



**Office of
Environment
& Heritage**

Date: 14 March 2019
Your reference: SSD 8445
Our reference: DOC19/196650
Contact: Calvin Houlison
4224 4179

Andrew Rode
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Dear Mr Rode

RE: Tahmoor South Coal Project - EIS Exhibition (SSD 8845)

I refer to your request for advice on the above SSD major project. We understand that the proposal comprises extension of the existing underground coal mine via an expanded longwall layout to the south, new ventilation shafts and expansion of the existing reject emplacement area.

The extension of the reject emplacement area will remove 43.4 hectares of Shale Sandstone Transition Forest (SSTF) Critically Endangered Ecological Community (CEEC), clearing of 100 individuals of the endangered species *Persoonia bargosensis* and 2,324 individuals of the vulnerable species *Grevillea parviflora* subsp. *parviflora*. The development would also impact directly on 49.1 ha of koala habitat.

We recommend that alternatives to avoid or minimise the impacts of the native vegetation clearing be further explored. Following this, the offset package outlined in the preliminary biodiversity offset strategy can then be further developed. We note that not all requisite offsets have been sourced at this stage.

We appreciate that the project has been refined to avoid directly undermining Dog Trap Creek prior to EIS lodgement. However, we also recommend that consideration be given to further reducing the extent of longwalls in this vicinity. In particular, reducing the length of Longwalls 101, 102 and 103 and re-designing Longwall 109 would reduce the risk of impacts on watercourses and Aboriginal cultural heritage arising from vibration, bedrock fracture and changes to hydrology. The extent of longwalls currently shown means that impacts to the Aboriginal cultural heritage rock art complex at Dog Trap Creek may occur, and that Dog Trap Creek, Teatree Hollow and 3rd order and above tributaries are highly likely to be impacted.

Our key issues are detailed at Attachment A and summarised below:

- 1) The proponent did not thoroughly demonstrate how the "avoid" principle of biodiversity assessment policy, guidelines and the SEARs were met with regard to the site's biodiversity constraints. This is particularly critical given the quantum of critically endangered native vegetation and threatened species including primary koala habitat proposed to be cleared.
- 2) Consideration should be given to reducing the quantum of clearing and resultant impacts upon listed threatened entities, with offsets limited to residual impacts only. The proponent should also undertake a hollow-bearing tree survey to quantify impacts to potentially occurring hollow dependent threatened species, and to determine high habitat value site constraints so impacts to these areas can be avoided and/or minimised.

- 3) Impacts for Further Consideration (IFFC) for *Persoonia bargoensis* in accordance with s.9.2 of the NSW Framework for Biodiversity Assessment (FBA) needs to further demonstrate that the local population will not be put at risk of extinction or have its viability significantly reduced as a result of this development. In the absence of further surveying, the eastern pygmy-possum should also be assumed present and included as a species to be offset.
- 4) Further development of the Biodiversity Offset Strategy (BOS) is required to demonstrate that required offsetting, after all avoidance measures have been applied, can be achieved. Further clarification regarding some species not identified to be offset as described at Attachment A must also be addressed.
- 5) Although the proposed longwall layout has largely avoided direct undermining of significant rock shelter artworks along Dog Trap Creek, further assessment of proposed subsidence, hydrology changes and vibration and dust to protect these significant sites should be undertaken. We recommend that the Extent of Longwalls boundary in this area be reconsidered, and that Longwalls 101 and 103 be reduced to provide increased protection to the Dog Trap Creek site complex.
- 6) We recommend that the proposed archaeological test excavations for surface infrastructure be undertaken prior to approval. The Heritage Management Plan should also be prepared as soon as possible, ideally prior to project approval, in consultation with the Aboriginal community.
- 7) It is considered highly likely that 3rd order and streams and tributaries either directly undermined or within close proximity of the proposed new workings, including Dog Trap Creek and Teatree Hollow, will be impacted as a result of the proposed longwall layout. Consideration should be given to further reducing longwall lengths 101, 103 and 104 and redesigning Longwall 109 in this location to further avoid impacts on 3rd order and above streams.
- 8) The impacts of mine wastewater discharge into the Bargo River from the expanded project layout, such as increased salinity and toxicity of discharge, requires further assessment. Successful remediation options to repair damage and consequences of previous mining operations have also not been addressed.
- 9) We recommend that the flood assessment be updated to address flooding characteristics across the full range of flood events to satisfy OEH's suggested SEARs, rather than depicting the extent of flooding for pre and post development conditions only.

Please contact Calvin Houlison, Senior Conservation Planning Officer on 4224 4179 or via e-mail calvin.houlison@environment.nsw.gov.au should you have any further queries.

Yours sincerely



MICHAEL SAXON
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15.3.2019

OEH DETAILED COMMENTS ON TAHMOOR SOUTH COAL PROJECT – EIS EXHIBITION (SSD 8445)

1. Biodiversity & Offsetting

Summary of Recommendations:

- The proponent should thoroughly demonstrate how the “avoid” principle of biodiversity assessment policy, guidelines and the SEARs has been met with regard to the site’s biodiversity constraints. This is particularly critical given the quantum of critically endangered native vegetation and threatened species including primary koala habitat proposed to be cleared for the purposes of an expanded reject emplacement area.
- Consideration should be given to reducing the quantum of clearing and resultant impacts upon listed threatened entities, with offsets limited to residual impacts only. The proponent should also undertake a hollow-bearing tree survey to quantify impacts to potentially occurring hollow dependent threatened species, and to determine high habitat value site constraints so impacts to these areas can be avoided and/or minimised.
- Impacts for Further Consideration (IFFC) for *Persoonia bargoensis* in accordance with s.9.2 of the NSW Framework for Biodiversity Assessment (FBA) needs to further demonstrate that the local population will not be put at risk of extinction or have its viability significantly reduced as a result of this development. In the absence of further surveying, the eastern pygmy-possum should also be assumed present and included as a species to be offset.
- Further development of the Biodiversity Offset Strategy (BOS) is required to demonstrate that required offsetting, after all avoidance measures have been applied, can be achieved. Further clarification regarding some species not identified to be offset as described at Attachment A must also be addressed.

