New South Wales Government

RTA

F3 Freeway to Branxton link

Independent Design Review: Conditions of Approval 53 and 54

MARCH 2007

AusLink National Network
F3 to Branxton link

Independent Design Review
Conditions of Approval 53 and 54

Roads and Traffic Authority of NSW

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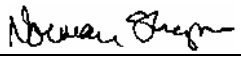
Certification

This report provides a true and fair presentation of the design review undertaken by the independent ecologist and road designer required under Conditions of Approval 53 and 54.

Dr Rhidian Harrington and Mr Vlad Sofrevski confirm that they have been involved in the development of the detailed concept design and that their views have been considered by the RTA.

Acacia Environmental Planning, Biosis Research and Hughes Trueman certify that at the time of accepting the contract for preparation of this report, they had no contractual interest in the construction and/or operation of the F3 to Branxton link.

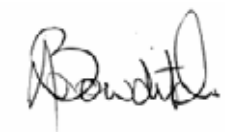
Acacia Environmental Planning Pty Ltd	Norman Shapro	
Biosis Research Pty Ltd	Rhidian Harrington	
Hughes Trueman Pty Ltd	Vlad Sofrevski	

Date: 28 February 2007

I have examined this report and the certification and accept the report on behalf of the RTA.

Name Allan Bowditch

Designation Project Development Manager
Infrastructure Development

Signed  Date 28 February 2007

References used in this report

References to previous organisations or titles in this report also mean their successor and current organisations or titles, as the case requires.

Reference in this report	Current organisation or title
• Minister for Urban Affairs and Planning • Minister for Infrastructure and Planning	Minister for Planning
• Department of Urban Affairs and Planning • PlanningNSW • Department of Infrastructure, Planning and Natural Resources	Department of Planning
• Director-General of the Department of Urban Affairs and Planning • Director-General of PlanningNSW • Director-General of the Department of Infrastructure, Planning and Natural Resources	Director-General of the Department of Planning
• Director-General of National Parks and Wildlife	Director-General of the Department of Environment and Conservation

Acknowledgements

Acacia Environmental Planning acknowledges the assistance of Messrs Allan Bowditch, Phil Davies, David Ledlin, Stuart Hill and Phil Vine of the RTA, Dr Rhidian Harrington and Messrs Robert Suansri and Nathan Smith of Biosis Research, and Mr Vlad Sofrevski of Hughes Trueman in preparing this report.

Summary

Background

On behalf of the Australian and NSW governments, the Roads and Traffic Authority of NSW (RTA) proposes to construct a highway link between the F3 Freeway and Branxton (the F3 to Branxton link or the Link). The F3 to Branxton link was granted concurrence by the Director-General of National Parks and Wildlife and approval by the Minister for Planning in 2001. On 1 August 2005, the Minister's approval became a project approval under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This is the Approved Project.

Need for independent design review

The Concurrence Report by the Director-General of National Parks and Wildlife (NPWS 2001) noted that due to a lack of detailed design information, it was not possible to determine if impacts on threatened flora and fauna could be reduced by modifying the concept design. Condition of Concurrence 3 requires the RTA to refine the concept design to reduce direct and indirect impacts on flora and fauna. Condition of Concurrence 4 requires the RTA to assess the impacts of road-related ancillary infrastructure (primarily fencing, water quality controls, access and utility relocations) that had not been identified or assessed in the concept design.

The Section 115C report by the Director-General of the Department of Urban Affairs and Planning (DUAP 2001) noted that there was scope to reduce direct and indirect impacts on flora and fauna when the detailed design was prepared. Condition of Approval 53 requires the RTA to engage an independent road design specialist and ecologist to review the detailed design to further reduce direct and indirect impacts on flora and fauna. Condition of Approval 54 requires the RTA to provide a dedicated fauna overpass at Stockrington Road unless it is not possible to provide the fauna overpass at this location, or the proposed multi-function overpass is an effective and appropriate design.

Table 1 summaries vegetation clearing figures for the concept design, and the 15 proposed design changes and road-related ancillary infrastructure. The concept design with the 15 proposed design changes would reduce clearing of endangered ecological communities.

Table 1 Summary of vegetation clearing

Vegetation community	EEC	2001 Mapping Concept Design[1]	2005 Mapping Concept Design	2005 Mapping Concept Design with 15 proposed design changes	+	2005 Mapping Road-related ancillary infrastructure	=	2005 Mapping Detailed Concept Design[2]
Alluvial Tall Moist Forest	No	9.1	6.6	7.6		1.0		8.6
Central Hunter Ironbark–Spotted Gum Grey Box Forest	No	Not defined	8.8	7.7		1.0		8.8
Central Hunter Riparian Forest	**Yes**	0.6	6.2	4.9		1.0		5.9
Coastal Foothills Spotted Gum-Ironbark Forest	No	22.5	13.3	9.7		0.5		10.2
Coastal Plains Smooth-barked Apple Woodland	No	19.4	12.1	16.9		1.0		17.9
Hunter Lowland Redgum Forest	**Yes**	16.1	15.6	13.7		3.1		16.8
Hunter Valley Moist Forest	No	Not defined	1.0	0.9		0.2		1.2
Kurri Sand Swamp Woodland	**Yes**	33.7	28.5	26.6		7.1		33.7
Lower Hunter Spotted Gum-Ironbark Forest	**Yes**	67.0	75.0	68.5		9.8		78.3
All native vegetation (rounded to nearest hectare)		**168**	**167**	**157**		**25**		**182**

Note 1: Taken from Table 3.1 in Appendix K of the Representations Report (RTA 2001). Conditions of Approval 60 and 61 are based on these figures.
Note 2: The detailed concept design is the concept design incorporating the 15 proposed design changes and road-related ancillary infrastructure.
All figures except column totals in hectares and rounded to the nearest tenth hectare. Column totals rounded to the nearest hectare.

Findings

- Reconciliation between the 2001 and 2005 vegetation mapping results in a minor decrease of 1.3 hectare in vegetation clearing for the Approved Project, however the relative proportion of clearing in each of the nine vegetation communities changes.

- The 15 proposed design changes would reduce the clearing footprint of the Approved Project by 11 ha, or about 6%. Importantly, it would reduce clearing in the four endangered ecological communities by 12 ha. This demonstrates that the proposed design changes effectively lessen impacts on flora and fauna and satisfy Condition of Approval 53 and Condition of Concurrence 3.

- Road-related ancillary infrastructure would require clearing of 25 ha comprising clearing for boundary and fauna exclusion fencing of 18 ha and clearing for water quality controls of 7 ha. The greatest clearing would occur in the Lower Hunter Spotted Gum – Ironbark Forest community.

- The independent ecologist finds that a dedicated fauna crossing at Stockrington Road and longitudinal fauna corridors at Tuckers Lane and Wine Country Drive are not warranted. The proposed design change along the Sugarloaf Realignment would substantially improve fauna connectivity in the Sugarloaf Range when compared to the Approved Project.

- The independent ecologist has identified five alternative design changes that would improve ecological outcomes. The independent road designer has investigated the five alternative design changes for feasibility and has prepared preliminary sketches. However, the RTA does not support the five alternative design changes for the reasons provided in Section 4. In general, although they would reduce direct and indirect impacts on flora and fauna, they would affect additional properties and land use, reduce the economic benefits of the F3 to Branxton link, substantially increase construction costs, or introduce adverse technical conditions that would be either difficult or costly (or both) to overcome.

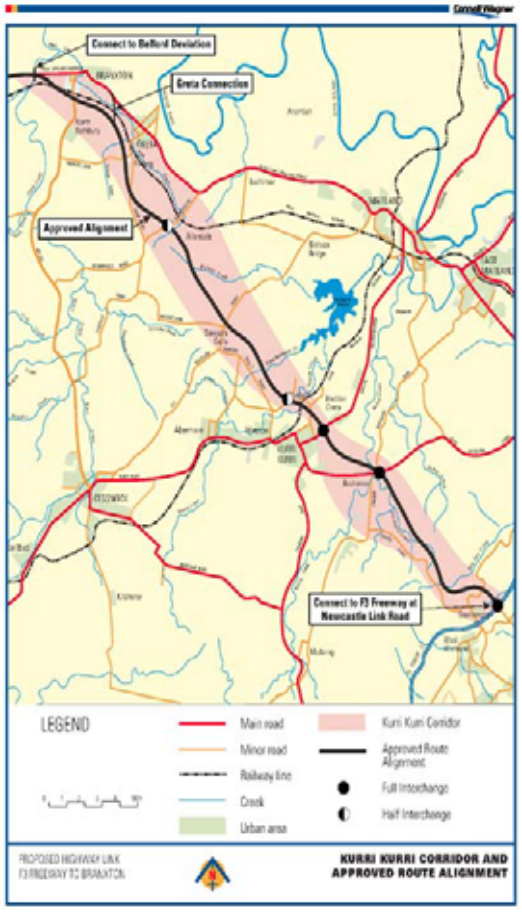
1 Introduction

1.1 The Approved Project

On behalf of the Australian and NSW governments, the Roads and Traffic Authority of NSW (RTA) proposes to construct a highway link between the F3 Freeway and Branxton (the F3 to Branxton link or the Link). The F3 to Branxton link would provide about 40 km of new dual carriageway between the F3 Freeway at Seahampton and the New England Highway west of Branxton. Figure 1 shows the location of the F3 to Branxton link.

The F3 to Branxton link was an activity that was assessed and determined under Part 5 of the *Environmental Planning and Assessment Act 1979* (the EP&A Act). It is within the Cessnock, Lake Macquarie, Maitland and Singleton local government areas.

Figure 1 Location of the F3 to Branxton link



In June 1995, Connell Wagner finalised the environmental impact statement (the EIS) for the RTA. Following introduction of the *Threatened Species Conservation Act 1995* (TSC Act) and consideration of impacts on threatened fauna, Connell Wagner finalised a fauna impact statement in January 1997 (the FIS). The RTA commissioned additional studies, including two reviews of environmental factors on detailed route selection between Allandale and Greta in 1998 and 2000.

The Director-General of the then National Parks and Wildlife granted concurrence subject to 15 conditions on 3 October 2001. The then Minister for Urban Affairs and Planning approved the Link on 7 November 2001, subject to 129 conditions. On 1 August 2005, the Minister's approval became a project approval under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This is the Approved Project. At the request of the RTA, the Minister modified the approval on 31 July 2006 to permit staged construction (but not opening).

The F3 to Branxton link is included in the Australian Government's AusLink National Land Transport Plan. The RTA is progressing detailed design development, utility adjustments and property acquisition. The Link is subject to agreed funding between the Australian and NSW governments.

1.2 Need for this report

Construction of the Link would clear native vegetation and habitat. The concept design, on which the environmental assessments and approvals were based, incorporates features to reduce impacts on flora and fauna, including fauna underpasses and a fauna overpass in the Sugarloaf Range.

The Concurrence Report by the Director-General of National Parks and Wildlife (NPWS 2001) noted that due to a lack of detailed design information, it was not possible to determine if impacts on threatened flora and fauna could be reduced by modifying the concept design. It imposed Condition of Concurrence 3 that requires the RTA to refine the design to reduce direct and indirect impacts on flora and fauna. It imposed Condition of Concurrence 2 that requires the RTA to gain approval from the Director-General for design changes and modifications that could affect threatened species, populations or endangered ecological communities. It also imposed Condition of Concurrence 4 that requires the RTA to assess the impacts of road-related ancillary infrastructure (primarily fencing, water quality controls, and construction and maintenance access) that had not been identified in the concept design.

The Section 115C report by the Director-General of the Department of Urban Affairs and Planning (DUAP 2001) noted that there was scope to reduce direct and indirect impacts on flora and fauna when the detailed design was prepared. The Department imposed Condition of Approval 53 that requires the RTA to engage an independent road design specialist and ecologist to review the detailed design to further reduce direct and indirect impacts on flora and fauna. The Department also imposed Condition of Approval 54 that requires the RTA to provide a dedicated fauna overpass at Stockrington Road unless it is not possible to provide the fauna overpass at this location, or the proposed multi-function overpass is an effective and appropriate design.

1.3 Independent ecologist and road designer

The RTA engaged the independent road designer, Mr Vlad Sofrevski of Hughes Trueman, Sydney and the independent ecologist, Dr Rhidian Harrington of Biosis Research, Sydney, to review the concept design in accordance with Condition of Approval 53. Curricula vitae for Mr Sofrevski and Dr Harrington are presented in Appendix 1. Mr Sofrevski and Dr Harrington confirm their independence in a statement at the beginning of this report. This report summarises their findings.

1.4 Detailed concept design

The RTA, and the project's independent ecologist and road designer, have undertaken an extensive review of the concept design for the Approved Project, on which the Minister's approval is based, to investigate ways to reduce the impacts of the Approved Project.

They have developed 15 proposed design changes[1]. Overall, the 15 proposed design changes would reduce impacts on flora and fauna, as well as improve other engineering and environmental outcomes. The detailed concept design is the concept design for the Approved Project that incorporates the 15 proposed design changes and road-related ancillary infrastructure.

The project's independent ecologist has also proposed five alternative design changes that have been investigated by the independent road designer for feasibility. The RTA does not support these alternative design changes.

Representatives from the Department of Environment and Conservation (DEC) and Department of Planning (DoP) participated in a two-day workshop and site inspection to review the proposed design changes in March 2005.

1.5 Structure of this report

This report presents the review of the proposed design changes by the independent ecologist and comments by the independent road designer and the RTA. Section 2 of this report describes the proposed 15 design changes that are fully supported by the RTA. In response to Condition of Concurrence 4, Section 3 of this report describes road-related ancillary infrastructure that would increase clearing of native vegetation and habitat and which was not considered in the concept design for the Approved Project. Section 4 of this report presents design changes proposed by the independent ecologist that are not supported by the RTA.

1.6 Vegetation mapping

2001 vegetation mapping

Vegetation clearing figures that were presented in the EIS (Connell Wagner 1995) and the Representations Report (RTA 2001) were based on vegetation polygons delineated from aerial photography and limited ground-truthing. Although the vegetation polygons within the concept design footprint were delineated, they were not delineated for the surrounding areas. These vegetation polygons are referred to as the *2001 mapping*.

2005 vegetation mapping

Since 2001, Biosis Research has used LHCCREMS vegetation mapping and updated it using 2003/2004 high-resolution aerial photography to better define vegetation community boundaries. Biosis Research has also updated the mapping to incorporate:

- The results of targeted flora surveys and selected ground-truthing.
- Threatened species and endangered ecological communities that have been gazetted since the approval in 2001.

[1] The design change at the South Maitland Railway requires development consent and is therefore not a change to the Minister's approval. The design change at Swamp Creek accommodates the change to the South Maitland Railway and is a change to the Minister's approval.

The updated LHCCREMS vegetation mapping is referred to as the *2005 mapping*.

1.7 Limitations with comparative assessments

Clearing limits in Conditions of Approval 60 and 61 were taken from Table 3.1 in Appendix K of the Representations Report (RTA 2001) and are derived from the 2001 mapping.

The concept design for the Approved Project was not sufficiently detailed to accurately determine the extent of vegetation clearing. It did not include fully developed footprints for interchanges and ramps, and it excluded ancillary road-related infrastructure and utility relocations. Consequently, the vegetation clearing areas in Conditions of Approval 60 and 61 understate the vegetation clearing that would occur to construct the Approved Project. Condition of Concurrence 4 acknowledges these limitations with respect to road-related ancillary infrastructure.

To enable like-with-like comparisons between the concept design and the detailed concept design, the clearing footprint of the concept design was mapped onto the 2005 mapping. The detailed concept design would reduce the road clearing footprint when compared to the concept design. Total vegetation clearing would increase due to the recognition of road-related ancillary infrastructure required by Condition of Concurrence 4.

