

NRE WONGAWILLI COLLIERY

NOISE AUDIT

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PREPARED FOR

GUJARAT NRE WONGA PTY LTD
NRE WONGAWILLI COLLIERY
WONGAWILLI ROAD
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AAAC

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Wilkinson Murray is an independent firm established in 1962, originally as Carr & Wilkinson. In 1976 Barry Murray joined founding partner Roger Wilkinson and the firm adopted the name which remains today. From a successful operation in Australia, Wilkinson Murray expanded its reach into Asia by opening a Hong Kong office early in 2006. 2010 saw the introduction of our Queensland office and 2011 the introduction of our Orange office to service a growing client base in these regions. From these offices, Wilkinson Murray services the entire Asia-Pacific region.



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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

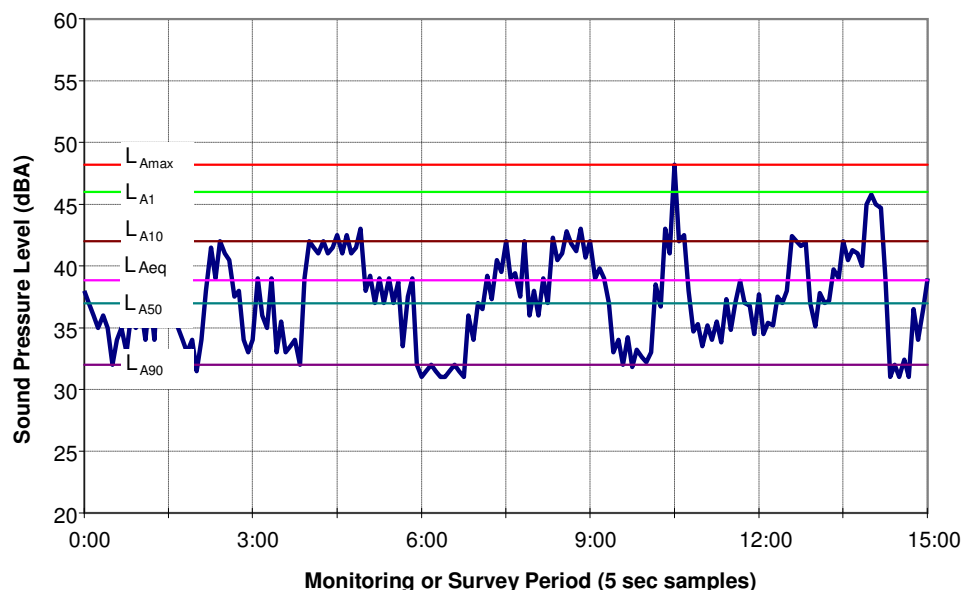
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time



INTRODUCTION

Project Background & History

The Wongawilli Colliery is located approximately 15km south west of Wollongong, near the village of Wongawilli in New South Wales. Historically, the Colliery has produced up to 2Mtpa with all coal produced transported to Port Kembla Coal Terminal via rail. Gujarat NRE Wonga Pty Ltd own and operate the Colliery including the rail line.

Environmental Resources Management Australia (ERM) conducted a noise impact assessment as part of an Environmental Assessment for Wongawilli Colliery. That assessment, reference 0097271 EA Noise "Wongawilli Colliery, Noise Impact Assessment – 2Mtpa Operations" was completed 1 October 2010 and will be referred to as ERM's Report for the remainder of this document.

A Project Approval was provided by the Minister for Planning and Infrastructure (Application Number 09_0161) on 2 November, 2011 with Conditions of Approval (CoA). Part of the Approval Conditions (Schedule 4 – Specific Environmental Conditions – General – Noise Audit, Condition 7) outline the requirements of a Noise Audit.

Wilkinson Murray Pty Limited (WMPL) was commissioned by Gujarat NRE Wonga Pty Ltd (Gujarat) to carry out the independent noise audit of the Wongawilli Colliery operations including rail movements along the spur.

Following a review of the ERM's Report, Project Approval and discussions with Gujarat personnel, the following aspects have been reviewed by WMPL:

1. Background noise monitoring including updated data and development of noise criteria by WMPL for additional receivers.
2. Noise model inputs and assumptions, such as scenarios, sound power levels, assessment location and weather data. Additional noise modelling by WMPL is included.
3. Reasonable and feasible mitigation measures regarding Colliery operation including rail movements.
4. Action plan to implement any audit recommendations and a monitoring plan to confirm the effectiveness of any audit recommendations.
5. Development of vibration criteria and assessment of impacts.

