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Tahmoor South Project

Biodiversity Assessment Update

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5315	SIMEC Mining – Tahmoor Coal Pty Ltd	Luke Baker	Wollondilly LGA

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Niche Environment and Heritage Pty Ltd (ACN 137 111 721)
Enquiries should be addressed to Niche Environment and Heritage
PO Box 2443, Parramatta NSW 1750, Australia
Email: info@niche-eh.com

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1. Introduction

1.1 Background

Tahmoor Coal Pty Ltd (Tahmoor Coal) owns and operates the Tahmoor Mine, an existing underground coal mine approximately 80 kilometres (km) south-west of Sydney in the Southern Coalfields of New South Wales (NSW). The mine has been operating since 1979 when product coal was first produced.

Currently, up to three million tonnes (Mt) of run-of-mine (ROM) coal is extracted annually from the mine. Product coal is primarily transported via rail to Port Kembla Coal Terminal, or to Newcastle Port Waratah from time to time, for shipment to both Australian and international markets. Tahmoor Mine employs close to 400 people.

1.2 The Project

Mining within the existing Tahmoor North mining area is scheduled for completion by approximately 2022, depending on geological and mining conditions. Without access to a new extraction area by this time, Tahmoor Mine would commence closure of the mine resulting in cessation of the extraction of the coking coal resource. Accordingly, Tahmoor Coal is seeking approval for the Tahmoor South Project, being an extension of underground coal mining at Tahmoor Mine, to the south of Tahmoor Coal's existing mining area (the Project).

Given its significance to the State, the Project is deemed to be State significant development (SSD) under the provisions of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). Under these provisions, the NSW Minister for Planning and Public Spaces, or delegate, is the consent authority for the Project. Approval for the Project is also required from the Commonwealth Minister for the Environment under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Following the receipt of updated Secretary's Environmental Assessment Requirements (SEARs) in June 2018, a comprehensive environmental impact statement (EIS) was prepared by AECOM Australia Pty Limited (AECOM 2018) for the Project. The EIS was publicly exhibited between 23 January and 5 March 2019 by the NSW Department of Planning, Industry and Environment (DPIE). In response, 91 submissions were received from the community and community organisations, and 15 responses were received from government agencies and councils.

On 20 February 2020, a submissions report (AECOM 2020a) was lodged with DPIE which responded to all submissions made during exhibition of the EIS. At the same time (i.e. 20 February 2020) a project amendment report (AECOM 2020b) was lodged with DPIE to document amendments made to the Project in response to the submissions and to reduce potential environmental impacts of the Project.

The amendments documented in the project amendment report included, among other things, changes to the mine plan and the REA. The changes to the mine plan included the removal of a longwall in the northern part of the mine (LW109), reconfiguration of the longwall layouts to comprise two series of shorter longwall panels, the reduction of the width of the longwalls, and a reduction in the height of extraction within the longwalls. The changes to the REA included a reduction in the proposed extension area by increasing the height of the REA.

1.3 Purpose of this report

This report has been prepared by Niche Environment and Heritage Pty Ltd (Niche) to consider the current changes to the Project in relation the Biodiversity Assessment Report. This report will be used to support a second project amendment report being prepared by EMM Consulting Pty Ltd on behalf of Tahmoor Coal.

1.4 Amendments to the Project

Tahmoor Coal has made the decision to make additional changes to the Project to further reduce potential environmental impacts, particularly potential subsidence and biodiversity impacts. These amendments include:

- the removal of two longwalls in the southern part of the mine (LW107B and LW108B);
- the containment of the REA within the bounds of the currently approved disturbance footprint; and
- changes to the layout of the ventilation shafts and associated transmission line easements.

The removal of LW107B and LW108B will reduce the estimated production volume of the Project from about:

- 43 million tonnes (Mt) of ROM coal considered in the project amendment report (AECOM 2020b) to 33 Mt;
- 30 Mt of coking coal considered in AECOM 2020b to 23 Mt; and
- 2 Mt of thermal coal considered in AECOM 2020b to 1.4 Mt.

The removal of LW107B and LW108B will also lead to a reduction in the volume of rejects from about 11.6 Mt to 9.7 Mt.

With the removal of LW107B and LW108B, the life of the mining will be reduced from about 2035 as described in the project amendment report (AECOM 2020b) to about 2032 (i.e. reduction of about three years). Some surface works, rehabilitation and mine closure would be undertaken after the completion of mining activities.

The containment of the REA within the currently approved disturbance footprint will ensure that no native vegetation, particularly the Shale Sandstone Transition Forest (SSTF) threatened ecological community, will be required to be cleared for the REA. However, to accommodate the reduced footprint, the height of the REA will be increased by 10 m, from a top of reduced level (RL) 310 m that was proposed in the project amendment report (AECOM 2020b), to a top of RL 320 m.

The changes to the layout of the ventilation shafts and associated transmission line easements are aimed at reducing clearing of the SSTF during construction.

All other aspects of the Project remain the same as those documented in the project amendment report (AECOM 2020b).

2. Biodiversity Assessment

2.1 Avoidance of biodiversity values

The justification for the Project, including details associated with site selection and design, has been provided in the Niche (2020) Tahmoor South Project Biodiversity Assessment Report (BAR) and the EIS (AECOM2020a; 2020b).

Further refinement of the Project design has resulted in an overall reduction in direct and indirect impacts to biodiversity previously assessed in the BAR. The key reductions in biodiversity impacts as a result of Project refinement include the following:

REA: The area proposed for the REA has been significantly reduced to only be within the bounds of the currently approved disturbance footprint. As a result, 11.06 ha of SSTF previously proposed to be directly impacted for the REA, has been avoided.

Transmission line: The proposed transmission line has been revised to maximise the existing cleared land, road, and existing easement as much as practical. Clearing is therefore only required where vegetation encroaches on the proposed transmission line easement. These areas are shown in Figure 3.

As detailed in the mitigation section of this report (section 3) the installation of the transmission line has also been designed to avoid direct impact to threatened flora by:

- Engaging a suitability qualified ecologist to be present during clearing associated with the transmission line easement to:
    - To clearly mark the threatened plants to ensure that the contractors avoid impacts during clearing event
    - To be present during the installation of the power poles to safeguard against direct impacts to the threatened plants.
- The transmission line will require on-going maintenance, such as slashing of vegetation within the easement to a height of 2 m. Given the plants will not grow above 2 m in height, the long-term maintenance slashing is unlikely to impact the threatened plants.

As such, the number of threatened flora proposed to be impacted in the BAR has been significantly reduced.

Ventilation shaft TSC 2: The area of direct impact to native vegetation for ventilation shaft TSC 2 has been reduced by 0.67 ha. The re-design of ventilation shaft TSC 2 has retained a portion of SSTF along Charlies Point Road. This refinement has avoided direct impacts to threatened flora, including *Persoonia bargoensis* and *Grevillea parviflora* subsp. *parviflora* which occur along Charlies Point Road.

Longwall layout: Two longwalls that were proposed in the southern part of the mine (LW107B and LW108B) have been removed from the mine plan. The extent of subsidence has therefore subsequently been reduced. The potential for subsidence-related impacts have been detailed in MSEC (2020). In summary, the revised mine plan will not result in the potential for greater subsidence impacts compared to that already assessed in the BAR.

2.2 Direct and indirect impacts

The revised Project would result in an overall reduction in direct impacts, and associated indirect impacts, to native vegetation and associated habitat.

The unavoidable direct impacts to native vegetation associated with the proposed surface infrastructure are provided in Table 1 and shown on Figure 3. In total, the native vegetation to be impacted by the amended Project is 24.32 ha (including 14.22 ha of native rehabilitation), which is a 13.45 ha reduction compared to the original impact proposed.

Table 1. Project disturbance

Project element	Native vegetation disturbance (ha)	Native Rehabilitated Vegetation (ha)	Total native vegetation impacted
Disturbance to native vegetation details in BAR (January 2020)			
REA	11.06	14.20	25.26
TSC 1 Ventilation shaft site	6.05	0.00	6.05
TSC 2 Ventilation shaft site	3.47	0.00	3.47
Powerline	2.99	0.00	2.99
Total	23.57	14.20	37.77
Revised Project disturbance to native vegetation			
REA	1.42[1]	14.22	14.22
TSC 1 Ventilation shaft site	6.04	0.00	6.04
TSC 2 Ventilation shaft site	2.80	0.00	2.80
Powerline	1.26	0.00	1.26
Total	10.10	14.22	24.32

2.3 Reduced subsidence related impacts

The reduced mine plan will result in an overall decrease in the potential extent of subsidence related impacts, which has been detailed in MSEC (2020).

The reduced mine plan in comparison to that assessed in the BAR is shown on Figure 2.

The BAR provides a detailed assessment of biodiversity values that occur within natural surface features sensitive to subsidence movements, e.g. rivers, streams and cliffs.

The refinements of the mine plan will result in a decrease in the subsidence study area. As such, the assessment of subsidence impacts already detailed in the BAR, would not be exceeded.

2.4 Reduced vegetation disturbance

The BAR (Niche 2020) has detailed the process for vegetation mapping and stratification, which is consistent with the methodology proposed in the OEH (2014) Framework for Biodiversity Assessment (FBA).

The amended Project would impact on two Plant Community Types (PCTs):

[1] Located within an area associated with existing Approval (see Figure 2). Therefore, is not considered in impact calculations and offset requirement for the Project.

- Approximately 10.10 ha of PCT 1395 Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest (HN556). This PCT, which has been attributed to two vegetation classes which is reflective of historic disturbance.
- Approximately 14.22 ha of mine site rehabilitation located on the former REA, which we have assigned a 'best fit PCT - PCT 1081 Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin (HN564).

Descriptions of both PCTs are provided in the BAR.

The validated vegetation mapping in relation to the refined Project is provided in Figure 4, and the associated area per PCT has been provided in Table 2.

In comparison to the original footprint, the revised Project would:

- Reduce the direct disturbance associated with PCT 1395 Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest (HN556) by 13.47 ha.
- The area of direct disturbance to mine rehabilitation (PCT 1081 Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin (HN564)) has very slightly increased by 0.02 ha.

Table 2. Comparison of impact

Plant community type	Area (ha)						
	REA	Powerline	TSC1	TSC2	TOTAL	Previous assessment	Difference
Mine rehabilitation vegetation (best fit – PCT 1081 Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin (HN564)	14.22	0.00	0.00	0.00	14.22	14.20	+0.02
PCT 1395 Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest (HN556) Good	0.00	0.66	0.66	2.80	4.12	17.26	-13.14
PCT 1395 Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest (HN556) Derived	0.00	0.60	5.38	0.00	5.98	6.31	-0.33
Total	**14.22**	**1.26**	**6.04**	**2.80**	**24.32**	**37.77**	**13.45**

2.5 Reduced impact to threatened ecological community

PCT 1395 Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin (HN556) aligns to Shale Sandstone Transition Forest, a Critically Endangered Ecological Community (CEEC) under both the BC Act and EPBC Act. Details regarding the condition and distribution of the CEEC are provided in the BAR.

Based on the revised footprint, two condition classes of SSTF would be impacted by the Project, as shown on Figure 4 and Table 3. This is a reduction of 13.47 ha compared to the original amount proposed to be directly impacted in the BAR.

Table 3. Impact to Shale Sandstone Transition Forest

Shale Sandstone Transition Forest condition class	Area impacted in BAR (ha)	Revised impact area (ha)	Reduction (ha)
PCT 1395 Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest (HN556) Derived	6.31	5.98	0.33
PCT 1395 Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest (HN556) Good	17.26	4.12	13.14
Total	23.57	10.10	13.47

2.6 Reduced impact to threatened flora

The BAR determined that three threatened flora would be impacted by the Project: *Persoonia bargoensis, Grevillea parviflora* subsp. *parviflora* and *Pomaderris brunnea.* All three species were attributed a credit offset liability. The BAR describes the survey effort and location details of the threatened flora.

The Amended Project would result in an overall reduction in the number of plants proposed to be directly impacted in the BAR. The reduced amount compared to that assessed in the BAR is shown in Table 4, and the location of the threatened flora in reference to the revised Project is provided in Figure 5.

The reduced impact to threatened flora has been largely attributed to the following:

- Most of the threatened flora occur along the existing Charlie Point Road easement, and the existing easement to the west of ventilation shaft TSC 1. Threatened flora that occur within the vicinity of the proposed transmission line easement would no longer need to be cleared as originally proposed in the BAR (section 2.1). Given the relatively small footprint required to install the power poles, the threatened flora can be avoided from direct impacts. Furthermore, given the height of the threatened flora (less than 2 m), the threatened flora will not need to be slashed or cleared during routine maintenance of the transmission line. Mitigation measures have been provided in section 3 to avoid direct and indirect impacts to threatened flora.
- The native vegetation proposed to be cleared for ventilation shaft site TSC 2 has been reduced. As such, the threatened flora which predominately occur towards the Charlies Point Road verge would be retained.
- The REA disturbance footprint has been significantly reduced, thus no longer impacting upon threatened flora.

The mitigation measures proposed to avoid/minimise indirect impacts have been detailed in the BAR. Those measures and controls specific to threatened flora have been further provided in section 3.

Table 4. Threatened Flora Impacted by the Project.

Threatened species	No. of plants impacted	
	BAR (Niche 2020)	Revised impact
Persoonia bargoensis	8	1
Grevillea parviflora subsp. *parviflora*	491	55
Pomaderris brunnea	1	0

2.7 Reduced impacts to threatened fauna

The BAR details the consideration and distribution of threatened fauna, including fauna survey effort.

The BAR determined that five 'species credit' threatened fauna would be impacted by the Project: Large-footed Myotis, Koala, Large-eared Pied Bat, Eastern Cave Bat and Eastern Pygmy Possum. A total of 17.26 ha of habitat (referred to as the species polygon) was assigned to each of the five threatened fauna species.

The species polygon coincided with the removal of PCT 1395 Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest (HN556) Good.

Given the reduction in impact to PCT 1395, the associated species polygon for each of the five threatened fauna species has subsequently been reduced. The area of impact (species polygon) for each of the threatened fauna is therefore 4.12 ha (Table 5). The species polygon for each of the threatened has been provided in Figure 6.

The mitigation measures proposed to avoid/minimise indirect impacts have been detailed in the BAR. Those measures and controls specific to threatened fauna have been further provided in section 3.

Table 5. Threatened Fauna (species credit fauna) – Area of habitat

Threatened species	Area of habitat impacted (ha)	
	BAR (Niche 2020)	Revised offset liability
Large-footed Myotis	17.26	4.12
Koala	17.26	4.12
Large-eared Pied Bat	17.26	4.12
Eastern Cave Bat	17.26	4.12
Eastern Pygmy Possum	17.26	4.12

2.8 Reduced impacts to Matters of National Environmental Significance (MNES)

Details regarding the survey effort and likelihood of occurrence for Commonwealth threatened biodiversity are provided in the BAR.

Given the reduced impact associated with the Project, the Commonwealth Assessment of Significance that were completed as part of the BAR have been amended and included in Annex 1 of this report. A summary of the conclusions associated with each of the Assessment of Significance have been provided in Table 6.

Based on the updated assessments, we concluded that despite the reduction in disturbance associated with Project, the removal of 10.10 ha of SSTF, a CEEC under the EPBC Act, is likely to have a significant impact on the CEEC.

No other threatened biodiversity listed on the EPBC Act are likely to be significantly impacted by the Project.

Table 6. Commonwealth Assessments of significance

MNES	Impact assessed in BAR	Revised Impact	Significant impact conclusion
Shale Sandstone Transition Forest	• Direct impact to 23.57 ha • Fragmentation and edge effects of remaining patches. • Indirect impacts associated with subsidence unlikely to impact the TEC.	• Direct impact to 10.10 ha. • Fragmentation and edge effects of remaining patches. • The revised Project has reduced the amount of Shale Sandstone Transition Forest by 13.47 ha. • Indirect impacts associated with subsidence unlikely to impact the species.	Significant impact likely.
Acacia bynoeana	• No individual plants impacted by surface infrastructure.	• No individual plants impacted by surface infrastructure. • Approximately 10.10 ha of potential habitat impacted by	Significant impact is unlikely.

