NSW EPA

DOC16/121931-10

The Acting Senior Planner
Resource Assessments
Planning Services
Department of Planning and Environment
GPO Box 39
SYDNEY NSW 2001

Dear Ms Donnelley

Re Broken Hill North Mine Recommencement Project – SSD No 7538

I refer to your electronic mail dated 2 February 2017 to the Environment Protection Authority (EPA) requesting our comments on the State Significant development application submitted to the Department of Planning and Environment proposing the recommencement of mining at the Perilya Broken Hill Limited (Perilya) North mine in Broken Hill.

The Perilya North mine is a scheduled premises under the *Protection of the Environment Operations Act 1997* and is regulated by the EPA through Environment Protection Licence No 2683. The mine is currently operating in a care and maintenance capacity and will need significant variations to conditions in the licence if project approval is granted by the Department of Planning and Environment.

We have reviewed the environmental impact statement and specialist consultant studies supporting the application and based on issues identified with the noise, blasting, air and health risk assessments we are currently unable to support approval of the project. Additional information about the proposal is required to be submitted for our review before we can make a determination about the project. The requested information is detailed at Attachment 'A' with justification and further detail provided in Attachment 'B'.

If you have any further enquiries about this matter please contact Jason Price by telephoning 02 6969 0700.

Yours sincerely

8/3/17

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ATTACHMENT 'A'

Background

Perilya Broken Hill Limited (Perilya) is proposing to recommence mining at the existing North mine on Consolidated Mining Leases No 4 and 5 located on the Barrier Highway in Broken Hill. The mine is currently in care and maintenance mode and is located on the line of lode within the city of Broken Hill. Residential suburbs exist along the mine's north and west boundaries about 500 metres from the proposed haul road and about 800 metres from the run of mine pad and mobile ore crusher.

Over a 25 year period the project will utilise the existing North mine Cosmopolitan decline to access remnant ore after which the decline will be extended to a depth of between 1,750 & 2,250 metres which is well below previous mining operations. Groundwater is intercepted at a depth of about 520 metres below ground level and will be pumped to the surface to de-water the decline pathway. Extracted ore will be stored and crushed on site then transported via the public road network to Perilya's Southern Operations mine for milling.

Waste rock is proposed to be placed in completed stopes underground or in the cosmopolitan open cut. Historic tailings are proposed to be harvested, processed into a paste and backfilled in completed stopes. Harvested tailings areas will be designed to store/evaporate groundwater pumped from the Cosmopolitan decline.

Current position, assessment of issues and summary of requested information

The EPA has reviewed the environmental impact statement (EIS[1]) and specialist consultant studies compendium supporting the State Significant development application for the proposed recommencement of mining at Perilya's North mine. Based on the information provided the EPA cannot adequately assess the impacts of the proposal. The EPA considers that the following issues should be addressed via revised assessments. These issues are justified and further detailed in Attachment 'B';

Air assessment

1. Clarify why particulate emissions in some of the waste rock and ore activities are based on 75% intensity during maximum daily operations;
2. Include combustion sources in the assessment;
3. Clarify the results presented in Tables 9.5 and 9.6, and Figures 9.8, 9.9, 9.11, and 9.12 of the air quality impact assessment (AQIA[2]);
4. Report concentrations of toxic air pollutants at and beyond the site boundary;
5. Report 100%ile annual average lead impacts at the nearest sensitive receptor;
6. Provide isopleths of metals concentrations; and
7. Ensure management measures are consistent with best practice for mining operations.

Health risk assessment

1. The Health Risk Assessment (HRA[3]) lacks a conceptual site model (CSM) and other essential elements that are required to demonstrate health risks associated with the Project have been comprehensively assessed;
2. Soil, air and bioavailability input data into the exposure model requires further justification and clarification to ensure Project impacts have been robustly assessed;
3. The soil and dust data used in the assessment appears conservative and not well justified;
4. The outdoor air lead concentrations used in the HRA are not clearly justified;

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[1] *Perilya Broken Hill Limited Environmental Impact Statement,* R.W. Corkery & Co., Pty Ltd, February 2017
[2] *Broken Hill North Mine Air Quality and Greenhouse Gas Assessment*, Pacific Environment Limited, January 2017.
[3] Broken Hill North Mine Health Risk Assessment (Pacific Environment Limited, January 2017).
[4] Broken Hill North Mine Noise Impact Assessment (Muller Acoustic Consulting Pty Ltd, January 2017).

