Species	EPBCA Status	Habitat Description	Likelihood of Occurrence and potential impact
		Resource Management Regions. Hairy-joint Grass is known to be reserved in Carnarvon Cooloola NP, Noosa NP (Briggs & Leigh, 1996), Carnarvon NP (Queensland CRA/RFA Steering Committee, 1998), and Daintree NP (Queensland Herbarium, 2008). In NSW and Queensland, Hairy-joint Grass is found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps (Queensland CRA/RFA Steering Committee, 1997, 1998; DECC NSW, 2005), as well as woodland (Queensland Herbarium, 2008). In south-east Queensland, Hairy-joint Grass has also been recorded growing around freshwater springs on coastal foreshore dunes, in shaded small gullies, on creek banks, and on sandy alluvium in creek beds in open forests (Queensland CRA/RFA Steering Committee, 1997, 1998), and also with bog mosses in mound springs (Queensland Herbarium, 2008). The distribution of this species overlaps with the following EPBC Act-listed threatened ecological communities: • Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions, • The community of native species dependent on natural discharge of groundwater from the • Great Artesian Basin, • Brigalow (Acacia harpophylla dominant and co-dominant), and • White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native [TSSC Conservation Advice (2008) online @http://www.environment.gov.au/biodiversity/threatened/species/pubs/9338-conservation-advice.pdf].	Environmental Significance.
Jointed Baloghia (*Baloghia marmorata*)	Vulnerable	Marbled Balogia has a geographically disjunct distribution (BRI, undated; Quinn et al., 1995) confined to the Lismore district, in north-east NSW, and the Tamborine Mountains and Springbrook, in south-east Queensland (NSW NPWS, 2002; DECC NSW, 2005; Harden, 2005). Locations include Canungra Land Warfare Centre Training, Joalah National Park (NP), Mt Pinbarren, Tamborine Mountain NP, along Mudgeeraba–Springbrook Road, Lower Beechmont, along Upper Coomera–Canungra Road, and Wilkie's Scrub within Gold Coast Council conservation reserve (BRI, undated; Forster et al., 1991; Barry & Thomas, 1994; Aussie Heritage, 2007; Queensland Herbarium, 2008). Localities in NSW include Davies Scrub Nature Reserve, Rouse Mill, Meerschaum Vale and Dalwood (Floyd, 1989; Quinn et al., 1995). Although definitive population estimates are unavailable, the largest is Tamborine Mountain NP with 175 individuals and another three locations have 100 individuals (Barry & Thomas, 1994; Quinn et al., 1995). This species occurs within the Northern Rivers (NSW) and South East Queensland Natural Resource Management Regions. Marbled Balogia is found in subtropical rainforest/notophyll vine forest and wet sclerophyll forest (brush box woodland) with rainforest understorey between 150 and 550 m above sea level (Queensland Herbarium, 2008). Soils are rich black or dark brown clay and loam derived from basalt (Quinn et al., 1995; Steenbeeke, 1998; NSW NPWS, 2002; DECC NSW, 2005; Harden, 2005). Associated species can include Eucalyptus microcorys, Archontophoenix cunninghamiana, Aphananthe philippinensis, Capparis arborea, Planchonella australis, Ficus spp., Olea paniculata, Planchonella myrsinoides, Brachychiton discolor, Mallotus claoxyloides, Drypetes deplancheri, and Calamus muelleri (Queensland Herbarium, 2008). The distribution of this species is not known to overlap with any EPBC Act-listed threatened ecological communities [TSSC Conservation Advice (2008) online @ http://www.environment.gov.au/biodiversity/threatened/species/pubs/8463-conservation-advice.pdf].	This threatened flora species was not observed within the Proposed Protection Zone. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Native Jute (*Corchorus cunninghamii)*	Endangered	The Native Jute occurs from the Richmond River in north east New South Wales to the Brisbane River in south east Queensland. It has an estimated extent of occurrence of 7000 km^2 and an estimated area of occupancy of less than 5 ha. In Queensland, the species is currently known from five locations between the Beenleigh district and the lower Brisbane River and two locations in northern New South Wales. This species is found at Ormeau (Darling Range), Wongawallan, Brisbane Forest Park, Enoggera Army base and Mount Cotton, in Queensland. In New South Wales, the Toonumbar population is found within Toonumbar National Park and a Hoop Pine plantation in Toonumbar State Forest. Surveys in 2001 recorded an estimated population size of 600–700 individuals (Stewart, 2001). However, more recent surveys have estimated that 2000 individuals occur within the Hoop Pine plantation alone (SFNSW, 2003) and a new sub- population of over 100 individuals was discovered on private land, near Toonum bar National Park in 2007 (Ruming, pers. comm., 2010). The Bungabbee population found within the Bungabbee Nature Reserve and Bungabbee State Forest was estimated to contain 50 individuals. However, a field inspection to Bungabbee Nature Reserve in 2007, failed to find any plants at previous locations where this species was found (Ruming, pers. comm., 2010). The total population at the four locations in Queensland (excluding the Enoggera site) is estimated to be approximately 6000 individuals (Parr, 2001). The Native Jute is found in a mosaic of wet sclerophyll and subtropical rainforest as well as grassy open forest. This species is generally located at low to mid elevations (110–430 m), on upper hill -slopes or hill -crests that have a south -easterly or easterly aspect. There is no specific geology or soil type associated with the species as it occurs on both metamorphic and igneous substrates and on loam or clay soils (Halford, 1995). In general the soils are shallow, stony and well drained and common canopy species occurring alongside this species include Grey Gum (Eucalyptus propinqua), Brush Box (Lophostemon confertus) and Grey Ironbark (Eucalyptus siderophloia) (Saunders, 2001). Due to the ecology of this species, the number of individual plants present at any one time can fluctuate widely, depending on the presence/absence of disturbance regimes and where a population is at in its lifecycle (Ruming, pers. comm., 2010). This species occurs within the South Eastern Queensland Bioregion and the South- East Queensland and Northern RiversNatural Resource Management Regions. The distribution of this species is not known to overlap with any EPBC Act-listed threatened ecological community [TSSC Conservation Advice (2014) online @ http://www.environment.gov.au/biodiversity/threatened/species/pubs/14659-conservation-advice.pdf]	This threatened flora species was not observed within the Proposed Protection Zone. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Stinking Laurel (*Cryptocarya foetida*)	Vulnerable	Leafless Tongue-orchid occurs in Victoria, NSW, and Queensland. In Victoria, the species is found in east Gippsland, between Orbost and Mallacoota. In NSW, it is recorded mainly on coastal and near coastal ranges north to near Forster, with two isolated occurrences inland north-west of Grafton. In Queensland, the species is found from the Tin Can Bay area and along the coast to the Glasshouse Mountains (Logan, 1998; Riley & Banks, 2002). Leafless Tongue-orchid occurs singly or more often in highly localised loose colonies and inhabits a range of habitats. This species occurs within the East Gippsland (Victoria), Southern Rivers, Hawkesbury–Nepean, Hunter–Central Rivers and Northern Rivers (NSW), South East Queensland, and Burnett Mary (Queensland) Natural Resource Management Regions. In NSW, it is known from 39 sites, the largest at Bulahdelah, which consists of two populations with 104 and 359 plants. It appears to be most common in the Shoalhaven area with 25 populations generally with less than 30 individuals (Clark et al., 2004). It is predicted to occur in Ben Boyd NP and Bellbird Creek Nature Reserve (NSW NPWS, 2004). In northern NSW, along with several coastal populations of up to 50 plants, Leafless Tongueorchid also occurs at two isolated inland sites—Gibraltar Range NP and Washpool NP (Parsons Brinckerhoff, 2006). The total NSW population size is estimated to be 1300 to 1500 plants (M. Clements, 2008, pers. comm.). The species occurs mostly in coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest (DAFF, 2002; Jones et al., 2006; Jones, 2006). It prefers open areas in the understorey of forested communities (DECC, 2005a). The soils include moist sands, moist to dry clay loam and occasionally in accumulated eucalypt leaves (Jones et al., 2006; Jones, 2006). The distribution of this species is not known to overlap with any EPBC Act-listed threatened ecological communities [TSSC Conservation Advice (2008) online	This threatened flora species was not observed within the Proposed Protection Zone. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.

Species	EPBCA Status	Habitat Description	Likelihood of Occurrence and potential impact
		@http://www.environment.gov.au/biodiversity/threatened/species/pubs/19533-conservation-advice.pdf].	
Floyd's Walnut (*Endiandra floydii*)	Endangered	'The Crystal Creek Walnut is known from Pimpama, just north of the Queensland Gold Coast, south to Byron Hills, six km south of Cape Byron, NSW. Several large populations are known. Two are in the ranges to the north of Murwillumbah, where numerous other smaller occurrences are also found. At least 50 individuals are known from the Urliup Road area (Barry & Thomas 1994) and 40–50 trees have been reported from Crystal Creek (R. Cremer pers. Comm.). A further concentration of plants is in Mooball National Park where nearly 80 individuals have been recorded (NPWS survey data, 1997). The Crystal Creek Walnut occurs in subtropical (including littoral) rainforest or wet sclerophyll forest, often with Lophostemon confertus (Brush Box) in the canopy and occasionally with Araucaria cunninghamii (Hoop Pine) tilize . Disturbed and regrowth sites may include Cinnamomum camphora (Camphor Laurel) and Lantana camara (Lantana) as weed components. Most locations are on soils derived from paleozoic metamorphics, sometimes with basalt nearby. A small number of sites are on alluvium or sand. Sheltered locations are apparently preferred, and landforms including ridgelines, slopes, gullies and creek flats have been documented. The altitude varies between close to sea level up to 430 m above sea level (Floyd 1989)' (in DEC, 2004: 3)	This threatened flora species was not observed within the Proposed Protection Zone. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Macadamia Nut (*Macadamia integrifolia*)	Vulnerable	Macadamia Nut occurs from Mt Bauple, near Gympie, to Currumbin Valley in the Gold Coast hinterland, south-east Queensland. The species was known to occur in north-east New South Wales; was described from 1850-60 specimens collected from Camden Haven, and there are specimens also from Lismore. It occurs as a scattered rare to occasional tree, and population sizes are difficult to estimate (Barry & Thomas, 1994). Populations in the south-east Queensland Regional Forest Agreement region (area of 10,000 km²) are estimated at 2 500 mature individuals in 20 populations. These populations were formerly declining but are presently stable (Queensland CRA/RFA Steering Committee, 1997). Macadamia Nut is conserved in at least four reserves in south-east Queensland (Nicholls Scrub National Park, Triunia National Park, Mt Cooroy Conservation Park and Mt Bauple National Park) but these are all small (Barry & Thomas, 1994). This species grows in remnant rainforest, including complex mixed notophyll forest, and prefers partially open areas such as rainforest edges (Ryan, 2006). This speciesoccurs within the Northern Rivers (NSW) and South East Queensland Natural Resource Management Regions. [TSSC Conservation Advice (2008) online @ http://www.environment.gov.au/biodiversity/threatened/species/pubs/7326-conservation-advice.pdf]	This threatened flora species was not observed within the Proposed Protection Zone. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Rough-shelled Macadamia (*Macadamia tetraphylla*)	Vulnerable	This species of nut tree is confined chiefly to the Richmond and Tweed Rivers in north-east NSW, extending just across the border into Queensland where it occurs within subtropical rainforest, particularly on basaltic soils. (Williams, Harden and McDonald, UNE, 1984; DECC, 2005). The species is also commonly noted as a paddock tree on soils of basaltic influence and as an ornamental or orchard tree associated with residential and/or rural activities (pers.obs.).	This threatened flora species was not observed within the Proposed Protection Zone. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Lesser Swamp Orchid (*Phaius australis*)	Endangered	This species is known from swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas (NPWS, 2002).	This threatened flora species was not observed within the Proposed Protection Zone. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Shiny-leaved Condoo (*Planchonella eerwah*)	Endangered	This conservation advice was approved by the Minister / Delegate of the Minister on 3 July 2008 Pouteria eerwah Conservation Advice - Page 1 of 4Approved conservation advice (s266B of the Environment Conservation and Biodiversity Protection Act 1999) Approved Conservation Advice forPouteria eerwah(Shiny-leaved Condoo)This Conservation Advice has been developed based on the best available information at the time this conservation advice was approved. DescriptionPouteria eerwah (previously Planchonella eerwah), Family Sapotaceae, also known as Shiny-leaved Condoo,Black Plum or Wild Apple, is variable in habit, ranging from a small tree to 4 m high through to a forest emergent to 40 m high. Young branchlets are greyish and hairy and exude a milky latex when cut. Leaves are egg-shaped to spathulate (spatula-shaped), 4–14 cm long, leathery and hairless with raised venation on both surfaces. The fruits are firm-fleshed, spherical, 3–6 cm long, red-purple to black, and contain three to five seeds. Flowers and fruits occur throughout the year with peak flowering from August to January (Stanley & Ross, 1986; Barry & Thomas, 1994; Harden et al., 2006). Shiny-leaved Condoo is restricted to three areas of south-east Queensland: the Ipswich–Beaudesert area south-west of Brisbane; the Beenleigh–Ormeau–Pimpama area, south-east of Brisbane; andthe Nambour–Maleny district on the Sunshine coast. The area is warm and subtropical with 60% of rain falling in the summer months. Annual rainfall is 650 mm in the drier western areas, to more than 1000 mm at higher elevations. There are seven known populations with an estimated combined population of 160 to 180 individuals (Wiley et al., 1999). One population occurring in the Nambour–Maleny district is protected in the National Park. Part of one population in the Ipswich area is protected in a Conservation Reserve (Wiley et al., 1999). This species occurs within the South East QueenslandNatural Resource Management Region. Shiny-leaved Condoo occurs on slopes 80–420 m above sea level. Populations in the Ipswich–Beaudesert area occur on rocky slopes and drainage lines on a variety of soils. Populations in the Beenleigh–Ormeau–Pimpama area occur on nutrient poor soils derived from metasediments. Populations in the Nambour–Malenyarea all occur on well-drained basaltic, dark sandy loams (Barry & Thomas, 1994). The populations south of Brisbane occur in Araucarian Notophyll Vine Forest and Araucarian Microphyll Vine Forest dominated by Flindersi species, with occasional emergent Araucaria cunninghamii and Harpullia pendula. The northern populations occur inthe canopy and lower strata of remnant Complex Notophyll Vine Forest dominated by Argyrodendron sp. (Kin Kin W.D.Francis AQ81198), Atalaya multiflora, Choricarpia subargentea, Excoecaria dallachyana, and Flindersiaaustralis (Barry & Thomas, 1994; Wiley et al., 1999).	This threatened flora species was not observed within the Proposed Protection Zone. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Quassi (*Samadera bidwilii)*	Vulnerable	Quassia is endemic to Queensland and is currently known to occur in several localities between Scawfell Island, near Mackay, and Goomboorian, north of Gympie (QDNR, 2000). Quassia has been confirmed as occurring in at least 40 known sites (QDNR, 2001). Quassia commonly occurs in lowland rainforest or on rainforest margins (Hewson, 1985), but it can also be found in other forest types, such as open forest and woodland (QDNR, 2001). Quassia is commonly found in areas adjacent to both temporary and permanent watercourses (Belleng Pty Ltd, 2004) in locations up to 510 m altitude. The species has been cultivated at the Royal Botanic Gardens, Melbourne (CHABG, 1994). Commonly associated tree species include Spotted Gum (Corymbia citriodora), Grey Gum (Eucalyptus propinqua), White Mahogany (E. acmenoides), Forest Red Gum (E. tereticornis), Pink Bloodwood (E. intermedia), an ironbark (E. siderophloia), Gum Topped Box (E. moluccana), Gympie Messmate (E. cloeziana) and Broad Leaved Ironbark (E. fibrosa) (QDNR, 2001). Quassia occurs within the Burnett Mary, Fitzroy, Mackay Whitsunday, and Burdekin (Queensland) Natural Resource Management regions.	This threatened flora species was not observed within the Proposed Protection Zone. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.

