Our ref: DOC19/779746
Senders ref: SSD 8194

Jessie Evans
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Dear Ms Evans

Subject: Dendrobium Mine Extension Project – Review of EIS – SSD 8194

Thank you for your e-mail dated 19 July 2019 requesting advice on the abovementioned major project. The South East Branch of the Biodiversity and Conservation Division, in consultation with Mr Martin Krogh of Policy, Strategy and Science Division, have reviewed the exhibited EIS against the Secretary's Environmental Assessment Requirements (SEARs) reissued by the Department of Planning & Environment on 18 September 2018 and the supplementary SEARs outlining Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requirements and the Framework for Biodiversity Assessment.

Detailed comments are provided in Attachment A and B. In summary:

- The EIS does not sufficiently demonstrate the "avoid" principle has been met, having regard to biodiversity assessment policy, guidelines and the SEARs. In its current form the proposal is likely to have a significant impact on NSW and Commonwealth-listed water-dependent threatened species and ecological communities, including Coastal Upland Swamp, Littlejohns Tree Frog (BC Act and EPBC Act), Giant Burrowing Frog and Giant Dragonfly.
- Subsidence has been underestimated for Area 5 due to the use of the original Incremental Profile Model, which does not consider outcomes from the 305m-wide longwalls used in Dendrobium Area 3B. Subsidence impacts of the proposal on water-dependent threatened species and communities and their habitats, as well as Aboriginal cultural heritage sites, are therefore likely to be underestimated.
- The setbacks proposed from significant stream features identified by the proponent assume that subsidence impact will not occur in areas with <200mm of valley closure, a threshold that is not supported from previous experience in the Southern Coalfields.
- The data that is used to characterise the shallow groundwater in the majority of monitored upland swamps in Areas 5 and 6 does not show a response in the groundwater level or soil moisture from a significant rainfall event. This raises doubt about the quality of data used to inform the upland swamp impact assessment and future monitoring of impacts from mining.
- The FBA has been incorrectly applied in calculating the maximum predicted offset liability for Coastal Upland Swamps. The Upland Swamp Offset Policy requires calculation against a 'worst-case scenario' for swamps, which under the predictions in the EIS includes significant erosion and scouring, equating to total loss of swamps.
- The FBA has been incorrectly applied in calculating offsets for loss of Koala habitat and other threatened species through clearing for surface infrastructure.
- Although the FBA does not require security of offsets for Coastal Upland Swamps and swamp-dependent threatened species to be demonstrated until the Extraction Plan stage,

the proponent has not adequately demonstrated that suitable offsets can be located for Coastal Upland Swamps or other threatened species.

- It is our understanding that the Maddens Plains Strategic Biodiversity Offset Site, set aside as an offset for the Dendrobium Underground Coal Mine and Bulli Seam Operations projects, is not legally available for use as an offset site by the proponent for the current project. Condition 15, Schedule 2 of the Dendrobium Underground Coal Mine consent (as modified June 2018) only allows the proponent to use this land to meet further offsetting requirements that are required under the 2001 consent or the project approval for the Bulli Seam Operations Project (including subsequent modifications).
- The proponent has not had discussions with the National Parks and Wildlife Service about the proposal to undertake track rehabilitation in upland swamp habitat on National Parks as an offset measure. NPWS already has a legal responsibility for managing reserves for conservation.
- The proposed extraction of Areas 5 and 6 is likely to harm multiple Aboriginal cultural heritage sites. We are particularly concerned that the current longwall design will harm sites that have high Aboriginal cultural and scientific significance.

In conclusion, the area of vegetation that will be directly cleared is relatively small. However, the likelihood of extensive subsidence is high, and this is predicted to have a significant impact on multiple threatened Coastal Upland Swamps and other water dependant ecosystems and threatened species. Significant Aboriginal cultural heritage sites are also at risk. The proponent has not followed the FBA in calculating the required offsets for predicted impacts, and from what has been presented to date, it is unlikely that they will be able to effectively offset these impacts. These impacts should therefore be avoided by using mining techniques and a layout that significantly reduce the extent and magnitude of subsidence.

If you have any questions about this advice, please do not hesitate to contact Mr Calvin Houlison, acting Senior Team Leader, Planning (Illawarra), via calvin.houlison@environment.nsw.gov.au or 4224 4179.

Yours sincerely

Michael Saxon 20/9/2019

Director, South East Branch
Biodiversity & Conservation Division
Environment, Energy and Science

ATTACHMENT A – Assessment summary for Dendrobium Mine Extension Project
ATTACHMENT B – Detailed comments for Dendrobium Mine Extension Project

ATTACHMENT A: Environment, Energy & Science (EES) assessment summary for Dendrobium Mine Extension Project (SSD 8194)

Key Issues

1	*Issue*	Avoidance of impacts – proposed mining layout does not adequately demonstrate avoidance of impacts, particularly to Coastal Upland Swamp threatened ecological community and threatened frogs
	Extent and Timing	Response to Submissions
	Recommended action	• The proponent undertake subsidence modelling and impact assessment for alternate mining layouts with a focus on narrower longwall widths (100m, 150m, 200m and 250m) and increased chain pillar widths to analyse reduced impacts on significant natural features (including threatened species and communities). • Setbacks proposed for significant stream features identified by South32 and other significant natural features be based on predicted valley closure values of <100mm.

2	*Issue*	Offsets for Coastal Upland Swamp TEC incorrectly calculated under the FBA guidelines and Upland Swamp Offset Policy.
	Extent and Timing	Response to Submissions
	Recommended action	• Update biodiversity offset strategy to reflect the "maximum offset liability" required under a worst-case scenario as per the *Addendum to NSW Swamp Offsets Policy for Major Projects (Upland swamps affected by longwall mining subsidence).* This will require credit calculation for total loss all vegetation types aligned with the Coastal Upland Swamp TEC.

3	*Issue*	Offsets for Coastal Upland Swamp TEC
	Extent and Timing	Response to Submissions

	Recommended action	• Update the biodiversity offset strategy to demonstrate that suitable offsets for Coastal Upland Swamps can be sourced in accordance with the *Addendum to NSW Swamp Offsets Policy for Major Projects (Upland swamps affected by longwall mining subsidence)*, *NSW Biodiversity Offsets Policy for Major Projects* and Appendix 7 of the FBA. This includes recognition that Maddens Plains is not available as an offset site for this proposal, and that track rehabilitation within the NPWS estate is not supported as an offset mechanism.

4	*Issue*	Peer review of upland swamp shallow groundwater monitoring data
	Extent and Timing	As soon as practicable
	Recommended action	• We request access to all raw swamp monitoring data to review.

5	*Issue*	Review the use of original Incremental Profile Model to assess subsidence predictions in Areas 5 and 6.
	Extent and Timing	Response to Submissions
	Recommended action	• The proponent undertake revised modelling of subsidence predictions for the proposal using a model that includes data from 305m wide longwall panels in Dendrobium Area 3B, as well as recent Metropolitan Mine longwalls in the vicinity of Eastern Tributary.

6	*Issue*	Assessment of ancillary aspects of development
	Extent and Timing	Response to Submissions
	Recommended action	• Threatened flora and fauna surveys must be undertaken for all ancillary elements, including car parking, transmission line easements and

		boreholes prior to approval, including avoidance, resultant mitigation measures and offset requirements.

7	*Issue*	Avoidance of native vegetation clearing impacts
	Extent and Timing	Response to Submissions
	Recommended action	• Map hollow bearing trees at all areas of surface impact to inform detailed design of infrastructure and demonstrate that significant biodiversity values have been avoided. Avoidance of all significant native vegetation (specifically Shale Sandstone Transition Forest TEC) must be demonstrated.

