Our ref: DOC20/1016548
Your ref: SSI-9487

Mick Fallon
Team Leader, Infrastructure Assessments
Planning and Assessment Group
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Dear Mick

Inland Rail Narromine to Narrabri – Environmental Impact Statement

Thank you for your email dated 7 December 2020 to the Biodiversity, Conservation and Science Directorate (BCS) of the Department of Planning, Industry and Environment inviting comments on the Environmental Impact Statement (EIS) for the Inland Rail Narromine to Narrabri project.

The project is the largest greenfield section of the Inland Rail project and involves:

- 306 kilometres of new single-track standard gauge railway with seven crossing loops
- bridges over rivers and other watercourses including the Macquarie, Castlereagh and Namoi Rivers
- numerous level crossings
- four borrow pits and three multi-function compounds.

For the purposes of construction and to introduce flexibility into the timing of retiring biodiversity credits, the project has been divided into 11 stages including four segments along the rail alignment, four borrow pits and three major construction compounds.

The BDAR has identified that the project will have the following impacts:

- the removal of 3,316 hectares of vegetation, of which 1,732 hectares is native vegetation
- the removal of 630 hectares of native vegetation from the Pilliga forests
- the removal of an estimated 13,000-30,000 hollow bearing trees
- the generation of 34,820 ecosystem credits and 160,421 species credits.

One key change that is required when applying the Biodiversity Assessment Method (BAM) to the project is that separate habitat suitability assessments must be completed for each IBRA subregion that the project intersects. This requirement coupled with inclusion of the spring 2020 field survey data will alter vegetation mapping, species credit species polygons, and ecosystem and species credit requirements. As a result, BCS proposes to liaise with ARTC and the accredited assessors when considering this updated information in the context of the recommendations made in this response.

A high-level review of the flooding and hydrology component of the EIS has been completed. BCS is committed to undertaking an iterative review approach to the modelling based on the justification provided by the proponent on key decision points. BCS understands that a working group is likely to be convened to address the flooding and hydrology matters, and we look forward to participating in that group.

BCS's recommendations are provided in **Attachment A,** detailed biodiversity comments are provided in **Attachment B,** and detailed flooding and hydrology comments are provided in **Attachment C**. If you require any further information please contact Renee Shepherd, Acting Senior Team Leader Planning, via renee.shepherd@environment.nsw.gov.au or (02) 6883 5355.

Yours sincerely

Sarah Carr
Director North West
Biodiversity, Conservation and Science Directorate

9 February 2021

Attachment A – BCS's Recommendations

Attachment B – BCS's Detailed Comments – Biodiversity

Attachment C – BCS's Detailed Comments – Flooding and Hydrology

BCS's Recommendations

Inland Rail Narromine to Narrabri – Environmental Impact Statement

BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BC Act	*Biodiversity Conservation Act 2016*
BC Regulation	Biodiversity Conservation Regulation 2017
BDAR	Biodiversity Development Assessment Report
EEC	Endangered Ecological Community
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
PCT	Plant Community Type
SAII	Serious and Irreversible Impacts
TEC	Threatened Ecological Community
TBDC	Threatened Biodiversity Data Collection

Recommendations – Biodiversity

1.1. The BDAR should be certified, and the credit calculations in the BAM calculator should be finalised, within 14 days of the report being submitted.

2.1 Update section 3.6.3 to include a table which states the area that could and could not be accessed in the project footprint, and where land could not be accessed the comparison of area of native and non-native vegetation.

3.1 Separate habitat suitability assessments must be completed for each IBRA subregion. This requires the submission of separate cases in the BAM-C for each IBRA subregion intersected by the subject site.

3.2 The minimum number of plots and transects required by Table 4 of the BAM for each vegetation zone in each IBRA subregion assessment must be met, and any additional candidate threatened species generated from the revised habitat suitability assessments must be assessed.

4.1 Additional information should be provided in Appendix B to justify the allocation of each PCT.

5.1 Review vegetation zone stratification for each PCT within the subject site.

5.2 Update the BDAR detailing the methods and metrics used to assign condition states to PCTs and provide adequate discussion and justification on the assignment of condition states.

6.1 The BDAR should describe how non-native vegetation has been determined in the subject site.

7.1 Liaise with BCS on vegetation zones to ensure plot locations and number of plots undertaken are adequate and appropriate along the length of the project.

8.1 Conduct a consistency review of each table within Appendix I with the information contained within the TBDC and habitat survey tab of BAM-C.

8.2 Update each table within Appendix I to identify all PCTs occurring within the subject site which have the potential to provide suitable habitat to candidate species credit species, including those which have been excluded from a species polygon.

8.3 In accordance with Section 6 of the BAM 2017, provide evidence and justification to support the exclusion of vegetation zones from each species polygon

9.1 The BDAR should discuss the applicability of applying modified dry benchmarks to PCTs within the subject site.

9.2 BCS will review the updated BDAR and BAM-C that will incorporate recommendations from this review and spring 2020 survey data, and liaise with the accredited assessors to determine the representativeness of the plot data for each vegetation zone.

9.3 If modified benchmarks are proposed, adequate detail should be provided on the method used to determine modified benchmarks, including justification of any assumptions made.

10.1 Figure 4.1 should be updated to be inclusive of all native vegetation identified in Appendix G.

10.2 All areas of native vegetation, including areas which are groundcover only, should be included within the landscape vegetation cover class assessment.

11.1 Species polygons for species assumed to be present to be re-examined following the update to the BDAR and BAM-C with the separate IBRA subregion assessments and spring 2020 field survey data.

12.1 Revise all sections of the BDAR which have been informed by the filtering and exclusion of threatened species records prior to 1998, to be inclusive of these records.

13.1 A TEC equivalency assessment should be conducted for all PCTs identified within the BAM-C as potentially equivalent to a BC Act or EPBC Act-listed TEC.

14.1 Confirm that all surface impacts have been included in the overall development footprint for the proposal and have been considered in Stage 2 of the BDAR.

15.1 A SAII assessment should be completed for Coolabah Bertya (*Bertya opponens)* in accordance with section 10.2 of the BAM. Information from this assessment should be used to update the impact assessment prepared under the EPBC Act.

15.2 Section 8.1 of the BDAR should be updated with proposed avoidance measures that will be implemented for Coolabah Bertya.

15.3 Targeted surveys should be conducted for Coolabah Bertya outside of drought conditions to more accurately determine the presence or absence of the species, and potential impacts to the species if it is present.

15.4 Provide clarification in Table 12.3 of the BDAR regarding the conclusion that only four individuals of Coolabah Bertya are likely to be impacted by the species.

16.1 Pre-construction and post-construction fauna connectivity states should be spatially represented within the BDAR in accordance with Section 4.2.1.9 of the BAM. The post-construction fauna connectivity state should provide indicative locations of proposed fauna passage features to be installed as per Appendix J.

17.1 Prescribed impacts to connectivity for threatened species should be revised to include all threatened species likely to be affected by the proposed development.

