availability with irregular large or small influxes of individuals occurring at any time of year (Higgins 1999).

Superb Parrots may forage up to 10 km from nesting sites, primarily in grassy box woodland. Primarily forages in trees, understorey shrubs and on the ground. Their diet consists mainly of grass seeds and herbaceous plants (OEH 2012).

The study area provides potential foraging habitat for these parrots in the form of native grasses and box-gum woodland vegetation and potential breeding habitat for the Little Lorikeet, Turquoise and Superb Parrot in the form of hollow-bearing trees. Approximately 51.09 ha of potential habitat, including up to 250 hollow-bearing trees, would be removed and/or directly disturbed by the project. This represents approximately 0.27 % of the potential habitat available in the locality (18,726.04 ha). Conservation reserves in the locality where habitat for these species would be unaffected are Mullion Range State Conservation Area and Girralang Nature Reserve. Given each of these species' high mobility, and the narrow corridor of vegetation to be removed, the project is unlikely to fragment or isolate patches of potential habitat for these parrots.

Does the proposal affect any threatened species that are at the limit of its known distribution?

The range of the Turquoise Parrot extends from southern Queensland through to northern Victoria, along the coastal plains and to the west of the Great Dividing Range (DEC 2005}). The Swift Parrot has a wide distribution as it breeds in Tasmania, but migrates to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland (DEC 2005y). The Little Lorikeet distribution extends from north of Cairns, down the east coast of Australia, to Adelaide (NSW Scientific Committee 2008f). The Superb Parrot is found throughout eastern inland NSW. On the south-western slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers (OEH 2012). As a result the study area is not at, or near, the limit of distribution for any of these species.

How is the proposal likely to affect the current disturbance regimes?

The study area has been subject to disturbances associated with the existing road corridors and electricity easements which follow the majority of the pipeline corridor. Much of the land the study area traverses has been subject to grazing and farming pressures. Where intensive farming practices have ensued and pasture improvements have been applied, rock outcrops and fallen timber have been removed and exotic grasses dominate the understory. Disturbance regimes currently observed at various locations throughout the study area include weed infestations, disturbance associated with the existing road reserves, and the presence of feral fauna including rabbits, foxes, cats, deer and goats. The project would involve the clearing of vegetation to install the pipeline underground, establish pumping stations and electricity services. The current disturbances (spread of weeds, roadside edge effects, past vegetation removal) may be exacerbated as a result of the project.

How is the proposal likely to affect habitat connectivity?

The proposed pipeline corridor primarily occurs within cleared paddocks within private properties or the existing road reserve. Where possible all efforts have been made to select a route that would require minimal removal of native vegetation and hollow-bearing trees. The pumping station locations, electricity supply to service the pipeline, and construction compounds have also been proposed where minimal native vegetation clearance would be required.

The most intact area of habitat for these parrot species occurs within the open woodland adjoining the Macquarie River at the Offtake Point and through to Long Point Road, and within the box-gum woodland which occurs throughout Mullion Range State Conservation Area adjoining Oaky Lane. The proposed pipeline corridor is closely aligned with Oaky Lane on the opposite (eastern) side to

the State Conservation Area, and would traverse predominantly cleared grassland and areas of open woodland.

Each of these species is known to travel many kilometres between breeding and foraging sites. Given these species' high mobility, and the narrow corridor of vegetation to be removed, the project is unlikely to fragment or isolate patches of potential habitat for any of these parrot species.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Swift Parrot, Little Lorikeet, Superb Parrot or Turquoise Parrot (DECC 2008b).

However the proposal would have an impact on known and/or potential habitat for these species through the removal of up to a maximum of 250 hollow-bearing trees (supporting a range of number and sized hollows) which the Little Lorikeet, Turquoise and Superb Parrots rely on for breeding. Although not listed as critical habitat, tree hollows are an essential requirement for breeding and are a limited habitat resource for these species.

Conclusion

The project would involve the removal of foraging and breeding habitat in the study area for Little Lorikeet, Turquoise Parrot and Superb Parrot and foraging habitat for Swift Parrot. These species have a high mobility and the project is unlikely to fragment or isolate patches of potential habitat for any of these. The potential foraging and breeding habitat in the study area for Little Lorikeet, Turquoise Parrot and Superb Parrot and forging habitat for Swift Parrot is contiguous with similar quality habitat that would not be disturbed such as Mullion Range State Conservation Area. Other large areas of potential habitat such as Girralang Nature Reserve would remain unaffected by the project. In view of these factors the project is unlikely to have a significant impact on Little Lorikeet, Turquoise Parrot, or Swift Parrot.

However given that the locality supports a key source population for this species, that the species may utilise breeding hollows within the study area and that up to 250 hollow-bearing trees will be removed the project is likely to have a significant impact on the lifecycle of this species.

Eastern False Pipistrelle	***Falsistrellus tasmaniensis***
Greater Long-eared Bat	***Nyctophilus timoriensis***
Yellow-bellied Sheathtail-bat	***Saccolaimus flaviventris***

The Eastern False Pipistrelle, Yellow-bellied Sheathtail Bat and Greater Long-eared Bat are listed as Vulnerable under Schedule 2 of the TSC Act. The Greater Long-eared Bat is also listed as Vulnerable under the EPBC Act.

Originally the Greater Longed-eared Bat was considered a subspecies of *Nyctophilus timoriensis*, however more recent studies have described the bat as a separate species, *Nyctophilus corbeni* (DSEWPaC 2010). In this assessment it is referred to under its former name as it remains listed under the TSC Act as *Nyctophilus timoriensis*.

These three species have been considered together for this assessment based on their shared dependency on tree hollows for roosting/breeding.

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The Yellow-bellied Sheathtail-bat has not been recorded within 10 km of the study area, however its range extends throughout the region and is likely to be present but has not yet been detected. The Eastern False Pipistrelle was detected during the current surveys with a probable level of certainty based on echolocation recording. A long-eared bat of the Nyctophilus genus was confidently detected based on its echolocation call being recorded during the field surveys. Harp traps were also deployed in conjunction with the Anabat detectors to be able to discern between ambiguous echolocation calls, however no individuals of this genus were captured within the harp traps during the surveys to confirm whether it is the Greater Long-eared Bat.

Each of these species are known to roost in hollow-bearing trees (both dead and alive). The Eastern False Pipistrelle and Greater Long-eared Bat have also been known to use caves and buildings on occasion (Churchill 1998), although no caves occur within the study area. A total of 250 hollow-bearing trees were recorded within the study area, however not all of these trees would be removed as part of the project.

Approximately 29% of the pipeline corridor would occur within existing road reserves and approximately 71% would traverse private properties. Where possible, the corridor would avoid treed areas and traverse predominantly cleared grassland and/or be trenched beneath the existing roads. The habitat to be removed exists as narrow strips along existing road reserves and as contiguous patches from the Offtake Point at the Macquarie River until where the route joins Long Point Road. A number of hollow-bearing trees (up to 250 supporting a range of number and sized hollows) would be removed as a result of the project. Consequently the project may have an impact on the lifecycle of these hollow-dependent microbats in the area through the removal of potential breeding resources. Although these species are highly mobile, the loss of known and/or potential foraging and breeding habitat could temporarily affect a local population as (surviving) individuals from the study area seek and establish new territory. The Yellow-bellied Sheathtail Bat in particular appears to be territorial (Churchill 2008) and the project would result in some intra-specific competition until new roost sites are established.

Whilst the project would impact potential breeding resources and foraging habitat within an area known to support the Eastern False Pipistrelle and likely to support both the Greater Long-eared Bat and Yellow-bellied Sheathtail-bat, not all hollow-bearing trees within the study area would be removed. Further, the potential habitat for these microbats within the study area is contiguous with similar quality habitat that would not be disturbed.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The study area provides both potential foraging and breeding habitat for the Eastern False Pipistrelle, Yellow-bellied Sheathtail-bat and Greater Long-eared Bat. Foraging habitat occurs throughout the wooded areas of the study area concentrated at Macquarie River, along Oaky Lane and within roadside remnant trees along Ophir Road. All three microbats may forage aerially for insects within the study area. However, the study area is not considered to provide limiting foraging resources.

Breeding habitat occurs throughout these same wooded areas and includes hollow-bearing trees that may not be directly connected with other continuous areas of wooded vegetation.

The study area provides potential habitat for these microbats in the form of woodland vegetation and hollow-bearing trees. Approximately 40.47 ha of potential habitat, including hollow-bearing trees, would be removed and/or directly disturbed by the project. This represents approximately 0.21 % of the potential habitat available in the locality (19,130.57 ha). Conservation reserves in the locality where habitat for these species would be unaffected are Mullion Range State Conservation Area and Girralang Nature Reserve. Given the species' high mobility, and the narrow corridor of vegetation to be removed, the project is unlikely to fragment or isolate patches of potential habitat for the Eastern False Pipistrelle, Yellow-bellied Sheathtail-bat or Greater Long-eared Bat.

Does the proposal affect any threatened species that are at the limit of its known distribution?

In NSW, the Eastern False Pipistrelle has a distribution extending east of the Great Dividing Range throughout the coastal regions of NSW, from the Queensland border to the Victorian border. It also occurs in Tasmania (Churchill 1998). The Yellow-bellied Sheathtail Bat has a large distribution extending across northern and eastern Australia (DEC 2005~). The Greater Long-eared Bat extends from central Queensland throughout much of NSW to the border of Victoria and into parts of South Australia. The Murray Darling Basin and Pilliga Scrub region is the stronghold for this species (DSEWPC 2012). The study area does not occur at or near the limit of distribution of any of these species.

How is the proposal likely to affect the current disturbance regimes?

The study area has been subject to disturbances associated with the existing road corridors and electricity easements which follow the majority of the pipeline corridor. Much of the land the study area traverses has been subject to grazing and farming pressures. Where intensive farming practices have ensued and pasture improvements have been applied, rock outcrops and fallen timber have been removed and exotic grasses dominate the understory. Disturbance regimes currently observed at various locations throughout the study area include weed infestations, disturbance associated with the existing road reserves, and the presence of feral fauna including rabbits, foxes, cats, deer and goats. The project would involve the clearing of vegetation to install the pipeline underground, establish pumping stations and electricity services. The current disturbances (spread of weeds, roadside edge effects, past vegetation removal) may be exacerbated as a result of the project.

How is the proposal likely to affect habitat connectivity?

The proposed pipeline corridor primarily occurs within cleared paddocks within private properties or the existing road reserve. Where possible all efforts have been made to select a route that would require minimal removal of native vegetation and hollow-bearing trees. The pumping station locations, electricity supply to service the pipeline, and construction compounds have also been proposed where minimal native vegetation clearance would be required.

The most intact area of habitat for these microbat species occurs within the open woodland adjoining the Macquarie River at the Offtake Point and through to Long Point Road, and within the box-gum woodland which occurs throughout Mullion Range State Conservation Area adjoining Oaky Lane and Ophir Road. The proposed pipeline corridor is closely aligned with Oaky Lane on the opposite (eastern) side to the State Conservation Area, and would traverse predominantly

cleared grassland and areas of open woodland. The Eastern False Pipistrelle, Yellow-bellied Sheathtail Bat and Greater Long-eared Bat forage throughout a variety of habitat types including wooded areas, along drainage lines and watercourses. The foraging habitat for these species is not considered to be limiting and they are known to travel many kilometres between roosting and foraging sites. Given these species' high mobility, and the narrow corridor of vegetation to be removed, the project is unlikely to fragment or isolate patches of potential habitat for any of these three microbat species.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Eastern False Pipistrelle, Yellow-bellied Sheathtail-bat or Greater Long-eared Bat (DECC 2008b).

However the project would have an impact on known and/or potential habitat for these species through the removal of up to a maximum of 250 hollow-bearing trees which these species rely on for breeding and sheltering. Although not listed as critical habitat, tree hollows are an essential requirement for breeding and are a limited habitat resource for these species.

Conclusion

The project would involve the removal of foraging and breeding habitat in the study area for Eastern False Pipistrelle, Yellow-bellied Sheathtail-bat and Greater Long-eared Bat. These species have a high mobility and the project is unlikely to fragment or isolate patches of potential habitat for any of these. The potential foraging and breeding habitat in the study area for Eastern False Pipistrelle, Yellow-bellied Sheathtail-bat and Greater Long-eared Bat is contiguous with similar quality habitat that would not be disturbed such as Mullion Range State Conservation Area. Other large areas of potential habitat such as Girralang Nature Reserve would remain unaffected by the project. In view of these factors the project is unlikely to have a significant impact on Eastern False Pipistrelle, Yellow-bellied Sheathtail-bat and Greater Long-eared Bat.

Spotted-tailed Quoll	***Dasyurus maculatus maculatus***

The Spotted-tailed Quoll is listed as Vulnerable under Schedule 2 of the TSC Act. The species is also listed as Endangered under the EPBC Act. The Spotted-tailed Quoll has been recorded on four occasions within 10 km of the study area. Two individuals were trapped (during 1989 and 1973) while sightings of Spotted-tailed Quolls have been reported on more recently as a result of Dan Lunney's community wildlife surveys (undertaken during 2004-2006).

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The Spotted-tailed Quoll occurs in a range of habitats including sclerophyll forest and woodlands, coastal heathlands and rainforests (Dickman and Read 1992; Edgar and Belcher 1995). Occasional sightings have been made in open country, grazing lands, rocky outcrops and other treeless areas (NPWS 1999f).

This species' habitat requirements include suitable den sites (such as hollow logs, tree hollows, rock outcrops or caves) and an abundance of food (NPWS 1999f). The diet of juveniles is

dominated by invertebrates, small mammals and birds, while the diet of adults is dominated by medium-sized mammals (Belcher *et al.* 2008). Individuals require large areas of relatively intact vegetation through which to forage (NPWS 1999f). The home range of a female is between 180 ha and 1000 ha, while males have larger home ranges of between 2000 ha and 5000 ha (Belcher *et al.* 2008).

The study area provides potential foraging and denning habitat for the Spotted-tailed Quoll within the box-gum woodlands and riparian forests (including hollow-bearing trees and hollow logs). This species is also likely to utilise wildlife corridors within the locality to move between areas of habitat.

The project would result in the removal and/or direct disturbance of approximately 40.22 ha of box-gum woodlands and riparian forests (potential habitat), including up to 250 hollow-bearing trees and rocky outcrops to be removed from the study area. Hollow-bearing trees and large boulderous rocky outcrops provide sheltering and denning opportunities for the Spotted-tailed Quoll and support prey species. However, no evidence of Spotted-tailed Quolls within the study area (e.g. latrine sites, tracks or kills) were detected during the current surveys. Approximately 29% of the pipeline corridor would occur within existing road reserves and approximately 71% would traverse private properties. Where possible, the route would avoid treed areas and traverse predominantly cleared grassland and/or be trenched beneath the existing roads. The habitat to be removed exists as narrow strips along existing road reserves and as contiguous patches from the Offtake Point at the Macquarie River until where the route joins Long Point Road.

The pipeline corridor and associated infrastructure would require the removal of vegetation that is potential habitat for the Spotted-tailed Quoll. Whilst the project would impact potential breeding and foraging habitat within the study area, not all vegetation within the study area would be removed. Further, the potential habitat for the Spotted-tailed Quoll within the study area is contiguous with similar quality habitat that would not be disturbed. Given the above, the proposal would have a minor impact on the lifecycle of the Spotted-tailed Quoll through the permanent removal and disturbance to potential breeding and foraging resources.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The Spotted-tailed Quoll is mostly nocturnal, although will hunt during the day. It hunts ground-dwelling fauna including reptiles, small wallabies, rats, bandicoots and insects but will also climb trees preying on nesting birds, possums and glider dens.

The project would involve the removal of potential habitat including rocky outcrops, up to 250 hollow-bearing trees and large fallen logs which support potential denning sites and habitat for prey species. Approximately 40.22 ha of potential habitat would be removed and/or directly disturbed by the project. This represents approximately 0.21 % of the potential habitat available in the locality (18,726.04 ha). Large areas of habitat occur for this species within the greater locality within Mullion Range State Conservation Area and Girralang Nature Reserve which would remain unaffected by the project. Given the species' high mobility, and the narrow corridor of vegetation to be removed, the project is unlikely to significantly fragment or isolate patches of potential habitat for the Spotted-tailed Quoll.

Does the proposal affect any threatened species that are at the limit of its known distribution?

Spotted-tailed Quoll records are generally confined to within 200 km of the coast and range from the Queensland border to Kosciuszko National Park (DSEWPaC). The project location does not occur at the limit of the Spotted-tailed Quoll range. There are historical records up to 200 km west of the project study area, however, these records are generally sparse west of the Great Diving Range.

How is the proposal likely to affect the current disturbance regimes?

The study area has been subject to disturbances associated with the existing road corridors and electricity easements which follow the majority of the pipeline route. Much of the land the study area traverses has been subject to grazing and farming pressures. Where intensive farming practices have ensued and pasture improvements have been applied, rock outcrops and fallen timber have been removed and exotic grasses dominate the understory. Disturbance regimes currently observed at various locations throughout the study area include weed infestations, disturbance associated with the existing road reserves, and the presence of feral fauna including rabbits, foxes, cats, deer and goats. The project would involve the clearing of vegetation to install the pipeline underground, establish pumping stations and electricity services. The current disturbances (spread of weeds, roadside edge effects, past vegetation removal) may be exacerbated as a result of the project.

How is the proposal likely to affect habitat connectivity?

The proposed pipeline corridor primarily occurs within cleared paddocks within private properties or the existing road reserve. Where possible all efforts have been made to select a route that would require minimal removal of native vegetation and hollow-bearing trees. The pumping station locations, electricity supply to service the pipeline, and construction compounds have also been proposed where minimal native vegetation clearance would be required.

The Spotted-tailed Quoll inhabits large home ranges and a broad range of vegetation types which occur within the study area, including box-gum woodlands and riparian forests in proximity to watercourses. These habitats are found throughout the study area, primarily extending from the Macquarie River at the Offtake Point and through to Long Point Road and within the box-gum woodland which occurs throughout Mullion Range State Conservation Area adjoining Oaky Lane and Ophir Road. The proposed pipeline is closely aligned with Oaky Lane on the opposite (eastern) side to the State Conservation Area, and would traverse predominantly cleared grassland and areas of open woodland. The pipeline corridor traverses large intact areas of vegetation which form regional wildlife corridors that are likely to be used by the Spotted-tailed Quoll. Although this species occupies large relatively intact areas of habitat, the clearing of a narrow corridor of vegetation to install the pipeline underground would be largely a temporary disturbance during construction to the movement patterns of this species and is unlikely to permanently fragment or isolate patches of potential habitat for the Spotted-tailed Quoll.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Spotted-tailed Quoll (DECC 2008b).

Conclusion

Based on the above assessment including the home range size, foraging habits and breeding biology of Spotted-tailed Quoll the project is unlikely to have a significant impact on the Spotted-tailed Quoll.

Regent Honeyeater	***Anthochaera phrygia***

The Regent Honeyeater is listed as Critically Endangered under Schedule 1A of the TSC Act. This species is also listed as Endangered under the EPBC Act.

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The Regent Honeyeater has been recorded twice within 10 km of the study area.

This species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support large numbers of mature trees, high canopy cover and abundance of mistletoes. The box-gum woodland and riparian forest communities within the study area support these important habitat features.

Regent Honeyeaters nest in loose colonies. There are three known key breeding areas, two of them in NSW - Capertee Valley and Bundarra-Barraba regions. The species breeds between July and January in box-gum and temperate woodlands and riparian forests. The study area is not known to support an important breeding area for this species. Although no recent records of this species occur in proximity to the study area, the current surveys were not undertaken in the optimal survey period to detect this species (winter months).

Approximately 29% of the pipeline corridor would occur within existing road reserves and approximately 71% would traverse private properties. Where possible, the route would avoid treed areas and traverse predominantly cleared grassland and/or be trenched beneath the existing roads. The habitat that would be removed exists as narrow strips along existing road reserves and as contiguous patches from the Offtake Point at the Macquarie River until where the route joins Long Point Road.

The pipeline corridor and associated infrastructure would require the removal of vegetation that is potential habitat for the Regent Honeyeater. Although habitat would be removed by the project, the Regent Honeyeater is not known to breed in the region and the removal of box-gum woodland habitats would impact potential foraging resources only. Whilst the project would impact potential foraging habitat within the area, not all vegetation within the study area would be removed. Further, the potential habitat for the Regent Honeyeater within the study area is contiguous with similar quality habitat that would not be disturbed.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The Regent Honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes. Important eucalypt species include Yellow Box, Blakely's Red Gum and White Box found within the woodland communities within the study area. Other important feed trees include *E. microcarpa, E. punctata, E. polyanthemos, E. mollucana, Corymbia robusta, E. crebra, E. caleyi, Corymbia maculata, E.mckieana, E. macrorhyncha, E. laevopinea*, and *Angophora floribunda* as well as nectar and fruit from the mistletoes *Amyema miquelii, A. pendula*

and *A. cambagei* during the breeding season. When nectar is scarce lerp and honeydew comprise a large proportion of the diet. Insects make up about 15% of the total diet and are important components of the diet of nestlings. A shrubby understorey is an important source of insects and nesting material (OEH 2012).

The study area supports important foraging resources for the Regent Honeyeater in the box-gum woodland and riparian forest communities. The project would involve the removal of some of these potential habitats from the study area. Approximately 40.22 ha of potential habitat would be removed and/or directly disturbed by the project. This represents approximately 0.21 % of the potential habitat available in the locality (18,726.04 ha). Large areas of habitat occur for this species within the greater locality within Mullion Range State Conservation Area and Girralang Nature Reserve which would remain unaffected by the project. Given the species' high mobility, and the narrow corridor of vegetation to be removed, the project is unlikely to fragment or isolate patches of potential habitat for the Regent Honeyeater.

Does the proposal affect any threatened species that are at the limit of its known distribution?

The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia (OEH 2005). Once recorded between Adelaide and the central coast of Queensland, its range has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. In NSW the distribution is very patchy and mainly confined to the two main breeding areas (Capertee Valley and the Bundarra-Barraba region) and surrounding fragmented woodlands (OEH 2012). The project is located toward the western extent of the species distribution, around 100 km east of the most westerly Regent Honeyeater records.

How is the proposal likely to affect the current disturbance regimes?