8	*Issue*	Extent of offset requirements for Koala
	Extent and Timing	Response to Submissions
	Recommended action / condition of consent	• The BAR needs to provide offsets for all Koala habitat being directly impacted, which includes the extent of native vegetation proposed to be cleared for surface infrastructure.

9	*Issue*	Updates to species credits species
	Extent and Timing	Response to Submissions
	Recommended action	• The BAR needs to demonstrate the extent of survey effort for all species credit species, including Giant Dragonfly, Rosenberg's Goanna and Powerful Owl is appropriate and a complete and comprehensive offset calculated for these species. Presence can be assumed and offset accordingly in lieu of additional survey effort.

10	*Issue*	Updates to biodiversity assessment
	Extent and Timing	Response to Submissions
	Recommended action	• Miscellaneous updates to credit calculations are required as detailed in our submission. Shapefiles are also required to verify the extent of identified TECs, particularly for Coastal Upland Swamps.

11	*Issue*	Performance measures for Coastal Upland Swamps
	Extent and Timing	Response to Submissions
	Recommended condition of consent	• Detailed measurable & enforceable performance measures for impacts to Coastal Upland Swamps are required. These should be consistent with the Upland Swamp Offset Policy that requires *negligible environmental consequences* to be defined in relation to: ○ shallow groundwater level within swamp sediments lower than the baseline level ○ rate of shallow groundwater level reduction that exceeds the baseline period.

12	*Issue*	Performance measures for threatened species
	Extent and Timing	Response to Submissions
	Recommended condition of consent	• Detailed measurable & enforceable performance measures for impacts to all threatened species identified as impacted by the proposal. Where relevant, these should be consistent with the Upland Swamp Offset Policy.

13	*Issue*	Establishment of an Independent Expert Panel for the Southern Coalfields

	Extent and Timing	Post-approval
	Recommended action / condition of consent	• DPIE establish a standing independent expert panel as per the Upland Swamp Offset Policy. Its role would be to provide advice to the consent authority on environmental consequences of mining under Coastal Upland Swamps, and to ensure that monitoring of impacts is rigorous and scientifically robust. Consideration be given to requiring the proponent (and potentially other miners in the Southern Coalfields) to fund the panel.

14	*Issue*	Review of hydrological modelling
	Extent and Timing	Response to Submissions
	Recommended action / condition of consent	• Further details are provided outlining how the hydrology model has been calibrated, to verify that loss of water/flows as a result of subsidence has been accurately estimated.

15	*Issue*	Consider alternatives to avoid or limit harm to Aboriginal cultural heritage
	Extent and Timing	Response to Submissions
	Recommended action / condition of consent	• Measures to avoid or limit the impact of the proposed longwalls on Aboriginal cultural heritage be developed that consider changes to the longwall layout. As a minimum, we recommend the applicant is required to reduce the impacts of these long walls on Aboriginal heritage sites: ○ LW514 – likely to harm sites 52-2-1780, 52-2-1779 and 52-2-1782. ○ LW516 – likely to harm site 52-2-1752. ○ LW603 – likely to harm sites 52-2-1456 and 52-2-1466.

16	*Issue*	Subsidence impacts on sites of Aboriginal cultural heritage significance
	Extent and Timing	Response to Submissions
	Recommended action / condition of consent	• Measures be put in place to reduce subsidence levels to a minimum or imperceptible level at all affected Aboriginal heritage sites, particularly at sites 52-2-1780, 52-2-1752 and 52-2-1456.

17	*Issue*	Preparation of Aboriginal Heritage Management Plan
	Extent and Timing	Pre-approval
	Recommended condition of consent	• An Aboriginal heritage management plan (AHMP) must be prepared at an early stage in consultation with the Registered Aboriginal Parties that includes and addresses recommendations of the Aboriginal cultural heritage assessment report (Niche, 2019). • We would welcome the opportunity to review a draft AHMP prior to any project approval being issued. • A protocol be developed to provide for appropriate Aboriginal community access to cultural heritage sites on Water NSW land as part of the AHMP. • A condition be imposed requiring updates to AHIMS site cards where new or amended site information is documented.

18	*Issue*	Extent of Aboriginal cultural heritage consultation
	Extent and Timing	Response to Submissions
	Recommended action	• The consultation process with the Aboriginal community to date should be clarified as detailed in our comments, and the consultation continued throughout the life of the project.

ATTACHMENT B - Environment, Energy & Science (EES) - Biodiversity and Conservation Division detailed comments for Dendrobium Mine Extension Project (SSD 8194)

1. Biodiversity

Summary

Further work is required to meet assessment requirements of the FBA and ensure compliance with the NSW Biodiversity Offsets Policy and the EPBC Act.

The key limitations of the assessment and the proposed offset strategy are:

- The proponent has not adequately demonstrate of avoidance of impacts as required by the FBA, particularly regarding impacts of undermining upon the Coastal Upland Swamp threatened ecological community.
- The "worst case scenario" to calculate the maximum offset liability for swamps has not been utilised, as required by the *Addendum for upland swamps impacted by longwall mining.*
- The offset package put forward by the proponent does not demonstrate that the maximum potential offset liability can be met for all predicted impacts.
- The proponent intends to use residual credits from the Maddens Plains Strategic Biodiversity Offset site as part of the offset for this development. It is our understanding that this is not permissible as conditions of consent preclude this site from being accessed for projects not associated with the Dendrobium or Bulli Seam operations consents (DA 60-030-2001 & MP 08_0150).
- Track rehabilitation on NPWS land as an offset measure is questionable, as the land is already protected for conservation and the proponent has not discussed this proposal with the NPWS.
- Update to species credit species assessments and offset calculations are required, including for koala, Rosenbergs goanna, giant dragonfly
- Direct impacts upon all ancillary aspects of surface infrastructure have not been fully assessed.

- The Biodiversity Assessment Report and Biodiversity Offset Strategy and the Biobanking Credit Calculator need to be updated to meet the reflect these changes. A checklist stating these changes have been made should be provided at Response to Submissions stage.
- Should the development progress to approval, Biodiversity and Conservation Division (BCD) officers request an opportunity to review and provide comment on proposed conditions of consent and performance measures for all threatened species and ecological communities (including Coastal Upland Swamps) affected by the proposal.

1.1 Summary of impact

The proposal would result in direct impact of up to 28.5 ha of native vegetation associated with clearing for surface infrastructure, including up to 1.5 ha of the Shale Sandstone Transition Forest Critically Endangered Ecological Community (CEEC). Other subsidence related impacts to native vegetation are expected, including impacts to 25 Coastal Upland Swamps that will be wholly or

partly directly undermined (21.6 ha). Coastal Upland Swamps are a listed threatened ecological community under NSW and Commonwealth legislation. No threatened flora species were recorded within areas directly impacted and subsidence related impacts to threatened flora are considered unlikely.

Six species credit fauna species were determined to be impacted by the project and therefore require offsetting. These species include: Broad-headed Snake, Littlejohn's tree-frog, Giant Burrowing Frog, Red-crowned Toadlet, Giant Dragonfly and Koala. An EPBC Act Assessment of Significance found a significant impact on the Giant Burrowing Frog and Littlejohn's Tree-frog is likely.

1.2 Avoidance of impacts

1.2.1 Avoidance of direct impacts

Direct impacts to terrestrial biodiversity include clearing of 28.5 ha of native vegetation, predominantly for four ventilation shafts. The proponent has used constraints mapping to locate proposed ventilation shaft away from areas with significant biodiversity values. Consideration should be given to reducing the total clearing area by changing ventilation shaft design.