5. The HRA does not adequately justify the bio accessibility values used;
6. The use of the maternal blood lead levels (BLL) value should be justified;
7. The National Health and Medical Research Council (NHMRC) recommended a BLL investigation level of 5 µg/dL should be used;
8. The HRA should assess lead impacts against 95% of the population;
9. Approximately 5% of children are at the recommended investigation level, therefore additional exposure should be prevented;
10. The origin of the geometric mean BLL data presented in Table 5-6 of the HRA is unclear;
11. Table 5-8 of the HRA should present values greater than 5 µg/dL rather than values greater than 10 µg/dL;
12. The Total Suspended Particulate (TSP) data used to estimate outdoor air lead concentrations is not justified as representative or conservative;
13. Dust and lead emissions must be prevented or minimised to the maximum extent achievable through the implementation of best practice;
14. Justification for the use of the selected chronic exposure screening criteria for lead is required;
15. The HRA lacks a detailed evaluation of uncertainties and their effect on the HRA outcomes;
16. Proposal related emissions generated at Southern Operations and fugitive emissions from exposure areas should be included in the assessment; and
17. It is unclear if the monitoring data adequately characterises existing air quality.

Noise assessment

1. Construction activities for the project should be assessed against the project specific noise level determined in accordance with the NSW Industrial Noise Policy;
2. Rating background levels identified in the noise impact assessment (NIA[4]) should be justified or based on measurements at logger 1;
3. The proponent should demonstrate that they have implemented all feasible and reasonable mitigation measures in attempting to meet any revised project specific noise level;
4. The noise model for the project should be updated to include G class inversion conditions;
5. The noise model for the project should include existing uses of the site;
6. Justification should be provided in detail about how truck movements were modelled on site;
7. A blast impact assessment should be completed that incorporates the actual blasting locations and potential blast configurations; and
8. Failure to include blast overpressure impacts needs to be justified or included in a revised assessment.

ATTACHMENT 'B'

Justification and further clarification of additional information

Air Quality Impact Assessment

The EPA has reviewed the AQIA (Broken Hill North Mine Air Quality and Greenhouse Gas Assessment, Pacific Environment Limited, January 2017) which was generally prepared in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW 2005 (Approved Methods).

However, the EPA has identified several issues with the AQIA, detailed below, which require addressing or clarification via the provision of a revised assessment.

1. It is unclear why some emissions during daily maximum operations are based on 75% intensity

   The particulate emissions for hauling ore from the portal to the ROM pad and materials processing at the ROM pad have been calculated assuming 75% intensity (492,750 tpa). All other waste rock and ore activities have been calculated assuming 100% intensity. It is noted that the emissions for annual average operations assumes 100% intensity.

   The AQIA must clearly justify why 75% intensity can be used to calculate emissions for some waste and ore activities when assuming maximum daily operations.

2. Emissions from combustion sources have not been included in the assessment

   Emissions from combustion sources (diesel engines) have not been considered in the assessment. These sources are generally considered a significant source of $PM_{2.5}$ emissions and should be assessed.

   The AQIA should be revised to include emissions from combustion sources.

3. It is unclear why results in Tables 9.5, 9.6 and Figures 9.8, 9.9, 9.11, and 9.12 show almost identical impacts for maximum daily operations and annual average operations

   The emissions assuming maximum daily operations are approximately 1.6 to 1.7 times the emissions assuming annual average operations. However, Tables 9.5 and 9.6 show identical impacts at almost all receptors, and isopleths in Figures 9.8/9.9 and 9.11/9.12 appear identical.

   The AQIA should either correct Tables 9.5 and 9.6, and Figures 9.8, 9.9, 9.11 and 9.12, or provide a plausible explanation why they are not significantly different.

4. Toxic Air Pollutants are only reported at sensitive receptors, and not at and beyond the mining lease boundary

   In accordance with the Approved Methods, ground level concentrations of toxic air pollutants should be reported at and beyond the mining lease boundary.

   The AQIA should be revised to report impacts of toxic air pollutants at and beyond the mining lease boundary.

5. Annual average cumulative lead impacts are not assessed at the nearest sensitive receptor

   In accordance with the Approved Methods, 100%ile cumulative annual average lead impacts should be reported at the nearest sensitive receptor.

   The AQIA should report the 100%ile annual average lead impacts at the nearest sensitive receptor.

