Flora and Fauna Review
of
Proposed Pacific Highway Upgrade
at
Bonville

Report to Department of Urban Affairs and Planning

Peter Smith

November 1999

Contents

Tables

1. Introduction

The Department of Urban Affairs and Planning (DUAP) is currently assessing a proposal by the Roads and Traffic Authority (RTA) for a 9.8 km four-lane dual carriageway upgrade of the Pacific Highway between Lyons Road and the southern end of Pine Creek State Forest at Bonville (the Bonville Project).

The proposal is subject to assessment under Division 4, Part 5 of the *Environmental Planning and Assessment Act 1979* and requires the approval of the Minister for Urban Affairs and Planning. Prior to the Minister's decision, the Director-General of DUAP is required to prepare an independent assessment of the proposal (the Director-General's Report), which takes into account the Environmental Impact Statement, the issues raised during its public exhibition, and any other information provided by the RTA.

As part of this process, I have been engaged by DUAP to review the flora and fauna aspects of the proposal and provide specialist advice for the Director-General's Report. I have previously provided a separate review for DUAP (Smith 1998) of the 8 Part Test prepared for the proposal by Biosis Research (1997).

For the present review, I have examined the following documents:

- the Preliminary Flora and Fauna Assessment prepared for the RTA by Biosis Research (1997) in April 1997;
- the Environmental Impact Statement (EIS) prepared for the RTA by PPK (1998) in July 1998;
- the Species Impact Statement (SIS) prepared for the RTA by Biosis Research (1998a) in July 1998;
- the Discussion Paper Compensatory Habitat Assessment prepared for the RTA by Biosis Research (1998b) in December 1998;
- the Species Impact Statement Supplementary Information Report (SISSIR) prepared for the RTA by Biosis Research (1999) in May 1999;
- the Supplementary Route Selection and Design Report prepared for the RTA by PPK (1999a) in June 1999;
- the Response to the Bellingen Environment Centre Representation prepared for the RTA by PPK (1999b, 1999c) in June 1999;
- the Representations Report prepared by the RTA (1999) in July 1999; and
- the Concurrence Report prepared by the National Parks and Wildlife Service (NPWS 1999) in September 1999.

I inspected the route of the proposed upgrade on 19-21 October 1999.

2. Description of the Proposal

The Bonville Project is the proposed upgrading of the Pacific Highway around Bonville, between Lyons Road and the southern end of Pine Creek State Forest, to a four-lane dual carriageway. It forms part of the Pacific Highway Upgrading Project, which is a joint

project of the State and Commonwealth Governments. The upgrade is 9.8 km long. Its southern end is about 11 km south of Coffs Harbour.

The major components of the design are:

- deviation from the existing highway for most of the length of the upgrade, the proposed route being generally close to the existing highway in the southern section, south of Pine Creek, but deviating well to the east in the northern section, effectively bypassing the village of Bonville;
- interchanges at Mailmans Track and Archville Station Road;
- overpasses for East Bonville Road, Bonville Station Road and Williams Road;
- realignment of Strouds Road to join the highway at the Lyons Road interchange currently under construction;
- provision of a service road through Pine Creek State Forest, including an underpass, to complete a continuous alternative route from Coffs Harbour to Raleigh adjacent to the highway;
- bridges over Pine Creek (65 m long), Reedys Creek (60 m long) and Bonville Creek (162.5 m long);
- three bridges over gullies at other locations along the route;
- a tunnel 60 m long within Pine Creek State Forest, specifically to provide a fauna overpass; and
- a new vehicle rest area adjacent to the Mailmans Track interchange.

3. Description of the Environment

3.1 Topography and Land Use

The southern section of the proposed route, south of Pine Creek, consists of hilly, terrain within Pine Creek State Forest and adjacent forested freehold land. North of Pine Creek, the route traverses cleared agricultural and rural residential lands with fragmented patches of remnant vegetation. The latter includes an area at the north-eastern end of the route that is NPWS estate proposed for addition to Bongil Bongil National Park. The topography in the northern section of the route consists of gently undulating rises interspersed with coastal flood plains and swamps associated with Pine, Reedys and Bonville Creeks.

3.2 Vegetation Communities

The SISSIR (Table B10) identifies 12 vegetation communities that will be affected by clearing for the proposed upgrade:

- Tallowwood/Sydney Blue Gum
- Moist Grey Ironbark/Grey Gum/Tallowwood/White Mahogany
- Dry Blackbutt
- Moist Blackbutt
- Paperbark
- Flooded Gum

- Swamp Mahogany
- Tallowwood
- Turpentine
- Scattered Trees
- Eucalypt Plantation
- Regrowth

Five of the above have been classified as regionally significant communities in the Coffs Harbour Local Government Area by Fisher *et al*. (1996):

- Moist Grey Ironbark/Grey Gum/Tallowwood/White Mahogany. Mentioned in the SISSIR (A1.2 Table 3 and Table B10), but not in the original SIS. Community terminology is confused. Other names used for this community in the SISSIR are 'Mixed Hardwood' (Table A3) and 'Narrow-leaved White Mahogany - Red Mahogany' (Figure 1). The tree layer is a mix of hardwood species, including Narrow-leaved White Mahogany (*Eucalyptus acmenoides*), Grey Ironbark (*E. siderophloia*) and Grey Gum (*E. punctata*). Other species such as Tallowwood (*E. microcorys*), Blackbutt (*E. pilularis*), Pink Bloodwood (*Corymbia intermedia*) and Brush Box (*Lophostemon confertus*) are also present. No Red Mahogany (*E. resinifera*) was recorded from the study area. Figure 1 of the SISSIR indicates that the proposed route crosses this community near Mailmans Track in Pine Creek State Forest.

- Dry Blackbutt. Tall open forest in which the dominant tree species are Blackbutt and Tallowwood. Pink Bloodwood and Turpentine (*Syncarpia glomulifera*) are also common. The distinction between Dry Blackbutt and Moist Blackbutt is not discussed in the SIS or SISSIR, but is based on the nature of the understorey. Moist Blackbutt has a dense, lush understorey of typically mesophytic shrubs, herbs and ferns, while Dry Blackbutt has a more xeric, open and grassy understorey (Baur 1965). Figure 1 of the SISSIR indicates that the proposed route crosses the Dry Blackbutt community only within Pine Creek State Forest.

- Flooded Gum. Tall Open Forest in which Flooded Gum (*Eucalyptus grandis*) is the dominant tree species, with Brush Box, Pink Bloodwood and Turpentine being common associates. Figure 1 of the SISSIR indicates that the proposed route crosses several areas of Flooded Gum community north of Pine Creek, but none within Pine Creek State Forest.

- Tallowwood. Tall Open Forest in which the dominant tree species is Tallowwood. Figure 1 of the SISSIR indicates that the proposed route crosses this community between Pine Creek State Forest and Pine Creek.

- Turpentine. Mentioned in the SISSIR (Table B10), but not in the original SIS. Turpentine is the dominant canopy species in this community. Other common canopy species include Tallowwood, Sydney Blue Gum (*Eucalyptus saligna*), Flooded Gum, Narrow-leaved White Mahogany, Grey Ironbark, Pink Bloodwood and Brush Box. Figure 1 of the SISSIR indicates that the proposed route crosses a tiny strip of this community just north of Pine Creek State Forest.

