

Community questions and responses

Woolgoolga to Ballina Pacific Highway upgrade

Theme (alphabetical)	Questions/issues	Response
General queries relating to the upgrade		
Biodiversity offsets	67. Can you provide details of the vegetation offsets? Some of the vegetation mapping in the Koala Plan is not correct.	The vegetation offsets required for the Woolgoolga to Ballina upgrade offset program are based on detailed on-ground mapping of the road corridor, carried out by a number of ecological experts. Offset properties are also assessed by detailed on-ground surveys to ensure the correct vegetation types and species habitat are being offset.
	64. Where is the overview of biobanking recipients? What landholdings are under biobanking agreements? 65. Why have adjoining landholders been omitted from biobank agreements?	Selection of offset sites for the Woolgoolga to Ballina upgrade offset package is underway. An open Expression of Interest process was held in June and July 2015 which attracted more than 90 applications, including several from the Bagotville, Wardell and Coolgardie area. Priority is being given to those landowners who submitted an expression of interest. If further properties are required, a second public expression of interest process will be carried out. Initial landowner visits were carried out in late 2015, after which a number of sites in the Wardell and Bagotville area were prioritised for full ecological assessment. These assessments are expected to be completed by late April, at which time a second

		<p>assessment panel will be convened to consider the results.</p> <p>Once finalised, registered BioBanking Agreements will be available on the Office of Environment and Heritage's website.</p>
Clearing	<p>19. As the RMS has recently cleared a 4.5 km narrow strip of 50 year old native vegetation south of Duck Creek when it could be easily have been avoided by using already cleared cane land beside it at a much reduced cost, what trust can the community place in the environmental and economic decisions made by the RMS?</p>	<p>Roads and Maritime seeks to balance all considerations when developing, building and operating Pacific Highway upgrades. This includes considering, assessing and minimising impacts to the environment and agricultural land, as well as constructability of the new highway.</p> <p>Vegetation removal is avoided whenever possible however some clearing is required along the project.</p> <p>An Environmental Impact Statement was developed for the project, in which clearing requirements were identified, assessed and approved by the Australian and NSW regulatory agencies. Roads and Maritime displayed the proposed design of the new highway, with no major concern about clearing at this site raised in the submissions received.</p> <p>As part of the project's approval, any vegetation cleared must be offset by protecting other areas of vegetated land. The offset ratio is at least 4:1 – this means for every hectare of cleared vegetation, at least four hectares must be preserved.</p> <p>Agricultural land located between Broadwater and Ballina is classified as regionally significant farmland. Impacts to cane farms along the project route are also outlined in the EIS.</p>
	<p>35. Does the clearing footprint include the removal of vegetation for the koala fences?</p>	<p>The project clearing limits include all work associated with building the new highway, including the provision of fencing.</p>
Connectivity	<p>74. How many generations of koalas will be required for them to learn to use appointed crossings?</p> <p>75. Is the RMS planning to run a training program to teach koalas to use road crossings?</p>	<p>Roads and Maritime has carried out more than 20 separate fauna studies over 15 years which focused on use of structures by native animals, from which we found koalas will use a range of structures to make successful crossings of the highway within months of opening the project to traffic.</p> <p>One of the most important things we have learned from these experiences is that koalas can and do maintain home-ranges right to the edge of the highway and use fauna connectivity structures.</p>
	<p>59. Has the RMS now conceded or</p>	<p>The proposed locations of the 26 connectivity structures can be found in the Ballina Koala</p>

	realised that connectivity ie an underpass is needed on Ken Law's property at Law's Point?	Plan on the project website . One of those connectivity structures is located on the Law property.
	77. Bridge underpass crossings will be the first areas to flood, how will koalas and other wildlife cope with this scenario?	The bridges and culverts that are designed for koala connectivity have been designed to consider accessibility during flooding. The flood immunity will vary depending on the structure location but have generally been designed to enable accessibility in a 1 in 50 year flood event.
	76. Any structure is prone to failure, how are you going to ensure that aerial crossings do not fall across the highway and cause an accident?	Aerial crossings for arboreal animals such as possums and gliders have been designed to strict safety standards and are routinely inspected.
Cost	15. As you failed to cost using the existing highway, how can you justify this omission and the extra hundreds of millions of dollars the new route will cost the taxpayer?	During the route options selection phase in 2005, Roads and Maritime (then RTA) investigated and costed six shortlisted options for the section between Woodburn and Ballina. Based on this work, a route using the existing highway alignment would pose a considerable engineering risk at a much greater cost than the preferred route (in 2005 dollars, the preferred route 2C was estimated to cost \$297 million and with a route east of the Richmond River estimated to cost \$562 million). More detail about the issues associated with a route using the existing highway can be found in the attached factsheet and at our website .
Economic impact	16. Rerouting of the highway away from Wardell will most likely lead to Wardell business closing due to the loss of highway trade, can you provide comment?	Roads and Maritime recognises the economic impact on towns and villages that are bypassed by the Pacific Highway upgrade once highway traffic is moved on to the new road. We work closely with stakeholders including councils, businesses, chambers of commerce and residents to ensure post bypass conditions are planned for, and motorists are encouraged into the bypassed towns through signposting services and tourist routes. Communities such as Broadwater and Woodburn have begun planning for the upgrade and developing strategies to encourage motorists off the new highway into their villages. A signage strategy for the Woolgoolga to Ballina Pacific Highway upgrade is being developed to advise motorists of bypassed towns and opportunities to exit the highway, including at Wardell. This plan will be released for community comment early in the building phase.

