UNITED WAMBO OPEN CUT COAL MINE PROJECT

April 2019

RESPONSE TO INDEPENDENT PLANNING COMMISSION FEBRUARY 2019 PUBLIC MEETING

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UNITED WAMBO OPEN CUT COAL MINE PROJECT

Response to Independent Planning Commission February 2019 Public Meeting

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
United Collieries Pty Limited

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1.0 Introduction

Under a Joint Venture arrangement, United Collieries Pty Limited (United) and Wambo Coal Pty Limited (Wambo) propose to develop the United Wambo Open Cut Coal Mine Project (the Project). The Project involves combining the existing open cut operations at Wambo with a proposed new open cut coal mine at United.

The Project was referred to the Independent Planning Commission (IPC) by the Department of Planning and Environment (DPE) for determination on 12 November 2018.

The IPC met with representatives of the Hunter Environment Lobby (HEL) on 5 February 2019. This included experts engaged by the Environmental Defenders Office NSW (EDO NSW) on behalf HEL. Submissions to the IPC were also made on behalf of HEL.

The IPC held a public meeting on 7 February 2019 at Singleton at which 34 speakers presented to the IPC. Some written comments were made to the IPC.

Section 2.0 of this report provides a response to the issues raised in the submissions to the IPC except for matters relating to greenhouse gas and climate change. Matters relating to greenhouse gas and climate change are addressed in a separate response.

The IPC has requested additional information, as per its correspondence dated 22 March 2019. The requested additional information is provided in **Section 3.0** of this report, except for matters relating to greenhouse gas and climate change which are addressed in the separate response noted above. In addition, responses to the questions asked by the IPC during the Project briefing on 5 February 2019 which were taken on notice by United and Wambo are also provided in **Section 3.0**.

2.0 Responses

2.1 Noise

Noise related issues were raised in a submission made on behalf of HEL and mentioned in other oral or written comments by members of the community to the IPC.

EDO NSW on behalf of HEL engaged Stephen Gauld of Day Design Pty Ltd to review the Noise Impact Assessment (NIA) for the Project (Umwelt 2016a). A detailed response to the submission made by Mr Gauld is provided in **Appendix 1**. A summary response to the issues raised in both the Gauld submission and the community comments is provided below.

With regard to the noise assessment for the Project:

- it has been completed in accordance with relevant guidelines, including the *Industrial Noise Policy* (INP) as required by the Secretary's Environmental Assessment Requirements (SEARs)
- it was subject to a peer review prior to completion by a separate noise expert to assess its adequacy and confirm that it followed relevant guidelines and practice. This was undertaken as part of the Environmental Impact Statement (EIS) preparation process to provide additional rigor to the assessment process
- it has been reviewed and scrutinised by DPE's noise specialists and the EPA noise experts and responses have been provided by the proponent on a range of questions that were raised during the government assessment process. This included the proponent making additional commitments
- the noise impacts of the Project have been reduced through changes to the Project and the application of a range of noise management and mitigation measures
- United has consulted with those residences identified as impacted by noise and has offered mitigation measures in accordance with the Voluntary Land and Acquisition Mitigation Policy: For State Significant Mining, Petroleum and Extractive Industry Developments (VLAMP) .

2.1.1 HEL Specialist Comments

The Gauld comments indicates that the methodology and assessment process presented in the NIA for the Project follows the requirements of the Industrial Noise Policy (INP) and the underlying requirements of the Noise Policy for Industry (NPfI).

The Gauld review only raises one purported issue with the NIA which is that the NIA does not provide evidence of any mitigation measures that would meet the Project Specific Noise Levels (PSNLs), but were considered unreasonable or not feasible. Instead, the review notes that the mitigation measures that are considered by the proponent to be reasonable and feasible are proposed and discussed.

The INP identifies that the PSNLs are not intended to be applied as a mandatory noise limit rather PSNLs are regarded as a planning tool against which to assess predicted noise impacts. That is, while a Project should strive to achieve the PSNLs, it is recognised that this is not possible in all cases.

As outlined in **Appendix 1**, the noise control measures that were determined to be reasonable and feasible in relation to providing effective control of potential impacts have been incorporated into the Project design and specifically assessed as part of the NIA. The INP does not call for a proponent to provide a detailed explanation of control measures that were considered but not found to be reasonable or feasible, or for the proponent to identify any measure that would reduce noise without consideration of what is reasonable and feasible as inferred by Gauld. It is considered that the analysis of the reasonable and feasible noise controls undertaken for the Project is appropriate and in accordance with the requirements of the INP.

It is noted that the outcomes of the iterative design and noise assessment process and the proposed implementation of feasible and reasonable mitigation measures reduced the noise impacts of the Project below those that would have occurred without the implementation of the proposed measures. Without the proposed measures, there would have been additional residences within both the noise acquisition and active management zones.

It is considered that the NIA has followed the requirements of the INP and appropriately discussed the consideration of reasonable and feasible mitigation measures to control the predicted noise impacts.

2.1.2 Community Comments

The key noise related issues raised by the community included:

- application of relevant noise policies, particularly in relation to low frequency noise
- adequacy of road and rail noise assessments
- independence in the development of the noise compliance protocol
- determination of background noise levels
- adequacy of noise compliance monitoring.

With regard to the comments on noise policy, the NIA for the Project was prepared in accordance with the INP which is the relevant policy applying to the assessment of the Project as required by the SEARs. As requested by the IPC, an analysis of the Project against the new *Noise Policy for Industry* (NPfI) was also undertaken and provided to the IPC. As discussed above, we note that the EDO NSW commissioned noise submission also indicated that the methodology and assessment process presented in the NIA for the Project follows the requirements of the INP and the underlying requirements of the NPfI.

With regard to low frequency noise, road and rail noise and background noise levels, these assessments have been undertaken in accordance with the INP. It is also noted that additional information has been submitted on several of these aspects in regard to earlier community submissions or agency questions and have been considered in detail as part of the assessment process. A more detailed response on these aspects is provided in **Appendix 1**.

With regard to the comments made regarding the independence of Global Acoustics which prepared the noise compliance protocol on behalf of United, Global Acoustics is an independent business that provides noise related services and advice to a range of clients. As a business that understands mining related noise impacts and the monitoring and management of these impacts, Global Acoustics is considered to be well placed to prepare a protocol for the monitoring of mining noise. Noise compliance management is the responsibility of the proponent and it is appropriate that the proponent (with appropriate support from technical experts) identifies how it will manage and assess compliance. The noise compliance protocol was developed to outline the proposed method for determining compliance with separate premise-specific criteria. The final protocol will be part of the Noise Management Plan for the Project and will be subject to review and approval by NSW government agencies, ensuring that it is appropriate to assess noise compliance.

In relation to noise compliance monitoring, a community comment suggested that noise monitoring undertaken by the proponent would be only management monitoring not compliance. There are two types of noise monitoring relevant to mining operations being continuous noise monitoring and attended noise monitoring. United has committed to implement a continuous noise monitoring system and proposes to utilise four directional real-time noise monitors to enable United to undertake ongoing assessments of compliance with relevant noise impact assessment criteria. This monitoring is used to inform the mine of its noise performance and to assist the mine to proactively manage noise impacts if it approaches compliance criteria.

Attended noise compliance monitoring will be undertaken as required by development consent conditions and is currently planned to be undertaken monthly. The attended monitoring process requires the acoustician undertaking the monitoring to stand near the noise monitor and to identify the source of the noise levels being recorded and to use this data to assist in the assessment of compliance. This data and the compliance assessment results are reported externally to government agencies and will also be made available on the mine's website.

Further details on noise related issues raised by the community are provided in **Appendix 1**.

2.2 Water Resources

EDO NSW on behalf of HEL engaged Dr Matthew Currell of RMIT University to review the Groundwater Impact Assessment (GIA) for the Project (AGE 2016) along with subsequent reports. Three submissions have now been received to date from Dr Currell. Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) has responded to the key points raised in the latest submission from Dr Currell which is provided in **Appendix 2** with a summary response provided in **Section 2.2.1**.

Water resource related issues were also raised in other oral or written comments by members of the community, many of which were more general in nature and did not raise any matters requiring a technical response. Where required, detailed responses are provided in **Appendix 2** and a summary provided in **Section 2.2.2**.

With regard to the GIA for the Project:

- it has been completed in accordance with relevant guidelines, including the *NSW Aquifer Interference Policy* (2012) (AIP) as required by the SEARs
- it was subject to two independent peer reviews to assess its adequacy and confirm that it followed relevant guidelines and practice
- it has been reviewed and scrutinised by DPE, DPI Water and the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC). Responses have been provided by the proponent on a range of questions that were raised during the government assessment process. This included the proponent making additional commitments
- the Project incorporates offset distances to Wollombi Brook and the Hunter River which exceed the 200 metre (m) offsets recommended in the AIP so that impacts to the alluvial system are minimised as far as possible
- no private bores will be impacted by more than 2 m drawdown as a result of the Project
- United and Wambo have adequate groundwater licences for the predicted groundwater take for the Project.

2.2.1 HEL Specialist Comments

In summary, Dr Currell's review raises issues in relation to:

- the groundwater monitoring network
- groundwater level trends
- groundwater-surface water interactions
- groundwater quality
- timing of the water management plan.

A detailed response is provided in **Appendix 2** with a summary provided below.

The GIA for the EIS was conducted in accordance with published guidance on groundwater modelling and designed for the purpose of determining compliance of the Project against government policy, specifically the AIP. The assessment was also subject to two peer reviews and was also reviewed by NSW government agencies. None of these reviews have identified the need for alternative modelling approaches as suggested by Dr Currell. It is considered that the GIA has been prepared in a manner that adequately and appropriately assesses the groundwater impacts of the Project.

Groundwater monitoring network

Dr Currell provides several comments on the monitoring network and concludes it is insufficient to detect Project impacts. The network proposed for monitoring the impact of the Project as outlined in the EIS (Umwelt 2016b) and Response to Submissions (RTS) (Umwelt 2017a and 2017b) comprises monitoring sites within all of the alluvial aquifers identified as potentially sensitive receptors surrounding the proposed activity, as well as monitoring points in the coal measures where depressurisation is predicted to enable the magnitude and progression of drawdown over time to be measured. This means it is designed to detect the impacts predicted to be generated by the Project and is therefore considered to be appropriate.

United has committed to ongoing review of groundwater monitoring and comparison to impacts over the life of the Project. Should the need for any additional monitoring be identified over the life of the Project additional monitoring bores will be installed.

Groundwater level trends

Dr Currell questioned the spatial distribution of monitoring bores to the west of the Project Area and indicated that spatial and temporal trends in groundwater levels should be further reviewed in relation factors such as climate, geology/topography and existing mining.

The purpose of additional monitoring bores to the west of the Wambo mining area is not outlined by Dr Currell, however, additional monitoring has not been proposed in this area as there is a lack of environmental receptors, and it is an elevated area where the water table is relatively deep. Therefore additional monitoring bores in this area are not considered necessary.

The GIA for the Project contained water level contour maps and hydrographs for each bore, sufficient to characterise the existing environment and to understand the impacts of climate and mining for the purposes of the assessment. AGE considers that further review is not required to inform the assessment process.

Groundwater-surface water interactions

The GIA for the EIS was conducted in accordance with published guidance on groundwater modelling and designed for the purpose of determining compliance of the Project against government policy. The peer reviews and also reviews undertaken by state agencies as part of the assessment process have not identified the need for alternative modelling approaches, as suggested by Dr Currell.

As outlined in **Appendix 2**, AGE acknowledges that understanding properties of the alluvial systems and groundwater surface water interactions is important and required for numerical modelling. It is also important to note that no direct mining of alluvial systems is proposed, and there is a significant setback between the mining and these environmental receptors.

The correspondence from Dr Currell concludes that *"without further detailed field data and additional modelling at different scale(s) (as described in my previous report) there is the prospect that substantially different impacts may in fact arise compared to those predicted in the modelling conducted to date"*. It is unclear why and how Dr Currell concludes finer scale modelling could result in different impacts. The modelling conducted to assess the impact of the Project was conducted using an appropriately sized and scaled model and included more detail along the water sources.

As noted above, the modelling methodology for the GIA was based around the information required by the AIP. The modelling methodology has been reviewed and considered appropriate by peer reviewers and NSW government agencies. The groundwater modelling undertaken for the Project is considered appropriate and meets relevant guidelines and professional practice. The finer scaled modelling suggested by Dr Currell is not considered necessary to inform the understanding of the groundwater impacts or groundwater assessment of the Project.

Groundwater quality

Dr Currell's review provides commentary on groundwater quality and concludes the assessment was inadequate due to the spatial nature of the monitoring network, the monitoring frequency and the amount/nature of data analysis.

Regarding the level of analysis provided to the water quality data, the scope of the GIA was designed to satisfy requirements of NSW and Commonwealth Government legislation, guidelines and policy. The amount of detailed analysis suggested by Dr Currell is considered to be beyond what is required to assess the groundwater impacts of the Project in line with relevant government policy and industry standards and is not considered necessary to identify and assess the impacts of the Project.

Water Management Plan timing

The review from Dr Currell comments that *"the fact that the revised groundwater monitoring program is not available means that there is no way for the public to scrutinise the planned groundwater monitoring program…"*.

The EIS and the RTS have outlined the monitoring proposed to be implemented as part of the Project which has included monitoring in all identified sensitive receptors and in the area of the mining activity. This information is available for the community to scrutinise and to inform the assessment process.

2.2.2 Community Comments

Detailed responses to water related concerns raised by the community are provided in **Appendix 2** and a summary response provided in **Table 2.1**.

Table 2.1 Summary of community concerns relating to water resources

Concern	Summary Response
Potential for proposed voids to become a contamination source	The GIA (AGE 2016) concluded that the final voids will act as a sink in perpetuity with no escape of contained void water. It was also suggested in a community comment that no geochemical assessment was undertaken for the Project which is incorrect. A geochemical assessment was undertaken and provided as part of the Response to Submissions (RTS).
Not providing clear information on how many supply works are going to be affected by two metres or greater of drawdown	Table 7-2 within the GIA (AGE 2016), provides information on the water supply works predicted by modelling to be impacted by the Project and cumulative impacts. There were two bores predicted to experience a drawdown of more than 2 m and these are situated on land owned by the Joint Venture. There are no significant impacts predicted on external water groundwater users.
Potential for 10 metres of drawdown in productive alluvium	As outlined in **Appendix 2**, the predicted drawdown is generally between 1 - 2 m in isolated zones along the fringes of the Hunter River and Wollombi Brook alluvium. No private water supply bores occur in the areas where drawdown is predicted within the alluvial aquifers.
The need for a trigger response plan to be based on two years' worth of data	It is agreed that triggers should be developed for monitoring bores where adequate baseline data is available. Monitoring has been on-going at both United and Wambo since 2000 and significant baseline dataset exceeding two years is available for development of triggers.
Mining exemptions from cease to pump rules in alluvial water sharing plans	The cease to pump rule is intended to manage water bores extracting groundwater in close proximity to creek systems that could be affecting stream flow during low flow periods. The cease to pump rule requires these bores to cease pumping when the water table falls below a prescribed level. As noted previously the mining will not directly extract groundwater from the alluvium or connected streams, and can only influence the alluvial systems indirectly through the underlying low permeability bedrock. The relatively low volumes of indirect take predicted are not sufficient to induce a detectable decline in groundwater levels at rivers and streams where the cease to pump rule could be applied.
Impacts to net baseflow of 450 megalitres per year which is a loss of nearly one-third of baseflow	The groundwater model predicts the baseflow within the Wollombi Brook alluvium will reduce due to the cumulative impact of mining. The Project, however, accounts for between 1ML/year to 37ML/year (depending on the stage of mining) of the cumulative impacts on baseflow to Wollombi Brook. All mining operations in the groundwater model area, including the proponent, are required to hold Water Access Licenses to account for water taken indirectly from baseflow. The proponents have a combined total entitlement of 370ML/year which is more than sufficient to account for any indirect losses from Wollombi Brook and the Hunter River alluvial systems and baseflow.
Cumulative impacts, including consideration of the bioregional assessment report	The cumulative impacts of the Project have been assessed as part of the detailed water assessments completed for the Project and through the EIS and RTS processes. It is also noted that the Project will be regulated by the water sharing process in New South Wales which is designed to protect environmental flows and downstream users and limit the amount of water that can be taken from water systems to within sustainable levels. The Project has sufficient water licences to cater for the predicted take for the Project.

2.3 Biodiversity

David C. Paull and Stephen Bell were engaged by EDO NSW on behalf of HEL to review biodiversity matters in relation to the Project. In addition, some matters in relation to biodiversity were raised in other oral or written comments by members of the community.

A detailed response to the issues raised is provided in **Appendix 3**. A summary response to the EDO NSW Specialist submissions and community comments are presented in **Section 2.3.1** and **Section 2.3.2** respectively.

With regard to the biodiversity assessment for the Project:

- it was undertaken in accordance with the NSW Biodiversity Offsets Policy for Major Projects (OEH 2014) which incorporates the NSW Framework for Biodiversity Assessment (FBA) which was the relevant NSW Government policy at the time of the assessment
- it has been reviewed and scrutinised by DPE and OEH. Responses have been provided by the proponent on a range of questions that were raised during the government assessment process. This included the proponent making additional commitments
- the additional disturbance area has been reduced by 40.8 hectares (ha), including 22.6 ha of *Central Hunter Valley Eucalypt Forest and Woodland Critically Endangered Ecological Community* (CEEC) since the EIS was exhibited
- a comprehensive biodiversity offset package has been proposed, including land based offsets and mine rehabilitation
- United has actively continued to expand the biodiversity offset package, extending one local offset and adding three further local biodiversity offsets during the assessment process
- 100% of the required biodiversity offsets for Stage 1 of the Project have been secured.

As presented to the IPC and at the public meeting, the Joint Venture has secured an additional offset area. The Wambo South Offset is approximately 265 ha and proximate to the Project Area providing an additional local offset.

The site contains approximately 194 ha of *Central Hunter Valley Eucalypt Forest and Woodland CEEC* (comprised of woodland and derived native grasslands), which generates 2,483 credits along with other non-CEEC credits. Field surveys have been undertaken. Credits generated from this site will be available for use to meet the credit needs for future stages.

2.3.1 HEL Specialist Comments

2.3.1.1 Mr David Paull

Mr Paull's correspondence raises issues related to:

- the quantum and patch sizes of *Central Hunter Valley Eucalypt Forest and Woodland CEEC* remaining in the Hunter, with Mr Paull suggesting that the patch of *Central Hunter Valley Eucalypt Forest and Woodland CEEC* proposed to be removed is one of the largest remnants
- the adequacy of offsets
- suggested problems with the NSW government's BioBanking methodology
- the suggested failure of the FBA methodology to consider landscape connectivity or cumulative impacts and that indirect impacts are not quantified

- net loss of CEEC and Regent Honeyeater habitat
- legitimacy and scientific merit of using mine rehabilitation as an offset
- use of the assessment of significance test for NSW-listed matters.

A detailed response is provided in **Appendix 3** with a summary provided below.

Central Hunter Valley Eucalypt Forest and Woodland CEEC patch size

Mr Paull suggests that the Project will impact on one of the largest remaining remnants of the *Central Hunter Valley Eucalypt Forest and Woodland CEEC* and that it is one of the last two significant areas of this community left.

The area of *Central Hunter Valley Eucalypt Forest and Woodland* CEEC proposed to be removed is 246.8 ha (including 12.8 ha of derived native grasslands, 209.7 ha of woodland/forest and 24.3 ha of young regeneration). Mr Paull's correspondence broadly refers to the area of CEEC to be removed as a single patch, however, it is made up of several patches. The largest patch wholly within the Project Area is approximately 98.4 ha. Some of the CEEC within the Project Area forms part of patches that extend outside the Project Area. The largest patch size for any of the patches of which the Project Area forms part is 751 ha (excluding derived native grassland outside of the Project Area as this is not mapped by OEH 2019), of which 127 ha will be removed by the Project.

As outlined in **Appendix 3**, Mr Paull is not correct in his statements that the Project will remove one of the largest remaining patches of the CEEC. There are at least 64 larger patches of the CEEC based on an analysis undertaken by Umwelt when compared to the 98.4 ha patch wholly within the Project Area. There are also several patches of the CEEC that are over 1,000 ha based on analysis of mapping produced by OEH in 2019. It is therefore clear that the patch proposed to be removed by the Project is not one of the two largest patches of the CEEC remaining.

Further discussion on patch size and inaccuracies in Mr Paull's correspondence relating to patch size are provided in **Appendix 3**.

Adequacy of Offsets

Mr Paull suggests that the proposed offsets for the Project are small and *'scattered up and down the valley'*. This suggestion is not correct as the offset areas contain large areas of vegetation and will provide a meaningful contribution to conservation outcomes in the Hunter Valley.

The like-for-like offsets currently proposed for *Central Hunter Valley Eucalypt Forest and Woodland CEEC* include 1,191.1 ha of the community made up of four offset sites in proximity to the Project Area and mine rehabilitation, as detailed in **Appendix 3**. The proposed offset sites do not represent insignificant or small areas of the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC in the Hunter Valley, noting that the conservation advice for the CEEC suggests that the median (not average) patch size is 1.7 ha.

Mr Paull also discusses offset ratios and their application in assessing the adequacy of the offsets under commonwealth legislation. It is noted that an assessment of the adequacy of an offset strategy under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Environmental Offsets Policy does not strictly use offset ratios, but considers the community's quality and context at both the impact and offset sites. The consideration of offset ratios is not relevant to the assessment of the Project which is being assessed under the NSW FBA. The FBA does not apply offset ratios but instead requires input of substantial biodiversity and landscape data into a calculator tool which determines credit loads for an impact site. These are then offset by credits on an offset site. Consideration of offset ratios is not consistent with the NSW biodiversity policy under which the Project is being assessed and is not relevant for the Project.

BioBanking Methodology

Mr Paull's correspondence includes a number of comments regarding his views of the merits and limitations of the BioBanking, the FBA and the NSW Offsets Policy for Major Projects. Mr Paull's views are noted but comments in relation to the merits of NSW government policy are not considered relevant to the assessment of the Project.

The FBA was the relevant government policy and methodology at the time of the assessment and is applicable to the Project. The Biodiversity Assessment Report (BAR) (Umwelt 2017c) was prepared in accordance with the FBA methodology and OEH's requirements.

FBA methodology not considering landscape connectivity or cumulative impacts

Mr Paull suggests that the FBA methodology used has failed to consider issues of landscape connectivity or cumulative impact adequately.

As noted above, the BAR was prepared in accordance with the requirements of the FBA. The importance of corridors and connectivity are captured in the FBA through the identification of local and/or regional biodiversity links as part of the connectivity value of the site. The potential loss of local and regional connectivity is factored in to the FBA credit calculations for the Project in that the Assessment Circle and associated Landscape Value Scores take into account the pre and post-clearing percentage of native vegetation cover. The FBA also requires an assessment of cumulative impacts as part of the indirect impact assessment outlined in 8.4.1.4 of the FBA.

Therefore, the FBA methodology does consider landscape connectivity and cumulate impacts.

Indirect impacts not quantified

Mr Paull suggests that one of the shortcomings of the current Offset Policy for Major Projects in NSW is the lack of quantification of indirect impacts.

The BAR was prepared following the policy and OEH's requirements. Comments in relation to the merits of the policy are not considered relevant to the assessment of the Project.

It is noted that indirect impacts, including a discussion on cumulative impact, loss in habitat connectivity, changes in fauna behaviour and the interruption of ecosystem processes were addressed in the BAR and in Section 2.3 of the Response to RFI report (Umwelt 2017d) as required in Section 8.4.1.4 of the FBA. Therefore indirect impacts have been appropriately assessed.

Net loss of CEEC and Regent Honeyeater

Mr Paull suggests that the Project will likely result in a net loss for *Central Hunter Valley Eucalypt Forest and Woodland CEEC* and regent honeyeater.

Based on the proposed offsets package (excluding further offsets required to be established for Stages 2 and 3 of the Project), a net loss for *Central Hunter Valley Eucalypt Forest and Woodland CEEC* and regent honeyeater is not likely, due to the grassland areas proposed to be regenerated to woodland and forested habitats.

The restoration of the *Central Hunter Valley Eucalypt Forest and Woodland CEEC* in existing grassland areas at the BioBank Sites and in mine rehabilitation represents a gain of around 644.7 ha.

For the regent honeyeater, the proposed restoration of existing grassland areas at the proposed BioBank Sites represents a gain of around 347 ha of vegetation dominated by key feed trees, which will improve the viability of the species in the Hunter Valley. This does not include any consideration of the extent of mine rehabilitation proposed. Therefore, there is no net loss in regent honeyeater habitat.

Legitimacy and scientific merit of using mine rehabilitation as an offset

Mr Paull suggests that the Commonwealth offset policy does require offsets to be additional to what is already required, specifically referencing that mine rehabilitation is a mandatory requirement under the *Mining Act 1912* (*Mining Act*).

While mine rehabilitation is mandatory under the *Mining Act*, the higher standards required for ecological rehabilitation is a commitment above and beyond standard rehabilitation requirements. Additionally, rehabilitated mining land would be sold after it has been signed off and once owned by another party could be used for activities such as grazing or other land use developments. As ecological rehabilitation, the land is expected to be placed into a stewardship agreement (or other future protection mechanism) which would provide long term protection.

Mr Paull also suggests there are serious questions of scientific merit as to the use of mine rehabilitation as a means to retire credits generated by the removal of good condition mature ecosystems.

NSW government policy provides for the use of mine rehabilitation to generate credits provided that strict performance criteria are met. It is acknowledged that this is an area of more recent policy development and therefore there is not currently extensive scientific study on this issue in NSW.

Under NSW government policy, there are a range of safeguard mechanisms in place so that if an area of ecological rehabilitation does not meet the required standard, the credits cannot be generated and an alternative offset must be provided.

With regard to scientific study on this topic, the report prepared by Umwelt (2017e) titled '*Assessment of Mine Rehabilitation Against Central Hunter Valley Eucalypt Forest and Woodland CEEC*' was a first-step to better understanding the ability of mine ecological rehabilitation in the Hunter Valley to be able to establish and form self-sustaining and recognisable ecological communities. While the findings were very promising and instructive, it was recommended that a more detailed study be undertaken. This has since been commenced through the current major research study being undertaken by Umwelt for the Australian Coal Industry's Research Program.

Assessment of significance test for NSW-listed matters

Mr Paull's statement in relation to 'a *proper consideration of the assessment of significance test for NSW-listed matters, according to section 5A of the EP&A Act, has not occurred'* is not correct. A proper consideration of (the former) Section 5A of the EP&A Act has occurred.

The biodiversity assessment for the Project was completed in accordance with the SEARs and in accordance with NSW Government policy. A summary of the requirements of the Seven Part Tests of Significance and where they are addressed in the FBA Assessment was outlined in Table 5.7 of the BAR (Umwelt 2017c).

2.3.1.2 Dr Stephen Bell

Dr Bell's correspondence raised two issues in relation to the biodiversity assessment completed for the Project, being:

- his view that Hunter Valley Weeping Myall Woodland has not been fully assessed across the Project Area
- his view that the proposed mine rehabilitation objectives or expected environmental outcomes are not achievable.

A 0.1 ha patch of *Hunter Valley Weeping Myall Woodland* Critically Endangered Ecological Community (HVWMW CEEC) under the *Biodiversity Conservation Act 2016* (BC Act) was avoided by Project planning and therefore will not be impacted by the Project.

As outlined in **Appendix 3**, it is recognised that, as per Bell's original submission, the identification of this community where it occurs without *Acacia pendula* as either a shrub or tree, or a sucker, is extremely difficult. During the intensive surveys of the Project Area, the only evidence of *Acacia pendula*, either as stems or suckers, which might portray the presence of the CEEC, was located in the stand that was since avoided through Project disturbance area re-design. A buffer area was included around this area.

While no other areas of this CEEC are known or expected, any other potential micro-occurrence of this community (devoid of *Acacia pendula*) would almost certainly be in an area that has been attributed to another NSW listed ecological community and/or the Central Hunter Eucalypt Forest and Woodland CEEC.

With regard to Mr Bell's comments on mine rehabilitation, as discussed above, the NSW government provides for the use of mine rehabilitation to generate biodiversity credits provided strict criteria are met. Further details on the use of mine rehabilitation are discussed in **Section 2.3.1.1** and **Appendix 3**.

2.3.2 Community Comments

The key community concerns in relation to biodiversity, included:

- the use of the Upper Hunter Strategic Assessment
- incorrect listing of the Regent Honeyeater and Swift Parrot as endangered rather than critically endangered in the DPE assessment report
- use of variation rules for critically endangered species and communities
- application of offsetting rules in relation to EPBC Act listed high conservation values ecological communities by using mine rehabilitation
- statement in the in the DPE assessment report that the main threat to Regent Honeyeater is disease
- reliance on *'Assessment of Mine Rehabilitation Against Central Hunter Valley Eucalypt Forest and Woodland CEEC*' report
- offset lands purchased and nothing done with them.

Detailed responses to biodiversity related concerns raised by the community are provided in **Appendix 3** and a summary response provided in **Table 2.2**.

Table 2.2 Summary of community concerns relating to biodiversity

Concern	Summary Response
The use of the Upper Hunter Strategic Assessment	The Project is not being assessed, managed and offset under the UHSA. The Project is being assessed under the FBA and NSW Offsets Policy for Major Projects which are NSW Government policy and are publically available. It was originally planned to assess the Project under the UHSA but this was changed in 2017 as part of the RTS process as the UHSA policy has not been finalised. Full FBA assessments have been completed and the UHSA is no longer relevant.
Incorrect listing of the Regent Honeyeater and Swift Parrot as endangered rather than critically endangered in the DPE assessment report	This comment refers to the DPE assessment report for the Project. As outlined in **Appendix 3**, it is acknowledged that the regent honeyeater and swift parrot are currently listed as 'critically endangered' under the Commonwealth EPBC Act. The EPBC Act Referral for the Project was submitted in October 2015. At that time, the swift parrot was listed as endangered not critically endangered. As per Section 158A of the EPBC Act, the assessment of the Project continues to assess this species as per its listing at the time of the controlled action decision. It is also noted, however, that the statements of listing status in the DPE report in no way affects the assessment outcomes as regardless of the listing status the impact of the Project on potential habitat for these species are addressed by the offset strategy developed in accordance with the FBA . Neither species have been recorded in the Additional Disturbance Area for the Project despite extensive targeted survey over many years.
Use of variation rules for critically endangered species and communities	It is correct that the FBA does not allow the variation rules to be used for critically endangered species/communities and species/communities listed under the EPBC Act, consequently the variation rules have not been used for those matters. The *Central Hunter Valley Forest and Woodland CEEC* has been offset using like-for-like offsetting rules approved by OEH and the Department of the Environment and Energy (DoEE).
Application of offsetting rules in relation to EPBC Act listed high conservation values ecological communities by using mine rehabilitation	The use of mine rehabilitation is provided for by the offsetting rules of the FBA and NSW Offsets Policy for Major Projects. United's offset strategy includes a combination of offset components including land-based offsets and revegetation programs. The proposed area of ecological mine rehabilitation will provide a significant area of CEEC and is considered appropriate for maximising biodiversity opportunities to improve the post-mining landscape.
Statement in DPE assessment report that the main threat to Regent Honeyeater is disease	With a small population size, disease and other stochastic events are a threat to this species as stated in the *National Recovery Plan for the Regent Honeyeater (Anthochaera Phrygia)* April 2016; however, the main threats identified in the Conservation Advice are clearing, fragmentation and degradation of its habitat. The impacts on this species have been correctly assessed and offsets are proposed under the FBA and the statement in the DPE assessment report in no way affects the assessment outcomes for this species.
Reliance on *'Assessment of Mine Rehabilitation Against Central Hunter Valley Eucalypt Forest and Woodland CEEC'* report	The report prepared by Umwelt (2017e) titled '*Assessment of Mine Rehabilitation Against Central Hunter Valley Eucalypt Forest and Woodland CEEC*' was a first-step to better understanding the ability of mine ecological rehabilitation in the Hunter Valley to be able to establish and form self-sustaining and recognisable ecological communities. Further details are provided in **Section 2.3.1.1** and **Appendix 3**.
Offset lands purchased and nothing done with them	The land-based offset sites for the Project are not just purchased and then proposed to be left unmanaged. The requirement to establish Biobank (or now called Stewardship) sites requires entering into a legally binding agreement that requires a range of management actions to improve the habitats on the sites in the long term.

2.4 Draft Conditions of Consent

EDO NSW was instructed to make a submission on behalf of its client, HEL, in relation to the draft conditions proposed for the Project by DPE (HEL Legal Submission). In broad terms, the HEL Legal Submission was critical of the draft conditions and opined that:

- the draft conditions do not resolve issues in a sensible and reasonable way (e.g. by providing for detail to be addressed in management plans)
- the draft conditions seek to 'condition away' matters such as ESD, which is not permissible
- the language used in the draft conditions is vague and therefore unenforceable
- it is unacceptable for draft conditions to frame certain matters as being 'to the satisfaction of the Secretary'
- if the IPC determines to grant development consent for the Project, certain of the draft conditions proposed by DPE should be amended in the manner outlined in the HEL Legal Submission.

The proponent does not propose to deal with each of the points raised in the HEL Legal Submission. Rather, the proponent's response which is provided below focusses on the main points raised in the HEL Legal Submission.

Mining projects are, by their nature, dynamic rather than static. Unlike a commercial office tower or an item of fixed infrastructure such as a railway, mining projects entail development which occurs over a long period (often 20 years or more) and over a relatively large spatial area. As such, it is essential that the conditions imposed to regulate mining projects are capable of accommodating a degree of flexibility so that they can regulate the various stages of the mining operation in an effective manner. It is also important that development consents for mining projects are drafted in a way that allows for proponents to readily and appropriately accommodate changes in community expectations, technology and mining practices over the life of the development consent.

It is for those reasons that DPE has developed a set of conditions which are commonly imposed for State Significant Infrastructure (SSI) and State Significant Development (SSD), including mining projects.

All of the draft conditions that have been proposed by DPE for the Project and which are subject to criticism in the HEL Legal Submission are generally consistent with the 'typical' set of conditions that are imposed on developments of a similar nature and scale to the Project. There is a substantial body of case law that has considered the manner in which those commonly imposed conditions are to be interpreted and applied. That case law has established the validity of, and recognised the desirability of, such conditions, and demonstrates that the comments made in the HEL Legal Submission are unfounded.

Without responding to every aspect of the HEL Legal Submission, the proponent considers that the material set out in the following paragraphs demonstrates that the conditions proposed by DPE for the Project are valid, appropriate and capable of being imposed by the consent authority.

1. It is well established under the *Newbury* tests (refer to *Dogild Pty Ltd v Warringah Council* (2008) 158 LGERA 429, [37]-[54] for a summary of the relevant cases) that conditions of development consent do not need to deal exhaustively with all possible conceivable issues that may arise in the implementation or operation of a project, in order to be valid.

2. It has been a standard approach for many years for conditions of development consent to require management plans to be prepared and implemented for a project, which provide detailed regimes as to how the project's interaction with different components of the environment (e.g. air, water, land and so on) is to occur. Indeed, the very act of formulating a condition for a management plan (or reviewing and amending a recommended condition for a management plan) involves consideration being given to the subject matter that is to form the basis of the plan.

3. Management plans do not serve the purpose of deferring consideration of impacts so that a consent authority can 'disavow itself of the requirement to consider impacts'. Management plans are a tool to assist in managing impacts that were identified in the assessment process. They are a management tool, not an impact assessment process. The formulation and imposition of a condition of consent requiring a management plan to address particular environmental impacts necessarily arises from consideration of what impacts are predicted as being likely to be associated with a development. The comments that environmental assessment documentation becomes 'less important over time' is merely an assertion without any evidentiary foundation. A proponent is always obliged to carry out development 'generally in accordance with' the environmental assessment documentation prepared for a project. Management plans provide more 'fine detail' than an EIS as to the features of the particular development and how particular environmental impacts associated with a development are to be managed.

4. It has been held by the Court that conditions of a development consent that make provision for management plans embodying an adaptive management approach is an appropriate approach to dealing with uncertainties as to environmental impacts, and that such an approach is both 'within power and [does] not impermissibly defer consideration of the matters the subject of adaptive management until after the grant of consent': see *Upper Mooki Landcare Inc v Shenhua Watermark Coal Pty Ltd and Minister for Planning* [2016] NSWLEC 6 at [144].

5. The case law from the NSW Land and Environment Court has recognised that, for large mining projects, conditions of planning approval or development consent that allow for resolution of issues as and when they arise during the course of the life of a mining project are not invalid. For example, in the case of *Ulan Coal Mines v Minister for Planning* (2008) 160 LGERA 20, the applicant contended that the following condition of approval for the Moolarben Coal Mine was invalid:

> *The Proponent must ensure that it has sufficient water for all stages of the project, and if necessary, adjust the scale of mining operations to match its water supply.*

In that case, Ulan contended that the condition was invalid because it lacked 'certainty and finality and may result in a significantly different project to the one that is the subject of the application and the Environmental Assessment accompanying the application' (at [43]). That argument was rejected by Justice Preston. His Honour relevantly found at [78]-[80] that:

> *Retention of practical flexibility, leaving matters of detail for later determination, and delegation of supervision of some stage or aspect of the development, may all be desirable and be in accordance with the statutory scheme …*
>
> *In this case, leaving a choice of the means by which the outcome or objective of ensuring sufficient water for all stages of the project is to be met, to the proponent, including the nature and extent of adjustments that should be made, cannot be said to be outside the statutory scheme …*
>
> *The scale of project subject to approval under Part 3A, which are often complex, extensive and multi-stage projects, make the retention of such flexibility appropriate and inevitable, a point also made in relation to other large scale projects under Part 5 of the Act and under Part 4.*

6. The language 'reasonable and feasible' as used in the draft conditions is a standard drafting approach used in development consents for mining projects. It is an appropriate approach to adopt, and the case law has not suggested anything to the contrary. The words 'generally in accordance with' are also reflective of standard wording used in development consents for mining and other SSD projects. The inclusion of a 'generally in accordance with' condition has been viewed by the courts as setting an 'essential outer parameters set by the definitions of the project and the other conditions of the approval, notably condition 2 [regarding requirement for the project to be carried out 'generally in accordance with' the environmental assessment], condition 5 [the number of years that mining operations are permitted to be conducted for] and condition 6 [rates of coal production]': see *Ulan Coal Mines Ltd v Minister for Planning* (2008) 160 LGERA 20 at [81].