1.1 **Background**

1.1.1 *Legislative Context*

The SEARs for the project were issued in June 2017, and as such is considered a “transitional” project in accordance with the *Biodiversity Conservation (Savings & Transitional) Regulation 2017*. Transitional projects with assessment requirements issued before August 2017 can utilise the “former planning provisions” in place before the *Biodiversity Conservation Act 2016* (BC Act). The appropriate methodology to assess biodiversity impacts for this project is the NSW Framework for Biodiversity Assessment (FBA). Biodiversity offsets for the project will be required in accordance with the NSW Biodiversity Offsets Policy for Major Projects (the Offsets Policy)(2014) and the FBA, which underpins the Offsets Policy.

The site and more broadly the Wollondilly LGA is in the area to which the Western District City Plan (2018) applies. The District Plan maps the vegetation on site as being within the Biodiversity Investment Opportunities (Cumberland Subregion) layer. Planning Priority W14 (Action 72a) states that biodiversity should be protected and enhanced by “supporting landscape-scale biodiversity conservation and the restoration of bushland corridors”.

1.1.2 *Proposal impact*

The Biodiversity Assessment Report (BAR) for the proposed Tahmoor South Project states that the development will have direct impacts on biodiversity, including the clearing of 43.4 hectares of Shale Sandstone Transition Forest (SSTF) Critically Endangered Ecological Community (CEEC), a further 5.7 hectares of non-threatened vegetation, removal of 100 individuals of the endangered species *Persoonia*

bargosensis and removal of 2324 individuals of the vulnerable species *Grevillea parviflora* subsp. *parviflora*. The development would also impact directly on 49.1 ha of koala habitat.

The site contains habitat for numerous threatened fauna species, 12 of which were recorded in the study area or immediately adjacent. These include the Glossy black-cockatoo, Little eagle, Powerful owl, Scarlet robin, Sooty owl, Varied sitella, Eastern bent wing bat, Eastern free-tail bat, Large footed myotis, Eastern cave bat, Eastern false pipistrelle and Red-crowned toadlet. A total of 34 threatened and migratory fauna have been attributed a moderate or higher likelihood of occurrence within the study area.

The BAR found the development would have a significant impact on the following Matters of National Environmental Significance (MNES) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act):

- Shale Sandstone Transition Forest (SSTF) CEEC
- *Persoonia bargoensis*

Impacts for the broader study area (the 20mm subsidence zone) were also assessed and described in the BAR.

1.2 Review of impact assessment

1.2.1 Avoidance of impacts

The site's biodiversity values are well documented in the BAR and considered to be high, given the quantum of critically endangered native vegetation and known site values as threatened species habitat. In February 2019, OEH undertook a site inspection of the two reject emplacement areas (REAs) where most of the clearing is to take place and concur with these findings.

The NSW Biodiversity Offsets Policy for Major Projects and FBA requires that before offsets are considered, impacts must first be avoided, with avoidable impacts minimised through mitigation measures, and only then offsets considered for residual impacts. We acknowledge that the proponent has taken certain steps to avoid and minimise biodiversity impacts, as addressed in the BAR, the EIS and the reject disposal options study (Appendix U).

However, there is limited discussion about alternative locations that were investigated, such as the area to the north of REA 2 which does not contain the SSTF CEEC. Although briefly mentioned in the EIS, the extent to which mitigating factors such as noise, dust and light spill to residential properties to the north have informed the REA expansion proposal warrants further examination to re-orientate the proposed REA. The preferred option for surface disposal (expanded REA) as opposed to co-disposal (underground disposal as paste and surface REA) has also not been addressed in terms of biodiversity constraints of the site. It is noted that co-disposal would reduce impacts on vegetation in comparison to the proposed surface disposal option.

Undergrounding of reject material as paste was discounted in the options report on the basis of technical complexity. However, we note that the analysis dates from 2013 and since this time, undergrounding 20% of reject material has been successfully implemented at another longwall coal mine in the Southern Coalfields. This may suggest an improved feasibility for undergrounding reject material since the options study was completed. Furthermore, other alternate options such as material reuse or off-site disposal have not been addressed in terms of biodiversity constraints. DPE should revisit and appraise the cost feasibility of alternate disposal options that may result in reduced impacts on vegetation.

As such, we recommend that alternatives be further considered with regard to biodiversity constraints, particularly given:

- the extent of impact proposed by way of CEEC clearing

- the impact is for reject or waste emplacement, a purpose secondary to coal extraction itself
- advancements in undergrounding of rejects disposal since the options study was completed

This concern has also been raised with the proponent prior to EIS lodgement. An option discussed was to re-orientate the REA slightly to avoid impacting upon a small linear track area to the east that had considerable biodiversity significance. A limiting factor to re-orienting the REA and to reduce direct impacts to SSTF CEEC was the existing consent conditions about noise, dust and light-spill on nearby landowners. Consideration could be given to reviewing and possibly fine-tune such conditions to re-orientate the REA to the north and retain areas of higher biodiversity significance.

1.2.2 Hollow-bearing trees and further loss

Hollow-bearing trees are a key habitat feature for a variety of threatened and non-threatened species. Removal of these trees is difficult to mitigate given the time it takes for hollows to form and so therefore it is preferable that impacts on hollow-bearing trees are avoided and/or minimised.

Given the large number of hollow dependent threatened fauna species which occur, or have potential to occur in the area, we recommend that a comprehensive assessment of hollow-bearing trees in all areas proposed to be impacted be undertaken. This assessment could be used to quantify impacts to potentially occurring hollow dependent threatened species and to determine high habitat value site constraints, so that further avoidance may be considered.

Section 6.5.1 of the FBA requires species credit species which cannot withstand further loss to be identified in the BAR. *Persoonia bargoensis* and *Grevillea parviflora* are both species which are listed as not able to withstand further loss within the NSW Threatened Species Profile Database, however this has not been addressed in the BAR. This further underlines the rationale for avoidance and as such, we recommend this matter be considered further for this project (ie re-orientation potential for the REA).

1.2.3 Impacts for Further Consideration

Section 9.2 of the FBA states that certain impacts require further consideration by the consent authority.

Impacts for Further Consideration (IFFC) for the SSTF are considered on page 112 of the BAR. This assessment found that 5% of the mapped occurrence of SSTF will be cleared, stating that this patch is “quite large in comparison to other ground truthed patches of the community in the locality”. The assessment states that “given SSTF is listed as Critically Endangered, all areas containing this community are important, particularly larger patches”. Some fragmentation of the vegetation community is expected from clearing both REAs.

