



Perilya Broken Hill Limited
ABN: 46 099 761 289

Response to Submissions

for the
Recommencement
of Mining
Operations at the

Broken Hill North Mine

Application No. SSD 7538



Prepared by:

R.W. CORKERY & CO. PTY. LIMITED



No. 1 Shaft, 1910



No. 2 Shaft & Concentrator, 1940



No. 3 Shaft, 1958



No. 3 Shaft, 2016

September 2017

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Broken Hill North Mine

State Significant Project SSD 7538

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Ref No. 938/09

September 2017



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LIST OF ACRONYMS

ACTRA	Australasian College of Toxicology and Risk Assessment
AHD	Australian Height Datum
AQIA	Air Quality Impact Assessment
BHLRG	Broken Hill Lead Reference Group
DA	Development Application
DPI	Department of Primary Industries
DRE	Division of Resources and Energy
EIS	Environmental Impact Statement
EPA	Environment Protection Authority
g/m ²	grams per square metre
ha	hectare
HDPE	High Density Polyethylene
HHRA	Human Health Risk Assessment
HRA	Health Risk Assessment
ICNG	Interim Construction Noise Guideline
IVBA	<i>in vitro</i> bioaccessibility
km/h	kilometres per hour
m	metre
m ³ /s	cubic metres per second
MAC	Muller Acoustic Consulting
MIC	maximum instantaneous charge
ML	megalitre
mm	millimetre
NIA	Noise Impact Assessment
OEH	Office of Environment and Heritage



PBET	physiologically based extraction test
PE	Pacific Environment
PEL	Pacific Environment Limited
PM ₁₀	particulate matter <10µm in diameter
PM _{2.5}	particulate matter <2.5µm in diameter
ROM	run-of-mine
RWC	RW Corkery & Co Pty Limited
SEARs	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
t	tonne
TDIs	tolerable daily intakes
tpa	tonnes per annum
TSP	Total Suspended Particulates
µg/m ³	micrograms per cubic metre
µg/dL	micrograms per decilitre (1 decilitre = 100mL)
UV	Ultraviolet
VPA	Voluntary Planning Agreement
WAL	Water Access Licence

1. INTRODUCTION

This document has been prepared by RW Corkery & Co Pty Limited on behalf of Perilya Broken Hill Limited (the Applicant). The Applicant has sought development consent (SSD 7538) for the following.

- Recommence mining operations using the existing Cosmopolitan Decline to extract ore to a depth of between 1 750m and 2 250m below surface over a period of approximately 25 years.
- Crush extracted ore within a surface ROM pad using a mobile crusher.
- Transport crushed ore via the public road network to the Applicant's Southern Operations using A-double Road Trains.
- Undertake ancillary activities associated with the proposed mining works, including re-establishment and refurbishment of a range of existing infrastructure, construction and operation of a Paste Fill Plant, including a tailings harvesting area, and construction of a haul road.

The Proposal is classified as State Significant Development and is fully described in the *Environmental Impact Statement* prepared to support the application for Development Consent under Part 4.1 of the *Environmental Planning and Assessment Act 1979*. The *Environmental Impact Statement* was placed on public exhibition between 5 February and 6 March 2017.

During and following that period, submissions from the following government agencies were received.

- Broken Hill City Council.
- DPI-Lands.
- DPI-Water.
- Division of Resources and Energy (now Division of Resources and Geoscience).
- Environment Protection Authority.
- NSW Health.
- Heritage Branch.
- Office of Environment and Heritage.
- Roads and Maritime Service.

In addition, the Department of Planning and Environment provided a range of requests for additional information. Responses to those requests were prepared as they were received and are not addressed in this document.

Nine submissions were received from the public during the exhibition period, three by way of objection, five in support and one providing comment. A further late submission from a member of the public providing comment was accepted by the Department on 9 April 2017.

This document has been prepared to provide a response to each of the submissions received. In order to facilitate review of this document, text drawn from submissions received is presented as *italicised* text. The Applicant's response is presented in non-italicised text.

In addition, since commencement of the exhibition period, a number of minor adjustments to the proposed activities have been made. In the majority of cases, these adjustments have been made in response to public or agency feedback and are intended to reduce the environmental or social impact of the Proposal. This document also describes each of those minor adjustments.

2. ADJUSTMENTS TO THE PROPOSED ACTIVITIES

2.1 INTRODUCTION

During the exhibition period, the Applicant received a range of feedback in relation to particular aspects of the Proposal from the public or from government agencies. The Applicant has considered this feedback and, where appropriate, has revised the proposed activities. This subsection provides a description of each of the proposed revisions and an assessment of the environmental impacts of each. In each case, the environmental impacts of the revised activities are considered to be neutral or less than the environmental impacts of the activities as originally proposed. **Figure 1** presents an overview of the revised Mine Site Layout.

2.2 REMOVAL OF THE EXISTING MINE WATER SETTLING POND

2.2.1 Revised Activity

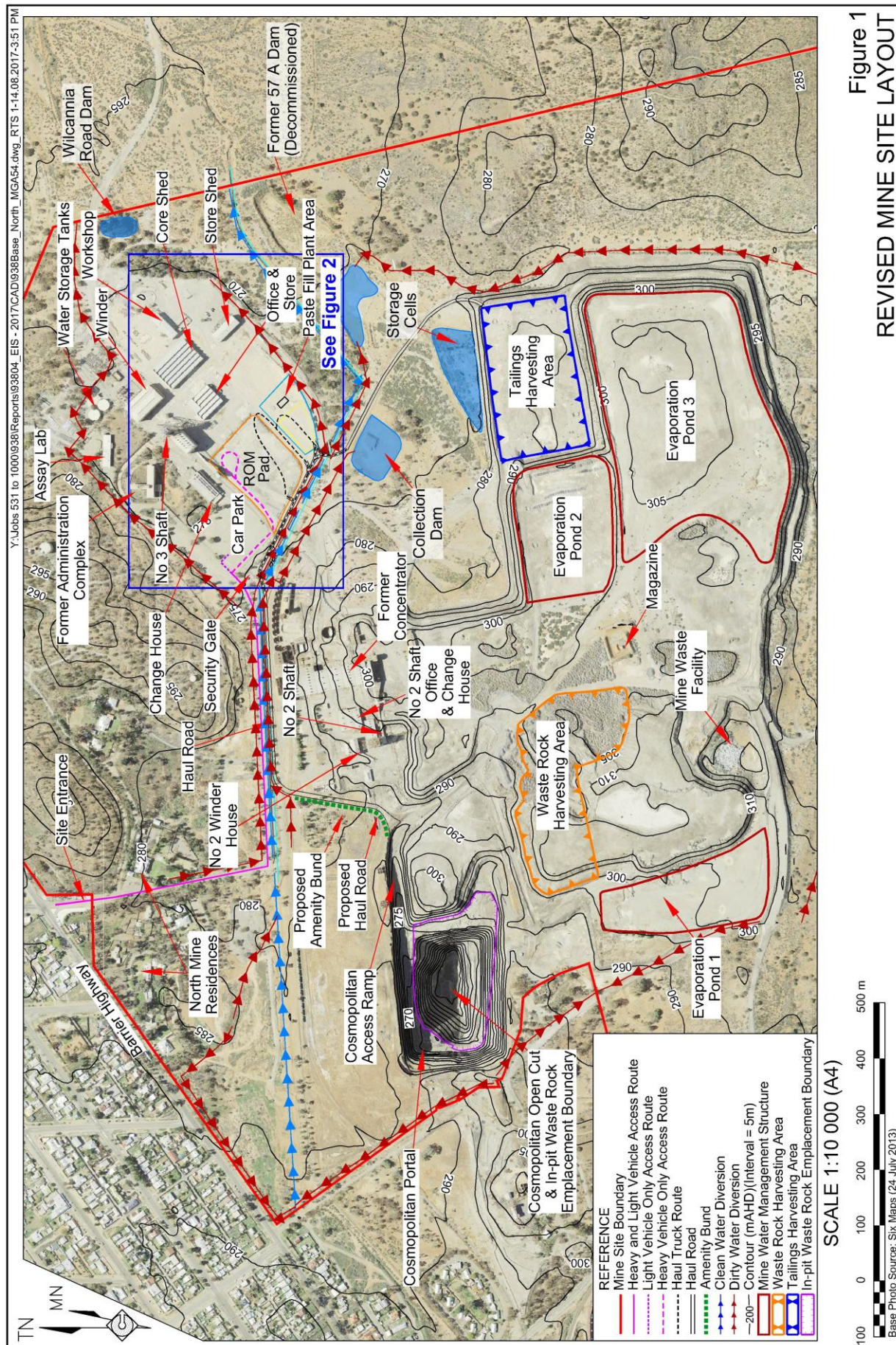
The Applicant has undertaken an inspection of the Existing Mine Water Settling Pond. In summary, previous waste rock extraction operations have resulted in the northern embankment to the pond now being inadequate for the proposed use of the pond. If the pond were to be used to store mine water, a breach of that embankment may result in an inrush of water to the underground workings. As a result, the Applicant no longer proposes to use the Existing Mine Water Settling Pond and that activity has consequently been removed from the Proposal.

2.2.2 Revised Environmental Assessment

The Existing Mine Water Pond was to be used to facilitate evaporation of water removed from the underground workings. **Table 1** presents a revised assessment of the anticipated annual rate of evaporation with the Existing Mine Water Settling Pond removed. In summary, annual maximum rates of evaporation would be reduced from 468.8ML to 450.2ML, a 4% reduction. This loss of evaporative capacity is not considered significant.

Table 1
REVISED Evaporation Pond Design Criteria

Structure	Area (ha)	Lining	Maximum Monthly Evaporation (ML) ¹	Minimum Monthly Evaporation (ML) ²	Annual Evaporation (ML) ³
Mine Water Settling Pond	0.8	Welded HDPE liner	2.9	0.4	18.6
Evaporation Pond 1	3.3		12.0	1.7	76.6
Evaporation Pond 2	4.0		14.6	2.0	92.8
Evaporation Pond 3	12.1		44.2	6.1	280.8
Total	19.4		70.8	9.8	450.2
Note 1: Assuming maximum mean monthly net evaporation of 365mm					
Note 2: Assuming minimum mean monthly net evaporation of 50mm					
Note 3: Assuming mean annual net evaporation of 2 321mm					
Source: RWC (2017) – After Table 2.14					



2.3 ENCLOSURE OF THE MOBILE CRUSHER

2.3.1 Revised Activity

The Applicant received a range of feedback, including in formal submissions, relating to the operation of the mobile crusher and the potential for emissions of particulate matter containing lead. The *Air Quality Assessment* prepared to support the application (PEL, 2017) identified in Appendix C that operation of the crusher would result in the emission of approximately 2 925t per annum (tpa) of total suspended particulates at the proposed maximum production rate of 300 000tpa. This source would comprise approximately 12% of modelled total particulate emissions.

In light of the feedback received, the Applicant proposes to construct an enclosure for the mobile crusher (**Figure 2**). The enclosure would be located within the ROM Pad area and would include dust extraction and collection that would result in negative pressure within the crusher enclosure. Collected dust would be removed from the Mine Site for processing at the Southern Operations concentrator.

2.3.2 Revised Environmental Assessment

Enclosure of the mobile crusher would result in a reduction in the amount of particulate material containing lead that would be emitted from the Mine Site. Section 3.5.2 presents an overview of the revised air quality assessment, taking into account enclosure of the mobile crusher.

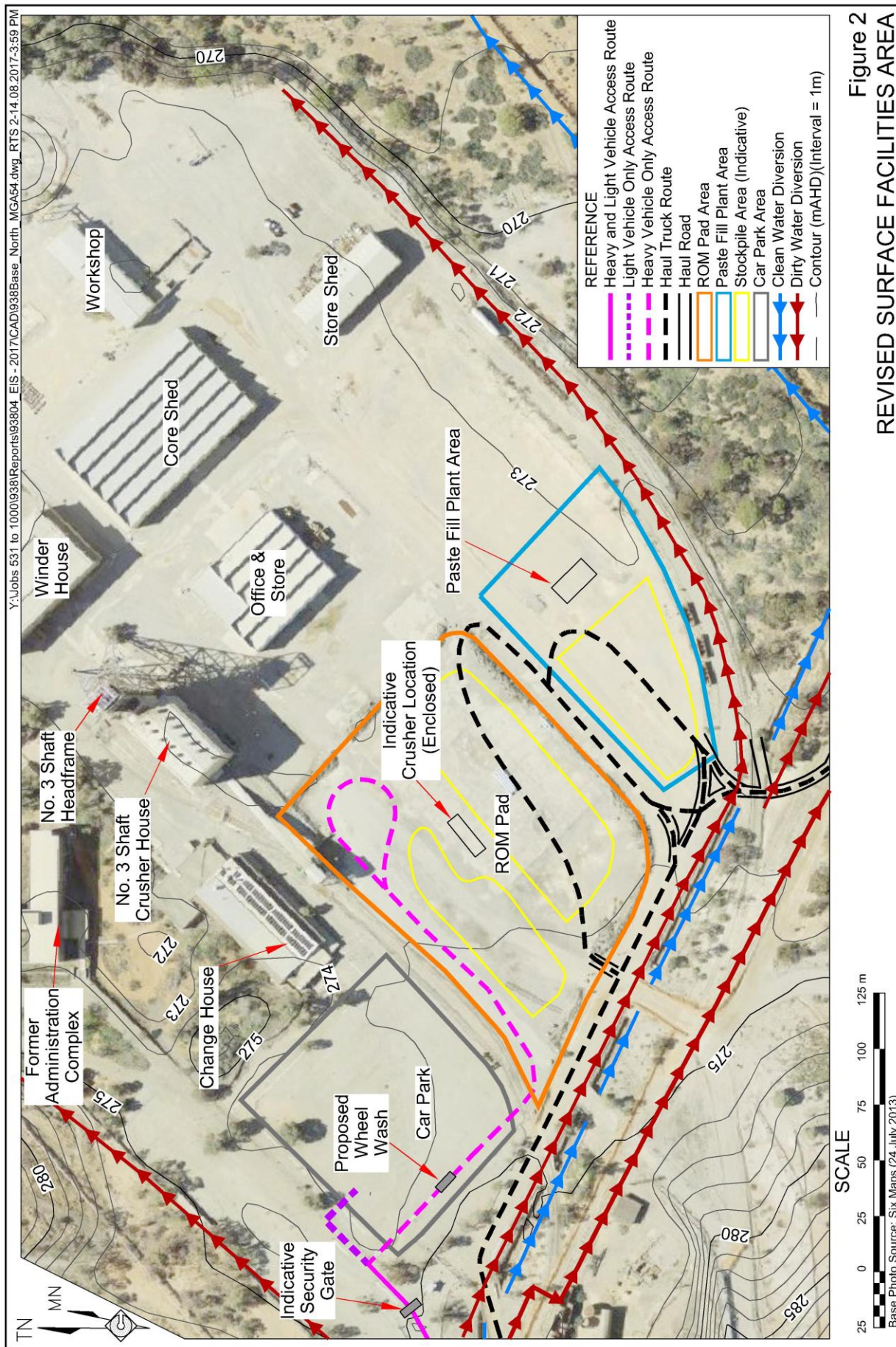
2.4 REVISED TRANSPORTATION ROUTE

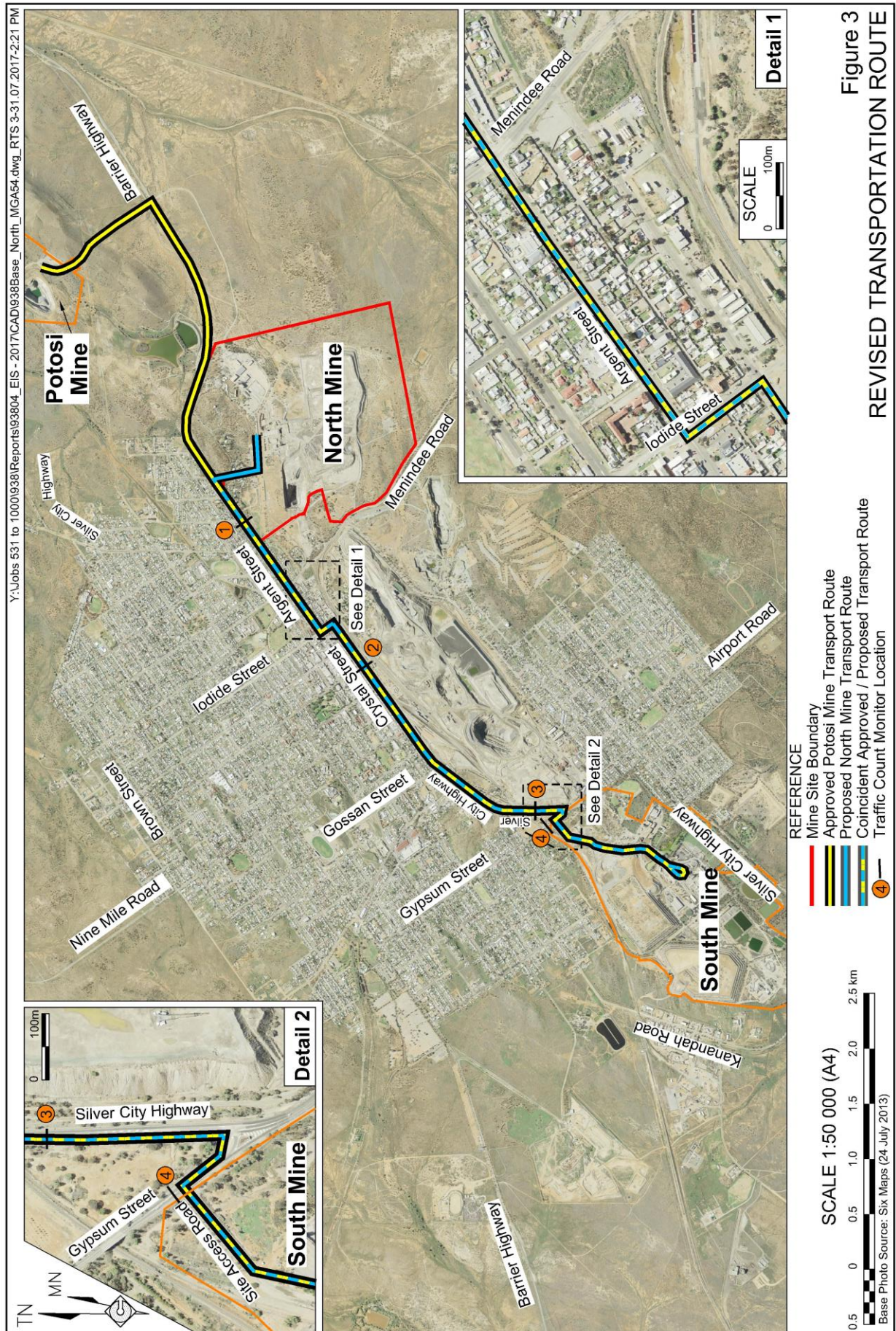
2.4.1 Revised Activity

The Applicant prepared and submitted to Broken Hill City Council an application to modify Development Consent DA448/2004 for the Potosi Mine. That application sought approval to transport ore using A-double Road Trains and to modify the approved transportation route for that operation from the existing gazetted route via Barrier Highway and Iodide Street to a new route via Menindee Road and Crystal Street. That route was consistent with that described in the *Environmental Impact Statement* for this application (**Figure 3**).

