ATTACHMENT G

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RE: ETON RANGE UPGRADE PROJECT – OPTIONS W1A-W2A AND X1A-X2A.

Dear Helen,

The following information represents findings of the recent assessment of the terrestrial ecology of the proposed upgrade of the Peak Downs Highway Eton Range Upgrade Project – Options W1A-W2A and X1A-X2A.

Introduction

Background

The Department of Transport and Main Roads (DTMR) is currently investigating the feasibility of constructing an alternative crossing of the Eton Range which is located approximately 40km south west of Mackay on the Peak Downs Highway. An alternative alignment which involved construction of a new carriageway to the west of the existing highway for a length of approximately 5km was identified by DTMR and the terrestrial ecology within this corridor was assessed by Ecological Survey and Management (EcoSM) in 2010.

The key findings of the 2010 survey were:

- Five regional ecosystems (REs) were identified (Four Least Concern REs and one Of Concern RE);
- No REs listed as Endangered under the *Vegetation Management Act 1999* (VM Act) were identified;
- 223 flora species were identified;
- No flora species which are listed as rare or threatened under State or Commonwealth legislation were identified during the field survey but two flora species listed as Near Threatened under the Queensland *Nature Conservation Act 1992* (NC Act) were considered to have a moderate potential of occurring within the study area [Veiny Whitewood and Small-leaved Malletwood].
- No rare or threatened fauna species were observed within the study area during the field survey but four species [Square-tailed Kite, Squatter Pigeon,

Black-chinned Honeyeater and the Ghost Bat] were considered to have a moderate potential to occur within the study area.

In 2011 EcoSM was engaged to assess two alternative options for upgrading the Eton Range crossing. Both of these options involved the creation of co-joined and/or separate carriageways located in close proximity to the existing highway (not greater than 100m from the centreline of the existing alignment).These options are referred to as Options W1A-W2A and X1A-X2A and are specifically described as:

> "Option W1A-W2A - This option runs to the west of the current Eton Range alignment until it merges with the current alignment approximately two thirds of the way down the range, overall length 2.5km. The alignment to the west does not extend any further than 100m, at any given point, from the current alignment. At the point where the new alignment merges with the existing alignment, widening of the existing carriageway will occur either side of the road to accommodate the intended 4 lanes of traffic. The terrain on the western side is relatively flat to the south with the slope increasingly falling away to the west the further north you travel along the new alignment.
>
> Option X1A-X2A - This option runs to the west and east of the current Eton Range alignment until it merges at a similar point to Option W1A-W2A, overall length 2.6km. The alignment also does not extend any further than 100m, at any given point, from the current alignment. At the point where the new alignment merges with the existing alignment, widening of the existing carriageway will occur either side of the road to accommodate the intended 4 lanes of traffic. The terrain on the eastern side is relatively flat for the full extent with the slope increasing in sections where natural watercourses occur."

The study area for this assessment was defined by the area within 50m on either side of the centreline of each option as well as the existing portions of the Peak Downs Highway where these options overlap.

Objective

The objectives of this supplementary assessment were to:

- map the regional ecosystems and habitat features present within the study area;
- provide a flora species list for the overall study area;
- undertake targeted searches for threatened plant species; and
- assess the potential for threatened flora and fauna species to occur within the study area based on database searches and habitat assessment.

Site Description

The Peak Downs Highway and more specifically the Eton Range crossing, traverse a steeply sloped, north-running spur and associated gullies. The flanking terrain falls sharply to the west, north and east and includes steep slopes (>30%), low cliffs, steeply incised ephemeral gullies and valley floors. The upper slopes and crest of this spur tended to support dry sclerophyll woodland to open forest while closed scrubs to complex notophyll vine forest dominated the lower lopes and valley floor.

The level of disturbance (ie. exotic flora) was found to be very high throughout much of the study area and increased along the edges of the existing highway and areas that have been cleared of remnant native vegetation for use as lay down areas, safety

ramps or powerline easements. The gullies along the alignment are ephemeral and there are no permanent watercourses within the study area.

Portions of the original Cobb & Co. Transport corridor including the remnants of the original creek crossing (man-made boulder walls) were identified on the lower slopes of the range crossing.

Methodology

Review of Existing Information

The database and mapping sources that were referenced during the previous ecological impact assessment (EIA) were re-assessed prior to commencement of the supplementary survey. Refer to EcoSM (2010) for a list of these sources.

The potential occurrence of threatened species identified during the review of existing information is assessed in the "Results" section of this report.

Field Surveys

Flora

Flora surveys were undertaken by two EcoSM ecologists over two days between 5th and 6th May 2011.

Site Selection

The field flora survey methods were developed in order to:

- validate existing Queensland Herbarium regional ecosystem and regrowth vegetation mapping and better define the distribution and composition of REs within DERM mapped mixed polygons;
- target rare and threatened flora species and their habitats as identified from database searches and published literature; and,
- produce a comprehensive quantitative floral inventory for all vegetation assessment sites and the study area as a whole.

The study area was surveyed in compliance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland, Version 3.1* (Neldner *et al.*, 2005). Assessment sites were conducted throughout the entire study area so as to represent existing DERM mapped remnant vegetation and specifically the variation of REs within these remnant areas. Areas of non-remnant vegetation were also surveyed in order to ensure site coverage and sampling of all potential habitat types.

A total of four Secondary Level vegetation assessment sites were conducted within the study area. Nine Tertiary Level and fourteen Quaternary Level vegetation assessment sites were also conducted. The details of these sites are provided in Appendix A.

Traverses

In addition to Secondary, Tertiary and Quaternary vegetation assessment sites, the entire study area was traversed on foot. The purpose of this type of assessment was to ensure adequate site coverage and to establish a comprehensive floral species list for the study area. This method is also essential for the detection of rare and threatened species.

Floral Inventory and Abundance

A comprehensive flora species list, including native and introduced species, was compiled for the study area and is presented in Appendix B. Relative abundance of flora species was assessed on a site by site basis. Abundance estimates were applied to species within each stratum of the community, with particular focus on the ecologically dominant layer as it is by these species that the community is defined and from this, the regional ecosystem determined (Neldner *et al*. 2005). The status (*remnant* / *non-remnant*) of existing vegetation is determined by comparing the existing *predominant canopy* with the *undisturbed predominant canopy*. The Queensland Herbarium defines the *predominant canopy* in the VM Act, as the ecologically dominant layer (EDL); namely, that stratum of the vegetation which contains the most above ground biomass. The EDL can be defined in terms of growth form, height, cover density and species. In the majority of cases, the EDL is equivalent to the upper stratum or crown cover as described by Walker and Hopkins (1990).

Abundance assessments of canopy species are quantitative (*i.e.* the basal area of stems per hectare was calculated using the Bitterlich stick methodology). This was utilised in conjunction with an estimation of crown cover [based on the crown or line intercept methodology (Greig-Smith 1964, Neldner *et al.* 2005)]. This allowed a descriptive measure of cover which, combined with growth form and median height, describe the structure of the vegetation community based on structural formation classes described by Walker and Hopkins (1990).

The crown cover definitions and associated crown separation descriptions (eg. sparse) were also applied to the lower strata to allow a consistent description of spatial distribution of the respective vegetative layers.

The landform description upon which the field validated vegetation communities occurred was based on simple erosional landform patterns characterised by relief and modal slope and described by Speight (1990).

For compilation of detailed floristic inventories at all secondary level assessment sites, the relative abundance of species was based on a modified version of the Braun-Blanquet technique (Hurst and Allen 2007, Mueller-Dumbois and Ellenberg 1974) as follows: + = individual plants, 1 = sparse, <5%; 2 = any number, <5%; 3 = 5 – 24%; 4 = 25 – 49%; 5 = 50 – 74%; 6 = 75 – 100%.

Vegetation Mapping

DERM mapped REs were validated in the field using the transect/quadrat data described above and the latest geology mapping (DME 2008). The boundaries of vegetation types were mapped in the field using a hand-held *Garmin* geographic positioning system and/or aerial photograph interpretation.

Ancillary Information

Other field characteristics such as habitat areas for rare and threatened species and regional connectivity were recorded and described. Photographic records were taken throughout the study area, capturing each community type, habitat type, potential impact areas and the broader landscape.

Co-ordinate System and Map Datum

Positional data was collected with a handheld *Garmin eTrex Vista HCX* Geographic Positioning System (GPS), with an accuracy of 4 to 10 m. Locations were recorded using the UTM coordinate system. All locations presented in this report are within zone 55K. The map datum used was GDA94.

Habitat Assessment

The quality of fauna habitat on the site was assessed on the basis of several criteria (see below). These criteria are adapted for tree less habitat types such as grasslands or wetlands as appropriate.

Low: Many fauna habitat elements in low quality areas have been removed or altered such as mature, hollow bearing trees, fallen timber and deep leaf litter. Remnants are often small in size, support substantial weed infestations of high or moderate threat weeds (e.g. Mother of Millions [*Bryophyllum delagoense*]) and are poorly connected to other areas of remnant vegetation.

Moderate: Some habitat components are present but others are lacking. For example a remnant may have a reasonably intact understorey but lack mature canopy species and fallen timber. Some weed infestations are present but are relatively small in size or comprise species of low to moderate threat. Linkages with other remnant habitats in the landscape may be lacking or somewhat tenuous.

High: Most habitat components are present (e.g. old-growth trees, fallen timber, lack of weeds and deep leaf litter), the remnant is large enough to support species that are typically associated with large intact areas of habitat (e.g. Powerful Owl [*Ninox strenua*] and Greater Glider [*Petauroides volans*]) and it is well connected or contiguous with other areas of native vegetation.

Results

Vegetation Communities

Field investigations revealed that the current DERM vegetation mapping for the area (Figure 1, Appendix C) was a relatively accurate reflection of the vegetation communities present. However, RE 8.12.5 was found to be markedly over-represented. A total of four REs were identified. A distinct association of one of these REs was also identified and specifically annotated in the supplied vegetation mapping (Appendix C). The four field-validated REs are presented in Table 1.

