15 Noise and vibration

15.1 Project changes and assessment

15.1.1 Relevant Project changes

The modifications to the Project that could change noise impacts are as follows:

- the rail spur realignment for which noise levels at private residences have been reassessed;
- the rail spur realignment construction — out of hours noise and vibration levels from construction at private residences have been reassessed (Appendix I); and
- the modified Spring Ridge Road diversion — as the road remains over 2 km from the nearest privately owned building, road noise from mine traffic along the Spring Ridge Road diversion is expected to remain negligible and thus was not further assessed.

While there are refinements to the mine plan, particularly the development of out-of-pit tailings emplacements and increasing the height of BOOPW out-of-pit waste rock emplacement, these are well removed from private residences and there are no proposed changes to the mining fleet. Hence, the noise impacts will remain as assessed in the EA (Chapter 16 and Appendix N) other than as discussed below.

15.1.2 Assessment method

i Rail spur noise

a. Key changes to criteria

Recent policy developments since the EA's publication influence the assessment of noise impacts from the changed rail spur alignment. A change in noise policy and criteria from the Industrial Noise Policy (INP) Environment Protection Authority (EPA 2000) to the draft Rail Infrastructure Noise Guideline (RING) (EPA 2013) is the most important for the adopted criteria and assessment methodology.

The Department of Planning and Infrastructure (DP&I) requested the draft RING be considered for rail spur noise in place of the INP. The RING is before the Minister for approval and its finalisation and release should be imminent.

While specific criteria for private rail spurs have not been published, verbal advice from DP&I and EPA is that the proposed criteria will be based on the method for determining amenity criteria described in the INP. Amenity criteria for rural receivers (INP Table 2.1) were used in this assessment. These are likely to apply to trains using the rail spur east of the balloon loop; the INP intrusive criteria will apply to noise generated by trains on the balloon loop and from coal loading. Table 15.1 provides a comparison of noise criteria for each policy.

Table 15.1 Changes to the rail spur noise criteria

Assessment	Policy	Assessment metric/period	Day criteria L_{eq}, dB(A)	Evening criteria L_{eq}, dB(A)	Night criteria L_{eq}, dB(A)
Operational noise					
EA	INP	$L_{eq(15\text{-}min)}$	35	35	35
Project change	RING[1]	$L_{eq(period)}$	50 (recommended) 55 (maximum)	45 (recommended) 50 (maximum)	40 (recommended) 45 (maximum)
Sleep disturbance					
EA	EPA (website[3])	$L_{eq(15\text{-}min)}$	N/A	N/A	45
Project change	RING	$L_{eq(period)}$	N/A	N/A	45[2]

Notes: *1. based on amenity levels for a rural area category as per Table 2.1 of the INP.*

2. consistent with the EA for assessment purposes, although the sleep disturbance criteria for onsite rail movements is unclear at this stage. Note the RING policy specifies an offsite L_{max} criteria of 80 dB(A).

3. www.environment.nsw.gov.au/noise/railnoise.htm

In summary the main changes associated with adopting a different policy than the EA include:

- criteria level change, from 35 dB(A) for all periods to 50 dB(A) day, 45 dB(A) evening and 40 dB(A) night;
- no acquisition or management rights if the RING criteria are exceeded, although reasonable and feasible mitigations are recommended where exceedances occur;
- assessment period changes from 15 minutes to day (15-hour), evening (4-hour) and night (9-hour); and
- model methodology change, from one train travelling along the spur representing a 15-minute period to assess all train movements in each day, evening and night period.

ii Rail spur noise modelling

Noise from the rail spur was modelled further to:

- assess the noise impacts of the changed rail spur alignment; and
- examine reasonable and feasible noise mitigation options to reduce noise levels at residences where it is predicted noise criteria will be exceeded because of rail operations (in response to submission NA-1).

a. Noise impacts of changed rail spur

iii Operational $L_{eq(period)}$ noise levels

To assess the noise impacts of the changed rail spur alignment, the noise modelling methodology was revised to quantify the $L_{eq(period)}$ noise levels in accordance with the RING. The RMR (2009) Dutch calculation for railway noise was used. The RMR methodology used a maximum of eight day and six night Cobbora train movements spread over each day (15-hour) (including the evening period) and night (9-hour) period Model outputs were calibrated against field measurements for train passbys in the Hunter Valley. The calibration identified the model to be within 1 dB(A), which demonstrates good correlation. The 3-D alignment of the rail spur was imported into the noise model, including revised offset distances, cuttings and spur elevations, which influences propagation.

The model considers:

- the noise emission level by source height and by octave;
- attenuation (that is weakened or lessened) from geometrical divergence;
- attenuation due to propagation;
- attenuation due to barriers;
- where applicable, attenuation due to propagation in housing regions; and
- where applicable, the noise level reduction because of reflections.

Table 15.2 provides the revised distances of receivers to the modified rail spur and a comparison of EA modelled noise levels against the modified rail spur noise levels. Thus the difference between modelled levels in the EA and the revised assessment is minimal in most cases. The change in the rail spur's location has the greatest influence on predicted noise levels. For example, a relatively large change in noise shown is due to topographic implications for the modified rail spur alignment.

Results demonstrate that the acceptable RING criteria for day will be satisfied for all receivers with the exception of receiver 3108; the acceptable RING criteria for night will be satisfied at all receivers with the exception of receivers 3062, 3108 and 5001. It is noted the maximum RING night criteria is met for all receivers with the exception of 3108. In comparison, the EA assessment identified all receivers in Table 15.2, with the exception of 3062, to be above criteria and in the management zone; 3108 and 5001 were within the acquisition zone.

When the RING is applied for on-site rail, it will not contain a provision for acquisition or management rights where exceedances occur, and so the current acquisition status of 3108 and 5001 as presented in the EA will no longer apply. Despite this, reasonable and feasible mitigation and management measures should be reviewed where the criteria are exceeded. (See section 15.1.3 for definitions of reasonable and feasible).

In summary, reasonable and feasible mitigation should be used at receivers 3062, 3108 and 5001 to reduce rail noise.

Table 15.2 Revised distances of private residences to the rail spur and modelled onsite L_{eq} rail noise comparison

Receiver	Nearest distance from realigned rail spur (m)	Approximate change in distance from EA assessment (m)[1]	$L_{eq(15\text{-}min)}$, (EA)	$L_{eq(15\text{-}hour)}$, (Day)	$L_{eq(4\text{-}hour)}$, (Evening)	$L_{eq(9\text{-}hour)}$, (Night)
3021	810	+10	39	39	39	38
3022	805	+10	39	39	39	38
3024	896	+5	39	38	38	37
3035	946	0	37	37	37	37
3041	957	+129	36	30	30	30
3043	610	+120	39	35	35	34
3062	383	-32	<35	45	45	45
3108	128	-127	**43**	53	53	53
5001[2]	497	-70	**48**	45	45	45
			Criteria			
			35	50[3]/55[4]	45[3]/50[4]	40[3]/45[4]

Notes: *1. Positive sign denotes realigned rail spur is at a greater distance than assessed in the EA.*

2. 5001 experiences an increase and decreased distance from particular sections of the rail spur.