In addition to the above, this vegetation type provides habitat for a large number of potentially occurring threatened species including the Koala. The importance of this vegetation for hollow dependent microbats, bird and mammal species is unknown as an assessment of hollow bearing trees has not been provided.

IFFC for *Persoonia bargoensis* are also considered in the BAR, which identifies that the proposed development will remove approximately 14% of the known population. The report states that despite this, the population is likely to remain viable, however there is no clear description what the local population comprises, and how this was determined. If impacts are uncertain, the Precautionary Principle should be considered. Further avoidance of impacts on this species should also be considered.

Detailed discussion on threats to the species, such as response to fire, disease etc and quantification of indirect impacts on adjoining land is also required. The assessment does not adequately address how the proposed offsets will contribute to the recovery of the species in the IBRA region. The existing area of habitat available for the *Persoonia bargoensis* may be overstated, as not all the areas described contain the species. For example, suitable habitat occurs in REA 1, however no *Persoonia bargoensis* were recorded in that area.

1.2.4 Subsidence impacts

The FBA does not prescribe assessment of direct impacts of a project that are not associated with the clearing of native vegetation, including subsidence and cliff falls associated with mining developments. Separate assessment of these impacts not covered by the FBA may be required if incorporated in the SEARs. The SEARs state that the EIS must address subsidence, including impacts on the natural environment.

Although subsidence-related impacts upon biodiversity are generally addressed in the BAR in accordance with the SEARs requirements, it is noted that not all private properties having flora and fauna potentially impacted by subsidence were inspected. The BAR states that a Biodiversity and Subsidence Management Plan with active monitoring will be implemented to reduce impacts on biodiversity. Further detail on how this will be achieved, and adaptive management strategies will need to be elaborated in the Plan. In preparing these post-approval plans, reference could also be made to the monitoring protocols under the Addendum to NSW Biodiversity Offsets Policy (Swamp Offsets Policy).

1.2.5 Adequacy of threatened species survey and assessment

Our review of the threatened species survey and assessment in the BAR focused on species credit entities. In general, survey effort and assessment were considered adequate unless otherwise mentioned in these comments. We also offer the following additional comments on threatened species survey and assessment.

i. Koala habitat & movement corridor

The Biobanking Credit Calculator and the BAR state that the area to be cleared contains 43.4 hectares of Koala habitat, however koalas are expected to utilise all vegetation types within this area. The area of impact for koalas should therefore be amended to 49.10 hectares in both the BAR and the Credit Calculator.

In addition to the removal of high-quality habitat, the proposal will impact on a primary movement corridor for the koala (see Figure 1; OEH 2019). All 49.1 ha of koala habitat is within a major regional koala link. The locality is also at the nexus of three primary koala linkages, the Bargo Corridor, Tree Hollow Corridor and Dog Trap Corridor, as mapped by OEH. These corridors are critical north-south and east-west links for the expanding koala population of south-west Sydney. The vegetation communities proposed for removal are higher fertility woodlands which are considered the most important vegetation types in the region for koalas.

While the survey conducted in the BAR found no evidence of koalas, their presence has been assumed and an offset derived accordingly on the basis of the site being suitable habitat for the species. A site visit by OEH officers in February 2019 confirmed this to be the case, as known koala feed trees were located at every site visited. Koala scratches on Grey Gum (*Eucalyptus punctata*) were observed at multiple sites, including three separate locations within the primary impact area. Some trees showed evidence of use by koalas over many years.

Scratches on Grey Gum were also observed in Dog Trap Creek and it is expected that koalas use the entirety of the site. Koalas are notoriously difficult to locate in the vegetation types on site, and nearby (Wilton/Appin) GPS tracking shows that koalas have home ranges of between 20-100ha (OEH unpublished data), meaning that a koala is more often than not absent from any particular point within its home range and importance needs to be inferred. As such, we are supportive of the decision to assume the site is koala habitat. However, the impact on local as well as regional koala connectivity needs to be further addressed.

ii. Eastern Pygmy-possum

A record for the eastern pygmy-possum exists approximately 3km west of REA 2. Habitat modelling undertaken across the region (DECC 2007) predicted this area to be moderate-good habitat for the eastern

pygmy-possum and suitable habitat occurs on site. Survey effort for this species relied mostly on infra-red camera traps. Nest tubes and pit fall trapping generally results in better success for detecting this species, and these were not used in fauna surveys for the proposed development. The eastern pygmy-possum can be a difficult species to detect regardless of the survey method used and given the proximity of the previous record and suitability of the habitat, we recommend that the species be assumed present and included as a species to be offset.

iii. Large-eared Pied Bat

The large-eared pied bat is expected to roost in the sandstone overhangs within the subsidence zone and forage in the higher fertility woodlands of the surface impact area. This species requires both suitable foraging and roosting habitat to persist in an area. Section 7.5.2 of the BAR states that the proposal will not impact on important foraging habitat. We are of the view there will be an impact.

Also, large-eared pied bats generally roost in cracks and overhangs in Sydney Sandstone rather than the dome shaped caves as noted in the report. It is entirely possible that 20mm of subsidence could impact on the roosting habitat of this species by collapsing fissures or overhangs. Although not required by the FBA, we recommend offsets be considered for this species particularly given the potential impacts of subsidence and its listing under both Commonwealth and State legislation.

iv. *Pomaderris brunnea*

Figure 11.7 of the EIS shows numerous records for *Pomaderris brunnea* within the area to be cleared for REA 1, despite Table 11.35 stating that there will be no direct clearance of *Pomaderris brunnea* habitat. This needs to be clarified. If *Pomaderris brunnea* is to be impacted, an offset will be required in accordance with the FBA and the EPBC Act as *Pomaderris brunnea* is listed as "vulnerable" under that Act.

1.2.5 Matters of National Environmental Significance (MNES)

OEH has undertaken an assessment of EPBC listed threatened entities in accordance with the Bilateral Agreement between the Commonwealth and State governments. Outcomes of this assessment are consistent with the FBA assessment, except where otherwise noted above. Commonwealth offsetting requirements are addressed below.