Table 1: Field-validated vegetation communities in the Study Area

Regional Ecosystem	Short Description	Vegetation Management Status	Biodiversity Status	EPBC Status
8.12.3	Notophyll rainforest / microphyll rainforest often with *Argyrodendron polyandrum* (Booyong) and *Paraserianthes toona* (Mackay Cedar), +/- *Araucaria cunninghamii* (Hoop Pine), on low to medium ranges on Mesozoic to Proterozoic igneous rocks	Least Concern	No concern at present	*Not applicable*
8.12.5	*Corymbia intermedia* (Pink Bloodwood), *E. portuensis* (White Mahogany) +/- *Lophostemon spp*. +/- *Syncarpia glomulifera* (Turpentine) +/- *Banksia integrifolia* (Coast Banksia), open forest on Mesozoic to Proterozoic igneous rocks	Least Concern	No concern at present	*Not applicable*
8.12.7 (incl. 8.12.7c)	*Corymbia citriodora* (Lemon-scented Gum) +/- *Eucalyptus portuensis* +/- *E. drepanophylla* (Narrow-leaved Ironbark) (or *E. crebra*) open forest to woodland on hillslopes and undulating plateaus, on Mesozoic to Proterozoic igneous rocks	Least Concern	No concern at present	*Not applicable*
8.12.12	Variable Corymbia spp. +/- *Eucalyptus tereticornis* (Queensland Blue Gum) +/- *E. platyphylla* (Poplar Gum) +/- *E. drepanophylla* +/- *E. portuensis* woodland on lower and mid-slopes of ranges on Mesozoic to Proterozoic igneous rocks	Least Concern	No concern at present	*Not applicable*

The vegetation fringing the existing highway was found to be moderately fragmented in parts due to the presence of historic and current disturbance areas. These areas included several property driveways/access points, an access track and the infrastructure footprint for an existing telecommunications tower, several historic lay-down areas, a low voltage powerline easement and an emergency brake failure ramp.

Despite the level of fragmentation, all of the vegetation communities that were identified within the study area align with remnant REs that have a VM Act Vegetation Management status of 'Least Concern' and Biodiversity status of 'No concern at present'. A total of four 'Least Concern' REs were identified. RE 8.12.5 is endemic to the sub-region (Clark-Connors Range province) while the other three REs occur ubiquitously upon ranges, hills and/or footslopes throughout the Central Queensland Coast bioregion. This is more a reflection of the reduced suitability of this landform for agricultural purposes.

The distribution of these communities within the study area is depicted in Figure 2.

These vegetation types are primarily threatened by ongoing farming practices (eg. aerial herbicide application, active thinning and timber getting), forestry and expansion of established graminoid, herbaceous and woody weeds which lead to an increased ability of the groundcover to carry a higher intensity of fire.

No 'Of Concern' or 'Endangered' REs were recorded within the study area. No threatened ecological communities as defined under the EPBC Act were recorded in the study area.

Species Richness

The late wet-season field survey (to which this report applies) identified 273 species (224 native and 49 exotic). These are listed in Appendix B where they have been assigned in accordance with their relative abundance within field-validated regional ecosystems. The location and type of flora survey sites is shown in Figure 2 (Appendix C).

The species richness was greatest within the vine forest communities (RE 8.12.3).

Threatened Flora

Database searches for the area within a 20 km radius of the study area (centered on S21^{o} 20' 09.0" E148^{o} 56' 14.5") identified a total of nine threatened flora species as occurring, or potentially occurring within the study area. Of these nine species, three are listed as 'Vulnerable' under the EPBC Act and the NC Regulation, or the EPBC Act alone and as such these species are considered matters of national environmental significance.

An assessment of the likelihood of presence of the State and Commonwealth listed species, based on published knowledge of preferred habitat and observations of habitat present within the study area is presented in Table 2.

Table 2: Threatened plant records returned from database searches for the study area

Scientific Name	Common Name	NC Reg'n [1]	EPBC Act [2]	Source [3]	Preferred habitat	Potential to occur in the study area? [4]
Actephila sessilifolia	Broad-leaved Actephila	NT	-	Wildlife Online	Shrub in dry rainforest and vine thickets north from Yarrol (Monto district to south of Gladstone) to Rollingstone near Townsville from altitude of 50 to 900m (Cooper 2004, Harden et al 2006a)	Low (to Moderate): Suitable habitat present (RE 8.12.3), but detailed searches failed to locate.
Atalaya rigida	Veiny Whitewood	NT	-	Wildlife Online, HERBRECS	Small tree to 8m in dry rainforest, monsoon forest, littoral rainforest and vine thickets north from Mt Glastonbury near Gympie to Cairns district from altitude of 40 to 500m (Harden et al 2006a)	Low (to Moderate): Suitable habitat present (RE 8.12.3), but detailed searches failed to locate. Records known from within two kilometres
Cartonema brachyantherum	ncn	NT	-	HERBRECS	Limited information is available for this species, but based on habitat and locality descriptions of Queensland Herbarium records (HERBRECS), the slender herb is known to occur on sandy soils in eucalypt open forest, primarily in the Townsville and Cairns districts with disjunct populations in the Rockhampton and Mackay areas. The cryptic species is known to flower between March and July (pers comms Queensland Herbarium)	Low (to Moderate): Suitable habitat present, but detailed searches failed to locate.

Scientific Name	Common Name	NC Reg'n [1]	EPBC Act [2]	Source [3]	Preferred habitat	Potential to occur in the study area? [4]
Eucalyptus raveretiana	Black Ironbox	V	V	DSEWPaC	Occurs on the banks of rivers, creeks and moderate sized watercourses on clayey or sandy loam and is often associated with *Melaleuca leucadendra* and/or *Melaleuca fluviatils* fringing open forest. Endemic to Central and North Queensland and known from Mackay to Ayr, with disjunct populations occurring in the Rockhampton area (DEWHA 2008a, Brooker and Kleinig 2004). The author has also witnessed this species as a planted street and park tree in Townsville, Collinsville and Bowen.	Low: Suitable habitat absent. No records within the immediate vicinity.
Eulophia venosa (*syn. Eulophia bicallosa*)	Veined Corduroy Orchid	NT	-	HERBRECS	Terrestrial orchid with irregularly shaped somewhat flattened tuberous rhizomes, solitary leaf on a slender stalk (200-400mm long) and flower stem to 800mm tall. Highly localised and rarely seen, species occurs in open woodland, grassy forest and on rainforest margins in disjunct localities of Cape Tribulation, Yarrabah (near Cairns) and in the Mackay area. Flowers from July to November (Jones 2006).	Low to Moderate: Suitable habitat present (RE 8.12.3), but detailed searches failed to locate. Survey outside preferred flowering period.

Scientific Name	Common Name	NC Reg'n [1]	EPBC Act [2]	Source [3]	Preferred habitat	Potential to occur in the study area? [4]
Leucopogon cuspidatus	ncn	V	-	DSEWPaC	Dwarf to small shrub with a spreading habit. Located in eastern Queensland from Blackdown Tableland to Mount Stewart near the Homestead township. Occurs in open forest, woodland and heath on rocky slopes with granitic or serpentinite substrates and generally found to be locally common within its location (DEWHA 2008b).	Low: Marginal habitat present, but easily discernible family which was not recorded within the study area. No records within the vicinity.
Parsonsia lenticellata	ncn	NT	-	Wildlife Online	Twiner of rainforest, gallery rainforest and open forest from the Daintree to Mackay area from an altitude of 0 to 450m (Cooper 2004). [Note: The very similar *Parsonsia paulforsteri* occurs at its northern limit in the Eton area (Harden et al 2006b, Cooper 2004).]	Low (to Moderate): Suitable habitat present (RE 8.12.3), but detailed searches failed to locate.
Rhodamnia pauciovulata	Small-leaved Malletwood	NT	-	Wildlife Online, HERBRECS	Shrub or small tree to 6m in dry rainforest, littoral rainforest and vine thickets from near sea level to 300m altitude north from Kilkivan and Gundiah (north of Gympie) to the Goodnight Scrub (south-west of Bundaberg) and also in the Mackay area and Whitsundays region (Cooper 2004, Harden et al 2006a)	RECORDED
Taeniophyllum muelleri	Minute Orchid	V	-	DSEWPaC	Common in shrubs and trees in rainforest, sheltered areas in open forest, humid gullies and streamside vegetation. Occurs from Wilson River (near Wauchope, NSW) to Cape York Peninsula from 50 to 1200m in altitude (Jones 2006)	Low (to Moderate): Suitable habitat (RE 8.12.3) present, but detailed searches failed to locate.

1 - "NC Reg'n" status: Conservation status of each taxon under the Status taken from the Queensland Nature Conservation (Wildlife) Regulation 2006: Vulnerable (V), Near Threatened (NT), Least Concern (C).

2 - "EPBC Act" status: Conservation status of each taxon under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act): Vulnerable (V), Endangered (E), Not Listed (–).

3 - "Source": DSEWPaC (DSEWPaC 2011), Wildlife Online (DERM 2011), HERBRECS (EPA 2009)

4 - Likelihood of occurrence are described as:

Very Low	The study area is outside the species normal range, habitat and/or underlying geology does not exist.
Low	Database searches indicate the species could potentially occur in the study area; however previous records are likely to be historic or invalid, the study area is outside the species normal range, habitat does not exist or the species is considered locally extinct (no further impact assessment required).
Moderate	Habitat exists for the species; however it is either marginal or not particularly abundant. The species is known from the wider region and could potentially occur (further impact assessment required).
High	The species is known to occur in the local area and core habitat exists in the study area (further impact assessment required).
Recorded	The species was recorded in the study area as part of field surveys

One State significant species listed as Near Threatened under the NC Regulation was recorded during the field survey. A total of twenty-seven (27) specimens of *Rhodamnia pauciovulata* (Small-leaved Malletwood) were identified at thirteen (13) locations within remnant vine forest (RE 8.12.3) in the north-eastern portion of the study area. These specimens were identified on both sides of the existing highway and ranged in size from less than 0.1m through to 5.5m in height. Most specimens were found to be in good health. Refer to Figure 3 (Appendix C) for the distribution and size class of the recorded specimens of *R. pauciovulata*.