MNES	Impact assessed in BAR	Revised Impact	Significant impact conclusion
	• Approximately 23.57 ha of potential habitat impacted by surface infrastructure • Indirect impacts associated with subsidence unlikely to impact the species.	surface infrastructure (reduction of 13.47 ha of habitat compared to previous assessment) • Indirect impacts associated with subsidence unlikely to impact the species.	
Grevillea parviflora subsp. *parviflora*	• Total of 491 plants impacted by surface infrastructure. • Approximately 23.57 ha of potential habitat impacted by surface infrastructure • Indirect impacts associated with subsidence unlikely to impact the species.	• Fifty-five plants to be impacted by surface infrastructure. Significant reduction in direct impacts due to mitigation measures and re-design of transmission line and ventilation shaft TSC 2. • Approximately 10.10 ha of potential habitat impacted by surface infrastructure (reduction of 13.47 ha of habitat compared to previous assessment) • Indirect impacts associated with subsidence unlikely to impact the species.	Significant impact is unlikely.
Leucopogon exolasius	• No individual plants impacted by surface infrastructure. • Approximately 23.57 ha of potential habitat impacted by surface infrastructure • Indirect impacts associated with subsidence unlikely to impact the species.	• No individual plants impacted by surface infrastructure. • Approximately 10.10 ha of potential habitat impacted by surface infrastructure (reduction of 13.47 ha of habitat compared to previous assessment) • Indirect impacts associated with subsidence unlikely to impact the species.	Significant impact is unlikely.
Persoona bargoensis	• Total of eight plants impacted by surface infrastructure. • Approximately 23.57 ha of potential habitat impacted by surface infrastructure • Indirect impacts associated with subsidence unlikely to impact the species.	• One plant to be impacted by surface infrastructure. • Approximately 10.10 ha of potential habitat impacted by surface infrastructure (reduction of 13.47 ha of habitat compared to previous assessment) • Indirect impacts associated with subsidence unlikely to impact the species.	Significant impact is unlikely.
Persoonia glaucescens	• No individual plants impacted by surface infrastructure. • Approximately 23.57 ha of potential habitat impacted by surface infrastructure • Indirect impacts associated with subsidence unlikely to impact the species.	• No individual plants impacted by surface infrastructure. • Approximately 10.10 ha of potential habitat impacted by surface infrastructure (reduction of 13.47 ha of habitat compared to previous assessment) • Indirect impacts associated with subsidence unlikely to impact the species.	Significant impact is unlikely.
Persoonia hirsuta	• No individual plants impacted by surface infrastructure. • Approximately 23.57 ha of potential habitat impacted by surface infrastructure • Indirect impacts associated with subsidence unlikely to impact the species.	• No known individuals of *Persoonia hirsuta* would be directly impacted by the Project. • Approximately 10.10 ha of potential habitat impacted by surface infrastructure (reduction of 13.47 ha of habitat compared to previous assessment)	Significant impact is unlikely.

MNES	Impact assessed in BAR	Revised Impact	Significant impact conclusion
		• Potential indirect impacts from subsidence are unlikely to significantly impact the species.	
Pomaderris brunnea	• One individual plant impacted by proposed transmission line. • Approximately 23.57 ha of potential habitat impacted by surface infrastructure • Indirect impacts associated with subsidence unlikely to impact the species.	• Transmission line construction and operation to avoid direct impacts to *Pomaderris brunnea*. • Indirect impacts associated with subsidence unlikely to impact the species.	Significant impact is unlikely.
Broad-headed Snake	• Species not recorded during assessment. • Approximately 23.57 ha of potential foraging habitat impacted by surface infrastructure. • Low likelihood for subsidence related indirect impacts to potential cliff line habitat.	• Approximately 4.12 ha of potential habitat impacted by surface infrastructure. • Low likelihood for subsidence related indirect impacts to potential cliff line habitat.	Significant impact is unlikely.
Large-eared Pied Bat	• Approximately 23.57 ha of potential foraging habitat impacted by surface infrastructure. • Low likelihood for subsidence related indirect impacts to potential cliff line habitat.	• Approximately 4.12 ha of potential habitat impacted by surface infrastructure. • Low likelihood for subsidence related indirect impacts to potential cliff line habitat.	Significant impact is unlikely.
Koala	• Species not recorded during assessment. • Approximately 23.57 ha of potential foraging habitat impacted by surface infrastructure. • Potential indirect impacts associated with subsidence unlikely to impact the species.	• Approximately 4.12 ha of potential habitat impacted by surface infrastructure. • Low likelihood for subsidence related indirect impacts to potential cliff line habitat.	Significant impact is unlikely.
Grey-headed Flying Fox	• Approximately 23.57 ha of potential foraging habitat impacted by surface infrastructure. • No camp sites impacted. • Potential indirect impacts associated with subsidence unlikely to impact the species.	• Approximately 4.12 ha of potential habitat impacted by surface infrastructure. • Low likelihood for subsidence related indirect impacts to potential cliff line habitat.	Significant impact is unlikely.
Greater Glider	• Species not recorded during assessment. • Indirect impacts associated with subsidence unlikely to impact the species. • Potential indirect impacts associated with subsidence unlikely to impact the species.	• Approximately 4.12 ha of potential habitat impacted by surface infrastructure. • Low likelihood for subsidence related indirect impacts to potential cliff line habitat.	Significant impact is unlikely.
Birds (Swift Parrot, Regent Honeyeater, Cattle Egret, Great Egret, Fork-tailed Swift, Rainbow Bee-eater, and Satin Flycatcher)	• Approximately 23.57 ha of potential foraging habitat impacted by surface infrastructure. • Potential indirect impacts associated with subsidence unlikely to impact the species.	• Approximately 4.12 ha of potential habitat impacted by surface infrastructure. • Low likelihood for subsidence related indirect impacts to potential cliff line habitat.	Significant impact is unlikely.

3. Mitigation Measures

Indirect impacts and associated mitigation measures have been detailed in the BAR.

Table 17 of the BAR details specific indirect impacts and how they relate to biodiversity, along with corresponding mitigation measures. This table has been updated to reflect the amended Project (Table 7).

The mitigation measures provided would be consistent with industry best practice to ensure that mitigation is effective and include the development of a Biodiversity Management Plan (BMP). Monitoring of the effectiveness of the mitigation measures would be incorporated as part of the management actions associated with the Project. Details of the BMP preparation have been provided in the BAR.

Table 7. Mitigation Measures

Indirect impact	Likely impact from the Project	Potential extent of the indirect impact prior to mitigation	Mitigation measure	Expected success of mitigation measure
Edge effects	The establishment of surface infrastructure would result in the creation of new edges adjacent to areas of existing native vegetation. The new edges could facilitate the establishment and spread of introduced plant species, however appropriate monitoring and control measures would be implemented during and after construction, to assist in preventing weed invasion. The surface infrastructure would be progressively rehabilitated and will eventually be entirely revegetated to a native, open woodland community, which will recreate fauna habitat.	Varying distance from subject site. Potentially occurring within 50 metres of disturbance area throughout the active life of the Project.	Fencing and/or the use of highly visible rope or tape boundaries will be used to delineate the boundary of vegetation clearing at the edge of the surface infrastructure areas. Signposting will be used to inform Project personnel and site visitors of areas of conservation value to restrict entry or inform behaviour that will reduce incidental interactions with fauna. Weed management and pest management and monitoring to be implemented as per the BMP to be developed for the Project. Sedimentation management to be applied in areas that may result in runoff during construction and operation.	Active weed, and pest management are anticipated to be successful at managing edge effects from the Project.
Weeds	Weeds have the opportunity to establish themselves in areas of disturbed vegetation. The greatest potential for establishment of weeds is in areas already disturbed or subject to agricultural land use. This is mainly toward the south of the Study Area. The Project has the potential to increase or lead to the establishment of weed species where they do not currently exist through the operation of machinery during construction as a result of the movement of construction vehicles and materials into the Study Area. Areas more likely to be exposed to weed incursions are areas of native	Variable depending on topography. However, typically would occur within close proximity to subject site given the subject site is not located adjacent to steep slopes.	Weed management and monitoring to be implemented according to the BMP. Weed management would be active in preventing the spread of weeds caused by construction and operation of the Project therefore preventing edge effects.	Active weed control methods are likely to be successful in managing the spread of weeds within adjacent areas.

Indirect impact	Likely impact from the Project	Potential extent of the indirect impact prior to mitigation	Mitigation measure	Expected success of mitigation measure
	vegetation that occur to the east of ventilation shaft TSC2, and west of the proposed REA and ventilation shaft TSC 1. These adjacent areas are in better condition and contain fewer introduced species. To mitigate the potential for weed invasion, weeds will be controlled during and after construction in accordance with the BMP and thus indirect impacts from weeds are likely to be minor within the adjacent woodland areas.			
Erosion and sedimentation	Erosion of soils during construction and operation of the Project may involve the following: • Alteration of soil structure beneath infrastructure items, and roads (these have been taken into consideration within the Study Area disturbance calculations). • The increase of surface water flow from the Study Area during rain events into the adjacent woodland areas • The deposition of soil particulates in drainage lines and within remnant vegetation. Mitigation measures will be put in place during the construction and operation to limit the erosion and sedimentation caused by the Project. With the mitigation measures in place, it is likely that the potential for erosion and sedimentation would be contained within the subject site.	Variable depending on topography. However, typically would occur within close proximity to subject site given the subject site is not located adjacent to steep slopes.	Stormwater management measures will be implemented in accordance with the recommendations in the Project's Water Management Plan. Adequate sediment controls will be applied where appropriate. Procedures for the management of spills throughout the Study Area will be developed including the requirements for vehicles to carry spill kits. Sediment basins are proposed to reduce sedimentation and overland flows. Details provided in the Project's specialist studies (HEC 2019). The detailed design of the basins will be undertaken and documented prior to the REA being extended above its current approved height. The rehabilitated landforms will be designed to shed water without causing excessive erosion or increasing downstream pollution.	Sedimentation control is known to reduce sedimentation spills.

Indirect impact	Likely impact from the Project	Potential extent of the indirect impact prior to mitigation	Mitigation measure	Expected success of mitigation measure
Dust	Dust will be generated from the construction and operating activities. Through accumulation with existing dust generated from existing operations, dust generated during construction of the Project has the potential to impact upon the health of plants and vegetation particularly in those areas of dense native woodland immediately adjacent to the subject site. Research shows that the impacts of dust on vegetation can have both positive and negative impacts, however the impacts of increased levels of dust on animals are unknown (Farmer 1993). Farmer (1993) anticipated that dust may increase the susceptibility of plants and vegetation to secondary stresses, such as drought, insects and pathogens, or allow penetration of toxic metals or phytotoxic gaseous pollutants. Any potential impact from dust associated with the Project is likely to be localised and confined to the immediate vicinity of the Study Area.	Variable depending on wind conditions. Potential for dust emissions likely throughout life of Mine.	Dust impacts will be mitigated through the onsite use of water suppression and the progressive rehabilitation of the overburden emplacement. Further, vegetation clearing protocols for the Project will seek to minimise exposed areas with the potential to generate dust by completing vegetation clearing as close to the commencement of overburden emplacement as practical.	Successful implementation of dust control would minimise dust. Current dust suppression mitigation works are on-going at the Mine.
Noise	Noise will be generated from the construction and the extended in-pit operating hours. Although relevant research is limited, studies have found that traffic noise can mask the important contact calls of certain birds such as the Budgerigar, Canary, and Zebra Finch, (Lohr et al. 2003). Parris and	Variable depending on wind conditions. Potential for noise impacts likely throughout life of Mine.	Tahmoor will continue to manage site operations in accordance with the existing noise restrictions and commitments.	Likely – given they are currently in operation at the mine.

Indirect impact	Likely impact from the Project	Potential extent of the indirect impact prior to mitigation	Mitigation measure	Expected success of mitigation measure
	Schneider (2008) found that it was increased volumes of noise and not increased volumes of traffic that were important. Various studies have indicated that changes in bird calls in response to traffic noise are twofold, either the birds change the characteristics of their call to avoid interaction of the sound of the call with the created sounds or they limit calling to periods when the levels of noise are reduced. The Project is unlikely to result in any additional noise impacts on local fauna as the hours of operation would be similar to that occurring at present.			
Fire	Historically, rural bushfires tend to be associated with a proficient growth of native grasses following large rain events. During summer, following rain events, dry swards of grasses pose a bushfire hazard when placed near a source of ignition. Vehicles driven through long grass with hot exhausts may cause a fire particularly during the hotter months of the year.	Potential to be widespread in locality, though unlikely.	Tahmoor Coal will continue to manage site operations in accordance with the existing Bushfire Management Plan, updating where necessary.	The existing Mine operations have not resulted in any significant fires, thus updates of the existing Bushfire Management Plan would likely assist in further prevention of fire.
Light	Lighting within the areas proposed for surface infrastructure may consist of low intensity directional lighting. There is some night lighting proposed at the REA and ventilation shafts; however this is limited to small directional lights (i,e. no flood lighting).	Variable depending on the type of light source however will largely be contained within the Study Area.	Tahmoor Coal will ensure lights are turned off at night if not required, and that the placement of lights for night work will be so that they are directed internally towards the work area to avoid/minimise light spill.	Mitigation measures likely to be successful at reducing light spill.

Indirect impact	Likely impact from the Project	Potential extent of the indirect impact prior to mitigation	Mitigation measure	Expected success of mitigation measure
	The light that is likely to be generated by the surface works is unlikely to result in a significant change to fauna movement given the lighting would be directional toward the surface infrastructure. Furthermore, operational lighting (e.g. from vehicle movement) will be restricted to hours of operation.			
Impacts to threatened flora during construction and maintenance of surface infrastructure	Without appropriate mitigation measures in place, indirect impact to threatened flora may occur during the construction of transmission line and ventilation shafts, in particular TSC 2. The impacts could occur by contractors who are not familiar with the threatened plants, nor understanding the location and proximity of the threatened plants to the construction and operational areas.	Within the confines of the surface infrastructure disturbance footprint and immediately adjacent.	Employees and contractors would be educated on and required to implement the following controls, to avoid impacts to threatened flora during construction and operation: - Ecologist to clearly flag the location of threatened flora within and immediately adjacent to the disturbance footprint. - The location of all plants to be provided on a map for contractors. - Appropriate signage and demarcation to be installed to inform contractors and staff the location of the threatened plants. - Ecologist to be present during the installation of the power poles to ensure that the threatened plants will not be directly impacted. - Ecologist to be present during the vegetation trimming/removal of the transmission line and ventilation shaft site TSC 2. - On-going transmission line maintenance to avoid clearing/trimming vegetation below 2 m in height.	Mitigation measures likely to be successful at reducing indirect impact to threatened flora.

4. Biodiversity Offset Liability

4.1 Reduced biodiversity offset liability

Due to the reduced impacts to biodiversity associated with the amended Project, the BioBanking Credit Calculator has been updated. The Landscape Scoring and plot data has not been edited or changed since the BAR was submitted. As such, the key changes to the BioBanking Credit Calculator are attributed to the change to vegetation impacts and habitat/species counts.

The BioBanking credits required for the amended Project are provided in Table 8 and the credit report has been attached to Annex 2.

A comparison has also been provided in Table 8 against the original credits required for the Project.

The key reduction in credits are in relation to:

- Shale Sandstone transition Forest – reduction of 629 credits
- *Grevillea parviflora* subsp. *parviflora* – reduction of 6,104 credits
- *Persoonia bargoensis* – reduction of 539 credits
- *Pomaderris brunnea* – reduction of 15 credits
- Threatened fauna – reduction of credits due to decrease in habitat impact.

Table 8. Offset liability for the Project

Threatened biodiversity	BAR (January 2019)		Revised offset liability		Reduction in credits required
	Area (ha)/ No. impacted	Credits required	Area (ha)/ No. impacted	Credits required	
Shale Sandstone Transition Forest /PCT1395 Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest (HN556)	23.57 ha	1,084	10.10 ha	455	629
Native mine rehabilitation/ PCT1081 Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin (HN564).	14.20 ha	398	14.22 ha	399	+1
Persoonia bargoensis	8	616	1	77	539
Grevillea parviflora subsp. *parviflora*	491	6,874	55	770	6,104
Pomaderris brunnea	1	15	0	0	15
Large-footed Myotis (southern myotis)	17.26 ha	380	4.12	91	289
Koala	17.26 ha	449	4.12	107	342
Large-eared Pied Bat	17.26 ha	224	4.12	54	170
Eastern Cave Bat	17.26 ha	224	4.12	54	170
Eastern Pygmy Possum	17.26 ha	345	4.12	82	263

4.2 Satisfying biodiversity offset liability

As documented in section 11.2 of the FBA, an offset requirement is represented as a number and type of biodiversity credits determined in accordance with Chapter 10 of the FBA. Subject to provisions in the NSW

Biodiversity Offsets Policy for Major Projects (OEH 2014), the conservation measures that may be used to address this offset requirement include:

1. Retirement of biodiversity credits from the biodiversity register established under Part 7A of the NSW *Threatened Species Conservation Act 1995* (TSC Act) (now BC Act).
2. Ecological rehabilitation or remediation of previously disturbed land.
3. Supplementary measures as determined in accordance with the NSW Biodiversity Offsets Policy for Major Projects (OEH 2014).
4. Payment into the Biodiversity Conservation Fund (BCF) (noting that the Commonwealth have endorsed payment into the BCF for like-for-like Commonwealth offset requirements).
5. A combination of the above.