17.2 Avoidance and mitigation measures should be proposed which contribute to the recovery of the entities listed above.

17.3 Residual prescribed impacts to the connectivity of threatened species which are likely to occur after the proposed avoidance and mitigation measures are implemented should be identified.

17.4 If residual prescribed impacts are identified, measures for offsetting residual prescribed impacts should be proposed in accordance with Section 6.1.2(b) of the Biodiversity Conservation Regulation 2017.

18.1 The fauna connectivity strategy should be prepared and incorporated in the BDAR, at least in an indicative form, to determine whether the proposed mitigation measures are adequate.

18.2 The fauna connectivity strategy should be included as a document that must be prepared in consultation with BCS as a condition of consent.

18.3 The use of drainage culverts as a fauna connectivity measure should be removed from the BDAR, unless culverts contain installed components designed specifically for this function.

18.4 Table 11.4 should provide further clarification on which drainage culverts would be receiving fauna passage design features and provide an indicative location within the subject site.

19.1 Consideration should be given to reviewing PCTs that have been assigned a derived PCT classification and assigning the original PCT from which the derived PCT has developed.

20.1 The BDAR should state whether the clearing undertaken at the site of Borrow Pit D is authorised under legislation separate to this development. Any area with a current authorisation does not require assessment for impacts to native vegetation.

21.1 Update the BDAR to correct minor errors or editing matters as discussed in this response.

Recommendations – Flooding and Hydrology

22.1 Additional studies should be reviewed and referenced when defining the 1% AEP.

22.2 The flood frequency analysis should be included for the gauging stations used in the study.

22.3 Comment should be provided on the reliability of the rating curves.

23.1 Additional justification and information is required to support the proposed quantitative design objectives.

24.1 Identification of any flood dependant ecosystems present in the vicinity of the rail alignment and the potential impact to their character as a result of the project is required.

25.1 Further assessment and proposed mitigation measures that will be implemented to reduce velocities is required. Confirmation of the decrease in velocities that are likely to occur as a result of these mitigation measures is required.

26.1 Additional information regarding the potential, if any, for the proposal to redistribute flood flows should be included. This information should consider both hydraulic and geomorphological impacts on the floodplain covered by a floodplain management plan as well as any redistribution between watercourses.

27.1 Additional information on the houses with increased flood levels is required, as well as reconciling these houses with the outcome of the relevant floodplain management plan.

27.2 Provide a methodology which outlines how the impacts to flooding to buildings will be mitigated.

28.1 Review the list of general comments and update the EIS accordingly.

Attachment B

BCS's detailed comments - Biodiversity

Inland Rail Narromine to Narrabri – Environmental Impact Statement

1. The BDAR should be certified as BAM compliant within 14 days of the submission date

Section 6.15 of the *Biodiversity Conservation Act 2016* (BC Act) states '*a biodiversity assessment report cannot be submitted in connection with a relevant application unless the accredited person certifies in the report that the report has been prepared on the basis of the requirements of (and information provided under) the biodiversity assessment method as at a specified date and that date is within 14 days of the date the report is so submitted'.*

The Biodiversity Development Assessment Report (BDAR) for the project, its associated Biodiversity Assessment Method calculator (BAM-C) generated credit reports and BAM-C credit case was certified and finalised in August 2020. The Environmental Impact Statement (EIS) for the project, which contains the BDAR, was submitted to the consent authority on 7 December 2020.

Recommendation:

1.1. The BDAR should be certified, and the credit calculations in the BAM calculator should be finalised, within 14 days of the report being submitted.

2. Comparison of areas that could not be accessed but require assessment would be beneficial

Section 3.6.3 of the BDAR states that access could not be obtained for the entire study area. Figure 3.5(a)-(d) displays the areas that were and were not accessed for field surveys.

It would be beneficial to understand the portion of the project footprint that could not be accessed but which most likely contains native vegetation and therefore requires assessment under the BAM. A table should be added to section 3.6.3 which details:

- the total project footprint (area in hectares),
- the area that could be accessed and could not be accessed
- and for the area that could not be accessed – the area considered to be non-native vegetation or cropped land compared to the area of native vegetation.

Recommendation:

2.1. Update section 3.6.3 to include a table which states the area that could and could not be accessed in the project footprint, and where land could not be accessed the comparison of area of native and non-native vegetation.

3. Separate habitat suitability assessments must be completed for each IBRA subregion intersected by the project

BCS have reviewed both the BDAR and the BAM-C and note that although the project footprint spans across six IBRA subregions the assessor has only carried out an assessment for one IBRA subregion. This does not conform to BAM for linear shaped developments.

As per section 6.4.1.7 of the BAM for linear shaped developments*, "the assessor must carry out a separate habitat suitability assessment for each IBRA subregion"*. This requires submission of separate cases in the BAM-C for each IBRA subregion intersected by the subject site. Relevant

site context assessments, inclusive of native vegetation cover classes, must be conducted for each IBRA subregion intersected.

As separate assessments are required for each IBRA subregion the minimum number of plots and transects required per vegetation zone area may differ from the number that were required for the single assessment that was completed. The minimum number of plots and transects required per vegetation zone as detailed in Table 4 of the BAM must be applied to each assessment that is carried out. In addition, as IBRA subregions function as a habitat suitability filter for candidate threatened species this may also impact the species lists generated for each IBRA subregion by adding new species (or removing species) that would require assessment in accordance with Section 6 of the BAM.

Recommendations:

3.1. Separate habitat suitability assessments must be completed for each IBRA subregion. This requires the submission of separate cases in the BAM-C for each IBRA subregion intersected by the subject site.

3.2. The minimum number of plots and transects required by Table 4 of the BAM for each vegetation zone in each IBRA subregion assessment must be met, and any additional candidate threatened species generated from the revised habitat suitability assessments must be assessed.

4. Additional justification is required for the selection of PCTs

Appendix B details the profiles for each plant community type (PCT). Minimal justification has been provided on how each PCT was assigned with limited reference made to identifying features like soil types, landscape position, existing mapping or attributes recorded in the field data sheets. It would be beneficial if at least a short-list of candidate PCTs was provided based on the key diagnostic features collected through the field survey, with a final justification describing why the selected PCT was the best fit.

Recommendation:

4.1 Additional information should be provided in Appendix B to justify the allocation of each PCT.

5. Vegetation zones may require revision

Section 5.3.1.2 and Section 5.3.1.4 of the BAM states that areas of each PCT that are in different broad condition states must be stratified into separate vegetation zones. Section 5.2.1 of the BDAR details that 39 PCTs have been identified within the subject site. It is noted by BCS that that only three of these PCTs have been stratified into more than one vegetation zone and that no detail or discussion has been provided in the BDAR regarding how these condition states were derived.

BCS questions the likelihood that the condition state for the majority of PCTs identified within the subject site would remain homogenous across the subject site's extent.

The BDAR should be updated to include a section describing how condition states were assigned to the PCTs, especially for those PCTs comprised of discontinuous patches or of distinct structural attributes.