Fencing	72. Fencing local roads to address road kills will require that residents must keep high gates accessing their driveways shut at all times, what is your solution to this problem?	Roads and Maritime will consult with residents on the location and type of proposed fencing and grids, similar to what is used on Skyline Road in Lismore.
	73. Fencing local roads will restrict movement of koalas leading to inbreeding, as no local road crossing have been identified how are you going to address this?	Roads and Maritime is proposing to build additional fauna fencing on parts of Wardell Road and the existing Pacific Highway between Wardell and Coolgardie. Wardell Road would cross over the alignment and we are proposing to build additional fauna connectivity structures on Wardell Road. A fauna / drainage culvert currently exists on the existing Pacific Highway south of Coolgardie. In addition we are proposing to build connectivity structures north of Coolgardie as part of the highway upgrade.
	69. Koalas can climb any fence except a solid smooth faced fence and can jump the first metre, therefore highway and local road fencing will need to be solid and smooth to at least two metres and will restrict residents views and highway users to only distant elevated locations, please comment? 70. If mesh fences are used, koalas will climb it and become trapped within the road corridor to quickly get run down and killed, what is your solution?	Wire netting 'floppy top' fencing is commonly used on highways and is proven to successfully exclude koalas and other wildlife from the alignment. The Investigation of the impacts of Roads on Koalas demonstrated that fencing significantly reduces koala road kill: "The behaviour of collared koalas and road kill data indicate that installation of floppy-top fencing does establish a barrier to Koala movement and, in turn, has the potential to substantially reduce road mortality."
	71. Road fencing elsewhere on your highway is frequently show to be	Roads and Maritime routinely carries out maintenance on exclusion fencing along the

	<p>damaged or flattened by falling trees or accidents, what is your maintenance schedule?</p>	<p>Pacific Highway both as a standard procedure and in response to damage.</p> <p>We are also investigations options to retrofit existing infrastructure north of Byron Bay to address koala ‘hotspots’ on the highway. Any proposal will be released to the community for comment. We will keep you informed of how this progresses.</p>
	<p>81. The local member for Port Stephens said in Parliament that one of her constituents hit a koala at Tomaree, killing it, that got past the fences and koala grids designed to stop them. How are you doing things differently here so that doesn’t happen, and if it does, how are you going to fix it, which isn’t really good enough after someone kills a koala</p>	<p>Roads and Maritime is committed to a ‘zero harm’ approach to managing koalas during building and operation of the Woolgoolga to Ballina Pacific Highway upgrade.</p> <p>Section 10 of the project will be the first of its kind to implement a completely ‘closed-system’ of fencing and koala grids.</p> <p>Given the outcomes of other projects, such as the Pacific Highway upgrade at Bonville, which clearly demonstrated a large reduction in annual koala road strikes through the provision of koala-proof fencing, Roads and Maritime Services is confident the closed system proposed for Section 10 will avoid koala road strikes.</p>
Flooding	<p>14. What is your plan for the area to the north of Wardell Road subject to observed three metre flood inundation?</p>	<p>Flood modelling for the Richmond flood plain is currently underway. Once complete, we will release this information for community comment as part of the detailed design consultation. We will keep you informed of when this consultation is expected to take place.</p>
Haulage	<p>63. Will trucks be going between quarries and construction sites using Back Channel Road, Wyrallah Rd, Kilgin Road, Broadwater Road, Bagotville Rd, Old Bagotville Rd, Thurgates Lane, Wardell Rd, Hillside Lane? If so, which of these? What operating hours? What speed restrictions? What training and enforcement for drivers and their supervisors? Will you put this in their contracts and cancel for bad behaviour?</p>	<p>Material needed to build section 10 will primarily be sourced from within the project footprint, reducing the need for trucks to haul material to the site.</p> <p>There will however still be a need to use surrounding local roads for some haulage and project access. As major work is not able to start in this section, details about the full requirement is not yet finalised. We will keep the community informed of when this information is available.</p> <p>Strict rules around project vehicle management will be implemented, including the In Vehicle Management System that assists with managing driver behaviour.</p> <p>Operating times will be in line with the approved working hours.</p>

<p>Noise</p>	<p>66. How is distance from highway measured and isn't topography included in assessments when establishing criteria for verandah enclosures?</p>	<p>Information about how noise is measured and the criteria used to manage noise is available in the attached factsheet or at our website. The project noise goals can be found in the EIS.</p>
<p>Quarries/ material sources</p>	<p>4. Are you proposing to quarry the higher land that you purchased around Lumley's Lane, Thurgates Lane and Hillside Lane? If so, what are you proposing to do with the koalas that live there? If not, what are you proposing to do with that land?</p>	<p>A material borrow site is proposed on land that Roads and Maritime owns, adjacent to Hillside Lane. This site is mostly on cleared land and will be rehabilitated with koala habitat when building work is complete.</p>
<p>Risks during construction</p>	<p>24. It doesn't appear that koala mortality, <i>during construction</i> has been factored in. Have I missed something? Can you discuss this? Does RMS assume the "draft connectivity measures" will reduce construction mortality to zero? Considering past experience from Yelgun-Chinderah, Bonville and Tintenbar to Ewingsdale upgrades mortality is expected to be high (30 to 60%) and displacement higher (up to 95%). These figures need to be included in the modelling for the 3 years of construction. This is, in my opinion, the major impact of the upgrade and it has been left out of the analysis!</p> <p>27. Why wasn't the impact of constructing the hwy included in</p>	<p>Roads and Maritime is committed to a 'zero harm' approach to managing koalas during building and operation of the Woolgoolga to Ballina Pacific Highway upgrade.</p> <p>We do not expect that any koala deaths will occur as a direct result of clearing 17ha of habitat as part of the Woolgoolga to Ballina Pacific Highway upgrade. The project team will implement two-stage pre-clearing surveys, which includes a koala capture and re-location procedure.</p> <p>The PVA modelled the initial loss of habitat for five koalas as a result of building work. When subjected to sensitivity analysis, variations in the amount of habitat lost due to road construction had a negligible impact on the long-term (50 year) population projections (see Fig. 11 of the PVA report).</p> <p>Similarly, if it is assumed that these same five koalas were removed (died) during building work, their loss would also have a negligible impact on population projections (see Fig. 10 of the PVA report). The same results would apply if 10-14 koalas were affected (see Figs 10 and 11 of the PVA report).</p> <p>We have no records any koalas deaths that have occurred directly as a result of clearing activities on any Pacific Highway upgrade, and only have one recorded koala death on a construction site since upgrading began in 1996.</p> <p>We are aware of koalas that have died on the existing highway, including where concrete safety barriers have been installed, as well as surrounding local roads neighbouring the</p>