Several mature specimens of *R. pauciovulata* were recorded on the banks of the main channel on the northern side of the highway. Survey of the channel on the southern (upstream) side of the highway failed to identify any mature specimens. As such, it is presumed that the specimens on the northern side of the highway have germinated from water dispersed seeds from plants further upstream and beyond the extent of the study area. Given that this species is widely distributed throughout the surveyed distribution of RE 8.12.3, coupled with direct evidence of dispersal from upstream sources, it is anticipated that this species is more widely distributed throughout the broader expanse of RE 8.12.3.

Plate 1: Foliage of *Rhodamnia pauciovulata* (Small-leaved Malletwood)

Six of the nine species identified from the database searches were considered to have a low (to moderate) likelihood of occurrence due to the availability of suitable habitat. The use of brackets around the proclamation of 'moderate' indicates that the species could potentially exist within preferred habitat within the study area but given that the detailed surveys failed to locate these species the likelihood has been reduced.

No Commonwealth listed significant species were recorded during the field survey and none are considered likely to occur within the study area.

Exotic Flora

The distribution of exotic flora was generally commensurate with the level of disturbance. Significant weed infestations were observed at the intersection of the Peak Downs Highway and a low voltage powerline easement. A small but expanding population of **Dalbergia sissoo* (Himalayan Raintree) was identified within the easement on the southern and northern side of the highway, while a dense thicket of **Ipomoea hederifolia* (Scarlet Creeper) was recorded on the northern side. A small population of **Ipomoea quamoclit* (Star of Bethlehem) was also recorded within dense thickets of **Lantana camara* (Common Lantana) in the north-eastern portion of the study area. These three species are not currently listed under the *Lands Protection (Pest and Stock Route Management) Act 2002* (LP Act) but **D.sissoo* and other varieties of the **Ipomoea* genus are recognized as locally significant pest plants under the Mackay Regional Council Pest Management Plan 2006-2009 (MRC 2006).

The majority of recorded exotic flora species were grasses and herbs. The distribution of declared pest species within the study area was mostly restricted to small infestations or individual specimens. However, **L. camara* was regularly encountered throughout the study area and was particularly prevalent within remnant and non-remnant vegetation on the western side of the Peak Downs Highway as well as upon the steep slopes to the north of the range crossing. In general these slopes were found to be heavily degraded and in poor overall condition.

Fauna Habitat Assessment

The quality of fauna habitat present within the study area is considered to be low to moderate for the open forest to woodland vegetation types (8.12.5, 8.12.7 and 8.12.12). These areas of the study area are well connected to other areas of remnant vegetation but have high levels of weed cover in some areas, fragmented by the existing highway alignment and generally have a low abundance of hollow bearing trees and ground logs.

The areas of vine forest (8.12.3) within the study area are considered to be of moderate to high habitat value as they have most habitat elements present, generally have low levels of weed cover and are well connected to areas of remnant vegetation.

Threatened Fauna

A total of 17 threatened or near threatened fauna species were identified as being previously recorded or potentially present within the search area. It should be noted that the EPBC Protected Matters Search Tools uses predictive modelling of species occurrence as well as actual records to determine potential presence of species. These species are listed in Table 3 along with an assessment of their potential to occur within the study area.

None of these species were confirmed as occurring within the study area or considered likely to occur. However, three species were considered to have a moderate potential to occur within the study area. These were the Square-tailed Kite (*Lophoictinia isura*),

Squatter Pigeon (*Geophaps scripta scripta*) and Black-chinned Honeyeater (*Melithreptus gularis*). The remainder of the species were assessed as having a low to moderate or low potential to occur within the study area.

Table 3: Threatened fauna records returned from database searches for the study area

Scientific Name	Common Name	NC Reg'n [1]	EPBC Act [2]	Source [3]	Preferred habitat	Potential to occur in the study area? [4]
Eulamprus amplus	Lemon-barred Forest Skink	NT	-	Qld Museum	Confined to rainforest in the Eungella National Park, Finch Hatton, Mt Blackwood and Conway State Forest areas where it is often seen basking on rocks along waterways (Wilson 2005).	Low to Moderate: Appears to be restricted to wet rainforests.
Lophoictinia isura	Square-tailed Kite	NT	-	Wildlife Online	This species hunts primarily over open forest, woodlands and mallee vegetation types that are rich in passerines, as well as adjacent low scrubby areas and wooded towns. It appears to prefer a structurally diverse landscape (Garnett & Crowley 2000).	Moderate: This species could potentially occur within the study area.
Tadorna radjah	Radjah Shelduck	NT	-	Wildlife Online	Tropical coast wetlands and rivers, mud-flats, salt-marsh, mangroves, paperbark swamps (Simpson & Day 1998).	Low: Suitable habitat not present within study area
Nettapus coromandelianus	Cotton Pygmy-goose	NT	-	Wildlife Online	This species is found on freshwater lakes, swamps and large water impoundments (Garnett and Crowley 2000).	Low: Suitable habitat not present within study area
Calyptorhynchus lathami	Glossy Black-cockatoo	V	-	Wildlife Online	This species occurs in eucalypt woodlands with an understorey or sub-canopy of Casuarina or Allocasuarina on the seeds of which its diet is based. It nests in tree hollows (Garnett & Crowley 2000).	Low There are few Allocasuarina trees within the study area.
Geophaps scripta scripta	Squatter Pigeon	V	V	Wildlife Online	This species in known from tropical dry, open sclerophyll woodlands and sometimes savanna (Higgins and Peter 1996). It appears to favour sandy soil dissected with low gravely ridges and is less common on heavier soils with dense grass cover. It is nearly always found in close association with permanent water. The southern sub species of the Squatter Pigeon is described as occurring south of the Burdekin River (Higgins and Davies 1996).	Moderate: Although this species is more common west of the range it is possible that it may occur within the woodland vegetation types within the study area.

Scientific Name	Common Name	NC Reg'n [1]	EPBC Act [2]	Source [3]	Preferred habitat	Potential to occur in the study area? [4]
Melithreptus gularis	Black-chinned Honeyeater	NT	-	Wildlife Online	This species occurs in the dry eucalypt woodlands with an annual rainfall of 400 - 700mm usually on the inland slopes of the Great Divide but extending to the coast between Brisbane and Rockhampton. It appears to favour vegetation associations with box and ironbark (Garnett and Crowley 2000).	Moderate: This species could potentially occur within the woodland vegetation types within the study area.
Macroderma gigas	Ghost Bat	V	-	Wildlife Online	The Ghost Bats roosts in shallow caves along cliff lines, boulder pile and deep limestone caves. They occur in a broad range of habitats including arid spinifex hill sides, grasslands, monsoon forest, savannah woodlands, tall open forest, deciduous vine forest and tropical rainforest (Churchill 2008).	Low to Moderate: Suitable roosting habitat potentially exists for this species close to the study area but not within the study area. Therefore, it could potentially forage within the study area but is considered unlikely to roost within the study area.
Erythrotriorchis radiatus	Red Goshawk	E	V	DSEWPaC	The Red Goshawk is generally found in open woodland, the edges of rainforest, and in dense riverine vegetation of coastal and subcoastal forests (Marchant & Higgins 1993). This species is known to have a large home range but nest in tall trees usually within 1km of a waterway or wetland (Garnett and Crowley 2000)	Low to Moderate: It is possible that the Red Goshawk could occur within the study area although the lack of substantial waterways or wetlands make it unlikely to nest within the study area.

Scientific Name	Common Name	NC Reg'n [1]	EPBC Act [2]	Source [3]	Preferred habitat	Potential to occur in the study area? [4]
Neochmia ruficauda ruficauda	Star Finch	E	E	DSEWPaC	The Star finch usually inhabits low dense damp grasslands bordering wetlands and waterways and also open savanna woodlands near water or subject to inundation (Higgins et. al. 2006). Absent from expanses of open county and uplands usually occurring in valleys (Higgins et. al. 2006). In Queensland this species' range has largely contracted to the southern Cape York. There have not been any confirmed records from the Cairns to Townsville region for some time and none were recorded during the Birds Australia Atlas project (Higgins et. al. 2006). Recent records around Rockhampton are thought likely to be aviary escapees (Higgins et. al. 2006).	Low: This species is usually found in valleys and the study area lacks suitable habitat.
Rostratula australis	Australian Painted Snipe	-	V	DSEWPaC	This species occurs in shallow, vegetated temporary or infrequently filled wetlands, sometimes with trees or shrubs where it feeds at the water's edge on seeds and invertebrates (Garnett and Crowley 2000). Since 1990 there have been fewer than 100 records of this species throughout Australia (Garnett and Crowley 2000).	Low: Suitable habitat not present within study area
Taudactylus eungellensis	Eungella Day Frog	E	E	DSEWPaC	Occurring in upland rainforest streams primarily within Eungella National Park, Cathu State Forest and Eungella State Forest (DEH 2005).	Low: This species is associated with wet tropical rainforest which does not occur within the study area.