The study area has been subject to disturbances associated with the existing road corridors and electricity easements which follow the majority of the pipeline route. Much of the land the study area traverses has been subject to grazing and farming pressures. Where intensive farming practices have ensued and pasture improvements have been applied, rock outcrops and fallen timber have been removed and exotic grasses dominate the understory. Disturbance regimes currently observed at various locations throughout the study area include weed infestations, disturbance associated with the existing road reserves, and the presence of feral fauna including rabbits, foxes, cats, deer and goats. The project would involve the clearing of vegetation to install the pipeline underground, establish pumping stations and electricity services. The current disturbances (spread of weeds, roadside edge effects, past vegetation removal) may be exacerbated as a result of the project.

How is the proposal likely to affect habitat connectivity?

Ecological studies of the Regent Honeyeater have shown that this species undertakes large-scale nomadic movements across hundreds of kilometres. The nature of these movements remain poorly understood and are likely to be dependent on foraging resource availability including spatial and temporal flowering patterns.

The proposed pipeline corridor primarily occurs within cleared paddocks within private properties or the existing road reserve. Where possible all efforts have been made to select a route that would require minimal removal of native vegetation. The pumping station locations, electricity supply to

service the pipeline, and construction compounds have also been proposed where minimal native vegetation clearance would be required.

The Regent Honeyeater inhabits box-gum woodlands and riparian forests. These habitats are found throughout the study area, primarily extending from Macquarie River at the Offtake Point and through to Long Point Road and within the box-gum woodland which occurs throughout Mullion Range State Conservation Area adjoining Oaky Lane. The proposed pipeline is closely aligned with Oaky Lane on the opposite (eastern) side to the State Conservation Area, and would traverse predominantly cleared grassland and areas of open woodland. Given that this species moves across the landscape in response to food resources, the clearing of a narrow corridor of vegetation is unlikely to fragment or isolate patches of potential habitat for the Regent Honeyeater.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Regent Honeyeater (DECC 2008b).

Conclusion

Based on the above assessment including the migratory and foraging habits and breeding biology of Regent Honeyeater the project is unlikely to have a significant impact on the species.

Barking Owl	***Ninox connivens***
Powerful Owl	***Ninox strenua***

The Barking Owl (*Ninox connivens*) and Powerful Owl (*Ninox strenua*) are listed as Vulnerable under Schedule 2 of the TSC Act. These species have been grouped for the impact assessment due to their similar dependency on tree hollows.

The Barking Owl was not recorded during the field surveys. The species has been previously recorded once within the locality, to the east of the study area north of Kinross State Forest.

The Powerful Owl was recorded during the field surveys whilst undertaking call-playback. The call was heard originating from the western side of Ophir Road towards Mullion Creek. Previously it had also been recorded once within the locality to the east of the study area, north of Kinross State Forest.

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The Barking Owl lives in forest and woodlands of tropical, temperate and semi-arid zones (Higgins 1999). The species has shown a preference in the area for dry ironbark woodlands (DEC 2005{). The powerful owl occupies wet and dry eucalypt forests and rainforests. It can occupy both unlogged and lightly logged forests, as well as undisturbed forests (Debus and Chafer 1994a).

All the forest owls require large mature trees or stags with hollows at least 0.5 m deep for nesting (Gibbons and Lindenmayer 1997). The Barking Owl favours nesting and roosting sites in woodland alongside watercourses (Higgins 1999). Powerful Owls prefer hollows in large old trees rather than

stags (Higgins 1999). Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm (Gibbons and Lindenmayer 1997).

The Barking Owl is thought to have a home range of less than 200 ha, although no detailed studies have been conducted. Pairs of Powerful Owls are believed to have high fidelity to a small number of hollow-bearing nest trees and will defend a large home range of 400-1450 ha.

Potential habitat for the forest owls occurs in the box-gum woodland, eucalypt and riparian forests within the study area. While it is considered likely that these species forage within the study area either regularly or occasionally, no preferred nesting habitat was observed within the area of direct impact, however, potential nest sites cannot be ruled out. Further foraging habitat, and potential nesting habitat may be indirectly impacted (e.g. edge effects) by the project. Approximately 74.58 ha of known and/or potential habitat would be directly modified and/or removed. This equates to approximately 0.39% of the known and/or potential habitat (e.g. box-gum woodland, eucalypt and riparian forest) available in the locality (19,130.57 ha). Given the large home range of the forest owls, that removal of nesting habitat is unlikely and the extent of habitat resources within the locality, it is unlikely that the project would disrupt the life cycle of the Barking or Powerful Owls.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The project would remove foraging habitat for these owls including the removal of up to 250 trees with hollows that provide habitat for arboreal prey species. Approximately 74.58 ha of foraging habitat would be removed from and/or directly disturbed within the subject site. An additional 15.02 ha containing foraging habitat and potential breeding habitat would be indirectly impacted by the project. Forest owls are highly mobile and are known to have a large home range. Given the extent of foraging and breeding resources within the locality it is unlikely the loss and/or disturbance of 0.47% of potential habitat would be significant for the owl species.

Does the proposal affect any threatened species that are at the limit of its known distribution?

The Barking Owl's distribution extends across the entire mainland of Australia except for the central arid regions (DEC 2005b). The Powerful Owl is found in south eastern Australia, mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria (DEC 2005u). The study area is not at, or near, the limit of distribution for the Barking Owl however lies at the western extent of the Powerful Owl's distribution.

How is the proposal likely to affect the current disturbance regimes?

The study area has been subject to disturbances associated with the existing road corridors and electricity easements which follow the majority of the pipeline corridor. Much of the land the study area traverses has been subject to grazing and farming pressures. Where intensive farming practices have ensued and pasture improvements have been applied, rock outcrops and fallen timber have been removed and exotic grasses dominate the understory. Disturbance regimes currently observed at various locations throughout the study area include weed infestations, disturbance associated with the existing road reserves, and the presence of feral fauna including rabbits, foxes, cats, deer and goats. The project would involve the clearing of vegetation to install the pipeline underground, establish pumping stations and electricity services. The current disturbances (spread of weeds, roadside edge effects, past vegetation removal) may be exacerbated as a result of the project.

How is the proposal likely to affect habitat connectivity?

The proposed pipeline corridor primarily occurs within cleared paddocks within private properties or the existing road reserve. Where possible all efforts have been made to select a route that would require minimal removal of native vegetation and hollow-bearing trees. The pumping station locations, electricity supply to service the pipeline, and construction compounds have also been proposed where minimal native vegetation clearance would be required.

The most intact area of habitat for these owl species occurs within the open woodland adjoining the Macquarie River at the Offtake Point and through to Long Point Road, and within the box gum woodland which occurs throughout Mullion Range State Conservation Area adjoining Oaky Lane and Ophir Road. The proposed pipeline corridor is closely aligned with Oaky Lane on the opposite (eastern) side to the State Conservation Area, and would traverse predominantly cleared grassland and areas of open woodland.

Both these owls occupy large home ranges, with the Barking Owl thought to defend territories up to 200 ha while the Powerful Owl home range is estimated to be in excess of 400 ha. Given these species' high mobility, and the narrow corridor of vegetation to be removed, the project is unlikely to fragment or isolate patches of potential habitat for these owls. The highly mobile forest owls are unlikely to be impacted by the reduced connectivity within the locality.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Barking or Powerful Owls (DECC 2008b).

Conclusion

Based on the above assessment including the home range size, foraging habits and breeding biology of Barking Owl and Powerful Owl, the project is unlikely to have a significant impact on these species.

Large-eared Pied Bat	***Chalinolobus dwyeri***

The Large-eared Pied Bat is listed as Vulnerable under Schedule 2 of the TSC Act. This species is also listed as Vulnerable under the EPBC Act.

The Large-eared Pied Bat was recorded within the study area during the current field surveys. The species was recorded once, with definite confidence, using an Anabat placed along Oaky Lane. The species has also been previously recorded at one other location within 10 km of the study area dating from 2005.

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The Large-eared Pied Bat is located in a variety of drier habitats, (Hoye and Dwyer 1995), however, can also be found on the edges of rainforests and in wet sclerophyll forests (Churchill 2008). The Large-eared Pied Bat requires caves or rock overhangs for breeding (DEC 2005m).

While the species will roost in caves, it can also use man-made structures such as mines and road culverts for roosting (Churchill 2008; DEC 2005m).

The Large-eared Pied Bat may roost among outcropping rocks and boulder piles on the steep slopes of the Macquarie River within the study area. However, no potential breeding habitat (i.e. caves or sandstone overhangs) occurs. The species may also forage throughout the study area for flying insects, particularly within the Macquarie River riparian vegetation and within watercourses along Oaky Lane.

Approximately 29% of the pipeline corridor would occur within existing road reserves and approximately 71% would traverse private properties. Where possible, the corridor would avoid treed areas and traverse predominantly cleared grassland and/or be trenched beneath the existing roads. The habitat to be removed exists as narrow strips along existing road reserves and as contiguous patches from the Offtake Point at the Macquarie River until where the route joins Long Point Road. Given that no caves or sandstone rock overhangs would be removed, it is unlikely the project would significantly affect the lifecycle of a local population of the Large-eared Pied Bat.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

Little is known of the foraging behaviour and diet of the Large-eared Pied Bat although they are known to have a relatively slow flight and have been observed flying low along creek beds and foraging within the canopy (DEC 2005m; Churchill 2008). Their diet is thought to consist of small flying insects (Hoye and Schulz 2008).

Foraging habitat occurs throughout the wooded areas of the study area concentrated at the Macquarie River, along Oaky Lane and within roadside remnant trees along Ophir Road. However, the study area is not considered to provide limiting foraging resources.

The study area provides potential habitat for the Large-eared Pied Bat in the form of woodland and riparian vegetation. Approximately 40.47 ha of potential habitat would be removed and/or directly disturbed by the project and 14.26 ha indirectly impacted. This represents approximately 0.29 % of the potential habitat available in the locality (19,130.57 ha). Conservation reserves in the locality where habitat for this species would be unaffected are Mullion Range State Conservation Area and Girralang Nature Reserve. Given the extent of potential foraging and roosting resources within the locality, the narrow corridor of vegetation to be removed and the reasonably high mobility of this species, the project is considered unlikely to have a major impact on habitat for the Large-eared Pied Bat.

Does the proposal affect any threatened species that are at the limit of its known distribution?

The Large-eared Pied Bat is found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. The study area occurs toward the western limit of the Large-eared Pied Bat's known distribution.

How is the proposal likely to affect the current disturbance regimes?

The study area has been subject to disturbances associated with the existing road corridors and electricity easements which follow the majority of the pipeline corridor. Much of the land the study area traverses has been subject to grazing and farming pressures. Where intensive farming

practices have ensued and pasture improvements have been applied, rock outcrops and fallen timber have been removed and exotic grasses dominate the understory. Disturbance regimes currently observed at various locations throughout the study area include weed infestations, disturbance associated with the existing road reserves, and the presence of feral fauna including rabbits, foxes, cats, deer and goats. The project would involve the clearing of vegetation to install the pipeline underground, establish pumping stations and electricity services. The current disturbances (spread of weeds, roadside edge effects, past vegetation removal) may be exacerbated as a result of the project.

How is the proposal likely to affect habitat connectivity?

The proposed pipeline corridor primarily occurs within cleared paddocks within private properties or the existing road reserve. Where possible all efforts have been made to select a route that would require minimal removal of native vegetation. The pumping station locations, electricity supply to service the pipeline, and construction compounds have also been proposed where minimal native vegetation clearance would be required.

The most intact area of habitat for the Large-eared Pied Bat occurs within the open woodland adjoining the Macquarie River at the Offtake Point and through to Long Point Road, and within the box gum woodland which occurs throughout Mullion Range State Conservation Area adjoining Oaky Lane. The proposed pipeline corridor is closely aligned with Oaky Lane on the opposite (eastern) side to the State Conservation Area, and would traverse predominantly cleared grassland and areas of open woodland. The Large-eared Pied Bat forages throughout a variety of habitat types including wooded areas, along drainage lines and watercourses. The foraging habitat for this species is not considered to be limiting and this species is known to travel many kilometres between roosting and foraging sites. Given this species' high mobility, and the narrow corridor of vegetation to be removed, the project is unlikely to fragment or isolate patches of potential habitat for the Large-eared Pied Bat.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Large-eared Pied Bat (DECCW 2009a).

Conclusion

Based on the above assessment including the foraging habits and breeding biology of Large-eared Pied Bat, the project is unlikely to have a significant impact on this species.

Eastern Bentwing-bat ***Miniopterus schreibersii oceanensis***

The Eastern Bentwing-bat is listed as Vulnerable under Schedule 2 of the TSC Act.

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

This species has been previously recorded on three occasions within 10 km of the study area; two records south of the pipeline corridor and one record approximately 5 km east of the pipeline corridor. During the current field surveys the Eastern Bentwing-bat was recorded at four locations

spread along the pipeline corridor with a possible level of certainty based on echolocation recording. These records were detected during the summer months of December and February. This species breeds in maternity caves where hundreds to thousands of individuals will annually occupy a cave with specific temperature and humidity characteristics. No caves occur within the study area and no known maternity caves occur in proximity to the pipeline corridor. Roosting resources are not restricted to caves and can include man-made structures including derelict mines, storm-water tunnels and buildings.

The region supports numerous old mine sites. These abandoned mine sites provide potential roost sites for the Eastern Bentwing-bat within the locality, however no old mines occur within the study area and therefore would not be impacted by the project.

The study are does not support any caves or breeding habitat for this species however the Eastern Bentwing-bat may forage throughout the forest and woodland habitats particularly in proximity to watercourses within the study area. Approximately 29% of the pipeline corridor would occur within existing road reserves and approximately 71% would traverse private properties. Where possible, the corridor would avoid treed areas and traverse predominantly cleared grassland and/or be trenched beneath the existing roads. The habitat to be removed exists as narrow strips along existing road reserves and as contiguous patches from the Offtake Point at the Macquarie River until where the route joins Long Point Road. The foraging habitat that would be impacted by the project is not a limiting resource for the Bentwing-bat and the habitat within the study area is contiguous with similar quality habitat that would not be disturbed. Given that no breeding resources would be disturbed the project is not likely to affect the lifecycle of a population of the Eastern Bentwing-bat.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The study area provides potential foraging habitat for the Eastern Bentwing-bat throughout the woodland and forest communities and along watercourses. This species hunts aerially for insects above tree tops within the study area. However, the study area is not considered to provide limiting foraging resources for this species.

Foraging habitat occurs throughout all wooded areas of the study area which are concentrated at Macquarie River, along Oaky Lane and within roadside remnant trees along Ophir Road. Approximately 40.47 ha of potential foraging habitat would be removed and/or directly disturbed by the project. This represents approximately 0.21% of the potential habitat available in the locality (19,130.57 ha). Conservation reserves in the locality where habitat for this species would be unaffected are Mullion Range State Conservation Area and Girralang Nature Reserve. Given the species' high mobility, and the narrow corridor of vegetation to be removed, the project is unlikely to fragment or isolate patches of potential habitat for the Eastern Bentwing-bat.

Does the proposal affect any threatened species that are at the limit of its known distribution?

Eastern Bentwing-bats occur along the east and north-west coasts of Australia (OEH 2005). The project lies 30 km inside the western limit of the Eastern Bentwing-bat's known distribution. With two records from 2008 and one from 2005 within 5 km of the project location, it is likely that the works would affect populations at the limit of the species' known distribution.

How is the proposal likely to affect the current disturbance regimes?

The study area has been subject to disturbances associated with the existing road corridors and electricity easements which follow the majority of the pipeline route. Much of the land the study area traverses has been subject to grazing and farming pressures. Where intensive farming practices have ensued and pasture improvements have been applied, rock outcrops and fallen timber have been removed and exotic grasses dominate the understory. Disturbance regimes currently observed at various locations throughout the study area include weed infestations, disturbance associated with the existing road reserves, and the presence of feral fauna including rabbits, foxes, cats, deer and goats. The project would involve the clearing of vegetation to install the pipeline underground, establish pumping stations and electricity services. The current disturbances (spread of weeds, roadside edge effects, past vegetation removal) may be exacerbated as a result of the project.

How is the proposal likely to affect habitat connectivity?

The proposed pipeline corridor primarily occurs within cleared paddocks within private properties or the existing road reserve. Where possible all efforts have been made to select a route that would require minimal removal of native vegetation and trees. The pumping station locations, electricity supply to service the pipeline, and construction compounds have also been proposed where minimal native vegetation clearance would be required.

The most intact area of foraging habitat for the Eastern Bentwing-bat occurs within the forest and woodland vegetation communities adjoining the Macquarie River at the Offtake Point and through to Long Point Road, and within the box-gum woodlands which occurs throughout Mullion Range State Conservation Area adjoining Oaky Lane and Ophir Road. The proposed pipeline corridor is closely aligned with Oaky Lane on the opposite (eastern) side to the State Conservation Area, and would traverse predominantly cleared grassland and areas of open woodland. The Eastern Bentwing-bat forages throughout a variety of habitat types including wooded areas, along drainage lines and watercourses. The foraging habitat for this species is not considered to be limiting and they are known to travel many kilometres between roosting and foraging sites. Given this species' high mobility, and the narrow corridor of vegetation to be removed, the project is unlikely to fragment or isolate patches of potential habitat for any of the Eastern Bentwing-bat.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Eastern Bentwing-bat (DECC 2008b).

Conclusion

Based on the above assessment including the foraging habits and breeding biology of the Eastern Bentwing-bat, the project is unlikely to have a significant impact on this species.

Southern Myotis	***Myotis macropus***

The Southern Myotis is listed as Vulnerable under Schedule 2 of the TSC Act.

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The Southern Myotis roosts in caves, mines or tunnels, under bridges, in buildings, tree hollows, and even in dense foliage. Breeding habitat is likely to be as per roosting habitat (DEC 2005n). Colonies occur close to permanent water bodies, ranging from rainforest streams to large lakes and reservoirs. The species may also roost and breed within tree hollows and dense foliage of the riparian vegetation.

Approximately 29% of the pipeline corridor would occur within existing road reserves and approximately 71% would traverse private properties. Where possible, the corridor would avoid treed areas and traverse predominantly cleared grassland and/or be trenched beneath the existing roads. The habitat to be removed exists as narrow strips along existing road reserves and as contiguous patches from the Offtake Point at the Macquarie River until where the route joins Long Point Road. A number of hollow-bearing trees (up to 250 supporting a range of number and sized hollows) would potentially be removed as a result of the project. Consequently the project may have an impact on the lifecycle of the Southern Myotis in the area through the removal of potential breeding resources. Although this species is highly mobile, the loss of potential foraging and breeding habitat could temporarily effect a local population as (surviving) individuals from the study area seek and establish new territory. However the Southern Myotis is not an obligate tree hollow nester and can utilise rock overhangs, caves and artificial tunnels also.

Whilst the project would impact potential breeding resources and foraging habitat within the study area providing potential habitat to Southern Myotis, not all hollow-bearing trees within the study area would be removed. Further, the potential habitat for this species within the study area is contiguous with similar quality habitat along the watercourses that would not be disturbed.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The study area provides both potential foraging and breeding habitat for the Southern Myotis. The species hunts aquatic insects and small fish with their large hind claws, and also catch flying insects (Richards et al. 2008). Foraging habitat occurs throughout the wooded areas surrounding watercourses within the study area concentrated at Macquarie River, along Oaky Lane and creek crossings. However, the study area is not considered to provide limiting foraging resources for this species.

The study area provides potential habitat for the Southern Myotis in the form of woodland and riparian vegetation. Approximately 40.47 ha of potential habitat would be removed and/or directly disturbed by the project. This represents approximately 0.32 % of the potential habitat available in the locality (19,130.57 ha). Where the woodland habitat is distanced from watercourses it is unlikely to provide preferred habitat for the Southern Myotis. Conservation reserves in the locality where habitat for this species would be unaffected are Mullion Range State Conservation Area and Girralang Nature Reserve. Given the extent of potential foraging and roosting resources within the locality, the narrow corridor of vegetation to be removed and the reasonably high mobility of this species, the project is considered unlikely to have a major impact on habitat for the Southern Myotis.

Does the proposal affect any threatened species that are at the limit of its known distribution?

Southern Myotis populations are found along the coast from the north-west of Australia, across the top-end and south to western Victoria (DEC 2005o). This species is found further inland along

major rivers such as the Macquarie River. The study area is approaching the western limit of this species' known distribution at this latitude.

How is the proposal likely to affect the current disturbance regimes?

The study area has been subject to disturbances associated with the existing road corridors and electricity easements which follow the majority of the pipeline corridor. Much of the land the study area traverses has been subject to grazing and farming pressures. Where intensive farming practices have ensued and pasture improvements have been applied, rock outcrops and fallen timber have been removed and exotic grasses dominate the understory. Disturbance regimes currently observed at various locations throughout the study area include weed infestations, disturbance associated with the existing road reserves, and the presence of feral fauna including rabbits, foxes, cats, deer and goats. The project would involve the clearing of vegetation to install the pipeline underground, establish pumping stations and electricity services. The current disturbances (spread of weeds, roadside edge effects, past vegetation removal) may be exacerbated as a result of the project.

How is the proposal likely to affect habitat connectivity?

The proposed pipeline corridor primarily occurs within cleared paddocks within private properties or the existing road reserve. Where possible all efforts have been made to select a route that would require minimal removal of native vegetation and hollow-bearing trees. The pumping station locations, electricity supply to service the pipeline, and construction compounds have also been proposed where minimal native vegetation clearance would be required.

The most intact area of habitat for the Southern Myotis occurs within the open woodland adjoining the Macquarie River at the Offtake Point and through to Long Point Road, and within the box gum woodland which occurs throughout Mullion Range State Conservation Area adjoining Oaky Lane and Ophir Road. The proposed pipeline corridor is closely aligned with Oaky Lane on the opposite (eastern) side to the State Conservation Area, and would traverse predominantly cleared grassland and areas of open woodland. The Southern Myotis forages throughout a variety of habitat types including wooded areas, along drainage lines and watercourses. The foraging habitat for this species is not considered to be limiting and this species is known to travel many kilometres between roosting and foraging sites. Given this species' high mobility, and the narrow corridor of vegetation to be removed, the project is unlikely to fragment or isolate patches of potential habitat for the Southern Myotis.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Southern Myotis (DECCW 2009a).

Conclusion

The project would involve the removal of foraging and one component of potential breeding habitat (hollow bearing trees) in the study area for Southern Myotis. This species has a high mobility and the project is unlikely to fragment or isolate patches of potential habitat. The potential foraging and breeding habitat in the study area for Southern Myotis is contiguous with similar quality habitat that would not be disturbed such as Mullion Range State Conservation Area. Other large areas of

potential habitat such as Girralang Nature Reserve would remain unaffected by the project. In view of these factors the project is unlikely to have a significant impact on Southern Myotis.