1.3 Offsetting

The Biodiversity Offset Strategy (BOS) as detailed at Chapter 11 of the BAR in accordance with the FBA and the Offsets Policy provides a preliminary assessment of several potential offset sites, including credits generated for these sites. Table 47 in the BAR describes the following credit shortfalls for threatened entities:

- Shale Sandstone Transition Forest (1847)
- Red Bloodwood - Grey Gum woodland (40)
- *Persoonia bargoensis* (5953)
- Cumberland Plain land snail (6) (based on the proposed offset sites).

The large number of credits still required for Commonwealth listed entities (ie large credit shortfalls for SSTF and *Persoonia bargoensis*) is of considerable concern and further certainty that these credits can be sourced should be required.

Several of the proposed offset sites are covered by a current mining lease, and therefore would require steps to remove the mining lease over the portion containing the future offset site to give certainty to in perpetuity conservation outcomes. The BAR does not provide certainty this will occur. Confirmation that these lots will be available as offset sites is required particularly given the credit shortfalls described above. If consent is granted for the project, the BOS will require further development and conditioned

accordingly. Timing for development of the final BOS is crucial to achieving appropriate offset outcomes and we recommend that the BOS be developed in consultation with, and to the satisfaction of, OEH. We remain available to discuss appropriate conditions of consent in this regard.

We are also supportive in principle of the final offset strategy using a staged approach, as suggested in the BAR. However, credit retirement is preferred over a maximum of three stages, commensurate to key milestones and offset outcomes, rather than more complex multi-staged offsetting as currently indicated. Staging of offsets and credit retirement will require further development in consultation with OEH as the project assessment progresses.

If the staged approach is not pursued, credits are to be retired prior to the commensurate impact occurring. This can be addressed by condition of consent should approval be granted. If this is not possible, then as per the Offsets Policy, a voluntary planning agreement is required to ensure that credits are retired as soon as practical following impacts occurring. Particular attention should be given to achieving strategic conservation outcomes for the threatened entities being offset.

We note that the following threatened entities will be offset:

Plant Community Types (PCTs):

- Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin
- Red Bloodwood – Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin

Threatened plants:

- *Persoonia bargoensis*
- *Grevillea parviflora subsp. parviflora*

Threatened fauna:

- Large-footed myotis
- Koala

Clarification of whether the Red-crowned toadlet and the Cumberland land snail are to be offset is required as impacts on these species are expected, and the BAR and EIS do not address these species consistently. For example, Page 11-144 of the EIS states that no offset is required for the Red-crowned toadlet despite the credit report stating that 2.4 ha will be impacted. Similarly, 0.5 ha of habitat for the Cumberland land snail will be impacted, requiring 6 credits (Table 47 of the BAR) however this species is not described as requiring an offset in the Executive Summary or elsewhere in the BAR. Any species to be impacted must be offset in accordance with the FBA.

All Commonwealth listed species will require “like-for-like” offsetting in accordance with the Bilateral Agreement for offsetting between the NSW and Commonwealth governments. Payment to the Biodiversity Conservation Fund is not an available option for these Commonwealth listed species. Hence, the need to provide further certainty in the BOS that such credit offsets can be sourced.

We note that some vegetation plots have been carried out in proposed offset sites (BAR, page 138). It should be noted that all future vegetation plots in offset areas should be done in accordance with the Biodiversity Assessment Method (BAM), using the BAM Calculator to derive credit values. Plots done using the BBAM will need to be updated to include all BAM requirements. This is required to develop Biodiversity Stewardship Agreements at offset sites, as new Biobanking Agreement applications are no longer being considered by OEH.

It should be noted that all offset sites will require targeted survey for species credit species to confirm the species is present at that particular offset site. Presence cannot be assumed for Biodiversity Stewardship sites as per Section 6.5.1.9 of the FBA.

1.4 Other post-approval & administrative matters

Should the project be approved, a "Biodiversity Management Plan" which addresses additional environmental management requirements should be prepared in consultation with relevant NSW agencies including OEH. This Plan should include a monitoring component for indirect impacts, and potential impacts on biodiversity resulting from subsidence (as addressed in the BAR). Adaptive management of any indirect or subsidence related impacts should also be included.

We have reviewed the data within the Biobanking Credit Calculator and determined that there are several minor issues with the data which need to be resolved to ensure that credit calculations are accurate. We will provide this feedback directly to the Proponent and we recommend that these issues be resolved prior to the Response to Submissions.

References:

- DECC (2007) Terrestrial Vertebrate Fauna of the Greater Southern Sydney Region, Vol 2. NSW Department of Environment and Climate Change, Hurstville. <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/terrestrial-vertebrate-fauna-greater-southern-sydney-region-pest-species-vol-02-070471.pdf>
- OEH (2019) Koala Corridors in the Macarthur and Wollondilly Regions. Unpublished report by the Office of Environment and Heritage, Hurstville.

2. Aboriginal Cultural Heritage

Summary of Recommendations:

- Although the proposed longwall layout has largely avoided direct undermining of significant rock shelter artworks along Dog Trap Creek, further assessment of proposed subsidence, hydrology changes, vibration and dust to protect these significant sites should be undertaken. We recommend that the Extent of Longwalls boundary in this area be reconsidered, and that Longwalls 101 and 103 be reduced to provide increased protection to the Dog Trap Creek site complex.
- We recommend that the proposed archaeological test excavations for surface infrastructure be undertaken prior to approval. The Heritage Management Plan should also be prepared as soon as possible, ideally prior to project approval, in consultation with the Aboriginal community.

2.1 Introduction

We support avoiding impacts to Aboriginal heritage wherever possible (AECOM 2018, p.11-174) and especially to the Dog Trap Creek site complex (Niche 2018). We appreciate that the applicant has reduced some longwalls to avoid the Dog Trap Creek sites. However, we have concerns regarding the staging of test excavation and Heritage Management Plan after project approval.

We have attached more detailed comments and recommendations to improve the Aboriginal cultural heritage assessment. These comments relate to the subsidence impacts, indirect impacts from changed hydrological patterns, vibration and dust, addressing comments from the Aboriginal community and preparing appropriate management strategies.

