proposed

Mt Arthur
UNDERGROUND PROJECT

Appendix 11

Noise Assessment

MT ARTHUR UNDERGROUND PROJECT

NOISE & VIBRATION ASSESSMENT

ACOUSTICS AND AIR

REPORT NO. 04253
VERSION F

WILKINSON MURRAY

MT ARTHUR UNDERGROUND PROJECT

NOISE & VIBRATION ASSESSMENT

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VERSION F

OCTOBER 2007

PREPARED FOR

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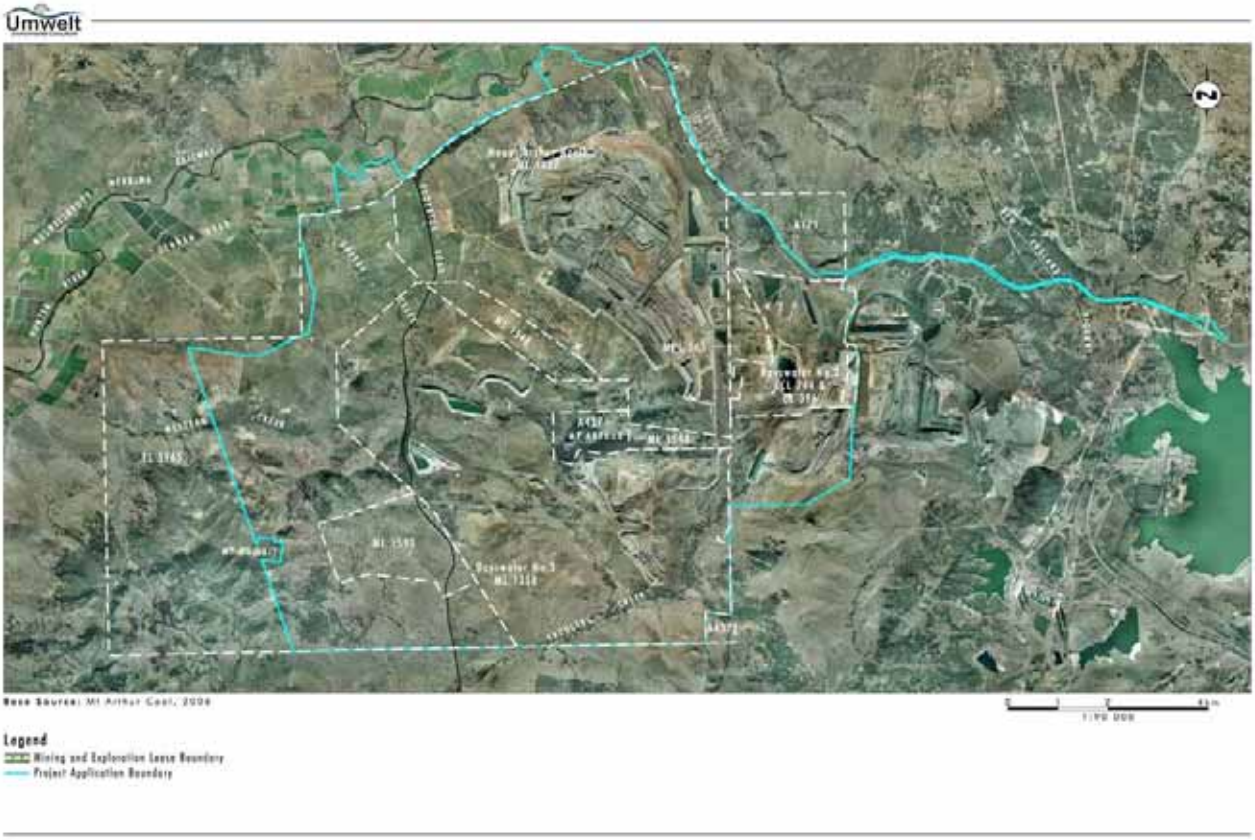
TABLE OF CONTENTS

1 INTRODUCTION

Mt Arthur Coal operates the Mt Arthur Coal open cut coal mine south of Muswellbrook in the upper Hunter Valley of NSW. The existing Mt Arthur Coal operations consist of three mining areas, the Bayswater No. 2 mining area (extraction complete), the Bayswater No. 3 mining area and the Mount Arthur North (MAN) mining area, as shown in Figure 1-1. It is proposed to extend the existing operations by developing underground longwall mining operations in five coal seams over an initial 21 year approval life. This proposal is referred to as the Mt Arthur Underground Project (MAU).