Scientific Name	Common Name	NC Reg'n [1]	EPBC Act [2]	Source [3]	Preferred habitat	Potential to occur in the study area? [4]
Dasyurus hallucatus	Northern Quoll	-	E	DSEWPaC	The Northern Quoll was once widespread in Queensland but has undergone a severe range contraction and is now absent from much of its former range. It is usually associated with dissected rocky escarpments but also known from eucalypt forest and woodlands, around human settlement and occasionally rainforest. In the Northern Territory Northern Quoll populations are becoming extinct within one year of the arrival of the Cane Toad (*Rhinella marina*) although in Queensland some remnant quoll populations persist in areas where Cane Toads have long been present (Van Dyck & Strahan 2008). The areas where the quoll persist in Queensland tend to be steep, rocky areas close to water that have not been recently burnt and appear to have become extinct in many lowland habitats formerly occupied (Woinarski et. al. 2008).	Low to Moderate: It is possible that this species occurs within the broader area but is considered more likely to be associated with the steeper and less accessible areas of the Eton / Connors Range.
Nyctophilus timoriensis / corbeni	South-eastern Long-eared Bat	V	V	DSEWPaC	Strahan (1995) notes that the eastern long-eared bat is distributed south of the Tropic of Capricorn but uncommon and localised. This species has undergone recent taxonomic review and is now considered to be Nyctophilus species 2 (Churchill 2008).	Low: This species is generally not considered to occur as far north as Mackay and is generally found further inland.
Pteropus conspicillatus	Spectacled Flying-fox	-	V	DSEWPaC	Confined to coastal QLD from Hinchbrook Island north to Cape York. Found in tall gallery rainforest but also camp in mangroves, paperbark, eucalypt forests and tall acacia trees (Churchill 1998).	Low: Suitable habitat for this species does not occur within the study area.
Egernia rugosa	Yakka Skink	V	V	DSEWPaC	A ground dwelling reptile found in dry open forests, woodlands and rocky areas of the brigalow belt. It is often found under dead timber and in deep rock crevices (Wilson, 2005).	Low: This species is usually found further inland and from drier habitats.

Scientific Name	Common Name	NC Reg'n [1]	EPBC Act [2]	Source [3]	Preferred habitat	Potential to occur in the study area? [4]
Rheodytes leukops	Fitzroy River Turtle	V	V	DSEWPaC	Known from the Fitzroy River and its tributaries (Cogger 2000).	Low: There is not suitable habitat for this species within the study area.

Discussion

The distribution of the four field-validated REs within the Clark-Connors Range sub-region of the Central Queensland bioregion is presented in Table 4. It is clearly evident that these vegetation types are well distributed and conserved within the bio-region and have undergone only minor reductions in extent since European settlement.

Table 4: Pre-clear and current distribution of field-validated Regional Ecosystems in sub-region (Clark-Connors Range province) [in Hectares]

Regional Ecosystem		8.12.3	8.12.5	8.12.7	8.12.12
Free-hold	Pre-clear	16687	11411	57349	33455
	2006	13806	10823	32763	29021
Lease-hold	Pre-clear	11803	9643	94226	19773
	2006	11753	9526	92261	19109
National Park	Pre-clear	8024	1399	8139	5227
	2006	7980	1398	8135	5031
State Forest	Pre-clear	20455	6899	23441	15837
	2006	20388	6890	23374	15474
Other	Pre-clear	514	348	1629	1548
	2006	564	382	1983	2602
TOTAL	Pre-clear	56969	29352	183155	74292
	2006	53927	28637	156533	68635

Clearing of remnant vegetation that will result from the construction of the Eton Range Crossing Upgrade Project will have a negligible impact in relation to the overall distribution of these vegetation types.

The southern two-thirds of Options W1A and W2A will intersect a greater percentage of disturbance areas (non-remnant vegetation) whilst also impacting remnant vegetation that is already moderately to heavily degraded. The primary concern is the proximity of the alignment to a steep slope and an associated distribution of remnant vine forest (RE 8.12.3) that is located to the west of the first bend on the decent of the existing highway.

The southern two-thirds of Options X1A and X2A will impact on a greater proportion of relatively intact remnant vegetation with low levels of weed cover at present. Further, this option will traverse the absolute crest or centerline of the main spur upon which the crossing is currently situated. The terrain to the east of the crest falls away sharply and tends to intact remnant vine forest (RE 8.12.3) on the mid and lower slopes. In some areas, the alignment occurs in close proximity to the steeper slopes and small cliff faces along the eastern side of the spur and would be likely to require a significantly larger area of clearing to accommodate earthworks and batters. The clearing of the existing intact forest would subject the adjacent vegetation communities to increased weed infiltration, erosion risk and discharge of inorganic pollutants (from road surface drainage). This would have the potential to significantly impact on the integrity and subsequent habitat potential of the adjacent vine forest community.

The northern third of both options primarily follow the existing highway alignment. Widening of the existing highway in this area would impact upon remnant vegetation, but in most cases the flanking vegetation communities were found to be heavily degraded with exotic flora species. Of most concern would be the potential impact upon relatively intact remnant RE 8.12.3 in the north-eastern portion of the alignment. A deeply incised ephemeral drainage line dissects the community and highway at this location. Twenty-seven specimens of the *R. pauciovulata* were identified within this vegetation type on both sides of the highway, but it is anticipated that this species is more widely distributed throughout the broader expanse of RE 8.12.3 and as such clearing of some or all of these specimens is unlikely to cause significant decline in the known population of the species.

Note: Historic rock wall abutments that would have supported a bridge crossing on the old Cobb & Co. route were identified on the northern edge of the remnant vine forest on the southern side of the highway (S21^{o} 20' 07.7" E148^{o} 56' 24.8").

Plate 2 & 3: Rock wall abutments of old Cobb & Co. route

The two alignment options are considered unlikely to impact on any species of fauna listed as threatened or near threatened under the EPBC Act or the NC Regulation. However, Options X1A and X2A would result in the removal of a greater area of intact remnant vegetation of good condition. This vegetation provides a greater habitat qualities for fauna and potential habitat for the three significant species considered to potentially occur within the study area.

It is considered that Options W1a and W2A would result in a lesser ecological impact in comparison to Options X1A and X2A. Where possible, clearing of *R. pauciovulata* should be avoided but clearing of any of the recorded 27 specimens is considered unlikely to result in a significant impact to the longevity of this species in the local area.

If you have any queries please do not hesitate to contact me on 0466 428 625 or chris.hansen@ecosm.com.au .

Kind regards,

Chris Hansen
Director – Senior Botanist
Ecological Survey & Management

APPENDIX A

Location and Description of Vegetation Assessment Sites

Table A-1: Location and description of vegetation assessment sites

Waypoint	Zone	Easting	Northing	Assessment Site	DERM mapped Regional Ecosystem	Field-validated Regional Ecosystem	Remnant Status
Secondiary Sites							
24	55 K	700918	7638961	**S008**	8.12.7/8.12.12 (80/20)	8.12.7	REMNANT
27	55 K	700813	7639258	**T011**	8.12.5	8.12.7	REMNANT
55	55 K	701040	7638876	**S018**	8.12.5	8.12.7	REMNANT
72	55 K	701177	7639497	**S025**	8.12.3	8.12.3	REMNANT
Tertiary Sites							
1	55 K	701159	7638331	**T001**	8.12.7/8.12.12 (80/20)	8.12.7c	REMNANT
5	55 K	700968	7638617	**T004**	8.12.7/8.12.12 (80/20)	8.12.7	REMNANT
18	55 K	700905	7638760	**T005**	8.12.7/8.12.12 (80/20)	8.12.7	REMNANT
41	55 K	700776	7639419	**T012**	8.12.5	8.12.3	REMNANT
48	55 K	701183	7638405	**T015**	8.12.7/8.12.12 (80/20)	8.12.7	REMNANT
58	55 K	701041	7639143	**T019**	8.12.5	8.12.7	REMNANT
66	55 K	701066	7639820	**T023**	8.12.5	8.12.5	REMNANT
82	55 K	701279	7639577	**T026**	8.12.7	8.12.3	REMNANT
Quaternary Sites							
3	55 K	701110	7638460	**Q002**	8.12.7/8.12.12 (80/20)	8.12.12	non-remnant
4	55 K	701021	7638582	**Q003**	8.12.7/8.12.12 (80/20)	8.12.7c	non-remnant
20	55 K	700927	7638889	**Q006**	8.12.7/8.12.12 (80/20)	8.12.7	REMNANT
23	55 K	700921	7638931	**Q007**	8.12.7/8.12.12 (80/20)	8.12.7	REMNANT
25	55 K	700825	7639083	**Q009**	8.12.7/8.12.12 (80/20)	8.12.7	REMNANT
42	55 K	700851	7639476	**Q013**	8.12.5	8.12.7	REMNANT
44	55 K	701188	7638353	**Q014**	8.12.7/8.12.12 (80/20)	8.12.7	REMNANT
49	55 K	701167	7638462	**Q016**	8.12.7/8.12.12 (80/20)	8.12.12	REMNANT
53	55 K	701058	7638700	**Q017**	8.12.7/8.12.12 (80/20)	8.12.7	REMNANT
60	55 K	701023	7639203	**Q020**	8.12.5	8.12.5	REMNANT
63	55 K	700923	7639449	**Q021**	8.12.5	8.12.5	REMNANT
65	55 K	700943	7639674	**Q022**	8.12.5	8.12.5	REMNANT
68	55 K	701086	7639603	**Q024**	8.12.5	8.12.5	REMNANT
89	55 K	701220	7639582	**Q027**	8.12.5 & 8.12.3	8.12.3	REMNANT