As detailed in the BAR, Tahmoor Coal proposes a biodiversity offset package that may employ a combination of offsetting opportunities including the following:

1. Establishment of Stewardship sites on Tahmoor Coal landholdings;
2. Purchase BioBanking/BAM credits on the public register;
3. Payment into the BCF;
4. Establishment of Stewardship sites on additional landholdings.

A staged offset approach has also been proposed given all infrastructure would not be constructed in the first year of the Project. The proposed timeframe for retirement of the credit offset requirement has been detailed in Table 9.

Table 9. Staged Offset Approach

Project stage	Credits required									
	PCT 1395 (good condition)	PCT 1395 (derived condition)	PCT 1081	*Persoonia bargoensis*	*Grevillea parviflora* subsp. *parviflora*	Large-footed Myotis	Koala	Large-eared Pied Bat	Eastern Cave Bat	Eastern Pygmy Possum
Stage 1 Offset liability (Year 1)										
Ventilation Shaft TSC 1	31	236	0	0	0	15	17	8	8	13
Total – Stage 1	**31**	**236**	**0**	**0**	**0**	**15**	**17**	**8**	**8**	**13**
Stage 2 Offset liability (Year 2)										
Ventilation Shaft TSC 2	130	0	0	77	770	61	73	38	38	56
Powerline	31	27	0	0	0	15	17	8	8	13
REA	0	0	315	0	0	0	0	0	0	0
Total – Stage 2	**161**	**27**	**315**	**77**	**770**	**76**	**90**	**46**	**46**	**69**
Stage 3 Offset liability (Year 4+)										
REA	0	0	84	0	0	0	0	0	0	0
Total – Stage 3	**0**	**0**	**84**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total Offset liability for Project	**192**	**263**	**399**	**77**	**770**	**91**	**107**	**54**	**54**	**82**

5. Conclusion

Tahmoor Coal have aimed to avoid and minimise environmental impacts from the Project through detailed revision of the Project, along with implementation of actions aimed at mitigating and managing potential indirect impacts from the Project.

The unavoidable impacts of the Project on ecological values have been reduced compared to the BAR submitted to the DPIE in January 2020.

The revised assessment will require the direct impact to 24.32 ha of vegetation of which 14.22 ha is mine rehabilitation.

A total of 10.10 ha of SSTF would be directly impacted by the Project. A formal EPBC Act Assessment of Significance concluded that the amended Project would have a significant impact on SSTF.

The Project has been revised to significantly reduce impacts on threatened flora. The revised Project will result in an impact to 55 *Grevillea parviflora* subsp. *parviflora* plants, and one *Persoonia bargoensis*. Formal EPBC Act Assessment of Significance concluded that the amended Project was unlikely to have a significant impact on threatened flora.

The Project has been revised to reduce the impacts of potential fauna habitat. A total of 4.12 ha of potential habitat for the following 'species credit' fauna may be impacted: Large-footed Myotis, Koala, Large-eared Pied Bat, Eastern Cave Bat and Eastern Pygmy Possum. Formal EPBC Act Assessment of Significance concluded that the amended Project was unlikely to have a significant impact on threatened fauna.

Biodiversity offsets required for unavoidable impacts from the Project have been calculated as follows:

- SSTF /PCT 1395 Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest (HN556) – 455 credits required
- Native mine rehabilitation/ PCT 1081 Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin (HN564) - 399 credits required.

Five threatened species require offsetting as a result of the Project. Their credit requirements are as follows:

- *Persoonia bargoensis* - 77 credits required
- *Grevillea parviflora* subsp. *parviflora* – 770 credits required
- Large-footed Myotis – 91 credits required
- Koala – 107 credits required
- Large-eared Pied Bat – 54 credits required
- Eastern Cave Bat – 54 credits required
- Eastern Pygmy Possum – 82 credits required.

A biodiversity offset strategy and staged offset approach has been summarised in this report, with further details provided in the BAR.

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AECOM 2018, Tahmoor South Project - Environmental Impact Statement, prepared for Tahmoor Coal Pty Ltd by AECOM Australia Pty Ltd.

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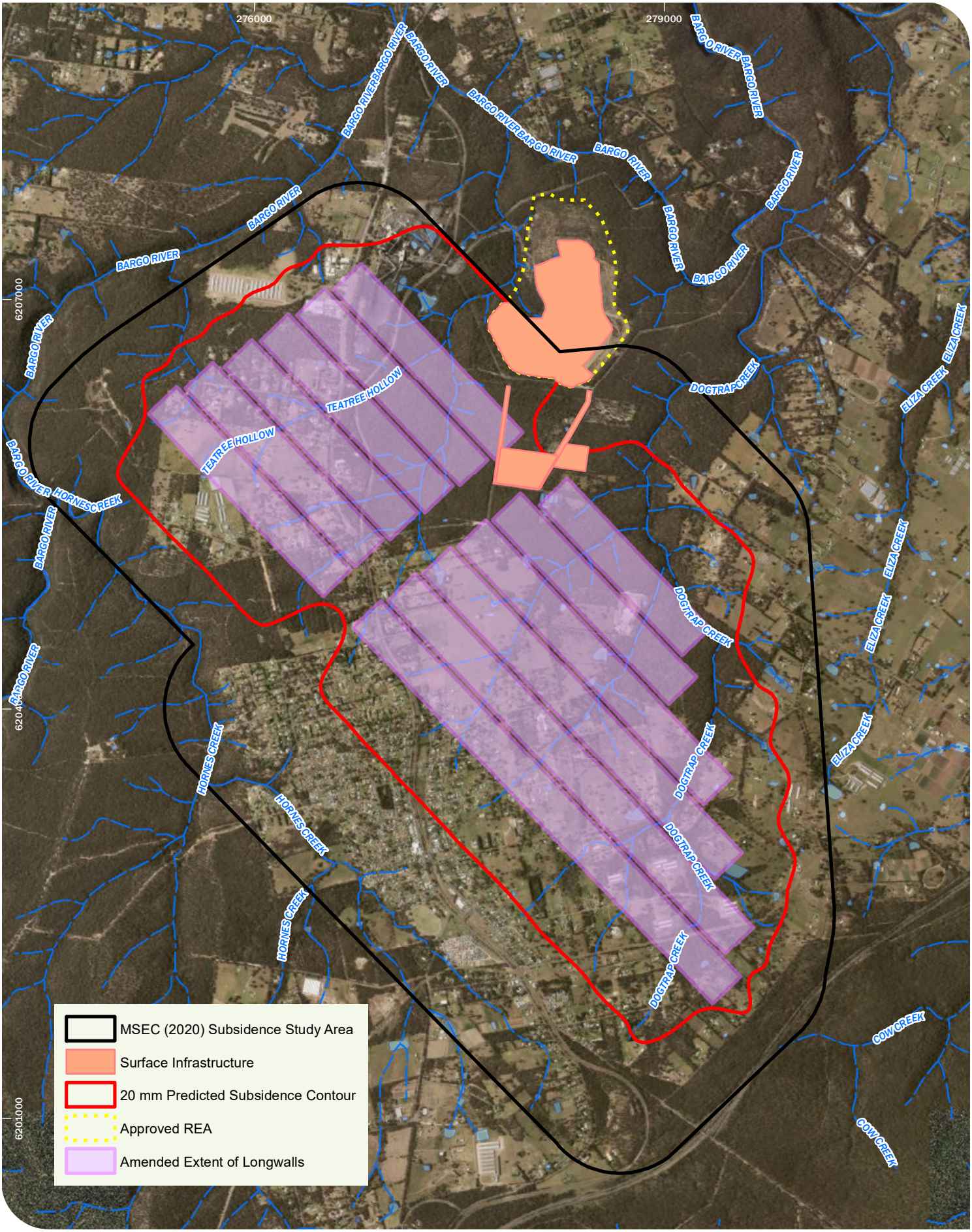
Figures



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Niche PM: Luke Baker
Niche Proj. #: 5315
Client: SIMEC

The Amended Project
Tahmoor South Project

Figure 1

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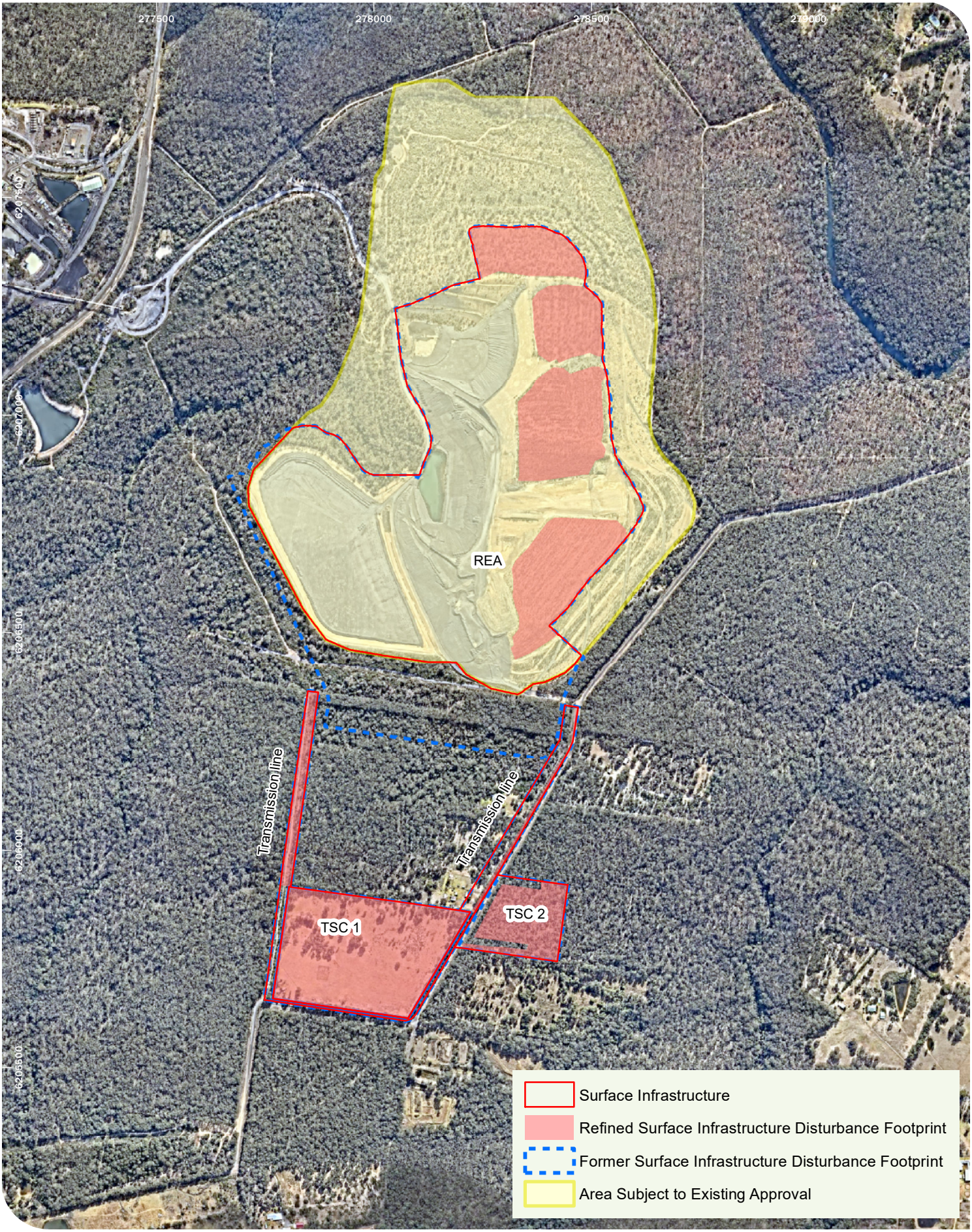

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Surface Infrastructure - Reduce Area of Direct Impact

Tahmoor South Project

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Niche Proj. #: 5315
Client: SIMEC

Figure 2

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Area of Direct Impact, Areas to be Retained, and Existing Approval

Tahmoor South Project

Niche PM: Luke Baker
Niche Proj. #: 5315
Client: SIMEC

Figure 3

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Validated Vegetation Mapping

Tahmoor South Project

Niche PM: Luke Baker
Niche Proj. #: 5315
Client: SIMEC

Figure 4

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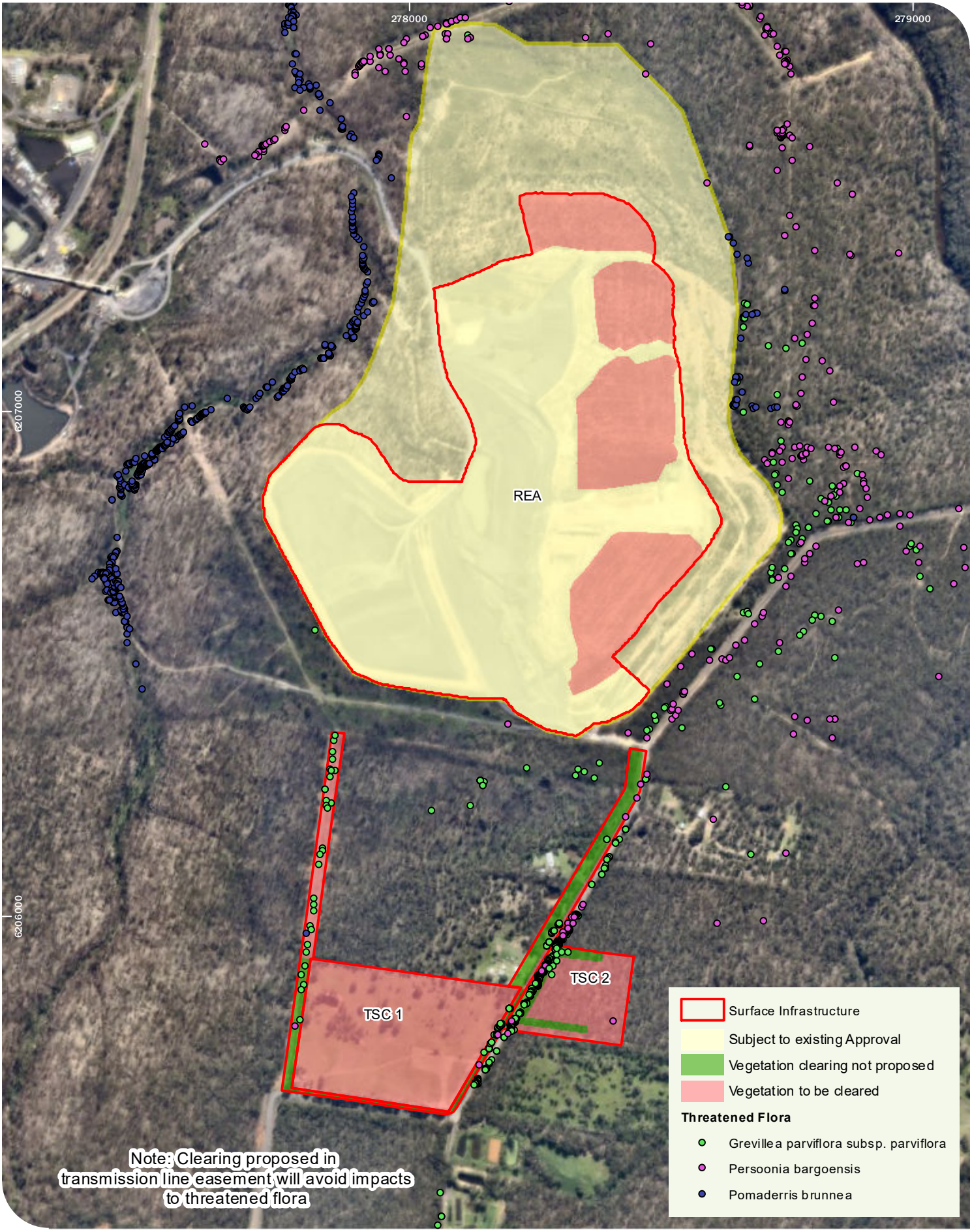

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Client: SIMEC

Threatened flora
Tahmoor South Project

Figure 5

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Threatened Fauna - species polygon (Koala, Large-eared Pied Bat, Eastern Cave Bat, Eastern Pygmy Possum, Large-footed Myotis

Tahmoor South Project

Niche PM: Luke Baker
Niche Proj. #: 5315
Client: SIMEC

Figure 6

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Annex 1. Commonwealth Assessment of Significance

Assessments of Significance are presented for the following MNES in relation to the Project:

- Threatened Ecological Communities
    - Shale Sandstone Transition Forest.

