UPGRADING THE PACIFIC HIGHWAY

Woolgoolga to Ballina Planning Alliance

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Woolgoolga to Ballina Upgrade

Supplementary Biodiversity Assessment

FINAL

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NSW GOVERNMENT Transport Roads & Maritime Services

aurecon

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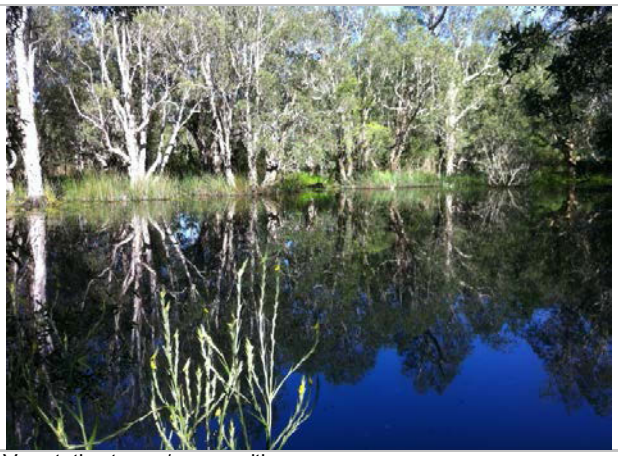
Appendix C. Ancillary site field notes

The following descriptions focus on sites with remnant vegetation present in varying densities.

Section 1 (New Site 2a) Cassons Creek



Vegetation types/communities

The majority of this site is located on lower elevated floodprone land which supports threatened ecological communities. Biometric vegetation types present include:
Swamp Box swamp forest of the coastal lowlands of the North Coast
Paperbark swamp forest of the coastal lowlands of the North Coast
Coastal floodplain sedgelands, rushlands, and forblands
Blackbutt - bloodwood dry heathy open forest on sandstones of the northern North Coast

Description and findings

The majority of this site supports native vegetation cover, with several billabongs along Cassons Creek with some small patches of cleared and modified land at the northern end of the site. The vegetation communities are largely intact, consisting of threatened ecological communities on lower elevated lands including areas of Swamp Sclerophyll Forest, Subtropical Coastal Floodplain Forest and Freshwater Wetlands.
There is an area of disturbed dry forest at the northern end of the site and a cleared area on the highest elevated portions of the site which provides the greatest potential to be used as an ancillary facility site. The threatened flora species *Maundia triglochinoides* was recorded in one of the billabongs on Cassons Creek occurring in moderate abundance.

Aquatic surveys were undertaken at two pond sites within the property to collect biota data representative of the entire aquatic system through the property. One pond is inside the boundary of the ancillary site and the other immediately outside to the east. These ponds and surrounding ephemeral swamps provide habitat for a diverse range of fish, birds, mammals, reptiles, amphibians and invertebrates.

Additional ponds were also discovered (not surveyed) on the property which would have similar ecological attributes to the surveyed ponds. Six species of fish were recorded within the study area, however none were threatened.
Water Quality was generally poor with a low mean dissolved oxygen content (28.3% sat) well below the ANZECC/ARMCANZ (2000) default trigger values for lowland streams (85-110%sat). Mean pH (6.17 pH units) was also outside the ANZECC/ARMCANZ (2000) trigger values (6.5 – 8.5 pH units). Mean electrical conductivity (375µS/cm) was within the ANZECC/ARMCANZ trigger values (125-2200µS/cm).

Section 1 Site 1a and 1b

Vegetation types/communities

The majority of this site supports exotic pasture with several areas of regenerating trees and shrubs and derived grasslands characteristic of the surrounding vegetation types. Surrounding Biometric vegetation types comprise:
Blackbutt - bloodwood dry heathy open forest on sandstones of the northern North Coast
Swamp Box swamp forest of the coastal low lands of the North Coast

Description and findings

This site comprises cleared and modified land, with the majority of the area supporting exotic pasture. There are several small patches with a higher proportion of native species with regenerating shrubs and trees and some native groundcovers.

Towards the southern end of Site 1a along a drainage swale there is a small patch of regenerating native trees including Broad-leaved Paperbark (*Melaleuca quinquenervia*) and Swamp Box (*Lophostemon sauveolens*) consistent with the threatened ecological community Subtropical Coastal Floodplain Forest. This area is in a moderate condition as specified under the biobanking methodology with a score 49 out of 100.
The northern sections on ridges and slopes supports cleared pasture areas with remnant and regenerating trees and shrubs and some areas of derived grassland. Dominant tree species include Blackbutt (*Eucalyptus pilularis*) and Tallowwood (*Eucalyptus microcorys*) and regenerating shrubs include Forest Oak (*Allocasuarina torulosa*) and Notched Bush-pea (*Pultenaea retusa*). Groundcover in these areas consists of derived grassland dominated by a mix of exotic and native species with a total of 18 species recorded in each of the two biobanking condition assessment plots undertaken. These areas are in a low-moderate condition as specified under the biobanking methodology with scores ranging between 33 and 42 out of 100.
Site 1b supports exotic pasture on a floodplain area below the existing dam wall. There are several remnant Swamp Mahogany (*Eucalyptus robusta*) and Red Mahogany (*Eucalyptus resinifera*) trees indicating the former present of a threatened ecological community. This area is in a low condition supporting limited native species and canopy cover.

Section 2 Site 1a, 1b and 1c

Site 1a

Site 1b

Vegetation types/communities

The majority of these sites supports exotic pasture and other modified areas of vegetation with several areas of remnant and regenerating trees and shrubs characteristic of the surrounding vegetation types. Surrounding Biometric vegetation types and remnant trees comprise: Blackbutt - bloodwood dry heathy open forest on sandstones of the northern North Coast

Description and findings

Site 1a supports maintained grassland dominated by exotic species with some regenerating trees. There has been some recent clearing of remnant trees along the northern boundary. There is a dam in south western corner of the site.
Site 1b is located behind the existing service station. This site supports a mix of exotic dominated vegetation with planted and remnant trees. There are some large remnant trees with hollows in the north east corner of the site with a slashed understorey.

Site 1c is within the construction footprint so was not further assessed. However this site supports the TEC Swamp Sclerophyll Forest as well as a population of the threatened flora species Slender Screw Fern (*Lindsaea incisa*).

Section 2 Site 2 (Halfway Creek)

Vegetation types/communities

This site supports intact remnant vegetation of the biometric vegetation types:
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast
Swamp Box swamp forest of the coastal lowlands of the North Coast

Description and findings

Halfway Creek was a slow flowing stream with clay banks and abundant submerged and emergent woody snags. The banks were dominated mainly by *Lomandra longifolia*, *Acacia floribunda* and surrounded by *Eucalyptus tereticornis*. Aquatic macrophytes included *Cyperus difformis* and *Entolasia marginata* and *Potamogeton tricarinatus*.
Water **q**uality was generally poor with a low mean dissolved oxygen content (32.9% sat) well below the ANZECC/ARMCANZ (2000) trigger values (85-110%sat). Mean pH (6.48 pH units) was also just below the trigger values (6.5 – 8.5 pH units). Mean electrical conductivity (176µS/cm) was within the ANZECC/ARMCANZ trigger values (125-2200µS/cm). These results indicate potentially suitable water quality conditions for the targeted threatened fish species Oxleyan Pygmy Perch and the Purple-spotted Gudgeon, however neither species were recorded during targeted surveys. Only one species was recorded during targeted surveys – the noxious fish species Eastern Gambusia.

Section 2 Site 4

Vegetation types/communities

This site contains cleared land with exotic pasture. There are intact areas of remnant vegetation surrounding this site comprising the biometric vegetation type:
Scribbly Gum - Red Bloodwood heathy open forest of the coastal low lands of the North Coast
The northern end of this site supports some remnant trees, however these are within the proposed construction footprint and therefore were assessed as part of the EIS assessment.

Description and findings

This area supports highly modified exotic grassland areas with little or no native groundcovers, shrub and tree regeneration
Mature and senescent trees surrounding, several with small to medium hollows. The majority of the ancillary facility site is cleared and contains weeds, exotic grasses and an orchard. Grassy understorey and scattered tall shrubs.
Threatened microbats, Brush-tailed Phacogale, Rufous Bettong are predicted on the site, with small area of habitat on site. Not significant relative to the large surrounding bushland. Unique habitat in similar and better condition to the west.

Section 2 Site 5a and 5b

Vegetation types/communities

This site supports cleared land with exotic pasture, planted rows of native trees and regenerating shrubs and trees. There are no intact areas of remnant vegetation within the site, however there are several biometric vegetation types in surrounding areas including:
Needlebark Stringybark - Red Bloodwood heathy woodland on sandstones of the lower Clarence of the North Coast
Orange Gum (Eucalyptus bancroftii) open forest of the North Coast

Description and findings

This area supports exotic grassland areas dominated by Whisky Grass (*Andropogon virginicus*) with some small patches where native groundcovers are present. There are planted rows of River Oak (*Casuarina cunninghamiana*) and regenerating shrubs and trees including Black She-oak (*Allocasuarina littoralis*) and Curracabah (*Acacia concurrens*) throughout paddock areas.
There is a drainage line along the northern boundary supporting native trees and shrubs.
The threatened flora species Square-fruited Ironbark was recorded on the property boundary at the southern end of the site
Site 5b is within the assessed construction footprint and therefore was not included in this assessment.

Section 3 Site 2 (Near Pheasants Creek)

Vegetation types/communities

The site is dominated by exotic grassland with some scattered remnant and regenerating trees. A creek line with a thin strip of riparian vegetation is also present. Biometric vegetation types within and surrounding the site comprise:
Spotted Gum - Grey Ironbark - Pink Bloodwood open forest of the Clarence Valley lowlands of the North Coast
Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast

Description and findings

This site is dominated by exotic pasture surrounded by remnant vegetation dominated by Large-leaved Spotted Gum (*Corymbia henryi*), Northern Grey Ironbark (*Eucalyptus*), Small-fruited Grey Gum (*Eucalyptus propinqua*) and Forest Red Gum (*Eucalyptus tereticornis*). There is a thin strip of riparian vegetation along the drainage line running through the site including Tea Tree (*Melaleuca alternifolia*), Swamp Box (*Lophostemon sauveolens*) and Broad-leaved Apple (*Angophora subvelutina*).

Vegetation along the creek line represents a disturbed example of the TEC Subtropical Coastal Floodplain Forest.
Pheasants creek was dry at the time of sampling. Pheasants Creek has a well-defined channel with sand/gravel substrate. Woody snags and the potential for deep residual pools were also evident within the dry channel. Due to the lack of available water, surveys were conducted further downstream of the ancillary facility site within a large residual pool. Water quality was poor within the pool with high electrical conductivity (6470 µS/cm) exceeding the ANZECC/ARMCANZ (2000) upper trigger value of 2200µS/cm. The high electrical conductivity within these pools indicates that saline groundwater is providing base flow. Dissolved oxygen (65.7%sat) and turbidity (83.6NTU) was also poor, both outside the ANZECC/ARMCANZ (2000) guidelines of 85-110%sat and 20NTU respectively. High water temperature of 26°C also reduced the inhabitability of the site. Given these poor water quality conditions, threatened fish species are not expected within the site.

Section 3 Site 4

Vegetation types/communities

This site contains areas of derived grassland and dry sclerophyll forest subject to cattle grazing. The biometric vegetation types within and surrounding this area comprise:
Scribbly Gum - Needlebark Stringybark heathy open forest of coastal lowlands of the northern North Coast
Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast

Description and findings

The forest type in this area supports a mixed canopy dominated by various species with a moderately modified understorey. Dominant canopy species include Scribbly Gum (*Eucalyptus signata*), Tallowwood (*Eucalyptus microcorys*), Northern Grey Ironbark (*Eucalyptus siderophloia*), Red Mahogany (*Eucalyptus resinifera*), Pink Bloodwood (*Corymbia intermedia*) and Stringybark (*Eucalyptus tindaliae*). The understorey is dominated by Blady Grass (*Imperata cylindrica*) with several other native grass, shrub and herb species –present in low abundance. This area is in a moderate-high condition as specified under the biobanking methodology with a score 61 out of 100.
There are areas of derived grassland which are dominated by a mix of native and exotic species and are slashed and grazed routinely with some remnant and regenerating trees. These areas still support a moderate diversity of native flora with 25 native species recorded in 20 x 20 metre plot, however the cover of exotic species in the ground cover is about 54%. This area is in a low moderate condition as specified under the biobanking methodology with a score 33 out of 100.
The threatened flora species Sandstone Rough-barked Apple (*Angophora robur*) was recorded in low abundance in forested areas.

Section 3 Site 6a and 6b

Vegetation types/communities

These sites are dominated by exotic grassland. Surrounding biometric vegetation types mainly comprise:
Scribbly Gum - Needlebark Stringybark heathy open forest of coastal lowlands of the northern North Coast.
Blackbutt - bloodwood dry heathy open forest on sandstones of the northern North Coast
Swamp Mahogany swamp forest of the coastal lowlands of the North Coast

Description and findings

Site 6a supports exotic grassland on a former dump site. There is a small dam at the eastern end of the site supporting aquatic macrophytes. A single seedling of Sandstone Rough-barked Apple (*Angophora robur*) was recorded on the mound of the dam wall. There is also a single *Acacia irrorata* tree in the central area of the site.

Site 6b is in a cleared gully area dominated by exotic grassland with some regenerating shrubs. This broad gully area has impeded drainage and is likely to have once supported Swamp Sclerophyll Forest similar to areas of remnant vegetation to the east and west. There is a drainage area along the northern boundary of the site. There are several areas of regenerating shrubs characteristic of the surrounding swamp sclerophyll forest including *Melaleuca sieberi*, Yellow Teatree (*Leptospermum polygalifolium*) and Bracken (*Pteridium esculentum*).

Section 3 Site 7b

Vegetation types/communities

The site is dominated by bare disturbed ground with regenerating shrubs and trees characteristic of surrounding vegetation types. The biometric vegetation type comprises:
Turpentine moist open forest of the coastal hills and ranges of the North Coast

Description and findings

This site is within an existing quarry with regenerating areas of vegetation. Common species regenerating in the quarry include Black She-oak (*Allocasuarina littoralis*), Flat-stemmed Wattle (*Acacia complanata*), Bloodwood (*Corymbia* spp.), Tallowwood (*Eucalyptus microcorys*) and Red Mahogany (*Eucalyptus resinifera*).
There is a large hollow tree at the northern end of the site.
In addition to this quarry area, there are several other similar areas adjacent to the assessed construction footprint and sufficient access trails.
The threatened flora species Slender Screw Fern (*Lindsaea incisa*) was recorded on the edge of the access trail to Site 7b from Bostock Road, occurring in a small drainage channel on the side of the trail. This population is on the edge of the assessed construction footprint.
Site 7a within assessed construction footprint and therefore not included in this assessment.

Section 3 Site 8

Vegetation types/communities

The site is dominated by bare disturbed ground and exotic grassland which is slashed and grazed with regenerating shrubs and trees characteristic of surrounding vegetation types. The biometric vegetation types in surrounding areas include:
Turpentine moist open forest of the coastal hills and ranges of the North Coast
Swamp Mahogany swamp forest of the coastal lowlands of the North Coast

Description and findings

This site is currently being used for timber milling and horse grazing, as well as having sheds and gardens. The vegetation has been highly modified supporting exotic grassland dominated by Carpet Grass (*Axonopus sp.*) with several large mature trees with hollows that have been retained and regenerating trees and shrubs in areas. Dominant tree species include Tallow wood (*Eucalyptus microcorys*), Turpentine (*Syncarpia glomulifera*) and Pink Bloodwood (*Corymbia intermedia*), with regenerating shrubs including Curracabah (*Acacia concurrens*) and *Persoonia stradbrokensis*.
The northeast boundary of the site adjoins an area of Swamp Sclerophyll Forest (TEC) and regeneration of vegetation characteristic of this TEC is present along this boundary including Broad-leaved Paperbark (*Melaleuca quinquenervia*) and Plume Rush (*Baloskion tetraphyllum*).

Section 3 Site 9

Vegetation types/communities

The site is dominated by exotic grassland which is grazed with regenerating shrubs and trees characteristic of surrounding vegetation types. The biometric vegetation types in surrounding areas include:
Turpentine moist open forest of the coastal hills and ranges of the North Coast
Swamp Mahogany swamp forest of the coastal lowlands of the North Coast
Spotted Gum - Grey Ironbark - Pink Bloodwood open forest of the Clarence Valley lowlands of the North Coast

Description and findings

This site supports exotic grassland with remnant and regenerating trees and shrubs, as well as a dam. The eastern boundary adjoins a drainage line supporting Swamp Sclerophyll Forest. There are several areas which support a higher proportion of native species.
In the northwest corner of the site there is a small patch of remnant trees including Large-leaved Spotted Gum (*Corymbia henryi*) and Northern Grey Ironbark (*Eucalyptus siderophloia*) with some native groundcovers including Barbed Wire Grass (*Cymbopogon refractus*) and Wiry Panic (*Entolasia stricta*). A total of 24 native flora species were recorded in a 20 x 20 metre plot in this area, and the exotic vegetation cover was about 8%. This area is in a moderate condition as specified under the biobanking methodology with a score 49 out of 100.
There are regenerating Broad-leaved Paperbark (*Melaleuca quinquenervia*) and Swamp Mahogany (*Eucalyptus robusta*) in the south east and north east corner of the site adjacent to intact areas of Swamp Sclerophyll Forest (TEC). This area represents a regenerating example of this TEC with a total of 29 native flora species were recorded in a 20 x 20 metre plot in this area, and the exotic vegetation cover was approximately 40%. This area is in a moderate-high condition as specified under the biobanking methodology with a score 49 out of 100.
There are several threatened flora populations in this area including scattered individuals of Sandstone Rough-barked Apple (*Angophora robur*) throughout the site and a population of *Maundia triglochinoides* in adjacent areas along the drainage line outside the eastern boundary of the site.

Section 3 site 10

Vegetation types/communities

The site is dominated by exotic grassland which is grazed with regenerating shrubs and trees characteristic of surrounding vegetation types. The biometric vegetation types in surrounding areas include:
Tallow wood dry grassy forest of the far northern ranges of the North Coast
Swamp Mahogany swamp forest of the coastal lowlands of the North Coast

Description and findings

The site comprises a cleared paddock dominated by exotic flora with vegetated drainage lines. Drainage lines are dominated by a mix of Broad-leaved Paperbark (*Melaleuca quinquenervia*), Radiata Pine (*Pinus radiata*) and Camphor laurel (*Cinnamonum camphora*). No threatened flora and fauna species habitat present.

Section 4 Site 4a, 4b and 4c

Vegetation types/communities

This site is dominated by exotic grassland with regenerating shrubs and trees characteristic of surrounding vegetation types with small areas of remnant vegetation. The biometric vegetation types in and surrounding these ancillary facility sites are:
Grey Gum - Grey Ironbark open forest of the Clarence lowlands of the North Coast
Spotted Gum - Grey Ironbark - Pink Bloodwood open forest of the Clarence Valley lowlands of the North Coast
Paperbark swamp forest of the coastal lowlands of the North Coast

Description and findings

Site 4a comprises cleared paddock dominated by exotic flora with isolated native trees and shrubs. Native trees include Northern Grey Ironbark (*Eucalyptus siderophloia*), Pink Bloodwood (*Corymbia intermedia*), Small-fruited Grey Gum (*Eucalyptus propinqua*). Native shrubs present include Prickly Beard-heath (*Leucopogon juniperinus*), Coffee Bush (*Breynia oblongifolia*) and Salwood (*Acacia disparrima* subsp. *disparrima*).
Two standing dead-trees (stags) with very small hollows are present which provide potential habitat for roosting bats. There are also denser clumps of shrubs beneath isolated paddock trees and areas which provide sheltering habitats for smaller and medium sized fauna. This area is a known emu passage between areas of bushland into cane farms and this ancillary facility site is expected to have impacts to emus.
Site 4b is dominated by sugar cane crops with a small area of Swamp Oak (*Casuarina glauca*) on the drainage channel along the eastern boundary.
Site 4c supports remnant forest on a steep slope adjoining the floodplain. This vegetation comprises regrowth of Northern Grey Ironbark with a disturbed understorey open to cattle grazing. There is limited habitat for threatened flora and fauna in this small isolated patch of remnant vegetation apart from foraging resources during the flowering period of the ironbarks.

Section 4 Site 7a

Vegetation types/communities

This site has been highly disturbed from the construction of drainage channels altering hydrology regimes as well as cropping, slashing and grazing therefore the vegetation communities are in a highly altered state. The relevant biometric vegetation types would include:
Paperbark swamp forest of the coastal lowlands of the North Coast
Swamp Oak swamp forest of the coastal low lands of the North Coast
Coastal floodplain sedgelands, rushlands, and forblands

Description and findings

Trees along drainage channels include Broad-leaved Paperbark (*Melaleuca quinquenervia*), Swamp Oak (*Casuarina glauca*) and Tuckeroo (*Cupaniopsis anacardioides*). The paddock area at the southern end of this site is dominated by the native grass species Water Couch (*Paspalum distichum*) which is common in freshwater wetlands, however this area appears to be used for cropping. The northern end of the site is regularly slashed and supports minimal habitat for flora and fauna.
The southern end of this site is highly flood prone, being inundated for long periods during recent flooding. This site supports potential habitat for migratory and wetland bird species with large numbers of Pacific Black Ducks, Ibis and Black-winged Stilts observed foraging and nesting during recent flooding.

Section 5 Site 1

Vegetation types/communities

This site is highly disturbed from the construction of drainage channels altering hydrology regimes as well as slashing and grazing therefore the vegetation communities are in a highly altered state. The relevant biometric vegetation types include:
Paperbark swamp forest of the coastal lowlands of the North Coast
Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast
Coastal floodplain sedgelands, rushlands, and forblands

Description and findings

Cleared grassy paddock dominated by Common Couch (*Cynodon dactylon*) with isolated trees including Forest Red Gum (*Eucalyptus tereticornis*), Broad-leaved Paperbark (*Melaleuca quinquenervia*), Prickly-leaved Tea Tree (*Melaleuca styphelioides*). All remnant and regenerating trees are part of the former threatened ecological communities occurring on coastal floodplains, most likely Subtropical Coastal Floodplain Forest TEC. Field observations confirmed the highly modified nature of this site with a low native diversity (up to 10 native flora species were recorded in a 20 x 20 metre plot) and lack of vegetation structure. This area is in a low condition as specified under the biobanking methodology with a score of 17 out of 100. This site is highly prone to flooding and was inundated for a long period during recent flooding events. There is one tree supporting hollows suitable for use by fauna, however the isolated nature of the tree limits the importance to highly mobile species such as tree-dwelling microbats and nesting bird species.

Section 5 Site 6

Vegetation types/communities

The site is dominated by exotic grassland which is grazed with regenerating shrubs and trees characteristic of surrounding vegetation types. The biometric vegetation types in surrounding areas include:
Blackbutt - bloodwood dry heathy open forest on sandstones of the northern North Coast
Swamp Mahogany swamp forest of the coastal lowlands of the North Coast

Description and findings

The site is a small triangle, adjacent to Mororo Creek Nature Reserve dominated by grazed exotic grassland with some minor regeneration and remnant trees. There is a small area of disturbed Blackbutt (*Eucalyptus pilularis*) dominated forest on slightly elevated sandy soils towards the northern end of the site. The remainder of the site is highly cleared supporting a few remnant trees and minor areas of regeneration characteristic of the TEC Swamp Sclerophyll Forest on Coastal Floodplains such as Swamp Mahogany (*Eucalyptus robusta*) and Red Mahogany (*Eucalyptus resinifera*).
The area of Blackbutt forest supports about 22 native flora species (in a 20 x 20 m plot) with a partially intact canopy and mid-storey layer. This area is in a moderate condition as specified under the biobanking methodology with a score of 58 out of 100.
The southern boundary has a large dead stag (120cm dbh) with large hollow trunk suitable for an owl nest/roost.
The adjacent Mororo Creek Nature Reserve has very high quality habitat with high structural and floristic diversity. A Koala was observed feeding in the adjacent reserve and scats were found on the ancillary facility site.

Section 6 Site 3a and 3b

Vegetation types/communities

This site is highly disturbed from the construction of road infrastructure altering hydrology regimes as well as slashing and grazing therefore the vegetation communities are in a highly altered state. The relevant biometric vegetation types include:
Paperbark swamp forest of the coastal lowlands of the North Coast
Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast

Description and findings

Site 3a
A large site bordering intact Subtropical Coastal Floodplain Forest Threatened Ecological Community (TEC) to the north. The northern section has a stand of moderately dense mature Forest Red Gum (*Eucalyptus tereticornis*) inside the site boundary as an extension to the existing forest which has been slashed and contains an exotic understorey. It has potential habitat for the Koala and other threatened species and a single hollow tree was recorded in this area. This area is in a low condition with a biobanking score of about 18 out of 100. The southern section is a large open paddock dominated by exotic pasture species with scattered trees once forming Subtropical Coastal Floodplain Forest dominated by Forest Red Gum and Swamp Box (*Lophostemon suaveolens*). The site has been mostly cleared except for stands of remnant trees retained in the landscape, including several remnant trees with hollows suitable for fauna. Potential habitat for Koala, Masked Owl, Powerful Owl, Spotted-tail Quoll, Brush-tailed Phascogale and microbats. The rare orchid species *Arthrochilus prolixus* (ROTAP: 2K) was recorded in this area at the base of a remnant tree in exotic grassland.
Site 3b
Site has dense regrowth in most areas indicative of past land clearing during the construction of the original highway. There are some small patches of remnant Subtropical Coastal Floodplain Forest TEC dominated by Forest Red Gum with a grassy understorey supporting a mix of native and exotic flora. These areas support relatively good structural diversity and there is a high potential for natural regeneration of forest on this site. This area has a biobanking score of between 61 and 74 out of 100 so the condition is moderate to high This area is potential habitat for Koala, gliders, nectarivore birds, microbats, owls and Brush-tailed Phascogale and adjoins a large area of intact habitat for these species. Some hollow-bearing trees and stags occur on site. Most low lying areas and depressions with sedges were completely dry, but would be suitable for frogs following larger rainfall events.