This report addresses potential noise and vibration impacts associated with all aspects of the Mt Arthur Underground Project proposal. Noise from mining and transport activities onsite has been assessed in accordance with the NSW Department of Environment & Climate Change's (DECC) *NSW Industrial Noise Policy (INP)*. Noise impacts from road traffic are assessed under the *Environmental Criteria for Road Traffic Noise (ECRTN)*. Noise impacts from additional rail movements on the Main Northern Railway are assessed under the *Interim Guidelines for the Assessment of Noise from Rail Infrastructure Projects*.

Figure 1-1 Mt Arthur Coal Existing Operations & Underground Project Application Area



2 PROJECT DESCRIPTION

The five target seams for the initial 21 year period are the:

- Woodlands Hill seam;
- Glen Munro seam;
- Arrowfield seam;
- Bowfield seam; and
- Piercefield seam.

'Punch longwall' mining techniques will be used in the Woodlands Hill and Glen Munro seams, meaning that the gate roads (mine access tunnels) for each longwall block will have access directly into the coal seam from open cut voids. Further open cut works will be required in both the Saddlers Pit and Belmont Pit in the Bayswater No. 3 mining area to set up for underground mining. These works will be completed in accordance with the existing Bayswater No. 3 development consent.

A range of ancillary mining infrastructure will be required above the underground mining area including ventilation fan facilities, access tracks, service boreholes (power etc.), gas drainage facilities, dewatering boreholes and other similar mining infrastructure. The exact locations in which these facilities are required will be determined as the Underground Project progresses, depending on mining operation needs.

The 21 year concept mine plan will result in the extraction of up to 160 million tonnes of coal at a production rate of approximately eight million tonnes per annum (Mtpa). The annual production rate is expected to vary between six and eight Mtpa depending on the seam, mining conditions and the timing of longwall panel changeovers.

The Underground Project has been designed to maximise the use of existing Mt Arthur Coal infrastructure, including the existing CHPP and rail facility. Some upgrade works and extensions will be required to these existing facilities, with some new Underground Project specific infrastructure also required.