7. Further, it is incorrect to say that the 'generally in accordance with' condition is 'vague and unenforceable, as shown in the case law'. There is case law to the contrary. For example, in the case of Wingecarribee Council v CSR Limited [1993] NSWLEC 184, Justice Stein expressly noted that there was case law that 'a condition that a plan be prepared 'generally in accordance with the plan submitted' has been held not to be void for uncertainty'. His Honour further noted that the phrase 'generally as depicted' or 'generally in accordance with' is 'obviously intended to allow for some deviation'. On the facts, Justice Stein found that the road proposed by the respondent could not be considered to be 'generally in accordance with'. This finding, in and of itself, lends support to the view that the condition is clearly enforceable.

8. Conditions which use phrases like 'generally in accordance with' and 'reasonable and feasible' are not vague and unenforceable. Rather, they import a degree of flexibility into development consents for mining and other SSD projects that has been recognised by the case law as being both desirable and inevitable.

9. The use of the language 'unless otherwise agreed by the Planning Secretary' and 'to the satisfaction of the Planning Secretary' is standard accepted language to use in conditions of development consent for mining projects. Use of such language does not impermissibly defer consideration of the matters the subject of the relevant proposed conditions of consent, as the case law has found.

As noted above, the draft conditions which are the subject of the HEL Legal Submission are standard conditions which are commonly found, in more or less the same terms, in development consents for mining and other SSD projects. They are appropriate conditions which recognise the importance of flexibility in the implementation of a mining project. They also reflect a common approach to dealing with issues of this nature in the context of a mining project, which fosters consistency in terms of community expectations regarding the conditions of consent which apply across the mining industry in NSW.

Those conditions are appropriate and lawful for the consent authority to impose. The proponent does not consider it necessary to respond individually to each of the conditions identified in the HEL Legal Submission, but this can be provided if required by the IPC.

2.5 Air Quality

Air related issues were raised in a submission on behalf of HEL and mentioned in other oral or written comments by members of the community to the IPC.

EDO NSW on behalf of HEL engaged A/Prof Howard A. Bridgman to review the Air Quality Impact Assessment (AQIA) for the Project (Jacobs 2016). A detailed response to the submission is provided in **Appendix 4**. A summary response to the issues raised in both Mr Bridgman's submission and the community comments is provided below.

With regard to the AQIA for the Project:

- it has been completed in accordance with relevant guidelines, including the *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW* (2005) as required by the SEARs
- it was subject to a peer review prior to completion by a separate air quality expert to assess its adequacy and confirm that it followed relevant guidelines and practice. This was undertaken as part of the EIS preparation process to provide additional rigor to the assessment process
- a revised assessment was also completed in accordance with the updated Approved Methods 2016 and provided to DPE and the IPC despite these updated guidelines not technically applying to the Project. The overall findings of the revised air quality assessment did not change with the application of the 2016 Approved Methods
- it has been reviewed and scrutinised by DPE and the EPA, including an independent peer review commissioned by DPE. All recommendations from the DPE commissioned review were addressed
- responses have been provided by the proponent on a range of questions that were raised during the government assessment process. This included the proponent making additional commitments
- United has consulted with the one residence identified as significantly impacted by air quality and has offered acquisition and/or mitigation measures in accordance with the VLAMP. This residence has existing acquisition rights under other mining consents and has now exchanged a contract for purchase with the Joint Venture.

2.5.1 HEL Specialist Comments

Mr Bridgman's submission raises issues in relation to:

- not applying the new National Environmental Protection Measures (NEPM)
- appropriateness of using 2014 for the basis of modelling
- pattern of contours derived from dispersion modelling.

A detailed response is provided in **Appendix 4** with a summary provided below.

Application of new NEPM

Mr Bridgman states that, under the new NEPM, in 2025 the $PM_{2.5}$ 24-hour standard is to be reduced to 25 µg/m^3 and the annual standard to 7 µg/m^3. This statement is incorrect. The National Clean Air Agreement does not provide certainty with regards to the timing or final numerical values for future $PM_{2.5}$ and PM_{10} standards. The Project can only be assessed against the criteria which have been specified as applicable by NSW Government legislation or policy which has been the approach taken for the Project.

Appropriateness of modelling parameters

Mr Bridgman provides commentary relating to whether 5 years of data is adequate to choose 2014 as the basis for modelling. Further, given the current drought conditions, he suggests that there may be potential for more frequent and more extreme particle concentrations.

When conducting air dispersion modelling to predict potential impacts, the Approved Methods requires the use of site representative meteorological data that are "correlated against a longer-duration site-representative meteorological database of at least five years (preferably five consecutive years) to be deemed acceptable". The assessments carried for the Project (Jacobs 2016 and 2018) have addressed this requirement.

Whilst not necessary to satisfy relevant guidelines, to address the issue raised by Mr Bridgman and some members of the community, additional air quality modelling has been conducted using 2018 (a recent drought affected year) as the basis for modelling (refer to **Appendix 4**). The updated modelling did not change the conclusions of the AQIA for the Project.

Dispersion modelling patterns

Mr Bridgman also provided commentary relating to differences between wind roses for 2014 and the spatial results from the dispersion modelling. As previously stated, the AQIA has been undertaken in accordance with the relevant guidelines and policy and has also been subject to government and independent peer review scrutiny. It is considered that the AQIA adequately represents predicted impacts from the Project.

2.5.2 Community Comments

The community concerns raised in relation to air quality, included:

- adequacy of 2014 being used as the baseline when recent dry years have had worse average air quality
- cumulative nitrogen dioxide load has not been assessed
- the findings of the revised air quality assessment using the updated NEPM are difficult to accept
- the proposed air quality modelling (assumed to mean monitoring) network is not available for comment
- the mines ability to control dust.

Detailed responses to air quality related concerns raised by the community are provided in **Appendix 4** and a summary response provided in **Table 3.3**.

Table 2.3 Summary of community concerns relating to air quality

Concern	Summary Response
Adequacy of 2014 being used as the baseline when the last three years have had worse average air quality	The original AQIA for the Project was completed in 2016. 2014 was selected as an appropriate representative year for modelling purposes following the relevant assessment guidelines. In response to the questions raised by the community, air quality modelling has been re-run with 2018 data. As outlined in **Appendix 4**, re-running the assessment with the 2018 data did not change the conclusions of the AQIA.
Assessment of cumulative nitrogen dioxide load has not been assessed	As outlined in **Appendix 4**, an assessment of cumulative nitrogen dioxide load has been undertaken for the Project in accordance with the EPA's 2016 Approved Methods. The assessment undertaken showed that the Project will not cause exceedances of EPA's criteria for nitrogen dioxide.
Findings of revised assessment using the updated NEPM are difficult to accept	A community member has indicated that they find it difficult to accept the finding from the updated air quality assessment using the new NEPM standards has not materially changed the level of air quality impacts. An updated AQIA was completed in accordance with the 2016 Approved Methods which reduced the PM_{10} annual criterion of 25 µg/m^3 from 30 µg/m^3. Due to the reduced criterion, there is an increase to the number of mine owned residences above the criterion, however, there is no change to the number of impacted private properties. The overall findings of the revised air quality assessment did not change with the application of the 2016 Approved Methods.

Concern	Summary Response
The air quality modelling (assumed to mean monitoring) network is not available for comment as the locations are not final	This statement is incorrect. In terms of air quality monitoring, the proposed air quality network has been presented in assessment documentation and is available for comment. For example, refer to Figure 3.2 of the *Response to Independent Planning Commission Recommendations* report (Umwelt, 2018) (IPC Response report).
The mines ability to control dust	A community member stated that it is impossible to control dust. This statement is incorrect. While there will be dust emissions associated with coal mining operations, there are a number of proactive and reactive management measures that can be applied to minimise the propagation of dust from the mine. United and Wambo have committed to implement a range of best practice dust controls and are committed to effectively managing the air quality impacts associated with the Project.

2.6 Economics

Economic related issues were raised in a submission on behalf of HEL and mentioned in other oral or written comments by members of the community to the IPC.

EDO NSW on behalf of HEL engaged Rod Campbell of The Australia Institute (TAI) to review the Economic Assessment for the Project. A detailed response to the submission is provided in **Appendix 5**. A summary response to the issues raised in both Mr Campbell's submission and the community comments is provided below.

With regard to the Economic Assessment for the Project:

- it has been completed in accordance with relevant guidelines, including the *NSW Government Guidelines for Economic Appraisal* and *Guidelines for the economic assessment of mining and coal seam gas proposals* as required by the SEARs
- it has been reviewed and scrutinised by DPE, including an independent peer review by the Centre for International Economics (CIE) commissioned by DPE
- responses have been provided by the proponent on a range of questions that were raised during the government assessment process.

2.6.1 HEL Specialist Comments

Mr Campbell's submission raises issues in relation to:

- use of relevant guidelines and adequacy of assessment
- coal demand forecasts and prices
- costs of filling mine voids
- company tax calculations
- accounting for biodiversity impacts.

A detailed response is provided in **Appendix 5** with a summary provided below.

Use of relevant guidelines and adequacy of assessment

Mr Campbell states that the economics assessment for the Project has not been adequate. As outlined in **Appendix 5**, the economic assessment prepared by Deloitte Access Economics (DAE) was undertaken in accordance with relevant guidelines put in place by the NSW Government for cost benefit analysis and also for the economic assessment of mining projects. It is noted again that the economic analysis was subject to an independent peer review undertaken by CIE on behalf of DPE with the overall finding that '*the CBA (cost benefit analysis) has been undertaken in a manner that is broadly consistent with the 2015 NSW Government guidelines for conducting mining related applications and the 2017 Guidelines for economic appraisals*'.

Coal demand forecasts and prices

A major theme in Mr Campbell's comments is a review of historical demand patterns for Australian coal exports. Coal demand forecasts are not directly incorporated into the economic assessment, as a market analysis of global coal demand is beyond the scope of economic assessments. The economic assessment is based on the Project being able to sell its output at market prices.

As discussed in **Appendix 5**, the potential for a decline or increase in the coal price since the DAE economic assessment was considered in the Response to Submissions in 2017. The assessment was undertaken using benchmark prices from Consensus Economics in March 2016 adjusted to reflect the quality of coal produced by the Project. As current forecasts are within the range of the sensitivity analysis conducted, DAE do not consider it beneficial to update the economic assessment for current coal price forecasts.

Cost of filling voids

Mr Campbell suggests that there has been no attempt to quantify what the benefits might be to the NSW community of not having voids and very saline lakes in the Hunter Valley. The outcome of filling the voids would be to have an additional area of rehabilitated land, however, as outlined in **Section 2.2** there would also be costs associated with predicted salinity impacts.

As detailed in **Section 2.7**, consideration of beneficial and adverse consequences of filling the void has been undertaken. As reported in the IPC Response report, filling the voids would equate to a cost of approximately $7.0 Million per ha for the additional land area gained from backfilling the voids. This cost is 1,400 times the cost of buying a similar piece of land and is well in excess of the reasonable value of this land. Backfilling the voids requires significant earthworks and will result in additional environmental impacts including the predicted movement of saline water into the adjacent water bodies of the Wollombi Brook and North Wambo Creek. The backfilling process only provides a relatively small area of additional useable land, approximately 111 ha in total area, would be made available for alternative land uses by backfilling the voids. This equates to approximately 3.6% of the Project Area.

Company tax calculations

Mr Campbell argues that the company tax calculations in the economic assessment do not take into account actual tax payments by the proponents. This issue was previously addressed in the Response to Submissions by noting that a sensitivity analysis considered potential changes in company tax paid. It is noted that the peer review by CIE included an analysis assuming no benefits relating to company tax and found that with this assumption, the Project continues to deliver net benefits for NSW.

As discussed in **Appendix 5**, it is noted that Mr Campbell does not accurately represent the approach used by DAE to calculate company tax payable.

Accounting for biodiversity impacts

Mr Campbell questions the approach to consideration of biodiversity impacts in the economic assessment. The assessment has been prepared on the basis that an offset strategy that meets government requirements will be implemented for the Project as this is both a commitment by the Joint Venture and will be required by any development consent issued for the Project. It is considered that biodiversity has been appropriately considered in the economic assessment.

2.6.2 Community Comments

The key community concerns in relation to economics, included:

- statements regarding the payment of tax by Glencore and Peabody
- suggestions of misinformation on economic costs of filling the voids.

Responses to these issues are provided below.

Taxation

There was some community commentary suggesting that Glencore and Peabody have not paid any tax during the period of 2013 to 2016. This included a comment that Glencore has been labelled the number 1 tax dodger by Michael West, a financial journalist, while Peabody was number 14. In relation to these comments, Glencore and Peabody provide the following response:

- *Glencore and Peabody comply with all their tax and financial reporting obligations in Australia.*
- *Glencore and Peabody have paid significant taxes and royalties to Australian Federal and State Governments*
- *Glencore and Peabody are very proud of the taxes and royalties they pay to Australian Governments, which form just one part of the very significant socio-economic contribution they make.*
- *It's important to note that Mr West has made a number of inaccurate claims about Glencore's tax payments in Australia and bases the lists referenced on revenues, not taxable income (or profits). Fairfax Media, his former employer, publicly corrected a number of the most serious of these errors on 26 July 2014.*
- *When it comes to the tax and royalty contributions from Glencore and Peabody, it is important to note:*
    - *profitability of mining companies in Australia is generally driven by the price of the commodities being mined, e.g. coal, iron ore, copper, nickel, zinc, etc.*
    - *the price of many of these commodities began to improve considerably during 2017 after a five-year downturn, market by low prices and low profitability*
    - *commodity prices remained strong during 2018, and this is reflected in general mining industry profitability in Australia and hence increased corporate tax liability*
    - *mining royalties are generally calculated and paid as a percentage of revenue per unit (tonne, ounce) of product sold.*
    - *corporate tax is paid on taxable profits, not on revenue.*

Misinformation on economic costs of filling the voids

Mr Alan Leslie provided additional written comments to the IPC dated 10 February 2019. In his comments, Mr Leslie claims that the economic costs of backfilling the voids has been deliberately misrepresented. The proponent strongly refutes this claim and has undertaken detailed work to estimate these costs including having mine plans and costs peer reviewed.

As presented in the IPC Response report, the estimated cost to fill the proposed voids is $777 Million in undiscounted terms, or $129 Million in present value terms. During the Response to Submissions process, United had originally estimated the cost of filling the voids in the order of $450 Million based on a less rigorous cost assessment process. Based on a request by the IPC, United undertook more detailed mine planning work than was previously undertaken on this scenario. United also commissioned a peer review of its mine planning assumptions and cost calculations. This assessment found that the cost to backfill both voids inclusive of all costs associated with material movement, rehandling, rehabilitation, drainage infrastructure, maintenance and production staff and overheads was $777 Million in undiscounted terms. Using a default discount rate of 7%, filling the voids is expected to cost $129 Million in present value terms.

Mr Leslie also states figures in relation the potential economic benefits of the Project, including:

- the 'mine is expected to produce 150,000,000 tonnes of coal over the life of the mine'
- 'at A$100/tonne that amounts to $15,000,000,000' ($15 Billion)
- $129 million is a 'pittance compared to coal revenue – it only amounts to 0.86% of revenue'.

Mr Leslie's figures are overly simplified and do not adequately represent the economic considerations of the Project. Mr Leslie's figures don't take into account a number of very important factors, including:

- the 150 Mt of coal production figure quoted relates to run-of-mine (ROM) coal (i.e. coal as extracted from the ground), not product (saleable) coal, therefore the estimated coal sales associated with the Project are grossly overestimated as product coal is only a proportion of ROM coal
- there is no consideration of operating costs, capital costs, decommissioning costs, rehabilitation expenses, environmental mitigation costs, local contributions, taxes (Australian, state and local) or royalties in Mr Leslie's figures. That is, the figures quoted assume that all sales are profit without any consideration of costs required to build and operate the mine
- the figures relating to sales are quoted in gross dollars whereas the figure quoted for backfilling the mine is quoted as a net present cost (i.e. after discounting). Therefore comparing these two figures is not accurate.

United considers that the detailed economic assessment and costs of void backfilling information provided to DPE and the IPC, and that are on the public record, appropriately represent the economic costs and benefits of the Project.

2.7 Final Landform

Several concerns were raised by the community in relation to final landform, primarily focussed on final voids. The key final landform related concerns raised by the community included:

- the justification of having final voids for the economic feasibility of the Project
- that the rationale for maintaining two larger final voids in the landscape are 'spurious and not based on good science'

- concerns about the long-term negative impacts of final voids on the environment and Ecologically Sustainable Development (ESD) implications
- suggestions that Peabody hasn't been allowed to leave final voids in the landscape since 1978 in the United States of America (US)
- that the final void water balance modelling has not addressed metals building up in the pit lake
- reference to IESC comments raising scientific uncertainty about the environmental impacts of the proposed final voids
- suggestion that there was no geochemical assessment which therefore limits the ability to evaluate potential water quality impacts of final voids.

2.7.1 Summary of Previous Assessments and Outcomes

A significant amount of information on final landform and final voids has been presented on the Project to DPE and the IPC to date. As outlined in this information, there are two final voids approved at Wambo. The Project proposes to maintain the two final voids of a similar size but in a different location (refer to **Figure 2.1**). Based on the existing Wambo approved final landform, two final voids will be left in the landscape regardless of the Project proceeding, however, none of the other benefits of the Project would be realised if the Project does not proceed.

As recommended by the IPC following its review of the Project in March 2018, United has undertaken a detailed further review of the range of final void rehabilitation options and presented this information in the IPC Response report. In summary this assessment concluded the following:

- It was determined by United that the Project could add another open cut mining area (United Open Cut) and be designed to extract 176 Mt of ROM coal without an additional void, maintaining the number of voids at two, as already approved for Wambo, and designing the final landform to be sympathetic with the surrounds.
- Two voids are necessary, one for each mining area (United Open Cut and Wambo Open Cut), to maintain project economic feasibility and to avoid adverse salinity impacts on surrounding waterways.
- The cost of backfilling the voids, at $777 Million on an undiscounted basis, would prevent the Project from being economically feasible.
- Backfilling the voids and not having a void as a groundwater sink would result in adverse salinity impacts on Wollombi Brook as saline groundwater would flow into the Wollombi Brook alluvium.
- While the Project will retain two voids and the voids will change from that currently approved in terms of location and design, these changes will also allow the economic benefits of the Project to be realised.

The development of an economically feasible mine plan for a large scale coal mine is a complex iterative process that considers a wide range of inputs including geological conditions, economics, environmental and social impacts, and planning and legislative controls. United has developed the proposed mine plan for the Project which includes maintaining two final voids in the landform. This plan was developed after a number of years of investigations and consideration of a number of different mine plan options. This included consideration of different final void outcomes, including the option of backfilling the voids.

The key issues considered in assessing the viability and feasibility of various alternatives and developing the final Project design were:

- minimising noise, dust and visual impacts on the surrounding community over the life of the Project
- maximising resource recovery
- financial viability
- mining efficiency
- optimisation of product coal quality from the various seams within the resource
- minimising impacts on biodiversity and water resources
- minimising social impacts
- establishing the future final landform.

As part of the IPC Response report, a detailed groundwater assessment was undertaken on the option of backfilling the voids to assess the potential water quality impacts. Groundwater studies have shown that in the absence of the proposed pit lakes in the voids, saline groundwater would flow to the Wollombi Brook resulting in increases in the salinity of the water in Wollombi Brook. The assessment (AGE 2017) found that the predicted increase in salinity would be in excess of the levels identified as acceptable in the AIP. This outcome is avoided by retaining voids in the final landform as the voids have been designed not to spill and to act as long-term evaporative sinks that capture salt that would otherwise export to the surrounding environment.

During the Project briefing with the IPC on 6 December 2018, the IPC requested the *"…proponent's view on the most desirable environmental outcome in relation to the Wambo void, setting aside economic (and other) considerations…".* Whilst United as the proponent does not agree that the issue of voids in the final landform can be assessed without consideration of economics as changes to the number or size of voids have significant impacts on Project feasibility, the additional information requested has been prepared.

In regard to the groundwater impacts, AGE has completed additional groundwater modelling to assess the groundwater impacts associated with backfilling the Wambo void. **Appendix 6** provides the results of the additional modelling. The assessment found that if the Wambo Open Cut is backfilled the evaporative sink effect does not occur, and the resulting hydraulic gradient causes the groundwater to flow from the backfilled Wambo Open Cut towards the lower lying areas at North Wambo Creek. This contribution of water from spoil to the alluvium is predicted to increase salinity. Further details on the additional groundwater modelling are provided below and in **Appendix 6**. The additional groundwater modelling on potential backfilled final landform options has been peer reviewed by Dr Frans Kalf of Kalf and Associates (KA). The peer review indicates:

> *Based on a risk analysis matrix by AGE (2019) it has been concluded that there would therefore be a high risk of salinity solute migration to North Wambo Creek for the cases where both pits are backfilled or where Wambo pit is backfilled and United pit remains open.*
>
> *Under these circumstances, and the Aquifer Interference Policy (AIP) required conditions of limited salinity increase exterior to the pits, the most acceptable option would be for both voids to remain open. KA is therefore in agreement with this conclusion based on the data, modelling and analysis conducted by AGE.*

An assessment of other potential beneficial and adverse environmental consequences of filling the voids was undertaken as part of the IPC Response report. Backfilling both voids would take an additional six years of mining operations whereas backfilling the Wambo void only would take approximately three years of mining operations. These additional mining operations would result in impacts such as dust, noise, water, lighting and visual impacts would be experienced for this additional period. The same environmental management controls that would be implemented for the Project would be implemented for the backfilling operation, however, it is noted that due to the need to re-excavate emplaced overburden to emplace in the voids much of the equipment would operate quite high in the landform requiring careful ongoing management of noise impacts.

As final rehabilitation of a large portion of the mine site would not be able to be achieved until the voids were filled, there would be a significant delay in rehabilitation of an area of around 500 ha when compared to the rehabilitation plan for the Project as proposed. The delay would be in the order of 15 - 20 years meaning that the time required to achieve full mine closure and relinquishment of the mining lease would be significantly longer.

The proposed final landform with the two voids seeks to strike a balance between mine planning, economic, environmental and social outcomes. It is United's position that the Project as proposed provides a balanced outcome that maintains the voids as long-term evaporative sinks avoiding impacts on surrounding water quality, maintains the number of voids at two as currently approved, provides an appropriate landform and provides an appropriate economic return allowing the significant economic benefits of the Project to be realised.

2.7.2 Community Comments

As outlined above, a number of issues were raised by the community in relation to land landform. Responses are provided below.

Justification of final voids for the feasibility of the Project

Some community comments indicated their view that if requiring voids to be backfilled would render the Project economically unfeasible then the Project should not be approved.

There are key reasons that final voids may be proposed as part of a mining project. These are:

- economic constraints making backfilling the voids not economically feasible
- to act as a long-term evaporative sink, capturing salt and avoiding impacts on surrounding water quality
- on balance, the costs and impacts associated with backfilling the voids outweigh the benefits of filling the voids. The key benefit of filling a void is the recovery of an additional area of land that is available for terrestrial land uses, and which is not a pit lake. As discussed above, filling the voids for this Project would require extensive earthworks which result in additional environmental impacts (e.g. dust, noise, visual for the period of works), significant economic costs and is predicted to result in adverse water impacts associated with the loss of an evaporative sink. These costs and benefits need to be considered and balanced.

At United, the configuration of the coal seams to be mined, the depth of the mine (up to approximately 300 m deep), the significant amount of material placed out of pit (approximately 206 million bank cubic metres) and the significant distance between the emplacements and the voids, are all factors that contribute to making it prohibitively expensive to backfill the pit. It should also be noted that the Project Area is an existing mining area and the constraints and opportunities of the existing landform needed to be considered in the design of the mine. The overburden is proposed to be emplaced over existing open cut mining areas at Wambo and is being used to cap and rehabilitate existing and future tailings emplacement areas and to improve the overall landform outcomes for this area.

The IPC Response report provided further assessment that found that the cost to backfill both voids inclusive of all costs associated with material movement, rehandling, rehabilitation, drainage infrastructure, maintenance and production staff and overheads was $777 Million. This equates to approximately $7.0 Million per ha for the additional land area gained from backfilling the voids, which is approximately 1,400 times the cost of buying a similar piece of land and is well in excess of the reasonable value of this land. Through this additional work United has confirmed that backfilling of the voids would prevent the Project from being economically feasible. The two approved final voids at Wambo would still remain, but the economic benefits of the Project would be lost.

As noted in the IPC Response Report, there are also environmental consequences to filling the voids which is discussed further below. On balance, the assessment of the Project concluded that the Project would result in a net benefit and that when considering the balance between mine planning, economic, environmental and social outcomes, two final voids are proposed to be maintained as part of the final landform.

Long term environmental impacts of final voids and ESD implications

An assessment of the potential beneficial and adverse environmental consequences of filling the voids was provided in the IPC Response report.

As discussed above, backfilling the voids would take an additional six years of mining operations resulting in a range of environmental impacts over this period. The backfilling would also delay rehabilitation and likely delay the time required to achieve rehabilitation outcomes by in the order of 15 - 20 years. Backfilling would also result in significant costs being incurred while only providing a relatively small area of additional useable land. In total an area of approximately 111 ha would be made available for alternative land uses by backfilling the voids. This equates to approximately 3.6% of the Project Area.

Further justification for leaving a final void is to create a pit lake that acts as a long term salinity sink. Where a void is a low point in the landform and is below the water table, water from the poor quality coal seam aquifers and other fractured rock aquifers flows to the void and forms a pit lake. The presence of a pit lake and the evaporation from the pit lake is a means of managing long term surface water and groundwater impacts as it effectively captures salt and keeps it in the void. As discussed above, if the voids were backfilled the saline water would instead flow into the surrounding drainage system (e.g. Wollombi Brook and North Wambo Creek) resulting in salinity impacts.

The groundwater assessment of the backfilling options include a risks analysis which concluded that the backfilling options presented a higher risk to the surrounding water resources than the option to retain residual open voids (refer to **Appendix 6**).

ESD requires the effective integration of social, economic and environmental considerations in decision-making processes. To justify the Project with regard to the principles of ESD, the benefits of the Project in an environmental and socio-economic context should outweigh any negative impacts. The long term environmental consequences of filling the voids, primarily in terms of the potential water impacts, would have an ongoing negative environmental impact that would potentially have implications for current and future generations. In terms of the precautionary principle, threats of serious or irreversible environmental damage should be avoided. Maintaining the final voids as evaporative sinks will manage long term water impacts as it effectively captures salt and keeps it in the void rather than in the downstream environment.

DPE has considered ESD principles in relation to the Project and concluded:

> *The Department is satisfied that the benefits of the Project outweigh its residual costs and considers that the Project is in the public interest, subject to strict conditions of consent.*

Final voids in the US

Commentary was provided on legislation in the US not allowing final voids in the landscape since 1978, inferring that final voids should also not be allowed in NSW. Peabody, the parent company of Wambo, has extensive experience operating coal mines in the US. The rules in the US governing final voids and post-mining land use are set at a State and Federal level and vary between States. Final voids are permitted in some States provided they comply with the requisite criteria on aspects including stability, safety, water quality and surrounding land use.

There is a strong policy framework in relation to rehabilitation and impacts on agricultural land, biodiversity and water. Regardless of whether voids are filled, the existing policy aims to provide for high quality rehabilitation and offsetting of impacts. In relation to the Project:

- the final landform has been designed to provide an improved landform incorporating micro-relief principles while maintaining the number of final voids at two as currently approved
- there will be no impact on any Biophysical Strategic Agricultural Land (BSAL)
- a biodiversity offset package is proposed in relation to biodiversity impacts
- adequate water licences are held for the predicted water take.

Adequacy of final void water balance modelling

A comment was made by a community member in relation to the final void water balance model making no mention of pH levels or concentrations of metals building up in the pit lake. It was further noted that historical water quality monitoring has detected metals but it is still suggested one of these uses of the pit lakes could be aquaculture.

The geochemical assessment (GeoTerra, 2017) for the Project provides substantial evidence that the potential for acid and metalliferous drainage is low. Metals are naturally occurring in the environment and historical water monitoring does show presence of metals in waterways surrounding the Project Area. It is predicted that salinity will increase in the final void over time as will any metals dissolved in runoff and seepage to the final void.

As discussed in **Section 3.7.1**, the final voids have been designed as sinks in order to capture salt and avoiding impacts on surrounding water quality. Groundwater modelling demonstrates that there is no potential for concentrated water from the pit lakes to seep to any groundwater source including the Wollombi Brook alluvium and the Hunter River alluvium. Final void recovery modelling demonstrates that there is no potential for concentrated water from the pit lakes to spill to the surface water environment. Therefore, the potential for impacts on the receiving environment associated with pit lake water quality are considered negligible.

Scientific uncertainty based on IESC comments

The representative from the Nature Conservation Council (NCC) suggested that there is scientific uncertainty about the environmental impacts of the two proposed mine voids based on the IESC report. It is concluded by the NCC representative that the IESC indicate there is a potential for one of the two proposed voids, Wambo Void Lake, to become a source of contamination to surface water and groundwater systems. Additionally it was suggested that a geochemical assessment was not included in the assessment documentation, which limits the ability to evaluate potential water quality impacts.

A detailed response to the IESC was prepared and submitted as part of the *Response to Submissions – Part B* in 2017 (Umwelt 2017b). This included a geochemical assessment. In some instances additional work was undertaken to meet the requests from the IESC, however, it is important to note that the additional work did not change the water resources assessment outcomes presented in the EIS for the Project. The technical clarifications and additional work simply provided additional rigor to the already very detailed water resources assessments undertaken as part of the EIS.

In relation to the Wambo void lake, groundwater flow modelling and analysis was undertaken in order to understand the potential likelihood and risk of the Wambo void lake and tailing storage facilities (TSF) becoming recharge sources. The groundwater assessment identified that due to extensive depressurisation of the Permian coal measures from approved and the proposed mining, groundwater is drawn towards and into the active mine areas. With regard to the proposed United final void, it also acts as a dominant groundwater sink, drawing in groundwater from the Permian coal measures and saturated spoil. The final voids will not become a recharge source to any aquifers.

With regard to scientific uncertainty and risk of impact, the most recent groundwater work completed to assess the potential implications of backfilling the voids concluded the backfilling options presented a higher risk to the surrounding water resources than the option to retain residual open voids (refer to **Appendix 6**).

2.7.3 Conclusion

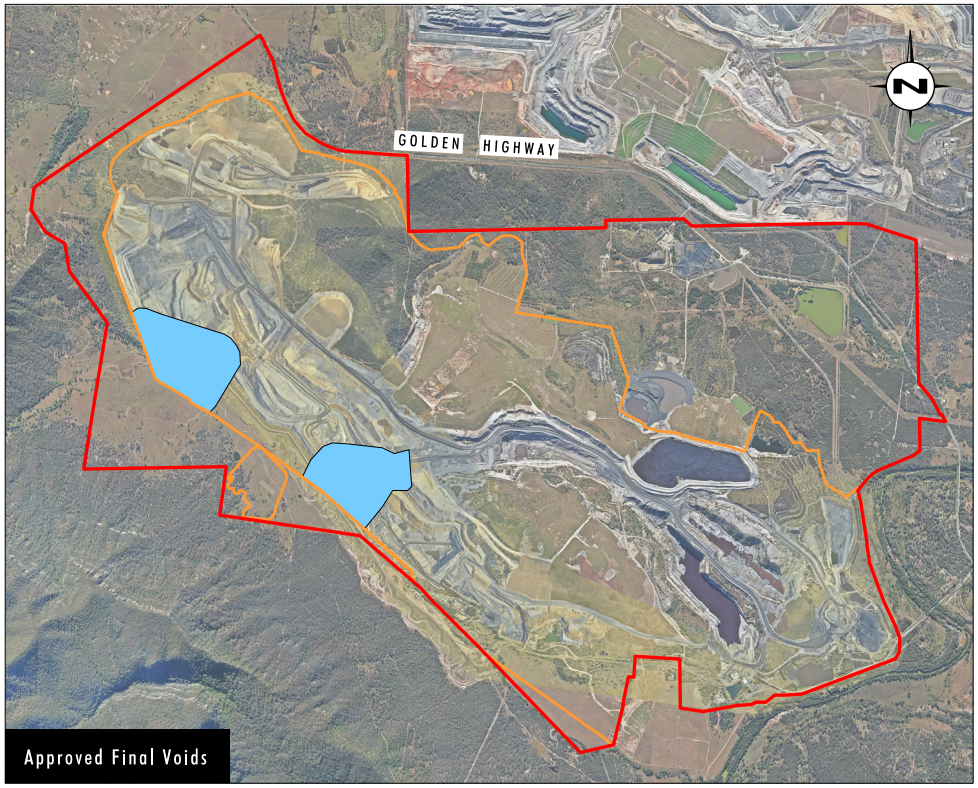
United has developed the proposed mine plan for the Project following many (approximately 6) years of investigations and consideration of a number of different mine plan options including various final void options. Based on the outcomes of the investigations undertaken, United has proposed a final landform that maintains two final voids. As previously discussed, the existing Wambo mine approved final landform includes two final voids. Therefore, while the Project does propose to change the location, size and design of the voids, the number of voids is not changed and there are significant economic benefits that would be realised from the Project.

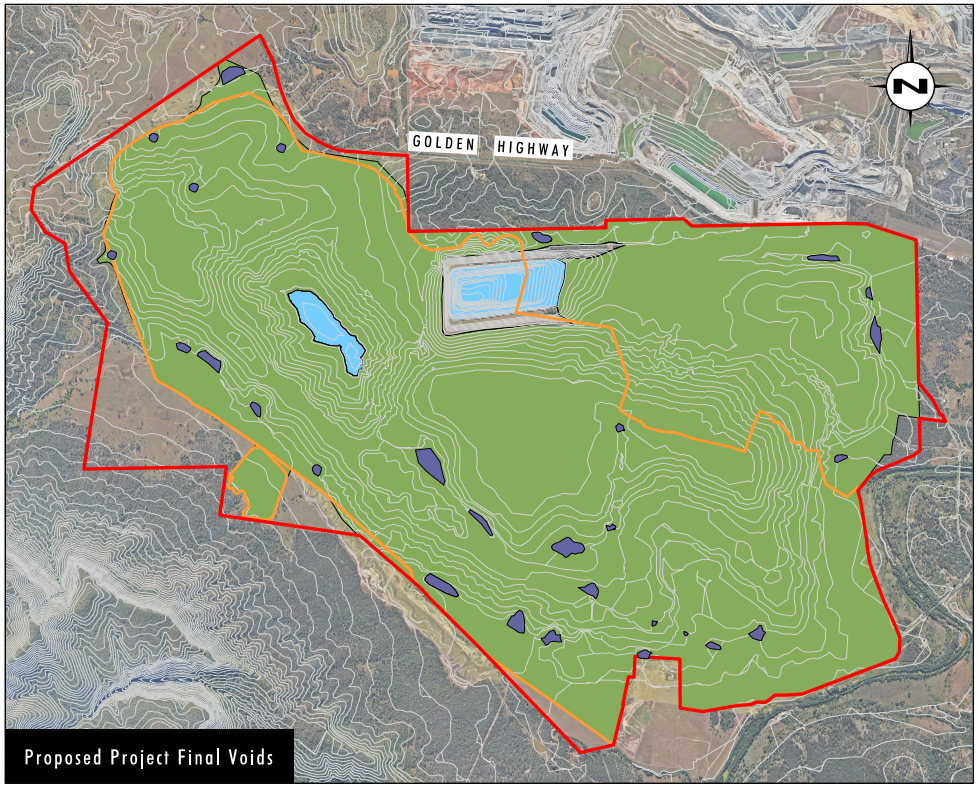
Groundwater studies indicate that when voids remain within the final landform, this creates a sink within the water table that captures salt that would otherwise export to the surrounding environment. The two scenarios representing backfilling of Wambo Open Cut and both Wambo and United Open Cut both resulted in additional flow of groundwater towards the lower lying areas where alluvial groundwater systems and connected streams are present. A risk analysis concluded the backfilling options presented a higher risk to the surrounding water resources than the option to retain the voids (refer to **Appendix 6**).

The process of backfilling the voids would also involve an additional six years of mining which would result in a range of environmental impacts, plus additional years beyond this period to monitor and sustain rehabilitation.

The proposed final landform seeks to strike a balance between mine planning, economic, environmental and social outcomes.

As outlined in previous documentation provided to the IPC, the backfilling of the voids would involve significant costs which would prevent the Project from being economically feasible. In this event, two voids would likely remain in the landscape of the Project Area as currently approved for the Wambo mine.





Aspect of Void	Approved Wambo Final landform (ha)		Project Proposed Final Landform	
	Void 1	Void 2	Wambo	United
Depth of Void* (m)	144	105	85	230
Maximum depth of Pit Lake (m)	94^	85^	20	175
Total catchment (ha)	390[1]	193[1]	223	261
Area of Pit Lake (ha)	28.4	9	24	52

Key Economic Benefits of the Project

- Net benefit to NSW - $414m
- Royalties payable to the NSW Government - $368.6m
- Employment - up to 500 people (250 continued plus 250 additional)
- Gross Regional Product (GRP) - $2.1 billion
- NSW Gross State Product (GSP) - $3.0 billion

0 1 2 3 km
1:70 000

Legend

- Project Area Boundary
- Approved Wambo Surface Development Area
- Rehabilitation
- Final Void
- Dam

Image Source: United (2018)
Data Source: United (2018)

FIGURE 2.1

Changes in Final Voids within Project

3.0 IPC Additional Information

3.1 IPC Additional Information Request

The IPC requested additional information in correspondence dated 22 March in relation to noise, the environmental consequences of filling voids, the greenhouse gas assessment and Glencore's cap on global coal production. The requested information is provided in the sections below.

3.1.1 Noise

The IPC requested:

> *Provide the Project Specific Noise Levels (PSNLs) to the nearest tenth of a decimal for properties in the acoustic zone around the Redmanvale Road area? Provide a breakdown of noise mitigation strategies for properties within the acoustic zone in and around Redmanvale Road?*

Table 3.1 provides the PSNLs for properties in the acoustic zone around the Redmanvale Road area. It is noted that the target PSNLs are based on the INPs minimum background noise level of 30.0 dB(A).