With respect to the above five items, in the opinion of WMPL, Item 5 which addressed the vibration impacts associated with the Colliery operations including rail movements are considered to be negligible. WMPL agree with the conclusions of ERM that rail movements are likely to be barely noticeable and any building damage would be highly unlikely. Vibration associated with other Colliery operations are also expected to be barely noticeable. As a result, further detailed assessment is, in the professional opinion of WMPL not warranted.

It is recommended that this Audit be read in conjunction with ERM's report and the CoA.

As per the requirements of the Approval, a draft version of this report has been issued for review by Environment Protection Authority (EPA).

The EPA concluded (ref EF13/3970:DOC13/59293:ATC dated 20 September, 2013) that the audit adequately addressed the issues and can be submitted to NSW Planning.

Some general EPA comments were provided for consideration in finalising the report. The comments primarily agreed with more detailed attended and unattended noise monitoring to assess compliance with the noise criteria. These comments will be addressed in detail as part of the Noise Monitoring and Management Plan to be prepared in consultation with Gujarat.

Discussion of Noise Criteria & Noise Goals related to Site Noise

Within the approval there are noise criteria, which must be met as part of the approval and noise goals which are levels that are to be aimed for over time. The relevant Tables from the approval have been reproduced below:

Noise Criteria

1. The Proponent shall ensure that the noise generated by the project (including train loading and shunting within the yard but excluding train movements on the Wongawilli rail spur) does not exceed the criteria in Table 3 and Table 4 at any residence on privately-owned land or on more than 25 percent of any privately-owned land.

Table 3 Noise Criteria dB(A) – Intrusive Noise Limits – Existing Residences

Receiver Area	Day	Evening	Night	
	$L_{Aeq,15min}$	$L_{Aeq,15min}$	$L_{Aeq,15min}$	$L_{A1,1min}$
RA1	43	43	43	59
RA2	44	43	43	60
RA3	40	40	38	48
All other existing residential receivers	40	40	38	48

Table 4 Noise Criteria dB(A) – Amenity Noise Limits – All Residences

Receiver Area	Day	Evening	Night
	$L_{Aeq,11hr}$	$L_{Aeq,4hr}$	$L_{Aeq,9hr}$
All privately-owned land	60	50	45

Notes to Table 3 & 4:

- To interpret the locations referred to Table 2 and 3, see Appendix 4.
- Noise generated by the project is to be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.

However, these noise criteria do not apply if the Proponent has an agreement with the relevant owner/s of the residence or land to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

Noise Goal

2. *The Proponent shall ensure that the noise generated by the project (including train loading and shunting within the yard but excluding train movements on the Wongawilli rail spur) does not exceed the criteria in Table 3 and Table 4 at any residence on privately-owned land or on more than 25 percent of any privately-owned land.*

Table 5 Noise Criteria dB(A) – Intrusive Noise Goals – Existing Residences

Receiver Area	Day	Evening	Night	
	<i>L_{Aeq,15min}</i>	<i>L_{Aeq,15min}</i>	<i>L_{Aeq,15min}</i>	<i>L_{A1,1min}</i>
RA1	40	40	38	51
RA2	40	40	38	51
RA3	40	40	38	48
<i>All other existing residential receivers</i>	40	40	38	48

Notes:

- *To interpret the locations referred to Table 5, see Appendix 4.*
- *Noise generated by the project is to be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.*
- *The noise goals in Table 5 may be varied by way of direction to the Proponent by the Director-General, following consideration of the results of the noise audit required under Condition 7 below.*

NOISE AUDIT

The following section provides a detailed review of the four remaining audit items.

Item 1 Background Noise Data & Noise Criteria / Goals

Review by Wilkinson Murray

ERM undertook measurements of existing background noise at three locations between 25 February and 12 March 2009 using ARL215 noise loggers in order to derive noise criteria. The locations, known as receiver areas (RA) have been defined by ERM.

In addition, a single 15-minute measurement was taken by ERM at each of the 3 logger locations on 12 March 2009.

Upon review of the background data (tables and the graphs) the following comments are made:

1. In general, the locations selected to obtain background data and the equipment used is considered acceptable and in line with the EPA's *Industrial Noise Policy (INP)*.
2. The RBL's developed are elevated during the evening (2 to 8dB) and night time (4 to 9dB) periods compared to the day with no explanation offered by ERM. Also, the attended measurements were conducted during a non-critical day period and offer no assistance in explaining these elevated noise levels.
3. In the opinion of WMPL, given that each of the three sites shows elevated levels during the evening and night, and given the season, the elevated levels are possibly due to both insects and weather; however, there are many instances where noise levels over time dramatically reduce and or increase. These situations may be attributed to Colliery Operations or in any case mechanical plant/processes. In conclusion, it can be said with confidence that there is insufficient data collected to statistically represent the long term background noise levels in the area. As such, suitable noise criteria cannot be derived.
4. It is important to note that the location address used by ERM identified as Lot 2410 Smiths Lane is actually 111 Smiths Lane. Refer to Appendix A of this report for clarification regarding the location of receivers and loggers together with an aerial identifying each location.