1.8 Clearing for utilities outside of the Approved Project

Following discussions between the Department of Planning and the RTA in August 2005, clearing for relocated utilities that occurs within the road construction footprint of the Approved Project counts towards the clearing limits in Conditions of Approval 60 and 61. Clearing for relocated utilities outside of the road construction footprint is separate from the Approved Project and must be assessed under the *Environmental Planning and Assessment Act 1979*. The impacts of utility relocations that are not road-related ancillary infrastructure are being assessed separately to the Link.

1.9 Relevant approval requirements

Conditions of Approval 53 and 54, and Conditions of Concurrence 2, 3 and 4 are relevant to the independent design review. Appendix 3 presents these conditions.

2
Description and review of the proposed design changes

The Approved Project is based on the concept design prepared for the EIS. It was refined after exhibition of the RTA's Representations Report (2001) to reduce the overall environmental impacts of the F3 to Branxton link. The proposed design changes are based on the RTA's current detailed concept design. Appendix 2 presents plans of the 15 proposed design changes.

2.1 Design parameters

Key trigger: compliance with current road design standards

Approved project and proposed design changes

The design parameters for the Approved Project and the proposed design change are summarised in Table 2.

Table 2 Changes to design parameters of the concept design

Design Parameter	Approved Project	Proposed Design Change	Reason
Design speed	100 km/h	110 km/h	Current standard
Stopping sight distance	100 km/h @ 1.5 sec	110 km/h @ 2.5 sec	Current standard
Minimum curve radius	600 m	700 m	Higher design speed
Vertical grade			
Main carriageway	5%	5%	No change
Ramps	7%	8%	Reduce costs
Pavement widths			
Travel lanes	3.5 m	3.5 m	No change
Inner shoulder	1.0 m	0.5 m	Overall width unchanged
Outer shoulder	2.0 m	2.5 m	Overall width unchanged
Median width			
Sugarloaf section	3.6 m & Type F barrier	5.0 m and WRSB	Safety and design constraints
Remaining sections	17 m depressed	12 m depressed and WRSB	Safety and reduced vegetation clearing
Flooding	1% annual exceedance probability	1% annual exceedance probability	No change
Vertical clearance			
Over roads	5.3 m	6.5 m	Clearance for haulage to heavy industry in Hunter and beyond
Over rail	4.7 m	7.3 m	Clearance for double stacked containers

WRSB: wire rope safety barrier

Independent ecologist review

Overall ecological outcome: neutral

Apart from the change to median widths, the other design parameters would have a minor change to vegetation clearing when compared to the Approved Project and are reflected in the vegetation clearing summary in Table 1. The change to median width would reduce vegetation clearing and is discussed in Section 2.2. Overall, this design change would reduce vegetation clearing.

Independent road designer comments

The change to the design speed reflects the current freeway design standards. The design parameters in Table 2 are appropriate for the proposed design speed.

RTA comments

The RTA notes the comments of the independent ecologist and road designer.

2.2 Median width

Approved project

The Approved Project generally adopts a 17 m median between Buchanan and Branxton. In the Sugarloaf Range, between the F3 Freeway and Buttai, about five kilometres of the Link would have a narrow median of 3.6 m with a Type-F concrete barrier.

Proposed design change

Key trigger: improved ecological outcomes

The median between Buchanan and Branxton would generally be reduced to 12 m. This width could accommodate one additional lane along each carriageway should an additional travel lane for each carriageway be required to accommodate future traffic requirements. In the Sugarloaf Range, 6.3 km of the Link would have a median of five metres. A barrier such as a wire rope safety fence would be located within the median. Additional travel lanes cannot be accommodated within the median through the Sugarloaf Range.

Independent ecologist review

Overall ecological outcome: positive

The proposed design change would reduce the construction footprint by about 16 hectares. At an average vegetation coverage of 50% over the length of the Link, the proposed design change would reduce clearing of native vegetation by about eight hectares. Narrowing the median width would have a positive ecological outcome by reducing clearing in seven vegetation communities. Narrowing the median width would also have a positive ecological outcome by reducing the length of fauna crossing structures.

Independent road designer comments

The reduced median width in the proposed design change presents a less desirable solution from an engineering perspective. However, it is an acceptable alternative.

RTA comments

The RTA notes the comments of the independent ecologist and road designer.

2.3 Newcastle interchange (Ch -500 to 900)

Approved project

The Newcastle interchange has roundabouts at the ramp terminals and a bridge spanning the F3 Freeway. The interchange accommodates the traffic movements shown in Table 3. The Newcastle Link Road to F3 southbound and the F3 northbound to the F3 to Branxton link are the only free-flow movements. The Approved Project would harm important Aboriginal and non-indigenous heritage items due to the construction of a culvert and a large fill batter over Minmi Creek.

Table 3 Approved Newcastle interchange movements

	Movement	Provision
1	F3 northbound to Newcastle Link Road	Yes, via roundabouts
2	F3 northbound to F3 to Branxton link	Yes, free flow
3	F3 southbound to Newcastle Link Road	Yes, via roundabout
4	F3 southbound to F3 to Branxton link	Yes, via roundabouts
5	F3 to Branxton link eastbound to F3 northbound	Yes, via roundabout and existing reverse loop ramp
6	F3 to Branxton link eastbound to F3 southbound	Yes, via roundabouts
7	F3 to Branxton link eastbound to Newcastle Link Road	Yes, via roundabouts
8	Newcastle Link Road westbound to F3 northbound	Yes, via roundabouts, overbridge and existing reverse loop ramp
9	Newcastle Link Road westbound to F3 southbound	Yes, free flow
10	Newcastle Link Road westbound to F3 to Branxton link	Yes, via roundabouts

Proposed design change

Key triggers: traffic safety and capacity, Aboriginal and non-indigenous heritage

The Newcastle interchange would be a free-flow interchange. It would accommodate the same traffic movements as the Approved Project, except that two extremely low volume movements (from the F3 southbound to the F3 to Branxton link westbound and the F3 to Branxton link eastbound to the F3 northbound) would be achieved by indirect movements. Direct routes for these two movements are available using John Renshaw Drive. Table 4 shows that all but the two indirect traffic movements would be free-flow and operate at higher speeds than the roundabouts in the Approved Project.

A cycleway would be constructed in the shoulder of the eastbound carriageway of the F3 to Branxton link and Newcastle Link Road. The proposed design change would provide four bridges over Minimi Creek to protect Aboriginal and non-indigenous heritage in Minmi Creek.

Table 4 Proposed Newcastle interchange movements

	Movement	Provision
1	F3 northbound to Newcastle Link Road	Yes, via free-flow ramp
2	F3 northbound to F3 to Branxton link	Yes, via free-flow ramp
3	F3 southbound to Newcastle Link Road	Yes, via existing free-flow ramp
4	F3 southbound to F3 to Branxton link	No, but access can be achieved via indirect movement to Newcastle Link Road, U-turn at Cameron Park Drive roundabout, and return across F3 Freeway
5	F3 to Branxton link eastbound to F3 northbound	No, but access can be achieved via indirect movement across F3 Freeway, U-turn at Cameron Park Drive roundabout, and back to existing reverse loop ramp
6	F3 to Branxton link eastbound to F3 southbound	Yes, via free-flow ramp
7	F3 to Branxton link eastbound to Newcastle Link Road	Yes, via bridges over ramps and F3 Freeway
8	Newcastle Link Road westbound to F3 northbound	Yes, via overbridge and existing reverse loop ramp
9	Newcastle Link Road westbound to F3 southbound	Yes, via existing free-flow ramp
10	Newcastle Link Road westbound to F3 to Branxton link	Yes, via bridges over ramps and F3 Freeway

Independent ecologist review

Overall ecological outcome: positive

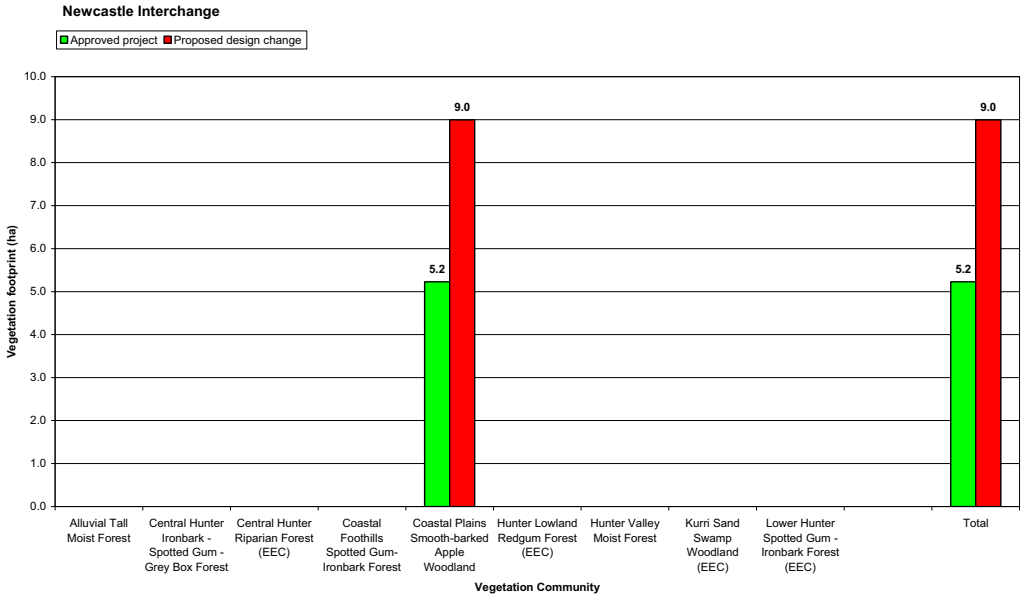
Even though reducing flora and fauna impacts are not key triggers for this proposed design change, it would reduce ecological impacts, including fragmentation and vegetation clearing.

Although targeted surveys were not conducted for the changes to the Newcastle interchange, no threatened plant species were previously recorded within this area and no Endangered Ecological Communities (EECs) were recorded within the footprint of the proposed design change. No threatened fauna species were previously recorded in this location, although the Sooty Owl *Tyto tenebricosa* was located about one kilometre northwest on the Stockrington Road Ridge (Harrington, et al 2007). The Masked Owl *Tyto novaehollandiae* has been previously recorded approximately 500 m west of this location (DEC Atlas of NSW Wildlife). Squirrel Gliders have also been detected in the vicinity of the Sugarloaf Range (Connell Wagner 1997).

The proposed design change would affect moderate quality Coastal Plains Smooth-barked Apple Woodland. This community is of moderate quality because it was previously logged, the mid-storey is sparse and ground cover is limited. It is also transected by tracks and easements and it is subject to rubbish dumping.

Figure 2 shows that the proposed design change would increase clearing. However, as noted in Section 1.7, the vegetation clearing for the Approved Project is understated. Importantly, the connectivity along Minmi Creek would be improved, and the impacts on associated Aboriginal objects and European relics would be reduced, due to the replacement of a 130 m long culvert by four bridges.

Figure 2 Newcastle interchange vegetation changes



This area falls within a DEC regional corridor, which extends from east of Mount Sugarloaf to the 'Tank Paddock'. It is described as the ridge running east-northeast from Mount Sugarloaf, together with the waterways and riparian areas north (Blue Gum Creek) and south (Minmi Creek) of the ridge. The proposed bridges over Minmi Creek would allow uninterrupted fauna movement across the Link within this recognised fauna corridor and would provide greater connectivity than the Approved Project. Improved connectivity in this area is considered more important than a slight increase in vegetation clearing of moderate quality Coastal Plains Smooth-barked Apple Woodland. The proposed design change at the Newcastle interchange is considered likely to reduce impacts on ecological values when compared to the Approved Project.

Independent road designer comments

The proposed design change would provide a desirable level of service for a freeway-to-freeway connection.

However, it would create potential conflict between weaving vehicles approaching and circulating within the Cameron Park Drive roundabout. This element of the interchange should be investigated further to address this issue.

RTA comments

The RTA notes the comments of the independent ecologist and road designer.

The potential traffic conflict would be caused by a low volume of weaving vehicles. The RTA is currently investigating a change to the Newcastle Link Road/Cameron Park Drive intersection to address the traffic issues raised by the independent road designer. This change is not a part of the F3 to Branxton link and will be assessed separately.

2.4 Sugarloaf realignment (Ch 900 to 4500)

Approved project

The F3 to Branxton link crosses steep terrain in the Sugarloaf Range and requires five major cuts and six deep fills to maintain an acceptable longitudinal grade. It crosses under Stockrington Road in a cut and cover tunnel and crosses over Blue Gum Creek and the heritage railway on a bridge. The cut and cover tunnel would be designed to support Stockrington Road, a 500 mm diameter high pressure gas main, an Optus optical fibre cable and a surface fauna crossing[2]. The design speed of the Link in the Sugarloaf Range is 100 km/h.

To minimise the extent of clearing caused by earthworks, the Approved Project proposed steep cut/fill batters (cuts 0.5h:1v; fills 1h:1v). Recent geotechnical investigations show that the material to be excavated from cuts is of poor quality. Cut batters need to be no steeper than 2h:1v where weathered claystones or interbedded coals and claystones occur and the upper sections of the cut batters need to be no steeper than 3h:1v. The base of the cutting at Ch 3700 (also referred to as Skyline Ridge) is in solid sandstone and 0.5h:1v cut batters are acceptable.

Fill batters would need to be no steeper than 2h:1v. Flatter cut/fill batters would increase clearing of native vegetation by 16 ha. Construction of structurally supported batters at the slopes originally proposed in the Approved Project would be feasible, however it would have a greater cost and risk when compared to the concept design presented in the EIS.

Cessnock City Council has granted development consent for the operation of an extractive industry north of the Link. The development would upgrade an existing track that crosses the Link at Ch 4250. No provision for an underpass was made in the Approved Project.

Proposed design change

<u>Key triggers: geotechnical limitations, improved ecological outcomes</u>

The F3 to Branxton link would follow a shorter and straighter alignment. The grade line would be raised to reduce the magnitude of cuts between Stockrington Road and Skyline

[2] The surface fauna crossing on top of the cut and cover tunnel is referred to as a "fauna overpass" in Condition of Approval 54 and other documents. However, there is no overpass structure – there is only the covered tunnel in which the F3 to Branxton link passes under Stockrington Road.

Ridge. Three bridges with a combined length of 840 m would be used to span three deep valleys and eliminate three large fills. The length of the proposed design change between Ch 900 and 4500 would be reduced by about 250 m when compared to the Approved Project. The design speed of the Link in the Sugarloaf Range would increase to 110 km/h.

The proposed cut and cover tunnel at Stockrington Road would be replaced by a single span bridge over the highway that would not function as a fauna overpass. The access track to the extractive industry would be realigned to cross under the F3 to Branxton link at Ch 4350.