The assessment appears to have complied with OEH guidelines, including the Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW and the Aboriginal Community Consultation Requirements for Proponents 2010 as required under the SEARs.

As this project is being assessed as State Significant Development, we understand that the requirement for an Aboriginal Heritage Impact Permit (AHIP) under Section 90 of the National Parks and Wildlife Act is switched off. Therefore, heritage impacts are to be addressed and managed throughout the life of the development by way of a Heritage Management Plan.

2.2 Aboriginal cultural heritage recommendations

Item	OEH Recommendation
Archaeological assessment	<ul style="list-style-type: none"> • Conduct archaeological test excavation before project approval (Niche 2018, p.95). • Provide a map of the survey transects in relation to the proposed longwalls and surface infrastructure. • Incorporate the site recorded by OEH into the EIS. Develop appropriate management recommendations in consultation with the RAPs. • Ensure all ancillary impact areas have been included in an Aboriginal heritage assessment.
Aboriginal community consultation	<ul style="list-style-type: none"> • Address outstanding comments from the Aboriginal community consultation process (detailed below).
Impact assessment	<ul style="list-style-type: none"> • Clarify why sites 52-2-3968 and 52-2-4194 that are located above longwalls are considered to have no risk of impact (see Figure 9, Niche 2018). • Assess the impact of changed hydrological patterns on water levels in Dog Trap Creek and the Aboriginal heritage values. • Clarify the risk of harm to open artefact scatters and isolated artefacts through subsidence and remediation. • Assess whether dust and vibration are likely to damage Aboriginal heritage sites, including the Dog Trap Creek site complex. • Assess the impact on the Dreaming site.
Heritage Management Plan (HMP)	<ul style="list-style-type: none"> • Prepare the HMP in consultation with the Aboriginal community. • If an adaptive management approach is adopted, it should be included in the HMP. • Explain which sites will be monitored under the HMP. • Develop appropriate management measures for remediation work. • Consider impacts to the Dog Trap Creek site complex from adjacent residential properties. • Provide a draft HMP to OEH for comment.
Mitigation measures	<ul style="list-style-type: none"> • Reduce the Extent of Longwalls boundary so that it excludes the Dog Trap Creek site complex. • Reduce Longwalls 101 and 103 to provide increased protection to the Dog Trap Creek site complex.
Minor administrative issues	<ul style="list-style-type: none"> • Correct minor typographical errors, discrepancies in the ACHAR and EIS to the number of recorded sites and ensure AHIMS site cards are submitted for recently recorded sites and AHIMS numbers are used in reporting. • Our office can be contacted directly for a detailed breakdown of suggested corrections.

2.3 Detailed Aboriginal cultural heritage comments

2.3.1 Test excavation and preparation of the management plan should occur before project approval

We are concerned that test excavation and preparing the Heritage Management Plan (HMP) are proposed as post-approval works. The decision maker is better informed about the extent of impacts to Aboriginal heritage if test excavation occurs before approval. Similarly, required management actions are best negotiated pre-approval. Test excavation is required before the HMP is finalised.

2.3.2 Some Aboriginal community consultation comments have not been addressed

Niche (2018) consulted with the Aboriginal community by following the Aboriginal Community Consultation Requirements for Proponents 2010 in accordance with the 2017 SEARs. Comments from the Registered Aboriginal Parties (RAPs) have been received between 2014 and 2018. The comments emphasised the overarching Aboriginal cultural heritage significance of the subject area and provided specific management recommendations.

The majority of these comments have been addressed by Niche (2018). However, we recommend that the applicant address:

- Whether all areas of surface impact have been surveyed (Cubbitch Barta Native Title Claimants).
- Which sites are proposed to be included in the HMP (Cubbitch Barta 2014).
- The comments provided by Duncan Falk Consultancy (19 September 2017).
- Historical Indigenous Research comment that some of the art along Dog Trap Creek indicates 'men's business sites' (Niche 2018, p.71).
- Whether the scarred tree was relocated during the Niche assessment (2018, p.71).

2.3.3 Aboriginal heritage sites occur across the subject area, with a cluster at Dog Trap Creek

A high proportion of the recorded sites occur at Dog Trap Creek (Niche 2018, p.35). Niche report that there are no similar concentrations of sites in the surrounding area, which increases the archaeological significance. The site complex includes rock art, shelters and artefact scatters. Across the broader study area, a rich and diverse range of sites was recorded, including rock shelters, art sites, axe grinding grooves, artefact scatters, a scarred tree and a Dreaming story.

2.3.4 OEH recorded an Aboriginal object during a site visit

During the OEH site visit on 14 February 2019, a previously unrecorded Aboriginal heritage site was identified. We recommend that this site is incorporated into the EIS. Any necessary management measures should be determined in consultation with the RAPs.

2.3.5 We request some additional detail on the archaeological assessment

A map showing the survey transects from the combined field surveys in relation to the proposed surface infrastructure and long walls is required. It is concerning that infrastructure such as transmission lines and gas pipelines is identified as potentially requiring Aboriginal heritage survey and assessment (AECOM 2018, p.11-174). Comprehensive assessment before project approval is required so that the extent of the harm is understood to assist appropriate management.

A methodology for the proposed test excavation at TSC 2 ventilation shaft and fan site is required (Niche 2018, p.95). We recommend that the test excavation occur before project approval. At present, there is no information about the archaeological deposit at the proposed test excavation locations.

2.3.6 Impacts to Aboriginal heritage are likely to occur

The EIS (AECOM 2018, p.11-286) shows impact to Aboriginal cultural heritage as having a 'moderate' level of harm after mitigations. Impact to Aboriginal objects through mining is often direct, permanent and irreversible. This does not reflect the provided definition of moderate impacts as 'short term to medium duration' (AECOM 2018, p.11-274).

The conclusion that the Dreaming site will have no loss of value is not discussed. The proposed changes to the landscape and potential changes to hydrology may impact the cultural landscape connected to these site values. The applicant should provide further justification for this conclusion (Niche 2018, p.88).

Clarification of why sites 52-2-3968 and 52-2-4194 are considered to have no impact given the location above longwalls is required (see Figure 9, Niche 2018).

We have provided additional comment below on subsidence impact to different site types.