3.3 Flora Species

A total of 218 native vascular plant species were recorded along the proposed route (SIS Appendix G). These include one threatened species, Rusty Plum (*Amorphospermum whitei*), which is listed as a vulnerable species in the *Threatened Species Conservation Act 1995*. Rusty Plum is a small to medium-sized tree. A total of 13 plants were found in or near the site of the proposed works in Pine Creek State Forest (locations shown on Figure 1 of the SISSIR).

In addition, six plant species classified by Sheringham and Westerway (1995) as

regionally significant in upper north east NSW (Coffs Harbour to Tweed Heads) were recorded along the route (SISSIR Table A3). None of these is listed on the Threatened Species Conservation Act 1995, nor on the national list of Rare or Threatened Australian Plants (Briggs and Leigh 1996). The six species are:

- Twin-leaved Coogera (*Arytera distylis*). A rainforest tree up to 20 m high. Regionally significant because it reaches its southern limit in upper north east NSW. Bonville is south of its previous known southern limit at Woodburn (Harden 1991). No information is given on where the species was found along the route.

- Umbrella Grass (*Digitaria divaricatissima*). A tufted perennial grass. Regionally significant because there are fewer than 20 records in upper north east NSW and the species is associated with habitats that are threatened with continuing depletion and degradation (Sheringham and Westerway 1995). It grows in woodland on better soils. No information is given on where the species was found along the route.

- Drooping Orchid (*Epipogium roseum*). A terrestrial orchid that is regionally signnificant because it is rare in upper north east NSW (fewer than five known localities). One plant was found at the site of the proposed Mailmans Track rest area.

- Broad-leaved Native Cherry (*Exocarpos latifolius*). A shrub or small tree 2-10 m high. Regionally significant because it reaches its southern limit in upper north east NSW. Bonville is south of its previous known southern limit at Evans Head (Harden 1992). No information is given on where the species was found along the route.

- *Hybanthus vernonii* subspecies *scaber*. A perennial herb that is regionally significant because it reaches its northern limit in upper north east NSW. That limit appears to be the Clarence River (Harden 1990). No information is given on where the species was found along the route.

- Climbing Fern (*Lygodium microphyllum*). A fern with climbing fronds that may be several metres long. The species is not actually listed by Sheringham and Westerway (1995), but certainly meets their criteria as a regionally significant species, since it reaches its southern limit in upper north east NSW. Bonville is south of its previous known southern limit at Iluka (Harden 1990). The species was recorded in the native vegetation between Williams Road and Lyons Road (Biosis Research 1997), but the exact location and habitat are not given

3.4 Fauna Species

Six native frog species, five native reptile species, 55 native bird species and 17 native mammal species were recorded in a 250 m wide corridor along the proposed route. These figures are based on the species listed in SIS Appendix H and differ from the totals given in the SIS and SISSIR, apparently because of addition errors. It also appears that Appendix H is an incomplete list of the species recorded, since mention is made elsewhere in the SIS of two additional bird species recorded along the route, the Square-tailed Kite and Wompoo Fruit-Dove (see below).

Twelve more bird species were recorded within the study corridor during my field inspection in October 1999 (see Appendix below). None of these has special conservation significance, but the fact that so many extra species were found illustrates the limitations of brief fauna surveys in providing a comprehensive species list.

Eight threatened species, all of which are classified as vulnerable species in the *Threatened Species Conservation Act 1995*, have been recorded along the route (note that the SIS Section 4.5.7 and the NPWS Concurrence Report only mention four of these species):

- Giant Barred Frog (*Mixophyes iteratus*). Recorded along Pine Creek and resident in the area of riparian vegetation that will be disturbed by construction of the proposed bridge (SIS Appendix F).

- Black-necked Stork (*Ephippiorhynchus asiaticus*). Not observed during the survey, but reported to visit farm dams near Herdegen Close.

- Osprey (*Pandion haliaetus*). A nest with young was recorded close to the proposed road corridor, on the western side, just south of East Bonville Road (location shown in Figure 4 of the SIS). This nest is apparently used each year.

- Square-tailed Kite (*Lophoicinia isura*). Not listed in SIS Appendix H, but the species profile in Appendix E states that the species was observed in the Pine Creek State Forest section of the study area.

- Wompoo Fruit-Dove (*Ptilinopus magnificus*). Not listed in SIS Appendix H, but recorded during the preliminary flora and fauna assessment (Biosis Research 1997) in the band of native vegetation between Archville Station Road and East Bonville Road.

- Koala (*Phascolarctos cinereus*). Koalas have been widely and frequently reported along the proposed route, including records during the SIS survey. Pine Creek State Forest is a major site for Koalas in the Coffs Harbour region and supports a population of about 400 animals (SIS Appendix I). Koalas also occur regularly further north in the fragmented vegetation of rural Bonville, where there is possibly a population of 50-100 animals.

- Yellow-bellied Glider (*Petaurus australis*). Not recorded during the SIS survey, but Appendix E notes that the species has been recorded previously in the study area. No details are provided.

- Little Bentwing-bat (*Miniopterus australis*). Calls attributed to this species were recorded in Pine Creek State Forest (SIS Table 2).

3.5 Wildlife Corridors

Two regionally significant wildlife corridors have been identified as crossing the proposed route (SIS Section 4.4.3):

- Pine Creek State Forest forms an important link in a major corridor from the tablelands to the coast, from Dorrigo National Park through Tuckers Nob State Forest and Pine Creek State Forest to Bongil Bongil National Park.

- The native vegetation between Bonville Creek and Lyons Road forms part of an alternative link between Tuckers Nob State Forest and Bongil Bongil National Park. However, the native vegetation in this corridor is more fragmented than in the Pine Creek State Forest corridor.

3.6 Watercourses and Wetlands

The proposed route crosses three major creeks: Pine, Reedys and Bonville Creeks. No seagrasses occur in these creeks at the sites of the proposed crossings, and the only mangroves are a few scattered River Mangroves (*Aegiceras corniculatum*) on the south bank of Bonville Creek (SISSIR Appendix 3).
Four wetland areas have been identified along the proposed route or nearby (SISSIR Appendix 4):

- Reedys Creek is more of a wetland than a flowing creek at the site of the proposed

crossing and downstream;

- Wetland No. 344 identified in State Environmental Planning Policy No. 14 (SEPP 14) occurs just east of the proposed route on the minor creek between Archville Station Road and East Bonville Road;
- SEPP 14 Wetland No. 335 occurs just east of the route on the minor creek between East Bonville Road and Bonville Station Road; and
- Bongil Bongil Swamp occurs just east of the route between Williams Road and Lyons Road.

4. Impacts on Flora and Fauna

4.1 Vegetation Communities

The total area of native vegetation to be cleared for the proposed works is 55.6 ha (not 54.1 ha as stated in the SISSIR, apparently an addition error), of which 28.2 ha (51%) are in regionally significant communities, 8.1 ha (15%) are in other communities, and 19.3 ha (35%) are in planted/disturbed communities (Table 1).

Table 1. Area to be cleared in each vegetation community along the route (SISSIR Table B10).