<p>study?</p> <p>37. How did you arrive at habitat loss for 2-5 koalas? Did you consider the reality?</p> <p>38. Did you look at displacement of and disruption to koalas as a result of the Highway?</p> <p>52. As clearing of one hectare of local koala habitat has been observed to result in the deaths of seven koalas will the proposed 17ha of clearing for the highway result in the deaths of 119 koalas? If the answer to the previous question was YES, how can this be justified? If the answer was NO, how can you prove this assumption?</p> <p>54. Koalas have low energy reserves and can die if just one of their trees has been removed, could you please comment on how this will affect the local koala population?</p>	<p>project sites. While there is no evidence these deaths are directly linked with construction activities, we have taken action to alter the configuration of concrete barriers to allow opportunities for wildlife to move out of the road corridor, as well as seeking opportunities for exclusion fencing and other measures where appropriate.</p> <p>A recent report prepared by Australian Museum Business Services for completed upgrade projects such as Bonville and Yelgun to Chinderah found:</p> <ul style="list-style-type: none"> • koalas can and do maintain home-ranges right to the edge of the highway • genetic variation in roadside koalas in the Yelgun to Chinderah and Bonville areas before the upgrades was relatively high and had apparently not been impacted by the long existence of the Pacific Highway • construction activities in the two study areas led to only one known death, suggesting direct impacts of clearing and construction are relatively minor at a population scale when appropriate mitigation strategies are in place • underpasses (both constructed culverts and 'natural' underpasses such as gullies) work in providing safe dispersal routes for koalas to cross the highway • clear and committed protocols and training procedures for construction workers on how to manage koala incidents on work sites are likely to save individual koalas. <p>We welcome any data the community or interest groups may have that directly links koala deaths to construction activities and are keen to share information with Friends of the Koala and others to ensure the best outcome for all wildlife.</p>	<p>project sites. While there is no evidence these deaths are directly linked with construction activities, we have taken action to alter the configuration of concrete barriers to allow opportunities for wildlife to move out of the road corridor, as well as seeking opportunities for exclusion fencing and other measures where appropriate.</p> <p>A recent report prepared by Australian Museum Business Services for completed upgrade projects such as Bonville and Yelgun to Chinderah found:</p> <ul style="list-style-type: none"> • koalas can and do maintain home-ranges right to the edge of the highway • genetic variation in roadside koalas in the Yelgun to Chinderah and Bonville areas before the upgrades was relatively high and had apparently not been impacted by the long existence of the Pacific Highway • construction activities in the two study areas led to only one known death, suggesting direct impacts of clearing and construction are relatively minor at a population scale when appropriate mitigation strategies are in place • underpasses (both constructed culverts and 'natural' underpasses such as gullies) work in providing safe dispersal routes for koalas to cross the highway • clear and committed protocols and training procedures for construction workers on how to manage koala incidents on work sites are likely to save individual koalas. <p>We welcome any data the community or interest groups may have that directly links koala deaths to construction activities and are keen to share information with Friends of the Koala and others to ensure the best outcome for all wildlife.</p>
<p>62. At the meeting you said you would be increasing training for construction workers, what does this mean, who will do the training, the same people who did Tintenbar</p>	<p>Roads and Maritime is committed to a 'zero harm' approach to managing koalas during building and operation of the Woolgoolga to Ballina Pacific Highway upgrade.</p> <p>As part of this commitment, we will carry out induction training for all contractors and project staff working in areas of known koala habitat and distribution in the project area.</p> <p>This would include clear and committed protocols and procedures on how to manage koala</p>	<p>Roads and Maritime is committed to a 'zero harm' approach to managing koalas during building and operation of the Woolgoolga to Ballina Pacific Highway upgrade.</p> <p>As part of this commitment, we will carry out induction training for all contractors and project staff working in areas of known koala habitat and distribution in the project area.</p> <p>This would include clear and committed protocols and procedures on how to manage koala</p>

	to Ewingsdale, around Bangalow and Ross' Lane?	incidents on work sites. The details about who would carry out this training and how it would be delivered are being developed. We will keep you informed of how this progresses.
	53. You stated Koalas can survive in two year old trees, this is incorrect, as in the above real life example when seven koalas impacted from a one hectare clearing tried to survive in our two year old koala planting they proceeded to die one at a time over approximately 6 months, including a mother and cub, would you care to comment or rephrase your original comment?	Please refer to page 18 of the PVA report : “Eucalypt plantations comprised mainly of preferred Koala food tree species and aged 6-15 years are rapidly occupied by Koalas if the animals are present nearby (Kavanagh and Stanton 2012, Rhind et al. 2014).”
Route selection	8. Where are all the studies and offset programs to accommodate other endangered species impacted by the highway?	The Woolgoolga to Ballina Pacific Highway upgrade Environmental Impact Statement (EIS) and Submissions/Preferred Infrastructure Report is available on the project website . These documents contain specific chapters that identify and assess project impacts in line with requirements of our approval agencies – NSW Department of Planning and Environment and the Federal Department of the Environment. Information about the route selection is also available on our website .
	23. Can you explain what other impacts from highway in Section 10 were considered and how?	
	17. GPS guidance and local knowledge will direct motorists onto the shortest route between Broadwater and Coolgardie being the old Pacific Highway, what is your plan to address this?	Motorists are likely to travel the safest, most efficient route – which in this case will be the new highway. The new highway between Broadwater and Coolgardie will be four lane, divided road with a design speed of 110km/h. While 1.3km shorter, the existing highway between Broadwater and Coolgardie is only one lane in each direction, varies between 50-100km/h with limited opportunities to overtake, and has many local accesses which pose safety risks to local and highway traffic.