6. Isopleths of metals concentrations are not reported

   Metals concentrations are only reported in tabular form.

   In accordance with the Approved Methods, isopleths should be presented to assess impacts.

7. Proposed dust management practices are not consistent with best practice measures identified in the EIS

   Section 128 of the *Protection of the Environment Operations Act 1997* requires that the occupier of any premises must ensure that all necessary practicable means are used to prevent or minimise air pollution. The proposed control measures listed in Section 7.1 of the AQIA do not include all control practices listed in Section 4.2.6 of the EIS or those considered best practice for mining operations.

   Specifically, requirements to limit operations where practicable during high winds should be included in the AQIA. It is noted that the AQIA did not assume ceasing operations during unfavourable winds and in this regard is considered conservative.

   The AQIA should include management measures that are consistent with those that are identified in the EIS or those considered best practice for mining operations.

Health Risk Assessment

The EPA sought a review of the HRA (*Broken Hill North Mine Health Risk Assessment (Pacific Environment Limited, January 2017)* from the Office of Environment and Heritage. Based on that review the EPA has concerns about the HRA and seeks the following information in a revised HRA.

1. The HRA lacks a conceptual site model (CSM) and other essential elements that are required to demonstrate health risks associated with the Project have been comprehensively assessed

   1.1 Receptors not clearly identified or assessed

   The EPA queries if there are any occupied/or likely to be occupied resource company residences near the entry to the mine site not noted in the HRA, located close to R5 and seemingly apparent on an aerial image of the site. If so these residents should also be considered in the HRA.

   It is unclear if the toxic air pollutants have been assessed at and beyond the mining lease boundary as required by the Approved Methods. For these pollutants the modelled grid maximum Ground Level Concentrations off-site should be used to compare to the chosen proposal criteria.

   The HRA should clarify that all potentially impacted receptors have been appropriately considered and assessed.

   1.2 The HRA lacks a CSM

   The HRA does not include a detailed description of the sources of contaminants and potential emissions, the pathways by which these contaminants may migrate through various media, and the receptors that may potentially be exposed. This information informs a conceptual site model for the operation and is required to aid in understanding how residents may be exposed to chemicals associated with mining operations. It is also required as a primary planning tool to support the risk assessment approach and methodology.

   The HRA should be revised to include a detailed and site specific conceptual site model for the proposal.

1.3 Potential impacts associated with exposure to other contaminants, in particular persistent and bio accumulative contaminants have not been considered. All contaminants of potential concern (CoPC) should be considered

The HRA states that based on the activities associated with the proposal, the main pollutants would be particulate matter (PM), primarily from dust generating activities, and heavy metals (lead, silver, zinc, copper, iron, mercury, nickel, arsenic, manganese, cadmium and chromium) mainly from the ventilation shaft (Section 5.1). As these heavy metals are associated with the ore body, their presence in extracted material and emissions associated with this material is likely to also be relevant.

The HRA considers potential impacts to human health associated with exposure to lead, but lacks further assessment of other heavy metals (noted above) that have also been demonstrated to be present in mine related dust emissions. The lack of assessment of non-lead heavy metals is not justified in the HRA.

We advise that all contaminants that may be present in significant concentrations in emissions related to the proposal should be considered in the assessment of health risk.

The HRA should be amended to include further consideration of potential exposure and impacts associated with persistent and bio accumulative contaminants likely to be emitted as a part of the proposal.

1.4 It is unclear how conservative and representative values are derived from the AQIA

Existing air quality
A monitoring program was established in July 2008 in the vicinity of the proposal and comprised high volume TSP and total lead at 2 locations.

A monitoring network has been established for the Proposal and consists of:
- dust deposition at 11 locations over 1 month measuring TSP and lead;
- PM_{10} monitoring at 2 locations using high volume samplers (one in six day run cycle).

Air assessment scenarios
Two scenarios were assessed in the AQIA:
- Annual operations, based on maximum annual transport off-site of 300,000 tonnes per annum; and
- Maximum daily production, based on maximum daily transport off-site of 1,800 tonnes per day.

Most activities were assumed to occur between 7:00am and 7:00pm, seven days per week. Wind erosion is assumed to occur 24 hours per day. TSP, PM_{10} and $PM_{2.5}$ emission rates were calculated using US EPA emission factors.