3. Acceptable amenity criteria.

4. Maximum amenity criteria.

5. Bold identifies exceedance of the EA acquisition criteria and shading identifies the receivers that should be considered for reasonable and feasible mitigation (ie above the acceptable amenity criteria), note it is understood the RING will not contain a provision for acquisition or management rights.

iv Sleep disturbance (L_{max}) noise levels

Table 15.3 provides the revised distances of receivers to the modified rail spur and a comparison of EA modelled L_{max} levels against the modified rail spur L_{max} levels. The difference in modelled levels between the EA and this assessment is minimal for the majority of receivers. The change in the rail spur's location has the greatest influence on predicted noise levels, due to topographic features.

It is not clearly understood what criteria will be applied to sleep disturbance under the RING. The conservative EA sleep disturbance criteria were used in this assessment. It is also unclear if the RING will specify acquisition rights for receivers that are above the sleep disturbance criteria due to rail passbys. Comments from the EPA via this response process note that licence limits for locations above 50 dB(A) L_{max} will not be granted and the DP&I would assign acquisition rights for these premises. This can be used to delineate, or mark out, which receivers next to the rail spur will be acquired, and which can be managed reasonably and feasibly.

It is noted the methodology for this assessment has changed compared with the EA. The EA included L_{max} events from both operational noise sources (ie in pit plant) and train passbys, with sources placed at representative locations around the mine and along the rail spur. The revised rail spur assessment used individual models for each receiver close to the rail spur. An L_{max} source was modelled at the closest point on the rail spur to each receiver. It is noted that maximum train movements are 10 per 24-hour period, and it is unlikely that shunting and locomotives under full load would occur at every near point for every train, as assumed in this assessment.

Results demonstrate the L_{max} levels from the modified rail spur will remain consistent with the EA results for receivers close to the rail spur, with the exception of receivers 3041 and 3043 where the increased distance of the rail spur will reduce noise levels. The L_{max} noise levels are noted to increase at several receivers, notably 3180 where the modified rail spur is much closer than the EA spur.

It is noted some noise increases occur for receivers further from the rail spur (3021 and 3022), this is due to an increase in height of the rail spur. L_{max} events from extractive operations are not predicted to result in the sleep disturbance criteria being exceeded as described in the EA.

It is recommended to consider reasonable and feasible mitigation options for receivers within Table 15.3 where the sleep disturbance criteria are exceeded. It is assumed from recent EPA and DP&I correspondence that acquisition rights will be available to receivers where predicted noise is above 50 dB(A) L_{max}.

Table 15.3 Revised distances of private residences to the rail spur and modelled onsite L_{max} rail noise comparison

Receiver	Nearest distance from realigned rail spur (m)	Approximate change in distance from EA assessment (m)[1]	EA predicted L_{max} noise level, dB(A)	Predicted L_{max} noise level, dB(A) modified rail
3021	810	+10	48	50
3022	805	+10	48	50
3024	896	+5	47	49
3035	946	0	46	48
3041	957	+129	48	36
3043	610	+120	50	38
3062	383	-32	**54**	**56**
3108	128	-127	**58**	**65**
5023	780	+106	49	48
5001[2]	497	-70	**51**	**54**
Criteria, L_{max}, dB(A)				
			45	45

Notes: *1. positive sign denotes realigned rail spur is further than alignment assessed in the EA.*

2. 5001 experiences an increase and decreased distance from the rail spur.

3. Bold identifies exceedance of the adopted L_{max} acquisition criteria and shading identifies the receivers that should be considered for reasonable and feasible mitigation, note it is understood the RING will not contain a provision for acquisition or management rights.

v Construction noise

A detailed construction noise model and assessment has been made in accordance with the Interim Construction Noise Guideline (ICNG) (DECC 2009) for proposed out of hours using the same methods as described in Appendix N of the EA (Section 4.5). The construction assessment was a response to the submission about construction noise and vibration and is presented in Appendix I.

15.1.3 Environmental management

Noise management measures will be applied as described in Chapter 5 of EA Appendix N. These will be further detailed in construction and operations noise management plans.

Appendix N of the EA (Section 4.5) presents construction noise impacts based on the indicative construction fleet, activities and schedule. The construction noise assessment has been refined based on additional information available since the construction noise assessment used in the EA. Final details of the construction fleet, activities and schedule will be determined after the construction contractors are appointed and will be assessed in the construction noise management plan.

CHC is committed to managing noise emissions to all receptors identified to fall within the noise management zone (between 35 dB(A) and ≤40 dB(A)) and acquiring four residences identified to be above acquisition levels (>40 dB(A)). These landowners will be provided with the opportunity for upfront acquisition.

i Reasonable and feasible

The definition of 'reasonable' and 'feasible' mitigation has been reproduced from Appendix 5 of the Draft RING (EPA 2013):

A feasible mitigation measure is a noise-abatement measure that can be engineered and is practical to build, given project constraints such as safety, maintenance and reliability requirements. It may also include options such as amending operational practices (eg changing timetable schedules) to reduce noise.

Selecting reasonable measures from those that are feasible involves judging whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of abatement. To make such a judgement, consider the following.

- Noise impacts:
  - existing and future levels, and projected changes in noise levels;
  - level of amenity before the project, eg the number of people affected or annoyed;
  - any noise performance criteria for the development, eg internal noise levels for certain rooms; and
  - the amount by which the triggers are exceeded.
- Noise mitigation benefits:
  - the amount of noise reduction expected, including the cumulative effectiveness of proposed abatement measures — ideally, a noise wall/mound should be able to reduce noise levels by at least 5 dB; and
  - the number of people protected.

- Cost-effectiveness of noise mitigation:
    - the total cost of mitigation measures, taking into account the physical attributes of the site, eg topography, geology, and the cost variation to the project given the expected benefit;
    - noise mitigation costs compared with total project costs, taking into account capital and maintenance costs; and
    - ongoing operational and maintenance cost borne by the community, eg running air conditioners or mechanical ventilation.
- Community views:
    - engage with affected land users when deciding about aesthetic and other impacts of noise abatement measures;
    - determine the views of all affected land users, not just those making representations, through early community consultation; and
    - consider noise mitigation measures that have majority support from the affected community.

The RING suggests taking into account the above considerations when determining which locations to mitigate first. In practice, the detail of the mitigation measures applied will largely depend on project-specific factors. The process aims to balance the project's benefits for the wider community against the costs and benefits of mitigation measures. These are the measures that minimise, as far as practicable, the local impacts of the project. Project approval conditions that flow from this process should be clear and achievable so that the proponent, local community, regulators and the ultimate operator are confident the proposed mitigation measures can achieve the predicted level of environmental protection.

ii Review of reasonable and feasible noise mitigation options

The reasonable and feasible noise mitigation options were reviewed for three potentially most affected properties. Residences were selected because they are predicted to experience the highest noise levels (residence 3062) or attempts to discuss acquisition or amenity agreements with the owners have been unsuccessful (residences 3108 and 5001).