Soft soils	18. Your argument of soft soils along the existing route and the eastern route falls short when we observe you happily treating 4.5 km of soft soil south of Duck Creek, please comment?	<p>Soft soils generally occur in low lying areas or floodplains where the water table is close to the surface. Roads and Maritime seeks to avoid building on soft soils, but in some in this case is necessary to tie into the existing Ballina bypass.</p> <p>While possible, the engineering constraints involved with building a highway on soils 25m deep, such as those found on the proposed eastern route, not only drastically increases the cost of the initial work, but also leaves a considerable ongoing maintenance liability for the NSW taxpayers. This does not present positive public value now or for the future.</p>
	13. What is the depth of soft paleovalley sediments in the Richmond River crossing at Laws Point?	<p>Geotechnical ground investigations at the proposed Richmond River bridge abutments are due to be carried out and will provide more detail about this location. It is expected this area will be shallow over a short distance. We plan to bridge much of this area.</p> <p>More information about soft soils in section 10 can be found in the attached factsheets, maps and at our website.</p>
Translocation	<p>61. In the RMS Draft Discussion Paper of the Ballina Koala Plan and at the meeting, you mention that you are considering the translocation of koalas. What does this mean-how many-where from?</p> <p>68. Relocating koalas into other uninhabited areas doesn't work as those areas are used by resident koalas and koalas don't get along, therefore how would you like to move in with your neighbours or relatives?</p>	<p>Roads and Maritime, in consultation with agencies and experts, is currently considering options to best manage koalas during major work in section 10. This may include the temporary relocation of koalas within the construction footprint to unoccupied habitat which has been identified though the koala field surveys lead by Dr Steve Phillips. More information about this habitat can be found in the Ecosure/Biolink Koala population survey report available on our website.</p>
Model inputs		
Baseline parameters/	28. You seemed to make a joke about the behavioural responses of koalas to certain noises and loss of	The PVA process takes into account many combinations of factors the koala population may face over consecutive generations. This includes habitat loss, health and disease, genetics, natural disasters such as fire, human impacts such as road-kills and natural predators. For

<p>Indirect impacts</p>	<p>trees etc. You aren't with them, you don't hear them bleating. Did you factor behavioural responses into the PVA and the interaction between stress and disease as an impact of the Highway compared to not? Please discuss not a yes or no answer.</p> <p>39. How did you incorporate cumulative impacts? What potential or actual impacts were omitted and why? And how did you incorporate interactions between threats causing or potentially causing impacts?</p> <p>42. You mentioned this at the meeting but would like more info on how you incorporated demographic stochasticity, environmental-biological fluctuations across the study area?</p> <p>43. How did you go about incorporating catastrophes? And did you look at the delayed effects of catastrophes?</p> <p>45. Why have sociological/social/emotional traits of koalas been overlooked?</p>	<p>any given timeframe, many possible futures for the koala population are tested to establish how the koala population can be expected to respond, including the probability of extinction over a defined period.</p> <p>Before PVA can be carried out, it is important to ensure the baseline data reflects the current status of the koala population being assessed.</p> <p>The Ballina Koala Plan PVA modelling was informed by the initial population size and data relating to the demographic structure, breeding potential and general health and status of the population being assessed. This data included ages of individuals, mortality rates, numbers of young born each year, dispersal distances, genetics and the potential for inbreeding. Estimates of the carrying capacity of the habitat and other environmental data, including the frequency of catastrophic events, are also used.</p> <p>The Ballina Koala Plan PVA input parameters were based on data collected from extensive field surveys and genetic analysis of collected tissue samples as well as historical data collected by the Friends of the Koala about the causes of koala mortality. These studies and the information gathered formed the baseline of input parameters.</p> <p>The modelling recognises that baseline data can and will change from year to year as circumstances change. For example, the number of young born can increase or decrease in response to certain factors. The purpose of a PVA project is to consider these uncertainties and their sensitivity to variation and incorporate them in the calculations.</p> <p>More information about the PVA process can be found in the attached Frequently Asked Questions documents, which are also available at our website.</p>
--------------------------------	--	--

<p>Breeding success / inbreeding</p>	<p>48. Did you run the model without inbreeding depression or only with? Did you start with it or bring it in later?</p> <p>55. Why was inbreeding taken into account in the “no road scenario’ when it is not currently an issue?</p>	<p>While inbreeding is very low in this population, the level of inbreeding depression is unknown.</p> <p>In order to take a conservative approach in the PVA modelling, inbreeding depression was assumed to be present and the default setting (6.29 lethal alleles) was used.</p> <p>Including inbreeding depression and the presence of lethal alleles in all models had the effect of reducing population size projections by about 20 to 40 per cent of those estimated when inbreeding depression and the presence of lethal alleles was switched “off” in the analyses.</p> <p>Sensitivity testing was carried out to investigate the impact of other settings, but this resulted in little difference for model projections of the size of the koala population over 50 years (see Fig. 12 of the PVA report).</p>
	<p>30. What are you defining as low breeding success? And how did you arrive at that?</p>	<p>Refer to page 11 of the Ecosure/Biolink Koala population survey:</p> <p>The reproductive status of females was ascertained using a four-tiered assessment:</p> <ol style="list-style-type: none"> 1. No pouch young present nor evidence of recent occupancy or lactation, 2. Pouch-young present, 3. Back-young present, or 4. Neither pouch-young nor back-young present, but evidence of recent/ongoing lactation (functioning mammary gland and elongated teat). <p>Breeding success per year among adult females was relatively low (44.83%), and was restricted to females aged between 3-7 years. For a species with an expected lifespan of about 10 years, the observed low breeding success suggests that:</p> <ul style="list-style-type: none"> • environmental conditions were not favourable to the population during the years before sampling • habitat quality was not as good as expected • disease may be a factor limiting reproductive output, or • high mortality could be accounting for the relatively few older aged, potentially-breeding, animals in the population.
	<p>25. Decreasing the mortalities by 20% and increasing Fecundity by 20%. These processes are not attributable to the upgrade, they can</p>	<p>The model/data inputs are based on the population status at the time of the survey carried out by Ecosure/Biolink for the Koala population survey report by Phillips <i>et al.</i> 2015.</p>