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

The Grey-headed Flying-fox is listed as Vulnerable under Schedule 2 of the TSC Act. This species is also listed as Vulnerable under the EPBC Act.

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The Grey-headed Flying-fox has not been recorded within 10 km of the study area however has potential habitat within the forests and woodlands within the study area. Agricultural crops present within the study area also provide potential foraging resources for this species.

The Grey-headed Flying-fox is found in a variety of habitats, including rainforest, mangroves, paperbark swamps, wet and dry sclerophyll forests and cultivated areas (Churchill 1998). The species is a canopy-feeding frugivore and nectarivore. Their major food source is Myrtaceae blossom (mostly eucalypt) and fruits such as native figs (Ficus spp.) and cultivated fruit orchards (Churchill 1998). Bats commute daily to foraging areas, usually within 15 km of the day roost (Strahan 1995), although some individuals may travel up to 70 km.

The study area provides potential foraging habitat for the Grey-headed Flying-fox within the eucalypt and riparian forests and woodlands. The project would result in the removal and/or direct disturbance of approximately 40.47 ha of foraging habitat for this species. An additional 14.26 ha would be indirectly impacted (e.g. edge effects).

No evidence of a camp site (breeding habitat) was found within the study area however the Grey-headed Flying-fox may forage throughout the forest and woodland habitats particularly in proximity to watercourses within the study area. Approximately 29% of the pipeline corridor would occur within existing road reserves and approximately 71% would traverse private properties. Where possible, the corridor would avoid treed areas and traverse predominantly cleared grassland and/or be trenched beneath the existing roads. The habitat to be removed exists as narrow strips along existing road reserves and as contiguous patches from the Offtake Point at the Macquarie River until where the route joins Long Point Road. The foraging habitat that would be impacted by the project is contiguous with similar quality habitat throughout the locality that would not be disturbed. Given that no known breeding sites would be disturbed the project is not likely to affect the lifecycle of a population of the Grey-headed Flying-fox.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The project would impact potential foraging habitat for the Grey-headed Flying-fox through the removal of eucalypt and riparian forest and woodland. Approximately 40.47 ha of eucalypt and riparian forest (potential foraging habitat) would be removed from and/or directly disturbed within the study area with a further 14.26 ha affected by indirect impacts (e.g. edge effects). This equates to only 0.29% of the potential habitat (e.g. eucalypt and riparian forest, woodlands and wetlands) available within the locality (18,873.01 ha). Given the availability of potential habitat within the locality (including protected habitat within Mullion Range State Conservation Area and Girralang Nature Reserve), that no known breeding habitat would be impacted and the high mobility of this

species, it is considered unlikely that the project would have major negative impacts on the Grey-headed Flying-fox within the locality.

Does the proposal affect any threatened species that are at the limit of its known distribution?

Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Bundaberg in Queensland to Melbourne in Victoria (OEH 2005). However, only a small proportion of this range is used at any one time, as the species selectively forages where food is available. As a result, patterns of occurrence and relative abundance within its distribution vary widely between seasons and between years (DSEWPaC). The majority of Grey-headed Flying-fox records are located in coastal regions and the Blue Mountains, however the species has been recorded as far west as Bathurst and Dubbo, placing the project location within the outer limit of its known distribution.

How is the proposal likely to affect the current disturbance regimes?

The study area has been subject to disturbances associated with the existing road corridors and electricity easements which follow the majority of the pipeline route. Much of the land the study area traverses has been subject to grazing and farming pressures. Where intensive farming practices have ensued and pasture improvements have been applied, rock outcrops and fallen timber have been removed and exotic grasses dominate the understory. Disturbance regimes currently observed at various locations throughout the study area include weed infestations, disturbance associated with the existing road reserves, and the presence of feral fauna including rabbits, foxes, cats, deer and goats. The project would involve the clearing of vegetation to install the pipeline underground, establish pumping stations and electricity services. The current disturbances (spread of weeds, roadside edge effects, past vegetation removal) may be exacerbated as a result of the project.

How is the proposal likely to affect habitat connectivity?

The project is likely to remove and/or modify about 54.73 ha (40.47 hectares from direct impacts with a further 14.26 ha indirectly impacted) of known and potential foraging habitat from the study area. The areas to be removed are contiguous with intact woodland that would remain. Given the availability of surrounding woodland and riparian forests, the small areas of proposed vegetation removal (the 40.47 ha to be removed and/or directly impacted is made up of smaller areas spread along the 37 km study area) and the high mobility of the Grey-headed Flying-fox, it is considered unlikely that the project would create or exacerbate barriers for this species.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Grey-headed Flying-fox (DECC 2008b).

Critical habitat can also refer to areas that are necessary for activities such as foraging, breeding or dispersal; for the long-term maintenance of the species; to maintain genetic diversity and long-term evolutionary development; or for the reintroduction of populations or recovery of the species (DEWHA 2009d). The *Draft National Recovery Plan for the Grey-headed Flying-fox* Pteropus poliocephalus (DECCW 2009b) describes foraging habitat that is considered critical to the survival

of the species. The vegetation that would be removed by the project is consistent with criteria number three listed in the recovery plan: natural foraging habitat that is productive during the final weeks of gestation, and during the weeks of birth, lactation and conception (September to May). Therefore, the project would adversely affect habitat critical to the survival of the Grey-headed Flying-fox, according to the draft recovery plan (DECCW 2009b).

Conclusion

Based on the above assessment including the dispersal and foraging habits and breeding biology of the Grey-headed Flying-fox, the project is unlikely to have a significant impact on this species.

Booroolong Frog	***Litoria booroolongenis***

The Booroolong Frog is listed as Endangered under Schedule 1 of the TSC Act and Endangered under the EPBC Act

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The Booroolong Frog has not been recorded within the study area and was not detected during the current surveys. The closest records occur approximately 50 km to the east of the study area spread south and north of Bathurst. The most recent of these records (dating from 2009) are found within the Macquarie River system. The pipeline corridor traverses creek crossings which are directly connected to the Macquarie River and supports the rocky cobble substrates preferred by the Booroolong Frog.

The Booroolong Frog inhabits permanent streams with fringing vegetation such as ferns, sedges or grasses and cobble banks or rocks in stream. Tadpole development occurs in permanent or temporarily connected or isolated pools. Basking and sheltering habitat occurs within 100 m of stream habitats. Frogs are thought to shelter during the non-breeding season beneath fallen timber, leaf litter, rocks and vegetation.

Sub-optimal potential habitat for the Booroolong Frog occurs within Summer Hill Creek (specifically at the Third and Forth Crossings and a tributary) and Oaky Creek. These streams are part of the Macquarie River system and support rocky in stream habitat required by the Booroolong Frog.

Direct impacts of the project would be localised to the trench where the pipeline would be installed using open cut techniques. Indirect impacts include increased erosion following the removal of vegetation along the banks of the waterways and increased sediments entering the streams during and post construction. These impacts would be minimised through either the temporary re-direction or damming of stream flow during construction as well as the use of standard erosion control techniques. Following construction the bank vegetation would be reinstated and allowed to regenerate. Any large rocks moved during construction would also be reinstated.

The Booroolong Frog has not been previously recorded within or in proximity to the study area. Despite this the species is known from the Macquarie River system and has potential habitat within the study area that may be directly affected by the project as well as likely potential habitats that occur downstream which may be indirectly impacted by the project. The available potential habitats within the study area are sub-optimal given the current disturbance regime where the streams are already traversed by existing roads and subject to riparian weed infestations.

The project would directly impact sub-optimal potential breeding habitat for the Booroolong Frog, which if present within the study area or downstream, the lifecycle of a resident population may be negatively affected by the project.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The Booroolong Frog forages within 100 m of stream habitats, moving amongst vegetation, leaf litter, fallen debris and rocky habitats. Although this species has not been recorded in proximity to the study area it is likely to only occupy localised areas of suitable habitat. No individuals were detected during the targeted surveys undertaken where potential habitat would be disturbed. The potential habitat to be directly disturbed only offers sub-optimal habitats for the Booroolong Frog that would be subject to temporary disturbances primarily during the construction phase as the pipeline is installed beneath the ground. Any boulders and rocky cobble substrates that are removed during construction would be reinstated following pipeline installation and habitat features including large rocks and debris would be retained immediate adjacent to the pipeline corridor. Given this, the project is unlikely to permanently affect potential habitat for the Booroolong Frog.

Does the proposal affect any threatened species that are at the limit of its known distribution?

The distribution of the Booroolong Frog is restricted to NSW and north-eastern Victoria, predominantly along the western-flowing streams of the Great Dividing Range (OEH 2005). It has disappeared from much of the Northern Tablelands, however several populations have recently been recorded in the Namoi catchment. The species is rare throughout most of the remainder of its range. The project is 50 km west of the western limit of the Booroolong Frogs known distribution. If present within the study area the project would be impacting on individuals at the limit of their known distribution.

How is the proposal likely to affect the current disturbance regimes?

The study area has been subject to disturbances associated with the existing road corridors and electricity easements which follow the majority of the pipeline route. Much of the land the study area traverses has been subject to grazing and farming pressures. Where intensive farming practices have ensued and pasture improvements have been applied, rock outcrops and fallen timber have been removed and exotic grasses dominate the understory. Disturbance regimes currently observed at various locations throughout the study area include weed infestations, disturbance associated with the existing road reserves, and the presence of feral fauna including rabbits, foxes, cats, deer and goats. The project would involve the clearing of vegetation to install the pipeline underground, establish pumping stations and electricity services. The current disturbances (spread of weeds, roadside edge effects, past vegetation removal) may be exacerbated as a result of the project.

How is the proposal likely to affect habitat connectivity?

The proposed pipeline corridor primarily occurs within cleared paddocks within private properties or the existing road reserve. Where possible all efforts have been made to select a route that would require minimal removal of native vegetation. The pumping station locations, electricity supply to service the pipeline, and construction compounds have also been proposed where minimal native vegetation clearance would be required.

The pipeline corridor traverses Summer Hill Creek and Oaky Creek where sub-optimal potential habitat for the Booroolong Frog occurs. Although the habitat within the study area is sub-optimal frogs may travel along the creeklines to and from better quality habitats. The project would temporarily disrupt connectivity for some individuals during the construction phase of the project where flows would be diverted or dammed and vegetation cleared to install the pipeline beneath the ground using open-cut techniques. Where the pipeline corridor would traverse the creeklines, the width of the corridor would be relatively narrow (6-10 m) and the localised impacts would be temporary. It is possible that the project construction works would disrupt habitat connectivity for the Booroolong Frog moving up and down stream, however this impact would be temporary and the project would be unlikely to fragment or isolate patches of potential habitat for the Booroolong Frog in the long-term.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Booroolong Frog (DECC 2008b).

Conclusion

Based on the above assessment the project would disturb a small area of sub-optimal potential habitat for the Booroolong Frog. Connectivity for this species may also be temporarily disrupted during the construction phase of the project. Despite this the project is unlikely to have a significant impact on the Booroolong Frog.

Koala	***Phascolarctos cinereus***

The Koala is listed as Vulnerable under Schedule 2 of the TSC Act. This species is also listed as Vulnerable under the EPBC Act (as of 30th April 2012).

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

Koalas live in breeding aggregations comprised of a dominant male, a small number of mature females, and juveniles (NPWS 2003). The home range of Koalas varies depending on the quality of the habitat and the number of available food trees. Home ranges can vary from less than one hectare to 500 ha (NPWS 2003). Home ranges in the Pilliga State Forest overlapped for both sexes and were approximately 12 ha for males and 9 ha for females. Koalas were found to continue to occupy all or part of their previous home-ranges after selective logging, and home-range sizes remained similar between logged and unlogged areas (Kavanagh et al. 2007).

The Koala has been recorded once within 10 km of the study area at Mullion Creek to the west of the study area dating from 2011. Additional records of the Koala occur beyond 10 km from the study area. The next closest records occur east of the study area in the vicinity of Freemantle Nature Reserve (records dating from 1993 to 2009); in the vicinity of Hill End (records dating from 1972 to 2007); and approximately 13 km north of the Offtake Point (dated 1976). The latter two locations occur on the opposite side of the Macquarie River to the study area (OEH 2012). The

study area contains box-gum woodlands and forest communities which support preferred feed tree species favoured by the Koala in the region.

Given the absence of records of this conspicuous species occurring in proximity to the study area, the significant barrier the Macquarie River is likely to pose restricting movement of individuals south of the river, the study area is not known to support an important breeding population of Koala.

Approximately 40.47 ha of box-gum woodland and riparian forest (potential habitat) would be removed and/or directly disturbed from the study area with a further 14.26 ha affected by indirect impacts (e.g. edge effects). This equates to only 0.29 % of the potential habitat available within the locality (18,873.01 ha). Approximately 29% of the pipeline corridor would occur within existing road reserves and approximately 71% would traverse private properties. Where possible, the route would avoid treed areas and traverse predominantly cleared grassland and/or be trenched beneath the existing roads. The habitat to be removed exists as narrow strips along existing road reserves and as contiguous patches from the Offtake Point at the Macquarie River until where the route joins Long Point Road.

The pipeline corridor and associated infrastructure would require the removal of vegetation that is potential habitat for the Koala. Whilst the project would impact potential breeding and foraging habitat within the study area, not all vegetation within the study area would be removed. Further, the potential habitat for the Koala within the study area is contiguous with similar quality habitat that would not be disturbed. Given the above, the proposal would have a minor impact on the lifecycle of the Koala through the permanent removal and disturbance to potential breeding and foraging resources.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The study area falls predominantly within the Central and Southern Tablelands Koala Management Area of the NSW Koala Recovery Plan (DECC 2008c). According to appendix 2 of the recovery plan, the study area provides a primary food tree species in the form of Ribbon Gum *Eucalyptus viminalis* (33 trees to be removed in total). Secondary food tree species within the study area include White Box *E.albens*, Blakely's Red Gum *E. blakelyi*, Apple-topped Box *E. bridgesiana*, Yellow Box *E. melliodora*, Red Box *E. polyanthemos* and Tumbledown Gum *E. dealbata*, Brittle Gum *E. mannifera* and Candlebark *E. rubida*. However no population is known to occur within the study area. It was suggested that a Koala population occurs at Oaky Lane (MWH Global 2011), however no information to support this prediction has been found. During the field surveys no evidence of Koalas was detected.

The project would involve the removal of potential habitat including some woodland communities containing a dominant canopy of favoured feed trees species. Approximately 40.47 ha of potential habitat would be removed and/or directly disturbed by the project. This represents approximately 0.21 % of the potential habitat available in the locality (18,873.01 ha). Large areas of habitat occur for this species within the greater locality within Mullion Range State Conservation Area and Girralang Nature Reserve which would remain unaffected by the project. The project would not reduce habitat connectivity for this species. Given the species mobility, and the narrow corridor of vegetation to be removed, the project is unlikely to significantly fragment or isolate patches of potential habitat for the Koala.

Does the proposal affect any threatened species that are at the limit of its known distribution?

The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia (OEH 2005). In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Koalas have been recorded within 10 km of the project however, with population records throughout the region, these are not at the limit of the species known distribution.

How is the proposal likely to affect the current disturbance regimes?

The study area has been subject to disturbances associated with the existing road corridors and electricity easements which follow the majority of the pipeline route. Much of the land the study area traverses has been subject to grazing and farming pressures. Where intensive farming practices have ensued and pasture improvements have been applied, rock outcrops and fallen timber have been removed and exotic grasses dominate the understory. Disturbance regimes currently observed at various locations throughout the study area include weed infestations, disturbance associated with the existing road reserves, and the presence of feral fauna including rabbits, foxes, cats, deer and goats. The project would involve the clearing of vegetation to install the pipeline underground, establish pumping stations and electricity services. The current disturbances (spread of weeds, roadside edge effects, past vegetation removal) may be exacerbated as a result of the project.

How is the proposal likely to affect habitat connectivity?

The proposed pipeline corridor primarily occurs within cleared paddocks within private properties or the existing road reserve. Where possible all efforts have been made to select a route that would require minimal removal of native vegetation and hollow-bearing trees. The pumping station locations, electricity supply to service the pipeline, and construction compounds have also been proposed where minimal native vegetation clearance would be required.

The Koala inhabits box-gum woodlands and riparian forests which occur within the study area. These habitats are found throughout the study area, primarily extending from Macquarie River at the Offtake Point and through to Long Point Road and within the box-gum woodland which occurs throughout Mullion Range State Conservation Area adjoining Oaky Lane. The proposed pipeline is closely aligned with Oaky Lane on the opposite (eastern) side to the State Conservation Area, and would traverse predominantly cleared grassland and areas of open woodland. The pipeline corridor traverses large intact areas of vegetation which form regional wildlife corridors that are likely to be used by the Koala. Although this species occupies large areas of habitat, the clearing of a narrow corridor of vegetation to install the pipeline underground would be largely a temporary disturbance during construction to the movement patterns of this species and is unlikely to permanently fragment or isolate patches of potential habitat for the Koala.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Koala (DECC 2008b).

Conclusion

Based on the above assessment the project is considered unlikely to result in a significant impact on the Koala.

Scarlet Robin	***Stagonopleura guttata***

The Scarlet Robin is listed as under Schedule 2 of the TSC Act as Vulnerable. This species has been recorded on at least 21 occasions within 10 km of the study area. These records occur to the east, west, and south of the study area including three records in proximity to the pipeline corridor.

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The Scarlet Robin defends a territory during the breeding season (July – January) where it will place an open cup nest of plant fibres and cobwebs often in the fork of a tree above 2 m from the ground; nests often located within a dead tree or dead branch of a live tree.

Approximately 29% of the pipeline route would occur within existing road reserves and approximately 71% would traverse private properties. Where possible, the route would avoid treed areas and traverse predominantly cleared grassland and/or be trenched beneath the existing roads. The habitat to be removed exists as narrow strips along existing road reserves and as contiguous patches from the Offtake Point at the Macquarie River until where the route joins Long Point Road. The project would involve the removal of foraging and breeding habitat in the form of riparian forest and box-gum woodland communities. Consequently the project is likely to have an impact on the lifecycle of the Scarlet Robin in the area through the removal of potential breeding resources. Whilst the project would impact potential breeding resources and foraging habitat within an area likely to support Scarlet Robins, the Scarlet Robin is not dependent on limiting breeding resources or habitat features. Given that no limiting and or essential breeding habitat resources would be removed as part of the project and that potential habitat for the Scarlet Robin within the study area is contiguous with similar quality habitat that would not be disturbed, the project would not present a major impact to the lifecycle of the Scarlet Robin population within the locality.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The Scarlet Robin favours dry eucalypt forests and woodlands with an open grassy understory with scattered shrubs (OEH 2012). Important habitat components for this species include abundant logs and fallen timber to provide foraging resources.

The Scarlet Robin can occupy both mature and regrowth communities. This species forages on insects and other invertebrates which are taken from the ground, or from tree trunks and logs. They occasionally forage within the mid and canopy layers. During autumn and winter Scarlet Robins move into grassy open woodlands and grasslands including grazed paddocks with scattered trees.

The study area provides potential habitat for the Scarlet Robin in the form of box-gum woodland communities, forests on slopes and native grasslands. Approximately 51.09 ha of potential habitat would be removed and/or directly disturbed by the project. This represents approximately 0.27% of the potential habitat available in the locality (18,838.7ha). Conservation reserves in the locality where Scarlet Robin habitat would be unaffected are Mullion Range State Conservation Area and

Girralang Nature Reserve. Given the species' high mobility, and the narrow corridor of vegetation to be removed, the project is unlikely to fragment or isolate patches of potential habitat for the Scarlet Robin.

Does the proposal affect any threatened species that are at the limit of its known distribution?

The Scarlet Robin is found from south eastern Queensland to south eastern South Australia and also in Tasmania and south western Western Australia (OEH 2005). In NSW, it occurs from the coast to the inland slopes. After breeding, some Scarlet Robins disperse to the lower valleys and plains of the tablelands and slopes. Some birds may appear as far west as the eastern edges of the inland plains in autumn and winter. The project site is located within the western extent of the Scarlet Robin distribution. Given the large number of records up to 100 km west of the project location, the project is not considered to be at the limit of its known distribution.

How is the proposal likely to affect the current disturbance regimes?

The study area has been subject to disturbances associated with the existing road corridors and electricity easements which follow the majority of the pipeline route. Much of the land the study area traverses has been subject to grazing and farming pressures. Where intensive farming practices have ensued and pasture improvements have been applied, rock outcrops and fallen timber have been removed and exotic grasses dominate the understory. Disturbance regimes currently observed at various locations throughout the study area include weed infestations, disturbance associated with the existing road reserves, and the presence of feral fauna including rabbits, foxes, cats, deer and goats. The project would involve the clearing of vegetation to install the pipeline underground, establish pumping stations and electricity services. The current disturbances (spread of weeds, roadside edge effects, past vegetation removal) may be exacerbated as a result of the project.

How is the proposal likely to affect habitat connectivity?

Most of the records of the Scarlet Robin occur from Mullion Range State Forest and Mullion Creek as well as the vegetation that occurs east of Ophir Road contiguous with the Mullion Range State Conservation Area. The proposed pipeline corridor primarily occurs within cleared paddocks within private properties or the existing road reserve. Where possible all efforts have been made to select a route that would require minimal removal of native vegetation and hollow-bearing trees. The pumping station locations, electricity supply to service the pipeline, and construction compounds have also been proposed where minimal native vegetation clearance would be required.

The most intact area of habitat for the Scarlet Robin occurs within the open woodland adjoining the Macquarie River at the Offtake Point and through to Long Point Road, and within the box-gum woodland communities which occur throughout Mullion Range State Conservation Area adjoining Oaky Lane and Ophir Road. The proposed pipeline is closely aligned with Oaky Lane on the opposite (eastern) side to the State Conservation Area, and would traverse predominantly cleared grassland and areas of open woodland. The Scarlet Robin forages in wooded areas and moves into grassy open areas during autumn and winter. The slight increase in distance between habitats along the existing road corridors are unlikely to fragment of isolate patches of potential habitat for the highly mobile Scarlet Robin.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Scarlet Robin (DECC 2008b).

Conclusion

Based on the above assessment including the foraging habits and breeding biology of the Scarlet Robin, the project is unlikely to have a significant impact on this species.

Little Whip Snake	***Suta flagellum***
Pink-tailed Worm-lizard	***Aprasia parapulchella***

The Pink-tailed Worm-lizard and Little Whip Snake are listed under Schedule 2 of the TSC Act as Vulnerable. The Pink-tailed Worm-lizard is also listed under the EPBC Act.