Clearing is also required for power easements, the Pit Top carpark and additional service boreholes. Up to 1 hectare of the critically endangered Shale Sandstone Transition Forest may be cleared for additional service boreholes and 0.5 ha for transmission lines. Shale Sandstone Transition Forest is listed as "not able to withstand further loss" in the *Threatened Species Profile Database.* The proponent has adequately mapped the extent of this vegetation type, however, consideration of alternate designs and locations to avoid impacts to this vegetation has not been demonstrated.

Recommended actions:

- *Threatened flora and fauna surveys be undertaken for the transmission line easements prior to approval. Results be detailed in an amended BAR.*
- *Any vegetation clearing required for the final development footprint that is additional to the BAR/BOS is assessed in accordance with the FBA.*
- *The amended BAR details how any additional values found during surveys are to be avoided.*
- *The amended BAR is to describe how alternative location/designs were considered for transmission lines and service boreholes.*
- *Hollow bearing trees are mapped at all areas of surface impact to inform detailed design of infrastructure and demonstrate that significant biodiversity values have been avoided.*

1.2.2 Avoidance of subsidence related impacts

The BAR identifies that the proposed mining layout will directly undermine 25 threatened Coastal Upland Swamps in the project area (21.6 ha) and potentially impact a total of 37 swamps within the 35^0 angle of draw. Upland swamps directly above (and within 60m of) longwall panels are predicted to experience the full range of subsidence related impacts including:

- Reduction in groundwater levels or desaturation of the upland swamp sediments; and/or
- Transition of the Coastal Upland Swamp to a drier vegetation type; and/or
- Desaturation of soil particles exposing the swamp to peat desiccation; and/or
- Exposure to greater bushfire intensity due to loss of inundation; and/or
- Increased scour and erosion events.

Total subsidence of 2,958ha in Area 5 and 1,075ha in Area 6 is predicted across the project area.

The extent of impact to significant swamps and streams, particularly the Coastal Upland Swamp threatened ecological community from longwall mining, are well known from previous approved longwalls at Dendrobium (notably Area 3B) and elsewhere on the Woronora Plateau. Although setbacks are proposed from significant stream features, all swamps identified in the project area are being undermined and therefore impacted as acknowledged in the BAR.

The BAR and EIS outlines the environmental water constraints that informed the design of the project, including geological constraints and setbacks from significant stream features, named watercourses, dam walls and dam water bodies. However, no alternative mining layouts or project scenarios are canvassed, including avoidance of swamps, streams or habitats of threatened species. The BAR has not sufficiently investigated alternative longwall geometry, which could include narrower longwalls, wider chain pillars, and/or mining techniques that may reduce impacts. Alternative methods include first workings only such as those proposed in the Russell Vale revised Preferred Project Report (2019), or narrower longwalls in use at Metropolitan, including under Woronora Dam.

The current longwall mine layout therefore fails to demonstrate avoidance as required by FBA, particularly with regard to impacts upon Coastal Upland Swamps and threatened species as detailed further at s1.6.

Recommended action:

- *The proposal is redesigned In order to meet the biodiversity assessment policy, guidelines and the SEARS. This should include additional subsidence assessment of alternative mining techniques and layouts.*

1.2.3 Mitigation

Mitigation measures for direct impacts to biodiversity were adequately addressed in the BAR, noting that most details will be deferred to specific management plans which will require consultation with BCD. Mitigation measures for Coastal Upland Swamps, including appropriate performance measures, are detailed below at s.1.5.

1.3 Survey effort and assessment

1.3.1 Pit Top carpark

Clearing impacts of 0.2 ha are expected for the Pit Top carpark. No fauna surveys have been done in this area. While we appreciate this is a small area, further evidence that habitat is not likely to be

significant for threatened entities and biodiversity values have been avoided where possible is required in the BAR.

Recommended action:

- *The BAR must demonstrate that potentially occurring threatened fauna species at Pit Top car park have been considered and assessed in accordance with sections 6.5 and 6.6 of the FBA. An assessment of hollow bearing trees and photographs could also be provided to justify the area has no significance for threatened fauna*.

1.3.2 Powerful Owl

The Powerful Owl is listed in Table 22 of the BAR as having habitat in the study area and has been recorded within 5 km. This is a dual credit species, with the species credit component being for breeding habitat. This species was assessed as not having breeding habitat, however, justification or demonstration of adequate survey effort to support this conclusion was not provided. The BAR does not provide detail on hollow bearing trees and it is difficult to conclude that breeding habitat is not present from the information presented. Call playback was only carried out at ventilation shaft 6B.

Recommended action:

- *The BAR must demonstrate that breeding habitat for the Powerful Owl was adequately assessed in accordance with sections 6.4 and 6.5 of the FBA.*
- *Map hollow bearing trees at all areas of surface impact to rule out the presence of suitable breeding hollows for this species.*

1.3.3 Rosenberg's Goanna

This species was assessed as an ecosystem species which is incorrect as it is a species credit entity based on FBA/BBAM data. (Noting that it has changed status under the current Biodiversity Assessment Method (BAM) data). The FBA contains associated data and must be used instead of the current BAM data. Archived FBA/BBAM data can be found at the following link: https://www.environment.nsw.gov.au/projects/biometric-dataset.htm

Recommended action:

- *Rosenberg's Goanna needs to be assessed and surveyed in accordance with sections 6.4 and 6.5 of the FBA. As the species occurs within clearing areas and other areas to be affected by subsidence (e.g. cliff tops and rock outcrops), a species polygon will need to be prepared to determine an offset liability.*

1.3.4 Koala

The Koala Plan of Management (KPoM) does not consider the dry sclerophyll forest (PCT 1083) core or potential habitat. This is based primarily on the tree species listed in schedule 2 of SEPP 44 Koalas. SEPP 44 is currently being reviewed by DPIE and is likely to expand the tree species list significantly, including *Eucalyptus sclerophylla* (scribbly gum) based on EES research on koala tree use in the region. This is one of the dominant species in PCT1083 (Red Bloodwood - scribbly

gum heathy woodland on sandstone plateaux, Sydney Basin), which is the main vegetation type to be cleared.

While we recognise that koala densities are likely to be higher in the mapped core koala habitat vegetation types, PCT 1083 should also be considered koala habitat as koalas have been frequently recorded in this vegetation type in BCD research in the region and in targeted surveys undertaken by Niche (2019) for this assessment.

Recommended action:

- *The BAR proposes to offset only 1.5 ha of preferred Koala habitat. All 28.5 ha of vegetation to be cleared is Koala habitat and needs to be offset accordingly.*

1.3.5 Survey effort: Figure 10 and Table 17

Survey effort, as described in Section 6.3 and Table 17 of the BAR, is generally considered adequate, however, there appear to be some inconsistencies with information provided in Figure 10 and it is unclear whether adequate survey was carried out at all surface infrastructure areas. For example, Figure 10 indicates that in area 6B, only bat echolocation and "nocturnal tracks" were carried out. Figure 10 does not indicate where nest boxes were placed.

The scale of the map makes it difficult to determine if nocturnal surveying was adequately done in ventilation shafts 6A, 5A and 5B. As an example, Figure 10 does not indicate that adequate surveying for Eastern Pygmy Possums was carried out. The map does not describe where nest boxes were placed, Area 6B was not surveyed using cameras, and thorough spotlighting does not appear to have been done in Area 6A, all methods used to detect this species.

Recommended actions:

- *Adequate species surveys for all potentially occurring species credit entities, at all surface infrastructure areas (including all ventilation shafts, power easements and service boreholes) needs to be demonstrated. If adequate surveying is not carried out, species should be assumed present and offset accordingly.*
- *Figure 10 could be divided into several maps to show detail of where survey methods were used and the location of tracks. Alternately, shapefiles could be provided to BCD for review.*

1.3.6 Inaccuracies regarding species credit classes

Table 43 lists the Gang-gang Cockatoo and Glossy Black Cockatoo as being dual credit species status. This is inaccurate as these species are ecosystem species under the FBA.