Table 3.1 Target PSNLs, dB(A)

Monitoring Location	Time Period	Intrusiveness Criteria LAeq,15minute	Project Amenity Level, LAeq, period	Proposed [1] Project Amenity Criteria LAeq,period	Target PSNL
N04 - Sentinex 18 Redmonvale	Day	35.0	50.0	45.0	35.0
	Evening	35.0	45.0	40.0	35.0
	Night	35.0	40.0	35.0	35.0
N09 Redmonvale	Day	35.0	50.0	45.0	35.0
	Evening	35.0	45.0	40.0	35.0
	Night	35.0	40.0	35.0	35.0

Note 1: Derived (at the time) in accordance with draft Industrial Noise Guideline (EPA 2015) process of subtracting 5 dB from the acceptable noise levels for the relevant receiver category. This method has been adopted by the Noise Policy for Industry.

For completeness, the 10th percentile operational noise levels to the nearest tenth of a decimal are provided in **Appendix 7**. **Table 3.2** provides a summary of the maximum 10th percentile for the day, evening and night periods for the Redmanvale Road acoustic zone.

Table 3.2 10th Percentile Operational Noise Level, dB(A) for the Redmanvale Road Acoustic Zone

Residence ID	Period	Max Predicted 10th %ile	Residence ID	Period	Max Predicted 10th %ile
R029	Day	38.7	R075	Day	37.9
	Evening	39.8		Evening	39.0
	Night	37.3		Night	37.3
R030	Day	38.5	R163	Day	38.3
	Evening	39.2		Evening	39.1
	Night	38.2		Night	37.9
R033	Day	40.3	R320	Day	40.2
	Evening	39.8		Evening	39.1
	Night	39.4		Night	40.0
R041a	Day	35.0	R343	Day	39.6
	Evening	34.6		Evening	39.7
	Night	37.1		Night	39.5
R041b	Day	35.5	R344	Day	38.4
	Evening	34.6		Evening	38.3
	Night	38.0		Night	36.8
R042	Day	39.1	R345	Day	38.7
	Evening	40.2		Evening	39.8
	Night	38.0		Night	37.3
R046	Day	36.8	R346	Day	37.3
	Evening	37.2		Evening	38.2
	Night	36.8		Night	36.6
R048	Day	39.4	R348	Day	36.6
	Evening	38.8		Evening	38.1
	Night	39.0		Night	35.9
R049	Day	38.8			
	Evening	39.2			
	Night	37.7			

The level of implementation of proposed noise mitigation strategies for properties within the acoustic zone in and around Redmanvale Road will depend on the level of the residual noise impact and the type of construction and orientation of the dwelling. Noise mitigation strategies that could be implemented include:

- installation of air conditioning
- installation of double-glazed windows
- acoustic treatment of ceiling spaces
- perimeter infill of pier foundations
- internal double gyprock of external timber walls facing the development
- augmentation of the topography immediately adjacent to the dwelling to create a noise barrier
- installation of a masking noise source such as a fountain.

3.1.2 Environmental Consequences of Filling Voids

The IPC requested:

> *The Commission notes that you have committed to providing additional information in relation to this matter [filling the voids], in particular, but not limited to, information relating to the most desirable, evidence based environmental outcome in relation to the Wambo void, setting aside economic (and other) considerations. The Commission requests that such information should include supporting materials and/or studies.*

As discussed in **Section. 2.7**, assessment of the potential beneficial and adverse environmental consequences of filling the voids has been undertaken. Backfilling both voids would take an additional 6 years of mining operations whereas backfilling the Wambo void only would take approximately three years of additional mining operations. These additional mining operations would result in impacts such as dust, noise, water, lighting and visual impacts being experienced for this additional period. The same environmental management controls that would be implemented for the Project would be implemented for the backfilling operation, however, it is noted that due to the need to re-excavate emplaced overburden to emplace in the voids much of the equipment would operate quite high in the landform requiring careful ongoing management of noise impacts.

As discussed in **Section 2.7**, in regard to the groundwater impacts, AGE has completed additional groundwater modelling to assess the groundwater impacts associated with backfilling the Wambo void. **Appendix 6** provides the results of the additional modelling. The assessment found that if the Wambo void is backfilled the evaporative sink effect does not occur, and the resulting hydraulic gradient causes the groundwater to flow from the backfilled Wambo Open Cut towards the lower lying areas at North Wambo Creek. This contribution of water from spoil to the alluvium is predicted to increase salinity. Further details on the additional groundwater modelling are provided in **Section 2.7.2** and in **Appendix 6**. The additional groundwater modelling on potential backfilled final landform options has been peer reviewed by Dr Frans Kalf of KA. The peer review indicates:

> *Based on a risk analysis matrix by AGE (2019) it has been concluded that there would therefore be a high risk of salinity solute migration to North Wambo Creek for the cases where both pits are backfilled or where Wambo pit is backfilled and United pit remains open.*
>
> *Under these circumstances, and the Aquifer Interference Policy (AIP) required conditions of limited salinity increase exterior to the pits, the most acceptable option would be for both voids to remain open. KA is therefore in agreement with this conclusion based on the data, modelling and analysis conducted by AGE.*

As outlined in **Section 2.7.1**, the proposed final landform with the two voids seeks to strike a balance between mine planning, economic, environmental and social outcomes. It is United's position that the Project as proposed provides a balanced outcome that maintains the voids as long-term evaporative sinks avoiding impacts on surrounding water quality, maintains the number of voids at two as currently approved, provides an appropriate landform and provides an appropriate economic return allowing the significant economic benefits of the Project to be realised.

3.1.3 Greenhouse Gas Assessment

The IPC requested:

> *The Commission notes that you have committed to providing additional information on the Project Greenhouse Gas Assessment, particularly in relation to Scope 3 emissions. The Commission awaits receipt of that information.*

As indicated in **Section 1.0**, matters relating to greenhouse gas and climate change are addressed in a separate response provided to the IPC.

3.1.4 Draft Conditions of Consent

In relation to noise, the following information has been requested:

- **Draft Conditions of consent:**

  Noise Operating Conditions - B4(e):

  - advise of the anticipated frequency of this condition being triggered, including evidence and source of information?
  - describe what would constitute 'reasonable steps'? and
  - advise how often in the last four years have noise-enhancing meteorological conditions been experienced on site?

The draft conditions of consent proposed for the Project include noise operating conditions. Condition B4(e) states:

B4. The Applicant must:

(e) take all reasonable steps to minimise the noise impacts of the development during noise-enhancing meteorological conditions when the noise criteria in this consent do not apply (see Appendix 4); and
…

Table 3.3 provides the frequency of meteorological conditions where the noise criteria in the consent would and would not apply over the past four years (i.e. 2015 to 2018). The meteorological data set was sourced from the Wambo mine meteorological station (Environment Protection Licence No. 529 monitoring point 17). It is noted that the meteorological station was upgraded in December 2016 and since the upgrade the more sensitive equipment installed has resulted in a reduction in the percentages of periods in which the proposed conditions of consent do not apply.

Meteorological conditions where the noise criteria in the consent would not apply are conditions that can significantly enhance the propagation of noise from the source to a receiver. These conditions can also significantly retard the propagation of noise especially when the wind is blowing towards the source or during strong temperature inversions where the stratification of the vertical air column can trap the noise within a deep open cut mine or behind a topographical feature such as a ridgeline. The analysis in **Table 3.3** includes all wind directions and is not source to receiver specific so it does not mean that the very noise-enhancing conditions would lead to adverse noise impacts occurring at a sensitive receiver. The percentage of time noise control measures may need to be implemented is a function of the source to receiver orientation not the percentage of the time meteorological conditions occur where the noise criteria in the consent would not apply. It is important to note that meteorological conditions where the noise criteria in the consent would not apply and that could enhance noise propagation, have been included in the design of and assessment of noise impacts, from the Project.

Table 3.3 Noise Enhancing Meteorological Conditions 2015 to 2018

Year	2015	2016	2017	2018	Average 2015 to 2018
Within Consent Conditions <= 3 m/s	54%	50%	75%	72%	63%
Outside Consent > 3 to <= 5 m/s	40%	40%	21%	23%	31%
Adverse > 5 m/s	6%	10%	4%	5%	6%

The INP uses a cut off wind speed of 5 m/s for monitoring and 3m/s for licensing. The NIA included the assessment of impacts for wind speeds from 3 to 5 m/s as these conditions can lead to enhanced noise propagation. Above 5 m/s wind noise masks the noise generated by industry and are not included in the assessment of noise impacts (identified as adverse in the table above).

The NIA for the Project included the modelling and analysis of noise impacts that could occur when the noise criteria in the consent would not apply. Therefore, while under the draft conditions of consent these meteorological conditions are periods where the noise criteria do not apply, they are included in the predicted noise impacts of the Project and have been thoroughly considered in the assessment process, including during the determination of voluntary acquisition and mitigation rights for affected receivers.

In completion of the NIA, the objective of United was to identify the period of time noise control measures would need to be in place during very noise-enhancing meteorological conditions so that these could be included in the design of the Project and in the planning of noise controls. It was recognised by United that noise control measures that were in place immediately prior to the meteorological conditions transitioning to conditions where the consent would not apply, would still need to remain in place to continue to minimise noise impacts. This will be the approach to the implementation of noise controls as part of the Project and will reduce the noise impacts during periods of meteorological conditions where the noise criteria in the consent would not apply.

The Noise Management Plan for the Project will address the management of noise impacts during very noise-enhancing meteorological conditions, including periods where the noise criteria do not apply. These conditions will be identified using an approved weather station.

The Noise Management Plan will include a Noise Trigger Action Response Plan (TARP). The Noise TARP would be augmented with a meteorological data and implementation (based on implementation at other Glencore managed operations) would be generally as follows:

1. when the measured noise levels attributable to the mine are more than 2 dB below the limit operations can continue as normal

2. when the measured noise levels attributable to the mine are within 2 dB of the limit and the meteorological conditions are standard or noise-enhancing the Noise TARP would require supervisors to start to implement further noise mitigation measures (see controls below)

3. when the measured noise levels attributable to the mine are at or above the limit and the meteorological conditions are standard or noise-enhancing the Noise TARP would require immediate action to reduce noise (see controls below)

4. when the measured noise levels attributable to the mine are above the license limit and the meteorological conditions are very noise-enhancing (periods where the consent criteria would not apply) the Noise TARP would require supervisors maintain all noise controls in place to minimise impacts.

The Project design included the implementation of noise control measure during very noise-enhancing meteorological conditions, including those conditions in which the noise criteria would not apply. The noise control measures included in the Project design were based on measures being implemented at other Glencore managed mining operations. The hierarchy of the controls vary from mine to mine and vary over the life of the mine to accommodate the mine plan design, mining methods, machine selection and the proximity to sensitive noise receivers.

The hierarchy of reasonable controls, as discussed in Section 8 of the Project NIA, include:

- removing ancillary equipment such as rehabilitation bulldozers from exposed location on the external face of waste emplacement areas
- slowing production rates by slowing trucks down and increasing the queue time at excavators
- modifying the noisier aspects of cyclic operation such as restricting bulldozers to first gear in reverse only
- relocating machines to less exposed locations such as:
    - moving to night dumps located behind higher more exposed dump location
    - moving equipment to locations deeper in the pit, or
    - moving equipment closer to the highwall to increase the topographical shielding
- stagger meal breaks so that the preferential use of machines in less exposed locations can be maximised
- before the primary items of the mining fleet are shutdown, shutting down the less-essential items of ancillary equipment
- shutting down primary items of the mining fleet based on the production priorities.

3.1.5 Glencore cap on global coal production

The IPC requested:

> *Advise as to the impacts, if any, that the recent announcement by Glencore to cap global coal production, may have on the project.*

In response to the IPC's query regarding Glencore's statement on global coal production, there will be no impact on the Project from that statement. Glencore and Peabody are joint parties to the United Wambo Project and as such each share equally in the production. In relation to Glencore's share of production, Glencore notes that this Project is one of several projects that were factored into the establishment of the production cap. Please refer to the attached Frequently Asked Questions document for further information (**Appendix 8**).

3.2 Project Briefing Responses

Representatives of United and Wambo attended a Project briefing with the IPC on 5 February 2019. Responses to the questions asked by the IPC during the Project briefing which were taken on notice by United and Wambo are provided below.

3.2.1 Rehabilitation Offsets

The IPC raised concerns in relation to the sunset clause in draft consent condition B57 in the instance that ecological rehabilitation targets had not been met at that time (i.e. within 10 years of the cessation of mining operations). Draft condition B57 for the Project states:

> *B57. Within 10 years of the cessation of mining operations, or other timeframe agreed by the Planning Secretary, the Applicant must retire the biodiversity credits generated from Ecological Mine Rehabilitation. If the Ecological Mine Rehabilitation areas do not comply with the objectives in Table 6 then the Applicant must retire the relevant deficient biodiversity credits in consultation with OEH and in accordance with the Biodiversity Offsets Scheme of the BC Act, to the satisfaction of the BCT.*

Under NSW government policy, there are a range of safeguard mechanisms in place so that if an area of ecological rehabilitation does not meet the required standard, the credits cannot be generated and an alternative offset must be provided. Specific performance measures and completion criteria would be required to be developed and approved by relevant government agencies, and would be applied to ensure appropriate consideration of condition, composition, structure and function of the ecological mine rehabilitation to establish the CEEC. As per Appendix D of the NSW Biodiversity Offsets Policy for Major Projects (under which the FBA operates), if it becomes clear that the ecological rehabilitation standard for which biodiversity credits have been generated is not able to be achieved, the proponent must instead source and retire these credits from an alternate offsets in order to meet its offset requirement. A rehabilitation security bond also provides further contingency for this.

As noted by the IPC, while the use of the Biodiversity Conservation Fund is an option under NSW government policy, this is not currently allowed for Commonwealth requirements under the EPBC Act. If the Biodiversity Conservation Fund does not become available in the future, the Joint Venture would need to meet its offsetting requirements by other means, most likely from additional land based offsets.

To this end, the IPC has requested confirmation of the known *Central Hunter Valley Eucalypt Forest and Woodland CEEC* remaining in the Hunter Valley that may be available. As outlined in **Appendix 3**, an analysis was completed of the *Vegetation of the Central Hunter Valley* by Peake (2006) and the recently released State Vegetation Type Map: Upper Hunter v1.0 VIS _ID 4894 (OEH 2019) with the likely equivalent map units and PCTs according to the approved conservation advice for the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC. According to the Approved Conservation Advice the current extent of the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC is estimated to be 36,590 ha based on Peake (2006) mapping. Based on further analysis completed by Umwelt, the current extent of the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC is estimated to be 45,918 ha. It is noted that these estimates are considered to be conservative as they do not include derived native grassland or shrubland, or additional map units which conform in part to the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC.

As outlined in **Appendix 3**, Glencore has contingency land under its management that could be used to generate credits for the CEEC if required to replace the proposed mine rehabilitation. Based on regional vegetation mapping and equivalency to the CEEC, across Glencore and Wambo held land outside of existing approved or proposed disturbance areas and conservation areas there are sufficient areas of the CEEC to generate more than the currently proposed 2,437 credits to be generated for the CEEC on mine rehabilitation. Therefore, in the unlikely event that the CEEC rehabilitation does not meet the required standard within 10 years of the cessation of mining operations as required by draft Condition B57, land held by Glencore and Wambo could be used to retire the relevant deficient credits.

3.2.2 Final Landform Groundwater Modelling

The IPC requested that information presented in relation to the additional groundwater modelling undertaken on filling the Wambo void be made available. This information is presented in **Appendix 6** and has been discussed in **Sections 2.7** and **3.1.2**.

4.0 References

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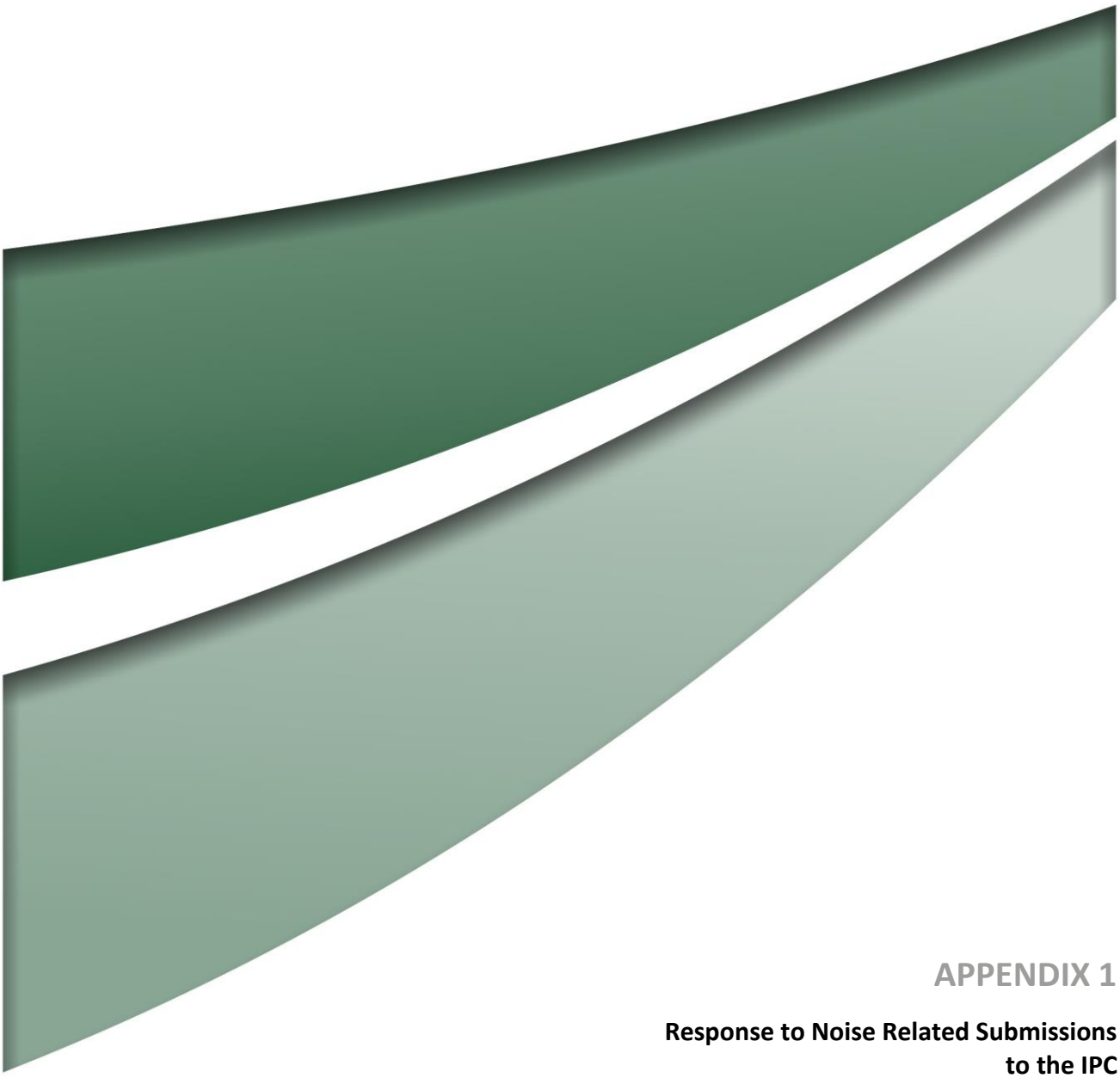

APPENDIX 1

Response to Noise Related Submissions to the IPC

umwelt
Environmental & Social Consultants

Inspired People
Dedicated Team
Quality Outcomes

Our Ref: 3509/JM/KD/TPr/02042019

2 April 2019

Aislinn Farnon
Approvals Manager

E: aislinn.farnon@glencore.com.au

Dear Aislinn

Re: United Wambo Open Cut Coal Mine Project – Response to Noise Related Submissions to IPC

This letter provides a response to noise issues raised in submissions to the NSW Independent Planning Commission (IPC) in February 2019. This includes a submission by Stephen Gauld of Day Design Pty Ltd who was engaged by the Environmental Defenders Office NSW (EDO NSW) on behalf of the Hunter Environment Lobby Inc. Mr Gauld was engaged to review and provided a submission on the United Wambo Open Cut Coal Mine Project (the Project) Noise Impact Assessment (NIA).

There were also some noise related issues raised in community oral and written comments. This letter provides a response to the issues raised.

Stephen Gauld Submission

The Gauld review indicates that the methodology and assessment process presented in the NIA for the Project follows the requirements of the Industrial Noise Policy (INP) and the underlying requirements of the Noise Policy for Industry (NPfI). We note that the INP is the relevant policy applying to the assessment of the Project, however, in response to previous questions raised by the IPC an analysis of the Project against the new NPfI has also been undertaken and provided to the IPC.

The Gauld review only raises one purported issue with the NIA which is that the NIA does not provide evidence of any mitigation measures that would meet the Project Specific Noise Levels (PSNLs), but were considered unreasonable or not feasible. Instead, the review notes that the mitigation measures that are considered by the proponent to be reasonable and feasible are proposed and discussed. The review by Stephen Gauld states that '*it is a failing of the NIA that it doesn't discuss and consider all the mitigation measures required to meet the PSNLs and avoids any scrutiny of whether the measures not finally proposed are actually reasonable and feasible*'.

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It is noted that the NIA for the Project has been completed in accordance with the relevant guidelines, primarily the INP as the relevant guideline at the time the assessment was undertaken. The NIA was also peer reviewed prior to completion by a separate noise expert to assess its adequacy and confirm that it followed relevant guidelines and practice. The NIA has also been reviewed and scrutinised by DPE's noise specialists and the EPA noise experts. It is considered that the NIA adequately assesses the potential noise impacts associated with the Project in accordance with relevant NSW Government Policy, including in how it discusses and assesses reasonable and feasible noise mitigation.

The three main strategies used for the Project to identify reasonable and feasible noise control and mitigation strategies were:

- Controlling noise at the source – There are three key approaches to controlling noise generated by the source: source elimination; Best Management Practice and Best Available Technology Economically Achievable.

- Controlling the transmission of noise – There are two key approaches: the use of barriers and land-use controls which attenuate noise by increasing the distance between source and receiver.

- Controlling noise at the receiver – There are two key approaches: negotiating an agreement with the landholder and acoustic treatment of dwellings to control noise.

The consideration of reasonable and feasible Project alternatives related to noise during the Project design, noise modelling and assessment process included investigation of:

- open cut pit orientation and the location of out-of-pit emplacement area

- mobile fleet selection (i.e. mine trucks) and the management of the noise impact associated with noise attenuation alternatives available for the equipment

- noise attenuation options for key items of plant and equipment (i.e. bulldozers, excavators, front-end loaders, graders, drill rigs and water carts)

- operational scenarios that considered alternative machine utilisation levels and alternative work locations

- operational alternatives for the Project under adverse meteorological conditions, including restricting activities in exposed locations

- the location and orientation of haul roads, and the provision of bund walls in strategic locations to maximise topographical shielding and hence limit noise propagation paths

- the orientation of benches to enable the mining equipment to maximise topographical shielding

- the design of out-of-pit emplacement areas to provide equipment on the exposed emplacement areas alternate shielded operational locations.

It is noted that the noise control measures listed above were determined to be feasible and reasonable and therefore have been adopted for the Project.

The noise control measures that were determined to be reasonable and feasible in relation to providing effective control of potential impacts have been incorporated into the Project design and specifically assessed as part of the NIA. These were determined as part of an iterative mine planning and noise assessment program where different options were identified and considered in the modelling and determined as effective or not. Some of the options considered (e.g. pit orientation, emplacement designs, haul road locations) also have major effects on mining operations and therefore the feasibility of such options needed to be considered as part of mining studies. For a complex project of this scale, the consideration of reasonable and feasible noise control options is a complex and iterative process that must be undertaken by the proponent as part of the planning process.

The NIA was completed in accordance with the INP. It is noted that the INP does not call for a proponent to provide a detailed explanation of control measures that where considered but not found to be reasonable or feasible. The INP states that:

> *"the project-specific noise levels supply the initial target levels and drive the process of assessing all feasible and reasonable control measures. Achievable noise limits result from applying all feasible and reasonable noise control measures".*

The NPfI states in Section 3.1 that "It is not mandatory to achieve the trigger levels but the assessment should provide justification if they cannot be met". The INP does not have the same wording but states in Section 7.5 that "Where a proposed mitigation strategy will not achieve the desired noise reduction and leaves a remaining noise impact, the problem needs to be solved by negotiation".

The NIA followed the methodology outlined in the INP which states in Section 1.4.1 that:

> *"The industrial noise source criteria* [that is, the PSNL] *set down in Section 2 are best regarded as planning tools. They are not mandatory, and an application for a noise producing development is not determined purely on the basis of compliance or otherwise with the noise criteria. Numerous other factors need to be taken into account in the determination. These factors include economic consequences, other environmental effects and the social worth of the development. The criteria help to determine consent/licence conditions because they provide information on the likely effect of any environmental noise associated with the development."*

The NIA also addressed Section 1.4.5 of the INP which states:

> *"Where noise impacts are predicted, noise-source managers should seek to achieve the criteria by applying feasible and reasonable mitigation measures. In this context feasibility relates to engineering considerations and what can practically be built, and reasonableness relates to the application of judgement in arriving at a decision…"*

As discussed above, United as the 'noise-source manager' has undertaken a detailed iterative Project design and noise assessment process that identified the reasonable and feasible measures that are to be implemented as part of the Project. Where impacts are predicted, United has also consulted with the affected residents and sought to reach agreement regarding either acquisition or mitigation measures depending on the level of impact and the request of the landowner. This approach is consistent with the INP.

It is noted that the outcomes of the iterative design and noise assessment process and the proposed implementation of feasible and reasonable mitigation measures reduced the noise impacts of the Project below those that would have occurred without the implementation of the proposed measures. Without the proposed measures, there would have been additional residences within both the noise acquisition and active management zones.

It is considered that the NIA has followed the requirements of the INP and appropriately discussed the consideration of reasonable and feasible mitigation measures to control the predicted noise impacts.

Public Meeting

Low Frequency Noise

The Hunter Community Network (HCN) indicated its view that DPE has cherry picked parts of different noise policies in its assessment process, highlighting low frequency noise. HCN stated that it considers that the assessment of low frequency noise should be conducted under the INP to maintain consistency.

As noted above, the NIA for the Project was prepared in accordance with the INP. In relation to low frequency noise, the NIA was conducted in accordance with Section 4 of the INP (EPA 2000). At the time the NIA was prepared, there were a range of different methods that could be used to assess low frequency noise, with the default method being that outlined in the INP. For completeness, the NIA provided the results for three methods being:

- INP
- at that time of preparation, Draft NPfI
- Broner – a method previously used in the assessment of low frequency noise impacts for mining projects in NSW.

By providing the results for each of these methods, the NIA was considered comprehensive and provided the determining authority with comprehensive information with which to understand and assess low frequency noise. This information is presented in Appendix G of the NIA.

Road and Rail Noise

HCN asserted in its comments that road and rail noise is not monitored, so the additional impacts on the community are unknown and unmanaged.

The Project does not propose any change to the approved maximum annual tonnages on the Wambo rail spur therefore there is no change to the total number of train movements on the spur and no change to the total train generated noise over the year. The Project utilises the Wambo rail spur, for which Wambo has consent conditions under DA 177-8-2204 requiring monitoring to be undertaken in accordance with the Wambo Mining Complex Noise Management Plan.

It is noted that the Australian Rail Track Corporation (ARTC) is responsible for the Main Northern Rail Line and have an Environment Protection Licence (3142) which has noise goals and certain monitoring requirements that are outside of the responsibility of the Project.

With regard to road traffic noise, the results presented in the NIA indicate the traffic volumes currently experienced and volumes predicted as a result of the Project would result in road traffic noise levels less than the criteria specified for arterial / sub-arterial roads in the *NSW Road Noise Policy*. Therefore, specific road noise monitoring is not considered to be required for the Project.

With the assessments completed for the Project, road and rail noise impacts have been assessed and are known. There is also an appropriate management framework in place.

Noise Compliance Protocol

HCN raised concerns that a noise protocol is being developed by Global Acoustics, a company that works for the mining industry. HCN stated that assessment and management of noise must be conducted by independent experts and finalised prior to any determination.

The NIA was completed by Umwelt and a noise compliance protocol has been developed by Global Acoustics. While engaged by the proponent, both consultants are independent with considerable experience in acoustics, particularly within the mining industry. Global Acoustics, as a business that understands mining related noise impacts and the monitoring and management of theses impacts, is considered to be well placed to prepare a protocol for the monitoring of mining noise, particularly when they currently undertake all compliance noise monitoring at Wambo. Both the NIA and noise management protocol have been prepared in accordance with relevant guidelines and been subject to rigorous review.

The noise compliance protocol, the subject of HCN's comments, was prepared in response to the Environment Protection Authority's (EPA) request for further information. The noise compliance protocol was developed to outline the proposed method for determining compliance with separate premise-specific criteria. The final protocol will be part of the Noise Management Plan for the Project and will be subject to review and approval by NSW government agencies, ensuring that it is appropriate to assess noise compliance.

Background Noise Levels

HCN notes that it objects to DPE's position that *'an additional 2 dBA exceedance for this additional project is 'negligible' when taken in the context of the existing mine noise disturbance'*.

The term 'negligible' as referred to by the HCN is used in both the *Voluntary Land Acquisition and Mitigation Policy* (VLAMP) (DPE, 2018) and in the NPfI.

The term has been used in the assessment process for the Project in a manner that is consistent with government policy. It is noted that a difference of 1-2dB is not generally considered to be discernible by the average listener and this is understood to be the basis of considering a 2dB exceedance to be negligible.

Background Noise Levels

HCN states that a key flaw in the noise assessment process is that existing mine noise pollution is counted as background noise with the PSNL being added in addition.

The background noise levels were determined in accordance with the INP.

In accordance with Section 3 of the INP, the assessment of the background noise environment, where practical, excluded the noise impact from the Wambo Open Cut mining operations from the analysis. United is not currently contributing to the noise environment as it is in care and maintenance.

Depending on the surrounding mining operations and the meteorological conditions at the time of monitoring, the background noise levels include noise contributions from road and rail noise sources as well as Hunter Valley Operations and Mt Thorley/Warkworth mining operations.

Compliance Monitoring

Ms Oloffson stated in the public meeting that a point of concern was *'the failure to state that noise monitoring by the proponent is management monitoring only, the fact that compliance monitoring depending on the conditions of consent could be one day per month, one day per quarter of the year – a consultant hired by the proponent which is classified as independent*'.

There are two main types of noise monitoring relevant to mining operations being continuous noise monitoring and attended noise monitoring.

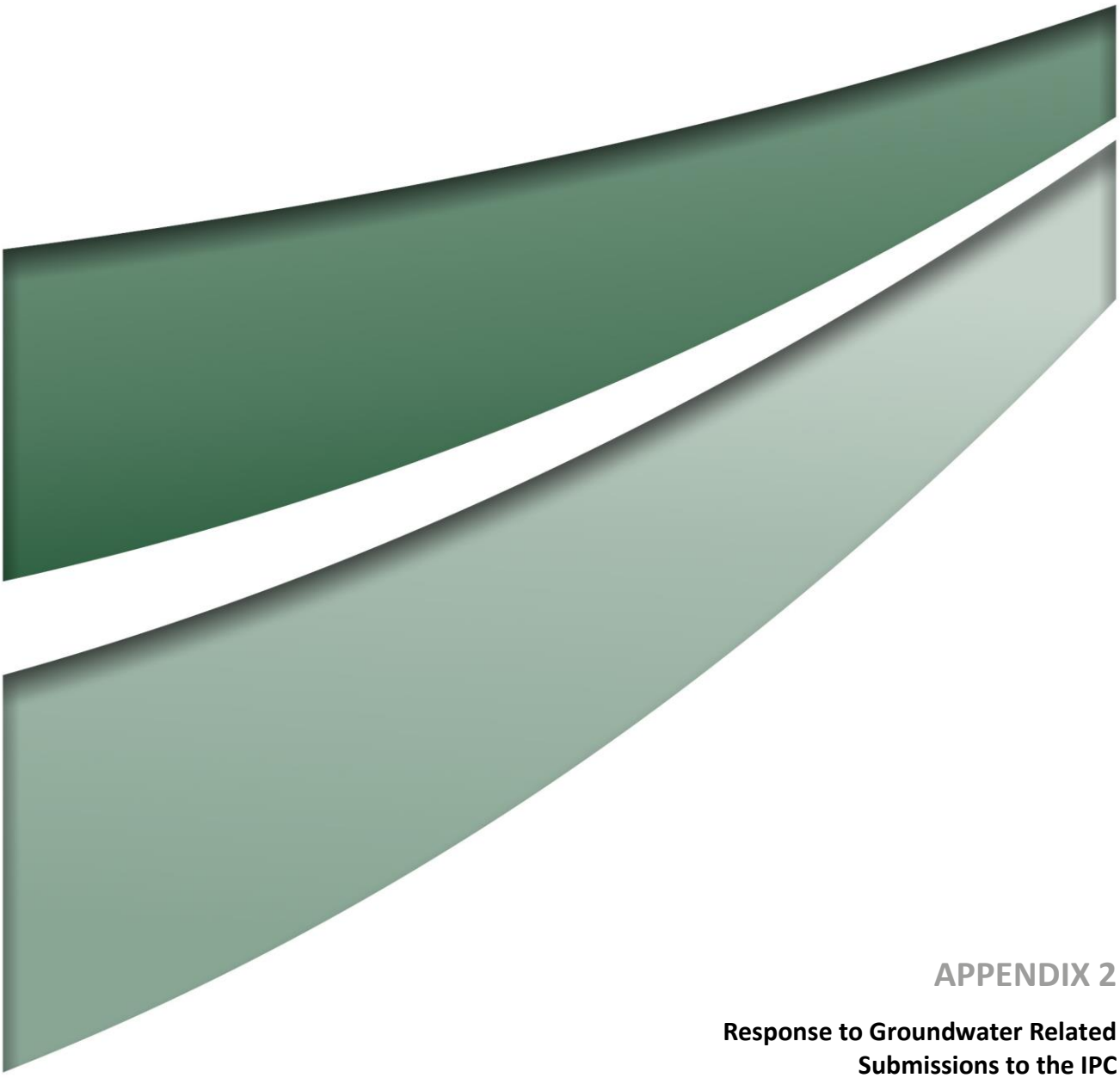
Central to the management of noise impacts is the implementation of an appropriate continuous noise monitoring system that will enable the proactive and real time management of operations during adverse noise propagating conditions. United has committed to implement such a system and proposes to utilise four directional real-time noise monitors to enable the assessment of ongoing compliance with relevant noise impact assessment criteria.

In addition to the real-time monitoring, attended noise monitoring will be undertaken at appropriate locations outlined in the NIA. The proposed monitoring frequency reflects the risk posed to the community, however, this would ultimately be governed by the requirements of the development consent and EPL. For the Project, monthly monitoring has been proposed. Monitoring is proposed to cover the day, evening and night periods, as required to satisfy the anticipated development consent and EPL requirements.

While attended monitoring is less regular, as Ms Oloffson states, the continuous monitoring is designed to provide ongoing real-time noise monitoring to allow effective management of operations to remain in compliance with noise limits.

Yours sincerely

Tim Procter
Principal Engineer



APPENDIX 2

Response to Groundwater Related Submissions to the IPC

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Project G1733G
Date: 3rd April 2019

United Collieries Pty Ltd
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Attention: Aislinn Farnon
via email: Aislinn.Farnon@glencore.com.au

Dear Aislinn,

RE: United Wambo Open Cut Coal Mine – Response to comments from Stakeholders

1 Introduction

United Collieries Pty Limited (United) and Wambo Coal Pty Limited (Wambo) operate neighbouring mining operations located approximately 16 kilometres west of Singleton in the Hunter Valley region of New South Wales (NSW). Under a Joint Venture arrangement, United and Wambo propose to develop the United Wambo Open Cut Coal Mine Project (the Project) which will involve combining the existing open cut operations at Wambo with a proposed new open cut coal mine at United. As part of the impact assessment process United engaged Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) to prepare a groundwater impact assessment (GIA) for the Project, and to subsequently respond to submissions from stakeholders.

United requested AGE review and provide a response to comments related to the technical issues related to groundwater contained within transcripts of meetings with the Independent Planning Commission.

2 Response to comments

2.1 Dr Matthew Currell – Hunter Environment Lobby

Three submissions have been received to date from Dr Matthew Currell of RMIT University, commenting on the GIA and subsequent reports. United requested AGE review and comment on the third submission from Dr Currell[1]. The sections below provide responses to the key themes raised in Dr Currell's review. The previous submissions made by Dr Currell have previously been responded to as part of the assessment process for the Project.

2.1.1 Groundwater monitoring network

The report from Dr Currell provides several comments on the monitoring network and concludes it is insufficient to detect Project impacts. When considering this comment, it is important to note there is no official guidance in Australia on what constitutes an appropriate groundwater monitoring network, and therefore the design of monitoring networks is based on the opinion of the projects stakeholders. Monitoring networks are typically designed to contain bores within key aquifers, adjacent to and surrounding the proposed activity. The key potential receptors of impact identified during the GIA were the:

- Hunter River and associated alluvial aquifer;
- Wollombi Brook and associated alluvial aquifer; and
- North Wambo Creek and associated alluvial aquifer.

These receptors will not be directly disturbed by mining, and therefore the impact occurs indirectly due to depressurisation of the coal measures and interception of groundwater flow. The GIA provides an assessment of the potential magnitude of the zone of depressurisation, which assists in locating monitoring sites. A logical monitoring network for the Project would comprise monitoring sites within the proposed activity area where depressurisation is predicted, and also at the surrounding receptors. These monitoring points would serve to, firstly detect any future changes as a result of the mining, secondly to enable improved calibration of numerical models and finally to measure compliance against government thresholds for water level and quality impact at the sensitive receptors.

The proponent is already significantly advanced towards achieving a monitoring network that will allow the above to occur as an existing approved monitoring network exists at both the Wambo and United mines for already approved activities. The GIA (AGE, 2016) provided information on the monitoring networks installed at Wambo Coal and United Collieries for groundwater monitoring. The network comprises a mixture of uPVC cased monitoring bores and vibrating wire piezometers. The network was first established in 2000 and has been augmented over time as sites have been added and removed. These bores are used to monitor the effects of mining at Wambo and United and have been approved under previous management plans used for compliance assessment. The results of the groundwater monitoring are reported in Annual Reviews.