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

No individuals of either the Pink-tailed Worm-lizard or Little Whip Snake were recorded during site surveys. Three records of the Pink-tailed Worm-lizard occur approximately 50 km east of the study area dating from 2002, while the closest record of the Little Whip Snake occurs approximately 45 km south-east of Suma Park Reservoir, recorded in 1985. Both these species have potential habitat within rocky areas throughout the grassland and open woodland habitats of the study area.

The Pink-tailed Worm-lizard is a fossorial species, which lives beneath surface rocks and occupies ant burrows. It feed on ants, particularly their eggs and larvae (Osborne and Jones 1995). The Pink-tailed Worm-lizard is oviparous (egg laying) with a clutch size of two. Females may need to reach an age of about 3 or 4 years before they can reproduce. There is little data on the breeding behaviour of this species. The Pink-tailed Worm-lizard is thought to lay eggs within the ant nests under rocks that it uses as a source of food and shelter (DEC 2005t). Key habitat features for the presence of the Pink-tailed Worm-lizard are a cover of native grasses (particularly Kangaroo Grass), sparse or no tree cover, little or no leaf litter, and scattered small rocks with shallow embedment in the soil surface (Osborne and Jones 1995).

The Little Whip Snake is found within grassy woodland and native grassland habitats, particularly those dominated by Yellow Box *E.melliodora* as well as secondary grasslands derived from the clearing of woodlands. This species also inhabits well drained hillside slopes, associated with scattered loose surface rocks. Most records have been found under partially embedded surface rocks or fallen timber and debris. The Little Whip Snake forages on small lizards and frogs. This nocturnal species is not well studied and many of its habits are not known.

Both these species have potential habitat within the study area in native grasslands and box-gum woodland communities where there are an abundance of surface rocks and fallen timber debris. Approximately 29% of the pipeline corridor would occur within existing road reserves and approximately 71% would traverse private properties. Where possible, the corridor would avoid treed areas and traverse predominantly cleared grassland and/or be trenched beneath the existing roads. The habitat to be removed exists as isolated areas along existing road reserves and within private paddocks and as contiguous patches from the Offtake Point at the Macquarie River until where the route joins Long Point Road. A number of rocky outcrops would be removed as a result of the project. Consequently the project may have an impact on the lifecycle of the Pink-tailed

Worm-lizard and Little Whip Snake in the area through the removal of potential breeding and shelter resources.

Whilst the project would impact potential breeding and shelter resources and foraging habitat for these species, there have been no proximate sightings of either of these species to the study area. Targeted searches for these species during the appropriate survey season did not detect individuals of these species or evidence (e.g. skin sloughs) of these species. Further, impacts to the rocky outcrop habitats within box-gum woodlands and native grasslands would be confined to a narrow pipeline corridor and suitable habitat for these species would remain intact within the study area. The impacts to the rocky outcrops and fallen debris would be temporary as surface rocks and woody debris removed as a result of the project would be retained adjacent to the pipeline corridor. Provided the mitigation measures in section 6.0 of this report are implemented, and in particular the pre-clearing surveys in areas of potential habitat for these species, any impact to a local population of Little Whip Snake or Pink-tailed Worm-lizard is expected to be temporary and would not affect the lifecycle of either species in the long term.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

Foraging resources including termites, ants, scorpions and centipedes utilised by the Pink-tailed Worm-lizard were commonly found beneath the rocks turned during the surveys. These prey species are often found in association with Pink-tailed Worm-lizards as they provide food and/or shelter through the use of their burrows. It is considered that the surface rocks within the study area provide potential habitat for the Pink-tailed Worm-lizard. Similarly the Little Whip Snake forages on small lizards and frogs and is dependent on partially embedded surface rocks and fallen timber to shelter.

The study area provides potential habitat for these reptiles in the form of box-gum woodlands, native and secondary grasslands with moderate to high densities of surface rocks and fallen timber debris. Approximately 51.09 ha of potential habitat would be directly impacted by the project. This represents approximately 0.17 % of the potential habitat available in the locality (30,003.81 ha). Although not all these habitats would support the critical surface rock component and is likely to be an overestimate of available habitats within the locality. Conservation reserves in the locality where habitat for these species would be unaffected are Mullion Range State Conservation Area and Girralang Nature Reserve. Although both these species have not been recorded in proximity to the study area and are likely to occupy localised areas, given no individuals were detected during the targeted surveys, the narrow corridor of habitat to be removed, that loose surface rocks and debris would be retained immediate adjacent to the pipeline corridor, and that pre-clearing surveys are undertaken, the project is unlikely to permanently affect potential habitat for the Little Whip Snake or the Pink-tailed Worm-lizard.

Does the proposal affect any threatened species that are at the limit of its known distribution?

Pink-tailed Worm-lizards occur throughout south-eastern Australia, where it is widely but patchily distributed from Gunnedah in northern NSW through southern NSW and the ACT to Bendigo in central Victoria (Brown 2010). The species has been recorded from several widely separated locations between Gunnedah and Albury in NSW, from numerous localities in the ACT, while in Victoria the species has been recorded only from the Bendigo region (Brown 2010). Other locations within this geographic area include near Cooma, Yass, Albury, Cootamundra, Tarcutta and

Queanbeyan (DEWHA 2008a; DECC 2009). Records cover a wide altitudinal range, from about 200 m altitude near Bendigo to over 800 m altitude in the ACT (Brown 2010). The Little Whip Snake is found within an area bounded by Crookwell in the north, Bombala in the south, Tumbarumba to the west and Braidwood to the east (OEH 2012). The study area does not occur at or near the limit of distribution of the Pink-tailed Worm-lizard, however the study area is beyond the northern extent of the known distribution for the Little Whip Snake.

How is the proposal likely to affect the current disturbance regimes?

The study area has been subject to disturbances associated with the existing road corridors and electricity easements which follow the majority of the pipeline route. Much of the land the study area traverses has been subject to grazing and farming pressures. Where intensive farming practices have ensued and pasture improvements have been applied, rock outcrops and fallen timber have been removed and exotic grasses dominate the understory. Disturbance regimes currently observed at various locations throughout the study area include weed infestations, disturbance associated with the existing road reserves, and the presence of feral fauna including rabbits, foxes, cats, deer and goats. The project would involve the clearing of vegetation to install the pipeline underground, establish pumping stations and electricity services. The current disturbances (spread of weeds, roadside edge effects, past vegetation removal) may be exacerbated as a result of the project.

How is the proposal likely to affect habitat connectivity?

The proposed pipeline corridor primarily occurs within cleared paddocks within private properties or the existing road reserve. Where possible all efforts have been made to select a route that would require minimal removal of native vegetation and trees. The pumping station locations, electricity supply to service the pipeline, and construction compounds have also been proposed where minimal native vegetation clearance would be required.

The most intact area of habitat for these reptile species occurs within the open woodland adjoining the Macquarie River at the Offtake Point and through to Long Point Road; within the box gum woodland which occurs throughout Mullion Range State Conservation Area adjoining Oaky Lane; and, native and secondary grasslands which occur adjacent to Oaky Lane and throughout private paddocks. The proposed pipeline corridor is closely aligned with Oaky Lane on the opposite (eastern) side to the State Conservation Area, and would traverse predominantly cleared grassland and areas of open woodland which also supports habitat for these reptiles. For the Pink-tailed Worm-lizard it is likely that individuals will use the same rocks over time, which maintain specific thermoregulatory properties. Although there is little known about the movement patterns of both the Little Whip Snake or the Pink-tailed Worm-lizard it is expected that the Pink-tailed Worm-lizard will not venture far from shelter and consequently be relatively localised, and that the Little Whip Snake will also not be highly mobile.

Targeted searches for these species were undertaken during appropriate survey conditions and did not detect these species. Given the lack of proximate records to suggest a resident population and the narrow corridor of vegetation to be removed, and the temporary disturbance to potential habitats, the project is unlikely to fragment or isolate patches of potential habitat for the Little Whip Snake or Pink-tailed Worm-lizard.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. A Register of Critical Habitat is maintained by the Minister under the EPBC Act. To date, no critical habitat has been listed for the Pink-tailed Worm-lizard or the Little Whip Snake (DEWHA 2008b).

However the proposal would have an impact on potential habitat for these species through the removal and/or direct disturbance of 58.2 ha of box-gum woodland and native grassland habitats with rocky outcrops which the Little Whip Snake and Pink-tailed Worm-lizard rely on for breeding. Although not listed as critical habitat, partially embedded surface rocks are an essential requirement for breeding and are a limited habitat resource for these species.

Conclusion

Based on the above assessment including retention of the most intact area of habitats for these reptile species (open woodland adjoining the Macquarie River at the Offtake Point, through to Long Point Road to woodland throughout Mullion Range State Conservation Area adjoining Oaky Lane; and, native and secondary grasslands which occur adjacent to Oaky Lane and throughout private paddocks), the project is considered unlikely to result in a significant impact on these species.

APPENDIX 4

Assessments of impacts according to EPBC Act significant impact guidelines

Euphrasia arguta

Euphrasia arguta is listed as Critically Endangered under the EPBC Act.

Is the action likely to lead to a long-term decrease in the size of a population of a species?

Euphrasia arguta was not recorded during field surveys and the project will not affect the most recent known population of the species at Nundle State Forest over 250 km away.

Given that a population has not been recorded in the study area, and that only a small amount of potential habitat (0.8% of the estimated total within the locality) would be impacted, it is considered unlikely that the project would lead to a long term decrease in the size of a population of *Euphrasia arguta*.

Is the action likely to reduce the area of occupancy of the species?

Historically, *Euphrasia arguta* has been recorded from relatively few places within an area extending from Sydney west to Bathurst, north to Walcha and east near the Hastings River. The current extent of occurrence of *Euphrasia arguta* is less than 100 square kilometres and its known area of occupancy in 2009 was approximately 0.03 km^2.

Euphrasia arguta was not recorded during field surveys and the project would not affect the most recent known population of the species at Nundle State Forest over 250 km away.

Is the action likely to fragment an existing population into two or more populations?

The species has not been previously recorded in the locality (Figure 8) and was not recorded within the study area during the current field survey. The nearest and most recently recorded population is over 250 km away at Nundle State Forest.

Given that a population has not been recorded in the study area the project would not lead to the fragmentation or isolation of a population of *Euphrasia arguta*.

Is the action likely to adversely affect habitat critical to the survival of a species?

'Habitat critical to the survival of a species or ecological community' is defined by DEH (2006) as areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal.
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators).
- To maintain genetic diversity and long term evolutionary development.
- For the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to:

- Habitat identified as critical in a recovery plan for the species or ecological community.
- Habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act (DEH 2006).

To date, no critical habitat for *Euphrasia arguta* has been listed on the Department of Sustainability, Environment, Water, Population and Communities Register of Critical Habitat.

In addition no critical habitat has been identified for this species under the TSC Act.

Is the action likely to disrupt the breeding cycle of a population?

Although the biology of *Euphrasia arguta* is poorly known the species is a semi parasitic annual herb flowering mainly from October to January. The species occurs in eucalypt forest with a mixed grass and shrub understorey, grassy areas near rivers. *Euphrasia arguta* has established in disturbed areas of these habitats and the largest known population of the species in Nundle State Forest followed mechanical clearing for a firebreak. Additionally it has been suggested that due to the volume of seed production there is 'potential for rapid population growth under good conditions' (TSSC 2011).

The species has not been previously recorded in the locality and was not recorded within the study area during the current field survey. The nearest record of the species is over 250 km from the subject site.

Important lifecycle elements for the species such as the suitability of the subject site to support habitat for pollinators (invertebrate and vertebrate), seed dispersal mechanisms and germination triggers would be affected by the direct impact of vegetation clearing. Indirect impacts that may affect the types and condition of the marginal habitat for the species that may operate in the study area include weed invasion and altered disturbance regimes as a result of ongoing operation and maintenance. However despite the known direct impact and potential indirect impacts on habitat for the species, pollinators, dispersal mechanisms and pathways and germination triggers would persist in the locality and fully structured preferred vegetation types on preferred soil types would remain in both private and public lands in the study area and locality. In the study area this includes public lands with environmental protection zoning that extend from the study area into the locality. Conservation reserves in the locality where riparian vegetation would be unaffected and the full range of features and conditions essential for the species lifecycle would continue to be present are Mullion Range State Conservation Area and Girralang Nature Reserve.

The project would not result in the direct loss of the species from known sites. Additionally there would not be an adverse effect on the life cycle of the species, including reproduction success and mode of dispersal such that a viable local population is placed at risk of extinction.

Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Although the species hasn't been recorded within the locality, the study area is considered to contain marginal habitat for this species. Marginal habitat for the species is limited to Riparian Forest/Woodland vegetation located at Summer Hill Creek Fourth Crossing, Oaky Creek and on the Macquarie River, totalling 1.15 ha. This accounts for a relatively small percentage (0.8) of the total potential habitat for this species within the locality which is estimated at 146.97 ha.

Given the area of potential habitat for the species in the locality including in local conservation reserves, current threats such as grazing and roadside vegetation management and disturbed condition of the potential habitat the relative importance of habitat within the study area for the long-term survival of the species is considered low.

The project is not likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Is the action likely to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat?

The project may increase the threat of weed invasion particularly during construction due to the spread of exotic annual and perennial grasses and herbs from existing disturbed areas. However the marginal potential habitat for the species in the study area is affected by weed invasion.

The EPBC Act KTP 'Competition and land degradation by feral rabbits' is identified by the Department of Sustainability, Environment, Water, Population and Communities as a potential threat to *Euphrasia arguta*. Rabbits were recorded in the current surveys and are ubiquitous to the rural landscape of the locality. The project is unlikely to promote the further establishment of rabbits.

Is the action likely to introduce disease that may cause the species to decline?

No information is available on the susceptibility of the species to plant diseases such as *Phytophthora cinnamomi*. However as a precaution, hygiene protocols for vehicles and machinery have been recommended.

Is the action likely to interfere with the recovery of the species?

No recovery plan has been prepared for this species. The Approved Conservation Advice for the species identified priority actions for recovery of *Euphrasia arguta*, none of which have relevance to the project.

As only a small portion of potential habitat would be impacted for this species, and it is not known to occur in the study area, the project is unlikely to interfere with the recovery of this species.

Conclusion

The project would directly impact upon a small area of potential habitat for *Euphrasia arguta* in the study area. Although the species has potential habitat in the study area, only a small area of potential habitat would be impacted by the project, compared to a large area of potential habitat available in the locality. The project is unlikely to fragment or isolate any populations or areas of potential habitat for this species, and potential habitat to be disturbed is not considered important to this species. For these reasons it is considered unlikely that the project would have a significant impact on *Euphrasia arguta*.

Thesium australe	**Austral Toadflax**

Thesium australe is listed as Vulnerable under the EPBC Act.

Is the action likely to lead to a long-term decrease in the size of an important population of a species?

The species has not been previously recorded in the locality (Figure 8) and was not recorded within the study area during the current field survey. The nearest and most recent record occurs over 150 km to north-east in 1959.

Given that a population has not been recorded in the study area, and that only a small amount of potential habitat (0.35% of the estimated total) would be impacted, it is considered unlikely that the project would lead to a long term decrease in the size of an important population of *Thesium australe*.

Is the action likely to reduce the area of occupancy of an important population?

Thesium australe is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia (DEC 2005|). The study area is falls within the known extent of occupancy of the species and it is considered that the study area supports potential habitat for the species. However the species was not recorded in the study area during the current investigations and the project would not lead to a reduction in the area of occupancy of an important population of this species.

Is the action likely to fragment an existing important population into two or more populations?

The species has not been previously recorded in the locality (Figure 8) and was not recorded within the study area during the current field survey. The nearest and most recent record was made over 150 km to north-east in 1959. The subject site is not located between any known populations. Given that a population has not been recorded in the study area, the project would not lead to the fragmentation or isolation of an important population of *Thesium australe*.

Is the action likely to adversely affect habitat critical to the survival of a species?

'Habitat critical to the survival of a species or ecological community' is defined by DEH (2006) as areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal.
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators).
- To maintain genetic diversity and long term evolutionary development.
- For the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to:

- Habitat identified as critical in a recovery plan for the species or ecological community.
- Habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act (DEH 2006).

To date, no critical habitat for *Thesium australe* has been listed on the Department of Sustainability, Environment, Water, Population and Communities Register of Critical Habitat.

In addition no critical habitat has been identified for this species under the TSC Act.

Is the action likely to disrupt the breeding cycle of an important population?

Thesium australe is a perennial herb and is likely to be pollinated by a range of invertebrates. The species is parasitic on roots of other plants and has a strong association with *Themeda australis*. The species is known to germinate in response to fire but also in the absence of fire.

The species has not been previously recorded in the locality and was not recorded within the study area during the current field survey. The nearest record of the species is over 150 km to the north-east of the subject site.

Important lifecycle elements such as the suitability of the subject site to support habitat for the species, pollination and dispersal mechanisms and germination triggers would be affected by the direct impact of vegetation clearing. Indirect impacts that may affect the types and condition of the marginal habitat for the species that may operate in the study area include weed invasion and altered disturbance regimes as a result of ongoing operation and maintenance. However despite the known direct impact and potential indirect impacts on habitat for the species, pollinators dispersal mechanisms and pathways and germination triggers would persist in the locality and fully structured preferred vegetation types on preferred soil types would remain in both private and public lands in the study area and locality. In the study area this includes public lands with environmental protection zoning that extend from the study area into the locality. Conservation reserves in the locality where grassy woodland would be unaffected and the full range of features

and conditions essential for the species lifecycle would continue to be present are Mullion Range State Conservation Area and Girralang Nature Reserve.

Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Although the species hasn't been recorded within the locality, the study area is considered to contain suitable habitat for this species including derived grasslands and poor to good condition and regrowth and remnant woodland.

Approximately 18,851 ha of potential habitat for *Thesium australe* exists within the locality including grassland and woodland vegetation. The project would involve the permanent direct loss of approximately 51.09 ha of these vegetation types and the temporary loss/disturbance of approximately 14.67 ha. The total area of direct impact constitutes 0.49% of the potential habitat for *Thesium australe* within the locality.

Given the area of potential habitat for the species in the locality including in local conservation reserves, current threats such as grazing and roadside vegetation management, the relative importance of habitat within the study area for the long-term survival of the species is considered low.

The project is not likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Is the action likely to result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The project may increase the threat of weed invasion particularly during construction due to the spread of exotic annual and perennial grasses and herbs from existing disturbed areas. However *Thesium australe* is known from modified plant communities including derived grasslands and its lifecycle is dependant on other plant species.

The EPBC Act KTP 'Competition and land degradation by feral rabbits' is identified by the Department of Sustainability, Environment, Water, Population and Communities as a threat to *Thesium australe*. Rabbits were recorded in the current surveys and are ubiquitous to the rural landscape of the locality. The project is unlikely to promote the further establishment of rabbits.

Is the action likely to introduce disease that may cause the species to decline?

No information is available on the susceptibility of the species to plant diseases such as *Phytophthora cinnamomi*. However as a precaution, hygiene protocols for vehicles and machinery have been recommended.

Is the action likely to interfere with the recovery of the species?

A draft recovery plan has been prepared for this species. As only a small portion of potential habitat would be impacted for this species, and it is not known to occur in the study area, the project is unlikely to interfere with the recovery of this species.

Conclusion

The project would directly impact upon a small area of potential habitat for *Thesium australe* in the study area. Although the species has potential habitat in the study area, only a very small area of potential habitat would be impacted by the project, compared to a large area of potential habitat available in the locality. The project is unlikely to fragment or isolate any populations or areas of potential habitat for this species, and potential habitat to be disturbed is not considered important to this species. For these reasons it is considered unlikely that the project would have a significant impact on an important population of *Thesium australe*.

Box Gum Woodland

Box Gum Woodland is listed as a Critically Endangered Ecological Community under the EPBC Act.

Vegetation mapping in the current surveys has identified 15.96 ha of EPBC Act listed box gum woodland in the study area. Vegetation mapping by DEC (2006) has estimated 4306.2 ha of BVTs equivalent to TSC Act and potentially EPBC Act listed box gum woodland in the locality. The location of EPBC Act listed box gum woodland is shown in Figures 7.1 to 7.12 with the DEC (2006) mapping presented in Figures 5.1 to 5.12. Generally the community throughout the study area is in a moderate condition.

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

Reduce the extent of an ecological community

The key locations where EPBC Act box gum woodland would be permanently and temporarily affected by the project including disturbance of vegetation and the soil profile are in the northern section of the study area near the Macquarie River and on Oaky Lane. The permanently impacted area of box gum woodland including for construction and operation of the project is estimated at 5.81 ha equating to approximately 0.13% of the estimated extent of the community in the locality. The temporarily impacted area of box gum woodland during construction of the project is estimated at 10.0 ha equating to 0.23% of the estimated extent of the community in the locality.

Fragment or increase fragmentation of an ecological community

Figures 5.1 to 5.12 show the distribution of EPBC Act box gum woodland mapped in the current surveys in relation to mapping of box gum woodland and other vegetation types by DEC (2006).

Box gum woodland of the study area on Oaky Lane generally occurs on the edge of the extensive vegetation cover and potential habitat for the community to a highly modified landscape extending to the east. At the northern end of the study area box gum woodland would remain relatively continuous with the retained adjoining vegetation.

Adversely affect habitat critical to the survival of an ecological community

'Habitat critical to the survival of a species or ecological community' is defined by DEH (2006) as areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal.
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators).
- To maintain genetic diversity and long term evolutionary development.
- For the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act (DEH 2006).

To date, there is no critical habitat listed by the Minister for Department of Sustainability, Environment, Water, Population and Communities for box gum woodland. However, the draft national recovery plan for the community (DECCW 2010b) states that 'in very broad terms, habitat critical to the survival of Box-Gum Grassy Woodland is on the moderate to highly fertile soils of the western slopes of NSW and Queensland, the northern slopes of Victoria, and the tablelands of the Great Dividing Range from southern Queensland through NSW and the ACT.' Further DECCW (2010b) suggest that given the currently highly fragmented and degraded state of the community all areas of Box-Gum Grassy Woodland which meet the minimum condition criteria 'should be considered critical to the survival of this ecological community.'

Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival

The project would result in the permanent removal of 5.81 ha of the community and the temporary loss/modification of 10.0 ha. The main abotic factor that would be modified would be the soil profile including surface and subsoils in locations of earthworks primarily for installation of the pipeline, pumping stations and power poles. There would be no modification or destruction of abotic factors that are necessary for the survival box gum woodland in the locality outside of the study area.

Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species

Box gum woodland within the study area that would be retained and that which occurs in the locality that would not be directly impacted includes both regrowth and remnant vegetation that is generally in a moderate condition. The main factors that are likely to cause a substantial change to the species composition of retained box gum woodland from the project are:

- The amplification of the impacts of existing introduced flora and fauna.
- Introduction of new and invasive exotic flora and fauna.