During exhibition of that application, submissions were received from the public objecting to the use of Crystal Street between Menindee Road. In light of those objections, the Applicant withdrew the proposed variation of the transportation route from that application. Broken Hill City Council approved the application to modify DA448/2004 on 22 February 2017, including the use of A-double road trains using the existing approved transportation route via Barrier Highway and Iodide Street.

In light of the above, the Applicant has revised the proposed transportation route for this application to be consistent with that approved for the Potosi Mine, namely via the Barrier Highway and Iodide Street. **Figure 3** presents the revised transportation route for which approval is sought under this application.





2.4.2 Revised Environmental Assessment

The revised transportation route is a State Road/Highway gazetted for the proposed class of vehicles to be used, namely A-double Road Trains operating at Higher Mass Limits. As a result, the Applicant contends that impacts associated with the revised route would be negligible.

Notwithstanding the above, the Applicant acknowledges concerns expressed by Broken Hill City Council and Roads and Maritime Service in relation to the status of the intersection of the Barrier Highway and Iodide Street. However, as the proposed heavy vehicle traffic would form only a small proportion of the total heavy vehicle traffic on that route and that the road is a State Road/Highway, that maintenance of the intersection and road is a matter for Roads and Maritime Service. The Applicant would be pleased to work with Broken Hill City Council and Roads and Maritime Service to resolve this issue.

It is noted that the revised transportation route would continue to use a section of Gypsum Street, a Regional Road under the care and management of Broken Hill City Council. This matter is addressed in Section 3.1.

3. GOVERNMENT AGENCY SUBMISSIONS

3.1 BROKEN HILL CITY COUNCIL

Broken Hill City Council provided a submission dated 6 March 2017. The submission raised a number of matters in relation to the application, each of which is addressed below. Importantly, Council notes that it supports the Proposal, stating that

“The socioeconomic benefits of the proposed development will have countless positive impacts on the City as a whole.”

Representative Comment(s)

It is Broken Hill City Council's understanding that that the proposed route from North Mine to Southern Operations via Argent Street onto Menindee Road and right onto Crystal Street has been withdrawn.

Further, it is Council's understanding that the approved route for the Potosi Development will be utilised for the recommencement of North Mine Project i.e. North Mine – Argent Street – Iodide Street – Crystal Street – South Road – Gypsum Street – Southern Operations and same route back to North Mine.

Abovementioned route will have a detrimental impact on regional roads under Council's care and maintenance. Council discussed aforementioned impacts with Perilya and the parties agreed to enter into a Voluntary Planning Agreement (VPA) to formalise future contributions from the developer to offset impacts on road infrastructure. In addition to agreed contributions for road infrastructure, the proponent offered to make contributions towards community amenities.

It is therefore proposed that a condition of consent be imposed, that prior to the development of the mine, unless the Secretary agrees otherwise, the Applicant must enter into a VPA with Council in accordance with the terms of the Applicant's offer as per table below.

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Funding area	Contributions plus GST	Details	Responsibility for administration
Gypsum Street/South Road intersection – East bound left turn lane.	\$280,000 upfront once-off payment.	Carry out works to upgrade intersection and widen lane by 0.5 metres – works to be carried out within 12 months of commencement of project. Council agrees that the following alternate route may be used during construction: South Road – Gaffney Street – Gypsum Street – Southern Operations and vice versa.	Council and Perilya.

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Funding area	Contributions plus GST	Details	Responsibility for administration
Gypsum Street/South Road intersection – East bound left turn lane.	As required.	Repair and upgrade remainder of intersection should further future deterioration occurs. Council agrees that the following alternate route may be used during construction: South Road – Gaffney Street – Gypsum Street – Southern Operations and vice versa.	Council and Perilya.
Westbound lane from South Road onto Gypsum Street.	Annual contribution of \$20,000 to be indexed at the Consumer Price Index of Australia.	Contributions to be made for the life of the project. Council agrees that the following alternate route may be used during construction: South Road – Gaffney Street – Gypsum Street – Southern Operations and vice versa.	Council and Perilya.
Annual community amenities contributions			
Zinc Lakes.	\$215,670	Gardening, slashing, garbage, maintenance, cleaning, water, electricity, rates, other.	Perilya.
Zinc ovals.	\$64,295		
Zinc Broken Hill Bowling Club.	\$10,100		
North Broken Hill Bowling Club.	\$49,978		
Pony Club.	\$13,100		
Rainbow Pre-school.	\$14,299		
Total community amenities contribution per annum.			\$367,442
Annual road maintenance contributions.			\$20,000
Once-off contribution for works associated with Gypsum Street/South Road intersection upgrade and widening with 0.5 metres.			\$280,000
Total annual contributions.			\$387,442

Response

The Applicant notes that the proposed VPA is consistent with its discussions with Broken Hill City Council and consents to the imposition of a condition as recommended.

Representative Comment(s)

The North Mine precinct contains thirty-two heritage items as per Broken Hill Local Environmental Plan 2013.

It is proposed that the following condition of consent be imposed on the development. Heritage – The Proponent shall prepare and implement a Conservation Management Plan for the site to the satisfaction of the Secretary. This plan must provide a strategic framework for all heritage items located on the Lease, based on the principles of the Burra Charter, and developed in consultation with OEH and Council. The plan must be submitted for the approval of the Secretary by December 2019.

Response

The Applicant consents to the imposition of a condition as recommended, however, the proposed completion date should be adjusted to “within 2.5 years of the date of this consent” to allow for delays in granting of development consent.

3.2 DPI-LANDS

DPI-Lands provided a submission dated 24 February 2017 stating that “the Department has no comments regarding this matter provided the methods and mitigation measures described in the EIS are followed.

As the Applicant would implement all management and mitigation measures identified in the EIS and this document, no further response is required.

3.3 DPI-WATER

DPI-Water provided a submission dated 7 March 2017. The following provides a response to each of the matters raised.

Representative Comment(s)

Additional information is required on the design of the evaporation ponds, the monitoring of their integrity, and of potential additional monitoring methods to ensure that perching does not occur within the old workings and to accurately monitor the area and rate of dewatering.

Response

Detailed designs of the evaporation ponds have yet to be completed, however, Section 2.8.4.5 of the *Environmental Impact Statement* identifies the indicative design criteria for the ponds. The Applicant recommends that a condition requiring preparation of a *Water Management Plan* to be prepared in consultation with DPI-Water include a requirement to provide detailed design and quality assurance procedures for the Evaporation Ponds.

In relation to monitoring to ensure that perching of water does not occur within the underground workings, the Applicant notes that sudden outburst of water from historic workings is a substantive health and safety risk to its workers and that this risk would be managed through its existing risk management practices. In summary, the Applicant anticipates that

measures to be implemented would include visual inspections to monitor for continued water flow from completed stopes and that workers would not be permitted to work in the vicinity of water-filled stopes until the Applicant has confirmed that the stopes have been fully drained. In addition, the Applicant notes that a range of ventilation shafts and other infrastructure intersect the existing water-filled workings at various levels. These structures, once access has been established, will permit more comprehensive monitoring program than is currently available. Finally, the Applicant would undertake drilling ahead of its development operations to test for open voids, including water filled voids.

Finally, in relation to accurate monitoring of the area and rate of dewatering, the Applicant would maintain the current automated water level logger within the No 3 Shaft and all water flows into and out of the underground workings would be metred. Where required, additional water level monitors would be installed.

Representative Comment(s)

The proponent has indicated sufficient water entitlement is held in Water Access Licence 40959 to account for the dewatering to remove existing water in the underground and for continued dewatering during operations. DPI Water advises WAL40959 also accounts for water take at other sites. The proponent should ensure sufficient entitlement is available to account for water take at all relevant sites during the project and during filling of the underground workings on mine completion.

Response

The Applicant acknowledges the fact that WAL40959 covers extraction of groundwater from all of its operations and would ensure that the cumulative annual extraction does not exceed the licenced volume.

Representative Comment(s)

DPI Water supports the proposed management and mitigation measures to address surface water management issues during the project but the proponent should also undertake maintenance of the clean water diversions to ensure ongoing stability and functioning in accordance with DPI Water's Guidelines for Controlled Activities on Waterfront Land.

Response

The Applicant acknowledges the requirement to maintain the clean water management structures as required and anticipates that the *Water Management Plan* to be prepared in consultation with DPI-Water should would identify an inspection and maintenance program for all surface water structures.

Representative Comment(s)

Prior to project approval, the proponent should provide clarification on the potential use/disposal of produced water in the southern operations and any treatment requirements or additional impacts. The proponent should also provide details on the likely split in volumes of produced water between the southern operations and the evaporation ponds, and the capacity of either option.

Response

Water that would be transferred from the Mine Site to the Southern Operations would be used for mining-related purposes, primarily processing operations, and would replace higher quality water supplied by Essential Water. Water transferred from the Mine Site would not be permitted to be discharged to natural drainage.

At the time of finalisation of this document, the Applicant is not able to estimate the anticipated split between water that would be transferred to the Southern Operations and water that would be transferred to the evaporations ponds. As a result, the Applicant has designed the evaporation ponds to manage 100% of all water removed from the Mine. In the event that some or all of the water removed from the Mine workings is exported from the Mine Site to the Southern Operations, then the environmental impacts of such a transfer would be no greater than those described in the *Environmental Impact Statement*.

Representative Comment(s)

The proponent should commit to establish a water supply options strategy, which maximises the use of water sources on site and minimises the use of town water supply.

Response

The Applicant would prioritise the use of on-site water sources where practicable thereby reducing use of raw water supplies by Essential Water. The Applicant recommends a condition to document this commitment as part of a *Water Management Plan*.

Representative Comment(s)

The proponent should provide evidence of the construction, integrity or adequacy of existing mine water settling pond to be used as an evaporation pond for the produced water.

Response

This recommendation is no longer relevant as use of the Existing Mine Water Settling Pond no longer forms a component of the Proposal (see Section 2.2).

Representative Comment(s)

The proponent should provide additional information on the proposed HDPE liner and its suitability to be exposed to UV for the life of the operations.

Response

The Applicant anticipates that the HDPE liner would be constructed using a product such as “Firestone GeoGard EPDM” membrane or similar. The manufacturer of that product states that such liners require little or no regular maintenance after installation, with the membrane capable of withstanding normal environmental exposure for well over 30 years.

Representative Comment(s)

The proponent should develop a strategy to monitor the effectiveness of the rate of dewatering, which is in addition to measuring the standing water level in the No. 3 shaft. Consideration should be given to assess other potential measurement or monitoring techniques to support the monitoring of the groundwater levels in the No. 3 shaft.

Response

This matter has been addressed previously.

Representative Comment(s)

The groundwater monitoring program should include clear measurement methodology (including metering where feasible) of all groundwater take from the project which is to include the initial dewatering, the future groundwater inflows during mining and the removal of water in mined material.

Response

This matter has been addressed previously.

Representative Comment(s)

The monitoring program should include assessment of the observed to predicted evaporation within the evaporation ponds to identify if there is potential leakage from these ponds.

Response

The Applicant acknowledges DPI-Water's concern that the Applicant be able to detect and remediate leakage from the Evaporation Ponds. However, the Applicant does not believe that simply comparing observed versus actual evaporation rates would adequately enable leak detection. As previously indicated, the Applicant recommends that the conditional requirement to prepare a *Water Management Plan* in consultation with DPI-Water to include a requirement to identify a suitable leak detection system within the Evaporation Ponds.

Representative Comment(s)

The following should be included as Conditions of Consent if the project is approved:

- *The proponent must prepare a Surface Water, Sediment and Erosion Control Plan in consultation with DPI-Water.*
- *The proponent must prepare a Groundwater Management Plan in consultation with DPI-Water.*

Response

The Applicant agrees with to the intent of the recommendation, however, respectfully suggests that the Department require preparation of a *Water Management Plan* addressing all aspects of water management within the Mine Site.

3.4 DIVISION OF RESOURCES AND ENERGY

Representative Comment(s)

The application has proposed that the portal/mine access be left open post mine closure (Domain 6, Section 2.13.3). DRE would require that, at closure, all mine shafts, vents and accesses be appropriately sealed with the surrounding area rehabilitated. The proponent is required to demonstrate that this would occur.

Response

The Applicant would appropriately seal all shafts and ventilation rises in a manner that is consistent with the relevant guidelines applicable at the time of closure of the North Mine. In addition, the Applicant would similarly seal the portal and decline in a manner that would ensure that reopening of vehicular access to the underground working would require substantial works, thereby preventing inadvertent or inappropriate access. At this stage, the Applicant anticipates that this would be achieved by backfilling the near surface sections of the decline and covering the portal with waste rock.

The Applicant anticipates that further information on the methodology and criteria to appropriate sealing of the mine openings would be provided in the *Mining Operations Plan* for the Mine.

3.5 ENVIRONMENT PROTECTION AUTHORITY

3.5.1 Introduction

The Environment Protection Authority provided a submission dated 8 March 2017. The submission addressed four principal areas as follows.

- Air quality.
- Health risks.
- Noise impacts.
- Blast impacts.

The Applicant engaged the following specialist consultants to prepare a response for each of the principal areas identified. The Applicant and its specialist consultants met with the Environment Protection Authority, NSW Health and their technical advisors by teleconference on 10 April 2017 to discuss the approach to the air quality and health risk assessment. During that teleconference, the general approach to completing the revised assessments was discussed and agreed.

The various reports prepared in response to the principal issues raised are presented in the following appendices.

- Air quality – Pacific Environment (PE, 2017b, presented as **Appendix 1**).
- Health risks – ToxConsult (ToxConsult, 2017, presented as **Appendix 2**).
- Noise impacts – Muller Acoustic Consultants (MAC, 2017b, presented as **Appendix 3**).
- Blast impacts – Prism Mining Pty Ltd (Prism, 2017, presented as **Appendix 4**).

The following subsections provide a brief overview of the results of the revised assessments, where appropriate, and a response to each of the matters raised in the submission.

3.5.2 Air Quality

3.5.2.1 Introduction

Pacific Environment (PE) prepared the *Air Quality and Greenhouse Gas Impact Assessment* to support the application for development consent, referred to hereafter as PE (2017a). The EPA raised a number of questions and issues in relation to that assessment. The Applicant engaged PE to prepare a response to the matters raised by the EPA. The resulting *Perilya Broken Hill North Mine – Air Quality Assessment Update* is presented as **Appendix 1** and is referred to hereafter as PE (2017b).

PE (2017b) included a revised assessment of air quality impacts as well as a response to each of the issues raised by the Environment Protection Authority. Section 3.5.2.2 presents a brief summary of the revised assessment of air quality impacts, prepared for non-technical experts. Readers seeking to review the technical aspects of the assessment should refer to **Appendix 1**.