APPENDIX B

Flora Species Inventory of the Study Area

Table B-1: Flora Inventory of the Study Area

FAMILY	Botanical Name	Common Name	Status[1]	8.12.3	8.12.5	8.12.7	8.12.12	Road Reserve
CYPERACEAE	Abildgaardia ovata	*Ncn*	LC			+		
MIMOSACEAE	Acacia bidwillii	Corkwood Wattle	LC			+-2		
MIMOSACEAE	Acacia disparrima ssp. disparrima	Hickory Wattle	LC	+-2	2			
MIMOSACEAE	Acacia leiocalyx ssp. leiocalyx	Black Wattle	LC		+-2	+-3		
MIMOSACEAE	Acacia leptocarpa	*Ncn*	LC		+-2	+-2		
MYRTACEAE	Acmena smithii	Lilly Pilly	LC	1				
RUTACEAE	Acronychia laevis	Glossy Acronychia	LC	2-3				
ADIANTACEAE	Adiantum aethiopicum	Maidenhair Fern	LC	2-3	1			
ADIANTACEAE	Adiantum hispidulum var. hispidulum	Rough Maidenhair Fern	LC	2-3				
FABACEAE	Aeschynomene indica	Buddha Pea	*					1
ASTERACEAE	Ageratum conyzoides ssp. conyzoides	Blue Top	LC		+-3 (e)	1		+-3
RUBIACEAE	Aidia racemosa	Archer Cherry	LC	1				
SIMAROUBACEAE	Ailanthus triphysa	White Bean	LC	2	+			
MIMOSACEAE	Albizia procera	Native Siris	LC	1-2 (e)	+	+		
EUPHORBIACEAE	Alchornea ilicifolia	Native Holly	LC	1				
SAPINDACEAE	Alectryon tomentosa	Hairy Alectryon	LC	+				
POACEAE	Alloteropis semialata	Cockatoo Grass	LC		1	1		
RHAMNACEAE	Alphitonia excelsa	Red Ash	LC		2	+-3		
APOCYNACEAE	Alstonia constricta	Milky Pine	LC	2-5				
AMARANTHACEAE	Alternanthera dentata	Purple Hedge	*		+			
FABACEAE	Alysicarpus vaginalis	Alyce Clover	LC					+
APOCYNACEAE	Alyxia ruscifolia	Chain Fruit	LC	2				
LORABTHACEAE	Amyema congener ssp. rotundifolium	Variable Mistletoe	LC			+		
POACEAE	Ancistrachne uncinulata	Hooky Grass	LC	+-2				
ULMACEAE	Aphananthe phillipinensis	Rough-Leaved Elm	LC	2				
ARAUCARIACEAE	Araucaria cunninghamii	Hoop Pine	LC	+				
MIMOSACEAE	Archidendron thoetziana	Southern Siris	LC	+				
STERCULIACEAE	Argyrodendron polyandrum	Brown Tulip Oak	LC	2-5				
POACEAE	Aristida calycina	Dark Wiregrass	LC			+-3		
POACEAE	Aristida gracilipes	(A) Wiregrass	LC	+				
POACEAE	Aristida holanthera	*Ncn*	LC					+
POACEAE	Aristida ramosa	Purple Wiregrass	LC					1
SAPINDACEAE	Arytera divaricata	Coogera	LC	2				
POLYPODIACEAE	Asplenium paleaceum	Scaly Asplenium	LC	+				
RUBIACEAE	Atractocarpus fitzilani	Native Gardenia	LC	+				
FABACEAE	Austrosteenisa blackii	Blood Vine	LC	3				
SCROPHULARIACEAE	Bacopa procumbens	*Ncn*	*					+
EUPHORBIACEAE	Baloghia inophylla	Scrub Bloodwood	LC	2 (d/l)				
ASTERACEAE	Bidens alba var. radicata	Shepard's Needles	*					1-3
POACEAE	Bothriochloa bladhii	Forest Bluegrass	LC		1			
POACEAE	Bothriochloa ewartiana	Desert Bluegrass	LC					+
POACEAE	Brachiaria decumbens	Signal Grass	*		+	+		+-3
PHYLLANTHACEAE	Breynia oblongifolia	Coffee Bush	LC	+	1			
EUPHORBIACEAE	Bridelia leichhardtii	Small-Leaved Scrub Ironbark	LC	1				
POACEAE	Capillipedium spicigerum	*Scented Top*	LC		1-3	+-1		
CAPPARACEAE	Capparis arborea	Native Pomegranite	LC	2-3				
CAPPARACEAE	Capparis ornans	Showy Caper	LC	+				
APOCYNACEAE	Carissa ovata	Klunkerberry	LC	2				
VITACEAE	Cayratia acris	Soft Water Vine	LC	+				

FAMILY	Botanical Name	Common Name	Status[1]	8.12.3	8.12.5	8.12.7	8.12.12	Road Reserve
FABACEAE	Centrostema molle	Centro	*			+-2		+-2
CAESALPINIACEAE	Chamaecrista bifida	*Ncn*	LC			+		
CAESALPINIACEAE	Chamaecrista noname	*Ncn*	LC			+		
CAESALPINIACEAE	Chamaecrista rotundifolia	Wynn's Cassia	*					+
ADIANTACEAE	Cheilanthes sieberi ssp. sieberi	Mulga Fern	LC			1		
ADIANTACEAE	Cheilanthes tenuifolia	Rock Fern	LC			1		
OLEACEAE	Chionanthus ramiflora	Native Olive	LC	3-4				
POACEAE	Chloris gayana cv.	Rhodes Grass	*					+-2
POACEAE	Chloris inflata	Purpletop Chloris	*					+-3
POACEAE	Chloris virgata	Feathertop Rhodes Grass	*					+-2
POACEAE	Chrysopogon falax	Golden Beard Grass	LC			+		
VITACEAE	Cissus cardiophylla	Heart-Leaved Water Vine	LC	+-2				
VITACEAE	Cissus oblonga	Smooth Water Vine	LC	+-3		+		
EUPHORBIACEAE	Cleistanthus dallachyanus	*Ncn*	LC	+				
POACEAE	Cleistochloa subjuncea	*Ncn*	LC			1		
RANUNCULACEAE	Clematis glycinoides	Clematis	LC	1				
VITACEAE	Clematocissus opaca	Forest Grape	LC	+	+			
VERBENACEAE	Clerodendrum floribundum	Smooth Lolly Bush	LC	2 (e)				
LAXMANNIACEAE	Cordyline murchinsoniae	Small Palm Lily	LC	+-2				
MYRTACEAE	Corymbia citridira ssp. citriodora	Lemon-Scented Gum	LC		1	3-6	+-2	
MYRTACEAE	Corymbia dallachiana	Dallachy's Gum	LC			+		
MYRTACEAE	Corymbia erythrophloia	Variable-Barked Bloodwood	LC				+	
MYRTACEAE	Corymbia intermedia	Pink Bloodwood	LC	2 (e)	2-4		2	
MYRTACEAE	Corymbia tessellaris	Carbeen	LC		+-2	+	2-3	
MYRTACEAE	Corymbia trachyphloia ssp. trachyphloia	Brown Blood	LC		+	+-2		
ASTERACEAE	Crassocephalum crepioides	Thickhead	*			+		+
FABACEAE	Crotalaria gorrensis	Gambia Pea	*			+		+-2
FABACEAE	Crotalaria lanceolata ssp. lanceolata	*Ncn*	*					+-1
LAURACEAE	Cryptocarya triplinervis var. pubescens	Three-Veined Laurel	LC	3	+			
SAPINDACEAE	Cupaniopsis ancardioides	Tuckeroo	LC	3-4		+		
ASTERACEAE	Cyanthilium cinereum	*Ncn*	LC		+	2		
ZAMIACEAE	Cycas media	*Ncn*	LC		3	1		
RUBIACEAE	Cyclophyllum coprosmoides	Coat Canthium	LC	+-2				
ORCHIDACEAE	Cymbidium canaliculatum	Black Orchid	LC			+		
CYPERACEAE	Cyperus gracilis	Whisker Grass	LC	+	+	1	+	
CYPERACEAE	Cyperus gunnii var. novae-hollandiae	*Ncn*	LC	2				
CYPERACEAE	Cyperus victorensis	*Ncn*	LC			+		
FABACEAE	Dalbergia sissoo	Himalayan Raintree	*		1			1
AMARANTHACEAE	Deeringia arborescens	*Ncn*	LC	+				
FABACEAE	Desmodium rhytidophyllum	Hairy Tre-Foil	LC			2		
FABACEAE	Desmodium tortuosum	*Ncn*	LC		+	+-2		
FABACEAE	Desmodium triflorum	*Ncn*	LC		1	+-2		
HEMEROCALLIDACEAE	Dianella caerulea	Blue Flax Lily	LC			+		
POACEAE	Dichanthium aristatum	Angleton Grass	*					+
POACEAE	Digitaria breviglumis	*Ncn*	LC	+-3 (e)		1-2		
POACEAE	Digitaria eriantha	Pangola Grass	*					
SAPINDACEAE	Dioscorea transversa	Native Yam	LC	1				
EBENACEAE	Diospyros australis	Black Plum	LC	1				
EBENACEAE	Diospyros geminata	Scaly Ebony	LC	2				