	<p>happen without the upgrade. We are working to have local roads fenced, discussing vaccine programs, increasing calls to have koalas checked and treated if necessary, are undertaking feral dog and fox programs, increasing landholder domestic dog awareness, undertaking weed control and planting projects, so decrease the mortality by at least 20% without highway construction. The community has probably already reduced the mortality by 4-8 individuals with works undertaken in the last 18 months and these programs will continue. This should be used as the baseline scenario, not as part of the upgrade scenario. Please comment.</p>	
	<p>26. Increasing Fecundity by 20%. Rod Kavanagh admitted to me on the phone that Chlamydia was not high in this population - "these k's are relatively healthy". So this appears to have been used to boost the analysis outcomes. Reducing the mortalities could increase the numbers to a level that increases the fecundity. Can you comment on this?</p>	<p>Dr Kavanagh's comment about Chlamydia related to the low numbers of captured koalas showing obvious signs of disease (Ecosure/Biolink report - Phillips et al. 2015).</p> <p>The 'health' of the population was not used as a factor in the PVA analysis, and as such did not influence PVA outcomes.</p> <p>The PVA modelling showed the size of the projected koala population after 50 years would be greater if fecundity could be increased, and also if mortality could be reduced. If the number of female mortalities can be reduced, there is likely to be some increase in population fecundity.</p>
<p>Disease</p>	<p>21. The PVA model-plan refers to a presumed incidence of disease. Can you explain what you levels you are presuming, and how you</p>	<p>See Part 3 of the Ecosure/Biolink Koala Population survey report for the mortality analysis. Disease is discussed on page 30. The above mortality estimates are included in the model.</p>

	have considered this in the model?	
Habitat/ connectivity	56. Why was habitat enhancement not taken into account in the “no road scenario” but was emphasised in the “with road scenario”?	<p>The habitat enhancement refers to 130ha of koala revegetation that is proposed as part of the mitigation measures for the new highway and will be planted should the Ballina Koala Plan be approved.</p> <p>This habitat enhancement is unlikely to be carried out if the road does not go ahead.</p>
	33. Is sheltering and dispersal habitat included in the estimated habitat loss for koalas?	<p>About 17ha of high quality koala habitat is proposed to be cleared as part of the project.</p> <p>The remaining 17ha was not included as koala population density was expected to be very low in this low quality habitat.</p> <p>However, when subjected to sensitivity analysis, variations in the amount of habitat lost due to road construction had a negligible impact on the long-term (50 year) population projections (see Fig. 11 of the PVA report).</p>
	22. It appears the only impact of the highway effectively analysed in the report was a reduction of connectivity from 100% to 40%, that is a 60% loss of connectivity due to connectivity structures providing connection for only 40% of the route. For engineering reasons they are not always where they need to be. What was the effect of 100% connectivity to 40% on population viability, considering where koalas are located – not just the formulas but the reality?	<p>On average, it is proposed there will be about 1.9 connectivity structures per kilometre of new road, or about one connectivity structure per 520 m of the road. Koala home-ranges can average about 15ha (i.e. 437m diameter; Kavanagh <i>et al.</i> 2007), this represents nearly one connectivity structure per koala home-range either side of the proposed highway upgrade in Section 10, providing opportunities for most animals living near the proposed road to cross safely or to disperse.</p> <p>Field investigations have ensured that structures are located adjacent to koala hotspots and to proposed habitat revegetation areas.</p>

<p>Males</p>	<p>44. Why have major landholdings been omitted from the study and why have mating males not been included in the study; despite the fact that landholders have expressed a knowledge of mating males adjacent to the route?</p>	<p>About 8250ha was included in the study area as defined by Dr Steve Phillips. Refer to the Ecosure/Biolink Koala Population survey report, Phillips <i>et al.</i> (2015).</p> <p>Breeding inputs and demographic assumptions have been included in the PVA model based on advice from Dr Phillips. Additionally the PVA has been peer reviewed by experts in the PVA field, independent of the project team.</p> <p>More information about the Ballina Koala Plan is available at our website.</p>
	<p>31. Where did you derive the lack of males from?</p>	<p>Refer to section 2.2 of the Ecosure/Biolink Koala Population survey report. Phillips <i>et al.</i> (2015) estimated about 196 koalas in the study area which, based on the sex ratios observed in the demographic study, translated to a population comprising 125 females and 71 males.</p>
<p>Population</p>	<p>20. How did you consider the koalas on the Plateau which appear to mostly have colonised through immigration from and expansion of the Lismore koala population?</p> <p>40. How did you decide on a spatial scale for the PVA? And how did you look at the interaction between the other populations-subpopulations.</p> <p>46. How did you look at the spatial structure of the population? And the interactions between them?</p> <p>50. It appears you set the subpopulations as east and west of the highway, rather than as the subpopulations identified in the genetics reports?</p>	<p>About 8250ha was included in the study area as defined by Dr Steve Phillips. Refer to the Ecosure/Biolink Koala Population survey report, Phillips <i>et al.</i> (2015).</p> <p>This population is not considered as “closed” for the purposes of modelling because of the degree of habitat connectivity with surrounding areas, refer to Figure 1 of the Ballina Koala Plan.</p> <p>The two genetics studies conducted in the study area (Neaves <i>et al.</i> 2015, Norman <i>et al.</i> 2015) found there was little evidence of any sub-structuring (i.e. genetic differences) within the koala population in the study area, and also that the genetic composition of this population was very similar to others in Northern NSW and South East Queensland – which indicated there was no genetic significance of this population. For example, the report by Neaves <i>et al.</i> (2015) found that:</p> <ol style="list-style-type: none"> “Wardell is a genetically diverse koala population, exhibiting similar levels of diversity to other sites sampled in this region (and higher than southern koala populations) Based on the samples provided, there is no evidence of sub-structuring or spatial genetic structure within Wardell All sites sampled showed some degree of genetic differentiation consistent with isolation by distance Gene flow is apparent between Wardell and other sites sampled in the surrounding area. In addition, there is evidence of recent movements of individuals, with two Wardell individuals appearing to have originated from outside Wardell

		e. Genetically, Wardell is most similar to sampling locations further north (i.e. Tyagarah and Coomera) but there is evidence of a long history of gene flow (both nuclear and mitochondrial) throughout the region, and across the species' entire distribution."
	29. Baseline population size was increased by 40 individuals (0-1yo) from the recommended population size in Biolink/Ecosure study. How did you arrive at 40 individuals?	No animals in 0-1 year age class were detected during the field survey and therefore were not included in the Biolink/Ecosure survey results. Because the PVA requires an estimate of animals in all age classes, an estimate had to be determined. The additional 40 animals is based on the breeding success of adult females aged 3-7 years. This results in 40 animals of this age class being included in the model and an initial population estimate of 236 animals.
	34. How did you come up with 2.85 koalas emigrating and immigrating and 2 animals crossing from other areas? Is this per year or over 50 years? Doesn't reflect reality.	An explanation of the dispersal rates is explained in section 5.4 "Estimating Dispersal" and 5.5 "Estimating immigration and emigration" of the Ballina Koala Plan . This information has been provided by the two genetic studies of the Ballina Koala population (Neaves <i>et al.</i> 2015, Norman <i>et al.</i> 2015) which are available on our website .
	47. It appears you used a density dependent model and not clear whether you determined that the carrying capacity of the study area was density dependent? Can you discuss?	The model assumed 'concordance' which means the likelihood of breeding increases with survival and vice versa. However carrying capacity is not density dependent.
	49. What did you determine to be the critical population level? Did you look at the sub populations separately?	For analysis, the population was treated as two sub-populations divided by the location of the proposed road. The results are shown for the western sub-population, eastern sub-population and the total population.