Refined stratification of broad condition states within PCTs may result in an increased minimum number of plots and transects required per vegetation zone area. The minimum number of plots and transects required by the BAM for each vegetation zone in the subject site must be met.

Recommendations:

5.1 Review vegetation zone stratification for each PCT within the subject site.

5.2 Update the BDAR detailing the methods and metrics used to assign condition states to PCTs and provide adequate discussion and justification on the assignment of condition states.

6. Inadequate justification has been provided for the presence of non-native vegetation

The BDAR states there is 1,584 hectares of non-native vegetation in the subject site. The area of "*crop and/or introduced grassland"* is clearly delineated in the environmental baseline maps 1-112 in Part E of the EIS map book. However, the methodology used to determine these areas of non-native vegetation is not clearly described. The BDAR should outline the methodology used to determine non-native vegetation, which may include (but not be limited to) the results from rapid assessments, photos of cultivated paddocks or aerial photography. This could be included as an additional description in Appendix B.

Recommendations:

6.1 The BDAR should describe how non-native vegetation has been determined in the subject site.

7. The vegetation integrity plots should adequately sample vegetation variability across a vegetation zone and be within relative proximity of the vegetation zone impacted

Table 4 of the BAM states the minimum plot requirement per vegetation zone area and goes on to clarify in Section 5.3.4.3 that *"If the broad condition state of the vegetation is more variable across the zone, additional plots/transects to the number specified in Table 4 may be required to ensure a representative sample is taken for the vegetation".*

BCS has conducted a review of the number of plots undertaken for a selection of PCTs mapped within the subject site. Although all vegetation zones meet the minimum number of plots required by BAM, in some cases the number of plots undertaken would be inadequate to provide a representative sample of PCT variability within the subject site.

As an example, the vegetation integrity score for PCT 56 is informed by 4 vegetation plots, one plot undertaken north-west of Warrumbungle National Park and a cluster of three plots, more than 50 kilometres away, west of Gilgandra (see Figure 1 in this response). The condition state and naturally occurring variability across this representation of PCT 56 has the potential to differ between these two locations as a response to different land management and disturbance history and unique environmental variables present at each location including (but not limited to) the relative rainfall, soil type and geology.

It is stated within section 3.4.3 of the BDAR that "*Wherever possible, within land access restrictions, plots were located to comply with the minimum number of plots required by Table 4 in the BAM (OEH 2017a). Due to refinements of the preferred corridor, borrow pits and ancillary facilities as part of efforts to reduce impacts on native vegetation, some plots used in the BAM calculations are located outside the final proposal site boundary".*

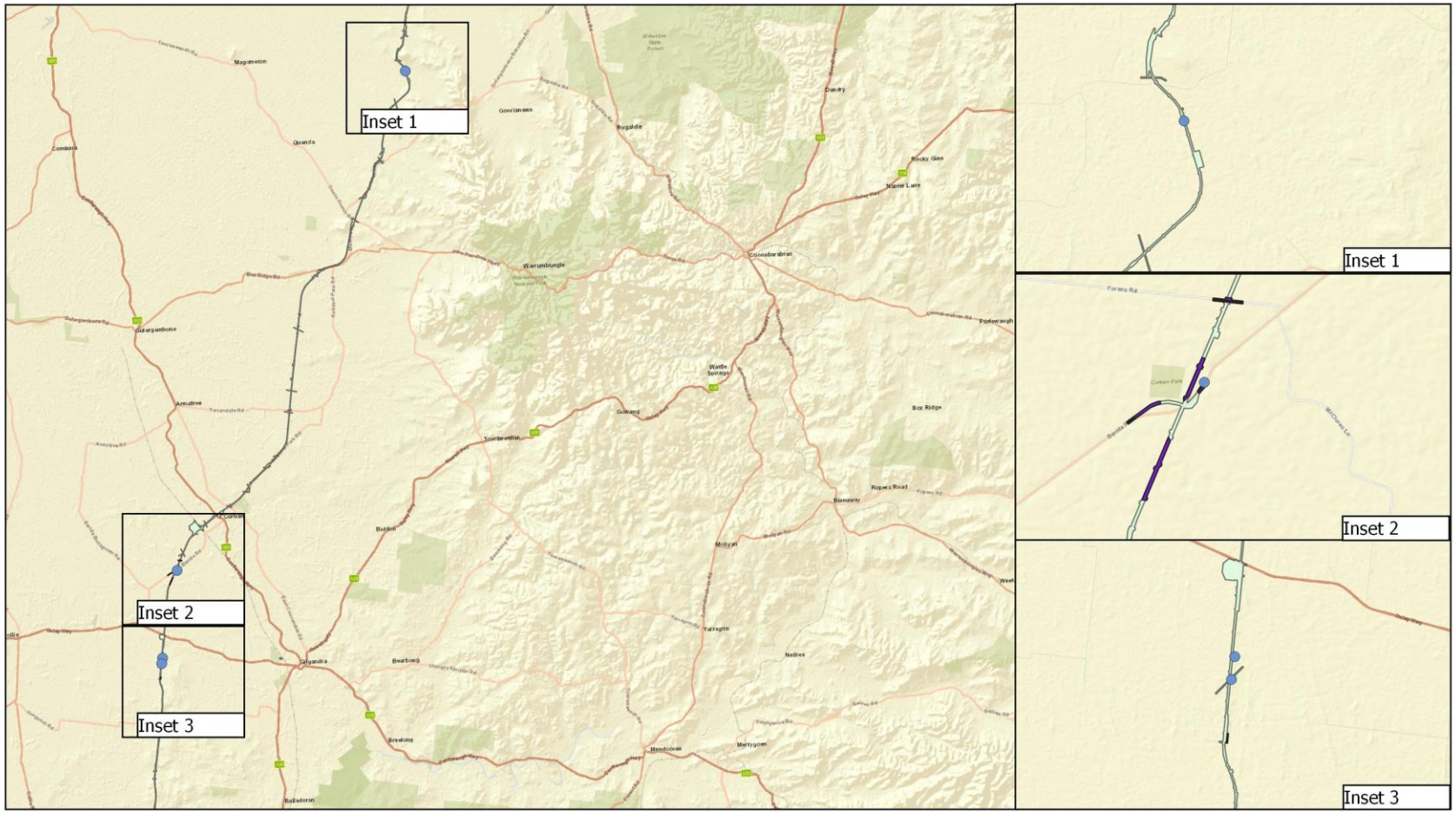
BCS has reviewed a sample of vegetation zones mapped within the subject site against the relative location of individual vegetation plots which have been used to inform that zone's vegetation integrity score. It was found that some vegetation zones were being informed by plots which were located a significant distance from the nearest equivalent vegetation zone. As an example, a vegetation integrity plot undertaken for PCT 244 was located south west of Narrabri, however, the closest vegetation patch of PCT 244 mapped within the subject site occurs west of

Black Hollow, approximately 120 kilometres to the south west of this plot (see Figure 2 in this response).