2.3.7 Subsidence is a key factor likely to harm Aboriginal cultural heritage

Dog Trap Creek site complex

We support the proposal to reduce longwalls 102 and 103 so that sites at Dog Trap Creek that have high Aboriginal cultural heritage significance will not be undermined (Niche 2018, p.77).

An improved Aboriginal heritage outcome could be achieved by further reducing longwalls 101 and 103. This would remove longwall mining under sites and the northern and southern ends of the Dog Trap Creek site complex (52-2-1520, 52-2-1521, 52-2-1533 and 52-2-1534).

Despite reducing the longwalls, Niche (2018, p.76) and MSEC (2018) explain that risks from subsidence remain. Niche (2018, p.76) overall assesses this risk as low. However, the predicted maximum movements could harm the Aboriginal heritage sites. The Dog Trap Creek site complex is predicted to have a maximum upsidence of 325mm and valley closure of 400mm (MSEC 2018, p.169). These predictions are higher for Tributary 1, Dog Trap Creek, that contains a rockshelter with art (although this site has been assessed as having low archaeological significance).

If the adaptive management approach suggested (AECOM 2018, p.11-27 and MSEC 2018, p.173) is adopted, this must be incorporated into the management plan. However, it would be preferable to take a precautionary approach and reduce the length of Longwall 103 rather than risk this damage occurring to the rock art.

We recommend the Extent of Longwalls boundary is revised so that the Dog Trap Creek Site complex is outside the permissible area of the longwalls. Figure 10.1 of the MSEC (2018, p.172) report and Figure 11 in the ACHAR (Niche 2018) show these sites inside the Extent of Longwalls boundary. This will provide more effective and enforceable protection for the Dog Trap Creek site complex.

The impact of changed hydrological patterns on the water levels at Dog Trap Creek has not been considered. This may impact the intangible Aboriginal cultural heritage values. The modelled baseflow reductions are highest at Dog Trap Creek (AECOM 2018, pp.11-105 and 11-78).

We are also mindful about indirect impacts on this site as a result of the existing adjoining residential lots and in the context of the broader urban expansion into the Tahmoor area. We suggest this is considered in the HMP generally.

Open artefact scatters and isolated artefacts

We are concerned that subsidence is not considered harm to stone artefacts (Niche 2018, p.41; MSEC 2018, p.169 and reflected in AECOM 2018, p.11-170). The language of 'less susceptible' used elsewhere in the ACHAR (Niche 2018, p. 75) is more appropriate. The MSEC report fails to consider the impact of cracking on the archaeological context of the artefacts, and only considers harm to the actual stone artefact. Further analysis of the risk of subsidence to the open archaeological sites is required.

We agree that remediation of longwall subsidence also has potential to harm Aboriginal objects on the surface (Niche 2018, p.74). Appropriate management and mitigation measures are required.

Scarred tree (site 52-2-1530)

Subsidence impacts to the scarred tree (site 52-2-1530) are assessed as low (MSEC 2018, p.169). However, we also request clarification of the impact that changes to water hydrology is likely to have on the scarred tree.

Grinding grooves

We appreciate the discussion provided by Niche (2018, p.75) and MSEC (2018, p.170) that potential mitigation measures for grinding groove sites can also cause harm. The RAPs must be consulted about these management options. A staged monitoring program could be developed through the HMP that allows cutting only if cracking is identified.

2.3.8 Dust and vibration

We recommend impacts from dust and vibration are considered in the impact assessment (Niche 2018). There is no assessment of the risk of dust damaging art panels, nor of vibrations damaging shelters and grinding groove sites (Niche 2018, chapter 13 and EMM 2018).

2.3.9 Proposed mitigations

We support the proposed Heritage Management Plan (Niche 2018, pp.95-96 and AECOM 2018, p.11-175). The HMP should be prepared as soon as possible, ideally before project approval. The HMP must be prepared in consultation with the RAPs, and we request that the draft is referred to OEH for comment before being adopted.

In addition to the Niche (2018, pp.95-96) recommendations we suggest the HMP also includes:

- Monitoring methodology that includes the triggers for reducing longwalls as described in the EIS (AECOM 2018, p.11-176).
- Detailed archaeological test excavation and salvage excavation methodology as required.
- Detail of the long term management of Aboriginal objects recovered through test excavation.
- Methodology for community collection of surface artefacts if required.
- Process for reassessment if the longwall design or surface impact footprint changes.
- Aboriginal heritage management requirements for the remediation of the mine site.
- Considerations for protecting the Dog Trap Creek site complex from impacts from adjacent residential properties.
- Controls for goats, noting comments by Niche (2018, p.65) of goats damaging artwork.
- Procedure for updating AHIMS site cards throughout the project.

2.3.10 Additional impact areas

The applicant must ensure that any ancillary impact areas such as temporary vehicle tracks, service installations, stockpile locations and lay down areas have been appropriately assessed for Aboriginal cultural heritage impacts in accordance with OEH guidelines.

2.3.11 AHIMS site cards must be updated and AHIMS site numbers used in reporting

AHIMS site cards must be submitted and updated for all sites recorded as part of this assessment. The appendix of site recordings (Niche 2018 Appendix and Figure 9), EIS (AECOM 2018, p.11-174) require updated AHIMS numbers for recently recorded sites.

References

- Niche Environment and Heritage. 2018. Aboriginal Cultural Heritage Assessment: Tahmoor South Project – Regulator Document. Report to Tahmoor Coal Pty Ltd, dated 19 November 2018.
- AECOM Australia Pty Ltd. 2018. Tahmoor South Project Environmental Impact Statement. Report to Tahmoor Coal Pty Ltd, dated 21 December 2018.

3. Water & Subsidence Impacts

Summary of Recommendations:

- It is highly likely that 3rd order streams and tributaries either directly undermined or within close proximity of the proposed new workings, including Dog Trap Creek and Teatree Hollow, will be impacted as a result of the proposed longwall layout. Consideration should be given to further reducing longwall lengths 101, 103 and 104 and redesigning Longwall 109 in this location to further avoid impacts on 3rd order and above streams.
- The impacts of mine wastewater discharge into the Bargo River from the expanded project layout, such as increased salinity and toxicity of discharge, requires further assessment. Successful remediation options to repair damage and consequences of previous mining operations have also not been addressed.