Other considerations

Veracity of report content

11. All RMS staff and consultants attending the Meerschaum Vale Hall on 22nd Feb 2016 appeared to be very much in favour of the RMS predetermined route, so how can we have any faith that this was an independent study?

12. The failure of Environmental Impact Studies is that the proponent selects and funds the consultant and therefore expects the desired outcome, in other areas this type of action could be considered bribery, can you comment how this affected the expected result?

9. Why is there inconsistency and untruths in communications with RMS?

51. Rod Kavanagh stated all models are not perfect, therefore why are we basing studies on a faulty model?

57. The model has indicated there will be no impact by building a four lane highway through the middle of Koala habitat, does this not indicate to you that your model is flawed?

Development of the Ballina Koala Plan and PVA report involved input and advice from experts and researchers from several institutions and scientific organisations including:

- Niche Environment and Heritage Pty Ltd
- Ecosure Pty Ltd
- Biolink Ecological Consultants
- Office of the NSW Chief Scientist and Engineer
- Australian Museum
- University of New South Wales
- Australian National University
- Southern Cross University
- University of Sydney
- Queensland University
- University of the Sunshine Coast
- NSW Office of Environment and Heritage
- NSW Environmental Protection Agency

The Ballina Koala Plan was reviewed by a series of experts independent of the project team and Roads and Maritime, including:

- Independent peer reviewer Associate Professor Jonathon Rhodes
- Koala Expert Advisory Committee, chaired by Chief Scientist and Engineer Mary O’Kane, which was established by the Minister for Roads, Maritime and Freight to provide oversight on the preparation of the koala management plans.

The experts involved in undertaking the PVA analysis are aware of the limitations of PVA modelling techniques. As noted by the NSW Chief Scientist and Engineer, chair of the Koala Expert Advisory Committee in her interim report to the NSW Minister for Roads

“As with all models, the models underlying the PVA are only as good as the data used to develop them and the appropriateness of the assumptions made within the model structure. Since PVA generally requires large amounts of data and these data are often not available, the reliability of viability estimates based on PVA has been severely questioned in the scientific literature (Beissinger and Westphal 1998, Fieberg and Ellner 2000, Coulson et al. 2001).

Given these limitations, the following factors are important to deliver the best possible result.

	<p>58. Models are only as good as the data input (garbage in = garbage out) and can be easily tweaked to give the desired output, do you agree or don't you understand models?</p>	<p>1. Sensitivity analyses are needed for all uncertain parameters</p> <p>One avenue to deal with the inherent difficulties of parameterising the PVA model is to undertake a large number sensitivity analyses to evaluate the effect of uncertainty in model parameter estimates and to document these effects.</p> <p>2. The larger the pool of expertise contributing to the model, the better the outcome</p> <p>To ensure that parameters are as robust as possible, input is required from a diverse range of experts in koala ecology, road mitigation, genetics and PVA modelling. Workshopping techniques and arranging for peer comment of critical elements of the PVA will be important and should underpin the preparation of the Ballina Koala Plan.</p> <p>3. Genetic analysis can fill important gaps or strengthen estimates derived by other means</p> <p>There are a range of parameters within the PVA model where the right genetic analysis can fill gaps or strengthen estimates derived by other means such as demographic studies based on field survey and literature reviews.”</p> <p>RMS and the experts working the Ballina Koala Plan addressed all the issues raised by the Office of the Chief Scientist in relation to limitations inherent in PVAs. Multiple workshops, including a major workshop in Sydney in October 2015, were held to agree on the input parameters for the model and to define the required sensitivity testing. Additional genetic testing and peer review of the results was also undertaken to inform model parameters particularly in relation to migration and internal dispersal.</p> <p>These efforts have resulted in the PVA being endorsed by the NSW Chief Scientist and Engineer Professor Mary O’Kane as chair of the Koala Expert Advisory Committee and Associate Professor Jonathan Rhodes, University of Queensland.</p> <p>All studies used to inform the PVA are available on our website. More information about definition and purpose for PVAs as well as strengths and weaknesses can be found in Section 3 of the Ballina Koala Plan.</p>
	<p>41. Where is the most uncertainty with the model? How did you address uncertainty in the model? How did you differentiate between uncertainty and variability in the</p>	<p>Sensitivity analyses were undertaken for all uncertain parameters. As noted in Section 7.2 of the Ballina Koala Plan</p> <p>“Sensitivity tests were applied within Vortex to investigate the influence of parameter estimates for key population variables. There will always be uncertainty surrounding the results of “snapshot” estimates derived from short-term field studies because these</p>

<p>model?</p>	<p>estimates vary from one year to another but, in the absence of long-term population data, the real question is -for which variables are these errors likely to have a significant impact on the results? Conversely, which variables are most likely to influence population viability outcomes if they can be controlled or manipulated by management?</p> <p>Sensitivity tests showed that breeding success (population fecundity; Figure 7) and female mortality rates for both juveniles and adults (Figure 8) were highly influential in the results of the PVA (i.e. in projected population sizes). This means that any errors in the estimation of these two variables are likely to have a significant effect on the results, and also that efforts to manipulate these variables through management are likely to have a beneficial effect on population viability.</p> <p>In contrast, sensitivity tests for other variables, including male mortality rates for juveniles, sub-adults and adults (Figure 9), initial population size (Figure 10), habitat carrying capacity (Figure 11), and the number of lethal alleles in the population (Figure 12), showed that management attempts to vary these parameters would be unlikely to have a large effect on the results, and, of course, that errors in the initial estimates for these parameters are unlikely to be of major concern for the analysis.</p> <p>The importance of birth rates (breeding success) being adequate to cover death rates (mortality) in this population is clearly shown in Figure 10 where population size is projected to decline rapidly. However, it should be noted that the declines observed in year 1 for initial population sizes of 500 and 400 animals were due to carrying capacity remaining capped at 291 individuals in the model. Management efforts to improve breeding success and/or to reduce mortality would be highly beneficial for this population. It is likely that by reducing mortality of females in particular (Figures 8 and 9), that breeding success in the population would also increase.”</p> <p>Environmental (or year to year) variability was defined using the standard deviation around the mean for one year in the absence of any other option and consistent with other PVAs undertaken in Australia and elsewhere.</p>
---------------	--