Recommendations by Wilkinson Murray

- It is recommended that additional noise logging be undertaken at a location representing residences (near Richie Crescent and Huxley Drive) further east from the Colliery operations impacted primarily by rail movements.

Assessment by Wilkinson Murray

WMPL undertook updated measurements of existing background noise which are summarised in Table 1. In deriving the summary, the impacts associated with weather and extraneous noise have been considered. For comparison, ERM locations and values have been included.

Appendix B provides the noise data collected by WMPL in graphical format.

Table 1 Summary of Long-Term Background Noise Data (RBL)

Receiver Area	Address of Logger	Logging Conducted by Who & When	Day	Evening	Night
RA1	Lot 2410 Smiths Lane	ERM 25 Feb to 9 Mar 2009	35	40	41
		WMPL 24 Apr to 4 May 2012	31	31	30
	70 Vista Parkway	WMPL 24 Apr to 2 May 2012	35	35	34
RA2	18 Wongawilli Road	ERM 25 Feb to 12 Mar 2009	35	37	39
		WMPL 24 Apr to 4 May 2012	36	35	31
RA3	Jersey Farm Road	ERM 25 Feb to 12 Mar 2009	32	40	41
		WMPL 24 Apr to 2 May 2012	32	35 (32)	30
RA4	66 Richie Crescent	WMPL 27 Apr to 3 May 2012	37	37	35

The summary in Table 1 clearly shows significant differences in typical background noise levels in the area between the ERM and WMPL measurements. In particular, during the more critical night time period, the WMPL measured levels are between 8 to 11dB lower than those measured by ERM.

It can be concluded that the updated measurements more appropriately describe the typical background noise in the area.

Furthermore, in comparison with the Approval Conditions (Schedule 4 – Specific Environmental Conditions – General – Noise Goals, Condition 2), these assumed Noise Goals are 3dB (higher) than the most stringent goal of 35dBA as derived from the revised WMPL noise level measurements. Although higher, the Noise Goals of the Approval are considered by WMPL to be reasonable goals for a working, established colliery to achieve considering the proximity of existing residential receivers and updated background noise levels.

It is noted that WMPL has undertaken noise logging at two additional locations as follows:

- The location 70 Vista Parkway has been included as noise complaints have been received from this residence. Given the location of this residence, it has been grouped within RA1.
- The location 66 Richie Crescent has been included to represent receivers impacted primarily by freight rail movements associated with the Colliery and has been assigned to be RA4. In consideration of the Approval, the noise goals for these residential receivers would be as per the requirements for “all other existing residential receivers”.

Item 2 Noise Model Inputs and Scenarios

Review by Wilkinson Murray

- ERM has constructed a noise model using Bruel and Kjaer's Predictor software (Predictor). That software utilises prediction method associated with International Standards (ISO) as follows:

9613-1 (1993)	Acoustics – Attenuation of Sound during Propagation Outdoors – Part 1: Calculation of the Absorption of Sound by the Atmosphere
9613-2 (1996)	Acoustics – Attenuation of Sound during Propagation Outdoors – Part 2: General Method of Calculation
- It appears that ERM has conducted a basic, typical worst case meteorological analysis in accordance with the *INP*.
- The three scenarios developed are not clear and concise; however, indicate that consideration was given to the noise from scenario 1 (surface operations), scenario 2 (rail movement) and a model that combines scenario 1 and 2 (scenario 3) was also assessed.
- An assessment of sleep disturbance was undertaken.

Upon review of the inputs and assumptions, the following comments are made:

- In general, the approach and software used is considered acceptable.
- The assumptions used are neither clear nor concise. Many aspects vary dramatically from our recent discussions with Gujarat personnel and in the opinion of WMPL (following discussions with Gujarat personnel), the predictions are unlikely to represent the worst case impacts associated with typical works required for 2Mtpa operations. It is understood that this may also be partly due to the discussions between Gujarat and ERM at the time and in context of the then anticipated future project scheduling. In order to illustrate this a few examples are provided:
 - Equipment usage during the day, evening and night.
 - Train type and number of wagons.
 - Scenarios developed.
 - Sound power levels used for scenarios.