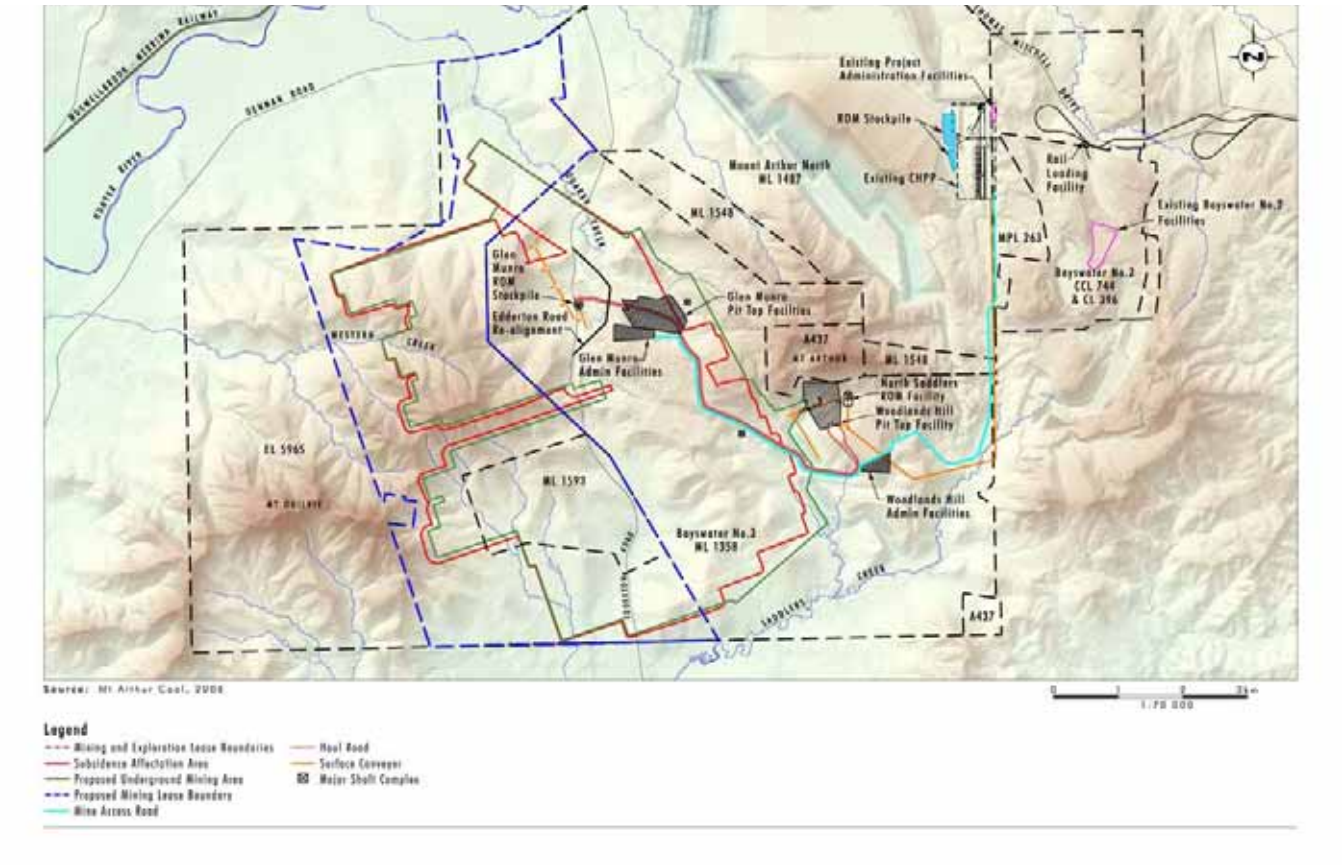
Coal from the underground mining operations will be crushed and sized at a new ROM coal facility to be constructed on previously mined land in the Saddlers Pit area as shown in Figure 2-1. After passing through this facility, coal will be delivered by overland conveyor (to be constructed) to the existing Mt Arthur Coal CHPP. The CHPP will require some upgrade works (including a new CPP module, additional stockpiling areas and associated handling facilities) to provide sufficient capacity for the coal from the Underground Project. However, this will not result in disturbance of any previously undisturbed land.

Coal from the Underground Project will be transported from the site via Mt Arthur Coal's existing rail facility. The existing rail loading facility will be used to load coal onto trains and will not require any upgrade works. Although no upgrades are required to the rail facility for the Underground Project, it is proposed to extend an existing passing lane on the Antiene rail spur, if required, to provide additional train movement capacity. The extended passing lane will be located to the east of the New England Highway near the intersection of the Antiene spur with the Main Northern Railway. The passing lane is planned to be constructed within the existing rail corridor. Noise from rail loading and movements of trains on the Antiene spur has previously been assessed under a separate consent (Bayswater Rail Loading Facility Consent granted on 2 November 2000).

All rail loading and movement noise for the combined Mt Arthur Coal Operations has, however, been assessed as part of this proposal.

Vehicular access to the Underground Project will be via the existing Mt Arthur Coal site access, with an additional section of internal access road constructed to connect this road to the Underground Project facilities. The locations of the access roads are shown in Figure 2-1.

Figure 2-1 Proposed Mt Arthur Underground Operations



3 OPERATIONAL NOISE CRITERIA

An ambient noise survey was carried out during the preparation of the MAN EIS during 1999 at several residences that are representative of the residential locations surrounding Mt Arthur Coal. Subsequent to this survey, some discussion took place with DECC regarding the exclusion of data under *NSW Industrial Noise Policy (INP)* rules, resulting in lower than measured background noise levels being adopted. As a result an assessed Rating Background Level (RBL) value was determined for each location. It is considered appropriate to use these assessed RBLs when setting criteria for the Underground Project, as any new ambient noise measurement data would likely be affected by noise from approved Mt Arthur Coal and other mining and industrial operations. The assessed RBLs are presented in Table 3-1, with the derived *INP* intrusiveness criteria and amenity criteria for daytime (7.00am-6.00pm), evening (6.00pm-10.00pm) and night time (10.00pm-7.00am) periods.