Vegetation community	Area to be cleared (ha)
Regionally significant communities:	
Moist Grey Ironbark/Grey Gum/Tallowwood/White Mahogany	6.0
Dry Blackbutt	10.8
Flooded Gum	8.2
Tallowwood	3.0
Turpentine	0.2
Subtotal	**28.2**
Other communities:	
Tallowwood/Sydney Blue Gum	3.0
Moist Blackbutt	4.0
Paperbark	0.2
Swamp Mahogany	0.9
Subtotal	**8.1**
Planted/disturbed communities:	
Scattered Trees	1.7
Eucalypt Plantation	16.8
Regrowth	0.8
Subtotal	**19.3**
TOTAL	**55.6**

There will be a net loss of flora and fauna habitat as a result of the proposal. It has been accepted that a compensatory habitat package is appropriate, and the RTA and NPWS are currently negotiating this package. The RTA draft policy on compensatory habitat (RTA 1998) considers that compensatory habitat is appropriate where there has been a loss of 'key habitat'. Key habitat is defined by the RTA as the natural environment inhabited by native flora and/or fauna species, populations or ecological communities which are deemed to be of significance. The significance of a species, population or

ecological community may be determined as a result of:

- inclusion on Schedule 1 of the *Threatened Species Conservation Act 1995* or the *Fisheries Management Amendment Act 1997* as an endangered species, population or ecological community, or presumed extinct species;
- inclusion on Schedule 2 of the *Threatened Species Conservation Act 1995* as a vulnerable species;
- inclusion in an area of habitat of an endangered species, population or ecological community declared critical habitat by the Minister of Environment;
- inclusion in a planning instrument under the *Environmental Planning and Assessment Act 1979* in a category of nature conservation significance;
- inclusion on the National Estate listing;
- inclusion within a conservation reserve gazetted under the *National Parks and Wildlife Act 1979* or under the *Forestry Act 1916*;
- being recognised as an area of high nature conservation value in a property agreement or regional vegetation management plan under the *Native Vegetation Management Act 1997*;
- inclusion in any other conservation agreement, state, national or international; or
- being of particular ecological significance to NPWS, NSW Fisheries, the Department of Land and Water Conservation, State Forests of NSW or other agency (the relevant agency will be required to provide written justification for an area being identified as of 'particular ecological significance').

Biosis Research (1998b) considered the issue of key habitat in relation to the Bonville Project and concluded that a total of 43 ha of key habitat would be lost. This figure includes all areas of native vegetation to be cleared except for areas of regrowth and the areas of eucalypt plantation between East Bonville Road and Bonville Creek. Other areas of eucalypt plantation, located within Pine Creek State Forest, were classified as key habitat. The NPWS Concurrence Report (Section 3.6.2.4) agreed with the figure of 43 ha as the amount of key habitat that would be lost and for which compensatory habitat is required.

4.2 Flora Species

The SIS and SISSIR considered the impact of the proposal on ten threatened plant species. These included the eight species listed in the NPWS Director-General's requirements for the SIS, and two other species, *Eleocharis tetraquetra* and *Thesium australe*, which have been recorded in the general locality (within 10 km). It was concluded that there is unlikely to be a significant effect on any threatened plant species (Table 2).

Table 2. Biosis Research assessments of likely impacts on threatened flora (SIS Appendix C and SISSIR Sections B5.1 and B7.1).

E = endangered, V = vulnerable

Species	TSC Act Status	Impact assessment
Acronychia littoralis (Scented Acronychia)	E	No records along route and no suitable habitat (littoral rainforest). No likely impact.
Amorphospermum whitei (Rusty Plum)	V	13 plants located along route, two of which will be lost. Additional unrecorded plants may be present along route. Impact not considered significant and will be reduced by ameliorative measures (pre-construction surveys; translocation of affected plants if feasible; propagation from cuttings and seeds).
Eleocharis tetraquetra	E	No records along route (despite a targeted search), but possible habitat present. Measures to protect watercourses and wetlands will minimise potential impact.
Hicksbeachia pinnatifolia (Red Boppel Nut)	V	No records along route, but possible habitat present. Measures to protect rainforest gullies will minimise potential impact.
Marsdenia longiloba	E	No records along route, but possible habitat present. Measures to protect rainforest gullies will minimise potential impact.
Parsonsia 'dorrigoensis'	V	No records along route, but possible habitat present. Measures to protect rainforest gullies will minimise potential impact.
Persicaria elatior	V	No records along route, but possible habitat present. Measures to protect watercourses and wetlands will minimise potential impact.
Phaius australis	E	No records along route, but possible habitat present. Measures to protect watercourses and wetlands will minimise potential impact.
Thesium australe	V	No records along route and no suitable habitat (grassland on coastal headlands is thought to be the key habitat on the NSW north coast, although the species occurs in other grassland and woodland habitats elsewhere). No likely impact.
Tinospora tinosporoides (Arrow-head Vine)	V	No records along route, but possible habitat present. Measures to protect rainforest gullies will minimise potential impact.

The NPWS Concurrence Report (Table 4) discusses three other 'threatened' flora species that may potentially occur along the route: *Austrobuxus swainii* (Pink Cherry), *Millettia australis* (Native Wisteria) and *Thozetia racemosa* (Rusty Vine). None of these species is, in fact, listed in the *Threatened Species Conservation Act 1995*. They are not threatened species. *A. swainii* and *M. australis* are rare species on the national list of Rare or Threatened Australian Plants (Briggs and Leigh 1996), while *T. racemosa* was formerly a vulnerable species on the ROTAP list (Briggs and Leigh 1988), but has since been delisted (Briggs and Leigh 1996).

None of the three species has been recorded along the route. They were listed in Appendix B of the SIS as significant species that may be present (based on records within 10 km of the site), but no profiles or impact assessments were provided in

Appendix C, nor were the three species considered further in the SISSIR. Table 4 of the NPWS Concurrence Report provides a brief assessment of the likely impacts on the three species, indicating that there is possible habitat along the route for each species, but that implementation of ameliorative measures will minimise the potential impact on the habitat. No particular concerns are raised by NPWS in relation to these species.

The SIS and SISSIR do not provide an assessment of the impact of the proposal on the six regionally significant plant species that were recorded along the route: *Arytera distylis*, *Digitaria divaricatissima*, *Epipogium roseum*, *Exocarpos latifolius*, *Hybanthus vernonii* ssp. *scaber* and *Lygodium microphyllum*. The NPWS Concurrence Report notes the presence of one of these species, *Epipogium roseum*, at the site of the proposed rest area near Mailmans Track. As one of the NPWS conditions of concurrence (No. 10), the RTA is required to undertake a survey for this species and to ensure that the design and construction of the proposed rest area minimises impacts on it. The other five regionally significant species are not mentioned in the NPWS concurrence report. However, some consideration of potential impacts and mitigation measures for these five species is warranted. This should be done as part of the proposed pre-construction surveys.

4.3 Fauna Species

The SIS and SISSIR considered the impact of the proposal on 47 threatened fauna species. These included the 39 species listed in the NPWS Director-General's requirements for the SIS, together with another species recorded along the route (Giant Barred Frog), and seven other species recorded within 10 km (Comb-crested Jacana, Barking Owl, Grass Owl, Regent Honeyeater, Red-legged Pademelon, Eastern Cave Bat and Eastern Chestnut Mouse). It was concluded that there is unlikely to be a significant effect on any threatened fauna species (Table 3).