Similarly, as noted in s1.4.3 above, Rosenberg's Goanna is a species credit entity under the FBA, Archived FBA/BBAM data can be found at the following link:
https://www.environment.nsw.gov.au/projects/biometric-dataset.htm

Recommended action:

- *Credit status of all species in Table 43 must be checked against credit classes listed in the archived Threatened Species Profile Database (link above) and inaccuracies noted and clarified in an amended BAR. All species credit entities need to be assessed in accordance with 6.4 and 6.5 of the BAR.*

1.3.7 Species polygons

Species polygons have been derived for the Red-crowned Toadlet, Giant Burrowing Frog, Littlejohn's Treefrog and Giant Dragonfly and we acknowledge the thorough analysis provided for these species. The FBA requires the BAR to include species polygons to determine the offset liability for all species credit entities. The BAR does not provide a species polygon for the Broad-headed Snake and Koala.

Regarding the Broad-headed Snake, we acknowledge the difficulty of presenting species polygons for small areas over such a large study area and therefore request digital shapefiles for review. Regarding the koala, a species polygon, including all areas of vegetation to be cleared for surface infrastructure as per our comments above, should be provided in the amended BAR.

As mentioned previously, the BAR also states that threatened fauna surveys have not been carried out for transmission line easements. As such, final species polygons, and therefore offset liabilities cannot be derived.

Recommended actions:

- *All fauna surveys should be completed prior to approval so species polygons can be finalised and used for accurately determining offset liabilities.*
- *Shapefiles of all species polygons should be provided to BCD for review.*

1.3.8 Biodiversity credit calculations

We have reviewed assessment in the Biobanking credit calculator (BBAM-C) and provide the following comments and recommendations:

1.3.9 Inconsistencies between BAR and BBAM-C

Table 9 of the BAR contains BVT/PCT names and areas of direct impact. BBAM-C contains some inconsistent information. For example, Table 9 has 0 ha for HN560, while BBAM-C states 16.3 ha. Similarly, Table 9 states 0 ha for HN662, while BBAM-C states 4.57ha.

Recommended action:

- *Amend data in BAR and BBAM-C to be consistent with each other.*

1.3.10 Biobanking plot map

Figure 6 of the BAR shows biobanking plots. This map does not indicate plot numbers, so it is not easy to cross-check plot locations with plot data in BBAM-C.

Recommended action:

- *Provide BCD with a shapefile indicating plot names and locations. Alternately, provide multiple maps at a scale where plot locations and numbers can be easily read.*

1.3.11 Clarification of cover scores in BBAM-C

From the BBAM-C, 10 of the plots in the vegetation type HN566 have a value of 0 for over-storey and mid-storey cover. This vegetation type is from the dry sclerophyll forest (shrubby sub-formation) which usually has at least some tree/shrub layer. It is unlikely that these values are so

low. Clarification is necessary. Comment is also required on whether these plots are typical of vegetation being assessed. If they are not typical, they should not be used to assess vegetation integrity scores in the BBAM-C.

Recommended actions:

- *Provide BCD with shapefiles or detailed maps with exact plot locations, including orientation of plots.*
- *Review data in BBAM-C and provide justification for using data as above, removing any plot data not representative of the vegetation to be cleared.*

1.4 Biodiversity offset strategy

1.4.1 Demonstrate that offsets can be secured

The Biodiversity Offset Strategy (BOS) is currently at a preliminary stage focusing on possible offset options and justification for the approach to offsetting upland swamps. The BOS does not currently meet the requirements of the FBA, which requires the BOS to be significantly more advanced at this stage of the approval process.

The minimum reporting requirements at Appendix 7 of the FBA require identification of the offset measures, including offset site, details and proposed justification for supplementary measures, up front. While we do not consider it essential that the BOS demonstrate a full suite of offsets is available to be secured at this stage, further work is required to demonstrate that offset areas are available and appropriate and can be secured before development commences or otherwise in accordance with the Major Projects Offset Policy.

As detailed previously, further work on survey and assessment to satisfy Stages 1 and 2 of the FBA is required to determine final offset liabilities and this needs to be done to provide a complete understanding of offsets required. This is particularly the case with regard to Coastal Upland Swamp offsets, which are discussed further at s.1.6 below.

1.4.2 Payment into the Biodiversity Conservation Fund

The BOS flags payment into the Biodiversity Conservation Fund administered by the BCT as an option for offsetting impacts, including make-up of any credit shortfalls. However, given the EPBC Act like-for-like offset requirements, this is not an allowable option for Commonwealth-listed entities, such as Coastal Upland Swamps, Littlejohns Tree Frog and Giant Burrowing Frog.

1.4.3 Maximum offset liabilities

“Maximum offset liabilities” are mentioned throughout the BAR in relation to both Coastal Upland Swamps and other biodiversity values required to be offset (e.g. impacts to the Broad-headed Snake). Table 27 in the BAR provides detail on monitoring methods to refine maximum offset liabilities for potentially affected threatened species. We generally support this approach, however, recommend that time limits for monitoring are included.

Where impacts are unlikely to be known for many years, they should be assumed to occur and maximum offset liabilities applied. This is to avoid possibly unacceptable timeframes to offset species impacts. This is discussed further specifically in relation to Coastal Upland Swamps at s.1.5 below.

1.4.4 Residual credits from Maddens Plains Strategic Biodiversity Offset site

We also note that residual credits from the Strategic Biodiversity Offset site at Maddens Plains, which was transferred into the National Parks estate to offset impacts in swamps from the Dendrobium and Bulli Seam Operations projects, are not available for use for the current project as suggested by the proponent. This includes residual credits for both species credit species and Coastal Upland Swamps, as detailed further at s1.5.2.

Recommended actions:

- *Biodiversity offset liabilities are determined prior to approval and detailed in conditions of consent.*
- *Once survey and assessment is complete, further work on the BOS to meet requirements listed in Appendix 7, Table 22 of the FBA will be provided in an updated BOS.*
- *The Biodiversity Offsets Strategy is complete and approved before development commences.*
- *Offset sites are secured before development commences.*
- *Expand Table 27 to include timeframes for monitoring to determine if impacts have occurred. Where impacts are expected to occur long-term, assume maximum offset liabilities. Where monitoring is not carried out, assume maximum offset liabilities.*

1.5 Coastal Upland Swamps

1.5.1 Avoidance of impacts

As previously outlined, the proposed mining layout would directly undermine 25 Coastal Upland Swamps within the project area, equating to 21.6 ha of this NSW and Commonwealth listed threatened ecological community (TEC) according to the BAR. Impacts are predicted to all swamps being directly undermined or with mining occurring within 60m. The extent of longwall mining and impacts from other projects, notably including Dendrobium Area 3B, supports the prediction that that upland swamps to be directly undermined will experience the full range of subsidence related impacts including:

- Reduction in groundwater levels or desaturation of the upland swamp sediments; and/or
- Transition of the Coastal Upland Swamp to a drier vegetation type; and/or
- Desaturation of soil particles exposing the swamp to peat desiccation; and/or
- Exposure to greater bushfire intensity due to loss of inundation; and/or
- Increased scour and erosion events.

The full extent of Coastal Upland Swamps within the project area that are proposed to be undermined by longwalls will be impacted by the proposed mining layout. As previously discussed, the proposed mining layout fails to adequately avoid impacts as required by the FBA, particularly regarding impacts on coastal upland swamps.

1.5.2 Offsets for Coastal Upland Swamps

The offset liability for Coastal Upland Swamps has not been correctly calculated in the EIS and supporting BAR and BOS. Further, the proponent has not demonstrated that suitable offsets can be located for Coastal Upland Swamps, as detailed below.