Table 3-1 Intrusive (the Project Alone) $L_{Aeq,15min}$ & Amenity (Cumulative) $L_{Aeq,period}$ Noise Criteria

Location	Assessed RBL (Day/Evening/Night)	Intrusive Criteria (Day/Evening/Night) $L_{Aeq,15min}$	Amenity Criteria (Day/Evening/Night) $L_{Aeq,period}$
Antiene Estate	32 / 35 / 33	37 / 40 / 38dBA	50 / 45 / 40dBA
Skellatar Stock Route Thomas Mitchell Drive Denman Road	34 /33 / 32	39 / 38 / 37dBA	50 / 45 / 40dBA
Racecourse Road	32 / 31 / 30	37 / 36 / 35dBA	50 / 45 / 40dBA
Denman Road West Roxburgh Vineyard and Roxburgh Road	32 / 31 / 30	37 / 36 / 35dBA	50 / 45 / 40dBA
South Muswellbrook (incl. the South Muswellbrook Development Area	30 / 30 / 30	35 / 35 / 35dBA	50 / 45 / 40dBA

These criteria also correspond to the intrusive and amenity noise criteria in the MAN development consent conditions. It is likely that the conditions of approval for the Mt Arthur Underground Project will have intrusive and amenity acquisition criteria 5dBA above the values shown in Table 3-1.

Over the course of the preparation of this Environmental Assessment an additional residence, Green Knobby Farm, was identified as having potential exposure to noise impacts from rail passbys. Green Knobby Farm is located at the eastern end of the Antiene Rail Spur where it joins the Main Northern Railway. It has been confirmed that this location has been recently acquired by Macquarie Generation. As such, no further assessment of noise impacts at this residence is warranted.

In addition, five other residences were identified located towards the east of Antiene. Based on a review of noise contours from a recent assessment for the proposed Mt Arthur South Pit Extension, (WM Report 05038) it is reasonable to conclude that these residences would not be impacted by operational mining noise. However, they may be impacted by noise from rail passbys and have been assessed as such. The residences under consideration are shown in Figure 3-1.

Figure 3-1 Additional Residences East of Antiene

An Environmental Noise Logger was left at East Antiene Location 2 from 13 to 26 April 2006. Meteorological data were collected from the nearest weather station at Mt Arthur Coal. Those periods in which wind speed at microphone level was greater than 5m/s or when it was raining were excluded from analysis in accordance with the *INP*. The logger was set to A-Weighted, fast response, continuously monitoring over 15-minute sampling periods. This equipment is capable of remotely monitoring and storing noise level descriptors for later analysis. The equipment calibration was checked before and after the survey and no significant drift occurred.

The noise logger enables the calculation of an Assessment Background Level (ABL), i.e. the single figure background level representing each assessment period (day, evening and night) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period. Over the whole measurement survey period the Rating Background Level (RBL), which is the median value of the ABL values for the period over all of the days, is determined. The RBL value is the appropriate background noise level recommended to be used by the *INP* and is defined in Appendix A.

The graphs in Appendix C show the noise environment from 13 to 26 April 2006. Calculated RBLs for the assessment periods, and the intrusiveness criteria derived from the RBLs in accordance with the INP are shown in Table 3-2. These RBLs and calculated goals are considered representative of the eastern portion of the Antiene rural residential estate which is located near to the New England Highway.

Table 3-2 Rating Background Levels at East Antiene Location 2

Parameter	Daytime (dBA)	Evening (dBA)	Night Time (dBA)
RBL	36	35	34
Intrusive Criterion	41	40	39
Amenity Criterion	50	45	40

3.1 Project-Specific Noise Levels

The project-specific noise goals for the project, as defined by the INP, are the more stringent of the intrusive and amenity criteria. Therefore, the project-specific noise goals for the Underground Project are the intrusive criteria at all locations. The project-specific noise goals for the Underground Project are summarised in Table 3-2.