Scenarios examining reasonable and feasible noise mitigation options to reduce noise levels at residences next to the rail spur were modelled and compared to a 'no-build' option.

The following three scenarios considered the noise mitigation from using acoustic barriers:

- Scenario A – barrier constructed next to residence (about 20 m from the dwelling and parallel to the track);
- Scenario B – medium long barrier constructed next to the rail spur (about 15 m from the track); and
- Scenario C – long barrier constructed next to the rail spur (about 15 m from the track).

Scenario B and C compared the difference between a shorter/higher barrier and a long/lower barrier. In each scenario, the best possible barrier height and length was used to achieve the adopted acceptable amenity criteria. Table 15.4 provides the ideal dimensions of the barrier for each scenario.

It is assumed the acoustic barriers are constructed of impervious panels supported between uprights. Indicative costs have been determined using a well-known brand based on a cost of $\$190/m^2$ (excluding foundations for the uprights) to buy and install. For Scenario A, a vegetated earth mound could also be used. This would have a larger footprint but would require minimal maintenance and would be planted providing a different aesthetic to a wall.

Table 15.4 Ideal dimensions of barrier and indicative costing

Receiver	Scenario	Height (m)	Length (m)	Indicative cost
3108	A	3.5	20	$13,300
	B	5	310	$294,500
	C	3.3	820	$514,140
5001	A	2.5	20	$9,500
	B	3	330	$188,100
	C	2.8	900	$478,800
3062	A	1.8	20	$6,840
	B	4.2	320	$255,360
	C	2.5	515	$244,625

The existing rail model used to quantify emissions of the changed rail spur alignment (Section 15.1.2) was revised to incorporate barrier scenarios A, B and C. Noise modelling quantified the noise attenuation of the barriers for the $L_{eq(period)}$ metric using the RMR (2009) Dutch calculation method for railway noise.

Architectural acoustic treatments to buildings have also been considered in the following section.

a. Acoustic barriers

The acoustic barrier designs, or configurations, required to meet the RING on-site rail criteria of 45 dB(A) $L_{eq(15\text{-}hour)}$ and 40 dB(A) $L_{eq(9\text{-}hour)}$ at the residences are presented in Table 15.5 and illustrated in Figure 15.1 and Figure 15.2.

Table 15.5 Result comparisons of barrier scenarios

Receiver	Scenario	Result, dB(A)	
		$L_{eq(15\text{-hour})}$	$L_{eq(9\text{-hour})}$
3108	No build	53.0	52.6
	A	40.4	40.0
	B	40.8	40.4
	C	40.3	39.9
5001	No build	45.1	44.7
	A	40.3	39.9
	B	42.6	42.3
	C	40.3	39.9
3062	No build	45.0	44.6
	A	39.6	39.3
	B	40.4	40.0
	C	40.3	39.9
		Criteria	
		45	40

b. Architectural acoustic treatments

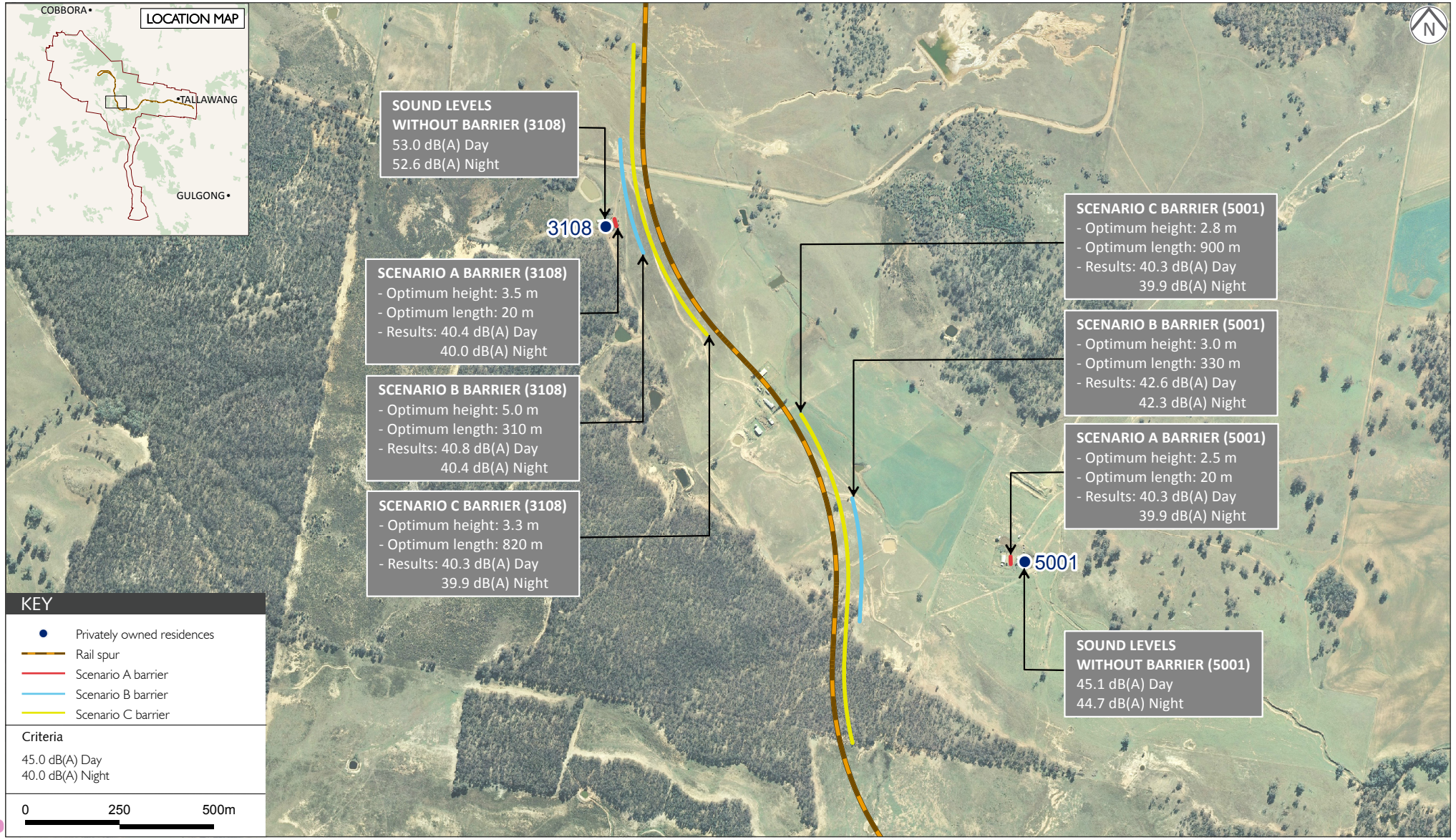
Architectural acoustic treatments to buildings are an alternative to acoustic barriers. It is important for every path to be treated for noise reduction to be effective. Often, the floor, external walls, roof, glazing and any other penetrations through the building need to be upgraded to improve overall sound insulation. As a result, the success of acoustic treatments on existing buildings is variable, particularly for older buildings. These treatments are discussed below.