Recommendations by Wilkinson Murray

- A revised model is to be developed with updated and current scenarios. This process is to be undertaken in consultation with Gujarat personnel.

Assessment by Wilkinson Murray

WMPL undertook the construction of a new and updated acoustic model, revised scenarios and updated predictions. A summary of the methodology is outlined below:

Noise Prediction Software

Operational noise levels at nearby receivers have been calculated using the Environmental Noise Model (ENM) (a proprietary computer program from RTA Technology Pty Ltd). This modelling software is recommended by the *INP* and has been previously accepted by the EPA for use in environmental noise assessments. The assessment models the total noise at each receiver from the operation of the Project. Factors that are addressed in the noise modeling are:

- Equipment (including trains) sound level emissions and locations;
- Screening from structures, earth bunds and noise walls;
- Receiver locations;
- Meteorological impacts;
- Ground topography;
- Noise attenuation due to geometric spreading;
- Ground absorption; and
- Atmospheric absorption.

Noise Model Scenarios

The following three main categories have been considered.

- Site complex noise without the presence of any train movements.
- Site complex noise together with noise associated with train load out process using train loading bin.
- Noise from trains moving past residential receivers.

For site noise a distinction between daytime (7.00am-6.00pm), evening (6.00pm-10.00pm) and night time (10.00pm-7.00am) operations also need to be made as all mobile plant associated with site maintenance and management of the coal stockpiles only operate during the day and mobile plant at the timber yard at the pit top only operate during the day and evening periods.

Train noise is to be assessed during the daytime (7.00am-10.00pm) and night time (10.00pm-7.00am) periods.

From the three categories, eight scenarios have been developed for this assessment which are summarised in Table 2. It is critical to note that these eight scenarios are quite different to the three scenarios as assessed by ERM. Given the input by Gujarat in developing the eight scenarios, it is in the professional opinion of WMPL that such scenarios are more robust and reflects the current understanding of typical worst case scenarios.

Table 2 Modelling Scenarios

Period	Scenario	
Day	SC1	Colliery infrastructure and all mobile plant
	SC2	Colliery infrastructure, all mobile plant and train loading
	SC3	Train movements (this is for both day and evening periods)
Evening	SC4	Colliery infrastructure and pit top mobile plant
	SC5	Colliery infrastructure, pit top mobile plant and train loading
Night	SC6	Colliery infrastructure
	SC7	Colliery infrastructure and train loading
	SC8	Train movements

A summary of all mobile plant and infrastructure items potentially contributing to the overall noise emitted from the Site is provided in Table 3.

Table 3 Summary of Mobile Plant and Infrastructure Items

Activity	Plant Items
Colliery infrastructure	<ul style="list-style-type: none"> Loaded surface conveyor system Vibrating screen/sizer unit Gearbox driving loading bin conveyor Gearbox driving coal stockpile conveyor Train loading bin (only operating during train loading process) Pit top transfer station Pit top gearbox
Mobile plant associated with site maintenance and management of the coal stockpiles	<ul style="list-style-type: none"> 2x CAT988B Front-End-Loaders D8 Dozer Backhoe Watercart
Pit top mobile plant	<ul style="list-style-type: none"> Diesel forklift

When the Colliery infrastructure is operating, it is conservatively assumed that all surface conveyors including those servicing train loading bins and coal stockpiles are operating.

As advised by Gujarat, coal trains accessing the Site consist of trains with two 82 Class locomotives and 21 wagons travelling at an average speed of 20km per hour along the rail spur.

To assess potential sleep disturbance impacts, only Scenario 7 has been considered as this represent the applicable activities with the most potential to generate sleep disturbance.

Sound Power Levels

Table 4 presents a summary of the L_{Aeq} sound power levels (SWLs) utilised in the noise prediction model for the various items of plant and mobile equipment.

Most of the SWLs are based on on-site measurements conducted by WMPL on Friday, 1 June 2012.

Plant associated with the conveyor servicing the coal stockpiles were not operating during the time of the survey and accordingly, the corresponding SWLs were deducted from the measured equipment of similar nature.

SWLs for mobile plant items such as the dozer, backhoe and watercart were obtained from the WM database as these items were not measureable at the time of the survey.

Activities relating to the coal train arriving, loading and departing did not occur during the time of the survey. As such, train SWLs were obtained from the RailCorp NSW standard rail noise database (prepared by WMPL for RailCorp). The database levels are adjusted for speed, number of locomotives, length of trains and audible wheel defects, with no allowance for shielding which is then addressed within the noise model.

SWL for the train load out process was based on values contained in ERM's Report.