BCS proposes to liaise with the proponent on both matters and provide further advice regarding each vegetation zone which may require additional vegetation plots or where current plot locations may be inappropriate. It is acknowledged that assessing the project per subregion (see Issue 3 in this response) and the additional plots that were undertaken in spring 2020 (section 3.4.5 of the BDAR) may further alter the representativeness of plots across the vegetation zones.

Recommendation:

7.1 Liaise with BCS on vegetation zones to ensure plot locations and number of plots undertaken are adequate and appropriate along the length of the project.


Inset 1
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Legend
Vegetation Zone
56
Plot Location
56
Subject Site Footprint
Figure 1: Locations of Plots Informing Vegetation Zone PCT_56
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DPIE and its employees disclaim liability for any act done on the information in the map and any consequences of such acts or omissions.
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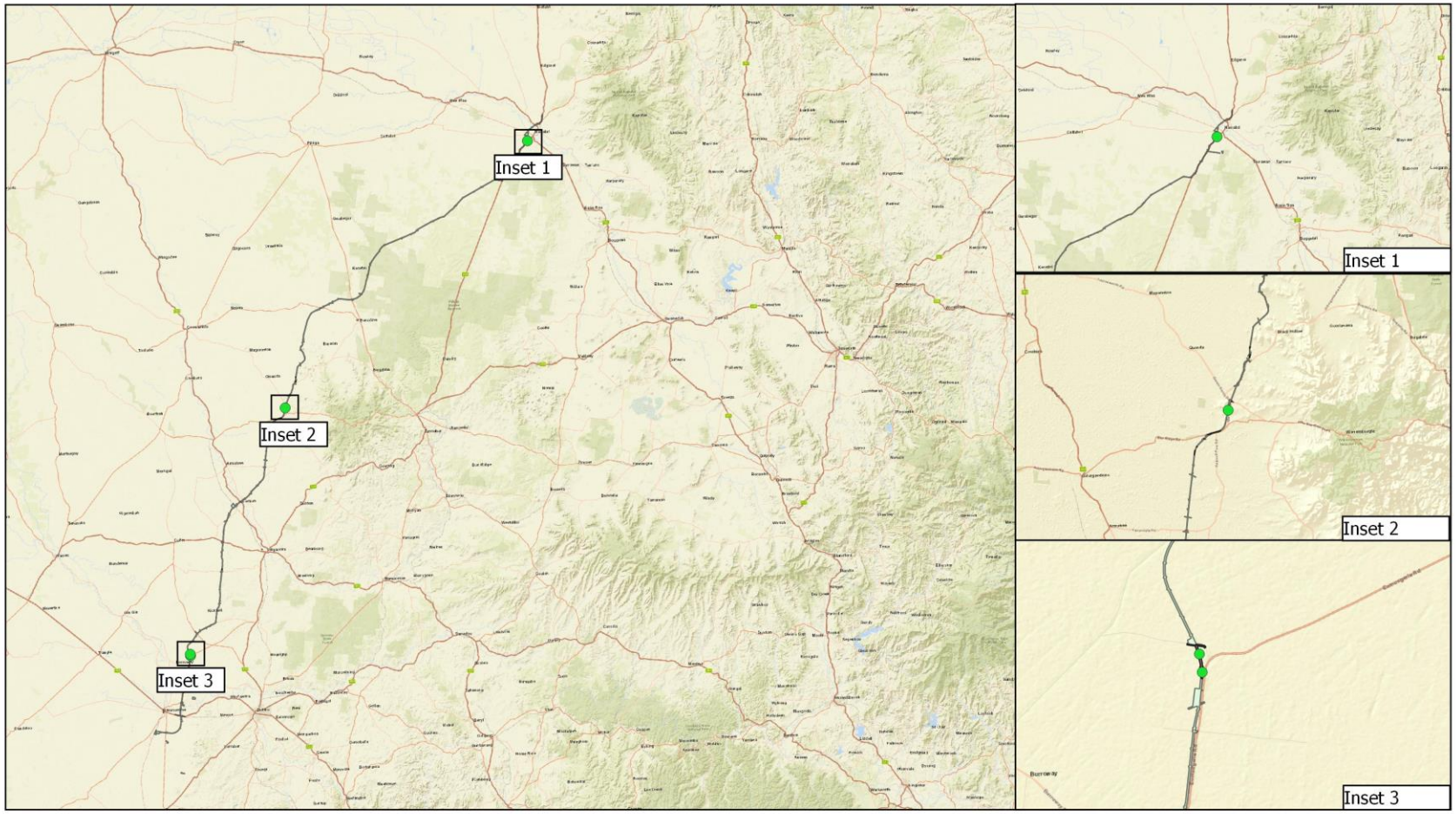
Planning, Industry & Environment



Legend

Vegetation Zone
244

Vegetation Plot
244

Subject Site Footprint

Figure 2: Locations of Plots Informing Vegetation Zone PCT_244

N

0 20 40 60 80 km

Datum/Projection: GCS GDA 1994

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8. Vegetation zones excluded from species polygons should be justified

A number of inconsistencies exist between candidate species credit species polygon description tables in Appendix I, habitat information within the Threatened Biodiversity Data Collection (TBDC) and habitat included/excluded within the 'habitat survey' tab of the BAM-C. This includes a substantial number of vegetation zones which have not been ticked within the habitat survey tab of the BAM-C and have not been identified within Appendix I of the BDAR. A sample of the species reviewed by BCS has been provided in Table 1 below.

Many of the excluded vegetation zones may have the potential to provide suitable habitat for the candidate species. No justification or evidence has been provided to support the determination of an absence of suitable habitat within these vegetation zones nor to exclude these zones from species polygons.

Within Appendix I of the BDAR each species polygon description table only lists the vegetation zones which have been determined as suitable habitat for a species credit species or references the general habitat preferences for the species. BCS requires that each species polygon table is updated to list all associated vegetation zones, as identified within the TBDC, and provide justification for each zone's exclusion from the relevant species polygon.

A lack of nearby BioNet Atlas records is not adequate justification for a vegetation zone's exclusion from a species polygon given the relative paucity of threatened species records within the region and the low frequency of threatened species survey that has occurred over the past 20-year period.

Recommendations:

8.1 Conduct a consistency review of each table within Appendix I with the information contained within the TBDC and habitat survey tab of BAM-C.

8.2 Update each table within Appendix I to identify all PCTs occurring within the subject site which have the potential to provide suitable habitat to candidate species credit species, including those which have been excluded from a species polygon.

8.3 In accordance with Section 6 of the BAM 2017, provide evidence and justification to support the exclusion of vegetation zones from each species polygon

Table 1: Sub-sample species polygon review of candidate species-credit-species.