Install underfloor insulation beneath the floorboards. The insulation can come in interlocking panels or standard insulation batts that sit between the flooring joists. The gap between the floor level and ground around the dwelling perimeter should be built up with brick or masonry block work. If access is required, a door or gap may be left at a location that does not directly face the noise source (ie the rail spur). All perimeter gaps and junctions need to be sealed with a sealant. Example insulation products include Expol underfloor insulation (www.expol.com.au/) and Ecofoam (www.ecofoamwallinsulation.com.au/).

Install insulation batts between ceiling joists in the roof cavity. Insulation batts (glasswool or similar) can be installed between the ceiling joists.

Install acoustic insulation in wall cavities. This can either be done by spraying granulated insulation in the wall cavity or by removing the internal wall layer and installing standard insulation batts.

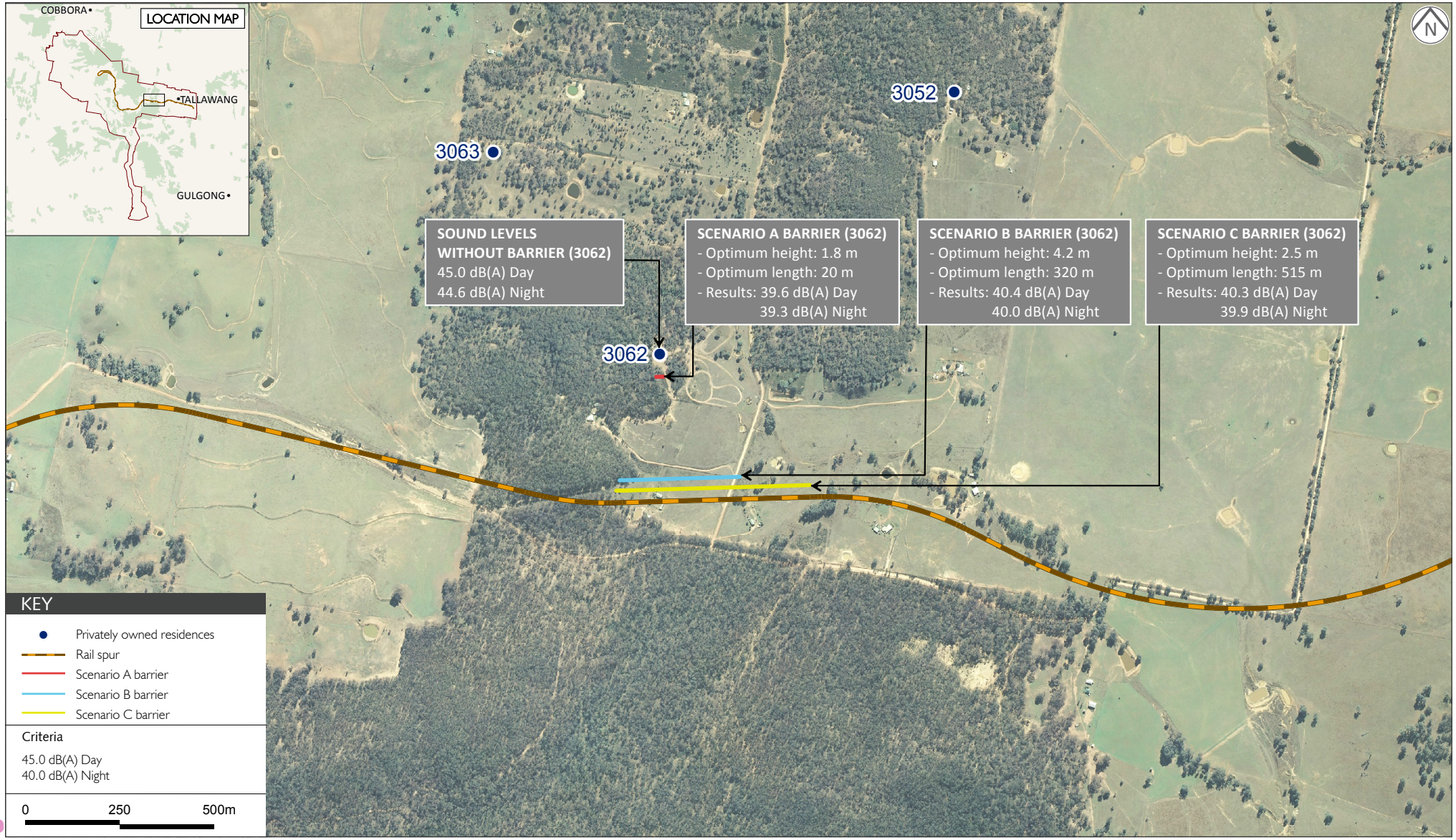
Construct an enclosed patio. This can be built on the side (or sides) of the house facing the rail spur (often referred to as a 'winter garden' or 'Queenslander'). It introduces an additional 'mass' layer and a large cavity that effectively acts as an additional cavity wall. It may be less intrusive than retrofitting acoustic insulation if internal wall linings need to be removed. The design could focus on containing the facades directly facing the rail spur or at most sensitive areas (ie bedrooms) of the dwelling only. If correctly designed and installed, it would provide a higher acoustic performance than installing acoustic insulation in wall cavities.



Cobbora Rail Barrier Investigation

Cobbora Coal Project - Preferred Project Report and Response to Submissions

Figure 15.1



Cobbora Rail Barrier Investigation

Cobbora Coal Project - Preferred Project Report and Response to Submissions

Figure 15.2

Glazing. Domestic glass is usually a poor acoustic performer and can make building facades less effective. Upgrade options include thicker laminated glass or double-glazed laminated windows with an air gap between panels. The frames and air gaps should be adequately sealed for the most noise reduction.

Because windows need to remain closed for effective noise reduction alternative means of internal ventilation (eg airconditioning) need to be considered for windows to remain fully closed.

Penetrations and detailing. It is important to seal all gaps between building elements properly. Use expanding foam or flexible sealants to fill all gaps in new and existing building elements.

Indicative costs of architectural acoustic treatments are presented in Table 15.6. Installation costs are excluded from the treatments and will vary depending on contractor.

Table 15.6 Indicative costs of architectural acoustic treatments per dwelling

Product	Indicative cost of material
Expol underfloor insulation (including fixings)	$1,800
Ecofoam underfloor insulation	$3,750
Ecofoam wall insulation	$3,200
Bradford R2.0 ceiling batts	$1,536
Bradford R2.0 wall batts	$1,563

Notes: Excludes GST. Assumes floor/ceiling area of 150 m^2 and a wall area of 125 m^2.

c. Summary

The review identifies that installing Barrier Option A or architectural treatments to residences are the most reasonable and feasible noise mitigation options.

Scenarios B and C are unfeasible due to their length and whether it is practical to install the barriers directly next to the rail spur, as well as potential visual amenity impacts and associated costs.

iii Construction noise and vibration

An out-of-hours construction noise and vibration assessment has been completed, see Appendix I.