Table 4 Summary of L_{Aeq} SWLs Used in Model

Item	L_{Aeq} SWL (dBA)	Reference
Loaded surface conveyor system	74/m	WMPL
Vibrating screen / sizer unit	104	WMPL
Gearbox driving loading bin conveyor	94	WMPL
Gearbox driving coal stockpile conveyor	94	WMPL
Pit top transfer station	94	WMPL
Pit top gearbox	92	WMPL
CAT988B Front-End-Loader	109	WMPL
D8 Dozer	113	WMPL
Backhoe	95	WMPL
Watercart	103	WMPL
Diesel forklift	99	WMPL
Train loading bin	105	ERM
2 X 82 Class Locomotives travelling at average speed of 20km/hr	83/m	RailCorp NSW
21 wagons travelling at average speed of 20km/hr	75/m	RailCorp NSW

Table 5 presents a summary of the $L_{A1,1min}$ SWLs utilised in the noise prediction model addressing potential sleep disturbance. Any potential impact from train movements along the spur has not been assessed given that the Approval does not provide any Noise Criteria.

Table 5 Summary of $L_{A1,1min}$ SWLs Used in Model

Item	L_{A1} SWL (dBA)	Reference
Train loading bin when coal first hits the empty wagon	112	ERM

Meteorology

The *INP* generally directs the use of a single set of meteorological data in the assessment of noise impacts. However, WMPL has adopted the more rigorous approach of predicting noise levels for a range of meteorological conditions based on the statistical distribution of data obtained from the locality.

The noise modelling presented in this assessment is based on hourly data obtained from the Bureau of Meteorology (BoM) Albion Park weather station for the period from 7 April 2011 to 31 December 2012.

The wind speed at; 0.75m/s, 1.25m/s, 1.75m/s, 2.25m/s and 2.75m/s (encompassing a 0.25m/s range either side) and wind direction at every 45 degrees (encompassing a 22.5 degree range either side) are considered plus a calm scenario. A total of 41 conditions are assessed for both the day and evening for each season.

During the night stability class, either Class A to E ($0^{\circ}/100m$ inversion), or a Class F ($3^{\circ}/100m$ inversion) are considered. In both cases, the enhancement due to wind is included as well as a calm scenario. A total of 81 conditions are considered for each season.

The probability of occurrence for all the above-mentioned conditions have been calculated and the noise level that occurs 10% of the time for each defined time period (day, evening and night) is presented at each receiver during the worst case season and this is compared against the relevant criteria.

This alternative assessment procedure involves significantly greater computational complexity than the use of a single set of meteorological conditions. However, WMPL believes it provides a more rigorous method of assessing noise exposure, and one that is more easily understood by the community. The approach of using the 10th percentile calculated noise level as a measure of noise impacts has been considered acceptable by the Department of Planning and Infrastructure (DoPI) and the EPA for previous similar mining project assessments.

In accordance with the *INP Application Notes*, noise levels at nearby receivers were also predicted for calm meteorological conditions. At night, those levels refer to calm isothermal meteorological conditions.

Predicted Operational Noise Levels

Noise levels at the identified receivers have been predicted for both calm and relevant weather conditions (i.e. provided as 10th percentile noise levels) within the worst case season (e.g. autumn, winter, spring, summer).

Tables 6, 7 and 8 present predicted $L_{Aeq,15min}$ noise levels emitted from the Site for the daytime, evening and night time assessment periods, respectively.

Table 9 summarises the predicted $L_{A1,1min}$ noise levels emitted from the Site.

Table 10 summarises the predicted $L_{Aeq,period}$ noise levels from train pass-bys.

Exceedances of the Noise Criteria have been predicted and are shown in bold italic font. Given that the exceedances result in non-compliance, it would be of further benefit to undertake more detailed site noise audits and further confirm with Gujarat the scenarios as modelled. This process would also involve either detailed audio or directional monitoring at typically 2 receiver locations over several days.

Table 6 Predicted $L_{Aeq, 15min}$ Noise Levels from the Site – Daytime Assessment Period

NCA	Receiver	L _{Aeq} Noise Level (dBA)		L _{Aeq} Noise Level (dBA)		Day L _{Aeq} Noise Criteria & Goals (dBA)
		10th Percentile		Calm		
		SC1	SC2	SC1	SC2	
		Colliery	Colliery + Train Loading	Colliery	Colliery + Train Loading	
RA1	30 Vista Parkway	45	46	45	46	43 (40)
	111 Smiths Lane	40	41	38	40	
RA2	18 Wongawilli Road	39	40	37	39	44 (40)
	1 Wongawilli Road	45	46	45	46	
RA3	80 Shone Avenue	40	40	35	35	40
	Jersey Farm	47	48	46	46	
RA4	66 Ritchie Crescent	28	29	26	27	40
	61 Huxley Drive	28	28	25	26	

Note: The Noise Goals (shown in brackets when differing from the Noise Criteria) are considered in the Approval as the noise level that the Colliery shall aim for over time.