Species	EPBCA Status	Habitat Description	Likelihood of Occurrence and potential impact
Toadflax (*Thesium austral*)	Vulnerable	'Austral Toadflax occurs in New South Wales, the Australian Capital Territory, Queensland and Victoria (Scarlett et al. 2003; NSW OEH 2013). It is also known from eastern Asia (e.g. China) (Zhang & Qiu 1999). Its current distribution is sporadic but widespread, occurring between the Bunya Mountains in south-east Queensland to north-east Victoria (Scarlett et al. 2003) and as far inland as the southern, central and northern tablelands in New South Wales and the Toowoomba region (ALA 2013). There is an outlier in Carnarvon National Park on the Consuelo Tableland of the southern Brigalow Belt (ALA 2013). It had been recorded once in Tasmania from the Derwent River valley in 1804, but is considered extinct in the state (Tas. DPIWE 2003). Many other previously known sites do not have recent records (ALA 2013; Leigh et al. 1984). Austral Toadflax is an inconspicuous plant (George 1984) and is often overlooked (Victorian Workshop 2000 pers. comm.). With survey training, collections increased substantially in northern New South Wales (Copeland 2000 pers. comm.). One expert suggested that there could be hundreds of thousands to a million across Australia (Thiele 2000 pers. comm.). In New South Wales, Austral Toadflax occurs on the coast, tablelands and western slopes (NSW NPWS 2003m). The Atlas of Living Australia (2013) indicates that there were 255 Austral Toadflax herbarium collections between 1990 and 2013 in New South Wales and the Australian Capital Territory. Over 200 of these were in the Nandewar, New England Tablelands and NSW North Coast Bioregions. In northern New South Wales, survey training lead to a significant increase in the discovery of new sites (Copeland 2000 pers. comm.). Sites include Perpendicular Point in Kattang Nature Reserve (1 plant per 1 m²); Look at Me Now Headland at Moonee Creek Nature Reserve (1 plant per 1 m²); Old Bar Park (Taree, 1 plant per 100 m²) (Cohn 2004); Yetman-Wallangra; Linton Nature Reserve; Boambee Head (50–100 plants); Hat Head National Park; Blackville; Bibbenluke; Cabramurra (locally frequent); and Yarrangobilly Caves (ALA 2013) Austral Toadflax is semi-parasitic on roots of a range of grass species (Copeland 2000 pers. comm.; Leigh et al. 1984), notably Kangaroo Grass (*Themeda triandra*) (Scarlett et al. 1994). It occurs in subtropical, temperate and subalpine climates over a wide range of altitudes. It occurs on soils derived from sedimentary, igneous and metamorphic geology on a range of soils including black clay loams to yellow podzolics and peaty loams (Leigh et al. 1984; Hunter et al. 1999; Cohn 2004). It occurs in shrubland, grassland or woodland, often on damp sites (George 1984; Harden 1992). Vegetation types include open grassy heath dominated by Swamp Myrtle (*Leptospermum myrtifolium*), Small- fruit Hakea (*Hakea microcarpa*), Alpine Bottlebrush (*Callistemon sieberi*), Woolly Grevillea (*Grevillea lanigera*), Coral Heath (*Epacris microphylla*) and *Poa* spp. (Griffith 1991); Kangaroo Grass grassland surrounded by *Eucalyptus* woodland; and grassland dominated by Barbed-wire Grass (*Cymbopogon refractus*) (Leigh et al. 1984; Hunter et al. 1999). At a NSW coastal site, associated plants included Coastal Wattle (*Acacia sophorae*), Coast Banksia (*Banksia integrifolia*),*Zieria prostrata* and Bitou Bush (*Chrysanthemoides monilifera*) (Cohn 2004).' (DEE 2017 online @ http://www.environment.gov.au/cgi- bin/sprat/public/publicspecies.pl?taxon_id=15202)	This threatened flora species was not observed within the Proposed Protection Zone. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.

3.2.1 Threatened Flora Summary

No flora species listed as critically endangered, endangered, vulnerable or conservation dependent under the *Environment protection and Biodiversity Conservation Act 1999* were observed within the study area. The proposed action within the Proposed Protection Zone is considered unlikely to have a significant impact upon critically endangered, endangered or vulnerable flora species.

The proposed action is unlikely to significantly impact the above threatened flora species.

3.3 Threatened Fauna Species

The Protected Matters Search identified twenty-five (25) threatened fauna species that have been reported occurring within 2km of the Proposed Protection Zone.

Table 6: Threatened Fauna Species

Species	EPBCA Status	Habitat Description	Likelihood of Occurrence and potential impact
Birds			
Regent Honeyeater (*Anthochaera Phrygia*)	Critically Endangered	The Regent Honeyeater is mostly recorded within box-ironbark eucalypt and riparian associations incorporating River She-oak on the inland slopes of the Great Dividing Range (Menkhorst et al, 1999; NPWS, 1999). Only three key breeding regions are known [north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region] although non-breeding flocks have been recorded in flowering coastal Swamp Mahogany and Spotted Gum forests particularly on the central coast and occasionally on the upper north coast (DEC. 2005; Menkhorst et al, 1999). "Since the beginning of the current recovery effort several large aggregations have been found. During May 1994, 151 birds were present at Howes Valley, NSW (Menkhorst 1997, Oliver 1998a). At the same time there were 47 at Warrumbungle National Park, giving a total known population of about 200 birds. During spring 1997 at least 400 Regent Honeyeaters were present in the Capertee Valley, NSW and, based on the proportion of colour-banded birds present, the actual population may have been closer to 800 (D. Geering unpublished data). During the same breeding season population estimates for the Bundarra-Barraba region, based on the number of breeding pairs found, extrapolated across the available habitat, suggest a maximum of 520 birds (Oliver 1998b). Therefore, the total population may be close to or greater than the upper limit of 1500 suggested by Webster and Menkhorst (1992)" (online @ http://www.environment.gov.au /biodiversity/threatened/publications /recovery/regent-heater/index.html#section12). Diet is mostly reliant on nectar from 16 species of Eucalypt and two species of Mistletoe although the preferred sources are three species of eucalypt; Red Ironbark, White Box and Yellow box (Webster & Menkhorst 1992; NPWS, 1999; Menkhorst et al, 1999). At times of food shortage (e.g. when flowering fails in preferred habitats), Honeyeaters also use other woodland types and wet lowland coastal forest dominated by *Eucalyptus robusta* (Swamp Mahogany) or *E. maculata* (Spotted Gum) (Franklin et al. 1989b; Geering & French 1998; Ley & Williams 1992; Oliver et al. 1999; Webster & Menkhorst 1992). They sometimes use native pine *Callitris* woodlands, usually where mixed with eucalypts. They regularly occur in remnant trees or patches of woodland in farmland, partly cleared agricultural land and riverine forest of River Sheoak, usually infested by mistletoe, and sometimes mixed with eucalypts (Franklin et al. 1989; D. Geering 2005, pers. comm.; Geering 1997; Geering & French 1998; Ley et al. 1996; Ley & Williams 1994; Oliver et al. 1999).	This threatened fauna species was not observed within the Proposed Protection Zone. It is considered that the preferred habitat for this species is largely absent from the proposed works area. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.