Table 3. Biosis Research assessments of likely impacts on threatened fauna (SIS Appendix E and SISSIR Sections B5.2 and B7.1).

E = endangered, V = vulnerable

Species	TSC Act Status	Impact assessment
Wallum Froglet (*Crinia tinnula*)	V	No records along route, but possible habitat present. Measures to protect watercourses and wetlands, and reduce barrier effects, will minimise potential impact.
Giant Barred Frog (*Mixophyes iteratus*)	E	Recorded at the proposed Pine Creek Bridge Site (SIS Appendix F). Impact of bridge construction will be reduced by ameliorative measures (relocation of individuals; habitat restoration; fauna underpass; maintenance of water quality) and not considered significant.

Species	TSC Act Status	Impact assessment
Green and Golden Bell Frog (*Litoria aurea*)	E	No records along route, but possible habitat present, and historical records nearby (Bongil Bongil Swamp). Measures to protect watercourses and wetlands, and reduce barrier effects, will minimise potential impact.
Green-thighed Frog (*Litoria brevipalmata*)	V	No records along route, but possible habitat present. Measures to protect watercourses and wetlands, and reduce barrier effects, will minimise potential impact.
White-crowned Snake (*Cacophis harriettae*)	V	No records along route, but possible habitat present. Measures to reduce barrier effects will minimise potential impact.
Pale-headed Snake (*Hoplocephalus bitorquatus*)	V	No records along route, but possible habitat present. Measures to reduce barrier effects will minimise potential impact.
Stephen's Banded Snake (*Hoplocephalus stephensii*)	V	No records along route, but possible habitat present. Measures to reduce barrier effects will minimise potential impact.
Black Bittern (*Ixobrychus flavicollis*)	V	No records along route, but possible habitat present, and Bonville Creek at Bonville is a known site. Measures to protect watercourses and wetlands will minimise potential impact.
Black-necked Stork (*Ephippiorhynchus asiaticus*)	E	A reported visitor to farm dams near Herdegen Close. Measures to protect watercourses and wetlands will minimise potential impact.
Red Goshawk (*Erythrotriorchis radiatus*)	E	No records along route or within 10 km. A rare visitor to the Coffs Harbour region, with no breeding records. No likely impact.
Square-tailed Kite (*Lophoictinia isura*)	V	Observed along route in Pine Creek State Forest. Forages over a wide area and unlikely to be affected, provided no nest sites are lost or disturbed. Ameliorative measures would be developed if a nest tree were located along the route.
Osprey (*Pandion haliaetus*)	V	A pair breeds regularly in a tree close to the route near East Bonville Road. Impact will be reduced by ameliorative measures (protection of nest, roost and feeding trees; minimisation of disturbance during nesting period; protection of aquatic habitat) and not considered significant.
Comb-crested Jacana (*Irediparra gallinacea*)	V	No records along route, but possible habitat present, and has been recorded nearby at the northern end of the route (Biosis Research 1997). Measures to protect watercourses and wetlands, especially Bongil Bongil Swamp, will minimise potential impact.

Species	TSC Act Status	Impact assessment
Bush Stone-curlew (*Burhinus grallarius*)	E	No records along route. Status in the Coffs Harbour region uncertain. Potential impact unknown, but unlikely to be significant.
Wompoo Fruit-Dove (*Ptilinopus magnificus*)	V	Recorded between Archville Station Road and East Bonville Road during the preliminary assessment. Some potential habitat (rainforest vegetation) will be lost, but impact unlikely to be significant.
Rose-crowned Fruit-Dove (*Ptilinopus regina*)	V	No records along route, but possible habitat present. Some of this habitat (rainforest vegetation) will be lost, but impact unlikely to be significant.
Glossy Black-Cockatoo (*Calyptorhynchus lathami*)	V	No records along route, but possible habitat present. No feeding resources (*Allocasuarina* trees) will be lost.
Swift Parrot (*Lathamus discolor*)	V	No records along route, but possible habitat present. Impact unlikely to be significant on this highly mobile species.
Barking Owl (*Ninox connivens*)	V	No records along route, but possible habitat present. Impact likely to be minimal because individuals range over a large area.
Powerful Owl (*Ninox strenua*)	V	No records along route, but possible habitat present. Impact likely to be minimal because individuals range over a large area.
Grass Owl (*Tyto capensis*)	V	No records along route, but possible habitat present. Impact likely to be minimal because individuals range over a large area.
Masked Owl (*Tyto novaehollandiae*)	V	No records along route, but possible habitat present. Impact likely to be minimal because individuals range over a large area.
Sooty Owl (*Tyto tenebricosa*)	V	No records along route, but possible habitat present. Impact likely to be minimal because individuals range over a large area.
Regent Honeyeater (*Xanthomyza phrygia*)	E	No records along route, but possible habitat present. Impact unlikely to be significant on this highly mobile species.
White-eared Monarch (Monarcha leucotis)	V	No records along route, but possible habitat present. Some of this habitat (rainforest vegetation) will be lost, but impact unlikely to be significant.
Barred Cuckoo-shrike (*Coracina lineata*)	V	No records along route, but possible habitat present. Some of this habitat (rainforest vegetation) will be lost, but impact unlikely to be significant.
Spotted-tailed Quoll (*Dasyurus maculatus*)	V	No records along route, but possible habitat present. Measures to reduce barrier effects will minimise potential impact.

Species	TSC Act Status	Impact assessment
Brush-tailed Phascogale (*Phascogale tapoatafa*)	V	No records along route, but possible habitat present, and recorded previously immediately north of area. Measures to reduce barrier effects will minimise potential impact.
Common Planigale (*Planigale maculata*)	V	No records along route, but possible habitat present. Ecological requirements poorly known. Measures to reduce barrier effects will minimise potential impact.
Koala (*Phascolarctos cinereus*)	V	Widely and frequently reported along the route, including records during the SIS survey. Measures to reduce barrier effects will minimise potential impact, reduce the current high frequency of roadkills, and make roadside habitat safer.
Yellow-bellied Glider (*Petaurus australis*)	V	Recorded previously along route. Measures to reduce barrier effects will minimise potential impact.
Squirrel Glider (*Petaurus norfolcensis*)	V	No records along route, but possible habitat present. Measures to reduce barrier effects will minimise potential impact.
Long-nosed Potoroo (*Potorous tridactylus*)	V	No records along route, but possible habitat present. Measures to reduce barrier effects will minimise potential impact.
Parma Wallaby (*Macropus parma*)	V	No records along route, and considered unlikely to occur in the area. Measures to reduce barrier effects will minimise potential impact.
Red-legged Pademelon (*Thylogale stigmatica*)	V	No records along route, but possible habitat present. Measures to reduce barrier effects will minimise potential impact.
Common Blossom Bat (*Syconycteris australis*)	V	No records along route, but possible habitat present. Impact likely to be minimal because individuals range over a large area.
Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)	V	No records along route, but possible habitat present. Ecological requirements uncertain. Potential impact unknown, but unlikely to be significant.
Eastern Freetail-bat (*Mormopterus norfolkensis*)	V	No records along route, but possible habitat present. Ecological requirements uncertain. Potential impact unknown, but unlikely to be significant.
Hoary Wattled Bat (*Chalinolobus nigrogriseus*)	V	No records along route, but possible habitat present. Impact likely to be minimal because individuals range over a large area.
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	V	No records along route, but possible habitat present. Impact likely to be minimal because individuals range over a large area.