Note: As advised by Gujarat, although Jersey Farm is residential, it will no longer have residences whilst mining at the Colliery occurs. It has been included in our calculation for completeness as it was included in the ERM assessment.

As can be seen from the table, exceedances are predicted during times when both colliery and train loading occurs as well as colliery only situations. The exceedances range from between 1 and 8dBA and are applicable to NCA's RA1 and RA2. As a result of the predicted exceedances, NRE is currently in non-compliance of the noise criteria outlined in the CoA and immediate action is required.

No exceedances have been predicted for residential receivers within RA3 or RA4.

Table 7 Predicted $L_{Aeq, 15min}$ Noise Levels from the Site – Evening Assessment Period

NCA	Receiver	L _{Aeq} Noise Level (dBA)		L _{Aeq} Noise Level (dBA)		Evening L _{Aeq} Noise Criteria & Goals (dBA)
		10 th Percentile		Calm		
		SC4	SC5	SC4	SC5	
		Colliery	Colliery + Train Loading	Colliery	Colliery + Train Loading	
RA1	30 Vista Parkway	43	46	40	42	43 (40)
	111 Smiths Lane	40	42	34	38	
RA2	18 Wongawilli Road	40	43	34	37	43 (40)
	1 Wongawilli Road	44	48	40	44	
RA3	80 Shone Avenue	34	36	29	30	40
	Jersey Farm	39	42	35	38	
RA4	66 Ritchie Crescent	28	30	24	25	40
	61 Huxley Drive	27	29	23	24	
Note:	The Noise Goals (shown in brackets when differing from the Noise Criteria) are considered in the Approval as the noise level that the Colliery shall aim for over time.					
Note:	As advised by Gujarat, although Jersey Farm is residential, it will no longer have residences whilst mining at the Colliery occurs. It has been included in our calculation for completeness as it was included in the ERM assessment.					

As can be seen from the table, exceedances are predicted during times when both colliery and train loading occurs. The exceedances range from between 2 and 5dBA and are applicable to NCA's RA1 and RA2. As a result of the predicted exceedances, NRE is currently in non-compliance of the noise criteria outlined in the CoA and immediate action is required.

No exceedances have been predicted for residential receivers within RA3 and RA4.

Table 8 Predicted $L_{Aeq, 15min}$ Noise Levels from the Site – Night Time Assessment Period

NCA	Receiver	L_{Aeq} Noise Level (dBA) 10 th Percentile		L_{Aeq} Noise Level (dBA) Calm		Night Time L_{Aeq} Noise Criteria & Goals (dBA)
		SC6	SC7	SC6	SC7	
		Colliery	Colliery + Train Loading	Colliery	Colliery + Train Loading	
RA1	30 Vista Parkway	42	45	38	40	43 (38)
	111 Smiths Lane	40	42	34	38	
RA2	18 Wongawilli Road	39	42	34	37	43 (38)
	1 Wongawilli Road	44	47	40	44	
RA3	80 Shone Avenue	33	36	28	30	38
	Jersey Farm	39	41	35	38	
RA4	66 Ritchie Crescent	27	29	24	25	38
	61 Huxley Drive	26	28	22	24	

Note: The Noise Goals (shown in brackets when differing from the Noise Criteria) are considered in the Approval as the noise level that the Colliery shall aim for over time.

Note: As advised by Gujarat, although Jersey Farm is residential, it will no longer have residences whilst mining at the Colliery occurs. It has been included in our calculation for completeness as it was included in the ERM assessment.

As can be seen from the table, exceedances are predicted during times when both colliery and train loading occurs. The exceedances range from between 1 and 4dBA and are applicable to NCA's RA1 and RA2. As a result of the predicted exceedances, NRE is currently in non-compliance of the noise criteria outlined in the CoA and immediate action is required.

No exceedances have been predicted for residential receivers within RA3 and RA4.