Measured emissions of heavy metals from the mine ventilation shaft, that were provided to PEL by the proponent were also used in the AQIA. We note that details of the measured heavy metal emissions are not included in the AQIA and therefore it is unclear how representative/conservative the values used are.

The HRA should provide additional information to justify the measured heavy metal emission estimates are representative and conservative.

1.5 The input information for the assessment of health risks requires the AQIA to be accurate

The AQIA provides information and source data on which the assessment of health risks associated with the facility is based. Consequently, any issue identified in the review of the AQIA that impacts the air quality model outputs, may also impact the input data used in the HRA to assess risk, and thus potentially the outcomes of the HRA.

If the AQIA requires amendment this is likely to necessitate relevant amendments to the HRA.

2. Soil, air and bioavailability input data into the exposure model requires further justification and clarification to ensure project impacts have been robustly assessed

The IEUBK model runs used the current soil and air lead data as the background situation, and the calculated cumulative soil and air values for the proposed mining activities. Default values in the model have been modified to Australian conditions, including in particular those outlined in the derivation of the National Environmental Protection (Assessment of Contaminated Sites) Measure (NEPM) HIL-A lead value, and some site specific values for certain parameters.

The values used for some of the parameters used in the IEUBK model require further clarification and justification to demonstrate they are accurate and appropriately conservative. ***The issues identified are presented in comments 3-6 below.***

3. The soil and dust data used in the assessment appears conservative but not well justified Outdoor soil lead (HRA Table 5-1)

3.1 Measured site data

Soil and dust are the primary sources of lead exposure to children. The HRA adopts soil lead concentration data from a report by Boreland et. al. (2002)[1]. The HRA states the soil lead data used were the geometric mean and maximum soil lead concentrations for district 6, with the highest lead concentrations used in the model.

The values used in the IEUBK model (in Appendix A) are the measured concentrations [767 µg/g (the geometric mean from Boreland district 6), 1011 µg/g (the upper 95% confidence interval value – not the stated maximum value)], added to the predicted concentration of lead in soil after 25 years of mining.

There have been more recent studies that have conducted soil sampling in nearby relevant locations[2]. The HRA should, where possible, evaluate recent soil lead data to assist in demonstrating that values used in the exposure model are conservative.

The HRA should be revised to better justify that the soil and dust lead concentrations used in the assessment are conservative.

[1] Boreland et. al. 2002. Lead dust in Broken Hill homes – a potential hazard for young children. Australian and New Zealand Journal of Public Health, 26(3), pp. 203-207.
[2] Yang et. al. 2015. Science of the Total Environment, 538, pp. 922-933, and others.

3.2 Estimated data from deposition modelling

The soil concentrations used in the IEUBK model (in HRA Appendix A) are the measured concentrations (in 3.1 above), added to the calculated concentration of lead in soil after 25 years of mining. The calculated incremental lead concentration in soil (2.78 mg/kg) is derived using the Pacific Environment Limited (PEL) depositional lead model incremental value of 3.1×10^{-6} mg Pb/m^2/year.

The calculated summed values (measured plus calculated lead concentration) are reported to be 812.64 µg/g and 1056.64 µg/g (Table 5-1). It is unclear how these concentrations were derived. Were they calculated by summing the measured (767 and 1011 µg/g) and calculated lead concentration (2.78 µg/g) as stated? This does not appear to be the case as the difference between the background and cumulative concentrations is approximately 45 µg/g.

The HRA should clarify the calculations used in the HRA to estimate outdoor soil lead concentrations.

3.3 It is unclear how the predicted incremental lead concentration in soil was derived

The predicted annual average concentration of lead deposited in residential areas (R1-R10) due to the proposal is stated (Section 5.2.2.3.1) as 3.1×10^{-6} mg Pb/m^2/year. The AQIA is referenced as the source of this value but we have not been able verify this value or locate it in the AQIA.

Using the predicted and measured dust deposition data (AQIA Tables 9.4 and 5.7 respectively) with the measured lead deposition data (AQIA Table 5.10) results in annual average deposition concentrations significantly larger than the value used in the HRA. This value is a critical parameter in the IEUBK model used to estimate lead exposure and proposal risks and must be accurately and clearly derived.

The HRA should clarify how the predicted annual average lead concentration was calculated, justify its conservativeness based on the measured the deposited soil, dust and lead data presented in the AQIA.