3.5.2.2 Assessment Methodology

Based on discussions during the teleconference on 10 April, it became apparent that the Environment Protection Authority, NSW Health and their advisors required a comparison of the existing emissions from the Mine Site with those that would be expected should the Proposal be approved. The approach taken by PE (2017a) for the original *Air Quality Assessment* did not allow this comparison because the existing emissions were based on monitoring results of actual emissions from all sources, including the Mine Site. This did not permit existing emissions from the Mine Site to be separated from emissions from other sources.

As a result, PE (2017b) modelled particulate emissions based on the following two scenarios.

- **Scenario AQ1** – The existing Mine Site, in the absence of any on-site operations. This was done to permit the contribution of the existing Mine Site to the background monitoring data to be quantified.
- **Scenario AQ2** – The proposed Mine Site, with mining activities as described in the *Environmental Impact Statement*, modified as described in Section 2 of this document.

Sections 2, 3 and 6 of PE (2017b) describe the revised assessment methodology. In summary, in order to ensure consistency with previously completed assessments for the Rasp Mine, permission was obtained from CBH Resources Limited to use ambient air quality monitoring data and meteorological data for use in the model established for that operation for the revised air quality assessment. In particular, the revised assessment methodology included the following.

- Use of meteorological data from the Bureau of Meteorology-operated Broken Hill Airport Station for 2016 rather than 2014 to ensure consistency with the recently completed *Air Quality Assessment* prepared for the Rasp Mine.
- Use of monitoring data from both the Applicant's operations as well as data collected for the Rasp Mine.

In assessing the existing emissions from the Mine Site, PE (2017b) undertook the following.

- The Mine Site was divided into six domains with emission sources with similar land surfaces and wind erosion potential. The existing emissions assessment assumed that there are no activities being undertaken within the Mine Site.
- Each domain was assigned an appropriate particulate matter control rate based on measurements from the adjacent Rasp Mine or the document *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and / or Minimise Emissions of Particulate Matter from Coal Mining* published by Office of Environment and Heritage in 2011 (Best Practice Report).
- The metal content of particulate matter emitted from each domain was determined based on samples collected within the Mine Site.
- Estimated existing particulate matter and associated metal concentrations resulting from emissions from the Mine Site alone were then determined based on a dispersion model.

In assessing the proposed emissions from the Mine Site, PE (2017b) undertook the following.

- Emission sources were identified based on the proposed activities within the Mine Site. Where land use patterns would remain unchanged as a result of the Proposal, the emission sources were as per the existing emissions assessment. Where land use patterns would change, appropriate emission inventory were determined based on the proposed activities, including as modified in Section 2 of this document.
- The metal content of particulate matter likely to be emitted from each domain was determined based on samples collected within the Mine Site.
- Estimated proposed particulate matter and metal concentrations resulting from the proposed activities were then determined based on a dispersion model.
- In order to determine average and worst case annual and 24-hour emissions, PE (2017b) modelled two production scenarios as follows.
 - Typical day – assumed the annual maximum production rate of 300 000tpa of ore over 365 days or 821t produced, crushed and transported per day.
 - Maximum day – assumed the daily maximum production and crushing rate of 1 350t/day and transportation of 1 800t/day.

Particulate emissions were assessed at 86 non-Proposal related receptors, including the following (**Figure 4**).

- 52 private residences.
- 14 schools and child-care centres.
- 5 health care facilities.
- A water tank and business premises (Mawson's Quarry offices).
- 13 play grounds and playing fields.

In addition, particulate emissions were also assessed at 16 Project-related residences, resulting in a total of 102 receptors assessed (**Figure 4**).

3.5.2.3 Additional Management and Mitigation Measures

The Applicant would implement the following additional management and mitigation measures identified by PE (2017b). These measures would be additional to those identified in Section 4.2.6 of the EIS.

Construction Operations (Evaporation Ponds)

- Undertake daily on-site and off-site inspections for visible dust, address any identified emissions immediately and maintain a log of all inspections.
- Limit vehicle speeds to 20km/h within construction areas.
- Regularly water disturbed areas using a water truck, including the use of dust suppressants where appropriate.

Mining Operations

- Install a variable speed drive fan within the No. 3 Vent Rise with a maximum ventilation flow rate of 235m³/s and ensure that the fan is operated at the minimum rate required to ensure safe operation of the Mine.
- Ensure that the haul road from the top of the Cosmopolitan Open Cut Ramp to the ROM Pad is sealed.
- Ensure that water sprays are installed alongside the haul road from the Tailings Harvesting Area to the Pastefill Plant and are operational whenever the haul road is in use.
- Maintain sealed roads with a maximum silt loading of 2.5g/m².
- Enclose the mobile crusher within a negative pressure enclosure and install a filtration system to control dust emissions from the crusher.
- Install a wind barrier/fence and water sprays around the ROM Pad.
- Cover stockpiled tailings within the Pastefill Plant Stockpile Area with tarpaulins or similar.
- Use dust suppressants in infrequently used “bare” areas to prevent dust lift off.

3.5.2.4 Revised Assessment of Impacts

Annual Average Particulate Matter Modelling Results

Section 7.1 of PE (2017b) presents the results of the revised annual average air quality modelling results. **Table 2** present a summary of those results.

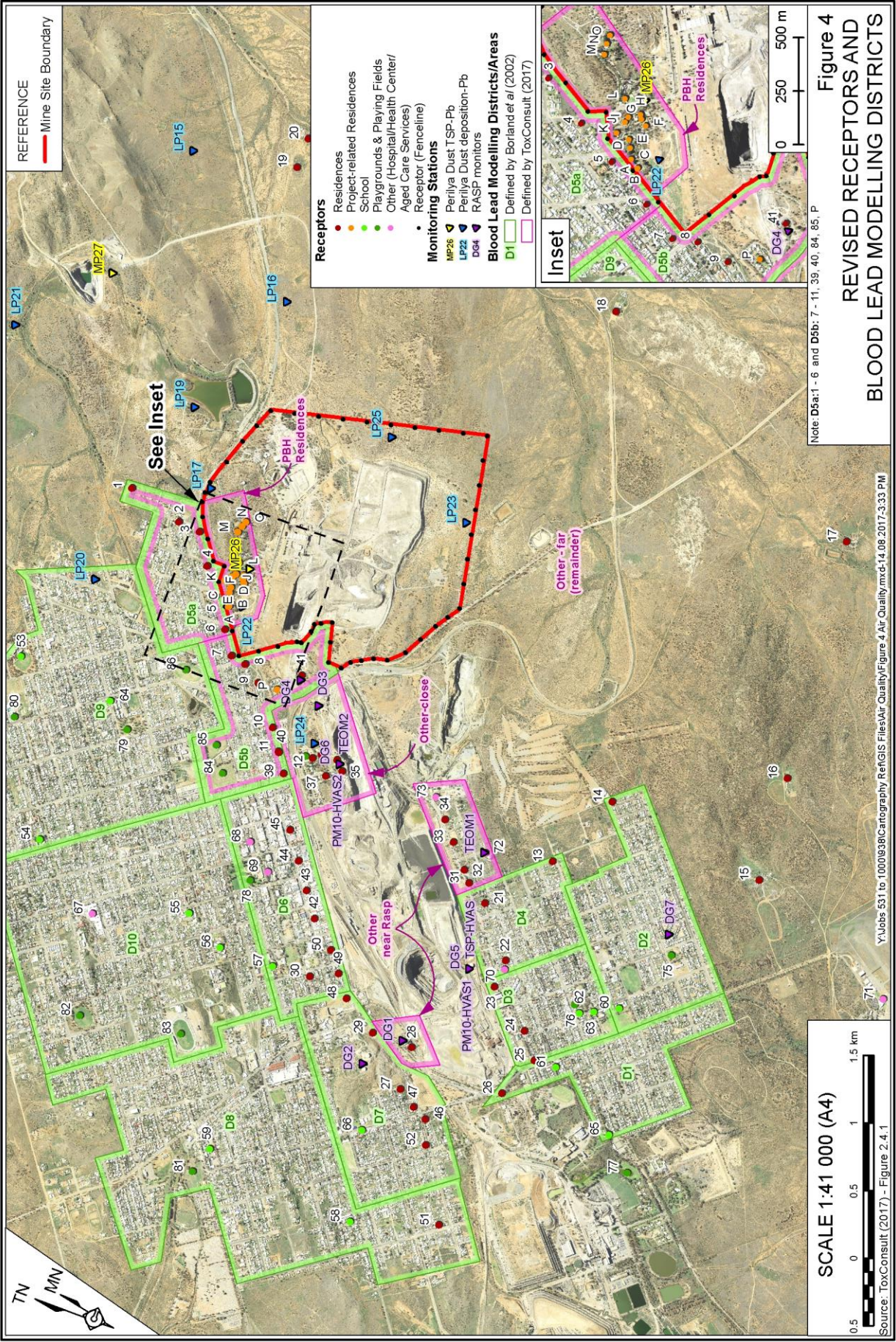


Table 2
Annual Average Particulate Matter Modelling Results

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	Scenario 1 Existing Mine Site	Scenario 2 Proposed Mine Site
Annual Average Deposited Dust		
• Number of exceedances of incremental criterion (2g/m ² /month).	Nil	Nil
• Number of exceedances of cumulative criterion (2g/m ² /month).	Nil	Nil
• Number of Receptors that would experience the same or reduced deposited dust levels.	71	
• Number of Receptors that would experience an increase in deposited dust levels.	31	
• Maximum increase in deposited dust.	0.01g/m ² /month	
Summary of results		
• There would be no exceedances of the deposited dust assessment criteria. • Most receptors would experience no change or a reduction in deposited dust levels. • 31 residences would experience a negligible increase of up to 0.01g/m²/month. This increase would be well within the bounds of measurement uncertainty and undetectable amongst the “noise” in any monitoring dataset.		
Annual Average Total Suspended Particulates (TSP)		
• Number of exceedances of cumulative criterion (90µg/m ³).	Nil	Nil
• Number of Receptors that would experience the same or reduced TSP concentrations.	13	
• Number of Receptors that would experience an increase in TSP concentration.	89	
• Maximum increase in TSP concentration.	Non-Project – 0.42µg/m ³ (Receptor 1)	
	Project-related – 1.71µg/m ³ (Receptor I)	
Summary of results		
• There would be no exceedances of the annual average TSP criterion of 90µg/m³. • 13 receptors would experience no change or a reduction in in annual average suspended particulate concentrations. • 89 receptors would experience a slight increase in annual average suspended particulate concentrations, with 54 of those experiencing an increase of 0.1µg/m³ or less. • The maximum increase at a non-Project related receptor is expected to be 0.42µg/m³ at Receptor 1, a 1.4% increase compared with the existing Mine Site. An increase of this magnitude would be at the limit of detection for monitoring equipment, within the bounds of measurement uncertainty and, as a result, undetectable amongst the “noise” in any monitoring dataset.		

Table 2 (Cont'd)
Annual Average Particulate Matter Modelling Results

Page 2 of 2

	Scenario 1 Existing Mine Site	Scenario 2 Proposed Mine Site
Annual Average PM ₁₀		
• Number of exceedances of cumulative criterion (25µg/m ³).	Nil	Nil
• Number of Receptors that would experience the same or reduced PM ₁₀ concentrations.	19	
• Number of Receptors that would experience an increase in PM ₁₀ concentration.	83	
• Maximum increase in PM ₁₀ concentration.	Non-Project – 0.20µg/m ³ (Receptor 1)	
	Project-related – 0.23µg/m ³ (Receptor I)	
Summary of results		
• There would be no exceedances of the annual average PM₁₀ criterion of 25µg/m³. • 19 receptors would experience no change or a reduction in PM₁₀ concentrations. • 83 receptors would experience a slight increase in annual average PM₁₀ concentrations, with 80 of those experiencing an increase of 0.1µg/m³ or less. • The maximum increase at a non-Project related receptor is expected to be 0.20µg/m³ at Receptor 1, a 1.0% increase. An increase of this magnitude would be at the limit of detection for monitoring equipment, within the bounds of measurement uncertainty and as a result, undetectable amongst the “noise” in any monitoring dataset.		
Annual Average PM _{2.5}		
• Number of exceedances of cumulative criterion (8µg/m ³).	Nil	Nil
• Number of Receptors that would experience the same or reduced PM _{2.5} concentrations.	1	
• Number of Receptors that would experience an increase in PM _{2.5} concentration.	101	
• Maximum increase in PM _{2.5} concentration.	Non-Project – 0.27µg/m ³ (Receptor 2)	
	Project-related – 0.67µg/m ³ (Receptor I)	
Summary of results		
• There would be no exceedances of the annual average PM_{2.5} criterion of 8µg/m³. • Almost all receptors would experience a slight increase in annual average suspended particulate concentrations, with 85 of those experiencing an increase of 0.1µg/m³ or less. • The maximum increase at a non-Project related receptor is expected to be 0.27µg/m³ at Receptor 2, a 3.0% increase. An increase of this magnitude would be at the limit of detection for monitoring equipment, within the bounds of measurement uncertainty and, as a result, undetectable amongst the “noise” in any monitoring dataset.		
Source: PE (2017b) – After Section 7.1		

The modelling indicates that there would be no exceedances of the relevant air quality assessment criteria and that modelled increases in particulate matter would be very minor. In particular, the proposed management and mitigation measures would result in substantial reductions in fugitive dust emissions compared with the existing Mine Site. Proposed emissions would be largely associated with emissions from the ventilation system which was modelled based on a maximum flow rate of 350m³/s. The Applicant has, however, committed to

installing a variable speed ventilation fan with a maximum flow rate of 235m³/s. As a result, the Applicant contends that the modelling is inherently conservative and the modelled increases in dust levels at some residences, as small as they are, would be unlikely to eventuate. In addition, the Applicant contends that it has implemented all reasonable and feasible mitigation measures to minimise particulate matter emissions from the Mine Site.

24-hour Average Particulate Matter Modelling Results

Section 7.2 of PE (2017b) presents the results of the revised 24-hour air quality modelling results. **Table 3** present a summary of those results.

Table 3
24-hour Average Particulate Matter Modelling Results

	Scenario 1 Existing Mine Site	Scenario 2 Proposed Mine Site
24-hour Average PM₁₀ (ventilation rate = 350m³/s)		
• Number of exceedances of cumulative criterion (50µg/m ³).	1 (Receptor D – 1 day)	Typical Day – Nil Maximum Day – Nil
• Number of Receptors that would experience the same or reduced maximum 24-hour PM ₁₀ concentration.	101	
• Number of Receptors that would experience an increase in maximum 24-hour PM ₁₀ concentration.	1 (Receptor D)	
• Maximum increase in 24-hour PM ₁₀ concentration.	0.4µg/m ³	
Summary of results		
• There is predicted to be one exceedance of the average 24-hour PM₁₀ criterion of 50µg/m³ at one Receptor under Scenario 1 – Existing Mine Site. • By contrast there are expected to be no exceedances of the average 24-hour PM₁₀ criterion of 50µg/m³ under Scenario 2 – Proposed Mine Site for either typical or maximum day scenarios. • All Receptors are expected to experience a reduction in the maximum cumulative 24-hour PM₁₀ concentration because of the Proposal under both typical day and maximum day scenarios, with one exception, Residence D.		
24-hour Average PM_{2.5} (ventilation rate = 235m³/s)		
• Number of exceedances of cumulative criterion (25µg/m ³).	Nil	Typical Day – 1 Maximum Day – 1 (Receptors M, N and O)
• Number of Receptors that would experience the same or reduced maximum 24-hour PM _{2.5} concentration.	96	
• Number of Receptors that would experience an increase in maximum 24-hour PM ₁₀ concentration.	6 (Receptors H, I, L M, N and O)	
• Maximum increase in 24-hour PM ₁₀ concentration.	4.4µg/m ³ (Receptor N)	
Summary of results		
• There is predicted to be no exceedances of the average 24-hour PM_{2.5} criterion of 25µg/m³ at any Receptor under Scenario 1 – Existing Mine Site. • By contrast there is expected to be one exceedances of the criterion under Scenario 2 – Proposed Mine Site for both typical and maximum day scenarios at Receptors M, N and O, all of which are Project-related. • All Receptors are expected to experience a reduction in the maximum cumulative 24-hour PM₁₀ concentration as a result the Proposal under both typical day and maximum day scenarios, with six exceptions, namely Receptors H, I, L M, N and O, all of which are Project related.		
Source: PE (2017b) – After Section 7.2		

The modelling indicates that except for a limited number of Project-related Receptors, all Receptors would experience a reduction in the maximum 24-hour concentration for both PM₁₀ and PM_{2.5}. A limited number of Project-related residences would experience an increase in the maximum cumulative 24-hour PM₁₀ and PM_{2.5} concentrations. The Applicant would manage this issue in consultation with its employees and the blood lead level-based management measures identified in Section 3.5.3.6.

Lead in Suspended Particulates

Section 7.3 of PE (2017b) presents the results of the revised metals in particulate matter modelling results. **Table 4** presents a summary of the results of the annual average lead concentration in suspended particulates.

It is noted that PE (2017b) also modelled 49 “fence line” receptors. The results of that modelling are also presented in **Table 4**.