Species	EPBCA Status	Habitat Description	Likelihood of Occurrence and potential impact
		Regent Honeyeaters usually build their nests in rough-barked trees, mostly eucalypts such as ironbarks, stringybarks or River Sheoak, or sometimes in smooth or boxbarked species (e.g. Blakely's Red Gum, White Box, Yellow Box) if rough-barked trees are not available (D. Geering 2005, pers. comm.; Geering 1997; Geering & Frenc 1998; Geering & Herman 1999; Ley & Williams 1992, 1994; Oliver et al. 1998). Nests are often also built amongst mistletoes in trees (D. Geering 2005, pers. comm.; Geering & Herman 1999; Oliver et al. 1998; Webster & Menkhorst 1992).	
Australasian Bittern (*Botaurus poiciloptilus*)	Endangered	The Australasian Bittern occurs mainly in densely vegetated, permanent and seasonal freshwater wetlands with tall dense vegetation particularly those dominated by sedges, rushes and/or reeds (e.g. Phragmites, Cyperus, Eleocharis, Juncus, Typha, Baumea, , Bolboschoenus) or cutting grass (Gahnia) growing over muddy or peaty substrate (Marchant & Higgins1990). The Bittern forages in still, shallow water, feeding on freshwater crayfish, fish (including goldfish), weevils, snakes, leaves and fruit (Marchant & Higgins 1990), frogs and tadpoles. The major threat to the Bittern in Australia is the loss or alteration of suitable habitat, primarily through the diversion of water away from wetlands for irrigation, and the drainage and salinisation of swamps (Garnett & Crowley 2000; Jaensch 2004; Kingsford 2000; Kingsford & Thomas 1995; Marchant & Higgins 1990). In Queensland, clearing of coastal wetlands for urbanisation, particularly around the Sunshine Coast, has greatly reduced the area of occupancy.	This threatened fauna species was not observed within the Proposed Protection Zone. It is considered that the preferred habitat for this species is largely absent from the proposed works area. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Red Knot (*Calidris canutus*)	Endangered	"The Red Knot is common in all the main suitable habitats around the coast of Australia (Barrett et al. 2002b; Minton, C.D.T. 2002, pers. comm.; Watkins 1993), but is less numerous in south-west Australia than elsewhere (Lane 1987). Very large numbers are regularly recorded in north-west Australia, with 80 Mile Beach and Roebuck Bay being particular strongholds. The only places it is not found in significant numbers are the northern part of the Great Australian Bight in South Australia and Western Australia, and along much of the NSW coast, where wader habitat is rather scarce (excluding the Hunter Estuary). It is also relatively absent west of Warranbool, Victoria through to the Coorong, South Australia. A flock, sometimes in the hundreds, is regularly recorded at Albany, south-west Western Australia (Minton, C.D.T. 2002, pers. comm.). It is occasionally recorded inland in all regions. In Queensland, the Red Knot migrates along the coast north of 19 °S, sometimes in large numbers; it is widespread along the coast south of Townsville and along the coasts of NSW and Victoria. There are few records between Bermagui and Lakes Entrance, and from west Bellarine Peninsula to Warrnambool. It is a regular visitor to the coasts of Tasmania, and King and Flinders Islands, in small numbers. In South Australia, the species is found mostly from The Coorong, north and west to the Yorke Peninsula and Port Pirie. In Western Australia there are scattered records in the south, and it is occasionally seen around Peron Peninsula and Carnarvon. It is widespread on the coast from Ningaloo and Barrow Island to the south-west Kimberley Division. In the Northern Territory it is mainly recorded from Darwin, but also seen at various other sites. It is also recorded at Norfolk Island, Lord Howe Island, Macquarie Island, Kermadec Island, Chatham Island, Auckland Island and Campbell Island (Higgins & Davies 1996). In Australasia the Red Knot mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps. They rarely use inland lakes or swamps (Higgins & Davies 1996). The Red Knot usually forage in soft substrate near the edge of water on intertidal mudflats or sandflats exposed by low tide. At high tide the may feed at nearby lakes, sewage ponds and floodwaters (Higgins & Davies 1996). They have also been recorded foraging on beds of eelgrass on tidal sandflats (Battley, P. in Higgins & Davies 1996), on a thick algal mat in shallow water (Dann 1983), and in shallow pools on crest of coral reef (Domm & Recher 1973). The Red Knot roosts on sandy beaches, spits and islets, and mudflats; also in shallow saline ponds of saltworks. In New Zealand they are known to roost on short wet pastures near the coast (Higgins & Davies 1996). They have been seen roosting on an inland claypan near Roebuck Bay, north-west Western Australia (Collins et al. 2001). They like to roost in open areas far away from potential cover for predators, but close to feeding grounds (Rogers 2001). In hot conditions, waders prefer to roost where a damp substrate lowers the local temperature (Rogers 1999b)". (DEE 2017 online @ http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=855)	This threatened fauna species was not observed within the Proposed Protection Zone. It is considered that the preferred habitat for this species is largely absent from the proposed works area. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Curlew Sandpiper (*Calidris ferruginea*)	Critically Endangered	"In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Records occur in all states during the non-breeding period, and also during the breeding season when many non-breeding one year old birds remain in Australia rather than migrating north. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters (Higgins & Davies 1996). Curlew Sandpipers forage on mudflats and nearby shallow water. In non-tidal wetlands, they usually wade, mostly in water 15–30 mm, but up to 60 mm, deep. They forage at the edges of shallow pools and drains of intertidal mudflats and sandy shores. At high tide, they forage among low sparse emergent vegetation, such as saltmarsh, and sometimes forage in flooded paddocks or inundated saltflats. Occasionally they forage on wet mats of algae or waterweed, or on banks of beachcast seagrass or seaweed. They rarely forage on exposed reefs (Higgins & Davies 1996). In Roebuck Bay, northern Western Australia, they are also said to feed on part of the mudflats that have been exposed for a longer period, foraging in small groups (Tulp & de Goeij 1994). Curlew Sandpipers generally roost on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh (Higgins & Davies 1996). They have also been recorded roosting in mangroves in Inverloch, Victoria (Minton & Whitelaw 2000). This species forages mainly on invertebrates, including worms, molluscs, crustaceans, and insects, as well as seeds. Outside Australia, they also forage on shrimp, crabs and small fish. Curlew Sandpipers usually forage in water, near the shore or on bare wet mud at the edge of wetlands. On wet mud they forage by pecking and probing. They probe in shallow water, and jab at the edge of the water where a film of water remains on the sand. They glean from mud, from the surface of water, or in drier areas above the edge of the water. For a 'jab' less than half the length of the bill is inserted into the substrate; a probe is performed with a slightly open bill inserted to its full length. Curlew Sandpipers may wade up to the belly, often with their heads submerged while probing. They often forage in mixed flocks (Dann 1999b), including with Red-necked Stints (Calidris ruficollis)". (DEE 2017 online @ http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=856)	This threatened fauna species was not observed within the Proposed Protection Zone. It is considered that the preferred habitat for this species is largely absent from the proposed works area. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Eastern Bristlebird (*Dasyornis brachypterus)*	Endangered	The Eastern Bristlebird inhabits low dense vegetation in a broad range of habitat types including sedgeland, heathland, swampland, shrubland, sclerophyll forest and woodland, and rainforest. It occurs near the coast, on tablelands and in ranges. The Eastern Bristlebird is found in habitats with a variety of species compositions, but is defined by a similar structure of low, dense, ground or understorey vegetation	This threatened fauna species was not observed within the Proposed Protection Zone. It is considered that the preferred habitat

Species	EPBCA Status	Habitat Description	Likelihood of Occurrence and potential impact
			for this species is largely absent from the proposed works area. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Red Goshawk (E*rthrotriorchis radiatus*)	Vulnerable	This raptor utilises coastal-subcoastal tall forests/woodlands, savanna traversed by forested rivers and rainforest fringes (Marchant & Higgins, 1993; NPWS, 2002; NPWS, 1999). In south-east Qld, *Araucaria* vine forests and open forests are a significant component of the vegetation mosaics frequented by Red Goshawks (Czechura 1997). In north-east NSW and south-east Qld, Red Goshawks are mainly found in rugged terrain (Debus 1993; Czechura 1996) as most suitable lowland forest has been cleared or modified. In northern Australia they nest in both rugged terrain and lowland sites (Aumann & Baker-Gabb 1991 in NPWS, 2002) The population size is difficult to estimate because the red goshawk has a very sparse and discontinuous distribution over a wide area — from the Kimberley in Western Australia across northern Australia, and down the east coast of Queensland to northern New South Wales. It is estimated there are between 100 and 200 breeding pairs in Queensland. Some researchers have suggested that the species is extinct in New South Wales, although there is evidence that some pairs do remain along the Queensland- New South Wales border (Ryan, 2006). Based on analysis during 2001, the distribution of the Red Goshawk in south-east Qld has been recorded from areas of different land tenure. Six pairs are centred in National Park lands and four pairs are recorded from either private land or other crown land (e.g. State Forests) (Stewart & Hobson 2002 in NPWS, 2002). Hunting occurs for medium-large birds within open forests and riparian/gallery forests over a very large home range of up to 200km2 (Blakers et al., 1984, Aumann and Baker-Gabb, 1991, Czechura and Hobson, 2000; NPWS, 2002). The home range of the red goshawk is extremely large — estimates for five pairs in south-east Queensland vary from 50 to 220sq.km. A Northern Territory telemetry study estimates the home range for females at 120sq.km and males at 200sq.km (Ryan, 2006; Debus & Czechura, 1988). Nesting is restricted to tall trees within proximity of a creek, river or wetland (NPWS, 1999; NT Parks & Wildlife Commission, 2002). Nests are usually built towards the outer edge of the canopy on a substantial live horizontal limb and braced against a vertical branch on the limb. Favoured nest trees are taller than 20m and species in the genera *Eucalyptus, Melaleuca, Corymbia* and, less frequently, *Angophora*. Red goshawks commonly nest in the tallest and largest tree in a stand of tall trees, often directly beside but always within 1km of a permanent waterway or wetland (Ryan, 2006).	This threatened fauna species was not observed within the Proposed Protection Zone. It is considered that the preferred habitat for this species is largely absent from the proposed works area. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Squatter Pigeon (*Geophaps scripta scripta*)	Vulnerable	This species inhabits open grasslands and woodlands typically with a native understorey although may occur in artificial pasture.	This threatened fauna species was not observed within the Proposed Protection Zone. It is considered that the preferred habitat for this species is largely absent from the proposed works area. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Swift Parrot (*Lathamus discolor*)	Critically Endangered	The required breeding habitats for this species is limited to southeast Tasmania in Eucalypt Forest containing suitable densities of hollow-bearing trees required for nesting (Swift Parrot Recovery Team, 2000). Within the winter period it is present on the mainland foraging on a small variety of winter-flowering Eucalyptus as it stores resources to enable its spring return to Tasmania (Swift Parrot Recovery Team, 2000). 'The Swift Parrot migrates from its Tasmanian breeding grounds to overwinter in the box-ironbark forests and woodlands of Victoria, New South Wales and southern Queensland. The principal wintering grounds are the inland slopes of the Great Dividing Range and along the eastern coastal plains (Saunders et al, 2010; DEWHA, 2009). In Victoria, approximately 38% of the total box-ironbark habitat (including habitat on private and public land) occurs within reserves (Environment Conservation Council, 2001). In New South Wales, only 5% of ironbark and woodland communities are reserved (DSEWPC, 2013). In central Victoria, Swift Parrots prefer box-ironbark forests dominated by Yellow Gum, Red Ironbark and Grey Box. In north-eastern Victoria and on the western slopes of New South Wales, Mugga Ironbark and Grey Box are preferred. Box-ironbark occurs across a range of landforms, but drainage lines account for a disproportionately high number of Swift Parrot foraging sites. A variety of grassy woodland vegetation types are also used in these areas, including White Box woodland, Grey Box woodland and\ Grey Box/Yellow Gum woodland (Kennedy & Tzaros in press; Swift Parrot Recovery Team, 2001). During a survey of the Victorian Goldfields bioregion, near Bendigo, Swift Parrots were recorded most frequently in Yellow Gum (51% of observations) in Box-Ironbark Forest (72.2% of sites). In this region, Swift Parrots occurred predominately on lower and upper slopes, and less often on mid slopes, drainage lines and ridges (Cheers & Cheers 2005). Key habitats for the species on the coast and coastal plains of New South Wales include Spotted Gum (Corymbia maculata), Swamp Mahogany (E. robusta) and Forest Red Gum (E. tereticornis) (Saunders 2002b). These tree species provide foraging and roosting habitat for the species. In northern New South Wales and south-eastern Queensland, Narrow-leaved Red Ironbark (E. crebra), Forest Red Gum forests and Yellow Box forest are commonly utilized (Swift Parrot Recovery Team 2001)' (Department of the Environment, Water, Heritage and the Arts, 2009: 5). Priority habitat in Queensland includes Bowman Park, Bardon; Rafting Creek Reserve Kenmore/Fig Tree Pocket (Brisbane) and Glen Lomond Park (Towoomba) [Saunders et al, 2011]	This threatened fauna species was not observed within the Proposed Protection Zone. It is considered that the preferred habitat for this species is largely absent from the proposed works area. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Bar-tailed Godwit (*Limosa lapponica baueri*)	Critically Endangered	*TSSC 2016:* The bar-tailed godwit (both subspecies combined) has been recorded in the coastal areas of all Australian states. It is widespread in the Torres Strait and along the east and south-east coasts of Queensland, NSW and Victoria. In Tasmania, the bar-tailed godwit has mostly been recorded on the south-east coast. In South Australia it has mostly been recorded around coasts from Lake Alexandrina to Denial Bay. In Western Australia it is widespread around the coast, from Eyre to Derby. Populations have also been recorded in the northern Australia, from Darwin east to the Gulf of Carpentaria. The bar-tailed godwit is a regular migrant to Christmas Island, Norfolk Island, Lord Howe Island. It has also been recorded on subantarctic islands such as Macquarie Island, Snares Islands, Auckland Islands and Campbell Islands (Higgins & Davies 1996).	This threatened fauna species was not observed within the Proposed Protection Zone. It is considered that the preferred habitat for this species is largely absent from the