4. The outdoor air lead concentrations used in the HRA are not clearly justified

The HRA (Table 5-2) presents the outdoor air lead concentrations used in the exposure model. The values provided are referenced to the proposal AQIA. However, the AQIA does not appear to include the values listed in the HRA and instead provides measured TSP lead concentrations (Section 5.4.4, Table 5.9).

The HRA should clarify how the outdoor air lead concentrations were obtained.

5. The HRA does not appropriately justify the bioaccessibility values used

Section 5.2.2.3.6 outlines the rationale for selecting a bioaccessibility value of 5% to be used in the model. The rationale is that previous studies for the Rasp Mine in Broken Hill found bioaccessibility of lead was 7.3% for surface dust and 1.4% for mine ore.

However, it is unclear if these values are representative of lead bioaccessibility from the North Mine. In addition, in the most recent HRA for Rasp Mine (PEL, 2015)[1] a model run using IEUBK default bioaccessibility values (50%) was undertaken (Run 2) as well as a run using locally derived bioaccessibility values (5%). The locally derived values were the same as those reported by Toxikos (Toxikos, 2010)[2] and referred to in the North Mine HRA by PEL. These

[1] Pacific Environment Limited (PEL) (2015). Health Risk Assessment Rasp Mine Broken Hill. Prepared for Broken Hill Operations Pty Ltd. 25 September 2015.

[2] Toxikos (2010). Health Risk Assessment for Rasp Mine Proposal, Broken Hill. Prepared for Broken Hill Operations Pty Ltd. 17 June 2010.

values were derived using in vitro methods. In PEL (2015) for Rasp Mine it states that Run 2 '*provides the most accurate estimate of the incremental increase from all exposure pathways*' rather than Run 3 using the locally derived bioaccessibility values.

This is reported to be because '*In vitro bioaccessibility values are not deemed to represent sufficient evidence of quantitative adjustment of bioavailability*'. Therefore it is not clear why the chosen values are considered suitable for this assessment.

The HRA should:

i. Justify why the bioaccessibility values from Rasp Mine are relevant for this site;
ii. Explain why the in vitro bioaccessibility values are deemed to provide sufficient evidence for quantitative adjustment of bioavailability; and
iii. Use the IEUBK default bioaccessibility value of 50% for the baseline assessment rather than considering it only in the sensitivity analysis.

6. <u>The use of the maternal BLL value should be justified</u>

The HRA (Section 5.2.2.3.6) only predicts BLLs in children aged 0-5 as they are the most vulnerable population (Section 3.3). Another potentially significant exposure pathway for lead to children is via maternal transfer. The HRA uses a maternal BLL from another report (Toxikos, 2010) but this value is not discussed or demonstrated as appropriate.

The HRA should be revised to discuss and justify the use of the chosen maternal blood lead levels (BLL) value.

7. <u>The National Health and Medical Research Council (NHMRC) recommended BLL investigation level of 5 µg/dL should be used</u>

The risk characterisation section of the report (Section 5.2.3) compares the outcomes from the IEUBK model to 5 and 10 µg/dL BLLs.

The NHMRC advises that BLLs above 5 µg/dL suggest a person has been exposed to lead levels above what is considered to be the average 'background' exposure in Australia. Consequently, the NHMRC recommend if a person has a BLL above 5 µg/dL the source of exposure should be investigated and reduced, particularly if the person is a child or pregnant woman.

All comparisons to 10 µg/dL should be removed from the HRA to reflect the NHMRC's effective halving of the 'recommended' BLL from 10 to 5 µg/dL. The comparisons to 10 µg/dL are not relevant and complicate the conclusions of the assessment.

The HRA should only use 5 µg/dL to compare against the outcomes from the IEUBK model.

8. <u>The HRA should assess lead impacts against 95% of the population</u>

The risk characterisation and conclusions of the report should be focused on the percentage of children who are predicted to have a BLL above the recommended investigation level (ie 5 µg/dL). The guidance in the NEPM is that 95% of the population should be below the blood lead goal rather than 50% of the population. In the HRA, PEL have presented most of the results in terms of the geometric mean.

The HRA should focus the results and conclusions primarily around the 95th percentiles rather than the geometric means.