Table 4
Annual Average Lead Concentration in Suspended Dust

	Scenario 1 Existing Mine Site	Scenario 2 Proposed Mine Site
Number of exceedances of cumulative criterion (0.5µg/m³).	Nil	Nil
Number of Receptors that would experience the same or reduced annual average lead concentration in suspended particulates.	75	
Number of Receptors that would experience an increase in annual average lead concentration in suspended particulates.	Non-Project Related - 15 Project-related – 12	
Maximum increase in annual average lead concentration in suspended particulates.	Non-Project Related – 1.8% or 0.004µg/m³ (Receptor 4)	
	Fence line – 2.2% or 0.005µg/m³	
	Project-related – 9.9% or 0.024µg/m³ (Receptor I)	
Summary of results - There would be no exceedances of the cumulative assessment criterion of 0.5µg/m³ under either Scenario 1 – Existing Mine Site or Scenario 2 – Proposed Mine Site. - The maximum increase for non-Project related receptors would be 0.004µg/m³, or less than 1% of the assessment criterion. This would represent a maximum change in annual average lead concentration in suspended particulates of 1.8%. This increase would be well within the bounds of measurement uncertainty and undetectable amongst the “noise” in any monitoring dataset. - The maximum increase for fence line receptors would be 0.005µg/m³, or 1% of the assessment criterion. This would represent a maximum change in annual average lead concentration in suspended particulates of 2.2%. This increase would be well within the bounds of measurement uncertainty and undetectable amongst the “noise” in any monitoring dataset. - The maximum increase for Project-related receptors would be 0.024µg/m³, or 5% of the assessment criterion. This would represent a maximum change in annual average lead concentration in suspended particulates of 9.9%. The Applicant would manage this issue in consultation with its employees and the blood lead level-based management measures identified in Section 3.5.3.6.		
Note 1: Excluding fence line receptors.		
Source: PE (2017b) – after Section 7.3 and Table 26		

In summary, the modelling indicated that there would be no exceedances of the cumulative assessment criterion of $0.5\mu\text{g}/\text{m}^3$ and that most receptors would experience a reduction in annual average lead concentration in suspended particulates. Of the 15 non-Project related receptors which would experience an increase in annual average lead concentration in suspended particulates, 14 would experience an increase of less than 0.5%, with one (Receptor 4) experiencing a minor increase of 1.8%. As previously identified, the modelling indicates that the proposed management and mitigation measures would result in a substantial reduction in fugitive dust emissions as a result of the Proposal, with the modelled increases resulting from the operation of the ventilation system. As a result, the Applicant contends that it has implemented all reasonable and feasible mitigation measures to minimise particulate matter emissions from the Mine Site.

Other Metals in Suspended Particulates

Section 7.3 of PE (2017b) presents the results of the revised metals in particulate matter modelling results. **Table 5** presents a summary of the results of the predicted 99.9th percentile 1-hour average concentrations for the metals other than lead. In summary, PE (2017b) predicts that there would be minor exceedances of the assessment criteria for Chromium and Mercury at a limited number of Project-related receptors. The Applicant would manage this issue in consultation with its employees and the blood lead level-based management measures identified in Section 3.5.3.6.

Table 5
Exceedances of the 99.9th Percentile 1-hour Average Metal Concentrations Criterion

Metal	Criterion ($\mu\text{g}/\text{m}^3$)	Number of Exceedances at Receptors	
		Existing	Proposed
Ag	0.18	Nil	Nil
As	0.9	Nil	Nil
Cd	0.018	Nil	Nil
CrIV	0.09	Receptor D ¹	Nil
CrIII	9	Nil	Nil
Cu	18	Nil	Nil
Fe	90	Nil	Nil
Hg	0.18	Nil	Receptors G, H, I, J and L
Mn	18	Nil	Nil
Ni	0.18	Nil	Nil ¹
Zn	90	Nil	Nil
Note 1: An exceedance was modelled at the Project Site boundary			
Source: PE (2017b) – after Section 7.3 and Table 26			

Concluding Comments

Based on the results of the revised air quality assessment prepared by PE (2017b), the Proposal would result in a reduction in fugitive emissions from the Mine Site. This would result in reduced particulate emissions at many Receptors. However, the modelling indicates that the ventilation system required to operate the Proposal would be an additional source of particulate emissions previously associated with, but not currently present within the Mine Site. These

emissions would result in negligible to very minor increases in particulate emissions at a number of non-Project related receptors. The Applicant contends that it has implemented all reasonable and feasible mitigation measures to minimise particulate matter emissions from the Mine Site and that Proposal-related particulate matter impacts would be negligible and well within the bounds of measurement uncertainty and, as a result, undetectable amongst the “noise” in any monitoring dataset.

3.5.2.5 Response to Submissions

Representative Comment(s)

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.

Response

PE (2017a) and PE (2017b) assessed two operational scenarios, namely:

- a typical day, where the maximum annual production rate of 300 000tpa was assumed to occur evenly throughout the year; and
- a maximum day, where the maximum possible production rate over a 24-hour period was modelled.

It is noted that when annualised, the maximum day scenario would result in production rate that would exceed the annual permissible production rate.

Representative Comment(s)

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.

Response

PE (2017b) includes emissions from combustion sources.

Representative Comment(s)

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.

Response

PE (2017b) notes that stack emissions are the controlling emission source for the proposed operations. As these do not vary substantially between average and maximum day scenarios, the differences in emission rates at surrounding receptors between these scenarios exists at the level of 2 to 3 decimal places. As PE (2017a) presented data to the appropriate number of significant figures, the rounding resulted in the results appearing to be identical.

Representative Comment(s)

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.

Response

Perimeter receptors have been assessed by PE (2017b).

Representative Comment(s)

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

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

The AQIA should report the 100th percentile annual average lead impacts at the nearest sensitive receptor.

Response

PE (2017a) assessed lead concentrations as the 99.9th percentile 1-hour concentration. PE (2017b) assessed lead concentration as the annual average lead concentration as requested.

Representative Comment(s)

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.

Response

Isopleths of each metal assessed are presented in PE (2017b).

Representative Comment(s)

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.

Response

The Applicant notes that all management measures identified in Section 4.2.6 of the EIS were included in the assessment presented in PE (2017a). Similarly, the assessment presented in PE (2017b) includes all management measures identified in Section 4.2.6 of the EIS and Section 3.5.2.3 of this document. The Applicant states that these measures are consistent with the Best Practice Management Measures, as relevant for an underground metalliferous mining operation.

Finally, the Applicant contends that as PE (2017b) did not identify any exceedances of the relevant criteria, an assessment of modified operations under high winds is not required at this stage of the application process. Notwithstanding this, the Applicant acknowledges that high winds have the potential to adversely impact on dust emissions and that modification of surface operations under such conditions would form a component of the *Air Quality Management Plan* to be prepared following the receipt of development consent.

3.5.3 Health Risk Assessment

3.5.3.1 Introduction

Following a review of the comments raised by the Environment Protection Authority in relation to the *Health Risk Assessment* prepared to support the application for development consent (PE, 2017c), the Applicant engaged ToxConsult Pty Ltd to prepare a new *Human Health Risk Assessment*. The resulting report is presented as **Appendix 2** and is referred to hereafter as ToxConsult (2017). This summary has been prepared based on that document for readers who are not technical experts. Readers seeking to review the technical aspects of the *Human Health Risk Assessment* should refer to **Appendix 2**.

ToxConsult (2017) was prepared by Dr Roger Drew and Ms Tarah Hagen. Dr Drew has primary degrees in biochemistry and pharmacology and postgraduate degrees in toxicology. He has more than 40 years of toxicological and risk assessment experience in academia, industry and consulting and is certified by the American Board of Toxicology. Dr Drew is also Adjunct Associate Professor in the Department of Epidemiology and Preventive Medicine at Monash University and is a recognised national and international expert in toxicology and risk assessment.

Ms Hagen has a Masters degree in Environmental Toxicology and Pollution Monitoring, an honours degree in ecotoxicology, and a degree in Applied Science (Biological Sciences). She has numerous years' experience in conducting screening and detailed human health and ecological risk assessments for a variety of industries and government. Ms Hagen regularly presents at scientific conferences and is a registered member and Secretary of the Australasian College of Toxicology and Risk Assessment.

3.5.3.2 Assessment Methodology - Lead

Background

ToxConsult (2017) was prepared broadly in accordance with the document *Environmental health risk assessment guidelines for assessing human health risks from environmental hazards* published by the Commonwealth Department of Health Environmental Health Standing Committee in 2012, as well as World Health Organisation and US Environment Protection Authority guidance.

ToxConsult (2017) identified a range of substances that may be emitted from the Mine Site that could be of potential concern. For the purposes of the *Human Health Risk Assessment*, these were divided into lead and all other metals.

In Broken Hill, there has historically been a high prevalence of elevated blood lead levels in children, the most sensitive section of the population. In particular, high blood lead levels in children are associated with a range of well publicised adverse health impacts, including neurological and behavioural impacts. While blood lead levels in children living in Broken Hill decreased steadily throughout the 1990's, they have remained fairly constant at an average level of approximately 5µg/dL since 2011.

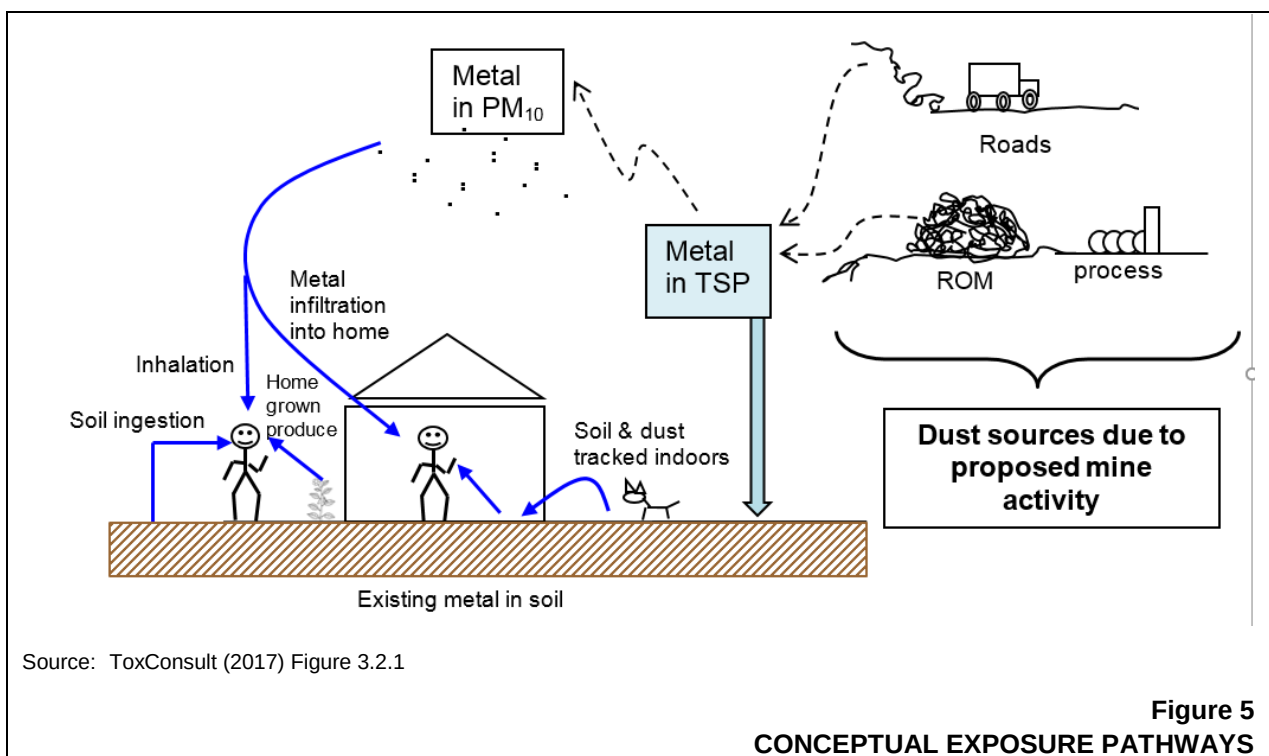
In light of the adverse health impacts associated with lead, the National Health and Medical Research Council identified a management goal for public health in relation to lead of $\leq 5\mu\text{g/dL}$ (micrograms per decilitre), down from the previous goal of $10\mu\text{g/dL}$. At levels above $5\mu\text{g/dL}$, a person's exposure to lead should be investigated and reduced.

Core to the health risk assessment is consideration of whether the proposed mine is likely to result in increases to existing lead exposures at Broken Hill and hence possible increases in blood lead levels. This is evaluated with the use of US EPA developed and validated methods to predict blood lead levels in children. Information on important inputs to the blood lead modelling, and the blood lead modelling itself, are discussed below.

Conceptual Exposure Pathways and Model

Figure 5 presents the conceptual exposure pathways for lead and other metals. In summary, there are three principal pathways for lead to enter the human body. In order of significance, these are as follows.

1. Ingestion of lead in soil and dust.
2. Inhalation of lead in soil and dust.
3. Lead in the diet.



ToxConsult (2017) determined that contamination of home grown produce in Broken Hill was unlikely to be a significant source of lead in blood and this pathway was not assessed.¹

¹ See Section 3.2 of TC (2017) for a justification for this conclusion.

Within Broken Hill, ingestion of soil and dust was determined to be the most likely exposure pathway for lead to enter the human body, particularly for the most at-risk age group of young children. In particular, hand-to-mouth transfer within this age group is widely acknowledged as a significant contributor to ingestion of lead.

Assessment Districts and Receptors

ToxConsult (2017) established 15 assessment districts/areas, including those identified by the NSW Department of Rural Health² (Boreland *et al* 2002) (**Figure 4**). For the purposes of this assessment, District 5, namely the district closest to the Mine Site, has been divided into two sub-districts, District 5a and District 5b. In addition, ToxConsult (2017) have identified four additional areas, namely:

- “Other – near Rasp” – including residences located to the south of Eyre Street and the east of King Street and to the southeast of South Road/Crystal St, in close proximity to the Rasp Mine.
- “Other – close” – including a range of receptors located in the vicinity of Iodide St, south of the railway line.
- “Other – far” – including receptors outside the urban area of Broken Hill.
- “PBH Residences” – including residences within the Mine Site.

For each district/area, ToxConsult (2017) assessed the receptor with the highest predicted deposited dust levels determined by PE (2017b), with the exception of District 5a and the PBH Residences where individual receptors were assessed.

Existing Lead Levels in Soil

Elevated lead levels in soils are a natural feature of Broken Hill with the Line of Lode exposed at the surface at the time it was discovered in 1883. However, since that date, continuous mining operations, including historic smelting and poor (by current standards) tailings and waste rock management practices, and historical use of leaded petrol and paint have resulted in substantial additions of lead to soils.

ToxConsult (2017) undertook a review of publicly available soil lead level data in consultation with officers of the Broken Hill Environmental Lead Program. This information, specific for each of the nominated districts, was incorporated into ToxConsult (2017) at Tables 3.4.1 and 3.4.2.

Bioaccessibility of Lead

Lead can only be absorbed into the body after it has been extracted from soil and rock particles by gastrointestinal juices during digestion. This process makes the lead bioaccessible for absorption. However not all the lead in swallowed soil is made bioaccessible. Lead that remains locked up in soils and particles is not absorbed from the gastrointestinal tract into the blood.

² Now called Population Health Unit, Western NSW and Far West Local Health District.

ToxConsult (2017) notes that, depending on the technical method used to determine the bioaccessibility of lead from soils at Broken Hill, estimates of the bioaccessibility varied widely, from an average of 1.4% for ore from the Rasp Mine to an average of 60% for topsoil.

ToxConsult (2017) states that there was insufficient information to determine which of the bioaccessibility values was best to use in the blood lead modelling. Consequently, the most conservative, namely that the assumed highest level of bioaccessibility, was used.

In light of the uncertainty associated with this and other assumptions ToxConsult (2017) states the following.

“Uncertainty in the actual bioaccessibility of lead from Broken Hill soils and dust should be kept in mind when interpreting the results of the IEUBK [blood lead level] modelling for absolute [blood lead level] concentrations undertaken in this HHRA. The bioaccessibility assumption in the modelling is likely conservative and will result in overestimation of [blood lead level] concentrations in children. As a result, in this HHRA less weight is placed on the absolute values of predicted [blood lead levels], and more on the comparison between different scenarios and the relativity of any shifts in predicted [blood lead level] population distributions. Since BPb modelling for each scenario has the same input parameters, such comparisons inherently minimise the uncertainty attached to the common BPb modelling input assumptions, the primary differences between scenarios being the changed lead exposures resulting from the Proposal.”

Blood lead Modelling Scenarios

In light of the above, ToxConsult (2017) assessed three scenarios as follows.

- Scenario 1 – Assesses health risks from lead and other metals in dust coming from the existing Mine Site with no active mining within the Mine Site based on the “Scenario 1 – existing Mine Site” scenario prepared by PE (2017b) over a 15 year period, as well as the measured background lead in air and soil from other sources.
- Scenario 2 – Assesses possible incremental health risks for lead and other metals from the Proposal only, in the absence of background contributions from other sources and assuming a mine life of 15 years at the maximum permitted annual production rate of 300 000tpa. While excluding background contributions from outside the Mine Site, this scenario includes background contribution from those sections of the Mine Site that would not be the subject of the proposed activities because these emissions were included in the modelling by PE (2017b).
- Scenario 3 – Assesses health risks from the cumulative impact of lead in dust from the Proposal (Scenario 2) plus current estimated lead background concentrations from non-Proposal related sources.