Table 9 Predicted $L_{A1,1min}$ Noise Levels (Sleep Disturbance) from the Site – Night Time Assessment Period

NCA	Receiver	$L_{A1,1min}$ Noise Level (dBA)	$L_{A1,1min}$ Noise Level (dBA)	Night Time $L_{A1,1min}$ Noise Criteria & Goals (dBA)
		10 th Percentile	Calm	
		SC7	SC7	
		Colliery + Train Loading	Colliery + Train Loading	
RA1	30 Vista Parkway	45	42	59(51)
	111 Smiths Lane	45	38	
RA2	18 Wongawilli Road	46	40	60(51)
	1 Wongawilli Road	51	48	
RA3	80 Shone Avenue	39	39	48
	Jersey Farm	45	33	
RA4	66 Ritchie Crescent	31	27	48
	61 Huxley Drive	31	25	

Note: The Noise Goals (shown in brackets when differing from the Noise Criteria) are considered in the Approval as the noise level that the Colliery shall aim for over time.

Note: As advised by Gujarat, although Jersey Farm is residential, it will no longer have residences whilst mining at the Colliery occurs. It has been included in our calculation for completeness as it was included in the ERM assessment.

As can be seen from the table, no exceedances are predicted.

Table 10 Predicted $L_{Aeq, period}$ Noise Levels from Train Movements along the Spur

NCA	Receiver	L _{Aeq} Noise Level (dBA)		L _{Aeq} Noise Level (dBA)		Daytime	Night Time
		10 th Percentile		Calm		L _{Aeq,r} period	L _{Aeq} , period
		SC3 or SC8 Train Movements		SC3 or SC8 Train Movements		Noise Criteria	Noise Criteria
		Day	Night	Day	Night	(dBA)	(dBA)
RA1	30 Vista Parkway	36	35	34	33	65	60
	111 Smiths Lane	35	34	33	32		
RA2	18 Wongawilli Road	48	48	48	47	65	60
	1 Wongawilli Road	43	42	42	41		
RA3	80 Shone Avenue	38	37	39	38	65	60
	Jersey Farm	41	40	35	34		
RA4	66 Ritchie Crescent	48	47	47	46	65	60
	61 Huxley Drive	45	44	44	43		

Note: As per the approval, during normal operations, four trains are assumed during the day and one during the night.

Note: As advised by Gujarat, although Jersey Farm is residential, it will no longer have residences whilst mining at the Colliery occurs. It has been included in our calculation for completeness as it was included in the ERM assessment.

As can be seen from the table, no exceedances are predicted.

Item 3 Discussion of Noise Mitigation

Review by Wilkinson Murray

The ERM report assumed the following at source noise mitigation as part of the noise modelling:

1. At source mitigation to reduce the individual noise from the following plant by 5dB:
 - a. Exhaust noise and engine bay noise of front end loaders to an assumed sound power level of 103dBA (from 108dBA). This could be achieved by installing mufflers, acoustic louvres or upgrading/lining enclosures.
 - b. Coal hopper noise (coal striking walls/base of hopper). This could be achieved by lining the walls/base with a hard wearing rubber and prevent coal to metal contact.
 - c. Coal elevator noise (coal striking metal chute). This could be achieved by operational changes by maintaining a minimum coal level preventing (or reducing) the coal striking the metal chute.
 - d. Compressor noise. This could be achieved by a suitable enclosure and acoustic lining.

Other at source mitigation recommend in the ERM report to be investigated includes:

- e. Procurement of low noise equipment, in particular conveyor systems, transfer stations and coal hoppers.
- f. All mufflers of any on-site fixed and mobile diesel plant to be upgraded and maintained. This excludes road vehicles.

In addition, the ERM report assumed the following noise mitigation measures to be considered.

2. The use of barriers to reduce noise associated with rail pass-bys along the rail spur impacting residences within Wongawilli Village and Horsley. The barrier is to achieve at least 5dB reduction from rail pass-bys.
3. A noise management plan to include:
 - a. Complaints handling protocol
 - b. Noise monitoring plan
 - c. Mitigation measures
 - d. Compliance reporting

Recommendations by Wilkinson Murray

WPML has reviewed these mitigations and following our predicted noise levels, the following comments and recommendations are made in and will be dealt with in more detail in the Noise Monitoring and Management Plan:

Colliery Operations

From our predictions and a review of the main plant/processes that contribute to the exceedances, the following is recommended:

- i. Use of quieter mobile plant or reduce the noise from the existing plant by at least 5dB. This is particular the case for both front end loaders and the dozer, however it is important to point out the SWL used by ERM for these plant items is much lower than used for our predictions. It is our professional opinion that the ERM values will be very difficult to achieve and not practical.
- ii. Reduction in noise emanating from the screen/sizer building and main conveyor by at least 5dB. It is noted that considerable work has already been undertaken by Gujarat on the screen / sizer building.
- iii. Audit of all reversing alarms with the commitment to ensure tonal alarms are replaced with non-tonal or quacker type alarms.
- iv. Any procurement of new plant will need to allow for low noise upgrades.
- v. Further on-site noise audits to ensure the noise from all major plant/processes are confirmed.