3.1 Comments

OEH has undertaken a detailed review of the project's water and subsidence impacts. This review can be made available upon request and is summarised below. The key issues arising from this review are as follows:

- Scale of proposed longwall mine layout for Tahmoor South
- High level of likely/predicted impacts to 3rd order streams
- Lack of evidence of successful Remediation Options to Repair Damage to 3rd order streams
- Potential Impacts to Thirlmere Lakes National Park World Heritage Area
- Mine water discharges high in salt and a range of other contaminants into the Bargo River
- Inadequate presentation, description and assessment of the level of impact and consequence from previous Tahmoor Longwall Mining Operations

3.1.1 Proposed mine layout & likely/predicted impacts to 3rd order streams

The depths of cover and width-to-depth ratios for the Tahmoor South mine proposal are quite similar to those for Dendrobium Mine. The subsidence report lacks any detailed discussion of Dendrobium or its impacts to swamps, streams, aquifers, water loss and connective fracturing.

The avoidance of comparisons with the Dendrobium mine in the Subsidence Assessment (and other specialist reports), despite its similar width-to-depth ratios, is concerning considering the major impacts that have recently occurred over Dendrobium Mine. Given the similarity in longwall layouts and depth of cover

there is a potential risk of surface to seam connective fracturing above the mine. If this occurs, surface water and groundwater could drain into the mine.

Third order and above streams under the Strahler characterisation are considered to be highly significant features in the landscape, since they are likely to be permanent streams providing a wide range of environmental and social values, including important habitat for threatened and endangered species. All creeks within the Project Area have been mapped as 'key fish habitat'.

Significant environmental impacts (direct and indirect) on 'key fish habitat' are to have habitat rehabilitated or offset by environmental compensation. Rehabilitation is very uncertain and the cumulative loss of 3rd order streams in the Southern Coalfields is emerging as a serious issue which compromises the environmental and social values of many of these streams (often in perpetuity). The cumulative loss of tributary flows to the Upper Nepean river is also of growing concern.

It is highly likely that Dog Trap Creek (3rd order stream), Teatree Hollow (3rd order stream) and a number of 1st and 2nd order tributaries will be fractured and drained for their entire length above the longwalls. Much of the land surrounding Dog Trap Creek is Crown land, extensively covered by native vegetation. The riparian corridor is in very good condition and various recreational trails exist within the Crown land corridor.

Approximately 70% of mapped pools in Dog Trap Creek will experience upsidence $\geq 100\text{mm}$ and valley closure $\geq 200\text{mm}$ and are therefore likely to be fractured and drained. There are also an extensive number of Aboriginal cultural heritage sites located in the upper drainage lines of Dog Trap Cree, as discussed in detail at Section 2 above.

3.1.2 Remediation options for 3rd order streams

A large number of Remediation Plans are currently being developed for streams affected by mining in the Southern Coalfields, however, they usually lack any objective measures to assess the success of any remediation applied. In all cases, it is highly uncertain that remediation will be a success or that flows and pool holding capacities will be restored. There is no objective scientific or peer-reviewed evidence that impacted areas above longwall mining operations have self-remediated as suggested in the EIS.

Under such circumstances, avoidance is the only effective solution to maintaining the social and environmental values of 3rd order and above streams as highly significant features in the landscape. Given the high environmental and associated social/cultural values of Dog Trap Creek in particular, it is recommended that LW101, LW104 & LW103 are reduced to avoid directly under the 3rd order sections of Dog Trap Creek or within its angle of draw. Consideration should also be given to redesigning LW109 so as not to impact the 3rd order sections of Dog Trap Creek.

3.1.3 Potential Impacts to Thirlmere Lakes National Park World Heritage Area

The Tahmoor South EIS is predicting there will be an impact on the Thirlmere Lakes National Park World Heritage Area as a result of the proposed mine expansion. Predicted impacts are a decrease in the Lakes' average water levels of 0.01-0.06m over the life of the project. We note that the Thirlmere Lakes Research Program being led by OEH, which aims to investigate the sensitivity of the Lakes to external influences including mining activity over a four year period, is currently ongoing.

3.1.4 Mine water discharges into Bargo River

Tahmoor Colliery currently discharges waste mine water to Teatree Hollow, a tributary of the Bargo River, under EPL 1389. The quality of the discharge is however poor and represents a significant point source of pollution to the Bargo River. This discharge dominates flow in the Bargo River; potentially due in large part to the fracturing and water diversions from previous mining underneath the Bargo River. Relative to other sites, the LDP1 discharge is high in levels of bicarbonate alkalinity, sodium, calcium, magnesium, potassium, arsenic, barium, selenium and zinc.

The electrical conductivity of the discharge is also high and the pH alkaline. Many of the contaminants are being discharged at levels that exceed the ANZECC guidelines including a number of contaminants (eg bicarbonate, barium) which are not specifically included on EPL1389. Cardno Ecology Lab (2010) previously undertook a study into the effects of saline mine water discharges on freshwater biota finding the Tahmoor Colliery discharge had the greatest effect on mayflies and water fleas. Given the levels of bicarbonate in the discharge waters it is likely to be toxic to sensitive aquatic fauna. This has not been assessed or addressed in the EIS.

The increasing salinisation of Australia's freshwater streams and rivers is of significant concern. Scientific experts in this area (e.g. Cañedo-Argüelles et al 2016) have recently argued that salinity standards for specific ions and ion mixtures, not just for total salinity, should also be developed and legally enforced to protect freshwater life and ecosystem services. The salt load from the discharge has largely been ignored in the EIS but is likely to be of the order of 2000 to 3000 tonnes per annum. This is potentially 20-30 times background salt loads to the Bargo River.

The impacts from the discharge are transferred downstream into the Bargo River and for approximately 5-6km downstream until the Bargo River joins the Nepean River. If the mine expansion is approved there is a need to review EPL1389 and address issues surrounding contaminants above ANZECC guidelines, toxicity of the discharge and the amount of salt being discharged into an important freshwater river.

3.1.5 Inadequate presentation, description and assessment of the level of impact and consequence from previous Tahmoor longwall mining operations

Likely impacts of the Tahmoor South proposal can be assessed by considering the impacts associated with previous mining at Tahmoor Colliery, as well as other sites in the Southern Coalfields. Since the depth of cover at Tahmoor South is shallower than at Tahmoor North and panel widths have been increased, the risk of surface impacts are potentially increased further for the Tahmoor South longwalls. Much of the detail in the EIS appears somewhat dated (often over 4-5 years old) and does not adequately consider the more recent impacts of mining LW29-32 in the Tahmoor North area of operations.