- Threatened flora
    - *Acacia bynoeana*
    - *Grevillea parviflora* subsp. *parviflora*
    - *Leucopogon exolasius*
    - *Persoonia bargoensis*
    - *Persoonia glaucescens*
    - *Persoonia hirsuta*
    - *Pomaderris brunnea.*

- Threatened Fauna
    - Broad-headed Snake (assessment undertaken as a precautionary approach).
    - Large-eared Pied Bat
    - Koala
    - Grey-headed Flying-fox
    - Greater Glider
    - Birds (grouped): Swift Parrot, Regent Honeyeater, Cattle Egret, Great Egret, Fork-tailed Swift, Rainbow Bee-eater and Satin Flycatcher.

Descriptions in regards to the lifecycle for the species have been taken from the relevant Commonwealth Conservation Advice unless otherwise stated.

Shale Sandstone Transition Forest	
Critically Endangered Ecological Community	**Significant Assessment Criteria**
An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:	
Reduce the extent of an ecological community	The Project would involve the removal of approximately 10.10 ha of Shale Sandstone Transition Forest (SSTF) as a result of clearing required for the Project. Subsidence as a result of the Project may cause cracking of the soil within the community, however SSTF occurs within drier soils and is not solely dependent on groundwater interaction that may be impacted by surface cracking. Previous vegetation mapping by Tozer et al. (2006) has mapped approximately 2,947 ha as occurring within 10 km of the Study Area. The Project will therefore result in reducing the extent of the SSTF in the locality by less than 1 per cent.
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or powerlines	Approximately 10.10 ha of SSTF would be impacted by the required clearing for the Project. Given SSTF is listed as Critically Endangered, all areas containing this community are considered important, particularly larger patches. The removal of SSTF within the surface infrastructure development footprint will result in fragmentation of the broader native vegetation community surrounding it. The clearing of SSTF within the powerline corridors would create a cleared corridor approximately 30 m wide. However, the powerline is located, for the most part, along existing cleared vehicle access tracks, including of Charlies Point Road. The construction of the ventilation shaft sites would also fragment portions of good quality SSTF and also an area of the derived form of the community along Charlies Point Road. The Project will result in the isolation of any areas of SSTF.
Adversely affect habitat critical to the survival of an ecological community	Given SSTF is listed as Critically Endangered, all areas containing this community are considered important, particularly larger patches. The habitat for SSTF that would be impacted within the Study Area consist of approximately 10.10 ha which equates to less than 1 per cent of SSTF within the locality (2,947 hectares has been mapped by Tozer et al. (2006) as occurring within 10 km of the Study Area). Much of the remaining SSTF within the locality is scattered within private lots, and Crown land that are not formally protected under conservation agreements. Within the locality, SSTF is informally protected within Upper Nepean State Conservation Area, WaterNSW Special Area, and Wirrimburra Sanctuary Bargo. None of these areas would be impacted by the Project. When compared to the amount of SSTF within the locality and priority conservation lands, the component of the CEEC that would be impacted by the Project is unlikely to adversely affect habitat critical to the survival of the community.
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil)	The Project would involve the clearing of approximately 10.10 ha of SSTF, and therefore destroy abiotic factors necessary for the CEEC survival within the impact footprint.

Shale Sandstone Transition Forest	
Critically Endangered Ecological Community	**Significant Assessment Criteria**
necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	The Project would not result in the removal of all SSTF within the locality: over 2,947 hectares has been mapped by Tozer et al. (2006) in the locality. As such, the SSTF to be cleared, and any potential indirect impacts of the Project, would not adversely affect all abiotic factors critical to the survival of the community within the locality.
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	The Project would result in the clearing of approximately 10.10 ha of SSTF. As stated above, the 99 percent of the community remaining in the locality will not be impacted directly by the Project. The Project is not likely to cause changes to the remainder of the CEEC within the locality that would lead to the decline or loss of functionally of the CEEC.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to; assisting invasive species, that are harmful to the listed ecological community, to become established, or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or	The Project would result in the reduction of SSTF within the Study Area through the clearing of approximately 10.10 ha of the CEEC. The Project would involve the implementation of mitigation measures such as a weed management plan. Through implementing this plan, it is unlikely that an increase in invasive species would occur within bushland surrounding the surface infrastructure footprint. The Project is not likely to increase the mobilisation of fertilisers, herbicides or other chemicals or pollutants into the CEEC which would impact on the species composition of the community. Any use of herbicides as part of a weed management plan would be undertaken using industry best practice.
Interfere with the recovery of an ecological community.	An approved recovery plan exists for SSTF as part of the recovery plan for the Cumberland Plain (DECCW 2010). The main recovery objectives of this recovery plan include (DECCW 2010): ▪ To build a protected area network, comprising public and private lands, focused on the priority conservation lands ▪ To deliver best practice management for threatened biodiversity across the Cumberland Plain, with a specific focus on the priority conservation lands and public lands where the priority management objectives are compatible with biodiversity conservation

Shale Sandstone Transition Forest	
Critically Endangered Ecological Community	**Significant Assessment Criteria**
	▪ To develop an understanding and enhanced awareness in the community of the Cumberland Plain's threatened biodiversity, the best practice standards for its management and the recovery program ▪ To increase knowledge of the threats to the survival of the Cumberland Plain's threatened biodiversity, and thereby improve capacity to manage these in a strategic and effective manner. The Project is likely to interfere with the recovery of SSTF, as the Study Area has been identified as part of a priority conservation land in the Cumberland Plain Recovery Plan (DECW 2010). Of the 9,642 ha of SSTF remaining (as mapped by NPWS 2002, Tozer 2003 and NSW Scientific Committee and Simpson 2008, referenced in DECCW 2010), approximately 3,145 ha (33%) has been mapped as priority conservation lands (DECCW 2010). The 10.10 ha that would be removed as part of the Project represents 0.76% of the area of SSTF mapped as part of a priority conservation lands (DECCW 2010).
Conclusion	The Project is considered **likely** to result in a significant impact to SSTF due to the following: ▪ The Project would result in the direct clearing of approximately 10.10 ha identified in the Cumberland Plain Recovery Plan (DECW 2010). ▪ The Project would result in fragmentation of SSTF due to direct clearing. ▪ The Project would reduce the extent of the CEEC.

Acacia bynoeana	
Vulnerable species	**Address of Criteria**
Background	*Acacia bynoeana* occurs in heath or dry sclerophyll forest on sandy soils. The species seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches (NPWS 1999). A population of *Acacia bynoeana* was recorded during previous survey along an existing Fire Trail off Ashby Close, within Bargo. The population does not occur within the Study Area and would therefore not be impacted by the Project. Within the Study Area, no individuals for *Acacia bynoeana* were recorded despite targeted survey. Whilst no individuals were recorded, it is noted that the Project would result in impacts to approximately 10.10 ha hectares of potential habitat for *Acacia bynoeana* through vegetation clearing. Potential habitat to be directly impacted includes Shale Sandstone Transition Forest. Given the species occurs within heath and Dry Sclerophyll Forest habitat typically occurring away from sensitive environmental features that may be impacted by subsidence (i.e. Watercourses, edges of ridges) subsidence is unlikely to impact upon the species.
Is this population an important population?	Given the species was not recorded in the Study Area despite targeted searches, the Project footprint is not likely to support an important population of the species.
An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of an important population of a species	*Acacia bynoeana* occurs in heath or dry sclerophyll forest on sandy soils. The species seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and recently burnt patches (NPWS 1999). *Acacia bynoeana* was not recorded during the current survey within the disturbance footprint, as such, no important population would be impacted. Furthermore, the species is not considered likely to be impacted by subsidence, as it is unlikely that cracking of soils within areas of potential habitat would lead to vegetation die back, or significant vegetation composition changes. Given no important population was recorded in the proposed surface facility areas, and the species is unlikely to be impacted by subsidence, the Project is unlikely to result in a long-term decrease in the size of a population.
Reduce the area of occupancy of an important population	The Project would not reduce the area of occupancy of the species as no individuals were recorded in the proposed surface facility footprint. It is unlikely that subsidence would result in the modification of habitat given the species is reliant upon dry sclerophyll forest habitats that are not solely reliant or groundwater. Furthermore, no important population was recorded within the Study Area.

Acacia bynoeana	
Vulnerable species	**Address of Criteria**
Fragment an existing important population into two or more populations	There is no known population within the Study Area and so the Project would not result in the fragmentation of an existing population.
Adversely affect habitat critical to the survival of a species	The Project is unlikely to adversely affect habitat critical to the survival of the species as: ▪ No individuals are known to occur and thus the species is not likely to be impacted by the Project. ▪ The species is relatively conspicuous and is unlikely to have remained undetected during the field survey if present. It is therefore likely the species is not present within the proposed footprint of the surface facility sites. ▪ Subsidence is unlikely to impact the species given it is reliant upon dry sclerophyll forest habitats.
Disrupt the breeding cycle of an important population	The following is known about the lifecycle of *Acacia bynoeana* (NPWS 1999): ▪ Plants are generally very small and produce few flowers. ▪ Flowers from September until March and the fruit matures November to January with the peak fruit maturation occurring in November. ▪ Seeds are shed at maturity. Seed production is considered to be minimal and seedlings are rare. There is apparently little local dispersal of seed. ▪ The plant has a woody rootstock and it is likely the species is able to re-sprout from this rootstock after fire. ▪ The species maintains a long-term soil-stored seedbank. ▪ Plants may not always be apparent and appear periodically, perhaps in response to local disturbance. The Project is unlikely to have an adverse impact on *Acacia bynoeana* such that the breeding cycle of an important population would be disrupted, due to the following: ▪ The Project would not impact upon any known individuals of *Acacia bynoeana*. ▪ The Project is unlikely to result in the loss of any known pollinators of the species. ▪ No important population was recorded within the Study Area. Given the species is relatively conspicuous, and is therefore unlikely to remain undetected during the field survey, it is likely that no individuals occur in the Study Area and none would be impacted by the Project. Furthermore, subsidence as a result of the Project is unlikely to impact the species as it occurs within dry sclerophyll vegetation.

Acacia bynoeana	
Vulnerable species	**Address of Criteria**
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The Project would result in the removal of approximately 10.10 ha of potential habitat. Based on previous vegetation mapping (Tozer 2006), the area of potential habitat in the locality is approximately >20,000 hectares, comprising of Sydney Hinterland Transition Woodland (7,705 hectares), Coastal Sandstone Ridgetop Woodland (11,239 hectares), and Cumberland Shale Sandstone Transition Forest (2,947 hectares). This vegetation would not be impacted by the Project. Given the species was not recorded during the current survey, and given the large extent of potential habitat, it is unlikely the Project would modify, destroy, remove or isolate the availability of quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	There is the potential for the Project to result in an increase in invasive species that may occur within areas of potential habitat. However, mitigation measures such as the implementation of a weed management plan would be undertaken as part of the Project. This would reduce the potential for any impacts on the habitat of *Acacia bynoeana*.
Introduce disease that may cause the species to decline, or	There is the potential for machinery to result in the spread of *Phytophthora cinnamomi*. However, mitigation measures such as vehicle wash downs would be undertaken to reduce the potential for any impacts to *Acacia bynoeana.*
Interfere substantially with the recovery of the species.	The Project is unlikely to interfere substantially with the recovery of the species as the species was not recorded during the current survey, no known populations should be impacted by the Project and potential habitat is relatively extensive in the locality.
Conclusion	The Project is unlikely to significantly impact *Acacia bynoeana* as: • the species was not recorded during the current or previous surveys in the Study Area • Potential habitat is relatively extensive in the locality • No known populations should be impacted by the Project • Mitigation measures such as weed management would be implemented to reduce impacts to potential habitat.

Grevillea parviflora subsp. parviflora	
Vulnerable Species	**Significant Assessment Criteria**
Background	*Grevillea parviflora* subsp. *parviflora* was recorded during the current and previous surveys at the following locations within the Study Area: ▪ Within and immediately surrounding the proposed and previous REA footprints ▪ Bushland to the east of Charlies Point Road ▪ Within the Anthony Road property owned by Tahmoor Coal ▪ At the site of the ventilation shafts ▪ Along Fire Road 5 in the Upper Nepean State Conservation Area. It is likely that the records within the REA, and area immediately surrounding the REA and to the east of Charlies Point Road are part of the same population given the proximity of all records and occupancy and connectivity of similar habitat. The total estimated count of *Grevillea parviflora* subsp. *parviflora* recorded during the current survey that would be directly impacted by the Project is 55 individuals – the majority of these occurring within ventilation shaft site TSC 2 The REA population extends to the east of Charlies Point Road and is likely to include an additional 10,000 plants based on approximately the presence of about 20.0 ha of suitable habitat. Furthermore, it should be noted that another site containing a population of the species within the tens of thousands of individuals was recorded within land owned by Tahmoor Coal located off Ashby Close, Bargo. This population would not be impacted by the Project.
Is this population an important population?	The population recorded within the surface infrastructure development footprint and immediate surrounds, should be regarded as an 'important population' as: 1. It is a key source population for breeding or dispersal. It is likely that the population is a key source population for breeding and dispersal given the size of the population and the extensive distribution in the locality. Sites of particular significance for *Grevillea parviflora* subsp. *parviflora* would include any population with greater than 50 plants; a population with a varied age structure including active recruitment of seedlings; and an area of intact habitat away from high disturbance areas (SEWPaC 2013). The population recorded fits this description. 2. It is a population that is necessary for maintaining genetic diversity. The population is very large and likely to contain a significant proportion of the genetic diversity of the species. It is likely that this population has distinct genetic differentiation from the northern populations of the species that occur in the Hunter Valley. 3. The population is near the limit of the species range. The population is at or near the southern limit of the range for the species which is identified as Bargo (SEWPaC 2013). Given its size and distribution, the population of *Grevillea parviflora* subsp. *parviflora* in the locality is considered to be an important population.
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	

Grevillea parviflora subsp. parviflora	
Vulnerable Species	**Significant Assessment Criteria**
Lead to a long-term decrease in the size of an important population of a species	*Grevillea parviflora* subsp. *parviflora* is unlikely to be impacted by subsidence, as the species does not occur within areas that are sensitive to subsidence-related impacts (e.g. bed of watercourses, ridgelines). The habitat within Dry Sclerophyll Forest vegetation may be exposed to subsidence cracking of the soil, however such an impact is unlikely to result in significant changes to floristics and composition that may impact upon *Grevillea parviflora* subsp. *parviflora*. The Project would impact approximately 55 individuals of *Grevillea parviflora* subsp. *parviflora*. During the field survey, *Grevillea parviflora* subsp. *parviflora* was also recorded to the east of Charlies Point Road which occurs outside of the development footprint. The individuals recorded within the surface infrastructure footprint area and to the east of this area are likely to constitute the same population. The area of potential habitat mapped to the east of Charlies Point Road is approximately 20 ha, and based on population counts equates to approximately 10,000 individuals of *Grevillea parviflora* subsp. *parviflora*. The Project would impact upon approximately 1 per cent of the localised distribution of this species which is considered to be part of a much larger (important) population of *Grevillea parviflora* subsp. *parviflora*. Despite the losses that would occur from the Project, the remaining 99 percent of the population is considered viable and not likely to decline over time as a result of the Project. Measures to mitigate potential indirect impacts as a result of the Project will be implemented (as detailed in the BAR) to ensure the remaining population is not affected.
Reduce the area of occupancy of an important population	The Project would reduce the area of occupancy of an important population by approximately 1 percent.
Fragment an existing important population into two or more populations	At present, the local distribution of this species is already fragmented by Charlies Point Road and the existing REA operations. The Project footprint surrounding the existing REA would result in increased distances between known records of individuals within the population. Many of the individuals to be removed occur within the proposed powerline corridor. Given the continuity of suitable habitat surrounding these corridors, it is likely that the species is present throughout the adjacent habitat.
Adversely affect habitat critical to the survival of a species	The Project is unlikely to adversely affect habitat critical to the survival of the species as: ▪ A larger population of *Grevillea parviflora* subsp. *parviflora* that occurs outside of the Study Area within land owned by Tahmoor Coal would not be impacted by the Project. This population is likely to be in the tens of thousands. ▪ A population within the Wirrimbirra Reserve in Bargo is informally protected, and Niche has recorded a population within the Nepean State Conservation Area off Avon Dam Road. Both these populations occur within the locality and would not be impacted by the Project.
Disrupt the breeding cycle of an	The following is known about the breeding cycle of *Grevillea parviflora* subsp. *parviflora*:

Grevillea parviflora subsp. parviflora	
Vulnerable Species	**Significant Assessment Criteria**
important population	▪ Biology and ecology of the species is poorly known, though it is believed that the species lives between 25–60 years (D. Keith pers.comm. cited in Benson and McDougall 2000). ▪ Flowering occurs in April, May and between July and December. The flowers are insect pollinated. One to two seeds are released at maturity (Benson & McDougall 2000) but have limited seed dispersal, probably of less than 2 m (DSEWPaC 2013) ▪ Plants are capable of suckering or regenerating from a rootstock (NSW DECC 2005p). Sucker stems usually occur in patches close to the parent plant (DSEWPaC 2013). ▪ After fire or other disturbance, regeneration can occur from both the rhizomes and seed in the soil seedbank. However, after fire, adult plants are killed and seedling recruitment is uncommon (Benson & McDougall 2000). ▪ Little is known about the production and viability of seed, seed predation or germination rates and requirements. Much of the current knowledge of *Grevillea parviflora* subsp. *parviflora* is based on general observations (DSEWPaC 2013). It is unlikely the Project would affect the lifecycle of the remaining population due to the following: ▪ The Project would remove approximately 55 individuals from the local population. The remaining plants within the population would not be impacted by the Project. ▪ The Project would impact upon 1 percent of the important population. The remaining population is considered viable and not likely to decline over time as a result of the Project. ▪ The Project is unlikely to result in the loss of any known pollinators of the species. ▪ A large population recorded within the Upper Nepean State Conservation Area would not be impacted by the Project. A population count has not been conducted, but it likely to exceed over a thousand individuals. Similarly the population recorded within Tahmoor Coal owned land off Ashby Close in Bargo would not be impacted. ▪ Subsidence is unlikely to cause any significant impact to the species. *Grevillea parviflora* subsp. *parviflora* is located within the dry sclerophyll forests away from creek and watercourses. It is unlikely subsidence would impact all areas that the species occupies.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The Project would impact approximately 55 individuals. Overall, the Project would lead to a decline in the total number of plants within the population and a reduction in the total available habitat for the species. The proportion of the estimated population that would not be affected by the Project is substantial (99 percent). It is unlikely that the Project would lead to a decline in the overall species.
Result in invasive species that are harmful to a vulnerable species	There is the potential for the Project to result in an increase in invasive species that may occur within areas of potential habitat. However, mitigation measures such as the implementation of a weed management plan would be undertaken as part of the Project. This would reduce the potential for any impacts on the retained habitat of *Grevillea parviflora* subsp. *parviflora.*

Grevillea parviflora subsp. parviflora	
Vulnerable Species	**Significant Assessment Criteria**
becoming established in the vulnerable species' habitat	
Introduce disease that may cause the species to decline, or	There is the potential for machinery to result in the spread of *Phytophthora cinnamomi*. However, mitigation measures such as vehicle wash downs would be undertaken to reduce the potential for any impacts to *Grevillea parviflora* subsp. *parviflora*.
Interfere substantially with the recovery of the species.	The Project would result in the loss of 5 percent of an important population. However, the species is relatively common within the locality, with populations in the tens of thousands recorded within the Nepean State Conservation Area and land owned by Tahmoor Coal located to the west of Bargo. These populations would not be impacted by the Project.
Conclusion	The Project is unlikely to result in a significant impact to *Grevillea parviflora* subsp. *parviflor*a as: ▪ The proposed disturbance would result in direct impacts to 55 plants within an important population, however over 10,000 plants would not be impacted by the Project and would remain viable. ▪ Larger populations supporting tens of thousands of plants would not be impacted by the Project. The populations located within the Nepean State Conservation Area and within Tahmoor Coal land to the west of Bargo would not be impacted by the Project. ▪ The species is unlikely to be impacted by subsidence. ▪ Mitigation measures proposed would reduce the likelihood of indirect impacts to the retained proportion of the important population within the Study Area and surrounds.

Persoonia bargoensis	
Vulnerable Species	**Significant Assessment Criteria**
Background	*Persoonia bargoensis* was recorded at various locations during the field survey including: ▪ A total of 692 individuals of *Persoonia bargoensis* were recorded within and adjacent to the surface infrastructure area. The bulk of the population occurs to the north and south of the REA and will not be affected by the Project ▪ Individuals recorded along Anthony Road ▪ Individuals recorded along Fire Roads off Ashby Close in Bargo One *Persoonia bargoensis* would be directly impacted by the Project, including approximately 10.10 ha of potential habitat. Potential habitat includes: Shale Sandstone Transition Forest.
Is this population an important population?	The population (being defined as the broader local population, not just those individuals recorded within the Study Area) should be regarded as an 'important population' if: 1. It is a key source population for breeding or dispersal - Given that the species is restricted in distribution to a very small area, it is likely that the 692 individuals form part of a population of this species which is a key source, and perhaps the only source, population for breeding and dispersal of this species. 2. It is a population that is necessary for maintaining genetic diversity - Again, given that the species is restricted in its entire distribution to very small areas it is likely that the 692 individuals recorded form part of a population that is necessary for maintaining genetic diversity for the species. 3. The population is near the limit of the species range - The population is at the limit of the range for the species which is identified above with northern, southern, eastern and western limits at Picton and Douglas Park, Yanderra, Cataract River and Thirlmere. Given its size and distribution, the local population of *Persoonia bargoensis* is considered to be an important population.
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of an important population of a species	Approximately 10.10 ha of potential habitat would be impacted by the Project. Potential habitat includes Shale Sandstone Transition Forest. *Persoonia bargoensis* is unlikely to be impacted by subsidence, as the species does not occur along ridgelines or close to waterways. The woodland and forest environments that it inhabits are not water dependent, and therefore subsidence is unlikely to impact the species. The Project would result in the loss of one individual as a result of the clearing required for the proposed works. Despite the losses that would occur from the Project, the remaining population, a further 691 plants, is considered viable and not likely to decline over time as a result of the Project.
Reduce the area of occupancy of an important population	The Project would directly impact 1 individual of *Persoonia bargoensis* for the Project. This is approximately 1 per cent of the important population.

Persoonia bargoensis	
Vulnerable Species	**Significant Assessment Criteria**
Fragment an existing important population into two or more populations	At present, the local distribution of this species is fragmented by Charlies Point Road and the existing REA operations. The Project would result in the removal of 1 individual for ventilation shaft site TSC 2. Given the continuity of suitable habitat surrounding these corridors, it is likely that the species is present throughout the adjacent habitat.
Adversely affect habitat critical to the survival of a species	The Project is unlikely to adversely affect habitat critical to the survival of the species as: ▪ The Project would result in the removal of 1 plants within the population. This is a reduction of 1 percent of the important population. The remaining 99 percent of the population would not be impacted by the Project and therefore would not result in extinction of the population. ▪ Based on previous mapping (Tozer 2006), the area of potential habitat in the locality is approximately 10,653 hectares, comprising of Sydney Hinterland Transition Woodland (2698.70 hectares) and Cumberland Shale Sandstone Transition Forest (573 hectares) (Tozer et al. 2006). The Project would result in the removal of approximately 0.2 per cent of potential habitat in the locality.
Disrupt the breeding cycle of an important population	The following is known about the life cycle of *Persoonia bargoensis* (DEC 2005): ▪ Grows in woodland to dry sclerophyll forest, on sandstone and clayey laterite on heavier, well-drained, loamy, gravelly soils of the Hawkesbury Sandstone and Wianamatta Shale in the catchments of the Cataract, Cordeaux and Bargo Rivers. ▪ Local populations are very small (mostly less than eight plants) and scattered, with a total population likely to be less than 250 (in 1999). The species appears to be associated with disturbance margins such as the edge of fire trails, possibly because of more light, less root competition, factors regulating the breaking of dormancy, or a factor relating to dispersal agents. The species is fire-sensitive and appears to need a minimum fire frequency of 10-15 years between fires. ▪ The longevity of *Persoonia bargoensis* is likely to be approximately 20 years. ▪ Flowering occurs mainly in summer (Blombery and Maloney 1992) but can extend into autumn (Douglas pers. obs.). ▪ Primarily pollinated by native bees (Bernhardt and Weston 1996). ▪ Plants are likely to be killed by fire and recruitment is solely from seed. ▪ Like most Geebungs this species seems to benefit from the reduced competition and increased light available on disturbance margins including roadsides. The Project is likely to result in a disruption to the breeding cycle of the species, given 1 percent of the population would be removed. This is unlikely to result in changes to the seed bank for the population in the long-term. The remaining 99 percent of the population would provide seed source which would not lead to extinction of the species within the locality.
Modify, destroy, remove or isolate or decrease the availability or	As described above, the Project would result in the loss of approximately 1 percent of the population. The Project would not isolate or decrease the availability or quality of the remaining habitat for this species to the extent that the species is likely to decline.

Persoonia bargoensis	
Vulnerable Species	**Significant Assessment Criteria**
quality of habitat to the extent that the species is likely to decline	
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	There is limited potential for the Project to result in an increase in invasive species within the REA and elsewhere where any surface infrastructure would be developed. The Project involves the implementation of good environmental practice including vehicle hygiene and development of a weed management plan. Further, the current REA activities and the exploration activities undertaken to date have not resulted in high number of invasive species establishing within the habitat for this vulnerable species.
Introduce disease that may cause the species to decline, or	There is the potential for machinery to result in the spread of *Phytophthora cinnamomi*. However, mitigation measures such as vehicle wash downs would be undertaken to reduce the potential for any impacts to *Persoonia bargoensis*.
Interfere substantially with the recovery of the species.	The Project would result in the loss of a relatively large number of individuals of this species and also 10.10 ha of known habitat. The impact of the Project on the important population would not extend beyond the Study Area and would therefore not interfere with the recovery of the species elsewhere in the locality.
Conclusion	The Project is considered unlikely to result in a significant impact to *Persoonia bargoensis* based on the following: ▪ The important population would be reduced by only 1 percent based on the removal of 1 of 692 known plants. ▪ The seed bank and viability of the population are unlikely to be impacted by the removal of 1 percent of the individuals in the population.

Persoonia glaucescens	
Vulnerable Species	**Significant Assessment Criteria**
Background	*Persoonia glaucescens* was not recorded during the current field surveys. A record of the species, obtained from the OEH Atlas of NSW Wildlife, occurs within the southern portion of proposed REA. This individual was not detected during the survey at the coordinates obtained from OEH. Approximately 10.10 ha of potential habitat would be removed as part of the disturbance associated with the Project. Potential habitat includes Shale Sandstone Transition Forest.
Is this population and important population?	No population has been mapped as occurring within the Project footprint.
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of an important population of a species	*Persoonia glaucescens* has not been recorded in the Study Area and thus the Project would not impact upon a known important population.
Reduce the area of occupancy of an important population	The Project would not impact upon an important population. Approximately 10.10 ha of potential habitat would be impacted by the Project. Potential habitat includes Shale Sandstone Transition Forest and Upper Georges Sandstone Woodland; approximately 14,000 hectares of similar potential habitat is mapped as occurring within the locality (Tozer et al. 2006). The Project would reduce the area of potential habitat within the locality by less than 1 percent.
Fragment an existing important population into two or more populations	The Project would not impact any known individuals of *Persoonia glaucescens.* The Project may result in some fragmentation of potential habitat as a result of vegetation clearance within the surface infrastructure area. 10.10 ha of potential habitat will be removed within the powerline corridors, the ventilation shaft sites and also along the southern and western edge of the existing REA. Habitat surrounding these area and the area bound by the powerline corridor would remain intact providing potential habitat for the species and connectivity across the broader landscape. Subsidence is unlikely to result in fragmentation of habitat for *Persoonia glaucescens.*
Adversely affect habitat critical to the survival of a species	The Project is unlikely to adversely affect habitat critical to the survival of the species as: ▪ *Persoonia glaucescens* was not recorded within the development footprint during the current survey. ▪ Subsidence is unlikely to impact on potential habitat for the species, as the species does not occur within habitat types that are sensitive to changes due to subsidence (eg. creek beds, groundwater dependent ecosystems etc.).
Disrupt the breeding cycle of an	The threatened species profile lists the following about the lifecycle of *Persoonia glaucescens:* ▪ Grows in woodland to dry sclerophyll forest on clayey and gravely laterite.

Persoonia glaucescens	
Vulnerable Species	**Significant Assessment Criteria**
important population	▪ Preferred topography is ridge-tops, plateaux and upper slopes. Aspect does not appear to be a significant factor. ▪ Within its habitat, *Persoonia glaucescens* is generally rare and the populations are linear and fragmented. Under ideal circumstances, the species can be locally common, though such conditions are very rare. ▪ Plants are killed by fire and recruitment is solely from seed. ▪ Like most Persoonia species this species seems to benefit from the reduced competition and increased light available on disturbance margins including roadsides. ▪ The Project is unlikely to have an adverse impact on the breeding cycle of *Persoonia glaucescens* due to the following: ▪ The Project would not impact upon any known individuals of *Persoonia glaucescens.* ▪ No important population was recorded. The Project is unlikely to result in the loss of any known pollinators of the species. The species does not occur within and/or is not likely to be reliant on the vegetation communities or habitats that may be adversely impacted by subsidence.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The Project would impact approximately 10.10 ha of potential habitat. Based on previous mapping (Tozer 2006), the area of potential habitat in the locality is approximately 14,000 ha, comprising of Cumberland Shale Sandstone Transition Forest and Upper Georges River Sandstone Woodland. The Project would result in the removal of less than 1 per cent of potential habitat in the locality. Given the species was not recorded within the development footprint during the current survey, and the extent of potential habitat is relatively extensive, it is unlikely the Project would modify, destroy, remove or isolate the availability of quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	There is limited potential for the Project to result in an increase in invasive species within the REA and elsewhere where any surface infrastructure would be developed or exploration activities would be undertaken. However, the Project also involves the implementation of good environmental practice including vehicle hygiene and development of a weed management plan. Further, the current REA activities and the exploration activities undertaken to date have not resulted in high number of invasive species establishing within the habitat for this vulnerable species.
Introduce disease that may cause the species to decline, or	There is the potential for machinery to result in the spread of *Phytophthora cinnamomi*. However, mitigation measures such as vehicle wash downs would be undertaken to reduce the potential for any impacts to *Persoonia bargoensis.*

Persoonia glaucescens	
Vulnerable Species	**Significant Assessment Criteria**
Interfere substantially with the recovery of the species.	No known individuals of this species would be removed by the Project. Approximately 10.10 ha of potential habitat would be removed by proposed surface infrastructure. The impact of the Project would not extend beyond the Study Area and would therefore not interfere with the recovery of the species elsewhere in the locality.
Conclusion	The Project would not result in a significant impact to *Persoonia glaucescens* due to the following: ▪ No individuals of *Persoonia glaucescens* were recorded within the disturbance area. ▪ *Persoonia glaucescens* does not occur within habitat that would be impacted by subsidence. ▪ The habitat for *Persoonia glaucescens* is relatively extensive within the locality.