Section 7 Site 3

Vegetation types/communities

This site is highly disturbed from slashing and grazing and therefore the vegetation communities are in a highly altered state. The relevant biometric vegetation types would include:
Red Mahogany open forest of the coastal low lands of the North Coast

Description and findings

Grassy paddocks currently being used for cattle grazing. A creek at the northern end has a series of deep pools providing habitat for migrating birds. The southern end is grassy with a small stand of mature Forest Red Gum (*Eucalyptus tereticornis*) and Pink Bloodwood (*Corymbia intermedia*). There is little habitat value for fauna species apart from several termite nests with holes potentially providing nesting opportunities for hollow-dependent fauna and some minor areas of ground habitats.

Section 7 site 4

Vegetation types/communities

This site is highly disturbed from pasture improvement and grazing, and therefore the vegetation communities are in a highly altered state. Biometric vegetation types would include:
Paperbark swamp forest of the coastal lowlands of the North Coast
Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast
Coastal floodplain sedgelands, rushlands, and forblands

Description and findings

Cleared paddock dominated by exotic pasture with scattered trees including Forest Red Gum (*Eucalyptus tereticornis*), Pink Bloodwood (*Corymbia intermedia*) and Swamp Box (*Lophostemon suaveolens*). There are several small areas of regenerating trees and shrubs adjacent to existing stands of trees and there is a small area of native groundcovers in the central area of the southern boundary however the site is dominated by exotic pasture grasses. These areas are in a moderate-low condition and have a biobanking condition score of about 42 out of 100.
Subtropical Coastal Floodplain Forest and freshwater wetland habitats adjoin the northern boundary, comprising forested areas dominated by Forest Red Gum and Swamp Box and areas of tall dense reeds dominated by Grey Rush (*Lepironia articulata*) with small patches of Broad-leaved Paperbark (*Melaleuca quinquenervia*). No open waterbodies or wet soaks suitable for threatened frogs or migratory birds were observed adjacent to the site. The site has an overall low habitat value for threatened fauna.

Section 8 Site 2a, 2b and 2c

Vegetation types/communities

This site is highly disturbed from cropping, pasture improvement and grazing, and therefore the vegetation communities are in a highly altered state being limited to several areas native trees. Former biometric vegetation are likely to include:
Paperbark sw amp forest of the coastal low lands of the North Coast
Sw amp Oak sw amp forest of the coastal low lands of the North Coast

Description and findings

All of the sites contain residential properties adjacent to and w ithin cane farms. The majority of sites are dominated by sugarcane or abandoned paddocks w ith very tall dense exotic grass growth and lack any native canopy or mid-storey. There are several small patches of native trees along drainage channels and surrounding residential properties including Forest Red Gum (*Eucalyptus tereticornis*) and Sw amp Oak (*Casuarina glauca*). The highly modified and isolated habitats present on these sites provides limited habitat value for threatened flora and fauna species.

Section 8 Site 3

Vegetation types/communities

This site is highly disturbed from clearing and grazing therefore the vegetation communities are in a highly altered state being limited to surrounding biometric vegetation types including:
Paperbark swamp forest of the coastal lowlands of the North Coast

Description and findings

This site is highly disturbed consisting of cane paddock and exotic pasture. Dominant species include Carpet Grass (*Axonopus* spp.), Paspalum (*Paspalum dilatatum*) and Common Couch (*Cynodon dactylon*). There are several paddock trees outside the western boundary mainly including Pink Bloodwood (*Corymbia intermedia*). There is a large remnant patch of Swamp Sclerophyll Forest which is in high condition adjoining the southern boundary of the site. There are also several large wood piles in the paddock area which potentially provide some cover for native fauna, however the location in open paddocks is unlikely to be suitable for a large majority of native fauna. This site is likely to be subjected to flooding during periods of high rainfall.

Section 9, Site 1

Vegetation types/communities

This site is highly disturbed from clearing for plantations and plant nursery infrastructure and therefore the vegetation communities are in a highly altered state being limited to several small patches of vegetation. Former biometric vegetation types are likely to include:
Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast
Swamp Mahogany swamp forest of the coastal lowlands of the North Coast

Description and findings

The site is currently a cycad, palm, grass tree farm that is regularly maintained with numerous plantation rows.
There is one area of intact Subtropical Coastal Floodplain Forest (TEC) in the northeast section of the site which is proposed to be partially impacted by the road upgrade. This area is in a high condition and supports a high diversity of native flora with an intact vegetation structure with a biobanking score of about 75 out of 100. Dominant species in this remnant comprise Swamp Box (*Lophostemon suaveolens*), Broad-leaved Paperbark (*Melaleuca quinquenervia*) and Forest Red Gum (*Eucalyptus tereticornis*) with an understorey of mesic shrubs and vines including Tuckeroo (*Cupaniopsis anacardioides*) and Water Vine (*Cissus hypoglauca*).
There is a disturbed area of forest on the western boundary adjoining the existing Pacific Highway. This area is dominated by Forest Red Gum with a dense sub-canopy of Camphor Laurel (*Cinnamomum camphora*). Although this area supports a high density of exotic flora (45% cover/abundance), there is still a moderate degree of floristic diversity and a somewhat intact vegetation structure. This area has a biobanking score of 40 out of 100.
The northeast corner of the site contains a structural and floristically diverse remnant floodplain forest with potential to support nectarivorous fauna. However this patch of forest is somewhat isolated from established vegetation corridors. The man-made ponds and drainage channel may provide habitat for migratory birds and other aquatic fauna. In the south there is a small patch of several remnant Forest Red Gum's (*Eucalyptus tereticornis)* and a large fallen tree.

Section 9, site 2

Vegetation types/communities

This site is highly disturbed from clearing and grazing therefore the vegetation communities are in a highly altered state being mainly limited to isolated paddock trees. Former biometric vegetation types are likely to include:
Swamp Mahogany swamp forest of the coastal lowlands of the North Coast
Swamp Box swamp forest of the coastal low lands of the North Coast

Description and findings

This site comprises an abandoned paddock with tall dense grass including a mix of the native Blady Grass (*Imperata cylindrica*) as well as exotic species such as Whisky Grass (*Andropogon virginicus*). There are numerous isolated paddocks trees present including Cabbage Tree Palm (*Livistona australis*), Pink Bloodwood (*Corymbia intermedia*) and Swamp Box (*Lophostemon suaveolens*).There are several areas of dense regeneration of Swamp Box and numerous Slash Pine (*Pinus elliottii*) seedlings have become established at the northern end of the site.
There is still a moderate degree of floristic diversity on this site with regeneration of canopy species, however the vegetation structure has been highly altered. This area has a biobanking score of about 43 out of 100.
Fauna habitat:
Low abundance of habitat resources, with most of site in the early stage of regeneration and a good regrowth rate. The exotic Slash Pine may be providing food for foraging Yellow-tailed Black-cockatoos.

Section 10, Site 1a and 1b


Vegetation types/communities

This site is highly disturbed from clearing and grazing therefore the vegetation communities are in a highly altered state being mainly limited to isolated paddock trees. Surrounding biometric vegetation types include:
Swamp Oak swamp forest of the coastal lowlands of the North Coast
Paperbark swamp forest of the coastal lowlands of the North Coast

Description and findings

Site 1a is on the southern side of the Richmond River and is currently being used for sugarcane across the whole site.
Site 1b is on the northern side of the Richmond River and comprises a heavily grazed paddock with limited native vegetation dominated by Common Couch (*Cynodon dactylon*), Carpet Grass (*Axonopus sp.*) with clumps of Common Rush (*Juncus usitatus*). There is a small wetland area at the southern end of the site which supports several native macrophytes such as Rushes (*Juncus spp.*) and Spike-sedges (*Eleocharis spp.*). Native vegetation is limited to several isolated paddock trees including Swamp Oak (*Casuarina glauca*) and Swamp Box (*Lophostemon suaveolens*). There are several Camphor Laurel (*Cinnamomum camphora*) within and surrounding the site.

Section 10, Site 3b


Vegetation types/communities

This site is highly disturbed from clearing and grazing and therefore the vegetation communities are in a highly altered state being mainly limited to isolated paddock trees. Former biometric vegetation types include:
Blackbutt grassy open forest of the lower Clarence Valley of the North Coast

Description and findings

This site supports an exotic grassland with planted and remnant trees and a small dam. There is a diversity of trees which have been planted including Swamp Mahogany (*Eucalyptus robusta*), Broad-leaved Paperbark (*Melaleuca quinquenervia*) and Mango (*Mangifera indica*). Remnant and regrowth trees present include White Mahogany (*Eucalyptus acmenoides*), Pink Bloodwood (*Corymbia intermedia*) and Blackbutt (*Eucalyptus pilularis*).

Section 10, Site 4

Vegetation types/communities

This site is highly disturbed from clearing and grazing, with vegetation communities in a highly altered state being mainly limited to isolated paddock trees. Former biometric vegetation types include:
Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast
White Booyong - Fig subtropical rainforest of the North Coast

Description and findings

This site contains mostly exotic grassland with a drainage line supporting native wetland vegetation. The grassland is dominated by South African Pigeon Grass (*Setaria sphacelata*) and Parramatta Grass (*Sporobolus africanus*). The drainage line comprises an incised channel supporting wetland species such as Cunjevoi (*Alocasia brisbanensis*), *Bolboschoenus caldwellii* and *Schoenoplectus mucronatus*.
The threatened flora species Hairy Joint-grass (*Arthraxon hispidus*) was recorded previously during January 2012 in the northwest corner of this site and the project. These previous surveys were conducted during ideal moist conditions. Recent surveys of this ancillary facility site during January 2013 were conducted during drier conditions and therefore Hairy Joint-grass was restricted to moister positions in and adjacent to drainage swales in the upgrade area. Data from previous surveys would be used to demonstrate the distribution of this species on this ancillary facility site.

Section 10, Site 5

Vegetation types/communities

This site is highly disturbed from clearing and grazing with vegetation communities being in a highly altered state being mainly limited to isolated paddock trees and disturbed roadside vegetation. Former biometric vegetation types include:
Hoop Pine - Yellow Tulipwood dry rainforest of the North Coast
White Booyong - Fig subtropical rainforest of the North Coast

Description and findings

This site supports exotic grassland dominated by Broad-leafed Carpet Grass (*Axonopus compressus*) with small patches of rainforest regrowth and Camphor Laurel (*Cinnamomum camphora*) trees. Part of the site includes regenerating rainforest vegetation in the road reserve adjacent to Coolgardie Road.
Small isolated patches of regrowth in grassland areas include native and exotic species including Moreton Bay Fig (*Ficus macrophylla*), Wouldow Bottlebrush (*Callistemon salignus*), Small-leaved Tuckeroo (*Cupaniopsis parvifolia*) and Cockspur Thorn (*Maclura cochinchinensis*) along with exotic species such as Camphor Laurel, *Lantana camara*, Small-leaved Privet (*Ligustrum sinense*) and Crofton Weed (*Ageratina adenophora*). The road reserve area comprises a steep embankment and rocky outcrops with regenerating rainforest species including Brown Kurrajong (*Commersonia bartramia*) and Sweet Pittosporum (*Pittosporum undulatum*) as well as a high abundance of exotic species such as Warrel Grass (*Paspalum mandiocanum*), *Lantana camara* and Small-leaved Privet.
There are areas of remnant rainforest and Camphor Laurel adjoining the edges of this paddock which support a relatively high diversity of rainforest flora.

Section 10, Site 6

Vegetation types/communities

This site is highly disturbed from clearing and grazing, with vegetation communities being in a highly altered state being mainly limited to isolated paddock trees and disturbed roadside vegetation. Adjacent biometric vegetation types include:
Forest Red Gum - Swamp Box of the Clarence Valley low lands of the North Coast
White Booyong - Fig subtropical rainforest of the North Coast

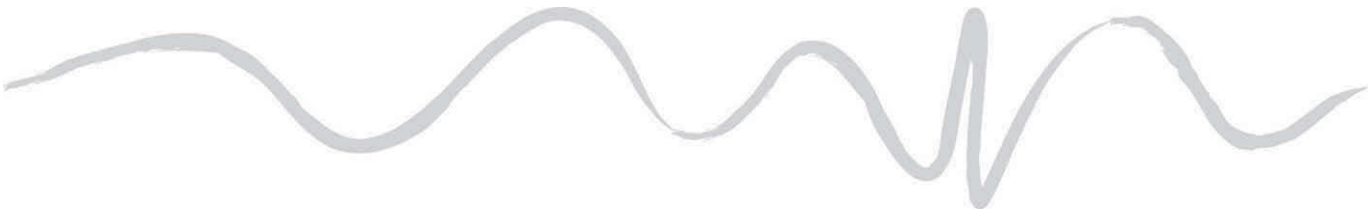
Description and findings

This site is dominated by exotic grassland with isolated trees including Camphor Laurel (*Cinnamomum camphora*), Broad-leaved Paperbark (*Melaleuca quinquenervia*), Figs (*Ficus spp.*), Brushbox (*Lophostemon confertus*), Tuckeroo (*Cupaniopsis anacardioides*) and Small-leaved Lilly Pilly (*Syzygium luehmannii*).
There are several stands of disturbed subtropical rainforest which slightly extend into the site on elevated lands north western boundary and lower elevated lands in the north eastern boundary. These areas support a high abundance of Camphor Laurel in addition to other noxious weeds such as *Lantana camara* and Groundsel Bush (*Baccharis halimifolia*).
A single Rough-shelled Bush Nut (*Macadamia tetraphylla*) tree about five metres high was recorded in cluster of regrowth at the base of the slope in the south-western area of the site.
The threatened flora species Hairy Joint-grass (*Arthraxon hispidus*) was recorded previously during January 2012 throughout the majority of the southeastern area of this site. These previous surveys were conducted during ideal moist conditions. Recent surveys of this ancillary facility site during January 2013 were conducted during dryer conditions and therefore Hairy Joint-grass was restricted to moister positions in and adjacent to drainage swales of the site. Data from previous surveys would be used to demonstrate the distribution of this species on this ancillary facility site.

Appendix D. Ecological survey report for Range Road interchange

Ecological Assessment

Additional Geotechnical Investigations at Range Road Interchange
Woolgoolga to Ballina Pacific Highway Upgrade
Woolgoolga to Glenugie Section



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Ecological Assessment

Additional Geotechnical Investigations at Range Road Interchange
Woolgoolga to Ballina Pacific Highway Upgrade
Woolgoolga to Glenugie Section

Prepared for: NSW Roads and Maritime Services

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2081-1002	Initial Draft	02/10/2012	Tom Pollard	Veronica Silver & David Andrighetto
2081-1013	Second issue	19/11/2012	Tom Pollard	Peter Thrift
2081-2003	Third issue	03/12/2012	Tom Pollard	Peter Thrift
2081-2004	Forth & Final issue	11/12/2012	Tom Pollard	Simon Williams

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Executive Summary

Introduction
RMS has proposed an alternative site and layout for the Range Road Interchange at Chainage 9,800 m of the Woolgoolga to Glenugie (W2G) Pacific Highway Upgrade. An additional 7 geotechnical investigation (GI) sites are required to adequately inform the detailed design stage of the alternate interchange option.

The purpose of this ecological assessment is to provide an assessment of the likely impacts of the GI works on threatened species, ecological communities and migratory species as defined under the New South Wales State Government *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth Government *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Methodology
The methodology for this ecological assessment has been formulated based on a review of the NSW Office of Environment and Heritage (OEH) *Threatened Species Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft, November 2004* (DEC 2004) and other relevant guidelines and is a combined result of a literature review and field surveys undertaken by GeoLINK.

Results
No threatened flora species listed under the TSC Act or the EPBC Act were detected within the study area. Vegetation occurring on the site was found to consist of the following plant communities:

- Dry Open Forest (Blackbutt association).
- Moist Open Forest (Blackbutt association).
- Riparian Rainforest.
- Modified community – regenerating Dry Open Forest.
- Modified community – Mixed Exotic/ Native Pasture.

The riparian rainforest community is indicative of the TSC Act listed Endangered Ecological Community of *Subtropical Floodplain Forest of the NSW North Coast Bioregion*. No GI sites are located in this area and no direct impacts would occur to this community.

No threatened fauna species listed under the TSC Act, FM Act or the EPBC Act were detected within the study area but a variety of fauna habitat resources were recorded including suitable habitat for a number of locally occurring threatened fauna species.

The results of the assessment of significance indicated that the Proposal is unlikely to result in a significant impact on any TSC Act listed threatened species, populations or endangered communities and therefore preparation of a Species Impact Statement is not required for the Proposal. The Proposal is also unlikely to result in a significant impact on any EPBC listed threatened species, populations or threatened communities and therefore referral to the Commonwealth Minister required for any species listed under the EPBC Act.

Impacts
The total area of native vegetation removal associated with the GIs (including access tracks) is relatively small and totals approximately 321 m^2. All of the vegetation to be removed occurs within Dry Open Forest (Blackbutt association). Removal of this vegetation would involve the removal of some habitat resources utilised by locally occurring fauna species. In addition, the works would contribute to a number of cumulative direct and indirect impacts to a minor extent. Detailed mitigation measures for the Proposal contained within RMS (2012) are considered to be adequate to ensure that negative impacts on threatened species and community within the Proposal are minimised.

Conclusion

While the GI works would contribute to additional incremental and cumulative impacts to threatened/migratory species and EECs as part of the broader W2G Highway Upgrade Project, these works would not significantly increase the risk of 'significant impacts' to threatened / migratory species and EECs.

1 Introduction

1.1 Background

GeoLINK has been engaged by the NSW Roads and Maritime Services (RMS) to prepare an ecological assessment for an area in which additional geotechnical investigations (GIs) are proposed for the Range Road Interchange Alternative Design, as part of the Woolgoolga to Glenugie (W2G) Pacific Highway Upgrade. GeoLINK has also been engaged to prepare an Addendum Environmental Assessment (EA) to assess the potential impacts of the additional GIs. This report details the findings of the ecological assessment and forms part of the baseline ecological information for the Addendum EA.

The site locality is approximately 15 km north of Woolgoolga (refer to **Illustration 1.1**). Specifically, the site encompasses two separate areas on either side of the existing Pacific Highway (refer to **Illustration 1.2**). These are subsequently referred to as Assessment Area 1 (AA1) and Assessment Area 2 (AA2). AA1 covers an area of approximately 10.2 ha on the eastern side of the existing highway. AA2 covers an area of approximately 2.2 ha on the western side of the existing highway.

The Proposal is to undertake geotechnical investigations to provide in-depth information on ground substrates, which is needed for the detailed design and construction of the project. In this assessment 'the site' refers to the Proposal footprint (refer to **Illustration 1.2**). The 'study area' refers to the site and adjoining land, which may be subject to indirect impacts from the Proposal.

Information shown is for illustrative purposes only

Drawn by: TJP Checked by: MVE Reviewed by: GJM Date: September 2012
Source of base data: Roads and Maritime Services and Department of Lands

0 1,500

North

The Site and General Locality

GeoLINK environmental management and design

Ecological Assessment: Additional Geotechnical Investigations at Range Road Interchange: W2G Pacific Highway Upgrade

2081-1004

Illustration 1.1

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Source of base data: Roads and Maritime Services

0 150

North

The Site

GeoLINK environmental management and design

Ecological Assessment: Additional Geotechnical Investigations at Range Road Interchange: W2G Pacific Highway Upgrade

2081-1016

Illustration 1.2

2

The Proposal

2.1 Description of the Proposed Works

RMS has proposed an alternative site and layout for the Range Road Alternative Interchange at Chainage 9,800 m of the W2G Pacific Highway Upgrade. Additional GIs are required to adequately inform the detailed design stage of the alternate interchange option.

RMS completed an EA of the detailed GIs between Woolgoolga and Glenugie in March 2012 (RMS 2012). This original EA addressed a range of potential impacts associated with the GIs and proposed a range of measures to mitigate or manage those potential impacts.

An additional 7 GI sites have been proposed at the proposed Range Road Interchange. These GI sites consist of 2 boreholes, identified as BH228 and BH235, and 5 test pits, identified as TPA92, TPA93, TPA94, TPA95, and TPA96 (refer to **Illustration 2.1**). The cleared pad area required for the works for each GI bore hole is typically 6 m x 3 m (18 m^2), while the cleared area for each test pit is typically 1.5 m x 4 m (6 m^2) (RMS 2012). Therefore the maximum total area of vegetation removal at the 7 GI sites would be 66 m^2. All of the vegetation to be cleared at GI sites would be within Dry Open Forest (Blackbutt Association).

In addition to clearing for the GI sites, vegetation clearing would be necessary to create access tracks to four of the test pit sites. The maximum width of vegetation clearing required to construct these access tracks is 3 m. The required area of vegetation removal for the access tracks would be 255 m^2, as detailed below:

- TPA92 and TPA94 require approximately 30-40 m of clearing, and will be accessed from the previously existing track at TP140. The maximum area of vegetation removal required is 120 m^2 (40 m x 3 m).
- TPA95 will utilise an existing access track until clearing is required for a length of approximately 25 m. The maximum area of vegetation removal required is 75 m^2 (25 m x 3 m).
- TPA96 will utilise an existing access track from previously undertaken BH96, until clearing is required for approximately 20 m. The maximum area of vegetation removal required is 60 m^2 (20 m x 3 m).

All of the vegetation to be cleared for access tracks would be within Dry Open Forest (Blackbutt Association).

In summary the total area of vegetation to be removed is approximately 321 m^2, comprising the clearing required at GI pad sites and for access tracks.

Further details of the Proposal are provided in the corresponding Addendum EA (GeoLINK 2012).

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Drawn by: TJP Checked by: MVE Reviewed by: GJM Date: November 2012
Source of base data: Roads and Maritime Services

North

0 150

Additional Geotechnical Investigation Locations

GeoLINK environmental management and design

Ecological Assessment: Additional Geotechnical Investigations at Range Road Interchange: W2G Pacific Highway Upgrade
2081-1015

Illustration 2.1

3 Method

3.1 Overview

The methodology for this ecological survey and assessment has been formulated based on a review of the NSW Department of Environment and Conservation [DEC] (currently the NSW Office of Environment and Heritage [OEH]) *Threatened Species Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft, November 2004* (DEC 2004); and the relevant Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) survey guidelines. The key components of the methodology are as follows:

- desktop review;
- undertake a field survey consisting of:
  - flora species census;
  - plant community mapping;
  - threatened flora searches;
  - opportunistic observations of fauna;
- assess the fauna habitat value;
- assess the ecological impacts of the Proposal; and
- outline mitigation measures to be implemented to reduce these potential impacts.

Specific flora and fauna survey methodology is provided in the following sections.

3.2 Desktop Review

A desktop review was undertaken to determine the flora and fauna species and vegetation communities of conservation significance recorded previously, or potentially occurring in the local area. The results of the desktop review were used to assist with consideration of species to be targeted during field surveys.

The desktop review included:

- conducting a search of the OEH Atlas of NSW Wildlife database for records of threatened species and endangered populations within a 20 x 20 km^2 area of the site;
- reviewing the OEH Coffs Harbour 1:100,000 threatened species map sheet for threatened species and endangered population records within a 10 km radius (i.e. ~314 km^2 area) of the site;
- conducting a search using the Protected Matters Online Search Tool for *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed threatened species, communities or species habitat likely to occur within a 10 km radius (i.e. ~314 km^2 area) of the site;
- reviewing the OEH Critical Habitat register;
- reviewing the Department of Environment, Climate Change and Water (DECCW) (currently OEH) Key Habitat and Corridors mapping;
- reviewing the Department of Planning (DoP) *State Environmental Planning Policy (SEPP) 14 – Coastal Wetland and SEPP 26 – Littoral Rainforest* mapping;
- reviewing *SEPP 44 – Koala Habitat Protection* as it applies to the site; and
- reviewing the *Coffs Harbour City Council Koala Plan of Management* (CHCC KPoM - Lunney *et al.,* 1999a, 1999b), including Koala habitat mapping available from the CHCC website.

3.3 Field Surveys

Flora and fauna surveys of the study area were undertaken by GeoLINK Ecologist (Tom Pollard) on 29, 30 and 31 August 2012. The field survey approach was undertaken in general accordance with the *Threatened Species Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft November 2004* (DEC 2004) and relevant SEWPaC guidelines.

3.4 Habitat Assessment

As it is recognised that not all species can be detected during a single seasonal period or survey event, habitat assessments were undertaken to identify any potential habitats (especially for threatened species) present within the study area.

3.4.1 Habitat Assessment Plots

In order to assess the habitat present, a grid of 50 x 50 m habitat assessment plots were established across AA1 and AA2 (refer to **Illustration 3.1**). A waypoint was recorded at the centre of each plot to enable location with a Global Positioning System. Each plot was assessed for the following features:

- plant community type;
- dominant plant species;
- vegetation structure;
- ground cover;
- level of disturbance;
- evidence of fire regime;
- presence of scats, tracks, scratches and pock marks, etc.;
- tree hollows and spouts;
- rocky outcrops or caves; and
- water features.