15.2 Response to submissions

15.2.1 Background levels and criteria

Submission

C-2

Issues

The MWRC comments the existing INP needs to be reviewed, particularly for rural areas, where background noise levels are significantly lower than the 30 dB(A) threshold. The MWRC would like the INP to more accurately record and reflect the background noise in rural areas and then set these as the threshold levels, not the existing 30 dB(A) threshold. The MWRC considers the potential impact of noise is underestimated because the flawed INP is applied.

Response

It is acknowledged that in some rural communities ambient background levels are lower than the 30 dB(A) L_{90} threshold recommended by the INP. The INP also notes the possibility of lower background levels but nominates 30 dB(A) as the appropriate representative background level for impact assessment purposes.

Long-term ambient noise levels for the Cobbora area were monitored in August 2009 (ERM 2009). The range of rating background levels (RBLs) for 10 locations in the Cobbora area are: 32 dB(A), 28 dB(A) and 28 dB(A) for day, evening and night respectively. These levels are conservative, as winter is typically the quietest season of the year due to inactivity of insects and other rural sources.

The background levels adopted are the lowest recommended of 30 dB(A) in accordance with the INP. This is the base value to which 5 dB(A) is added, resulting in the criteria.

15.2.2 Meteorological parameters

Submissions

I-9, I-63, NA-1, G-10

Issues

Submissions comment on the meteorological information presented in the assessment. One submission comments the prevailing wind in the Project area is west-south-west, as opposed to the easterly wind flow used in the air quality assessment and as such the predictions of noise and dust pollution impacts on surrounding landholders are understated. Two submissions comment that winds within the local area will be from the west and south-west and will amplify noise and dust impacts at residences. Submissions comment that requests to have these areas monitored before operations begin were ignored.

The EPA comments that the model should have included winds up to 3 m/s; however, the EPA considers the potential impacts were adequately assessed by including inversion conditions in the modelling. The EPA notes it will include winds up to 3 m/s as conditions under which any noise licence limits would apply.

Response

Meteorological data is analysed differently for noise and air quality modelling. The noise assessment analyses winds in accordance with the INP for speeds less than or equal to 3 m/s. The data set is broken into seasonal day, evening and night periods to determine the wind directions and speeds for the assessment. The air quality assessment approach uses all wind speeds.

The highest percentage occurrence of winds between 2.5 m/s and 3 m/s for any direction was 3.5% and therefore 3 m/s winds are not prevailing. The 10^{th} percentile wind speed was determined to be 2.25 m/s and is representative of wind speeds at the site. The 10^{th} percentile calculation method is considered a sound method for determining the prevailing wind speeds for a subject site. Table 15.7 summarises the prevailing winds (ie occurring more than 30% of the time) used in the noise assessment. Inversion meteorological parameters provide a worst-case assessment and the standard 3 m/s for assessing compliance will be part of the conditions for the Project.

Table 15.7 Prevailing winds

Direction (degrees)	Direction (name)	Season	Time	L_{10} wind speeds (m/s)[1]	Percentage occurrence (%)
247.5	South-west	Autumn	Day	2.1	34.6
247.5	South-west	Winter	Evening	1.8	32.5
247.5	South-west	Autumn	Evening	1.8	32
270	West	Autumn	Day	2.3	31.7
225	South-west	Autumn	Day	2.1	31.6
247.5	South-west	Autumn	Night	2	31.5
225	South-west	Spring	Evening	2.1	31
247.5	South-west	Winter	Night	2.2	30.9
247.5	South-west	Winter	Day	2.2	30.8
270	West	Winter	Evening	2	30.4

Note: wind speeds which are exceeded 10% of the time or the average maximum wind speed.

15.2.3 Modelling methodology and results

Submissions

NA-1, NA-13, G-10

Issue

Two submissions comment on the methodology used for the noise assessment. The EPA comments the modelled elevations of some plant (particularly the rail load-out and the CHPP) vary between years. It wants a clear answer to whether fixed plant will increase or decrease in elevation throughout the life of the mine. If plant elevations do not change, the EPA asks for the model to be amended to reflect that and new predicted levels provided.

One submission comments that noise model impact predictions for residences understate the possibility of excessive noise pollution, and that mining three pits simultaneously will cause significant cumulative noise impacts.

The DP&I makes the following comments:

- further information is required on what mitigation measures have been incorporated into the noise modelling predictions;
- further information is required regarding how noise is being minimised in the design of the railway line;
- further information is required on what equipment has been included in the low frequency (LF) noise assessment;
- modelled predictions should include the results of mitigation with and without the inclusion of 3 m barriers on the northern side;
- further information is required on what the noise modelling has assumed along the bridge crossings of Tallawang Creek where significant cut and fill is expected;

- bulldozers are identified in the product and bypass stockpile but not identified in Table 3.5;
- no noise source at the height of the skyline conveyor system has been included;
- assessment results for Dapper Union Church should be included if it is still used for services;
- further information is required if scrapers will be used to remove topsoil;
- further information is required to justify why drainage flows were not included in the assessment as noise sources are below receptors;
- further information is required for the reasons for the minimal difference in predicted results for Class F and Class G inversions; and
- further discussion is required regarding reasonable and feasible mitigation measures to reduce sleep disturbance impacts where sleep disturbance exceedances are recorded.

Response

The ground elevation at the rail load-out is 414 mRL. Therefore, the rail load-out source has been modelled at a lower elevation for Year 8, 16 and 20. This source is not acoustically significant in this area (108 dB(A)), as there are six D11 dozers (115 dB(A)) next to this source, some at higher elevations (RL122), and these dominate noise emissions from this area of the mine. Changing the height of the rail load-out would not result in any significant change to noise emissions from the mine. The labelling on Figure 3.3 in EA Appendix N is incorrect, the height of the CHPP is 410 m for all modelled scenarios.

The noise assessment was made in accordance with all relevant contemporary noise and vibration requirements. The noise modelling assessed emissions for simultaneous pit operation, and predicts that three private residences will experience noise levels above 40 dB(A) and eight residences will experience noise levels above 35 dB(A). Recent acquisitions and application of the RING mean that no residences will be above 40 dB(A) acquisition criteria and only one will be above 35 dB(A) operational criteria. Noise modelling results have been shown to be true, or validated, on many occasions with field data that demonstrated the conservative nature of predictions.

Mining operations are not a significant contributor to receiver exceedances, the Year 20 scenario identified two receivers above the PSNL due to mining operations. The remainder of exceedances are due to rail noise. Therefore, noise mitigation for mining operations was not a focus of the assessment, and all reasonable and feasible mitigation has been considered for the rail spur as discussed in Section 15.1.2.

The rail spur will be designed to minimise noise emissions using best practice methods, including the following:

- continuous welded rail (CWR) will be used to eliminate rail joint impact noise (ie the ‘click-clack’ sound of rail wheels on track joints);
- heavy duty pre-stressed concrete sleepers will be used to absorb pressure from train loads and help to minimise wheel/track noise;
- heavy duty rail clips will be used to fix the rail to the sleeper housing, which lessens movement and then reduces regenerated noise;

- 10 mm heavy duty rubber pads will be installed below the rail to lessen the impact where the rail sits in the sleeper housing and provide increased noise dampening;
- curved track will be kept within ARTC guidelines to eliminate wheel to rail head (wheel squeal) noise from small radius curves; and
- track grades will be within track ARTC guidelines to lessen locomotive power surge under load and to minimise braking noise downslope.