	<p>79. I am finding this very distressing. I would like to have faith in the RMS but as a Friend of Koala and local it is concerning that despite of every effort you have put in to protect koalas in other Highway upgrades, koalas are still dying, getting injured or sick as a result of your works. In Tintenbar to Ewingsdale, only last year, a koala was missed in the pre-clearing at Bangalow and as I was told, it was injured when it fell out of the tree and although taken into care, there are now no trees for it to go back where it came from because you cleared them all. How do we have faith in your words when your actions are debatable, and who will do these pre-clearing surveys, the same people as did the T2E?</p>	<p>Roads and Maritime is committed to a 'zero harm' approach to managing koalas during building and operation of the Woolgoolga to Ballina Pacific Highway upgrade.</p> <p>We have no records of any koala deaths that have occurred directly as a result of clearing activities on any Pacific Highway upgrade, and only have one recorded koala death on a construction site since upgrading began in 1996.</p> <p>We are aware of koalas that have died on the existing highway, including where concrete safety barriers have been installed, as well as surrounding local roads neighbouring the project sites. While there is no evidence these deaths are directly linked with construction activities, we have taken action to alter the configuration of concrete barriers to allow opportunities for wildlife to move out of the road corridor, as well as seeking opportunities for exclusion fencing and other measures where appropriate.</p> <p>We do not expect that any koala deaths will occur as a direct result of clearing 17ha of high quality habitat as part of the Woolgoolga to Ballina Pacific Highway upgrade. The project team will implement two-stage pre-clearing surveys, which includes a koala capture and re-location procedure.</p> <p>As part of our 'zero harm' commitment, we will carry out induction training for all contractors and project staff working in areas of known koala habitat and distribution in the project area. This would include clear and committed protocols and procedures on how to manage koala incidents on work sites. The details about who would carry out this training and how it would be delivered are being developed. We will keep you informed of how this progresses.</p> <p>We welcome any data the community or interest groups may have that directly links koala deaths to construction activities and are keen to share information with Friends of the Koala and others to ensure the best outcome for all wildlife.</p>
	<p>2. Minister Hunt's condition required that the PVA model to be undertaken for no less than 50 years. Did you run the model for longer than 50 years? If so, what happened re extinction and why didn't you include it in the plan?</p>	<p>The PVA model was run for the 50 years as required by the Condition of Approval. This timeframe is considered appropriate for determining risk of extinction.</p>
	<p>32. How did you avoid/minimise Type II errors, that is failing to</p>	<p>The model is a simulation given a range of inputs, which produces a projected population size after a number years. It is not a statistical test which type II errors are considered.</p>

	observe a difference when there actually is one?	
	85. If the road is shown to be causing an unjustified impact on koalas will it be ripped up and rerouted and will you say sorry and will those in charge be forced to resign?	Refer to the NSW Conditions of Approval which specifies corrective actions and additional offsets.
Next steps		
Initiatives	60. The Plan acknowledges that plantings are unlikely to be used by large numbers of koalas. The plan suggested that this could be reversed through management interventions to increase population size. What do you mean by management interventions?	<p>The PVA found there are significant opportunities to reduce koala deaths in the area which would need the involvement of and support by local and state authorities, along with the wider community.</p> <p>According to the PVA outcomes, koala deaths on other local and state roads in the region outside the upgrade project footprint are impacting on the long-term viability of the Ballina population. Reduction in koala deaths on these roads would help improve the future viability of the local koala population. The PVA indicates domestic dogs and disease are also a threat to koalas in the study area. The local community and other government agencies have an important role in developing and implementing appropriate strategies to control predators and disease.</p> <p>Roads and Maritime will share information gathered in the PVA studies with relevant local, state and community stakeholders to help inform future management strategies.</p> <p>For more information refer to “Management Implications” on page 52 of the Ballina Koala Plan and the Frequently Asked Questions document on our website.</p>
	82. If the road goes ahead as planned and there are injured/frightened/disoriented koalas, perhaps the RMS can fund a series of TV ads, training for locals, making people aware of the sound a koala makes, and also what sound it makes if it's in distress, and provide details in the	<p>Roads and Maritime is happy to work with Friends of the Koala to investigate opportunities to raise awareness about koalas.</p> <p>We would like to acknowledge the input and cooperation by Friends of the Koala in supplying genetic information and mortality data to help inform the investigations and management plans.</p> <p>We look forward to a cooperative working relationship in the future.</p>

	<p>ad for FOK or any other body that can assist in the event that someone does come across one of these displaced or injured animals. It might raise awareness of what to listen or look out for.</p>	
	<p>7. Where are all the community funds mentioned by Rod Kavanagh? Funds and grants have been syphoned into Wardell community, where are Meerschaum Vale funds to compensate for impacts on our community?</p>	<p>No funds have been 'syphoned' into any particular community.</p> <p>Dr Kavanagh's comment related to opportunities for the community to bid for funding to address predators and disease:</p> <p>"Recent trials have shown that a newly-developed vaccine has the potential to protect wild koalas from <i>Chlamydia</i> infections and to improve reproductive success in females (Waugh <i>et al.</i> 2015). Research funding is required to make the necessary assessments, and to consider whether medical intervention is required or indeed appropriate. Local community support may be the best way to obtain the research funds required."</p> <p>For more information see the Ballina Koala Plan on our website.</p>
	<p>10. Are you legally liable for any koala deaths or extinctions from the rerouting of the highway, if not why not?</p>	<p>Roads and Maritime is committed to a 'zero harm' approach to managing koalas during building and operation of the Woolgoolga to Ballina Pacific Highway upgrade.</p> <p>We also have a legal responsibility to implement the requirements of approved management plans (including Koala Management Plan being prepared to cover section 10) required under the State and Federal Conditions of Approval, which are issued under the NSW Environmental Planning & Assessment Act and Commonwealth Environment Protection Biodiversity Conservation Act.</p>
	<p>5. Given that RMS have made acquisitions over time for tree plantings, why haven't large scale tree plantings commenced?</p> <p>6. In addition, given that RMS have taken ownership of lands and have not pursued large scale plantings then haven't they had major responsibility in contributing to</p>	<p>The project's Conditions of Approval are clear. Major work cannot start in the area known as Section 10, which starts at Broadwater and finishes at Coolgardie, until the Ballina Koala Plan is approved. This includes large scale planting.</p> <p>We are progressing planning for this planting work to be carried out should the plan be approved. We will keep you informed of how this progresses.</p>