FAMILY	Botanical Name	Common Name	Status[1]	8.12.3	8.12.5	8.12.7	8.12.12	Road Reserve
EBENACEAE	Diospyros hebecarpa	(An) Ebony	LC	1				
SAPINDACEAE	Diploglottis obovata	Native Tamarind	LC	+				
ORCHIDACEAE	Dockrilla bowmanii	*Ncn*	LC	+				
SINOPTERIDACEAE	Doryopteris concolor	*Ncn*	LC	3-4				
POLYPODIACEAE	Drynaria sparsisora	*Ncn*	LC	+				
EUPHORBIACEAE	Drypetes deplanchei	Yellow Tulip	LC	3				
MELIACEAE	Dysoxylum mollisimum ssp. molle	Red Bean	LC	1				
ELAEOCARPACEAE	Elaeocarpus obovatus	Hard Quandong	LC	+-4				
SAPINDACEAE	Elattostachys xylocarpa	White Tamarind	LC	+				
POACEAE	Eleusine indica	Crows Foot Grass	LC					2
ASTERACEAE	Emilia sonchifolia	Emilia	LC			+		
ASTERACEAE	Epaltes australe	*Ncn*	LC			+		2
POACEAE	Eragrostis spartinoides	*Ncn*	LC		2	+-3		
POACEAE	Eragrostis tenuiflora	Elastic Grass	*					
MYRTACEAE	Eucalyptus drepanophylla	Northern Grey Ironbark	LC		+-3	+-4	2-3	
MYRTACEAE	Eucalyptus exserta	Queensland Peppermint	LC		2-4	+-2		
MYRTACEAE	Eucalyptus platyphylla	Poplar Gum	LC			+-1		
MYRTACEAE	Eucalyptus portuensis	White Mahogany	LC		4-6	+-4	1	
MYRTACEAE	Eucalytus tereticornis	Queensland Blue Gum	LC				3-4	
MYRTACEAE	Eugenia reinwardtiana	Beach Cherry	LC	+				
ANACARDIACEAE	Euroschinus falcata	Ribbonwood	LC	+-3		+		
LAXMANNIACEAE	Eustrephus latifolius	Wombat Berry	LC	+-1	1			
CONVOLVULACEAE	Evolvus alsinoides	Creeping Speedwell	LC		+			
CYPERACEAE	Exocarya scleroides	*Ncn*	LC	+-2				
MORACEAE	Ficus hillii	Sandpaper Fig	LC	2				
MORACEAE	Ficus opposita	Sandpaper Fig	LC	+		+		
MORACEAE	Ficus racemosa	Cluster Fig	LC	2-3 (d/l)				
MORACEAE	Ficus rubiginosa forma rubiginosa	Rock Fig	LC			+		
MORACEAE	Ficus virens ssp. sublanceolata	White Fig	LC	+				
MORACEAE	Ficus watkinsiana	Stangler Fig	LC	+				
CYPERACEAE	Fimbristylis cinnamometorum	*Ncn*	LC			+-2		+-3
FABACEAE	Fleminiga lineata	*Ncn*	LC		1	+-2		+-2
RUTACEAE	Flindersia australis	Crows Ash	LC		+			
RUTACEAE	Flindersia schottiana	Cudgeree	LC	+-3				
PHYLLANTHACEAE	Flueggea leucopyros	Currant Bush	LC		+			
CYPERACEAE	Gahnia aspera	Saw Sedge	LC	+-2				
RUTACEAE	Geijera salicifolia var. latifolia	Broad-Leaved Wilga	LC	2				
ORCHIDACEAE	Geodorum densiflorum	Pink Nodding Orchid	LC		+	+		
PHYLLANTHACEAE	Glochidion apodogynum	Cheese Tree	LC	2 (e)	+-1	+-2	+-2	
ASTERACEAE	Glossocardia bidens	Native Cobblers Pegs	LC			+		
VERBENACEAE	Glossocarya hemiderma	Glossocarya	LC	+				
FABACEAE	Glycine cryptoloba	*Ncn*	LC			+		
FABACEAE	Glycine tabacina	Glycine Pea	LC			2		
APOCYNACEAE	Gomphocarpus physocarpus	Balloon Cotton	*					+
MYRTACEAE	Gossia bidwillii	Python Tree	LC	3				
MYRTACEAE	Gossia hillii	Scaly Myrtle	LC	+				
ASTERACEAE	Helichrysum boormanii	*Ncn*	LC			+		
POACEAE	Heteropogon contortus	Bunched Speargrass	LC		1-3	2-5		
POACEAE	Heteropogon triticeus	Giant Speargrass	LC			2-4		

FAMILY	Botanical Name	Common Name	Status[1]	8.12.3	8.12.5	8.12.7	8.12.12	Road Reserve
APOCYNACEAE	Heterostema acuminatum	Blue Tiger Butterfly Vine	LC					
MALVACEAE	Hibiscus divaricatus	*Ncn*	LC		2			
VIOLACEAE	Hybanthus stellarioides	Spade Flower	LC			+		
POACEAE	Hyparrhenia rufa ssp. altissima	Thatch Grass	*		+-2	+		2-5
LAMIACEAE	Hyptis suaveolens	Hyptis	*					+
POACEAE	Imperata cylindrica	Blady Grass	LC		+		+-2	+-2
FABACEAE	Indigofera brevidens var. brevidens	(An) Indigo	LC	+ (e)				
FABACEAE	Indigofera hirsuta	Hairy Indigo	LC					+-2
CONVOLVULACEAE	Ipomoea hederifolia	Scarlet Creeper	*					2
CONVOLVULACEAE	Ipomoea quamoclit	Star Of Bethelehem	*					1
SAPINDACEAE	Jagera psuedorhus var. psuedorhus	Foam Bark	LC	2-3	+-2	+		
OLEACEAE	Jasminum didymum ssp. racemosum	Slender Jasmine	LC	2-3				
RUBIACEAE	Kailarsenia ochreata	Native Gardenia	LC	1		1-2		
VERBENACEAE	Lantana camara var. camara	Common Lantana	*	+-3 (e)		+-1	1-4	
DRYOPTERIDACEAE	Lastreopsis microsora	Creeping Shield Fern	LC	+-3				
CAESALPINIACEAE	Leucaena leucocephala	White Popinac	*					+-2
LAMIACEAE	Leucas linifolia	*Ncn*	*					+
CAMPANULACEAE	Lobelia purpurascens	White Root	LC			+		
LAXMANNIACEAE	Lomandra longifolia	Spiny-Headed Mat-Rush	LC			+		
LAXMANNIACEAE	Lomandra multiflora ssp. multiflora	Many-Headed Mat Rush	LC		+	+		
MYRTACEAE	Lophostemon confertus	Brush Box	LC	3		+-5		
MYRTACEAE	Lophostemon grandiflorus	Northern Swamp Box	LC				2	
MYRTACEAE	Lophostemon suaveolens	Swamp Box	LC			+-2	2-3	
EUPHORBIACEAE	Macaranga tanarius	Macaranga	LC	+ (e)				
FABACEAE	Macroptilium atropurpureum	Siratro	*					1-3
EUPHORBIACEAE	Mallotus philippensis	Red Kamala	LC	4		1		
CELASTRACEAE	Maytenus disperma	Orange Bush	LC	+ (e)				
POACEAE	Megathyrsus maximus var. maximus cv. Hamil	Guinea Grass	*					1
POACEAE	Megathyrsus maximus var. pubiglumis	Green Panic	*		+-2	+	+-4	+-5
MYRTACEAE	Melaleuca viridflora	Broad-Leaved Tea Tree	LC			+-4		
MYRTACEAE	Melalueca fluviatilis	Paper-Barked Tea Tree	LC				1	
POACEAE	Melinis minutiflora	Molasses Grass	*			1		+-5
ANNONACEAE	Melodorum leichhardtii	Zig-Zag Vine	LC	2				
MELASTOMATACEAE	Memecyclon pauciflorum var. pauciflorum	*Ncn*	LC	1				
RUTACEAE	Micromelum minutum	Micromelum	LC	2-3				
POLYPODIACEAE	Microsorum sp. (n-r)	*Ncn*	LC	+-3				
ANNONACEAE	Miliusa brahei	*Ncn*	LC	2-4				
MIMOSACEAE	Mimosa pudica var. unijuga	Common Sensitive Plant	*			1		+-3
SAPINDACEAE	Mischocarpus anodontus	Veiny Pear-Fruit	LC	1				
POACEAE	Mnesithea rottboellioides	*Ncn*	LC		+	1		+
COMMELINIACEAE	Murdannia graminea	Slug Herb	LC			+		
MYOPORACEAE	Myoporum acuminatum	Boobialla	LC		1			
MYRSINACEAE	Myrsine porosa	(A) Muttonwood	LC	+				
LAURACEAE	Neolitsea brassii	Northern Bolly Gum	LC	+-2				
OLEACEAE	Notelaea microcarpa var. microcarpa	Narrow-Leaved Mock Olive	LC	+				
OLEACEAE	Olea paniculata	Native Olive	LC	1				