3.5 Flora Surveys

Flora surveys were conducted in order to provide a list of species present within the study area, identify vegetation communities and determine the occurrence of threatened species. A total survey effort of six person hours was dedicated to flora surveys. A list of all flora species, including threatened species, noted during field surveys was produced (refer to **Appendix A**).

3.5.1 Random Meander Surveys

Between habitat assessment plots, the 'random meander' method was employed to record general flora species and also target potential threatened flora species. The floristic composition and structure of vegetation communities within the site were recorded. The identification of flora species were recorded in the field and those that required further clarification were collected and keyed-out using relevant literature.

3.6 Fauna Surveys

3.6.1 Opportunistic Fauna Sightings

The primary assessment of the potential for threatened fauna species of the site consisted of a fauna habitat and usage assessment. No specific targeted fauna surveys were conducted during this assessment. However, opportunistic sightings of all fauna species, including threatened species, were noted during field surveys and a fauna list for the site produced (refer to **Appendix B**).

3.6.2 Threatened Fauna Habitat Assessment

The occurrence of specific habitat features appropriate for threatened species known or potentially occurring at the site was evaluated as part of the habitat assessment (refer to **Section 3.4**).

Features known to be utilised by threatened species were assessed such as hollow-bearing trees, nest trees, watercourses, specific food trees, wetland habitats, leaf litter and caves or other structures suitable for roosting or denning purposes.

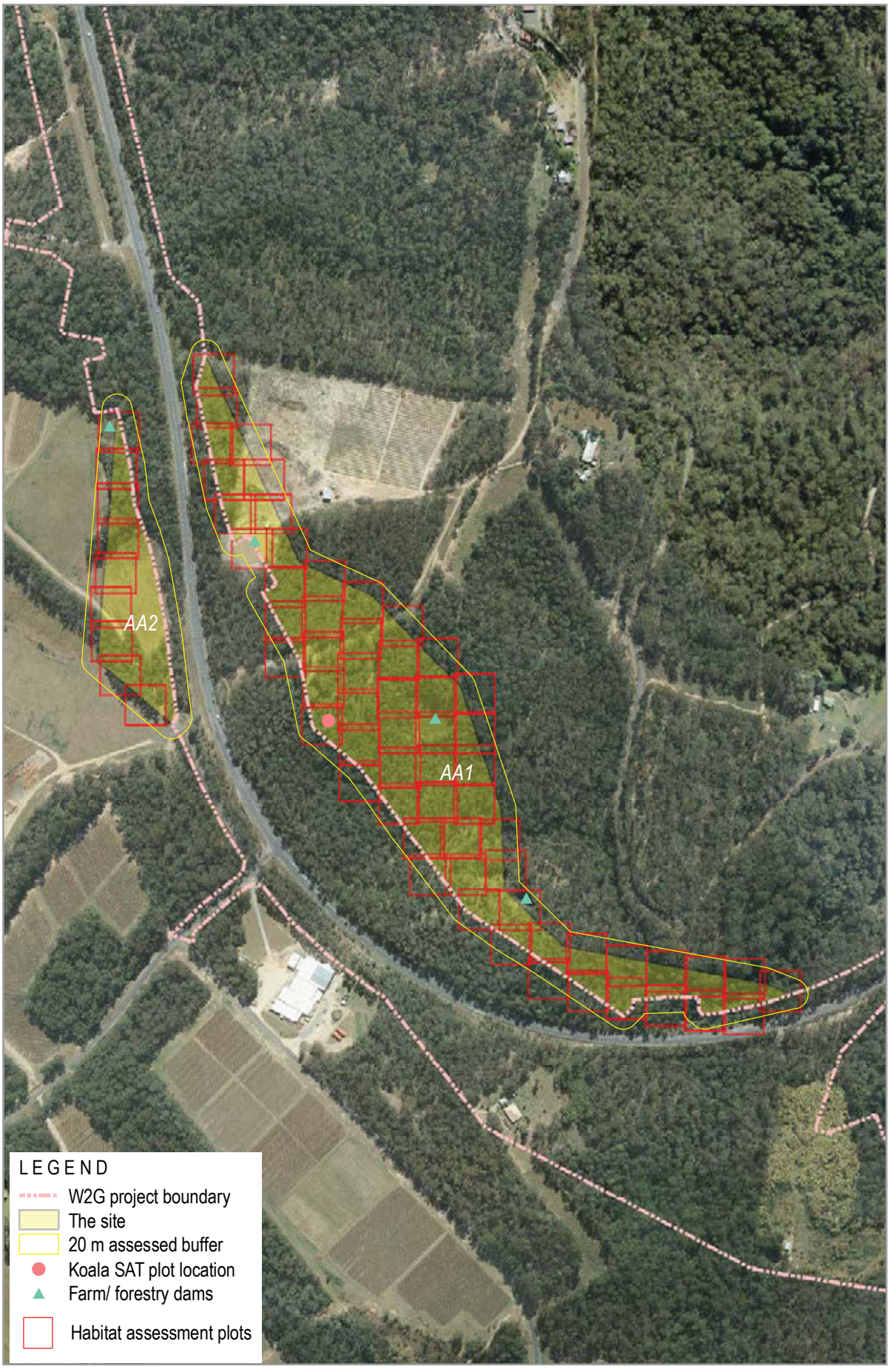
3.6.3 Threatened Fauna Habitat Usage Survey

A threatened fauna habitat usage survey was conducted as part of the random meander traverses between habitat assessment plots (refer to **Section 3.5.1**). This involved investigating evidence of habitat utilisation by threatened fauna species such as:

- koala scats around the base of suitable feed trees (scat searches were carried out at any of these feed trees that were encountered in the habitat assessment plots or opportunistically when a tree was encountered along random meander traverses between these plots);
- latrine sites for Spotted-tailed Quoll;
- regurgitation pellets and nest/roost sites for forest owls;
- inspection for 'whitewash' and pellets under any potential owl roost sites;
- worn glider runs in trees and incisions on tree trunks (sap trees);
- chewed cones beneath Allocasuarina/Casuarina trees indicating Glossy Black Cockatoo feeding; and
- visual inspection of the entrance to hollows and bird nests for evidence of bird activity.

Information shown is for illustrative purposes only

Drawn by: TJP Checked by: MVE Reviewed by: GJM Date: December 2012
Source of base data: Roads and Maritime Services



North

0 140

Habitat Assesment Plots and Fauna Survey Locations

GeoLINK environmental management and design

Ecological Assessment: Additional Geotechnical Investigations at Range Road Interchange: W2G Pacific Highway Upgrade
2081-1017

Illustration 3.1

3.7 Survey Limitations

While some species may utilise the site, they may have avoided detection due to their rarity, cryptic nature or the sporadic utilisation of the site.

Notwithstanding, given the relatively small size of the site and the disturbed nature of the road side habitats, the survey effort was considered adequate in determining the habitat values present. In addition, the precautionary approach has been applied in determining those threatened species not detected during the survey, but considered to have potential to occur at the site based on the habitat present.

3.8 Weather

Weather conditions during the survey period (29-31 August 2012) were generally warm and sunny. At the time of the survey the area was experiencing an extended dry period of approximately four weeks with very little rainfall.

4

Results

4.1 Desktop Review

4.1.1 Threatened Species Database Searches

OEH Atlas of NSW Wildlife search

Results of the OEH Atlas of NSW Wildlife searches for threatened flora and fauna species and endangered populations recorded within a 20 x 20 km^2 area around the site are provided in **Appendix C**. In total, the database identified records of 61 threatened species (17 flora and 44 fauna species) listed under the *Threatened Species Conservation Act 1995* (TSC Act) in the search area. This included a record of one threatened fauna population. No Endangered Ecological Communities (EECs) were recorded in the search area. A potential occurrence assessment of the non-marine species within the study area is provided in **Appendix D** (marine species were excluded due to the study area not extending into any marine environments).

OEH Coffs Harbour 1:100,000 Threatened Species Map Sheet

A search of the OEH Coffs Harbour 1:100,000 threatened species map sheet for threatened flora and fauna identified records of 30 threatened species (excluding marine species) (6 flora and 26 fauna species) listed under the TSC Act in the search area (10 km radius of the site).

EPBC Protected Matters Report

The Protected Matters Search Tool identified 37 non-marine threatened species (16 flora and 21 fauna species) listed under the EPBC Act as species that are *likely* to occur or *may* occur within the search area or have *habitat* that is *likely* to occur or *may* occur within the search area (i.e. 10 km radius of the site). The database search results are provided in **Appendix C**. None of the subject species were assessed for significant impact under the Administrative Guidelines for EPBC Act listed species. For the Grey-headed Flying-fox, Koala, Little Lorikeet, Large-eared Pied Bat and Spotted-tailed Quoll, each of which are dually listed under the EPBC Act as Vulnerable; in accordance with the objectives of the bilateral agreement between the Commonwealth of Australia and State of NSW (SEWPaC undated), the conclusion of the Section 5A Assessment indicates that the Proposal is not likely to have a significant impact on this species. Therefore referral to the Commonwealth Minister is not required.

Migratory Species

A total of 40 migratory species listed within the EPBC Act were identified for the search area by the Protected Matters Search Tool (refer to **Appendix C**). Eight are listed as migratory terrestrial species, five are listed as migratory wetland species and the remainder are listed as marine species.

Threatened Ecological Communities

Two threatened ecological communities listed under the EPBC Act were identified within the search area by the Protected Matters Search Tool. These communities are *Littoral Rainforest and Coastal Vine Thickets of Eastern Australia* and *Lowland Rainforest of Subtropical Australia*.

Critical Habitat

A search of the Register of Critical Habitat indicated that the site does not contain or adjoin any areas of listed Critical Habitat.

Fisheries Management Act Listed Species and Protected Habitats

No threatened species or habitat for threatened species listed under the *Fisheries Management Act 1994* (FM Act) occurs on the site or would be affected by the Proposal.

Key Habitats and Corridors in North Eastern NSW
OEH mapping indicates that a small section within the north portion of the site falls within a sub-regional wildlife corridor (Lazyman Creek). This corridor links the New-Sherwood and Newfoundland State Forest regional corridors to the west and east respectively (refer to **Illustration 4.1**). **Illustration 4.1** also shows the nearest areas mapped by DECCW as key habitats occur to the north-east of the site in Newfoundland State Forest.

SEPP 44 - Koala Habitat Protection/ CHCC Koala Plan of Management
Coffs Harbour City Council (CHCC) Local Government Area (LGA) is not subject to SEPP 44, as indicated in Schedule 1 of the legislation.

The CHCC Koala Plan of Management (CHCC KPoM - Lunney *et al.,* 1999a, 1999b) is a comprehensive KPoM prepared under SEPP 44 - Koala Habitat Protection covering the whole of CHCC LGA, excluding land within the former Pristine Waters Council LGA (in which the site occurs). Consequently the site is not covered within this plan.

SEPP 14 Coastal Wetland and SEPP 26 Littoral Rainforest
No areas at the site or in close proximity are mapped as State Environmental Planning Policy 14 (SEPP 14) Coastal Wetland or SEPP 26 Littoral Rainforest.

Native Vegetation Act
Vegetation clearing works on the site may be subject to approval under the Native Vegetation Act 2003.

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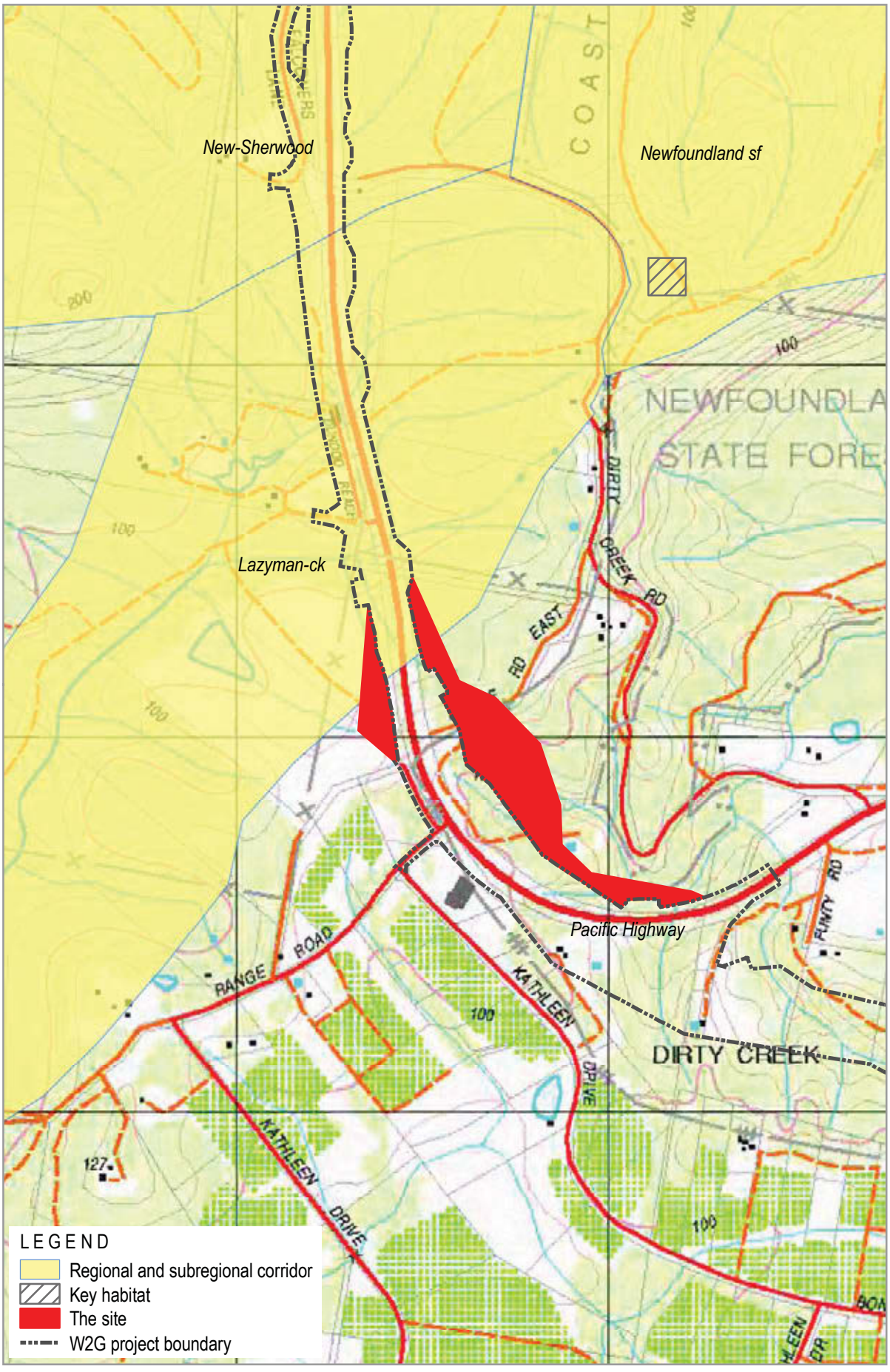
Drawn by: TJP Checked by: MVE Reviewed by: GJM Date: December 2012
Source of base data: Roads and Maritime Services



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North

Key Habitats and Corridors

4.2 Habitat Assessment

The habitat assessment indicated that a variety of habitat resources are present at the site, including hollow-bearing trees, water features and a variety of native groundcover types. The location of hollow-bearing trees, water features and rock overhangs is shown in **Illustration 4.2**. These features are likely to provide habitat for a range of common fauna species. The potential for these and other habitat features to provide habitat for threatened fauna species is discussed in subsequent sections.

The assessment also indicated that the disturbance level at the site is generally moderate, reflecting a history of past selective logging. Evidence of burning on bark and dead wood, as well as the nature of the understorey would seem to indicate that fires have been a regular feature of these forests.

The data collected from habitat assessment plots are provided in **Appendix G**.

Information shown is for illustrative purposes only

Drawn by: TJP Checked by: MVE Reviewed by: GJM Date: November 2012
Source of base data: Roads and Maritime Services

North

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Significant Fauna Habitat Features

GeoLINK environmental management and design

Ecological Assessment: Additional Geotechnical Investigations at Range Road Interchange: W2G Pacific Highway Upgrade
2081-1018

Illustration 4.2

4.3 Flora Surveys

4.3.1 Plant Communities

Plant associations occurring along the proposed highway alignment were mapped and reported in the Woolgoolga to Wells Crossing Preferred Route Report (RTA 2006). In addition to this, the W2G Geotechnical Investigations EA (RMS 2012) listed communities occurring along the proposed alignment. The current investigation at Range Road identified five communities within the study area. These are shown in **Table 4.1** along with an equivalency with RTA (2006) and RMS (2012).

Table 4.1 Plant Communities and Equivalent Communities from Previous Reports

Plant Community (GeoLINK 2012)	*Mapped Vegetation Association (RTA 2006)*	*Vegetation Communities (RMS 2012)*
Dry Open Forest (Blackbutt association)	Dry Ridgetop Forest – Rich Soil	Blackbutt/ Tallowwood ridgetop and upper slopes forest
	Dry Ridgetop Forest - Sandstone	Blackbutt/ Tallowwood ridgetop and upper slopes forest
Moist Open Forest (Blackbutt association)	Moist Gully Forest and Lower Slopes	Blackbutt/ Tallowwood lower slopes and gully forest
Riparian Rainforest (*Lowland Rainforest on Floodplain in the NSW North Coast Bioregion EEC* equivalent to the EPBC listed *Lowland Rainforest of Subtropical Australia* community)	Rainforest	No equivalent
Modified community – regenerating Dry Open Forest	No equivalent	No equivalent
Modified community – Mixed Exotic/ Native Pasture	Totally Cleared/ Open Pasture/ Weedy Fallow	No equivalent

The rainforest association mapped in RTA (2006) is equivalent to the EEC *Lowland Rainforest on Floodplain in the NSW North Coast Bioregion* (subsequently referred to as Lowland Rainforest EEC). The three EECs identified as occurring along the proposed highway corridor within RMS (2012) did not include Lowland Rainforest EEC.

Plant communities occurring within the study area are shown in **Illustration 4.3** and descriptions provided in the following sections. A list of flora species recorded during the survey is also provided in **Appendix A**.

4.3.1.1 Dry Open Forest (Blackbutt association)

Dry Open Forest is the dominant community occurring within the study area. This community occupies approximately 15.9 ha of a total assessed area of 19.8 ha (including the 20 m assessed buffer).

Dominant overstorey species are Coastal Blackbutt (*Eucalyptus pilularis*), Grafton Stringybark (*E. tindaliae*) and White Mahogany (*E. acmenoides*), with a number of other species such as Tallowwood (*E. microcorys*), Grey Gum (*E. propinqua*) and Grey Ironbark (*E. siderophloia*) occurring at lower densities. The midstorey is generally open, but when present is dominated by Forest Oak (*Allocasuarina torulosa*), Wild May (*Leptospermum polygalifolium*) and a number of Acacia species including White Sally Wattle (*Acacia floribunda*), Curracabah (*A. concurrens*) and Fringed Wattle (*A. fimbriata*). The understorey is commonly

dominated by Hairy Bush Pea (*Pultenaea villosa*). Other understorey shrubs include Dogwood (*Jacksonia scoparia*), Prickly Moses (*Acacia ulicifolia*), Lance Beard Heath (*Leucopogon lanceolatus*), and Forest Grass Tree (*Xanthorrhoea latifolia*). A number of grasses and lilies are also present including Spiny-headed Mat-rush (*Lomandra longifolia*), Wattle Mat-rush (*L. filiformis*), Blue Flax-lily (*Dianella caerulea*), Kangaroo Grass (*Themeda triandra*), Wiry Panic (*Entolasia stricta*) and Blady Grass (*Imperata cylindrica*).

This community is shown in **Plate 4.1**.

Plate 4.1 Dry Open Forest

Weed species are not a prominent feature of this community. In moister areas there are small infestations of Lantana (*Lantana camara*) and Billy Goat Weed (*Ageratum houstonianum*).

Condition/ Disturbance
This community is moderately disturbed due to historic grazing, logging and a relatively frequent burning regime.

Conservation Status
This community does not have any significant conservation value.

4.3.1.2 Moist Open Forest (Blackbutt association)

Moist Open Forest occurs on moist lower slopes surrounding, but not including, the riparian zone of Dirty Creek in the south-eastern section of the study area (refer to **Illustration 4.3** and **Plate 4.2**). This community occupies approximately 1.3 ha of a total assessed area of 19.8 ha (including the 20 m assessed buffer).

The dominant overstorey species in this community is Coastal Blackbutt, with lesser occurrences of Tallowwood and Turpentine (*Syncarpia glomulifera*). The midstorey is generally well developed and includes species such as Tree Heath (*Trochocarpa laurina*), Cheese Tree (*Glochidion ferdinandi*), Green Wattle (*Acacia irrorata*), Fringed Wattle, Willow Bottlebrush (*Callistemon salignus*) and occasional Bangalow Palm (*Archontophoenix cunninghamiana*). The understorey is commonly dominated by species such as Soft Bracken (*Calochlaena dubia*), Blue Flax-lily and Blady Grass.

Plate 4.2 Moist Open Forest

Condition/ Disturbance
This community is moderately disturbed due to historic grazing, logging and a relatively frequent burning regime. Weeds are generally not prominent, however, Lantana occurs sporadically.

Conservation Status
This community does not have any significant conservation value.

4.3.1.3 Lowland Rainforest EEC

Lowland Rainforest EEC occupies a small section of the lower areas of Dirty Creek in the south-east of the study area (**Illustration 4.3**). This community occupies approximately 0.5 ha of a total assessed area of 19.8 ha (including the 20 m assessed buffer). This community has no distinct boundary with the adjacent Moist Open Forest, with many of the constituent non-eucalypt species extending across both communities. This community represents a depauperate form of Lowland Rainforest EEC, occupying a narrow riparian zone, with a limited plant species diversity and broken canopy structure (this may reflect previous disturbance events including past logging activities).

The dominant canopy species in this community consist of a mix of Weeping Lilly Pilly (*Waterhousea floribunda*), Guoia (*Guoia semiglauca*), Scentless Rosewood (*Synoum glandulosum*), Soft Corkwood (*Caldcluvia paniculosa*), Creek Sandpaper Fig (*Ficus coronata*) and Bangalow Palm. Occasional emergent sclerophyllous species are also present (representing <5% f the total canopy cover), including Blackbutt, Turpentine, White Mahogany and Swamp Box (*Lophosestemon suaveolens*). Understorey shrubs, ferns and lilies include Bolwarra (*Eupomatia laurina*), Narrow-leaved Palm Lily (*Cordyline stricta*), Native Ginger (*Alpinia caerulea*), Rough Tree-fern (*Cyathea australis*), Soft Bracken and Spiny-headed Mat-rush. Vines are common in this community and form dense thickets in open areas. Species include Austral Sarsaparilla (*Smilax australis*), Prickly Supplejack (*Ripogonum discolor*) and Whip Vine (*Flagellaria indica*).

Condition/Disturbance
This community is moderately disturbed due to historic logging and proximity to highway construction activities. Although evidence of burning is apparent on some dead wood and lower bark of trees, this community is likely to have less frequent and less intense fires compared with the adjacent Dry Open Forest and Moist Open Forest communities due to the location of this community in a protected, relatively moist gully. Although the overall weed burden is low, patches of Lantana (*Lantana camara*) occur in small open, disturbed gaps and on the periphery of this community.

Conservation Status

This community is consistent with the TSC Act listed EEC, *Lowland Rainforest on Floodplain in the NSW North Coast Bioregion* (Lowland Rainforest EEC) (NSW Scientific Committee 1999) and equivalent to the EPBC Act listed TEC *Lowland Rainforest of Subtropical Australia* Threatened Species Scientific Committee (TSSC 2011).

Plate 4.3 Lowland Rainforest EEC (in background)

Plate 4.4 Interior of Lowland Rainforest EEC

4.3.1.4 Modified Community – regenerating Dry Open Forest

This community has established following relatively recent clearing of Dry Open Forest (Blackbutt association) on the east side of the existing highway (**Illustration 4.3**). This community is not developed to the point that a eucalypt overstorey has recovered. However, many of the understorey species from Dry Open Forest are present. This community occupies approximately 0.4 ha of a total assessed area of 19.8 ha (including the 20 m assessed buffer).

As previously mentioned, this community lacks the canopy eucalypts such as Coastal Blackbutt that are typical of the adjacent Dry Open Forest. Understorey species are consistent with those listed for Dry Open Forest (refer to **Section 4.3.1.1**), with Hairy Bush-pea particularly prominent (**Plate 4.5**).

Condition/ Disturbance

This community is highly disturbed and reflects areas once occupied by Dry Open Forest that have been cleared and then left fallow to regenerate. Given time and no further disturbance this area would revert to Dry Open Forest.

Conservation Status

This community does not have any particular conservation significance.

Plate 4.5 Modified Community – regenerating Dry Open Forest

4.3.1.5 Modified Community – Mixed Native/ Exotic Pasture

This modified community occupies approximately 1.7 ha of a total assessed area of 19.8 ha (including the 20 m assessed buffer) and occurs north of Range Road adjacent to operating orchards (**Illustration 4.3**). The presence of fallow paddocks with mounded rows indicates a historic use as orchards and a history of significant disturbance.

This community includes a mix of common native species and weed species. Identification to species level was challenging due to recent slashing removing the majority of the identifiable features. Positively identified species included the natives Spiny-headed Mat Rush, Blady Grass and Kangaroo Grass and the exotic weed Whiskey Grass (*Andropogon virginicus*).

This community is shown in **Plate 4.6**.