LF components in all sources are captured by virtue of using measured emission levels of each plant as listed in EA Appendix N. 'C' weighting correction was applied to the 1/1 octave sound power levels for all operational sources, including CHPP but excluding rail. Section 2.4 of the report identifies that both the <60 dB(C) and 15 dB above C-A are satisfied. LF components from rail were not considered, due to intermittent nature of trains and quantity (two per night). The 'C' weighted correction was applied to the CHPP for results presented in Appendix N. The 3 m barrier for the northern end of the rail spur is not specifically designed for acoustic emissions and has been included to remain consistent with other project studies. The noise benefits of this barrier are modest at 3–5 dB.

The modified rail spur covers all topography, including cuts and elevation (fills) of the proposed rail line. Bulldozer levels were included in Table 3.1 of Appendix N in the EA.

The skyline conveyor was modelled at 3 m above ground, it is noted this source is an insignificant contributor compared with other noise sources (ie more than 10 dB(A) quieter than nearby plant).

The EA (Appendix N, Section 4.1) states that predicted levels at Dapper Church would be below 35 dB(A) and satisfy adopted 'places of worship criteria'.

Scrapers were not assessed in the mode; however, acoustically similar plant (such as dozers) was used and can be interchanged accordingly. It is unlikely that both a dozer and scraper would be used simultaneously, and results are treated as representative.

The topography around the Project site is undulating with two broad shallow valleys following Laheys Creek and Spring Creek draining north. The pit areas are located within these valleys and drainage flows towards receivers were not considered relevant as receivers are separated by intervening topography.

Modelling methodology ISO 9613 includes an option for assessing CONCAWE meteorology corrections algorithms. Results presented are therefore as predicted for both F and G class inversion scenarios. Further, a review of G class stability for the Dubbo region identified the occurrence was 11% during nights in winter months and according to the INP could not be assessed.

Sleep disturbance impacts and reasonable and feasible mitigation measures have been discussed in detail within sections 15.1.2 and 15.1.3 respectively.

15.2.4 Mine noise impacts

Submissions

I-9, I-13, I-12, I-63, I-70, I-124, G-10, NA-13

Issue

Submissions comment on the increased noise impacts to communities, towns and properties as a result of the Project. Submissions also note that experiences with other open-cut mining operations in the Ulan and Wollar areas has been that many more properties are affected by noise exceedance than predicted through noise modelling in the EAs of these large projects. On submission comments that the noise impacts of the Project have not been adequately assessed. Two submissions comment that noise from the Project will impinge on tourist areas in the region, including wineries.

The AAO comments that the risks of seismic disturbance at SSO are low. Seismic monitoring equipment is already in place at Siding Spring and will continue to operate. The AAO may publish the resulting data on a suitable web-site.

The DP&I made the following comments:

- insufficient information was provided to accept that remaining residents were consulted effectively;
- the status of receptors 1198 and 1199 requires clarification for Year 20 when the contour map shows that they will experience a noise exceedance of 35 dB(A);
- the status of reception 3062 requires clarification as it is identified as above the sleep disturbance criterion with 54 dB(A) predicted but is not listed as >35 dB(A);
- aggregated landholdings within the affection zone need to be identified;
- a contour map showing the noise sources and the receptor levels is required; and
- blasting hours proposed are from 0800 to 1800, which should consider the influence of inversions.

Response

As described in the EA, mitigation measures will keep noise emissions from operations below EPA noise criteria, except at eight private residences close to the rail spur where the sleep disturbance criteria are not met. Further acquisitions have been completed (see Table 15.8), with no remaining receivers above the operational acquisition criteria the RING uses for rail-affected receivers. Residences disturbed by rail noise are in ongoing discussions with CHC to acquire the properties or to enter into amenity agreements. The majority of exceedances are from the rail spur; reasonable and feasible mitigation measures to reduce noise levels at these residences are discussed in Section 15.1.3.

Table 15.8 Current management and acquisition status

Receiver	LOT	DP	Acquisition/amenity agreement status (as presented in the EA)	Acquisition/amenity agreement status (current)
1178	109	754305	Discussion in progress	Owners not considering sale at present
3021	12	750751	Amenity agreement in progress	Negotiations on hold due to family matter
3022	12	750751	Amenity agreement in progress	As above
3024	12	750751	Amenity agreement in progress	As above
3035	12	750751	Amenity agreement in progress	As above
3041	98	750751	Acquisition agreement reached	Property to be sub-divided for rail.
3043	102	750751	Acquisition agreement reached	Property to be sub-divided for rail.
3057	44	750751	Acquisition agreement reached	Settlement reached
3062	20	253275	Have been approached regarding noise impacts	Not concerned at this stage
3108	1	1041071	Best endeavours to negotiate not successful	Best endeavours to negotiate not successful
5001	114	704129	Best endeavours to negotiate not successful	Best endeavours to negotiate not successful
5023	1	1106998	Acquisition agreement	Settlement reached

A series of maps are provided in Appendix N in the EA that show the predicted Project-related and cumulative noise levels. The Project-specific noise level of 35 dB(A) will not be exceeded in the closest village, Cobbora, or at any other town at any time during the Project. The highest operations noise levels experienced in the village will be in Year 20. Based on the meteorological conditions most conducive to transmitting sound, the 35 dB(A) noise level contour will be about 2.5 km south of the village during this period (see EA Figure 16.7). Therefore, noise levels are not expected to disturb residences, other than those identified, or towns or tourism in the region.

As described in Section 15.2.3, the noise modelling methods used have been validated based on extensive field measurements at other mines in NSW. Noise monitoring for the Project will similarly be used to determine the validity of the predicted noise levels.

Receptors 1198 and 1199 have a modelled level of 35.3 dB(A) and 35.1 dB(A) respectively for Year 20 adverse weather, Table 4.1 in the EA was modified to reflect this.

Receiver 3062 has been reassessed with methodology in accordance with the RING, see Section 15.1.3.

Table 15.9 summarises the remaining aggregated landholding where 25% or more of the total property is affected by mining extraction operations. It is anticipated the requirement for an assessment of aggregated landholding next to the rail spur will not be required after the imminent release of the RING, as it will not impose management or acquisition zones due to exceedances of the criteria.

Table 15.9 Summary of vacant aggregated land identified to be within the affectation zone (private ownership)

Lot/DP number	Approximate land area within the affectation zone
116/754305	60%
50/754305, 20/754305, 6/75435, 41/754305	70%

Noise contour maps are provided in the EA (Appendix N).

CHC will co-operate with AAO in monitoring the effects of its blasting. In the unlikely event that blasting at Cobbora is found to affect SSO, CHC will modify its blasting activities to mitigate seismic risks.

Weather conditions will be monitored at the same time as blasting to avoid inversion conditions. The 0800 to 1800 hours is a general time period across the year and would avoid inversions during 6–9 months of the year.