Candidate species credit species	Method for determining species presence	PCTs present in subject site and listed in TBDC as representative vegetation type	Vegetation zones ticked as representative within the BAM-C	Vegetation zones identified as representing potential habitat within Appendix I	Comments
Coolabah Bertya	Assumed present	PCT 746	No	PCT 148	Species polygon generated around existing BioNet Atlas records within the subject site. PCT 746 prescribed with 'Good condition' in the BAM-C, no clarification why this habitat was not assumed to represent suitable habitat.
				PCT 399	
				PCT 411	
Pale-Headed Snake	Assumed present	PCT 1384	Yes	None. General habitat preferences identified only i.e. "*Could occur throughout the Pilliga but would be concentrated around creek lines where frogs (their main prey) occur".*	Species polygon generated around selected PCTs considered representative of riparian vegetation with 500m buffer applied from edge of tree line. All PCTs excluded prescribed with 'Good Condition' in the BAM-C, no clarification why this habitat was assumed not to represent suitable habitat.
		PCT 27	No		
		PCT 78	Yes		
		PCT 36	No		
		PCT 88	Yes		
		PCT 56	No		
		PCT 244	No		
		PCT 247	No		
		PCT 394	Yes		
		PCT 148	Yes		
		PCT 206	No		
Greenhood Orchid	Surveyed	PCT 141	Yes	PCT 394	No clarification specifically referencing

		746	Yes		that PCTs 202, 244 and 255 were surveyed comprehensively to conclusively determine absence of species. All PCTs excluded prescribed with 'Good Condition' in the BAM-C.
		148	Yes		
		202	No		
		256	Yes	PCT 398	
		255	No		
		88	Yes		
		244	No		

9. The impact of drought conditions on vegetation integrity scores requires further review

Section 3.6.3 of the BDAR acknowledges the prevailing drought conditions during the field surveys and that lower plant species diversity was likely as a result of the conditions. Whilst the BDAR states that benchmark plots were used to reach the minimum number of plots for vegetation zones where the required number of plots were not completed, it remains likely that the drought conditions have affected the vegetation integrity scores and therefore the biodiversity credit obligation. BCS acknowledges that the additional plots that were undertaken in spring 2020 are likely to be more representative of the vegetation zones than the previous surveys, and they may alter the vegetation integrity scores for relevant PCTs. Despite this, impacted vegetation composition and structure scores will be influencing the credit outcome.

It should be noted that the practice note "*Guidance for assessors and decision-makers in applying modified benchmarks to assessments of vegetation integrity*" was published in December 2020. This practice note provides guidance for assessors and decision-makers in using modified benchmarks to assess vegetation integrity when applying the BAM. It also recommends that consideration be given to using modified benchmarks when extreme climatic variation is adversely affecting the composition and structure of growth form groups important to a PCT or when the available BAM-C benchmark data has a low confidence rating.

BCS recommends that the BDAR discusses the applicability of applying modified dry benchmarks to PCTs which were considered to have their compositional or structural attributes adversely affected by drought conditions. Section 2 of the abovementioned practice note supplies environmental thresholds and a decision-making tree to assist in the applicability of dry benchmarks to a subject site. In addition, BCS proposes to review the updated BDAR and BAM-C based on the recommendations in this response and the spring 2020 data that will be added to the project. Following consideration of these two key updates and liaison with the accredited assessors, a determination can be made on the representativeness of the plot data for each vegetation zone.

If modified dry benchmarks are proposed BCS requires that the method used to determine modified benchmarks, including justification of any assumption made, be adequately detailed within the BDAR.

Recommendations:

9.1 The BDAR should discuss the applicability of applying modified dry benchmarks to PCTs within the subject site.

9.2 BCS will review the updated BDAR and BAM-C that will incorporate recommendations from this review and spring 2020 survey data, and liaise with the accredited assessors to determine the representativeness of the plot data for each vegetation zone.

9.3 If modified benchmarks are proposed, adequate detail should be provided on the method used to determine modified benchmarks, including justification of any assumptions made.

10. The mapping of native vegetation extent requires consistency between Figure 4.1 and Appendix G also the landscape vegetation cover class estimate requires revision

Areas of native vegetation extent (derived native grassland) have been excluded from Figure 4.1 and the landscape vegetation cover class assessment within the BDAR, despite these areas being identified within the subject site's vegetation zone maps in Appendix G. Native vegetation extent identified and mapped within the subject site is required to be included within the native vegetation cover polygon on the landscape assessment map and the vegetation percent cover class assessment (Section 4.3 of the BAM 2017).

Clarification is provided in the *BAM Operational Manual Stage 1* (page 13) which states that the mapping requirements for the landscape vegetation cover class assessment must mirror that for the subject site and must be inclusive of all areas of native vegetation, including areas which are groundcover only.

Recommendations:

10.1 Figure 4.1 should be updated to be inclusive of all native vegetation identified in Appendix G.

10.2 All areas of native vegetation, including areas which are groundcover only, should be included within the landscape vegetation cover class assessment.

11. Species polygons for candidate species which have been assumed will be re-examined following input of new information

Despite targeted surveys being undertaken for candidate species, several threatened species have been assumed to occur within the subject site. This precautionary approach has been used in recognition of the potential impact of drought on the detectability of some species, and the limited access to some areas of the subject site.

Section 6.4.1.30 of the BAM states that where a species is assumed to be present on the subject land the assessor must use either an expert report to delineate the species polygon, or the species polygon must encompass the entire vegetation zone/s in which the candidate species is predicted to occur. A number of species polygons for species assumed to occur within the subject site do not conform with this section of the BAM, for example species polygons which have been limited to assigned indicative nest tree locations or vegetation within a certain proximity of a BioNet Atlas record. The examples identified include (but are not limited to) the following candidate species credit species:

- Spiny Peppercress
- *Tylophora linearis*
- Winged Peppercress
- Native Milkwort
- Coolabah Bertya
- Barking Owl
- Masked Owl
- Glossy-black Cockatoo
- Bush-stone Curlew
- Pale-headed Snake
- Koala
- Squirrel Gilder
- Little Eagle
- Square-tailed Kite

BCS proposes to re-examine the appropriateness of the species polygons following the update of the BDAR and BAM-C to incorporate the separate IBRA subregion assessments and the spring 2020 field survey data.

Recommendation:

11.1 Species polygons for species assumed to be present to be re-examined following the update to the BDAR and BAM-C with the separate IBRA subregion assessments and spring 2020 field survey data.

12. The BDAR should include threatened and migratory entity records prior to 1998

Section 3.7 of the BDAR states that *"identification of potential habitat for threatened and migratory species was based on presence of records from a 20-kilometre radius of the proposal site since 1998".*

BCS is not supportive of this method of filtering and excluding species records given both the relative paucity of threatened species records within the region and the low frequency of threatened species survey that has occurred over the past 20-year period.

Recommendation:

12.1 Revise all sections of the BDAR which have been informed by the filtering and exclusion of threatened species records prior to 1998, to be inclusive of these records.

13. A TEC equivalency assessment should be provided for all PCTs associated with a TEC

Section 5.2.1.4 of the BAM states that '*The assessor must identify any TECs that are associated with a PCT, or the most likely PCTs'*. This is inclusive of the conservation and listing advice of both BC Act and EPBC Act-listed threatened ecological communities (TECs).