The network proposed for monitoring the impact of the Project as outlined in the EIS and RTS comprises monitoring sites within all of the alluvial aquifers identified as potentially sensitive receptors surrounding the proposed activity, as well as monitoring points in the coal measures where depressurisation is predicted to enable the magnitude and progression of drawdown over time to be measured.

[1] Currell (2018). *"Further review of United Wambo Open Cut Coal Mine Project – groundwater impacts"* – dated 12 December 2018, prepared for EDO NSW on behalf of the Hunter Environment Lobby.

When considering monitoring networks at mines it is important to note the number of monitoring bores within a monitoring network at all open cut mines is continually in flux, as bores are constantly being removed as mining progresses and new bores added to address new issues and projects. This is the case for the United and Wambo mines, and the fact that not all bores that have existed are proposed to be monitored simply indicates the dynamic nature of monitoring networks. Ultimately it is not the number of bores that is important, but the ability of the network to detect impacts and assist in determining their significance. Given that the existing and proposed monitoring bore network contains sites within all sensitive receptors as well as in closer proximity to the proposed activity means it is designed to detect the impacts predicted to be generated by the Project.

Further bores are proposed to assist in ongoing monitoring and management, but these are not necessary to assess the impacts of the Project. As noted, it is not the number of bores that is important, but the ability of the network to detect impacts and assist in determining their significance. This is the key objective of the Water Management Plans (WMP) that will be developed in consultation with government stakeholders should the Project be approved.

Dr Currell also reviewed a map of groundwater monitoring bore and vibrating wire piezometer locations and concluded that the two additional monitoring bores and two additional vibrating wire piezometers proposed to be installed on to the north of the Approved and Proposed Wambo Open Cut *"are only a marginal improvement on the network as assessed in my previous expert report, and partly address the concern that spatial coverage of monitoring bores to the north and west of the project was inadequate. However, there are still relatively few monitoring points to the west of the Wambo Open Cut, meaning it will be difficult to detect and characterise potential changes in groundwater levels in this area resulting due to expanded mining operations." " … the depth(s) and aquifers to be monitored by the new bores and piezometers should also be provided."*

The proposed new monitoring bores to the north are situated because they are located between the mining areas and the key environmental receptor, the Hunter River and its associated alluvial aquifer. This is an obvious location for monitoring as it will allow the environmental impact of mining from the Project to be monitored and assessed. The purpose of monitoring points at the key receptors is not for local scale research, but to determine if the Project complies with the acceptable thresholds of impact on water levels and quality outlined in the NSW Aquifer Interference Policy (AIP). The purpose of additional monitoring bores suggested to the west of the Wambo mining area is not outlined by Dr Currell, however monitoring has not been prioritised in this area as there is a lack of environmental receptors, and it is an elevated area where the water table is relatively deep.

It is considered the existing monitoring data has provided adequate information to assess the impact of the Project on the surrounding receptors. A monitoring network for the Project has been provided that will enable the impacts in the mining area to be measured and compliance at surrounding receptors to be determined. The network however remains preliminary and will be finalised in consultation for the NSW government during development of the Projects WMP should the Project be approved.

During operations the WMP remains a 'live document' allowing sites to be added and removed from the network as required. The WMP will include regular updates to the groundwater model which will assist in determining the need to adapt the monitoring network with additional bores as detailed impacts are revealed over the life of the Project.

2.1.2 Review of groundwater level trends

Dr Currell notes that there remains a "*…lack of hydrographs & linking of these to water level contour maps, use of these combined data to better understand spatial and temporal influences on groundwater flow patterns (including existing mining operations)."* Dr Currell then comments that further information is required *"…with respect to the spatial and temporal trends in groundwater levels, and their relationship to factors such as climate, geology/topography and existing mining. Without this information, observed*

trends in groundwater levels are likely to be open to ambiguous interpretation, and resolution of the cause of changes to groundwater levels (due to mining or other influences) difficult to achieve."

The GIA for the Project contained water level contour maps and hydrographs for each bore, sufficient to characterise the existing environment and to understand the impacts of climate and mining at the scale of the assessment. Both Wambo and United mines continue to gather groundwater level information and present hydrographs in Annual Reviews for each site. The baseline data review is therefore ongoing. Further review is not required for the EIS as regular review of spatial and temporal trends in groundwater levels will be undertaken over the life of the Project according to the process outlined within the WMP. Whenever groundwater levels are reviewed in all mining areas it is a necessity to consider the influences of factors such as climate, geology/topography and existing mining to ensure an appropriate interpretation is reached. The review being requested by Dr Currell is a standard and continuous process conducted over the life of the Project and will focus on determining the significance of different influences on groundwater levels, so the impact of mining can be understood and reported upon. The WMP for the Project will specify thresholds for groundwater levels and quality, which if exceeded will trigger the TARP (Trigger Action Response Plans) process. The TARPs included within the WMP will outline the process to respond to the triggering of a water level or quality threshold. This typically includes site review of the monitoring data against climatic conditions and mining activities to determine the cause of the trigger event. Where it is determined the trigger event may be a result of mining activities, action and responses are outlined in the TARP. If the reason for the trigger event is unclear it is referred to a consultant hydrogeologist to investigate.

2.1.3 Groundwater-Surface Water Interaction

Dr Currell comments that a *"dedicated study of ground-surface water interaction, including further field data to inform conceptual modelling and alternative modelling approaches (given the general poor suitability of the type of modelling adopted to capture spatial and temporal dynamics of ground-surface water interaction)"* is required. The review then concludes that *"this is a major potential oversight which was not captured in the IPC's assessment and recommendations",* and *"... there has been no significant change in the methodologies or assumptions used or the results determined using this updated modelling."*

The GIA for the EIS was conducted in accordance with published guidance on groundwater modelling and designed for the purpose of determining compliance of the Project against government policy. The peer review and review by state and federal regulators have not identified the need for alternative modelling approaches.

It is acknowledged that understanding properties of the alluvial systems and groundwater surface water interactions is important to assess the nature of potential impacts generated by the Project. However, it is important to note that no direct mining of alluvial systems is proposed, and there is a significant setback between the mining and these sensitive environmental receptors. This means that the alluvial systems can only be impacted indirectly by groundwater pressure and flux changes occurring through the low permeability bedrock. It is therefore the low permeability coal measures that retard impacts between the mining areas and alluvial aquifers and streams. This means that collection of data from the coal measures is more important than localised information within the alluvium, as the coal measures material forms the pathway between the mining area and the receptors. Post mining the ability of the overburden emplaced within the completed mining areas begins to influence connectivity with the alluvial receptors.

The concern about the GIA study approach seems founded on the assumption that groundwater flow from the low permeability Permian bedrock from the Project Area forms a significant component of the water within the alluvial aquifers/surface water systems, and there is good hydraulic connection between the mining area and the receptors. It is important to remember that the alluvial aquifers are replenished from multiple sources including rainfall that directly infiltrates the soil profile within the floodplain, or flows downslope to the floodplain, lateral flows from the significant upstream catchments,

stream leakage and upward recharge from the underlying bedrock. Monitoring within the Hunter Valley has consistently shown that even when mining occurs in proximity to alluvial aquifers with significant upstream catchments, and results in changes in groundwater pressure adjacent to or under alluvial aquifers/water courses, the limited exchange from the Permian strata and the other sources of recharge means the alluvial aquifers and streams are not detrimentally impacted. This is also the case for the Project with numerical modelling indicating although coal measures could become depressurised under the Wollombi Brook and the Hunter River, this will not lead to reductions in alluvial groundwater levels and flows to connected surface waters that would impact on environmental receptors and cannot be managed through water licensing.

The submission concludes that *"without further detailed field data and additional modelling at different scale(s) (as described in my previous report) there is the prospect that substantially different impacts may in fact arise compared to those predicted in the modelling conducted to date."*.

The need for varying resolution in the numerical model was identified early during preparation of the GIA. Existing numerical models were available covering the Project area, however the decision was made to move the model into MODFLOW USG to allow the use of an unstructured grid to represent the receptors surrounding the Project area and the proposed mining at a fine scale, whilst allowing areas of lesser concern beyond the area of influence to be at a coarser scale. The minimum cells size was 30 m along the water sources which is refined given the total size of the model and the availability of data. The model grid was shown in the GIA (Figure 6-1) and no concerns about the grid were raised in the independent peer reviews by the peer reviewers and the Department of Industry – Water.

It is unclear why and how the submission concludes even finer scale modelling could result in different impacts. This model is already refined at the sensitive receptors and is appropriately detailed to reflect the data and potential impacts associated with the Project. There is no obvious reason why further refinement would change the model predictions as there will be no changes in the conceptualisation and model input data. As noted above, there is no direct mining of alluvial systems proposed and there is a significant setback between the mining and these environmental receptors. The numerical model was designed to represent flow to alluvial aquifers and surface water bodies and the magnitude of the changes in these flows due to the Project to ensure the impacts could be compared with thresholds provided within the AIP.

The GIA also acknowledged the limitations of the modelling and to address this included an uncertainty analysis to determine the potential range in the magnitude of impacts from the Project. The uncertainty analysis included determining the potential ranges in groundwater flow intercepted from flowing to the alluvial aquifers. These impacts were determined to be manageable under the NSW regulatory regime and had negligible effect on the predicted impacts on the key environmental receptors, the alluvial aquifers.

2.1.4 Groundwater quality

The report from Dr Currell provides commentary on groundwater quality and concludes the assessment was inadequate due to the spatial nature of the monitoring network, the monitoring frequency and the amount/nature of data analysis.

We have responded regarding the spatial nature of the monitoring bore network above. When considering the frequency of water quality monitoring it is important to consider the rate of groundwater flow. In relatively low permeability coal measures any groundwater moves very slowly and any changes in groundwater quality therefore manifest relatively slowly as well. For example groundwater in a coal seam with a moderate hydraulic conductivity (0.1 m/day) and subject to a hydraulic gradient of 1:100 would move a distance of less than one metre per year. Whilst monitoring of surface water systems can be more frequent, the monitoring frequency adopted for groundwater reflects this very slow rate of water movement. Regarding the level of analysis provided to the water

quality data, the scope of the GIA was designed to satisfy requirements of NSW and Commonwealth Government legislation, guidelines and policy. The amount of detailed analysis suggested by Dr Currell reflects an academic approach and is beyond what is required to assess the direct and indirect groundwater impacts of the Project in line with relevant government policy and industry standards. Groundwater assessments for major projects aim to provide insight into groundwater systems and assess impacts on these systems at a regional scale. They are not required to contain detailed investigation of small-scale localised processes at every bore as this is not required to assess and understand the potential impacts that a mining project may have. Despite this the work conducted for the Project during the GIA and response to submissions is considered to have identified the relevant water quality issues associated with the Project. Further review of water chemistry data will be outlined in WMPs and is provided in Annual Reviews, but additional assessment at this stage is not considered warranted. An exception could occur where there is potential to impact upon private bores and more detailed assessment is required around localised areas. However, this is not the case for the Project, there are no private water supply bores in its proximity.

2.1.5 Timing of Water Management Plan

The review from Dr Currell comments that *"the fact that the revised groundwater monitoring program is not available means that there is no way for the public to scrutinise the planned groundwater monitoring program. It is a reasonable expectation that communities with an interest in the environmental values of the region be given information about the specific details of groundwater and surface water monitoring programs, as well as baseline datasets, prior to a determination being made regarding project approval."*

The GIA has followed relevant assessment guidelines to provide the information to characterise the impacts of the Project and provide the consent authority with information on which to assess the Project. The EIS and the RTS has also outlined the monitoring proposed to be implemented as part of the Project which has included monitoring in all identified sensitive receptors and in the area of the mining activity. Whilst an initial approach to monitoring has been outlined, there remains the ability to consider further monitoring and management measures through consultation with consent authorities on the WMP. The WMP remains a 'live document' over the life of the Project allowing sites to be added and removed from the network as required, and the outcomes of model updates to be integrated. The WMP will directly address all conditions in an approval and also incorporate all the commitments in the EIS. The WMP will be publicly available on the proponent's website for communities to review along with annual monitoring reports.

3 Mr Keith Hart – Nature Conservation Council New South Wales

United requested AGE respond to the comment from Mr Keith Hart representing the Nature Conservation Council of New South Wales that *"scientific uncertainty about the environmental impacts of the two proposed mine voids is introduced by the independent expert IESC report, which I mentioned previously, which certainly has more scientific credibility than the voluminous advocacy of the proponent's EIS and the unquestioning support of the project from the New South Wales Department of Planning. The independent IESC notes that there is a potential for one of the two proposed voids, Wambo Void Lake, to become a source of contamination to surface water and groundwater systems; these are referenced in the document, Commissioners. And a geochemical assessment was not included in the assessment documentation, which limits the ability to evaluate potential water quality impacts."*

The EIS GIA (AGE 2016) concluded that the final voids and associated in-pit overburden emplacement will gradually fill with water and groundwater over time. The final voids are predicted to reach a final pit lake level of approximately 55m AHD in Wambo Open Cut and 19m AHD in United Open Cut.

These pit lake water levels are predicted to be about 30m to 50m below pre-mining groundwater levels, indicating that the voids will act as a sink in perpetuity with no escape of contained void water.

A geochemical assessment was undertaken and described in the Response to Submissions (RTS) which indicated that *"…the vast bulk of the overburden, interburden and floor materials are unlikely to be acid producing or release significant salinity and will be acid consuming. This is consistent with the current experience within the Project Area as most of the overburden material is acid consuming, the operational practice of rapid burial and mixing of any potential acid forming (PAF) materials with overburden is expected to be sufficient to control any potential for acid generation."*

4 Ms Georgina Woods – Lock the Gate

United requested AGE to respond to the following comments from Ms Georgina Woods

- Comment*: "…the Department of Planning hasn't given the Commission clear information to say how many water supply works are going to be affected by the more than two metre draw down trigger in the aquifer interference policy. They just say that the impacts are acceptable without actually articulating what those impacts are."*
- Response: Table 7-2 within the groundwater assessment prepared for the EIS (AGE, 2016), provides information on the water supply works predicted by modelling to be impacted by the Project and cumulative impacts. There are two bores predicted to experience a drawdown of more than 2 m and these are situated on land owned by the Joint Venture and therefore there are no significant impacts on external water groundwater users.

- Comment: *"The independent expert scientific committee noted that this project is going to cause up to 10 metres draw down in productive alluvium, but the proponent has said that that's not the case, but if you look at the maps in their EIS it's very clear that the 10 metre draw down contour overlaps with the Wollombi Brook and Hunter River alluvium".*
- Response: Figure 7-2 within the groundwater assessment prepared for the EIS (AGE, 2016), provides a map indicating the maximum drawdown within the Quaternary alluvium predicted by numerical modelling. The submission correctly notes drawdown up to 10 metres is shown on Figure 7-2 in areas at the fringes of the Hunter River alluvium and Wollombi Brook alluvium. The report also further explains these figures noting in Section 7.1.2 that *"…it should be noted that the drawdown levels are a reflection of drawdown through the model cells, irrespective of actual saturated thickness of the groundwater systems. Therefore, the drawdowns simulated can exceed the saturated thickness of the alluvium."* This issue was raised in the peer review by Dr Kalf and responded to with a figure contained within the RTS (refer RTS Part A – Page 346 of 558) that shows the maximum drawdown to the base of the Quaternary alluvium generated by the Project. The figures shows drawdown is generally between 1 and 2 metres in isolated zones along the fringes of the Hunter River and Wollombi Brook alluvium. No private water supply bores are present in the areas where drawdown is predicted within the alluvial aquifers.

- Comment: *"It's absolutely crucial that any trigger response plan like that be based on two years of baseline data."*
- Response: Yes, it is agreed that triggers should be developed for monitoring bores where adequate baseline data is available. Monitoring has been on-going at both United and Wambo since 2000 and significant baseline dataset exceeding two years is available for development of triggers. Section 10.3.1 within the groundwater assessment prepared for the EIS (AGE, 2016)

provides a methodology for setting water quality triggers. Section 10.3.2 provides a methodology for water level triggers.

5 Ms Jan Davis – Hunter Environment Lobby

United requested AGE responds to the following comments from Ms Jan Davis.

- Comment: *"…However, there is no discussion of the fact that mining is exempt from the cease to pump rule in alluvial water sharing plans. So while the proponent may hold adequate entitlements, ground water will continue to be drawn down, regardless of the environmental condition of the aquifer system and any protections within water sharing rules."*
- Response: The cease to pump rule is intended to manage water bores extracting groundwater in close proximity to creek systems that could be affecting stream flow during low flow periods. The cease to pump rule requires these bores to cease pumping when the water table falls below a prescribed level. As noted previously the mining will not directly extract groundwater from the alluvium or connected streams, and can only influence the alluvial systems indirectly through the underlying low permeability bedrock. The GIA indicates the volumes of indirect water take from the alluvial aquifers and streams will be relatively limited and can be accounted for with water licences held by the proponent. The relatively low volumes of indirect take predicted are not sufficient to induce in a detectable decline in groundwater levels at rivers and streams where the cease to pump rule could be applied.

- Comment: *"3.19 outlines that approved cumulative impacts from existing and future mining reduce the net base flow of ground water entering Wollombi Brook from 1450 megalitres a year to 1000 megalitres per year. The loss of 450 megalitres per year base flow is a loss of nearly one-third of the flow. This is a substantial loss. Any additional loss is too much. It is not insignificant."*
- Response: The comment is correct. The numerical model predicts the baseflow within the Wollombi Brook alluvium will reduce due to the cumulative impact of mining. However, when considering the model predictions, it is important to understand firstly that baseflow is only a fraction of the total flow in the rivers and creeks, and secondly the water sharing process in New South Wales is designed to protect environmental flows and downstream users. When determining the volume of available entitlements available for consumptive use the water sharing plans firstly allow for environmental flows, town water supply and stock/domestic use before calculating availability for consumptive use through the water licensing process. This approach is designed to protect downstream users and the environment. All mining operations in the model area including the proponent are required to hold Water Access Licenses to account for water taken indirectly from baseflow. The proponents have a combined total entitlement of 370ML/year assuming full allocation under the Hunter Unregulated WSP which is sufficient to account for any indirect losses from Wollombi Brook and the Hunter River alluvial systems and baseflow.

- Comment: *"The repeat of the proponent's assertion that there will be no significant impacts on water sources beyond those already approved ignores the significant cumulative impacts already occurring in the Hunter region, as identified in the bioregional assessment report."*
- Comment: *"The bioregional assessment report for the Hunter region, released last year, has estimated that the cumulative impact of mining will cause changes in water availability to the Hunter regulated river at Greta, and are very likely – greater than 95 per cent chance, that is – to exceed five gigalitres, or five billion litres, per year over the period 2013 to 2042. Five GL is equivalent to an estimated use of basic right access in the Hunter regulated system, or half the town*

water licences, or over twice the stock and domestic licences. This is a substantive volume of water to be lost from the system. This loss is borne by other water users and the river environment. Using a conservative value of $1000 per megalitre for water trading purposes, this loss of flow to the river system is worth $5 million every year. This significant impact must be considered as part of the merit assessment for this project."

- Response: The cumulative impacts were not ignored but represented in the numerical model and calculated as part of the GIA to inform the decision making process. As noted in the previous response the NSW government calculates the sustainable rates of consumptive use from aquifers and catchments after making allowances for environmental flows, town water supply and stock/domestic uses. All mining operations are required to hold Water Access Licenses to account for water taken directly from mining areas and indirectly due to drawdown effects on the surrounding environments. Numerical modelling indicates the proponents have a combined total entitlement that is sufficient to account for water both taken directly from mining areas and indirectly due to drawdown effects. Where the impacts are in excess of the entitlement the operation will be required to purchase the additional allocation at market rates or change operations to ensure cumulative impacts remain within sustainable limits of extraction for each water source.

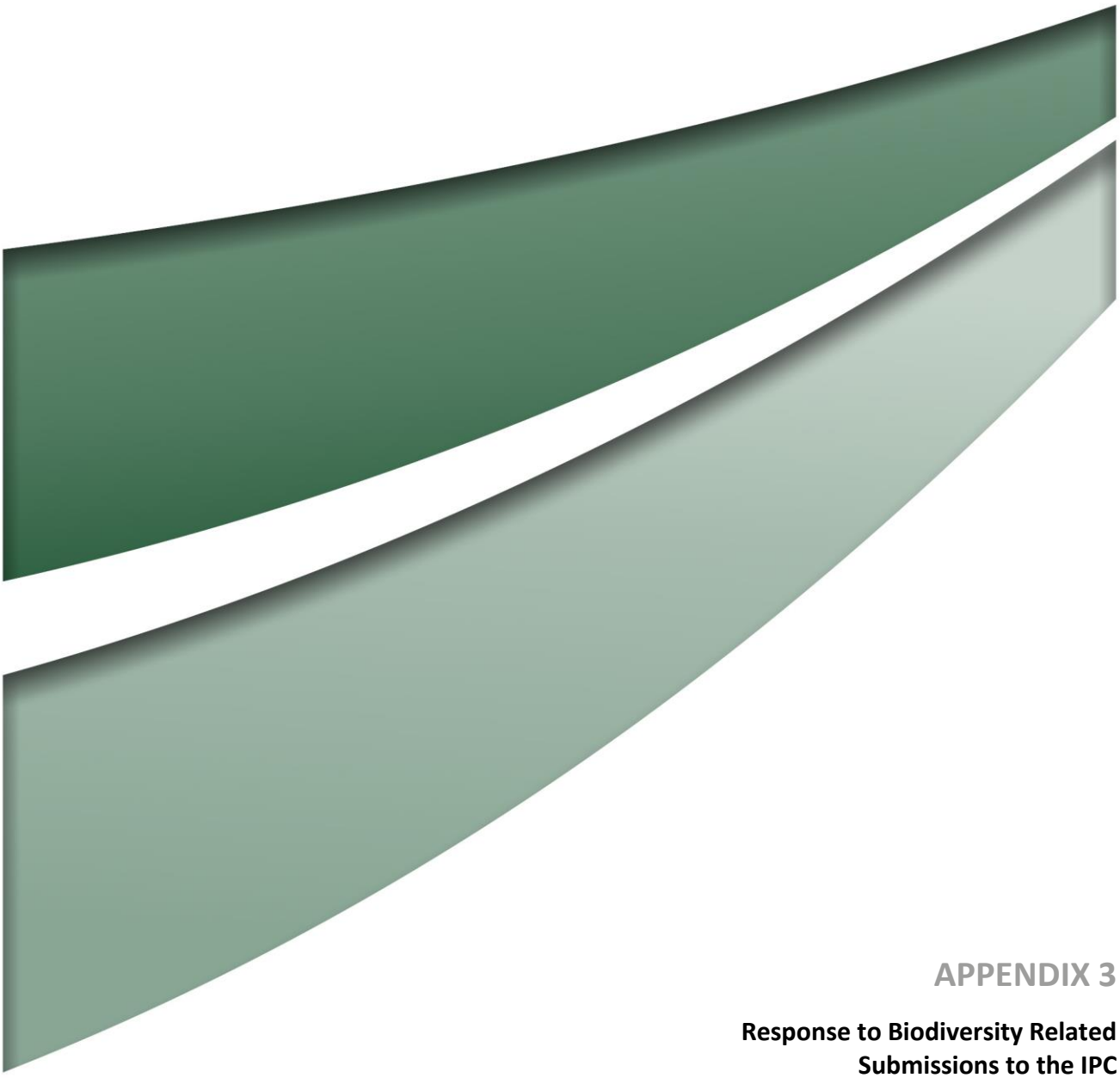
6 References

Australasian Groundwater and Environmental Consultants Pty Ltd, 2016. "*United Wambo Open-Cut Coal Mine Project - Groundwater Impact Assessment*". Prepared for Umwelt Australia Pty Ltd. Project No. G1733. July 2016.

Geoterra, 2017. "*United Wambo Open-Cut Coal Mine Project – Waste Rock / Tailings Geochemical Characterisation and Acid and Metalliferous Drainage Assessment*". Warkworth, NSW. UNi2-R1A. February 2017.

Yours faithfully,

James Tomlin
Principal Hydrogeologist/Director
Australasian Groundwater and Environmental Consultants Pty Ltd



APPENDIX 3

Response to Biodiversity Related Submissions to the IPC

Inspired People.
Dedicated Team.
Quality Outcomes.

Our Ref: 3509/JM/KD/TP/RP/11042019

11 April 2019

Aislinn Farnon
Approvals Manager

E| aislinn.farnon@glencore.com.au

Dear Aislinn

Re: United Wambo Open Cut Coal Mine Project - Response to Biodiversity Related Submissions to the Independent Planning Commission

This letter provides a response to biodiversity issues raised in submissions to the NSW Independent Planning Commission (IPC) in February 2019. David C. Paull and Stephen Bell were engaged by the Environmental Defenders Office NSW (EDO NSW) on behalf of the Hunter Environment Lobby Inc. to review biodiversity matters in relation to the United Wambo Open Cut Coal Mine Project (the Project). In addition, some matters in relation to biodiversity were raised in public submissions. This letter provides a response to the issues raised by David C. Paull, Stephen Bell and in the public submissions.

1.0 Mr David Paull

The following response to issues raised by Mr Paull is provided in three parts. These are:

- issues raised in Mr Paull's presentation to the IPC Meeting on 5 February 2019 (excluding where those issues were also raised in his written submission in which event the responses are provided for the written submission)
- issues raised in Mr Paull's written submission to the IPC dated 5 February 2019
- issues raised in Mr Paull's supplementary written submission to the IPC dated 14 February 2019.

Presentation to IPC

Mr Paull addressed the IPC Meeting on 5 February 2019 in relation to the biodiversity impacts resulting from the Project. As noted above, most of the issues raised by Mr Paull in his presentation are covered by his written submissions and are responded to below. However, the presentation to the IPC included comments relating to the Framework for Biodiversity Assessment (FBA) policy and the size and quality of the *Central Hunter Valley Eucalypt Forest and Woodland CEEC* in the impact area and offset areas which are responded to below:

Newcastle
75 York Street
Teralba NSW 2284
Ph. 02 4950 5322

Perth
PO Box 783
West Perth WA 6872
First Floor
7 Havelock Street
West Perth WA 6005
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Canberra
PO Box 6135
56 Bluebell Street
O'Connor ACT 2602
Ph. 02 6262 9484

Sydney
Level 3
50 York Street
Sydney NSW 2000
Ph. 1300 793 267

Brisbane
Level 11
500 Queen Street
Brisbane QLD 4000
Ph. 1300 793 267

www.umwelt.com.au

Umwelt (Australia) Pty Limited
ABN: 18 059 519 041

Mr Paull's comment

> *"First one is the impact that this mine is going to have, really, on one of the last largest remnants of a particularly critically endangered ecological community in the Hunter Valley. It's called Central Hunter Valley eucalypt forest and woodland, and it was listed in 2013,…."*
>
> *"So I was asked to look at this community and just determine whether or not this particular patch – and we're talking about a patch. It's nearly a 200 hectare patch - is actually critical for the survival of that community as determined under the listing criteria . . . it would have to be one of the last two significant areas of remnant vegetation for this critically endangered community left in the Valley."*

Response

The area of *Central Hunter Valley Eucalypt Forest and Woodland* CEEC proposed to be removed is 246.8 hectares (including 12.8 ha of derived native grasslands, 209.7 ha of woodland/forest and 24.3 ha of young regeneration) and comprises several 'patches' as defined by the conservation advice.

Mr Paull's submission broadly refers to the area of CEEC to be removed as a single patch, however, it is made up of several patches. The largest patch wholly within the Project Area is approximately 98.4 ha. Some of the CEEC within the Project Area forms part of patches that extend outside the Project Area. The recently released State Vegetation Type Map: Upper Hunter v1.0 VIS _ID 4894 (OEH 2019) was used to map CEEC outside of the Project Area to assist in determining the patch size of the patches that extend outside of the Project Area. The largest patch size for any of the patches of which the Project Area forms part is 751 ha (excluding derived native grassland outside of the Project Area as this is not mapped by OEH 2019), of which 127 ha will be removed by the Project.

The above statement by Mr Paull is not correct as there are at least 64 larger patches of the CEEC based on an analysis undertaken by Umwelt when compared to the verified 98.4 ha patch wholly within the Project Area. This analysis was completed by Umwelt using the mapping/modelling of plant community types (PCTs) in the recently released State Vegetation Type Map: Upper Hunter v1.0 VIS _ID 4894 which has been prepared by OEH (OEH 2019) clipped to Permian-derived soils and polygons within 30 metres of each other treated as a single patch. An important note for this analysis is that derived native grasslands are not considered, therefore the patches of the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC are likely to be much bigger if these were incorporated. In addition to this, the analysis by Umwelt only includes the plant community types (total of seven) that are likely to correspond to the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC; there are also a high number of other plant community types (total of ten) that will meet the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC in part according to the conservation advice. Therefore the analysis completed is conservatively low and there are likely to be more of the larger patches than identified in the desktop analysis.

Based on this analysis, the comment by Mr Paull that the patch in the Project Area is 'one of the last two' significant areas of this community is not correct. Further data regarding patch sizes is provided in response to further comments by Mr Paull below.

Mr Paull's comment

> *"Now, when I looked at the determination for this one it didn't go into as much specifics about the distribution and the size of the remnants. It does say that the average size now of the remnants for this community is 1.7 hectares. 1.7. Not very big.*

"In this case, they have said they have got a few little offsets. And they're small – they're scattered up and down the valley a little bit . . . . But it would be very difficult to offset this [CEEC], just because of the loss of the connectivity and the size of it. You would have to basically go to Singleton Army Base, basically, and buy that whole lot . . . An offset is what management you can apply to that site to increase the value of that offset site. And so you would really want to be thinking about an offset that was substantial in size, to offset the loss of this one. So, as I said, they're very hard to find."

Response

The like-for-like offsets currently proposed for *Central Hunter Valley Eucalypt Forest and Woodland CEEC* include 1,191.1 ha of the community made up of:

- 149.6 ha at the proposed Wambo BioBank Site (with an additional 47.9 ha to be regenerated to the forest and woodland form of the CEEC), adjoining substantial vegetation associated with Wollemi National Park
- 212.7 ha at the proposed Jerrys Plains BioBank Site (with an additional 56.8 ha to be regenerated to the forest and woodland form of the CEEC). The overall *Central Hunter Valley Eucalypt Forest and Woodland* CEEC patch size (of which this proposed offset forms part) is currently close to 600 ha when considering the surrounding regional vegetation State Vegetation Type Map: Upper Hunter v1.0 VIS _ID 4894 (OEH 2019) and regional soil landscape mapping (Kovac and Laurie 1991)
- 128.8 ha at the proposed Brosi BioBank Site (with an additional 33.9 ha to be regenerated to the forest and woodland form of the CEEC), adjoining substantial vegetation associated with Wollemi National Park
- 194.2 ha at the proposed Wambo South Offset (with an additional 30ha of derived native grassland to be regenerated to the forest and woodland form of the CEEC)
- 505.8 ha of mine rehabilitation.

As detailed above, the proposed offset sites do not represent insignificant or small areas of the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC in the Hunter Valley, noting that the conservation advice for the CEEC suggests that the median (not average) patch size is 1.7 ha. The offset sites contain a suitable variety of the CEEC in its variable forms including woodland, forest and derived grassland and shrublands. Areas of derived grassland and shrubland in the offsets represent an opportunity to provide an areal gain for the community in the Hunter Valley, with a substantial area proposed to be regenerated (from grassland) into the woodland and forested forms of the CEEC. As illustrated by the recently released State Vegetation Type Map: Upper Hunter v1.0 VIS _ID 4894 (OEH 2019) each of the proposed offset sites are part of substantial patches of the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC.

The availability of patches of CEEC have been underestimated due to a range of factors, which are outlined in our response to Mr Paull's report (paragraph 9) below. Additional areas are currently being investigated to further offset the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC for Stages 2 and 3 of the Project that are expected to add approximately 314 ha of CEEC to the offset package.

Mr Paull's comment

"The CEEC is a high nutrient soil type of community, and that is where most of the development of the Hunter Valley historically has occurred, through agriculture, and now again with mining."

Response

This statement is not accurate. The Approved Conservation Advice notes that the CEEC occurs on soils of medium fertility – lower fertility than the deep Quaternary alluvium, and higher fertility than the skeletal Triassic derived soils.

Mr Paull's comment

> *"I think for Commonwealth requirements, you're tending to look at – say for an offset ratio of about eight to 10 to one. That's certainly the ballpark for another community I know, a white box, yellow box, red gum one. It's much more critically endangered, in terms of overall percentage that has been cleared."*

Response

An assessment of the adequacy of an offset strategy under the EPBC Act Environmental Offsets Policy does not strictly use offset ratios, but considers the community's quality and context at both the impact and offset sites. Furthermore, the policy settings favour the improvement of lower quality offset sites and the regeneration of grassland to mature habitats over the long term.

Regardless, the consideration of offset ratios is not relevant to the assessment of the Project which is being assessed under the NSW FBA. The FBA does not apply offset ratios but instead requires input of substantial biodiversity and landscape data into a calculator tool which determines credit loads for an impact site. These are then offset by credits on an offset site. Consideration of offset ratios is not consistent with the NSW biodiversity policy under which the Project is being assessed.

Mr Paull's comment

> *". . . since 2008 we've gone from using expert scientific opinion to using a black box, which is the BioBanking Methodology. Okay. Now, it's supposed to be scientific. You – you're putting numbers in. That looks like science. Does it adequately take into account all the 35 factors that we need to be considering here? And I'm saying it doesn't, for there's a couple of problems with the BioBanking Methodology, which now is in its third incarnation"*

Response

Mr Paull's comments in relation to his views of the merits and limitations of the BioBanking, the FBA and the NSW Offsets Policy for Major Projects are noted, however, the FBA was the relevant government policy and methodology at the time of the assessment. The Biodiversity Assessment Report (BAR) was prepared in accordance with the FBA methodology and OEH's requirements. Comments in relation to the merits of the policy are not considered relevant to the assessment of the Project.

Written Submission - David C. Paull - Review of biodiversity considerations within the United Wambo Open Cut Coal Mine Project (SSD 7142)

Mr Paull's comment

> *"9. . . Mapped occurrences of the community include 27 remnants greater than 100 ha and more than 1,000 small remnants less than 10 ha indicating a high level of fragmentation (Peake 2006). However, these estimates are 12 years old and considerable amounts of this endangered ecological community (EEC) have been removed, particularly by the coal industry, in the Hunter Valley over the last 12 years, amounting to hundreds of hectares."*

Response

As noted by Mr Paull, the patch size data contained in the approved conservation advice for *Central Hunter Valley Eucalypt Forest and Woodland CEEC* is based on vegetation mapping by Peake (2006). There are three reasons why the patch size estimates referred to in the approved conservation advice are likely to be underestimated:

1. The mapping by Peake (2006), upon which the estimates are based, does not cover the full range of the *Central Hunter Valley Eucalypt Forest and Woodland CEEC* as there are further patches outside the Central Hunter Valley study area mapped by Peake (2006).

2. There has been significant (but poorly documented) natural regeneration of vegetation types (such as ironbark, grey box and bulloak forms) that conform to the *Central Hunter Valley Eucalypt Forest and Woodland CEEC*. Due to substantial land use change throughout the Hunter Valley, significant areas have been able to naturally regenerate over the past 10-20 years, particularly on mine-controlled land (refer to **Figure 1**). The extent of natural regeneration appears to substantially exceed the area of removal of the CEEC, based on analysis of the current OEH vegetation map of the Hunter Valley (refer below). This work by OEH post-dates Peake (2006).

3. This patch size assessment is based only on woody forms of the *Central Hunter Valley Eucalypt Forest and Woodland CEEC* and does not take into account the derived native grassland component of the CEEC which would substantially increase the patch size estimates. It is noted that the area of CEEC proposed to be impacted by the Project consists of both woodland and derived native grassland forms and therefore comparing this 'patch' to patches of woodland only forms of the CEEC is not a like for like comparison.

Table 1 below details the results of an analysis completed by Umwelt of the *Vegetation of the Central Hunter Valley* by Peake (2006) and the recently released State Vegetation Type Map: Upper Hunter v1.0 VIS _ID 4894 (OEH 2019) with the likely equivalent map units and PCTs according to the approved conservation advice for the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC. Applicable Peake (2006) map units according to the conservation advice include:

- MU7 Narrabeen Footslopes Slaty Box Woodland
- MU10 Central Hunter Box – Ironbark Woodland
- MU27 Central Hunter Ironbark – Spotted Gum – Grey Box Forest
- MU32 Central Hunter Bulloak Forest.

With reference to the OEH mapping, applicable PCTs according to the conservation advice include:

- 1603 Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter
- 1604 Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter
- 1605 Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter
- 1655 Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin
- 1691 Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter

- 1692 Bull Oak grassy woodland of the central Hunter Valley
- 1748 Grey Box grassy open forest of the Central and Lower Hunter Valley.

Note there are a further four Peake (2006) map units and ten PCTs according to the conservation advice that may meet the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC in part that have not been included in this analysis. Therefore the analysis is considered likely to underestimate the actual extent of the CEEC.

The applicable map units/PCTs were clipped to the mapped layer of Permian derived soils according to the Soil Landscapes of the Singleton 1:250,000 sheet (Kovac and Laurie 1991) and Soil Landscapes of the Murrurundi 1:100,000 Sheet (McInnes-Clarke 2002). Areas outside these map sheets were excluded from this assessment based on the fact that soils derived from sedimentary Permian rock are largely absent. Any polygons within 30 metres of one another were treated as a single patch as per the approved conservation advice.

Table 1 below includes the patch size ranges, median patch size and mean patch size according to the approved conservation advice, re-analysis of Peake (2006) based on merging adjoining patches of woodland/forest and analysis of the latest mapping by OEH (2019). According to the latest mapping by OEH (2019) there are a similar number of larger patches of the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC when compared to the approved conservation advice and re-analysis of the mapping by Peake (2006).