Independent ecologist review

Overall ecological outcome: positive

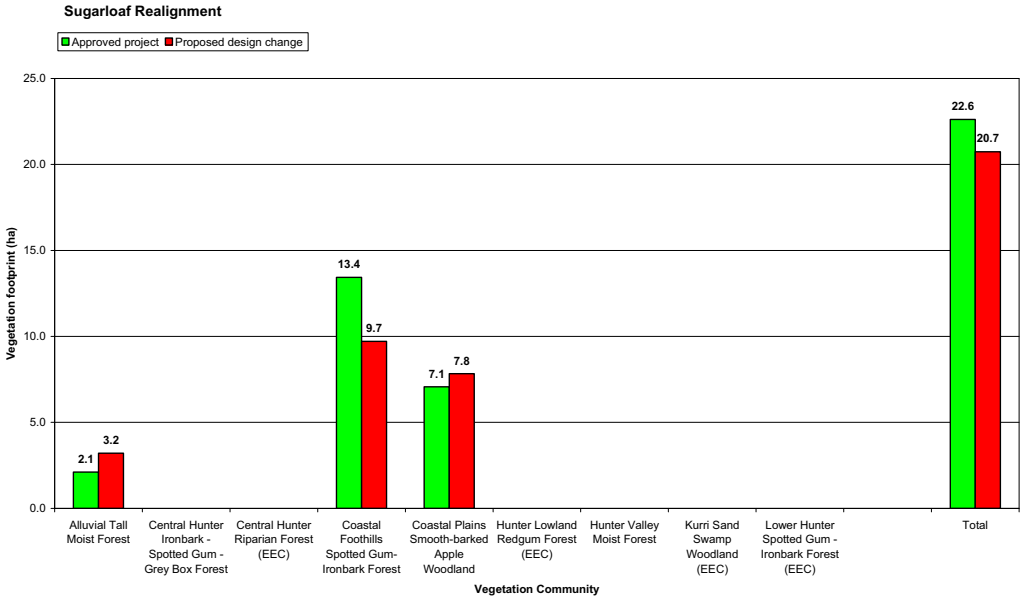
Sugarloaf bridges

Although the alignment of the proposed design change would avoid a significant population of *Tetratheca juncea* (>100 clumps), it would result in the loss of two sub-populations of 2 and 33 clumps, thus reducing the impacts on this species in this section. No EECs were recorded within the footprint of the proposed design change. The Sooty and Masked Owls (listed under the TSC Act) have previously been located in this section (Harrington, et al 2007). Squirrel Gliders have also been detected in the vicinity of the Sugarloaf Range (Connell Wagner 1997).

The most significant impact on fauna in the Sugarloaf Range from the Approved Project is the disruption to fauna connectivity in the region. The ridge running east northeast from Mount Sugarloaf, together with the waterways and riparian areas north (Blue Gum Creek) and south (Minmi Creek) of the ridge, are a regional wildlife corridor. Burnt Creek and the three unnamed gullies between Stockrington Road ridge and Blue Gum Creek provide important riparian habitat within this regional corridor. The proposed design change would significantly fauna connectivity when compared to the Approved Project because it would maintain uninterrupted riparian vegetation along the creek lines. The areas under the bridges would serve as key wildlife links along the Sugarloaf Range and associated creek valleys. The use of high bridges at these locations would also allow a native plant understorey to recolonise the areas beneath the bridges and allow all native fauna species to move through this habitat corridor. Vegetation clearing would be limited to construction and maintenance access tracks and bridge pylons.

In addition to the improved fauna connectivity, Figure 3 shows that the proposed design change would have a positive ecological outcome because it would reduce clearing. The proposed design change in the Sugarloaf Range is considered likely to reduce impacts on ecological values when compared to the Approved Project.

Figure 3 Sugarloaf realignment vegetation changes



Stockrington Road dedicated fauna overpass

As described above, Stockrington Ridge forms part of a regional corridor identified by the DEC. The proposed design change would pass through an expanse of open forest at Stockrington Ridge, which extends from Awaba State Forest in the south to the edge of Hexham Swamp in the north. This area is already fragmented to a degree by numerous forestry tracks, electricity transmission lines and George Booth Drive, although these barriers would be passable to more mobile terrestrial fauna.

In the Approved Project, a part of the surface of the cut and cover tunnel would have been dedicated to the passage of ridge top fauna; the remainder of the tunnel's surface would have supported Stockrington Road, a gas pipeline and a telecommunication service. The fauna crossing proposed in the Approved Project is intended to link ridge top habitat along the Sugarloaf Range, the ridge of which forms an integral component of the regional corridor discussed above. Ridgeland habitat extends almost continuously between Awaba and Heaton State Forests in the south, to Black Hill in the northeast, as well as towards extensive bushland in the catchment of Buttai Creek in the northwest. The fauna crossing was initially intended to facilitate the movement of terrestrial and arboreal mammals and reptiles in a north-south direction along the ridge top habitat.

A surface fauna crossing at this location is inappropriate because the habitat surrounding the crossing is poor. The vegetation was previously logged and is relatively immature. The mid-storey is sparse and ground cover is limited. It is also transected by tracks and easements and it is subject to rubbish and car dumping.

In addition to the poor state of the habitat, the road and pipeline are inappropriate next to the surface fauna crossing. Bridges, with fencing that directs ridge top fauna under them, are considered a better option for maintaining connectivity within this region. The three

large bridges over Blue Gum Creek and its tributaries negate the need for a fauna crossing in the Stockrington-Seahampton section of the F3 to Branxton link (Harrington, et al 2007).

Independent road designer comments

The proposed design change would improve the road geometry.

RTA comments

The RTA notes the comments of the independent ecologist and road designer.

2.5 Surveyors Creek realignment (Ch 5300 to 8700)

Approved project

The F3 to Branxton link is located at the base of a side slope in the Buttai. The RTA made a commitment to constructing combined sedimentation basins/water storage ponds on the northern side of the Link at Buttai to provide a permanent water supply for animals.

Proposed design change

Key trigger: reduced vegetation clearing

The F3 to Branxton link would be located to the southwest of the Approved Project between Ch 5300 and 8700. The maximum separation between the Approved Project and the proposed design change would be about 200 m near Ch 7200. When compared to the Approved Project, it would be about 70 m longer. However, it would reduce the volume of earthworks and the height of the fill centred at Ch 7300.

The proposed design change would reduce the area of native vegetation clearing. A combined heavy and light vehicle rest area would be located on both sides of the Link at Buttai, between Ch 7500 and 8000. Combined sedimentation basins/water supply ponds for animals would not be provided.

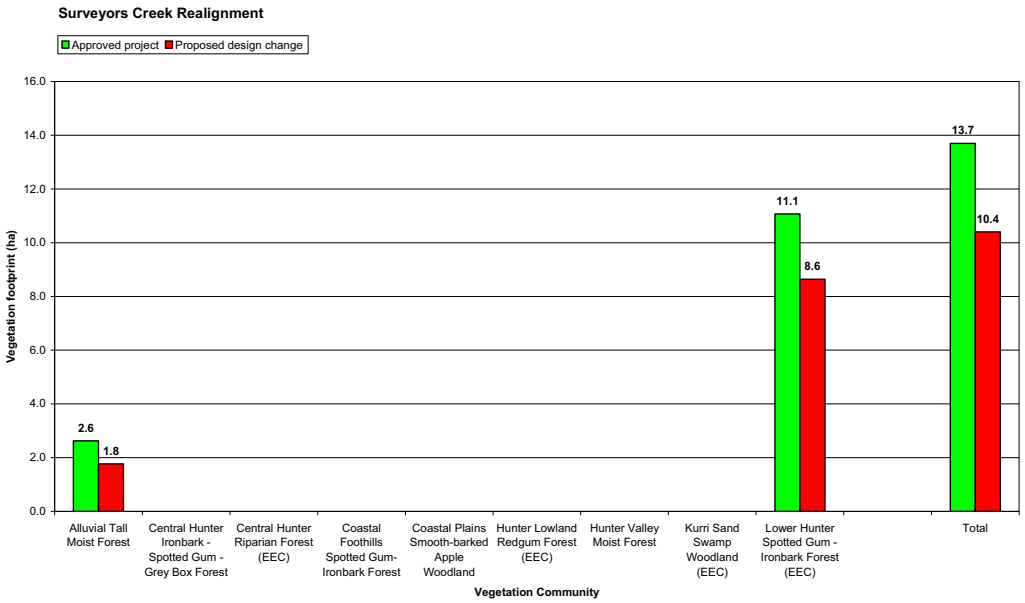
Independent ecologist review

Overall ecological outcome: positive

No threatened plant species were recorded within the footprint of the proposed design change. However, Lower Hunter Spotted Gum-Ironbark Forest, which is listed as an EEC on the TSC Act, would be affected. The Powerful Owl *Ninox strenua* has previously been recorded in this section (Harrington, et al 2007), and Squirrel Gliders have been detected in the vicinity of the Sugarloaf Range (Connell Wagner 1997). Figure 4 shows that the proposed design change would have a positive ecological outcome because it would reduce clearing.

The provision of permanent water supply ponds for animals is not required due to the proximity of existing water supplies and the difficulties in maintaining suitable water quality.

Figure 4 Surveyors Creek realignment vegetation changes



Independent road designer comments

The proposed design change would provide satisfactory road geometry.

RTA comments

The RTA notes the comments of the independent ecologist and road designer.

2.6 Buchanan interchange (Ch 9900)

Approved project

At the Buchanan interchange, the F3 to Branxton link passes under John Renshaw Drive and provides onload and offload ramps to a roundabout, a T-intersection and a slip lane at John Renshaw Drive. Buchanan Road passes over the Link and connects to John Renshaw Drive and George Booth Drive at a roundabout. Table 5 highlights (in yellow) important heavy vehicle hauling movements between the Hunter Valley and the Port of Newcastle.

Proposed design change

Key triggers: improved traffic movements, reduced vegetation clearing

Buchanan interchange would be a two lane, grade-separated elliptical roundabout. John Renshaw Drive would be realigned to join the north and south facing ramps of the Buchanan interchange and cross over the Link on two two-lane bridges. The roundabout at the intersection of John Renshaw Drive and George Booth Drive would be moved slightly north to provide a suitable alignment for new bridges on John Renshaw Drive over Wallis and Surveyors creeks. Buchanan Road would cross under the Link to join the roundabout at the intersection of John Renshaw Drive and George Booth Drive. Table 6 highlights (in yellow) important heavy vehicle hauling movements between the Hunter Valley and the Port of Newcastle.

Table 5 Approved Buchanan interchange movements

	Movement	Provision
1	F3 to Branxton link westbound to JRD[1] eastbound	Yes, indirect via roundabouts
2	F3 to Branxton link westbound to JRD westbound	Yes, via roundabout
3	F3 to Branxton link eastbound to JRD eastbound	Yes, via roundabout
4	F3 to Branxton link eastbound to JRD westbound	Yes, via roundabouts
5	F3 to Branxton link westbound to Buchanan Road	Yes, via roundabout and bridge over the F3 to Branxton link
6	F3 to Branxton link eastbound to Buchanan Road	Yes, indirect via roundabouts and bridge over the F3 to Branxton link
7	Buchanan Road to F3 to Branxton link westbound	Yes, indirect via bridge over the F3 to Branxton link, roundabout and loop ramp
8	Buchanan Road to F3 to Branxton link eastbound	Yes, indirect via bridge over the F3 to Branxton link and roundabouts
9	JRD westbound to F3 to Branxton link eastbound	Yes, via roundabout
10	JRD westbound to F3 to Branxton link westbound	Yes, via T-intersection
11	JRD eastbound to F3 to Branxton link eastbound	Yes, via roundabouts
12	JRD eastbound to F3 to Branxton link westbound	Yes, via roundabout and loop ramp

1: John Renshaw Drive

Table 6 Proposed Buchanan interchange movements

	Movement	Provision
1	F3 to Branxton link westbound to JRD[1] eastbound	Yes, via roundabout
2	F3 to Branxton link westbound to JRD westbound	Yes, via roundabout
3	F3 to Branxton link eastbound to JRD eastbound	Yes, via roundabout
4	F3 to Branxton link eastbound to JRD westbound	Yes, via roundabout
5	F3 to Branxton link westbound to Buchanan Road	Yes, indirect via roundabouts and crossing under the F3 to Branxton link
6	F3 to Branxton link eastbound to Buchanan Road	Yes, indirect via roundabouts and crossing under the F3 to Branxton link
7	Buchanan Road to F3 to Branxton link westbound	Yes, indirect via crossing under the F3 to Branxton link and roundabouts
8	Buchanan Road to F3 to Branxton link eastbound	Yes, indirect via crossing under the F3 to Branxton link and roundabouts
9	JRD westbound to F3 to Branxton link eastbound	Yes, via roundabout
10	JRD westbound to F3 to Branxton link westbound	Yes, via roundabout
11	JRD eastbound to F3 to Branxton link eastbound	Yes, via roundabouts
12	JRD eastbound to F3 to Branxton link westbound	Yes, via roundabouts

1: John Renshaw Drive

Section 4 presents an alternative design change for the Buchanan interchange.

Independent ecologist review

Overall ecological outcome: positive

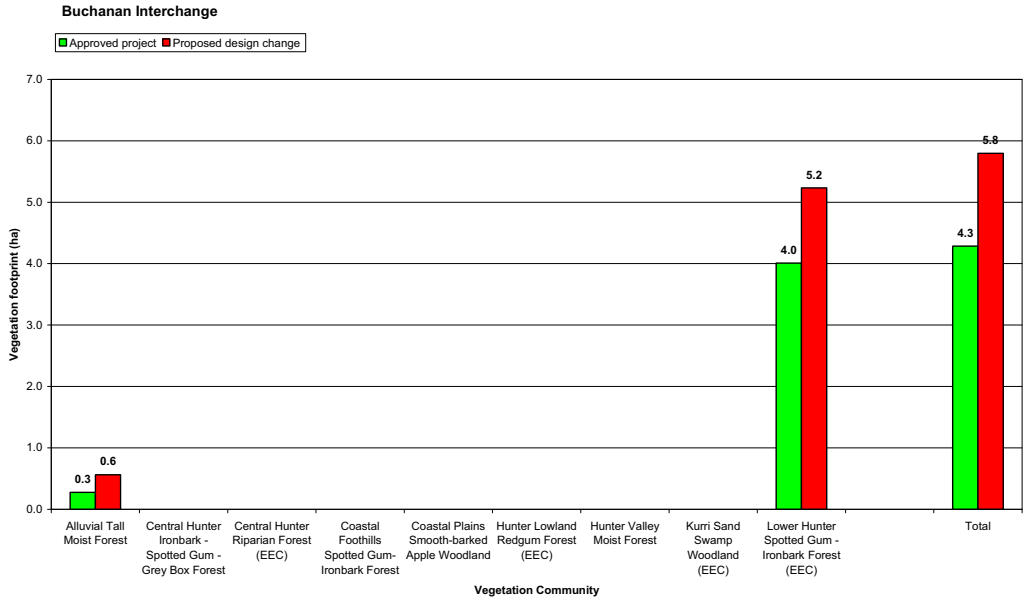
No threatened plant species have been recorded in the footprint of the proposed design change. However, Lower Hunter Spotted Gum-Ironbark Forest, which is listed as an EEC on the TSC Act, would be affected. No threatened animal species have previously been located near the Buchanan interchange.

The proposed design change would have an impact on Lower Hunter Spotted Gum-Ironbark Forest and Alluvial Tall Moist Forest, both of which are of poor quality. Because these communities were previously logged, the mid-storey is absent and ground cover is dominated by introduced grasses and weeds. Both communities are subject to grazing impacts.

It was anticipated that the proposed design change would reduce vegetation clearing. However, the Approved Project lacks design information on the cuts and fill batters for the onload and offload ramps and roundabouts, and shows that vegetation between the ramps and the main carriageways would not be cleared. It therefore understates the clearing area.

Figure 5 shows that the proposed design change would increase vegetation clearing. As noted in Section 1.7, the actual vegetation clearing is likely to be reduced. Despite the indicated increase in clearing area, the proposed design change would have a positive ecological outcome when compared to the Approved Project.

Figure 5 Buchanan interchange vegetation changes



Independent road designer comments

The proposed design change would produce a more compact and more conventional interchange layout.

RTA comments

The RTA notes the comments of the independent ecologist and road designer.

2.7 Averys Lane overpass (Ch 11500)

Approved Project

Averys Lane crosses over the F3 to Branxton link at Ch 11500. The alignment is centred on the constructed formation of Averys Lane.

Proposed design change

Key trigger: construction under traffic

The alignment of the Averys Lane bridge would be moved up to 10 m to the west to facilitate construction under traffic. After completion of the bridge, the approaches from Averys Lane would be diverted and its existing formation between the approaches and the Link would be closed.

Independent ecologist review

Overall ecological outcome: negative

No threatened plant species or EECs were recorded under the footprint of the design change for Averys Lane. No threatened animal species have been previously located near the Averys Lane Overpass. Figure 6 shows that the proposed design change would increase vegetation clearing by 0.4 ha in the Alluvial Tall Moist Forest vegetation community.