Table 5.1 of the BDAR lists the PCTs in the proposal site and whether they conform to a BC Act or EPBC Act-listed TEC. BCS has identified PCTs that are aligned with TECs in the BAM-C that have not been identified in the BDAR, including:

- PCT 49 - Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes Bioregions (Myall Woodland)
- PCT 55 - Myall Woodland
- PCT 55 - Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions (Brigalow)
- PCT 145 - Myall Woodland
- PCT 244 - Brigalow
- PCT 250 - White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands (Box Gum Woodland)
- PCT 436 - Box Gum Woodland
- PCT 589 - Box Gum Woodland
- PCT 619 - Box Gum Woodland
- PCT 1384 - Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions (Fuzzy Box Woodland)

In addition to the list of PCTs above which have been identified as "not listed" within Table 5.1 of the BDAR, there has been no discussion or justification provided on PCTs which have been identified within Table 5.1 as potentially consistent with a listed TEC but do not meet that TEC's definition and/or diagnostic criteria.

A TEC equivalency assessment for all PCTs identified within the BAM-C as potentially equivalent to a BC Act or EPBC Act-listed TEC, should be conducted. TEC equivalency assessments require detailed and systematic comparison of a vegetation patches' compositional, structural and functional attributes against the diagnostic criteria held in both NSW listings and federal conservation advice. As such, without detailed understanding of each vegetation patch within a vegetation zone, informed by survey, a determination of non-equivalence cannot be assumed beyond reasonable doubt.

Equivalency assessments should be supported by evidence and data collected during the field survey. The compositional, structural and functional aspects of a vegetation patch should not be assumed to be non-equivalent if access to a patch could not be obtained.

Recommendation:

13.1 A TEC equivalency assessment should be conducted for all PCTs identified within the BAM-C as potentially equivalent to a BC Act or EPBC Act-listed TEC.

14. Confirmation is required that all surface impacts from the proposal have been included in the development footprint

Section 1.2.3 and Figures 1.3(a-b) of the BDAR provides spatial detail of the infrastructure components required for the project. BCS notes that the location of temporary surface infrastructure like material laydown areas have not been addressed within the BDAR and are not readily evident in the mapping.

It is unclear if all surface infrastructure components required for the project have been included within the development footprint.

Recommendation:

14.1 Confirm that all surface impacts have been included in the overall development footprint for the proposal and have been considered in Stage 2 of the BDAR.

15. A SAII assessment should be conducted for Coolabah Bertya and targeted survey effort undertaken for this species should be clarified

Bertya opponens (Coolabah Bertya) was listed as an approved serious and irreversible impact (SAII) entity on 22 October 2020 and as such requires consideration under Section 10.2 of the BAM.

Section 8.3.1 of the BDAR states that *the reduction in the extent of native vegetation is less significant at the regional scale and is unlikely to threaten the persistence of any populations of native plants and vegetation communities. It is unlikely that an ecologically significant proportion of any regional plant populations would be located entirely within the proposal site.*

If a disjunct population of Coolabah Bertya is present within Bohena Creek Reserve, this has the potential to represent a genetically distinct population of this SAII species. Given that only a very small number of populations of this species are known within NSW a population within the subject site could be ecologically significant.

The BDAR has stated that 13.8 hectares of potential habitat would be removed as a result of the project. This could represent a significant loss to a species which meets Principle 3 set out in Clause 6.7 of the Biodiversity Conservation Regulation 2017, being representative of a species which has a very limited geographic distribution.

Impacts to this SAII species have the potential to be further exacerbated by the recent approval of the neighbouring Narrabri Gas development, which will result in the loss 10,309 individuals and 6.37 hectares of occupied habitat and, if consent is granted, by the recently exhibited Narrabri Underground Mine Stage 3 project which is proposed to result in the loss of a further 25,939 individuals and 6 hectares of occupied habitat.

As such, removal of this species and its habitat should be a high priority for avoidance and Section 8.1 of the BDAR should be updated to discuss proposed avoidance measures and the measures proposed to contribute to the recovery of the Coolabah Bertya.

BCS recognises the targeted survey for this species was conducted within the subject site and despite the presence of species records within the subject site no individuals were found. However, the species has been assumed present as drought conditions could have impacted detectability of the species. BCS recommends that further targeted surveys are undertaken for the species outside of drought conditions to more accurately determine the presence or absence of the species, and the potential impact to the species if it is present. BCS also requests that further clarification be provided on the conclusion that impacts from the proposal would only affect four individuals of the species, as stated within Table 12.4 of the BDAR.

The impact assessment prepared for this species under the EPBC Act (Appendix J of the BDAR) should be updated with any new information or data gathered during the abovementioned SAII assessment.

Recommendations:

15.1 A SAII assessment should be completed for Coolabah Bertya (*Bertya opponens)* in accordance with section 10.2 of the BAM. Information and data from this assessment should be used to update the impact assessment prepared under the EPBC Act.

15.2 Section 8.1 of the BDAR should be updated with proposed avoidance measures that will be implemented for Coolabah Bertya.

15.3 Targeted surveys should be conducted for Coolabah Bertya outside of drought conditions to more accurately determine the presence or absence of the species, and potential impacts to the species if it is present.

15.4 Provide clarification in Table 12.3 of the BDAR regarding the conclusion that only four individuals of Coolabah Bertya are likely to be impacted by the species.

16. Mapping of connectivity features in accordance with Section 4.2.1.9 of the BAM should be provided

From review of Table 11.4 of the BDAR it is unclear to BCS on the number and indicative location of fauna connectivity structures and mitigation devices which are being proposed to be installed within the subject site.

Section 4.2.1.9 of the BAM states that "*For development sites, the assessor must identify the connectivity of different areas of habitat that may facilitate the movement of threatened species across their range and identify these on the Location Map*". Mapping of connectivity features as per Section 4.2.1.9 has not been supplied in the BDAR.

BCS request that fauna connectivity across the project site for both pre-construction and post-construction states are spatially represented in the BDAR to allow for a better understanding of the potential impact of the proposed development, particularly the impact to connectivity through the Pilliga forest. Post-construction state connectivity mapping should provide indicative locations of proposed fauna passage features to be installed as per Appendix J of the BDAR. This will allow for a better understanding of the coverage and adequacy of fauna connectivity measures across the subject site.

It should be noted as discussed in issue 18 below that drainage culverts not specifically designed for fauna passage, and/or which lack fauna passage features, are not considered by BCS to specifically represent fauna connectivity structures.

Recommendation:

16.1 Pre-construction and post-construction fauna connectivity states should be spatially represented within the BDAR in accordance with Section 4.2.1.9 of the BAM. The post-construction fauna connectivity state should provide indicative locations of proposed fauna passage features to be installed as per Appendix J.