Species	TSC Act Status	Impact assessment
Golden-tipped Bat (*Kerivoula papuensis*)	V	No records along route, but possible habitat present. Impact unlikely to be significant because relatively little habitat would be lost.
Little Bentwing-bat (*Miniopterus australis*)	V	Calls attributed to this species were recorded in Pine Creek State Forest. No known maternity colonies along route. Impact unlikely to be significant because relatively little habitat would be lost.
Common Bentwing-bat (*Miniopterus schreibersii*)	V	No records along route. Possible foraging and roosting habitat present, but no known maternity colonies. Impact unlikely to be significant on this highly mobile species.
Large-footed Myotis (*Myotis adversus*)	V	No records along route, but possible habitat present. Measures to protect watercourses and wetlands (foraging habitat) will minimise potential impact.
Greater Broad-nosed Bat (*Scoteanax rueppellii*)	V	No records along route, but possible habitat present. Impact likely to be minimal because individuals range over a large area.
Eastern Cave Bat (*Vespadelus troughtoni*)	V	No records along route, but possible habitat present. No likely roosting/breeding caves. Impact likely to be minimal because individuals range over a large area.
Eastern Chestnut Mouse (*Pseudomys gracilicaudatus*)	V	No records along route. Possible habitat (swampy areas) present in Bongil Bongil National Park addition, but should not be affected.

The NPWS Concurrence Report notes that the SIS and SISSIR have provided little information on the occurrence of large hollow-bearing trees in the areas to be cleared for the proposed upgrade. I agree that this is a deficiency. Tree hollows are a critical nesting or roosting resource for many threatened species. Furthermore, the number of tree hollows available tends to be limited in forests with a long history of logging, such as Pine Creek State Forest. Threatened species that could potentially be affected by a further reduction in the availability of tree hollows include the Glossy Black-Cockatoo, Barking Owl, Powerful Owl, Masked Owl, Sooty Owl, Brush-tailed Phascogale, Yellow-bellied Glider, Squirrel Glider, Yellow-bellied Sheathtail-bat, Eastern Freetail-bat, Hoary Wattled Bat, Eastern False Pipistrelle and Greater Broad-nosed Bat. The issue will need to be addressed in the proposed pre-construction surveys, and mitigation measures adopted where necessary.

4.4 Wildlife Corridors

Two regionally significant wildlife corridors have been identified along the route (Pine Creek State Forest and the native vegetation between Lyons Road and Bonville Creek). The potential barrier effects of the proposed upgrade on these corridors have been identified as a major issue in the SIS, SISSIR and NPWS Concurrence Report, and a range of mitigation measures have been introduced to minimise the impact (see Section 5 below). The NPWS Concurrence Report considers that the species likely to be most adversely affected by barrier effects at Bonville are the Koala, Yellow-bellied Glider and Squirrel Glider.

4.5 Watercourses and Wetlands

An assessment of the impact of the proposal on threatened and other significant fish

species has been made by Bill Rooney (SISSIR Appendix 3). His report notes the lack of information on the freshwater fish fauna within the study area. No threatened fish species, as listed in the *Fisheries Management Act 1994*, have been recorded in the area, the nearest record being the endangered Oxleyan Pygmy Perch (*Nannoperca oxleyana*) about 90 km north. Potentially suitable habitat for this species occurs along the route (Reedys Creek and other shallow, swampy wetlands). A small amount of potential habitat will be lost, and there may be short-term construction impacts, but the report concludes that there is unlikely to be a significant long-term impact on this habitat.

Seven other significant fish species may utilise aquatic habitats within or near the proposed route. These include two potentially threatened species, Purple-spotted Gudgeon (*Mogurnda adspersa*) and Freshwater Crayfish (*Tandanus* sp. - north coast form), and five species that are at or near the southern limit of their distribution, Duboulay's Rainbowfish (*Melanotaenia duboulayi*), Soft-spined Rainbowfish (*Rhadinocentrus ornatus*), Mouth Almighty (*Glossamia aprion*), Olive Perchlet (*Ambassis agassizii*) and Spangled Perch (*Leiopotherapon unicolor*). The report concludes that the bridges proposed for the major creek crossings at Pine Creek, Reedys Creek and Bonville Creek will not have a significant impact on these species or their habitat.

A wetland evaluation of the proposed route was made by Adam King (SISSIR Appendix 4). His report notes that the proposal has incorporated mitigation measures to reduce the impact of construction and the long-term environmental effects of traffic passing through the area. At present, the large volume of traffic using the existing Pacific Highway poses a significant threat to wetlands in the area because there are few mitigation measures in place that are capable of capturing accumulated road pollutants and large chemical spills from road accidents. Overall, the proposal is expected to have a good outcome for the Bonville wetlands, provided that the additional recommendations in Appendix 4 are implemented in conjunction with the mitigation measures already adopted.

The report concluded that the direct and indirect impacts would be limited to local vegetation removal at the road crossing sites, and a temporary reduction in local water quality during construction. Direct impacts on the Bonville wetland resource have been reduced to a minimal level by avoiding the physical disturbance of identified natural wetlands in good condition. Consequently, there will be no significant net loss of natural wetlands, and no need for compensatory wetland habitat.

5. Proposed Mitigation and Compensation Measures

5.1 Habitat Loss

The proposal has been modified in Pine Creek State Forest to minimise clearing. Modifications include: reducing the median width south of the fauna overpass; refining the location and grading of the highway and service roads; increased use of wire rope safety barriers; and relocating the heavy vehicle inspection bay to the existing highway footprint. Nevertheless, the modified proposal will result in the loss of more native vegetation than the original proposal (about 2 ha more) in order to provide a wide vegetated median in the northern section of Pine Creek State Forest. The purpose of the wide median is to allow gliders to cross the highway safely. In my opinion, its benefits would outweigh the additional loss of habitat involved.
The proposal will result in the clearing of a total of about 55.6 ha of native vegetation, of which about 43 ha has been identified as 'key habitat'. All key habitat removed (i.e. 43 ha) will be offset by means of a compensatory habitat package currently being negotiated between the RTA and the NPWS. The package is to include the acquisition

and transfer of lands and/or funds for rehabilitation and management to the NPWS, and is one their conditions of concurrence (No. 4).

5.2 Barrier Effects

Proposed mitigation measures that will allow for fauna movements across the highway are:

- A 60 m wide vegetated (planted) fauna overpass (highway tunnel) in the centre of the Pine Creek State Forest section (an overpass can be expected to be more attractive to a wider range of fauna than an underpass).
- A vegetated median up to 50 m wide, consisting of retained vegetation and plantings, in the northern section (about 60%) of Pine Creek State Forest (north of the fauna overpass). This will allow gliders to cross the highway safely in two stages (gliders are unlikely to cross the highway in one glide, and are unlikely to use fauna underpasses).
- A combined service road and fauna underpass (highway bridge) in Pine Creek State Forest north of the fauna overpass.
- A fauna underpass (highway bridge) in Pine Creek State Forest between Mailmans Track and the fauna overpass.
- A fauna underpass (culvert) in Pine Creek State Forest south of Mailmans Track.
- A combined creek and fauna underpass (65 m long highway bridge) over Pine Creek.
- A combined creek and fauna underpass (60 m long highway bridge) over Reedys Creek.
- A combined fauna and cattle underpass (highway bridge) in the strip of native vegetation between Archville Station Road and East Bonville Road.
- A combined creek and fauna underpass (162.5 m long highway bridge) over Bonville Creek.
- A fauna underpass (highway bridge) in the strip of native vegetation near Herdegen Close/Titans Close.