9. Approximately 5% of children are at the recommended investigation level, therefore additional exposure should be prevented

Table 5-6 presents the estimated percentage of children with BLLs greater than 5 µg/dL (note this is assuming 5% bioaccessibility, see issue 4). These values are either approximately 5% or higher. This means that even when using the lower bioaccessibility value, the BLL of children in the area is either at or above the recommended investigation level of 5 µg/dL. The text below this table does not consider these values in relation to the aim of having 95% of children with BLLs less that the recommended investigation level (5 µg/dL). Consequently, the potential emissions from the proposed mine need to be carefully considered and all possible controls need to be in place to ensure that lead emissions from the site are negligible and do not provide a source of lead for children in the area.

The HRA should:

i. Provide further discussion on the data in Table 5-6 in relation to the NEPM guidance that 95% of the population should have a BLL below the recommended investigation level (i.e. 5 µg/dL); and

ii. Ensure that all possible controls are in place so lead emission from the site are effectively negligible. This may include enclosure of the primary crusher and screening area, sealing haul roads and identifying "free areas" and developing appropriate mitigation measures to prevent dust lift off in these areas.

10. The origin of the geometric mean BLL data presented in the HRA (Table 5-6) is unclear

Table 5-6 shows the geometric mean BLLs for each scenario considered in the model. It is unclear if these values are the averages across the different age groups (from Table 5-5). If this is the case it needs to be stated. In addition, it may be more appropriate and conservative to change these to the maximum BLLs for each scenario.

The HRA should clarify the source of the geometric mean BLL values in Table 5-6, and consider replacing these with the maximum values from each scenario.

11. Table 5-8 should present values greater than 5 µg/dL rather than values greater than 10 µg/dL

Table 5-8 of the HRA shows the sensitivity of blood lead modelling to the absorption percentage (bioaccessibility). The BLLs greater than 10 µg/dL are shaded but based on the current guidance from the NHMRC it is more appropriate to shade the values greater than 5 µg/dL to clearly show that they exceed the recommended investigation level.

The HRA should amend Table 5-8 to show the values greater than 5 µg/d.

12. The TSP data used to estimate outdoor air lead concentrations is not justified as representative or conservative

The TSP data used in the HRA to estimate outdoor air lead concentrations (AQIA Table 5.9) was collected at two high volume air sampler locations LP26 and LP27. These air monitors have been operational since July 2008 and monitor TSP and total lead for 24 hours every 6 days. LP26 is located within the Broken Hill North Mine site, while LP27 is located approximately 1.7 km to the north east (NE) of the site.

LP26 is likely to experience much higher concentrations of air emissions than LP27 due to its proximity to the main emission sources associated with the proposal. In addition, the contour plots for the predicted air contaminant concentrations do not extend far to the north east of the site, despite the most significant air emission source (the ROM pad) being located in this area. Consequently, LP27 is likely to represent background (ie non site impacted) air quality most of the time.

The HRA should provide additional information to justify the estimated outdoor air lead concentrations are representative, conservative and suitable for use in the exposure model.

13. Dust and lead emissions must be prevented or minimised to the maximum extent achievable through the implementation of best practice

Based on the modelling undertaken in the HRA, 5% of children may potentially have BLLs close to 5 µg/dL under the most conservative background scenario assessed (BH6 background Table 5-6).

The NHMRC 2015 note as a part of their review of studies[1] on low level lead exposure that there is evidence to suggest that BLLs less than 5 micrograms per decilitre (µg/dL) are associated with reductions in IQ or academic achievement. In addition, it is noted that lead is similar to particulate matter in that there is little or no evidence to suggest there is a level below which no adverse effects on human health would be anticipated.

Consequently, reducing the amount of lead in the environment (e.g. in soil, dust and air) as much as possible should be a priority and focus of any project that may increase lead exposure, as this will reduce the risk of harm from lead exposure, especially for young children and unborn babies.

Many of the engineering and other controls proposed to be implemented to mitigate air emissions do not appear to be consistent with best practice for dust mitigation (such as use of enclosed crushing or screening, sealing haul roads and application of chemical dust suppressant on unsealed "free areas"). This is despite the AQIA including a section on best practice dust control (AQIA Section 7), which lacks specific detail. Proposal emissions are also noted to include principal toxic air pollutants prescribed in the *Protection of the Environment Operations (Clean Air) Regulation 2010*, such as arsenic, cadmium and nickel. The EPA requires[2] principal toxic air pollutants to be minimised to the maximum extent achievable through the application of best-practice process design and/or emission controls.