17. Prescribed connectivity impacts on all threatened species with the potential to be impacted should be identified, discussed and mitigated in the BDAR. Offsets should be proposed for all residual prescribed impacts to connectivity

Table 9.4 of the BDAR provides the following references to scientific literature in relation to fauna connectivity being intersected by linear infrastructure "*Rail lines can be physical barriers, where a species cannot pass across the railway or behavioural, when the species may be physically able to cross the barrier but does not do so because of unfavourable ambient conditions or perceived risk (Barrientos and Borda-de-Agua 2017)".*

"Physical barrier constraints mainly affect species of small size with reduced mobility, such as reptiles and frogs. Some fauna species will not cross open spaces, for example certain insects will turn back at the edge of a patch (Bhattacharya et al. 2003) (which can have flow-on effects for flora if they are pollinators)".

"Railways have been shown to be more permeable to forest song bird movements than were roads, likely due to their narrower width and lower traffic, with the gap size in the vegetation was the most important factor constraining forest bird movement, especially when the gap was larger than 30 metres (Tremblay and St. Clair 2009)".

In reference to the likely impacts to fauna connectivity within the Pilliga, Table 9.4 states that "*The proposal would clear a gap of about 73 kilometres by 50 metres through the Pilliga, and for much of this length increase the existing gap associated with Pilliga Forest Way".*

Table 9.4 of the BDAR provides discussion on select threatened species likely to be impacted as a result of the project. However, BCS believes that this discussion has been limited to those threatened species which may have some potential to benefit from the installation of dedicated fauna underpasses and has not included the full cohort of threatened species likely to be impacted as a result of the project, as per the references to scientific literature provided above.

Section 9.2.1.5 of the BAM details the required assessment criteria to be analysed for the prescribed impacts on the connectivity of habitat for threatened species. This includes criteria (e) which states, "*predict the consequences of the impacts for the bioregional persistence of the suite of threatened species and communities currently benefitting from the connectivity with reference to relevant literature and other published sources of information and taking into consideration mobility, abundance, range and other relevant life history factors".*

BCS requests that discussion of potential impact and proposed methods of mitigation is expanded upon to include all threatened species likely to be impacted due to this prescribed impact, including (but not limited to) the following taxa:

- threatened woodland birds, especially smaller ground dwelling passerines such as the Speckled Warbler

- threatened plants with limited seed dispersal, including the Greenhood Orchid, Pine Donkey Orchid, Slender Darling Pea, *Commersonia procumbens*, Native Milkwort, Coolabah Bertya
- threatened reptiles, including the Pale-headed Snake

It is recommended that the BDAR be updated to discuss proposed prescribed impact avoidance measures and measures proposed to contribute to the recovery of the entities listed above.

In addition, BCS recommends that Table 9.4 explicitly identifies if any residual prescribed impacts to the connectivity of threatened species are likely to occur after the proposed avoidance and mitigation measures are implemented. If residual prescribed impacts cannot be adequately avoided or mitigated the remaining residual impacts should be offset via additional biodiversity credits (above the credit requirement generated by BAM-C for direct impacts) and/or other listed conservation measures in accordance with Section 6.1.2(b) of the Biodiversity Conservation Regulation 2017.

Recommendations:

17.1 Prescribed impacts to connectivity for threatened species should be revised to include all threatened species likely to be affected by the proposed development.

17.2 Avoidance and mitigation measures should be proposed which contribute to the recovery of the entities listed above.

17.3 Residual prescribed impacts to the connectivity of threatened species which are likely to occur after the proposed avoidance and mitigation measures are implemented should be identified.

17.4 If residual prescribed impacts are identified, measures for offsetting residual prescribed impacts should be proposed in accordance with Section 6.1.2(b) of the Biodiversity Conservation Regulation 2017.

18. Drainage culverts not specifically designed for fauna passage should not be considered to represent adequate fauna passage structures

BCS supports a fauna connectivity strategy as discussed in section 11.1.2 of the BDAR. However, this strategy should form part of the BDAR as a mitigation measure. Preparing that strategy now, at the very least in an indicative form, allows BCS to make a more informed assessment of the likely residual impacts to fauna that may need to be further mitigated or offset. The strategy should identify when the features are going to be installed, the proposed monitoring program for both the use of the structures by fauna and the structural integrity of each feature, and how long the structures are going to be maintained for.

It is noted that drainage culverts which have not been designed to facilitate fauna passage represent most of the connectivity features proposed to mitigate impacts to fauna movement through the subject site. It is BCS's understanding that limited studies of fauna use of drainage culverts, implementing a BACI design, have been conducted for the context of the threatened species likely to be impacted by this project. Evidence of drainage culvert use by fauna in NSW is generally limited to incidental observations of occasional culvert use and not based on evidence or scientific study. As such, BCS believes that drainage culverts should not be identified as measures to mitigate fauna movement across the subject site, unless the installed components have been designed specifically for this function.

Some recommendations have been made within Table 11.4 of the BDAR for the implementation of design features which would assist in facilitating the movement of fauna, this includes:

- rocks, logs, ropes and ledges and other fauna furniture installed within the culvert to cater for species which are unlikely to pass through an empty drainage culvert
- revegetation plantings at the approaches to the culverts to attract species which would otherwise be unlikely to enter an empty drainage culvert
- fencing at least 200 metres either side of culverts to direct fauna to the crossing location.

Given the absence of best practice guidelines or design recommendations for fauna underpasses, BCS supports the use of the above design features for increasing the likelihood of fauna utilisation of drainage culverts. However, BCS requests further clarification be provided in Table 11.4 identifying which drainage culverts will be receiving the fauna passage design components listed above and their location within the subject site.

Recommendations:

18.1 The fauna connectivity strategy should be prepared and incorporated in the BDAR, at least in an indicative form, to determine whether the proposed mitigation measures are adequate.

18.2 The fauna connectivity strategy should be included as a document that must be prepared in consultation with BCS as a condition of consent.

18.3 The use of drainage culverts as a fauna connectivity measure should be removed from the BDAR, unless culverts contain installed components designed specifically for this function.

18.4 Table 11.4 should provide further clarification on which drainage culverts would be receiving fauna passage design features and provide an indicative location within the subject site.

19. Derived PCTs will no longer be able to be assigned under BAM 2020

Section 4.2.3 of the BAM 2020 states that when assigning PCTs, assessors will no longer be able to identify native vegetation as a derived PCT, but rather the original PCT from which the derived PCT has developed must be identified.

The proponent should note that it is acceptable to assign derived PCTs according to the method detailed within BAM 2017. However, if the proponent is considering pursuing land-based offsets to satisfy the project's credit obligation, it is advised that parent PCTs be assigned. Sourcing like-for-like land-based offsets under the BAM 2020 (to commence 22 October 2021) for derived PCTs will not be possible.

Recommendation:

19.1 Consideration should be given to reviewing PCTs that have been assigned a derived PCT classification and assigning the original PCT from which the derived PCT has developed.