Condition/ Disturbance

This community is highly disturbed and reflects areas once occupied by Dry Open Forest that have been cleared and planted to orchards. Weedy pasture grasses are likely to be common in these areas, including Whiskey Grass.

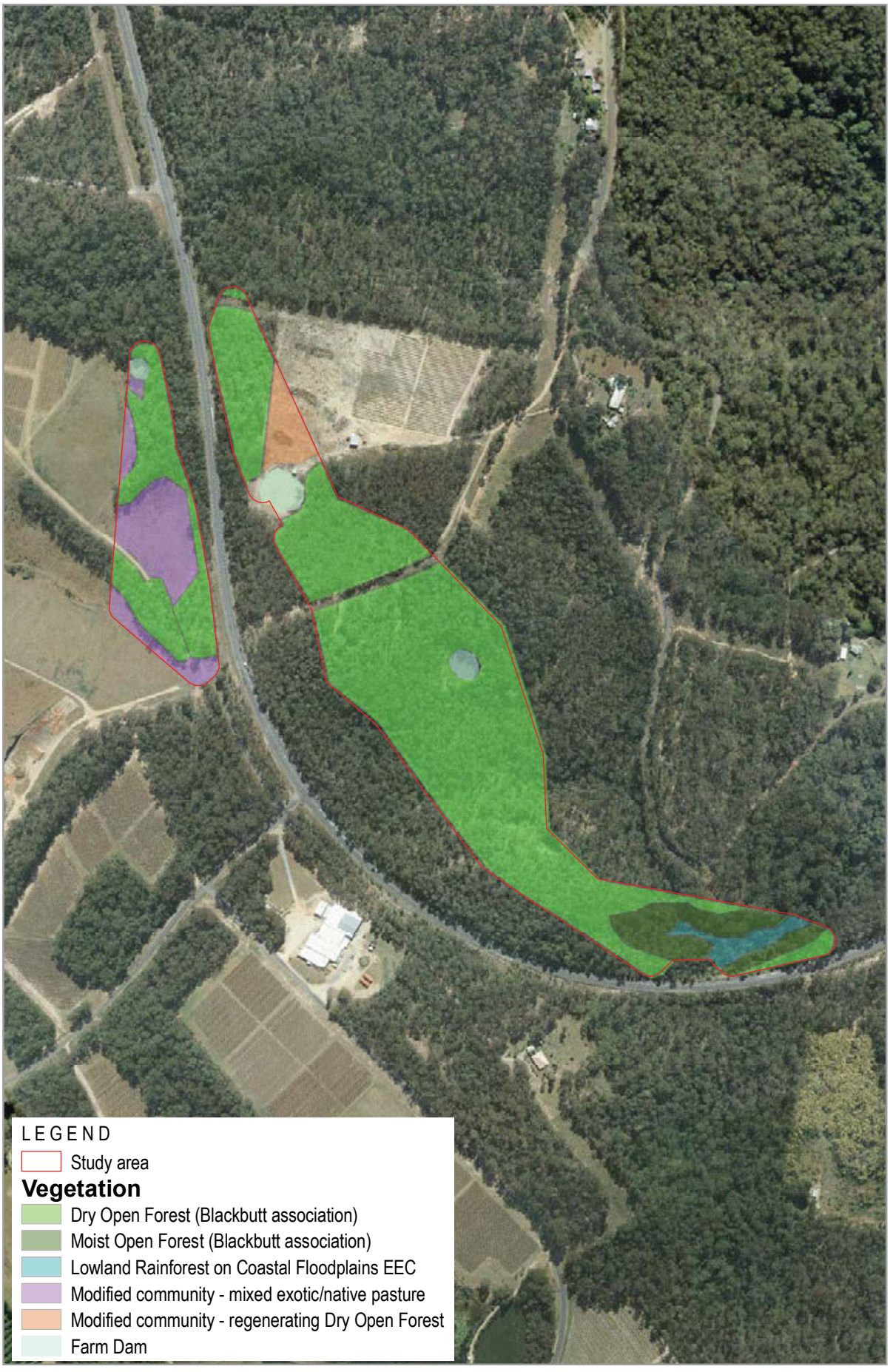
Conservation Status

This community does not have any particular conservation significance.

Plate 4.6 Mixed Native/ Exotic Pasture

Information shown is for illustrative purposes only

Drawn by: TJP Checked by: MVE Reviewed by: GJM Date: December 2012
Source of base data: Roads and Maritime Services



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North

Plant Communities

GeoLINK environmental management and design

Ecological Assessment: Additional Geotechnical Investigations at Range Road Interchange: W2G Pacific Highway Upgrade
2081-1020

Illustration 4.3

4.3.2 Threatened Flora Species

No threatened flora species listed within the TSC Act of EPBC Act were detected within the study area during the field investigations. No ROTAP species were recorded during the field investigations.

4.3.3 Endangered Ecological Communities

As previously discussed the Rainforest community occurring along Dirty Creek constitutes the TSC Act listed EEC of *Lowland Rainforest on Floodplain in the NSW North Coast Bioregion* (Lowland Rainforest EEC) (NSW Scientific Committee 1999), and is equivalent to the EPBC Act Listed TEC *Lowland Rainforest of Subtropical Australia*.

No other EECs listed under the TSC Act or EPBC Act were recorded within the study area.

4.3.4 Noxious Weeds

Three weed species listed as noxious weeds under the *Noxious Weeds Act 1993* (NW Act) within the Coffs Harbour City Council LGA were recorded at the site. These species are:

- Groundsel Bush (*Baccharis halimifolia*);
- Lantana (*Lantana camara*); and
- Crofton Weed (*Ageratina adenophora*).

Lantana and Crofton Weed are N4 listed species. The control requirement for N4 species is that 'the growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority'.

Lantana was located within wetter parts of the site, primarily near the small dam in AA1, and near the fringe of the Lowland Rainforest EEC in AA2. Density varied from low to medium. Crofton weed was also located here and near the small farm dam in AA1 and density of this species was generally low.

Groundsel Bush is a N3 listed species. The control requirement for N3 species is that "the plant must be fully and continuously suppressed and destroyed".

Groundsel Bush was located near the small farm dam in AA1. The density of this species was low.

4.4 Fauna Surveys

4.4.1 Opportunistic Fauna Sightings

A variety of common bird, amphibian and mammal species were observed during the survey. A list of these species is provided in **Appendix B**.

4.4.2 Threatened Fauna Habitat Assessment

The study area was found to contain a variety of fauna habitat resources as discussed below:

- Flowering vegetation, providing a nectar food resource for nectivorous species such as birds and arboreal mammals. The nectar also attracts pollinating insects which in turn provide food for insectivores including microchiropteran bats.
- Plant species that produce a fleshy drupe or berry (fruit) such as Sandpaper Fig, Bangalow Palm and Narrow-leaved Palm Lily which provide suitable foraging resources for frugivorous birds. The occurrence of these resources however is not substantial enough to provide any significant habitat for threatened frugivorous birds (e.g. Wompoo Fruit Dove *Ptilinopus magnificus*). No threatened frugivorous pigeons were recorded during the survey.
- Koala feed trees were encountered at a low density across the site. These trees consisted of Tallowwood, Grey Gum and Scribbly Gum. Scat searches were conducted around the base of these

trees, resulting in a positive result around a single Tallowwood tree. A Spot Assessment Technique (SAT) plot (Phillips & Callighan 1995) was established at this locality (refer to **Illustration 3.1**). Results of the SAT indicated that the Koala activity level in this area was 7% (scats found at 2 trees out of a total of 30). This result indicates low levels of Koalas usage, which is typically associated with transient activity (Phillips & Callighan 1995). No Koalas were observed during the survey.

- Groundcover, providing shelter and foraging resources for ground-dwelling species and small birds. This groundcover varied, with some areas dominated by grasses and lilies and other areas with a thick low shrub layer.
- The study area represents potential foraging habitat for birds of prey such as raptors and owls, as part of an extensive area of forested habitat within Newfoundland State Forest locally of similar habitat value.
- Sandstone rock overhangs providing potential roosting sites for microchiropteran bats. These rock overhangs were located midway up the range as a small sandstone cliff (refer to **Plate 4.7**), and also along steep drainage lines where erosion has exposed the sandstone bedrock. No roosting microchiropteran bats were observed at any of these rock overhangs.
- Eighteen hollow-bearing trees were present, providing potential habitat for hollow-dependent birds, arboreal mammals and reptiles (refer to **Plate 4.8** and **Illustration 4.2**).
- A number of farm and forestry dams, which (to varying degrees) have intact surrounding wetland vegetation that can provide breeding and foraging habitat for amphibians, reptiles and waterbirds (refer to **Plate 4.9**).
- Ephemeral drainage lines with pooled water in the dry season provide drinking water for mammals and habitat for a number of locally occurring common frog species (refer to **Plate 4.10**). This may also provide potential habitat for the threatened species Green-thighed Frog (*Litoria brevipalmata*).

Although the site was found to contain a variety of fauna habitat resources, the site is unlikely to provide habitat critical to the long-term survival of any local threatened fauna populations as:

- habitat features present are mostly of low quality;
- the study areas has been subject to a moderate disturbance history (logged state forest with evidence of a relatively frequent fire regime); and
- the site generally lacks key habitat features that would be required to support resident or breeding individuals of most locally occurring threatened species.

Plate 4.7 Rock overhang providing a potential bat roost

Plate 4.8 Hollow limb of Blackbutt tree

Plate 4.9 Small farm/forestry dam

Plate 4.10 Small pool in ephemeral drainage line

4.4.3 Threatened Fauna Habitat Usage Survey

Eighteen hollow-bearing trees that could potentially provide habitat for threatened species were located at the site (**Illustration 4.2**). The majority of these trees were dead stags, except for one Coastal Blackbutt and one Swamp Box. Hollows varied in diameter from small openings of 0-5 cm to large >20 cm piped trunks. The location of these hollow-bearing trees is shown in **Table 4.2**. No particular evidence of usage around these hollow-bearing trees was noted, such as direct observation of threatened fauna entry/exit, presence of owl regurgitation pellets, worn glider runs or glider feed incisions.

No chewed cones were noted beneath Allocasuarina / Casuarina trees that would indicate feeding usage by Glossy Black Cockatoos. Also, no latrine sites for Spotted-tailed Quoll, or whitewash from roosting owls were detected during the survey.

Features known to be utilised by threatened species were assessed such as hollow-bearing trees, nest trees, watercourses, specific food trees, wetland habitats, leaf litter and caves or other structures suitable for roosting or denning purposes.

Table 4.2 Hollow-bearing Tree Location and Details

Hollow-bearing Tree ID	*Tree Species/ Type*	*Location (easting, northing)*	*Tree and Hollow Dimensions (cm)*
TP-HT01	Swamp Box (*Lophostemon suaveolens*)	514199, 6682586	Tree DBH – 80 Potential hollows - 0-5, 5-10 and 10-20
TP-HT02	Stag	513748, 6682969	Stag DBH - 80 Potential hollow - 5-10
TP-HT03	Stag	513721, 6682830	Stag DBH - 80 Actual hollows - 0-5 and 5-10
TP-HT04	Stag	513722, 6682828	Stag DBH - 60 Potential hollow – 0-5
TP-HT05	Stag	513759, 6682839	Stag DBH - 50 Potential hollows - 0-5 and 5-10
TP-HT06	Coastal Blackbutt (*Eucalyptus pilularis*)	514017, 6682591	Tree DBH - 70 Actual hollow - 5-10
TP-HT07	Stag	514024 , 6682549	Stag DBH - 60 Potential hollows - 0-5 and 5-10
TP-HT08	Stag	513917, 6682654	Stag DBH – 120 Actual hollows - 0-5, 5-10 and 10-20
TP-HT09	Stag	513986, 6682630	Stag DBH - 60 Actual hollows - 0-5, 5-10 and 10-20
TP-HT010	Stag	514011, 6682626	Stag DBH - 60 Potential hollows 10-20 and >20
TP-HT011	Stag	513714, 6683017	Stag DBH – 40 Actual hollow - >20 pipe
TP-HT012	Stag	513693, 6683002	Stag DBH - 80 Actual hollow ->20 pipe
TP-HT013	Stag	513622, 6683118	Stag DBH - 50 Potential hollows - 0-5 and 5-10

Hollow-bearing Tree ID	*Tree Species/ Type*	*Location (easting, northing)*	*Tree and Hollow Dimensions (cm)*
TP-HT014	Stag	513584, 6683195	Stag DBH - 50 Potential hollow - 5-10
TP-HT015	Stag	513475, 6683269	Stag DBH - 60 Actual hollow - 0-5
TP-HT016	Stag	513468, 6683290	Stag DBH - 60 Potential hollow - 0-5 and 5-10
TP-HT017	Stag	513469, 6683297	Stag DBH - 60 Actual hollow - 5-10
TP-HT018	Stag	513481, 6683299	Stag DBH - 60 Potential hollow - >20 pipe

Note:

Stag: refers to an unidentifiable dead tree.
Actual hollow: refers to defined tree hollows visible to an on-ground observer.
Potential hollow: refers to tree features such as cavities, notches and dead branches that are likely to support actual hollows, however; they are not visible to an on-ground observer.

4.4.4 Threatened Fauna

No threatened fauna species were detected within the study area. However, a number of threatened fauna species are considered to have potential to occur within the study area (refer to **Appendix D**). These species are discussed in further detail in **Section 5**.

5

Discussion of Potential Impacts

5.1 Vegetation Clearing and Habitat Removal

5.1.1 Vegetation/Habitat Removal

The Proposal would result in the removal of vegetation and habitat from within the site.

As detailed in the Geotechnical Investigations EA (RMS 2012), potential impacts on native vegetation would mainly be associated with localised clearing at the GI sites, as well as the clearing required for the creation of access tracks.

This vegetation clearing would involve complete vegetation removal (including trees and native understorey) and/or limb lopping to provide a clear zone for heavy machinery (e.g. drill rigs and excavators) to operate within the site. The use of vehicles and concentrated foot traffic in the vicinity of the rig would also result in localised disturbance to the vegetated understorey.

Clearing for access tracks would be kept to a minimum as sites would be strategically positioned, where possible, near existing roads and formed tracks. If a GI site is not in proximity to an existing road or access tracks, the GI site would preferentially be located on grassed or fallowed ground. Vegetation clearance would only be undertaken where no other option existed for access to a GI site. Dimensions for access track clearing consist of a maximum width of three metres. Where possible, the existing groundcover would be left undisturbed to minimise erosion (RMS 2012).

GIs within the site consist of 5 test pits and 2 bore holes (**Illustration 2.1**). Vegetation clearing associated with these GIs is estimated to be approximately 321 m^2. This figure accounts for both the cleared area around GI sites as well as clearing required for 3 m wide access tracks.

Table 5.1 shows the areas of vegetation that would require clearing at each GI site in order to establish the pad areas and for access tracks to the GI sites. Approximately 66 m^2 of Dry Open Forest (Blackbutt association) would potentially require clearing at the GI sites and approximately 255 m^2 of Dry Open Forest (Blackbutt association) would potentially require clearing along access tracks. No mapped hollow-bearing trees are within 20 m of any of these proposed GI sites.

Table 5.1 Approximate areas of vegetation to be cleared

GI Type and Code/Access tracks	*Plant Community*	*Clearing Area (m^2)*
TPA92, TPA93, TPA94, TPA95, TPA96, BHA228, BHA235	Dry Open Forest (Blackbutt association)	66
Access tracks (for TPA93, TPA94, TPA95 and TPA96)	Dry Open Forest (Blackbutt association)	255
	TOTAL	321

The site does not contain any prominent habitat features or plant species that would not otherwise exist within the adjoining forest system. The vegetation that may be removed would provide foraging habitat for a range of fauna, though the potential for this vegetation be used as significant nesting/roosting sites is limited due to an absence of hollow-bearing trees or other significant habitat features within the clearing areas. No significant habitat for threatened fauna species would be removed within the areas to be cleared.

As mentioned previously, The proposed vegetation clearing is precluded from needing development consent under the *Native Vegetation Act 2003* by virtue of Section 25(g) which states that *any clearing that is, or is part of, an activity carried out by a determining authority within the meaning of Part 5 of the EPA Act if the determining authority has complied with that Part.*

5.1.2 Habitat Fragmentation

The Proposal requires the removal of discrete small areas of vegetation for the purpose of conducting geotechnical investigations. This would not result in additional significant fragmentation of the local landscape. The overall current local movement potential for native fauna throughout the site would remain unchanged upon completion of the Proposal.

None of the GI sites are located within the northern section of the site that lies within the OEH mapped east-west orientated sub-regional wildlife corridor (**Illustration 4.1**). Considering this and the minor nature of the Proposal, the works are not expected to have a negative impact on the function of this corridor.

5.1.3 Edge Effects

GI sites would generally be located adjacent to existing open areas such as roads, access tracks, grassy clearings or areas of fallow land. The Proposal would only incrementally add to the existing edge effects that would be experienced in these areas. Overall, the largely forested environment surrounding these features would limit potential negative edge effects. There is a minor potential that the Proposal would increase weed infestation by way of producing bare ground and introducing weed seeds. However, the environmental safeguards developed to limiting weed/pest transfer would minimise this risk (safeguards 36-37 in RMS 2012). The limited occurrence of weeds within the forest communities at the site, despite a history of logging, suggests the habitat has some resilience to weed invasion, particularly in the Dry Open Forest community which dominates the site.

5.1.4 Death or Injury During Clearing and Construction

During vegetation removal there is a risk of mortality or injury to fauna, particularly:

- ground-dwelling fauna such as common reptiles and frog species; and
- avifauna which roost or nest in trees (if tree removal is required). However, no nest sites were detected during the survey.

Safeguards to protect native fauna (safeguards 33-35 in RMS 2012) would ensure the risks are minimised.

5.2 Indirect Impacts

Potential indirect impacts of the Proposal such as erosion and sedimentation, water quality, noise, etc. are addressed in RMS (2012). Such impacts have the potential to have a minor adversely effect on adjacent habitats, however the safeguards provided would ensure the risks and potential magnitude of these impacts is low.

5.3 Significant Species and Ecological Communities

5.3.1 Endangered Ecological Communities

The rainforest community located in the south-eastern portion of the site constitutes the TSC Act listed EEC, *Lowland Rainforest on Floodplain in the NSW North Coast Bioregion*. This community is equivalent to the EPBC Act listed TEC *Lowland Rainforest of Subtropical Australia*.

No GI sites are located within the mapped boundary of this community. There is a very low risk that the Proposal would result in some indirect impacts to this community from erosion and sedimentation, affected water quality, spread of weeds, etc. However, safeguards provided in RMS (2012) would minimise the risk of

such threats. A Seven-part Test of Significance (Section 5A Assessment) conducted in accordance with Section 5A of the EP&A Act for *Lowland Rainforest EEC* concluded that the local occurrence of this community was unlikely to be significantly affected by the Proposal (refer to **Appendix D**).

No other TSC Act or EPBC Act listed EECs occur within the study area.

5.3.2 Threatened Species

As discussed in **Section 4.1.1**, a total of 61 threatened species (including one threatened fauna population) listed within the TSC Act and 37 non-marine threatened species listed within the EPBC Act, were identified in the database searches as being known or predicted to occur (based on habitats) within the defined search areas. A number of these species, however, are not considered likely to occur based on the habitat requirements of the species and the lack of these features within the site. In addition, no threatened flora species were detected during the field investigations.

Based on the results of the field investigations and habitats present within the subject site, a total of 24 threatened fauna species and five threatened flora species were considered potential occurrences on site (refer to **Appendix D**). These species are:

Fauna:

- Green-thighed Frog;
- Glossy-black Cockatoo;
- Little Lorikeet;
- Varied Sittella;
- Square-tailed Kite;
- Black-chinned Honeyeater;
- Grey-crowned Babbler;
- Barking Owl;
- Powerful Owl;
- Masked Owl;
- Large-eared Pied Bat;
- Hoary Wattled Bat;
- Little Bentwing-bat;
- Eastern Bentwing-bat;
- Eastern Freetail-bat;
- Yellow-bellied Sheathtail-bat
- Greater Broad-nosed Bat
- Yellow-bellied Glider;
- Squirrel Glider;
- Brush-tailed Phascogale;
- Common Planigale;
- Rufous Bettong;
- Eastern Pygmy-possum;
- Koala;
- Grey-headed Flying Fox; and
- Spotted-tailed Quoll.

Flora:

- Orara Boronia;

- Square-fruited Ironbark;
- Hairy Melichrus;
- Rusty Plum; and
- Moonee Quassia.

The fauna species are listed threatened species under the TSC Act and were the 'subject species' of a Section 5A Assessment in accordance with Section 5A of the EP&A Act. As the flora survey for the study was conducted to a level of detail that is sufficient to identify the presence of threatened species at the site, it was considered that a Section 5A Assessment was not necessary for the flora species.

For the Grey-headed Flying-fox, Koala, Little Lorikeet, Large-eared Pied Bat and Spotted-tailed Quoll, each of which are dually listed under the EPBC Act as Vulnerable; in accordance with the objectives of the bilateral agreement between the Commonwealth of Australia and State of NSW (SEWPaC undated), the conclusion of the Section 5A Assessment indicates that the Proposal is not likely to have a significant impact on these species. Therefore referral to the Commonwealth Minister is not required and significance assessment was undertaken for these species under the EPBC Act.

5.3.3 Migratory Species

Results of the Protected Matters Search Tool indicated that a total of 40 migratory terrestrial and wetland bird species listed in the EPBC Act may occur in the study area. None of these were detected within the study area during the survey, however several of these species area considered potential occurrences within the study area such as the Rufous Fantail (*Rhipidura rufifrons*), Cattle Egret (*Bubulcus ibis*).

Due to the expected minor scale of the impacts, the Proposal is unlikely to result in a significant impact to any EPBC Act listed migratory species. However, the potential impact of the Proposal on migratory species under the Administrative Guidelines for significant impact was conducted and is given in **Appendix E**.

5.3.4 Fisheries Management Act Listed Species and Protected Habitats

No threatened species or habitat listed under the FM Act would be impacted by the Proposal.

6

Mitigation Measures

6.1 Safeguards

Detailed mitigation measures for the Proposal have been developed and are contained within the W2G Geotechnical Investigations EA (RMS 2012). These mitigation measures are considered to be adequate to ensure that negative impacts associated within the Proposal are minimised. No additional mitigation measures are considered to be necessary for the Proposal.

7

Summary and Conclusions

7.1 Conclusion

RMS has proposed an alternative site and layout for the Range Road Interchange at Chainage 9,800 m of the Woolgoolga to Glenugie (W2G) Pacific Highway Upgrade. An additional 7 GI sites are required to adequately inform the detailed design stage of the alternate interchange option.

To undertake the investigations, some removal of native vegetation would be necessary. The total area of native vegetation removal is relatively small and totals approximately 321 m^2 of Dry Open Forest (Blackbutt association). Areas to be cleared contain a number of fauna habitat resources which would be utilised by locally occurring fauna species, potentially including a number of threatened species.

OEH has mapped a sub-regional wildlife corridor which crosses the far northern section of the site. The Proposal is however not expected to result in habitat fragmentation or isolation locally, nor significantly affect the value of the subject regional corridor.

A small area of the EEC *Lowland Rainforest on Floodplain in the NSW North Coast Bioregion* (equivalent to the EPBC Act listed TEC *Lowland Rainforest of Subtropical Australia*) occurs in the south-eastern corner of the site. However, no GI sites are located in this area and no direct impacts would occur to this area. Mitigation measures developed for the Proposal (RMS 2012) would limit any indirect impacts on this community.

Based on the results of the field investigations, local records and the habitats present, the site provides potential habitat for 16 threatened fauna species and five threatened flora species (referred to as the 'subject species'). Seven-part Tests of Significance assessments, in accordance with Section 5A of the EP&A Act, have been prepared for those fauna species listed within the TSC Act considered as potentially occurring within the study area. The flora survey effort was adequate to identify the presence of threatened flora species at the site, and therefore no significance assessments were undertaken for potentially occurring threatened flora species.

The results of the assessment of significance indicated that the Proposal is unlikely to result in a significant impact on any TSC Act listed threatened species, populations or endangered communities and therefore preparation of a Species Impact Statement is not required for the Proposal. The Proposal is also unlikely to result in a significant impact on any EPBC listed threatened species, populations or threatened communities and therefore referral to the Commonwealth Minister required for any species listed under the EPBC Act.

Detailed mitigation measures for the Proposal contained within RMS (2012) are considered to be adequate to ensure that negative impacts on threatened species and community within the Proposal are minimised.

Project Team

The Project team members included:

Simon Williams
Project Manager

Tom Pollard
Ecologist

Veronica Silver
Senior Ecologist

David Andrighetto
Ecologist

References

Department of Environment and Conservation [DEC] (2004). *Threatened Biodiversity Survey and Assessment: guidelines for developments and activities (working draft)*. New South Wales Department of Environment and Conservation, Hurstville, NSW.

GeoLINK (2012). Addendum Environmental Assessment. Additional Geotechnical investigations at Range Road Interchange. Woolgoolga to Ballina Pacific Highway Upgrade.

Lunney, D., Moon, C., Matthews, A., and Turbill, J. (1999a). Coffs Harbour City Koala Plan of Management. Part A The Plan. NSW National Parks and Wildlife Service, Hurstville.

Lunney, D., Moon, C., Matthews, A., and Turbill, J. (1999b). Coffs Harbour City Koala Plan of Management. Part B Coffs Harbour Koala Study. NSW National Parks and Wildlife Service, Hurstville.