Table 1 Patch Size Ranges of the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC according to Approved Conservation Advice, Peake (2006) and OEH (2019)

Patch Size Range (ha)	Approved Conservation Advice – number of patches	Vegetation of the Central Hunter Valley by Peake (2006) – number of patches	State Vegetation Type Map: Upper Hunter v1.0 VIS _ID 4894 (OEH 2019) – number of patches
0.1 – 10	2614	1,801	3,235
>10 – 100	371	265	294
>100	65	51	64
Median Patch Size (ha)	1.7 ha	1.67 ha (1.73 ha excluding patches <0.1ha)	0.35 ha (0.58 ha excluding patches <0.1ha)
Mean Patch Size (ha)	Not specified	13.91 ha (14.14 ha excluding patches <0.1ha)	10.19 ha (12.76 ha excluding patches <0.1ha)

According to the assessment undertaken by Umwelt which treats map units/PCTs within 30 metres of one another as a single patch in line with the Approved Conservation Advice, there are a number of substantially larger remnants of the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC than the patch mapped in the Additional Disturbance Area for the Project. **Table 2** details the top 10 largest patches of likely *Central Hunter Valley Eucalypt Forest and Woodland* CEEC according to Peake (2006) and OEH (2019) mapping. According to the Peake (2006) there are 54 larger patches and according to OEH (2019) there are 64 larger patches of the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC than the 98.4 ha largest patch wholly within the Project Area. Again, it is noted that the area of CEEC proposed to be impacted by the Project includes its derived native grassland form whereas the patches in **Table 2** are based on forest and woodland forms only.

Table 2 Top 10 largest patches of *Central Hunter Valley Eucalypt Forest and Woodland* CEEC according to Peake (2006) and OEH (2019)

Vegetation of the Central Hunter Valley by Peake (2006) (Hectares)	State Vegetation Type Map: Upper Hunter v1.0 VIS _ID 4894 (OEH 2019) (Hectares)
1929	5105
1535	2896
1069	1613
745	1232
650	1198
643	1088
611	1073
476	1022
474	1001
456	962

As demonstrated in the discussion above, there are many patches of the CEEC remaining that are larger than that proposed to be impacted by the Project and based on the most recent mapping by OEH (2019) there are currently at least 64 patches over 100 ha of the CEEC remaining when considering only forested and woodland forms of the community. This is not to intended to infer that the impact of the Project on the CEEC is not significant (as was outlined in the biodiversity assessment prepared for the Project which noted that the predicted impact was considered significant with this impact to be addressed by appropriate offsets), but to provide accurate context around the remaining patches of this community.

Mr Paull's comment

> *"17. The Framework for Biodiversity Assessment (FBA) methodology used in this instance has failed to consider issues of landscape connectivity or cumulative impact adequately . . . "*

Response

The importance of corridors and connectivity are captured in the FBA through the identification of local and/or regional biodiversity links as part of the connectivity value of the site. The potential loss of local and regional connectivity is factored in to the FBA credit calculations for the Project in that the Assessment Circle and associated Landscape Value Scores take into account the pre and post-clearing percentage of native vegetation cover. Significantly connected lands drive higher credits loads. The FBA also requires an assessment of cumulative impacts as part of the indirect impact assessment outlined in 8.4.1.4 of the FBA.

Mr Paull's comment

> *"22. . . . While many of these impacts are difficult to quantify in detail, a generalised indirect impact index could have been created for use in the FBA so that offset liability for indirect impacts are quantified for use in the Calculator. This is one of the chief shortcomings of the current Offset Policy for Major Projects in NSW, but which remain important in considering the merits of the Project."*

Response

Mr Paull's comment in relation to his views of the limitations of the NSW Offsets Policy for Major Projects is noted, however, this was the relevant government policy at the time of the assessment and therefore is required to be applied for the Project. The biodiversity assessment was prepared following the policy and OEH's requirements. Comments in relation to the merits of the policy are not considered relevant to the assessment of the Project.

It is noted that indirect impacts, including a discussion on cumulative impact, loss in habitat connectivity, changes in fauna behaviour and the interruption of ecosystem processes were addressed in the BAR and in Section 2.3 of the Response to RFI report (Umwelt 2017) as required in Section 8.4.1.4 of the FBA.

Mr Paull's comment

> *"24. . . for both CHVEF and the Regent Honeyeater a net loss is likely"*

Response

Based on the current offsets package (excluding further offsets required to be established for Stages 2 and 3), a net loss for *Central Hunter Valley Eucalypt Forest and Woodland CEEC* and regent honeyeater is not likely due to the grassland areas proposed to be regenerated to woodland and forested habitats.

The restoration of the *Central Hunter Valley Eucalypt Forest and Woodland CEEC* in existing grassland areas at the BioBank Sites and in mine rehabilitation represents a gain of around 644.7 ha.

For the regent honeyeater, the proposed restoration of existing grassland areas at the proposed BioBank Sites represents a gain of around 347 ha of vegetation dominated by key feed trees, which will improve the viability of the species in the Hunter Valley. This does not include any consideration of the extent of mine rehabilitation proposed.

Mr Paull's comment

> *"24. the proposal cannot . . . 6. be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs (mine rehabilitation is a mandatory requirement under the Mining Act)"*

Response

While mine rehabilitation is mandatory under the *Mining Act*, the higher standards required for ecological rehabilitation, including the need for rehabilitated lands to conform to naturally-occurring vegetation communities or threatened ecological communities, is a commitment above and beyond standard rehabilitation requirements. Ecological mine rehabilitation requires more planning, risk and financial burden on a proponent and therefore this commitment is additional to what is already required as per the principles of the Commonwealth Offset Policy.

Mr Paull's comment

> *"24. . . . there remain questions as to the accuracy of the Umwelt (2017) review given no data was provided to support these claims)"*

Response

The *Assessment of Mine Rehabilitation against the Central Hunter Valley Eucalypt Forest and Woodland CEEC* report prepared by Umwelt (2017) was provided to the Office of Environment and Heritage (OEH) for its review in August 2017. The data analysed by this study was collected by existing monitoring programs at the respective mine sites. This data would have been provided to government agencies as part of annual environmental reporting requirements. Umwelt is currently working to provide this information to OEH as part of ongoing research into this community and mine rehabilitation, as further detailed in response to Stephens Bell's comments below.

Mr Paull's comment

> *"24. . . . use of rehabilitation without any contingency suggest this is not being achieved)."*

Response

Under NSW government policy, there are a range of safeguard mechanisms in place so that if an area of ecological rehabilitation does not meet the required standard, the credits cannot be generated and an alternative offset must be provided. Specific performance measures and completion criteria would be required to be developed and approved by relevant government agencies, and would be applied to ensure appropriate consideration of condition, composition, structure and function of the ecological mine rehabilitation to establish the CEEC. As per Appendix D of the NSW Biodiversity Offsets Policy for Major Projects (under which the FBA operates), if it becomes clear that the ecological rehabilitation standard for which biodiversity credits have been generated is not able to be achieved, the proponent must instead source and retire these credits from an alternate offset in order to meet its offset requirement. A rehabilitation security bond also provides further contingency for this.

Further to this Glencore has contingency land under its management that could be used to generate credits for the CEEC if required to replace the proposed mine rehabilitation. Based on regional vegetation mapping and equivalency to the CEEC, across Glencore and Wambo held land outside of existing approved or proposed disturbance areas and conservation areas there are sufficient areas of the CEEC to generate more than the currently proposed 2,437 credits to be generated for the CEEC on mine rehabilitation. Therefore, in the unlikely event that the CEEC rehabilitation does not meet the required standard within 10 years of the cessation of mining operations as required by draft Condition B57, land held by Glencore and Wambo could be used to retire the relevant deficient credits.

Mr Paull's comment

> *"27. However, some communities have not had their residual liability dealt with through the offset strategy. This includes HV_905 (800 credits short – this is the target CHVEFW community, raising questions about the claim that this matter has been retired in full)."*

Response

The residual credits required for Stage 1 for HU905 represents the portion of the HU905 community in the Project Area that does not conform to the *Central Hunter Valley Eucalypt Forest and Woodland CEEC*. This includes areas of HU905 derived grassland outside the CEEC buffer areas and areas dominated by cooba shrubland. These credits will be retired through the Biodiversity Conservation Fund or through additional land based offsets, or a combination of these two mechanisms.

Mr Paull's comment

> *"28. There are serious questions of scientific merit as to the use of mine rehabilitation as a means to retire credits generated by the removal of good condition mature ecosystems. The most important is that there is insufficient scientific evidence that complex ecosystems, such as those targeted here, can achieve a condition that would resemble a functioning, self-generating community."*

Response

NSW government policy provides for the use of mine rehabilitation to generate credits provided that strict performance criteria are met. It is acknowledged that this is an area of more recent policy development and therefore there is not currently extensive scientific study on this issue in NSW. It is also noted that this policy has and will continue to drive further improvements in rehabilitation quality and provides the opportunity for mine rehabilitation to formally provide a significant contribution to the future biodiversity values of the Hunter Valley. It is also noted that there are policy safeguards that provide for alternative offsetting outcomes should the required standard of rehabilitation not be met.

With regard to scientific study on this topic, the report prepared by Umwelt (2017) titled '*Assessment of Mine Rehabilitation Against Central Hunter Valley Eucalypt Forest and Woodland CEEC*' was a first-step to better understanding the ability of mine ecological rehabilitation in the Hunter Valley to be able to establish and form self-sustaining and recognisable ecological communities. While the findings were very promising, and instructive, it was recommended that a more detailed study be undertaken. This has since been commenced through the current major research study being undertaken by Umwelt for the Australian Coal Industry's Research Program. This study, titled "*Establishing Self-sustaining Ecological Mine Rehabilitation that Achieves Recognised Ecological Communities*" has now completed extensive literature reviews and is about to embark on an intensive program of mine rehabilitation and reference site data collection. OEH is collaborating with Umwelt in the data collection and analysis components of the project, and it is intended to publish joint scientific papers in leading journals as a result of the work. Project completion is planned for prior to the end of 2019. A key focus of Umwelt's work on this project will be in relation to the establishment of complex ecological communities that are recognisable as PCTs and/or threatened ecological communities. Furthermore, the project is particularly examining the *Central Hunter Valley Eucalypt Forest and Woodland CEEC* through its sampling and analysis. Both Umwelt and OEH will be collecting and analysing information on functioning, or self-sustainability.

Mr Paull's comment

> *37. The rehabilitation of creek zones, specifically Swamp Oak Forest, has not been documented anywhere by the proponent. One has to imagine how the species credit liability is actually going to be offset under the proposed offset strategy as the proponent would either have to:*
>
> - *create water bodies with appropriate feed for the southern myotis (which is evolved to take small water animals in mid-flight), and/or*
> - *create sufficient hollows to support a local population of southern myotis.*
>
> *Just identifying existing riparian creek zones as an offset is insufficient, without taking into consideration, condition of the site and suitability for this species.*

Response

The proposed offset for southern myotis is included, in part, at the Mangrove BioBank Site, where the species has been recorded in the locality and credits have been generated in the timbered (including those areas supporting tree hollows) areas along Wybong Creek. Habitat reconstruction in the Project Area has not been proposed to generate credits for the species. The remaining credit requirement will be explored through additional offsets (or confirmation of the species in suitable habitat in existing offsets) or payment into the Fund.

Mr Paull's comment

> *"39. A proper consideration of the assessment of significance test for NSW-listed matters, according to section 5A of the EP&A Act, has not occurred."*

Response

This statement is not correct, a proper consideration of (the former) Section 5A of the EP&A Act has occurred.

The biodiversity assessment for the Project was completed in accordance with the SEARs and in accordance with NSW Government policy. The Department of Planning and Environment (DPE) advised that the requirements of Section 5A of the EP&A Act are to be considered in a Biodiversity Assessment Report (BAR). A summary of the requirements of the Seven Part Tests of Significance and where they are addressed in the FBA Assessment was outlined in Table 5.7 of the BAR (Umwelt 2017).

Written Submission - David C. Paull – Supplementary Submission to the Independent Planning Commission. Significance of Central Hunter Valley Eucalypt Forest and Woodland (CHVEFW) in relation to the proposed United Wambo Open Cut Coal Mine Project (SSD 7142)

Mr Paull's comment

> *Below are some key points regarding the status and significant of the different vegetation communities that fall under the CHVEFW definition (main source: Peake 2006).*
>
> *Only 0.8% (2,600 ha) of the Hunter Valley area is protected (apart from defence lands – a de facto protection).*

Response

Peake (2006) noted that as of May 2005 19.2% of the Hunter catchment was land dedicated under the state's conservation reserve system. Peake (2006) noted that 0.82% of the study area of the Hunter Remnant Vegetation Project (the subject of the Peake 2006 report) was land dedicated under the state's conservation reserve system but this study area did not cover the full extent of the Hunter Valley. There has been an increase in conservation area since these figures were generated in 2006. In the Hunter Catchment approximately 20.6% and in the Hunter Remnant Vegetation Project study area 0.85% is currently in conservation areas.

Mr Paull's comment

> *Peake (2006) mapped the extent of [Central Hunter Grey Box—Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions (corresponding to MU10)] in 2006 at over 40,000 ha or 30% of the original extent. The actual extent of this community is now 14,818 ha according to the updated description on the OEH website https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=20126.*

Response

Mr Paull correctly refers to the information on the OEH website, however, the statement about Peake (2006) is incorrect as this report does not state that the mapped extent of MU10 was over 40,000 ha. It is noted that there was an error in the NSW Scientific Committee – Final Determination for this NSW listed threatened community. The NSW Scientific Committee – Final Determination details that the Central Hunter Grey Box – Ironbark Woodland as being '*approximately 46,920 ha which is estimated to be 32% of the pre-European distribution*' according to Peake (2006). However, this is an incorrect attribution to Peake (2006). According to Peake (2006 vol 2 p 64) the pre-European estimated area is 46,920 ha, with the extant (current) area being 14,818 ha, or approximately 32% of the estimated pre-European extent. The extent stated in Peake (2006) is therefore consistent with that stated on the OEH website as referenced by Mr Paull. That is, the inference in the statement from Mr Paull that the area of this community has declined from over 40,000 ha to 14,818 ha since 2006 is not correct.

2.0 Stephen Bell - United Wambo Open Cut Coal Mine Project (Project) – Independent Planning Commission Meeting

Mr Bell's comment

1. Hunter Valley Weeping Myall Woodland

> *In my review of the most recent documents concerning this proposal, I cannot see any indication that a revised assessment of HVWMW has been done in keeping with the sentiments of Tozer and Chalmers (2016). Consequently, I stand by my earlier comments that HVWMW is yet to be fully assessed across the proposed project area.*

Response

A 0.1 hectare patch of *Hunter Valley Weeping Myall Woodland* Critically Endangered Ecological Community (CEEC) under the *Biodiversity Conservation Act 2016* (BC Act) was previously identified within an area formerly planned to be impacted as part of the Project. This area of CEEC was avoided by placing a 20 metre buffer from the edge of this community and therefore the recorded area of this CEEC will not be impacted by the Project.

Section 3.4.1.1 of Response to Submissions Part B (Umwelt May 2017) provides a detailed response to Dr Stephens Bell's original comments in relation to the identification of this CEEC. It is recognised that, as per Bell's original submission, the identification of this community where it occurs without *Acacia pendula* as either a shrub or tree, or a sucker, is extremely difficult. Although the community could occur in the absence of this species in its various growth forms, the remaining assemblage of species is unlikely to occur in a repeating pattern, and at a scale, that would facilitate its identification and mapping and, importantly, its separation from other listed ecological communities, such as *Central Hunter Grey Box – Ironbark Woodland* EEC. Any other potential micro-occurrence of this community (devoid of *Acacia pendula*) would almost certainly be in an area that has been attributed to another NSW listed ecological community and/or the *Central Hunter Eucalypt Forest and Woodland* CEEC. Further to this, the United Wambo Additional Disturbance Area has been devoid of grazing and agricultural practices (two key reasons for the past removal of *Acacia pendula*) for at least 30 years and it can be reasonably expected in this time that any areas conducive to *Acacia pendula* would have been recolonised by this species. Across large parts of the central Hunter Valley *Acacia pendula* is re-establishing as a result of the removal or easing of livestock grazing pressure. This is primarily evident through the growth of suckers that have remained viable at or below the ground surface. Dense stands of trees can develop within relatively few years. During the intensive surveys of the Project Area, the only evidence of *Acacia pendula*, either as stems or suckers, which might portray the presence of the CEEC, was located in the stand that was since avoided through Project disturbance area re-design.

Mr Bell's comment

> *2. Mine Rehabilitation Offsets*
>
> *I therefore do not believe that the proposed mine rehabilitation objectives or expected environmental outcomes will be achieved, or that satisfactory re-establishment of cleared threatened ecosystems on mined lands will occur. Novel ecosystems (Doley & Audit 2013; Erskine & Fletcher 2013) will be established in their place, which are unlikely to provide an adequate offset for cleared threatened communities.*

Response

Establishment of mine rehabilitation is addressed above as part of the response to Mr Paull's submission. In summary the NSW government provides for the use of mine rehabilitation to generate biodiversity credits provided strict criteria are met. In addition to this, Umwelt have commenced through the Australian Coal Industry's Research Program a study titled "*Establishing Self-sustaining Ecological Mine Rehabilitation that Achieves Recognised Ecological Communities*". A key focus is the establishment of complex ecological communities that are recognisable as Plant Community Types (PCTs) and/or threatened ecological communities.

Regarding availability of the mine rehabilitation data in the report prepared by Umwelt (2017) titled '*Assessment of Mine Rehabilitation Against Central Hunter Valley Eucalypt Forest and Woodland CEEC*', this data is provided to relevant government agencies as part of annual monitoring reports. In addition to this, OEH commissioned Umwelt to undertake the collection of the data from the majority of the rehabilitation sites, 32 of the 51 sites analysed, as part of surveys completed on Mount Owen mine rehabilitation.

3.0 Other Community Commentary

Keith Hart (Nature Conservation Council - NCC)

Comment

> *"The biodiversity impacts of the project are being assessed, managed and offset under the framework of the Upper Hunter Strategic Assessment, UHSA. The UHSA is a joint Commonwealth/State Government initiative.*
>
> *Unfortunately, in spite of numerous references to the UHSA by the proponent and the New South Wales Department of Planning, no such document has appeared in the public domain. I'm not sure how the public is able to assess the impacts of mining of biodiversity without such a document available."*

Response

The Project is not being assessed, managed and offset under the UHSA. The Project is being assessed under the FBA and NSW Offsets Policy for Major Projects which are NSW Government policy and are publically available.

The Project was formerly proposed to be assessed under the UHSA following the UHSA Interim Policy however as the UHSA policy finalisation process has been delayed within government, a change was made to assess the Project under FBA and a full FBA assessment was undertaken. The FBA report was prepared and included in the Response to Submissions Part B which was submitted in May 2017.

Comment

> *"NCC would like to point out that there is an inaccurate listing in table E1 of the New South Wales Department of Planning and Environment's final assessment report – the reference will be in our document, Commissioners – showing the listing of the swift parrot and the Regent Honeyeater as endangered rather than critically endangered. They are shown on the Commonwealth Department of Environment's website."*

Response

This is a reference to a statement in the DPE assessment report.

It is acknowledged that the regent honeyeater and swift parrot are currently listed as 'critically endangered' under the Commonwealth EPBC Act. The regent honeyeater was listed as critically endangered on 8 July 2015, while the swift parrot was listed as critically endangered on 5 May 2016. An EPBC Act Referral for the Project was submitted in October 2015 that included detailed assessments of the regent honeyeater (*Anthochaera phrygia*) and swift parrot (*Lathamus discolor*). The regent honeyeater was assessed as critically endangered in line with this species updated listing status, while the swift parrot was assessed as endangered based on the listing status at the time. As per Section 158A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the assessment of the Project continues to assess these species as per their listing at the time of the controlled action decision.

It is also noted, however, that the listing status in no way affects the assessment outcomes as regardless of the listing status the impact of the Project on potential habitat for these species are addressed by the offset strategy developed in accordance with the FBA . Neither species have been recorded in the Additional Disturbance Area for the Project despite extensive targeted survey over many years.

Comment

> *"The Policy does not allow variation in rules to be applied to critically endangered species and communities or threatened species and ecological communities that are considered nationally significant."*

Response

It is correct that the FBA does not allow the variation rules to be used for critically endangered species/communities and species/communities listed under the EPBC Act, consequently the variation rules have not been used for those matters. The *Central Hunter Valley Forest and Woodland CEEC* has been offset using like-for-like offsetting rules approved by OEH and the Department of Environment and Energy (DoEE) and as appropriate under the EPBC Act Environmental Offsets Policy.

Comment

> *"The New South Wales Department of Planning has broken most of these rules in relation to the United Wambo project by approving the destruction of an EPBC Act listed high conservation value ecological community, and offsetting 44.5 per cent of the area to be destroyed with mine rehabilitation. NCC would like to ask the IPC how the Department of Planning can be allowed to get away with such a variation of the 2016 Biodiversity Offsets Policy."*

Response

The Project is expected to impact up to 246.8 hectares of the *Central Hunter Valley Eucalypt Forest and Woodland CEEC*, which equates to 14,477 ecosystem credits under the FBA. Up to 505.8 hectares of ecological mine rehabilitation is proposed to be restored to assist in the offsetting for this community in the Project Area which contributes 2,437 credits (17% of the CEEC requirement) to the offset package.

The use of mine rehabilitation is provided for by the offsetting rules of the FBA, and there is no limit to the use of mine rehabilitation under the NSW Offsets Policy for Major Projects. Furthermore, United's offset strategy includes a combination of offset components including land-based offsets and revegetation programs. The proposed 505.8 hectares of ecological mine rehabilitation will provide a significant area of CEEC and is considered appropriate for maximising biodiversity opportunities to improve the post-mining landscape.

G. Woods (Lock The Gate)

Comment

> *"The speaker from NCC already mentioned the mischaracterisation in the assessment report of the Regent Honeyeater as an endangered species rather than a critically endangered species."*

Response

This is a reference to a statement in the DPE assessment report. As per the above response, the regent honeyeater was assessed as critically endangered in line with this species updated listing status.

Comment

> *"The assessment report says that the offset strategy is acceptable and in accordance with the conservation advice, but it doesn't – and it claims that the conservation advice for the Regent Honeyeater identifies the main threat to the species as disease, which is absolutely untrue."*

Response

This is a reference to a statement in the DPE assessment report. With a small population size, disease and other stochastic events are a threat to this species as stated in the *National Recovery Plan for the Regent Honeyeater (Anthochaera Phrygia)* April 2016; however, the main threats identified in the Conservation Advice are clearing, fragmentation and degradation of its habitat. The impacts on this species have been correctly assessed and offsets are proposed under the FBA. The statement in the DPE assessment report in no way affects the assessment outcomes for this species.

M. McClean

Comment

> *"The Umwelt report used the conservation advice in order to create, effectively, a tick-the-box, that if you pretend, you make this assumption, you pull the data here, you distort it this way, you can do this, and "Hey, we won't even try, and look! We've done some really good rehabilitation here. We've got some CECs. Trending!" Now, the "trending" is of grave concern to me."*

Response

The report prepared by Umwelt (2017) titled '*Assessment of Mine Rehabilitation Against Central Hunter Valley Eucalypt Forest and Woodland CEEC*' was a first-step to better understanding the ability of mine ecological rehabilitation in the Hunter Valley to be able to establish and form self-sustaining and recognisable ecological communities. The findings presented in the report suggested that some of the rehabilitation was trending towards the recognisability aspect of the *Central Hunter Valley Eucalypt Forest and Woodland CEEC* despite not being specifically planned to achieve this outcome.

As detailed above in response to Mr Paull's submission, a comprehensive research project is underway. Titled "*Establishing Self-sustaining Ecological Mine Rehabilitation that Achieves Recognised Ecological Communities*", this project has now completed extensive literature reviews and is about to embark on an intensive program of mine rehabilitation and reference site data collection. OEH is collaborating with Umwelt in the data collection and analysis components of the project, and it is intended to publish joint scientific papers in leading journals as a result of the work. Project completion is planned for prior to the end of 2019. A key focus of Umwelt's work on this project will be in relation to the establishment of complex ecological communities that are recognisable as PCTs and/or threatened ecological communities. Furthermore, the project is particularly examining the *Central Hunter Valley Eucalypt Forest and Woodland CEEC* through its sampling and analysis. Both Umwelt and OEH will be collecting and analysing information on functioning, or self-sustainability. It is anticipated that this project will provide a more definitive assessment of whether or not successful ecological rehabilitation of the *Central Hunter Valley Eucalypt Forest and Woodland CEEC* has been undertaken, or if trends are statistically significant.

J. Fenwick

Comment

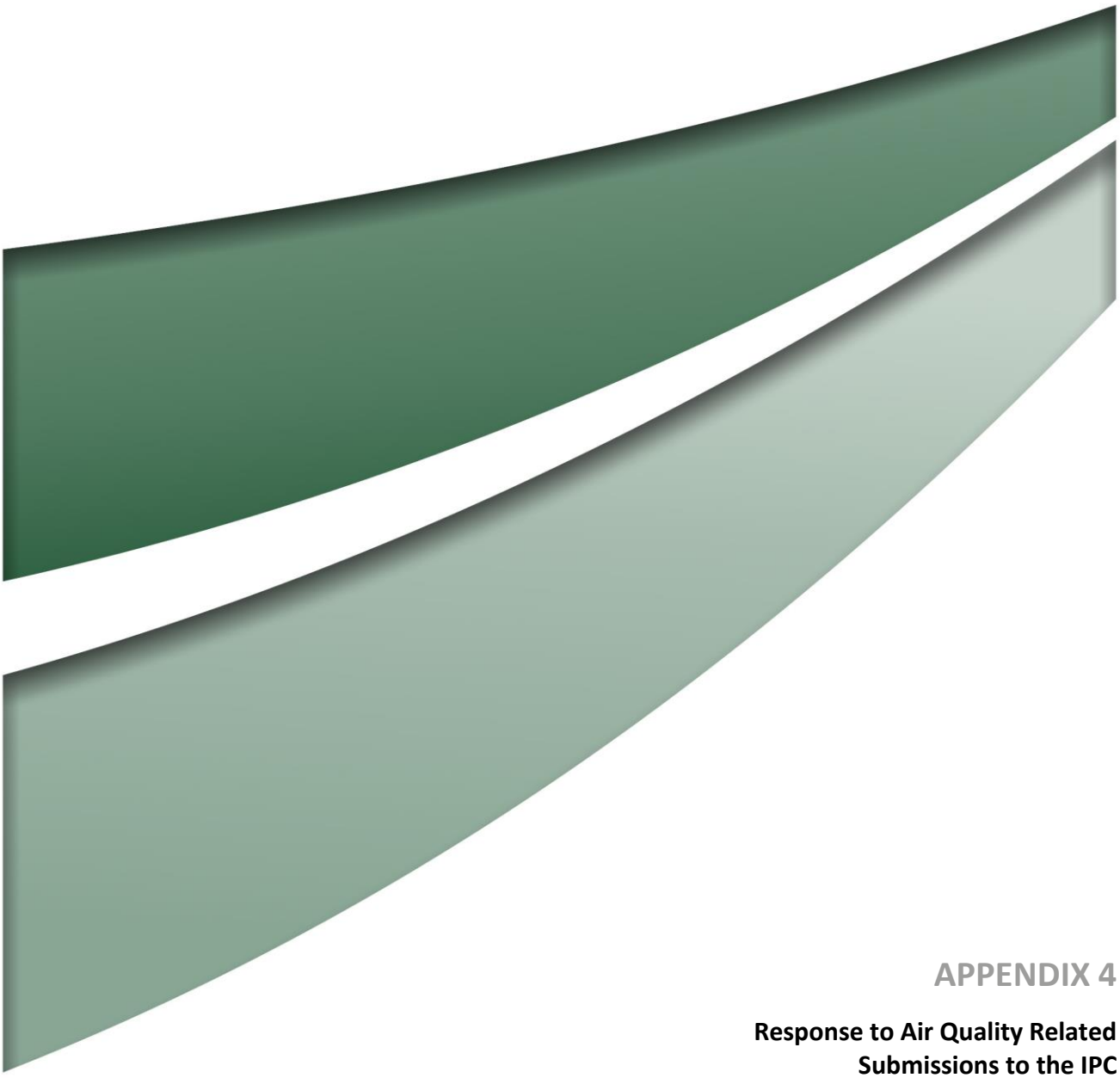
> *"And to – to buy land and say, we're not going to mine this, I don't really see how that can be an offset, because they're not doing – they're just buying it and not doing anything with it. How can that offset that damage that they are doing somewhere else – destruction somewhere else?"*

Response

The land-based offset sites for the Project are not just purchased and then proposed to be left unmanaged. The requirement to establish Biobank (or now called Stewardship) sites under the FBA requires a range of management actions to improve the habitats on the sites in the long term. Depending on the specific values of the offset sites, this includes measures such as regeneration and supplementary planting of grasslands, habitat augmentation (nest boxes, placement of fallen logs), weed control and feral pest management. These management actions will improve the quality of the vegetation and habitats of the sites resulting in a gain in biodiversity value, which will be conserved in perpetuity.

Yours sincerely

Travis Peake
National Ecology Leader



APPENDIX 4

Response to Air Quality Related Submissions to the IPC

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JACOBS

Umwelt (Australia) Pty Ltd
75 York Street
Teralba NSW 2284
Attention: Kirsty Davies

12 April 2019 IA084400

Dear Kirsty

Review of comments on the United Wambo Open Cut Coal Mine Project for the Independent Planning Commission Public Meeting

Thank you for the providing a copy of the relevant air quality related information that was provided to the Independent Planning Commission (IPC) as part of the Public Meeting for the United Wambo Open Cut Coal Mine Project (the Project). As requested I have reviewed and provided comment on the following items:

- "Comments on the United Wambo Open Cut Mine Project and associated documents, for the IPC Public Meeting". Prepared by A/Prof Howard A. Bridgman, Conjoint Professor, Newcastle University.
- A request to the Department of Planning and Environment (DP&E) from the IPC relating to adverse meteorological conditions.
- Issues raised by the community at the Public Meeting via oral and written comments.

Information to address each item above is provided below.

1. Information from A/Prof Howard A. Bridgman

Page 2 paragraph 3 indicating that "in 2025, the $PM_{2.5}$ 24-hour standard is to be reduced to 20 µg/m^3 and the annual standard to 7 µg/m^3."

The statement above refers the National Clean Air Agreement which states that: "*Ministers agreed to adopt reporting standards for annual average and 24-hour $PM_{2.5}$ particles of 8 µg/m^3 and 25 µg/m^3 respectively, aiming to move to 7 µg/m^3 and 20 µg/m^3 respectively by 2025" and "The decision was also taken to review PM_{10} standards in 2018. The review will be co-led by the NSW and Victorian governments, in discussion with other jurisdictions."*

The National Clean Air Agreement resulted in the NSW Government adopting the annual average $PM_{2.5}$ and PM_{10} standards of 8 µg/m^3 and 25 µg/m^3 respectively as impact assessment criteria. The Agreement does not provide certainty with regards to the timing or final numerical values for future $PM_{2.5}$ and PM_{10} standards. In addition there have been no publicly available outcomes or notifications that PM_{10} standards were reviewed in 2018 and there is currently no State legislation regarding the aim to move to more stringent $PM_{2.5}$ criteria by 2025. In the absence of this certainty

the Project can only be assessed against the criteria which have been specified as applicable by NSW Government legislation or policy; the approach taken for the Project.

Page 2 paragraph 4 discussing "Whether 5 years of data adequate to choose 2014 as the year to use as the basis for modelling"

When conducting air dispersion modelling to predict potential impacts, the EPA's "Approved Methods" requires the use of site representative meteorological data that are "correlated against a longer-duration site-representative meteorological database of at least five years (preferably five consecutive years) to be deemed acceptable". The assessments carried for the Project (Jacobs 2016 and 2018) have addressed this requirement.

It is acknowledged that there has been evidence of higher than average particulate matter concentrations across NSW in 2017 and 2018. These conditions have been influenced by regional events including dust storms that have arisen from generally lower than average rainfall across NSW in 2017 and 2018, indicative of a drought. It is re-iterated that the air quality assessments of the Project have been carried out in accordance with the EPA's current assessment guidelines.

The use of 2017 or 2018 meteorological data is unlikely to change the conclusions relating to the potential air quality impact risk of the Project at sensitive receptors since the air dispersion models are primarily driven by wind and turbulence effects. That is, the models do not generally assume reduced suppression of dust due to lower rainfall (or the effects of drought). Nevertheless, to address this question the outcome of using an alternative meteorological year (2018) has been tested.

The effect on assessment outcomes relating to the potential air quality impact risk of the Project due to an alternative meteorological year has been tested by:

- Obtaining meteorological monitoring data from seven locations for the 2018 calendar year. These stations are listed in Section 5.1 of Jacobs (2018).
- Re-calculating emissions from the Project as per proposed operations in Year 2 and based the 2018 meteorological data.
- Predicting the contribution of the Project (in Year 2) to local air quality using a computer-based dispersion model (CALPUFF) as per the methodologies outlined by Jacobs (2018), and based on the 2018 meteorological datasets.
- Comparing the results from use of the 2014 and 2018 meteorological datasets.

Figure 1 shows the annual wind patterns as measured by the Wambo mine meteorological station, comparing data for 2014 and 2018. Wind-patterns were similar in both years with the most common winds from the northwest and southeast to east. The percentage of calm conditions was also similar, in the order of 10 to 15 percent in both years.

Figure 1 Annual wind-roses for 2014 and 2018 from Wambo mine meteorological data

Annual statistics from data collected at the Wambo mine meteorological station between 2011 and 2018 are presented in **Table 1**. Rainfall in 2018 was lower than the long term average of 646 mm (Jerrys Plains 1884 to 2014) but not dissimilar to the rainfall amount in 2014, the modelled meteorological year for the Project air quality impact assessment.

Table 1 Annual statistics from data collected at Wambo mine meteorological station

Statistic	2011	2012	2013	2014	2015	2016	2017	2018
Mean wind speed (m/s)	2.0	1.9	2.1	2.2	2.2	2.5	2.0	2.1
Percentage of calms (%)	21	25	17	13	13	10	13	10
Rainfall (mm)	787	430	635	559	738	721	443	536

Data 2011 to 2015 were the basis for the Project air quality impact assessment.

The results from simulating the contribution of the Project to local area air quality, using both the 2014 and 2018 meteorological datasets, are provided in **Figure 2** to **Figure 7**. These results include the predicted Project contributions for all relevant particulate matter classifications and averaging times.

The results in **Figure 2** to **Figure 7** do not show any clear evidence that the maximum or annual average concentrations or deposited dust levels due to the Project will be significantly higher when tested with a meteorological dataset that coincided with lower rainfall conditions. The conclusions of the air quality impact assessment (Jacobs 2018) therefore do not change as a result of the alternative meteorological modelling year.

Nevertheless it is acknowledged that, in years of lower than average rainfall conditions there would potentially be an increased frequency of occasions when the proponent would need to

modify operations in response to observed, measured or forecast conditions to maintain compliance with a contemporary Project consent for this type of operation (should development consent be issued). These strategies will be outlined in the Air Quality Management Plan, consistent with plans implemented other nearby mining operations.