The cumulative impacts of past longwalls at Tahmoor Colliery have had significant impacts on the Bargo River, Myrtle Creek and Redbank Creek. Mining has now drained approximately 2.8km of Redbank Creek, caused extensive iron staining and emptying of the weir pool on Redbank Creek. It is highly unlikely that these impacts will ever be successfully restored, despite the current requirement to remediate Redbank Creek.

The mine layout and depth of cover to the coal seam are very similar to Dendrobium Mine, but the impacts at Dendrobium mining operations have largely been ignored in the EIS. As such, it is likely the Tahmoor South proposal will cause similar adverse impacts to those already experienced in the Southern Coalfields. The cumulative impacts across the broader area arising from the current proposal should be carefully considered as part of the current proposal.

4. Floodplain Risk Management

Summary of Recommendations:

- We recommend that the flood assessment be updated to address flooding characteristics across the full range of flood events to satisfy OEH's suggested SEARs, rather than depicting the extent of flooding for pre and post development conditions only.

4.1 Comments

The report indicates utilising a RORB hydrologic model and a TUFLOW hydraulic model for the flood assessment. These models can provide adequate information on flooding behaviour. However, the report has only depicted the extent of flooding for pre and post development conditions, which is considered inadequate to satisfy the project's SEARs. The SEARs required the proponent to address flooding behaviour in the vicinity of the project which includes information on flood characteristics for pre and post development scenarios (i.e. extent, depth, velocity, hydraulic and hazard categories etc).

4.2 Recommendation

Accordingly, to satisfy the SEARs, it is prudent to address flooding characteristics for the full range of floods in order to:

- determine the impact of the project on flooding behaviour;
- determine the impact of flooding on the project;
- address the risk to people and infrastructure associated with various flood events;
- address the impacts on existing downstream areas for the full range of flooding.
- prepare an emergency response plan to ensure risk to personnel and damages to infrastructure during larger flood events is minimised and managed. The plan would include a flood evacuation strategy to ensure that safe evacuation from the site can be achieved.

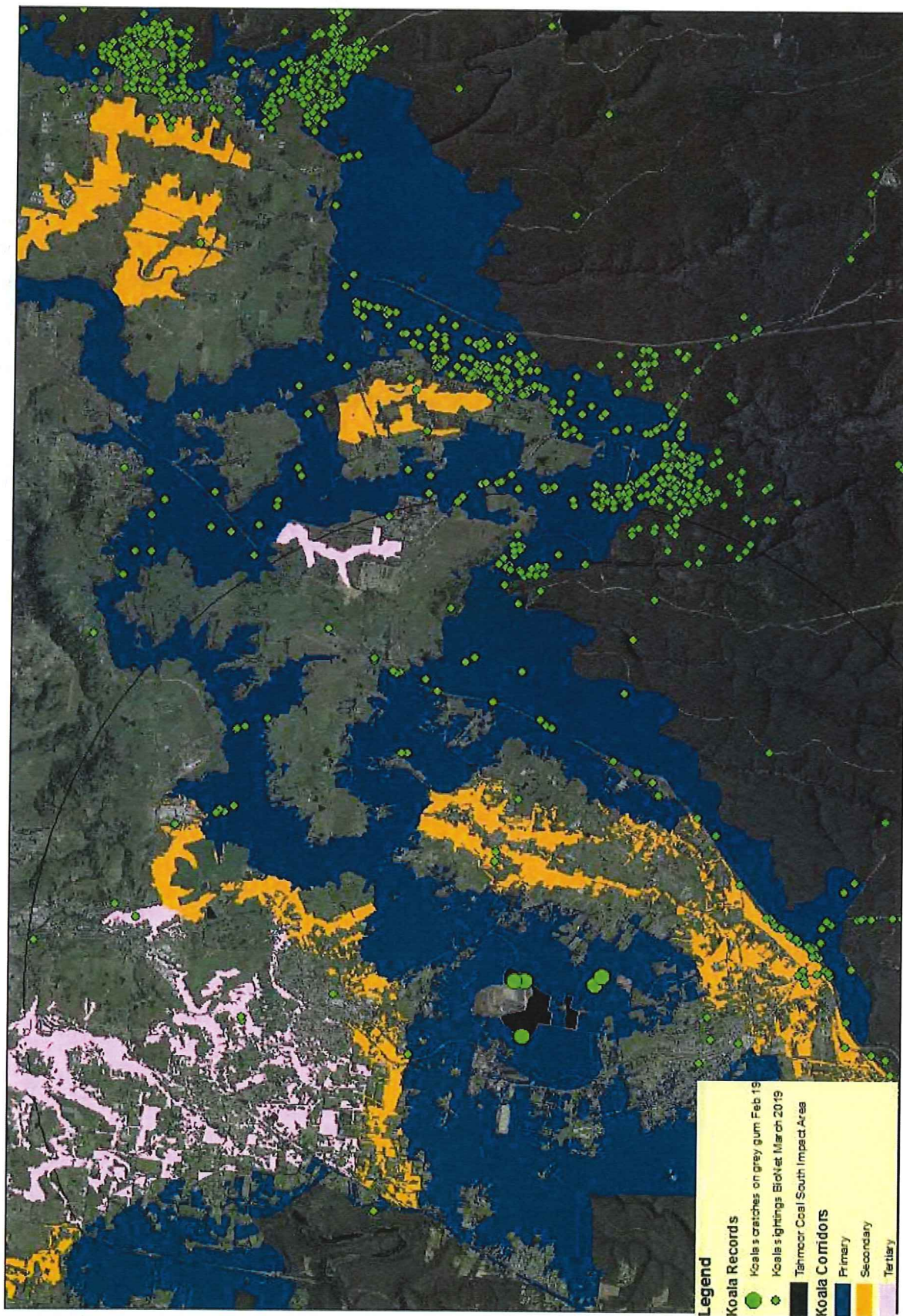


Figure 1: Koala Corridors in the region surrounding Tahmoor South