5.3 Roadkills

Proposed mitigation measures that will reduce the incidence of roadkills of fauna are:

- Exclusion fencing (preventing the passage of Koalas and other fauna) will be installed along the highway throughout Pine Creek State Forest and in other parts of the route identified as possible black spots for roadkills.
- Speed control treatment to create slow zones (60 km per hour) on the service roads at two strategic fauna crossing points: adjacent to the fauna overpass in Pine Creek State Forest; and in the strip of native vegetation near Herdegen Close/Titans Close.

5.4 Aquatic Flora and Fauna

Following exhibition of the EIS and SIS, additional studies were undertaken to assess potential impacts on aquatic flora and fauna (SISSIR Appendices 3 and 4). The following modifications were made to mitigate these impacts:

- Culvert originally proposed for Reedys Creek crossing upgraded to 60 m long bridge. Permeable base layer to be provided beneath adjacent fill (north side) to maintain groundwater flow.

- Additional culverts proposed at wetland crossing north of East Bonville Road. Permeable base layer to be provided to maintain groundwater flow.

- Permeable base layer to be provided below proposed culverts at the wetland south of East Bonville Road and the creek west of Bongil Bongil Swamp.

Additional measures to mitigate impacts at each creek and wetland crossing during construction and operation are described in the SISSIR Section 8.3.

5.5 Individual Threatened Species

Rusty Plum (*Amorphospermum whitei*): The two specimens to be removed as part of the clearing for the proposal will be translocated to an appropriate habitat, if feasible. Pre-construction surveys will be carried out to search for additional specimens that may require protection or translocation. Cuttings and seeds will also be collected for propagation and use in landscaping and/or planting in suitable adjoining habitat.

Giant Barred Frog (*Mixophyes iteratus*): Targeted surveys will be conducted at Pine Creek prior to bridge construction and any individuals found will be relocated to nearby suitable habitat. Construction will be undertaken to avoid winter months if possible (when the species is less active).

Osprey (*Pandion haliaetus*): Clearing activities near the Osprey nest will be avoided or minimised during the nesting period (June to October).

5.6 Pre-construction Surveys

Pre-construction surveys are proposed to locate and map the position of threatened flora individuals that may require protection measures or translocation/propagation. The pre-construction surveys will also target threatened fauna species and their habitat requirements.

5.7 Koala Monitoring Study

A long-term Koala monitoring and research program will be undertaken by Australian Museum Business Services to assess local Koala habitat requirements and behaviour patterns, and the effectiveness of the proposed mitigation structures. The study will run for six years, including two years before construction, two years during construction and two years after construction. Some of the monitoring methods used will allow collection of data on species other than Koalas.

5.8 Weed Management

A Weed Management Strategy will be developed in consultation with NPWS as part of the Environmental Management Plan. The NPWS Concurrence Report requires the strategy to address weed management during both construction and operation of the road. The strategy will identify the significance and prioritise areas along the route for weed control and management, and will identify the relevant weed species and appropriate removal and disposal methods for the collection and destruction of all weed material.

6. Issues Raised in Public Submissions

Sixty-three submissions were received by the RTA following the public exhibition of the EIS and SIS. These comprised 38 from individuals, 11 from NSW government agencies, seven from interest groups, three from Commonwealth government agencies, three from businesses and one from local government. My assessment of the major issues raised in the submissions, based on the summaries provided in the Representations Report Section 5.3 and the NPWS Concurrence Report Section 4, is provided in Table 4.

Table 4. Major flora and fauna issues raised in public submissions.

Issue	RTA response
Upgrading of the existing highway would be the most desirable option for minimising environmental impacts.	Natural environment issues favour the existing route overall, but issues such as visual impact, community access and Koala management are difficult to address on this route. Current proposal includes mitigation measures that would not have been possible on the existing route, such as the fauna overpass and various fauna underpasses.
Detailed submission from Bellingen Environment Centre proposed an alternative to the exhibited proposal considered to have less environmental impact, including a route 200-300 m east of the proposed route through Pine Creek State Forest, incorporating a bored tunnel under Overhead Bridge Road to provide a naturally vegetated overpass at least 150 m long.	Detailed assessment of proposed alternative undertaken (PPK 1999b, 1999c). Concluded that alternative route would extend through forest of only marginally less ecological value (marginally higher in Koala habitat values), would result in greater forest clearing (an extra 5 ha), and would cause greater fragmentation of the forest. The proposed tunnel was considered impracticable.
Loss of habitat for Koalas and other fauna. No data provided on extent of vegetation clearance and habitat loss.	55.6 ha of native vegetation will be cleared, including 43 ha of 'key habitat'. Compensatory habitat package being negotiated with NPWS for the 43 ha.
Disagreement with statements in SIS that exclusion fencing will in effect provide additional habitat for Koalas - secures existing habitat, but doesn't compensate for habitat loss.	Accepted by RTA that fencing will not compensate for habitat loss - compensatory habitat will be required for all key habitat lost.
Impact on the regionally significant Koala population in Pine Creek State Forest.	Exclusion fencing, fauna underpasses and a six-year Koala monitoring study incorporated in original proposal, now supplemented by additional measures, especially the fauna overpass.

Issue	RTA response
Provision of safe crossings for fauna not adequately addressed, especially in relation to the regionally significant Pine Creek State Forest corridor. Number and dimensions of crossings inadequate, and reliance on underpasses unsatisfactory for some fauna (especially gliders).	Additional measures incorporated in proposal, especially a 60 m wide dedicated fauna overpass, and wide separation of carriageways in northern Pine Creek State Forest to allow gliders to cross safely.
Underpasses may become focus sites for predators.	A 60 m wide dedicated fauna overpass is now proposed in Pine Creek State Forest, and the Reedys Creek culvert has been upgraded to a bridge. Appropriate measures for reducing predation threats in underpasses are being negotiated with NPWS.
Potential impacts on flora and fauna of watercourses and wetlands not adequately considered, particularly in relation to proposed crossings of Pine, Reedys and Bonville Creeks, and wetland areas.	Additional aquatic ecological assessment and wetland evaluation studies undertaken, including assessment of impact on threatened fish species. Further mitigation measures adopted, including upgrading of Reedys Creek crossing from culvert to bridge.
Potential impacts on aquatic systems from disturbance of acid sulphate soils.	Potential acid sulphate soils will be located in more detail prior to construction, and controlled carefully during all works through the Acid Sulphate Soils Management Plan outlined in EIS Appendix H.
Impacts, mainly indirect, on natural heritage values of Bongil Bongil National Park, which has been interim listed on the Register of the National Estate.	Proposed route crosses the very western edge of NPWS land proposed for addition to the park. The route was adjusted to reduce the impact on this area, and mitigation measures are proposed to further reduce the impact. Since the area to be cleared is already close to the forest boundary, edge effects are unlikely to increase significantly.
Proposed Mailmans Track interchange will result in loss of Koala habitat and loss of rainforest vegetation in gullies.	Modifications made to reduce the extent of vegetation clearing necessary to construct the interchange. Minor adjustments to alignment made to reduce the impact on rainforest gullies, but major adjustments constrained by engineering and safety issues.
Proposed heavy vehicle inspection bay should be moved away from Pine Creek State Forest.	Inspection bay relocated to existing highway footprint to minimise impact. Provision of an inspection bay in this site is strategically important. The site has the least bypass potential of any section of the Pacific Highway on the NSW north coast.
Clearing of riparian vegetation should be kept to a minimum.	Agreed.