NSW Scientific Committee (1999). Final Determination to list the Lowland Rainforest on Floodplain in the New South Wales North Coast bioregion as an Endangered Ecological Community on Part 3 of Schedule 1 of the Act.

Phillips, S., and Callaghan, J. (1995). The Spot Assessment Technique for determining the significance of habitat utilisation by Koalas. Unreviewed addendum to: Proceedings of a conference on the status of the Koala in 1995. Australian Koala Foundation: Brisbane.

RMS (2012). Woolgoolga to Ballina Pacific Highway Upgrade - environmental assessment to inform detailed geotechnical investigations between Woolgoolga and Glenugie.

RTA (2006). Pacific Highway Upgrade – Woolgoolga to Wells Crossing Preferred Route Report.
Threatened Species Scientific Committee (TSSC) (2011). Approved Conservation Advice for the Lowland Rainforest of Subtropical Australia.

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Appendix A

Flora Species Recorded at the Site

Table A.1 Flora Species Recorded On Site

Family	*Species*	*Common Name*
Asteliaceae	*Cordyline stricta*	Narrow-leaved Palm Lily
Arecaceae	*Archontophoenix cunninghamiana*	Bangalow Palm
Asteraceae	*Ageratina adenophora**	Crofton Weed
	Baccharis halamifolia	Groundsel Bush
Casuarinaceae	*Allocasuarina torulosa*	Forest Oak
Cunoniaceae	*Caldcluvia paniculosa*	Soft Corkwood
Cyperaceae	*Eleocharis* sp.	Spike-Rush
	Gahnia clarkei	Tall Saw-sedge
Dennstaedtiaceae	*Pteridium esculentum*	Bracken
Dicksoniaceae	*Calochlaena dubia*	Soft Bracken
	Cyathea australis	Rough Tree-fern
Ericaceae (Styphelioideae)	*Leucopogon lanceolatus*	Lance Beard Heath
	Trochocarpa laurina	Tree Heath
Euphorbiaceae	*Glochidion ferdinandi var. ferdinandi*	Cheese Tree
Eupomatiaceae	*Eupomatia laurina*	Bolwarra
Flagellariaceae	*Flagellaria indica*	Whip Vine
Fabaceae (Faboideae)	*Jacksonia scoparia*	Dogwood
	Pultenaea villosa	Hairy Bush-pea
Fabaceae (Mimosoideae)	*Acacia fimbriata*	Fringed Wattle
	Acacia concurrens	Curracabah
	Acacia ulicifolia	Prickly Moses
	Acacia irrorata	Green Wattle
	Acacia leiocalyx	-
	Acacia floribunda	White Sally Wattle
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush
	Lomandra filiformis	Wattle Mat-rush
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily
Meliaciae	*Synoum glandulosum*	Scentless Rosewood
Moraceae	*Ficus coronata*	Creek Sandpaper Fig
Myrtaceae	*Callistemon salignus*	Willow Bottlebrush
	Corymbia variegata	Spotted Gum
	Eucalyptus acmenoides	White Mahogany
	Eucalyptus microcorys	Tallowwood
	Eucalyptus pilularis	Coastal Blackbutt
	Eucalyptus propinqua	Grey Gum
	Eucalyptus resinifera	Red Mahogany
	Eucalyptus siderophloia	Grey Ironbark
	Eucalyptus tindaliae	Grafton Stringybark
	Leptospermum polyagalifolium	Wild May
	Lophostemon suaveolens	Swamp Box
	Melaleuca quinquenervia	Broad-leaved Paperbark

Family	*Species*	*Common Name*
	Syncarpia glomulifera	Turpentine
	Waterhousea floribunda	Weeping Lilly Pilly
Nymphaeaceae	*Nymphaea sp.*	Water Lily
Phormiaceae	*Dianella caerulea var. caerulea*	Blue Flax lily
Phyllanthaceae	*Glochidion ferdinandi*	Cheese Tree
Phylidraceae	*Phylidrum lanuginosum*	Frogmouth
Poaceae	*Entolasia stricta*	Wiry Panic
	Imperata cylindrica	Blady Grass
	*Andropogon virginicum**	Whiskey Grass
	Oplismenus aemulus	Basket Grass
	Themeda australis	Kangaroo Grass
Proteaceae	*Persoonia media*	Tall Geebung
Ripogonaceae	*Ripogonum discolor*	Prickly Supplejack
Rutaceae	*Zieria smithii*	Sandfly Zieria
Sapindaceae	*Guioa semiglauca*	Guioa
Smilacaceae	*Smilax australis*	Austral Sarsaparilla
Thelypteridaceae	*Christella dentata*	Binung
Verbenaceae	*Lantana camara**	Lantana
Xanthorrhoeaceae	*Xanthorrhoea latifolia*	Forest Grass Tree
Zingiberaceae	*Alpinia caerulea*	Native Ginger

Notes:

* Denotes exotic species

Appendix B

Fauna Species Recorded at the Site

Table B.1 Fauna Species Recorded at the Site

Scientific Name	*Common Name*	*Comments*
	Avifauna	
Cacomantis variolosus	Brush Cuckoo	Heard
Cormobates leucophaea	White-throated Treecreeper	Observed
Pardalotus striatus	Striated Pardalote	Heard
Coracina novaehollandiae	Black-faced Cuckoo-shrike	Observed and heard
Colluricincla harmonica	Grey Shrike-thrush	Observed and heard
Rhipidura albiscapa	Grey Fantail	Observed and heard
Malurus lamberti	Variegated Wren	Observed and heard
Aviceda subcristata	Crested Hawk	Heard
Manorina melanocephala	Noisy Miner	Observed and heard
Dacelo novaeguineae	Kookaburra	Observed and heard
Cracticus nigrogularis	Pied Butcherbird	Observed and heard
Phylidonyris novaehollandiae	New Holland Honeyeater	Observed and heard
	Amphibia	
Crinia parinsignifera	Eastern Sign-bearing Froglet	Heard calling at farm/ forestry dams
Crinia signifera	Common Eastern Froglet	Heard calling at farm/ forestry dams
Litoria fallax	Dwarf Tree Frog	Heard calling at farm/ forestry dams
	Mammalia	
Macropus giganteus	Eastern Grey Kangaroo	Observed

Appendix C

OEH Atlas of NSW Wildlife and EPBC Act Protected Matters Search Tool Database Results

Data from the BioNet Atlas of NSW Wildlife website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions.
Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°; ^^ rounded to 0.01°).

Search criteria : Public Report of all Valid Records of Threatened (listed on TSC Act 1995) Animals in selected area [North: -29.88 West: 153.04 East: 153.24 South: -30.08] returned a total of 1483 records of 141 species.
Report generated on 12/09/2012 4:37 PM

Kingdom	Class	Family	Scientific Name	Common Name	NSW status	Comm. status	Records
Animalia	Amphibia	Myobatrachidae	*Crinia tinnula*	Wallum Froglet	V,P		8
Animalia	Amphibia	Myobatrachidae	*^Mixophyes iteratus*	Giant Barred Frog	E1,P,2	E	21
Animalia	Amphibia	Hylidae	*Litoria aurea*	Green and Golden Bell Frog	E1,P	V	2
Animalia	Amphibia	Hylidae	*Litoria brevipalmata*	Green-thighed Frog	V,P		2
Animalia	Reptilia	Elapidae	*Hoplocephalus stephensii*	Stephens' Banded Snake	V,P		1
Animalia	Aves	Casuariidae	*Dromaius novaehollandiae*	Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	E2,P		26
Animalia	Aves	Columbidae	*Ptilinopus magnificus*	Wompoo Fruit-Dove	V,P		10
Animalia	Aves	Ciconiidae	*Ephippiorhynchus asiaticus*	Black-necked Stork	E1,P		63
Animalia	Aves	Accipitridae	*Hieraaetus morphnoides*	Little Eagle	V,P		3
Animalia	Aves	Accipitridae	*^^Lophoictinia isura*	Square-tailed Kite	V,P,3		9
Animalia	Aves	Accipitridae	*Pandion cristatus*	Eastern Osprey	V,P		45

Animalia	Aves	Gruidae	*Grus rubicunda*	Brolga	V,P		21
Animalia	Aves	Turnicidae	*Turnix maculosus*	Red-backed Button-quail	V,P		6
Animalia	Aves	Cacatuidae	*^Calyptorhynchus lathami*	Glossy Black-Cockatoo	V,P,2		104
Animalia	Aves	Psittacidae	*Glossopsitta pusilla*	Little Lorikeet	V,P		34
Animalia	Aves	Psittacidae	*^^Lathamus discolor*	Swift Parrot	E1,P,3	E	1
Animalia	Aves	Psittacidae	*^^Pezoporus wallicus wallicus*	Eastern Ground Parrot	V,P,3		10
Animalia	Aves	Strigidae	*^^Ninox connivens*	Barking Owl	V,P,3		1
Animalia	Aves	Strigidae	*^^Ninox strenua*	Powerful Owl	V,P,3		39
Animalia	Aves	Tytonidae	*^^Tyto novaehollandiae*	Masked Owl	V,P,3		15
Animalia	Aves	Tytonidae	*^^Tyto tenebricosa*	Sooty Owl	V,P,3		1
Animalia	Aves	Climacteridae	*Climacteris picumnus victoriae*	Brown Treecreeper (eastern subspecies)	V,P		10
Animalia	Aves	Meliphagidae	*Anthochaera phrygia*	Regent Honeyeater	E4A,P	E	1
Animalia	Aves	Meliphagidae	*Melithreptus gularis gularis*	Black-chinned Honeyeater (eastern subspecies)	V,P		8
Animalia	Aves	Pomatostomidae	*Pomatostomus temporalis temporalis*	Grey-crowned Babbler (eastern subspecies)	V,P		9
Animalia	Aves	Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	V,P		10
Animalia	Mammalia	Dasyuridae	*Dasyurus maculatus*	Spotted-tailed Quoll	V,P	E	16
Animalia	Mammalia	Dasyuridae	*Phascogale tapoatafa*	Brush-tailed Phascogale	V,P		10
Animalia	Mammalia	Dasyuridae	*Planigale maculata*	Common Planigale	V,P		3
Animalia	Mammalia	Phascolarctidae	*Phascolarctos cinereus*	Koala	V,P	V	8

Animalia	Mammalia	Burramyidae	*Cercartetus nanus*	Eastern Pygmy-possum	V,P		1	
Animalia	Mammalia	Petauridae	*Petaurus australis*	Yellow-bellied Glider	V,P		78	
Animalia	Mammalia	Petauridae	*Petaurus norfolcensis*	Squirrel Glider	V,P		27	
Animalia	Mammalia	Potoroidae	*Aepyprymnus rufescens*	Rufous Bettong	V,P		28	
Animalia	Mammalia	Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	V,P	V	73	
Animalia	Mammalia	Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V,P		2	
Animalia	Mammalia	Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	V,P		1	
Animalia	Mammalia	Vespertilionidae	*Chalinolobus nigrogriseus*	Hoary Wattled Bat	V,P		19	
Animalia	Mammalia	Vespertilionidae	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle	V,P		3	
Animalia	Mammalia	Vespertilionidae	*Miniopterus australis*	Little Bentwing-bat	V,P		36	
Animalia	Mammalia	Vespertilionidae	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	V,P		4	
Animalia	Mammalia	Vespertilionidae	*Myotis macropus*	Southern Myotis	V,P		5	
Animalia	Mammalia	Vespertilionidae	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V,P		2	
Animalia	Insecta	Petaluridae	*Petalura gigantea*	Giant Dragonfly	E1		1	

Data from the BioNet Atlas of NSW Wildlife website, which holds records from a number of custodians. The data are only indicative and cannot be considered comprehensive inventory, and may contain errors and omissions.
Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°; ^^ rounded to 0.01°).

Search criteria : Public Report of all Valid Records of Threatened (listed on TSC Act 1995) Plants in selected area [North: -29.88 West: 153.04 East: 153.24 Sout 30.08] returned a total of 221 records of 107 species.
Report generated on 13/09/2012 9:05 AM

Kingdom	Class	Family	Species Code	Scientific Name	Common Name	NSW status	Comm. status	Records	Info
Plantae	Flora	Apocynaceae	1233	*Marsdenia longiloba*	Slender Marsdenia	E1,P	V	3	
Plantae	Flora	Araceae	10749	*^^Typhonium sp. aff. brownii*	Stinky Lily	E1,P,3		1	
Plantae	Flora	Casuarinaceae	8980	*Allocasuarina defungens*	Dwarf Heath Casuarina	E1,P	E	5	
Plantae	Flora	Ericaceae	2614	*^^Leucopogon confertus*	Torrington Beard-heath	E1,P,3	E	13	
Plantae	Flora	Ericaceae	9428	*Melichrus hirsutus*	Hairy Melichrus	E1,P	E	6	
Plantae	Flora	Fabaceae (Faboideae)	11644	*Pultenaea maritima*	Coast Headland Pea	V,P		9	
Plantae	Flora	Juncaginaceae	3363	*Maundia triglochinoides*		V,P		1	
Plantae	Flora	Lindsaeaceae	8126	*^^Lindsaea brachypoda*	Short-footed Screw Fern	E1,P,3		1	
Plantae	Flora	Lindsaeaceae	8128	*^^Lindsaea incisa*	Slender Screw Fern	E1,P,3		8	

Plantae	Flora	Myrtaceae	8724	*Angophora robur*	Sandstone Rough-barked Apple	V,P	V	5	
Plantae	Flora	Myrtaceae	4193	*Eucalyptus tetrapleura*	Square-fruited Ironbark	V,P	V	43	
Plantae	Flora	Orchidaceae	4415	*^Cryptostylis hunteriana*	Leafless Tongue Orchid	V,P,2	V	1	
Plantae	Flora	Rutaceae	6457	*Acronychia littoralis*	Scented Acronychia	E1,P	E	4	
Plantae	Flora	Rutaceae	11598	*Boronia hapalophylla*	Shannon Creek Boronia	E1,P		1	
Plantae	Flora	Rutaceae	9099	*Boronia umbellata*	Orara Boronia	V,P	V	70	
Plantae	Flora	Sapotaceae	11957	*Niemeyera whitei*	Rusty Plum, Plum Boxwood	V,P		22	
Plantae	Flora	Simaroubaceae	9497	*Quassia sp. Mooney Creek*	Moonee Quassia	E1,P	E	28	

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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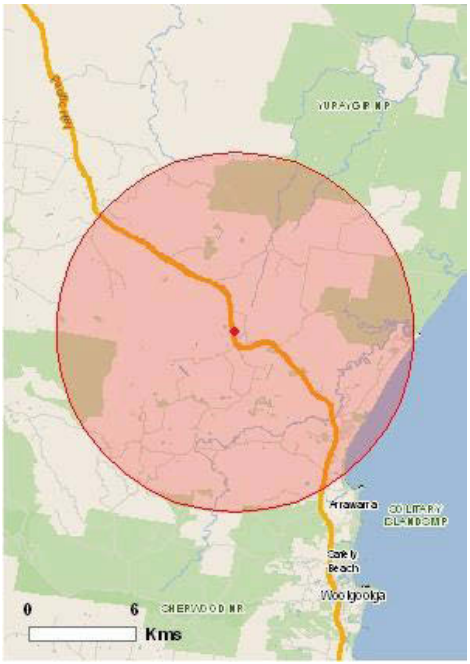

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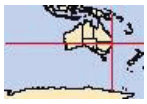

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	61
Listed Migratory Species:	40

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate.

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	2
Commonwealth Heritage Places:	None
Listed Marine Species:	64
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	5
State and Territory Reserves:	5
Regional Forest Agreements:	1
Invasive Species:	15
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Endangered	Species or species habitat likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
Diomedea exulans antipodensis Antipodean Albatross [82269]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans gibsoni Gibson's Albatross [82271]	Vulnerable	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche bulleri Buller's Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris impavida Campbell Albatross [82449]	Vulnerable	Species or species habitat may occur within area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat likely to occur within area
Fish		
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Nannoperca oxleyana Oxleyan Pygmy Perch [64468]	Endangered	Species or species habitat known to occur within area
Frogs		
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat likely to occur within area
Litoria olongburensis Wallum Sedge Frog [1821]	Vulnerable	Species or species habitat likely to occur within area
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area
Mixophyes iteratus Giant Barred Frog, Southern Barred Frog [1944]	Endangered	Species or species habitat likely to occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat may occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll	Endangered	Species or species

Name	Status	Type of Presence
(southeastern mainland population) [75184]		habitat may occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Petrogale penicillata		
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus		
Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat may occur within area
Pseudomys novaehollandiae		
New Holland Mouse [96]	Vulnerable	Species or species habitat likely to occur within area
Pseudomys oralis		
Hastings River Mouse [98]	Endangered	Species or species habitat likely to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Plants		
Allocasuarina defungens		
Dwarf Heath Casuarina [21924]	Endangered	Species or species habitat known to occur within area
Angophora robur		
Sandstone Rough-barked Apple [56088]	Vulnerable	Species or species habitat likely to occur within area
Arthraxon hispidus		
Hairy-joint Grass [9338]	Vulnerable	Species or species habitat may occur within area
Boronia umbellata		
Orara Boronia [56301]	Vulnerable	Species or species habitat likely to occur within area
Cynanchum elegans		
White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area
Eucalyptus tetrapleura		
Square-fruited Ironbark [7490]	Vulnerable	Species or species habitat likely to occur within area
Marsdenia longiloba		
Clear Milkvine [2794]	Vulnerable	Species or species habitat likely to occur within area
Melichrus sp. Newfoundland State Forest (P.Gilmour 7852)		
Hairy Melichrus [82048]	Endangered	Species or species habitat likely to occur within area
Parsonsia dorrigoensis		
Milky Silkpod [64684]	Endangered	Species or species habitat likely to occur within area
Phaius australis		
Lesser Swamp-orchid [5872]	Endangered	Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Rutidosis heterogama Heath Wrinklewort [13132]	Vulnerable	Species or species habitat likely to occur within area
Samadera sp. Moonee Creek (J.King s.n. 1949) [84091]	Endangered	Species or species habitat likely to occur within area
Streblus pendulinus Siah's Backbone, Sia's Backbone, Isaac Wood [21618]	Endangered	Species or species habitat likely to occur within area
Taeniophyllum muelleri Minute Orchid, Ribbon-root Orchid [10771]	Vulnerable	Species or species habitat likely to occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
Tylophora woollsii [20503]	Endangered	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Coeranoscincus reticulatus Three-toed Snake-tooth Skink [59628]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Emydura macquarii signata (Bellinger River, NSW) Bellinger River Emydura [1785]	Vulnerable	Species or species habitat likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area
Uvidicolus sphyrurus Border Thick-tailed Gecko, Granite Belt Thick-tailed Gecko [84578]	Vulnerable	Species or species habitat likely to occur within area
Sharks		
Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat may occur within area
Carcharodon carcharias Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable*	Species or species habitat may occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Sterna albifrons Little Tern [813]		Breeding likely to occur within area
Thalassarche bulleri Buller's Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta (sensu stricto) Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross [64459]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat may occur within area
Migratory Marine Species		
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharodon carcharias Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Breeding likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Breeding may occur within area
Xanthomyza phrygia Regent Honeyeater [430]	Endangered*	Species or species habitat likely to occur within area
Migratory Wetlands Species		

Name	Threatened	Type of Presence
Ardea alba Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Foraging, feeding or related behaviour may occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Vulnerable*	Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Telstra Corporation Limited

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable*	Species or species habitat may occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Foraging, feeding or related behaviour may occur within area
Gallinago megala Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Gallinago stenura Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Breeding likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding likely to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Breeding may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Vulnerable*	Species or species habitat likely to occur within area
Sterna albifrons Little Tern [813]		Breeding likely to occur within area
Thalassarche bulleri Buller's Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta (sensu stricto) Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross [64459]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat may occur within area
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Campichthys tryoni Tryon's Pipefish [66193]		Species or species habitat may occur within area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area
Corythoichthys ocellatus Orange-spotted Pipefish, Ocellated Pipefish [66203]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Hippichthys cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within area
Hippichthys heptagonus Madura Pipefish, Reticulated Freshwater Pipefish [66229]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus kelloggi Kellogg's Seahorse, Great Seahorse [66723]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Micrognathus andersonii Anderson's Pipefish, Shortnose Pipefish [66253]		Species or species habitat may occur within area
Micrognathus brevirostris thorntail Pipefish, Thorn-tailed Pipefish [66254]		Species or species habitat may occur within area
Microphis manadensis Manado Pipefish, Manado River Pipefish [66258]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Solegnathus dunckeri Duncker's Pipehorse [66271]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Solenostomus paegnius Rough-snout Ghost Pipefish [68425]		Species or species habitat may occur within area
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Mammals		
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Places on the RNE [Resource Information]

Note that not all Indigenous sites may be listed.

Name	State	Status
Natural		
Woolgoolga Area and Solitary Islands	NSW	Indicative Place
Red Rock National Park (former)	NSW	Registered
Sherwood Nature Reserve	NSW	Registered
Solitary Islands Marine Area	NSW	Registered
Yuraygir National Park and Adjacent Areas	NSW	Registered

State and Territory Reserves [Resource Information]

Name	State
Coffs Coast	NSW
Sherwood	NSW
Solitary Islands	NSW
Yuraygir	NSW
Yuraygir	NSW

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Frogs		
Bufo marinus Cane Toad [1772]		Species or species habitat likely to occur within area
Mammals		
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species

Name	Status	Type of Presence
		habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area

Coordinates

-29.98 153.14

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix D

Threatened Species Potential Occurrence Assessment

Table D1 Threatened Fauna Species Identified by the Database Searches

Scientific Name	Common Name	Status		Habitat Requirement	Suitability of Site Habitat	Potential Occurrence	Impact Risk/ Need for 7-Part Test
		TSC Act	EPBC Act				
Amphibia							
Crinia tinnula	Wallum Froglet	V	-	Acid paperbark and sedge swamps known as 'wallum', this is a banksia-dominated lowland heath ecosystem characterised by acidic waterbodies.	No potential habitat at the site.	Unlikely	No 7-part Test required.
Litoria aurea	Green and Golden Bell Frog	E	V	Amongst vegetation in and around permanent swamps, lagoons, farm dams and on flood-prone river flats, particularly where there are bullrushes or spikerushes.	Low - a few farm dams provide marginal potential habitat.	Unlikely – Habitat quality and few local records indicate a low likelihood of occurrence.	No 7-part Test required.
Litoria brevipalmata	Green-thighed Frog	V	-	Rainforest, moist to dry eucalpyt forest and heath, typically where surface water gathers after rain.	Medium	**Possible**	7-part Test required.
Mixophyes balbus	Stuttering Frog	V	V	Cool rainforest, moist eucalypt forest and occasionally along creeks in dry eucalypt forest.	No potential habitat at the site.	Unlikely	No 7-part Test required.
Mixophyes iteratus	Giant Barred Frog	E	E	Deep, damp leaf litter in rainforests, moist eucalypt forest and near dry eucalypt forest.	No potential habitat at the site.	Unlikely	No 7-part Test required.
Aves							
Anthochaera phrygia (formerly Xanthomyza phrygia)	Regent Honeyeater	CE	E	Dry open forest and woodland with an abundance of nectar-producing eucalypts, particularly box-ironbark woodland, swamp mahogany forests, and riverine sheoak woodlands.	Low as transient forager.	Marginally possible as rare transient forager	No 7-part Test required. Impact risk of the Proposal is low as native vegetation clearing constitutes only a minor fraction of the total area of available foraging habitat in the study area and broader locality.
Botaurus poiciloptilus	Australasian Bittern	E	E	Permanent freshwater wetlands with tall dense vegetation, particularly bullrushes and spikerushes.	Low	Low	No 7-part Test required.
Calyptorhynchus lathami	Glossy Black-	V	-	Sheoaks in coastal forests and woodlands, timbered	Forest Oak (*Allocasuarina*	**Possible** However,	7-part Test required.

Scientific Name	Common Name	Status		Habitat Requirement	Suitability of Site Habitat	Potential Occurrence	Impact Risk/ Need for 7-Part Test
		TSC Act	EPBC Act				
	Cockatoo			watercourses, and moist and dry eucalypt forests of the coast and the Great Divide up to 1,000 m.	*torulosa*) present as a scattered mid-storey tree within forests at the site.	no chewed cones observed beneath Forest Oak trees.	
Climacteris picumnus	Brown Tree Creeper	V	-	Eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range, and less commonly on coastal plains and ranges.	Low	Low	No 7-part Test required.
Dasyornis brachypterus	Eastern Bristlebird	E	E	High elevation open forest, woodland with dense tussock or sedge understorey adjacent to rainforest or wet eucalypt forest.	No habitat is present at the site.	Unlikely	No 7-part Test required.
Daphoenositta chrysoptera	Varied Sittella	V	-	Inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	Moderate	**Possible**	7-part Test required.
Dromaius novaehollandiae	Emu population in the NSW North Coast Bioregion and Port Stephens LGA	EP	-	Open forest, woodland, coastal heath, coastal dunes, wetland areas, tea tree plantations and open farmland, and occasionally in littoral rainforest.	Marginal habitat present.	Unlikely	No 7-part Test required.
Ephippiorhynchus asiaticus	Black-necked Stork	E	-	Swamps, mangroves, mudflats, dry floodplains.	No potential habitat on or adjacent to the site.	Unlikely	No 7-part Test required.
Erythrotriorchis radiatus	Red Goshawk	CE	V	Along or near watercourses, swamp forest and woodlands on the coastal plain.	Marginal as opportunistic foraging habitat as minor fraction of broader foraging territory. Nesting not known or likely on site.	Marginally possible as rare forager.	No 7-part Test required. Impact risk of the Proposal is low as this species is highly mobile and native vegetation clearing constitutes only a minor fraction of the total area of available foraging habitat in the study area and broader

Scientific Name	Common Name	Status		Habitat Requirement	Suitability of Site Habitat	Potential Occurrence	Impact Risk/ Need for 7-Part Test
		TSC Act	EPBC Act				
							locality.
Glossopsitta pusilla	Little Lorikeet	V	V	Distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri.	Low to moderate	**Possible**	7-part Test required.
Grus rubicunda	Brolga	V	-	Shallow swamps, floodplains, grasslands and pastoral lands, usually in pairs or parties.	No potential habitat on or adjacent to the site.	Unlikely	No 7-part Test required.
Hieraaetus morphnoides	Little Eagle	V	-	Open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used.	Marginal as opportunistic foraging habitat as minor fraction of broader foraging territory. Nesting not known or likely on site.	Marginally possible as rare forager.	No 7-part Test required. Impact risk of the Proposal is low as this species is highly mobile and native vegetation clearing constitutes only a minor fraction of the total area of available foraging habitat in the study area and broader locality.
Lathamus discolor	Swift Parrot	E	E	Forests, woodlands, plantations, and banksias.	Low as transient forager.	Marginally possible as rare transient forager.	No 7-part Test required. Impact risk of the Proposal is low as this species is highly mobile and native vegetation clearing constitutes only a minor fraction of the total area of available foraging habitat in the study area and broader locality.
Lophoictinia isura	Square-tailed Kite	V	-	Dry woodland and open forest, particularly along major rivers and belts of trees in urban or semi-	Marginal as opportunistic foraging habitat as	**Possible**	7-part Test required.