- *Approach to assigning site value scores*

The approach taken to assignment of site value scores for Coastal Upland Swamps in Appendix 9 of the BAR (Approach to the Coastal Upland Swamp Offset Liability) is incorrect: It is inconsistent with the method of calculating the maximum predicted offset liability outlined in the *Addendum for upland swamps impacted by longwall mining subsidence.*

We do not support the rationale behind this approach for the following reasons:

- The upland swamp offsets policy recognises that impact on the shallow groundwater regime within swamp sediments is likely to result in loss of the groundwater-dependent vegetation community and threatened species in that community over time, as a result of loss of critical ecosystem function.
- The upland swamp offset policy requires the offset liability to be assessed as a potential maximum (i.e. worst case scenario) given the uncertainty in the prediction of subsidence and consequent high likelihood of significant environmental impacts. This is consistent with the precautionary principle as Coastal Upland Swamps are features of high environmental value (for both biodiversity and water provision to the downstream system) that are at high risk of impact that, once expressed, is permanent and irreversible. The worst-case scenario of total loss of that PCT is required to be measured in the BBAM-C.

- Maximum offset liability

The swamp offset policy requires the "maximum offset liability" to be provided in the event of greater than "negligible" environmental consequences, stating that: "*It is recognised that the impact of altering the hydrological regime within upland swamps is not equivalent to removing all vegetation. However, this impact is likely to result in total loss of the upland swamp ecological community in the long-term as a result of loss of the critical ecosystem functions"*.

The "maximum offset liability", therefore, should reflect complete loss of the swamp's ecosystem function, being the worst case scenario of bedrock fracturing and/or groundwater loss. The EIS predicts that all upland swamps to be directly undermined will experience the full range of subsidence related impacts including:

- Reduction in groundwater levels or desaturation of the upland swamp sediments; and/or
- Transition of the Coastal Upland Swamp to a drier vegetation type; and/or
- Desaturation of soil particles exposing the swamp to peat desiccation; and/or
- Exposure to greater bushfire intensity due to loss of inundation; and/or
- Increased scour and erosion events.

This is acknowledged by the proponent in the BAR and BOS (p102). However, the proponent has only calculated credits based on a change of vegetation to a different, drier PCT. We consider this to be the best-case scenario for impacted upland swamps in the longer-term, not the worst-case scenario required by the FBA, and therefore an inappropriate reduction to the maximum offset liability. The maximum offset liability, which is defined as complete loss for upland swamps predicted to experience greater than negligible levels of impact, needs to be assumed up front in accordance with the FBA and then demonstrated that it can be legally secured at Extraction Plan stage.

We note that the Policy does provide for re-crediting or reduction in the future offset liability for upland swamps. However, this can only occur within 5 years of completion of mining following a full assessment of data and support from the Independent Expert Panel.

The Policy requires the proponent to demonstrate that offsets can be legally secured prior to Extraction Plan, which would occur sometime after any project approval. However, the Policy also specifically states that the overarching principles of the NSW Biodiversity Offsets Policy for Major Projects (2014) remain directly applicable. These include under Objective 1 "knowing biodiversity requirements upfront". The minimum reporting requirements at Appendix 7 of the FBA requiring identification of offset sites, details and proposed justification for supplementary measures up front also remain applicable.

- *Approaches to NSW and Commonwealth offset requirements*

In addition to the issues described above, the BOS at s.11.4.3 presents divergent approaches to selecting offset sites and supplementary measures for swamps. For example, under the discussion of NSW TSC Act offsets for upland swamps no details of stewardship sites in private ownership are provided, referring instead to proposed rehabilitation projects for swamps within the Water NSW land and/or the National Parks estate. To date, no formal approach has been made to BCD or NPWS regarding proposed supplementary measures within the NPWS estate. NPWS Illawarra Area has indicated that no approach from the proponent has been made to date, and that such an approach to meet offset obligations within the NPWS estate is not supported.

In contrast, the discussion of Commonwealth EPBC Act offsets for swamps states *"land has been identified to meet up to 75% of the EPBC Act direct offset liability"* on private land. We note that this is on the basis of "conservative score and quality estimates" from the EPBC Act offset calculator, which have not been assessed or approved by the Commonwealth. No details have been provided on these potential offset sites.

Furthermore, the assertion that 75% of the EPBC Act liability for offsetting impacts to Coastal Upland Swamps is based on acceptance of both NPWS and WaterNSW of track rehabilitation on their lands. No discussion has been had with either agency about the acceptance or feasibility of this approach. Calculations for the area of benefit of this method also rely on inclusion of an additional 10m buffer around rehabilitated track that are suggested as benefiting from the action. We do not support this approach for the purposes of calculation.

As the NSW Government is responsible for undertaking assessment of EPBC Act, MNES matters under the bilateral assessment agreement prior to any Commonwealth DoEE approval being given, it is essential that the full extent of proposed offset measures for Commonwealth species be clarified up front in the BOS.

- *Strategic Biodiversity Offset Maddens Plains site*

The BOS at s.11.4.2 also proposes using residual credits from the Strategic Biodiversity Offset site at Maddens Plains, which was transferred into the National Parks estate and used to offset impacts in swamps from the Dendrobium and Bulli Seam Operations projects (DA 60-030-2001 & MP 08_0150).

It is unlikely that the proponent can utilise these credits. The terms of this transfer are facilitated in the existing Dendrobium and BSO consents at Schedule 2 Condition 15 and Schedule 2 Condition

14 respectively. The wording of these conditions provides that residual credits from the Maddens Plains site may be accessed to meet "further offsetting requirements" for Dendrobium and BSO projects, including for any modifications for the existing approvals DA 60-030-2001 and MP 08_0150. It does not, however, allow for residual credits to be utilised for any other future mining projects, including at either of these mines:

> *"If the Secretary has issued a statement under this condition, the proponent can rely on that statement and the residual conservation values that the land subject to the statement may hold, to meet further offsetting requirement(s) that may be required under this approval or the development consent for the Dendrobium Coal Mine (60-3-2001) / Bulli Seam Operation Project (08_0150).*
>
> *The Secretary's statement under this condition can be relied on a number of times in respect of the same land until all of the conservation values of the land the subject of the Secretary's statement have been relied upon to meet offsetting requirements under this approval or the development consent for the Dendrobium Coal Mine (60-3-2001) / Bulli Seam Operations Project (08_0150)".*

The Biodiversity Conservation Regulation 2017 also states under cl 5.1 that the land is not eligible to be established as a biodiversity stewardship site, and therefore generate biodiversity credits that may be utilised for future projects, if there is already a legal obligation, such as consent condition or offset arrangement, to carry out biodiversity conservation measures on the land.

1.5.3 Performance measures

Enforceable and prescriptive performance measures should be included as part of any project approval. Detailed measurable and enforceable performance measures for impacts to coastal upland swamps are required to be imposed as part of any project approval conditions. These should be consistent with the Upland Swamp Offset Policy that requires negligible environmental consequences to be defined in relation to:

- shallow groundwater level within swamp sediments lower than the baseline level
- rate of shallow groundwater level reduction that exceeds the baseline period.