Issue	RTA response
Threat of increased weed invasion associated with road construction.	A weed management strategy will be prepared to address weed management during construction and operation of the road.
Impact on Osprey nest near East Bonville Road.	Nest will not be directly affected. Clearing activities will be avoided or minimised in the vicinity of the nest during the breeding season (June-October).
Lack of information in SIS on flora and fauna survey procedures. No vegetation mapping provided.	Additional information provided in SISSIR, including vegetation maps.

7. NPWS Concurrence Conditions

The Director-General of National Parks and Wildlife has granted concurrence to the Bonville Project subject to 18 conditions set out in the NPWS Concurrence Report. These conditions are summarised below:

A. General

1. The activity must be undertaken in accordance with the conditions outlined in Section 9 of the Representations report, unless modified by the following conditions.

2. The RTA must inform NPWS and seek approval for any proposed variation of the proposal which may contribute to adverse impacts on threatened species.

3. The RTA must ensure that the activity is undertaken as described in the EIS, SIS and SISSIR. The activity shall incorporate and implement the flora and fauna amelioration measures described in Section 6 of the SIS, or as amended by the additional amelioration measures described in Section B8 of the SISSIR and the concurrence conditions of the NPWS Concurrence Report.

4. The RTA must negotiate a compensation package with NPWS. The compensation package is to include the acquisition and transfer of lands and/or funds for rehabilitation and management to the NPWS.

5. The RTA must engage an appropriately qualified and experienced rehabilitation specialist/ecologist to provide advice and assist with the implementation and monitoring of mitigation measures for the duration of the project.

B. Flora

6. The RTA must undertake a pre-construction survey in the road reserve within Pine Creek State Forest to locate and map the position of threatened flora individuals. Procedures to ensure the protection of identified threatened flora individuals must be included in the Environmental Management Plan.

7. The RTA must assess the feasibility of the proposed translocation of individuals of the threatened plant Rusty Plum (*Amorphospermum whitei*), and any other threatened flora species identified within the construction area, which would otherwise be destroyed by road construction activities. Translocation proposals must be submitted to NPWS for approval. In addition, irrespective of any translocation proposals, the RTA is to undertake propagation of a representative

selection of the individual plants impacted by construction, using an appropriate method such as seed, cutting or marcot.

8. The RTA must identify in the field, in consultation with NPWS, the new boundary between the road corridor and the NPWS lands identified as additions to Bongil Bongil National Park. Appropriate measures are to be implemented by the RTA to ensure that there are no impacts, direct or indirect, on the Bongil Bongil National Park additions.

9. The RTA is to prepare a Weed Management Strategy which addresses weed management during construction and the on-going operation of the road. The strategy will identify the significance and prioritise areas along the route for weed control and management, as well as identify the relevant weed species and appropriate removal and disposal methods.

10. The RTA must undertake a survey to determine the location of any specimens of Drooping Orchid *Epipogium roseum*, which was located at the site of the proposed rest area opposite Mailmans Track. The RTA must ensure that the design and construction of the rest area minimises impacts on this species.

C. Fauna

11. The RTA must provide the fauna mitigation measures detailed in the SIS and SISSIR, including the fauna underpasses and fauna overpass, associated 'furnishing' (such as Koala refuge poles), fauna exclusion fencing, and vegetation in rehabilitation areas to encourage fauna usage. The position, design and construction of these measures are to be refined where necessary from the results of the Koala research and monitoring study being undertaken for the RTA by Australian Museum Business Services.

12. The RTA must undertake a survey of the road corridor within Pine Creek State Forest to identify and locate the position of suitable trees to be retained for potential glider crossing points across the proposed road.

13. The RTA must ensure that appropriate fauna shelter and refuge structures are installed beneath the bridges and within the culverts that have been nominated as fauna movement corridors. The RTA must also ensure that the maximum area possible beneath the nominated bridges is vegetated with local native species to encourage use by fauna.

14. The RTA is to provide NPWS with copies of progress reports from the Koala research and monitoring study being undertaken by Australian Museum Business Services in Pine Creek State Forest.

15. The RTA will contribute $10 000 in total towards the costs incurred by NPWS in the implementation of recovery actions for the Koala on the north coast.

16. The RTA must include protocols within the Environmental Management Plan for pre-clearing surveys and processes for minimising impacts during construction on the Koala, Giant Barred Frog and Osprey.

D. Environmental Management Plans

17. The RTA must provide all Environmental Management Plans to NPWS for review and comment before the commencement of clearing or construction. Matters to be addressed in the appropriate plans include:

    - Development of 'best practice' pre-clearing guidelines for threatened species. The guidelines must specifically address:
        - the requirement for minimal clearing and disturbance of native vegetation

that provides habitat for threatened species;
  - procedures that are sympathetic to the specific habitat requirements of threatened fauna species considered by the SIS;
  - the retention where possible of large hollow-bearing trees;
  - procedures for felling those large hollow-bearing trees that must be removed in order to minimise impacts on native fauna in general, and threatened species in particular, which may be present in these hollows;
  - the management of construction activities near retained large hollow-bearing trees and trees retained as likely crossing points for arboreal fauna;
  - the management of roosting, breeding and/or hibernating fauna that are displaced or injured during clearing; and
  - the feasibility of a staged approach to clearing and construction in areas that are identified as containing threatened species and/or where the route crosses wildlife corridors.

- The outcomes of the feasibility study for translocation or propagation of the threatened plant Rusty Plum (*Amorphospermum whitei*).

- The provision of details on each of the proposed fauna mitigation structures, including:
  - structure design and dimensions;
  - the areas to be revegetated at entrances/exits and the plant species to be used;
  - details of any structures to be incorporated within the mitigation structures to encourage use by fauna.; and
  - details of the base (floor) of fauna crossing structures.

E. Dispute Resolution

18. In the event that the RTA and NPWS cannot reach agreement on the interpretation of any issues relating to one or more of the above conditions, the matter shall be referred to the Director-General of Urban Affairs and Planning for mediation between the parties.

8. Conclusions

The original proposal by the RTA to upgrade the Pacific Highway at Bonville, as outlined in the EIS and SIS, has been considerably modified in response to environmental concerns raised by other government agencies, interest groups and members of the public. The RTA has made commendable efforts to address these concerns. The modifications are described in the Representations Report and attached documents, including the SIS Supplementary Information Report and the Supplementary Route Selection and Design Report. The Director-General of National Parks and Wildlife has granted concurrence to the project subject to a series of 18 conditions set out in the Concurrence Report. These conditions further refine and strengthen the proposed mitigation measures.