Species	EPBCA Status	Habitat Description	Likelihood of Occurrence and potential impact
		During the non-breeding period, the distribution of bar-tailed godwit (western Alaskan) is predominately New Zealand, northern and eastern Australia (Bamford et al. 2008). In Australia, L. l. baueri mainly occur along the north and east coasts (Garnett et al. 2011). At northern hemisphere breeding sites, the bar-tailed godwit (western Alaskan) nests on the ground in open tundra, usually on dry elevated sites and often between clumps of grass (del Hoyo et al. 1996; Woodley 2009). The nest is usually a depression lined with bits of vegetation and lichens (del Hoyo et al. 1996). The bar-tailed godwit (western Alaskan) occurs mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It has also been recorded in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats (Higgins & Davies 1996). The bar-tailed godwit (western Alaskan) usually forages near the edge of water or in shallow water, mainly in tidal estuaries and harbours. They prefer exposed sandy or soft mud substrates on intertidal flats, banks and beaches. On Heron Island, Qld they have been seen feeding on insect larvae among the roots of Casuarina (Higgins & Davies 1996). The bar-tailed godwit (western Alaskan) usually roosts on sandy beaches, sandbars, spits and also in near-coastal saltmarsh (Higgins & Davies 1996). In some conditions, shorebirds may choose roost sites where a damp substrate lowers the local temperature. During periods of cyclonic activity, shorebirds moved to sheltered areas to avoid high winds and heavy rain (Jessop & Collins 2000)	proposed works area. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Northern Siberian Bar-tailed Godwit (*Limosa lapponica menzbieri*)	Critically Endangered	The bar-tailed godwit (bothsubspecies combined)has been recorded in the coastal areas of all Australian states. It is widespread in the Torres Strait and along the east and south-east coasts of Queensland, NSW and Victoria. In Tasmania, the bar-tailed godwit has mostly been recorded on the south-east coast. In South Australia it has mostly been recorded around coasts from Lake Alexandrina to Denial Bay. In Western Australia it is widespread around the coast, from Eyre to Derby. Populations have also been recorded in the northern Australia, from Darwin east to the Gulf of Carpentaria. The bar-tailed godwit is a regular migrant to Christmas Island, Norfolk Island, Lord Howe Island. It has also been recorded on subantarctic islands such as Macquarie Island, Snares Islands, Auckland Islands and Campbell Islands (Higgins & Davies 1996).During the non-breeding period, the distribution of L. l. menzbieriis predominantly in the north and north-westof Western Australia and in south-eastern Asia (Bamford et al. 2008 The bar-tailed godwit (northern Siberian) occurs mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It has also been recorded in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats (Higgins & Davies 1996).	This threatened fauna species was not observed within the Proposed Protection Zone. It is considered that the preferred habitat for this species is largely absent from the proposed works area. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Eastern Curlew (*Numensius madagascariensis*)	Critically Endangered	TSSC 2015: "Within Australia, the eastern curlew has a primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including Tasmania. Eastern curlews are rarely recorded inland. They have a continuous distribution from Barrow Island and Dampier Archipelago, Western Australia, through the Kimberley and along the Northern Territory, Queensland, and NSW coasts and the islands of Torres Strait. They are patchily distributed elsewhere. During the non-breeding season in Australia, the eastern curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass (Zosteraceae). Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes within the mangroves. The birds are also found in coastal saltworks and sewage farms (Marchant & Higgins, 1993). The eastern curlew mainly forages during the non-breeding season on soft sheltered intertidal sandflats or mudflats, open and without vegetation or covered with seagrass, often near mangroves, on saltflats and in saltmarsh, rockpools and among rubble on coral reefs, and on ocean beaches near the tideline. The birds are rarely seen on near-coastal lakes or in grassy areas (Marchant & Higgins, 1993). The eastern curlew roosts during high tide periods on sandy spits, sandbars and islets, especially on beach sand near the high-water mark, and among coastal vegetation including low saltmarsh or mangroves. They occasionally roost on reef-flats, in the shallow water of lagoons and other near-coastal wetlands. Eastern curlews have occasionally been recorded roosting in trees and on the upright stakes of oyster-racks (Marchant & Higgins, 1993). At Roebuck Bay, Western Australia, birds have been recorded flying from their feeding areas on the tidal flats to roost 5 km inland on a flooded supratidal claypan (Collins et al., 2001). In some conditions, shorebirds may choose roost sites where a damp substrate lowers the local temperature. This may have important conservation implications where these sites are heavily disturbed beaches (Rogers, 1999). It may be possible to create artificial roosting sites to replace those destroyed by development (Harding et al., 1999). Eastern curlews typically roost in large flocks, separate from other shorebirds (Marchant & Higgins, 1993)."	This threatened fauna species was not observed within the Proposed Protection Zone. It is considered that the preferred habitat for this species is largely absent from the proposed works area. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Southern Black-throated Finch (*Poephila cincta cincta*)	Endangered	The Black-throated Finch (southern) occurs at two general locations: in the Townsville region, where it is considered to be locally common at a few sites around Townsville and Charters Towers (BTF Recovery Team 2004; Garnett & Crowley 2000); and at scattered sites in central-eastern Queensland (between Aramac and Great Basalt Wall National Park) (BAAM 2011; BTF Recovery Team 2004). Since 1998, birds likely to be of the southern subspecies have been recorded at the following sites (Barrett et al. 2003; BTF Recovery Team 2004): • Townsville and its surrounds (Giru, Serpentine Lagoon, Toonpan, and near Ross River Dam) • Ingham, and sites nearby (near Mutarnee [at Ollera Creek], and near Mount Fox) • scattered sites in central-eastern Queensland (Great Basalt Wall, Yarrowmere Station, Moonoomoo Station, Doongmabulla Station, Fortuna Station and Aramac) The Black-throated Finch (southern) historically occurred from far south-eastern Queensland, near the Queensland-NSW border, through eastern Queensland north to the divide between the Burdekin and Lynd Rivers (Blakers et al. 1984; Schodde & Mason 1999). The subspecies is now extinct at most sites south of Burdekin River, and is confined to a very few remaining 'pockets' of suitable habitat (Roberts 1977; Storr 1984c, 1984d). It has been absent from Brisbane and its surrounds since the 1930s (Lord 1956; Woodall 1987) or 1940s (BTF Recovery Team 2004), and appears to have become extinct around most of Rockhampton during the early to mid 1970s, despite having been numerous there during the 1950s (Blakers et al. 1984; BTF Recovery Team 2004; Longmore 1978). It was last recorded in the Rockhampton region during 1988–89 (BTF Recovery Team 2004). There have been very few records of the subspecies south of 23° S since the late 1970s, and there have been almost no records from this region since 1995 (Barrett et al. 2003; Blakers et al. 1984; BTF Recovery Team 2004). Black-throated Finches (southern) were recorded from the Severn River, near Ballandean in southern Queensland, in the early 1980s and mid 1990s (BTF Recovery Team 2004) and there is a single record from Stanthorp, near Brisbane in 2002 (BTF recovery Team 2008, pers.comm.).	This threatened fauna species was not observed within the Proposed Protection Zone. It is considered that the preferred habitat for this species is largely absent from the proposed works area. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.

Species	EPBCA Status	Habitat Description	Likelihood of Occurrence and potential impact
		In NSW the Black-throated Finch (southern) was formerly widespread and 'tolerably abundant' in the Northern Tablelands and North-West Slopes Regions (Cooper & McAllan 1995; Gould 1972; Ley & Cook 2001; Morris et al. 1981), but there have been few published records since the 1960s (Higgins et al. 2006a; Ley & Cook 2001), and only three since 1992 (Morris 1994; Morris & Burton 1994, 1996a) at: • Swan Brook, in November 1992 • Pindari Dam, near Ashford, in May 1994 (incorrectly published as April 1994 in Morris and Burton 1996a) (Ley & Cook 2001) • Bukkalla, in November 1994 (Morris & Burton 1996a). The subspecies has not been recorded in NSW since the mid 1990s, despite general (BTF Recovery Team 2004), and specific searches of the Inverell-Ashford, Tenterfield and Boggabilla districts between October and December 2000 (Ley & Cook 2001). The lack of recent records from NSW and southern Queensland suggests that the Black-throated Finch (southern) may now be extinct in NSW [DEE 2017 online @ http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64447].	
Australian Painted Snipe (*Rostratula australis*)	Endangered	The Australian painted snipe occurs in shallow freshwater (occasionally brackish) wetlands, both ephemeral and permanent, such as lakes, swamps, claypans, inundated or waterlogged grassland/saltmarsh, dams, rice crops, sewage farms and bore drains, generally with a good cover of grasses, rushes and reeds, low scrub, Muehlenbeckia spp. (lignum), open timber or samphire (Reader's Digest, 1997; Marchant and Higgins, 2003). It has been recorded at wetlands in all states and territories (Barrett et al, 2003; Blakers et al., 1984) and is most common in eastern Australia. Important areas for this species in the past have included the Murray-Darling Basin (particularly the Riverina of Victoria and New South Wales), Queensland Channel Country, Fitzroy Basin of Central Queensland, south-eastern South Australia and adjacent parts of Victoria (Rogers et al., 2005). Records published over the past twenty years provide evidence for Australian painted snipe occurring more widely and frequently in the remote arid and tropical regions of Australia than was previously thought (Hassell and Rogers, 2002; Jaensch 2003a, 2003b; Jaensch et al., 2004; Black et al., 2010). The Australian painted snipe is inferred to have undergone a severe decline in the number of mature individuals since the 1950s (Garnett and Crowley, 2000; Lane and Rogers, 2000; Rogers et al., 2005; Garnett et al., 2011; BirdLife Australia, 2012) and specifically over the last three generations (~26 years) due to the loss and degradation of its wetland habitat (Rogers et al., 2005). There has been an increase in the number of sightings in 2010–11 associated with increased rainfall; however, this must be considered within the context of overall, long-term population decline (Jaensch pers. comm., 2012; BirdLife Australia, pers. comm., 2012; Rogers pers. comm., 2012). It is estimated that the species' current population is 2500 mature individuals (Garnett et al., 2011; BirdLife Australia, pers. comm., 2012)	This threatened fauna species was not observed within the Proposed Protection Zone. It is considered that the preferred habitat for this species is largely absent from the proposed works area. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Black-breasted Bottun-quail *(Turnix melanogaster*)	Vulnerable	The Black-breasted Button-quail is patchily distributed in coastal and sub-coastal valleys from Rockhampton in Queensland to northern NSW (Garnett 1992; Readers Digest, 2002). Within this range the quail is 'restricted to rainforests and forests, mostly in areas with 770-1200 mm rainfall per annum (Bennett 1985; Hughes & Hughes 1991; Marchant & Higgins 1993). They prefer drier low closed forests, particularly semi-evergreen vine thicket, low microphyll vine forest, araucarian microphyll vine forest and araucarian notophyll vine forest (Bennett 1985; Hughes & Hughes 1991; Marchant & Higgins 1993; Milledge and McKinley, 1998; Smyth et al. 2001). They may also be found in low, dense acacia thickets and, in littoral area, in vegetation behind sand dunes (Smith & Mathieson, 2004). An extensive dense leaf-litter layer is required for foraging (Hughes & Hughes 1991) and possibly also roosting (McConnell & Hobson 1995). Fallen logs and a dense, heterogeneously distributed shrub layers are also considered to be important habitat characteristics for shelter and breeding (Smith et al. 1998; Smyth & Young 1996). The species has also recorded from vine forest remnants between Hoop Pine plantations and agricultural land (Smith et al. 1998) and occasionally in areas of pasture grass adjacent to habitat areas (Hughes & Hughes 1991)' [in DEWHA, 2009 online @ http://www.environment.gov.au/cgi-in/sprat/public/publicspecies.pl?taxon_id=92312/03/2009)]	This threatened fauna species was not observed within the Proposed Protection Zone. It is considered that the preferred habitat for this species is largely absent from the proposed works area. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Insects			
Australian Fritillary (*Argynnis hyperbius inconstans*)	Critically Endangered	TSSC 2017: The Australian fritillary has been recorded in scattered locations across south-eastern Queensland and north-eastern New South Wales (Braby 2000; Sands & New 2002). The subspecies appearsto have had a core distribution between Gympie in Queensland and Port Macquarie in NSW, although there are historical records which extend beyond this range. The subspecies has been recorded as far north as Mt Bellenden Ker in Queensland, and as far south as the Hunter Valley in NSW (Sands & New 2002). The Australian fritillary was, at times, considered to have been common at certain locations (Binns 1976; Sands & New 2002). It was reported to be abundant around Gympie at intervals between 1977 and 1994, and around Port Macquarie in 1977, 1985 and 1994 (Sands & New 2002). However, the subspecies experienced declines throughout the 1980s and 1990s. In 1994, Dunn et al. estimated that the subspecies' distribution had contracted by 80 percent (Dunn et al., 1994). The Australian fritillary is restricted to areas where its larval food plant, Viola betonicifolia (the arrowhead violet), occurs (NSW Scientific Committee 2002). The arrowhead violet is widespread throughout Queensland and NSW, at both high and low altitudes. However, the Australian fritillary appears to only occupy lower altitude sites (<600m), and in these lower altitude regions there has been significant clearing for urban expansion. Modelling indicates that around half of the previously suitable Australian fritillary habitat was cleared by 1997 (Neldner pers. comm., 2016). In addition to land clearance, the arrowhead violet has declined in abundance due to weed invasion (mostly exotic grasses), trampling by livestock, drought and wetland drainage (Sands pers. comm., 2016). While the arrowhead violet is widespread, moderate densities of the species are believed to be necessary to sustain breeding populations of the Australian fritillary (Sands & New 2002; Qld DEHP 2010). Aggregations of the arrowhead violet hat would sustain breeding populations have become increasingly rare in areas where the butterfly was formerly known to occur. This lack of aggregations of the plant in suitable coastal locations appears to have impacted upon the Australian fritillary (Andren pers. comm., 2016). One of the last reliable sightings of the subspecies was in 2001 near Port Macquarie. A sighting was also reported in the vicinity of Caboolture, Queensland at this time (Sands & New 2002). A considerable search effort has been made to find populations of the Australian fritillary by interest groups. Most sites where the subspecies was once well known have been surveyed, many repeatedly (Andren pers. comm., 2016). However, targeted surveys have repeatedly failed to locate the subspecies. There continues to be sporadic reports of the subspecies, although none have been verified by photographs or specimens or have been able to be repeated by other observers. In 2014, a sighting was reported near the town of Seventeen Seventy in Queensland, and a sighting was reported in 2015 near Port Macquarie. While the Australian fritillary has been successfully bred in captivity in the past, there are no known captive populations of the subspecies (Andren pers. comm., 2016).	This threatened fauna species was not observed within the Proposed Protection Zone. It is considered that the preferred habitat for this species is largely absent from the proposed works area. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Mammals			
Large-eared Pied Bat (*Chalinolobus dwyeri*)	Vulnerable	The Large-eared Pied Bat occurs within drier habitats, including dry sclerophyll forests and woodlands (Hoye and Schulz in Van Dyck and Strahan, 2008) although it has been recorded within a range of habitats, including wet and dry sclerophyll forest, Cyprus pine dominated forest, tall open eucalypt forest with a rainforest sub-canopy, sub-alpine woodland, but typically in association with sandstone relief. In	This threatened fauna species was not observed within the Proposed Protection