Recommended actions:

- *The extent of Coastal Upland Swamp offsets, including the maximum offset liability, be quantified up front in line with the swamp offset policy, major projects offset policy principles and FBA.*
- *The BBAM-C needs to be updated to assume full loss of threatened upland swamp community vegetation as the "maximum offset liability" for impact assessment. BBAM-C and revised credit calculations need to be provided in an amended BAR.*
- *Where relevant, species credits for threatened species known or predicted to occur within the swamps must also be calculated.*
- *Access be provided to raw swamp monitoring data, to interrogate its veracity given the absence or apparent unresponsiveness of swamp piezometer readings during significant rainfall events.*

- *That conditions of consent require that, on approval of an extraction plan, legal ability to secure offsets for the swamps to be undermined in that extraction plan is demonstrated as calculated using the FBA.*
- *That conditions of consent require South32 to fund the appointment of an Independent Expert Panel, as per the* Upland *Swamp Offsets Policy, to provide expert advice to the consent authority on the environmental consequences of mining beneath upland swamps.*

1.5.4 Veracity of monitoring & swamp assessment

The results of monitoring from swamps presented in the BAR vary in comparison to monitoring undertaken by DPIE staff. There appears to be instances where swamp piezometers are unresponsive to large rainfall events, and periods where piezometer monitoring data is absent. Furthermore, the extent of monitoring data presented omits some recent instances of longwall mining impacts, notably at Area 3B and Metropolitan (Eastern Tributary).

We request access to raw monitoring data to inform our assessment of the impacts of the proposal on swamps and streams. Impacts to streams are discussed further at Section 3 below. We also request access to shapefiles for swamps to review the upland swamp vegetation mapping undertaken by Niche as part of this EIS and used in the BAR.

Recommended actions:

- *The veracity of subsidence models needs to be evaluated and reviewed by BCD, particularly noting that:*
    - *pertinent data from recent longwall mining impacts at Metropolitan (Eastern Tributary) and Area 3B was not included*
    - *swamp piezometer readings showed unresponsiveness or no data during significant rainfall events*
- *Shapefiles for Coastal Upland Swamps are also required to allow review of new mapping of the identified TEC in the BAR.*

1.6 Commonwealth MNES

We have carried out a preliminary assessment of EPBC Act listed threatened species and communities based on information in the current BAR and can provide this to Planning & Assessment upon request. As detailed in these comments, further work is needed to meet the requirements of the FBA, and this will need to be complete before we can finalise the bilateral agreement assessment.

The EPBC Act assessment in the BAR has concluded that the following entities will be significantly impacted and therefore require an offset: Coastal Upland Swamps of the Sydney Basin Bioregion, giant burrowing frog and Littlejohn's tree frog. Most EPBC Act matters will be dealt with via the FBA assessment, noting that payment to the Biodiversity Conservation Fund is not allowable for EPBC Act listed entities and offsets will need to be "like for like".

The current BOS does not meet Commonwealth requirements and substantial work is still required to ensure appropriate "like for like" offsets can be secured, as outlined in previous sections.

2. Water and streams

Summary

- The proponent has asserted that the *"the proposed longwalls have been to minimise the potential impacts on the major streams and the critical stream features".* However it is unlikely that impact have been minimised given the range of subsidence impacts to swamps and streams predicted across the project area. Although the proposed layout has been informed by a constraints analysis in the EIS, a full range of layouts and avoidance options has not been presented.
- The prediction of seam to surface connective fracturing between the surface and the mine workings would result in permanent loss of water from threatened Coastal Upland Swamps and streams, including important breeding habitat for threatened species. Water loss is unlikely to return to the catchment
- Subsidence impacts for Area 5 are potentially underestimated as the original Incremental Profile Model (IPM) for subsidence does not take into account recent experiences of similar longwall widths at Dendrobium Area 3B and other mines in the Southern Coalfields
- No details regarding the adequacy of calibration of hydrology modelling has been submitted, and we are unable to verify whether the magnitude of water and flow losses have been potentially underestimated
- Impacts to streams are acknowledged and it is stated that remediation will occur. However, there are very few examples of successful stream remediation, and those few examples from nearby indicate that remediation is likely to be cost prohibitive across the entire project footprint.

2.1 Subsidence impacts to streams & watercourses

Approximately 37 km (5%) of watercourses located above the proposed longwalls for the Project (ie. Area 5 and Area 6) would be expected to experience direct mining induced impacts (Appendix E)[1]. This will add to the approximately 98 km of watercourse likely to have experienced direct impacts due to longwall and bord and pillar mining. This represents around 14% of the total length of watercourse within the upper Avon River and Cordeaux River catchments (Appendix E).

There has been limited mapping of stream features and assessments regarding 'major' and 'critical' features as part of the constraints analysis for the mine layout design. The classification of major and critical is subjective and ill defined. The EIS has not provided subsidence predictions for all pools and rockbars and therefore an appropriate risk of fracture and drainage for individual pools/rockbars cannot always be identified[2].

[1] Economists for the Bulli Seam proposal valued swamps at $2M/Ha [so $50M-$60M worth of swamps irreversibly impacted] and streams at $5M/km [so $185M worth of streams irreversibly impacted; on top of $490M worth of streams impacted already – i.e. the cumulative impact to streams will be $675M using community valuations from the Bulli Seam Economics report.

[2] Stream mapping for other mining EIS's has been far more comprehensive than that supplied in the Dendrobium Area 5 & 6 EIS. The EIS is therefore considered inadequate in this regard.

The proposed setback distances from streams and identified pools are inadequate to protect major streams and *critical* stream features from subsidence related impacts. Subsidence predictions for these features still indicate a risk (and at times a very high risk) of impact based on Bulli Seam PAC (2010) risk thresholds.

Based on subsidence predictions impacts are likely on the perennial 5th order Avon River, perennial 5th order Cordeaux River, and perennial 3rd and 4th order Donalds Castle Creek due to valley related compressive strains, closure and upsidence.

All tributaries that lie adjacent to or above the longwalls are expected to be fractured and drained. Some of these include 3rd order streams (eg AR19, DC8, AR31, AR32, LA13). This will cause all these tributaries to cease to flow and pools to dry out except after significant rainfall events.

2.2 Consider results from previous mining impact assessments

The subsidence assessment for Area 5 relies on the original Incremental Profile Model, which does not consider outcomes from the 305m-wide longwalls used in Dendrobium Area 3B and recent Metropolitan Mine longwalls in the vicinity of Eastern Tributary. Subsidence impacts of the proposal on streams and watercourses, as well as other key environmental assets such as swamps, are therefore, likely to be underestimated.

The Type 3 pool impacts assessment ignores experiences in the Upper Georges River and Eastern Tributary. It therefore underestimates likelihood and consequence (i.e. risk) of Type 3 pool impacts occurring[3]. 200mm closure is inappropriate as a risk or design criterion for Type 3 pool impacts.

Longwalls used in the strain analysis for Area 5 (Table 4.5 in Subsidence Assessment) contain no longwalls greater than 200m in width or depths of cover greater than 250m. Strain analysis is therefore extrapolating well outside the range of the database for longwalls in Dendrobium Area 5[4].

2.3 Impacts to aquatic biodiversity

Many of the streams in the project area are identified as being key fish habitat but receive inadequate protection from impact. In contrast to the EIS's conclusions, Macquarie Perch, listed as endangered under NSW Fisheries Management Act and Commonwealth EPBC Act, have previously been recorded in Donalds Castle Creek[5] (up and downstream of fire road No 6. and from the saddle off 6M fire road, downstream end near Cordeaux River).

2.4 Water loss

The EIS concludes that Dendrobium Mine as a whole is likely to result in the loss of up to approximately 1300-1400 ML/yr of stream flow from the Cordeaux River catchment and a similar amount from the Avon River catchment (including the reservoirs; HEC 2019). The EIS is therefore

[3] The Independent Expert Panel for Mining in the Catchment has commented on this previously for Metropolitan Mine.

[4] A similar case can be made for Area 6 since longwalls used in the strain analysis for Area 6 (Table 4.6 in Subsidence Assessment) contain no longwalls greater than 230m in width or depths of cover greater than 370m.