FAMILY	Botanical Name	Common Name	Status[1]	8.12.3	8.12.5	8.12.7	8.12.12	Road Reserve
POACEAE	Oplismenus undulatifolius	(A) Basket Grass	LC	1-3	1			
POACEAE	Ottochloa gracillima	Gracefull Grass	LC	+				
BIGNONIACEAE	Pandorea pandorana	Wonga Vine	LC	1-2				
POACEAE	Panicum effusum	Hairy Panic	LC			+		
POACEAE	Panicum simile	Two-Coloured Panic	LC		+	+-2		+
POACEAE	Papsalidium distans	Shot Grass	LC		+	1		
MIMOSACEAE	Paraserianthes toona	Mackay Cedar	LC	2				
APOCYNACEAE	Parsonsia longipetiolata	Green-Leaved Silkpod	LC	+				
APOCYNACEAE	Parsonsia paulforsteri	Narrow-Leaved Silkpod	LC	2				
PASSIFLORACEAE	Passiflora foetida	Stinking Passionvine	*					+
PASSIFLORACEAE	Passiflora suberosa	Corky Passionvine	*	2-3	1-2			
RUBIACEAE	Pavetta australiensis	Butterfly Bush	LC	2-3				
ADIANTACEAE	Pellaea nana	Small-Leaved Sickle Fern	LC	+-3				
RUTACEAE	Pentaceras australe	Penta's Ash	LC	1				
PIPERACEAE	Peperomia blanda var. floribunda	*Ncn*	LC	+-3				
ASTERACEAE	Peripleura hispidula	*Ncn*	LC			1		
PROTEACEAE	Persoonia falcata	(A) Geebung	LC			+-1		
PHYLLANTHACEAE	Phyllanthus gunnii	Gunn's Phyllanthus	LC	+	1			
PHYLLANTHACEAE	Phyllanthus virgatus	*Ncn*	LC			2		
URTICACEAE	Pipturus argenteus	Native Mulberry	LC	+ (e)				
NYCTAGINACEAE	Pisonia aculeata	Pisonia	LC	+				
PITTOSPORACEAE	Pittosporum ferrugineum ssp. linifolium	Rusty Pittosporum	LC	+				
LECYTHIDACEAE	Planchonia careya	Cocky Apple	LC		+	+-2		
PLANTAGINACEAE	Plantago deblis	*Ncn*	LC			+		+
MENISPERMACEAE	Pleiogyne australe	Wiry Grape	LC	1				
ANACARDIACEAE	Pleiogynium timorense	Burdekin Plum	LC	+-2		+		
RUBIACEAE	Pogonolobus reticulatus	*Ncn*	LC			+		
ANNONACEAE	Polyalthia nitidissima	Canary Beech	LC	+				
ARALIACEAE	Polyscias elegans	Celery Wood	LC	2				
FABACEAE	Pongamia pinnata	*Ncn*	LC	+				
SAPOTACEAE	Pouteria myrsinifolia	Blunt-Leaved Coondoo	LC	+				
SAPOTACEAE	Pouteria pohlmaniana	Yellow Boxwood	LC	+				
RUBIACEAE	Psychotria sp. (Shute Harbour L.J. Webb 7916)	*Ncn*	LC	2		+-2 (e)		
RUBIACEAE	Psydrax odorata ssp. australiana	Shiny Canthium	LC		+			
ASTERACEAE	Pterocaulon redolens	*Ncn*	LC			1		
ASTERACEAE	Pterocaulon sphacelatum	Applebush	LC					+
POLYPODIACEAE	Pyrrosia confluens	Robber Fern	LC	+				
MYRTACEAE	**Rhodamnia pauciovulata**	**Small-Leaved Malletwood**	**NT**	**2**				
POACEAE	Rhynchelytrum repens	Red Natal Grass	*			+		+-3
PHYTOLACCACEAE	Rivinia humilis	Baby Pepper	*	+-4				
LAMIACEAE	Salvia reflexa	Mintweed	*		+			
POACEAE	Sarga nitida forma aristata	*Ncn*	LC		+-2	+-3		1
CYPERACEAE	Scleria mackaviensis	*Ncn*	LC	2-3	3	2		
FLACOURTICACEAE	Scolopia braunii	Flintwood	LC	+				
APOCYNACEAE	Secamone elliptica	Corky Milk Vine	LC	+				
CAESALPINIACEAE	Senna obtusifolia	Sicklepod	*					1
POACEAE	Setaria oplismenioides	*Ncn*	LC	1				
POACEAE	Setaria surgens	*Ncn*	LC					+-2
MALVACEAE	Sida cordifolia	Flannel Weed	LC			+		

FAMILY	Botanical Name	Common Name	Status[1]	8.12.3	8.12.5	8.12.7	8.12.12	Road Reserve
ASTERACEAE	Sigesbeckia orientalis	Indian Weed	*	+ (e)				
SMILACACEAE	Smilax australis	Austral Sarsparilla	LC	2-3				
SOLANACEAE	Solanum nigrum	Blackberry Nightshade	*					+
SOLANACEAE	Solanum seaforthianum	Brazilian Nightshade	*	+-2				
SOLANACEAE	Solanum torvum	Devil's Fig	*			+		+
ASTERACEAE	Sonchus oleraceus	Milk Thistle	*					+
POACEAE	Sorghum halepense	Johnson Grass	*					+-2
RUBIACEAE	Spermacoce brachystema	*Ncn*	LC			+-2		
VERBENACEAE	Stachytarpheta jamaicensis	Blue Snakeweed	*			+		
MENISPERMACEAE	Stephania japonica var. discolor	Tape Vine	LC		+			
STERCULIACEAE	Sterculia quadrifida	Peanut Tree	LC	1				
FABACEAE	Stylostanthes harmata	Stylo	*		+	1		1
FABACEAE	Stylostanthes scabra	Shrubby Stylo	*					1-3
MYRTACEAE	Syzygium australe	Brush Cherry	LC	+-3 (d/l)				
FABACEAE	Tephrosia filipes	*Ncn*	LC		+	1		+
COMBRETACEAE	Terminalia porphyrocarpa	(A) Damson Tree	LC	2-3				
VITACEAE	Tetrastigma nitens	Native Grape	LC	2				
POACEAE	Themeda quadrivalvis	Grader Grass	*					1-4
POACEAE	Themeda triandra	Kangaroo Grass	LC			1-5		
RUBIACEAE	Timonius timon	Timon Tree	LC	2				
MENISPERMACEAE	Tinospora smilacina	Arrow-Head Vine	LC	+				
ULMACEAE	Trema tomentosa var. tomentosa	Poison Peach	LC			1		
BORAGINACEAE	Trichodesma zeylanica	Rough Bluebell	LC		2			
ASTERACEAE	Tridax procumbens	Tridax Daisy	*					+-2
ULMACEAE	Triumfetta rhomboidea	Chinese Burr	*					+-2
MORACEAE	Trophis scandens	Burney Vine	LC	+-2				
FABACEAE	Uraria lagopodoides	*Ncn*	LC			+		
POACEAE	Urochloa mosambicensis	Sabi Grass	*					+
GOODENIACEAE	Velleia pubescens	*Ncn*	LC			+-2		+-3
LAXMANNIACEAE	Xanthorrhoea latifolia ssp. latifolia	Forest Grass Tree	LC			+-3		
FABACEAE	Zornia muriculata	*Ncn*	LC			2		

Legend

1. "Status" indicates the Queensland conservation status of each taxon under the *Nature Conservation (Wildlife) Regulation 2006.* The codes are Least Concern (LC) and Naturalised Exotic (*). Threatened taxa are described as Endangered (E), Vulnerable (V) or Near Threatened (NT). No species which are afforded a conservation status under the *Environmental Conservation and Biodiversity Conservation Act 1999* were identified in the Study Area.

2. Relative abundance" was based on the Hurst & Allen modification of the Braun-Blanquet technique cover-abundance scale (Hurst and Allen 2007, Mueller-Dombois & Ellenberg 1974, Whittaker 1975) as follows:

   - + = one or two individuals only
   - 1 = sparse, <5%;
   - 2 = any number, <5%;
   - 3 = 5 – 24%;
   - 4 = 25 – 49%;
   - 5 = 50 – 74%;
   - 6 = 75 – 100%.