Based on the above ToxConsult (2017) indicates Scenario 2 should not be considered representative of absolute levels of lead in blood associated with the proposed activities because:

- the existing sources of lead in the environment, including emissions from the Mine Site should the Proposal not proceed, would continue to result in exposure to lead; and

- the uncertainty associated with the assumptions used in the modelling (see discussion below) are such that absolute blood lead level data produced by the modelling should be treated with caution.

As a result, ToxConsult (2017) indicates comparison between Scenarios 1 and 3 provides a more reliable estimate of whether there would be a material change in blood lead levels as a result of the Proposal because many of the same assumptions were used for Scenarios 1 and 3, effectively minimising much of uncertainty associated with a range of key assumptions.

Blood Lead Level Modelling Methodology

ToxConsult (2017) used the Integrated Exposure Uptake Biokinetic (IEUBK) model developed by the US Environmental Protection Agency to predict blood lead concentrations in children aged 1 to 2 years, the most susceptible section of the population surrounding the Mine Site. Detailed parameters used in the modelling are presented in Section 3.9 of ToxConsult (2017) and technical reviewers are referred to that section.

The model outputs include the following.

- Geometric mean blood lead levels, by age for the population.
- A distribution curve of blood lead concentrations for a population with the specified exposure inputs.
- The percentage of children of a particular age group with predicted blood lead concentrations in excess of the 5µg/dL goal.

ToxConsult (2017) notes that the IEUBK model predicts blood lead level concentrations for a theoretical population of children all assumed to be exposed to conditions that exist at a particular discrete location. These results should not be interpreted as a definitive assessment of the likely blood lead level for a particular individual child living at that location. Indeed, ToxConsult (2017) state that “the modelling pertains to an individual only in a statistical sense”.

3.5.3.3 Revised Assessment of Impacts – Lead

Scenario 2 – Proposal alone

The results of the IEUBK modelling of blood lead levels under Scenario 2 are presented in Section 3.10.1 of ToxConsult (2017). ToxConsult note that this scenario is subject to substantial uncertainty in relation to assumptions and inputs to the IEUBK model, including assumptions in relation to the bioaccessibility of lead in children. Notwithstanding this, ToxConsult note that incremental changes as a result of the Proposal would be very low at most receptors, with District 5a and the PBH Residences predicted to have the highest incremental increases in line with the results of the air quality modelling.

Scenario 1 and 3 – Existing vs Proposed

The impact of the Proposal on modelled blood lead levels is best judged by comparing the difference between the modelled blood lead levels for Scenario 1 (the existing North Mine after 15 years, including background) and Scenario 3 (the proposed North Mine after 15 years, including background).

Table 6 presents the results of the IEUBK modelling for Scenario 1 and Scenario 3 for children between 1 and 2 years of age after 15 years of the proposed mining activities. In summary, the modelling predicts that with the exception of Receptor 4 and receptors within the Mine Site (**Figure 4**), the Proposal would result in negligible change or a reduction in the modelled blood lead levels of children between 1 and 2 years of age at any residence surrounding the Mine Site. Indeed, the median blood lead level of children in District 5a, the closest district to the Mine Site, is predicted to decrease slightly from 6.406µg/dL to 6.398µg/dL.³

Table 6
Modelled Geometric Mean Blood Lead Concentrations – Scenarios 1 and 3

District	Receptor	Modelled BPb concentration (µg/dL)		
		Scenario 1: Existing	Scenario 3: Proposed	Differential
D1	26	11.165	11.165	0
D2	14	6.555	6.550	- 0.005
D3	23	11.165	11.165	0
D4	13	11.165	11.165	0
D5a	1	6.406	6.406	0
	4	6.406	6.468	0.062
	D5a_median	6.406	6.398	- 0.008
D5b	7	6.021	6.021	0
D6	45	14.207	14.208	0.001
D7	48	14.253	14.253	0
D8	51	6.019	6.019	0
D9	86	6.021	6.021	0
D10	56	5.934	5.934	0
Other - near Rasp	73	10.790	10.785	- 0.005
Other – close	41	6.297	6.296	- 0.001
Other – far	19	3.769	3.769	0
PBH Residences	A	6.021	6.006	- 0.015
	I	6.021	6.579	0.558
	PBH residences_median	6.021	6.085	0.064
Source: ToxConsult (2017) – after Table 3.10.2				

The results for Receptors 4 and PBH residences may be summarised as follows.

- Receptor 4.
 - The geometric mean blood lead level of a population of hypothetical children living at Receptor 4 is predicted to increase slightly from 6.406µg/dL to 6.468µg/dL, an increase of 0.062µg/dL under Scenario 3 compared with Scenario 1, noting that the absolute predicted increases are likely a conservative estimate.

³ ToxConsult (2017) note that the modelled geometric mean blood lead level estimates are reported to three decimal places in order to be able to discern subtle differences between receptors. However, given the uncertainties and likely conservatism in some of the modelling input parameters, particularly those associated with Scenario 2, this level of precision may not accurately reflect the level of accuracy resulting from the modelling.

- The proportion of a population of hypothetical children living at Receptor 4 with a blood lead level greater than $5\mu\text{g/dL}$ is modelled to increase from 70.095% to 70.802%, an increase of 0.707%.³
 - As previously described, while the absolute blood lead levels derived under both Scenario 1 and Scenario 3 are subject to substantial uncertainties, it is clear that existing blood lead levels of a substantial proportion of children in the vicinity of Receptor 4 are likely to be already elevated. The Applicant contends that the Proposal would result in a negligible additional increase in the proportion of children with elevated blood lead levels.
 - Notwithstanding the above, in recognition of the fact that children in the vicinity of Receptor 4 are likely to have an elevated blood level whether the Proposal proceeds or not, the Applicant would facilitate education and monitoring programs for parents with children living in the vicinity of Receptor 4. Further information in relation to this commitment is provided in Section 3.5.3.6.
- PBH Residences.
 - The geometric mean blood lead level of a population of hypothetical children living at Residence I (the location with the highest predicted annual deposited dust) is expected to increase from $6.021\mu\text{g/dL}$ to $6.579\mu\text{g/dL}$, an increase of $0.558\mu\text{g/dL}$ ³ under Scenario 3 compared with Scenario 1, noting that the absolute predicted increases are likely a conservative estimate.
 - The proportion of a population of hypothetical children living at Residence I with a blood lead level greater than $5\mu\text{g/dL}$ is expected to increase from approximately 65.4% to 72.0%, an increase of 6.6%. See however, discussion below in relation to the measured blood lead levels of children living within the Mine Site.
 - Using the median increase in lead exposure as an exposure index for the PBH residences as a group, the modelling suggests an increase in the geometric mean blood lead level of a population of hypothetical children to increase from $6.021\mu\text{g/dL}$ to $6.085\mu\text{g/dL}$, an increase of $0.064\mu\text{g/dL}$ under Scenario 3 compared with Scenario 1.
 - The proportion of a population of hypothetical children living at a PBH residence with the median increase in lead exposure with a blood lead level greater than $5\mu\text{g/dL}$ is expected to increase from 65.4% to 66.2%, an increase of 0.826%.
 - The Applicant notes, however, that monitoring of blood lead levels of children living in PBH Residences occurs at the request of parents. Currently there are 11 children under the age of 12 years living within the Mine Site and at Junction Circle.
 - The median blood lead level of those children is $3.0\mu\text{g/dL}$. This compares with the modelled median blood lead level under Scenario 1 of $6.021\mu\text{g/dL}$ and the mean blood lead level for children within Broken Hill of between 4.9 to $5.2\mu\text{g/dL}$.

- Of the children living in PBH Residences, two children recorded elevated blood lead levels of 9.3µg/dL and 5.2µg/dL. Based on this, 18% of sampled children have blood lead levels greater than 5µg/dL. This compares with the modelled proportion of children at the PBH Residences with blood lead levels under Scenario 1 exceeding 5µg/dL of 65.4% and the measured proportion within the wider Broken Hill community with blood lead levels greater than 5µg/dL of 48%.

The above indicated both the conservative nature of the modelling which has substantially overestimated the actual blood lead levels of children living at the PBH Residences and the fact that the Applicant's existing management measures identified in Section 3.5.3.6 are effective in managing blood lead levels in children in residences that it controls.

- In light of the above and the high level of management of blood lead levels in children within housing controlled by the Applicant, the Proposal would not have a significant impact on blood lead levels in children living in PBH Residences.

3.5.3.4 Assessment Methodology – Other Metals

Background

The Secretary's Environmental Assessment Requirements (SEARs) for the Proposal identified the requirement for a Health Risk Assessment for "air quality (including heavy metals) ... having regard to NSW Health's requirements and commensurate with the likely level of risk". The requirements of NSW Health included with the SEARs state that the Health Risk Assessment "should focus on (but not be limited to) the increased risk of exposure to lead by the community".

Taking into account the above and the anticipated level of risk associated with metals other than lead, the original *Health Risk Assessment* (PE, 2017c) addressed lead only. The submission provided by the Environment Protection Authority raised a number of matters related to health risks associated with metals other than lead. In light of these comments, the Applicant engaged ToxConsult to complete a *Human Health Risk Assessment* for metals other than lead. The resulting assessment is based on data presented in PE (2017b) and is presented in Section 4 of ToxConsult (2017).

Given the outcome of the assessment, a very brief overview only is provided below. Readers seeking additional information are referred to Section 4 and the associated appendices of ToxConsult (2017).

The conceptual exposure pathways and model and assessment districts/areas and receptors are as described for lead and presented in **Figures 4 and 5**.

No background data for metals other than lead is available. As a result, ToxConsult (2017) has considered incremental impacts only.

Assessment Approach and Methodology

ToxConsult (2017) assessed impacts associated with metals other than lead using the following approaches.

1. Acute health risks.

Based on comparison of 1-hour modelled metal concentrations (99.9th, 99th, 97.5th, 95th and 50th percentile) in airborne PM₁₀ from PE (2017b) to acute air guideline values set for protection of human health.

2. Chronic health risks.

These were assessed by calculation of lifetime time-weighted average daily intakes and comparison with reputable tolerable daily intakes (TDIs) set to protect human health. The TDIs were adjusted for assumed high end background intakes for populations not impacted by point sources of metals.

3. Cancer risks.

Two metals, namely cadmium and nickel, have the potential to directly alter genetic material (i.e. they are genotoxic) and may be a lung cancer risk. This risk was quantified by multiplying the annual average concentration in PM₁₀ by an estimate of the carcinogenic potency of the metal. The resulting estimated 'cancer risk' was compared with a target acceptable risk of 1×10^{-5} as suggested by enHealth (2012) and NEPM (2013).

Daily intakes for the tolerable daily intake assessment were estimated based on exposure equations described in Section 4.4.1 of ToxConsult (2017) for two scenarios, as follows.

- Scenario 1 – emissions associated with the existing Mine Site. This scenario differs from Scenario 1 described for the lead assessment above in that it does not include metal concentrations in air or soil from sources other than the North Mine.
- Scenario 2 – emissions associated with the proposed activities. This scenario is largely consistent with Scenario 2 described above for the lead assessment.

3.5.3.5 Assessment of Impacts – Other Metals

ToxConsult (2017) determined the following.

1. Acute health risks.

The 1-hour modelled concentration of metals other than lead in PM₁₀ were sufficiently low that the Hazard Indices (sum of the ratios of exposure concentration vs guideline values for all metals of concern) were markedly below the target hazard index value of 1. Taking into consideration the overall conservatism in the assessment, this indicates the likelihood of exceeding the health-based acute air guideline values as a result of the Proposal proceeding is very low.

2. Chronic health risks.

The average daily intake of metals other than lead was sufficiently low that the incremental change in Hazard Index from Scenario 1 to Scenario 2 were such that, considering the overall conservatism in the assessment, the likelihood of exceeding health-based chronic TDI's as a result of the Proposal is very low.

3. Cancer risks.

ToxConsult (2017) state that the highest calculated overall cancer risk is 4.5×10^{-7} at the Applicant-owned Residence N. This is below the commonly accepted risk of one in one hundred thousand (1×10^{-5}). As a result, ToxConsult (2017) conclude that the Proposal would not pose an unacceptable inhalation carcinogenic risk.

3.5.3.6 Existing and Additional Management and Mitigation Measures

For the sake of completeness, the following describes the management and mitigation measures currently implemented by the Applicant to manage blood lead levels in children living in all residences it controls.

- Provide education to all employees in relation to the management of lead, both at work and at home. As eligibility to occupy a PBH Residences is only available to the Applicant's employees, at least one parent will have received this education.
- Undertake blood lead level testing of all children under the age of 18 years when requested by parents.
- Provide the results of the testing to parents on receipt and maintain a record of all tests undertaken.
- Implement an investigation in the event that a child returns a blood lead level in excess of $5.0\mu\text{g/dL}$. The investigation seeks to identify potential sources of lead and actions to be taken to reduce or manage the child's blood lead level. These actions may include:
 - physical works at the residence;
 - education and assistance for the parents, including from an external service provider;
 - increased frequency of testing; and
 - any other action that the investigators, parents or the Applicant believe may assist to reduce the child's blood lead level.
- Provide, in the event that the child's blood lead level cannot be reduced to an acceptable level, alternative accommodation for the family.

In light of the level of concern that EPA and NSW Health have in relation to this issue, the Applicant would augment the above with the following additional management and mitigation measures for all PBH Residences.

- Provide additional education to all parents in PBH Residences, including the following.
 - provision of a living with lead information pack and face to face meeting with the Applicant's Rehabilitation Coordinator and Human Resource Advisor, on arrival; and
 - provision of updated information annually and at any time on request.
- Implement a procedure to remind parents to request a blood lead level test for all children living at the residence six monthly. Requesting such testing will remain the responsibility of parents.
- Implement, further management measures when
 - a child returns a blood lead level of 4µg/dl or higher; or
 - a child returns a series of results showing an increasing trend; or
 - a parent requests additional assistance.
- The further management measures may include the following in addition to those identified above.
 - One or more consultations between parents and specialist medical/paediatric expert(s).
 - Implementation of appropriate measures to immediately reduce the blood lead level of the child, including chelation therapy or similar.
 - Relocation of the family to alternative accommodation.

Finally, and in recognition of the fact that non-PBH Residences are not under the control of the Applicant, but that District 5a is located in close proximity to the Mine Site, the Applicant would implement the following for residents within District 5a as shown on **(Figure 4)**.

- Provide residents within District 5a with publicly available information in relation to management of lead at home.
- Sponsor an annual information session for interested residents.
- Facilitate access to publicly available services, including those operated by the Broken Hill Environmental Lead Program such as Lead Smart Broken Hill.

3.5.3.7 Response to Submissions

Representative Comment(s)

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.

Response

PE (2017b) and ToxConsult (2017) have assessed 86 non-Proposal related receptors within assessment districts, including;

- 52 private residences;
- 14 schools and child-care centres;
- 5 health care facilities;
- 1 water tank and business premises (Mawson's Quarry offices); and
- 13 play grounds and playing fields (**Figure 4**).

In the case of private residences, care was taken to assess the residence within each district that would be most likely to be impacted by the Proposal.

In addition, 16 Applicant-owned residences were assessed. As a result, the Applicant contends that PE (2017b) and ToxConsult (2017) have assessed all receptors that would be likely to be impacted by the Proposal.

Representative Comment(s)

The HRA lacks a [Conceptual Site Model]

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.

Response

A Conceptual Site Model has been included in Section 3.2 of ToxConsult (2017).

Representative Comment(s)

Potential impacts associated with exposure to other contaminants, in particular persistent and bio accumulative contaminants have not been considered. All contaminants of potential concern (Co PC) 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 nonlead 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.

Response

Section 4 of ToxConsult (2017) and Section 3.5.3.6 of this document provide an assessment for metals other than lead. ToxConsult state that

“All metals were included in a hazard index HHRA methodology and therefore were, by default, conservatively assumed to act in an additive manner.” (T Hagen, pers com).

Representative Comment(s)

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;*
- *PM₁₀ 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, PM₁₀ 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.

Response

PE (2017b) and ToxConsult (2017) both state that the assumptions used are representative and conservative.

Representative Comment(s)

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.

Response

ToxConsult (2017) prepared a new *Human Health Risk Assessment* based on the substantial revisions to the Air Quality Assessment presented in PE (2017b).

Representative Comment(s)

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.

Response

Sections 3.4 to 3.9 of ToxConsult (2017) justify the relevant inputs to the IEUBK model.

Representative Comment(s)

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

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)⁴. 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 locations⁵. 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.

Response

Section 3.4 of ToxConsult (2017) provides a justification of the soil and lead dust concentrations used.

Representative Comment(s)

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/m²/year.

⁴ 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.

⁵ Yang et. al. 2015. Science of the Total Environment, 538, pp. 922-933, and others.

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.

Response

Section 2.6 of ToxConsult (2017) describes how metal concentrations in soil were derived from the modelled deposition information.

Representative Comment(s)

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/m²/year. The AQIA is referenced as the source of this value but we have not been able to 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.