[5] It is noted that no electrofishing was conducted in areas of the streams above the proposed longwalls. The EIS is therefore considered inadequate in this regard.

predicting 1.3 to 1.4GL per annum loss from Cordeaux catchment and a similar amount for Avon catchment.

That makes 2.6-2.8 GL per annum loss in total, which is difficult to verify in the absence of information verifying the adequacy of hydrological model calibration. The hydrology review does not include any details on the adequacy of model calibration. In the absence of such details, we maintain concern that the hydrology models has potentially under-estimated the magnitude of water/flow losses.

The cumulative impact of 30 years of mining would lead to losses being of the order of 78-84 GL (also potentially a serious underestimate). If recovery of groundwater does not occur for a century (see groundwater recovery estimates) then such losses are of the order of 260-280 GL. This will have a severe impact on aquatic habitat, flows and threatened and endangered species in the area as a whole. Impacts will be exacerbated further during drought periods.

Modelling for the EIS suggested that for catchments overlying Area 5, there would be a 6% to 22% reduction in streamflow due to the Project for a median climatic year (63% to 100% for 10th percentile climate and 3% to 11% for 90th percentile climate; HEC 2019). These estimates come with high levels of uncertainty, but nevertheless identify serious and probably permanent impacts to the surface hydrology of the area.

2.5 Performance measures & proposed remediation of streams

Longwalls directly undermining (or being within the angle of draw) major 3rd order and above streams risk having a significant impact on water supply and water dependant ecosystems. Major streams such as the Avon River, Cordeaux River, Donalds Castle Creek and 3rd order or higher streams in the area should have a negligible impact performance measure applied. However, based on the proposed mine plan this measure does not appear to be achievable.

It is stated in the EIS that remediation of streams impacted by subsidence as a result of undermining will be undertaken across the project area. It is highly unlikely that any proposed remediation could be successful given the magnitude and areal extent of predicted fracturing. Remediation costs, if enforced properly to be successful, are likely to be very significant and an assessment of the financial implications for the project need serious consideration.

Recommended actions:

- *The identified setbacks from the proposed mine layout to significant and watercourses are considered inadequate to provide protection to these features. A full range of design scenarios and layouts to consider further avoidance of impacts to significant streams should be provided*
- *Further information should be provided outlining how the hydrology model has been adequately calibrated, to verify that loss of water/flows has been accurately estimated*
- *Revised modelling of subsidence predictions for the Areas 5 & 6 should be undertaken using a model that includes data from 305m wide longwall panels in Dendrobium Area 3B, as well as recent Metropolitan Mine longwalls in the vicinity of Eastern Tributary.*

3 Aboriginal cultural heritage

Summary

- The proposed extraction of Areas 5 and 6 is likely to harm Aboriginal cultural heritage sites of significance. The current longwall design is therefore likely to impact on sites that have high Aboriginal cultural and scientific significance.
- Based on the precautionary principle, lack of certainty about subsidence impacts on Aboriginal cultural heritage sites (recognising that predicting impacts from longwall mining can be difficult, as per Niche 2019, p.72) should not prevent action being taken to avoid or limit the risk of those impacts occurring. The subsidence impacts of LW514, LW506 and LW613 on Aboriginal cultural heritage are high risk as discussed below.
- The preparation of an Aboriginal heritage management plan at an early stage, in consultation with the Registered Aboriginal Parties (RAPs) is supported. The Aboriginal community consultation process to date should also be clarified and a protocol developed for appropriate Aboriginal community access to sites on Water NSW land. Further minor updates to the assessment are also recommended, as detailed below.

3.1 The Aboriginal cultural heritage SEARs have largely been addressed

The Aboriginal cultural heritage assessment report (ACHAR) prepared by Niche (2019) has largely addressed the Aboriginal cultural heritage assessment requirements in the SEARs.

However, attempts to avoid harm to Aboriginal heritage sites needs to be better demonstrated, and appropriate mitigation measures provided where harm could not be avoided. The measures appear limited to designing surface infrastructure to avoid recorded Aboriginal heritage sites (Niche 2019, p.85).

It does not appear that any attempt has been made to design the long walls in a way that avoids or limits harm to Aboriginal objects. The proposed mitigation measures are based on monitoring and while they would document harm, these measures would not prevent that harm occurring (Niche 2019, p.86).

Several Aboriginal heritage sites are predicted to incur high levels of subsidence

The predicted total vertical subsidence is over 1m at nine Aboriginal heritage sites, and over 2m at one site (Niche 2019, pp.70-72):

- 52-2-1456 – grinding grooves – predicted 1.7m total vertical subsidence.
- 52-2-1465 – grinding grooves – predicted 1.85m total vertical subsidence.
- 52-2-1466 – grinding grooves – predicted 2.15m total vertical subsidence.
- 52-2-1592 – grinding grooves – predicted 1.25m total vertical subsidence.
- 52-2-1779 – grinding grooves – predicted 1.15m total vertical subsidence.
- 52-2-1780 – rockshelter with art and deposit – predicted 1.65m total vertical subsidence.
- 52-2-1782 – rockshelter with art – predicted 1.25m total vertical subsidence.

- 52-2-3955 – rockshelter with art and deposit – predicted 1.05m total vertical subsidence.
- 52-2-4467 – grinding grooves – predicted 1.25m total vertical subsidence.

The sandstone rockshelters and platforms containing these sites are unlikely to survive subsidence impacts of this magnitude.

3.2 Sites of high significance are likely to be harmed

Of the 58 sites of Aboriginal cultural heritage sites that are at risk of harm through subsidence, we particularly mention the following three sites that are of both high cultural and scientific significance and are at risk of high levels of subsidence impacts:

- **Site: 52-2-1780:** a rock shelter of high scientific and Aboriginal cultural significance. Adjacent to a grinding groove site 52-2-1779.

  Predicted impacts: This site is located directly above LW514. The predicted total vertical subsidence is 1.65m. The rockshelter is unlikely to survive the predicted impacts.

  Proposed solution: Reduce the extent of LW514 above sites 52-2-1780 and 52-2-1779 to bring the predicted harm to a minimum or imperceptible level.

- **Site: 52-2-1752:** a rock shelter of high scientific and Aboriginal cultural significance.

  Predicted impacts: This site is located at the western end of LW516. The predicted total vertical subsidence is 5cm. This could cause significant damage to the site.

  Proposed solution: Reduce the western extent of LW516 to bring the predicted harm to site 52-2-1752 to a minimum or imperceptible level.

- **Site: 52-2-1456:** grinding grooves of moderate scientific and high Aboriginal cultural significance.

  Predicted impacts: This site is located directly above LW603. The predicted total vertical subsidence is 1.7m. This sandstone platform the grinding grooves are located on would be unlikely to survive that level of subsidence.

  Proposed solution: Reduce the extent of LW603 the section above site 52-2-1465 to bring the predicted harm to a minimum or imperceptible level.

We recommend that the proponent consider further measures to reduce predicted subsidence impacts at the above sites.

3.3 The proposed long walls are predicted to harm Aboriginal cultural heritage sites

In total, 14 of the proposed 26 longwalls are predicted to cause harm to Aboriginal cultural heritage sites. Eleven grinding groove sites and 9 rockshelter sites are located directly over long walls (Niche 2019, p.83).

Having reviewed the reporting, there are some long walls that appear to have a higher potential to harm sites of high Aboriginal cultural heritage and scientific significance. The long walls that pose the greatest risk are likely to be:

- LW514 – likely to harm sites 52-2-1780, 52-2-1779 and 52-2-1782.

- LW516 – likely to harm site 52-2-1752.
- LW603 – likely to harm sites 52-2-1456 and 52-2-1466.

As a minimum, we recommend the applicant is required to reduce the impacts of these long walls on Aboriginal heritage sites.