Persoonia hirsuta	
Vulnerable Species	**Significant Assessment Criteria**
Background	During the field survey, no records for *Persoonia hirsuta* were recorded. The species is relatively conspicuous and unlikely to remain undetected during the current and previous field surveys. Approximately 10.10 ha of potential habitat would be removed as part of the disturbance associated with the Project. Potential habitat to be impacted includes Shale Sandstone Transition Forest.
Is this population and important population?	No population has been mapped as occurring within the Project footprint.
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of an important population of a species	The Project would not impact upon an important population.
Reduce the area of occupancy of an important population	The Project would not impact upon an important population. Approximately 10.10 ha of potential habitat would be impacted by the Project. Potential habitat includes Shale Sandstone Transition Forest and Upper Georges Sandstone Woodland; approximately 14,000 hectares of similar potential habitat is mapped as occurring within the locality (Tozer et al. 2006). The Project would reduce the area of potential habitat within the locality by less than 1 percent.
Fragment an existing important population into two or more populations	The Project would not impact any known individuals of *Persoonia hirsuta*. The Project may result in some fragmentation of potential habitat as a result of vegetation clearance within the surface infrastructure area. 10.10 ha of potential habitat will be removed within the powerline corridors, the ventilation shaft sites and also along the southern and western edge of the existing REA. Habitat surrounding these area and the area bound by the powerline corridor would remain intact providing potential habitat for the species and connectivity across the broader landscape. Subsidence is unlikely to result in fragmentation of habitat for *Persoonia hirsuta*.
Adversely affect habitat critical to the survival of a species	The Project is unlikely to adversely affect habitat critical to the survival of the species as: ▪ *Persoonia hirsuta* was not recorded within the development footprint during the surveys. ▪ Subsidence is unlikely to impact on potential habitat for the species, as the species does not occur within habitat types that are sensitive to changes due to subsidence (eg. creek beds, groundwater dependent ecosystems etc.).
Disrupt the breeding cycle of an important population	The threatened species profile lists the following about the lifecycle of *Persoonia hirsuta*: ▪ The Hairy Geebung is found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. ▪ It is usually present as isolated individuals or very small populations. ▪ Plants are killed by fire and recruitment is solely from seed. The Project is unlikely to have an adverse impact on the breeding cycle of *Persoonia hirsuta* due to the following: ▪ The Project would not impact upon any known individuals of *Persoonia hirsuta*.

Persoonia hirsuta	
Vulnerable Species	**Significant Assessment Criteria**
	▪ No important population was recorded. ▪ The Project is unlikely to result in the loss of any known pollinators of the species. ▪ The species does not occur within and/or is not likely to be reliant on the vegetation communities or habitats that may be adversely impacted by subsidence.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The Project would impact approximately 10.10 ha of potential habitat. Based on previous mapping (Tozer 2006), the area of potential habitat in the locality is approximately 14,000 hectares, comprising of Cumberland Shale Sandstone Transition Forest and Upper Georges River Sandstone Woodland. The Project would result in the removal of less than 1 per cent of potential habitat in the locality. Given the species was not recorded within the development footprint during the current survey, and the extent of potential habitat is relatively extensive, it is unlikely the Project would modify, destroy, remove or isolate the availability of quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	There is a limited potential for the Project to result in an increase in invasive species within the REA and elsewhere where any surface infrastructure would be developed, or exploration activities would be undertaken. However, the Project also involves the implementation of good environmental practice including vehicle hygiene and development of a weed management plan. Further, the current REA activities and the exploration activities undertaken to date have not resulted in a high number of invasive species establishing within habitat of this vulnerable species.
Introduce disease that may cause the species to decline, or	There is the potential for machinery to result in the spread of *Phytophthora cinnamomi*. However, mitigation measures such as vehicle wash downs would be undertaken to reduce the potential for any impacts to *Persoonia hirsuta*.
Interfere substantially with the recovery of the species.	No known individuals of this species would be removed by the Project. Approximately 10.10 ha of potential habitat would be removed by proposed surface infrastructure. The impact of the Project would not extend beyond the Study Area and would therefore not interfere with the recovery of the species elsewhere in the locality.
Conclusion	The Project would not result in a significant impact to *Persoonia hirsuta* due to the following: ▪ No individuals of *Persoonia hirsuta* were recorded within the disturbance area. ▪ *Persoonia hirsuta* does not occur within habitat that would be impacted by subsidence. ▪ The habitat for *Persoonia hirsuta* is relatively extensive within the locality.

Pomaderris brunnea	
Vulnerable Species	**Significant Assessment Criteria**
Background	A population of *Pomaderris brunnea* was recorded along Teatree Hollow Creek during the survey. Over 300 individuals were recorded within the gully environment of Teatree Hollow Creek. The species has also been previously recorded in creeklines at Wirrimbirra Sanctuary (Bargo) (SEWPAC 2013). The Wirrimbirra population contained 900 plants in the late 1980s (SEWPAC 2013). Together, these local records are likely to form a local population of the species totalling at least 1,235 individuals. Whilst *Pomaderris brunnea* occurs within a gully environment adjacent to Teatree Hollow Creek, it is highly unlikely subsidence would result in die back of the population due to the following: ▪ Teatree Hollow Creek undergoes extensive periods of dryness, thus the species unlikely to be affected by any potential creek surface cracking or changes to groundwater as a result of subsidence. ▪ Much of the population was recorded on the top of middle banks of Teatree Hollow Creek and not within areas inundated with water. Thus any changes to the water regime are unlikely to result in impacts to the population. ▪ Die back of vegetation from gas emissions may occur as a result of the Project, however based on previous experience in the Southern Coalfields, the likelihood of this occurring is low, and any impacts would be isolated and localised. Given the population does not occur within the bed of the creek, and is largely positioned away from the lower banks, die back from gas emissions is unlikely.
Is this population an important population?	The population (being defined as the broader local population, not just those individuals recorded within the Study Area) should be regarded as an 'important population' if: ▪ It is a key source population for breeding or dispersal: The individual plants within Teatree Hollow Creek, Dogtrap Creek and Hornes Creek are likely to form part of a broader population within the Wirrimbirra Nature Sanctuary. Together this population is likely to be locally important for dispersal and breeding. ▪ It is a population that is necessary for maintaining genetic diversity: The population is likely to contain a significant proportion of the genetic diversity of the species within the locality. It is likely that this population has distinct genetic differentiation from other populations of this species. ▪ The population is near the limit of the species range: The local records of this species are not at the limit of the species range. The population of *Pomaderris brunnea* recorded within Teatree Hollow is considered to be part of an important population for the species.
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of an important population of a species	The revised Project footprint will not result in the removal of any of the important population Subsidence is unlikely to result in a decrease in the population of the species as: ▪ *Pomaderris brunnea* is not a strictly water dependent species. It does not occur in the watercourse. It occurs in moist forest communities and gullies often near water. ▪ Teatree Hollow Creek experiences periods of dryness. Whilst it is a possibility that subsidence can result in loss of water from watercourses, the population of *Pomaderris brunnea* in the Study Area is already exposed to such conditions.

Pomaderris brunnea	
Vulnerable Species	**Significant Assessment Criteria**
	▪ Teatree Hollow Creek has been previously mined beneath. No declines in the population have been previously observed. ▪ Any vegetation die back from gas emissions is likely to be isolated and localised. Based on previous experience in the Southern Coalfields, it is unlikely that any gas emissions would cause significant impact to the vegetation. The Project is therefore unlikely to result in a long-term decrease in size of an important population.
Reduce the area of occupancy of an important population	The Project footprint will not result in the removal any Pomaderris brunena and will not reduce the total area of occupancy of the population. Mitigation measures would prevent indirect impacts to the important population.
Fragment an existing important population into two or more populations	The revised Project will not result in a direct impact to the species. The Project will not fragment a known population of the species.
Adversely affect habitat critical to the survival of a species	The Project is unlikely to adversely affect habitat critical to the survival of the species as: ▪ No individuals will be directly impacted. ▪ Mitigation measures proposed would prevent indirect impacts to the remaining population. ▪ Potential habitat for the species is unlikely to be significantly impacted by the Project and associated subsidence. ▪ The species is found within the Wirrimbirra Sanctuary which occurs within the locality (SEWPaC 2013). This population is unlikely to be impacted by the Project.
Disrupt the breeding cycle of an important population	The following is known about the breeding cycle of *Pomaderris brunnea*: ▪ The species is expected to live for 10-20 years, while the minimum time to produce seed is estimated to be 4-6 years ▪ Grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines. ▪ Flowers appear in September and October. The Project is unlikely to disrupt the breeding cycle of an important population as: ▪ One individual of the important population would be cleared. ▪ Mitigation measures would prevent indirect impacts. ▪ The Project is unlikely to impact known dispersal or reproduction mechanisms. ▪ The Project is unlikely to result in changes to the fire regime for the species as appropriate fire regimes will be implemented in the Tahmoor Coal Bushfire Management Plan.

Pomaderris brunnea	
Vulnerable Species	**Significant Assessment Criteria**
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The species occurs in the Sydney region of the Central Coast of NSW, east of Tamworth on the Northern Tablelands of NSW, and in the East Gippsland region of Victoria. In NSW, the species was originally considered endemic to the Sydney Hawkesbury Sandstone region. It is found on the Colo River, the Nepean River floodplain at Menangle, in creeklines at Wirrimbirra Sanctuary (Bargo) and on the Hawkesbury River. The distribution may extend into the southern section of Yengo National Parks along major creeklines and floodplains. The Wirrimbirra population contained 900 plants in the late 1980s. (source: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=16845) The Project is unlikely to result in such a decrease in habitat that the species is likely to decline. The important population would not be cleared, and as such, a viable seedbank would be maintained.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	There is the potential for the Project to result in an increase in invasive species that may occur within areas of potential habitat. However, mitigation measures such as the implementation of a weed management plan would be undertaken as part of the Project. This would reduce the potential for any impacts on the habitat of *Pomaderris brunnea*.
Introduce disease that may cause the species to decline, or	There is the potential for machinery to result in the spread of *Phytophthora cinnamomi*. However, mitigation measures such as vehicle wash downs would be undertaken to reduce the potential for any impacts to the remaining *Pomaderris brunnea* population.
Interfere substantially with the recovery of the species.	A National Recovery Plan for *Pomaderris brunnea* was developed in 2011. The overall objective of recovery is to minimise the probability of extinction of *Pomaderris brunnea* in the wild and to increase the probability of populations becoming self-sustaining in the long term. No individuals of the species would be impacted by the Project. Mitigation measures are proposed to minimise and prevent impacts to the species. It is unlikely that the direct impacts to *Pomaderris brunnea* as a result of the Project would interfere substantially with the recovery of the species.
Conclusion	The Project is considered unlikely to result in a significant impact to *Pomaderris brunnea*

Leucopogon exolasius	
Vulnerable Species	**Significant Assessment Criteria**
Background	No *Leucopogon exolasius* were recorded during the extensive field surveys throughout the Study Area. The species is relatively conspicuous when not in flower and was unlikely to remain undetected during targeted surveys within the disturbance footprint. Furthermore, the species is unlikely to be impacted by subsidence given the species occurs within the following vegetation communities: Shale Sandstone Transition Forest and Upper Georges River Sandstone Woodland, Western Sandstone Gully Forest and Sydney Hinterland Transition Woodland. These vegetation communities are not reliant solely on groundwater dependency, and any surface cracking within the communities is unlikely to result in measurable species composition changes to areas of potential habitat for *Leucopogon exolasius.* Furthermore, the species typically occurs on the slopes of gullies away from the riparian zone of creeks. Thus, any subsidence related impacts to hydrology are unlikely to impact habitat for the species.
Is this population and important population?	No population has been mapped as occurring within the Project footprint.
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of an important population of a species	The Project would not impact upon an important population.
Reduce the area of occupancy of an important population	The Project would not impact upon an important population.
Fragment an existing important population into two or more populations	The Project would not impact any known individuals of *Leucopogon exolasius.* The Project would not impact an important population.
Adversely affect habitat critical to the survival of a species	The Project is unlikely to adversely affect habitat critical to the survival of the species as: ▪ Leucopogon exolasius was not recorded within the development footprint or broader study area during targeted survey. ▪ Subsidence is unlikely to impact on potential habitat for the species, as the species does not occur within habitat types that are sensitive to changes due to subsidence (eg. creek beds, groundwater dependent ecosystems etc.).
Disrupt the breeding cycle of an important population	No important population occurs within the Study Area, as such, the breeding cycle would not be impacted.

Leucopogon exolasius	
Vulnerable Species	**Significant Assessment Criteria**
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Based on previous mapping (Tozer 2006), the area of potential habitat in the locality is over 20,000 ha, comprising of Cumberland Shale Sandstone Transition Forest, Western Sandstone Gully Forest, Upper Georges River Sandstone Woodland and Sydney Hinterland Transition Woodland. The Project would result in the removal of less than 1 per cent of potential habitat in the locality. However, it should be noted that this habitat is marginal at best given the species was not recorded. Given the species was not recorded within the development footprint during the current survey, and the extent of potential habitat is relatively extensive, it is unlikely the Project would modify, destroy, remove or isolate the availability of quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	There is a limited potential for the Project to result in an increase in invasive species within the REA and elsewhere where any surface infrastructure would be developed or exploration activities would be undertaken. However, the Project also involves the implementation of good environmental practice including vehicle hygiene and development of a weed management plan. Further, the current REA activities and the exploration activities undertaken to date have not resulted in high number of invasive species establishing within the habitat for this vulnerable species.
Introduce disease that may cause the species to decline, or	There is the potential for machinery to result in the spread of *Phytophthora cinnamomi*. However, mitigation measures such as vehicle wash downs would be undertaken to reduce the potential for any impacts to *Leucopogon exolasius*.
Interfere substantially with the recovery of the species.	No known individuals of this species would be removed by the Project. Approximately 10.10 ha of potential habitat would be removed by proposed surface infrastructure. The impact of the Project would not extend beyond the Study Area and would therefore not interfere with the recovery of the species elsewhere in the locality.
Conclusion	The Project would not result in a significant impact to *Leucopogon exolasius* due to the following: ▪ No individuals of *Leucopogon exolasius* were recorded within the disturbance area. ▪ *Leucopogon exolasius* does not occur within habitat that would be impacted by subsidence. ▪ The habitat for *Leucopogon exolasius* is relatively extensive within the locality.

Hoplocephalus bungaroides Broad-headed Snake	
Vulnerable Species	**Address of Criteria**
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it would:	
Lead to a long-term decrease in the size of an important population of a species	The Broad-headed Snake has not been recorded in the Study Area during current or previous surveys, nor has the species previously been recorded within the Study Area. No known local population of the Broad-headed Snake is therefore known to occur within the Study Area. The closest records obtained from BioNet is a record approximately four km to the west of the Study Area along the ridgeline of the Bargo River, and a record six km to the south along the Avon River. These areas differ from the Study Area as they contain extensive deep incised gullies and cliff lines. These areas are also within conservation lands managed by NSW NPWS and WaterNSW respectively. Given the species was not detected during targeted surveys, and the absence of records, it is highly unlikely that habitat exists within the surface infrastructure area footprint. Furthermore, the habitat to be cleared is situated away from rocky outcrops which the species is known to occupy, so movement into the surface infrastructure footprint to use hollow-bearing trees is unlikely. Potential habitat for the species is also quite limited within the Study Area. The Broad-headed Snake is known to be selective in its selection of rock outcrops for habitat. The Broad-headed Snake is known to occupy ridgelines facing north or west, as the species relies upon specific thermal conditions that are only attained in such ridgelines. These outcrops must have limited to no shading from the woodland canopy, again to allow penetration of high levels of sunlight. Finally, the outcrop must also include suitable rock exfoliations, which take the form of thin layers of rock resting directly on larger rock and without sand or debris between the layers (Pringle et al. (2003), Webb and Shine (1994) and Webb and Shine (1998a, 1998b & 1998c). Within the Study Area, suitable potential habitat is limited to a number of cliff line habitats along the valleys of the, the Bargo River, Dogtrap Creek and Hornes Creek. However, based on traverses throughout these areas during the field survey, areas of suitable rock exfoliation are quite limited. As discussed in the BAR, MSEC (2019) predict that a small number of cliffs may be subject to the impacts of subsidence, which are more likely to be impacted if directly mined beneath. MSEC (2019) states that any impacts to the cliffs that are directly mined beneath, are expected to affect between 3 to 5 percent of the total length of the cliffs. One cliff in the Study Area would be mined beneath. Based on this prediction, the length of the cliffs along Dogtrap Creek that may be impacted by subsidence equates to a length of approximately two (2) metres. Whilst there is always the possibility that the rocky outcrops of the cliff could be potential habitat for the species, the likelihood of suitable exfoliating rock habitat occurring within this relatively small area of cliff line, is quite low. Furthermore, the likelihood of subsidence impacting the precise exfoliating rock habitat for which a Broad-headed Snake resides is considered to be low. As such, it is considered unlikely that the Broad-headed Snake would be subject to impacts that would lead to a long-term decrease in the size of an important population.
Reduce the area of occupancy of an important population	Subsidence impacts as a result of the Project are likely to cause some minor and isolated rock falls and cracking as detailed above. This may impact only a minimal area of potential habitat for the species (about 2 m of cliff line within the Study Area). Seven hollow-bearing trees (which the species may utilise) would be impacted by the Project in the surface infrastructure area. It is highly unlikely isolated/minor subsidence impacts would reduce the area of occupancy of an important population, should it occur.