The HRA should:

i. ***Revise the HRA and EIS to demonstrate that dust and lead emissions will be prevented or minimised to the maximum extent achievable through implementation of best practice process design, emission controls, and environmental management; and***
ii. ***Undertake a best practice assessment for dust mitigation to ensure the above recommendation is achieved. This may include enclosure of the primary crusher and screening area, sealing haul roads and identifying "free areas" and developing appropriate mitigation measures to prevent dust lift off in these areas.***

14. Justification for the use of the selected chronic exposure screening criteria for lead is required

The chosen screening criteria for lead is the 1998 Ambient Air NEPM goal of 0.5 µg/m^3 as a yearly average. The HRA should consider potentially more recent and appropriate criteria such as the 2015 US EPA RSL for residential air which is significantly lower (0.15 µg/m^3).

The HRA should be revised to justify the use of the chosen criteria for lead and other contaminants for health assessment.

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[1] NHMRC 2015. Information paper – Evidence on the Effects of Lead on Human Health.
[2] See Section 7.2.1 of the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA, 2005) (Approved Methods).

15. The HRA lacks a detailed evaluation of uncertainties and their effect on the HRA outcomes

The HRA includes a short sensitivity analysis that only considers bioaccessibility of lead in soil and dust (Section 5.2.3.1). The HRA lacks a detailed and comprehensive evaluation of uncertainties and the potential effect on health risk assessment outcomes as would be expected (EnHealth 2012 (Section 5.15) and NEPM (B4, Section 6.6)). This evaluation is required to characterise the significance, variability and uncertainty associated with the assessment findings.

The HRA should be revised to include a comprehensive evaluation of uncertainties associated with the proposal and assessment methodology, and the potential effect these have on the health risk assessment outcome.

16. Proposal related emissions generated at Southern Operations and fugitive emissions from exposure areas should be included in the assessment

Emissions from the processing of ore at the Southern Operations do not appear to have been considered in the AQIA. Emissions associated with Southern Operations, with the other mining operations in Broken Hill, need to be included to comprehensively assess potential site related and cumulative air impacts.

Emissions from wind erosion of exposed areas which are extensive and therefore likely to be potentially significant, have not been considered or assessed.

The HRA and AQIA should:

i. ***Include proposal related Southern Operations emissions in the assessment of air impacts (it is acknowledged the milling of the ore at Southern Operations is not included in this proposal but this information would help assess impacts from the mining and processing of ore from the North mine);***
ii. ***Assess emissions generated by wind erosion of exposed areas within and around the mine; and***
iii. ***Review the AQIA to ensure all potential significant emission sources are identified and assessed.***

17. It is unclear if the monitoring data adequately characterises existing air quality

The monitoring data used to characterise existing air quality in the study area consisted of 11 dust deposition monitors (operated since July 2011), 2 high volume samplers (operated since July 2008) and 2 TEOMs located at the RASP mine site (operated since February 2014) (AQIA Section 5.4.2). However, these sites are not discussed or justified as providing robust representative air concentration data for the dust, particulate matter or lead. Also, it is the EPA's understanding the 2 TEOMs located on the RASP mine have been in operation for a longer period than since February 2014.

The Proponent must demonstrate the datasets used to characterise existing air quality in the study area are robust and adequately characterise existing air quality for proposal relevant air pollutants.

Minor errors

HRA Section 5.2.3 incorrectly refers to Table 2 rather than Table 5-6. The assessment focuses on children of ages up to 7 rather than 0-5 (Section 3.3).

Noise Impact Assessment

The EPA has reviewed the NIA (*Broken Hill North Mine Noise Impact Assessment, Muller Acoustic Consulting Pty Ltd, January 2017)* and has identified issues that need to be addressed in a revised NIA.

1. Construction noise criteria are incorrectly derived from the interim construction noise guideline

   The assessment compared construction noise levels to noise management levels derived following the interim construction noise guideline. The guideline states that it does not apply to construction associated with mining, and the proponent has not explained why the guideline should apply in this case.

   The highest predicted construction noise level ($L_{eq(15min)}$ 38 dBA) for the project is the same as the maximum operational noise level. This indicates that all feasible and reasonable mitigation measures will be needed, for both construction and operational noise, in an attempt to meet any revised project specific noise level (see point 2).

   Construction activities for the project should be assessed against the project specific noise level determined in accordance with the NSW Industrial Noise Policy.