	declines?	
	<p>1. At the last meeting at Meerschaum Vale Hall, the RMS suggested that it was looking at the Moreton Rail Link as a model for Section 10 of the Highway upgrade. What have you decided re this?</p>	<p>Roads and Maritime, in consultation with agencies and experts, is currently considering options to best manage koalas during major work in section 10.</p> <p>This may include the temporary relocation of koalas within the construction footprint to unoccupied habitat, similar to what was implemented as part of the Moreton Bay Rail Project.</p> <p>Unoccupied habitat has been identified though the koala field surveys lead by Dr Steve Phillips. More information about this habitat can be found in the Ecosure/Biolink Koala population survey report available on our website.</p> <p>We will continue to work with other agencies to investigate innovative measures to manage project impact on the local koala population.</p>
Future opportunities	<p>78. Given that the Koala Planting Strategy will not be available until after Hunt makes his decision, can only comment theoretically. It would seem that a large number of seeds would be required (> 50000). Where will you be sourcing propagation material and plants from? How will you be ensuring local provenance and plantings will not be detrimental to the local populations of koala food trees?</p>	<p>The contract for the koala planting will specify a local provenance requirement for sourcing seed.</p>
	<p>83. Can we have an independent koala specialist such as yourself Maria at the RMS clearing of Koala habitat to ensure koalas are actually seen, safely removed and not dropped in the trees and buried (as I have "heard" there was an</p>	<p>An experienced ecologist is required to carry out pre-clearing surveys and be present during clearing.</p> <p>A range of procurement packages will be let for this work, including for clearing, which will encourage local participation.</p> <p>These opportunities will be advertised by open tender on the NSW tendering website:</p>

	unwritten policy of burying the evidence of any "collateral damage in the building of Ross lane to Bangalow section of the highway).	www.tenders.nsw.gov.au
	84. Could we have local indigenous unemployed people trained to be rangers and protect the wildlife and fauna and educate locals, school groups and visitors about the animals, plants and aboriginal history in this area (particularly the scar trees?). It is about time we had an aboriginal history museum like the tweed example too.	A range of procurement packages will be let for this work which will encourage local participation. These opportunities will be advertised by open tender on the NSW tendering website: www.tenders.nsw.gov.au
Monitoring	<p>3. What other Plans and documents are to be prepared for the Section 10 koalas, including plans that will include measures for koalas? What will be in which document? When will they be available?</p> <p>80. Robust monitoring was identified as essential by the Expert Peer Reviewer and in the Plan. What will be monitored, who will monitor, for how long – 50 years, and most importantly, if monitoring shows impacts from the Highway, what are you going to do when you are already supposedly doing your best? – Relocate the road, it is too late once the damage is done, you can't bring a dead koala back to life and it isn't fair on friends of koala to</p>	<p>As part of the project's Conditions of Approval, Roads and Maritime is required to prepare and implement a Koala Management Plan.</p> <p>This document includes procedures to be implemented to manage the impact on koalas during construction and operation, including a detailed monitoring program. This document can only be submitted if the Ballina Koala Plan is approved. It will be made available online.</p> <p>The Conditions of Approval are available at the project website.</p>

	<p>have to retrieve sick or injured ones because of your poor planning.</p>	
	<p>36. Can you comment on the monitoring programs and results undertaken by RMS elsewhere on koalas, including deaths injuries and illness associated with construction and operation of Highway upgrades elsewhere? I mean how does a koala react when its favourite tree is 5 m from the Highway with semis roaring past all night? Did you incorporate results from monitoring of these projects of 14 years into the PVA model? Can we get copies of these 14 years of monitoring reports?</p>	<p>Roads and Maritime has carried out more than 20 separate fauna studies over 15 years which focused on use of structures by native animals, from which we found koalas will use a range of structures to make successful crossings of the highway within months of opening the project to traffic.</p> <p>We have no records of any koalas deaths that have occurred directly as a result of clearing activities on any Pacific Highway upgrade, and only have one recorded koala death on a construction site since upgrading began in 1996.</p> <p>We are aware of koalas that have died on the existing highway alongside construction sites, including where concrete safety barriers have been installed, as well as surrounding local roads neighbouring the project sites. While there is no evidence these deaths are directly linked with construction activities, we have taken action to alter the configuration of concrete barriers to allow opportunities for wildlife to move out of the road corridor, as well as seeking opportunities for exclusion fencing and other measures where appropriate.</p> <p>A recent report prepared by Australian Museum Business Services for completed upgrade projects such as Bonville and Yelgun to Chinderah found:</p> <ul style="list-style-type: none"> • koalas can and do maintain home-ranges right to the edge of the highway • genetic variation in roadside koalas in the Yelgun to Chinderah and Bonville areas before the upgrades was relatively high and had apparently not been impacted by the long existence of the Pacific Highway • construction activities in the two study areas led to only one known death, suggesting direct impacts of clearing and construction are relatively minor at a population scale when appropriate mitigation strategies are in place • underpasses (both constructed culverts and ‘natural’ underpasses such as gullies) work in providing safe dispersal routes for koalas to cross the highway • clear and committed protocols and training procedures for construction workers on how to manage koala incidents on work sites are likely to save individual koalas. <p>We welcome any data the community or interest groups may have that directly links koala deaths to construction activities and are keen to share information with Friends of the Koala and others to ensure the best outcome for all wildlife.</p> <p>More information about monitoring can be found at our website.</p>