Independent road designer comments

The key trigger appears to justify the proposed design change.

RTA comments

The RTA notes the comments of the independent ecologist and road designer.

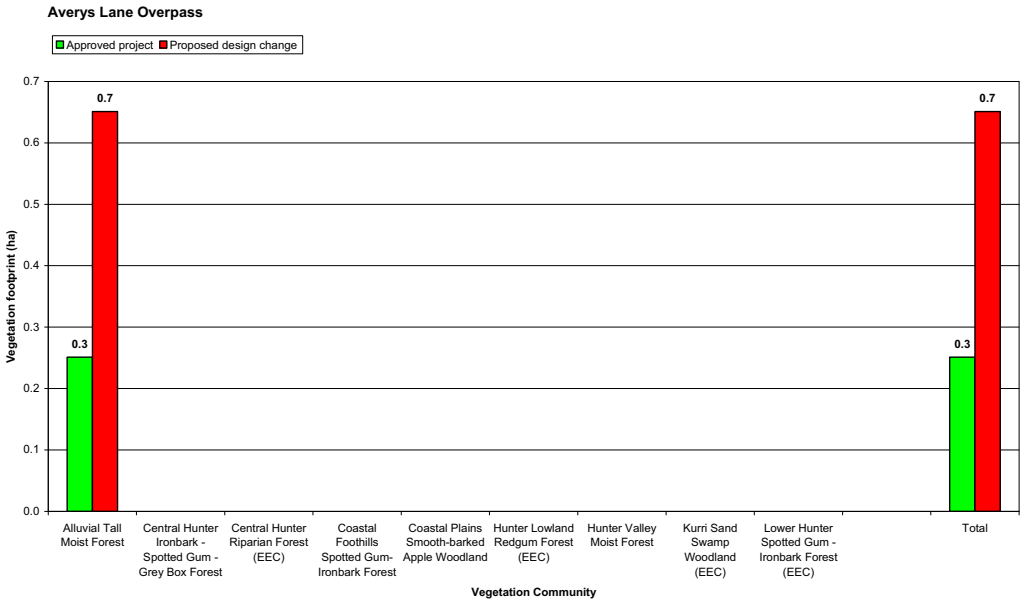
2.8 Kurri Kurri interchange (Ch 13800)

Approved project

The Kurri Kurri interchange is a double-roundabout diamond interchange. Main Road (Main Road 195), which links Kurri Kurri with Heddon Greta, crosses over the Approved Project on a single bridge. Onload and offload ramps from both carriageways of the Approved Project connect to two roundabouts at the ramp terminals on Main Road and accommodate all traffic movements.

The Approved Project severs Stanford Road. To accommodate traffic between Stanford Merthyr and Heddon Greta, the Approved Project realigns Stanford Road to join with the western roundabout at Main Road.

Figure 6 Averys Lane overpass vegetation changes



Proposed design change

Key trigger: reduced vegetation clearing

The Kurri Kurri interchange would be a two-lane, grade-separated, elliptical roundabout. Main Road would cross over the Approved Project on the two bridges of the elliptical roundabout. Onload and offload ramps from both carriageways of the Approved Project would connect to Main Road at the roundabout and accommodate all traffic movements.

The proposed design change would sever Stanford Road. Culs-de-sac would be constructed on Stanford Road at the northern end of Stanford Merthyr and south of the Kurri Kurri Golf Course. Access to the golf course from Main Road and Stanford Road would be maintained. Direct access between Stanford Merthyr and Heddon Greta would be closed. Indirect access would be maintained between Stanford Merthyr and Heddon Greta using State Roads. The removal of the realigned section of Stanford Road would reduce clearing of Kurri Sand Swamp Woodland when compared to the Approved Project.

Independent ecologist review

Overall ecological outcome: positive

Kurri Kurri interchange

Eucalyptus parramattensis ssp. *decadens*, a threatened species under the TSC Act and the EPBC Act, was recorded within the footprint of the proposed design change. Additionally, Kurri Sand Swamp Woodland, an EEC under the TSC Act, would be affected. No threatened animal species have been detected near the Kurri Kurri interchange, although Squirrel Gliders have been recorded in the Kurri Kurri area (DEC Atlas of NSW Wildlife).

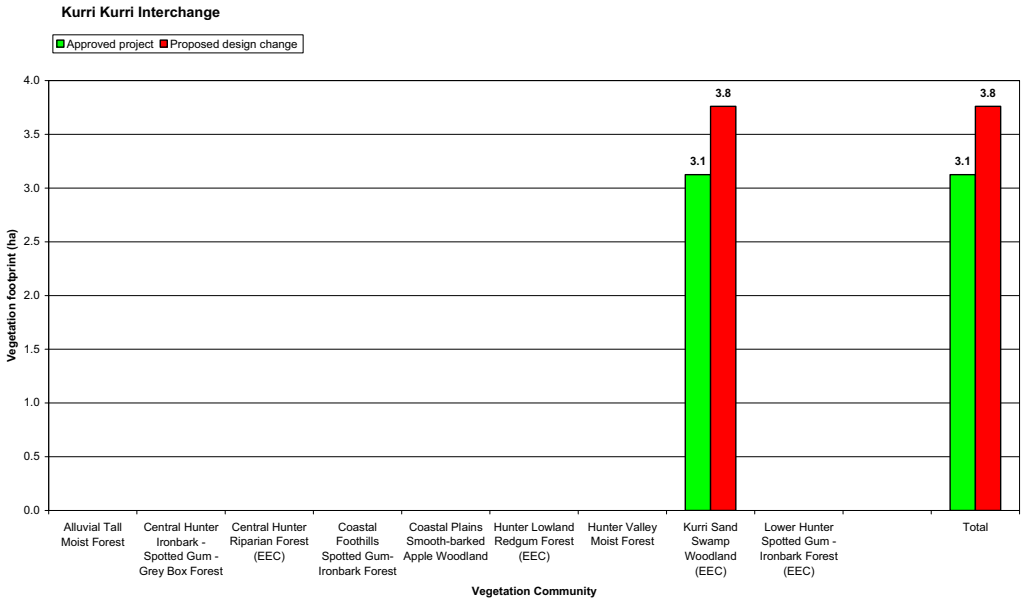
The proposed design change would affect poor quality Kurri Sand Swamp Woodland. It is poor quality because it was previously logged, the mid-storey is sparse and ground cover is limited. It is also transected by tracks and easements and is subject to rubbish dumping.

It was anticipated that the proposed design change would reduce clearing in Kurri Sand Swamp Woodland. However, the Approved Project lacks design information on the cuts and fill batters for the onload and offload ramps and roundabouts, and shows that the Kurri Sand Swamp Woodland vegetation between the ramps and the main carriageways would not be cleared. It therefore understates the clearing area.

Figure 7 shows that the proposed design change would increase clearing. As noted in Section 1.7, the actual vegetation clearing is likely to decrease. The proposed design change would close Stanford Road and should increase connectivity within the adjacent patches of Kurri Sand Swamp Woodland, when the section of road south of the Link is revegetated. The closure of the section of Stanford Road south of the Link may also reduce rubbish dumping within the adjacent Kurri Sand Swamp Woodland, because it would remove direct vehicle access.

Despite the indicated increase in the clearing area in Kurri Sand Swamp Woodland, the proposed design change would have a positive ecological outcome when compared to the Approved Project.

Figure 7 Kurri Kurri interchange vegetation changes



Electricity transmission line relocations

The relocation of overhead electricity transmission lines between the Kurri Kurri interchange and McLeod Road would require clearing of native vegetation. As noted in Section 1.8, EnergyAustralia will assess the impacts of electricity adjustments separately to the F3 to Branxton link.

Independent road designer comments

The proposed design change would produce a more compact and more conventional interchange layout. It would also rationalise the interchange's traffic movements.

However, it is noted that the proposed design change would eliminate the connection to Stanford Road.

RTA comments

The RTA notes the comments of the independent ecologist and road designer. Closure of Stanford Road would reduce clearing of, and ongoing impacts on, Kurri Sand Swamp Woodland. The environmental impacts of the closure of Stanford Road are assessed in a separate report (Acacia Environmental Planning 2007).

2.9 McLeod Road overpass (Ch 15000)

Approved project

McLeod Road is realigned to cross the F3 to Branxton link on a bridge at the edge of a cutting. It connects at a T-intersection with a new road linking McLeod Road to the Kurri Kurri TAFE. Relocation of overhead electricity transmission lines would require clearing of Kurri Sand Swamp Woodland.

Proposed design change

Key trigger: design refinement

The bridge over the Link would be moved from the edge to the centre of the cut to reduce ramp earthworks. Relocation of overhead electricity transmission lines would require clearing of Kurri Sand Swamp Woodland.

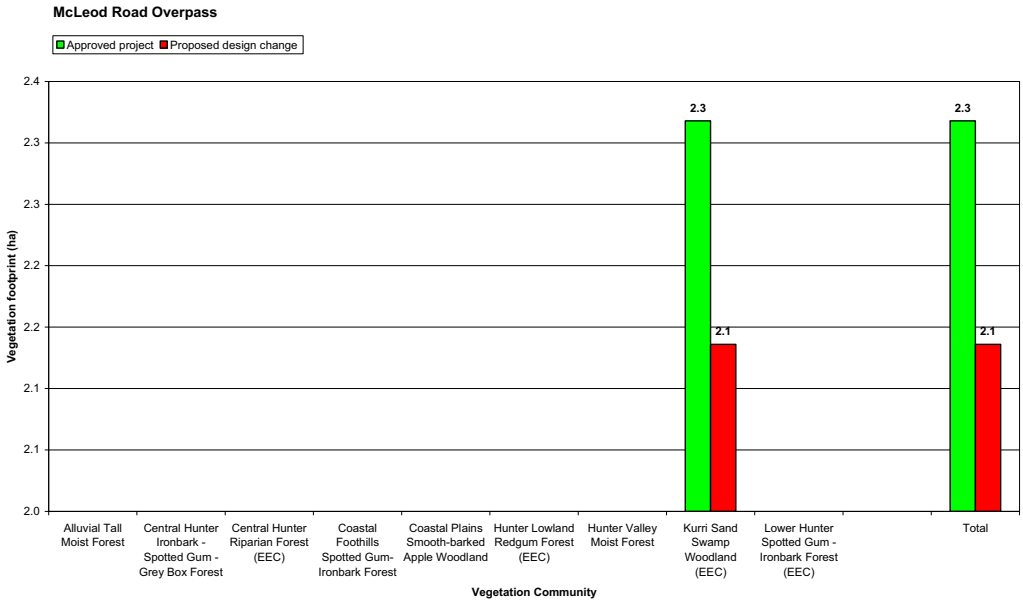
Independent ecologist review

Overall ecological outcome: positive

Eucalyptus parramattensis ssp. *decadens*, a threatened species under the TSC Act and the EPBC Act, was recorded within the footprint of the proposed design change. Additionally, Kurri Sand Swamp Woodland, an EEC under the TSC Act, would be affected. No threatened animal species have been detected near the McLeod Road overpass, although Squirrel Gliders have been recorded in the Kurri Kurri area (DEC Atlas of NSW Wildlife).

The proposed design change would affect two small fragmented patches of good quality Kurri Sand Swamp Woodland. Roads, electricity easements, residential housing and a wastewater treatment plant surround the two patches of vegetation. Figure 8 shows that the proposed design change would have a positive ecological outcome because it would reduce clearing.

Figure 8 McLeod Road overpass vegetation changes



Independent road designer comments

The key trigger appears to justify the proposed design change.

RTA comments

The RTA notes the comments of the independent ecologist and road designer.

2.10 South Maitland Railway and Swamp Creek (Ch 15800)

Approved project

The F3 to Branxton link rises to cross over both the South Maitland Railway and Swamp Creek on separate bridges for each carriageway. The bridges over the South Maitland Railway would be 150 m long and provide 4.7 m clearance for railway traffic. The South Maitland Railway is listed as an item of environmental heritage on two environmental planning instruments (the *Hunter Regional Environmental Plan 1989* and the *Cessnock Local Environmental Plan 1989*).

The level of Swamp Creek is about 13 m below the level of the railway line in normal flow conditions and 6.5 m below in flood conditions. Large fill embankments and bridge abutments are required to gain the required elevation and will require clearing of Kurri Sand Swamp Woodland.

Proposed design change

Key triggers: provide additional rail clearance, design refinement

The owners of the South Maitland Railway require the option to move double-stacked containers on the railway. The minimum clearance would increase from 4.7 m to 7.3 m. To achieve this clearance, the RTA would need to lift the height of the bridges over the South Maitland Railway. This would increase the length of the bridges, increase visual

impacts, require additional fill for the bridge abutments and result in more clearing of native vegetation.

To provide the track clearance required for the South Maitland Railway, the design would be changed to allow the Railway to cross over the F3 to Branxton link. The formation of the Railway would be raised over a distance of 900 m and a rail bridge would be built over the Link.

The F3 to Branxton link would be lowered to cross in a cutting below the South Maitland Railway and above Swamp Creek on bridges that would be 55 m long. The height of the Swamp Creek embankments and the extent of bridge abutments would be reduced when compared to the Approved Project. This design change would reduce the area of Kurri Sand Swamp Woodland to be cleared for the bridge approaches and abutments.

The part of the proposed design change that affects the South Maitland Railway requires development consent from Cessnock City Council and is not a part of the Approved Project. The RTA received development consent in 2006. Clearing associated with this development is separate from the Approved Project and does not contribute towards the clearing limits in Conditions of Approval 60 and 61.

Independent ecologist review

Overall ecological outcome: positive

South Maitland Railway

Separate ecological assessments were prepared for the development application submitted to Cessnock City Council (Harrington, et al 2005, 2007a; Smith 2005). No threatened plant species were recorded within the raised railway embankment footprint of the development. However, Kurri Sand Swamp Woodland and Central Hunter Riparian Forest, both EECs under the TSC Act, would be affected. No threatened animal species have been detected near Swamp Creek, although Squirrel Gliders have been recorded in the Kurri Kurri area (DEC Atlas of NSW Wildlife). The development would affect 1.0 ha of moderate quality Kurri Sand Swamp Woodland and 0.1 ha of Central Hunter Riparian Forest and does not contribute towards the clearing limits in Conditions of Approval 60 and 61.

Harrington, et al (2005) and Smith (2005) determined that the development, in isolation from the Link, would be unlikely to constitute a significant impact to any threatened (or migratory) species, population or ecological community listed under the TSC Act or EPBC Act. When compared to the Approved Project, the development would be likely to have a minor impact on ecological values due to the increase in clearing to raise the embankment of the South Maitland Railway.

Swamp Creek

Eucalyptus parramattensis ssp. *decadens*, a threatened species, was previously recorded within the construction footprint of the Approved Project at Swamp Creek (Harrington, et al 2005). Additionally, Kurri Sand Swamp Woodland, an EEC under the TSC Act,

would be affected. No threatened animal species have been detected near the proposed Swamp Creek Bridge, although Squirrel Gliders have been recorded in the Kurri Kurri area (DEC Atlas of NSW Wildlife).

The proposed design change would affect moderate quality Kurri Sand Swamp Woodland and Central Hunter Riparian Forest. Figure 9 shows that the proposed design change would have a positive ecological outcome because it would reduce clearing.