Other than where box gum woodland would be temporarily modified on the subject site, the project is unlikely to cause a substantial change in the species composition of the retained stands of the community or result in an increase in the impact of introduced flora and fauna that are impacting on the community in the region.

Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

Assisting invasive species, that are harmful to the listed ecological community, to become established; or

The class of invasive introduced flora species that are identified as posing the highest level of threat to box gum woodland are exotic perennial grasses. There are several key exotic perennial grass species affecting box gum woodland including Phalaris *Phalaris aquatica* common to abundant throughout the study area and wider region. Land degradation and grazing by European rabbits is a threat to box gum woodland particularly in view of the floristic structure of the community where the groundcover stratum supports the highest level of plant species richness. The proposed action has some potential to assist one invasive flora species identified as a posing a threat to become further established. The project is unlikely to promote the further establishment of European rabbits.

Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community

The project would not involve the use of chemicals or result in the mobilisation of pollutants that would kill or interfere with the life cycle of flora species that occur in box gum woodland in the study area or locality.

To interfere with the recovery of an ecological community

The draft national recovery plan for the community has been prepared by DECCW (2010b). The objective of the draft recovery plan is to minimise the risk of extinction of the ecological community through: populations or ecological communities. The key thresholds are:

- Achieving no net loss in extent and condition of the ecological community throughout its geographic distribution.

- Increasing protection of sites in good condition.
- Increasing landscape functionality of the ecological community through management and restoration of degraded sites.
- Increasing transitional areas around remnants and linkages between remnants.
- Bringing about enduring changes in participating land manager attitudes and behaviours towards environmental protection and sustainable land management practices to increase extent, integrity and function of box-gum grassy woodland.

In the absence of compensatory measures there would be a residual loss of box gum woodland that would not be consistent with the recovery of the community.

Conclusion

The project will result in the permanent removal of 5.81 ha (approximately 0.13% of the estimated extent of the community in the locality) as well as temporary impacts to a further 10.0 ha of this community. Main impacts include the removal of vegetation and exacerbation of disturbance regimes. Box gum woodland within the study area is considered 'critical to the survival of this ecological community' in the draft recovery plan (DECCW 2010b). Recommendations have been made that would mitigate and ameliorate the temporary impacts to box gum woodland as a result of the project. However, based on residual impacts outlined above, we conclude that the project is likely to result in a significant impact to box gum woodland.

Regent Honeyeater	***Anthochaera phrygia***

The Regent Honeyeater is listed as Endangered under the EPBC Act. This species is also listed an Critically Endangered under the TSC Act.

Is there a real chance or a possibility that the action will lead to a long-term decrease in the size of a population of the species?

The Regent Honeyeater has been recorded twice within 10 km of the study area, in 1978 and 2005.

Approximately 29% of the pipeline route would occur within existing road reserves and approximately 71% would traverse private properties. Where possible, the route would avoid treed areas and traverse predominantly cleared grassland and/or be trenched beneath the existing roads. The habitat that would be removed exists as narrow strips along existing road reserves and as contiguous patches from the Offtake Point at the Macquarie River until where the route joins Long Point Road.

Whilst the project would impact potential foraging habitat within the area, not all vegetation within the study area would be removed. Further, the potential habitat for the Regent Honeyeater within the study area is contiguous with similar quality habitat that would not be disturbed. Given the above and the lack of recent records of this species the project is not likely to lead to a long-term decrease in the size of a population of the Regent Honeyeater.

Is there a real chance or a possibility that the action will reduce the area of occupancy of the species?

The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia (OEH 2005). Once recorded between Adelaide and the central coast of Queensland, its range has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. In NSW the distribution is very patchy and mainly confined to the two main breeding areas (Capertee Valley and the Bundarra-Barraba region) and surrounding fragmented woodlands (OEH 2012). The project is located toward the western extent of the species distribution, around 100 km east of the most westerly Regent Honeyeater records. However given the lack of recent records of this species within 10 km of the study area, and the nomadic movement of this species in response to food availability, the project would be unlikely to reduce the area of occupancy of the Regent Honeyeater.

Is there a real chance or a possibility that the action will fragment an existing population into two or more populations?

Ecological studies of the Regent Honeyeater have shown that this species undertakes large-scale nomadic movements across hundreds of kilometres. The nature of these movements remain poorly understood and are likely to be dependent on foraging resource availability including spatial and temporal flowering patterns.

The proposed pipeline corridor primarily occurs within cleared paddocks within private properties or the existing road reserve. Where possible all efforts have been made to select a route that would require minimal removal of native vegetation. The pumping station locations, electricity supply to service the pipeline, and construction compounds have also been proposed where minimal native vegetation clearance would be required.

The Regent Honeyeater inhabits box-gum woodlands and riparian forests. These habitats are found throughout the study area, primarily extending from Macquarie River at the Offtake Point and through to Long Point Road and within the box-gum woodland which occurs throughout Mullion Range State Conservation Area adjoining Oaky Lane. The proposed pipeline is closely aligned with Oaky Lane on the opposite (eastern) side to the State Conservation Area, and would traverse predominantly cleared grassland and areas of open woodland. Given that this species moves across the landscape in response to food resources, the clearing of a narrow corridor of vegetation is unlikely to fragment an existing population of Regent Honeyeaters into two of more populations.

Is there a real chance or a possibility that the action will adversely affect habitat critical to the survival of the species?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. A Register of Critical Habitat is maintained by the Minister under the EPBC Act. To date, no critical habitat has been declared for the Regent Honeyeater (DEWHA 2009e).

Critical habitat can also refer to areas that are necessary for activities such as foraging, breeding or dispersal; for the long-term maintenance of the species; to maintain genetic diversity and long-term evolutionary development; or for the reintroduction of populations or recovery of the species (DEWHA 2009d).

Is there a real chance or a possibility that the action will disrupt the breeding cycle of a population of the species?

This Regent Honeyeater inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support large numbers of mature trees, high canopy cover and abundance of mistletoes. The box-gum woodland and riparian forest communities within the study area support these important habitat features.

Regent Honeyeaters nest in loose colonies. There are three known key breeding areas, two of them in NSW - Capertee Valley and Bundarra-Barraba regions. The species breeds between July and January in box-gum and temperate woodlands and riparian forests. The study area is not known to support an important breeding area for this species. It should be noted, the current surveys were not undertaken in the optimal survey period to detect this species (winter months).

The pipeline corridor and associated infrastructure would require the removal of vegetation that is potential habitat for the Regent Honeyeater. Although habitat would be removed by the project, the Regent Honeyeater is not known to breed in the region and the removal of box-gum woodland habitats are likely to impact potential foraging resources only. Given the above, the project would be unlikely to disrupt the breeding cycle of a population of the Regent Honeyeater.

Is there a real chance or a possibility that the action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The project would directly impact up to 40.22 ha of potential foraging habitat (box-gum woodlands and riparian forest) for the Regent Honeyeater. The habitat to be directly impacted represents 0.21% of potential habitat within the locality (18,726.04 ha). The removal and/or disturbance of potential habitat by the project would include both temporary and permanent direct impacts. Following installation of the pipeline, areas of the habitat would be allowed to regenerate.

The Regent Honeyeater moves nomadically across the landscape in response to foraging resource availability. Despite the lack of recent or proximate records of the species in relation to the study area the potential habitat to be removed by the project is considered to be of moderate to high importance for the long-term survival of the Regent Honeyeater within the locality. The species has not been recorded within the study area previously but it has been recorded within the locality (recorded during 1978 and 2005) and has the potential to occur within the study area utilising foraging resources within box-gum woodlands. Furthermore, the study area does support preferred tree species of the Regent Honeyeater. Given the species' high mobility and that large areas of similar quality habitat would remain adjacent to the study area, the loss and/or direct disturbance of 40.22 ha of potential habitat within the locality (0.21% of that available) is unlikely to decrease the availability and quality of habitat to the extent that the Regent Honeyeater as a species is likely to further decline.

Is there a real chance or a possibility that the action will result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat?

Competition with other honeyeater species is listed as a threat to the Regent Honeyeater by the Office of Environment and Heritage (DECC, 2005d). The vegetation removal proposed by the project would lead to some habitat alteration which is known to favour the colonisation of Noisy

Miners *Manorina melanocephala*. Noisy Miners live in territorial family groups which are aggressive to other woodland birds and have been listed as a threat which can disadvantage species including the Regent Honeyeater. The Noisy Miner was recorded during the field investigations and is known to be present within open woodland habitats throughout the study area. The vegetation to be cleared primarily occurs along the existing road reserves and traverses cleared private properties, and is comprised of narrow strips along the existing road reserves and as contiguous patches from the Offtake Point at the Macquarie River until where the route joins Long Point Road. The project is not likely to result in disruptive species including the Noisy Miner to become established where it does not already occur. Research is being conducted into the potential impact of the feral honeybee on the Regent Honeyeater (DECC, 2005d). The project is not considered likely to result in either feral honeybees or Noisy Miners to become established in potential Regent Honeyeater habitat where they do not already occur.

Is there a real chance or a possibility that the action will introduce disease that may cause the species to decline?

No diseases have been identified as threats to the Regent Honeyeater by the Office of Environment and Heritage or Department of Sustainability, Environment, Water, Populations and Community (Menkhorst et al. 1999; DECC, 2005d). A variety of factors however contribute to tree dieback which is threat to the Regent Honeyeater. Disease including Myrtle Rust has been recorded on Myrtaceae species within bushland along the coast. This fungal disease may lead to dieback however the long-term effects of the disease remain unknown. The disease has not been recorded within the Orange Region and it is considered unlikely that the project would introduce this disease provided standard equipment hygiene protocols are followed.

Is there a real chance or a possibility that the action will interfere with the recovery of the species?

The key threats to Regent Honeyeater populations are loss, fragmentation and degradation of the species' habitat (DSEWPaC). This specifically refers to the removal of mature canopy species as these provide favourable foraging habitat. A federal recovery plan was in place from 1999 to 2003 to ensure the continued presence of the species in the wild and attempt to down-list its status from endangered to vulnerable.

Conclusion

Based on the above assessment, it is unlikely Regent Honeyeater would be subject to significant impacts as a result of the project.

Swift Parrot	***Lathamus discolor***

The Swift Parrot is listed as Endangered under the EPBC Act. This species is also listed as Endangered under the TSC Act.

Is there a real chance or a possibility that the action will lead to a long-term decrease in the size of a population of the species?

The Swift Parrot is a highly nomadic species that occurs in woodlands and forests in NSW (Higgins 1999). It migrates in response to food availability and seasonal changes. It is often recorded in

NSW between May and August and breeds in Tasmania during the warmer seasons (Higgins 1999).

While on the mainland, Swift Parrots occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter-flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. Commonly used lerp-infested trees include Grey Box *E. microcarpa*, Grey Box *E. moluccana* and Blackbutt *E. pilularis* (DEC 2005z).

The project would remove and/or directly disturb approximately 51.09 ha of box-gum woodland and riparian forests which include important winter-flowering eucalypt species which the Swift Parrot may rely upon on a seasonal basis. The study area does not provide potential breeding habitat as the species breeds exclusively in Tasmania (Higgins 1999).

The project would impact potential foraging habitat for the Swift Parrot through the removal of riparian forest and box-gum woodland. Approximately 51.09 ha of potential foraging habitat would be removed from and/or directly disturbed within the study area with a further 14.67 ha affected by indirect impacts (e.g. edge effects). This equates to only 0.35 % of box-gum woodland and riparian forests within the locality (18,726.04). Conservation reserves in the locality where habitat for this species would be unaffected are Mullion Range State Conservation Area and Girralang Nature Reserve. The vegetation to be removed occurs as a narrow linear extent along the pipeline corridor, provided these important foraging resources are replenished within the locality, the project is unlikely to reduce the availability of winter-flowering resources that would lead to a long-term decrease in the size the Swift Parrot population.

Is there a real chance or a possibility that the action will reduce the area of occupancy of the species?

The Swift Parrot has a wide distribution as it breeds in Tasmania, but migrates to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland (DEC 2005y). This nomadic species moves across a broad range of the landscape in response to seasonal food availability. As a result the study area is not at, or near, the limit of distribution for this species and the project is unlikely to reduce the occupancy of the species.

Is there a real chance or a possibility that the action will fragment an existing population into two or more populations?

Swift Parrots are winter migrants to NSW, and travel to foraging sites on a cyclic basis depending on food availability (DEC 2005z). The project would involve removal of potential feed trees from the study area. The areas to be removed (predominantly roadside areas) are contiguous with intact forest that would remain. Given the availability of surrounding eucalypt forests, the narrow areas of proposed vegetation removal/disturbance (the 51.09 ha to be removed is made up of smaller areas spread along the 37 km route) and the high mobility of the Swift Parrot, it is considered unlikely that the project would fragment an existing population into two or more populations.

Is there a real chance or a possibility that the action will adversely affect habitat critical to the survival of the species?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. A Register of Critical Habitat is maintained by the Minister under the EPBC Act. To date, no critical habitat has been declared for the Swift Parrot (DEWHA 2009d).

Critical habitat can also refer to areas that are necessary for activities such as foraging, breeding or dispersal; for the long-term maintenance of the species; to maintain genetic diversity and long-term evolutionary development; or for the reintroduction of populations or recovery of the species (DEWHA 2009d).

The Swift Parrot is reliant on a mosaic of winter foraging habitat throughout the south-east of Australia which it may selectively utilise depending on flowering productivity across the region.

Is there a real chance or a possibility that the action will disrupt the breeding cycle of a population of the species?

The Swift Parrot is a highly nomadic species that occurs in woodlands and forests in New South Wales (Higgins 1999). It is often recorded in New South Wales between May and August and breeds in Tasmania during the warmer seasons (Higgins 1999). The project would not disrupt the breeding of this species in Tasmania.

Is there a real chance or a possibility that the action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The Swift Parrot has not been recorded within 10 km of the study area however the Swift Parrot is nomadic moving across the landscape utilising foraging resources seasonally so may forage within the study area on occasion.

The project would remove and/or directly disturb approximately 51.09 ha of box-gum woodland and riparian forests which include important winter-flowering eucalypt species which the Swift Parrot may rely upon on a seasonal basis. The habitat to be directly impacted represents 0.27 % of potential habitat within the locality (18,726.04 ha).

The habitat to be impacted includes largely intact woodlands with little disturbance, this habitat is of moderate to high quality habitat for this species. Given this, despite the absence of records of the species within the study area and the species' high mobility, the loss and/or direct disturbance of 51.09 ha of potential habitat within the locality should be offset to alleviate the direct impacts (remove and decreased quality) that the project would have to ensure that the Swift Parrot is not likely to further decline.

Is there a real chance or a possibility that the action will result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat?

Predation or competition by invasive species is not listed as a threat to the Swift Parrot by the Office of Environment and Heritage or Department of Sustainability, Environment, Water, Population and Communities (Swift Parrot Recovery Team 2001). The project is unlikely to result in the introduction or exacerbation of any invasive species that is harmful to the Swift Parrot in the study area.

Is there a real chance or a possibility that the action will introduce disease that may cause the species to decline?

Infection by *Psittacine circoviral* (beak and feather) disease affecting endangered psittacine species is listed as a key threatening process (NSW Scientific Committee 2008e; DEH 2005). Swift Parrots are considered to have a high potential for being adversely impacted by *Psittacine circoviral* due to their low population numbers and the fact that *Psittacine circoviral* has been recorded in wild birds in NSW (NSW Scientific Committee 2008e). The project would be unlikely to result in the introduction of *Psittacine circoviral* into the study area, or increase the incidence of *Psittacine circoviral* in birds in NSW.

Is there a real chance or a possibility that the action will interfere with the recovery of the species?

The Department of Sustainability, Environment, Water, Populations and Community identifies clearing and fragmentation of wintering and breeding habitats, decline of nest site availability, competition from other species, beak and feather disease, and death from collision as the key threats to Swift Parrot populations. The objective of the National Recovery Plan for the Swift Parrot is to prevent further population decline and to achieve a demonstrable sustained improvement in the quality and quantity of Swift Parrot habitat to increase carrying capacity (Saunders and Tzaros 2011). Beak and feather disease was listed as a key threatening process in 2001 and a threat abatement plan was published in 2005.

The potential habitat to be removed provides winter foraging resources that this species may rely on seasonally. Although the proportion of habitat to be directly impacted is small (0.27 %), degradation of foraging resources would occur through clearing of wintering foraging habitats. Provided the recommended mitigation measures outlined in section 6.0 of this report are undertaken, the project would not interfere with the recovery of the Swift Parrot.

Conclusion

Based on the above assessment, it is unlikely that the Swift Parrot would be subject to significant impacts as a result of the project.

Spotted-tailed Quoll	***Dasyurus maculatus maculatus***

The Spotted-tailed Quoll is listed as Endangered under the EPBC Act. The species is also listed as Vulnerable under the TSC Act.

Is there a real chance or a possibility that the action will lead to a long-term decrease in the size of a population of the species?

The Spotted-tailed Quoll occurs in a range of habitats including sclerophyll forest and woodlands, coastal heathlands and rainforests (Dickman and Read 1992, Edgar and Belcher 1995). Occasional sightings have been made in open country, grazing lands, rocky outcrops and other treeless areas (NPWS 1999h).

This species' habitat requirements include suitable den sites (such as hollow logs, tree hollows, rocky outcrops or caves) and an abundance of food (NPWS 1999h). The diet of juveniles is dominated by invertebrates, small mammals and birds, while the diet of adults is dominated by medium-sized mammals (Belcher *et al.* 2008). Individuals require large areas of relatively intact vegetation through which to forage (NPWS 1999h). The home range of a female is between 180 hectares – 1000 hectares, while males have larger home ranges of between 2000 hectares – 5000 hectares (Belcher *et al.* 2008).

The Spotted-tailed Quoll has been previously recorded four times within 10 km of the study area (including in immediate proximity to the study area), predominantly west and east of the study area. Two individuals were trapped (during 1989 and 1973) while sightings of Spotted-tailed Quolls have been reported on more recently as a result of Dan Lunney's community wildlife surveys (undertaken during 2004-2006).

The study area provides potential foraging and denning habitat for the Spotted-tailed Quoll within the box-gum eucalypt woodlands and riparian forests. This species is also likely to utilise wildlife corridors within the locality to move between areas of habitat.

About 40.22 ha of box-gum eucalypt woodland and riparian forest (potential habitat) would be removed from and/or directly disturbed within the study area with a further 14.26 ha affected by indirect impacts (e.g. edge effects). This equates to only 0.29 % of the potential habitat (e.g. box-gum eucalypt woodlands and riparian forest) available within the locality (18,726.04 ha).

The project would involve the removal of potential habitat including rocky outcrops, up to 250 hollow-bearing trees (supporting a range of number and sized hollows) and large fallen logs which support potential denning sites and prey species. Large areas of habitat occur for this species within the greater locality within Mullion Range State Conservation Area and Girralang Nature Reserve which would remain unaffected by the project. Given the species' high mobility, and the narrow corridor of vegetation to be removed, the project is unlikely to result in a long-term decrease in the size of a population of the Spotted-tailed Quoll.

Is there a real chance or a possibility that the action will reduce the area of occupancy of the species?

The study area does not lie at or near the limit of the area of occupancy of the Spotted-tailed Quoll, which extends between the Victorian and Queensland borders in New South Wales. Spotted-tailed Quoll records are generally confined to within 200 km of the coast and range from the Queensland border to Kosciuszko NP (DSEWPaC). The project study area lies west of a broader distribution of records of the species. Impacts to the Spotted-tailed Quoll occurring within the study area and surrounds are unlikely to reduce the species' extent through this broader distribution of records. Given this, and that the study area does not occur at or near the limit of the area of occupancy of the Spotted-tailed Quoll, the project is unlikely to reduce the area of occupancy for this species.

Is there a real chance or a possibility that the action will fragment an existing population into two or more populations?

Given the distribution of records both east and west of the study area, and the close proximity of some records to the study area, it is considered likely that the Spotted-tailed Quoll occurs within and passes through the study area from time to time.

The project runs alongside the Mullion Range State Conservation Area and crosses regional biodiversity corridors, as well as a number of smaller local riparian and roadside corridors. By crossing these wildlife corridors, the project creates (or increases) a barrier to fauna movement between areas of habitat, however this disturbance would be predominantly temporary as a proportion of the disturbed vegetation would be allowed to regenerate. Although the project would not present a permanent barrier to movement, the prolonged disturbance over the duration of construction may disrupt the movement patterns of the Spotted-tailed Quoll and result in the fragmentation of a population of Spotted-tailed Quoll into two or more populations.

Is there a real chance or a possibility that the action will adversely affect habitat critical to the survival of the species?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. A Register of Critical Habitat is maintained by the Minister under the EPBC Act. To date, no critical habitat has been declared for the Spotted-tailed Quoll (DEWHA 2009d).

Critical habitat can also refer to areas that are necessary for activities such as foraging, breeding or dispersal; for the long-term maintenance of the species; to maintain genetic diversity and long-term evolutionary development; or for the reintroduction of populations or recovery of the species (DEWHA 2009d).

Is there a real chance or a possibility that the action will disrupt the breeding cycle of a population of the species?

No evidence of Spotted-tailed Quolls was detected (e.g. latrine sites, tracks or kills) during the current surveys. Despite this the confirmed historical records of this species and presence of high quality habitat occurring within and surrounding the study area suggest that this species will traverse and utilise resources within the study area from time to time.

The Spotted-tailed Quoll requires suitable den sites (such as hollow logs, tree hollows, rock outcrops or caves) for breeding (DEC 2005„). Within the study area, hollow-bearing trees, hollow logs and boulderous rocky outcrops provide potential breeding habitat for this species. Most of the areas to be removed that contain such breeding resources occur within the northern extent of the study area within intact box-gum woodlands and riparian forests. These patches of vegetation and sheltering resources to be removed are contiguous, however, with intact forest that also contains the same potential breeding resources.

The project would impact areas of high quality potential breeding resources for the Spotted-tailed Quoll within the study area which has the potential to affect the breeding opportunities for a resident population of this species.