Hoplocephalus bungaroides Broad-headed Snake	
Vulnerable Species	**Address of Criteria**
Fragment an existing important population into two or more populations	Based on previous mine subsidence predictions, subsidence impacts associated within the Project could cause rock falls and surface cracking. Given the species has not been recorded during the surveys and only one previous record occurs in the locality, it is unlikely fragmentation of an important population would occur.
Adversely affect habitat critical to the survival of a species	No critical habitat has been listed for the species on the EPBC Act Register of Critical Habitat. Given that the species has not been recorded in the Study Area despite targeted surveys and the lack of previous records in the locality, the Study Area is not likely to support habitat critical to the survival of the Broad-headed Snake.
Disrupt the breeding cycle of an important population	The following is known about the breeding cycle of the Broad-headed Snake (DEC 2005): ▪ Preferred habitat is centred on the communities occurring on the Triassic sandstone of the Sydney Basin. ▪ The sites where they occur are typified by exposed sandstone outcrops and benching and in these locations the vegetation is mainly woodland, open woodland and/or heath. ▪ Seasonally occupies distinctive microhabitats within these broader habitat types. They utilise rock crevices and exfoliating sheets of weathered sandstone during the cooler months and tree hollows during summer. ▪ Nocturnal to crepuscular (active at dusk) and is an 'ambush predator', preying predominantly on lizards, particularly Lesueurs Velvet Geckos, at least during the cooler months. ▪ During this time the species can be found frequenting exposed sandstone ridgetops where it refuges under exfoliating sheets of sandstone resting on naked rock or within crevices. These refuges often have a predominantly west to north westerly aspect. This aspect effect is thought to provide thermoregulatory advantage and maximises temperature levels for the peak feeding periods of early evening. ▪ During the warmer months of the year they become arboreal frequenting tree hollows and undergo a presumed dietary shift to small mammals, although crepuscular arboreal skinks (*Eulamprus tenuis*) have also been reported in the diet of summer captured individuals (G. Turner 1998 unpublished). ▪ They give birth to live young (ovoviviparous) The Project is unlikely to disrupt the breeding cycle of an important population due to the following: ▪ Subsidence impacts are likely to be minimal and isolated. Only small scale impacts to surface rock and potential habitat are considered likely to occur. ▪ The species has not been previously recorded in the Study Area. ▪ The species was not recorded during surveys undertaken to date. ▪ The majority of potential habitat for the species is unlikely to be impacted by the Project (23 of 24 cliff lines within the Study Area unlikely to be impacted (MSEC 2019) and hollow-bearing trees are likely present throughout woodland/forest habitat within the Study Area) ▪ Hollow-bearing trees outside of the surface infrastructure area would not be impacted by subsidence. ▪ Food sources are unlikely to be impacted by the Project.

Hoplocephalus bungaroides **Broad-headed Snake**	
Vulnerable Species	**Address of Criteria**
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	It is unlikely that the Project would result in the loss of habitat to the extent that the species is likely to decline. Based on previous subsidence predictions (MSEC 2019) localised and isolated rock falls and surface cracking may occur. Within the Study Area, this may affect about 2 m of cliff line. This is unlikely to significantly reduce the extent and quality of potential habitat such that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	It is unlikely the Project would introduce invasive species that are harmful to the species habitat. Potential key habitat for the species is located away from proposed surface works.
Introduce disease that may cause the species to decline, or	It is unlikely the Project would introduce disease that is harmful to the species. The potential habitat for the species is located away from proposed surface works.
Interfere substantially with the recovery of the species.	The Project is unlikely to substantially interfere with the recovery of the species. Degradation of breeding habitat through subsidence impacts is likely to be isolated and insignificant when compared to the availability of potential habitat in the Study Area.
Conclusion	The proposed action is unlikely to have a significant impact on the Broad-headed Snake due to the following: ▪ The species was not recorded during targeted survey. ▪ An important population is unlikely to be present within the Study Area given the lack of records, and non-detection during survey. ▪ Clearing associated with the surface infrastructure is unlikely to result in a decline of important habitat for the species. ▪ Subsidence related impacts to habitat are likely to be minor and isolated.

***Phascolarctos cinereus* (Koala**	
Criteria (Vulnerable Species)	**Address of Criteria**
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of a population	The Koala was not recorded during the field surveys despite targeted surveys including spotlighting and scat surveys. However, a record of the Koala by OEH exists within the Study Area. Potential habitat in the Study Area is widespread however is likely to be more concentrated toward the far west of the Study Area within vegetated land that is extensive along the Bargo River. Approximately 4.12 ha of potential foraging habitat would be cleared for the surface infrastructure. Given the species has not been detected during targeted surveys, and no populations are known in the area, it is unlikely that a population exists within the Study Area. Furthermore, habitat for the Koala is unlikely to be significantly impacted by subsidence. Therefore, it is considered unlikely the Project would affect a population in the long-term.
Reduce the area of occupancy of the species	It is unlikely that the Project would reduce the area of occupancy of the Koala as: ▪ Subsidence impacts within the Study Area are anticipated to be localised and minor and unlikely to impact any potential habitat for the Koala ▪ No populations of the Koala are known to occur within the Study Area ▪ No populations of the Koala are known to occur within the area of potential habitat to be cleared by the Project ▪ Potential habitat for the Koala is relatively extensive within the Locality. The Locality includes the Nepean State Conservation Area, vegetated corridors along the Bargo River to the west of the Study Area, and land managed by Water NSW.
Fragment an existing population into two or more populations	It is unlikely that the Project would fragment an existing population of the Koala as: ▪ Subsidence impacts within the Study Area are anticipated to be localised and minor and unlikely to impact any potential habitat for the Koala ▪ No populations of the Koala are known to occur within the Study Area ▪ No populations of the Koala are known to occur within the area of potential habitat to be cleared by the Project ▪ Vegetation clearance as a result of the surface works will result in some fragmentation of habitat, however the species has not been recorded during targeted fauna survey.
Adversely affect habitat critical to the survival of a species	No critical habitat has been listed for the species on the EPBC Act Register of Critical Habitat. The Study Area is not likely to support habitat critical to the survival of the Koala given the species is more likely to utilise the extensive vegetation west and south of the Study Area which adjoins the Nepean State Conservation Area, Conservation land managed by Water NSW and vegetation along the Bargo River.

Phascolarctos cinereus (Koala	
Criteria (Vulnerable Species)	**Address of Criteria**
Disrupt the breeding cycle of a population	The following is known about the breeding cycle of the Koala (DEC 2005): ▪ Home range size varies with quality of habitat, ranging from less than 2 ha to several hundred hectares in size. ▪ Generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery. ▪ Animals reach sexual maturity at two years and although breeding can occur yearly, this does not generally occur (DECC 2008). ▪ Diet is primarily comprised of eucalypt leaves. Koalas have been observed to feed on 70 eucalypt and 30 non-eucalypt species. However, in any one area, koalas feed almost exclusively on a small number of preferred species which vary widely on a regional, local and possibly seasonal basis (DECC 2008). ▪ Some groundcover vegetation and other features such as hollow logs, are also useful to provide shelter while on the ground and refuge in extreme weather conditions (DECC 2008). ▪ Studies have shown that koala activity was greater in structurally diverse forest with the majority of trees 25.5-80 diameter at breast height (dbh), or 50–80 cm dbh. (DECC 2008) ▪ The recovery plan (DECC 2008) lists koala food species for different regions. None of the primary food tree species listed for the central coast management area were recorded in the area to be disturbed for surface infrastructure. However secondary food tree species *E. eugenioides* and -supplementary food species *E. globoidea* were recorded in the Study Area. The Project is unlikely to have an adverse effect on the species ability to breed successfully due to the following: ▪ Subsidence impacts to potential habitat would be localised and minor and unlikely to result in impacts to the Koala habitat. ▪ Habitat features within the Study Area are likely to be extensive and not all areas of potential habitat would be impacted by the Project. ▪ No known population occurs within the Study Area. ▪ No Koalas were recorded within the area to be disturbed for surface infrastructure.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The species has not been previously recorded in the surface area footprint. Approximately 4.12 ha of potential habitat would be impacted by surface infrastructure. Habitat is unlikely to be impacted by subsidence. It is unlikely that the Project would result in the loss of habitat to the extent that the species is likely to decline as over >20,000 ha of potential foraging/breeding habitat has been mapped by Tozer et al (2006) as occurring within the locality (including: Shale Sandstone Transition Forest, Upper Georges River Sandstone Woodland, Western Sandstone Gully Forest).
Result in invasive species that are harmful to a critically endangered or endangered species becoming	A biodiversity management plan would be implemented as part of the Project which would propose weed control measures to minimise impacts to adjacent bushland. It is unlikely that the Project would result in an increase in feral pest activity that may impact potential Koala habitat.

***Phascolarctos cinereus* (Koala**	
Criteria (Vulnerable Species)	**Address of Criteria**
established in the critically endangered or endangered species' habitat	
Introduce disease that may cause the species to decline, or	It is unlikely that the Project would result in the introduction of a disease that may cause the species to decline.
Interfere substantially with the recovery of the species.	The Project is unlikely to interfere substantially with the recovery of the species as: ▪ A population is unlikely to occur within the surface infrastructure footprint where loss of habitat through native vegetation clearing would occur. ▪ Habitat is unlikely to be impacted by subsidence given the species may utilise a range of vegetation. Furthermore, feed trees are unlikely to be significantly impacted as a result of subsidence.
Conclusion	The proposed action is unlikely to have a significant impact on the Koala due to the following: ▪ The species was not recorded in the Study Area despite targeted survey. ▪ No important populations are known to occur within the Study Area. ▪ Habitat to be removed is relatively extensive throughout the locality. ▪ Subsidence is unlikely to result in impacts to potential habitat for the species.

Chalinolobus dwyeri (Large-eared Pied Bat)	
Criteria (Vulnerable Species)	**Address of Criteria**
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of a population	Although the Large-eared Pied Bat was not detected during the survey, there is one record of the species within the north of the broader Subsidence Study Area. Several other records occur adjacent to the Bargo River to the north and north-east of the Subsidence Study Area and also along the Nepean River to the south of the Subsidence Study Area. The Large-eared Pied Bat may utilise caves and rocky crevices for roosting and breeding habitat but forages nearby in woodland or forested habitat (DERM 2011).The National Recovery Plan for the species (DERM2011) notes that all records of the species are within several kilometres of cliff lines or rocky terrain and that sandstone cliffs and fertile wooded valley habitat within close proximity of each other should be considered habitat critical to the survival of the Large-eared Pied Bat. According to MSEC (2019), a total of 24 cliffs are located within the Study Area. The cliffs may provide roosting habitat for the species. The cliffs are generally located within the valleys of the Bargo River, Dogtrap Creek and Hornes Creek. Given the proximity of the cliff line along the Bargo River, to the surface infrastructure area (within two km), and the proximity of local records of the species, the species is considered likely to utilise the Study Area, including the surface infrastructure area, for foraging habitat. A total of 4.12 ha forested habitat will be removed within the surface infrastructure area. As detailed in MSEC (2019), most (23 out of a total of 24) cliffs will not be directly mined beneath. These include the cliffs along the Bargo River and Hornes Creek, which are all located outside the extents of the proposed longwalls. The cliffs that occur outside of the area directly above longwalls, are predicted to experience very low levels of vertical subsidence and are not expected to experience any substantial conventional tilts, curvatures or strains (MSEC 2019). The likelihood of cliff instabilities along the Bargo River and Hornes Creek has been assessed by MSEC (2019) using case studies where previous longwall mining has occurred close to but not directly beneath cliffs. The case studies have indicated that very minor rock falls have been observed outside the extracted goaf areas of longwall mining in the Southern Coalfield, although there have been no recorded large cliff instabilities. These case studies are supported by previous impacts from mining at Tahmoor, Appin and Tower Collieries, which have not experienced any large instabilities beyond the extent of the longwall mining area (MSEC 2019). Based on the MSEC (2019) predictions and previous experience in the Southern Coalfields, it is unlikely that potential roosting habitat for the Large-eared Pied Bat within the cliffs to be directly mined beneath would be impacted by large scale instabilities which may destroy this potential habitat. As discussed in MSEC (2019), previous experience in the Southern Coalfield has indicated that cliffs which are directly mined beneath may exhibit instabilities. The one cliff that occurs above the longwalls and may exhibit instabilities occurs along Dogtrap Creek and is 55 metres long and 10 metres high. There is the potential for the cliffs to support roosting habitat for the Large-eared Pied Bat. It is predicted by MSEC (2019) that the cliff to be undermined could experience the full range of predicted subsidence movements, and based on previous experience in the southern coalfields that there is a moderate to likely probability that rock falls and cliff instabilities would occur somewhere

Chalinolobus dwyeri (Large-eared Pied Bat)	
Criteria (Vulnerable Species)	**Address of Criteria**
	along this cliff line. MSEC (2019) states that any impacts to the cliffs that are directly mined beneath, are expected to affect between 3-5 % of the total length of the cliffs. Based on this prediction, the length of the cliff along Dogtrap Creek that may be impacted by subsidence is relatively small (about 2.75 metres). Given the relatively small length of the cliff line that would potentially be impacted by subsidence, the probability that roosting habitat would be impacted is very low. Even more unlikely is that subsidence would result in impacts to a crevice in which a roosting population of Large-eared Pied Bat is present, particularly given no caves are known to occur above the longwalls. As such, , it is unlikely that the species would be impacted by subsidence related impacts. The vegetation clearance required within the surface infrastructure area will impact on 4.12 ha of potential foraging habitat for the species. Given the extent of potential foraging habitat available within the surrounding landscape the low likelihood of impacts as a result of subsidence, it is considered unlikely that the Project would lead to a long term decrease in the size of a population.
Reduce the area of occupancy of the species	It is unlikely that the Project would reduce the area of occupancy of the Large-eared Pied Bat as: ▪ Subsidence impacts within the Study Area are anticipated to be localised and minor. ▪ Not all potential habitat within the Study Area would be impacted by subsidence and clearing associated with the Project. ▪ Not all habitat features are likely to be impacted by subsidence e.g. logs, tree hollows.
Fragment an existing population into two or more populations	It is unlikely that the Project would fragment an existing population of the Large-eared Pied Bat as: ▪ Subsidence impacts within the Study Area are anticipated to be localised and minor; ▪ The species is relatively mobile and the extent of vegetation clearing is unlikely to significantly fragment habitat.
Adversely affect habitat critical to the survival of a species	No critical habitat has been listed for the species on the EPBC Act Register of Critical Habitat. The Study Area is not likely to support habitat critical to the survival of the Large-eared Pied Bat given the species is more likely to utilise the extensive deeper gullies of the Bargo River.
Disrupt the breeding cycle of a population	The following is known about the breeding cycle of the Large-eared Pied Bat (DEC 2005): ▪ Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years. ▪ Found in well-timbered areas containing gullies. ▪ The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy. ▪ Likely to hibernate through the coolest months. It is uncertain whether mating occurs early in winter or in spring. The Project is unlikely to have an adverse effect on the species ability to breed successfully due to the following:

Chalinolobus dwyeri (Large-eared Pied Bat)	
Criteria (Vulnerable Species)	**Address of Criteria**
	▪ Subsidence impacts to potential habitat would be localised and minor. ▪ Habitat features within the Study Area are likely to be extensive and not all areas of potential habitat would be impacted by the Project. ▪ Not all habitat features are likely to be impacted by subsidence e.g. logs, tree hollows.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The species has not been previously recorded in the surface area footprint. Approximately 4.12 ha of potential habitat would be impacted by the surface infrastructure development. Subsidence impacts to potential habitat are likely to be minor and isolated. It is unlikely that the Project would result in the loss of habitat to the extent that the species is likely to decline as over >20,000 ha of potential foraging/breeding habitat has been mapped by Tozer et al (2006) as occurring within the locality (including: Shale Sandstone Transition Forest, Upper Georges River Sandstone Woodland, Western Sandstone Gully Forest).
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat	A biodiversity management plan would be implemented as part of the Project which would include weed control measures to minimise impacts to adjacent bushland. It is unlikely that the Project would result in an increase in feral pest activity that may impact potential Large-eared Pied Bat habitat.
Introduce disease that may cause the species to decline, or	It is unlikely that the Project would result in the introduction of a disease that may cause the species to decline.
Interfere substantially with the recovery of the species.	The Project is unlikely to interfere substantially with the recovery of the species as: ▪ An important population is unlikely to occur within the surface infrastructure footprint where loss of habitat through native vegetation clearing would occur. ▪ Impact as a result of subsidence toward potential habitat is likely to be isolated rock falls, and surface rock cracking. As such, all habitat is unlikely to be impacted by the Project.
Conclusion	The proposed action is unlikely to have a significant impact on the Large-eared Pied Bat due to the following: ▪ The species was not recorded in the Study Area despite targeted trapping survey. ▪ No important populations are known to occur within the Study Area. ▪ Habitat to be removed is relatively extensive throughout the locality. ▪ Subsidence related impacts are likely to be relatively isolated and minor in nature.