Response

Section 2.6 of ToxConsult (2017) describes how metal concentrations in soil were derived from the modelled deposition information.

Representative Comment(s)

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.

Response

Section 3.5 and Appendix D of ToxConsult (2017) justifies the outdoor lead concentrations used in the *Human Health Risk Assessment*.

Representative Comment(s)

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)⁶ 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)⁷ and referred to in the North Mine HRA by PEL. These 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.**

Response

Section 3.6 of ToxConsult (2017) presents a review of the available bioaccessibility data for Broken Hill ores and soils and, as differences in available bioaccessibility values could not be adequately resolved, the most conservative value has been adopted. This value coincides with the default value recommended by US EPA for predictive blood lead modelling using IEUBK.

⁶ Pacific Environment Limited (PEL) (2015). Health Risk Assessment Rasp Mine Broken Hill. Prepared for Broken Hill Operations Pty Ltd. 25 September 2015.

⁷ Toxikos (2010). Health Risk Assessment for Rasp Mine Proposal, Broken Hill. Prepared for Broken Hill Operations Pty Ltd. 17 June 2010.

Representative Comment(s)

The use of the maternal BLL value should be justified

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.

Response

Section 3.8 of ToxConsult (2017) provides additional information in relation to maternal blood lead levels in Broken Hill.

Representative Comment(s)

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

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.

Response

The recommended criterion has been used by ToxConsult (2017).

Representative Comment(s)

The HRA should assess lead impacts against 95% of the population

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.

Response

ToxConsult state that their assessment presents modelled BLLs for the percentage of the population that are predicted to be above 5 µg/dL, as well as comparing the estimated population distributions for children for the existing and proposed situation. They state that inherently when comparing a population distribution, this includes information for 95% of the population (T Hagen, pers. com.).

Representative Comment(s)

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 than 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.***

Response

The Applicant contends that it has committed to best practice dust and lead management practice and PE (2017b) and ToxConsult (2017) state that such measures have been incorporated into their assessment.

Notwithstanding the above, the Applicant notes that blood lead levels of children in Broken Hill are higher than the NEPM guideline and that it is contributing to a range of programs to manage this issue. However, ToxConsult (2017) identifies that the Proposal would result in a negligible change in blood lead level concentrations in children in Broken Hill.

Representative Comment(s)

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.

Response

This comment is no longer relevant as ToxConsult (2017) includes a new *Human Health Risk Assessment*.

Representative Comment(s)

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/dL.

Response

ToxConsult (2017) presents an assessment of blood lead levels greater than 5µg/dL.

Representative Comment(s)

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.

Response

Section 7.1.1 of PE (2017b) and Section 3.11 of ToxConsult (2017) state that the TSP data used to support *Human Health Risk Assessment* is conservative.

Representative Comment(s)

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 studies⁸ 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 requires⁹ 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***

⁸ NHMRC 2015. Information paper- Evidence on the Effects of Lead on Human Health.

⁹ See Section 7.2.1 of the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA, 2005) (Approved Methods).

- 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.***

Response

Section 4 of PE (2017b) states that the recommendations contained in the document *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining* have been used to inform the management and mitigation measures used in the air quality assessment and committed to by the Applicant.

Representative Comment(s)

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/m³ 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/m³).

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

Response

ToxConsult (2017) fully justifies the assumptions used in the *Human Health Risk Assessment*.

Representative Comment(s)

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 (En Health 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.

Response

Section 3.11 and 4.6 of ToxConsult (2017) provide an assessment of the uncertainties associated with the *Human Health Risk Assessment*.

Representative Comment(s)

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.**

Response

PE (2017b) has completely revised the Air Quality Assessment taking into account wind erosion from exposed areas within the Mine Site as well as all other significant emission sources. The Applicant notes that emissions from the Southern Operations are included in background monitoring data and therefore there is no requirement to separately model those emissions.

Representative Comment(s)

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.

Response

Section 3 and Appendix C of PE (2017b) provides a description of the monitoring network throughout Broken Hill that has been relied upon to characterise the existing air quality environment. In summary, long-term 16 deposited dust gauges, 2 TEOMs and 6 HVAS samplers have been used to determine the existing dust environment and differential background concentrations have been used for different receptors based on the proximity of each monitoring point. The Applicant notes that this level of background data is far in excess of that previously accepted as adequate for other air quality assessments.

Representative Comment(s)

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).

Response

This comment is no longer relevant.

3.5.4 Noise Impact Assessment

Muller Acoustic Consulting (MAC) prepared the *Noise Impact Assessment* to support the application for development consent. For the purposes of this document that report is referred to as MAC (2017a). The EPA have raised a number of questions and issues in relation to that assessment. The Applicant engaged MAC to prepare a response to the matters raised by the EPA in relation to noise. The resulting report is presented as **Appendix 3** and, for the purposes of this document, that report is referred to hereafter as MAC (2017b). MAC (2017b) presents a response to each issue raised and the following summarises those responses.

Representative Comment(s)

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.

Response

MAC (2017b) identifies that the SEARs state the following.

'if a claim is made for specific construction noise criteria for certain activities, then this claim must be justified and accompanied by an assessment of the likely construction noise impacts of these activities under the Interim Construction Noise Guideline.'

MAC (2017a) justifies the use of the *Interim Construction Noise Guideline* (ICNG) for activities associated with construction of the haul road and refurbishment activities because these are unique, of a short duration and distinctly different from the longer-term activities associated with the day-to-day operation of the North Mine. In addition, MAC (2017b) notes that there are numerous examples of the ICNG being accepted for similarly distinctive activities associated with mining projects. As a result, MAC (2017b) and the Applicant contend that the Noise Management Levels identified in MAC (2017a) are appropriate for the short duration construction-related activities assessed.

Notwithstanding the above, the Applicant notes that the worst-case construction noise levels within the most noise affected Noise Catchment, namely NC1, were determined by MAC (2017a) to be 38dBA, equal to the day-time criterion determined under the *Industrial Noise Policy*. Furthermore, MAC (2017b) revised the noise assessment to reflect a more realistic noise scenario of only a single construction activity occurring at one time and determined that the anticipated noise level within NC1 would be 37dBA.

Representative Comment(s)

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 $L_{eq(15min)}$ 35dBA at all times of day. The assessment has predicted operational noise levels up to $L_{eq(15min)}$ 38dBA 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 (NIA4) should be justified or based on measurements at logger 1.

Response

MAC (2017b) notes the following.

- Noise loggers L2 and L3 were established on the Mine Site for security reasons at the same offset from the Barrier Highway as residences across the road.
- There were no mining-related activities occurring within the Mine Site during the background noise monitoring survey.
- Noise logger L1 was located in the back yard of a private residence approximately 300m from the Barrier Highway.

In light of the above, MAC (2017b) and the Applicant reject the assertion that background noise levels measured by noise loggers L2 and L3 should be discarded and the results from noise logger L1 should be used for all Noise Catchments, including those adjacent to the Barrier Highway.

Representative Comment(s)

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.

Response

The Applicant contends that this comment is not relevant because the background levels at L2 and L3 can in fact be justified. Notwithstanding this, the Applicant notes that the EIS includes a range of commitments that should be considered “reasonable and feasible mitigation measures”, including the following.

- Installation of an amenity bund adjacent to those sections of the haul road that would be in direct line of sight of residences to the north of the Mine Site.
- Limitation of surface activities such as site preparation, crushing, transportation, tailings harvesting and rehabilitation to the day-time period.
- Installation of frequency modulated reversing alarms to all mobile equipment.
- Implementation and enforcement of a Driver's Code of Conduct.

In addition, the Applicant has committed in Section 2.3 of this document, to fully enclosing the crusher to limit dust emissions. This would have the added benefit of also reducing noise emissions from this source.

Representative Comment(s)

Class G inversions need to be 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 4dBA. 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.

Response

MAC (2017b) remodelled noise emissions from the Mine Site, including:

- G Class temperature inversions;
- an enclosed crusher; and
- transportation operations from the Tailings Harvesting Area to the Pastefill Plant.

Table 7 presents the results of the original and revised modelling. In summary, the revised noise assessment modelling returns anticipated noise levels the same or 1dBA lower than the original noise assessment modelling.

Table 7
Operational Noise Modelling Results

Page 1 of 2

Noise Catchment	Period of Operation ¹	Original Assessment ¹		Revised Assessment ³		Project-specific Noise Criterion
		Neutral	Temperature Inversion ²	Neutral	Temperature Inversion ⁴	
NC1	Day	37	-	37	-	38
	Evening	38	-	37	-	38
	Night	<30	35	<30	34	35
NC2	Day	36	-	36	-	38
	Evening	36	-	36	-	38
	Night	<30	35	<30	34	35
NC3	Day	31	-	30	-	36
	Evening	31	-	30	-	36
	Night	<30	32	<30	30	35
NC4	Day	33	-	31	-	36
	Evening	33	-	31	-	36
	Night	<30	33	<30	33	35
NC5	Day	<30	-	<30	-	36
	Evening	<30	-	<30	-	36
	Night	<30	31	<30	<30	35

Table 7 (Cont'd)
Operational Noise Modelling Results

Page 2 of 2

Noise Catchment	Period of Operation ¹	Original Assessment ¹		Revised Assessment ³		Project-specific Noise Criterion
		Neutral	Temperature Inversion ²	Neutral	Temperature Inversion ⁴	
NC6	Day	<30	-	<30	-	35
	Evening	<30	-	<30	-	35
	Night	<30	<30	<30	<30	35
NC7	Day	<30	-	<30	-	35
	Evening	<30	-	<30	-	35
	Night	<30	<30	<30	<30	35
NC8	Day	<30	-	<30	-	35
	Evening	<30	-	<30	-	35
	Night	<30	<30	<30	<30	35
NC9	Day	<30	-	<30	-	35
	Evening	<30	-	<30	-	35
	Night	<30	<30	<30	<30	35
Note 1: Source – MAC (2017a) – After Table 12 Note 2: Temperature inversion = Class F Note 3: Source – MAC (2017b) – After Table 1 Note 4: Temperature inversion = Class G Note 5: Units = dB(A) L_{eq} (15 min)						

Representative Comment(s)

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.

Response

Section 1.5.3.5 of the EIS states that the Mine Site has been in care and maintenance since the previous mining operations ceased in 2008. Approved exploration activities are short-term activities that would cease to be undertaken under the current exploration approval and would continue under the development consent once granted. These activities are not additional to the proposed activities; rather form a subset of them. As a result, the noise model is not required to assess noise emissions from mining-related activities within the Mine Site.

Representative Comment(s)

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.

Response

Appendix C of MAC (2017a) clearly shows two truck noise sources as linear sources, not stationary sources. MAC (2017b) acknowledges that a linear noise source representing a truck moving between the Tailings Harvesting Area and the Pastefill Plant was not modelled. This was because, in the majority of cases, the same trucks would be used to transport ore and tailings. As a result, MAC (2017a) assessed a worst case scenario of haulage of ore.

Notwithstanding this, there may be rare occasions when contract or other trucks are bought to site to transport tailings material and that may occur concurrently with transportation of ore. In order to accurately reflect that scenario, a line source from the Tailings Harvesting Area to the Pastefill Plant was included in the remodelled noise impact assessment.

3.5.5 Blast Impact Assessment

Representative Comment(s)

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.

Response

The Applicant notes that the original blasting assessment prepared to support the *Environmental Impact Statement* (MAC, 2017a) erroneously assumed that blasting operations would occur from Level 12 and below. As a result, that assessment assumed a point-to-point distance from the closest stope to the closest non-Project related residence of 890m.

In light of the Environment Protection Authority's submission, the Applicant engaged Prism Mining Pty Ltd to undertake a comprehensive review of anticipated blasting impacts. The resulting report, referred to hereafter as Prism (2017), is presented as **Appendix 4**. This summary has been prepared based on that document for readers who are not technical experts. Readers seeking to review the technical aspects of that document should refer to **Appendix 4**.

In completing that assessment, Prism (2017) took into account the following.

- Blasting operations are likely to include development, cut and fill and long-hole open stope blasting. Maximum Instantaneous Charges (MIC) for each style of blasting are anticipated to be 6kg, 6kg and 105kg respectively.¹⁰
- As a result, Prism (2017) did not consider development or cut and fill blasting to present significant impact and impacts associated with long-hole open stope blasting only were assessed.
- The minimum point-to-point distance¹¹ between proposed stope blasting operations (on Level 4 in the vicinity of the Cosmopolitan Open Cut) and a privately-owned residence (Residence 8 on **Figure 6**) is 344m. Distances between stopes to the mined and privately-owned residences increase with:
 - depth, with lower Levels typically at greater distances from residences; and
 - position within the orebody, with stopes on the same Level located in the eastern section of the orebody typically further from residences in the western section of the orebody.

Prism (2017) used the following formula for estimating ground vibration impacts.

$$PVS = K \times SD^a$$

Where:

PVS = peak vector sum vibration (mm/s),

K = K-factor site constant (typically falling between 500 to 5 000),

a = exponent site constant (typically -1.4 to -1.6),

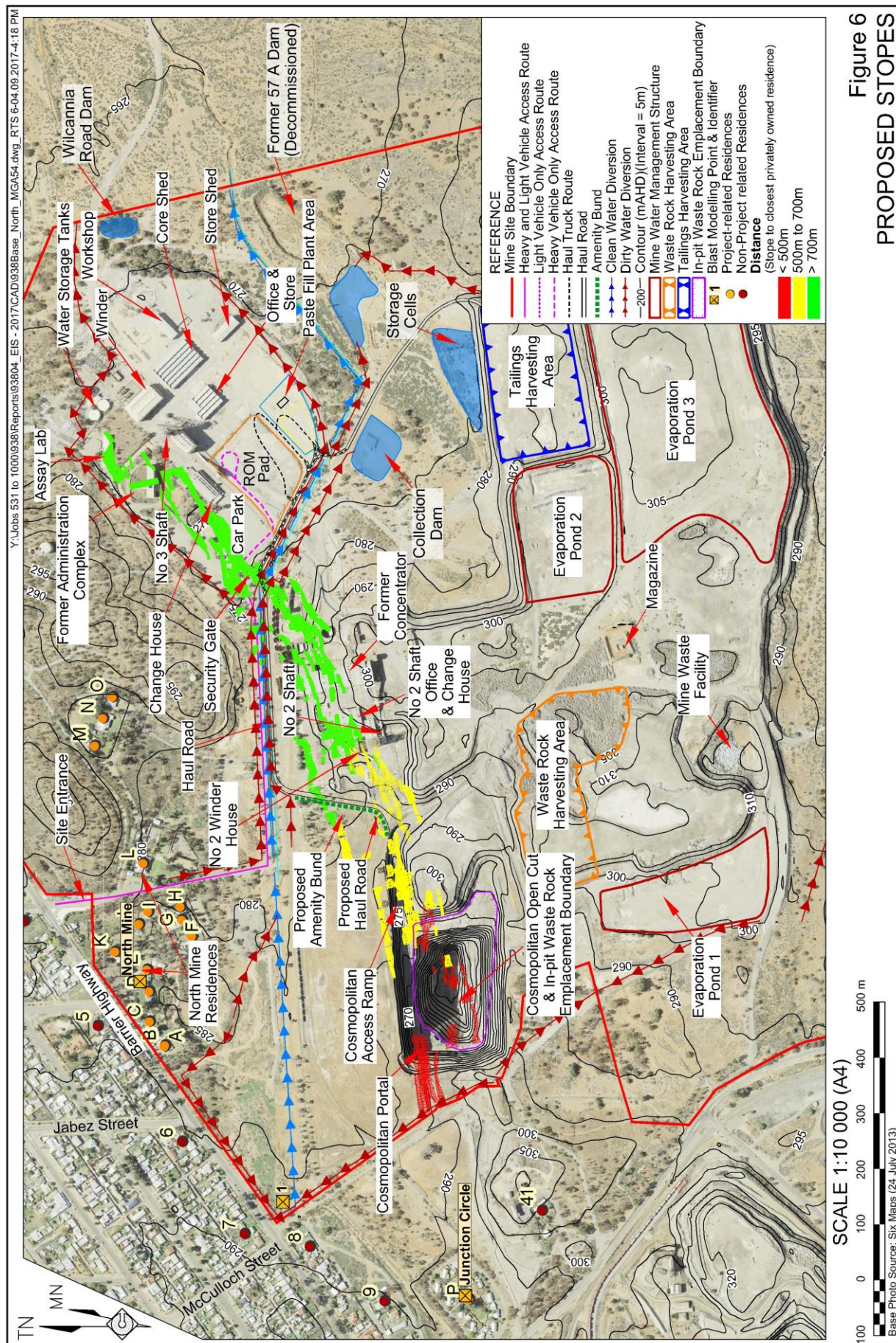
SD = scaled distance (m/sqrt.MIC) = D/(sqrt(MIC)),

D = distance between the blast and monitoring location or point of interest (m),

MIC = maximum instantaneous charge (kg per blasthole, deck or delay interval as appropriate).

¹⁰ Based on 21m long, 76mm diameter blast holes fired on a hole-by-hole basis

¹¹ Point-to-point distance between each stope and the closest residence is the straight line distance in three dimensions, taking into account elevation differences.