3. The annotation that has been used after some of the relative abundance scores are as follows:

   - d/l = drainage line
   - e = edge of vegetation community

APPENDIX C

Figures

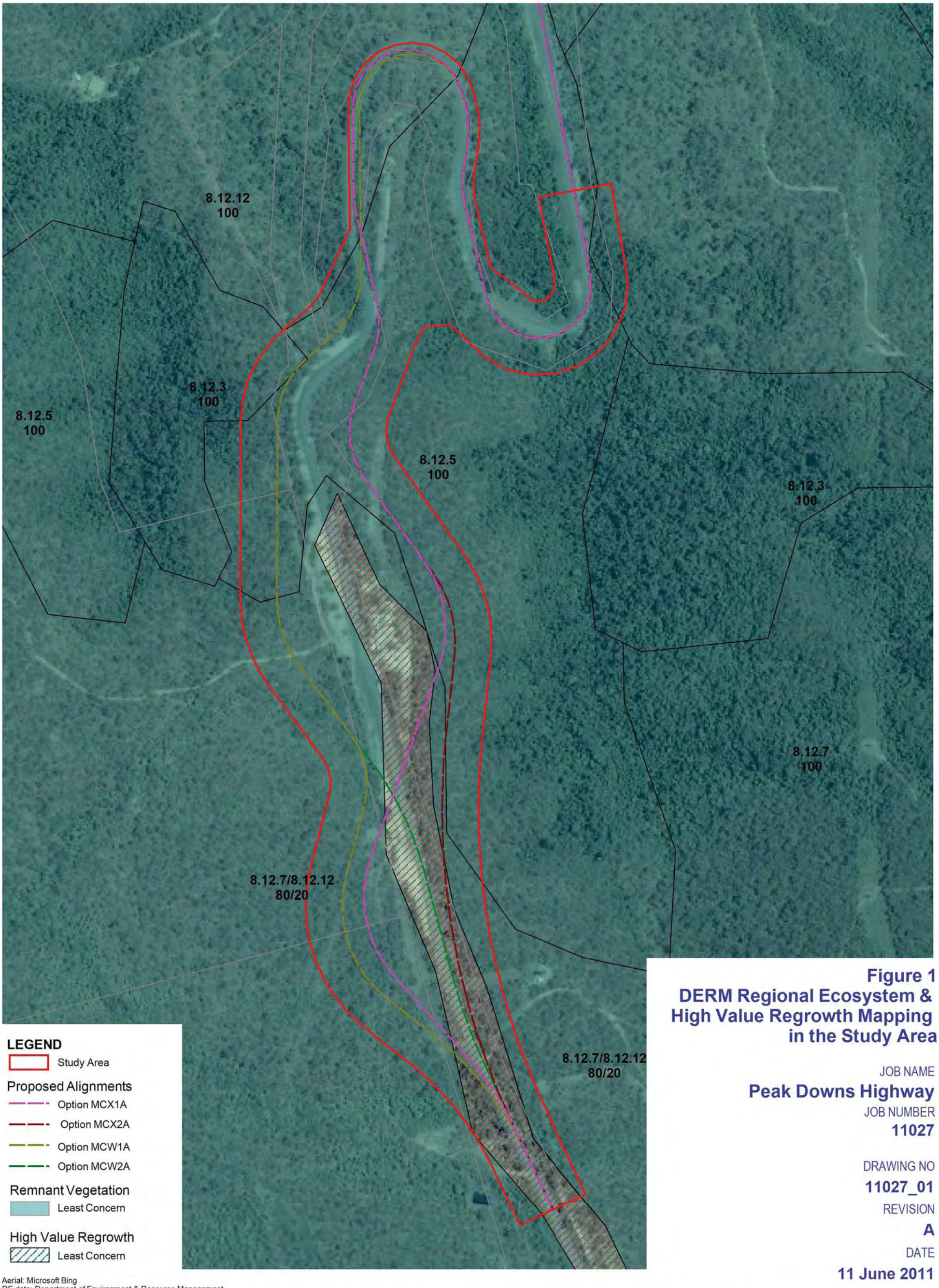

Figure 1
DERM Regional Ecosystem & High Value Regrowth Mapping in the Study Area

JOB NAME
Peak Downs Highway
JOB NUMBER
11027

DRAWING NO
11027_01
REVISION
A
DATE
11 June 2011

ecological survey & management

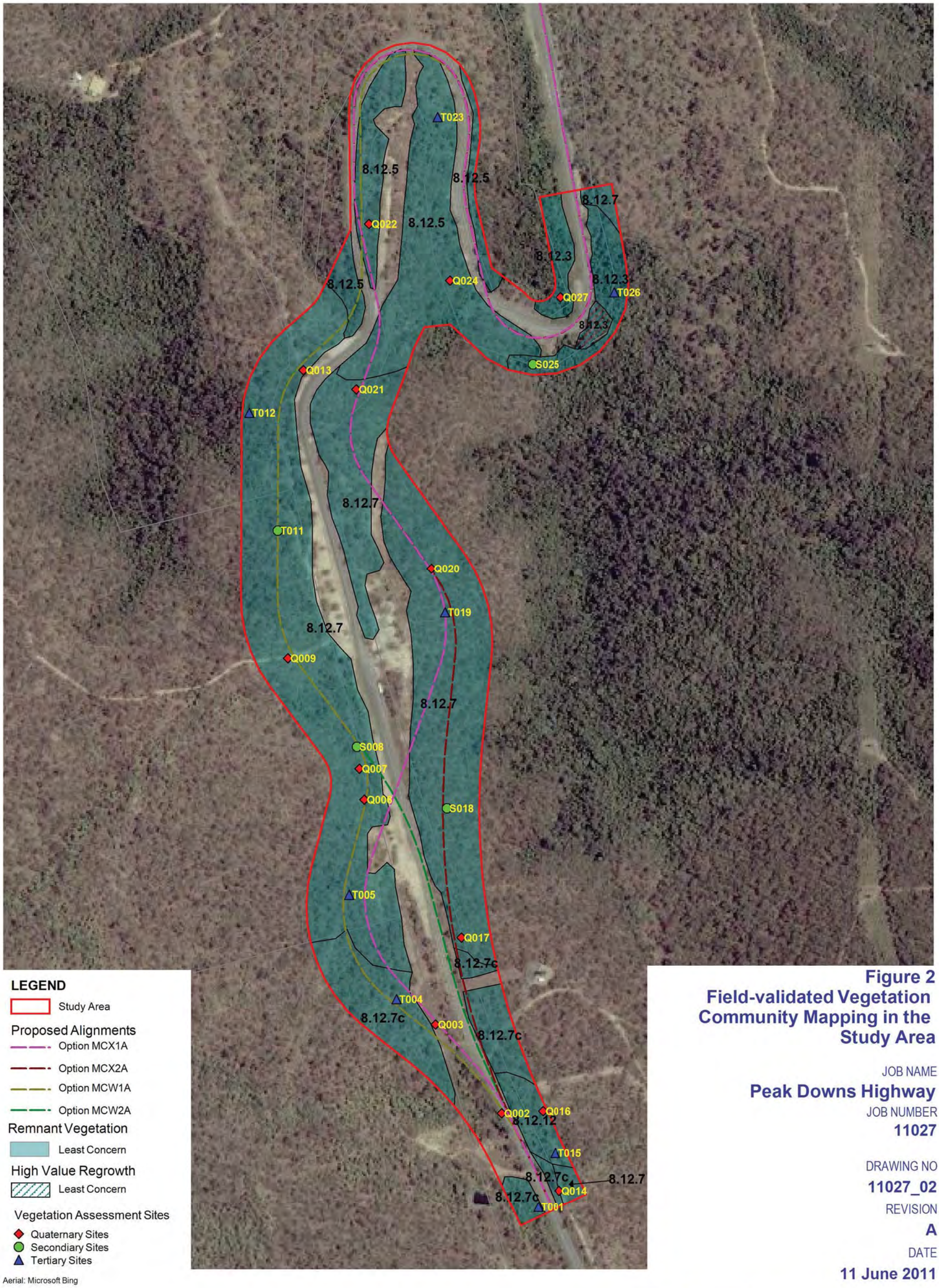

Figure 2
Field-validated Vegetation Community Mapping in the Study Area

JOB NAME
Peak Downs Highway
JOB NUMBER
11027

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11027_02
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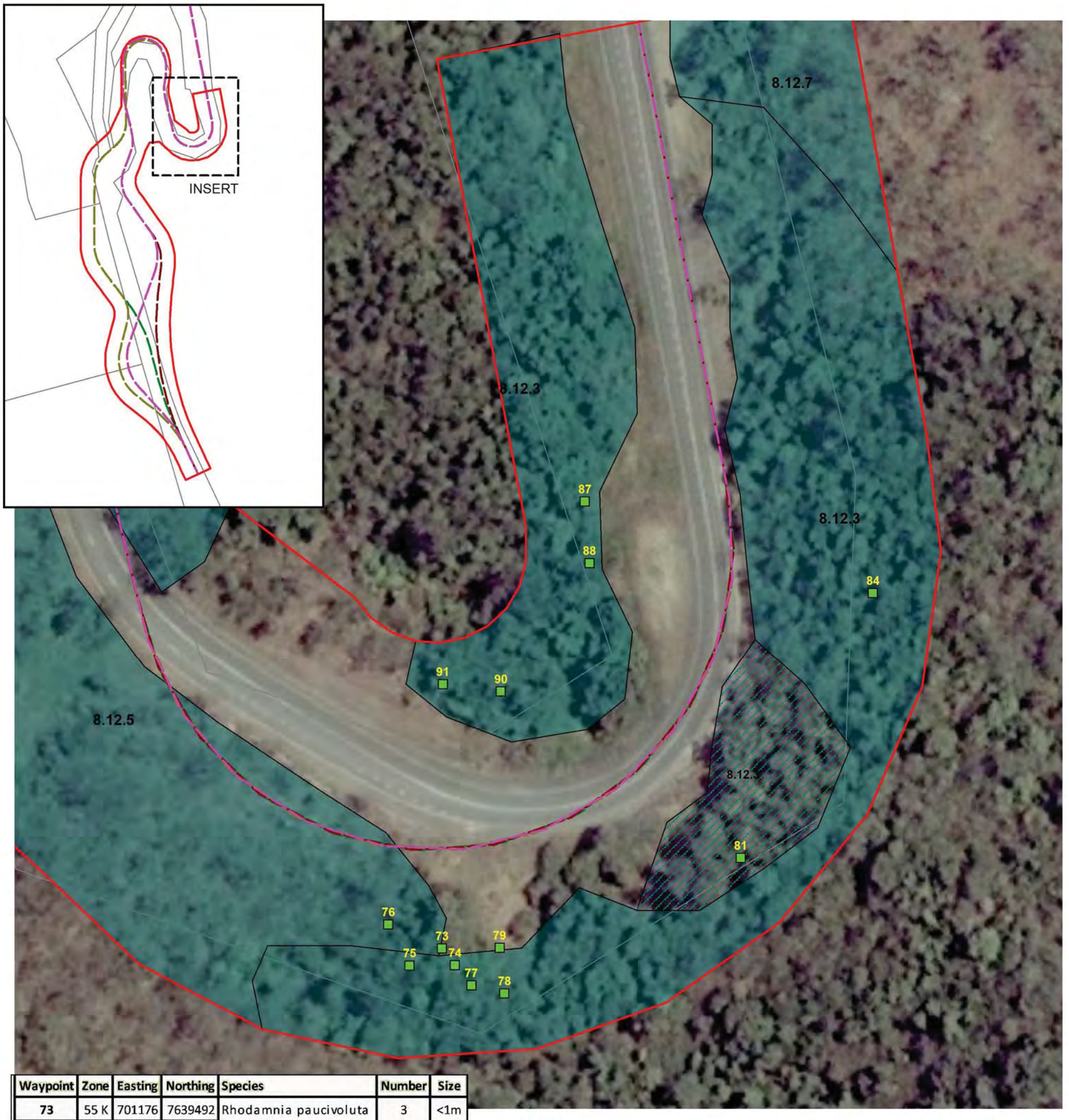

Waypoint	Zone	Easting	Northing	Species	Number	Size
73	55 K	701176	7639492	Rhodamnia paucivoluta	3	<1m
74	55 K	701179	7639488		6	1-2m
75	55 K	701168	7639488		4	2-4m
76	55 K	701163	7639498		1	4-6m
77	55 K	701183	7639483			
78	55 K	701191	7639481			
79	55 K	701190	7639492			
81	55 K	701249	7639513	Rhodamnia paucivoluta	1	1-2m
84	55 K	701282	7639577	Rhodamnia paucivoluta	1	1-2m
87	55 K	701212	7639600	Rhodamnia paucivoluta	2	<1m
					1	1-2m
					2	2-4m
					1	4-6m
88	55 K	701213	7639585	Rhodamnia paucivoluta	1	<1m
90	55 K	701191	7639554	Rhodamnia paucivoluta	3	1-2m
91	55 K	701177	7639556	Rhodamnia paucivoluta	1	2-4m

LEGEND

Study Area

Proposed Alignments

- Option MCX1A
- Option MCX2A
- Option MCW1A
- Option MCW2A

Remenant Vegetation

- Least Concern

High Value Regrowth

- Least Concern

Threatened Flora Species

- *Rhodamnia pauciovulata (Small-leaved Malletwood)*

Aerial: Microsoft Bing

NORTH

SCALE 0 20 40m

Figure 3
Location of Threatened Flora Species in the Study Area

JOB NAME
Peak Downs Highway

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