20. The BDAR should demonstrate that the recent vegetation clearing within the proposed location of Borrow Pit D was undertaken lawfully and not for the purposes of the project

Table 8.4 of the BDAR states that much of the 20.9 hectares located at the site of Borrow Pit D had been cleared during field surveys by the landholder. The proponent should detail in the BDAR whether this clearing is authorised under legislation that is separate to this development. If so, the BDAR is not required to assess this site any further. If the clearing is allegedly unauthorised the incident will be investigated by DPIE and appropriate action will be undertaken.

Recommendation:

20.1 The BDAR should state whether the clearing undertaken at the site of Borrow Pit D is authorised under legislation separate to this development. Any area with a current authorisation does not require assessment for impacts to native vegetation.

21. Minor edits to the BDAR are required

Some minor edits to the BDAR are required to correct errors, including:

- Section 8.3.1 states that "*The proposal may remove between 13,079 and 29,930 hollow-bearing trees based on these estimates (see Table 8.2)….".* This section then provides an adjusted total to account for small hollows in ironbark trees being missed during the assessment. In both cases the value provided states that 29,930 trees will be removed. This section should be revised with the correct non-adjusted lower estimate of 25,778 trees provided.
- Update the references in section 14 to include the Smith et al. (2015) reference in section 11.1.2. It is potentially *Smith, D. J., & van der Ree, R. (2015). Field methods to evaluate the impacts of roads on wildlife. In R. van der Ree, D. J. Smith, & C. Grilo (Eds.), Handbook of road ecology (pp. 82–95). West Sussex: Wiley.*

Recommendation:

21.1 Update the BDAR to correct minor errors or editing matters as discussed in this response.

BCS's detailed comments – flooding and hydrology

Inland Rail Narromine to Narrabri – Environmental Impact Statement

It should be noted that this is a high-level review of the EIS flooding and hydrology component and BCS is committed to undertaking an iterative review approach to address the matters identified in this response. Following the outcomes of upcoming discussions with ARTC and the Planning and Assessment Group, BCS may undertake a more detailed review of certain components and provide relevant feedback.

22. Additional studies should be reviewed when defining the 1% AEP

A comparison of the 1% annual exceedance probability (AEP) design flows has been carried out against some of the previous studies (e.g Narrabri Flood Study – Namoi River, Mulgate Creek and Long Gully [WRM 2016]) however there are a number of other studies which should be reviewed and referenced to enable a comparison and to ensure that the continuity of estimated discharges have been considered. Similarly, additional information should be included to summarise the origin of the estimated flows and parameters used.

The flood frequency analysis (FFA) should be included for those water sources with gauging stations and that were used as part of the study. Comment on the reliability of rating curves should also be included.

Recommendations:

22.1 Additional studies should be reviewed and referenced when defining the 1% AEP.

22.2 The flood frequency analysis should be included for the gauging stations used in the study.

22.3 Comment should be provided on the reliability of the rating curves.

23. Additional information is required to support the proposed quantitative design objectives

The quantitative design objectives and their relevant justification and description are included in Table 3.1 of the flooding and hydrology assessment. It would be beneficial if additional information could be provided regarding how the objectives were developed, including relevant documents or studies that have been used as a reference source. This will assist in determining whether the objectives are relevant to this project.

Recommendation:

23.1 Additional justification and information is required to support the proposed quantitative design objectives.

24. Impacts to wetlands and flood-dependent ecosystems should be assessed across a range of floods

There does not appear to be any reference to investigations into the potential impact to flood dependant ecosystems. If these ecosystems are present in the vicinity of the proposed alignment, then any impact on flooding which may affect these ecosystems should be identified and assessed. This is especially important for the small floods or low flows as these flows are crucial to maintaining the ongoing character of the ecosystems. The flooding characteristics at the full range of floods therefore need to be considered.

Recommendation:

24.1 Identification of any flood dependant ecosystems present in the vicinity of the rail alignment and the potential impact to their character as a result of the project is required.

25. Further information is required to identify the impact to confirm any increases in velocity and subsequent impacts to erosion

A thorough assessment of river styles has been undertaken however little detail has been provided regarding the impact of increased erosion. If streams are currently fragile and unstable, any increase in velocity or concentration of flow could increase the erosion. An indication of how this will be assessed and mitigated is required. Scour protection as noted in the EIS finishes at the corridor boundary and therefore does not consider the impact to the downstream stream corridor.

The proposal results in a number of streams incurring a lower velocity in the design scenario compared to the existing scenario. Additional explanation is required to identify why this is the expected outcome.

Recommendation:

25.1 Further assessment and proposed mitigation measures that will be implemented to reduce velocities is required. Confirmation of the decrease in velocities that are likely to occur as a result of these mitigation measures is required.

26. Potential redistribution of flows on the floodplain should be assessed

No assessment has been undertaking which assesses the potential redistribution of flows within the floodplain or between watercourses, particularly the Macquarie River and Namoi River floodplains. The *Floodplain Management Plan for the Lower Namoi Valley Floodplain 2020* and the *Draft Floodplain Management Plan for the Macquarie Valley Floodplain 2018* contain a rule for granting flood work approvals whereby the redistribution of the peak flood flow must be considered.

Recommendation:

26.1 Additional information regarding the potential, if any, for the proposal to redistribute flood flows should be included. This information should consider both hydraulic and geomorphological impacts on the floodplain covered by a floodplain management plan as well as any redistribution between watercourses.

27. Flooding impact on buildings and the relationship with relevant flood risk management studies requires greater detail

The EIS has identified a number of buildings which will incur an increase in flood levels due to the proposal that is greater than 10 millimetres (mm). Insufficient information is contained in the report regarding the location, type of building and impact. There is also no reconciliation regarding the impact and the relevant flood risk management study, and if these houses have been identified in the floodplain management plan.

Recommendations:

27.1 Additional information on the houses with increased flood levels is required, as well as reconciling these houses with the outcome of the relevant floodplain management plan.

27.2 Provide a methodology which outlines how the impacts to flooding to buildings will be mitigated.

28. General comments

The following general comments are provided for consideration and for update in the EIS:

a. Section 4.2.3 has noted that consultation has occurred with landholders in relation to the impact of the proposal on the supply of farm water from existing water flows. It should be confirmed whether the impact on farm water supply has been limited to the consultation activities described or whether a desktop assessment has been carried out which identified any farm dams downstream of the proposal which may be affected.

b. The design provides flood immunity for a 1% AEP flood at formation level. The worst-case scenario will be when the railway line overtops, which is track level. Some narrative should be provided as to when this is envisaged to occur especially near the urban areas.

c. Appendix G – Figure 4.1c has an area downstream of the proposal “now high hazard”. If this does happen are there any implications to both the environment and emergency evacuation?

d. The emergency management arrangement and failure in section 7.1.10 has limited information, including the consultation with the State Emergency Service (SES) undertaken for the purposes of preparing the EIS. For example, the afflux maps show an increase in levels along the Wee Waa Road which is a major road into Narrabri. It is not clear whether these roads have been considered in the assessment of impacts to roads in section 7.1.4 over the range of floods.

Recommendation:

28.1 Review the list of general comments and update the EIS accordingly.