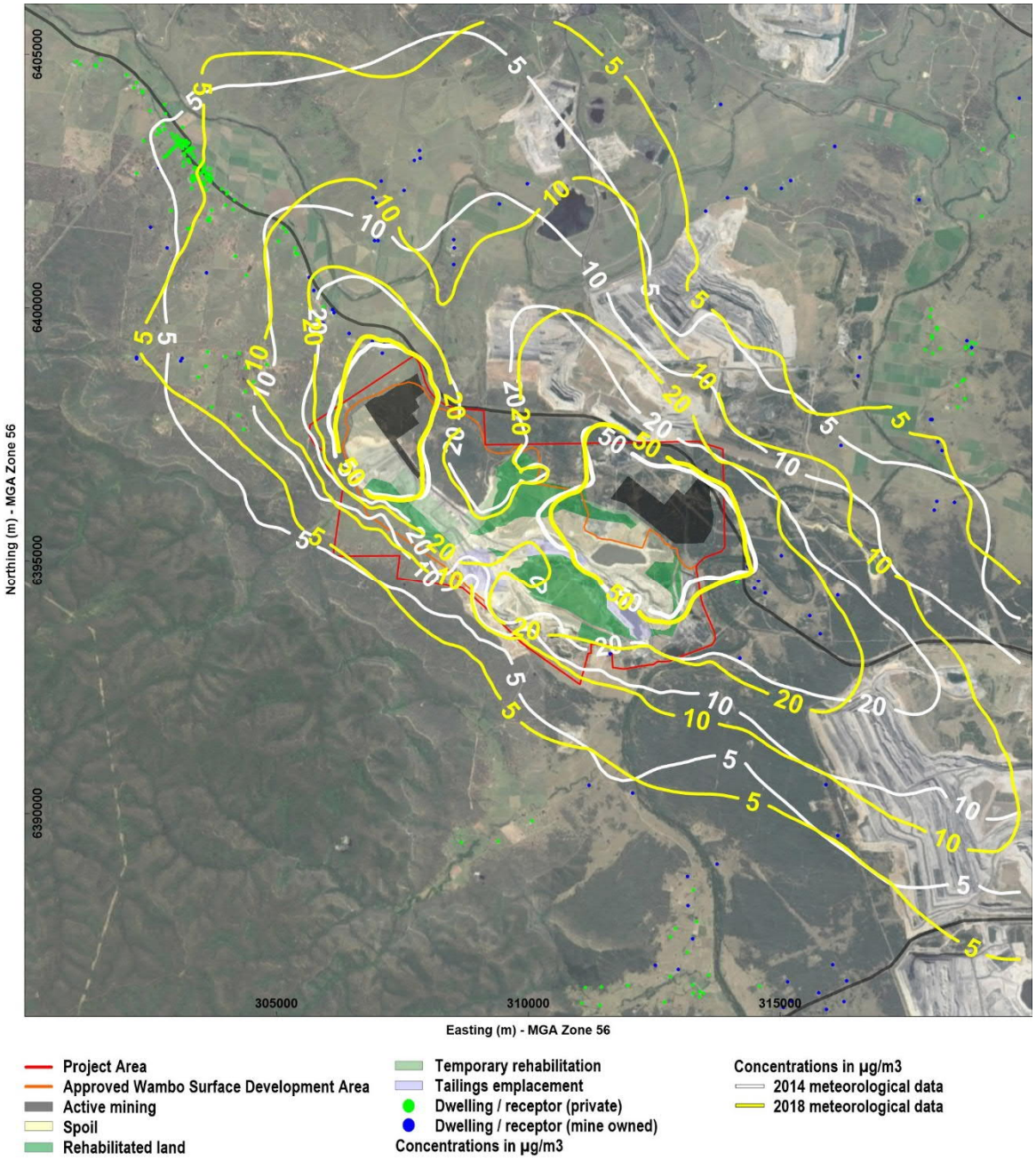


Figure 2 Maximum 24-hour average PM_{10} concentrations due to the Project in Year 2

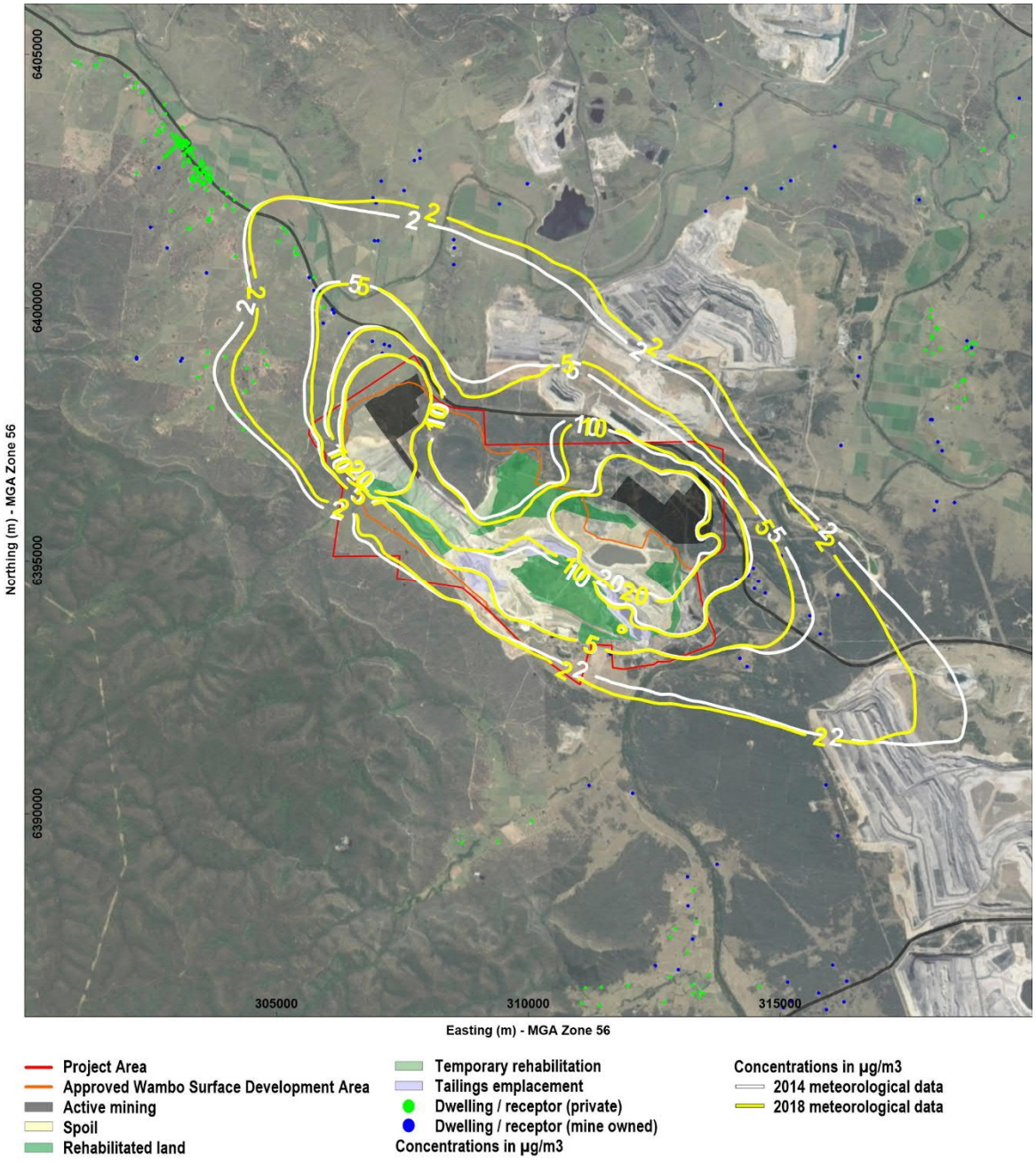


Figure 3 Annual average PM_{10} concentrations due to the Project in Year 2

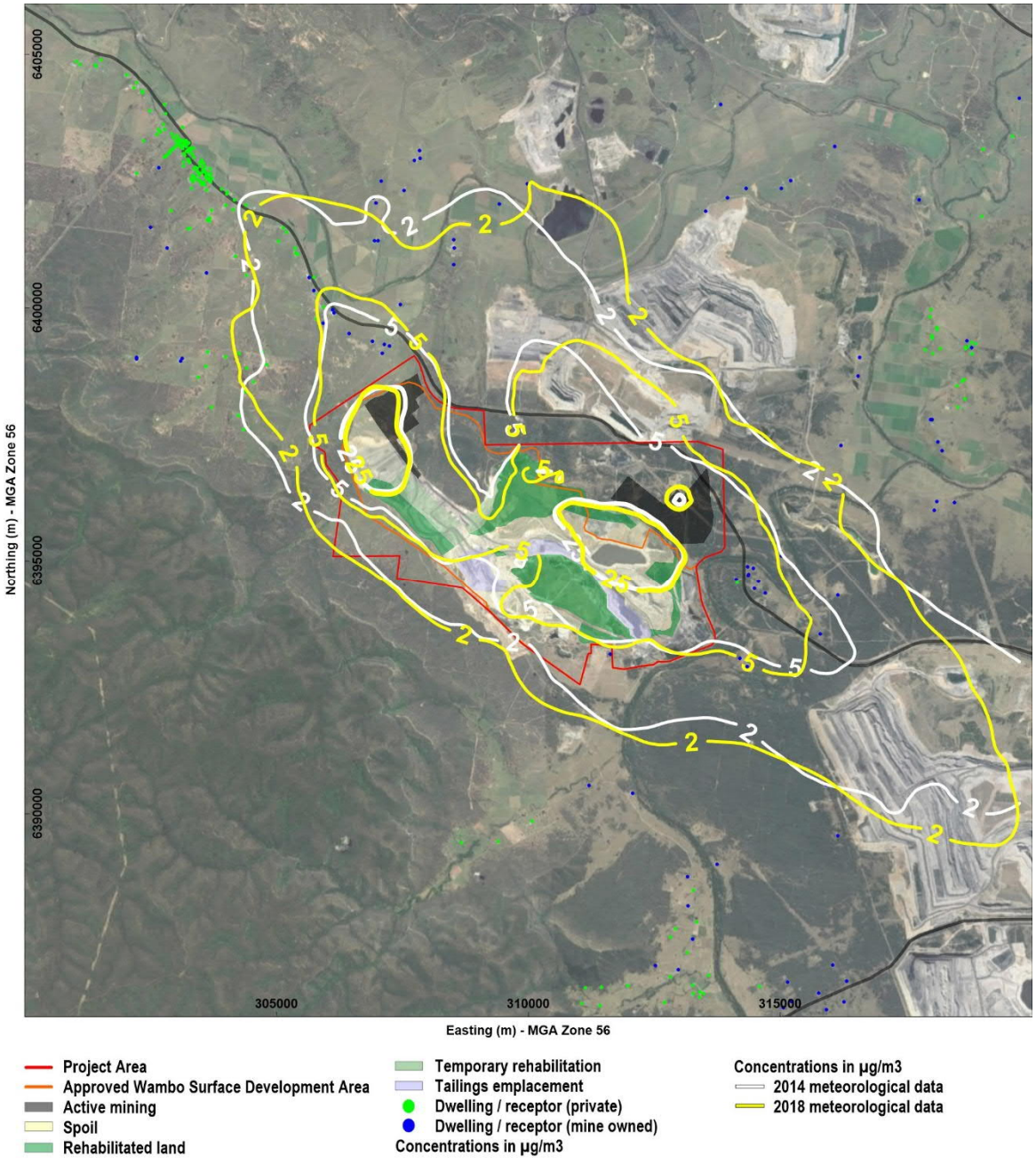


Figure 4 Maximum 24-hour average $PM_{2.5}$ concentrations due to the Project in Year 2

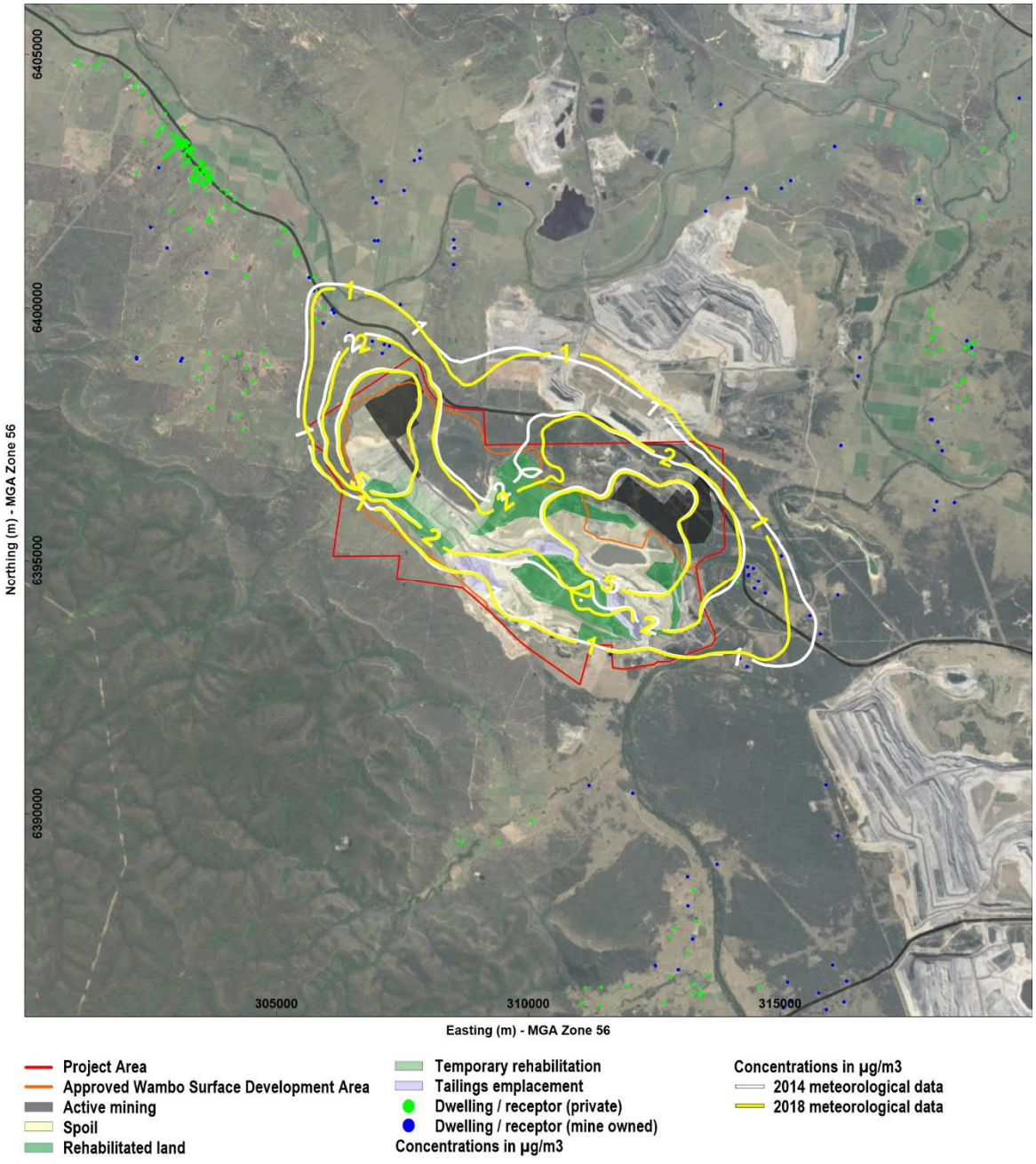


Figure 5 Annual average $PM_{2.5}$ concentrations due to the Project in Year 2

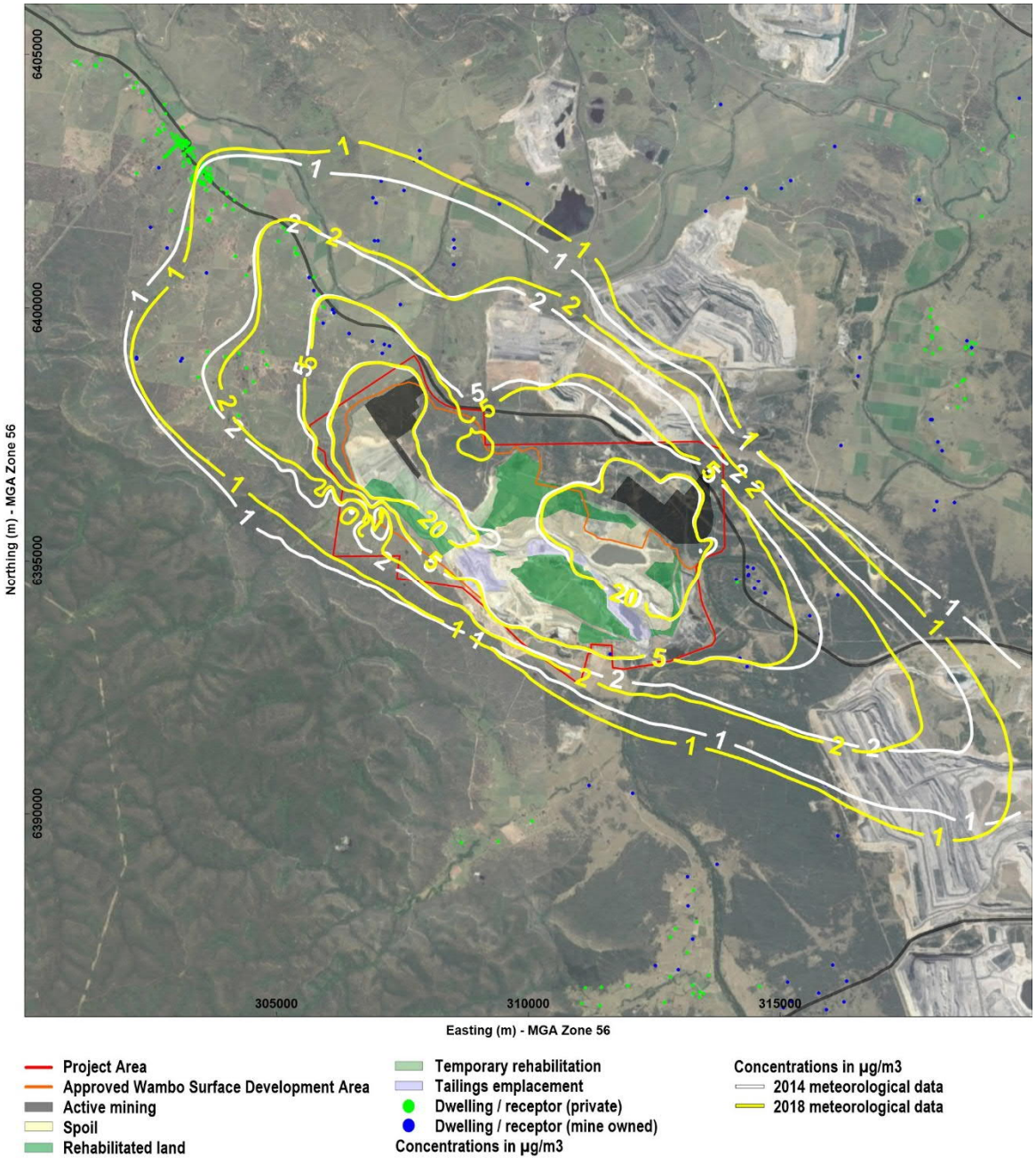


Figure 6 Annual average TSP concentrations due to the Project in Year 2

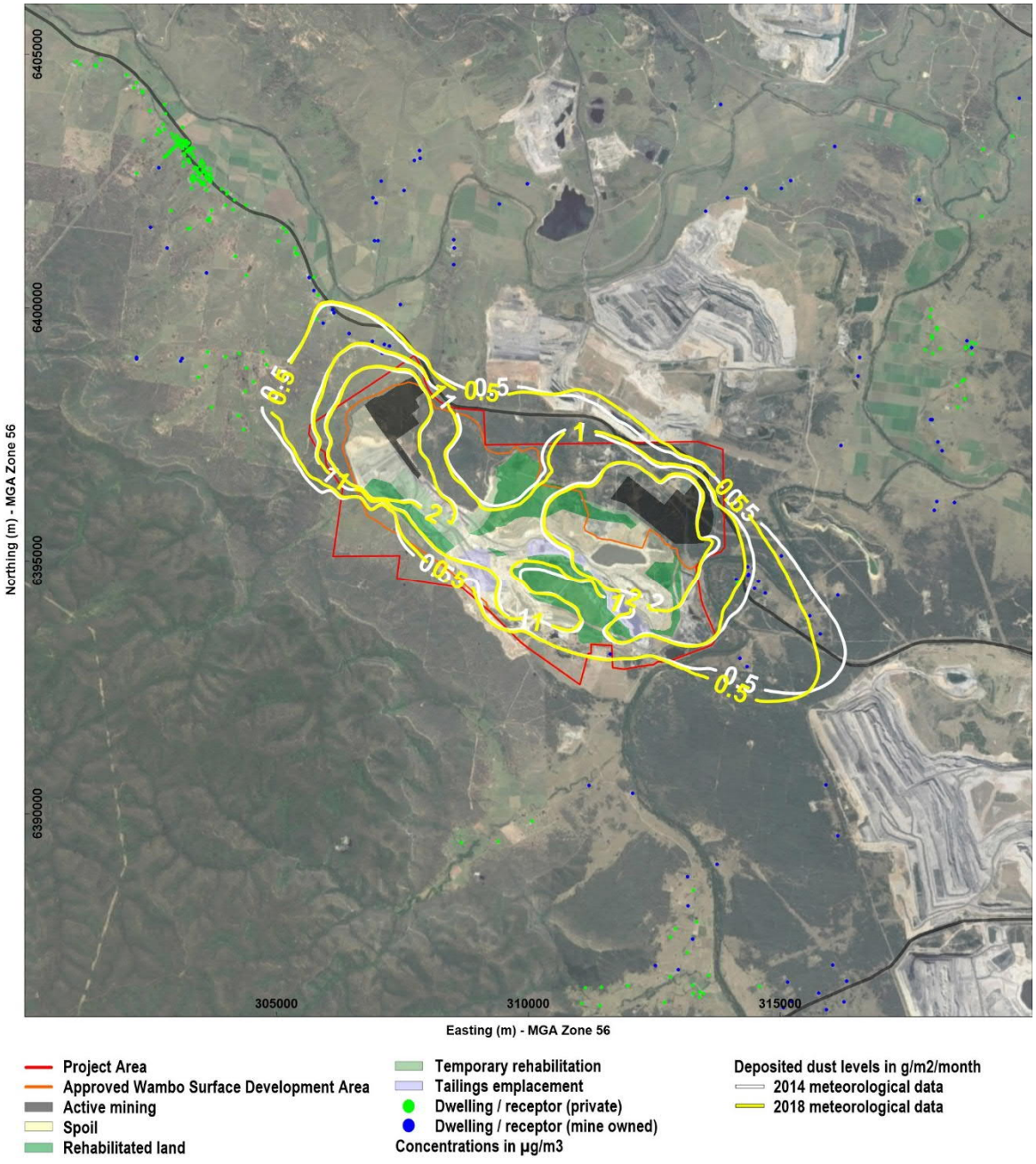


Figure 7 Annual average dust deposition due to the Project in Year 2

Page 3 paragraph 2 referring to the pattern of contours derived from dispersion modelling which states "This is because the plot maximum results at different individual times for each station, rather than all stations at the same time. This is not very realistic."

This point is not clear. As per the Secretary's Environmental Assessment Requirements (SEARs) the air quality investigation has considered the EPA's "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW" (DEC 2005) in addition to the EPA's specific issues to be addressed (see Attachment 2 of the SEARs). The EPA required the assessment to present, among other averaging times, incremental and cumulative maximum 24-hour average concentrations in the vicinity of the Project. These requirements have been addressed by the air quality impact assessments for the Project (refer to Jacobs 2016 and 2018).

It is unclear what A/Prof Bridgman means by "the plot maximum results at different individual times for each station, rather than all stations at the same time". The dispersion models are informed by 3-dimensional meteorological modelling which provides wind fields informed by all surface weather stations for every hour of the selected meteorological year. Model predictions of air quality conditions are made for every hour of the simulation year; that is, the same individual times based on measured meteorological conditions at all weather stations for that hour.

Finally, it is relevant to highlight the process that has been undertaken to derive the necessary information to determine the potential air quality impacts of the Project. Specifically:

- The DP&E, with input from the EPA, specified the assessment requirements for the Project, in the form of SEARs. A detailed air quality impact assessment was therefore carried out with consideration of the, then applicable, "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW" (DEC 2005). This assessment was subject to independent third party peer review on multiple occasions. The peer reviews concluded that the air quality assessment had adequately addressed the SEARs.
- Submissions relating to air quality were addressed in the form of a revised air quality impact assessment which was carried out in accordance with EPA guidelines published after the Project application, namely, "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW" (EPA 2016). The updated EPA guidelines introduced more stringent air quality assessment criteria than were, and still are, applicable to the Project. The DP&E and EPA indicated that this revised assessment had adequately addressed their requirements.

The process above highlights that the air quality related documentation, prepared for the proponent and available to the IPC, has addressed all applicable requirements. This information should be considered as sufficient to determine the potential air quality impacts of the Project.

2. Request of the DP&E from the IPC

The IPC has requested the following from the DP&E:

"Air Quality Operating Conditions - B28(d):

- advise of the anticipated frequency of this condition, including evidence and source of this information?"

Where

"B28. The Applicant must:

(d) minimise the air quality impacts of the development during adverse meteorological conditions and extraordinary events"

The definition and frequency of "adverse meteorological conditions" can be identified from the air quality impact assessment carried out for the Project (Jacobs 2018).

Section 5 of Jacobs (2018) provided a detailed analysis of the existing environment including a review of the meteorological conditions which have historically influenced the local air quality conditions. "Adverse meteorological conditions" have been defined as those conditions which give rise to ambient particulate matter concentrations or deposited dust levels above EPA assessment criteria, based on the historical data. Five years of concurrent ambient air quality and meteorological monitoring data (2011 to 2015) were analysed in order to determine these conditions. The ambient air quality monitoring data were examined for time of year, time of day and wind speed and wind direction relationships.

In summary, the air quality monitoring data showed the following trends:

- There are seasonal variations in particulate matter concentrations, with PM_{10} levels generally higher in spring and $PM_{2.5}$ levels generally higher in winter.
- There are daily variations in particulate matter concentrations, with levels typically highest in the morning and evening.
- The very highest short-term (i.e. hourly averaged) particulate matter concentrations have occurred under both light and strong wind conditions, usually when winds were from the northwest or southeast.

The trends above highlighted that elevated ambient particulate matter concentrations or deposited dust levels could occur under a range of conditions and that there is no specific definition for adverse meteorology. Historical ambient air quality monitoring data have been used to identify the typical number of days that have exceeded a criteria. **Figure 8** shows the number of days each year (for 2011 to 2015) when PM_{10} concentrations exceeded 50 $\mu g/m^3$. The represented number of days include extraordinary events such as bushfires and/or dust storms. These data indicate that, to the northwest and southeast of the Project (i.e. prevailing winds directions) there are typically between zero (0) and eight (8) days each year where ambient air quality (as PM_{10}) has exceeded the EPA criteria.

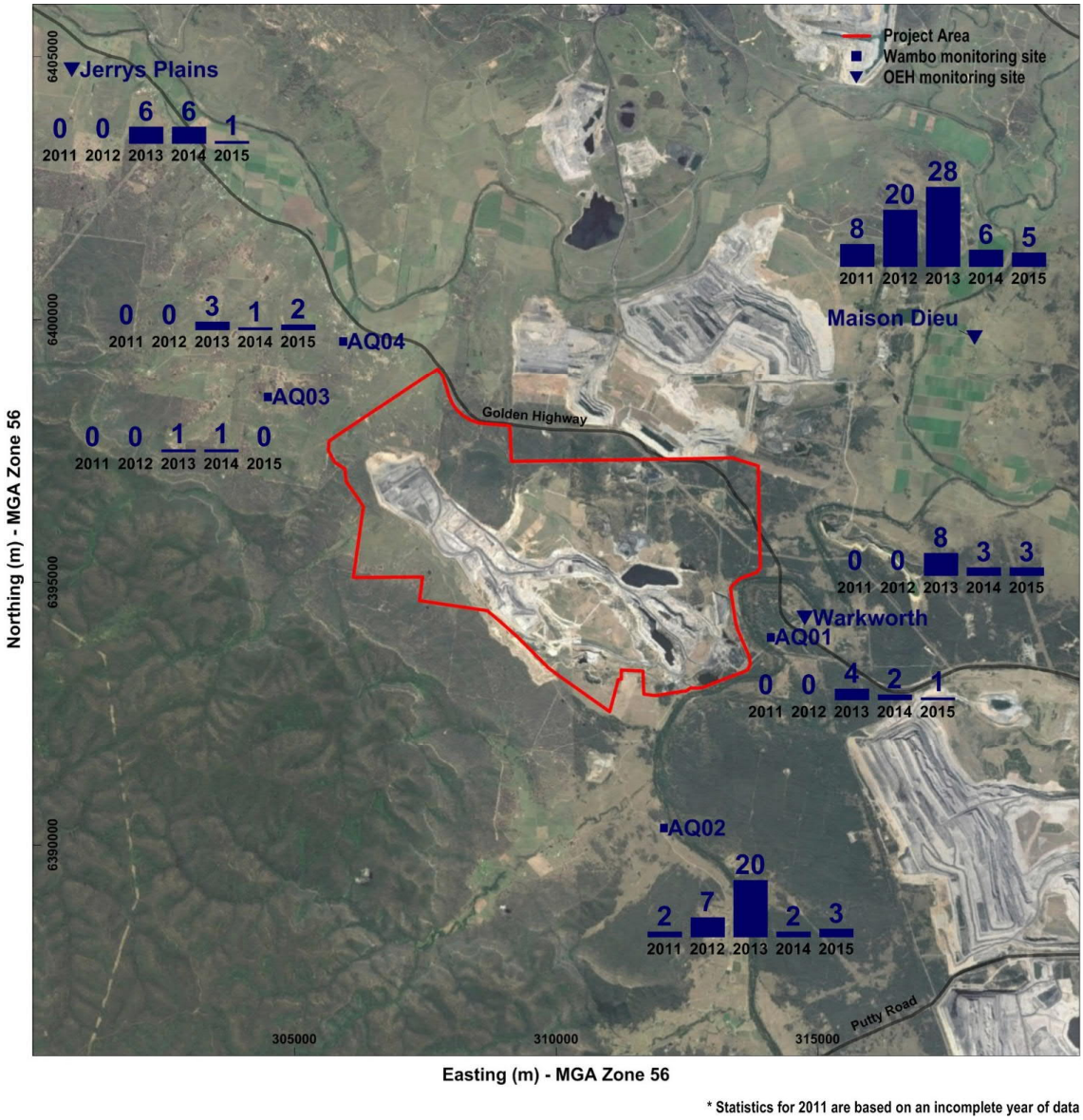


Figure 8 Historical number of days per year above 50 µg/m^3 PM_{10} (days)

The Air Quality Management Plan (AQMP) for the Project will acknowledge these trends in meteorological and ambient air quality conditions and will incorporate both proactive and reactive strategies to minimise impacts under conditions that may lead to elevated ambient particulate matter concentrations or deposited dust levels, however often these may occur.

Proactive and reactive dust control strategies will be adopted by United. Reactive air quality management include the modification or suspension of activities in response to the following triggers:

- Visual conditions, such as visible dust from trucks above wheel height;

- Meteorological conditions, such as dry, windy conditions, with winds blowing towards sensitive receptors; or
- Ambient air quality conditions (that is, elevated short-term PM_{10} concentrations).

Proactive air quality management will involve the discussion and planning of activities in advance of potentially adverse conditions. Specifically, the pro-active air quality management approach will include:

- Implementation of a system to provide environmental personnel with a daily forecast of expected dust conditions in the vicinity of the operation.
- Discussion of the dust forecast at daily pre-shift meetings.
- Modifying the planned mining activities, as appropriate, to minimise or avoid the potential dust impacts.

As part of the AQMP, United will also implement a Dust Management Trigger Action Response Plan (TARP) for the Project. The TARP will define "trigger" levels which require specific, targeted actions for managing dust. Typically the trigger levels include "Normal", "Level 1" and "Level 2" classifications that are, as noted above, determined by either visual, meteorological, ambient air quality, or forecast conditions.

The Wambo meteorological data have been analysed to determine how often the typical Level 1 (wind speed > 6 m/s) and Level 2 (wind speed > 8 m/s) meteorological triggers would have occurred in each of the past eight years. **Table 2** shows these results. It can be seen from this information that, based only on wind speed, there could be on average in the order of 120 days each year when activities will need to be reviewed and/or modified in response to wind conditions. This information provides an indication of the anticipated frequency of Condition B28(d).

Table 2 Number of days when Level 1 or Level 2 triggers would have occurred

Statistic	2011	2012	2013	2014	2015	2016	2017	2018
Number of days when maximum wind speed was >6m/s ("Level 1")	98	113	127	177	127	127	91	115
Number of days when maximum wind speed was >8m/s ("Level 2")	14	20	28	32	24	33	16	18

Finally, the strategies outlined above are best practice within the NSW mining industry, based on evaluations of all proposed measures against Donnelly et el (2010).

3. Issues raised by Non-Government Organisations

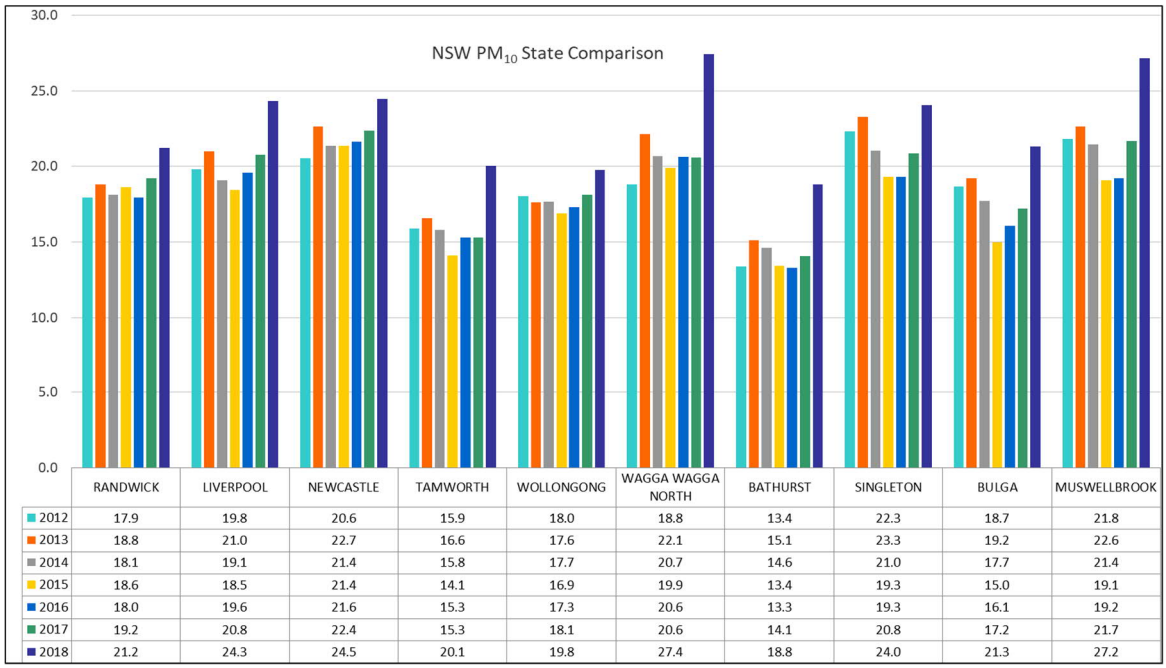
"We had the opportunity to look at the data from last year, and annual air quality average data from several Upper Hunter air quality monitoring stations in close proximity to this project or in proximity to this project actually last year exceeded the annual PM_{10} national standard. I think there was about six of them that are, you know, in the vicinity of this mine that last year recorded annual average PM_{10} levels below the national standard."

"The NEPM guidelines are already being regularly exceeded at all the surrounding regional monitors. This is an indication that the air shed is already saturated with mine dust and any more is far too much."

"In Jerrys Plains last year, there were 11 days over the 24 hour standard and many more than that in places like Camberwell and Mount Thorley and Warkworth, and one of the things that strikes us about the assessment of this project is that the air quality assessment is conducted against the baseline year 2014, and if you have a look at the last six years of data, which is as long as the air quality monitoring network has been functioning in the Upper Hunter, all of the last three years in many locations have had worse average air quality than 2014.

"Certainly last year had much worse air quality than 2014 and it's our contention, really, that the proponent is measuring the impact of this mine on air quality in the Hunter region against a base year that is not the same as the current environment that people are experience."

Higher than long-term average particulate matter concentrations in 2018, compared to previous years, is acknowledged but not unique to the Hunter Valley. This is demonstrated by **Figure 9** below which shows the measured annual average PM_{10} concentrations at various rural and metropolitan locations across NSW.



	RANDWICK	LIVERPOOL	NEWCASTLE	TAMWORTH	WOLLONGONG	WAGGA WAGGA NORTH	BATHURST	SINGLETON	BULGA	MUSWELLBROOK
2012	17.9	19.8	20.6	15.9	18.0	18.8	13.4	22.3	18.7	21.8
2013	18.8	21.0	22.7	16.6	17.6	22.1	15.1	23.3	19.2	22.6
2014	18.1	19.1	21.4	15.8	17.7	20.7	14.6	21.0	17.7	21.4
2015	18.6	18.5	21.4	14.1	16.9	19.9	13.4	19.3	15.0	19.1
2016	18.0	19.6	21.6	15.3	17.3	20.6	13.3	19.3	16.1	19.2
2017	19.2	20.8	22.4	15.3	18.1	20.6	14.1	20.8	17.2	21.7
2018	21.2	24.3	24.5	20.1	19.8	27.4	18.8	24.0	21.3	27.2

Figure 9 Measured annual average PM_{10} concentrations at various rural and metropolitan locations across NSW

The monitoring data from **Figure 9** show that PM_{10} concentrations were higher in 2018 than in all previous years for all the listed rural and metropolitan locations, including at the main NEPM-defined "performance monitoring stations" in the Hunter Valley, namely, Singleton and Muswellbrook. That is, the higher particulate matter concentrations in 2018 were not unique to the Hunter Valley. The higher than average PM_{10} concentrations have been influenced by lower than average rainfall (across NSW) from late 2017 through 2018 and an increased frequency of regional events such as dust storms which occurred across many parts of NSW.

The data from **Figure 9** also show that air quality in the Hunter Valley is not dissimilar to air quality at other regional and metropolitan locations, with the exception of Bathurst which has historically measured generally lower average PM_{10} concentrations than other OEH monitoring sites. Note that including results from multiple monitoring sites located within reasonably close proximity (such as all other monitors in the OEH Upper Hunter air quality monitoring network) is not appropriate for this comparison. This comparison, and outcome, should be determined from data collected at "performance monitoring stations" as per the NEPM.

Finally, the data from **Figure 9** show that conditions in 2014 were, from an air quality perspective, close to the typical environment that people experience in the Hunter Valley. This conclusion is based on 2014 PM_{10} concentrations that were almost identical to the long term averages from all available data.

> *"The cumulative load of nitrogen dioxide being released into the airshed on a daily basis has not been clearly assessed. This is a major failing of the air quality assessment."*

Potential cumulative impacts of nitrogen dioxide (NO_2) were identified by adding the predicted maximum NO_2 conditions due to the Project to the measured maximum NO_2 concentrations in the Hunter Valley. This is a conservative approach as the maximum NO_2 contributions from the Project are unlikely to occur at the same time that the maximum measured NO_2 concentrations. Therefore the cumulative impacts will be over-estimated. This assessment was carried out in accordance with the EPA's "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW" (EPA 2016) and showed that the Project will not cause exceedances of EPA criteria for NO_2. Full details of this cumulative NO_2 assessment can be found in Sections 8.5 and 8.7.2 of Jacobs (2018).

> *"It is very difficult to accept the finding for this proposal that the new air quality assessment using the updated NEPM standards has not materially changed the level of air quality impacts. This finding is contradicted in the department's response to the review recommendation 20 that identifies that the new assessment has raised the number of impacted mine owned properties from 22 to 41. This is a substantial increase in the number of air quality exceedances and demonstrates a clear increase in cumulative impacts when the new standards are applied."*

The conclusions of the most recent air quality assessment of the Project (Jacobs 2018) did not change as a result of the EPA's updated impact assessment criteria (derived from the NEPM Standards). These conclusions were made in respect to private sensitive receptors. The number of potentially impacted mine owned properties did increase as a result of applying the more stringent assessment criteria, as noted by the DP&E. The mine owned properties are closer to the Project than the private sensitive receptors.