***Petauroides volans* (Greater Glider)**	
Criteria (Vulnerable Species)	**Address of Criteria**
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of a population	The Greater Glider was not recorded during the field surveys despite targeted survey, however the species has been recorded along the Bargo River approximately 1.3 km to the north of the Study Area. Potential habitat in the Study Area occurs along the gullies of the Bargo River. No known habitat for the species would be impacted by the proposed surface infrastructure, and thus would not lead to a long-term decrease of a population of the species. Furthermore, subsidence would not result in the loss of hollow bearing trees, nor decrease the amount of suitable eucalypt forest habitat that a population could utilise. Thus, subsidence would not result in a long-term decrease in the size of any potential population.
Reduce the area of occupancy of the species	It is unlikely that the Project would reduce the area of occupancy of the Greater Glider as: ▪ The species does not occur within the area proposed to be cleared for surface infrastructure. ▪ Subsidence is unlikely to impact upon habitat for this species eg. tree hollows, tall eucalypt forest.
Fragment an existing population into two or more populations	It is unlikely that the Project would fragment an existing population of the Greater Glider as: ▪ Subsidence impacts within the Study Area are anticipated to be localised and minor. These potential impacts would not result in fragmentation of potential habitat. ▪ The species does not occur within the area proposed to be cleared for surface infrastructure, and thus unlikely to result in fragmentation of an important habitat.
Adversely affect habitat critical to the survival of a species	No critical habitat has been listed for the species on the EPBC Act Register of Critical Habitat. The Study Area is not likely to support habitat critical to the survival of the Greater Glider given the species is more likely to utilise the extensive deeper gullies of the Bargo River.
Disrupt the breeding cycle of a population	The following is known about the breeding cycle of the Greater Glider (Threatened Species Scientific Committee 2016): ▪ The Greater Glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands. ▪ It is primarily folivorous, with a diet mostly comprising eucalypt leaves, and occasionally flowers ▪ During the day it shelters in tree hollows, with a particular selection for large hollows in large, old trees ▪ Home ranges are typically relatively small (1–4 ha) ▪ Females give birth to a single young from March to June. ▪ Sexual maturity is reached in the second year. ▪ Longevity has been estimated at 15 years, so generation length is likely to be 7–8 years. ▪ The relatively low reproductive rate may render small isolated populations in small remnants prone to extinction The Project is unlikely to have an adverse effect on the species ability to breed successfully due to the following:

***Petauroides volans* (Greater Glider)**	
Criteria (Vulnerable Species)	**Address of Criteria**
	▪ Subsidence impacts to potential habitat are highly unlikely. ▪ Habitat features within the Study Area are likely to be extensive and not all areas of potential habitat would be impacted by the Project. ▪ The Project would not result in the clearing of likely habitat for the species.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The species has not been recorded in the surface infrastructure footprint despite targeted survey. However, the species has been recorded along the Bargo River approximately 1.3 km to the north of the Study Area. Potential habitat in the Study Area occurs along the gullies of the Bargo River and Nepean River. No known habitat for the species would be impacted by the proposed surface infrastructure. Furthermore, subsidence would not result in the loss of hollow bearing trees, nor decrease the amount of suitable eucalypt forest habitat that a population could utilise. Thus, the Project is unlikely to reduce the habitat utilised by a population to an extent that the species would decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat	The Project would implement a biodiversity management plan which would propose weed control measures to minimise impacts to adjacent bushland. It is unlikely that the Project would result in an increase in feral pest activity that may impact potential Greater Glider habitat.
Introduce disease that may cause the species to decline, or	It is unlikely that the Project would result in the introduction of a disease that may cause the species to decline.
Interfere substantially with the recovery of the species.	The Project is unlikely to interfere substantially with the recovery of the species as: ▪ An important population is unlikely to occur within the surface infrastructure footprint where loss of habitat through native vegetation clearing would occur. ▪ Habitat for the species is unlikely to be impacted by subsidence.
Conclusion	The proposed action is unlikely to have a significant impact on the Greater Glider due to the following: ▪ The species was not recorded in the Study Area despite targeted survey. ▪ No important populations are known to occur within the Study Area. ▪ Habitat to be removed for the surface infrastructure is unlikely to be utilized by the Greater Glider. ▪ Subsidence related impacts are likely to be relatively isolated and minor in nature. Subsidence would not impact habitat available for the species.

Grey-headed Flying-fox	
Criteria (Vulnerable Species)	**Address of Criteria**
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of a population	The Grey-headed Flying-fox was not recorded during the current field survey, however it is likely the species would utilised the Study Area for foraging habitat. No known camp sites exist within the area proposed for surface infrastructure or within the Study Area. Approximately 4.12 ha of potential foraging habitat would be cleared for the surface infrastructure, however potential habitat is widespread throughout the locality. Given the species has not been detected during the current survey, and no populations are known in the area, it is unlikely that an important population exists within the Study Area. Furthermore, habitat features for the Grey-headed Flying-fox are unlikely to be impacted by subsidence.
Reduce the area of occupancy of the species	It is unlikely that the Project would reduce the area of occupancy of the Grey-headed Flying-fox as: ▪ Subsidence within the Study Area are unlikely to impact upon habitat for the species. ▪ No known camp sites occur within the Study Area. ▪ An important population does not occur within the Study Area.
Fragment an existing population into two or more populations	It is unlikely that the Project would fragment an existing population of the Grey-headed Flying-fox as: ▪ Subsidence impacts within the Study Area are anticipated to be localised and minor. ▪ The species is relatively mobile and vegetation clearing is unlikely to significantly fragment habitat.
Adversely affect habitat critical to the survival of a species	No critical habitat has been listed for the species on the EPBC Act Register of Critical Habitat.
Disrupt the breeding cycle of a population	The following is known about the breeding cycle of the Grey-headed Flying-fox (DEC 2005): ▪ Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. ▪ Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. ▪ Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young. ▪ Annual mating commences in January and conception occurs in April or May; a single young is born in October or November. ▪ Site fidelity to camps is high; some camps have been used for over a century. ▪ Can travel up to 50 km from the camp to forage; commuting distances are more often <20 km.

Grey-headed Flying-fox	
Criteria (Vulnerable Species)	**Address of Criteria**
	▪ Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines. ▪ Also forage in cultivated gardens and fruit crops. It is uncertain whether mating occurs early in winter or in spring. The Project is unlikely to have an adverse effect on the species ability to breed successfully due to the following: ▪ Subsidence is unlikely to impact habitat for the Grey-headed Flying Fox. ▪ Habitat features within the Study Area are likely to be extensive and not all areas of potential habitat would be impacted by the Project.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The species has not been previously recorded in the surface area footprint. Approximately 4.12 ha of potential foraging habitat would be impacted by the REA development footprint. Habitat is relatively extensive throughout the locality. Subsidence is unlikely to result in impacts to foraging habitat. The species is unlikely to decline due to the Project.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat	The Project would implemented a biodiversity management plan which would propose weed control measures to minimise impacts to adjacent bushland which is foraging habitat for the species. It is unlikely that the Project would result in an increase in feral pest activity that may impact potential Grey-headed Flying-fox.
Introduce disease that may cause the species to decline, or	It is unlikely that the Project would result in the introduction of a disease that may cause the species to decline.
Interfere substantially with the recovery of the species.	The Project is unlikely to interfere substantially with the recovery of the species as: ▪ An important population is unlikely to occur within the surface infrastructure footprint where loss of habitat through native vegetation clearing would occur. ▪ Impact to habitat as a result of subsidence is unlikely.
Conclusion	The proposed action is unlikely to have a significant impact on the Grey-headed Flying-fox due to the following: ▪ The species was not recorded in the Study Area despite targeted trapping survey. ▪ No important populations are known to occur within the Study Area. ▪ Habitat to be removed is relatively extensive throughout the locality. ▪ Habitat would not be impacted by subsidence.

BIRDS **Endangered species: Swift Parrot (*Lathamus discolor*) and Regent Honeyeater (*Xanthomyza phrygia)***	
Criteria (Critically Endangered and Endangered Species)	**Address of Criteria**
An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of a population	Neither of these species were recorded during the current survey, nor have they been previously recorded in the Study Area. It is unlikely subsidence associated with the Project would impact potential habitat associated with these species. Furthermore, the proposed surface infrastructure would remove approximately 4.12 ha of native vegetation. Despite the loss of this native vegetation, the Project is unlikely to lead to a long-term decrease in the size of a population due to the following: ▪ It is unlikely a population of either of these species exist in the Study Area, as neither of the species were recorded during the current or previous surveys. ▪ Extensive potential habitat surrounding the Study Area would not be impacted by the Project.
Reduce the area of occupancy of the species	The impact of the Project may reduce native vegetation by 4.12 ha. Potential habitat immediately adjacent to the Study Area is extensive which extends into Nepean State Conservation Area, and Conservation Lands managed by Water NSW. It is unlikely that the loss of native vegetation as a result of surface infrastructure associated with the Project would reduce the area of occupancy of either of these bird species. Furthermore, no populations of these species have been recorded in the Study Area.
Fragment an existing population into two or more populations	Neither of the species are likely to have populations reliant upon the Study Area. Whilst the Project would result in some fragmentation, the species are mobile and therefore unlikely to be impacted by fragmentation.
Adversely affect habitat critical to the survival of a species	No critical habitat has been listed for these species on the EPBC Act Register of Critical Habitat. As these species have not been recorded in the Study Area, the potential habitat within the Study Area is not likely to represent habitat critical to the survival of these species.
Disrupt the breeding cycle of a population	The Project is unlikely to disrupt the breeding cycle of a population as: ▪ Neither of these species are likely to have populations reliant upon the Study Area. ▪ The species have not been recorded in the Study Area. Thus a population of these species is unlikely to occur. ▪ The species are mobile and likely to move to other areas of potential habitat. ▪ Potential habitat immediately adjacent to the Study Area is extensive.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to	The Project would remove and decrease approximately 4.12ha of native vegetation associated with the surface works for the Project. It is unlikely that the Project would result in the loss of habitat to the extent that the species is likely to decline as extensive potential habitat occurs within the locality.

BIRDS **Endangered species: Swift Parrot (*Lathamus discolor*) and Regent Honeyeater (*Xanthomyza phrygia)***	
Criteria (Critically Endangered and Endangered Species)	**Address of Criteria**
the extent that the species is likely to decline	
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat	There is the potential for the Project to result in an increase in invasive species such as introduced weeds into adjacent habitat. However, mitigation measures such as the implementation of a weed management plan would be carried out. This would reduce the potential for any impacts of the habitat of these species.
Introduce disease that may cause the species to decline, or	It is unlikely the Project would introduce disease that would cause these species to decline.
Interfere substantially with the recovery of the species.	The Project is unlikely to substantially interfere with the recovery of the species as neither have been recorded in the Study Area. No known habitat for these species occurs in the Study Area.
Conclusion: The proposed action is unlikely to have a significant impact on Swift Parrot (*Lathamus discolor*) and Regent Honeyeater (*Xanthomyza phrygia).*	

BIRDS Migratory species: Cattle Egret, Great Egret, Fork-tailed Swift, Regent Honey Eater, Rainbow Bee-eater, Satin Flycatcher.	
Criteria (Migratory Species)	**Address of Criteria**
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The impact of the Project may reduce potential habitat 4.12 ha. Potential habitat immediately adjacent to the Study Area is extensive and is part of a corridor of vegetation along the Bargo River, Nepean State Conservation Area and land managed by Water NSW. It is unlikely that the loss of potential habitat within the Study Area would reduce the area of a population of any of these bird species. Whilst the Project would result in some fragmentation, the species are mobile and therefore unlikely to be impacted by fragmentation. It is unlikely that the Project would result in the loss of habitat to the extent that the species are likely to decline as over 20,000 hectares of potential habitat occurs within the locality.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or	There is the potential for the Project to result in an increase in invasive species such as introduced weeds into adjacent habitat. However, mitigation measures such as the implementation of a weed management plan would be implemented. This would reduce the potential for any impacts of the habitat of the species.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	The Project is unlikely to disrupt the breeding cycle of an important population as: ▪ None of these species are likely to have ecologically significant proportions of the population reliant upon the Study Area; ▪ The species have not been recorded in the Study Area. Thus, an ecologically significant proportion of the population of any of these species is unlikely to occur. ▪ The species are mobile and likely to move to other areas of potential habitat. ▪ Potential habitat immediately adjacent to the Study Area is extensive.
Conclusion: The proposed action is unlikely to have a significant impact on Cattle Egret, Great Egret, Fork-tailed Swift, Regent Honey Eater, Rainbow Bee-eater, and Satin Flycatcher.	

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Annex 2. Credit Profile

Biodiversity credit report

This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 2/08/2020 Time: 9:35:52PM Calculator version: v4.0

Major Project details

Proposal ID: 0112/2019/5018MP

Proposal name: 5315 Tahmoor South Project (2020)

Proposal address: Tahmoor Coal Pty Ltd P.O. Box 100 Tahmoor NSW 2573

Proponent name: Tahmoor Coal Pty Ltd

Proponent address:

Proponent phone:

Assessor name: Luke Baker

Assessor address:

Assessor phone:

Assessor accreditation: 0112

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	10.10	455.51
Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion	14.22	399.00
Total	24.32	855

Credit profiles

1. Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion, (HN556)

Number of ecosystem credits created	456
IBRA sub-region	Cumberland - Hawkesbury/Nepean

Offset options - Plant Community types	Offset options - IBRA sub-regions
Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion, (HN556) Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion, (HN513) Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion, (HN604)	Cumberland - Hawkesbury/Nepean and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion, (HN564)

Number of ecosystem credits created	399
IBRA sub-region	Cumberland - Hawkesbury/Nepean

Offset options - Plant Community types	Offset options - IBRA sub-regions
Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion, (HN564) Yellow Bloodwood - ironbark shrubby woodland of the dry hinterland of the Central Coast, Sydney Basin Bioregion, (HN612)	Cumberland - Hawkesbury/Nepean and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Summary of species credits required

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Koala	Phascolarctos cinereus	4.12	107
Bargo Geebung	Persoonia bargoensis	1.00	77
Large-eared Pied Bat	Chalinolobus dwyeri	4.12	54
Southern Myotis	Myotis macropus	4.12	91
Small-flower Grevillea	Grevillea parviflora subsp. parviflora	55.00	770
Small-flower Grevillea	Grevillea parviflora subsp. parviflora	0.00	770
Eastern Pygmy-possum	Cercartetus nanus	4.12	82
Eastern Cave Bat	Vespadelus troughtoni	4.12	54

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Contact Us

Niche Environment and Heritage
02 9630 5658
info@niche-eh.com

NSW Head Office – Sydney
PO Box 2443 North Parramatta
NSW 1750 Australia

QLD Head Office – Brisbane
PO Box 540 Sandgate
QLD 4017 Australia

Sydney
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Central Coast
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Aboriginal heritage
Historical heritage
Conservation management
Community consultation
Archaeological, built and landscape values

Environmental management and approvals
Impact assessments
Development and activity approvals
Rehabilitation
Stakeholder consultation and facilitation
Project management

Environmental offsetting
Offset strategy and assessment (NSW, QLD, Commonwealth)
Accredited BAM assessors (NSW)
Biodiversity Stewardship Site Agreements (NSW)
Offset site establishment and management
Offset brokerage
Advanced Offset establishment (QLD)