Scientific Name	Common Name	Status		Habitat Requirement	Suitability of Site Habitat	Potential Occurrence	Impact Risk/ Need for 7-Part Test
		TSC Act	EPBC Act				
				urban areas. Home range can extend over at least 100 km^2.	minor fraction of broader foraging territory. Nesting not known or likely on site.		
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	-	Drier open forests or woodlands dominated by box and ironbark eucalypts, and open forests of smooth-barked gums, stringybarks, ironbarks and tea-trees.	Low	**Possible**	7-part Test required.
Ninox connivens	Barking Owl	V	-	Eucalypt woodland, open forest, swamp woodlands and timber along watercourses.	Moderate	**Possible**	7-part Test required.
Ninox strenua	Powerful Owl	V	-	Woodland and open forest to tall moist forest and rainforest, common along drainage lines.	Moderate	**Possible**	7-part Test required.
*Pandion cristatus (*formerly *Pandion haliaetus)*	Eastern Osprey	V	-	Forage for fish in fresh, brackish or saline waters of rivers, lakes, estuaries with suitable nesting sites nearby.	No potential habitat on or adjacent to the site	Unlikely	No 7-part Test required.
Pezoporus wallicus wallicus	Eastern Ground Parrot	V	-	Heathland and sedgeland within or adjacent to swamps.	No potential habitat on or adjacent to the site	Unlikely	No 7-part Test required.
Pomatostomus temporalis temporalis	Grey-crowned Babbler	V	-	Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains.	Low to moderate	**Possible**	7-part Test required.
Ptilinopus magnificus	Wompoo Fruit-dove	V	-	Rainforests, low-elevation moist eucalypt forest, and Brush Box forests.	Marginal habitat associated with the study area	Unlikely – at best as rare foraging transient	Local occurrence potential unlikely to be affected by the works. No 7-part Test required.
Turnix maculosa	Red-backed Button-quail	V	-	Grassland, sedgelands near creeks. Swamps and wetlands.	No potential habitat on or adjacent to the site	Unlikely	No 7-part Test required.
Turnix melanogaster	Black-breasted Button-quail	E	V	Drier rainforests and viney scrubs, often in association with Hoop Pine and a deep moist leaf litter layer. During drought it may move to adjacent wetter rainforests.	Low to moderate	Unlikely	No 7-part Test required.
Tyto novaehollandiae	Masked Owl	V	-	Dry eucalypt forest and woodlands.	Moderate	**Possible**	7-part Test required.

Scientific Name	Common Name	Status		Habitat Requirement	Suitability of Site Habitat	Potential Occurrence	Impact Risk/ Need for 7-Part Test
		TSC Act	EPBC Act				
Tyto tenebricosa	Sooty Owl	V	-	Dry, subtropical and warm temperate rainforests and wet eucalypt forests. Nest in large tree hollows.	Marginal potential habitat on site	Low – limited area of potential habitat is unlikely to attract species	No 7-part Test required.
				Mammalia			
Aepyprymnus rufescens	Rufous Bettong	V	-	Tall moist eucalypt forest to open woodland with tussock grass understorey.	Moderate	**Possible**	7-part Test required.
Cercartetus nanus	Eastern Pygmy Possum	V	-	Range from rainforest to heath. North Coast mainly in rainforest, wet eucalypt forest and tee-tree-banksia scrub.	Low to moderate	**Possible**	7-part Test required.
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Near cave entrances and crevices in cliffs.	Moderate	**Possible**	7-part Test required.
Chalinolobus nigrogriseus	Hoary Wattled Bat	V	-	Dry open eucalypt forest dominated by spotted gum, boxes and ironbarks. Also healthy coastal forests where Red Bloodwood and Scribbly Gum are common. Naturally sparse understorey is favourable.	Moderate	**Possible**	7-part Test required.
Dasyurus maculatus maculatus	Spotted-tailed Quoll	V	E	Dry and moist eucalypt forests and rainforests, fallen hollow logs, large rocky outcrops.	Moderate	**Possible**	7-part Test required.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Moist and dry eucalypt forest and rainforest, particularly at high elevations.	Low (prefers more elevated sites)	Low	No 7-part Test required.
Miniopterus australis	Little Bentwing-bat	V	-	Moist eucalypt forest, rainforest and dense coastal scrub.	Moderate	**Possible**	7-part Test required.
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	Forest or woodland, roost in caves, old mines and stormwater channels.	Moderate	**Possible**	7-part Test required.
Mormopterus norfolkensis	Eastern Freetail-bat	V	-	Occurs in dry sclerophyll forest and woodland east of the Great Dividing Range. Roosts in tree hollows.	Moderate	**Possible**	7-part Test required.
Myotis macropus	Large-footed Myotis	V	-	Bodies of water, rainforest streams, large lakes, reservoirs.	Low	Low – no significant potential habitat.	Local occurrence potential unlikely to be affected by the works. No 7-part Test required. No 7-part Test required.

Scientific Name	Common Name	Status		Habitat Requirement	Suitability of Site Habitat	Potential Occurrence	Impact Risk/ Need for 7-Part Test
		TSC Act	EPBC Act				
Petaurus australis	Yellow-bellied Glider	V	-	Tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Dens in tree hollows of large trees, often in family groups. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south.	Moderate	**Possible**	7-part Test required.
Petaurus norfolcensis	Squirrel Glider	V	-	Blackbutt, bloodwood and ironbark eucalypt forest with heath understorey in coastal areas, and box-ironbark woodlands and River Red Gum forest inland.	Moderate	**Possible**	7-part Test required.
Petrogale penicillata	Brush-tailed Rock Wallaby	V	V	North-facing cliffs and dry eucalypt forest and woodland, inhabiting rock crevices, caves, overhangs during the day, and foraging in grassy areas nearby at night.	Low to moderate	Unlikely	No 7-part Test required.
Phascogale tapoatafa	Brush-tailed Phascogale	V	-	Drier forests and woodlands with hollow-bearing trees and sparse ground cover.	Moderate	**Possible**	7-part Test required.
Phascolarctos cinereus	Koala	V	-	Appropriate food trees in forests and woodlands, and treed urban areas.	Moderate	**Known - scats recorded on site**	7-part Test required.
Planigale maculata	Common Planigale	V	-	Rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas with surface cover close to water.	Low to moderate	**Possible**	7-part Test required.
Pseudomys novaehollandiae	New Holland Mouse	-	V	Occurs in open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes.	Low	Unlikely	No 7-part Test required.
Pseudomys oralis	Hastings River Mouse	E	E	Dry open forests with dense, low groundcover with diverse mix of ferns, grass, sedges and herbs.	Low to moderate	Unlikely	No 7-part Test required.
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Moderate	**Likely**	7-part Test required.

Scientific Name	Common Name	Status		Habitat Requirement	Suitability of Site Habitat	Potential Occurrence	Impact Risk/ Need for 7-Part Test
		TSC Act	EPBC Act				
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	Forages in a variety of habitats, roosts in tree hollows and buildings.	Moderate	**Possible**	7-part Test required.
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	Woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest.	Moderate	**Possible**	7-part Test required.
Insecta							
Petalura gigantea	Giant Dragonfly	E	-		Low	Low	No 7-part Test required.

V = Vulnerable; E = Endangered; CE = Critically Endangered; EP = Endangered Population

Table D.2 Threatened Flora Species Identified by the Database Searches

Scientific Name	*Common Name*	*Status*		*Habitat Requirement*	*Suitability of Site Habitat*	*Potential Occurrence*	*Impact Risk/ Need for 7-Part Test*
		TSC Act	*EPBC Act*				
Acronychia littoralis	Scented Acronychia	E	E	Littoral rainforest on sand.	No potential habitat on or adjacent to the site	Unlikely	No 7-part Test required.
Allocasuarina defungens	Dwarf Heath Casuarina	E	E	Tall heath on sand, also on clay and sandstone.	No potential habitat on or adjacent to the site	Unlikely	No 7-part Test required.
Angophora robur	Sandstone Rough-barked Apple	V	V	Dry open forest in sandy or skeletal soils on sandstone, or occasionally granite, with frequent outcrops of rock.	Dry Open Forest (Blackbutt association) on sandstone may be suitable habitat at the site.	Low - this species was not identified during the field survey. Moderate at the broader locality.	No 7-part Test required.
Arthraxon hispidus	Hairy-joint Grass	V	V	Moist shady places in or on the edges of rainforest and wet eucalypt forest, often near creeks or swamps.	Low – generally only found on basalt and enriched alluvial substrates	Unlikely	No 7-part Test required.
Boronia hapalophylla	Shannon Creek Boronia	E	-	Occurs in dry woodland on sandstone hill slopes and ridge tops above Shannon Creek. Currently only known from a small area near Shannon Creek.	No potential habitat at the site. However, possible in the broader study area.	Unlikely	No 7-part Test required.
Boronia umbellata	Orara Boronia	V	V	Understorey shrub near gullies in wet open forest. Regenerates well after disturbance.	Dry Open Forest (Blackbutt association) on sandstone may be suitable habitat at the site.	**Moderate** However, this species was not identified during the field survey and therefore occurrence at the site is considered unlikely.	No 7-part Test required.
Cryptostylis hunteriana	Leafless Tongue-orchid	V	V	Does not have well defined habitat and is known from a range of communities, including swamp-heath and woodland.	Low	Unlikely	No 7-part Test required.
Cynanchum elegans	White-flowered Wax Plant	E	E	Dry, littoral or subtropical rainforest, and occasionally in scrub or woodland.	Moderate	**Moderate** However, this species was not identified during the field survey and therefore occurrence at the site is considered unlikely.	No 7-part Test required.

Scientific Name	Common Name	Status		Habitat Requirement	Suitability of Site Habitat	Potential Occurrence	Impact Risk/ Need for 7-Part Test
		TSC Act	EPBC Act				
Eucalyptus tetrapleura	Square-fruited Ironbark	V	V	Dry or moist eucalypt forest on moderately fertile soil, often in low areas with poor drainage.	Some of the forest of mid-upper drainage lines of the site may be suitable habitat.	**Moderate** However, this species was not identified during the field survey and therefore occurrence at the site is considered unlikely.	No 7-part Test required.
Lindsaea brachypoda	Short-footed Screw Fern	E	-	Very moist habitats in subtropical or warm-temperate rainforest or palm forest.	No potential habitat on or adjacent to the site	Unlikely	No 7-part Test required.
Lindsaea incisa	Slender Screw Fern	E	-	Dry eucalypt forest on sandstone and moist shrubby eucalypt forest on metasediments. Waterlogged or poorly drained sites along creeks, where ferns, sedges and shrubs grow thickly.	Low on site. Possible in broader study area.	Unlikely on Site. Local occurrence potential in broader study area unlikely to be affected by the Proposal.	No 7-part Test required.
Marsdenia longiloba	Clear Milkvine	E	V	Subtropical and warm temperate rainforest, lowland moist eucalypt forest adjoining rainforest and, sometimes, in areas with rock outcrops.	No potential habitat on or adjacent to the site	Unlikely	No 7-part Test required.
Maundia triglochinoides	-	V	-	Swamps or shallow fresh water on clay.	No potential habitat on or adjacent to the site	Unlikely	No 7-part Test required.
Melichrus hirsutus	Hairy Melichrus	E	E	Low-altitude eucalypt forest with shrubby understorey on sandy infertile soil with rocky outcrops.	Dry Open Forest (Blackbutt association) on sandstone may be suitable habitat at the site.	**Moderate** However, this species was not identified during the field survey and therefore occurrence at the site is considered unlikely.	No 7-part Test required.
Niemeyera whitei (formerly *Amorphospermum whitei)*	Rusty Plum	V	-	Rainforest and adjoining moist eucalypt forest.	Dry Open Forest (Blackbutt association) on sandstone may be suitable habitat at the site.	**Moderate** However, this species was not identified during the field survey and therefore occurrence at the site is considered unlikely.	No 7-part Test required.

Scientific Name	Common Name	Status		Habitat Requirement	Suitability of Site Habitat	Potential Occurrence	Impact Risk/ Need for 7-Part Test
		TSC Act	EPBC Act				
Parsonsia dorrigoensis	Milky Silkpod	V	E	Subtropical and warm temperate rainforest, on rainforest margins, and in moist eucalypt forest up to 800 m, on brown clay soils.	Moderate in rainforest and moist eucalypt forest areas	**Marginally Possible** However, this species was not identified during the field survey and therefore occurrence at the site is considered unlikely.	No 7-part Test required.
Phaius australis	Southern Swamp Orchid	E	E	Swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest mostly in coastal areas.	Low	Unlikely	No 7-part Test required.
Pultenaea maritima	Coast Headland Pea	V	-	Grasslands on exposed coastal headlands.	No potential habitat on or adjacent to the site	Unlikely	No 7-part Test required.
Quassia sp. Mooney Creek	Moonee Quassia	E	E	Shrubby layer below tall moist and dry eucalypt forest, including forest edges, generally at low altitudes.	Dry Open Forest (Blackbutt association) on sandstone may be suitable habitat at the site.	**Moderate** However, this species was not identified during the field survey and therefore occurrence at the site is considered unlikely.	No 7-part Test required.
Rutidosis heterogama	Heath Winklewort	V	V	Heaths in clay soils, disturbed roadsides.	Low	Unlikely	No 7-part Test required.
Streblus pendulinus	Siah's Backbone	-	E	Found in warmer rainforests, chiefly along watercourses at altitudinal range is from near sea level to 800 m above sea level. Grows in well-developed rainforest, gallery forest and drier, more seasonal rainforest. On Norfolk Island, the species is found in a variety of forest types, though it is rare.	Moderate	**Moderate** However, this species was not identified during the field survey and therefore occurrence at the site is considered unlikely.	No 7-part Test required.
Taeniophyllum muelleri	Minute Orchid	-	V	Grows on outer branches and branchlets of rainforest trees; coast and coastal ranges, from sea level to 250 m alt., north from the Bellinger River.	Low-Moderate	**Moderate** However, this species was not identified during the field survey and therefore occurrence at	No 7-part Test required.

Scientific Name	Common Name	Status		Habitat Requirement	Suitability of Site Habitat	Potential Occurrence	Impact Risk/ Need for 7-Part Test
		TSC Act	EPBC Act				
						the site is considered unlikely.	
Thesium australe	Austral Toadflax	V	V	Grassland or grassy eucalypt woodland where *Themeda australis* is predominant, on grassy headlands.	Low	Unlikely	No 7-part Test required.
Typhonium sp. aff. *brownii*	Stinky Lily	E	-	Moist eucalypt forest and moist eucalypt -subtropical rainforest interface. Only known from four locations west of Coffs Harbour; Kangaroo River, Bruxner Park, Bindarri National Park and Upper Corindi.	Low on site. Possible in broader study area.	Unlikely	No 7-part Test required.
Tylophora woollsii	Cryptic Forest Twiner	E	E	Moist eucalypt forest, moist sites in dry eucalypt forest and rainforest margins.	Moderate	**Moderate** However, this species was not identified during the field survey and therefore occurrence at the site is considered unlikely.	No 7-part Test required.

V = Vulnerable; E = Endangered; EP = Endangered Population

Appendix E

Section 5A Assessment of Significance

Seven-part Test of Significance for TSC Act Listed Endangered Ecological Community (EEC)
A Seven-part test of Significance is required for the EEC *Lowland Rainforest on Floodplain in the NSW North Coast Bioregion*

Lowland Rainforest on Coastal Floodplains in the NSW North Coast Bioregion
Study Area Habitat Values and Local Population Extent.

The Scientific Committee, established by the TSC Act, has made a Final Determination to list *Lowland Rainforest on Coastal Floodplains of the NSW North Coast Bioregion* as an EEC in Part 3 of Schedule 1 of the Act.

The NSW Scientific Committee (1999) describes the key features of Lowland Rainforest, in an undisturbed state, being a closed canopy forest characterised by its high species richness and structural complexity. The constituent species are diverse, but along with its landscape position on floodplains, allow the determination of this as a distinct vegetation community. In disturbed stands the canopy continuity may be broken, or the canopy may be smothered by exotic vines. This community occupies less than 1000 ha in NSW and stands are small and isolated, mainly due to the effects of clearing.

The main recognised threats to this community are:

- clearing for competing land uses (including clearing of understorey for recreational facilities);
- clearing and fragmentation effects on the functional ecology of constituent plants and pollinators;
- fire;
- grazing;
- rubbish dumping; and
- dissection by vehicular and foot tracks.

Site and Local Occurrence
The rainforest community along Dirty Creek constitutes this TSC Act listed EEC. The condition of this EEC on the site is of low-medium quality (e.g. evidence of previous logging, deleterious effects of fire, and proximity to the Pacific Highway). The relatively low species diversity of this community may reflect these past influences. This community encompasses a very small area of approximately 0.47 ha of the site in the far south-east corner along Dirty Creek. This community extends outside the site further downstream along Dirty Creek where it intergrades into Swamp Sclerophyll Forest on Coastal Floodplains EEC.

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

No consideration under this part of the assessment is required.

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

No consideration under this part of the assessment is required.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:
(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

The GI sites are not located within this community, and therefore no Lowland Rainforest EEC would be directly impacted by the Proposal.
The Proposal imposes a minor risk of a range of indirect impacts to adjacent areas of EECs locally, including sedimentation and erosion, water quality, weed invasion impacts, edge effects, and changes to runoff patterns and/or nutrient loads. However the risk and potential magnitude to which the Proposal may contribute to such impacts is not significant given effective implementation of the mitigation methods detailed in the Geotechnical Investigations EA (RMS 2012).

Overall, the incremental impacts of the Proposal are not considered likely to adversely affect the extent or adversely modify the composition of the subject EEC such that its local occurrence is likely to be placed at significant risk of extinction.

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

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

No proposed GI sites are located within this community. Therefore, Lowland Rainforest EEC would be directly or substantially indirectly impacted with effective implementation of the mitigation measures detailed in the Geotechnical Investigations EA (RMS 2012).

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

No clearing within the subject EEC would be required in the Proposal. Clearing for GIs and access tracks in adjacent open forest communities at the site would involve vegetation removal estimated to consist of 321 m^2 of Dry Open Forest (Blackbutt association).

The locations of clearing within these communities would not add to existing fragmentation or isolation of the subject EEC, and contiguity between the EEC on the site and those EECs downstream along Dirty Creek would remain.

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

No proposed GI sites are located within this community. Therefore, Lowland Rainforest EEC would be directly or substantially indirectly impacted with effective implementation of the mitigation measures detailed in the Geotechnical Investigations EA (RMS 2012).

Overall while the Proposal may result in some minor incremental and cumulative effects, it is not considered likely to remove, modify, fragment or isolate any habitat significant to the long-term survival of the subject EEC at the locality.

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

No areas of critical habitat are listed under the TSC Act that coincide with the site.

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

No recovery plan or threat abatement plan has been prepared for Lowland Rainforest EEC. OEH has identified 21 priority actions to help recover the Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion in New South Wales (OEH undated). The Proposal would not create barriers to the implementation of these priority actions.

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

A KTP is defined under the TSC Act as a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities. The current list of KTPs under the TSC Act, and whether the Proposal is recognised as a KTP is shown in **Table E.1**.

Table E.1 Key Threatening Processes

Listed Key Threatening Process (as described in the final determination of the Scientific Committee to list the threatening process)	***Legislation***		***Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?***		
	TSC Act	***EPBC Act***	***Likely***	***Possible***	***Unlikely***
Alteration of habitat following subsidence due to longwall mining	✓				✓
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	✓				✓
Anthropogenic climate change	✓	✓		✓	
Bush rock removal	✓				✓
Clearing of native vegetation	✓	✓		✓	
Competition and grazing by the feral European Rabbit (*Oryctolagus cuniculus*)	✓	✓			✓
Competition and habitat degradation by feral goats (*Capra hircus*)	✓	✓			✓
Competition from feral honeybees (*Apis mellifera*)	✓				✓
Death or injury to marine species following capture in shark control programs on ocean beaches	✓				✓
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments	✓	✓			✓
Forest Eucalypt dieback associated with over-abundant psyllids and bell miners	✓				✓
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	✓				✓
Herbivory and environmental degradation caused by feral deer	✓				✓
Importation of red imported fire ants (*Solenopsis invicta*)	✓	✓			✓
Incidental catch (bycatch) of Sea Turtles during coastal otter-trawling operations within Australian waters north of 28 degrees South		✓			✓
Incidental catch (or bycatch) of seabirds during oceanic longline fishing operations		✓			✓
Infection by Psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations	✓	✓			✓
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	✓	✓		✓	
Infection of native plants by *Phytophthora cinnamomi*	✓	✓		✓	

Listed Key Threatening Process (as described in the final determination of the Scientific Committee to list the threatening process)	*Legislation*		*Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?*		
	TSC Act	*EPBC Act*	*Likely*	*Possible*	*Unlikely*
Introduction of the large earth bumblebee (*Bombus terrestris*)	✓				✓
Invasion and establishment of exotic vines and scramblers	✓				✓
Invasion and establishment of Scotch broom (*Cytisus scoparius*)	✓				✓
Invasion and establishment of the Cane Toad (*Bufo marinus*)	✓	✓			✓
Invasion, establishment and spread of *Lantana camara*	✓				✓
Invasion of native plant communities by African Olive (*Olea europaea* L. subsp. *cuspidata*)	✓				✓
Invasion of native plant communities by *Chrysanthemoides monilifera* (bitou bush and boneseed)	✓				✓
Invasion of native plant communities by exotic perennial grasses	✓	✓			✓
Invasion of the yellow crazy ant (*Anoplolepis gracilipes* (Fr. Smith)) into NSW	✓				✓
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.	✓	✓			✓
Loss of biodiversity and ecosystem integrity following invasion by the Yellow Crazy Ant (*Anoplolepis gracilipes*) on Christmas Island, Indian Ocean.		✓			✓
Loss of hollow-bearing trees	✓				✓
Loss or degradation (or both) of sites used for hill-topping by butterflies	✓				✓
Predation and hybridisation of feral dogs (*Canis lupus familiaris*)	✓				✓
Predation by the European red fox (*Vulpes* vulpes)	✓	✓			✓
Predation by the feral cat (*Felis catus*)	✓	✓			✓
Predation by exotic rats on Australian offshore islands of less than 1000 km^2 (100,000 ha)		✓			✓
Predation by *Gambusia holbrooki* Girard, 1859 (Plague Minnow or Mosquito Fish)	✓				✓
Predation by the Ship Rat (*Rattus rattus*) on Lord Howe Island	✓				✓
Predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*)	✓	✓			✓
Removal of dead wood and dead trees	✓				✓

The minor nature of the Proposal, which does not require clearing activity within this EEC area, is such that no KTPs associated with Lowland Rainforest EEC are considered likely to be substantially contributed to,

especially with effective implementation of the safeguards in RMS (2012). Additionally, although the Proposal requires vegetation removal, none would occur within this EEC.

Conclusion

The Proposal will not result in the direct removal of any of the Lowland Rainforest EEC and is unlikely to have a significant impact on the ongoing viability of this community at the site.

Seven-part Test of Significance for Threatened Fauna

Seven-part Tests of Significance are required for the following threatened fauna species:

Fauna:

- Green-thighed Frog;
- Glossy-black Cockatoo;
- Grey-crowned Babbler;
- Little Lorikeet;
- Black-chinned Honeyeater;
- Varied Sittella;
- Square-tailed Kite;
- Barking Owl;
- Powerful Owl;
- Masked Owl;
- Hoary Wattled Bat;
- Little Bentwing-bat;
- Eastern Bentwing-bat;
- Eastern Freetail-bat;
- Large-eared Pied Bat;
- Yellow-bellied Sheathtail-bat
- Greater Broad-nosed Bat
- Yellow-bellied Glider;
- Squirrel Glider;
- Brush-tailed Phascogale;
- Eastern Pygmy-possum;
- Common Planigale;
- Rufous Bettong;
- Grey-headed Flying Fox:
- Koala; and
- Spotted-tailed Quoll.