The project will result in a net loss of 55.6 ha of native vegetation. However, I am satisfied from my inspection of the documents and my field inspection of the site that other adverse impacts on native flora and fauna, especially the barrier effects of the highway, can be satisfactorily mitigated, provided that:

- the proposed mitigation measures are implemented,

- the NPWS concurrence conditions are followed, and

- the mitigation measures are refined and additional measures taken where necessary, based on the results of the Koala monitoring study, the proposed pre-construction flora and fauna surveys, and continuing negotiations with NPWS.

The RTA has accepted that compensation is appropriate for the loss of 'key habitat' that will result from the project (43 ha). A compensatory habitat package is currently being negotiated with NPWS and is one of their conditions of concurrence. It is important that a satisfactory compensatory habitat package be developed and implemented. This should be one of the main DUAP concurrence conditions.

I recommend that the Minister for Urban Affairs and Planning should grant approval for the project and should support the NPWS concurrence conditions. However, I have several concerns which should be addressed in the Minister's conditions of concurrence:

- NPWS concurrence conditions only require that pre-construction flora and fauna surveys be carried out in Pine Creek State Forest. I believe that they should be carried out in all areas of native vegetation along the route, not just Pine Creek State Forest.

- The pre-construction surveys should include identification and mapping of the location of large hollow-bearing trees along the route. These are a major habitat resource for threatened and other fauna. They should be retained wherever possible, and protected from disturbance during construction. The NPWS Concurrence Report identifies the need to retain large hollow-bearing trees, and the current lack of information on where they occur along the route, but does not include a specific condition of concurrence to redress this deficiency. NPWS condition 12 only requires the pre-construction surveys to identify trees suitable for glider crossing points.

- The NPWS concurrence conditions only require one regionally significant plant species to be considered, *Epipogium roseum*. However, five other regionally significant plant species have also been recorded along the route (*Arytera distylis*, *Digitaria divaricatissima*, *Exocarpos latifolius*, *Hybanthus vernonii* ssp. *scaber* and *Lygodium microphyllum*). The pre-construction surveys should search for occurrences of all regionally significant species, not just *Epipogium roseum*. Appropriate measures should be taken to minimise impacts on these species wherever possible.

References

Baur, G.N. 1965. *Forest Types in New South Wales*. Research Note No. 17. Forestry Commission of NSW.

Biosis Research. 1997. *Preliminary Flora and Fauna Assessment of the Pacific Highway Upgrade from Mailmans Track to Lyons Road, Bonville*. Prepared for Roads and Traffic Authority by Biosis Research, St Leonards, April 1997.

Biosis Research. 1998a. *Species Impact Statement for the Proposed Pacific Highway Upgrade from Mailmans Track to Lyons Road, Bonville*. Prepared for Roads and Traffic Authority by Biosis Research, St Leonards, July 1998.

Biosis Research. 1998b. *Discussion Paper Compensatory Habitat Assessment for the Bonville Deviation*. Prepared for Roads and Traffic Authority by Biosis Research, St Leonards, December 1998.

Biosis Research. 1999. *Addendum Species Impact Statement: the Bonville Project*. Prepared for Roads and Traffic Authority by Biosis Research, St Leonards, March 1999.

Briggs, J.D. and Leigh, J.H. 1988. *Rare or Threatened Australian Plants: 1988 Revised Edition*. Special Publication 14. Australian National Parks and Wildlife Service, Canberra.

Briggs, J.D. and Leigh, J.H. 1996. *Rare or Threatened Australian Plants: 1995 Revised Edition*. CSIRO Centre for Plant Biodiversity Research/Australian Nature Conservation Agency, Canberra.

Fisher, M., Body, M. and Gill, J. 1996. *The Vegetation of the Coffs Harbour City Council LGA*. Prepared for Coffs Harbour City Council.

Harden, G.J. (ed.). 1990-1993. *Flora of New South Wales*. Four volumes. Royal Botanic Gardens Sydney/NSW University Press, Kensington.

NPWS. 1999. *Concurrence Report for the Proposed Pacific Highway Upgrade from Mailmans Track to Lyons Road, Bonville*. National Parks and Wildlife Service, Hurstville, September 1999.

PPK. 1998. *Bonville Project, Pacific Highway, Coffs Harbour: Environmental Impact Statement*. Two volumes. Prepared for Roads and Traffic Authority by PPK Environment and Infrastructure Pty Ltd, Concord West, July 1998.

PPK. 1999a. *Bonville Project, Pacific Highway, Coffs Harbour: Supplementary Route Selection and Design Report*. Prepared for Roads and Traffic Authority by PPK Environment and Infrastructure Pty Ltd, Brisbane, June 1999.

PPK. 1999b. *Bonville Project, Pacific Highway, Coffs Harbour: Ecological Assessment of the Bellingen Environment Centre Inc Alternative Route through Pine Creek State Forest*. Prepared for Roads and Traffic Authority by PPK Environment and Infrastructure Pty Ltd, Brisbane, June 1999.

PPK. 1999c. *Bonville Project, Pacific Highway, Coffs Harbour: Response to the Bellingen Environment Centre Inc Representation*. Prepared for Roads and Traffic Authority by PPK Environment and Infrastructure Pty Ltd, Brisbane, June 1999.

RTA. 1998. *Policy and Guidelines: Road Development and Impacts on Habitat Amelioration Measures: Compensatory Habitat*. Draft 6, 12/11/98. Roads and Traffic Authority, Rosebery.

RTA. 1999. *Representations Report: the Bonville Project*. Four volumes. Environmental Technology, Roads and Traffic Authority, Rosebery, July 1999.

Sheringham, P. and Westaway, J. 1995. *Significant Vascular Plants of Upper North East New South Wales*. NSW National Parks and Wildlife Service.

Smith, P. 1998. *Proposed Pacific Highway Upgrade at Bonville: Review of Flora and Fauna Assessment*. Prepared for Department of Urban Affairs and Planning by P. & J. Smith Ecological Consultants, Blaxland, November 1998.

Appendix. Additional fauna species recorded in the SIS survey area during my field inspection in October 1999.

Australian White Ibis *Threskiornis molucca*: Reedys Creek.

Black-winged Stilt *Himantopus himantopus*: Reedys Creek.

Brown Cuckoo-Dove *Macropygia amboinensis*: Bonville Station Road.

Shining Bronze-Cuckoo *Chrysococcyx lucidus*: Mailmans Track.

Variegated Fairy-wren *Malurus lamberti*: Bonville Creek, nesting.

Striated Pardalote *Pardalotus striatus*: Bonville Station Road and Reedys Creek.

Brown Gerygone *Gerygone mouki*: Sid Burke Rest Area and Mailmans Track.

Striated Thornbill *Acanthiza lineata*: Mailmans Track.

Scarlet Honeyeater *Myzomela sanguinolenta*: Reedys Creek and Mailmans Track.

Cicadabird *Coracina tenuirostris*: Bonville Station Road.

Pied Currawong *Strepera graculina*: Mailmans Track.

Torresian Crow *Corvus orru*: Bonville Station Road and Mailmans Track.