Is there a real chance or a possibility that the action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The project would directly impact up to 40.22 ha of potential foraging and breeding habitat (eucalypt box-gum woodlands and riparian forest) for the Spotted-tailed Quoll. The habitat to be directly impacted represents 0.21 % of potential habitat within the locality (18,726.04 ha). A further 14.26 ha of box-gum woodlands and riparian forest would be indirectly affected (e.g. edge effects) by the project. In total, about 0.29 % of the potential habitat occurring in the locality would be impacted by the project. Although only a small percentage of habitat that would be impacted proportional to that which occurs within the locality, that large areas of high quality habitat that would remain untouched within the protected areas of Mullion Range State Conservation Area and Girralang Nature Reserve and that important habitat features (e.g. large boulders) would be salvaged and transferred to nearby areas, the habitat quality within the study area would be modified and diminished as a result of project, however it is unlikely that this would occur to a level that would lead to the decline of the Spotted-tailed Quoll.

Is there a real chance or a possibility that the action will result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat?

DSEWPaC identifies predation and competition by/with the Red Fox (*Vulpes vulpes*), Dingo (*Canis lupus dingo*), domestic dog (*Canis lupus familiaris*) and cats (*Felis catus*) as a threat to the Spotted-tailed Quoll (DEWHA 2009e). The feral cat, domestic dog and Red Fox were all recorded within the study area during the current surveys and may already be having an effect on the Spotted-tailed Quoll. However the project is unlikely to increase the extent or abundance of these invasive species further throughout the study area.

Is there a real chance or a possibility that the action will introduce disease that may cause the species to decline?

The Department of Sustainability, Environment, Water, Populations and Communities does not list disease as a threat to the Spotted-tailed Quoll (DEWHA 2009e). The project is unlikely to lead to the introduction of a disease that would cause a decline in the Spotted-tailed Quoll.

Is there a real chance or a possibility that the action will interfere with the recovery of the species?

There is currently no published recovery plan for the Spotted-tailed Quoll. The Department of Sustainability, Environment, Water, Populations and Communities identify the red fox, feral cat and cane toad as threats to the recovery of the Spotted-tailed Quoll within respective threat abatement plans (DEWHA 2008d, DEWHA 2008c, DSEWPaC 2011).

The Cane Toad may also pose a threat to the recovery of the Spotted-tailed Quoll. Cane Toad records are unprecedented in the region however and the project is highly unlikely to result in this species becoming established in the study area or locality. However as a precaution it is recommended that the vegetation management plan states use of sugar cane mulch in revegetation and/or landscaping works is strictly regulated to minimise any risk of Cane Toad transportation to the area.

The project would result in the removal of some forested areas containing hollow-bearing trees and hollows logs, including riparian vegetation. However, similar habitat resources occur and would remain adjacent to the cleared areas.

Conclusion

Based on the above assessment, it is unlikely Spotted-tailed Quoll would be subject to significant impacts as a result of the project. However, as a precautionary approach a Referral under the provisions of the EPBC Act has been undertaken to specifically address this species.

Booroolong Frog	***Litoria booroolongenis***

The Booroolong Frog is listed as Endangered under the EBC Act and endangered under the TSC Act.

Is there a real chance or a possibility that the action will lead to a long-term decrease in the size of a population of the species?

The Booroolong Frog has not been recorded within the study area and was not detected during the current surveys. The closest records occur approximately 50 km to the east of the study area spread south and north of Bathurst. The most recent of these records (dating from 2009) are found within the Macquarie River system. The pipeline corridor traverses creek crossings which are directly connected to the Macquarie River and supports the rocky cobble substrates preferred by the Booroolong Frog.

Sub-optimal potential habitat for the Booroolong Frog occurs within Summer Hill Creek (specifically at the Third and Forth Crossings and a tributary) and Oaky Creek. These streams are part of the Macquarie River system and support rocky in stream habitat required by the Booroolong Frog.

Direct impacts of the project would be localised to the trench where the pipeline would be installed using open cut techniques. Indirect impacts include increased erosion following the removal of vegetation along the banks of the waterways and increased sediments entering the streams during and post construction. These impacts would be minimised through either the temporary re-direction or damming of stream flow during construction as well as the use of standard erosion control techniques. Following construction the bank vegetation would be reinstated and allowed to regenerate. Any large rocks moved during construction would also be reinstated.

The project has the potential to injure or kill individuals present within the study area during the construction phase, impact potential habitat and temporarily disrupt habitat connectivity. These combined impacts have the potential to lead to a long-term decrease in the size of a local population.

Is there a real chance or a possibility that the action will reduce the area of occupancy of the species?

The distribution of the Booroolong Frog is restricted to NSW and north-eastern Victoria, predominantly along the western-flowing streams of the Great Dividing Range (OEH 2005). It has disappeared from much of the Northern Tablelands, however several populations have recently been recorded in the Namoi catchment. The species is rare throughout most of the remainder of its range. The project is 50 km west of the western limit of the Booroolong Frogs known distribution. If present within the study area the project would be impacting on individuals at the western extent of their known distribution and would potentially reduce the area of occupancy for this species.

Is there a real chance or a possibility that the action will fragment an existing population into two or more populations?

The Booroolong Frog has not been recorded in proximity to the study area however potential habitats occur throughout the region associated with the Macquarie River system. The installation of the pipeline beneath the ground at creek crossings would potentially disrupt connectivity for this species as they would travel closely associated with the streams. This disruption to connectivity would be more intense during the spring and summer months during the breeding season when frogs are more active. The disturbance and disrupted connectivity associated with the installation of the pipeline at creek crossing would be temporary in nature, so the disrupted connectivity would be unlikely to lead to the long-term fragmentation of an existing population.

Is there a real chance or a possibility that the action will adversely affect habitat critical to the survival of the species?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. A Register of Critical Habitat is maintained by the Minister under the EPBC Act. To date, no critical habitat has been declared for the Booroolong Frog (DEWHA 2009d).

Critical habitat can also refer to areas that are necessary for activities such as foraging, breeding or dispersal; for the long-term maintenance of the species; to maintain genetic diversity and long-term evolutionary development; or for the reintroduction of populations or recovery of the species (DEWHA 2009d).

Is there a real chance or a possibility that the action will disrupt the breeding cycle of a population of the species?

The Booroolong Frog inhabits permanent streams with fringing vegetation such as ferns, sedges or grasses and cobble banks or rocks in stream. Tadpole development occurs in permanent or temporarily connected or isolated pools. Basking and sheltering habitat occurs within 100 m of stream habitats. Frogs are thought to shelter during the non-breeding season beneath fallen timber, leaf litter, rocks and vegetation.

The Booroolong Frog has not been previously recorded within or in proximity to the study area. Despite this the species is known from the Macquarie River system and has potential habitat within the study area that may be directly affected by the project as well as likely potential habitats that occur downstream which may be indirectly impacted by the project. The available potential habitats within the study area are sub-optimal given the current disturbance regime where the streams are already traversed by existing roads and subject to riparian weed infestations.

The project would directly impact sub-optimal potential breeding habitats for the Booroolong Frog, which if present within the study area or downstream, the lifecycle of a local population may be disrupted by the project.

Is there a real chance or a possibility that the action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The habitats currently available for the Booroolong Frog within the study area are in sub-optimal condition as they are already subject to disturbances associated with the road crossing (e.g.

increased sediment run-off from hard surfaces, riparian weed infestation, litter dumping and other anthropomorphic disturbances). The project would directly impact on creek crossings and have some indirect impacts to downstream habitats through increased sediments in the waterways. These impacts would be temporary so are unlikely to reduce habitat quality or availability to the extent that the species would decline.

Is there a real chance or a possibility that the action will result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat?

The Department of Sustainability, Environment, Water, Population and Communities identify predation of tadpoles by introduced fish as threats to the recovery of the Booroolong Frog. The introduced Mosquito Fish is listed as a threat to the Booroolong Frog, however the project would not increase the spread or distribution of this species where it does not already occur. Other introduced fish species are known to occur within the river system which would prey on tadpoles however the project would not increase the spread or density of these species within the study area. Foxes, cats and dogs were also recorded within the study area during the surveys which pose a threat to the Booroolong Frog through predation, however the project would not increase the prevalence or range of these species throughout the study area.

Is there a real chance or a possibility that the action will introduce disease that may cause the species to decline?

The Department of Sustainability, Environment, Water, Population and Communities identify chytrid fungus as a threat to the recovery of the Booroolong Frog. A national threat abatement plan is in place to control and record the spread of chytrid fungus by both preventing amphibian populations that are currently chytridiomycosis-free from becoming infected and reducing the impact of the disease on currently infected populations.

Provided the project works are carried out following strict hygiene protocols to control for chytrid fungus, the project would not exacerbate the prevalence of chytrid fungus in the region.

Is there a real chance or a possibility that the action will interfere with the recovery of the species?

There is currently no published recovery plan for the Booroolong Frog. As mentioned, the Department of Sustainability, Environment, Water, Population and Communities identify chytrid fungus, habitat disturbance and predation of tadpoles by introduced fish as threats to the recovery of the species. A national threat abatement plan is in place to control and record the spread of chytrid fungus by both preventing amphibian populations that are currently chytridiomycosis-free from becoming infected and reducing the impact of the disease on currently infected populations.

Provided the project works are carried out following strict hygiene protocols to control for chytrid fungus, the project would not exacerbate the prevalence of chytrid fungus or increase the density of invasive predator species in the region.

Conclusion

It is unconfirmed whether the species is resident within the study area, however if present has the potential to be significantly impacted by the project. However, provided the mitigation and management measures outlined in section 6.0 of this report are implemented, the project would be unlikely to result in a significant impact to the Booroolong Frog.

Greater Long-eared Bat	***Nyctophilus timoriensis***

The Greater Long-eared Bat is listed as Vulnerable under the EPBC Act. This species is also listed as Vulnerable under the TSC Act. Originally the Greater Longed-eared Bat was considered a subspecies of *Nyctophilus timoriensis*, however more recent studies have described the bat as a separate species, *Nyctophilus corbeni* (DSEWPaC 2010). In this assessment it is referred to under its former name as it remains listed under the TSC Act as *Nyctophilus timoriensis*.

Is there a real chance or a possibility that the action will lead to a long-term decrease in the size of an important population of the species?

A long-eared bat of the Nyctophilus genus was confidently detected based on its echolocation call being recorded during the field surveys. Harp traps were also deployed in conjunction with the Anabat detectors to be able to discern between ambiguous echolocation calls, however no *Nyctophilus* spp. were captured within the harp traps during the surveys to confirm whether it is the Greater Long-eared Bat.

The Greater Long-eared Bat is likely to forage within 1 km of their roosting site. The project would involve the removal and/or direct disturbance of 40.47 ha of potential habitat including up to 250 hollow-bearing trees (supporting a range of number and sized hollows) which provide potential breeding and roosting sites for this species. Given the availability of potential habitat within the locality (19,130.57 ha) (including protected habitat within Mullion Range Conservation Area and Girralang Nature Reserve), that no breeding habitat would be impacted and the high mobility of this species, it is considered unlikely that the project would lead to a long-term decrease in the size of an important population of the Greater Long-eared Bat.

Is there a real chance or a possibility that the action will reduce the area of occupancy of an important population of the species?

The Greater Long-eared Bat's known distribution extends from central Queensland throughout much of NSW to the border of Victoria and into parts of South Australia. The Murray Darling Basin and Pilliga Scrub region is the stronghold for this species (DSEWPaC 2012). The study area does not occur at or near the limit of distribution for the Great Long-eared Bat. The project would potentially result in the loss of up to 250 hollow-bearing trees (supporting a range of number and sized hollows) which would increase competition for remaining hollows. This increased pressure has the potential to reduce the area of occupancy inhabited by this species however the study area is not known to support an important population of this species.

Is there a real chance or a possibility that the action will fragment an existing important population into two or more populations?

The project would involve removal of potential foraging and breeding habitat from the study area. The areas to be removed are contiguous with intact forest that would remain. Given the availability

of surrounding eucalypt and riparian forests, the proportionally small area of proposed vegetation removal/direct disturbance (the 40.47 ha to be removed/directly disturbed is made up of smaller areas spread along the 37 km route including proposed ancillary sites) and the high mobility of the Great Long-eared Bat, it is considered unlikely that the project would fragment an existing population into two or more populations.

Is there a real chance or a possibility that the action will adversely affect habitat critical to the survival of the species?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. A Register of Critical Habitat is maintained by the Minister under the EPBC Act. To date, no critical habitat has been declared for the Greater Long-eared Bat (DEWHA 2009d).

Critical habitat can also refer to areas that are necessary for activities such as foraging, breeding or dispersal; for the long-term maintenance of the species; to maintain genetic diversity and long-term evolutionary development; or for the reintroduction of populations or recovery of the species (DEWHA 2009d).

The project would have an impact on potential habitat for this species through the removal of up to a maximum of 250 hollow-bearing trees (supporting a range of number and sized hollows) which the Greater Long-eared Bat would rely on for breeding and sheltering. Although not listed as critical habitat, tree hollows are an essential requirement for breeding and are a limiting habitat resource for this species.

Is there a real chance or a possibility that the action will disrupt the breeding cycle of an important population of the species?

There is scarce information on the biology or social structure of the Greater Long-eared Bat, though it is thought that they roost solitarily under exfoliated bark and in the crevices on trees. During the breeding season, females are believed to form roosting colonies in larger tree cavities.

Approximately 29% of the pipeline corridor would occur within existing road reserves and approximately 71% would traverse private properties. Where possible, the corridor would avoid treed areas and traverse predominantly cleared grassland and/or be trenched beneath the existing roads. The habitat to be removed exists as narrow strips along existing road reserves and as contiguous patches from the Offtake Point at the Macquarie River until where the route joins Long Point Road. A number of hollow-bearing trees (up to 250) would be removed as a result of the project. Consequently the project may have an impact on the lifecycle of the Greater Long-eared Bat in the area through the removal of potential breeding resources.

Whilst the project would impact potential breeding resources and foraging habitat within an area likely to support the Greater Long-eared Bat, not all hollow-bearing trees within the study area would be removed. Further, the potential habitat for this species within the study area is contiguous with similar quality habitat that would not be disturbed. Although this species is highly mobile, the loss of potential foraging and breeding habitat could temporarily effect a local population as

(surviving) individuals from the study area seek and establish new territory. The loss of this number of hollows may result in some intra-specific competition while new roost sites are established.

Despite the loss of breeding and roosting opportunities the study area is not known to support an important population of this species, and therefore the project is unlikely to disrupt the breeding cycle of an important population Greater Long-eared Bat within the study area.

Is there a real chance or a possibility that the action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Greater Long-eared Bat has been recorded roosting within tree hollows and has also been known to use caves and buildings on occasion (Churchill 1998), although no caves occur within the study area. A total of 250 hollow-bearing trees were recorded within the study area, however not all of these trees would be removed as part of the project.

Foraging habitat occurs throughout the wooded areas of the study area concentrated at the Macquarie River, along Oaky Lane (largely avoided by the project) and within roadside remnant trees along Ophir Road. However, the study area is not considered to provide limiting foraging resources.

Breeding habitat occurs throughout these same wooded areas and includes hollow-bearing trees that may not be directly connected with other continuous areas of wooded vegetation.

The study area provides potential habitat in the form of woodland vegetation and hollow-bearing trees. Approximately 40.47 ha of potential habitat, including hollow-bearing trees, would be removed and/or directly disturbed by the project. This represents approximately 0.21 % of the potential habitat available in the locality (19,130.57 ha). Conservation reserves in the locality where habitat for these species would be unaffected are Mullion Range State Conservation Area and Girralang Nature Reserve. Although this species is highly mobile, the loss of potential foraging and breeding habitat could temporarily effect a local population as (surviving) individuals from the study area seek and establish new territory. The loss of this number of hollows may result in some intra-specific competition while new roost sites are established. However the removal of habitat resources and diminished habitat quality through increased edge effects are unlikely to result to an overall decline of the species.

Is there a real chance or a possibility that the action will result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat?

Predation by feral predators including foxes, cats and dogs has not been recorded, however is listed as a threat to the Greater Long-eared Bat (Dickman et al. 1993). Competition for tree hollows with Common Starling and Common Myna are also a threat to the Greater Long-eared Bat. Each of these invasive species were recorded during the field investigations. The project would be unlikely to increase the range of occupation or density of these invasive species within the study area.

Is there a real chance or a possibility that the action will introduce disease that may cause the species to decline?

The Greater Long-eared Bat may be susceptible to pathogens such as the Australian bat Lyssavirus (DEWHA 2009b). The project is unlikely to introduce the Australian bat Lyssavirus to the study area.

Is there a real chance or a possibility that the action will interfere substantially with the recovery of the species?

The Department of Sustainability, Environment, Water, Population and Communities indicates that the key contributing factors leading to the decline of Greater Long-eared Bats are habitat loss and fragmentation. The species is particularly susceptible to clearing of mallee and woodland habitats given that populations are located exclusively within these areas. A draft species recovery plan is in production and will aim to investigate the implications of other factors such as feral animal competition and pesticide exposure.

The project would result in 40.47 ha of potential habitat loss/direct disturbance including the removal of up to 250 hollow-bearing trees (supporting a range of number and sized hollows) which are a limiting resource for this species. Provided the recommended mitigation measures are followed and lost paddock trees are replaced, offset options are undertaken and bat boxes installed to counteract the loss of breeding and roosting opportunities the project would be unlikely to interfere with the recovery of the Greater Long-eared Bat.

Conclusion

Based on the above assessment the project is unlikely to have a significant impact on the Greater Long-eared Bat.

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

The Grey-headed Flying-fox is listed as Vulnerable under the EPBC Act. The species is also listed as Vulnerable under the TSC Act.

Is there a real chance or a possibility that the action will lead to a long-term decrease in the size of an important population of the species?

The Grey-headed Flying-fox has not been recorded within 10 km of the study area however has potential habitat within the forests and woodlands within the study area. Cultivated crops and fruit trees present within the study area also provide potential foraging resources for this species.

The Grey-headed Flying-fox is found in a variety of habitats, including rainforest, mangroves, paperbark swamps, wet and dry sclerophyll forests and cultivated areas (Churchill 1998). The species is a canopy-feeding frugivore and nectarivore. Their major food source is Myrtaceae blossom (mostly eucalypt) and fruits such as native figs (*Ficus* spp.) and cultivated fruit orchards (Churchill 1998). Bats commute daily to foraging areas, usually within 15 kilometres of the day roost (Strahan 1995), although some individuals may travel up to 70 kilometres. Grey-headed flying-foxes seasonally congregate in large camps of up to 200,000 individuals (Churchill 1998). The availability of blossom in the surrounding area influences the number of bats in a camp (Churchill 1998).

The study area provides potential foraging habitat for the Grey-headed Flying-fox within the eucalypt and riparian forests and woodlands. No evidence of a camp site (breeding habitat) was found within the study area.

The study area provides potential foraging habitat for the Grey-headed Flying-fox within the eucalypt and riparian forests and woodlands. The project would result in the removal and/or direct disturbance of approximately 40.47 ha of foraging habitat for this species. An additional 14.26 ha would be indirectly impacted (e.g. edge effects). The foraging habitat that would be impacted by the project is contiguous with similar quality habitat throughout the locality that would not be disturbed.

Given the availability of potential habitat within the locality (18,873.01 ha) (including protected habitat within Mullion Range Conservation Area and Girralang Nature Reserve), that no breeding habitat would be impacted and the high mobility of this species, it is considered unlikely that the project would lead to a long-term decrease in the size of an important population of the Grey-headed Flying-fox.

Is there a real chance or a possibility that the action will reduce the area of occupancy of an important population of the species?

Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Bundaberg in Queensland to Melbourne in Victoria (OEH 2005). However, only a small proportion of this range is used at any one time, as the species selectively forages where food is available. As a result, patterns of occurrence and relative abundance within its distribution vary widely between seasons and between years (DSEWPaC). The majority of Grey-headed Flying-fox records are located in coastal regions and the Blue Mountains, however the species has been recorded as far west as Bathurst and Dubbo, placing the project location within the outer limit of its known distribution. Although at the western extent of the species range, the project is unlikely to reduce the area of occupancy of an important population of the Grey-headed Flying-fox within the locality.

Is there a real chance or a possibility that the action will fragment an existing important population into two or more populations?

Grey-headed Flying-foxes commute daily to foraging areas, usually within 15 km of the day roost (Strathan 1995), although some individuals may travel up to 70 km. The project would involve removal of potential foraging habitat from the study area. The areas to be removed are contiguous with intact forest that would remain. Given the availability of surrounding eucalypt and riparian forests, the small areas of proposed vegetation removal/direct disturbance (the 40.47 ha to be removed/directly disturbed is made up of smaller areas spread along the 37 km route including proposed ancillary sites) and the high mobility of the Grey-headed Flying-fox, it is considered unlikely that the project would fragment an existing important population into two or more populations.

Is there a real chance or a possibility that the action will adversely affect habitat critical to the survival of the species?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. A Register of Critical Habitat is maintained by the Minister

under the EPBC Act. To date, no critical habitat has been declared for the Grey-headed Flying-fox (DEWHA 2009d).

Critical habitat can also refer to areas that are necessary for activities such as foraging, breeding or dispersal; for the long-term maintenance of the species; to maintain genetic diversity and long-term evolutionary development; or for the reintroduction of populations or recovery of the species (DEWHA 2009d). The *Draft National Recovery Plan for the Grey-headed Flying-fox* Pteropus poliocephalus (DECCW 2009b) describes foraging habitat that is considered critical to the survival of the species. The vegetation to be removed by the project is consistent with criteria number three listed in the recovery plan: natural foraging habitat that is productive during the final weeks of gestation, and during the weeks of birth, lactation and conception (September to May). Therefore, the project would adversely affect habitat critical to the survival of the Grey-headed Flying-fox, according to the draft recovery plan (DECCW 2009b).

Is there a real chance or a possibility that the action will disrupt the breeding cycle of an important population of the species?

Pregnant Grey-headed Flying-foxes congregate in maternity camps, giving birth to a single young a couple of weeks later (Churchill 1998). No colonies or maternity camps occur within the study area or are known within the locality.

Given the impacts to potential foraging habitat are unlikely to lead to a long-term decrease in the size of an important population of the Grey-headed Flying-fox (described above) and that no breeding habitat would be impacted, it is considered unlikely that the project would disrupt the breeding cycle of an important population of the Grey-headed Flying-fox.

Is there a real chance or a possibility that the action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The project would directly impact up to 40.47 ha of potential foraging habitat (box-gum woodlands and riparian forest) for the Grey-headed Flying-fox. The habitat to be directly impacted represents 0.21 % of potential habitat within the locality (18,873.01 ha). A further 14.26 ha of box-gum woodlands and riparian forest would be indirectly affected (e.g. edge effects) by the project. In total, 0.29 % of the potential habitat occurring in the locality would be impacted by the project.