<table>
<tr><th>Species</th><th>EPBCA Status</th><th>Habitat Description</th><th>Likelihood of Occurrence and potential impact</th></tr>
<tr><td></td><td></td><td>south-eastern Queensland it has been noted primarily within higher altitude moist tall open forest adjacent to rainforest (Schulz et al. 1999) including Main Range National Park and land west of Mt Barney (Hoye 2005).

‘Little is known about the habitat and roosting requirements of the Large-eared Pied Bat, but natural roosts may depend heavily on sandstone outcrops. It has been found roosting in disused mine shafts, caves, overhangs and disused Fairy Martin (Hirundo ariel) nests for shelter and to raise young (Hoye & Dwyer 1995; Schulz 1998). It also possibly roosts in the hollows of trees (Duncan et al. 1999).’ [in DEWHA, 2009 online @ http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=183.]</td><td>Zone.

It is considered that the preferred habitat for this species is largely absent from the proposed works area.

The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.</td></tr>
<tr><td>Spotted-tailed Quoll (Dasyurus maculatus maculatus)</td><td>Endangered</td><td>The species has been recorded from a wide range of habitats such as rainforest, open forest, woodland, coastal heathland, and inland riparian forest (Edgar and Belcher, 2002; Forest Practices Board, 2002). Additional habitat requirements include suitable den sites (such as hollow logs, tree hollows, rock outcrops or caves) and an abundance of food (such as birds and small mammals) (NSWNPWS, 1999; Edgar & Belcher, 2001; Belcher, 2000; Jones & Ross, 1996). Habitat range for males has been estimated to be as large as 2000-2200 hectares per individual, while for females, which are more protective of their dens, this value is considerably less at between 700-850 hectares per individual (Belcher, 2000; NPWS, 1999). Population density is therefore naturally quite low and has been estimated at 1 individual per 3 km2 even within optimal ‘core’ habitat (Jones & Rose, 1996).</td><td>This threatened fauna species was not observed within the Proposed Protection Zone.

It is considered that the preferred habitat for this species is largely absent from the proposed works area.

The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.</td></tr>
<tr><td>Greater Glider (Petauroides volans)</td><td>Vulnerable</td><td>“The greater glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands. It is primarily folivorous, with a diet mostly comprising eucalypt leaves, and occasionally flowers (Kehl & Borsboom 1984; Kavanagh & Lambert 1990; van der Ree et al., 2004). It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows (Andrews et al., 1994; Smith et al., 1994, 1995; Kavanagh 2000; Eyre 2004; van der Ree et al., 2004; Vanderduys et al., 2012). The distribution may be patchy even in suitable habitat (Kavanagh 2000). The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species (Kavanagh 1984).

During the day it shelters in tree hollows, with a particular selection for large hollows in large, old trees (Henry 1984; Kehl & Borsboom 1984; Lindenmayer et al., 1991; Smith et al., 2007; Goldingay 2012). In Grafton/Casino, Urbenville and the Urunga/Coffs Harbour Forestry Management Areas (FMAs) in northern New South Wales (NSW), the abundance of greater gliders on survey sites was significantly greater on sites with a higher abundance of tree hollows (Andrews et al., 1994; Smith et al., 1994, 1995). In the Grafton/Casino FMA, the greater glider was absent from surveyed sites with fewer than six tree hollows per hectare (Smith et al., 1994). In southern Queensland, greater gliders require at least 2–4 live den trees for every 2 ha of suitable forest habitat (Eyre 2002).</td><td>This threatened fauna species was not observed within the Proposed Protection Zone.

It is considered that the preferred habitat for this species is largely absent from the proposed works area.

Further discussions regarding this species are provided below.

The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.</td></tr>
<tr><td>Koala (Phascolarctos cinereus)</td><td>Vulnerable</td><td>This species primarily occurs within Eucalypt Forest and Woodlands containing a suitable density of favoured food trees within coastal eastern and southeastern Australia. Preferred habitat generally contains a high percentage of primary food trees although underlying geology and soil type can be an important factor. Eucalypt Forests associated with drainage lines and floodplains of richer soil types (i.e. moisture and nutrients) can also be favoured due to feed trees containing higher levels of nutrients and less potential for toxicity (Hindell & Lee, 1990; Moore & Foley, 2000).

Within SEQLD six primary foraging trees were identified by Pahl (1993); Tallowwood (Eucalyptus microcorys), Forest Red Gum (E. tereticornis), Scribbly Gum (E. 36tilize36), Grey Gum (E. propinqua), Red Mahogany (E. resinifera) and White Stringybark (E. tindaliae). Further research undertaken by Phillips & Callaghan (1996) in Tweed Shire indicates that Swamp Mahogany (E. robusta) and Blue Gum (E. tereticornis) [including hybrids of the two] on alluvial deposits and Quaternary and Neranleigh-Fernvale Group geomorphologies were considered to be primary habitats. Areas with sub-dominance of these species on Neranleigh-Fernvale alliances supporting Blue Gum (E. tereticornis), Tallowwood (E. microcorys) and/or Grey Gum (E. propinqua) comprise secondary habitat or primary habitat depending on the density of the latter two species. Phillips & Callaghan (1998) also noted Tallowwood to be a primary browse species and two types of Grey Gum (E. propinqua, E. biturbinata) to be secondary browse species in Currumbin.

Recent studies (Biolink, 2007) indicate that Eucalyptus tereticornis, E. microcorys and E. propinqua/E. biturbinata are the most preferred koala food trees throughout the Gold Coast LGA. Within the Tweed Coast Swamp Mahogany Eucalyptus robusta and Forest Red Gum E. tereticornis are the most preferred tree species with Tallowwood E. microcorys and Grey Gum E. propinqua being the next most preferred (Biolink, 2011).

Within utilized Eucalypt Forest habitat the koala spends most of its time in distinct home-ranges which may overlap if available habitat area is reduced. Males are territorial but a dominance-hierarchy exists and they may attack during the summer breeding season. Home ranges of the species are considered to be large and can vary dependent upon habitat quality and extent. Studies have shown various home range sizes exist with the males usually larger than the female (Male 135ha, Female: 110ha [Ellis et al, 2002], Male: 34.4ha, Female: 15ha [White, 1999]).

A review of a number of published scientific reports notes that Koala density generally ranges between 0.02 and 1.26 animals per hectare. Densities are considered to vary dependent upon habitat quality, size, connectivity, presence of impediments to movement (stock fences, dogs, roads etc).

<table><tr><th>Source</th><th>Study Location</th><th>Habitat Type</th><th>Additional Comments</th><th>Koala/ha</th></tr></table></td><td>This threatened fauna species was not observed within the Proposed Protection Zone. Traces if this species has been recorded within the Coomera Woods Master Planned Development site.

It is considered that the preferred habitat for this species is largely absent from the proposed works area.

Koala favoured trees as defined within the NES Guidelines for the vulnerable koala are found within the Coomera Woods Master Planned Development site and Proposed Protection Zone.

It is noted that the potential habitat provided within the Proposed Protection Zone is poor and highly disturbed due to the constant anthropogenic disturbances and presence of edge effects.

Further discussions regarding this species are below.</td></tr>
</table>

<table>
<tr><th>Species</th><th>EPBCA Status</th><th>Habitat Description</th><th>Likelihood of Occurrence and potential impact</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>Dique et al, 2003</td><td>Southeast QLD Pine Rivers Shire</td><td>Tall shrubby open forest (Tertiary surfaces) and Tall open forest upon metamorphics</td><td>Stratified by two habitat descriptions ‘urban’ and ‘bushland’</td><td>0-0.76</td></tr>
<tr><td>Dique et al, 2004</td><td>Southeast QLD Koala Coast ~375sqm of Redland, Logan and Brisbane City shires</td><td>Eucalypt Forests. Predominately RE 12.9-10.4 & 12.11.5</td><td>Study stratified by habitat descriptions: ‘urban’, ‘remnant bushland’, ‘bushland’ and ‘other’. Remnant and bushland areas further stratified by proximity to the centre of the study area (high density=close to centre, low density=further away)</td><td>Range 0.02-1.26
Urban: 0.17 +/- 0.013
High remnant: 0.70 +/- 0.023
Low remnant: 0.20 +- /0.014
High bushland: 0.30+/-0.006
Low bushland: 0.11 +/-0.007
Other: 0</td></tr>
<tr><td>White and Kunst 1990</td><td>Southeast QLD Sheldon</td><td>Eucalypt Forest</td><td></td><td>0.4 (0.3-0.46)</td></tr>
<tr><td>Sullivan et a 2004</td><td>Southwest QLD</td><td>Eucalypt Forest/woodland within the mulgalands</td><td>Habitat stratified by floristics and landzone.</td><td>0.0007-2.513</td></tr>
<tr><td>Biolink 2007</td><td>Coombabah Koala Habitat Area</td><td>Mapped gold coast city vegetation (per Ryan et al, 2003) filtered to exclude communities not containing eucalypts</td><td>Spot assessment technique for koala faecal pellets. Not based upon koala observation transects per Dique, 2003; EPA, 2005.</td><td>0.22+/-0.04</td></tr>
<tr><td>Biolink 2007</td><td>Coomera-Pimpama Koala Habitat Area</td><td>Mapped gold coast city vegetation (per Ryan et al, 2003) filtered to exclude communities not containing eucalypts</td><td>Spot assessment technique for koala faecal pellets. Not based upon koala observation transects per Dique, 2003; EPA, 2005.</td><td>0.23+/-0.03</td></tr>
</table>

The area to be cleared is less than 2ha and is not considered critical habitat for the survival of this species. It is considered unlikely that the proposed action will significantly impact the Koala. Further discussions regarding this species are below.</td><td>The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.</td></tr>
<tr><td>Long-nose Potoroo (Potorous tridactylus tridactylus)</td><td>Vulnerable</td><td>Long-nosed Potoroos are generally restricted to areas with an annual rainfall greater than 760 mm where they inhabit dry and wet sclerophyll forests and woodland with a heathy understorey (Johnson in Strahan, 2002; DEC, 2005). The preferred habitat in north eastern NSW is dry and wet open shrubland (Mason 1997, DEC, 2005, Johnston in Strahan, 2002). In all habitats the species requires relatively thick groundcover growing on friable soils (Bennett, 1993). Within these areas the Potoroo digs for its food the main component of which is hypogeal fungi with other important items including hard-bodied arthropods, vascular plant tissues, seeds and fleshy fruits (Bennett & Baxter, 1989; Claridge et al, 1993).

It is also noted that a small, disjunct population of Potoroos exists in a small area of Crown land between the northern shore of Cobaki Broadwater and the NSW-Queensland border (Bali et al, 2003; Ecopro, 2004; Warren & Associates, 1992; Hero, 2001). The extensive 2003 survey undertaken by Bali et al notes that “within the Cobaki area, potoroos were most frequently trapped in Scribbly Gum Mallee Heathland followed by, Tree Broom Heathland, Scribbly Gum/Swamp Mahogany Forest, Black She-oak Heathland, Swamp Mahogany Forest and Scribbly Gum Forest. Our results suggest that potoroos prefer Scribbly Gum Mallee Heathland with an understorey of sedges and grasses such as Restio spp., Lomandra spp. and Gahnia spp., which is found along both sides of the Cobaki Lakes” (Bali et al, 2003: 16).</td><td>This threatened fauna species was not observed within the Proposed Protection Zone.