15.2.5 Onsite rail noise

Submissions

NA-1, I-102

Issues

Submissions comment that the predicted rail noise increase to 35 dB(A) appears optimistic considering current background noise levels are well below 35 B(A). One submission comments there is not enough information about on-site rail noise, including construction details and locomotives to be used.

The EPA also comments it will not provide licence limits for some locations because the predicted noise levels are above those it would usually license to and that the DP&I will assign acquisition rights. The EPA also comments Table 5.1 of the noise impact assessment should include receiver number 3062 for the exceedances of the L_{max} criteria based on the discussion under Table 4.6, which indicates they would be included in discussions about noise management.

The DP&I asks for on-site rail noise to be assessed against a potential criterion using the INP amenity criterion that will be the assessment methodology used within the soon-to-be released RING.

Response

Predicted noise levels in the EA are presented as 15-minute averages, as required by the INP. Given train passbys are typically less than five minutes (depending speed and length), the levels may appear lower than expected as they are averaged out over the 15-minute period (ie five minutes loud train passby then 10 minutes quieter ambient noise), as required by the policy.

Section 15.1.2 provides a detailed assessment relating to L_{max} criteria and assesses the INP amenity criterion (ie RING).

15.2.6 Off-site rail noise

Submissions

C-2, NA-1, NA-13, G-2, I-8, I-15, I-38, I-55, I-66, I-84, I-85, I-116, I-135, I-150, I-157, I-187

Issues

Submissions comment on the noise impacts of the increased rail traffic as a result of the Project, particularly on towns, properties and communities along the coal chain, and that these additional movements have not been adequately assessed.

One submission comments that the EA does not include enough specific detail about the volume of mine-related rail traffic from the Ulan cluster of mines, and that the cumulative impact of the increasing volumes of rail traffic was not addressed. The submission requests further details of existing movements and any predicted increases in rail traffic from the development of Ulan West and Moolarben Stage 2.

The EPA comments there is potential for greater than a 2 dB(A) increase in off-site rail traffic noise levels and as such recommends the Project only use locomotives that have received an 'approval to operate on the NSW rail network'. The DP&I comments that CHC must meet locomotive noise objectives in the EPL and design rolling stock to minimise noise.

The DP&I asks for further investigation into the location of the 0.5 dB(A) decrease from rail emissions where the Project rail no longer constitutes 10% of the total traffic. The DP&I also asked for more information on rail noise mitigation discussions with the ARTC.

Response

The Project will increase noise emissions from rail haulage and residences next to the rail line will experience increased noise levels.

The rail hauliers have not been selected; they will decide which locomotives are used. Despite this, all locomotives will need to comply with the ARTC's EPL3142 noise criteria, which limits the noise emissions of locomotives to contemporary standards.

The off-site rail noise assessment (EA Appendix N Section 4.7) considered future rail movement from all mines (including a detailed assessment to Ulan) up to 2021. In accordance with relevant government policy, the off-site rail noise assessment has considered potential impacts associated with CHC and cumulative movements from all down line mines. Train movement calculations were based on the Hunter Valley rail corridor 2012 to 2021 (EMM 2012).

The increase in off-site rail noise from the Project has been calculated at 2 dB(A) and 5 dB(A) for years 2017 and 2021 respectively. Results of the off-site rail assessment are provided in Table 15.10 and Table 15.11. There will be lower coal production during the initial stages of the Project, this is reflected in the 2017 rail numbers, while 2021 reflects full production.

Train movements used for the assessment were sourced from the *Hunter Valley Corridor 2012–2021 Capacity Strategy* (the 'Strategy') (ARTC 2012). The 2 dB(A) noise increase occurs at the Tallawang and the Ulan loop where few trains are operating. The more conservative 0.5 dB(A) noise level increase occurs on the section between Muswellbrook and Antiene (Table 15.12). The L_{max} noise level is above the *Interim Guideline for Assessment of Noise from Rail Infrastructure Projects* (IGANRIP) (EPA & DP&I 2007).

Table 15.10 Summary of train movements and Project related increase – 2017

Rail line	Day movements (contracted + prospective) excluding CHC[2]	Night movements (contracted + prospective) excluding CHC	Day movements (CHC)	Night movements (CHC)	Percentage volume of CHC trains (day)	Percentage volume of CHC trains (night)	Day difference (dB(A))	Night difference (dB(A))
Bylong to Mangoola	24.9	14.9	5	4	20%	27%	0.8	1.0
Bengalla to Muswellbrook	36.4	21.8	5	4	14%	18%	0.6	0.7
Muswellbrook to Antiene	68.3	41.0	5	4	7%	10%	0.3	0.4

Notes 1. *Train movements sourced from* Hunter Valley Corridor 2012–2021 Capacity Strategy *(ARTC 2012).*

2. *Cobbora trains subtracted prospective movements.*

Table 15.11 Summary of train movements and Project related increase – 2021

Rail line	Day movements (contracted + prospective) excluding CHC[2]	Night movements (contracted + perspective) excluding CHC	Day movements (CHC)	Night movements (CHC)	Percentage volume of CHC trains (day)	Percentage volume of CHC trains (night)	Day difference (dB(A))	Night difference (dB(A))
Bylong to Mangoola	23.9	14.3	8	6	34%	42%	1.3	1.5
Bengalla to Muswellbrook	35.3	21.2	8	6	23%	28%	0.9	1.1
Muswellbrook to Antiene	71.6	43.0	8	6	11%	14%	0.5	0.6

Notes 1. *Train movements sourced from* Hunter Valley Corridor 2012–2021 Capacity Strategy *(ARTC 2012).*

2. *Cobbora trains excluded from movements.*

Table 15.12 Noise increases from additional train movements – Muswellbrook to Antiene

Distance[1] (m)	Contracted train noise, dB(A)[2]			Cobbora train noise, dB(A)[3]			Total train noise, dB(A)		
	Day, $L_{eq(15\text{-hour})}$	Night, $L_{eq(9\text{-hour})}$	L_{max}	Day, $L_{eq(15\text{-hour})}$	Night, $L_{eq(9\text{-hour})}$	L_{max}	Day, $L_{eq(15\text{-hour})}$	Night, $L_{eq(9\text{-hour})}$	L_{max}
15	72.2	72.2	88	62.7	63.7	88	72.7	72.8	88
20	70.2	70.2	86	60.7	61.7	86	70.7	70.8	86
25	68.2	68.2	84	58.7	59.7	84	68.7	68.8	84
40	67.2	67.2	80	57.7	58.7	80	67.7	67.8	80
50	65.2	65.2	78	55.7	56.7	78	65.7	65.8	78
80	64.2	64.2	74	54.7	55.7	74	64.7	64.8	74
100	62.7	62.7	72	53.2	54.2	72	63.2	63.3	72
140	72.2	72.2	69	62.7	63.7	69	72.7	72.8	69
IGANRIP or EPL3142 Trigger	**65**	**60**	**85**	**65**	**60**	**85**	**65**	**60**	**85**

Notes: *1. Assumed distance to nearest privately owned receptor.*

2. Based on 2021 data for 71.6 contracted (ie excluding CHC) movements during the day and 43 contracted movements during the night.