In completing the assessment, Prism (2017) determined the following values for each of the above variables.

- K-factor site constant (K) = 2 500, based on a review of blasting operations at the North Mine in 2007 and 2008, Southern Operations in 2016 and other local mining operations in 2014.
- Exponent site constant (a) = negative 1.6.
- MIC = 105kg.
- Point-to-point distance between blasting operations and privately-owned residents = 344m to 1 750m.

Table 8 presents the results of the blast assessment in the absence of further blast controls. In summary, the assessment indicates that, in the absence of further blast controls, blasting would result in a PVS exceeding:

- the 5mm/s criteria at point-to-point distances of less than 500m; and
- the 3mm/s criterion at point-to-point distances of less than 700m.

Table 8
Revised Ground Vibration Impact Assessment Results

Distance to Receiver (m)	Peak Vector Sum Vibration (mm/s) ¹	MIC limit for 5mm/s (kg)	MIC limit for 3mm/s (kg)
344	9.04	50.1	26.4
400	7.11	67.7	35.7
450	5.89	85.6	45.2
500	4.97	-	55.8
550	4.27	-	67.6
600	3.71	-	80.4
650	3.27	-	94.4
700	2.90	-	-
750	2.60	-	-
800	2.34	-	-
850	2.13	-	-
900	1.94	-	-
Note 1: Assuming an MIC of 105kg			
Source: Prism (2017) – after Table 3.2			

Figure 6 presents an overview of planned stopes classified by distance to the closest privately-owned residence.

- Less than 500m to a privately-owned residence.
- Between 500m and 700m to a privately-owned residence.
- Greater than 700m to a privately-owned residence.

In order to reduce potential impact, the Applicant in some cases may be able to reduce the MIC to approximately 50kg by decking holes¹² or by blasting half-length holes. For stopes that may be accessed from the top, i.e. via down-hole blasting, either method may be used. However, for stopes that may only be accessed from the bottom only, requiring up-hole blasting, decking is the only method available.

A reduction of the MIC below 50kg is technically possible for down-hole blast holes by blasting one third-length holes, i.e. with an MIC of approximately 33kg. However, for up-hole blast holes, installing more than two explosive columns in a single hole becomes practically difficult and can result in undesired blasting outcomes associated with sympathetic detonation. As a result, the maximum practical reduction in MIC for up-hole blasts would be 50kg.

Table 8 also presents the required MIC to achieve the identified 5mm/s and 3mm/s PVS criteria. In summary, a reduction in MIC to 50kg would ensure compliance with the 5mm/s criterion for all stopes. However, compliance with the 3mm/s criterion could only be achieved for stopes more than 500m from the closest non-Project related residence.

Table 9 presents the known mining inventory included within the planned stopes within each of these zones. In summary, the Applicant's mine planning indicates that 187 847t of ore with a contained value of approximately \$75 million occurs within 500m of the closest privately-owned residence. Of that ore, approximately 91% by value occurs in stopes that can only be accessed using up-hole blasting techniques. As a result, a strict application of a 3mm/s blast criterion would result in sterilisation of ore with an approximate value of \$68 million. By contrast, a 5mm/s criterion would not sterilise any ore, although a high level of care would be required to ensure compliance with the 5mm/s criterion at distances less than 500m from the closest privately-owned residence.

Table 9
Identified Mining Inventory

Distance to Closest Receiver (m)	Stope Classification	Tonnes	Pb (%)	Zn (%)	Ag (g/t)	Value of Contained Metal in Concentrate (AUD)
344m to 500m	Down-hole blasting	26 818	3.8	119	2.7	\$6,516,899
	Up-hole blasting	161 029	6.1	177	5.6	\$68,317,839
	Sub-total	187 847	5.8	155	4.43	\$74,834,737
500m to 700m	Down-hole blasting	160 911	5.1	82.5	3.8	\$47,156,346
	Up-hole blasting	161 818	6.3	123	4.9	\$61,381,099
	Sub-total	322 729	5.7	105	4.46	\$108,537,445
Grand Total		510 576	5.73	122	4.66	\$183,372,183
Source: Perilya Broken Hill Limited						

The Applicant contends that sterilisation of this material would be contrary to the objects of both the *Mining Act 1992* and the *Environmental Planning and Assessment Act 1979*.

¹² Decking of blast holes involves installing separate columns of explosives in a single hole, separated by a length of stemming material. The Applicant anticipates that, taking into account the additional stemming requirements, the MIC for decked holes would be approximately 50kg per deck.

The Applicant acknowledges that a 3mm/s criterion has been applied to EPL12559 for the Rasp Mine. However, the Applicant contends that that criterion was determined by the EPA to be necessary as a result of a number of blasting-related complaints and the particular geological setting of that operation. In the absence of demonstrated concerns or issues with blasting operations at any of its operations, including historically at the North Mine, the Applicant contends that a unilateral application of a 3mm/s criterion at the North Mine would not be reasonable and would not be consistent with natural justice.

Notwithstanding this, the Applicant acknowledges the need to balance the amenity requirements of surrounding residences with its obligations to maximise recovery of a State-owned resource and ensure the ongoing economic and employment benefits that the Proposal would produce. As a result, the Applicant proposes that the blasting criteria identified in **Table 10** be implemented for the Proposal. As discussed below, as an underground mining operation, air blast overpressure is not relevant to the Proposal.

Table 10
Proposed Blasting-related Criteria

Location	Time of Blasting	Ground Vibration (mm/s)			
		Criterion	Allowable exceedance	Criterion	Allowable exceedance
Residence on Privately owned land	6.45am to 7:00pm	5	5% of the total number of blasts per year	10	0%
	7:00pm to 6:45am	3			
Note 1: Typical blast times would be 6:45am to 7:00am and 6:45pm to 7:00pm, 7 days per week					

In order to ensure compliance with the above, the Applicant would implement the recommendations of Prism (2017). In summary, this would include the following.

- Establish an additional fixed blast monitoring location on Perilya-controlled land adjacent to the residence at 617 Argent Street (Residence 8 on **Figure 6**).
- Ensure that all close proximity blasts, namely blasts within 700m of the closest privately-owned residence, are treated as critical and that a commensurate level of design and quality control is implemented.
- Limit the use of multi-blast or long duration blasts.
- Recommence blasting operations at locations least likely to result in exceedances of the relevant criterion, namely at distances greater than 700m from the closest privately-owned residence, before progressively moving closer to residences once blast impacts and control measures are well understood.
- Undertake initial detailed monitoring of all blasts using a mobile blast monitor, at point-to-point distances to the closest non-Project related residence of between 344m to 700m, to replicate the impacts of close proximity blasting to test proposed control measures.
- Undertake detailed review of all blast monitoring results and compare the actual monitoring results with those predicted at the design stage for each blast. Where discrepancies are identified, review assumptions used within the site model and implement an adaptive management process to modify future blast practices.

- Ensure open and honest communication with surrounding residents, including:
 - public notification of blast times via the Applicant's website, a noticeboard at the Mine Site entrance, public notices in the newspaper, regular newsletter or letter box drops, etc;
 - advanced notice, where practicable; of "close proximity" blasts, namely blasts within 700m of the closest privately-owned residence; and
 - quarterly publication on the Applicant's website of the results of blast monitoring.

Representative Comment(s)

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.

Response

Prism (2017) state that blast overpressure impacts associated with underground mining operations are not considered applicable. In the case of the Proposal, there are no direct connections between stopes to be blasted and the surface.

Prism (2017) also state that air blast overpressure results from underground blasts are generally due to wind levels recorded at the time of the blast event, or structural and/or microphone movement in response to ground vibration (none of which should be considered blast overpressure).

In order to demonstrate that underground blasting within the Mine Site has no blast overpressure impacts, initial blasts would be monitored for blast overpressure and once the Applicant has satisfied the Environment Protection Authority that no such impacts are occurring, such monitoring would cease.

3.6 NSW Health – Western NSW Local Health District

Representative Comment(s)

Health Risk Assessment

Contrary to the statement on page 2-24 of the Health Risk Assessment (HRA), blood lead levels (BLLs) of children between 1 and 4 years of age, from 1991 to 2014, have not necessarily been in steady decline. In fact between 2011 and 2014 the number of children with BLLs <10µg/dL has gone from 88% down to 80%.

The NHMRC recommends 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. Any reference or comparison to 10µg/dL in the HRA should be removed so as to avoid confusion and misrepresentation of the assessment.

The HRA shows in one modelling scenario that BLLs in children may increase slightly over a 25 year period. There should be no increase in children BLLs, and preferably a decline, as a result of the operation of the mine.

The current Health Risk Assessment does not seem to take into consideration any dust generated from “free areas” on the site. All “free areas” should be identified and included in the modelling for the HRA.

The bioaccessibility (sic) value of 10% used in the HRA, Part 5.2.2.3.6 does not reflect the values that have been suggested by researchers in Broken Hill. Yang & Cattle 2015, found a mean bioaccessibility (sic) value of between 51% and 60% in Broken Hill while Juhasz 2011, found over 60% bioaccessibility (sic) in Broken Hill.

The proponent should review their IEUBK modelling taking into consideration the above comments.

Response

This matter has been addressed in Section 3.5.5.

Representative Comment(s)

Updated Human Health Risk Assessment

Within one year of the commencement of operation of the project, and every five years thereafter, the Proponent should update the HRA prepared for the project and presented in the EA using current monitoring data.

Response

The Applicant contends that an updated Human Health Risk Assessment as requested is not warranted is the absence of evidence of adverse impacts as a result of the Proposal, particularly as the Proposal would continue to be just one of many variables that would influence blood lead levels surrounding the Mine Site. The Applicant would support community-wide measures to manage blood lead levels.

Representative Comment(s)

Air Quality

All haulage roads should be sealed and maintained and the mobile crusher enclosed to limit dust emissions from their respective activities.

Free areas should be identified and managed to ensure they are not a source of dust generation.

The conversion of the existing tailings area into an evaporation pond should be subject to a management plan to the satisfaction of the NSW EPA.

Response

The Applicant would seal on the top of the Cosmopolitan Open Cut Ramp to the ROM Pad. The haul road from the Tailings Harvesting Area to the Pastefill Plant would remain unsealed because it would be used only infrequently and because road-side water sprays would be installed and would be operational whenever the haul road is in use.

The mobile crusher would be installed within a negative pressure enclosure and would include dust extraction to control dust emissions from the crusher.

Finally, the Applicant would use dust suppressants in infrequently used “bare” areas to prevent dust lift off.

Representative Comment

Community Health

Western NSW Local Health District and NSW Health have reviewed the risk assessment presented by Perilya Broken Hill Ltd which has identified lead as the main driver of health risk with regard to this proposal and as such feel the proponent should contribute to public health education and blood lead level monitoring.

During the implementation of the project and in consultation with the Broken Hill Lead Reference Group, the Proponent should make a reasonable contribution towards the cost of:

- public health monitoring, particularly in relation to child blood lead levels; and*
- public education campaigns about the health risks associated with lead.*

The Proponent should prepare and implement a Lead Management Plan (LMP) for the project and:

- a) be prepared using best practice dust and lead minimisation strategies.*
- b) be prepared in consultation with the Broken Hill Lead Reference Group.*
- c) be updated in alignment with ongoing HRAs.*
- d) outline the proposed commitment towards the cost of:*
 - public health monitoring, particularly in relation to child blood lead levels, and tracking of this data over time; and*
 - public education campaigns about the health risks associated with lead, including lead hygiene, lead and children, tank water lead risks and soil lead contamination risks.*
- e) identify additional reasonable and feasible measures that could be implemented either on site or in the areas adjoining the site to minimise the potential lead impacts of the project and “free areas”;*
- f) include a program for the staged implementation of the measures identified in (c) above in the event that dust emissions are higher than predicted or the public health monitoring suggests further action is required to reduce blood lead levels in the environment surrounding the site; and*

- g) *include a detailed communication strategy, that outlines how the relevant dust and blood level monitoring data would be reported on the Proponent's website along with any relevant public education material.*

Response

The Applicant is an active member of the Broken Hill Lead Reference Group (BHLRG) and will consider reasonable contribution/s to projects funded by the BHLRG in relation to:

- a) public health monitoring, particularly in relation to child blood lead levels; and
- b) public education campaigns about the health risks associated with lead.

In relation to preparation of a *Lead Management Plan*, the Applicant anticipates that this would be either a stand-alone document or a component an *Air Quality Management Plan* to be prepared in consultation with a range of government agencies, including NSW Health, and the Broken Hill Lead Reference Group. In addition, the Applicant agrees that the Plan should address the matters identified.

3.7 HERITAGE BRANCH

Representative Comment(s)

The Archaeological Assessment provided as part of the EIS concludes that there is nil to low potential for historical archaeological 'relics' or Aboriginal heritage to be located within the study area. If any unexpected archaeological deposits/relics are discovered during the course of works it is recommended that the Heritage Division shall be notified in writing and mitigation strategies shall be negotiated prior to works continuing in the affected area(s) based on the nature of the discovery.

Response

This recommendation is consistent with commitments provided in the *Environmental Impact Statement*.

Representative Comment(s)

The Historic and Aboriginal Heritage Assessment and Statement of Heritage Impact (SoHI) by Oz Arch, 2017, identifies 32 heritage items of heritage significance on the site. The proposed development does not impact directly on the fabric of any of the heritage items identified. However seven items have the potential to be indirectly impacted. The SoHI identifies clear and specific management recommendations that are to be implemented throughout the life of this project. It is recommended that these protocols are implemented so that the proposed works will not have any negative physical or visual impact on the identified significant heritage items.

Response

This recommendation is consistent with commitments provided in the *Environmental Impact Statement*.

Representative Comment(s)

There are 32 individually listed heritage items within the Broken Hill North Mine leases precinct. It is imperative that these sites are maintained and protected. It is recommended that the Godden MacKay Logan Perilya North and South Leases, Broken Hill Conservation Management Plan Draft Report, November 2006, be finalised and up-dated to include Conservation and Cyclical Maintenance Schedules and policies for future use. This plan should be endorsed by the NSW Heritage Division and implemented prior to the recommencement of works. This shall be undertaken by the proponent in consultation with Broken Hill Council.

Response

Section 2.13 of the *Environmental Impact Statement* identifies that mine closure and relinquishment is likely to be a complex matter, with significant implications for final land use and management of items of heritage significance. The Applicant has committed at Section 2.13.5 of the *Environmental Impact Statement* to undertake extensive consultation with relevant stakeholders, including State and Federal agencies, Broken Hill City Council and the community, both individuals and community groups. In addition, as the Applicant controls only a section of the Line of Lode, consultation with other mine operators will also be required. In light of the above, Table 2.20 of the *Environmental Impact Statement* presents the Applicant's proposed the timeline for consultation and preparation of a *Rehabilitation and Mine Closure Plan*. It is expected that that plan would include the matters identified by the Heritage Branch.

In light of the above, the Applicant contends that preparation of the Plan as recommended by the Heritage Branch prior to the commencement of works would be unreasonable.

Representative Comment(s)

The City of Broken Hill is on the National Heritage List and as such cumulative impacts on sites such as the North Mine must be carefully managed to avoid negative impacts to national heritage values. It is recommended that planning throughout the redevelopment of this site will have heritage values as a primary consideration. It is recommended that the proponents continue to liaise with the federal Department of the Environment and Energy, the NSW Heritage Division and the Broken Hill Council to ensure ongoing protection and management of the site's heritage values.

Response

The Applicant wrote to the Federal Minister for the Environment and Energy advising that the application for Development Consent had been submitted on 16 March 2017. That correspondence stated that the Proposal would have no impacts on matters of National Environmental Significance, include heritage matters.

3.8 OFFICE OF ENVIRONMENT AND HERITAGE

Representative Comment(s)

The EIS does not fully address SEARs for biodiversity assessment as it has not been documented how the Framework for Biodiversity Assessment has been used to assess the impacts of the development. Despite this, OEH considers that the site is highly disturbed and

the vegetation that is to be cleared is planted, so we support the conclusion that it is unlikely that the proposal will have a significant impact on species or communities listed under the Threatened Species Conservation Act 1995.

Response

Noted.

Representative Comment(s)

OEH support the conclusion that the proposed development activities are unlikely to harm or impact [Aboriginal Cultural Heritage] values identified during the heritage assessment. We note that Management and Mitigation Measures defined in the EIS are mostly adequate however consider further refinement is necessary to ensure that no additional harm occurs to any [Aboriginal Cultural Heritage] encountered during works associated with this proposal.

Response

Noted. The Applicant anticipates that an *Unanticipated Finds Protocol* or similar will be a conditional requirement of any development consent issued, and that that document can appropriately address the required refinements to the management and mitigation measures identified by the Office of Environment and Heritage.

3.9 ROADS AND MARITIME SERVICE

Representative Comment(s)

State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

Clause 16(1) of the State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries 2007 (Mining SEPP) states:

“Before granting consent for development for the purposes of mining or extractive industry that involves the transport of materials, the consent authority must consider whether or not the consent should be issued subject to conditions that do any one or more of the following:

- a) require that some or all of the transport of materials in connection with the development is not to be by public road,*
- b) limit or preclude truck movements, in connection with the development, that occur on roads in residential areas or on roads near to schools,*
- c) require the preparation and implementation, in relation to the development, of a code of conduct relating to the transport of materials on public roads.”*

Roads and Maritime, notes that under clause 16, it is the responsibility of the DPE as the relevant consent authority, to consider whether some or all of the transport of materials is not to be by public road.