It is considered that the preferred habitat for this species is largely absent from the proposed works area.

The proposed action is considered unlikely to significantly impact this</td></tr>
</table>

Species	EPBCA Status	Habitat Description	Likelihood of Occurrence and potential impact
			Matter of National Environmental Significance.
New Holland Mouse (*Pseudomys novaehollandiae*)	Vulnerable	The New Holland Mouse is a small, burrowing native rodent. The species is similar in size and appearance to the introduced house mouse (Mus musculus), although it can be distinguished by its slightly larger ears and eyes, the absence of a notch on the upper incisors and the absence of a distinctive 'mousy' odour. The species is grey-brown in colour and its dusky-brown tail is darker on the dorsal side. The species has a head-body length of approximately 65–90 mm, a tail length of approximately 80–105 mm and a hind foot length of approximately 20–22 mm (Menkhorst and Knight, 2001)' ((Threatened Species Scientific Committee (TSSC), 2010k: 1). 'The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. At a landscape scale, the species appears to be clumped in its distribution, most likely due to its specific habitat requirements' (Posamentier and Recher, 1974; Braithwaite and Gullan, 1978; Fox and Fox, 1978; Fox and Mckay, 1981 in (Threatened Species Scientific Committee (TSSC), 2010j: 2). Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey and vegetated sand dunes (Keith and Calaby, 1968; Posamentier and Recher, 1974; Fox and Fox, 1978; Hocking, 1980; Fox and Mckay, 1981; Norton, 1987; Pye, 1991; Wilson, 1991; Lazenby et al., 2008). The New Holland Mouse is a social animal, living predominantly in burrows shared with other individuals (Kemper, 1980; Lazenby et al., 2008). The home range of the New Holland Mouse ranges from 0.44 ha to 1.4 ha (Lazenby et al., 2008; Lazenby, 1999). The species peaks in abundance during early to mid stages of vegetation succession typically induced by fire (Posamentier and Recher, 1974; Braithwaite and Gullan, 1978; Fox and Fox, 1978; Fox and Mckay, 1981)' ((Threatened Species Scientific Committee (TSSC), 2010k: 2). 'It is likely that the species spends considerable time foraging aboveground for food, predisposing it to predation by native predators and introduced species, including the red fox (Vulpes vulpes), cat (Felis catus) and dog (Canis familiaris)' (Lazenby, 1999 in Threatened Species Scientific Committee (TSSC), 2010j: 2).	This threatened fauna species was not observed within the Proposed Protection Zone. It is considered that the preferred habitat for this species is largely absent from the proposed works area. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Grey-headed Flying-fox (*Pteropus poliocephalus*)	Vulnerable	The Grey-headed Flying-fox inhabits subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps (Eby, 1995). Urban gardens and cultivated fruit crops also provide habitat for this species (NSW NPWS 1999c). Grey-headed Flying-foxes forage on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca, Banksia (Eby, 2000) and fruits of rainforest trees and vines (NSW NPWS 1999c). During periods when native food is limited, Grey-headed Flying-foxes disperse from colonial roosts, often foraging in cultivated gardens and fruit crops (NSW NPWS 1999c). This species roosts in large aggregations or camps in close proximity (20 km or less) to a regular food source, often in stands of riparian rainforest, Paperbark or Casuarina forest (Eby, 1995). This species is a canopy-feeding frugivore, blossom-eater and nectarivore of rainforests, open forests, woodlands, Melaleuca swamps and Banksia woodlands. As such, it plays an important ecosystem function by providing a means of seed dispersal and pollination for many indigenous tree species (Eby 1996; Pallin 2000). Given the abundance of forage species in the locality and the species is capable of travelling extensive distances to forage, it is considered unlikely that the proposed development will significantly impact the Grey-headed Flying-fox. Nevertheless, an assessment of significance was conducted for the species.	This threatened fauna species was not recorded during survey works. No roost sites were identified within the Proposed Protection Zone of proposed works area. This species is considered possible to use this site given the potential foraging vegetation. An assessment for this species is provided below. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
False Water Rat (*Xeromys myoides*)	Vulnerable	The false water rat occurs in three regions of coastal Australia: The Northern Territory, central south Queensland and south-east Queensland. Maps of these regional sub populations are provided in the draft significanty impact guidlines for the false water rat (see link above). The species may occur in the Kimberley region of Western Australia due to its close proximity with populations in the Northern Territory and the location of suitable habitat (Morris 2000). Within its range, it is patchily distributed and no where is it particularly abundant (Gynther & Janetzki 2008). Detail on the locality and extent of these known sub populations is provided in the national recovery plan. Since inception of the national recovery plan, significant new sub populations have been confirmed in Moreton Bay, which includes Pumicestone Passage between Bribie Island and the mainland (Gynther 2011). In the Sunshine Coast region along the Maroochy River system a combined total of 214 false water rat nests over 200ha of wetlands have been recorded since February 2012; locations include Glass Mountain, Hussey and Bells Creeks (pers.comm Nina Kaluza). Further north sub populations have been identified in the Gladstone harbour and at Laird Point on Curtis Island (QGC 2013).	This threatened fauna species was not observed within the Proposed Protection Zone. It is considered that the preferred habitat for this species is largely absent from the proposed works area. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Reptiles			
Collared Delma (*Delma torquata*)	Vulnerable	The Collard Delma inhabits eucalypt-dominatedwoodlands and open-forests in Land Zones 3 (Alluvium), 9(undulating country or fine-grained sedimentary rocks), 10(sandstone ranges). Common Regional Ecosystems (RE)include RE 11.3.2, RE 11.9.10, RE 11.10.1 and RE 11.10.4.These REs are located in Bioregion 11 (Brigalow Belt),located to the north and west of South East Queensland.The species is also known in the Toowoomba Ranges inhabitats associated with exposed rocky outcrops on ridges or slopes in vegetation communities dominated by Narrow-Leaf Ironbark (Eucalyptus crebra). Other areas where the species has been recorded is the Mt Crosby and Moggill State Forest sites, as well as Anstead and Pinjarra Hills.	This threatened fauna species was not observed within the Proposed Protection Zone. It is considered that the preferred habitat for this species is largely absent from the proposed works area. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance.
Three-toed Snake-tooth Skink (*Saiphos reticulatus*)	Vulnerable	The Three-toed Snake-tooth Skink occurs on the coast and in the ranges from the Macleay Valley in NSWto Cooloola in south-eastern Queensland (DEC, 2005; DEW, 2007). The Three-toed Snake-tooth Skink is known to inhabit rainforest and occasionally moist eucalypt forest, on loamy or sandy soils (Czechura, 1974; DEC, 2005; DEW, 2007). It is found in leaf litter, often immediately adjacent to fallen tree trunks	This threatened fauna species was not observed within the Proposed Protection

Species	EPBCA Status	Habitat Description	Likelihood of Occurrence and potential impact
		(Ehmann, 1987; Cogger, et al.,1993). Projected foliage cover was estimated at 70–80 per cent at two sites (Ehmann, 1987). The Three-toed Snake-tooth Skink feeds on earthworms and beetle grubs. In NSW, this species occurs within the Beaury, Koreelah, Whian Whian, Wiangaree and Yabbra State Forests and at Grafton and Grady's Creek Flora Reserve. In Queensland, it occurs at Binna Burra, Emuvale, Tambourine Mountain, Beechmont, Lamington, and Cunningham's Gap National Park and Cooloola State Forest (Greer & Cogger, 1985; Cogger et al., 1993). This speciesoccurs within the Northern Rivers (NSW) and South East Queensland (Queensland) Natural Resource Management Regions.	Zone. It is considered that the preferred habitat for this species is largely absent from the proposed works area. The proposed action is considered unlikely to significantly impact this Matter of National Environmental Significance

3.3.1 Threatened Fauna Summary

In summary of the above fauna occurrence discussions, the proposed development is unlikely to significantly impact upon fauna species of National Environmental Significance that are critically endangered, endangered or vulnerable listed within the Protected Matters Search. According to impact criteria reviewed in the NES Significant Impact Guidelines, the proposed action is not considered unlikely to fragment or isolate an existing NES population, disrupt the breeding cycle or critical habitat of a NES population, or introduce disease which may cause a NES species to decline or otherwise result in the decline of a population of a threatened species of fauna.

It is noted that the proposed variation encompasses approximately 1.5 hectares and three (3) vegetation communities. The proposed action is located within existing area of low ecological value, areas which have been previously cleared for bushfire management and/or disturbed as a result of adjacent landuses. A Vegetation Management Plan has been provided for the management of vegetation to be cleared and retained (refer to attachment 6).

As outlined for the individual species listed in the Protected Matters Search (and discussed individually above), the Proposed Protection Zone is unlikely to provide favoured habitat and/or required ecological features for a number of discussed species. For those species that may utilise the habitat of the project area (i.e. for foraging, breeding or dispersal at some stage of its life cycle) it is considered that the removal of approximately 1.5ha of modified/disturbed vegetation is unlikely to result in the loss of a significant area of habitat (refer to Figure 2).

Vulnerable Fauna Species

Three (3) vulnerable species were recorded / considered potential occurrences within the Proposed Protection Zone. The Grey-headed Flying Fox was recorded flying over the study area during field works and considered possible to occur based upon the vegetation and insects within the study area and surrounding area. The koala has been recorded within the Coomera Woods Master Planned Development site during current and previous survey works. The Greater Glider (*Petauroides Volans*) is considered a potential occurrence by the Department as discussed within previous correspondence in relation to EPBC 2017/8134. Each species has been analysed separately below.

For the EPBC Act listed 'vulnerable' species of fauna considered potential occurrences (Grey-headed Flying Fox and Koala) based upon locality, distribution and available habitat there is not a real chance or possibility that the proposed action will:

<u>Grey-headed Flying Fox *(Pteropus poliocephalus)*</u>

This species was not recorded within the Coomera Woods Development site during survey works, however considered a possible occurrence based on the vegetation within the Coomera Woods Development site.

The Grey-headed Flying-fox requires foraging resources and roosting sites. It is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, Melaleuca swamps and Banksia woodlands (DoE 2018). It also feeds on commercial fruit crops and on introduced tree species in urban areas. The primary food source is blossom from Eucalyptus and related genera but in some areas it also utilises a wide range of rainforest fruits (Eby 1998).

Based upon the locality, distribution and available habitat it is unlikely that the proposed action will:

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

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

1. *key source populations either for breeding or dispersal*
2. *populations that are necessary for maintaining genetic diversity, and/or*
3. *populations that are near the limit of the species range.*

Mega-bat species are considered to be wide ranging in the region, it is considered that they are not genetically isolated on the Proposed Protection Zone and form part of populations within the wider region.

The Proposed Protection Zone is not currently occupied by an important population. The proposed action is unlikely to lead to a long term decrease in the size of the population of the discussed species as result of loss of a relatively small area of potential habitat affected, the high mobility of the potentially affected species (i.e. Grey Headed Flying Fox) and given the availability potential habitat within the locality. The habitat to be modified is considered insufficient to maintain a population of the discussed species and would be considered to represent a minor area within the typical large ranges of the species.

- **Reduce the area of occupancy of an important population**

No important populations of threatened fauna species are known within the Proposed Protection Zone or Coomera Woods Development site.

Stages of lifecycle potentially affected by development

Table 7: Grey-headed Flying Fox Stages of Lifecycle

Species	Habitat Preference	Roosting/Breeding
Grey-headed Flying-fox	The Grey-headed Flying-fox inhabits subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps (Eby, 1995). Urban gardens and cultivated fruit crops also provide habitat for this species (NSW NPWS 1999c). Grey-headed Flying-foxes forage on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca, Banksia (Eby, 2000) and fruits of rainforest trees and vines (NSW NPWS 1999c). During periods when native food is limited, Grey-headed Flying-foxes disperse from colonial roosts, often foraging in cultivated gardens and fruit crops (NSW NPWS 1999c). This species is a canopy-feeding frugivore, blossom-eater and nectarivore of rainforests, open forests, woodlands, Melaleuca swamps and Banksia woodlands. As such, it plays an important ecosystem function by providing a means of seed dispersal and pollination for many indigenous tree species (Eby 1996; Pallin 2000).	This species roosts in large aggregations or camps in close proximity (20 km or less) to a regular food source, often in stands of riparian rainforest, Paperbark or Casuarina forest (Eby, 1995). Camps provide resting habitat, sites of social interactions and refuge for animals during significant phases of their annual cycle, such as birth, lactation and conception (Parry-Jones and Augee 1992, 2001). "Roosting habitat critical to survival: Grey-headed Flying-foxes roost in large aggregations in the exposed branches of canopy trees (Ratcliffe 1931, Nelson 1965a, Parry-Jones and Augee 1992). The locations of camps are generally stable through time, and several sites have documented histories that exceed 100 years (Lunney and Moon 1997). Camps provide resting habitat, sites of social interactions and refuge for animals during significant phases of their annual cycle, such as birth, lactation and conception (Parry-Jones and Augee 1992, 2001). On the basis of current knowledge, roosting habitat that meets at least one of the following criteria can be explicitly identified as habitat critical to survival, or essential habitat, for Greyheaded Flying-foxes. Roosting habitat that: 1. is used as a camp either continuously or seasonally in > 50% of years 2. has been used as a camp at least once in 10 years (beginning in 1995) and is known to have contained > 10 000 individuals, unless such habitat has been used only as a temporary refuge, and the use has been of limited duration (i.e. in the order of days rather than weeks or months) 3. has been used as a camp at least once in 10 years (beginning in 1995) and is known to have contained > 2 500 individuals, including reproductive females during the final stages of pregnancy, during lactation, or during the period of conception (i.e. September to May) (in DECCW, 2009)

For vulnerable species that may utilise the habitat of the project area (i.e. for foraging, breeding or dispersal at some stage of its life cycle) it is considered the removal and modification of ~1.5ha of modified vegetation (scattered mature native trees) is unlikely to result in the loss of a significant area of habitat. The vegetation to be removed is insignificant in the context of the available habitat of the locality.