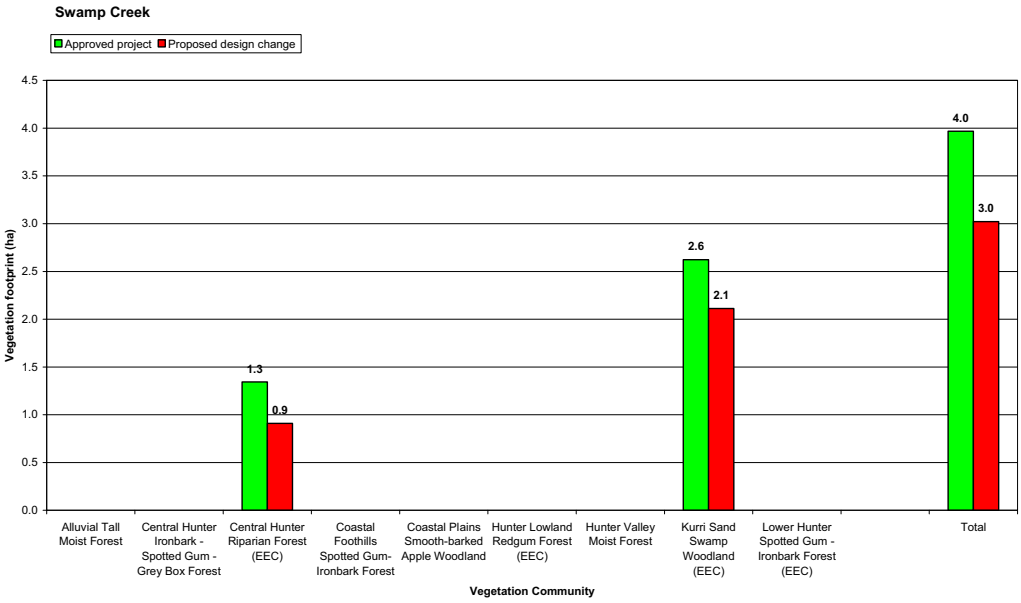
Independent road designer comments

The proposed design change would create more desirable vertical geometry in the vicinity of the South Maitland Railway crossing.

RTA comments

The RTA notes the comments of the independent ecologist and road designer.

Figure 9 Swamp Creek vegetation changes



2.11 Loxford interchange (Ch 16600)

Approved project

The Loxford interchange is a half diamond configuration and provides east-facing ramps to the F3 to Branxton link. A westbound offload ramp from the Link provides access to Hart Road at a T-intersection. A T-intersection and onload ramp from Hart Road provide access to the eastbound F3 to Branxton link. Hart Road crosses over the Link.

Proposed design change

Key trigger: construction under traffic

The alignment of the Hart Road bridge would be moved up to 20 m to the northwest to facilitate construction under traffic. Native vegetation remnants in the road reserve would be cleared. The Hart Road embankment would slightly increase clearing of Lower Hunter Spotted Gum-Ironbark Forest. The alignment of the two ramps would be moved to the southwest up to 20 m to provide suitable intersection geometry.

Independent ecologist review

Overall ecological outcome: neutral

Eucalyptus parramattensis ssp. *decadens*, a threatened species, was recorded within the footprint of the proposed design change. Additionally, Kurri Sand Swamp Woodland and Lower Hunter Spotted Gum-Ironbark Forest, both EECs under the TSC Act, would be affected. No threatened animal species have been detected near the proposed Loxford interchange, although Squirrel Gliders have been recorded in the Kurri Kurri area (DEC Atlas of NSW Wildlife).

The onload and offload ramps of the proposed design change would affect the edges of a small patch of moderate quality Kurri Sand Swamp Woodland and Lower Hunter Spotted Gum-Ironbark Forest. Although the centre of this patch of Kurri Sand Swamp Woodland is of moderate to good condition, the areas affected by the proposed design change are of poor quality. They were previously cleared, have a weed-dominated ground cover, and are subject to grazing impacts.

It was anticipated that the proposed design change would slightly increase clearing. However, the Approved Project lacks design information on the cuts and fill batters for the onload and offload ramps and shows that the vegetated areas between the ramps and the main carriageways would not be cleared. It therefore understates the clearing area.

Figure 10 shows that the proposed design change would increase clearing. As noted in Section 1.7, the actual vegetation clearing is likely to be unchanged. Despite the indicated increase in clearing, the proposed design change is unlikely to worsen the ecological outcome when compared to the Approved Project.

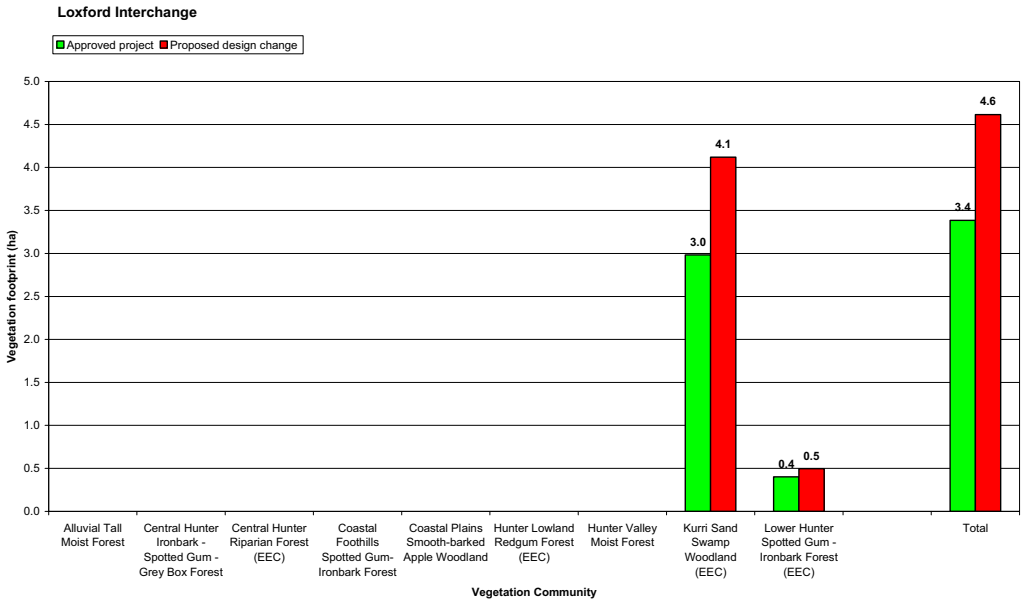
Independent road designer comments

The key trigger appears to justify the proposed design change.

RTA comments

The RTA notes the comments of the independent ecologist and road designer.

Figure 10 Loxford interchange vegetation changes



2.12 Sawyers Gully realignment (Ch 20000 to 22300)

Approved project

The Approved Project crosses 132 kV and 66 kV electricity transmission lines that will need to be relocated. Old Maitland Road crosses over the F3 to Branxton link at Ch 21600. The alignment is centred on the constructed formation of Old Maitland Road.

Proposed design change

Key triggers: eliminate 132 kV electricity crossings, construction under traffic

The alignment of the Link would be moved up to 70 m to the north to move the construction footprint into the existing cleared electricity easements. The electricity easement would be relocated to the south of the Approved Project. The design change would eliminate all electricity line crossings of the Link at this location. The alignment of the Old Maitland Road bridge would be moved up to 25 m to the east to facilitate construction under traffic.

Independent ecologist review

Overall ecological outcome: positive

No threatened plant species were recorded within the construction footprint of the proposed design change. However, Lower Hunter Spotted Gum-Ironbark Forest and Central Hunter Riparian Forest, both EECs under the TSC Act, would be affected. No threatened animal species have been detected near Sawyers Gully.

The proposed design change would affect the edges of a large patch of moderate quality Lower Hunter Spotted Gum-Ironbark Forest and a small patch of Central Hunter

Riparian Forest. Figure 11 shows that the proposed design change would have a positive ecological outcome because it would reduce clearing.

The relocation of overhead electricity transmission lines at Sawyers Gully would require clearing of native vegetation. EnergyAustralia is assessing the impacts of electricity adjustments separately to the Link.

Independent road designer comments

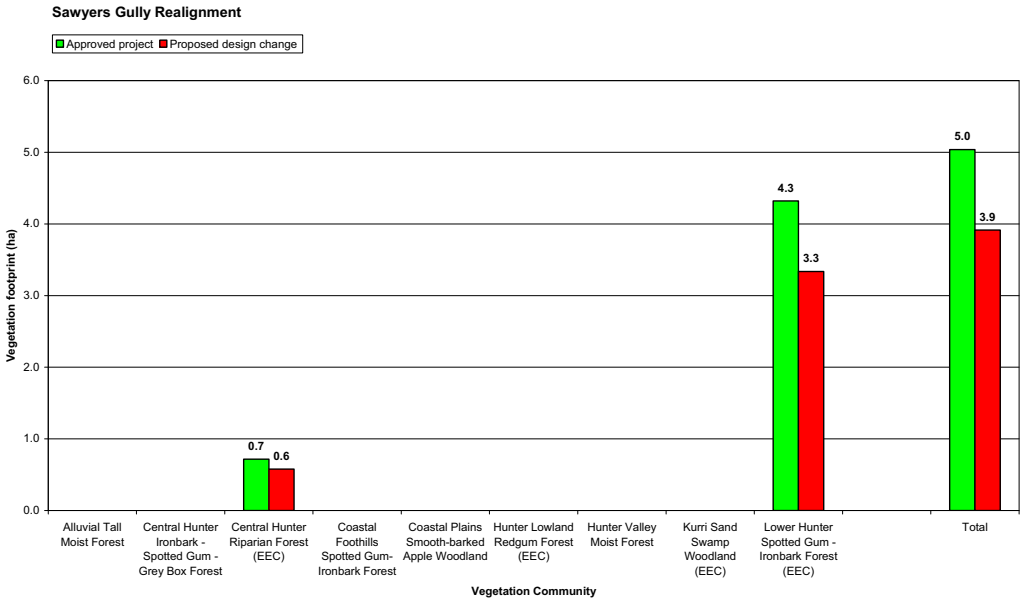
The proposed design change would provide satisfactory road geometry.

The key trigger of construction under traffic appears to justify the change to the alignment of Old Maitland Road.

RTA comments

The RTA notes the comments of the independent ecologist and road designer.

Figure 11 Sawyers Gully realignment vegetation changes



2.13 Allandale interchange (Ch 27500)

Approved project

The Allandale interchange at Lovedale Road is a half diamond configuration with roundabouts and provides east-facing ramps to the F3 to Branxton link. A westbound offload ramp from the Link provides access to Lovedale Road at a roundabout. A roundabout and onload ramp from Lovedale Road provide access to the eastbound F3 to Branxton link. Lovedale Road crosses over the Link. A private road that provides access between Lovedale Road and the Allandale Quarry would be realigned.

Proposed design change

Key trigger: reduced vegetation clearing, design refinement

The Allandale interchange would have a dumbbell configuration with two roundabouts, southeast-facing ramps, and a bridge over the Link connecting the roundabouts. The northeast roundabout would be located on the existing alignment of Lovedale Road; the southwest roundabout would be offset 140 m south of the existing alignment of Lovedale Road.

Lovedale Road would be realigned to the southwest and cross over the Link on a shorter bridge where the Link is in a cutting. The southeast-facing ramps would connect to the roundabouts and accommodate the same traffic movements as the Approved Project.

The existing T-intersection at the private road providing access to Allandale Quarry would be connected to the southwest roundabout and provide access to either carriageway of the F3 to Branxton link or Lovedale Road.

Independent ecologist review

Overall ecological outcome: positive

No threatened plant species were recorded within the footprint of the proposed design change. However, Hunter Lowland Redgum Forest and Lower Hunter Spotted Gum-Ironbark Forest, both EECs on the TSC Act, would be affected. No threatened animal species have been detected near Lovedale Road, although Squirrel Gliders have been recorded on the route further to the north near Camp Road (Connell Wagner 1997, DEC Atlas of NSW Wildlife).

The proposed design change would affect the edges of a small patch of moderate quality Lower Hunter Spotted Gum-Ironbark Forest. Figure 12 shows that the proposed design change would have a positive ecological outcome because it would reduce clearing.

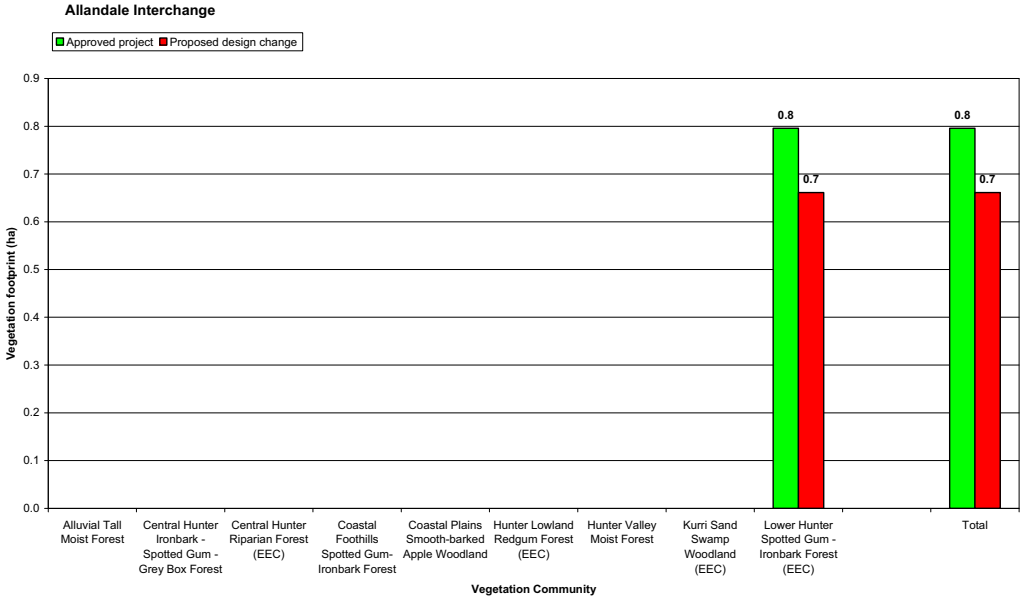
Independent road designer comments

The key trigger appears to justify the proposed design change. Access to the Allandale Quarry and to the proposed Anvil Creek development would be improved.

RTA comments

The RTA notes the comments of the independent ecologist and road designer.

Figure 12 Allandale interchange vegetation changes



2.14 Camp Road underpass (Ch 30000)

Approved project

Camp Road crosses over the F3 to Branxton link on a skew bridge 150 m long. The F3 to Branxton link is in a cutting.

Proposed design change

Key trigger: design refinement

Camp Road would be re-aligned to cross under the Link at a less acute angle. The length of the underpass under the Link would be 35 m, a substantial reduction in length and cost when compared to the Approved Project.

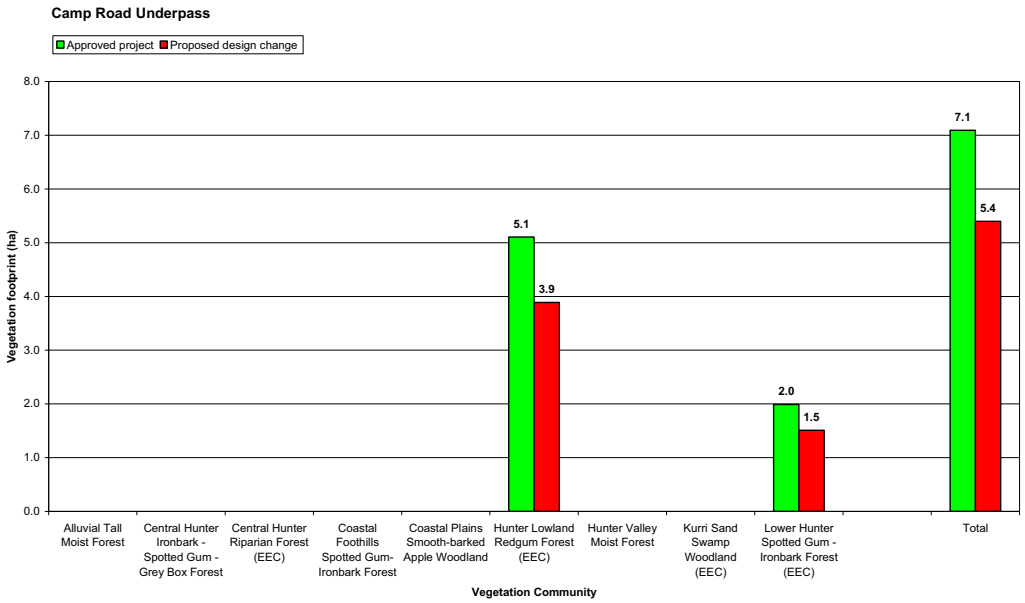
Independent ecologist review

Overall ecological outcome: positive

The proposed design change would affect mostly farmland, although isolated trees of the Hunter Lowland Redgum Forest and Lower Hunter Spotted Gum-Ironbark Forest communities would be affected at the north and south end of the proposed design change. No habitat trees would be affected.