Table 3-3 Project-Specific Noise Levels at all Locations

Location	Project-Specific Noise levels (Day/Evening/Night)
Antiene Estate	37 / 40 / 38dBA
Skellatar Stock Route Thomas Mitchell Drive Denman Road	39 / 38 / 37dBA
Racecourse Road	37 / 36 / 35dBA
Denman Road West Roxburgh Vineyard and Roxburgh Road	37 / 36 / 35dBA
South Muswellbrook (incl. the South Muswellbrook Development Area)	35 / 35 / 35dBA
East Antiene Location 1	41 / 40 / 39dBA
East Antiene Location 2	41 / 40 / 39dBA
East Antiene Location 3	41 / 40 / 39dBA
East Antiene Location 4	41 / 40 / 39dBA
East Antiene Location 5	41 / 40 / 39dBA

4 OPERATIONAL NOISE IMPACTS

4.1 Calibration of Noise Model

Previous noise modelling for the Mt Arthur Coal operations has been based on the ENM environmental noise model, with calculations performed under the full range of meteorological conditions experienced at the site. The noise levels to be compared with the criteria in Section 3 were the levels predicted to be exceeded for 10% of the day, evening or night period during the worst-case season of the year.

These calculations, including calculations for the MAN EIS (URS, 2000) were based on a set of meteorological data obtained from a 90m inversion tower at Bengalla Mine during 1999, located within the Hunter River alluvial zone. This data was used because it contained direct measurements of the strength of temperature inversions, rather than relying on indirect measures such as Pasquill stability class. Reliable and consistent access to data from this source has been difficult, with only one year of data available for past assessments. Therefore, for past assessments this year has been assumed as representative in terms of meteorological conditions in the area.

Since mining operations began at MAN in 2002, noise levels have been continuously monitored by four permanent BarnOwl directional noise monitoring units, and more recently one additional mobile unit. It is therefore of interest to compare measured noise levels with the predictions of the ENM model, using meteorological inputs as described above.

As part of its conditions of approval, Mt Arthur Coal is required to produce annual predictions of noise levels arising from the MAN operation. These predictions are based on the best estimate of operations to be undertaken in the following year. As part of this process, operations from the preceding winter are also modelled, and the results compared to measurements taken at locations throughout the surrounding area by the BarnOwl directional noise monitors. Such a comparison was undertaken in late 2005 using actual operations and monitoring data for July 2005.

Noise levels at surrounding residences are calculated using the ENM prediction model, and are based on:

- Ground topography at a specified time, as provided by Mt Arthur Coal;
- Noise source locations, as provided by Mt Arthur Coal. These represent worst-case equipment locations for operations during the relevant period;
- Source sound power levels, based on current noise emission levels for each item of plant (plant noise emission testing is completed by Mt Arthur Coal); and
- Meteorological conditions derived from monitoring conducted at Bengalla Mine, as described above.

Night-time noise levels are calculated under 41 meteorological conditions and presented as a 10^{th} percentile exceedance level. Table 4-1 presents a comparison of calculated and measured results for July 2005 at five locations where BarnOwl monitors were located. Night time noise levels in the month of July were chosen as this generally represents the worst case for noise impacts from the mine, due to the prevalence of temperature inversions at night.

Table 4-1 Comparison of Measured and Predicted 10th Percentile Exceedance L_{Aeq} Noise Levels, Night Period, July 2005

Location	10th Percentile Exceedance L_{Aeq} Noise Levels (dBA)	
	Measured	Predicted (Bengalla Met Conditions)
Webber Monitor	39.8	43.8
Sth Mus. Monitor	36.5	39.5
Antiene Residence	37.1	38.2
Racecourse Rd Sth	34.9	41.6
Denman Rd Monitor	37.3	46.7

Table 4-1 shows predicted levels under worst case weather conditions are up to 9dBA above measured noise levels. This discrepancy between predicted and measured results is consistent with the findings of comparisons completed in 2002-2004, indicating an ongoing trend of over-prediction. Given that topographical data, noise source locations and sound power levels of plant and infrastructure have been checked for accuracy, and that the ENM model has previously been shown to allow for ground effects, shielding from barriers and propagation of noise over distance to an acceptable level of accuracy, the only variable left for analysis is the effect of meteorological conditions in the ENM model. Given that the data used in the noise modelling are based on the measurement of wind speed and temperature inversion over one winter in 1999 taken in the Hunter River alluvial zone, it is appropriate to consider whether the meteorological conditions in that data set may be resulting in the observed over-prediction of noise levels.