LW505, LW511, LW512 and LW602B are also predicted to cause significant subsidence impacts to Aboriginal heritage sites, however, Niche (2019) assess the sites along these long walls to be less scientifically significant. However, all Aboriginal heritage site are of significance to the Aboriginal community. There are measures the applicant could consider to reduce harm from these longwalls as well:

- The harm caused by LW505 could be reduced by shortening the eastern extent to avoid undermining sites 52-2-1592 and 52-2-3955.
- LW511 and LW512 could be reduced in width (by increasing space between the longwalls) to potentially reduce the impact to sites 52-2-1567, 52-2-4465, 52-2-4466 and 52-2-4467.
- Harm caused by LW602B could be reduced by reducing the southern extent to avoid undermining sites 52-2-1466 and 52-2-1464.

We also recommend that the Niche and MSEC reports are revised to be consistent in their subsidence predictions relating to Aboriginal heritage. The Niche conclusion that rockshelters over longwalls are unlikely to be impacted is not consistent with the subsidence impacts predicted (see Niche 2019, p.69 compared to Niche 2019, p.70). The conclusion from MSEC that grinding groove sites are unlikely to be impacted seems inconsistent with the Niche conclusion (Niche 2019, p.72) and MSEC (2018, p.94).

3.4 Aspects of the Aboriginal community consultation process require further information

We request further information on three points in the Aboriginal community consultation process:

- It does not appear that Niche (2019, p.17) provided an appropriate response to Cubbitch Barta Native Title Claimants who requested detail of the survey coverage, ground surface visibility and potential for subsurface archaeological deposits in the proposed surface infrastructure areas. The response that this matter can be deferred to an AHMP is not appropriate. This question must be addressed in the ACHAR and an appropriate response provided to the RAPs and BCD.
- Niche (2019, pp.7, 15) should clarify the level of consultation with the South Coast Native Title Claimants. We note that the consultation process about Areas 5 and 6 started before the South Coast Native Title Claim was registered. However, Niche (2019, p.15) then undertook a second Native Title search. The actions implemented as a result of this second search need to be explained.
- The ACHAR refers to a RAP called Walnuja (Niche 2019, p.15). Walnuja is not listed in either Table 1 (Summary of RAPs) or the letter with the notification of the RAPs that was provided to OEH. Niche should clarify this RAP and amend the ACHAR as required.

3.5 The significance assessment requires minor review

The Niche (2019, p.53) statement of significance for site 52-2-1278 is that the site has low scientific significance ‘due to the large number of axe grinding grooves at the site and the close

proximity to the site Metro Catchment-Art01'. This statement is inconsistent. It is likely that a higher scientific significance assessment is warranted at this site. Niche should clarify the significance statement for site 52-2-1278.

3.6 The impact assessment requires minor review

The impact assessment at Table 22 (Niche 2019, p.73) shows that site 52-2-4468 (a grinding grooves site) is expected to be totally harmed resulting in a total loss of value. However, this site is near Ventilation Shaft 5B and surface infrastructure work will avoid harming the site (Niche 2019, p.78). Protective measures to avoid harm during construction of the vent shaft are proposed, including fencing and signage, and we support these measures.

3.7 AHIMS site cards must be updated

AHIMS site cards must be updated in accordance with s.89A of the National Parks and Wildlife Act. For example, Niche (2019, p.40) have provided a corrected location for site 52-2-1457. This information must be submitted to AHIMS.

It appears that most of the sites within the study area require updated site cards to be submitted to AHIMS. The updated site information can be submitted to the AHIMS Registrar through the contact details available online: https://www.environment.nsw.gov.au/topics/aboriginal-cultural-heritage/protect-and-manage/aboriginal-heritage-information-management-system

We have additional minor comments for amending the ACHAR:

- The Niche (2019, p.41) report and MSEC report (2018, p.93) must be updated to be consistent in the number of Aboriginal heritage sites subject to impacts.
- The AHIMS site numbers must be included in the ACHAR (for example site Dendrobium ACHA Shelter 2).
- The ACHAR is internally inconsistent in the number of sites being described as inside the study area. There are 60 sites listed in Table 7 (Niche 2019, p.27) and 58 sites described elsewhere (e.g. Niche 2019, p.34). The site count total in Table 18 is also incorrect (Niche 2019, p.63).
- The site description for sites 52-2-1734 and 52-2-1735 is identical in Table 12 of the ACHAR (Niche 2019, p.42). This should be corrected.
- Site 52-2-1567 is missing from Table 12 (Niche 2019, p.41).

Recommended actions:

- *We recommend that the applicant be consider reducing the predicted subsidence levels at all affected Aboriginal heritage sites to a minimum or imperceptible level (i.e. <20mm total vertical subsidence). We particularly recommend that measures are implemented to reduce the predicted total vertical subsidence at the following sites:*
  - *52-2-1780*
  - *52-2-1752*
  - *52-2-1456.*
- *The proposal should further consider measures to avoid or limit the impact of the proposed long walls on Aboriginal cultural heritage. The current mitigation for subsidence impacts*

(Niche 2019, p.85) is monitoring to identify mining induced changes in site condition. This only identifies harm after it has occurred and after sites have been undermined and does not avoid or limit that harm. As a minimum, we recommend the applicant is required to reduce the impacts of these long walls on Aboriginal heritage sites:

- *LW514 – likely to harm sites 52-2-1780, 52-2-1779 and 52-2-1782.*
- *LW516 – likely to harm site 52-2-1752.*
- *LW603 – likely to harm sites 52-2-1456 and 52-2-1466.*

- *We recommend any project approval define harm to Aboriginal heritage appropriately, including harm to a rock shelter or sandstone platform on which art or grinding grooves are located. De-stabilising the rock shelter or sandstone platform creates a direct risk to the survival of the art of grinding grooves, so damage to those structures should also be considered as harm to Aboriginal heritage.*
- *The subsidence report must include all Aboriginal heritage sites in the proposed expansion area. The MSEC report predicted impacts (2018, p.953) should be revised to include all 58 of the sites identified by Niche. Currently the MSEC report only provides predictions for 55 sites. We request a copy of the amended MSEC predictions as this may require amendments to our recommendations.*
- *A single map overlay combining all recorded sites in the study area (e.g. Niche Figures 12 and 13) with the long wall layout (e.g. MSEC drawing 856-20) should be provided. This is to show the complete set of known sites in relation to the proposed long wall layout. This figure should be included in an amended ACHAR with the impact assessment revised as required.*
- *Consultation with the Aboriginal community should continue through the life of Areas 5 and 6, if approved. Consultation with the Registered Aboriginal Parties is the minimum consultation requirements, and the applicant can also consult the broader Aboriginal community. The consultation requirements do not prevent additional parties being added to the list of RAPs. We support an open and transparent consultation process. Further information on the consultation process should be provided to the Department.*
- *An Aboriginal heritage management plan (AHMP) must be prepared at an early stage in consultation with the Registered Aboriginal Parties that includes and addresses the Niche (2019, pp.87-88) recommendations. We would welcome the opportunity to review a draft AHMP prior to any project approval being issued.*
- *We support appropriate Aboriginal community access to cultural heritage sites. A protocol for Aboriginal community access to cultural heritage sites within the Water NSW managed catchment lands should be developed. This is a key outcome of the Aboriginal community consultation (e.g. Niche 2019, p.18).*
- *AHIMS site update cards are required. We recommend that it is a condition of project approval that site update cards are provided to the Aboriginal Heritage Information Management System (AHIMS) where there is new information available (including locational information) or where changes to the site condition are documented.*
- *We recommend the additional comments in relation to further information and amendments to the ACHAR outlined in our comments above should be addressed.*