No threatened plant species were recorded within the footprint of the proposed design change. However, Hunter Lowland Redgum Forest and Lower Hunter Spotted Gum-Ironbark Forest, both EECs on the TSC Act, occur immediately adjacent to the new alignment. Squirrel Gliders have been previously recorded in the surrounding forest patches (Connell Wagner 1997, DEC Atlas of NSW Wildlife). Figure 13 shows that the proposed design change would have a positive ecological outcome because it would reduce clearing.

Figure 13 Camp Road underpass vegetation changes



Independent road designer comments

The proposed design change presents a less desirable solution from an engineering perspective. However, it is an acceptable alternative.

RTA comments

The RTA notes the comments of the independent ecologist and road designer.

2.15 Tuckers Lane to Black Creek (Ch 31800 to 39500)

Approved project

The F3 to Branxton link crosses under Tuckers Lane and generally runs parallel to the Main Northern Railway. A northbound offload ramp crosses over the F3 to Branxton link and the Main Northern Railway and extends to an at-grade T-intersection with the New England Highway at Greta. A southbound link and onload ramp extend from the Greta T-intersection over the Main Northern Railway to the Link.

The F3 to Branxton link crosses under Wine Country Drive and crosses over a private railway spur and the Main Northern Railway to the west of the former coal loading site. It then crosses over Black Creek and joins the existing dual carriageways of the New England Highway near Standen Drive. The section of the New England Highway west of Branxton joins the Link at an at-grade T-intersection.

Longitudinal fauna corridors[3] must be provided at the crossings at Tuckers Lane and Wine Country Drive.

[3] The RTA Representations Report (2001) refers to longitudinal fauna corridors. The corridor refers to the area between the toe of the bridge abutment and the carriageways of the F3 to Branxton link.

Proposed design change

Key triggers: improved traffic safety, optimisation of traffic movements, reduced vegetation clearing

The alignment of the Tuckers Lane bridge would be moved up to about 30 m to the north to facilitate construction under traffic. The connections to Greta would be removed and would reduce clearing of threatened species habitat.

A two-lane, grade-separated, elliptical roundabout (the Branxton interchange) would be located to the east of Wine Country Drive to provide full access from the Link to the New England Highway between Greta and Branxton.

The northern arm of the Branxton interchange would cross the Main Northern Railway and Anvil Creek and connect to the New England Highway east of Branxton. The section of the New England Highway between the northern arm and Branxton would be re-aligned to connect at an at-grade T-intersection. The southern arm of the Branxton interchange would connect to Wine Country Drive at an at-grade roundabout.

Wine Country Drive would cross over the Link on a new bridge and the Main Northern Railway on the existing bridge. The alignment of the Wine Country Drive bridge would be moved up to about 10 m to the west to facilitate construction under traffic.

Between Wine Country Drive and west Branxton, the Link would be moved to the south to cross the Main Northern Railway and a private spur line at a less acute angle, resulting in shorter and lower bridges than the Approved Design.

After crossing the Main Northern Railway, the Link would traverse the former coal loading site and would cross Black Creek on new bridges before joining the existing dual carriageway of the New England Highway near Standen Drive.

The proposed design change would replace the at-grade T-intersection west of Branxton with an intersection providing only eastbound left-in/left-out movements. A combined heavy and light vehicle rest area would be located on both sides of the Link, to the north of the Main Northern Railway.

Longitudinal fauna corridors proposed at bridges over the Link at Tuckers Lane and Wine Country Drive would not be provided.

Section 4.5 presents an alternative design change for the Branxton interchange.

Independent ecologist review

Overall ecological outcome: positive

Proposed alignment

No threatened plant species were recorded within the footprint of the proposed design change. However, Central Hunter Riparian Forest, Hunter Lowland Redgum Forest and Lower Hunter Spotted Gum-Ironbark Forest, all EECs on the TSC Act, would be affected.

The Grey-crowned Babbler *Pomatostomus temporalis*, a threatened species under the TSC Act, has been previously detected in this section (Harrington, et al 2007).

The vegetation surrounding the proposed design change consists of a significant area of disturbed Lower Hunter Spotted Gum-Ironbark Forest and Central Hunter Ironbark - Spotted Gum-Grey Box Forest, a small patch of heavily disturbed and regenerating Hunter Lowland Redgum Forest, and a small patch of disturbed Central Hunter Riparian Forest. Although cleared pastures, roads and a railway already fragment this habitat, it provides a string of forest refugia in what is a mostly cleared area.

The proposed Branxton interchange would slightly decrease fauna connectivity in an east-west direction within the forest patch. However, connectivity in the vicinity is already disrupted. Agricultural land and Wine Country Drive separate woodland patches on either side of Wine Country Drive and are barriers to fauna movement. Additionally, no threatened mammals occur in the immediate vicinity of the proposed Branxton interchange. Apart from birds, the only fauna likely to move through this region are macropods. Most fauna movements between the forest patches on either side of Wine Country Drive would occur south of the proposed Branxton interchange, where the woodland is continuous (although sparse) at North Rothbury.

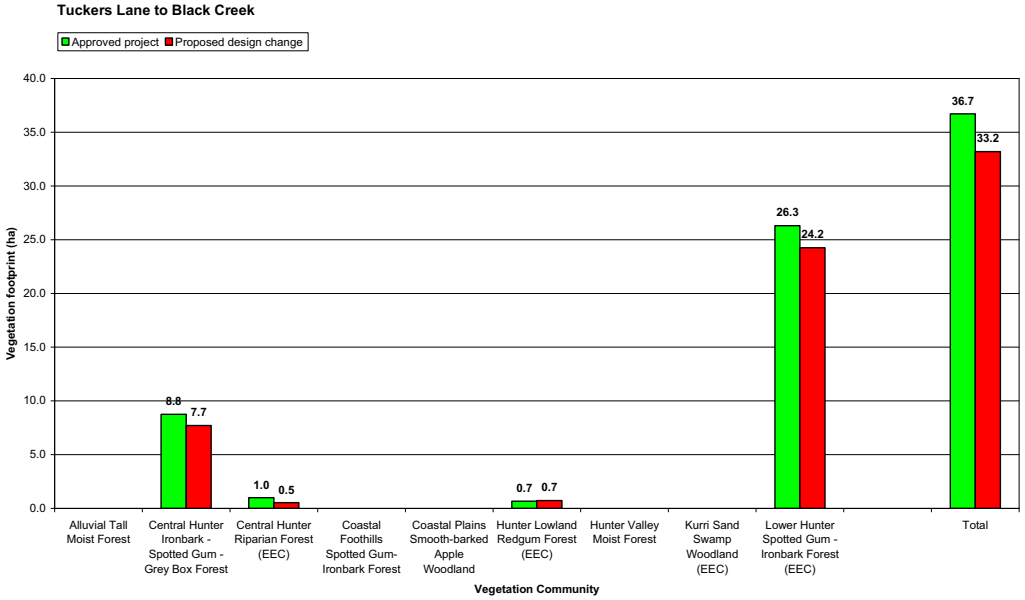
The proposed design change would affect moderate quality Lower Hunter Spotted Gum-Ironbark Forest and Central Hunter Ironbark - Spotted Gum-Grey Box Forest, and poor quality Hunter Lowland Redgum Forest, as well as Central Hunter Riparian Forest along Anvil and Black Creeks. The proposed design change at Branxton would have a positive ecological impact because it would reduce clearing in two of the three EECs. Figure 14 shows that the proposed design change would have a positive ecological outcome because it would reduce clearing.

Need for longitudinal fauna corridor

Based on a review of ecological issues associated with the Approved Project, longitudinal fauna corridors proposed at bridges over the Link at Tuckers Lane and Wine Country Drive are not warranted. The vegetation surrounding these bridges consists of Lower Hunter Spotted Gum-Ironbark Forest and Central Hunter Ironbark - Spotted Gum-Grey Box Forest, and although fragmented by cleared farmland and roads, it forms part of a string of forest refugia in what is a mostly cleared area. The proposed corridors are intended to facilitate movement of fauna within these remnant forest patches.

The proposed longitudinal fauna corridor at the Tuckers Lane bridge is unlikely to increase connectivity as Tuckers Lane is a narrow gravel country road and the likelihood of road kill is low. The longitudinal fauna corridor is likely to be a greater hindrance to wildlife movement than Tuckers Lane. Macropods, birds and gliders that would move throughout the area are unlikely to use the fauna corridor to cross Tuckers Lane. Given the poor condition and existing fragmentation of fauna habitat on either side of Tuckers Lane, it is unlikely that smaller animals would move through this area. A longitudinal fauna corridor at Tuckers Lane is not supported.

Figure 14 Tuckers Lane to Black Creek vegetation changes



The proposed longitudinal fauna corridor at the Wine Country Drive bridge is also unlikely to increase faunal connectivity. Agricultural land occurs to the east of Wine Country Drive at this point; it separates the woodland patches on either side and would hinder fauna movements. Additionally, like the situation at Tuckers Lane, no threatened species other than the Grey-crowned Babbler are present in the vicinity. Macropods, birds and gliders that would move throughout the area are unlikely to use the fauna corridor to cross Wine Country Drive. Given the poor condition and existing fragmentation of fauna habitat on either side of Wine Country Drive, it is unlikely that smaller animals would move through this area. The majority of fauna crossing Wine Country Drive would do so to the south of the fauna corridor, at North Rothbury, where the woodland is continuous (although thin). A longitudinal fauna corridor at Wine Country Drive is not supported.

Independent road designer comments

The geometry of the main carriageway of the proposed design change would be similar to the Approved Project.

From the engineering perspective, access from Wine Country Drive and the New England Highway to the Link would be optimised and more conventional.

The left-in/left-out connection to the west of Branxton would provide more access control and therefore improves the road safety.

RTA comments

The RTA notes the comments of the independent ecologist and road designer.

3
Description and review of road-related ancillary infrastructure

The Approved Project did not identify the location or scope of fencing, water quality controls or construction and maintenance access within the road corridor (called road-related ancillary infrastructure). Road-related ancillary infrastructure would extend clearing of native vegetation and habitat which was not considered in the Approved Project. Appendix 2 presents plans showing road-related ancillary infrastructure. The impacts of road-related ancillary infrastructure are assessed in separate reports (Acacia Environmental Planning 2007, Acacia Environmental Planning 2007a).

To satisfy Condition of Concurrence 4, the independent ecologist and the RTA road designer have examined opportunities to reduce the area that requires clearing for road-related ancillary infrastructure wherever possible.

The vegetation clearing areas for road-related ancillary infrastructure include a constructability margin for potential site-specific constraints and give a realistic assessment of the clearing of native vegetation required to construct and operate the F3 to Branxton link.

3.1 Construction and maintenance access

Approved project

The Approved Project did not include modelled intersections, interchanges or ramps, or construction and maintenance access adjoining the top of cuts and the toe of fill embankments. Consequently, it understates the construction footprint of the Approved Project.

Construction and maintenance access

The clearing footprint of the RTA detailed concept design (which includes the 15 design changes and road-related ancillary infrastructure) includes modelled intersections, interchanges and ramps. The clearing footprint also accommodates a construction and maintenance access area four metres wide at the toe of fill embankments and the top of cuts. Fauna exclusion fencing, when it is required, would be constructed in this access area and would not require additional clearing of native vegetation.

Independent ecologist review

Construction and maintenance access would require additional clearing of native vegetation in all nine vegetation communities when compared to the Approved Project. The RTA has reduced the areas that would require clearing for construction and maintenance access as far as practical and provided a more accurate clearing estimate than the concept design.

The vegetation clearing areas for the Approved Project with the 15 proposed design changes presented in Table 1 include clearing construction and maintenance access.

Independent road designer comments

Construction and maintenance access on freeways is an integral part of the road infrastructure and conforms to current practice.

RTA comments

The RTA notes the comments of the independent ecologist and road designer.

3.2 Boundary and fauna exclusion fencing

Approved project

The Approved Project did not consider clearing for fencing along the road reserve boundary or provide detail on fauna exclusion fencing. Consequently, it understates the construction footprint of the Approved Project.

Boundary fencing

The clearing footprint of the RTA detailed concept design (which includes the 15 design changes and road-related ancillary infrastructure) includes boundary and fauna exclusion fencing. An area four metres in from the road reserve boundary would be cleared to install and maintain boundary fences. Fencing would generally be located 0.3 m in from the road reserve boundary. As noted in Section 3.2, fauna exclusion fencing would be located within the construction and maintenance access area of the road clearing footprint and would not increase the clearing of native vegetation.

Independent ecologist review

Boundary and fauna exclusion fencing would require additional clearing of native vegetation in all vegetation communities except Coastal Plains Smooth-barked Apple Woodland and Coastal Foothills Spotted Gum-Ironbark Forest when compared to the Approved Project. The total area of native vegetation that would be cleared for fencing would be 18.2 ha. The RTA has reduced the areas that would require clearing for boundary and fauna exclusion fencing as far as practical and provided a more accurate clearing estimate than the concept design.

The vegetation clearing areas for the Approved Project with the 15 proposed design changes presented in Table 1 include clearing for fencing.

Independent road designer comments

Boundary and fauna exclusion fencing on freeways is an integral part of the road infrastructure and conforms to current practice.

RTA comments

The RTA notes the comments of the independent ecologist and road designer.

3.3 Water quality controls

Approved project

The Approved Project did not consider the location of construction and operational water quality controls. Consequently, it understates the construction footprint of the Approved Project.

Water quality controls

Sedimentation basins and their associated drainage systems are essential to manage construction and operational impacts on stormwater discharge quality. The clearing footprint of the RTA detailed concept design (which includes the 15 design changes and road-related ancillary infrastructure) includes all sedimentation basins needed to manage operational stormwater quality, based on the RTA Road Design Guide, the RTA Water Policy and the Department of Housing's guideline *Managing Urban Stormwater - Soils and Construction*.

Due to topography, about 30 sedimentation basins would need to be located on land that has high conservation significance for flora to allow gravity discharges to natural watercourses or drainage lines. Most if not all of the permanent basins would also be used by the construction contractor to manage construction water quality. The impacts of the sedimentation basins that would be located in areas with high conservation significance for flora are considered in a separate report (Acacia Environmental Planning 2007).

Independent ecologist review

The construction and operation of stormwater quality controls would require additional clearing of native vegetation when compared to the Approved Project. The total area of native vegetation that would be cleared for water quality controls would be 6.4 ha across nine vegetation communities. The RTA has reduced the areas that would require clearing for water quality controls as far as is practical and provided a more accurate clearing estimate than the concept design.

The vegetation clearing areas for the Approved Project with the 15 proposed design changes presented in Table 1 include clearing for water quality controls.

Independent road designer comments

Stormwater discharge quality controls are an integral part of the road infrastructure and conform to current practice.

RTA comments

The RTA notes the comments of the independent ecologist and road designer.

4
Alternative design changes proposed by the independent ecologist

The independent ecologist has proposed five alternative design changes to reduce ecological impacts. The independent road designer and the RTA have provided comments on the alternative design changes. Appendix 4 presents a plan of each alternative design change, and the changes to vegetation clearing boundaries between the proposed and alternative design changes.