It is noted that compressor noise was not identified by WMPL to be a major noise source and as such mitigation is not required at this instance.

Train Loading Operations

From our predictions and a review of the main plant/processes that contribute to the exceedances, the following is recommended:

- i. Reduction in noise emanating from the loading bin operation by at least 5dB. This is in line with ERM's recommendations.
- ii. Further on-site noise audits to ensure the noise from all major plant/processes are confirmed.

Rail Operations

Gujarat has, over the last few years focussed on reducing noise from their rail operations. The following is a summary of the mitigations thus far:

- Use of quieter locomotives that meet the noise limits contained within RailCorp's EPL.
- Increase the number of carriages from 17 to the current 21.
- Minimise train movements during night time.

On the basis of the above and considering average movements (as per the Approval) during the day and night and normal operations, the predicted noise levels (refer Table 10) are well below noise criteria.

It is noted that given the current site configuration, the current number of wagon cannot be increased unless considerable changes to the infrastructure is undertaken with significant capital cost. Such an approach is considered neither reasonable nor necessary.

Further to this, the ERM recommended barrier to achieve 5dB reduction is, at this stage not considered necessary.

In the opinion of WMPL, the following reasonable mitigation measures are to be detailed as part of the noise management plan.

- i. Continued use of the quieter locomotives.
- ii. Track maintenance plan.
- iii. More scheduled movements (when possible) during the day and less at night.
- iv. Confirmation of noise levels from the locomotives and carriages at the typically most impacted residential receivers.

Item 4 Action Plan to Confirm Effectiveness of Audit Recommendations

In summary, the audit recommendations by WMPL are as follows:

- i. Noise logging be undertaken again and include background data at a location representing residences (near Richie Crescent and Huxley Drive) further east from the Colliery operations impacted primarily by rail movements – COMPLETED
- ii. A revised model is to be developed with updated and current scenarios. This process is to be undertaken in consultation with Gujarat personnel – COMPLETED
- iii. Use of quieter mobile plant or reduce the noise from the existing plant by at least 5dB. This is particular the case for both front end loaders and the dozer – TO BE CONFIRMED
- iv. Reduction in noise emanating from the screen/sizer building and main conveyor by at least 5dB. – TO BE CONFIRMED
- v. Audit of all reversing alarms with the commitment to ensure tonal alarms are replaced with non-tonal or quacker type alarms – TO BE CONFIRMED
- vi. Procurement of low noise plant – AS REQUIRED
- vii. Reduction in noise emanating from the loading bin operation by at least 5dB – TO BE CONFIRMED
- viii. Further on-site noise audits to ensure the noise from all major plant/processes are confirmed – TO BE ORGANISED AS PART OF NOISE MONITORING AND MANAGEMENT PLAN

The next stage would be to prepare a detailed Noise Monitoring and Management Plan in consultation with Gujarat.

CONCLUSION

Wilkinson Murray has conducted a noise audit of the EA and associated Approval for NRE Wongawilli Colliery located in Wongawilli, New South Wales. This assessment is required as part of the Approval Conditions.

WMPL identified the four items considered requiring review with respect to noise:

1. Background noise monitoring including updated data and development of noise criteria by WMPL for additional receivers.
2. Noise model inputs and assumptions, such as scenarios, sound power levels, assessment location and weather data. Additional noise modelling by WMPL as required.
3. Reasonable and feasible mitigation measures regarding Colliery operation rail related activities.
4. Action plan to implement any audit recommendations and a monitoring plan to confirm the effectiveness of any audit recommendations.

The main findings of our audit include:

- Background monitoring conducted in the EA was not indicative of the typical existing acoustic environment.
- The revised noise criteria and goals as per the Approval is considered by WMPL as reasonable for an established working mine near residential receivers.
- The existing ERM model has been revised by WMPL to include more up to date assumptions and scenarios. In particular, the SWL's and scenarios appear to be underestimated by ERM; as a consequence, exceedances have been predicted. This has resulted in non-compliance for RA1, RA2 and RA3 which need to be addressed immediately.
- A discussion of suitable mitigation has been undertaken and will be appropriately detailed as part of a Noise Monitoring and Management Plan in consultation with Gujarat.



APPENDIX A

AERIAL OF RECEIVER & LOGGER LOCATIONS



Figure A-1 Noise Sensitive Receivers / Logger Locations