Yours sincerely

Shane Lakmaker
Principal (Air Quality)

References

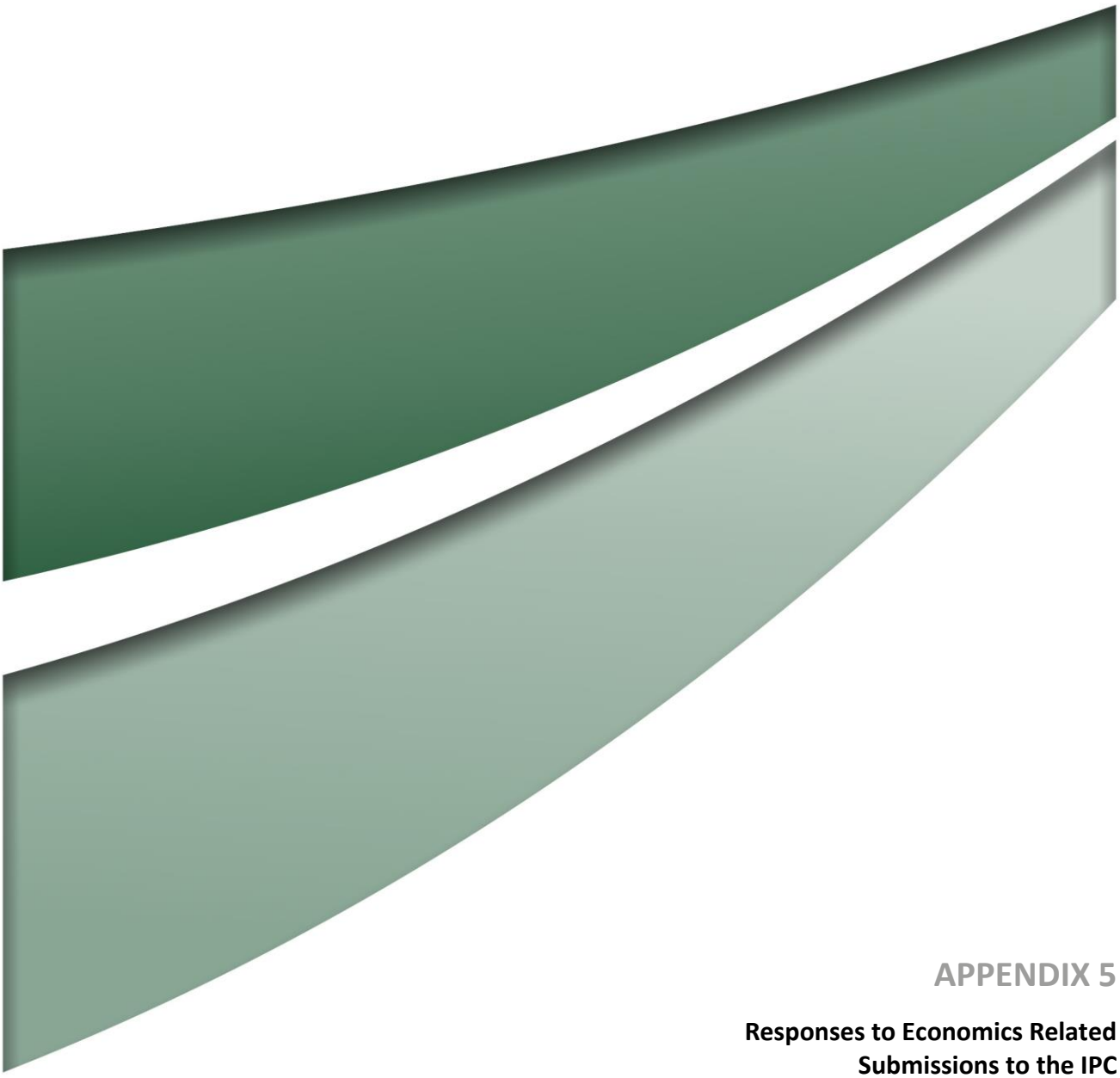
DEC (2005) “Approved Methods for the Modelling and Assessment of Air Pollutants in NSW”. Published by the DEC (now EPA), August 2005.

Donnelly S-J, Balch A, Wiebe A, Shaw N, Welchman S, Schloss A, Castillo E, Henville K, Vernon A and Planner J (2010) “NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and / or Minimise Emissions of Particulate Matter from Coal Mining”. Prepared by Katestone Environmental Pty Ltd for NSW Office of Environment and Heritage, December 2010.

EPA (2016) “Approved Methods for the Modelling and Assessment of Air Pollutants in NSW”. Published by the Environment Protection Authority, 2016.

Jacobs (2016) “United Wambo Open Cut Coal Mine Project - Air Quality Impact Assessment”. Dated 13 July 2016.

Jacobs (2018) “United Wambo Open Cut Coal Mine Project - Air Quality Impact Assessment for Independent Planning Commission”. Dated 2 July 2018.



APPENDIX 5

Responses to Economics Related Submissions to the IPC

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Response to comments by The Australia Institute

4 April 2019

Deloitte Access Economics has reviewed the submission to the Independent Planning Commission made by Rod Campbell on behalf of The Australia Institute (TAI) and have also reviewed the transcript of proceedings dated 5 February 2019.

As requested by United Collieries, we have responded in this document to five matters in TAI's submission that are relevant to the economic assessment of United and Wambo Open Cut Coal Mine Project undertaken in 2016 by Deloitte Access Economics[1]. Those five matters are: use of relevant guidelines and adequacy of approach to assessment, coal demand forecasts and prices, cost of filling in mine voids, company tax calculation, and biodiversity impacts.

In undertaking this review we reference our Economic Assessment report dated July 2016 and the submission made by TAI to the Independent Planning Commission dated February 2019.

In general, TAI's commentary does not focus directly on the content of the economic assessment, but looks at broader concerns relating to the international and domestic coal market. Potential changes in these markets and their implications for the project are outside the scope of a cost-benefit analysis (CBA) and are not covered in the relevant NSW guidelines.

We have not found any factually incorrect statements made by TAI relating to Deloitte Access Economics' analysis and the reported dollar values are accurate.

Use of relevant guidelines and adequacy of assessment

Deloitte Access Economics' assessment was undertaken in accordance with relevant guidelines put in place by the NSW Government for cost benefit analysis and also for the economic assessment of mining projects. In particular, the following guidelines were used in preparing the report:

- NSW Treasury (2007) "NSW Government Guidelines for Economic Appraisal"
- NSW Government (2015) "Guidelines for the economic assessment of mining and coal seam gas proposals".

Since completion of the economic analysis, Treasury has issued a new guideline for undertaking cost benefit analysis but the nature of requirements in both guidelines are similar. A full account of the requirements of these guidelines is given in Appendix A of our report and the relevant requirements are cross-referenced against sections of the report.

Appendix A of the report demonstrates that the economic assessment addresses all requirements of the NSW Government and does so using standard and accepted methodologies.

[1] Economic Assessment of the United and Wambo Open Cut Coal Mine Project' (2016).

We note that our economic analysis was subject to an independent peer review undertaken by the Centre for International Economics (CIE) with the overall finding that the economic assessment was "undertaken in a manner that is broadly consistent with the 2015 NSW Government Guidelines for conducting mining related applications"[2]. The CIE also supported the overall conclusion of our analysis that the economic benefits of the Project are likely to exceed the economic costs of the project.

A number of questions regarding the approach were raised by stakeholders throughout the submissions process and were formally addressed in the response to submissions from 25 January 2017[3].

Coal demand forecasts and prices

A major consideration in TAI's submission is a review of historical demand patterns for Australian coal exports with the major point being that the volume of thermal coal exported has been fairly stable since 2014-15.

Coal demand forecasts are not directly incorporated into the economic assessment, as a market analysis of global coal demand is beyond the scope of economic assessments. The economic assessment is based on the Project being able to sell its output at market prices. The Project involves production of up to 10 Mtpa of ROM coal which means that the Project would account for at most around 4% of ROM coal production in NSW.[4]

Whether or not it is possible for the Project to successfully sell to the market is a commercial matter for the proponent. Further, the ability to sell output for a particular project is not directly linked to the overall volume of coal exports from Australia – rather it is likely to be more closely related to the commercial relationships, marketing, logistics and quality of product produced by the proponent as part of the Project.

Coal demand is indirectly considered within the CBA via coal prices. In periods of low demand, prices are likely to be lower than in periods of high demand.

The potential for a decline in the coal price since the economic assessment was considered in the response to submissions in 2017. The assessment was undertaken using benchmark prices from Consensus Economics in March 2016 adjusted to reflect the quality of coal produced by the Project. The Consensus benchmark thermal export price was around A$89.7/tonne in the long run and, depending on the coal product, prices in the assessment ranged from around A$80/tonne to around A$105/tonne in the long run.

The economic analysis included sensitivity testing of a potential 30% increase in coal price forecasts and a 20% decrease. Under both of these sensitivity analyses the Project was found to deliver net benefits to the NSW community.

[2] CIE (2016) Peer review of economic assessment: United Wambo Open Cut Coal Mine Project, Prepared for NSW Department of Planning and Environment, October.
[3] 'Response to Submissions on the Economic Assessment' (2017).
[4] NSW Government (2017) "The Coal Chain", https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/air/the-coal-chain.pdf

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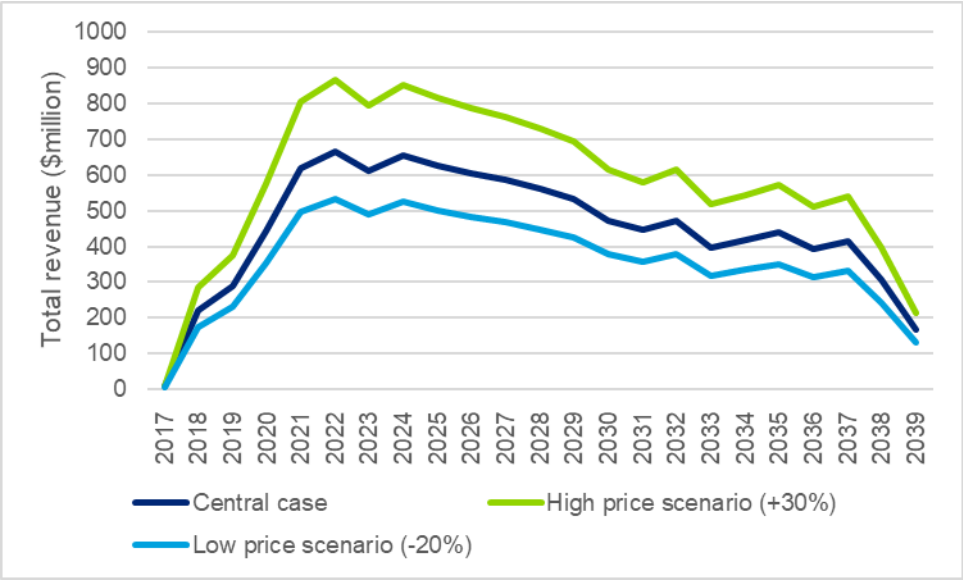
Chart i: Total saleable revenue under different thermal coal price scenarios, 2017-2039, real $2016 million



Source: Deloitte Access Economics.

Recent Consensus forecasts (November 2018) are for long run benchmark prices of around US$69/tonne for both contract and spot markets or A$96/tonne at current exchange rates. This suggests that current long term forecasts are around 7% higher than at the time of the original economic assessment.

As current forecasts are within the range of the sensitivity analysis we do not consider it beneficial to update the economic assessment for current coal price forecasts.

Costs of filling in mine voids

TAI provide analysis of net producer surplus after filling in the mine void. TAI argue that, when using a discount rate of 7%, the net producer surplus remains positive even after accounting for filling in mine voids.

We broadly agree with the TAI's suggestion that dollar values based on different discount rates should not be added together. It is also the case that costs and benefits presented in real dollar terms should not be considered alongside numbers presented in nominal dollar terms and vice versa for numbers presented in nominal dollar terms.

Company tax calculations

TAI argue that the company tax calculations in the economic assessment do not take into account actual tax payments by the proponents.

This issue was previously addressed in the response to submissions by noting that a sensitivity analysis considered potential changes in company tax paid. The results found that if the company tax rate was decreased by 50%, the project would still deliver net benefits to NSW of $381 million assuming a 7% discount rate. Further, the peer review by the CIE included an analysis assuming no benefits relating to company tax and found that the Project continues to deliver net benefits for NSW.[5]

[5] CIE above n2.

We note that TAI do not accurately represent the approach used by Deloitte Access Economics to calculate company tax payable. In the economic assessment we apply a 30% corporate tax rate, as the marginal tax rate, to an estimate of taxable income in each year. Taxable income was estimated as gross mining revenue less total costs (inclusive of FOB costs, rehabilitation and decommissioning costs, environmental mitigation costs and property acquisition costs), royalties and depreciation. Calculations of annual income tax payable also took into account tax losses accrued by the project. The approach taken suggests an effective tax rate of 26% on profits, which is similar to other estimates. For instance, average effective tax rates of 23% and around 26% for the mining sector have been estimated by Clark et al. (2011)[6] and Davidson (2015) [7] respectively.

Biodiversity impacts

TAI identify that the economic assessment assumes that biodiversity offsets perfectly offset any damage costs. This issue has been previously addressed in the response to submissions. The assessment has been prepared on the basis that an offset strategy that meets government requirements will be implemented for the Project. An estimate of offset costs was included in the operational costs of the CBA. On this basis, it is considered that biodiversity has been appropriately considered in the assessment. Further, it is not considered that quantifying these impacts would have a significant impact on the net benefits to NSW.

[6] Clark J, Greagg P & Leaver A (2011) Average rates of company tax across industries revisited, http://www.treasury.gov.au/PublicationsAndMedia/Publications/2011/Economic-Roundup-Issue-2/Report/Average-rates-of-company-tax-across-industries-revisited

[7] Davidson S (2015) Official evidence on mining taxes: 2015 update, http://www.minerals.org.au/file_upload/files/publications/Official_evidence_on_mining_taxes_2015_Update_SDavidson_May_2015.pdf

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Limitation of our work

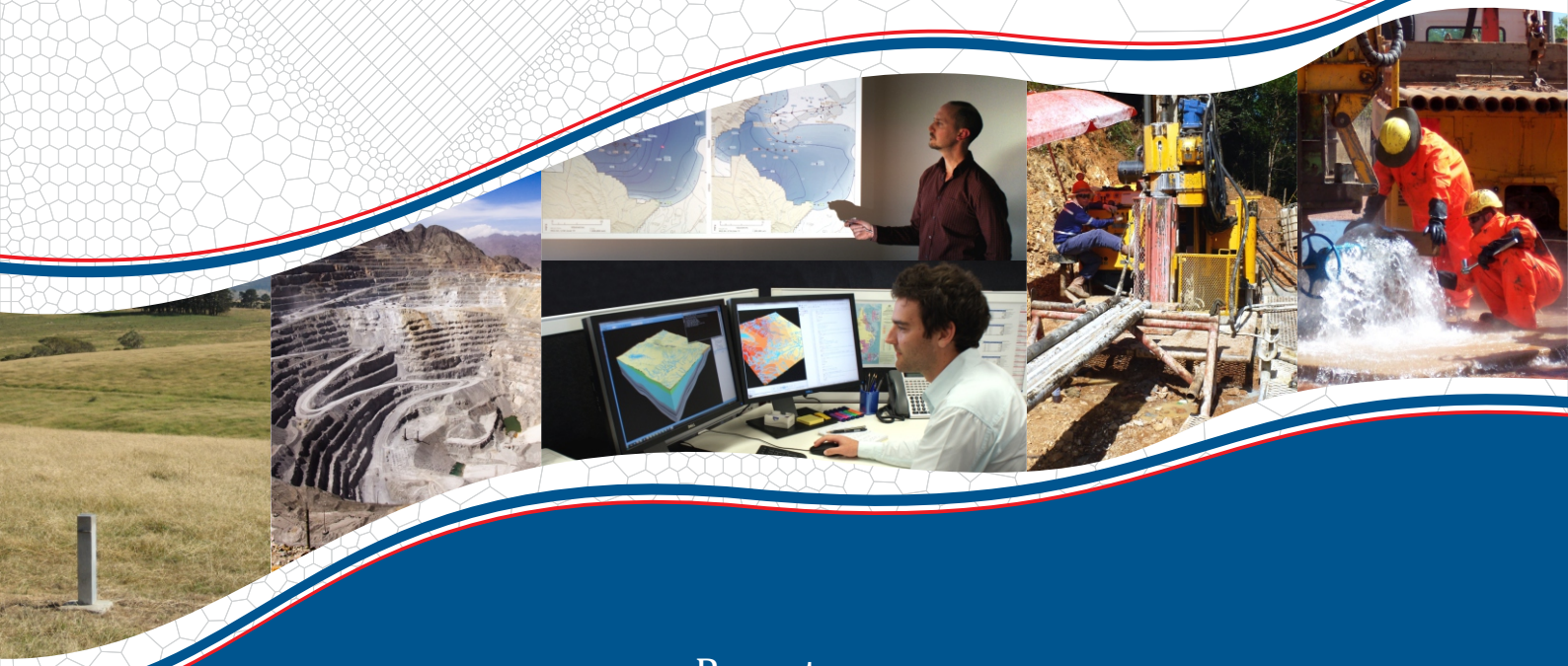
General use restriction

This report is prepared for United Collieries Pty Ltd as proponent for the United Wambo Open Cut Coal Mine Project. The report has been prepared for the purpose of assisting United Collieries in formulating its response to the NSW Government on the recent submission made by The Australian Institute (TAI) to the Independent Planning Commission on the United Wambo Open Cut Coal Mine Project. You should not refer to or use our name or the advice for any other purpose. This report is not intended to and should not be used or relied upon by anyone else and we accept no duty of care to any other person or entity.

APPENDIX 6

Final Landform Groundwater Modelling

Australasian Groundwater and
Environmental Consultants Pty Ltd



Report on

United Wambo Open Cut Coal Mine Project Final Landform Modelling IPC Response

Prepared for
Glencore Coal Pty Limited

Project No. G1733G April 2019
www.ageconsultants.com.au ABN 64 080 238 642

Document details and history

Document details

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v03.04	Draft for client comment	PD/JST	JST	25/02/2019
v04.01	Draft for client comment	JST	JST	11/03/2019
v04.02	Final	PD/JST	JST	29/03/2019
v04.03	04.02 + additional edit to Table 2 (re F. Kalf)	PD/JST	JST	10/04/2019
V04.04	04.03 + addressed comments (re J. Hinks)	PD/JST	JST	11/04/2019

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Report on

United Wambo Open Cut Coal Mine Project
Final Landform Modelling – IPC response

1 Introduction

United Collieries Pty Limited (United) and Wambo Coal Pty Limited (Wambo) operate neighbouring mining operations located approximately 16 kilometres west of Singleton in the Hunter Valley region of New South Wales (NSW). Under a Joint Venture arrangement, United and Wambo propose to develop the United Wambo Open Cut Coal Mine Project (the Project) which will involve combining the existing open cut operations at Wambo with a proposed new open cut coal mine at United.

The Project is a State Significant Development as defined under State Environmental Planning Policy (State and Regional Development) 2011 and requires development consent under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The Project also requires a modification to the existing Wambo development consents.

An Environmental Impact Statement (EIS) including a groundwater assessment prepared by Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) was submitted in 2016. In 2018 the New South Wales Independent Planning Commission (IPC) requested further information on the impact of backfilling the proposed residual open voids associated with the Project. AGE was commissioned to assess the impact on the groundwater regime of backfilling the proposed open voids using numerical modelling, and a report was prepared documenting the modelling outcomes (AGE, 2018). This report describes additional modelling scenarios designed to assess other backfill options including backfilling the Wambo void only and leaving the United void open.

2 Objectives and scope of work

During the project briefing on 6th of December 2018 the IPC requested the: *"…proponent's view on the most desirable environmental outcome in relation to the Wambo void, setting aside economic (and other) considerations…"* To address this request, United prepared a conceptual final landform that represented the Wambo void as backfilled and the United void as open. United then engaged AGE to assess groundwater impacts associated with backfilling of the Wambo void. This report outlines the results of this modelling and compares the model predictions to the impacts predicted for the other scenarios where the two voids remain open and where both voids are backfilled.

3 Methodology

Post mining conditions for the EIS were simulated using a numerical model that was developed and calibrated to predict impacts from the proposed mine development and cumulative impacts. A full description of the numerical model is provided in Appendix B of the groundwater impact assessment (AGE, 2016).

The United and Wambo coal mining operations were established in 1989 and the late 1960's, respectively. There have been a range of underground and open cut coal mining operations at both mines since that time. The AGE (2016) numerical model represents the already approved open cut and underground mining activities, as well as the proposed Project. The Project involves a revised final landform, which includes final voids within the United and Wambo open cuts. The voids will replace the two currently approved voids located within the Wambo Open Cut.

The numerical model was used to assess the impact of backfilling the final voids in Wambo and/or United pits. Three model scenarios were utilised to achieve this as follows:

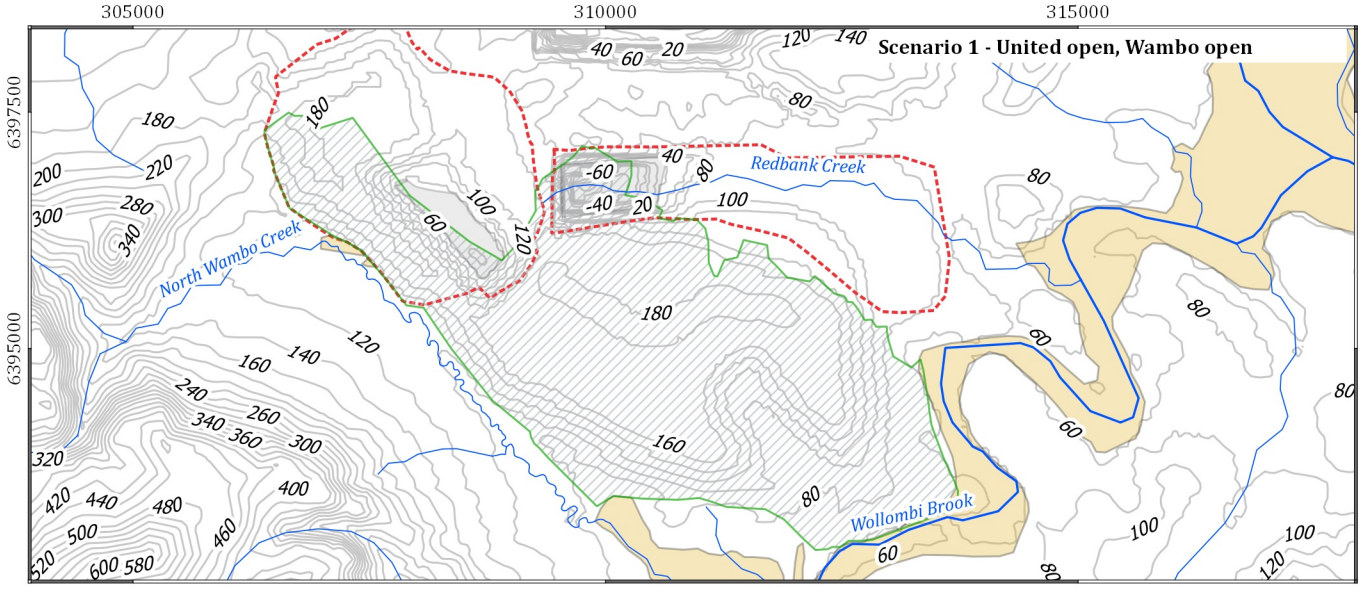
- *Scenario 1* – both Wambo and United voids remain open and form pit lakes– identical to AGE (2016);
- *Scenario 2* – both voids backfilled – as described by AGE (2018); and
- *Scenario 3* – Wambo void backfilled, United void open – focus of this report.

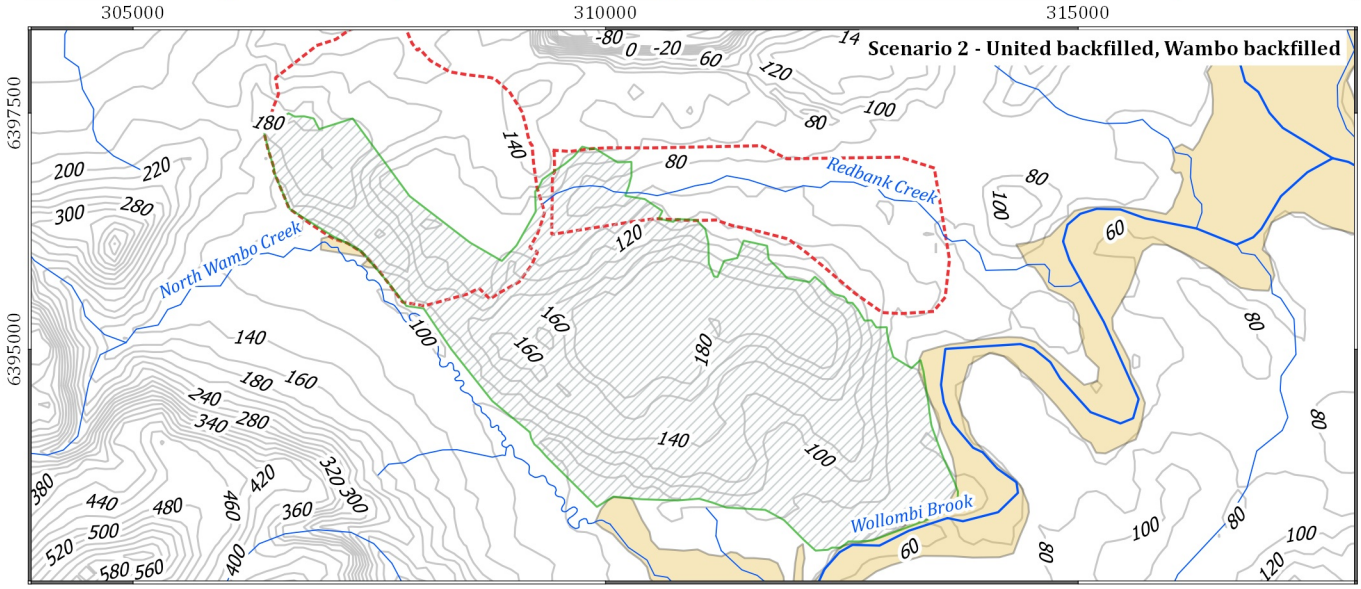
From the numerical model perspective, the main differences between scenarios was the elevation of the final landform surface, and the specified head which represented the equilibrated water level within the final void lake(s) (depending of the scenario). A summary of these conditions is presented in Table 1. The terrain of the final landform for each scenario is presented in Figure 3.1.

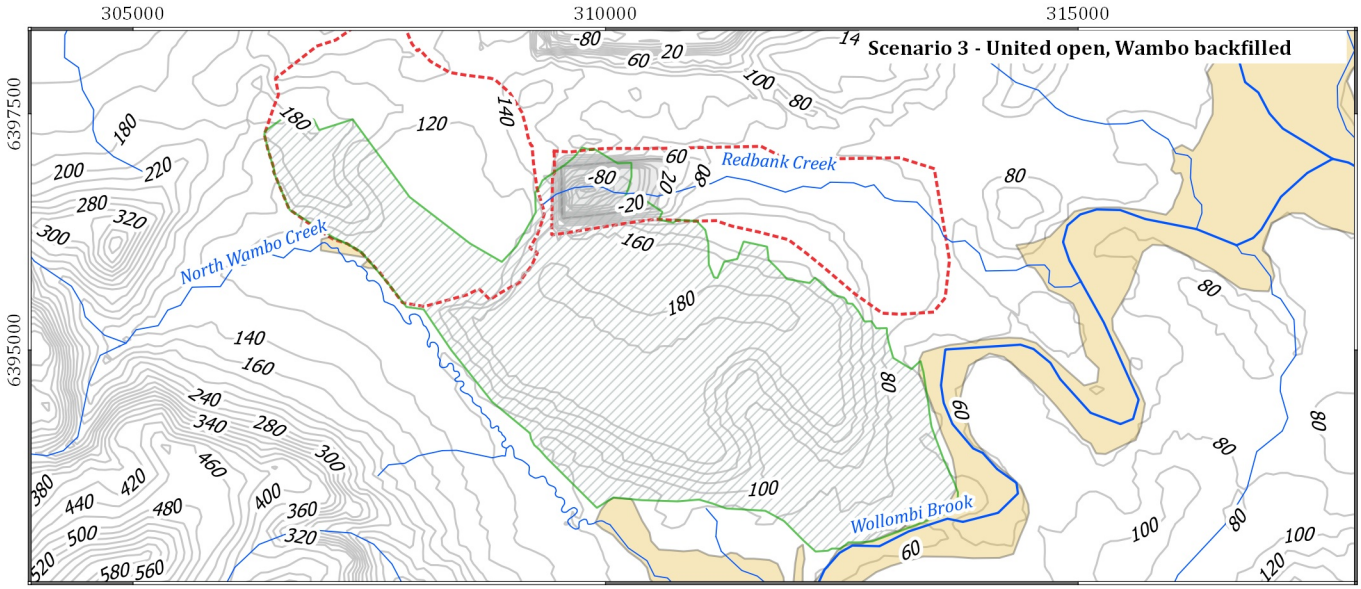
Table 1 - Summary of modelling scenarios

Scenario	Minimum elevation of the pit/void floor		Defined recovery water level 1000 years post mining	
	United (m RL)	Wambo (m RL)	United (m RL)	Wambo (m RL)
Scenario 1 – both voids open	-144	43	19	55
Scenario 2 – both voids backfilled	75	80	n/a	n/a
Scenario 3 – Wambo backfilled	-144	110	19	n/a

Note: *n/a – recovery water table not defined and left to be calculated by model*







GDA94, Zone 56
1:80,000

1 0 1 2 km

LEGEND

- alluvium
- proposed final void lake
- pit backfill outline
- Existing mine disturbance area
- topographic surface

Wambo and United - final lanform modelling (G1733G)

Final landform - Scenarios 1-3

DATE 11/04/2019

FIGURE No: **3.1**

Source: 1 second SRTM Derived DEM-S - © Commonwealth of Australia (Geoscience Australia) 2011.; GEODATA TOPO 250K Series 3 - © Commonwealth of Australia (Geoscience Australia) 2006.;
G:\Projects\G1733.United\3_GIS\Workspaces\G1733G - United void options\02.01_G1733G_Final landform scenarios 1-3.qgs

4 Model predictions

4.1 Predicted final void water levels

Post mining recovery conditions were simulated over a period of 1000 years using groundwater levels from the end of mining as the starting heads. For each scenario the model indicates the water levels gradually rise post mining until they establish a new equilibrium. The predicted rise in water levels within the United and Wambo Open Cut is shown in Figure 4.1 and in Table 2.

The final void water level predicted for the United Open Cut is the same for both Scenario 1 and Scenario 3 because the void remains open in both cases. Note the blue line depicting the Scenario 1 water level is not shown on the graph because it is the same as Scenario 3. The figure shows that when United void is backfilled it rises more slowly over time to reach an equilibrium level of 46 m RL.

When the Wambo Open Cut remains open the model represents the water levels remaining at 55 mRL as previously indicated in the EIS. When the final landform surface includes backfilled Wambo void, the model predicts the spoils will slowly saturate and the groundwater level will rise to between 80 and 83 mRL.

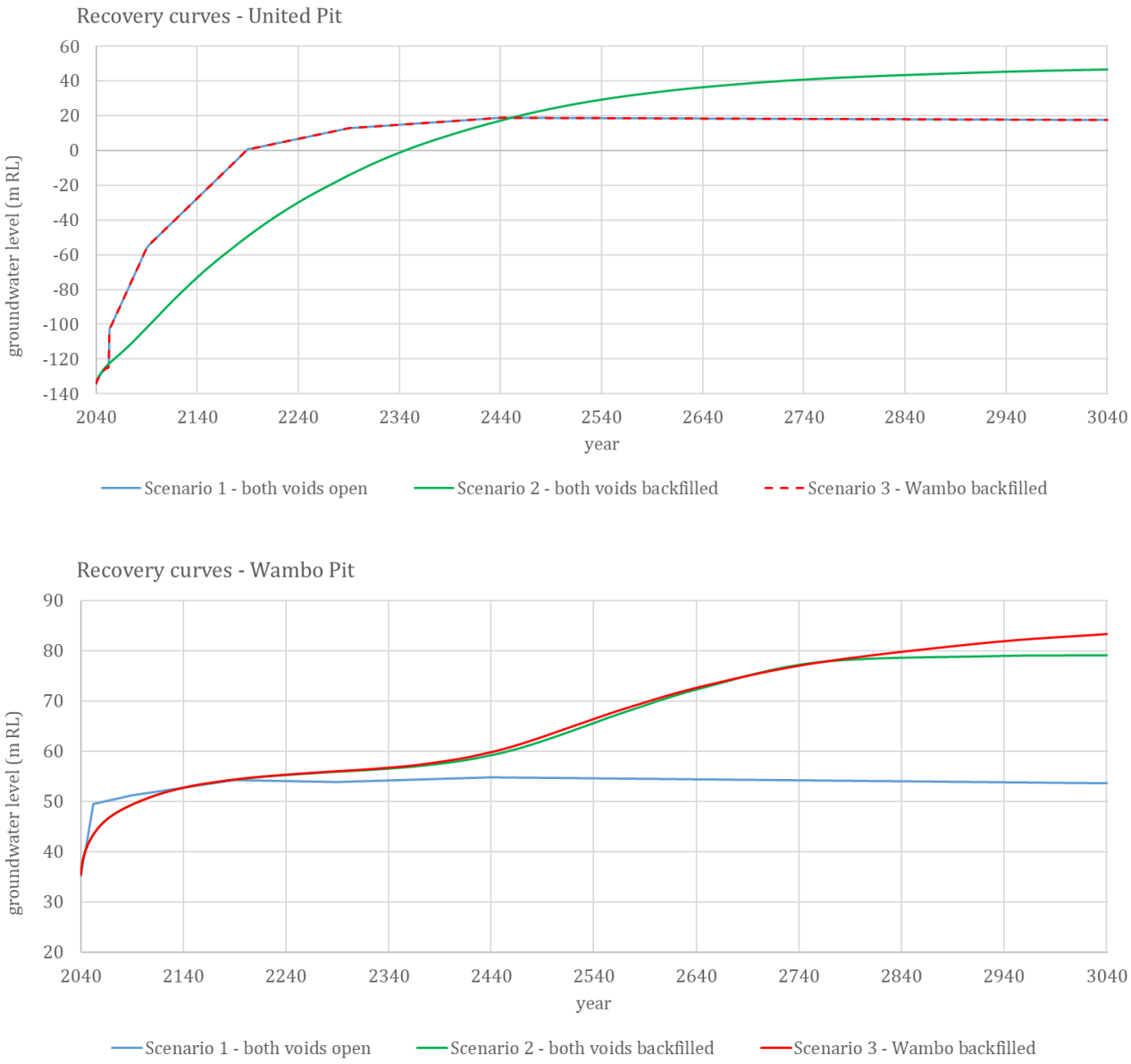


Figure 4.1 Recovery curves –United and Wambo Open Cut

Table 2 – Groundwater levels in final voids 1000 years post mining

Scenario	United (m RL)	Wambo (m RL)
Scenario 1 – both voids open	19	55
Scenario 2 – both voids backfilled	46	80
Scenario 3 – Wambo backfilled	19	83[1]

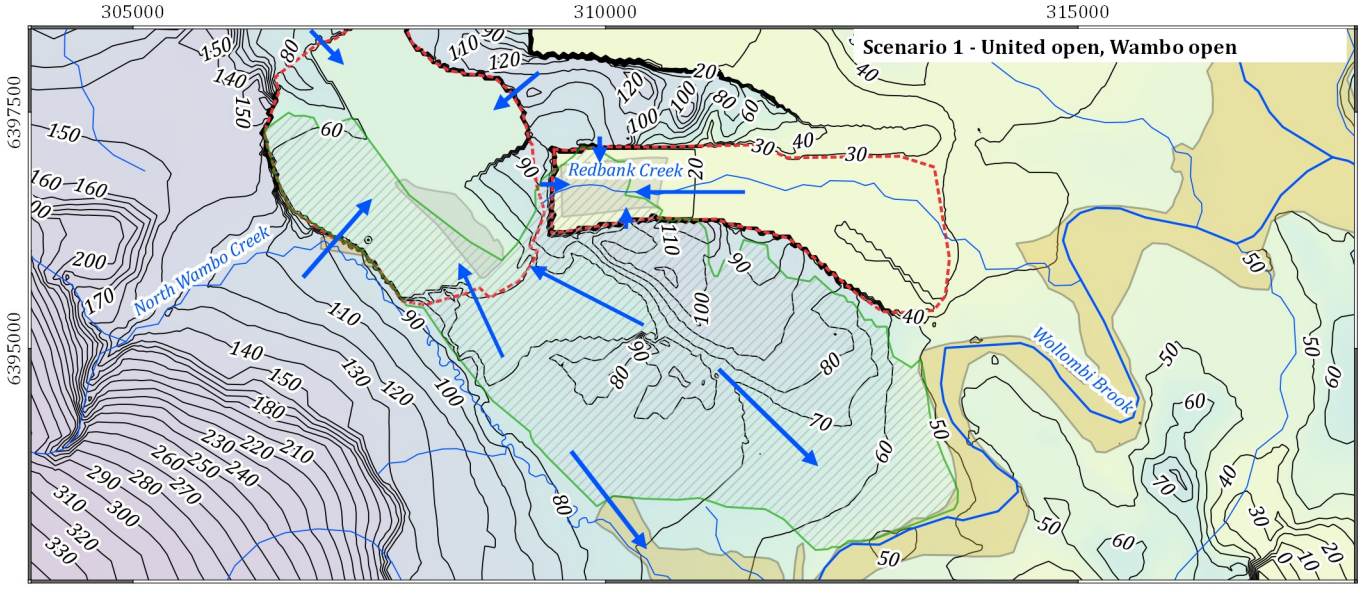
Note: *1 – whilst Wambo void is backfilled in both scenario 2 and 3, differences in the shape of the landform result in slightly differing recovered water levels*

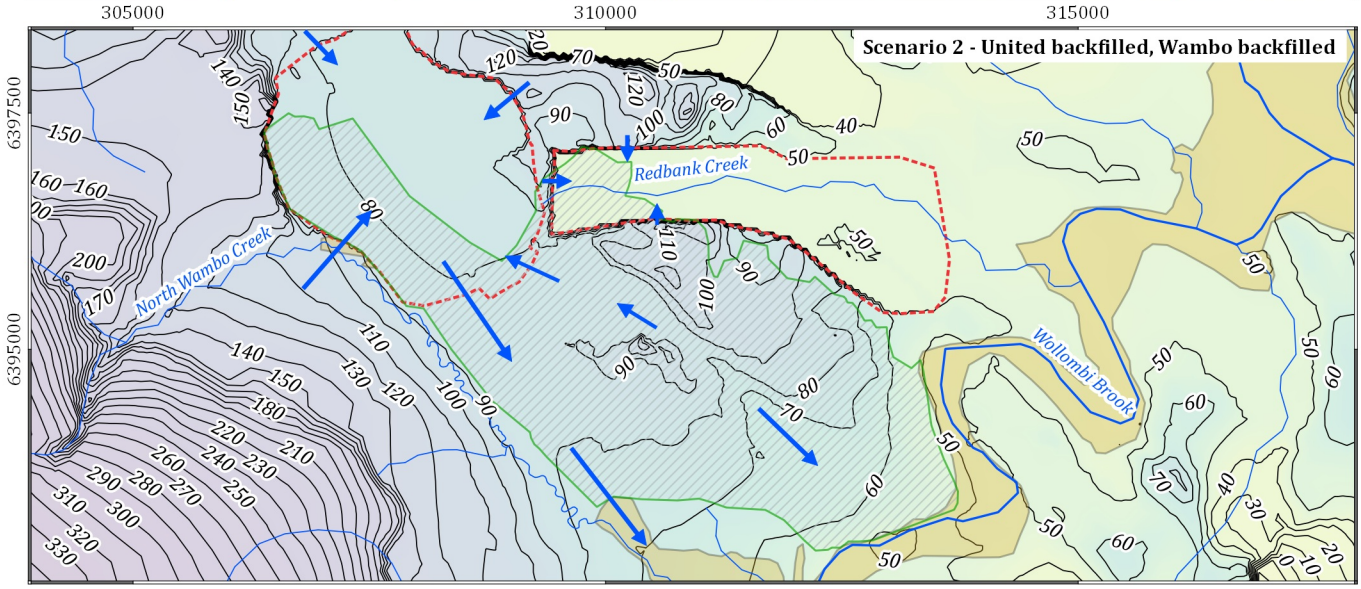
4.2 Post mining water table surface

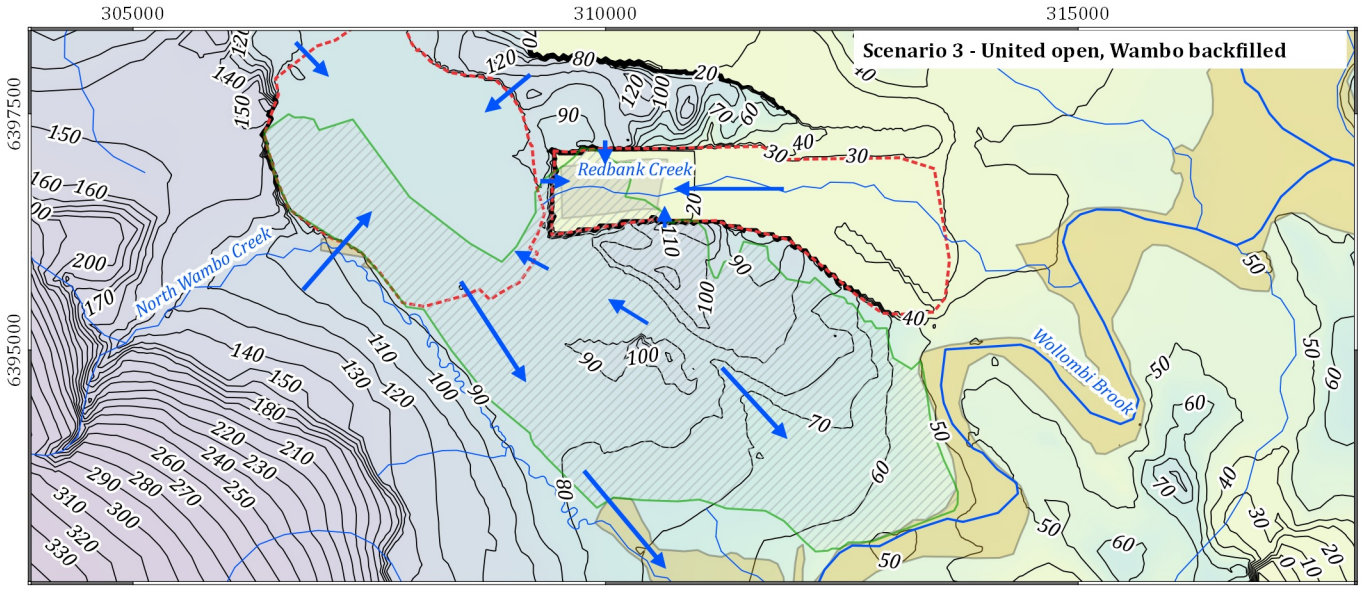
The equilibrated groundwater table 1000 years post mining was extracted from the model and is shown for each scenario in Figure 4.2. Arrows showing the inferred groundwater flow directions for each scenario are also presented on the figure.