To allow comparisons to be made between the clearing footprints of the proposed and alternative design changes, envelopes that contain these footprints were defined. They are not comparable to the envelopes used to compare clearing footprints between the Approved Project and the proposed design changes presented in Section 2

4.1 Buchanan interchange alternative location

Independent ecologist proposal

The Buchanan interchange could be moved from its present location into the Wallis Creek floodplain west of Wallis Creek. Figure 15 shows that the alternative design change would be likely to reduce the amount of vegetation that would require clearing as the Buchanan interchange would be located within already cleared farmland.

No threatened plant species have been recorded in the footprint of alternative design change. However, Lower Hunter Spotted Gum-Ironbark Forest, which is listed as an EEC on the TSC Act, would be affected. No threatened animal species have previously been recorded in the vicinity.

The alternative design change would affect Alluvial Tall Moist Forest and Lower Hunter Spotted Gum-Ironbark Forest, both of which are of poor quality because they have been previously logged, the mid-storey is absent and ground cover is dominated by introduced grasses and weeds. Both communities are subject to grazing impacts.

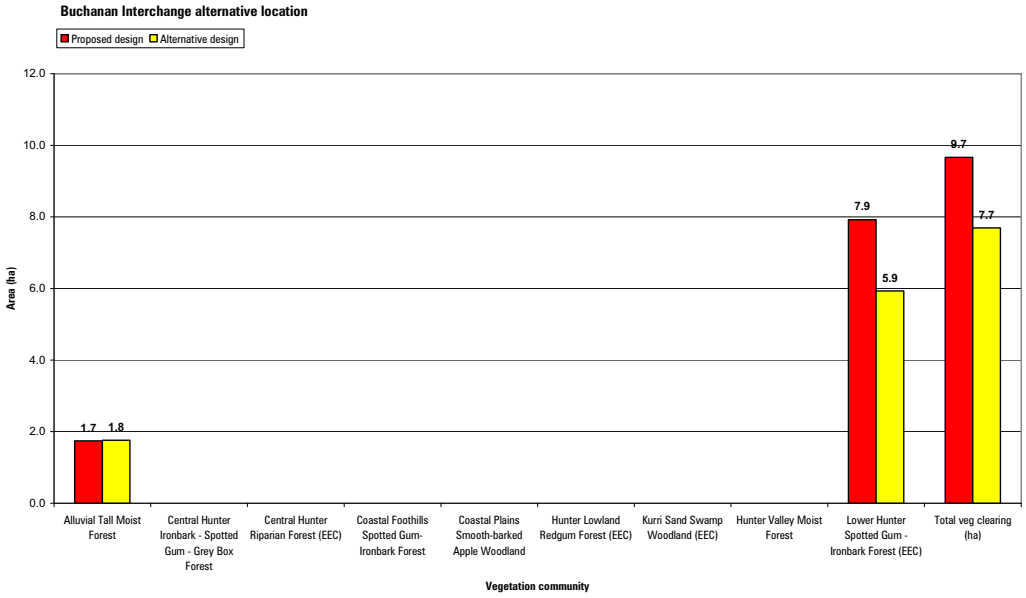
The alternative design change would have a positive ecological outcome because it would reduce overall clearing.

Independent road designer comments

The alternative design change appears feasible from an engineering perspective. The new interchange type is more desirable as it provides free flow arrangement for all movements.

However, the new location of the interchange is less desirable as it does not coincide with the intersection point of John Renshaw Drive and the Link, and it decreases the distance to the Kurri Kurri interchange.

Figure 15 Buchanan interchange alternative location vegetation changes



RTA comments

The Buchanan interchange is a major focal point on the Link and provides access to Kurri Kurri, the Hunter Economic Zone (HEZ) and the Port of Newcastle via John Renshaw Drive (Main Road 588). The detailed concept design would locate the interchange at the crossing point of these two major road corridors.

The alternative design would move the Buchanan interchange into the Wallis Creek floodplain. This location would alter the traffic movement patterns in the area and reduce the efficiency of both the interchange and the Link. The alternative design would also increase visual impacts in an exposed area and would negate the measures included in the detailed concept design to minimise visual impacts in this area.

The alternative design would affect one additional property. It would also have greater impact on two properties that would be affected by the detailed concept design. The increase in property impact would be likely to reduce the viability of these rural grazing properties.

The detailed concept design would produce a material surplus of 85,000 m^3 whereas the alternative design would require 160,000 m^3 of additional fill that would need to be sourced from adjoining sections of the Link. Regrading of the carriageways to restore the material balance may result in additional clearing of native vegetation that would reduce the benefit of the alternative design. The alternative design would also increase the road pavement area by about 13,400 m^2 and the bridge area by about 500 m^2.

The increased quantities for earthworks, road pavement, bridges and property acquisitions would increase the cost of the Buchanan interchange by about $4.6 M. This cost increase does not include the cost of additional earthworks in adjoining sections to provide the additional fill required.

The RTA adapted the traffic network model to include the alternative design. The model indicates that the Link would be less attractive to traffic that would use the Buchanan interchange and predicts a reduction of 3% in forecast daily total vehicle kilometres travelled. It also predicts that the forecast traffic volume between the Buchanan interchange and the Kurri Kurri interchange would decline by about 2,000 vehicles per day. The model indicates that Kurri Kurri traffic would find John Renshaw Drive a more attractive route than the Link because travel time would decrease. Consequently, the alternative design would result in less traffic migrating to the Link and would reduce the potential benefits to the existing road network.

Given the potential adverse impacts on properties, the greater visual impact, the increased cost of construction and reduced traffic benefits, the RTA considers that the disadvantages of the alternative design outweigh its benefits. Accordingly, the RTA does not support this alternative design.

4.2 Buchanan to Kurri Kurri alternative alignment

Independent ecologist proposal

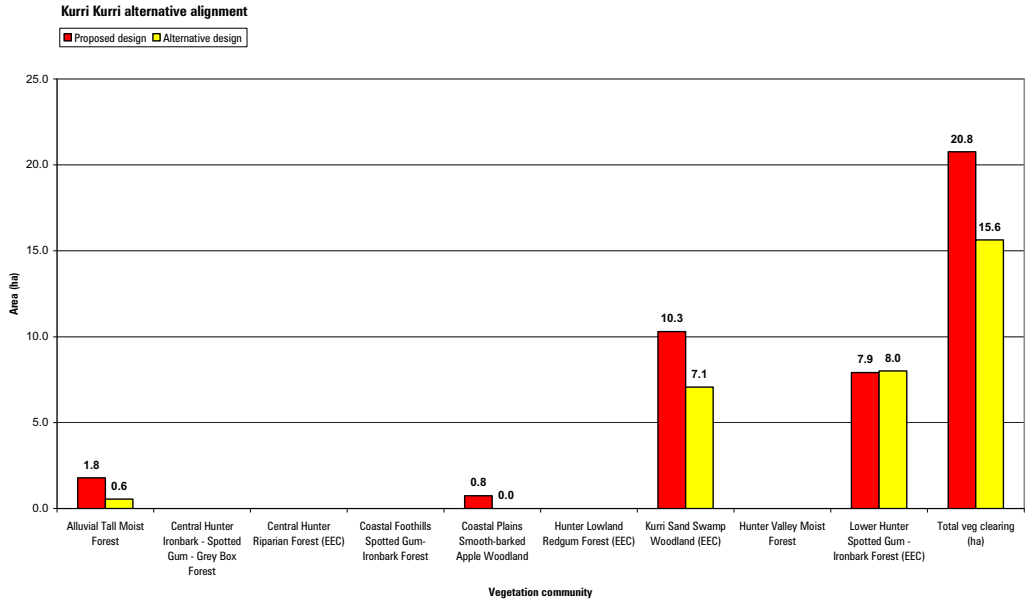
The alignment of the Link could be moved to the northeast between Buchanan interchange and Kurri Kurri interchange. This section of the Link does not form part of a regional fauna corridor and the surrounding Kurri Sand Swamp Woodland vegetation is already highly fragmented by numerous tracks, easements for overhead electricity lines and John Renshaw Drive. However, vegetation to the south of the Link is connected to Werakata National Park, although numerous tracks, Leggets Lane and a railway interrupt connectivity.

North of the Link, the Kurri Sand Swamp Woodland extends approximately 1.5 km to the township of Heddon Greta, but it is also fragmented by tracks and easements for overhead electricity lines. Moving the alignment to the northeast would result in a smaller area of Kurri Sand Swamp Woodland being fragmented. It would also reduce the area of Kurri Sand Swamp Woodland to be cleared.

Eucalyptus parramattensis ssp. *decadens*, a threatened species under the TSC Act and the EPBC Act, was recorded within the footprint of the alternative design change. Additionally, Kurri Sand Swamp Woodland and Lower Hunter Spotted Gum – Ironbark Forest, which are both EECs under the TSC Act, would be affected. No threatened animal species have been detected in the vicinity of Kurri Kurri interchange, although Squirrel Gliders have been recorded in the Kurri Kurri area (DEC Atlas of NSW Wildlife).

The alternative design change would affect poor quality Alluvial Tall Moist Forest, Kurri Sand Swamp Woodland and Lower Hunter Spotted Gum – Ironbark Forest. It is poor quality because it has been previously logged, the mid-storey is sparse and ground cover is limited. It is also transected by tracks and easements and is subject to rubbish dumping. Figure 16 shows that the alternative design change would have a positive ecological outcome because it would reduce clearing.

Figure 16 Buchanan to Kurri Kurri alternative alignment vegetation changes



Independent road designer comments

The alternative design change appears feasible from an engineering perspective.

The overall road geometry appears acceptable, although the vertical geometry in the Kurri Kurri interchange vicinity is less desirable.

RTA comments

The route of the F3 to Branxton link crosses the Wallis Creek floodplain in the Buchanan area. The floodplain is inundated in a 1% Annual Exceedance Probability flood event. One of the RTA's design objectives for the Link is to provide flood immunity during such an event. The detailed concept design satisfies this design objective and follows the shortest direct route, about 1.5 km, across the floodplain between Buchanan Road and Averys Lane.

The alternative design would move the route further to the north and would extend the length of the route in the floodplain by a further 0.5 km. However, the alternative design would not provide flood immunity in a 1% Annual Exceedance Probability flood event and would need to be raised by about four metres to satisfy the design objective. The wider, higher embankment would increase visual impacts in an area with high visibility and would negate the measures included in the detailed concept design to minimise visual impacts in this area.

The alternative design would reduce the overall length between the Buchanan and Kurri Kurri interchanges by 200 m but would not substantially alter travel times or network performance when compared to the concept design. However the alternative design would change the balance of cut to fill material and alter pavement and bridge areas: it would increase the extent of excavation by about 215,000 m^3 and produce about 350,000 m^3 of surplus material. It would decrease the road pavement area by about 9,500 m^2 but it would increase the bridge area by about 630 m^2. Raising the alternative design to provide flood immunity would require about 200,000 m^3 of material, and would result in a net surplus of 150,000 m^3, which would require regrading of the carriageways in the adjoining sections to restore the material balance. This could result in additional clearing of native vegetation that may reduce the benefit of the alternative design.

The detailed concept design has an impact on nine privately-owned properties and a large area of Crown land that covers about half of the route between the Buchanan and Kurri Kurri interchanges. By comparison, the alternative design would have an impact on seven privately-owned properties and a small portion of Crown land. However the alternative design would have a major impact on the Kurri Kurri Golf Course and the former Kurri Kurri waste disposal site.

Land surrounding the Kurri Kurri Golf Course is mostly developed residential land or vegetated land comprising Kurri Sand Swamp Woodland. There would be little opportunity to acquire adjoining land to maintain the Golf Course's facilities and a reduction in the size and functionality of the Golf Course is unlikely to be acceptable to the membership. It may also be difficult to acquire suitable land in the area to relocate the Golf Course.

Geotechnical investigations confirm that the detailed concept design avoids the former Kurri Kurri waste disposal site. However, the alternative design would cross most of the site. The site is likely to be contaminated and the RTA would need to undertake remediation, such as excavation and transport of contaminated wastes to a licensed waste disposal facility. The costs to remediate landfills, and to manage safety and environmental risks during remediation, are high and the RTA would generally not accept such costs and risks if there were suitable alternatives.

The alternative route would cross areas containing potential acid sulphate soils and soft soils. Management of potential acid sulphate soils and soft soils would increase construction costs and may require preloading, which would extend the construction period. The alternative design would reduce the extent of works needed to adjust or relocate electricity transmission lines in the Kurri Kurri area.

The change in quantities of construction materials and earthworks would increase the construction cost by about $4.5 M when compared to the detailed concept design. This cost would be partially offset by a reduction in costs to relocate electricity transmission lines of about $1 M. However the relocation of the Kurri Kurri Golf Course and the management of contaminated material at the former Kurri Kurri waste disposal site would add substantial additional costs, which cannot be readily quantified at this time, to the alternative design.

Since the approval of the F3 to Branxton link in 2001, property developers and investors have made strategic acquisitions in proximity to the road corridor. The RTA is aware of a proposed development that includes a major residential subdivision adjoining Heddon Greta. The alternative design would have a major impact on the proposed development.

Given the potential adverse impacts on the Wallis Creek floodplain, the Kurri Kurri Golf Course, the contamination risks associated with disturbing the former Kurri Kurri waste disposal site, and the increased construction costs, the RTA considers that the disadvantages of the alternative design outweigh its benefits. Accordingly, the RTA does not support this alternative design.

4.3 Buchanan to Kurri Kurri alternative alignment and interchange location

Independent ecologist review

The alignment of the Link could be moved to the northeast between the Buchanan interchange and the Kurri Kurri interchange, generally as discussed in Section 4.2. The alternative alignment could be combined with the relocation of the Buchanan interchange, as discussed in Section 4.1. The benefit of these two design changes would be to further decrease vegetation clearing described in Sections 4.1 and 4.2. These sections also provide a description of the threatened species and communities that would be affected by this alternative design, including the quality of habitat. Figure 17 shows that the proposed design change would have a positive ecological outcome because it would reduce clearing.

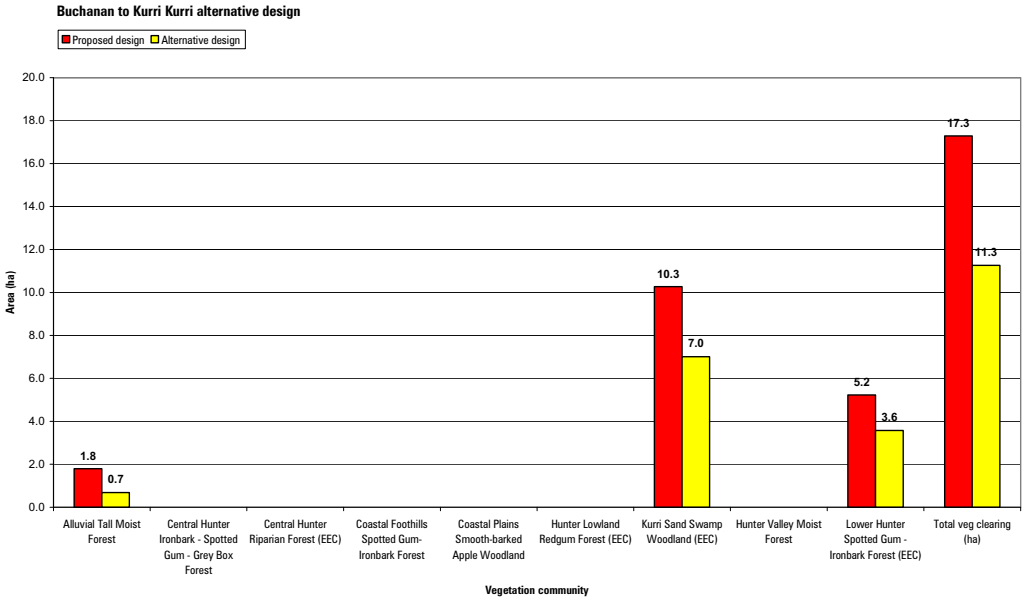
Independent road designer comments

The proposed design change appears feasible from an engineering perspective. The new interchange configuration is more desirable as it provides free flow arrangement for all movements.