It is considered unlikely that the proposal will reduce the area of occupancy to an important population.

- **Fragment an existing important population into two or more populations**

No important populations of threatened fauna species are known to occur within the Proposed Protection Zone. The area of vegetation to be removed is largely modified/disturbed and has been subject to historic uses limiting the ecological values. The Proposed Protection Zone contains potential habitat containing suitable flowering flora species (i.e. eucalypts etc.) attracting the Grey-headed Flying-fox.

The proposed action will result in the removal of a small portion (~1.5ha) of potential habitat from the Proposed Protection Zone. This removal is not considered to be a significant reduction in the regional foraging base for the Grey-headed Flying-fox.

Furthermore, as no roost sites were recorded within the Proposed Protection Zone, it is considered that breeding requirements will not be disturbed as part of the proposal.

The Grey Headed Flying Fox is considered to be a mobile taxon and its dispersal ability throughout the locality is considered highly unlikely to be affected by this proposal.

- **Adversely affect habitat critical to the survival of a species**

Habitat critical to the survival of a species refers to areas that are necessary:

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

Critical habitat may be habitat identified in a recovery plan for the species or listed as Critical Habitat on the Register maintained by the minister under the EPBC Act. The Proposed Protection Zone is not listed as habitat critical to the survival of a threatened fauna species within the Critical Habitat Register.

It is considered that the project site does not contain habitat critical to the survival of the discussed vulnerable species as defined within the NES Guidelines and the species profiles/studies reviewed relevant to the species.

- **Disrupt the breeding cycle of an important population of each species**

No important populations of threatened fauna species are known from the Proposed Protection Zone. Whilst present within the locality it is considered unlikely that the removal of ~1.5ha of modified vegetation (scattered mature native trees) to be impacted by the proposed action will cause a significant impact on the species.

As no roost sites were recorded within the Proposed Protection Zone, it is considered that breeding requirements will not be disturbed as part of the proposal.

As such the breeding cycles of the Grey Headed Flying Fox are unlikely to be disrupted by the proposal. An assessment of significance was conducted for the species by SHG (2017) who also found that no significant impact would arise upon this species as a result of the proposed action.

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

For vulnerable species that may utilise the habitat of the project area (i.e. for foraging, breeding or dispersal at some stage of its life cycle) it is considered the removal of ~1.5ha of modified/disturbed vegetation (scattered mature native trees) is unlikely to result in the loss of a significant area of habitat. The vegetation to be removed is insignificant in the context of the available habitat of the locality.

The vulnerable species potential occurrences occupy large home ranges, are mobile and are considered unlikely to experience isolation within the Proposed Protection Zone or be unable to access habitats of the surrounding locality as a result of the proposal.

It is therefore considered unlikely that the proposed action will modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

- **Resulting invasive species that are harmful to the vulnerable species becoming established in the vulnerable species' habitat**

Invasive flora species are common within the Proposed Protection Zone (refer to section 2.1.2) and a vegetation management plan has been prepared to reduce propagule spread to retained and offsite habitats (refer to Attachment 6).

It is considered unlikely that the proposed action will significantly increase occurrence of invasive species that are harmful to the vulnerable species and becoming established within the species' habitat.

- **Introduce disease that may cause each species to decline**

As far as the intended use of the Proposed Protection Zone as an urban development there is limited possibility of disease introduction. Potential vectors of disease (i.e. introduced fauna species) are considered unlikely to increase via the project and implementation of wash-down procedures for plant and equipment to minimize the chance of transporting weed propagules into the Proposed Protection Zone is recommended within the Vegetation Management Plan. Protocols should also be developed to ensure such plant disease are not introduced into new locations where they may impact upon the areas external the proposed Protection Zone.

The proposed action is unlikely to introduce disease that may cause either of the discussed species to decline.

- **Interfere substantially with the recovery of each species**

The vulnerable species potential occurrences occupy large home ranges, are mobile and are considered unlikely to experience isolation within the Proposed Protection Zone or be unable to access habitats of the surrounding locality as a result of the proposal. The removal of approximately 1.5ha of modified vegetation/sparse mature native trees is unlikely to interfere substantially with the recovery of this species.

The proposed action is considered not to compromise the recovery of the discussed specie as detailed within existing recovery plans (federal and/or state) for the discussed species.

Conclusion

The proposed action is unlikely to result in a significant effect on this species as:

- This species was not recorded utilising the potential habitat within the Proposed Protection Zone or proposed works area.
- No roost sites were identified within the proposed works area.
- The habitat is not considered critical to the survival of this species.
- Potential habitat within the study area is degraded and not considered limited within the locality.
- The proposed action is unlikely to lead to a long-term decrease in the population size or interfere substantially with the recovery of this species.
- An assessment of significance was conducted for the species by SHG (2017) who also found that no significant impact would arise upon this species as a result of the proposed action.

Koala (*Phascolarctos cinerus)*

This species was directly observed within the Coomera Woods Master Planned Development site on multiple occasions. Further discussions regarding this species are below.

Conservation Status

Koala populations in Queensland, New South Wales and the Australian Capital Territory are listed as Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999*. Additionally, the koala is also listed as Vulnerable under

Queensland's *Nature Conservation Act 1992*.

Geographic Context
The Protected Matters Report within a 2km buffer identifies that the koala has the potential to occur within the Proposed Protection Zone. The Proposed Protection Zone is therefore considered to fall within the modelled distribution of the koala.

The following is an assessment of the proposed action against the Significant Impact Guidelines and Referral Guidelines for the vulnerable Koala (Koala Referral Guidelines). As noted the response provides a response against current conditions within and adjacent to the Proposed Protection Zone:

The Koala Referral Guidelines separate the geographical context into two zones (inland and coastal) based on the per annum rainfall average (800mm). The Harvest Estate site is mapped within a 'coastal' area as depicted within the map below.

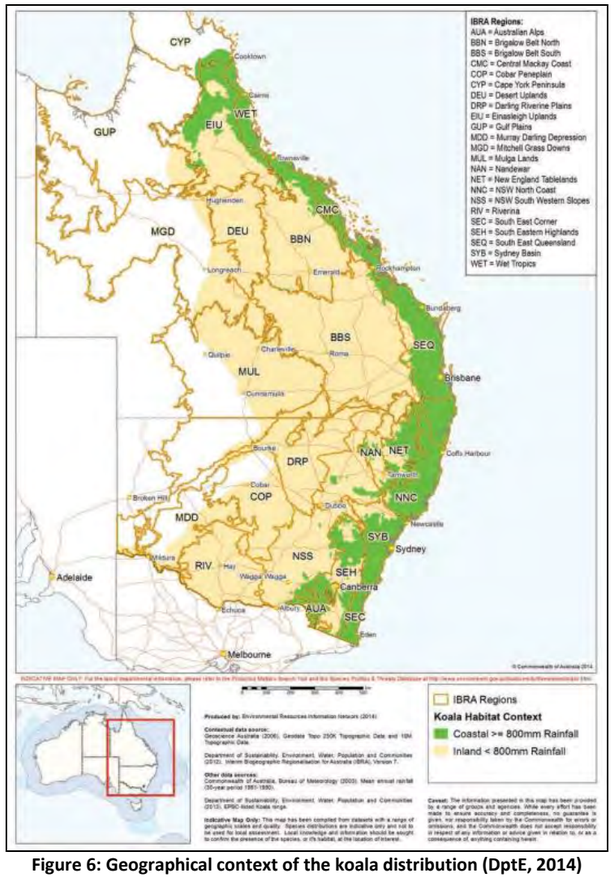

Figure 6: Geographical context of the koala distribution (DptE, 2014)

It is noted that within each of the previous site specific surveys that have occurred across the Coomera Woods Development site no koalas have been recorded within/using the proposed Protection Zone.

Based upon the current site conditions and small impact area it is unlikely that the proposed action will:

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

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

1. *key source populations either for breeding or dispersal*
2. *populations that are necessary for maintaining genetic diversity, and/or*
3. *populations that are near the limit of the species range.*

EPBC Act Referral Guidelines for the vulnerable koala to determine an Important population;

i. key source populations either for breeding or dispersal

The CW Site koala population is not a source for breeding and dispersal. The population is a sink where the immigration rates are lower than the extinction rates (Pulliam 1988; Dias 1996) and do not allow for an excess in population to disperse.

ii. populations that are necessary for maintaining genetic diversity

As the population is not large enough to allow for dispersal the CW site population is not necessary for maintaining genetic diversity within the Coomera area koala population.

iii. populations that are near the limit of the species range

This population is not near the limit of the species range.

The current koala population size within the impact area does not warrant "important population" status as it does not meet the requirements within the Significant Impact Guidelines. As this population is not important this means that there is also no significant impact to the population if the proposed action were to proceed. The population is not viable due to habitat constraints within the Proposed Protection Zone.

The Proposed Protection Zone is not considered to contain critical habitat for the Koala as defined under the Koala Referral Guideline or an important population as defined under the Significant Impact Guidelines (refer to Table 8). As such the action will not lead to a long term decrease in the size of an important population. The UKA Koala population was largely removed from the Coomera Woods Development site as part of the East Coomera Koala Conservation Project to allow for urban development. Detailed studies using both direct and indirect survey methods confirm koalas on-site are transient and low in numbers through the remaining un-cleared portions of the Urban Koala Area. Low records of direct observations for Koalas in these areas is predicted given the lack of surrounding linkages to critical habitat areas and the depletion in numbers as a result of the direct translocation.

- **Reduce the area of occupancy of an important population**

The Proposed Protection Zone does not contain an important population as defined by the Significant Impact Guidelines. The action will not have a significant impact on an important population of the species. While the proposed action will remove preferred Koala tree species, this habitat is not considered critical habitat and is disturbed, fragmented and subject to edge effects from surrounding current and future urban development and roads. Importantly, the UKA is intended for urban development which resulted in the UKA population removed from the Coomera Woods Development site via another project completed by the Local Government Authority.

Detailed site studies using direct census survey methods determined the small population residing within the Coomera Woods Development Site is not viable over the long-term (refer to Attachment 4). Thus, the proposal within the Proposed Protection Zone is unlikely to have a significant impact on an area of occupancy of the species.

- **Fragment an existing important population into two or more populations**

The Proposed Protection Zone does not contain an important population. The Urban Koala Area Koala population was largely removed from the Coomera Woods Development site as part of the East Coomera Koala Conservation Project to allow for urban development. Alterations to the existing population occurred through direct removal of animals from the study area. As the Proposed Protection Zone is not considered to contain an important population and does not maintain the critical habitat factors required to support a koala population it cannot result in the severing of an existing population into two or more populations.

- **Adversely affect habitat critical to the survival of a species**

Habitat critical to the survival of a species refers to areas that are necessary:

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

The Koala Habitat Assessment Tool is used in accordance with the Koala Referral Guidelines is performed below:

Table 8: Koala Habitat Assessment Tool

Attribute	Score	Comment
Koala Occurrence	1	The EPBC Act Protected Matters Search Tool identified the Koala as having potential to occur within the Proposed Protection Zone. While there is evidence of Koala occurrence on the Coomera Woods Development site, it is noted that East Coomera Koala Conservation Project has involved the relocation of 180 'at risk' Koalas out of the imminent Coomera development area. This has included the removal of 19 Koalas off the Coomera Woods Master Planned Development site and a significant number from the surrounding areas as part of the East Coomera Koala Conservation Project, reducing the number of Koalas in the area. Recent surveys of the Coomera Woods Master Planned Development Site, post relocation of 180 koalas, results: • Phillips performed a site survey using the SAT method and determined that approximately 33% of the Coomera Woods Development site was utlilised by koalas, 5 of the 15 sites recorded koala activity. One of the SAT sites was within the Proposed Protection Zone (PO27), this site did not record any koala activity (Phillips, 2015: pg. 6). • SGH performed a 4 day field survey completed in 2015 observed one juvenile male. Scats were observed in several locations, concentrated to gully lines and foothills. Overall use of the Coomera Woods Development site was determined to be "low". No SAT sites were performed within the Proposed Protection Zone.