Although the Grey-headed Flying-fox has potential to forage in the study area, and that the habitat fits the description of 'critical foraging habitat' (DECCW 2009b), the habitat to be directly impacted is considered to be of low to moderate importance for the long-term survival of the Grey-headed Flying-fox. The potential habitat is considered to be of low to moderate importance given the availability of surrounding woodland and riparian forests, the small areas of proposed vegetation removal/direct disturbance (the 40.47 ha to be removed and/or directly impacted is made up of smaller areas spread along the 37 km study area) and the high mobility of the Grey-headed Flying-fox, Given this, the large (and diverse) extent of potential habitat available in the locality (18,873.01 ha; which also fits the description of 'critical foraging habitat' (DECCW 2009b) and the species' high mobility, the loss and/or disturbance of 0.29 % of potential habitat within the locality is considered unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Grey-headed Flying-fox is likely to decline.

Is there a real chance or a possibility that the action will result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat?

The Department of Sustainability, Environment, Water, Population and Communities identifies competition with the Black Flying-fox (*Pteropus alecto*) as a threat to the Grey-headed Flying-fox due to shared roosting and foraging resources (DEWHA 2009b). However, the study area occurs well south of the southern limit of the Black Flying-fox's distribution (Bellinger River; (DEC 2005c)) and the project is unlikely to result in this species becoming established in the study area or locality.

Is there a real chance or a possibility that the action will introduce disease that may cause the species to decline?

The Grey-headed Flying-fox may be susceptible to pathogens such as the Australian bat Lyssavirus and pollutants such as lead (DEWHA 2009b). The project is unlikely to introduce the Australian bat Lyssavirus to the study area. Although the project would result in the increased use of machinery during construction, and therefore possibly increased exhaust gases in the environment, it is unlikely to increase the incidence of lead to the point that the Grey-headed Flying-fox would decline.

Is there a real chance or a possibility that the action will interfere substantially with the recovery of the species?

A key determining factor in the decline of Grey-headed Flying-fox populations are changes in land use resulting in loss and fragmentation of native vegetation used for foraging and roosting (DSEWPaC).

The Office of Environment and Heritage (on behalf of the Department of Sustainability, Environment, Water, Population and Communities) has developed a draft national recovery plan for the Grey-headed Flying-fox (DEWHA 2009b). The following recovery objectives outlined in this plan relevant to the project include:

- Identify and protect foraging habitat critical to the survival of Grey-headed Flying-foxes throughout their range.
- Identify, protect and enhance roosting habitat critical to the survival of Grey-headed Flying-foxes.

The Grey-headed Flying-fox has potential to forage within the study area and the foraging habitat is considered to be critical to the species' survival (DECCW 2009b). The project would directly impact 0.21% of the potential foraging habitat occurring in the locality. Whilst adjoining areas of foraging habitat would be subject to indirect impacts such as weed invasion and increased light penetration (14.26 ha of that habitat occurring in the locality), the habitat would not be removed. Further, the majority of potential habitat occurring in the locality also likely meets the criteria for identification as 'critical foraging habitat' (DECCW 2009b).

No evidence of a camp site (roosting/breeding habitat) was found within the study area and no known camp sites occur within the locality and therefore would not be impacted by the project.

Given that evidence of a camp site was not found within the study area, and that a total of only 0.29% of potential habitat within the locality would be impacted (directly and indirectly), it is unlikely that the project would interfere with these recovery objectives.

Conclusion

Based on the above assessment the Grey-headed Flying-fox is unlikely to be significantly impacted by the project.

Koala	***Phascolarctos cinereus***

The Koala is listed as Vulnerable under the EPBC Act (as of 30th April 2012). This species is also listed as Vulnerable under the TSC Act.

Is there a real chance or a possibility that the action will lead to a long-term decrease in the size of an important population of the species?

The study area falls predominantly within the Central and Southern Tablelands Koala Management Area of the NSW Koala Recovery Plan (DECC 2008c). According to appendix 2 of the recovery plan, the study area provides a primary food tree species in the form of Ribbon Gum *Eucalyptus viminalis* (33 trees to be removed in total). Secondary food tree species within the study area include White Box *E.albens*, Blakely's Red Gum *E. blakelyi*, Apple-topped Box *E. bridgesiana*, Yellow Box *E. melliodora*, Red Box *E. polyanthemos*, Tumbledown Gum *E. dealbata*, Brittle Gum *E. mannifera* and Candlebark *E. rubida*. However no population is known to occur within the study area. It was suggested that a Koala population occurs at Oaky Lane (MWH Global 2011), however no information to support this prediction has been found. During the field surveys no evidence of Koalas was detected.

The project would involve the removal of potential habitat including some woodland communities containing a dominant canopy of favoured feed trees species. Approximately 40.47 ha of potential habitat would be removed and/or directly disturbed by the project. This represents approximately 0.21% of the potential habitat available in the locality (18,873.01 ha). Large areas of habitat occur for this species within the greater locality within Mullion State Conservation Area and Girralang Nature Reserve which would remain unaffected by the project. The project would not reduce habitat connectivity for this species. Given the species' mobility, and the narrow corridor of vegetation to be removed, the project is unlikely to significantly fragment or isolate patches of potential habitat for the Koala and therefore is not expected to lead to a long-term decrease in the size of an important population of Koala.

Is there a real chance or a possibility that the action will reduce the area of occupancy of an important population of the species?

The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia (OEH 2005). In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Koalas have been

recorded within 10 km of the project however, with population records throughout the region, these are not at the limit of its known distribution. The project would not reduce the area of occupancy of an important Koala population in the locality.

Is there a real chance or a possibility that the action will fragment an existing important population into two or more populations?

The proposed pipeline corridor primarily occurs within cleared paddocks within private properties or the existing road reserve. Where possible all efforts have been made to select a route that would require minimal removal of native vegetation. The pumping station locations, electricity supply to service the pipeline, and construction compounds have also been proposed where minimal native vegetation clearance would be required.

The Koala inhabits box-gum woodlands and riparian forests which occur within the study area. These habitats are found throughout the study area, primarily extending from the Macquarie River at the Offtake Point and through to Long Point Road and within the box-gum woodland which occurs throughout Mullion Range State Conservation Area adjoining Oaky Lane. The proposed pipeline is closely aligned with Oaky Lane on the opposite (eastern) side to the State Conservation Area, and would traverse predominantly cleared grassland and areas of open woodland. The pipeline corridor traverses large intact areas of vegetation which form regional wildlife corridors that are likely to be used by the Koala. Although this species occupies large areas of habitat, the clearing of a narrow corridor of vegetation to install the pipeline underground would be largely a temporary disturbance during construction to the movement patterns of this species and is unlikely to permanently fragment or isolate patches of potential habitat for an important population of the Koala.

Is there a real chance or a possibility that the action will adversely affect habitat critical to the survival of the species?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. A Register of Critical Habitat is maintained by the Minister under the EPBC Act. To date, no critical habitat has been declared for the Koala (DEWHA 2009d).

Critical habitat can also refer to areas that are necessary for activities such as foraging, breeding or dispersal; for the long-term maintenance of the species; to maintain genetic diversity and long-term evolutionary development; or for the reintroduction of populations or recovery of the species (DEWHA 2009d).

Is there a real chance or a possibility that the action will disrupt the breeding cycle of an important population of the species?

Koalas live in breeding aggregations comprised of a dominant male, a small number of mature females, and juveniles (NPWS 2003). The home range of Koalas varies depending on the quality of the habitat and the number of available food trees. Home ranges can vary from less than one hectare to 500 ha (NPWS 2003). Home ranges in the Pilliga State Forest overlapped for both sexes and were approximately 12 ha for males and 9 ha for females. Koalas were found to continue to occupy all or part of their previous home-ranges after selective logging, and home-range sizes remained similar between logged and unlogged areas (Kavanagh *et al.* 2007).

The Koala has been recorded once within 10 km of the study area at Mullion Creek to the west of the study area dating from 2011. Additional records of the Koala occur beyond 10 km from the study area. The next closest records occur east of the study area in the vicinity of Freemantle Nature Reserve (records dating from 1993 to 2009); in the vicinity of Hill End (records dating from 1972 to 2007); and approximately 13 km north of the Offtake Point (dated 1976). The latter two locations occur on the opposite side of the Macquarie River to the study area (OEH 2012). The study area contains box-gum woodlands and forest communities which support preferred feed tree species favoured by the Koala in the region.

Given the absence of records of this conspicuous species occurring in proximity to the study area, the significant barrier the Macquarie River is likely to pose restricting movement of individuals south of the river, the study area is not known to support an important breeding population of Koala.

The pipeline corridor and associated infrastructure would require the removal of vegetation that is potential habitat for the Koala. Whilst the project would impact potential breeding and foraging habitat within the study area, not all vegetation within the study area would be removed. Further, the potential habitat for the Koala within the study area is contiguous with similar quality habitat that would not be disturbed. Given the above, the project has the potential to disrupt the breeding cycle of the Koala however this impact is expected to be minor if a Koala population is resident.

Is there a real chance or a possibility that the action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Approximately 40.47 ha of box-gum woodland and riparian forest (potential habitat) would be removed and/or directly disturbed from the study area with a further 14.26 ha affected by indirect impacts (e.g. edge effects). This equates to only 0.29 % of the potential habitat available within the locality (18,873.01 ha). Approximately 29% of the pipeline corridor would occur within existing road reserves and approximately 71% would traverse private properties. Where possible, the route would avoid treed areas and traverse predominantly cleared grassland and/or be trenched beneath the existing roads. The habitat to be removed exists as narrow strips along existing road reserves and as contiguous patches from the Offtake Point at the Macquarie River until where the route joins Long Point Road.

Although only a small percentage of habitat that would be impacted proportional to that which occurs within the locality and that large areas of high quality habitat that would remain untouched within the protected areas of Mullion Range State Conservation Area and Girralang Nature Reserve, the habitat quality within the study area would be modified and diminished as a result of project, however it is unlikely that this would occur to a level that would lead to the decline of the Koala as a species.

Is there a real chance or a possibility that the action will result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat?

Within the National Koala and Management Strategy 2009-2014, dogs are listed as a threat to the Koala (DEWHA 2009). Wild and domestic dogs were recorded within the study area during the current surveys. It is unlikely that the project would facilitate the increase in dog numbers and range to where they are not already established.

Is there a real chance or a possibility that the action will introduce disease that may cause the species to decline?

Within the National Koala and Management Strategy 2009-2014, the disease chlamydia is listed as a threat to the Koala (DEWHA 2009). This disease may already be present in populations of Koala within the region and it is unlikely that the project would lead to the introduction of chlamydia that would cause a decline in the Koala.

Is there a real chance or a possibility that the action will interfere substantially with the recovery of the species?

The approved recovery plan for the Koala (DECC 2008) identifies the specific recovery objectives for this species. The two primary objectives which relate to this project include: conserve Koalas in their existing habitat; and, rehabilitate and restore Koala habitat and populations.

Resident populations of Koala have not been confirmed within the study area however the project would result in the removal and/or direct disturbance to 40.47 ha woodland and forested areas containing preferred feed tree species. Although the removal of potential habitat for the Koala is not in keeping with the recovery plan for this species, a considerable area of similar habitat resources would remain adjacent to the cleared areas and occur within the locality (18,873.01 ha). The project is not expected to interfere with the recovery of the Koala.

Conclusion

Based on the above assessment the project is considered unlikely to result in a significant impact on the Koala.

Large-eared Pied Bat	***Chalinolobus dwyeri***

The Large-eared Pied Bat is listed as Vulnerable under the EPBC Act. This species is also listed as Vulnerable under the TSC Act.

The Large-eared Pied Bat was recorded within the study area during the current field survey. The species was recorded once, with definite confidence, using an Anabat placed along Oaky Lane. The species has also been previously recorded at one other location within 10 km of the study area dating from 2005.

Is there a real chance or a possibility that the action will lead to a long-term decrease in the size of an important population of the species?

Little is known of the foraging behaviour and diet of the Large-eared Pied Bat although they are known to have a relatively slow flight and have been observed flying low along creek beds and foraging within the canopy (DEC 2005m; Churchill 2008). Their diet is thought to consist of small flying insects (Hoye and Schulz 2008).

Foraging habitat occurs throughout the wooded areas of the study area concentrated at the Macquarie River, along Oaky Lane and within roadside remnant trees along Ophir Road. However, the study area is not considered to provide limiting foraging resources. The Large-eared Pied Bat may roost among outcropping rocks and boulder piles on the steep slopes of the Macquarie River within the study area. However, no potential breeding habitat (i.e. caves or sandstone overhangs) occurs.

The study area provides potential habitat for the Large-eared Pied Bat in the form of woodland and riparian vegetation. Approximately 40.47 ha of potential habitat would be removed and/or directly disturbed by the project and 14.26 ha indirectly impacted. This represents approximately 0.29% of the potential habitat available in the locality (19,130.57 ha). Conservation reserves in the locality where habitat for this species would be unaffected are Mullion Range State Conservation Area and Girralang Nature Reserve.

Although a large area of habitat would be removed/directly disturbed (40.47 ha), a large area of potential habitat remains within the locality (19,130.57 ha). No breeding habitat would be removed by the project. The removal of these foraging and potential roosting habitats is unlikely to lead to a long-term decrease in the size of an important population Large-eared Pied Bat within the locality.

Is there a real chance or a possibility that the action will reduce the area of occupancy of an important population of the species?

The Large-eared Pied Bat is found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. The study area occurs towards the western limit of the distribution for this species, however the impacts that would result form the project would not be expected to reduce the occupancy of an important population of this species.

Is there a real chance or a possibility that the action will fragment an existing important population into two or more populations?

The proposed pipeline corridor primarily occurs within cleared paddocks within private properties or the existing road reserve. Where possible all efforts have been made to select a route that would require minimal removal of native vegetation. The pumping station locations, electricity supply to service the pipeline, and construction compounds have also been proposed where minimal native vegetation clearance would be required.

The most intact area of habitat for the Large-eared Pied Bat occurs within the open woodland adjoining the Macquarie River at the Offtake Point and through to Long Point Road, and within the Stringybark Box Gum Woodland which occurs throughout Mullion Range State Conservation Area adjoining Oaky Lane. The proposed pipeline corridor is closely aligned with Oaky Lane on the opposite (eastern) side to the State Conservation Area, and would traverse predominantly cleared grassland and areas of open woodland. The Large-eared Pied Bat forages throughout a variety of habitat types including wooded areas, along drainage lines and watercourses. The foraging habitat for this species is not considered to be limiting and this species is known to travel many kilometres between roosting and foraging sites. Given this species' high mobility, and the narrow corridor of vegetation to be removed, the project is unlikely to fragment an existing population of Large-eared Pied Bat into two or more populations.

Is there a real chance or a possibility that the action will adversely affect habitat critical to the survival of the species?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. A Register of Critical Habitat is maintained by the Minister under the EPBC Act. To date, no critical habitat has been declared for the Large-eared Pied Bat (DEWHA 2009d).

Critical habitat can also refer to areas that are necessary for activities such as foraging, breeding or dispersal; for the long-term maintenance of the species; to maintain genetic diversity and long-term evolutionary development; or for the reintroduction of populations or recovery of the species (DEWHA 2009d).

The National Recovery Plan for the Large-eared Pied Bat (Department of Environment and Resource Management 2011) identifies critical habitat as diurnal roosts for shelter. Roost sites can include disused mine shafts, caves, overhangs and abandoned fairy martin *Hirundo ariel* nests (Schulz 1998). The value of mine shafts and disused fairy martin nests as roost sites has not been evaluated to date. From the type locality it would appear that mines may offer important roost sites, particularly in areas where natural roosts are uncommon or absent. No mine caves or mine shafts occur within the study area however these resources area likely to occur within the locality.

Sandstone cliffs and fertile wooded valley habitat within close proximity of each other should be considered habitat critical to the survival of the Large-eared Pied Bat (DECC 2007). The rocky regions within the study area are basalt in nature.

Is there a real chance or a possibility that the action will disrupt the breeding cycle of an important population of the species?

The Large-eared Pied Bat is located in a variety of drier habitats, (Hoye and Dwyer 1995), however, can also be found on the edges of rainforests and in wet sclerophyll forests (Churchill 2008). The Large-eared Pied Bat requires caves or rock overhangs for breeding (DEC 2005m). While the species will roost in caves, it can also use man-made structures such as mines and road culverts for roosting (Churchill 2008; DEC 2005m).

The Large-eared Pied Bat may roost among outcropping rocks and boulder piles along the edge of the Macquarie River within the study area. No known maternity caves are known from the region. The species may also forage throughout the study area for flying insects, particularly within the Macquarie River riparian vegetation and within watercourses along Oaky Lane.

The project would directly impact some potential roosting habitat (i.e. outcropping rocks and boulder piles) and the likely preferred foraging habitat within the study area (i.e. Macquarie River riparian vegetation) for this species.

Approximately 29% of the pipeline corridor would occur within existing road reserves and approximately 71% would traverse private properties. Where possible, the corridor would avoid treed areas and traverse predominantly cleared grassland and/or be trenched beneath the existing roads. The habitat to be removed exists as narrow strips along existing road reserves and as

contiguous patches from the Offtake Point at the Macquarie River until where the route joins Long Point Road. Given that breeding habitat would be removed (e.g. caves or rock overhangs), it is unlikely the project would disrupt the breeding cycle of an important population of the Large-eared Pied Bat.

Is there a real chance or a possibility that the action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Little is known of the foraging behaviour and diet of the Large-eared Pied Bat although they are known to have a relatively slow flight and have been observed flying low along creek beds and foraging within the canopy (DEC 2005m; Churchill 2008). Their diet is thought to consist of small flying insects (Hoye and Schulz 2008).

Foraging habitat occurs throughout the wooded areas of the study area concentrated at Macquarie River, along Oaky Lane and within roadside remnant trees along Ophir Road. However, the study area is not considered to provide limiting foraging resources. The Large-eared Pied Bat may roost among outcropping rocks and boulder piles on the steep slopes of the Macquarie River within the study area. However, no potential breeding habitat (i.e. caves or sandstone overhangs) occurs.

The study area provides potential habitat for the Large-eared Pied Bat in the form of woodland and riparian vegetation and outcropping rock and boulder piles. Approximately 40.47 ha of potential habitat would be removed and/or directly disturbed by the project and 14.26 ha indirectly impacted. This represents approximately 0.29 % of the potential habitat available in the locality (19,130.57 ha). Conservation reserves in the locality where habitat for this species would be unaffected are Mullion Range State Conservation Area and Girralang Nature Reserve. Given the extent of potential foraging and roosting resources within the locality, the narrow corridor of vegetation to be removed and the reasonably high mobility of this species, the project is considered unlikely to remove and or diminish habitat quality to an extent that the Large-eared Pied Bat is likely to decline.

Is there a real chance or a possibility that the action will result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat?

No specific invasive species are listed as a threat to the Large-eared Pied Bat (Department of Environment and Resource Management 2011). Predation by feral predators including foxes, cats and dogs is listed as a threat to other bat species and can similarly be considered a potential threat to the Large-eared Pied Bat. Each of these invasive species were recorded during the field investigations. The project would be unlikely to increase the range of occupation or density of these invasive species within the study area.

Is there a real chance or a possibility that the action will introduce disease that may cause the species to decline?

The Large-eared Pied Bat may be susceptible to pathogens such as the Australian bat Lyssavirus (DEWHA 2009b). The project is unlikely to introduce the Australian bat Lyssavirus to the study area.

Is there a real chance or a possibility that the action will interfere substantially with the recovery of the species?

The National Recovery Plan for the Large-eared Pied Bat does not clearly identify the main threatening processes to the species. It does indicate that disturbance or destruction of subterranean roost sites is a direct threat to populations due to the communal roosting tendencies of the species (Department of Environment and Resource Management 2011). Vegetation clearing is suggested as a potential threat, particularly when it occurs in the vicinity of maternity roosts.

The habitat to be cleared does not occur in proximity to any known maternity roosts and would not impact on critical habitats listed for this species. The project would not be expected to interfere with the recovery of this species.

Conclusion

Based on the above assessment, it is unlikely Large-eared Pied Bat would be subject to significant impacts as a result of the project,

Pink-tailed Worm-lizard	***Aprasia parapulchella***

The Pink-tailed Worm-lizard is listed under the EPBC Act as Vulnerable. The Pink-tailed Worm-lizard is also listed as Vulnerable under the TSC Act.

Is there a real chance or a possibility that the action will lead to a long-term decrease in the size of an important population of the species?

Foraging resources including termites, ants, scorpions and centipedes utilised by the Pink-tailed Worm-lizard were commonly found beneath the rocks turned during the surveys. These prey species are often found in association with Pink-tailed Worm-lizards as they provide food and/or shelter through the use of their burrows. It is considered that the surface rocks within the study area provide potential habitat for the Pink-tailed Worm-lizard.

The study area provides potential habitat for these reptiles in the form of box-gum woodlands, native and secondary grasslands with moderate to high densities of surface rocks and fallen timber debris. Approximately 51.09 ha of potential habitat would be directed impacted by the project. This represents approximately 0.17 % of the potential habitat available in the locality (30,003.81 ha). Although not all these habitats would support the critical surface rock component and is likely to be a vast overestimate of available habitats within the broader locality. Conservation reserves in the locality where habitat for these species would be unaffected are Mullion Range State Conservation Area and Girralang Nature Reserve. Although this species has not been recorded in proximity to the study area it may only occupy localised areas. Given no individuals were detected during the targeted surveys, the corridor of habitat to be removed is very narrow and direct impacts would be localised, that loose surface rocks and debris would be retained immediately adjacent to the pipeline corridor, the project is unlikely to lead to a long-term decrease in the size of an important population of the Pink-tailed Worm-lizard.

Is there a real chance or a possibility that the action will reduce the area of occupancy of an important population of the species?

The study area does not occur at or near the limit of distribution of the Pink-tailed Worm-lizard, and provided the mitigation measures recommended are followed the area of occupancy of a resident population within the study area would not be reduced.

Is there a real chance or a possibility that the action will fragment an existing important population into two or more populations?

The most intact area of habitat for these reptile species occurs within the open woodland adjoining the Macquarie River at the Offtake Point and through to Long Point Road, and within the box-gum woodland which occurs throughout Mullion Range State Conservation Area adjoining Oaky Lane and native and secondary grasslands which occur adjacent to Oaky Lane and throughout private paddocks. The proposed pipeline corridor is closely aligned with Oaky Lane on the opposite (eastern) side to the State Conservation Area, and would traverse predominantly cleared grassland and areas of open woodland which also supports habitat for this species. Individual Pink-tailed Worm-lizards are likely to use the same rocks over time which maintains specific thermoregulatory properties. Although there is little known about the movement patterns of the Pink-tailed Worm-lizard it is expected that the species will not venture far from shelter and consequently be relatively localised.