2. Two background noise logger measurements appear to be on the North mine site

   Background noise levels for loggers identified in the NIA as L2 and L3 appear to have been established on the mining lease contrary to the NSW Industrial Noise Policy and have potentially been affected by mining activities related to land preparation, exploration, truck movements and a mechanics garage, adversely influencing background noise levels.

   It is also noted that these two loggers have logged higher background levels than logger L1 which appears to be located at the actual residential sensitive receptors.

   To exclude potential noise from existing operations at the North mine, data from logger 1, further from the site, could be utilised where a rating background level of 30 dBA was measured for all assessment periods (day, evening and night).

   A rating background level of 30 dBA would result in project specific noise levels of $L_{eq(15min)}$ 35 dBA at all times of day. The assessment has predicted operational noise levels up to $L_{eq(15min)}$ 38 dBA at sensitive receiver locations, which would mean all feasible and reasonable mitigation measures need to be considered and applied.

   Rating background levels identified in the noise impact assessment (NIA[4]) should be justified or based on measurements at logger 1.

3. Feasible and reasonable mitigation measures to be considered

If background levels at L2 and L3 cannot be justified all feasible and reasonable mitigation measures must be considered to meet the revised project specific noise criteria and any subsequent exceedances of the criteria addressed consistent with the Department of Planning and Environment's voluntary land acquisition and mitigation policy.

The NIA has not recommended any noise mitigation measures or best practice methods for the proponent to consider in an environment where compliance at some receptors is marginal.

The proponent should demonstrate that they have implemented all feasible and reasonable mitigation measures in attempting to meet any revised project specific noise level.

If background levels cannot be justified all feasible and reasonable mitigation measures must be considered to meet the revised project specific noise criteria and any subsequent exceedances of the criteria addressed consistent with the Department of Planning and Environment's voluntary land acquisition and mitigation policy.

4. Class G inversions need to included in the NIA

The assessment did not explain how the significance of inversion conditions was determined, but modelled F class as "worst case". Broken Hill is in an arid area, so G class inversion conditions should have been modelled. We expect that would increase predicted noise levels by about 4 dBA. All feasible and reasonable mitigation measures need to be applied in an effort to meet the project specific noise level.

The noise model for the project should be updated to include G class inversion conditions.

5. Existing activities at the mine need to be included in the NIA

Modelling does not appear to have included any existing uses of the site, such as truck movements associated with Potosi Mine and works being completed on the Cosmopolitan decline. All existing uses of the site should be included in modelling, to demonstrate that the site's operational noise contribution is acceptable. North Mine and Potosi Mine are on the same environment protection licence, so both mines need to be included in the noise impact assessment.

The noise model for the project should include existing uses of the site.

6. Justification of modelled truck movements needs to be provided

Appendix C of the assessment indicates that two stationary haul trucks were placed: one in the Cosmopolitan Open Cut, and one on a former tailings storage facility. It appears that no moving trucks were included in the model. Both modelled locations appear to be further away or more shielded from receivers than the proposed haul road. The proponent should better explain how truck movements were modelled on the site.

Justification should be provided in detail about how truck movements were modelled on site.

7. Blasting impacts should be revised

The inputs for the prediction of blast impacts at residential receptors are not clear and the blasting calculation is oversimplified considering the number of variable blasting configurations controlled by the proponent. The distance to receptors in the blast calculation also appears to be incorrect based on Figure 2.6 in the EIS and discussions with the proponent which indicates blasting and mining may commence from the base of the Cosmopolitan open cut.

The calculation that a worst case peak particle velocity (ppv) impact of 4.5 mm/s at the nearest receptor is based on blasting at level 12 (400 mbgl) and the nearest potentially affected residence is not identified.

Potential blasting configurations proposed by the proponent and modelling of the impacts should be included in a comprehensive blast impact assessment so the EPA can consider the potential impacts on surrounding sensitive receptors. We also consider a goal of <3mm/s ppv impact at receptors is appropriate to mitigate unreasonable vibration impacts. The ANZECC blasting guideline references a long term goal of <2mm/s at sensitive receptors.

A blast impact assessment should be completed that incorporates the actual blasting locations and potential blast configurations.

8. Blast overpressure impacts have not been included

There is no predicted blast overpressure and no explanation about why this was not considered applicable. Blast overpressure impacts from this proposal are potentially likely to occur.

Failure to include blast overpressure impacts needs to be justified or included in a revised assessment.