However, the new location of the interchange is less desirable as it does not coincide with the intersection point of John Renshaw Drive and the Link, and it decreases the distance to the Kurri Kurri interchange.

The overall road geometry appears acceptable, although the vertical geometry in the Kurri Kurri interchange vicinity is less desirable.

Figure 17 Buchanan to Kurri Kurri alignment and interchange location vegetation changes



RTA comments

This alternative design is a combination of the alternative designs described in Sections 4.1 and 4.2. The Buchanan interchange would be moved about 650 m north onto the Wallis Creek floodplain to suit the alternative alignment between the Kurri Kurri and Buchanan interchanges. The RTA's comments in Section 4.2 apply to this alternative design as well as the additional comments below.

The alternative design would change the balance of cut to fill material and alter pavement and bridge areas. The alternative design would increase road pavement area by about 23,500 m^2 and would increase bridge area by about 2,150 m^2. The alternative design would need to be raised by about four metres to satisfy the RTA design objective for flood immunity. This would substantially alter earthworks quantities and would require regrading the carriageways of adjoining sections to restore the material balance. This could result in additional clearing of native vegetation that may reduce the benefit of the alternative design. Increased quantities for earthworks, road pavement and bridge works would increase the cost of the alternative design in excess of $15 M.

The RTA adapted the traffic network model to include the alternative design. The model indicates that the Link would be less attractive to traffic that would use the Buchanan interchange and predicts a reduction of 13% in forecast daily total vehicle kilometres travelled. It also predicts that the forecast traffic volume between the Buchanan interchange and the Kurri Kurri interchange would decline by about 3,500 vehicles per day.

A higher reduction of about 4,300 vehicles per day would be expected on the section from the Buchanan interchange to the F3 Freeway. Forecast reductions of up to 1,400 vehicles per day would be expected on the sections between the Kurri Kurri and Branxton

interchanges. Consequently, the alternative design would result in less traffic migrating to the Link and would significantly reduce the potential benefits to the existing road network.

Given the potential adverse impacts on properties, particularly the Kurri Kurri Golf Course, the contamination risks associated with disturbing the former Kurri Kurri waste disposal site, the greater visual impact, the increased cost of construction, and reduced traffic benefits, the RTA considers that the disadvantages of the alternative design outweigh its benefits. Accordingly, the RTA does not support this alternative design.

4.4 Allandale Quarry alternative alignment

Independent ecologist review

The alignment of the F3 to Branxton link east and north of the Allandale Quarry could be moved closer to the Allandale Quarry, and would flatten the horizontal curvature in this section. This would allow the Link to exit the main patch of Hunter Lowland Redgum Forest to the northeast of Allandale Quarry sooner and pass through already cleared land to the north of Allandale Quarry instead of passing through the southern edge of a patch of Hunter Lowland Redgum Forest. The proposed change would reduce clearing in Hunter Lowland Redgum Forest.

No threatened plant species were recorded within the footprint of the alternative design change. However, Central Hunter Riparian Forest (as part of River-flat Eucalypt Forest), Hunter Lowland Redgum Forest and Lower Hunter Spotted Gum-Ironbark Forest, which are all EECs under the TSC Act, would be affected. No threatened animal species have been detected in the vicinity of the Allandale Quarry, although Squirrel Gliders have been located on the route further to the north near Camp Road (Connell Wagner 1997, DEC Atlas of NSW Wildlife). Figure 18 shows that the alternative design change would have a positive ecological outcome because it would reduce clearing.

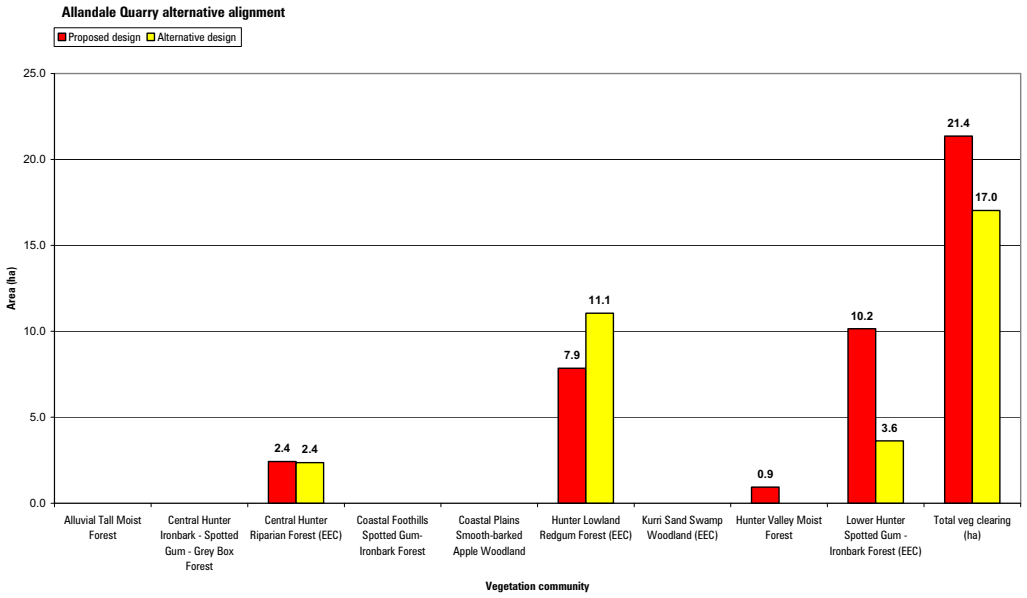
Independent road designer comments

The alternative design change appears feasible from an engineering perspective. The overall road geometry appears acceptable.

RTA comments

When the RTA was developing route corridors for the Link in the early 1990s, an alignment was considered that was closer to the Allandale Quarry than the concept design. However, following extensive consultation with the quarry operator, the RTA agreed to move the alignment to the north to provide greater separation and vegetative screening between the quarry and the Link. The amended alignment was exhibited with the EIS in 1995 and included in the concept design which was approved by the Minister for Planning in 2001. The detailed concept design also adopts this alignment.

Figure 18 Allandale Quarry alternative alignment vegetation changes



The alternative design would shift the alignment of the Link to the southwest, closer to the Allandale Quarry stockpile and working areas. The detailed concept design provides a separation to the quarry stockpile area and working face of about 450 m and 800 m respectively. In comparison, the alternative design would reduce the separation to 300 m and 700 m respectively.

Cessnock City Council *Development Control Plan 39 Guidelines for Land Use Conflict and Buffer Zones* identifies (among other issues) dust, vibration, blast over-pressure, flyrock from blasting and visual impact as potential land use conflicts for quarry operations. DCP 39 nominates a minimum self-contained buffer of 500 m from quarry operations to Category B land uses, which include public roads. However, it also recognises that buffers may need to be increased where blasting occurs. The Allandale Quarry extracts material by blasting. The reduction in separation between the Allandale Quarry and the alternative design is likely to be unacceptable to the quarry operator because it could impose restrictions on blasting and the quarry's operation, or sterilise part of the quarry's resource. The alternative design is also unacceptable to the RTA if the reduced buffer increases the risk of flyrock reaching the road reserve.

The alternative design would reduce the length of the Link by about 70 m and would not substantially alter travel times or network performance when compared to the concept design. However, the alternative design would change the balance of cut to fill material: it would increase excavations by almost 500,000 m^3 and produce more than 660,000 m^3 of surplus material whereas the detailed concept design borrows about 220,000 m^3 of fill from adjoining sections. This would substantially change the earthworks balance for this and adjoining sections of the Link and would require regrading the carriageways to restore the material balance. Regrading could result in additional clearing of native vegetation that may reduce the benefit of the alternative design.

The change to the earthworks balance caused by the alternative design would increase construction costs by about $4.4 M when compared to the detailed concept design. This cost increase does not include the cost of additional earthworks in adjoining sections to accommodate the additional surplus material produced.

Given the potential adverse impacts on the operation of the Allandale Quarry, the risk to road users from flyrock reaching the road reserve, and the increased cost of earthworks, the RTA considers that the disadvantages of the alternative design outweigh its benefits. Accordingly, the RTA does not support this alternative design.

4.5 Branxton interchange alternative location

Independent ecologist review

The Branxton interchange could be relocated about 500 m to the west of its location presented in Section 2.15. It would traverse partly cleared farmland west of the existing overhead electricity line easement and east of the unnamed tributary of Anvil Creek. This would reduce impacts on the western end of a patch of Lower Hunter Spotted Gum – Ironbark Forest. The alternative design would reduce clearing in Lower Hunter Spotted Gum – Ironbark Forest.

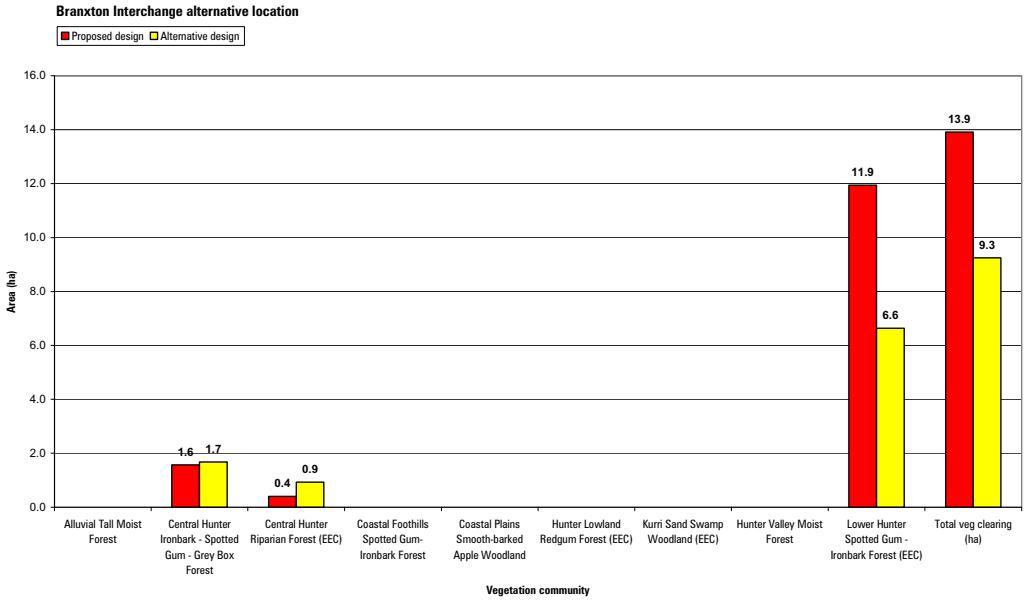
No threatened plant species were recorded within the footprint of the alternative design. However, Central Hunter Riparian Forest (as part of River-flat Eucalypt Forest), Central Hunter Riparian Forest and Lower Hunter Spotted Gum-Ironbark Forest, which are EECs under the TSC Act, would be affected. The Grey-crowned Babbler *Pomatostomus temporalis*, a threatened species under the TSC Act, has been previously detected in this section (Harrington, et al 2007).

Both the proposed and alternative design changes would affect a significant area of moderate quality Lower Hunter Spotted Gum-Ironbark Forest and Central Hunter Ironbark - Spotted Gum-Grey Box Forest, and a small patch of poor quality Central Hunter Riparian Forest along Anvil Creek. Although cleared pastures, roads and a railway already fragment this habitat, it provides a string of forest refugia in what is a mostly cleared area. Figure 19 shows that the alternative design would have a positive ecological outcome when compared to the proposed design change because it would reduce clearing.

Independent road designer comments

The alternative change appears feasible from an engineering perspective. The overall road geometry appears acceptable.

Figure 19 Branxton interchange alternative location vegetation changes



RTA comments

The RTA initially considered a location for the Branxton interchange that was 200 m closer to Wine Country Drive, within the edge of the Lower Hunter Spotted Gum – Ironbark Forest vegetation community. The RTA consulted land owners who would have been affected on both sides of the Main Northern Railway. After considering their comments, and design issues created by existing topography, the railway line and electricity transmission lines, the RTA moved the Branxton interchange to the location described in Section 2.15.

The alternative design would affect two additional semi-rural properties that are not affected by the proposed design change described in Section 2.15. It would place connecting roads close to dwellings on both properties. The alternative design would also increase visual and noise impacts in Branxton and on surrounding properties due to its location and elevation relative to the surrounding topography.

The alternative design would require 165,000 m^3 of additional fill that would need to be sourced from adjoining sections of the Link. Regrading the carriageways to restore the material balance may result in additional clearing of native vegetation that would reduce the benefit of the alternative design.

The alternative design would increase the costs for earthworks and property acquisition by about $2 M when compared to the proposed design change described in Section 2.15. This cost increase does not include the cost of additional earthworks in adjoining sections to provide the additional fill required.

The RTA adapted the traffic network model to include the alternative design. The model indicates that the Link would be less attractive to traffic that would use the Branxton interchange and predicts a reduction of 5% in forecast daily total vehicle kilometres travelled. It also predicts that the forecast traffic volume between the Branxton interchange and the Buchanan interchange would decline by about 1,600 vehicles per day. Consequently, the alternative design would result in less traffic migrating to the Link and would reduce the potential benefits to the existing road network.

Given the potential adverse impacts from partial or total acquisition of two additional properties, the impact of higher road traffic noise levels, the increased cost of earthworks and reduced traffic benefits, the RTA considers that the disadvantages of the alternative design outweigh its benefits. Accordingly, the RTA does not support this alternative design.

5
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Glossary

2001 mapping	Vegetation mapping used in 2001 to estimate vegetation clearing polygons for the concept design. The clearing limits in Conditions of Approval 60 and 61 in the Minister's approval are based on this mapping.
2005 mapping	Vegetation mapping prepared by Biosis Research. It is based on the LHCCREMS vegetation mapping. The mapping has been refined to incorporate data from ground-truthing along the F3 to Branxton link and vegetation community boundaries from 2003/2004 high resolution aerial photography.
Approved Project	The activity approved by the then Minister for Urban Affairs and Planning in November 2001. It is based on the concept design. Since 1 August 2005, the F3 to Branxton link is a project approved under Part 3A of the EP&A Act. At the request of the RTA, the Minister modified the approval on 31 July 2006 to permit staged construction (but not opening).
Ch	Chainage
Chainage	The measured distance in metres along the F3 to Branxton link from a starting point at the Newcastle interchange and ending at Branxton. Chainage numbers increase from east to west. Negative chainages refer to the section of the F3 to Branxton link that is east of the F3 Freeway.
Concept design	The conceptual road design on which the EIS, FIS and assessments in the Representations Report were based. The concept design does not include road-related ancillary infrastructure.
DEC	Department of Environment and Conservation (previously the NSW EPA and the NPWS)
Detailed concept design	The detailed conceptual road design that refines the concept design and incorporates 15 proposed design changes and road-related ancillary infrastructure.
EIS	Environmental Impact Statement prepared by Connell Wagner in 1995
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPA	NSW Environment Protection Authority
F3 to Branxton link	The Approved Project.
FIS	Fauna Impact Statement prepared by Connell Wagner in 1997
LHCCREMS	Lower Hunter and Central Coast Regional Environmental Management Strategy
LHCCREMS vegetation mapping	Vegetation mapping of the Hunter region catchment compiled for the Lower Hunter and Central Coast Regional Environmental Management Strategy.
Link	The F3 to Branxton link
NPWS	National Parks and Wildlife Service
Representations Report	Representations Report prepared by the RTA in 2001.
Road-related ancillary infrastructure	Infrastructure needed to construct and operate the F3 to Branxton link. It includes boundary and fauna exclusion fencing, water quality controls, construction and maintenance access within the road corridor, and a constructability margin. Condition of Concurrence 4 requires the RTA to assess the impacts of clearing for road-related ancillary infrastructure.
Skyline Ridge	The cut in a ridge centred at Ch 3700.
TSC Act	*Threatened Species Conservation Act 1995*