As the potential impact level of the Proposal is low, a generic seven-part test was conducted that covers all of the subject species. The habitat values within the site and extent of local population per species/species group are detailed below. The responses to the seven-part tests are structured as follows:

- Part **(a)**, **(d)**, **(f)** and **(g)** are answered per species or as a collective group of species depending on the nature of impacts.
- Part **(b)** deals specifically with Endangered Populations and is not relevant to the subject threatened species listings.
- Part **(c)** deals specifically with EECs, hence is not relevant to this threatened fauna species assessment.
- Part **(e)** deals with Critical Habitat which is not relevant to the subject species/Proposal.

Green-thighed Frog

Study Area Habitat Values and Local Population Extent.

The site provides a small area of potential foraging habitat for the local population of the subject species population, forming a fraction of the potential habitat available locally. Potential aquatic breeding habitat occurs in ephemeral pools along drainage lines and low lying depressions within the study area. Potential local population and interconnected sub-populations of the subject species may extend outside the study area in adjacent open forest and grassy paddock areas.

Glossy Black-cockatoo

Study Area Habitat Values and Local Population Extent.

Allocasuarina (she-oak) species are present in some areas of the site as a midstorey species within Open Forest and are potential feed trees for Glossy Black-cockatoo. *Allocasuarina* was not a dominant feature of the forests, and rather occurred sporadically across the site. Glossy Black-cockatoo are mobile species with a significant foraging range, but rely on the presence of hollow-bearing trees for breeding. Given the high mobility of this species, the range of the local population would extend well beyond the confines of the study area. For this assessment the local population would include all pairs/colonies dependant on habitat within a 10 km radius of the site to satisfy foraging and/or breeding requirements.

Grey-crowned Babbler, Little Lorikeet, Black-chinned Honeyeater and Varied Sittella

The open forest habitats in the study area would provide potential foraging and nesting habitat for the subject species, and specifically hollow-bearing trees in the study area may provide potential nesting habitat for the Little Lorikeet. The range of the local population of the subject species would extend well beyond the confines of the site. For this assessment, the local population would comprise of all known sub-populations within a 10 km radius of the site.

Square-tailed Kite

This medium-sized raptor is a specialised predator of nestling birds in passerine-rich open forests, woodlands and adjacent heathlands. Square-tailed Kites depart the breeding grounds of passerines when the latter finish breeding or migrate. Nesting generally occurs near water courses in open forest or woodland (OEH undated).

The site is considered to contain suitable foraging habitat for this species as part of its extensive foraging range. Larger eucalypts may also provide possible nesting opportunities. The range of the local Square-tailed Kite population would extend well beyond the confines of the site into other forest/woodland areas in the locality.

Barking Owl, Powerful Owl and Masked Owl

The open forests of the study area provide potential foraging habitat for both of the subject species. The subject species have very large home ranges, up to hundreds of hectares in size that may encompass the study area.

The locality includes extensive areas of open forest habitat that could be used by these highly mobile species (e.g. Newfoundland State Forest and forested areas to the east and west of the existing Pacific Highway). For this assessment, the local populations of these species would consist of all individuals/pairs whose core range is based within the locality.

Hoary Wattled Bat, Little Bent-wing Bat, Eastern Bentwing-bat, Eastern Freetail-bat, Yellow-bellied Sheathtail-bat, Greater Broad-nosed Bat and Large-eared Pied Bat

Study Area Habitat Values and Local Population Extent.

The site and general area (particularly forest areas) offer aerial foraging habitat for all of the subject species. Relative to the extent of habitat locally, the site offers only a limited area of potential foraging habitat as part of the local population of the subject species wider foraging range.

Potential roosting habitat for the subject species in the study area includes:

- hollow-bearing trees: provides potential breeding roosting habitat for the Eastern Freetail-bat, Hoary Wattled Bat and Yellow-bellied Sheathtail-bat; though only potential non-breeding roosting for Little Bent-wing Bat and Eastern Bentwing-bat;
- rock overhangs and crevices may provide potential breeding roosting habitat Large-eared Pied Bat; and
- decorticating bark: provide potential non-breeding roosting habitat only for a number of the subject species.

The range of the local population for these species extends well beyond the confines of the study area. For this assessment the local population for these species would include all individuals/colonies dependant on habitat within a 10 km radius of the site to satisfy foraging and/or breeding requirements.

Grey-headed Flying-fox

Study Area Habitat Values and Local Population Extent.

The Dry Open Forest, Moist Open Forest, and Rainforest at the site forms a minor fraction of the local Grey-headed Flying-fox population's opportunistic foraging range. The site is not known roosting habitat for the species. A significant Grey-headed Flying-fox maturity roost is known to occur locally at Woolgoolga, approximately 15 km south of the site. Due to the species' ecology and the high mobility of the subject species, the site offers only a fraction of the local portion of these species opportunistic foraging range. The entire Grey-headed Flying-fox population along the east coast of Australia is known to integrate and inter-breed, and hence constitutes a single population.

Koala

Study Area Habitat Values and Local Population Extent.

The open forests at the site supports scattered Koala food tree species, consisting of Tallowwood, Grey Gum and Scribbly Gum. The results of this assessment suggest the study area does not support a core part of a local sub-populations range and is likely mainly to be used as secondary habitat. The SAT assessment indicated that Koala usage is likely to be low at the site. For this assessment, the local population would include all interconnected potential occurring sub-populations within Newfoundland State Forest and other forested areas to the east and west of the site.

Yellow-bellied Glider

Study Area Habitat Values and Local Population Extent.

The open forests of the study area provides potential foraging habitat for the subject species. Yellow-bellied Gliders are highly mobile species and individuals can have home ranges of up to 100 ha.

These species require mature or old-growth forest to sustain breeding populations. The study area consists of disturbed open forest, with limited tree hollow development, and would not be classed as mature or old-growth.

Suitable breeding habitat is likely to occur in the locality, which includes extensive areas of open forest and woodland habitat that could be used by these highly mobile species (e.g. Newfoundland State Forest and forested areas to the east and west of the existing Pacific Highway). For this assessment, the local populations of these species would consist of all individuals/sub-populations whose core range is based within the locality.

Squirrel Glider, Brush-tailed Phascogale and Eastern Pygmy-possum

Extensive open forests (and rainforest for the Eastern Pygmy-possum) on the site provides potential foraging and denning/shelter habitat for the subject species (the latter by way of the presence of a number of hollow-bearing trees).

The occurrence of potential habitat locally for the subject species would extend well beyond the confines of the study area, including habitat in Newfoundland State Forest and interconnected forested areas to the east and west of the existing Pacific Highway. For this assessment, the local populations of these species would consist of all individuals/sub-populations whose core range is based within the locality.

Common Planigale

Common Planigale are found in rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and they usually occur close to water. They breed from October to January and females build nests lined with grass, eucalypt leaves and shredded bark (OEH undated). For this assessment, the local populations of these species would consist of all individuals/sub-populations whose core range is based within the locality.

Rufous Bettong
Potential breeding and foraging habitat for Rufous Bettong occurs where a dense understorey of native grasses such as Blady Grass (*Imperata cylindrica*) and Kangaroo Grass (*Themeda australis*) is present in open forest within the subject area. Similar habitat occurs widely throughout the locality.

For this assessment, the local populations of these species would consist of all individuals/sub-populations whose core range is based within the locality.

The Proposal requires the removal/modification of a small area of dry open forest habitat with a grassy understorey. This constitutes only a small portion of habitat available to this species in the broader study area.

Spotted-tailed Quoll
The Spotted-tailed Quoll was once widely spread throughout south-eastern Australia, but is now only considered common in Tasmania. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites.

Females occupy home ranges up to about 750 hectares and males up to 3500 hectares; usually traverse their ranges along densely vegetated creek lines. Average litter size is five; both sexes mature at about one year of age (OEH undated).

A number of records of the Spotted-tailed Quoll occur within 10 km of the site (refer to **Appendix C**) with two site within 1 km of the site to the east in Newfoundland State Forest.

The occurrence of potential habitat locally for the subject species would extend well beyond the confines of the study area, including habitat in Newfoundland State Forest and interconnected forested areas to the east and west of the existing Pacific Highway. For this assessment, the local populations of these species would consist of all individuals/sub-populations whose core range is based within the locality.

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

The Proposal is to conduct geotechnical investigations to inform the final design of the Range Road interchange at Dirty Creek. Clearing for GIs and access tracks in adjacent open forest communities at the site would involve vegetation removal estimated to consist of 321 m^2 of Dry Open Forest (Blackbutt association).

Clearing associated with the GIs would be minimal and generally located adjacent to cleared areas, in grassed areas, or on fallow previously disturbed land. Clearing of trees would only be undertaken as a last resort if an access track or GI site could not be located in an open area (RMS 2012).

The impact on the viability of the local population of the subject species is described below.

Green-thighed Frog
The Proposal would result in the loss/modification of a small area of potential foraging habitat for the Green-thighed Frog. The Proposal also imposes a risk of indirect impacts to adjacent and lower catchment habitats (e.g. water quality and sedimentation and erosion impacts), which includes potential breeding and foraging habitat. While this is a negative (incremental and cumulative) affect, the Green-thighed Frog is not considered likely to be significantly affected given:

- only a minor fraction of the foraging habitat available to the subject species in the study area and broader locality would be directly affected;

- no significant potential breeding habitat would be affected;
- the locality includes extensive areas of potential habitat (e.g. within Newfoundland State Forest and forested areas to the east and west of the Pacific Highway) which would not be affected by the Proposal; and
- the Proposal would be undertaken following the mitigations measures detailed in the corresponding Geotechnical Investigations EA (RMS 2012), ensuring that potential indirect impacts (e.g. erosion and sedimentation, water quality) on adjacent habitats are minimised.

Overall the Proposal is not likely to have an adverse effect on the life cycle of the Green-thighed Frog such that a viable local population is likely to be placed at significant risk of extinction.

Glossy Black-cockatoo

Glossy Black-cockatoo was not observed during site inspections, nor was there evidence of feeding of this species by way of chewed cones beneath one of its feed trees Forest Oak (*Allocasuarina torulosa*). This species occurs sporadically at the site as a midstorey species. Clearing of Forest Oak trees associated with the Proposal would only be undertaken as a last resort if an access track or GI site could not be located in an open area. No potential nesting habitat for the Glossy Black-cockatoo would be affected.

Considering that this species is highly mobile and a large area of suitable habitat exists at the broader locality, it is not expected that the proposed action will have an adverse effect on the life cycle of the species such that a viable local population is likely to be placed at risk of extinction.

Grey-crowned Babbler, Little Lorikeet, Black-chinned Honeyeater and Varied Sittella

Clearing of trees or shrubs would only be undertaken as a last resort if an access track or GI site could not be located in an open area. In this case, the Proposal would potentially result in the loss of a small area of potential foraging habitat for the subject species. While this is a negative effect, the Proposal is considered unlikely to significantly affect any potentially occurring local population of the subject species as:

- only a minor fraction of the foraging resources available in the study area and broader locality would be directly affected;
- the subject species would continue to be able to move between local habitats post-works;
- the locality includes extensive areas of potential habitat (eg. Newfoundland State Forest and forested areas to the east and west of the Pacific Highway) which would not be affected by the Proposal;
- other threats to the Grey-crowned Babbler (e.g. predation), would not be increased by the Proposal; and
- no hollow-bearing trees that may be potential nesting sites for Little Lorikeet would be removed as part of the Proposal.

Overall the Proposal is considered unlikely to have an adverse effect on the life cycle of the subject species such that a viable local population is likely to be placed at significant risk of extinction.

Square-tailed Kite

Clearing of trees or shrubs that are represent potential foraging or nesting habitat for this species would only be undertaken as a last resort if an access track or GI site could not be located in an open area. In this case, the Proposal would potentially result in the loss of a small area of potential foraging habitat for the subject species. While this is a negative effect, the Proposal is considered unlikely to significantly affect any potentially occurring local population of the subject species as:

- only a minor fraction of the foraging resources available in the study area and broader locality would be directly affected;
- the subject species would continue to be able to move between local habitats post-works;
- the locality includes extensive areas of potential habitat (eg. Newfoundland State Forest and forested areas to the east and west of the Pacific Highway) which would not be affected by the Proposal;
- no large eucalypt trees or stags that may be potential nesting sites for the subject species would be removed as part of the Proposal.

Overall the Proposal is considered unlikely to have an adverse effect on the life cycle of the Square-tailed Kite such that a viable local population is likely to be placed at significant risk of extinction.

Barking Owl, Powerful Owl and Masked Owl

Clearing of trees that may form part of a larger stand of forest that provides potential foraging for threatened forest owls would only be undertaken as a last resort if an access track or GI site could not be located in an open area. In this case, the Proposal would potentially result in the loss of a small area of potential foraging habitat for the subject species. While this is a negative effect, the Proposal is considered unlikely to significantly affect any potentially occurring local population of the subject species as:

- only a limited area of potential foraging habitat would be directly affected;
- extensive areas of potential foraging and roosting habitat occur locally (e.g. Newfoundland State Forest and forested areas to the east and west of the Pacific Highway) and would not be directly or substantially indirectly affected by the Proposal;
- the subject species are highly mobile and would continue to be able to move between local habitats post establishment of the works; and
- no potential nesting habitat would be affected.

The Proposal is considered unlikely to have an adverse impact on the life cycle of the subject species such that a viable local population is likely to be placed at significant risk of extinction.

Hoary Wattled Bat, Little Bent-wing Bat, Eastern Bentwing-bat, Eastern Freetail-bat, Yellow-bellied Sheathtail-bat, Greater Broad-nosed Bat and Large-eared Pied Bat

The Proposal requires the removal/ modification of a small area of potential open forest aerial foraging habitat that may be utilised by the subject species. The Proposal (worst case clearing scenario) may also require the removal/modification of a small area of potential Eastern Freetail-bat roosting habitat beneath eucalypt bark. The Proposal is considered unlikely to significantly affect the local population of the subject species as:

- only a very limited area of potential habitat at the site would be directly affected and the foraging carrying capacity of the area is unlikely to be significantly reduced;
- the locality includes extensive areas of potential habitat (e.g. Newfoundland State Forest and forested areas to the east and west of the Pacific Highway) which would not be affected by the Proposal; and
- the majority of habitat and key habitat features that may be utilised by this species (e.g. hollow-bearing trees, rock overhangs) would remain intact in the study area following construction, and hence the carrying capacity of the study area would be largely unchanged post construction.

The Proposal is considered unlikely to have an adverse impact on the life cycle of the subject species such that a viable local population is likely to be placed at significant risk of extinction.

Grey-headed Flying-fox

The habitat removal required as part of the Proposal may include removal of potential flowering foraging sources for the Grey-headed Flying-fox, consisting primarily of shrub species. While this is a negative incremental effect, the Proposal is considered unlikely to have a significant effect on the subject local population of the subject species as:

- only a minor fraction of the foraging and potential nesting resources available in the study area and broader locality would be directly affected;
- a limited area of moderate quality habitat adjacent to the Pacific Highway would be directly affected;
- alternative foraging habitat in the locality is extensive and would continue to provide potential habitat for the subject species;
- no barriers to the movement of this species would be created;
- no known or likely roosting habitat would be affected; and
- the Proposal would be undertaken following the mitigations measures detailed in the corresponding Geotechnical Investigations EA (RMS 2012), ensuring that potential indirect impacts (e.g. erosion and sedimentation) on adjacent habitats are minimised.

Overall, while the Proposal would impose some minor incremental and cumulative negative effects, the life cycle of the subject species is unlikely to be significantly affected such that a viable local population is likely to be placed at risk of extinction.

Koala

GI sites would generally be located adjacent to cleared areas, in grassed areas, or on fallow previously disturbed land. Clearing of trees (potentially including Koala food trees) would only be undertaken as a last resort if an access track or GI site could not be located in an open area. Even if a small number of Koala feed trees were to be removed as part of the Proposal the impacts on Koala are unlikely to be significant as:

- the site appears only to be subject to a low level of Koala usage;
- only a minor fraction of the foraging resources available in the study area and broader locality would be directly affected;
- Koalas are highly mobile and would continue to be able to move between local habitats post-works; and
- the locality includes extensive areas of potential habitat (e.g. Newfoundland State Forest and forested areas to the east and west of the Pacific Highway) which would not be affected by the Proposal.

Overall the Proposal is considered unlikely to have an adverse effect on the life cycle of the Koala such that a viable local population is likely to be placed at significant risk of extinction.

Yellow-bellied Glider, Squirrel Glider, Brush-tailed Phascogale and Eastern Pygmy-possum

The Proposal requires the removal/ modification of a small area of potential foraging habitat that may be utilised by the subject species. This is considered unlikely to have a significant effect on a potentially occurring local population of the subject species as:

- only a very limited area of potential habitat at the site would be directly affected;
- only a minor fraction of the open forest foraging resources available in the study area and broader locality would be directly affected;
- the locality includes extensive areas of potential habitat (e.g. Newfoundland State Forest and forested areas to the east and west of the Pacific Highway) which would not be affected by the Proposal;
- the majority of habitat and key habitat features that may be utilised by this species (e.g. hollow-bearing trees, foraging resources) would remain intact in the study area following construction, and hence the carrying capacity of the study area would be largely unchanged post construction; and
- all of the subject species would continue to be able to move between local habitats post establishment of the works.

Common Planigale

The Proposal requires the removal/ modification of a small area of potential foraging and nesting habitat that may be utilised by the subject species. This is considered unlikely to have a significant effect on a potentially occurring local population of the subject species as:

- only a very limited area of potential habitat at the site would be directly affected;
- only a minor fraction of the open forest foraging resources available in the study area and broader locality would be directly affected.
- the locality includes extensive areas of potential habitat (e.g. Newfoundland State Forest and forested areas to the east and west of the Pacific Highway) which would not be affected by the Proposal; and
- the majority of habitat and key habitat features that may be utilised by this species (e.g. hollow-bearing trees, foraging resources) would remain intact in the study area following construction, and hence the carrying capacity of the study area would be largely unchanged post construction.

Rufous Bettong

The Proposal is considered unlikely to have a significant effect on a potentially occurring local population of Rufous Bettong as:

- only a very limited area of potential grassy dry open forest habitat would be directly affected;

- only a minor fraction of the required understorey habitat utilised by Rufous Bettong in the study area would be directly affected;
- the majority of habitat and key habitat features that may be utilised by this species (e.g. foraging resources, hollow logs etc.) would remain intact in the study area following construction, and hence the carrying capacity of the study area would be largely unchanged post construction;
- the locality includes extensive areas of potential habitat (e.g., Newfoundland State Forest and interconnected forested areas to the east and west of the Pacific Highway) which would not be affected by the Proposal; and
- all of the subject species would continue to be able to move between local habitats post establishment of the works.

The Proposal is considered unlikely to have an adverse impact on the life cycle of the subject species such that a viable local population is likely to be placed at significant risk of extinction.

Spotted-tailed Quoll
The Proposal is considered unlikely to have a significant effect on a potentially occurring local population of Spotted-tailed Quoll as:

- only a very limited area of potential foraging/denning habitat of the target species would be directly affected by the Proposal;
- the majority of habitat and key habitat features that may be utilised by this species (e.g. foraging resources, hollow logs etc.) would remain intact in the study area following construction and hence the carrying capacity of the study area would be largely unchanged post construction;
- all of the subject species would continue to be able to move between local habitats post establishment of the works; and
- the very large home range of this species means that the vast majority of habitat utilised by this species at the locality would not be significantly impacted by the Proposal, with extensive areas remaining post construction in Newfoundland State Forest and interconnected forested areas to the east and west of the Pacific Highway).

  The Proposal is considered unlikely to have an adverse impact on the life cycle of the subject species such that a viable local population is likely to be placed at significant risk of extinction.

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

All Subject Species
No consideration under this part of the assessment is required.

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

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

All Subject Species
No consideration under this part of the assessment is required.

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

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

All Subject Species
Clearing for GIs and access tracks in adjacent open forest communities at the site would involve vegetation removal estimated to consist of 321 m^2 of Dry Open Forest (Blackbutt association).

Clearing associated with the GIs would be minimal and generally located adjacent to cleared areas, in grassed areas, or on fallow previously disturbed land. Clearing of trees would only be undertaken as a last resort if an access track or GI site could not be located in an open area (RMS 2012).

Effective implementation of the mitigations measures detailed in the Geotechnical Investigations EA (RMS 2012) would minimise the risk of adjacent habitats being significantly affected by indirect impacts (e.g. by erosion and sedimentation, water quality impacts).

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

All Subject Species
Areas are considered likely to become 'fragmented or isolated' if the Proposal is likely to create a situation preventing future movement of individuals between these areas.

The locations and scale of vegetation removal associated with GIs at the site would not add to existing fragmentation or isolation of the habitat for any of the subject species.

Overall while the Proposal may result in some minor incremental and cumulative effects, it is not considered likely to remove, modify, fragment or isolate any habitat significant to the long-term survival of the subject species at the locality.

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

All Subject Species
The Proposal only affects a limited area of potential habitat locally for the known/potential local population of the subject species. Considering this and that the Proposal is considered unlikely to have an adverse effect on the lifecycle of any of the subject species such that a viable local population is likely to be placed at risk of extinction (refer to responses in *(a)*); the habitat affected by the Proposal is not considered significant to the long-term survival of these species in the locality.

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

No areas of critical habitat are listed under the TSC Act within the study area nor are there any areas of critical habitat any of these subject species listed under the TSC Act.

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

All Subject Species – Introduction
Part 4 of the TSC Act states "*The object of a recovery plan is to promote the recovery of the threatened species, population or ecological community to which it relates to a position of viability in nature*." Any development which adversely affects threatened species or their habitat, or contributes to relevant KTPs may be interpreted as being inconsistent with this general objective. Specific recovery and threat abatement strategies are discussed below.

Koala
An approved recovery plan currently exists for the Koala (DECC 2008), however the specific objectives of this recovery plan are not relevant to the Proposal. The Proposal would not have a significant negative effect on

any of the priority actions associated with the Koala (OEH website: www.threatenedspecies.environment.nsw.gov.au)

Overall the Proposal is not considered significantly inconsistent with the specific objectives or actions of the relevant recovery plan or priority actions.

Grey-headed Flying-fox
A draft recovery plan currently exists for the Grey-headed Flying-fox (DECCW 2009). The specific objectives and actions of this plan are not likely to be affected by the Proposal. The Proposal would not have a significant negative effect on any of the priority actions associated with the Grey-headed Flying-fox (OEH website: www.threatenedspecies.environment.nsw.gov.au).

Overall the Proposal is not considered significantly inconsistent with the specific objectives or actions of the relevant recovery plan or priority actions.

Yellow-bellied Glider
A recovery Plan has been developed for Yellow-bellied Glider (NPWS 2003). The Proposal is consistent with the objectives of this recovery plan. Furthermore, the Proposal would not have a significant, long-term negative effect on any of the priority actions associated with the subject species (OEH website: *www.threatenedspecies.environment.nsw.gov.au*).

Barking Owl, Powerful Owl and Masked Owl
The 'Recovery Plan for the Large Forest Owls' (DEC 2006) applies for the subject species. The Proposal is consistent with the objectives and actions of this plan. The Proposal is also consistent with priority actions associated with the subject species (OEH website: *www.threatenedspecies.environment.nsw.gov.au*).

All Remaining Subject Species
Although there are no recovery plans developed for the remaining subject species, the Proposal is also consistent with the priority actions for these species (these actions can be found on the OEH website: *www.threatenedspecies.environment.nsw.gov.au*).

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

A KTP is defined under the TSC Act as a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities. The current list of KTPs under the TSC Act, and whether the Proposal is recognised as a KTP is shown in **Table E.2**.

Table E.2 Key Threatening Processes

Listed Key Threatening Process (as described in the final determination of the Scientific Committee to list the threatening process)	***Legislation***		***Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?***		
	TSC Act	***EPBC Act***	***Likely***	***Possible***	***Unlikely***
Alteration of habitat following subsidence due to longwall mining	✓				✓
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	✓				✓
Anthropogenic climate change	✓	✓	✓		
Bush rock removal	✓				✓
Clearing of native vegetation	✓	✓	✓		
Competition and grazing by the feral European Rabbit (*Oryctolagus cuniculus*)	✓	✓			✓

Listed Key Threatening Process (as described in the final determination of the Scientific Committee to list the threatening process)	*Legislation*		*Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?*		
	TSC Act	*EPBC Act*	*Likely*	*Possible*	*Unlikely*
Competition and habitat degradation by feral goats (*Capra hircus*)	✓	✓			✓
Competition from feral honeybees (*Apis mellifera*)	✓				✓
Death or injury to marine species following capture in shark control programs on ocean beaches	✓				✓
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments	✓	✓			✓
Forest Eucalypt dieback associated with over-abundant psyllids and bell miners	✓				✓
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	✓				✓
Herbivory and environmental degradation caused by feral deer	✓				✓
Importation of red imported fire ants (*Solenopsis invicta*)	✓	✓			✓
Incidental catch (bycatch) of Sea Turtles during coastal otter-trawling operations within Australian waters north of 28 degrees South		✓			✓
Incidental catch (or bycatch) of seabirds during oceanic longline fishing operations		✓			✓
Infection by Psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations	✓	✓			✓
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	✓	✓		✓	
Infection of native plants by *Phytophthora cinnamomi*	✓	✓		✓	
Introduction of the large earth bumblebee (*Bombus terrestris*)	✓				✓
Invasion and establishment of exotic vines and scramblers	✓			✓	
Invasion and establishment of Scotch broom (*Cytisus scoparius*)	✓				✓
Invasion and establishment of the Cane Toad (*Bufo marinus*)	✓	✓			✓
Invasion, establishment and spread of *Lantana camara*	✓			✓	
Invasion of native plant communities by African Olive (*Olea europaea* L. subsp. *cuspidata*)	✓				✓
Invasion of native plant communities by *Chrysanthemoides monilifera* (bitou bush and boneseed)	✓				✓
Invasion of native plant communities by exotic perennial grasses	✓	✓		✓	

Listed Key Threatening Process (as described in the final determination of the Scientific Committee to list the threatening process)	*Legislation*		*Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?*		
	TSC Act	*EPBC Act*	*Likely*	*Possible*	*Unlikely*
Invasion of the yellow crazy ant (*Anoplolepis gracilipes* (Fr. Smith)) into NSW	✓				✓
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.	✓	✓			✓
Loss of biodiversity and ecosystem integrity following invasion by the Yellow Crazy Ant (*Anoplolepis gracilipes*) on Christmas Island, Indian Ocean.		✓			✓
Loss of hollow-bearing trees	✓				✓
Loss or degradation (or both) of sites used for hill-topping by butterflies	✓				✓
Predation and hybridisation of feral dogs (*Canis lupus familiaris*)	✓				✓
Predation by the European red fox (*Vulpes* vulpes)	✓	✓			✓
Predation by the feral cat (*Felis catus*)	✓	✓			✓
Predation by exotic rats on Australian offshore islands of less than 1000 km2 (100,000 ha)		✓			✓
Predation by *Gambusia holbrooki* Girard, 1859 (Plague Minnow or Mosquito Fish)	✓				✓
Predation by the Ship Rat (*Rattus rattus*) on Lord Howe Island	✓				✓
Predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*)	✓	✓			✓
Removal of dead wood and dead trees	✓			✓	

The main KTP listed under the TSC Act which the Proposal may contribute to which are relevant to the subject species include clearing of native vegetation, removal of deadwood and dead trees and anthropogenic climate change.