The figure highlights that if the Wambo void is not backfilled, the evaporation from the void lake depresses the level of the lake surface. The depressed lake level creates a hydraulic gradient in the surrounding water table towards the void lake, conditions sometimes referred to as a hydraulic 'sink'.

If the Wambo Open Cut is backfilled the evaporative sink effect does not occur, and the model indicates groundwater levels will rise to an elevation of about 80 m RL. This means that the water table in the backfilled Wambo Open Cut is higher than water levels in North Wambo Creek alluvium. This hydraulic gradient causes the groundwater to flow from the backfilled Wambo Open Cut towards the lower lying areas at North Wambo Creek.







GDA94, Zone 56
1:80,000

1 0 1 2 km

LEGEND

- alluvium
- Existing mine disturbance area
- proposed final void lake
- direction of groundwater flow
- pit backfill outline
- water level contour

Wambo and United - final lanform modelling (G1733G)

Groundwater levels 1000 years post mining

DATE 11/04/2019

FIGURE No: 4.2

Source: 1 second SRTM Derived DEM-S - © Commonwealth of Australia (Geoscience Australia) 2011.; GEODATA TOPO 250K Series 3 - © Commonwealth of Australia (Geoscience Australia) 2006.;
G:\Projects\G1733.United\3_GIS\Workspaces\G1733G - United void options\02.01_G1733G_Final landform scenarios 1-3.qgs

4.3 Water levels – North Wambo Creek alluvium

The model was used to determine the potential for rising water levels within the North Wambo Creek alluvium downstream from the mined area (location: 309492m east, 6393949m north). Figure 4.3 shows the predicted groundwater levels at the downstream point. The figure shows that when the Wambo void is backfilled there is increased flow to the North Wambo Creek alluvium, with the model indicating the potential for water levels to rise above the natural topographic surface. Whilst the potential for rising water level is not necessarily an environmental risk, the contribution of water from spoils to the alluvium has the potential to increase salinity.

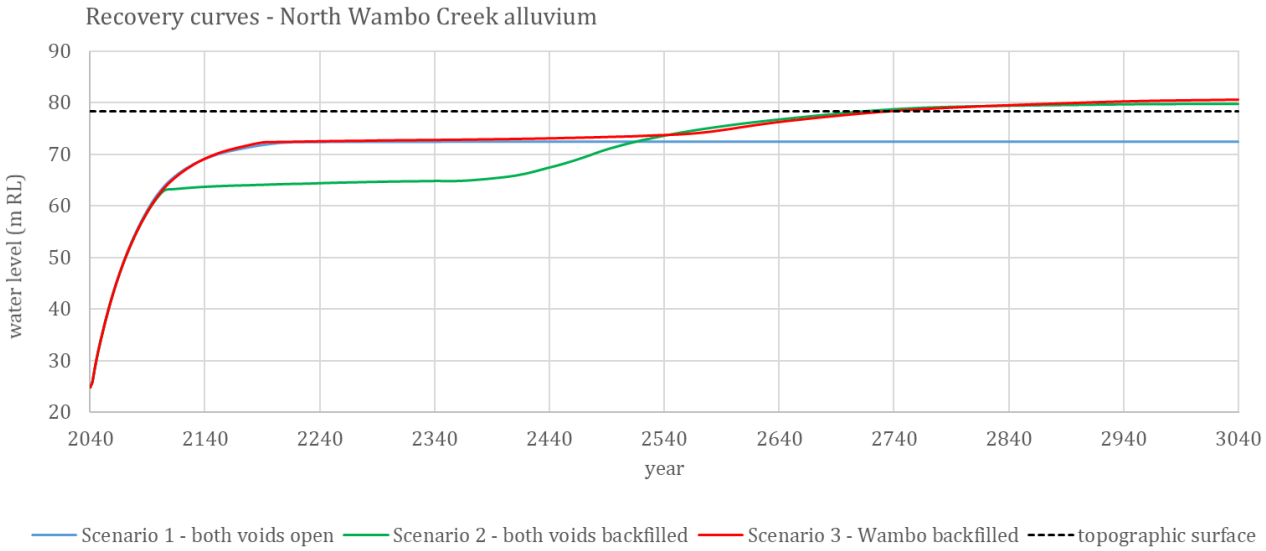


Figure 4.3 Recovery curves – North Wambo Creek alluvium

5 Risk analysis

The work described above indicates that all three scenarios considered for the final landform have the potential to have unwanted environmental outcomes. If open voids remain they are expected to promote concentration of salt within the pit lakes, whereas if the voids are backfilled the salts within the spoil material used to backfill the mining areas will move into the surrounding environment. To try and better understand the magnitude of the environmental risks for each scenario a qualitative risk analysis was undertaken. The risk analysis used the risk matrix and process described in the Preliminary Environmental Assessment for the Project. Table 3 summarises the consequence, likelihood and risk determined for each scenario. The risk analysis suggested that the backfilling options present a higher risk to the alluvial and surface water receptors than does the residual open voids due to the potential discharge of groundwater with a salinity higher than background levels.

Table 3 – Risk analysis summary

Potential Impact	Status and proposed control	Risk assessment		
		Consequence	Likelihood	Risk and score
Movement of salt via groundwater to alluvial and surface water receptors	Scenario 1 – United and Wambo voids will form a sink with salinity increasing over time.	1 – Negligible – inward hydraulic gradient will prevent outflow of pit lake water	D – Unlikely	Low (2)
	Scenario 2 – Permanent pit lakes will not form and salinity will not accumulate in voids.	3-4 – Moderate to major – groundwater will move through mined spoils to lower lying alluvial groundwater systems and creeks downstream	A – Almost certain	High (20-23)
	Senario 3 – The United void will form a sink with salinity increasing over time, whilst the Wambo void will be backfilled.	3-4 – Minor to major – inward hydraulic gradient will prevent outflow of some pit like water only locally around United void, but groundwater in Wambo spoils will move to lower lying alluvial groundwater systems and creeks downstream.	A – Almost certain	Moderate to High (16-23)

6 Conclusions

A numerical groundwater flow model developed for the Project was used to assess the impact of other options for treatment of the final landform including backfilling the Wambo Open Cut only and backfilling both the Wambo and United Open Cut. The modelling indicates when residual open cut areas remain within the final landform, the lakes that form are water table windows that create an 'evaporative pumping effect', drawing in groundwater from the surrounding overburden emplacements. This creates a low point or a 'sink' within the water table and reduces the potential for groundwater that has come into contact with the spoil emplacements from moving towards lower lying areas where alluvial groundwater systems and connected streams are present.

The two scenarios representing backfilling of Wambo Open Cut and both Wambo and United Open Cut both resulted in higher groundwater levels within the overburden emplacements, which promoted additional flow of groundwater towards the lower lying areas where alluvial groundwater systems and connected streams are present. A risks analysis concluded the backfilling options presented a higher risk to the surrounding water resources than the option to retain residual open voids.

7 References

Australasian Groundwater and Environmental Consultants Pty Ltd, 2016. "*United Wambo Open-Cut Coal Mine Project - Groundwater Impact Assessment*". Prepared for Umwelt Australia Pty Ltd. Project No. G1733. July 2016.

Australasian Groundwater and Environmental Consultants Pty Ltd, 2018. "*United Wambo Open-Cut Coal Mine Project – Final Landform Modelling*". Prepared for Umwelt Australia Pty Ltd. Project No. G1733F. July 2018.

Geoterra, 2017. "*United Wambo Open-Cut Coal Mine Project – Waste Rock / Tailings Geochemical Characterisation and Acid and Metalliferous Drainage Assessment*". Warkworth, NSW. UNi2-R1A. February 2017.

Mackie C.D., 2009, "*Hydrogeological Characterisation of Coal Measures and Overview of Impacts of Coal Mining on Groundwater Systems in the Upper Hunter Valley of NSW*", thesis for PhD in Groundwater Management – Faculty of Science, University of Technology, Sydney, January 2009.

Umwelt (Australia) Pty Ltd, 2017. "*United Wambo Open-Cut Coal Mine Project – Response to Request for Further Information. Final".* Prepared for United Collieries Pty Ltd. R22/Final. September 2017.

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12 April 2019

Attn: Kirsty Davies
Senior Environmental Consultant
Umwelt (Aust) Pty Ltd, Teralba, NSW 2284

United Wambo Open Cut
Final Landform AGE Modelling
KA Peer Review

Background

In March 2019 Kirsty Davies, Senior Environmental Consultant at Umwelt (Aust.) Pty Ltd, sent Kalf and Associates Pty Ltd (KA) a request to conduct a peer review of an Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) Assessment report for the Wambo and United voids.

The scope of the review was to be conducted by KA as proposed in an email by K. Davies as follows:

- *review the submissions to the IPC regarding the backfilling of the final voids, including the current draft submission for background*
- *participate in a teleconference with AGE to discuss the additional modelling work undertaken for the reports and the results*
- *provide a draft report and teleconference to review with Project team and AGE*
- *provide a short letter report that will be attached to the current draft submission.*

As background KA was supplied with the following updated document:

> AGE 2019, United Wambo Open Cut Coal Mine Project – Final Landform Modelling – IPC response. Project No. G1733G, March.

This report includes a modelled scenario reported on in the EIS for a case where both the Wambo and United open cut pits would remain as open (i.e. not back filled), but also for the case where both pits were backfilled. In addition it also includes the

case where the Wambo pit is backfilled and the United pit remains open.

KA Peer Review of the AGE 2019 report

AGE has provided a suitable modelling simulation and description of the three post-mining completion cases.

The report covers the background, objectives, methodology and model water level predictions of the sites including water quality aspects. It also covers the environmental consequences as modelled in the report for the three cases considered with appropriate conclusions. In particular the AGE report deals with post mining influenced flow between the Permian strata and alluvial groundwater systems including the probable recovery of water levels in alluvium associated with North Wambo Creek and Wollombi Brook.

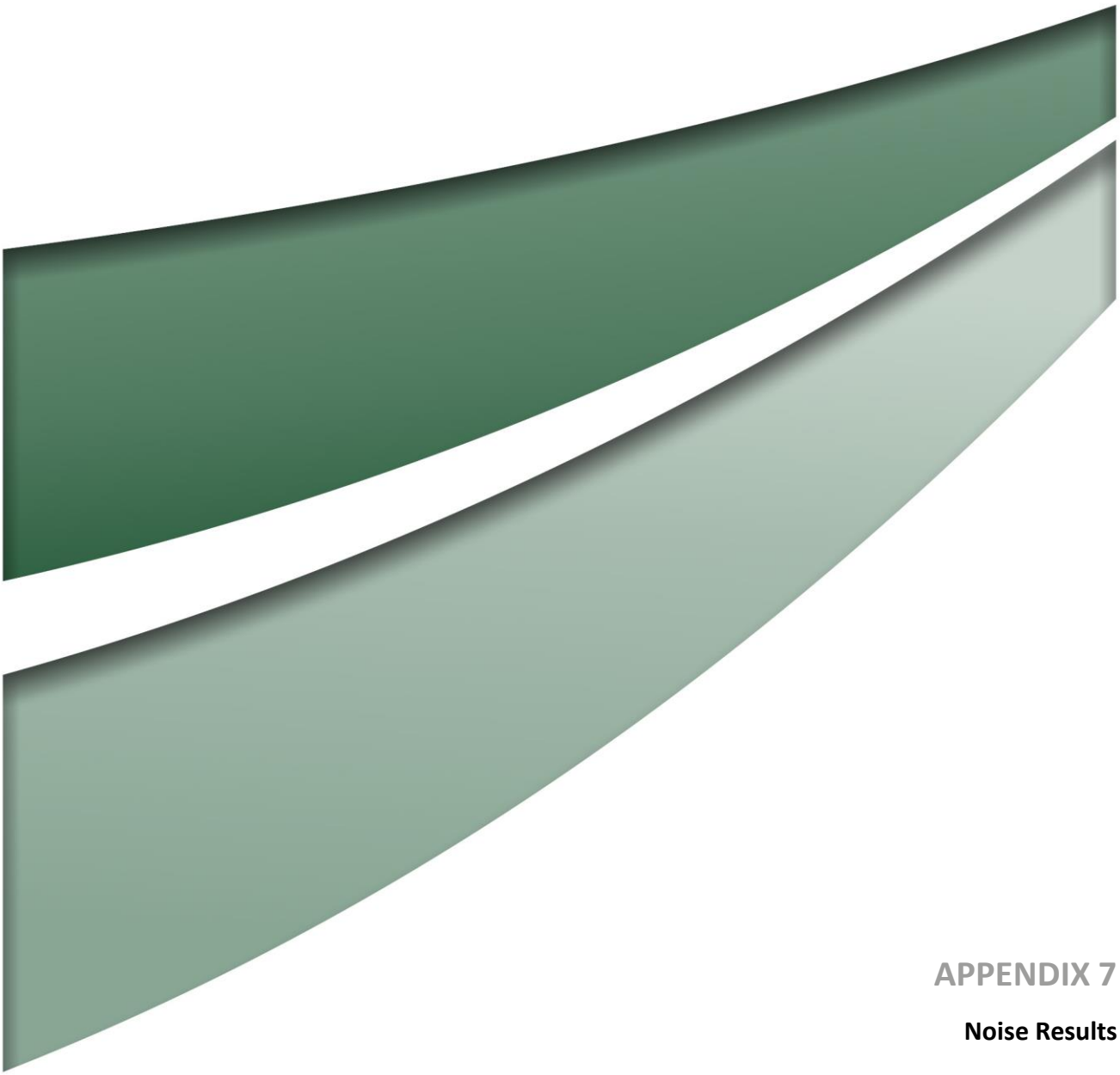
Based on the modelling conducted by AGE for the open void case, water levels in both voids would recover but remain below the surrounding groundwater levels. Hence under these conditions there would be no escape of ultimately high salinity ponded water or groundwater (i.e. there would always be groundwater inflow towards and into the voids) and hence no environmental consequences of escaping water/groundwater to adjacent strata, surrounding landscape, or North Wambo Creek and Wollombi Brook.

For the case where both voids are backfilled, or where Wambo pit is backfilled and United pit remains open, groundwater levels would recover at both pit sites. Where both pits are backfilled and where only Wambo pit is backfilled these pit groundwater levels would lie above the exterior groundwater levels. This would be due to the nature of the pit infill sediments of somewhat higher permeability, associated rainfall infiltration and consequent lateral seepage of groundwater and subsequent migration of salinity solute into the surrounding landscape and North Wambo Creek.

Based on a risk analysis matrix by AGE (2019) it has been concluded that there would therefore be a high risk of salinity solute migration to North Wambo Creek for the cases where both pits are backfilled or where Wambo pit is backfilled and United pit remains open.

Under these circumstances, and the Aquifer Interference Policy (AIP) required conditions of limited salinity increase exterior to the pits, the most acceptable option would be for both voids to remain open. KA is therefore in agreement with this conclusion based on the data, modelling and analysis conducted by AGE.

Dr F. Kalf
B.Sc. M.App.Sc. Cert. Eng. Hydrology, Ph D.



APPENDIX 7

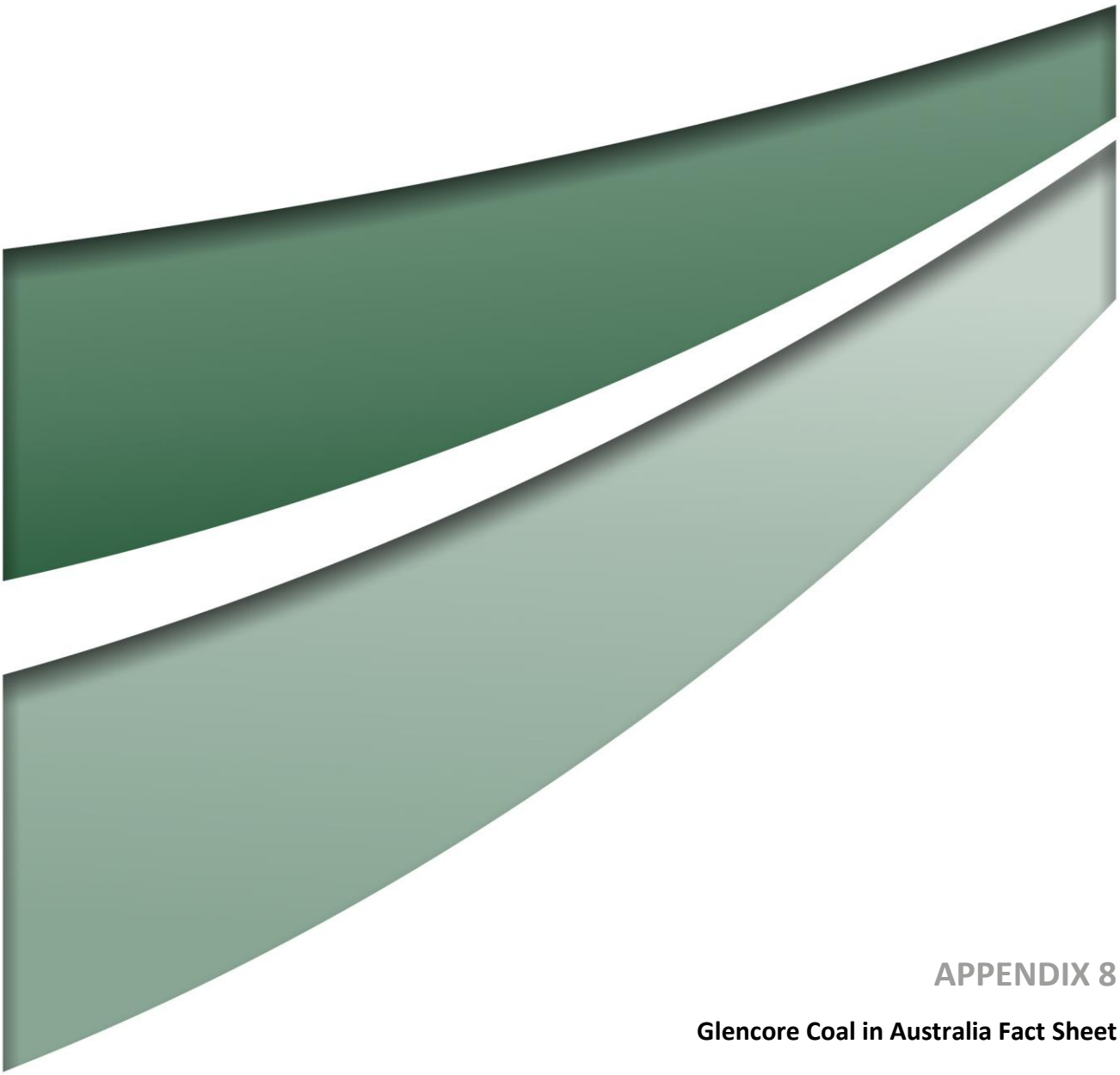
Noise Results

United Wambo Open Cut Coal Mine – 10th Percentile Operational Noise Level, dB(A) for Redmanvale Road Area

Receiver ID	Period	PSNL	Year 3				Year 7				Year 11				Year 16				Max Predicted 10th %ile Noise Level
			All Seasons Day	Non-winter Evenings	Non-winter Night	Winter Night	All Seasons Day	Non-winter Evenings	Non-winter Night	Winter Night	All Seasons Day	Non-winter Evenings	Non-winter Night	Winter Night	All Seasons Day	Non-winter Evenings	Non-winter Night	Winter Night	
Area 6 - R029	Day	35	38.7	-	-	-	34.8	-	-	-	36.4	-	-	-	37.4	-	-	-	38.7
	Evening	35	-	39.8	-	-	-	35.1	-	-	-	36.0	-	-	-	38.1	-	-	39.8
	Night	35	-	-	31.4	37.3	-	-	30.5	34.5	-	-	31.9	35.7	-	-	32.2	36.8	37.3
Area 6 - R030	Day	35	36.6	-	-	-	36.1	-	-	-	38.3	-	-	-	38.5	-	-	-	38.5
	Evening	35	-	36.1	-	-	-	38.0	-	-	-	36.4	-	-	-	39.2	-	-	39.2
	Night	35	-	-	35.6	34.6	-	-	33.5	35.2	-	-	38.2	38.0	-	-	34.7	37.5	38.2
Area 6 - R033	Day	35	36.9	-	-	-	39.3	-	-	-	40.3	-	-	-	39.4	-	-	-	40.3
	Evening	35	-	37.2	-	-	-	39.8	-	-	-	38.1	-	-	-	38.9	-	-	39.8
	Night	35	-	-	36.2	32.9	-	-	32.7	38.9	-	-	38.1	39.4	-	-	36.8	38.9	39.4
Area 6 - R041a	Day	35	35.0	-	-	-	33.6	-	-	-	34.4	-	-	-	34.2	-	-	-	35.0
	Evening	35	-	34.6	-	-	-	33.8	-	-	-	32.7	-	-	-	34.6	-	-	34.6
	Night	35	-	-	36.5	37.1	-	-	33.2	33.8	-	-	35.3	34.6	-	-	32.3	34.6	37.1
Area 6 - R041b	Day	35	35.1	-	-	-	33.6	-	-	-	35.5	-	-	-	34.3	-	-	-	35.5
	Evening	35	-	34.5	-	-	-	33.6	-	-	-	34.0	-	-	-	34.6	-	-	34.6
	Night	35	-	-	37.0	38.0	-	-	32.9	33.7	-	-	36.4	35.7	-	-	32.6	34.4	38.0
Area 6 - R042	Day	35	35.7	-	-	-	37.0	-	-	-	37.2	-	-	-	39.1	-	-	-	39.1
	Evening	35	-	37.5	-	-	-	37.8	-	-	-	36.2	-	-	-	40.2	-	-	40.2
	Night	35	-	-	33.7	32.4	-	-	33.8	36.3	-	-	36.7	37.0	-	-	34.1	38.0	38.0
Area 6 - R046	Day	35	35.3	-	-	-	34.8	-	-	-	35.2	-	-	-	36.8	-	-	-	36.8
	Evening	35	-	35.4	-	-	-	36.0	-	-	-	33.6	-	-	-	37.2	-	-	37.2
	Night	35	-	-	36.2	35.3	-	-	33.6	34.8	-	-	35.9	35.3	-	-	34.0	36.8	36.8
Area 6 - R048	Day	35	36.5	-	-	-	36.4	-	-	-	39.4	-	-	-	39.3	-	-	-	39.4
	Evening	35	-	36.4	-	-	-	35.9	-	-	-	37.3	-	-	-	38.8	-	-	38.8
	Night	35	-	-	35.6	34.5	-	-	32.4	35.9	-	-	39.0	38.9	-	-	36.0	38.4	39.0
Area 6 - R049	Day	35	36.1	-	-	-	35.6	-	-	-	38.1	-	-	-	38.8	-	-	-	38.8
	Evening	35	-	36.2	-	-	-	37.3	-	-	-	36.2	-	-	-	39.2	-	-	39.2
	Night	35	-	-	37.3	33.8	-	-	33.9	34.9	-	-	37.7	37.5	-	-	35.0	37.5	37.7
Area 6 - R075	Day	35	36.0	-	-	-	36.3	-	-	-	37.4	-	-	-	37.9	-	-	-	37.9
	Evening	35	-	36.8	-	-	-	37.3	-	-	-	35.7	-	-	-	39.0	-	-	39.0
	Night	35	-	-	37.1	33.0	-	-	35.2	35.9	-	-	36.6	36.6	-	-	34.7	37.3	37.3
Area 6 - R163	Day	35	35.8	-	-	-	35.8	-	-	-	36.9	-	-	-	38.3	-	-	-	38.3
	Evening	35	-	37.2	-	-	-	37.3	-	-	-	35.0	-	-	-	39.1	-	-	39.1
	Night	35	-	-	36.0	33.3	-	-	34.9	35.6	-	-	36.6	36.4	-	-	34.7	37.9	37.9
Area 6 - R320	Day	35	38.1	-	-	-	36.7	-	-	-	40.2	-	-	-	39.7	-	-	-	40.2
	Evening	35	-	37.6	-	-	-	35.6	-	-	-	38.8	-	-	-	39.1	-	-	39.1
	Night	35	-	-	35.0	35.5	-	-	32.6	34.8	-	-	39.2	40.0	-	-	36.1	39.0	40.0
Area 6 - R343	Day	35	37.9	-	-	-	36.0	-	-	-	39.6	-	-	-	38.3	-	-	-	39.6
	Evening	35	-	38.8	-	-	-	36.0	-	-	-	39.7	-	-	-	38.9	-	-	39.7
	Night	35	-	-	36.2	36.7	-	-	32.2	33.5	-	-	38.9	39.5	-	-	36.1	37.7	39.5

Receiver ID	Period	PSNL	Year 3				Year 7				Year 11				Year 16				Max Predicted 10th %ile Noise Level
			All Seasons Day	Non-winter Evenings	Non-winter Night	Winter Night	All Seasons Day	Non-winter Evenings	Non-winter Night	Winter Night	All Seasons Day	Non-winter Evenings	Non-winter Night	Winter Night	All Seasons Day	Non-winter Evenings	Non-winter Night	Winter Night	
Area 6 - R344	Day	35	35.8	-	-	-	37.1	-	-	-	36.9	-	-	-	38.4	-	-	-	38.4
	Evening	35	-	36.2	-	-	-	37.4	-	-	-	35.1	-	-	-	38.3	-	-	38.3
	Night	35	-	-	36.8	33.9	-	-	34.9	36.4	-	-	36.4	36.4	-	-	34.1	36.7	36.8
Area 6 - R345	Day	35	38.7	-	-	-	34.8	-	-	-	36.4	-	-	-	37.4	-	-	-	38.7
	Evening	35	-	39.8	-	-	-	35.1	-	-	-	36.0	-	-	-	38.1	-	-	39.8
	Night	35	-	-	31.4	37.3	-	-	30.5	34.5	-	-	31.9	35.7	-	-	32.2	36.8	37.3
Area 6 - R346	Day	35	35.7	-	-	-	34.6	-	-	-	36.0	-	-	-	37.3	-	-	-	37.3
	Evening	35	-	36.1	-	-	-	36.4	-	-	-	32.0	-	-	-	38.2	-	-	38.2
	Night	35	-	-	32.2	31.6	-	-	31.5	34.2	-	-	32.2	34.7	-	-	32.4	36.6	36.6
Area 6 - R348	Day	35	34.3	-	-	-	32.9	-	-	-	32.9	-	-	-	36.6	-	-	-	36.6
	Evening	35	-	35.5	-	-	-	32.8	-	-	-	34.2	-	-	-	38.1	-	-	38.1
	Night	35	-	-	30.4	31.8	-	-	29.6	32.4	-	-	31.0	32.4	-	-	30.1	35.9	35.9

Note 1: All predicted noise levels are as $L_{Aeq,15minute}$



APPENDIX 8

Glencore Coal in Australia Fact Sheet

GLENCORE COAL IN AUSTRALIA

March 2019

Frequently Asked Questions (FAQ) about Glencore's Climate Change Announcement

Why has Glencore made this climate change announcement?

The announcement reflects the increased focus our shareholders are placing on climate change issues, including a number of shareholders who belong to the Climate Action 100+ initiative.

What is Glencore's position on climate change?

Glencore has a stated public position that acknowledges the science of climate change and the global ambition to transition to a low carbon economy.

What was included in Glencore's climate change statement?

a) Paris Consistent Strategy/Capital Discipline

Glencore has committed to manage our future global coal production capacity broadly to current levels.

From 2020, Glencore will disclose projected reduction of indirect Scope 3 emissions including mitigation efforts such as investment in carbon capture and storage projects.

- Mitigation efforts in relation to Scope 3 emissions should not be interpreted as liability for or offsetting of our Scope 3 or indirect emissions.
- Our Scope 3 indirect emissions are our customers' Scope 1 direct emissions and it is those parties, rather than Glencore, that have the ability to control the extent of those emissions.
- Scope 1 direct emissions are subject to the climate policies and regulation of the jurisdictions in which those emissions occur. It is for that reason that climate policies and regulation do not seek to regulate Scope 3 indirect emissions at the point of extraction.

From 2020, Glencore will disclose how significant capital expenditure and investments align with the Paris Goals. This includes any new investment in fossil fuel assets.

b) Public Scope 1 and 2 Targets

Glencore is on track to achieve its target of reducing direct Scope 1 emission intensity by 5 % (of 2016 levels) by 2020.

From 2020, Glencore will release new longer-term direct Scope 1 and Scope 2 emission reduction targets.

c) Review of Progress

Glencore will report annually on the progress in meeting its climate change objectives.

Every three years Glencore will review changes to Nationally Determined Contributions (NDCs) under the Paris Agreement and other developments to inform our approach to climate change strategy.

d) Alignment with Taskforce on Climate Related Financial Disclosures (TCFD)

Glencore has accepted the recommendations of TCFD and will disclose the metrics, targets, scenarios we use to manage climate related risks and opportunities.

e) Corporate Climate Change Lobbying

Glencore will do a review of its membership in trade associations including consideration of their stated positions on climate change.

What does this mean for Australian coal employees?

The climate change statement will not have an impact on our coal employees nor will any mines shut ahead of schedule as a result of the production cap.

What does manage our future global coal production capacity broadly to current levels mean?

Glencore has a world-class coal mining business and will continue to have a world-class coal mining business. We have indicated that we will manage our coal production to around 150 Mt per annum going forward to align with the stated cap.

We will not be freezing all our coal projects nor are we exiting coal. Glencore will continue to consider acquisitions, divestments, expansions and projects against our investment criteria.

Glencore will continue to develop a pipeline of coal projects assessed against market conditions, project economics and now the coal production cap.

How will the coal production cap work?

The coal production cap applies to both thermal and coking coal production.

The coal production cap applies to Glencore's global attributable coal production.

When examining the coal production cap, we differentiate between:

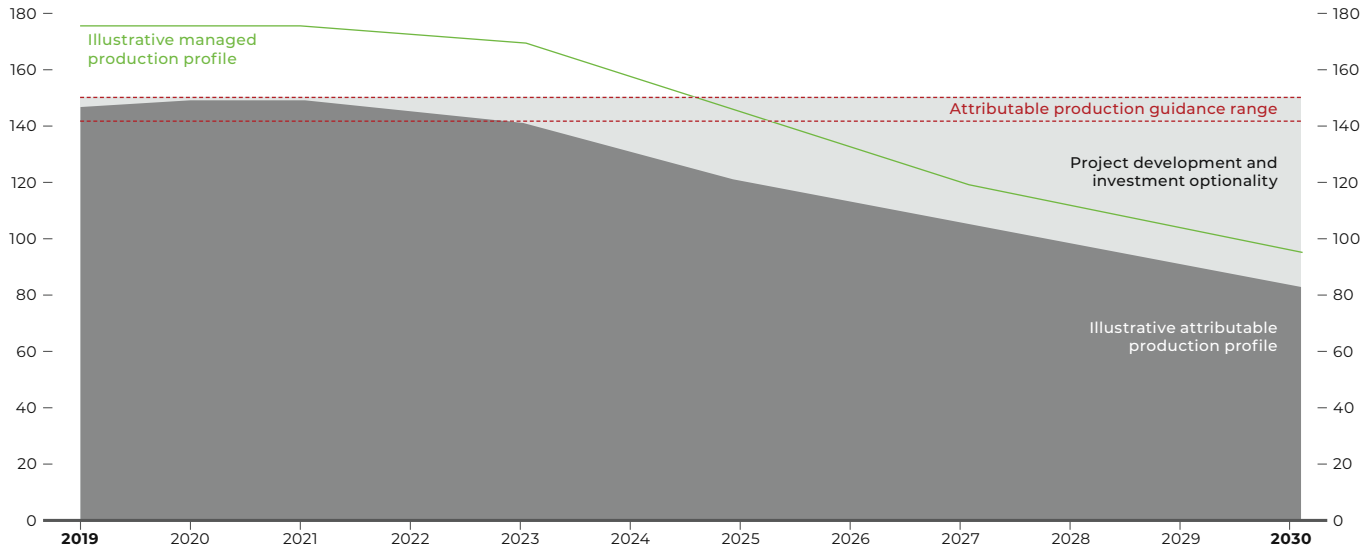
- Managed coal production: which includes the total volume of coal produced from operations in which we have a management role.

  e.g. Joint Ventures like Ravensworth North (Glencore 90% and Itochu 10%) in NSW where Glencore manages operations on behalf of other participants that own a portion of the operation. All of the output of the joint venture is considered to be managed coal production.

GLENCORE COAL IN AUSTRALIA

March 2019

GLENCORE MANAGED AND ATTRIBUTABLE COAL PRODUCTION (Mt)



- Attributable coal production: which includes the volume of coal production in which we have a financial equity interest. For mines that are held in a joint venture ownership structure, Glencore's attributable coal production will be a subset of the managed coal production.

  e.g. Ravensworth North produced 9.1Mt of coal in 2018. Glencore's attributable share in accordance with the Joint Venture agreement is 90% or 8.2Mt.

What's included in the cap and what does this mean for existing coal projects?

All existing mining operations managed by Glencore as at February 2019 are included in the production cap.

It is important to note that the coal production cap has factored in projects currently in the planning phase and planned replacement tonnage from our existing project pipeline.

This includes but is not limited to United Wambo, Glendell North, Mangoola North, Bulga extension and Mt Owen extension.

Does this mean Glencore can't buy new coal assets or start new projects?

No. Glencore can buy new coal assets and commence new projects so long as we manage volumes to remain within the production cap.

The cap also provides the flexibility to acquire interests currently held by joint venture partners in our existing operations.

What does this mean for the Wandoan Coal Project?

The Wandoan Coal Project continues to be under active consideration but we have clearly indicated that market conditions must be appropriate before we will move to develop this resource.

Like any other coal project if or when Wandoan is developed it will need to be managed within the coal production cap.

What is Glencore's global coal production profile to 2030?

The diagram above shows the current coal production profile for Glencore out to 2030 with both the managed production (green line) and attributable production (dark grey section) shown.

Because coal mines extract a finite resource our business needs to continue to develop projects and new mines to simply maintain our current levels of production.

Over time as resources are depleted and mines come to the end of their economic life, without further investment or development of new projects our production levels will decrease. This will create a gap between production levels and the 'cap' which will allow us to make further investments in coal assets, subject to meeting our investment criteria.

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