Targeted searches for this species were undertaken during appropriate survey conditions and did not detect any individuals. Given the lack of proximate records to suggest a resident population and the narrow corridor of vegetation to be removed, and the temporary disturbance to potential habitats and retention of important breeding resources (e.g. surface rocks transferred to nearby areas), the project is unlikely to fragment an existing important population of Pink-tailed Worm-lizard into two or more populations.

Is there a real chance or a possibility that the action will adversely affect habitat critical to the survival of the species?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. A Register of Critical Habitat is maintained by the Minister under the EPBC Act. To date, no critical habitat has been declared for the Pink-tailed Worm-lizard (DEWHA 2009d).

Critical habitat can also refer to areas that are necessary for activities such as foraging, breeding or dispersal; for the long-term maintenance of the species; to maintain genetic diversity and long-term evolutionary development; or for the reintroduction of populations or recovery of the species (DEWHA 2009d).

Critical habitat for Pink-tailed Worm-lizard would include rocky outcrops of slightly embedded rocks within native grasslands. The project would involve the removal and/or disturbance to some of these critical resources.

Is there a real chance or a possibility that the action will disrupt the breeding cycle of an important population of the species?

The Pink-tailed Worm-lizard is a fossorial species, which lives beneath surface rocks and occupies ant burrows. It feed on ants, particularly their eggs and larvae (Osborne and Jones 1995). The Pink-tailed Worm-lizard is oviparous (egg laying) with a clutch size of two. Females may need to reach an age of about 3 or 4 years before they can reproduce. There is little data on the breeding behaviour of this species. The Pink-tailed Worm-lizard is thought to lay eggs within the ant nests under rocks that it uses as a source of food and shelter (DEC 2005t). Key habitat features for the presence of the Pink-tailed Worm-lizard are a cover of native grasses (particularly Kangaroo Grass), sparse or no tree cover, little or no leaf litter, and scattered small rocks with shallow embedment in the soil surface (Osborne and Jones 1995).

This species has potential habitat within the study area within the native grasslands and box-gum woodland communities where there are an abundance of surface rocks and fallen timber debris. Approximately 29% of the pipeline corridor would occur within existing road reserves and approximately 71% would traverse private properties. Where possible, the corridor would avoid treed areas and traverse predominantly cleared grassland and/or be trenched beneath the existing roads. The habitat to be removed exists as isolated areas along existing road reserves and within private paddocks and as contiguous patches from the Offtake Point at the Macquarie River until where the route joins Long Point Road. A number of rocky outcrops would be removed as a result of the project. Consequently the project may disrupt the breeding cycle of the Pink-tailed Worm-lizard through the removal of potential breeding resources.

Is there a real chance or a possibility that the action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

No individuals of the Pink-tailed Worm-lizard were recorded during targeted surveys. Three records of the Pink-tailed Worm-lizard occur approximately 50 km east of the study area dating from 2002.

This species has potential habitat within rocky areas throughout the grassland and woodland habitats of the study area.

Whilst the project would impact potential breeding resources and foraging habitat for this species, there have been no proximate sightings of this species to the study area. Targeted searches for Pink-tailed Worm-lizards during appropriate survey conditions did not detect individuals this species or evidence (e.g. skin sloughs) of this species. Further the rocky outcrop habitats within box-gum woodlands and native grasslands would be confined to a narrow pipeline corridor and suitable habitat for these species would remain intact within the study area. The impacts to the rocky outcrops and fallen debris will be temporary as surface rocks and woody debris removed as a result of the project would be retained adjacent to the pipeline corridor. Despite this, any impact to a local population of Pink-tailed Worm-lizard through the removal and/or disturbance to potential habitat would be unlikely to lead to an overall decline of the species.

Is there a real chance or a possibility that the action will result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat?

Rabbits are listed as a threat to Pink-tailed Worm-lizards as they graze heavily reducing habitat quality for this species. Rabbits were detected during the current surveys. The project would not exacerbate or increase the range of Rabbits within the study area.

Is there a real chance or a possibility that the action will introduce disease that may cause the species to decline?

No diseases are listed as a threat to the Pink-tailed Worm-lizard. The project would not encourage the introduction of any diseases that would lead to a decline in the species.

Is there a real chance or a possibility that the action will interfere substantially with the recovery of the species?

There is currently no published recovery plan for the Pink-tailed Worm-lizard. The Department of Sustainability Environment, Water, Population and Communities identify the threats to this species as climate change, pollution and habitat destruction. The Office of Environment and Heritage threatened species profile elaborates on this, identifying habitat loss and fragmentation, removal of rocks and habitat degradation by slashing or tree planting as threatening processes (OEH 2005). The project would involve the removal of potential habitat for the Pink-tailed Worm-lizard however provided the recommended mitigation measures are followed to retain rocky habitats and undertake pre-clearing surveys, the project is unlikely to interfere with the recovery of the species.

Conclusion

Based on the above assessment the project has the potential to have impact on the Pink-tailed Worm-lizard if present, however provided the recommended mitigation measures are followed including pre-clearing surveys and translocation of surface rocks, then a significant impact resulting form the project is unlikely.

Australian Painted Snipe	***Rostratula australis***

The Australian Painted Snipe is listed as Vulnerable under the EPBC Act. This species is also listed as Endangered under the TSC Act. The Australian Painted Snipe is usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands, ephemeral or permanent, although they have been recorded in brackish waters (Marchant and Higgins 1993).

Is there a real chance or a possibility that the action will lead to a long-term decrease in the size of an important population of the species?

The Australian Painted Snipe occurs in both coastal and inland shallow freshwater wetlands. Preferring fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber, it can also inhabit brackish wetlands (Marchant and Higgins 1993). Foraging takes place on mudflats or vegetated wetlands and has also been recorded under clumps of tea trees. The species' diet includes vegetation, seeds, and terrestrial invertebrates as

well as freshwater/estuarine invertebrates gleaned from water or mudflats (Marchant and Higgins 1993). Emergent grasses or reeds within standing water are required for breeding.

Approximately 29% of the pipeline route would occur within existing road reserves and approximately 71% would traverse private properties. Where possible, the route would avoid impacts to farm dams. However, the project would impact areas of grassland that are inundated at times, and has the potential to indirectly impact farm dams (e.g. noise and disturbance during construction). The habitat available within the study area is considered marginal only and impacts would be temporary. All areas of grassland would be reinstated to their prior state following installation of the underground pipeline. Given this, the project is considered unlikely to result in a long-term decrease in the size of an important population of the Australian Painted Snipe.

Is there a real chance or a possibility that the action will reduce the area of occupancy of an important population of the species?

The Australian Painted Snipe has been recorded throughout the Australian mainland, with historical records in Tasmania. No individuals have been previously recorded within 100 km of the study area. The project would not reduce the area of occupancy of an important Australian Painted Snipe population.

Is there a real chance or a possibility that the action will fragment an existing important population into two or more populations?

The proposed pipeline route primarily occurs within cleared paddocks within private properties or the existing road reserve. Where possible all efforts have been made to select a route that would avoid farm dams. The most intact area of habitat for the Australian Painted Snipe occurs as scattered farm dams within open paddocks within the agricultural lands either side of Ophir and Long Point Roads. Generally speaking, some individuals of Australian Painted Snipe appear to be resident in areas of habitat whereas other individuals appear to be nomadic, temporarily occupying areas where suitable habitat exists (DEWHA 2003). Given the species' high mobility, that only a narrow corridor of grassland vegetation would be removed (leaving vast areas of similar grassland vegetation either side), that the removed grassland would be replaced as per the PC&RMP, and that no records of the Australian Painted Snipe occur within 100 km of the study area, the project is unlikely to fragment an existing important population into two or more populations.

Is there a real chance or a possibility that the action will adversely affect habitat critical to the survival of the species?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. A Register of Critical Habitat is maintained by the Minister under the EPBC Act. To date, no critical habitat has been declared for the Australian Painted Snipe (DEWHA 2009d).

Critical habitat can also refer to areas that are necessary for activities such as foraging, breeding or dispersal; for the long-term maintenance of the species; to maintain genetic diversity and long-term evolutionary development; or for the reintroduction of populations or recovery of the species (DEWHA 2009d).

Is there a real chance or a possibility that the action will disrupt the breeding cycle of an important population of the species?

The Australian Painted Snipe requires tall vegetation (such as grasses or reeds) and standing water for nesting, it will often nest on a small island of tussocks or reeds within a wetland area (DECC 2005b). The species forages nocturnally on mud-flats and in shallow water for worms, molluscs, insects and some plant-matter.

This species has not been previously recorded within 100 km of the study area being investigated and potential habitats present are marginal. Habitats present are considered unlikely to sustain breeding activities.

Given the absence of records of this species occurring within 100 km of the study area and the lack of preferred potential breeding habitats, it is considered unlikely that the project would disrupt the breeding cycle of an important population of Australian Painted Snipe.

Is there a real chance or a possibility that the action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The study area provides marginal potential habitat for the Australian Painted Snipe in the form of farm dams and paddocks which may occasionally become inundated. The project avoids farm dams, and the area of inundated grasslands may vary depending on rainfall. As such, it is difficult to quantify the area of potential habitat that may be impacted by the project. However, given the species' high mobility, that only a narrow corridor of grassland vegetation would be removed (leaving vast areas of similar grassland vegetation either side), and that the removed grassland would be replaced as per the PC&RMP, the project is unlikely to modify, destroy, isolate or decrease the availability or quality of habitat to the extent that the Australian Painted Snipe would decline.

Is there a real chance or a possibility that the action will result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat?

The threat abatement plans for the European Fox and Feral Cat are relevant to this species (NPWS 2001; Environment Australia 1999p; Environment Australia 1999b). The overall objective of these plans is to focus fox and cat control on areas where the impacts of predation on threatened fauna are greatest (NPWS 2001; Environment Australia 1999b). The Australian Painted Snipe is identified as a low priority species for fox control (NPWS, 2001). Feral cats and foxes were recorded within the study area during the current surveys. It is unlikely that the project would facilitate an increase in cat and fox numbers within areas of potential habitat for the Australian Painted Snipe (i.e. predominantly cleared agricultural lands subject to inundation).

Is there a real chance or a possibility that the action will introduce disease that may cause the species to decline?

The project is unlikely to introduce or spread disease that would cause the Australian Painted Snipe to decline as a species.

Is there a real chance or a possibility that the action will interfere substantially with the recovery of the species?

To date, no national or state Recovery Plan has been prepared for the Australian Painted Snipe. Resident populations of Australian Painted Snipe have not been confirmed within the study area however the project would result in the temporary disturbance of a narrow corridor of grassland vegetation. A considerable area of similar habitat resources would remain adjacent to the temporarily disturbed (cleared and then soil layers and vegetation reinstated) corridor. The main threats to the Australian Painted Snipe include drainage of breeding sites in wetlands, reduced water quality from siltation and pollution, predation by foxes and feral cats, use of herbicides, insecticides and other chemicals near wetlands and grazing and associated frequent burning of wetlands (DECC 2005b). The project is not expected to increase the prevalence of these threats or interfere with the recovery of the Australian Painted Snipe.

Conclusion

Based on the above assessment the project is not expected to significantly impact the Australian Painted Snipe.

For an assessment of potential impacts to Australian Painted Snipe habitat within the Ramsar wetland Macquarie Marshes refer to *The Macquarie River to Orange Pipeline Project. Aquatic Ecology Assessment* (Cardno Ecology Lab 2012).

Superb Parrot	***Polytelis swainsonii***

The Superb Parrot is listed as Vulnerable under the EPBC Act. The Superb Parrot is also listed as Vulnerable under the TSC Act.

Is there a real chance or a possibility that the action will lead to a long-term decrease in the size of an important population of the species?

The Superb Parrot has been recorded over 50 times within 10 km of the study area with a high density of records occurring south-west of the southern extent of the pipeline corridor near the city of Orange. This density of records suggests that the Superb Parrot may return to this area annually to breed. This regular breeding colony is likely to constitute a key source population and thus would be considered an important population. This important population is likely to utilise resources within the study area.

The study area provides potential foraging habitat for the Superb Parrot in the form of native grasses and box-gum woodland communities and breeding habitat in the form of hollow-bearing trees. Approximately 51.09 ha of potential habitat, including hollow-bearing trees, would be removed and/or directly disturbed by the project. This represents approximately 0.27% of the potential habitat available in the locality (18,726.04 ha). Conservation reserves in the locality where habitat for these species would be unaffected are Mullion Range State Conservation Area and Girralang Nature Reserve.

Although the proportion of habitat to be removed would be quite low, critical breeding resources would be removed which may increase intraspecific competition for remaining hollows and reduce available habitats within the study area. This impact is heightened as an important breeding colony occurs at the southern extent of the study area. There is potential for the project to result in a long term decrease in an important population.

Is there a real chance or a possibility that the action will reduce the area of occupancy of an important population of the species?

The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers (OEH 2012). As a result the study area is not at, or near, the limit of distribution for this species and the project will not result in a significant reduction in the area of occupancy for this species..

Is there a real chance or a possibility that the action will fragment an existing important population into two or more populations?

The majority of records of the Superb Parrot occur towards the southern extent of the study area, however potential habitat for the Superb Parrot occurs throughout the box-gum woodlands which occur within the study area.

The proposed pipeline corridor primarily occurs within cleared paddocks within private properties or the existing road reserve. Where possible all efforts have been made to select a route that would require minimal removal of native vegetation and hollow-bearing trees. The pumping station locations, electricity supply to service the pipeline, and construction compounds have also been proposed where minimal native vegetation clearance would be required.

The most intact area of habitat for the Superb Parrot occurs within the open woodland adjoining the Macquarie River at the Offtake Point and through to Long Point Road, and within the box-gum woodland which occurs throughout Mullion Range State Conservation Area adjoining Oaky Lane. The proposed pipeline corridor is closely aligned with Oaky Lane on the opposite (eastern) side to the State Conservation Area, and would traverse predominantly cleared grassland and areas of open woodland.

Superb Parrots may forage up to 10 km from nesting sites, primarily in grassy box gum woodland. This species is also known to travel many kilometres between breeding and foraging sites. Given this species' high mobility, and the narrow corridor of vegetation to be removed, the project is unlikely to fragment the existing important population into two or more populations.

Is there a real chance or a possibility that the action will adversely affect habitat critical to the survival of the species?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. A Register of Critical Habitat is maintained by the Minister

under the EPBC Act. To date, no critical habitat has been declared for the Superb Parrot (DEWHA 2009d).

Critical habitat can also refer to areas that are necessary for activities such as foraging, breeding or dispersal; for the long-term maintenance of the species; to maintain genetic diversity and long-term evolutionary development; or for the reintroduction of populations or recovery of the species (DEWHA 2009d).

Although the study area provides breeding and foraging habitat for an important population of this species, given the availability of habitat in the locality it is unlikely to be considered critical habitat.

Is there a real chance or a possibility that the action will disrupt the breeding cycle of an important population of the species?

Superb Parrots occur in box-gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forests. They nest in the hollows of large trees (dead or alive) in open box-gum woodland or isolated paddock trees. Tree species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box.

The study area provides breeding habitat for the Superb Parrot within the box-gum woodland communities that occur within the study area. Approximately 29% of the pipeline corridor would occur within existing road reserves and approximately 71% would traverse private properties. Where possible, the corridor would avoid treed areas and traverse predominantly cleared grassland and/or be trenched beneath the existing roads. The habitat to be removed exists as narrow strips along existing road reserves and as contiguous patches from the Offtake Point at the Macquarie River until where the route joins Long Point Road. A number of hollow-bearing trees (up to 250) would potentially be removed as a result of the project.

Whilst the project would impact potential breeding resources and foraging habitat within an area known to support the Superb Parrot, not all hollow-bearing trees within the study area would be removed. Further, the potential habitat within the study area is contiguous with similar quality habitat that would not be disturbed.

In addition to the removal/direct disturbance of 51.09 ha of important foraging habitat in the study area, the project would be likely to disrupt the breeding cycle of an important population of the Superb Parrot through the loss of up to 250 hollow-bearing trees (supporting a range of number and sized hollows).

Is there a real chance or a possibility that the action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

This species primarily forages in trees, understorey shrubs and on the ground. Their diet consists mainly of grass seeds and herbaceous plants (OEH 2012). The study area provides potential foraging habitat for the Superb Parrot in the form of native grasses and box-gum woodland communities and breeding habitat in the form of hollow-bearing trees. Approximately 51.09 ha of potential habitat, including hollow-bearing trees, would be removed and/or directly disturbed by the

project. This represents approximately 0.27% of the potential habitat available in the locality (18,726.04 ha). Conservation reserves in the locality where habitat for these species would be unaffected are Mullion Range State Conservation Area and Girralang Nature Reserve. Although a large area of important foraging resources (51.09 ha) would be removed and/or directly disturbed by the project including the removal of up to 250 (hollow-bearing trees supporting a range of number and sized hollows), provided the recommended mitigation measures area followed the project would not be expected to decrease the quality of habitat to a extent that the Superb Parrot would decline.

Is there a real chance or a possibility that the action will result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat?

The national Recovery Plan for the Superb Parrot does not list any invasive species as a threat to the Superb Parrot. The project is unlikely to result in the introduction or exacerbation of any invasive species that is harmful to the Superb Parrot in the study area.

Is there a real chance or a possibility that the action will introduce disease that may cause the species to decline?

Infection by *Psittacine circoviral* (beak and feather) disease affecting psittacine species is listed as a key threatening process (NSW Scientific Committee 2008e; DEH 2005). Superb Parrots are considered to have a high potential for being adversely impacted by *Psittacine circoviral* due to their low population numbers and the fact that *Psittacine circoviral* has been recorded in wild birds in NSW (NSW Scientific Committee 2008e). The project would be unlikely to result in the introduction of *Psittacine circoviral* into the study area, or increase the incidence of *Psittacine circoviral* in birds in NSW.

Is there a real chance or a possibility that the action will interfere substantially with the recovery of the species?

The Department of Sustainability, Environment, Water, Population and Communities identifies the most significant threat to the Superb Parrot as the clearing, degradation and fragmentation of box gum woodland throughout the species' range. This is particularly important when it occurs within breeding and foraging habitats, and corridors of vegetation used for regular movements. A national Recovery Plan for the Superb Parrot was published in 2011 which reiterates the dependence of the Superb Parrot on box gum foraging habitat within 10 km of breeding sites.

The project would remove and/or directly disturb 51.09 ha of important foraging resources which occur in proximity to a breeding colony. In addition to this the project would potentially remove up to 250 hollow-bearing trees (supporting a range of number and sized hollows) which are a critical breeding resource for this species. There is potential for the project to interfere with the recovery of the species.

Conclusion

Based on the above assessment the project is likely to have a significant impact on the Superb Parrot through the loss and/or direct disturbance of up to 250 limiting potential breeding hollows and 51.09 ha of important foraging habitat for an important population of this species.

Migratory Fauna

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, destroy or isolate an area of important habitat for a migratory species.
- Result in an invasive species that is harmful to a migratory species becoming established in an area of important habitat for the migratory species.
- Seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species.

An area of important habitat for a migratory species is defined in DEWHA (DEWHA 2009c) as:

- 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 lifecycle stages; and/or
- Habitat utilised by a migratory species which is at the limit of the species range; and/or
- Habitat within an area where the species is declining.

Further, the process for identifying important habitat specifically for migratory shorebirds is detailed in DEWHA (2009b).

Seven migratory species are considered to have known and/or potential habitat within the study area, and a moderate or higher likelihood of occurrence; Rufous Fantail (recorded during field surveys), White-bellied Sea-eagle *Haliaeetus leucogaster*, Cattle Egret *Ardea ibis*, Satin Flycatcher *Myiagra cyanoleuca*, Rainbow Bee-eater *Merops ornatus*, Australian Reed-warbler *Acrocephalus australis* and Latham's Snipe *Gallinago hardwickii*. An additional species, Australian Painted Snipe, is considered to have a low likelihood of occurrence but has been nominated as a subject species in the supplementary DGRs. For this reason Australian Painted Snipe has been considered in the following assessment.

One (Latham's Snipe) of the eight migratory species with known and/or potential habitat in the study area is included in the *Significant impact guidelines for 36 migratory shorebird species* (2009b). Following these guidelines, a site may be considered important habitat for Latham's Snipe if it:

- Supports at least 18 individuals, and
- Is a naturally occurring open freshwater wetland with vegetation cover nearby (for example, tussock grassland, sedges, lignum or reeds within 100 m of the wetland).

No records of Latham's Snipe occur within the study area. No naturally occurring wetlands occur within the study area. Therefore, the study area is not considered 'important habitat' for the one species listed within the *Significant impact guidelines for 36 migratory shorebird species* (2009b). The remaining seven migratory birds with known and/or potential habitat in the study area are considered further below.

Of the remaining seven migratory birds, three have been previously recorded within or immediately adjacent to the study area: Rufous Fantail, Rainbow Bee-eater and Australian Reed-warbler. The Rufous Fantail and Rainbow Bee-eater have been recorded once each, and the Australian Reed-warbler twice. The definitions of 'important habitat' have been considered and the study area is not considered to be important habitat for these three species or the remaining migratory birds.

As habitat within the study area has been ruled out as 'important habitat' according to DEWHA guidelines (DEWHA 2009c; 2009b), only the last Significant Impact Criterion needs to be addressed:

- Will the project seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species.

The study area is considered unlikely to support an ecologically significant proportion of the population of any of the eight migratory species with known and/or potential habitat. Further, impacts from the project on these species are considered as unlikely to result in serious lifecycle disruption for any of these species.

The table below lists the eight migratory species with known and/or potential habitat in the study area, whether or not they have been previously recorded within the study area, whether or not they are listed in the DEWHA (2009b) guidelines, and whether or not the study area provides important habitat.

Common Name	Recorded in Study Area?	Listed in DEWHA (2009b) Guidelines?	Does Study Area provide 'important habitat'?
White-bellied Sea-eagle	No	No	No
Cattle Egret	No	No	No
Satin Flycatcher	No	No	No
Rufous Fantail	Yes, once (current surveys)	No	No
Rainbow Bee-eater	Yes, once (previously)	No	No
Australian Reed-warbler	Yes, twice (previously)	No	No
Australian Painted Snipe	No	No	No
Latham's Snipe	No	Yes	No

Conclusion

Based on the above assessment, the project is considered unlikely to result in a significant impact on any migratory species.

Refer to *The Macquarie River to Orange Pipeline Project. Aquatic Ecology Assessment* (Cardno Ecology Lab 2012b) for assessment of downstream impacts on the Macquarie Marshes, and associated migratory species.