The applicant in section 2.14.5 of the Environmental Impact Statement (EIS) has provided reasons for the proposal not recommencing haulage of ore by rail to South Mine. The reasons given are:

- *Prior to 2008, the mine's access to the ARTC controlled section of rail network was limited.*
- *Prior to 2008 the total tonnage of ore allowed to be transported by rail was restricted to 20,000 tonnes per month (the current proposal requires the transportation of 25,000 tonnes per month).*
- *Rail corridor movements have increased substantially since 2008.*
- *Use of road transport affords a greater level of flexibility.*

There is no evidence that the applicant has made contact with ARTC to enquire what access would be available and what tonnage could be transported by rail. In your email of 27 February 2017 you requested Roads and Maritime's opinion regarding transportation by rail. In this regard it is our opinion that the applicant has not demonstrated that some or all of the haulage of ore cannot be by rail. As previously stated, Roads and Maritime notes the responsibility for considering if haulage can or cannot occur on rail sits with DPE. In this regard, Roads and Maritime requests DPE advise its conclusions after consideration of clause 16(1) of the Mining SEPP.

Response

The Applicant notes that the rail haulage operations require the use of three separate networks as follows.

- Rail network within the North Mine Site.
- National rail network controlled by ARTC between the North Mine and the Southern Operations.
- Rail network within the Southern Operation Mine Site.

Section 2.14.5 of the EIS states that the Applicant considered and rejected the use of rail to transport ore from the Mine Site to the Southern Operations for the following reasons.

- a) Access to the ARTC-controlled section of the rail-network from the boundary of the Mine Site to the boundary of the Southern Operations Mine Site was limited.
- b) The substantial increase in movements of ARTC stock since the previous use of the rail corridor for ore movement to Southern Operations would limit movement capacity further.
- c) Previous use of the rail corridor limited movements to approximately 20 000t per month whereas the requirement for the current project is 25 000t per month.
- d) Additionally, road transport affords a greater level of flexibility to the operation allowing for the peaks and troughs of a mining operation.

In relation to Points a) to c) above, the Applicant's General Manager, Mr Bruce Byrne, spoke with Mr Ross Powell of ARTC on 8 and 14 March 2017. During those conversations, Mr Byrne raised the historic lack of flexibility of access and practical difficulties using the section of

ARTC-controlled rail. Those discussions did not identify solutions or potential solutions to the previously experienced issues and the Applicant identified that further discussions were unlikely to be fruitful.

In addition, the Applicant notes that the rail network within the Mine Site is no longer suitable for rail traffic and that sections of the rail network within the Southern Operations not used for day-to-day transportation of concentrate are also not suitable. In particular, the rail unloading facilities at the Southern Operations are no longer compliant with acceptable safety and operational standards.

Finally, the Applicant has met and discussed this issue with Roads and Maritime Service (on 14 March 2017), the Broken Hill Roads and Traffic Committee (on 21 March 2017) and Mr Kevin Humphries (NSW Member for Barwon - 17 March 2017). No objections to the proposed use of road transportation were during any of these meetings.

Representative Comment(s)

Haulage of ore by road including Menindee Road (MR66) and Crystal Street

The EIS identifies the preferred haulage route as North Mine access road, Barrier Highway (HW8), Menindee Road, Crystal Street, South Road (HW22), Gypsum Street and South Mine access road. Roads and Maritime does not object to this proposed route, noting that works would be required at the intersections of North Mine access road and Barrier Highway, Barrier Highway and Menindee Road, Gypsum Street and South Road and South Mine access and Gypsum Street to accommodate the longer vehicles. Road pavement improvements along the route would also be required.

The swept path analysis provided by the applicant has not been thoroughly reviewed and assessed by Roads and Maritime on the basis that it now appears this route will not be pursued. Clarification from the applicant is sought confirming the proposed haulage route.

Response

This matter has been addressed in Section 2.4.

Representative Comment(s)

Haulage of ore by road via Iodide Street (HW22)

Roads and Maritime has received verbal advice that this route is now preferred by the applicant. It appears from the swept path analysis provided by the applicant that the use of this section of road in the haulage route would require widening of the Iodide and Crystal Streets intersection, relocation of an electricity pole, setback of a hold line at the Iodide/Argent intersection, loss of car parking in Iodide Street and road shoulder reconstruction. Roads and Maritime, at this time, is not satisfied that 30 metre road trains will be able to safely pass each other through this section of the road network.

Please note that 30 metre road trains are Restricted Access Vehicles (RAVs) and this section of road is currently open to RAVs up to 36.5 metres in length. At the time this part of the network was gazetted to permit 36.5 metre vehicle access, the road environment was assessed, including

geometry and traffic volumes. An increase in length and/or volumes of vehicles using this route would change the environment. Should such change be assessed as adversely impacting road safety, the gazettal may be revoked or modified. It is important to be aware that the ability for RAVs to operate on this route should not be assumed and that improvements may be necessary to ameliorate an increased road safety risk, particularly that of conflict between RAV's and other vehicles.

Should the use of the rail not be considered a viable option for the transportation of ore, and, the Menindee Road/Crystal Street route no longer part of the applicant's proposal, careful assessment of the preferred route will be required before Roads and Maritime will be in a position to comment on the proposal.

Response

The Applicant met with Roads and Maritime Service on site on 14 March 2017 to discuss the above. During that meeting, it was noted that the proposed route is gazetted for use by 36.5m A-double Road Trains and that the Applicant is proposing to use shorter 28.5m A-double Road Trains. In addition, to the Applicant's knowledge, there is no restriction on the number of 36.5m A-double Road Trains that may use the route. Indeed, Roads and Maritime Service did not object to the use of 28.5m A-double Road Trains during the recent application to modify DA448/2004.

Notwithstanding the above, the Applicant acknowledges the Roads and Maritime Service's concerns and committed during its meeting to consider contributing to any upgrade of the Barrier Highway / Iodide Street and Iodide Street / Crystal Street intersections on a pro rata basis based on traffic volumes.

4. PUBLIC SUBMISSIONS

4.1 INTRODUCTION

This subsection provides a response to the public submissions received following the exhibition period. As indicated in Section 1, the following public submissions were received in relation to the Proposal, as classified by the Department of Planning and Environment.

- Supporting submissions – five individual members of the general public or private companies supporting the Proposal.
- Opposing submissions – three individual members of the general public opposing the Proposal.
- Comment only submissions – one individual member of the general public provided a submission that was neither an objection nor in support of the Proposal.

A further submission, including range of questions, was received by Department of Planning and Environment on 9 April 2017 from R Gould. The Department requested that a response be prepared to this submission as well. For the purposes of consistency, this submission has been classified as being a “comment only” submission.

Table 11 presents an overview of the submissions received and the issues raised by each submission. This subsection initially provides a range of comments from those submissions that were in support of the Proposal. The remainder of the subsection provides, for each issue raised, selected extracts from each submission in italics, as well as a consolidated response to that issue.

Table 11
Overview of Public Submissions

Contact name	City	Road Transport	Lead Management	Processing Operations	Adequacy of the EIS	Environmental Performance
Objections						
Confidential 2	Broken Hill	✓	✓	✓		
Confidential 3	Cardiff				✓	✓
Richard White	Broken Hill	✓				
Comment only						
Confidential 1	Broken Hill					
R Gould	Broken Hill	✓	✓			
Support						
Confidential 4	Broken Hill					
J Bishop	Broken Hill					
B Rowbotham	Broken Hill					
M Haynes	Broken Hill					
J Smith	Broken Hill					

4.2 SUBMISSIONS IN SUPPORT

Representative Comment(s)

This project will provide employment for the community.

Confidential 4

The Perilya North Mine project is set to create new local jobs as well as preserve and secure jobs for the existing workforce. Perilya have proven with the Potosi Project that they can transport product and equipment through town safely with minimal disruption to the local community. Broken Hill has always been a mining town and it's in the entire towns best interest that this project goes ahead.

Jonathon Bishop

In regards to the North Mine operations this will benefit the community of Broken Hill. Employment both on site and in the community benefiting the town as a whole. I am in fully agree with the north mine recommencement of operations.

Bradley Rowbotham

I believe it is in the best interests of the community for this development to go ahead.

Mathew Haynes

I support the recommencement of mining operations at the North Mine and believe it's in the best interest of the Broken Hill community. After reviewing the document I don't see any issues that should prevent the acceptance of the submission

Jonah Smith

Response

The Applicant acknowledges the supporting submissions and concurs with the conclusion that the Proposal would result in a substantial net benefit for the community of Broken Hill.

4.3 ROAD TRANSPORTATION AND THE USE OF THE RAIL NETWORK

Representative Comment(s)

I strongly disapprove of the plans to run A double trucks to cart lead ore through the streets of Broken Hill for 2 years. Short term cartage is bad enough but 25 years is a completely different matter The North Mine has a railway line connected to the NSW Rail system, it runs through the main Broken hill marshalling yards and runs directly to the Perilya mine site where the ore is processed if this railway line was extended to the East by approximately 2 to 3 kilometres the problem with trucks passing through the streets of Broken Hill would be eliminated. Nobody in Broken hill wants to curtail mining in our region because we all know it is future but environmental and safety need to be given much more consideration. The cost to extend the rail could be written off over a number of years but the cost of trucking would continue for the life of the project.

Richard White

There is a RAIL LINE connecting North Mine with their Southern Operations. If a new facility is not built at the North Mine This should be used. This is a much safer option than trucking thru town.

There is also the cost for up keep of the road that falls on the state, that could be better spent.

There is a rail line connecting North Mine with Southern Operations and this should be used for transportation of ore from North Mine.

The only distance of rail track that might need updating is on North Mine site, track in place only updating approx. 1-2 km. (this was used when Potosi was previous operating up to 2008).

The rest of the rail line is used daily. If Perilya know they have to use the rail option they can start repair work to this short stretch of track and it will be no delay to their project.

Train line in place. I do not believe transport should be necessary between sites by public road.

I think this is a reasonable request when the mine is going to operate for 25 years.

Current road route have houses on both sides for most of the route. Route turn 200m from post office centre of town. This is straight thru centre of town.

Confidential 2

Could you also ask why the product cannot be carted by rail as these road trucks are being loaded in the same manner as the tailings harvesting trucks, and these trucks that are going through the middle of town are also being contaminated when being loaded as they are being loaded next to the crusher that should be covered ,and the stockpiled tailing's also the dust that blows off the tailing dumps in the middle of town onto the roads again is highly bio available and the weight of the loaded trucks causes the dust to blow off the road into the homes to contaminate the homes these trucks Perilya are talking 96 plus Potosi trucks, these trucks will be travelling these roads for 25 plus years

R Gould

Response

The issue of the proposed revised transportation route has been previously addressed. However, the Applicant notes that the proposed transportation route is a State Road/Highway and that that route is currently approved for the class of vehicles to be used, namely A-double Road Trains operating at Higher Mass Limits.

The option of using rail to transport ore from the North Mine Site to the Southern Operations was assessed by the Applicant and rejected as not feasible. Section 2.14.5 of the *Environmental Impact Statement* and Section 3.9 documents the reasons for that conclusion.

Issues related to lead management raised by R Gould are addressed in Section 4.4.

4.4 LEAD MANAGEMENT

Representative Comment(s)

A fully enclosed dust proof crushing, processing facility should be built on site and ore loaded and taken out of Broken Hill by existing rail line. There is no need for transport of ore on public road thru the city centre. Back and forth. CBH built a facility in 2011 and this should be the norm for any other Lead Mines situated in Broken Hill town Centre.

The crushing of ore by a mobile crusher on a ROM pad open air, scooped with loader buckets on to trucks, should not even have to be commented on. NO thanks. Ore at North Mine have a very high lead content. It cannot be crushed and handled like their current Potosi Operations. North Mine is situated in TOWN.

Confidential 2

Could you ask why the need to use ROAD REGISTERED TRUCKS to [haul] tailings. These trucks are being loaded with a front end loader, when dumping the material into the truck the whole of the truck is covered in this toxic material the truck wash only washes the wheel base area not the whole of the truck, the toxic dust blows over the whole of the truck. Any truck registered for public road use should not be allowed to be used to cart tailing's these tailings are highly bio-available. they are worse [than] the lead on its own as tailings contain lead mill reagents and heavy metals

R Gould

Response

The issue of enclosing of the crusher has been previously addressed in Section 2.3. In summary, the Applicant proposes to enclose the mobile crusher with a negative pressure enclosure, including a dust collector.

In relation to contamination of vehicles used to transport ore or tailings material, the Applicant notes that the principal pathways for transportation and deposition of contaminated material from the Mine Site would be as follows. In each case the Applicant has committed to the following control measures.

- Dust on wheels and the underbody of vehicles.

The Applicant has committed to install and operate a wheel wash and to ensure that all vehicles departing contaminated sections of the Mine Site would be required to pass through the wheel wash.

- Dust blowing from the material loaded into the truck.

The Applicant has committed to use rigid covers for all trucks transporting ore on the public road network. In addition, material to be transported from the Mine Site would be wetted down before loading to control emissions during loading and unloading. This would also reduce the potential for emissions during transportation.

Trucks, including haul trucks transporting material from the Cosmopolitan Portal to the ROM Pad or the Waste Rock Harvesting Area to the Cosmopolitan Portal and road registered trucks, transporting tailings from the Tailings Harvesting Area

to the Pastefill Plant Area would do so at speeds that would minimise the potential for the emission of dust. In addition, this material would also be wetted down to further control dust emissions during loading, transportation and unloading.

Finally, the Applicant would require the transport contractor to increase the frequency of pressure washing of the outside of its trucks from fortnightly to weekly.

4.5 LOCATION OF PROCESSING FACILITIES

Representative Comment(s)

Ideally a new facility same as CBH should be built on site. No need for transport.

This ORE contain [sic] very high levels of lead which is not clear in submission. Crushing and loading have to be in enclosed facilities.

The State Government should help fund a new environmentally friendly processing facility.

Also could processing facilities at Southern Operations be relocated to North Mine?

Confidential 2

Response

The Applicant notes that relocating the processing facility from the Southern Operations to the North Mine or constructing a new processing facility at the North Mine would not be viable.

4.6 CONTENT/ADEQUACY OF THE APPLICATION

Representative Comment(s)

It took me to page 7 of the executive summary to know that this is a lead mine, and only because of mention of potential increases (albeit small) to the lead blood levels in local kids. I must say, the lack of transparency about what it is that's actually being dug up and processed really gives cause for concern about the rigour of assessment and what impacts might actually be.

The conclusion also states that 'the proposal and associated activities [why are the associated activities not part of the proposal?] have been assessed in terms of... social and economic issues' but there isn't actually any stated assessment of social issues or mention of what they are. There isn't even any mention of consultation with the local community.

I think to make the claim that it's been assessed without actually assessing it is insincere and don't believe that the proponent has the integrity to run the operation as assessed.

Confidential 3

Response

The Applicant notes that each of the matters raised in the submission are addressed in the body of the *Environmental Impact Statement* as follows and that it would appear that the author of the submission has only reviewed the Executive Summary.

- Section 1.4.3.2 – identifies lead as a principal product to be produced by the Proposal.
- Section 4.15 – provides a socioeconomic assessment of the Proposal.
- Section 3.2.1 – describes consultation with the local community.

4.7 ENVIRONMENTAL PERFORMANCE

Representative Comment(s)

Furthermore, EPL 2683 and 2688 for Perilya have had non-compliant annual returns every year since issue in 2000. Both licences. 16 years.

Is the department confident that the proposal will not negatively impact the local environment or community, including health impacts for children?

Confidential 3

Response

This is a matter for the Environment Protection Authority, however, the Applicant notes that it works closely with the Environment Protection Authority to manage the environmental performance of its operations and that the Environment Protection Authority has not raised this matter in its submission.

5. REFERENCES

- Boreland, F., Lyle, D. M., Wlodarczyk, J., Balding, W. A. and Reddan, S** (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.
- enHealth, 2012**, *Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards*.
- Muller Acoustic Consultants (MAC) 2017a**. *Noise Impact Assessment*, presented as Part 3 of the *Specialist Consultant Studies Compendium* that accompanied the EIS.
- Muller Acoustic Consultants (MAC) 2017b**. *Response to EPA Submissions: Noise Impact Assessment – Broken Hill North Mine*, presented as **Appendix 3**.
- NEPM (2013)**. *National Environment Protection (Assessment of Site Contamination) Measure*
- National Health and Medical Research Council and Environmental Health Committee (NHMRC) (2015)**. *Information paper- Evidence on the Effects of Lead on Human Health*.
- NSW EPA (2005)**. *Approved Methods for the Modelling and Assessment of Air Pollutants*.
- Pacific Environment (PE) 2017a**. *Air Quality and Greenhouse Gas Assessment* presented in as Part 1 of the *Specialist Consultant Studies Compendium* that accompanied the EIS.
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