Clearing of native vegetation is defined as the destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation so as to result in the loss, or long term modification, of the structure, composition and ecological function of stand or stands (OEH undated). The Proposal would contribute to this process by requiring the removal of a minor area of vegetation at the site.

Anthropogenic climate change is evidence that modification of the environment by humans may result in future climate change. Human induced activities as a result of energy use, industrial processes, solvent and other product use, agriculture, land use change and forestry, and waste cause greenhouse gas emissions (OEH undated).

The Proposal is not considered likely to significantly contribute to any other KTP, especially with effective implementation of the safeguards provided in the Geotechnical Investigations EA (RMS 2012).

Conclusion

While the Proposal may impose some minor negative (incremental and cumulative) effects, it is unlikely that the Proposal would significantly adversely affect the local population viability of any of the subject threatened fauna species.

References

Department of Environment and Conservation (DEC) (2005), *Approved Recovery Plan for* Quassia *sp. Mooney Creek (Moonee Quassia)*, Department of Environment and Conservation (NSW), Hurstville.

Department of Environment and Conservation (DEC) (2006). *NSW Recovery Plan for the Large Forest owls: Powerful Owl (Ninox Strenua), Sooty Owl (Tyto tenebricosa) and Masked Owl (Tyto novaehollandiae).* DEC, Sydney.

Department of Environment and Climate Change (DECC) (2008). *NSW Recovery Plan for the Koala* (*Phascolarctos cinereus*) DEC, Sydney.

Department of Environment, Climate Change and Water (DECCW) (2009). *Draft National Recovery Plan for the Grey-headed Flying-fox* (*Pteropus poliocephalus*) Prepared by Dr Peggy Eby. Department of Environment, Climate Change and Water NSW, Sydney.

Keighery, G.J. (1996). Phytogeography, Biology and Conservation of Western Australian Epacridaceae. *Annals of Botany* **77**: 347-355.

NSW National Parks and Wildlife Service (NPWS) (2003). *Recovery Plan for the Yellow-bellied Glider* (*Petaurus*
australis). NSW National Parks and Wildlife Service, Hurstville.

Office of Environment and Heritage (OEH) (undated). *Threatened species profiles* (online) http://www.threatenedspecies.environment.nsw.gov.au/tsprofile Accessed 26/09/2012

Roads and Maritime Services (RMS) (2012). WOOLGOOLGA TO BALLINA PACIFIC HIGHWAY UPGRADE Environmental assessment to inform detailed geotechnical investigations between Woolgoolga and Glenugie. Roads and Maritime Services, Grafton.

Appendix F

EPBC Act Migratory Species: Significant Impact Criteria Assessment

Migratory Species
The site provides a small area of foraging and possibly roosting and nesting habitat for a number of habitat generalist EPBC Act listed migratory species (e.g. Rufous Fantail, *Rhipidura rufifrons*, Cattle Egret (*Bubulcus ibis*) as part of an extensive area of similar quality habitat throughout the general locality and beyond. The site does not provide particularly significant foraging, roosting or nesting habitat for any migratory species populations.
DEH (2006) states that "*an area of 'important habitat' for a migratory species is:*

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

The site does not constitute important habitat for any migratory species populations. It provides a relatively small area of opportunistic foraging and possibly roosting and nesting habitat for a number of somewhat habitat generalist EPBC Act listed migratory species, as part of an extensive area of similar habitat throughout the general locality and beyond.

Migratory Species Significant Impact Criteria Assessment
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

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

The Proposal does not affect habitat that constitutes important habitat for any other migratory species population. Consequently the Proposal is not considered likely to substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species:

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

The Proposal does not affect habitat that constitutes important habitat for any other migratory species population. Additionally the nature of the Proposal is such that no invasive species are considered likely to be introduced:

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

The site only provides a relatively small area of opportunistic foraging and possibly roosting and nesting habitat for a number of somewhat habitat generalist EPBC Act listed migratory species as part of an extensive area of similar quality habitat throughout the general locality and beyond. The site does not provide any significant foraging, roosting or nesting habitat for any migratory species populations. Mitigation measures detailed in RMS (2012) would minimise any potential environmental impacts of the Proposal.

Overall the Proposal is not considered likely to seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

Conclusion
While the Proposal would have some negative impacts (e.g. vegetation removal) it is considered unlikely to result in a significant impact on any migratory listed species. Consequently referral to SEWPaC and approval by the Minister is not required.

Reference

DEH (2006). *EPBC Act Policy Statement 1.1: Significant Impact Guidelines - Matters of National Environmental Significance*. Australian Government Department of the Environment and Heritage.

Appendix G

Raw Data from Habitat Assessment Plots

GPS waypoint id	Easting	Northing	Vegetation Type/Habitat type	Presence of Hollow Trees?	Groundcover type and density (%)	Degree of disturbance	Evidence of burning/fire regime?	Presence of water features?	% Koala feed trees
1	513356	6683326	Dry Open Forest (Blackbutt association) and Swamp Sclerophyll Forest EEC and Farm Dam	No	Open water and fringing vegetation - 70%, grasses/lilies - 20%, ferns/shrubs - 10%	moderate (logged forest, no large trees)	Yes (burnt bark)	Yes (constructed farm dam)	Tallowwood (*Eucalyptus microcorys*) <15%
2	513352	6683278	Dry Open Forest (Blackbutt association) and Swamp Sclerophyll Forest EEC	No	Grasses/lilies - 70%, ferns/shrubs - 25%	moderate (logged forest, no large trees)	Yes (burnt bark)	Yes (ephemeral drainage line)	Swamp Mahogany (*Eucalyptus robusta*) <15%
3	513354	6683232	Dry Open Forest (Blackbutt association) and Swamp Sclerophyll Forest EEC	No	Grasses/lilies - 60%, shrubs - 30%, leaf litter 10%	moderate (logged forest, no large trees)	Yes (burnt bark)	Yes (ephemeral drainage line)	none
4	513353	6683185	Dry Open Forest (Blackbutt association)	No	Shrubs - 60%, grasses/lilies - 30%, , leaf litter 10%	moderate (logged forest, no large trees)	Yes (burnt bark and logs)	No	none
5	513351	6683137	Exotic Pastureland	No	Grasses/lilies - 90%, , bare ground 10%	high (previously cleared and mounded for orchard)	No	No	none
6	513344	6683093	Exotic Pastureland	No	Grasses/lilies - 75%, bare ground 25%	high (previously cleared and mounded for orchard)	No	No	none
7	513345	6683048	Dry Open Forest (Blackbutt association)	No	Leaf litter 50%, grasses/lilies - 45%, fallen dead wood 5%	moderate (logged forest, no large trees)	Yes (burnt bark and logs) <10 years	No	Grey Gum (*Eucalyptus propinqua*) <15%
8	513357	6683001	Dry Open Forest (Blackbutt association)	No	Leaf litter 44%, grasses/lilies - 55%, fallen dead wood 1%	moderate (logged forest, no large trees)	Yes (burnt bark and logs) <10 years	No	Grey Gum (*Eucalyptus propinqua*) <15%
9	513391	6682961	Dry Open Forest (Blackbutt association) & Exotic Pastureland	No	Dry Open Forest - Leaf litter - 43%, Grasses/lilies - 55%, Fallen Dead Wood - 2%; Exotic Pastureland - Grasses/lilies - 80%, bare ground - 20%	moderate/high (previously logged young forest and cleared pasture/orchard	Yes (burnt bark and logs) <10 years	No	Grey Gum (*Eucalyptus propinqua*) <15%

GPS waypoint id	Easting	Northing	Vegetation Type/Habitat type	Presence of Hollow Trees?	Groundcover type and density (%)	Degree of disturbance	Evidence of burning/fire regime?	Presence of water features?	% Koala feed trees
10	513482	6683405	Dry Open Forest (Blackbutt association) and cleared powerline easement	No	Grasses/lilies - 50%, Shrubs - 30%, litter - 15%, bare ground - 4%, fallen dead wood - 1%,	Moderate-high (young logged forest with few large trees & edge of farm & powerline easement)	Yes - (burnt bark and fallen wood)	No	No
11	513487	6683360	Dry Open Forest (Blackbutt association)	No	Shrubs - 50%, Grasses/lilies - 30%, litter - 15%, bare ground - 4%, fallen dead wood - 1%,	Moderate (young logged forest with few large trees & edge of farm)	Yes - (burnt bark and fallen wood)	No	No
12	513480	6683312	Dry Open Forest (Blackbutt association)	No	Shrubs - 60%, Grasses/lilies - 30%, litter - 5%, bare ground - 4%, fallen dead wood - 1%,	Moderate (young logged forest with few large trees & edge of farm)	Yes - (burnt bark and fallen wood)	No	No
13	513532	6683310	Dry Open Forest (Blackbutt association) and small area of orchard	No	Shrubs - 70%, Grasses/lilies - 20%, litter - 5%, bare ground - 4%, fallen dead wood - 1%,	Moderate (young logged forest with few large trees & edge of farm)	Yes - (burnt bark and fallen wood)	No	No
14	513497	6683264	Dry Open Forest (Blackbutt association)	Yes - TP HT015, TP HT016, TP HT017 & TP HT018	Shrubs - 60%, Grasses/lilies - 30%, litter - 4%, fallen dead wood - 1%,	Moderate (young logged forest with few large trees & edge of farm)	Yes - (burnt bark and fallen wood)	No	No
15	513550	6683264	Modified community - regenerating Dry Open Forest (Blackbutt association) minus overstorey	no	Shrubs - 70%, Grasses/lilies - 25%, bare ground - 4%, fallen dead wood - 1%,	Moderate-high (young regenerating forest)	No	No	No
16	513512	6683217	Modified community - regenerating Dry Open Forest (Blackbutt association) minus overstorey & farm/forestry dam	no	Shrubs - 50%, Grasses/lilies - 25%, Open water - 25%, bare ground - 4%, fallen dead wood - 1%,	Moderate-high (young regenerating forest & constructed dam)	Yes - (burnt bark and fallen wood)	yes - farm dam	No

GPS waypoint id	Easting	Northing	Vegetation Type/Habitat type	Presence of Hollow Trees?	Groundcover type and density (%)	Degree of disturbance	Evidence of burning/fire regime?	Presence of water features?	% Koala feed trees
17	513559	6683217	Modified community - regenerating Dry Open Forest (Blackbutt association) minus overstorey & farm/forestry dam	no	Shrubs - 70%, Grasses/lilies - 20%, Open water - 5%, bare ground - 4%, fallen dead wood - 1%,	Moderate-high (young regenerating forest & constructed dam)	No	yes - farm dam	No
18	513580	6683171	Dry Open Forest (Blackbutt association) & farm/forestry dam	Yes - TP HT014	Shrubs - 40%, Open water - 25%, Grasses/lilies - 20%, litter - 5%,	Moderate-high (young logged forest with few large trees & constructed dam)	Yes - (burnt bark and fallen wood)	yes - farm dam	No
19	513631	6683128	Dry Open Forest (Blackbutt association)	yes - TP HT013	Grasses/lilies - 65%, litter - 20%, shrubs - 10%, bare ground - 4%, fallen dead wood - 1%	Moderate (young logged forest with few large trees & edge of farm)	Yes - (burnt bark and fallen wood)	No	No
20	513534	6683171	Open water (farm dam)	n/a	open water - 100%	High (constructed farm dam)	n/a	yes - farm dam	n/a
21	513579	6683120	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 50%, shrubs - 25%, litter - 20%, bare ground - 4%, fallen dead wood - 1%	Moderate (young logged forest with few large trees & edge of farm)	Yes - (burnt bark and fallen wood)	Yes - edge of farm dam	No
22	513579	6683073	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 60%, litter - 20%, shrubs - 15%, bare ground - 4%, fallen dead wood - 1%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	No
23	513627	6683080	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 70%, litter - 20%, shrubs - 5%, bare ground - 4%, fallen dead wood - 1%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	No
24	513683	6683099	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 70%, litter - 20%, shrubs - 5%, bare ground - 4%, fallen dead wood - 1%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	No

GPS waypoint id	Easting	Northing	Vegetation Type/Habitat type	Presence of Hollow Trees?	Groundcover type and density (%)	Degree of disturbance	Evidence of burning/fire regime?	Presence of water features?	% Koala feed trees
25	513735	6683069	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 60%, shrubs - 20%, litter - 10%, bare ground - 10%	Moderate (young logged forest with few large trees & access road)	Yes - (burnt bark and fallen wood)	No	Tallowwood (*Eucalytpus microcorys*) <15%
26	513679	6683051	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 60%, shrubs - 20%, litter - 10%, bare ground - 10%	Moderate (young logged forest with few large trees & access road)	Yes - (burnt bark and fallen wood)	No	No
27	513630	6683033	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 60%, shrubs - 20%, litter - 10%, bare ground - 10%	Moderate (young logged forest with few large trees & access road)	Yes - (burnt bark and fallen wood)	No	No
28	513579	6683025	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 60%, shrubs - 20%, litter - 10%, bare ground - 10%	Moderate (young logged forest with few large trees & access road)	Yes - (burnt bark and fallen wood)	No	No
29	513630	6682985	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 50%, shrubs - 30%, litter - 10%, fallen dead wood -5%, bare ground - 5%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	No
30	513676	6683004	Dry Open Forest (Blackbutt association)	yes - TP HT012	Grasses/lilies - 50%, shrubs - 30%, litter - 10%, fallen dead wood -5%, bare ground - 5%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	No
31	513730	6683022	Dry Open Forest (Blackbutt association)	yes - TP HT011	Grasses/lilies - 50%, shrubs - 20%, litter - 20%, fallen dead wood -5%, rock - 5%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	Grey Gum (*Eucalyptus propinqua*) <15%
32	513782	6683024	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 60%, shrubs - 20%, litter - 10%, fallen dead wood -5%, bare ground - 5%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	Grey Gum (*Eucalyptus propinqua*) <15%
33	513832	6682976	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 70%, shrubs - 15%, litter - 10%, fallen dead wood - 5%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	Grey Gum (*Eucalyptus propinqua*) <15%

GPS waypoint id	Easting	Northing	Vegetation Type/Habitat type	Presence of Hollow Trees?	Groundcover type and density (%)	Degree of disturbance	Evidence of burning/fire regime?	Presence of water features?	% Koala feed trees
34	513780	6682972	Dry Open Forest (Blackbutt association) & farm/forestry dam	No	Grasses/lilies - 70%, shrubs - 15%, litter - 5%, fallen dead wood - 5%, rock - 5%	Moderate (young logged forest with few large trees) and constructed farm dam	Yes - (burnt bark and fallen wood)	Yes - farm dam	Grey Gum (*Eucalyptus propinqua*) <15%
35	513729	6682971	Dry Open Forest (Blackbutt association) & farm/forestry dam	Yes - TP-HT02 stag	Grasses/lilies - 70%, litter - 15%, bare ground - 10%, fallen dead wood 5%	Moderate (young logged forest with few large trees) and constructed farm dam	Yes - (burnt bark and fallen wood)	Yes - farm dam	Grey Gum (*Eucalyptus propinqua*) <15%
36	513676	6682955	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 50%, shrubs - 50%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	No
37	513629	6682936	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 50%, shrubs - 30%, litter - 15%, fallen dead wood 5%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	Grey Gum (*Eucalyptus propinqua*) and Tallowwood (*E. microcorys*) <15%
38	513832	6682924	Dry Open Forest (Blackbutt association)	No	Shrubs - 50%, grasses/lilies - 30%, litter - 10%, fallen dead wood 5%, bare ground - 5%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	No
39	513780	6682924	Dry Open Forest (Blackbutt association) & farm/forestry dam	No	Open water - 50%, Grasses/lilies - 20%, shrubs - 20%, fallen dead wood - 5%, bare ground 5%	Moderate (young logged forest with few large trees) and constructed farm dam	Yes - (burnt bark and fallen wood)	Yes - farm dam	Tallowwood (*Eucalytpus microcorys*) <15%
40	513730	6682924	Dry Open Forest (Blackbutt association) & farm/forestry dam	No	Open water - 50%, Grasses/lilies - 20%, shrubs - 20%, fallen dead wood - 5%, bare ground 5%	Moderate (young logged forest with few large trees) and constructed farm dam	Yes - (burnt bark and fallen wood)	Yes - farm dam	Grey Gum (*Eucalyptus propinqua*) <15%

GPS waypoint id	Easting	Northing	Vegetation Type/Habitat type	Presence of Hollow Trees?	Groundcover type and density (%)	Degree of disturbance	Evidence of burning/fire regime?	Presence of water features?	% Koala feed trees
41	513677	6682908	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 50%, shrubs - 30%, litter - 10%, fallen dead wood - 5%, bare ground - 5%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	No
42	513677	6682860	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 60%, shrubs - 40%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	Grey Gum (*Eucalyptus propinqua*) <15%
43	513733	6682878	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 60%, shrubs - 40%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	No
44	513780	6682881	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 50%, shrubs - 30%, litter - 15%, fallen dead wood 5%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	No
45	513831	6682881	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 50%, shrubs - 30%, rock - 15%, litter - 4%, fallen dead wood -1%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	yes - ephemeral stream with small pools	No
46	513831	6682830	Dry Open Forest (Blackbutt association)	No	Shrubs - 60%, Grasses/lilies - 30%, litter - 5%, fallen dead wood - 5%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	yes - ephemeral stream	No
47	513781	6682831	Dry Open Forest (Blackbutt association)	No	Shrubs - 40%, Grasses/lilies - 40%, litter - 15%, bare ground - 3%, fallen dead wood -2%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	yes - ephemeral stream	Scribbly Gum (*Eucalyptus signata*) <15%
48	513730	6682830	Dry Open Forest (Blackbutt association)	Yes - TP HT03 & TP HT04	Grasses/lilies - 60%, Shrubs - 30%, litter - 5%, rock - 4%, fallen dead wood -1%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	yes - ephemeral stream with small pools	Grey Gum (*Eucalyptus propinqua*) <15%
49	513764	6682783	Dry Open Forest (Blackbutt association)	Yes – TP HT05	Grasses/lilies - 60%, Shrubs - 20%, litter - 15%, fallen dead wood - 5%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	yes - ephemeral stream with small pools	Tallowwood (*Eucalytpus microcorys*) <15%

GPS waypoint id	Easting	Northing	Vegetation Type/Habitat type	Presence of Hollow Trees?	Groundcover type and density (%)	Degree of disturbance	Evidence of burning/fire regime?	Presence of water features?	% Koala feed trees
50	513814	6682783	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 60%, Shrubs - 20%, litter - 15%, fallen dead wood - 5%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	yes - ephemeral stream with small pools	Tallowwood (*Eucalytpus microcorys*) <15%
51	513866	6682782	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 60%, Shrubs - 20%, litter - 10%, fallen dead wood - 5%, rock - 5%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	yes - ephemeral stream with small pools	Grey Gum (*Eucalyptus propinqua*) <15%
52	513873	6682740	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 60%, Shrubs - 20%, litter - 15%, rock - 3%, fallen dead wood -2%,	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	yes - ephemeral stream with small pools	No
53	513821	6682735	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 50%, Shrubs - 30%, litter - 10%, rock - 5%, fallen dead wood -5%,	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	No
54	513772	6682735	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 50%, Shrubs - 25%, litter - 15%, rock - 3%, fallen dead wood -2%,	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	Tallowwood (*Eucalytpus microcorys*) <15%
55	513838	6682689	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 50%, Shrubs - 25%, litter - 15%, rock - 3%, fallen dead wood -2%,	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	No
56	513892	6682688	Dry Open Forest (Blackbutt association) & farm/forestry dam	No	Grasses/lilies - 50%, open water - 25%, shrubs - 20%, litter - 5%	Moderate (young logged forest with few large trees) & constructed dam	Yes - (burnt bark and fallen wood)	yes - farm/forestry dam	No
57	513933	5592644	Dry Open Forest (Blackbutt association)	Yes - TP HT08	Grasses/lilies - 50%, shrubs - 30%, litter - 19%, bare ground - 1%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	No
58	513881	6682641	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 60%, shrubs - 15%, litter - 15%, fallen dead wood - 5%, bare ground - 5%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	No

GPS waypoint id	Easting	Northing	Vegetation Type/Habitat type	Presence of Hollow Trees?	Groundcover type and density (%)	Degree of disturbance	Evidence of burning/fire regime?	Presence of water features?	% Koala feed trees
59	513931	6682595	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 45%, shrubs - 35%, litter - 10%, fallen dead wood - 5%, bare ground - 5%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	No
60	513981	6682628	Dry Open Forest (Blackbutt association)	Yes - TP HT09 & TP HT10	Grasses/lilies - 50%, shrubs - 30%, litter - 10%, fallen dead wood - 5%, bare ground - 5%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	No
61	513984	6682579	Dry Open Forest (Blackbutt association)	No	Grasses/lilies - 50%, shrubs - 30%, litter - 10%, fallen dead wood - 5%, bare ground - 5%	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	No
62	514035	6682612	Dry Open Forest (Blackbutt association)	Yes - TP HT07	Grasses/lilies - 60%, shrubs - 20%, litter - 10%, rock - 5%, bare ground - 4%, fallen dead wood - 1%,	Moderate (young logged forest with few large trees)	Yes - (burnt bark and fallen wood)	No	Tallowwood (*Eucalytpus microcorys*) <15%
63	514035	6682569	Moist Open Forest (Blackbutt association)	Yes – TP HT06					
64	514089	6682604	Moist Open Forest (Blackbutt association) & Lowland Rainforest EEC	No	Grasses/lilies - 70%, leaf litter - 20%, fallen dead wood - 5%, bare ground 5%	Moderate (logged forest, few large trees)	yes (burnt bark and fallen wood)	yes - dry ephemeral stream	Grey Gum (Eucalyptus propinqua) <15%
65	514088	6682559	Lowland Rainforest EEC	No	Grasses/lilies - 60%, ferns - 20%, bare ground - 20%	Moderate (close proximity to highway but some large emergent eucalypts)	yes (burnt bark)	yes - dry ephemeral stream	none
66	514141	6682598	Moist Open Forest (Blackbutt association)	No	Grasses/lilies - 50%, ferns 20%, litter 20%, bare ground 10%	Moderate (logged, access tracks also a few weeds)	yes (burnt bark and fallen wood)	yes - dry ephemeral stream	none
67	514141	6682553	Lowland Rainforest EEC	No	Grasses/lilies - 50%, bare ground - 20%, litter 30%	Moderate (logged, some large emergent trees present)	yes (burnt bark)	yes - ephemeral stream with small pools	none

GPS waypoint id	Easting	Northing	Vegetation Type/Habitat type	Presence of Hollow Trees?	Groundcover type and density (%)	Degree of disturbance	Evidence of burning/fire regime?	Presence of water features?	% Koala feed trees
68	514193	6682595	Moist Open Forest (Blackbutt association)	Yes - TP-HT01	Grasses/lilies - 50%, ferns 25%, litter 20%, fallen dead wood 5%	Moderate (young logged forest, some large emergent trees present	yes (burnt bark and fallen wood)	yes -ephemeral stream with small pools	none
69	514192	6682548	Moist Open Forest (Blackbutt association) and Lowland Rainforest EEC	No	Grasses/lilies - 50%, ferns 25%, litter 20%, fallen dead wood 5%	Moderate (young logged forest and previous culvert construction, some large emergent trees present	yes (burnt bark and fallen wood)	yes -water flowing through culvert	Tallowwood (Eucalyptus microcorys) <15%
70	514241	6682579	Moist Open Forest (Blackbutt association)and Lowland Rainforest EEC	No	Grasses/lilies - 50%, ferns 25%, litter 20%, fallen dead wood 5%	Moderate (young logged forest, some large emergent trees present	yes (burnt bark and fallen wood)	yes -ephemeral stream with small pools	none