3. Based on hypothetical eight maximum CHC movements during the day and six maximum CHC movements during the night.

The ARTC and CHC have met (most recently on 11 January 2013) to discuss rail noise management. The ARTC has asked CHC to liaise with affected residents and provide abatement strategies for the Project. CHC is committed to working closely with the community and the ARTC to manage and reduce noise impacts from the Project. In particular, CHC has committed to manage noise levels at receivers where a 2 dB(A) noise level increase is predicted from the Tallawang to Ulan loop.

15.2.7 Management measures

Submissions

NA-1, NA-13, C-4

Issue

Submissions comment on the management measures presented in the noise assessment. The DP&I asks for further options for mitigating noise at the remaining receptor in the management zone, such as stopping work at night during worst case weather conditions/emissions or installing real-time monitoring systems. The DP&I also notes CHC needs to show it has done its best for the receiver for management and acquisition, such as a communications log. Wellington Council asks that the EPA set up strict consent conditions and proactive compliance management to protect landholders potentially affected by changes in noise levels. The EPA notes the noise management plan needs to include the mitigation measures discussed in the noise impact assessment for sleep disturbance.

The DP&I suggests the noise modelling has limited discussion on what mitigation measures were incorporated into the predictions

Response

CHC is committed to managing noise emissions from the Project so that they remain below the predicted noise levels at private residences. The noise monitoring program outlines methods for managing noisy activities during worst-case meteorological conditions. This includes real time and attended monitoring systems and, where these systems identify exceedances, the pit operations will be modified to remove/relocate the items of plant or activity responsible for any exceedances. Negotiations with the community have been ongoing and CHC continues to liaise with potentially impacted stakeholders.

The Project approval conditions are expected to contain strict and rigorous noise criteria. CHC will comply with these conditions. The noise management plan will include mitigation measures for sleep disturbance as detailed in the noise impact assessment (EA Appendix N Section 5). Negotiations with landholders are confidential. CHC will provide appropriate information directly to DP&I. Additionally, Section 15.1.3 provides a review of reasonable and feasible mitigation considerations to reduce rail spur noise.

15.2.8 Health impacts

Submissions

I-37, I-70, I-135, NA-13

Issue

Submissions comment on the negative health impacts from the Project's noise emissions. The DP&I comments there have been no discussions on reasonable and feasible mitigation measures to reduce sleep disturbance impacts to receptors experiencing exceedances in sleep disturbance criterion.

Response

Health impacts may occur if noise levels cause ongoing sleep disturbance. L_{max} events associated with rail movements may be above sleep disturbance criteria in some locations. Should this occur reasonable and feasible mitigation options are provided in Section 15.1.3.

15.2.9 Construction impacts

Submission

C-2, NA-13

Issue

The MWRC comments that experience from the mining cluster at Ulan has shown construction usually has a 24-hour phase, even if only for part of the construction period, and this will increase adverse affects. The MWRC comments that road noise and other road impacts should be assessed.

The DP&I made the following comments:

- more information is required on managing noise outside of standard construction hours if construction will continue seven days a week;

- if construction is to occur outside standard construction hours, the assessment needs to show the receptors where the RBL +5 dB(A) is exceeded and that worst case scenarios at each receptor have been assessed;
- further information is required on construction noise from two of the three road diversions proposed;
- additional information is needed on the assumptions used to predict the noise level for each construction activity;
- construction of bridges around creek crossings may have additional noise impacts, such as pile driving, which has not been assessed;
- the tables identifying noise impacts at private receptors should discuss further the activities occurring near the receptors;
- a noise assessment of any construction blasting is not completed;
- an assessment of night-time noise impacts from construction vehicles has not been completed;
- will crushing or cement batching plants be required for construction and if so where will they be located;
- more information is required on the noise impacts of the construction equipment fleet; and
- the model did not assess vibration impacts apart from blasting.

The DP&I also comments that there has been no detailed assessment on the other local traffic routes used by construction traffic, particularly for constructing the eastern end of the rail spur where a large number of trucks will be needed for ballast and gravel.

Response

The noise assessment provided a general construction noise assessment because detailed information about construction activities is still being finalised. Detailed management measures to control construction noise and vibration impacts, including traffic generation and blasting, will be provided in the construction noise management plan. For information on proposed out of hours construction noise and vibration impacts see Appendix I.

15.2.10 Road noise

Submission

NA-1

Issue

The EPA comments that since truck deliveries are proposed for daytime only, it has recommended a condition that truck deliveries only occur during the day period. The DP&I comments there has been no assessment of the noise impacts from the Dapper Road and Brooklyn Road diversions.

Response

As the modified road diversions are more than 2 km from the nearest privately owned receptors, road noise associated with the diversion is expected to remain negligible and has not been further assessed.

Road traffic generated by construction will be included in the detailed construction noise and vibration assessment report, which is being completed.

15.3 Conclusions

Modifications that have the potential to change noise impacts of the Project have been reviewed and include:

- rail spur realignment;
- out of hours construction assessment; and
- implications associated with the modified Spring Ridge Road diversion.

The DP&I's request to complete an assessment using the RING resulted in several key changes to the assessment methodology, criteria and results.

Noise levels from the revised rail spur alignment and the RING criteria result in the day criteria being satisfied for all receivers, with the exception of receiver 3108. The criteria for night are satisfied at all receivers, with the exception of 3062, 3108 and 5001.

The RING for on-site rail does not contain a provision for acquisition or management rights where exceedances occur, however, reasonable and feasible mitigation and management measures were reviewed where the criteria are exceeded, in particular for receivers 3062, 3108 and 5001.

The L_{max} levels from the modified rail spur will reduce compared with the EA at receivers 3041 and 3043 due to an increased distance from the rail spur. The L_{max} noise levels are noted to increase at several receivers, notably 3180 and 5001 where the modified rail spur is much closer than the EA spur. It is recommended to consider reasonable and feasible mitigation options for receivers where the sleep disturbance criteria are exceeded. It is assumed acquisition rights will be available to receivers above 50 dB(A) L_{max}.

Reasonable and feasible options for the rail spur have been reviewed and it is recommended to install a localised barrier next to receivers or use dwelling treatments to reduce noise intrusion.

For operational and extraction noise, CHC is committed to managing noise from the Project so that it remains below the predicted noise levels at private residences. Reasonable and feasible management measures include establishing an effective noise monitoring program, and using real-time and attended monitoring systems. Where exceedances are identified, the pit operations will be modified to remove or relocate the items of plant to achieve compliance.

Off-site rail noise emissions are identified to comply with the RING's 2 dB(A) project-related rail noise increase at the Tallawang to Ulan loop, while the highly conservative 0.5 dB(A) project-related increase would be satisfied at the Muswellbrook to Antiene line. CHC is committed to working closely with the community and ARTC to manage and reduce rail noise impacts from the Project. In particular, CHC has committed to manage noise levels at receivers where a 2 dB(A) noise level increase is predicted from the Tallawang to Ulan loop.

Several Project refinements have resulted in changes to construction areas, Appendix I provides a noise and vibration assessment for proposed out-of-hours activities.

Changes associated with the road realignment are considered negligible.