		• SGH performed koala specific surveys using the strip transect method in October 2016 and observed two koalas within the Coomera Woods Development site. No koalas were observed within the Proposed Protection Zone (SHG, 2017: pg. 33). • Planit performed a comprehensive koala survey over a concentrated 36hr period utilising the line transect method and determined that up to 5 koalas were using the Coomera Woods Development site. None of the 5 individuals observed were recorded within the Proposed Protection Zone (Planit, 2017: pg. 22). The SAT method was also used recreating the sites performed by Phillips (2015), Planit found that PO27 recorded 0% activity and concluded that the use of the Coomera Woods Development site was "low". It is noted that the potential habitat provided within the Proposed Protection Zone is minimal due to the presence of edge effects and low density of vegetation. Each of the previous site specific surveys that have occurred across the Coomera Woods Development site has resulted in no koalas being recorded within/using the Proposed Protection Zone. As there is evidence of koala occurrence within 2km of the Proposed Protection Zone within the previous 5 years, this attribute has been scored 1.
Vegetation Composition	2	A detailed description of the vegetation composition on Proposed Protection Zone is provided within the flora portion of Section 2 of this assessment, and based on the results from 2004, 2008 and 2015 ecological field surveys. The Proposed Protection Zone was found to be dominated by species that achieve the definition of 'woodland' and 'forest' as referenced in the Koala Referral Guidelines. Ecological survey of the Proposed Protection Zone is predominately dominated by Eucalyptus and Corymbia species. Specifically, these species included *Eucalyptus tereticornis* (Forest Red Gum), *Eucalyptus siderophloia* (Grey Gum), *Corymbia intermedia* (Pink Bloodwood), *Corymbia citriodora* (Spotted Gum) and Broad-leaved Ironbark (*Eucalyptus fibrosa*)/or Grey Ironbark (E. *siderophloia*). Further, there was a high dominance of *Allocasuarina littoralis* (Black She-oak), *A. torulosa* (Forest She-oak) and Wattles (*Acacia disparrima, A. leiocalyx, A. melanoxylon*) throughout the shrub layer and a number of weed species were identified. As vegetation composing of canopy species on site is made up of more than two species considered to be Koala food trees, this attribute has been given a score of 2.
Habitat Connectivity	0	The Proposed Protection Zone is bound by the Gold Coast Railway Line to the west, Foxwell Road the south and existing and approved development to the north and east. Current aerial imagery shows small vegetated patches to the south. Connectivity to these patches are segregated by existing arterial road and rail infrastructure and future development and EPBC approvals. Additionally, the Bloom Estate to the immediate east has now completed vegetation clearing, removing the majority of vegetation adjoining the eastern boundary with the exception of the retained gully line. Urban development has expanded significantly in the wider Coomera area over the past decade, with residential estates now dominating the landscape to the east and west of the Pacific Motorway. A primary barrier to dispersal between the Proposed Protection Zone and bushland directly to the west is the Gold Coast Railway Line and Coomera Train Station. Trains travel along this portion of the line between Brisbane and the Gold Coast roughly every half an hour between 5am and 12pm. The high frequency of train movements along the track poses significant threats of injury or death to dispersing Koalas. In addition, vegetation clearing of isolated pockets between the railway line and Pacific Motorway associated with Westfield's Northern Frame Precinct (EPBC2014/7291) and Shopping Centre (EPBC20147292) has now been completed. The construction of the shopping centre has commenced and together with the rail corridor, this effectively forms an impenetrable koala barrier to the west and south-west of the Proposed Protection Zone. The upgrade to the Foxwell road interchange with the M1 motorway (Exit 54) had recently been completed. Demonstrating its support for the development of the Coomera regional centre, the majority of the funding was provided by the Federal Government with the balance provided by the State government and some significant commitments by developers within the Coomera Town Centre. With Foxwell road planned as an arterial road, the section between the recently completed interchange and the entrance to the Coomera Rail station is currently being upgraded from a 2 lane to a 6 lane road. The section to the east of the access road to the station had already been upgraded to 6 lanes by Council. This major road with high traffic volumes forms a very significant barrier between the site and the remaining habitat to the south. From the above it is evident that the Proposed Protection Zone is surrounded by barriers against the movement of koalas to and from remaining habitat patches and the Koala Conservation Area (which is to be retained and restored by Council as permanent koala habitat for the survival of the species in the broader Coomera / Pimpama area). Furthermore, the Coomera Town Centre Structure Plan shows that the surrounding Coomera area is expected to undergo even further development in the future. The Proposed Protection Zone is located centrally within this urban development zone and, as such, will be completely surrounded by existing and future development. Consequently, the project area will become a completely isolated patch fragmented from habitat patches elsewhere in the landscape once surrounding development is complete. The Proposed Protection Zone is not part of a contiguous landscape. No suitable corridors to support the regular and ongoing movement of Koalas between habitat areas has been planned within the Coomera Town Centre. The local ecological corridor illustrated within the Coomera Town Centre Structure Plan which extends through adjoining developments to the north-east (to ultimately link up with the Koala Conservation Area) is designed to allow for the immediate refuge for wildlife. This corridor, with its mature vegetation and dense canopy, could facilitate dispersal of individual koalas through adjoining developments to the Koala Conservation Area located to the north and east of the East Coomera urban footprint. The Referral Guidelines, in Table 8: Barriers to dispersal and fragmentation address mitigation measures against 'barriers to movement to or from habitat critical to the survival of the koala that is likely to result in a long-term reduction in genetic fitness or access to habitat critical to the survival of the koala'. It provides that the retention of corridor(s) of at least 100m width would only have a moderate effect in the mitigation of barriers and that corridors greater than 300m can be considered to have higher effectiveness.

Having regard to the provisions of Table 8 mentioned above, with a minimum width of approximately 80m (varying in width up to approximately 100m), the corridor through the UKA does not mitigate against the barriers surrounding the Proposed Protection Zone and would not provide effective movement to prevent long-term reduction in genetic fitness.

Further investigations of the ecological corridor have revealed that there are one-way koala exclusion fences in place at three locations that prevent koalas from moving from the koala conservation area into the ecological corridor (and potentially onwards to the Proposed Protection Zone). Those fences are located at:

Location 1: the interface between the Gainsborough Greens residential development and the koala conservation area (refer to figure 7).

The Gainsborough Greens estate is located directly north of Yawalpah road, straddles the ecological corridor and adjoins the koala conservation area. A continuous one-direction koala fence had been constructed between the conservation area and the Gainsborough Greens development precincts (e.g. residential and open space precincts). This design is a standard chain-wire fence with a 60cm strip of sheet metal attached beneath the top of the fence on the side of the conservation area.

The strip inhibits arboreal fauna from climbing the exclusion side of the fence, preventing access to the urban area and the ecological corridor from the conservation area. As the 60cm metal sheeting is only installed on the one side of the exclusion fencing, koalas are able to escape from Gainsborough Greens to the conservation area by climbing the fence on the urban side and dropping down into retained vegetation on the opposite side.

The installation of such fencing has been found effective in restricting koala movement across main roads and changing koala movement behaviours (Jones et al, 2013). These one-direction fences allow koalas to move from the Gainsborough Greens development into the koala conservation area but does not allow koalas to move out of the koala conservation area.

Location 2: along Gainsborough Drive (refer to figure 7).

Gainsborough Drive is a two lane road that cross the corridor approximately 300m north of Yawalpah Road. A one direction koala fence is constructed along only the northern boundary of Gainsborough Drive. The one-direction koala exclusion fence is erected such that it excludes movement from the north towards the south. As there is no exclusion fence along the southern side of Gainsborough Drive, koalas can still cross the road and move northwards – in the direction of the koala conservation area

Location 3: along Yawalpah Road (refer to figure 7).

A one-direction koala exclusion fence is constructed on the northern boundary of Yawalpah road reserve; The one-direction koala exclusion fence adjoins residential acoustic / koala exclusion fence on either side of the ecological corridor. Koalas can thus not move around the one-direction koala exclusion fence. There is no fence on the southern boundary of Yawalpah Road reserve.

Again, the one-direction koala exclusion fence is erected such that it excludes movement from the north towards the south. It is thus not possible for koalas within the Gainsborough Greens ecological open space to cross the fence into Yawalpah Road and move southwards within the ecological corridor or towards the urban footprint.

As there is no fence along the southern boundary of Ywalpah Road, koalas can however cross the road and move northwards – out of the urban footprint and towards the koala conservation area

At each of these above mentioned locations, koalas are able to move from the south to the north, but are unable to move from the north within the ecological corridor.

The presence of these fences, and the inability of koalas to move from the koala conservation area to the urban areas in the south, is consistent with the empirical evidence obtained from the surveys conducted on the site that there are only a small number of koalas using the site. Despite that the site is used by that small number of koalas, the ecological corridor does not allow for recruitment of koalas from the northern koala conservation area and thus results in a sink, where mortality rates exceed breeding and recruitment.

One-way Fauna Exclusion Fence - Design & function

The one-way fauna exclusion fencing constructed as part of the Gainsborough Greens development are in accordance with the Department of Transport and Main Roads (Qld) *Fauna Sensitive Road Design Manual, Volume 2: Preferred Practices*.

This design is a standard 1.8m chain-wire fence with a 60cm strip of sheet metal attached beneath the top of the fence on the opposite site to the road. The strip inhibits arboreal fauna from climbing the exclusion side of the fence, preventing access to the roads and ecological corridor from the conservation area.

As the 60cm metal sheeting is only installed on the one side of the exclusion fencing, koalas are able to escape from roadways and urban areas to the conservation area by climbing the fence on the road way side and dropping down into retained vegetation on the opposite side.

		A concrete strip is inserted along the bottom of the fence – preventing animals from burrowing under the fence. This design effectively deters koala movement from the conservation area to the ecological corridor. ***Application of one-way fauna exclusion fences*** One direction koala fences are widely used in Queensland and New South Wales to prevent koalas from moving onto roads and reduce the incidence of koala strikes by vehicles. These fences however also allow koalas, that may find its way into the road reserve or within urban area, the means to scale the fence and escape using a drop-down method. One direction koala exclusion fences are widely used along roads developed or upgraded by the QLD Department of Transport and Main Roads. Projects include upgrades of the Bruce Highway and sections of roads near Kawartha Forest to guide fauna to appropriate crossing structures. New South Wales road projects include the $4.36 billion Woolgoolga to Ballina Pacific Highway which include a number permanent koala exclusion fences in key locations in Wardell, an upgrade jointly funded by the Australian and NSW governments. The koala exclusion fences have been installed in accordance with the Conditions of Approval for the upgrade as part of the project's Koala Management Plan. The Tweed Coast Comprehensive Koala Plan of Management (2015) includes the use of fauna exclusion fencing within the Koala Area Precincts and Koala Linkage Precincts to facilitate the safe movement of koalas through the landscape while mitigating potential vehicle strikes. It is noted that one-way fauna exclusion fencing has been incorporated into the landscape design for the Gainsborough Greens development at the request of the City of Gold Coast to allow arboreal fauna access to the conservation areas and restrict movement from the conservation areas to the urban landscape. The *East Coomera Koala Population Study 2017* prepared by Biolink also recommended further installation of one-way koala exclusion fencing around the conservation areas and rural landscape to prevent koalas dispersing out of these areas and into the high-risk urban landscape (pg. 61 & 71). ***The effectiveness of the one-way fauna exclusion fences*** The installation of such fencing has been found effective in restricting koala movement across main roads and changing koala movement behaviours (Jones et al, 2013). This study recorded a koala crossing a major road numerous times prior to installation of one-way fauna exclusion fencing, approaching the road on 38 occasions and crossing 19 times (50% approach-crossing ration). Post construction the animal approached the road 11 times along the fauna-exclusion fence side, none of these approaches resulted in the koala crossing the road.

Figure 7: Location of one-way fauna exclusion fencing (Source: Google Maps, 2018)

Figure 8: one-way koala fencing at the interface between Gainsborough Greens Development and the koala conservation area (Location 1)

Figure 9: one-way koala fencing at the interface between Gainsborough Greens Development and the koala conservation area (Location 1)

Figure 10: One-way exclusion fencing along Gainsborough Drive (Location 2)

Figure 11: One-way exclusion fencing along northern side of Yawalpah Road (Location 3)

Additional barriers to movement of koalas at Yawalpah Road