In the Bengalla data set from 1999, temperature inversion strengths of up to 15°C/100m were recorded. Appendix C of the *INP* indicates that the maximum temperature inversion strength that typically exists in non-arid areas would be of the order of 3-4°C/100m and recommends that a temperature inversion strength of 3°C/100m is adopted for modelling. It is possible that either the Bengalla measurements are not typical in the Mt Arthur Coal operational area (perhaps attributable to the location and limited height of the tower), or indeed that the ENM noise model over-predicts the effect of such very strong inversions. It should be noted that due to its location in the low lying alluvial zone of the Hunter River, the top of the Bengalla inversion tower is below some of Mt Arthur Coal's operational areas (e.g. overburden emplacement areas).

The noise level predictions were therefore repeated under a range of increasing temperature inversion strengths with no prevailing wind. These calculated noise levels are compared with the measured levels in Table 4-2.

Table 4-2 Predicted L_{Aeq} Noise Level with Increasing Inversion Strength Night-Time Operations, July 2005

Location	Measured 10th Percentile Exceeded (dBA)	Neutral Conditions	Temperature Inversion Strength (°C/100m)			
			2	4	7	10
Webber Monitor	39.8	27.1	36.8	40.2	43.7	46.8
Sth Mus. Monitor	36.5	24.5	34.7	37.3	39.8	41.7
Antiene Residence	37.1	22.9	33.5	36.4	38.2	40.2
Racecourse Rd Sth	34.9	23.4	34.8	38	42.8	45.5
Denman Rd Monitor	37.3	31.6	38.5	41.5	44.3	46.7

At a temperature inversion strength of 4°C/100m, predictions at three of the five monitored locations are within 1dBA of the measured 10th percentile with the two remaining locations 3-4dBA above the measured level. The predicted LAeq noise level at the Antiene location is 0.7dBA below the measured level. It is desirable to have a degree of conservatism inherent in any noise modelling exercise, however in this case it is noted that the location also has a degree of exposure to coal loading and rail movements on the Antiene joint user rail line owned by Anglo Coal. These noise sources were not modelled as part of this calibration exercise as they are regulated as part of separate approvals. It is likely that measured noise levels at Antiene are elevated as a result of those activities.

It is therefore reasonable to adopt a temperature inversion strength of 4°C/100m when modelling night-time operations at Mt Arthur Coal, on the basis that this gives a good correlation with measured noise levels during the worst-case month. This temperature inversion value has therefore been used in this assessment. This approach is more conservative than that outlined in the *INP*, where a temperature inversion strength of 3°C/100m is recommended.

4.2 Noise Modelling Methodology

As described above, operational noise levels at residences have been calculated using the ENM prediction model. This model has been endorsed by the DECC for environmental noise assessment, and as described above, using appropriate meteorological conditions its results have been directly validated for noise in this area. For this study, proposed Underground Project operations are modelled, and predicted noise levels are combined with noise from operations at Mt Arthur Coal and the proposed Mt Arthur Coal South Pit Extension. Total predicted operational noise levels are then compared with the project-specific noise levels described in Section 3.

Calculations were undertaken for three progressive operational scenarios, namely worst case winter nights in years 5, 10 and 15 of the Mt Arthur Underground Project. These modelled scenarios correspond to MAN EIS Years 10, 15 and 21 and South Pit extension Years 5, 10 and 15 respectively. These three years capture the three different mine entry scenarios proposed for the different target coal seams. The modelled scenarios will refer to the relevant Underground Project year. Years 5, 10 and 15 which correspond to the Woodlands Hill, Glen Munro and Arrowfield mining operations respectively. Previous work has shown that predicted noise levels are highest during night-time in winter, largely as a result of adverse

meteorological conditions. It has been demonstrated that if operational noise levels comply with criteria during winter nights, they are likely to comply at all other times.

All calculations were performed under adverse meteorological conditions using the methodology outlined in Section 4.1.

Recent work undertaken by Wilkinson Murray with regard to Mt Arthur Coal's proposed South Pit Extension Project (WM report 05038) involved remodelling of approved MAN operations with proposed South Pit Extension operations. This assessment details the impacts of those operations combined with the Underground Project operations, and compares the combined noise levels with both the project-specific noise levels and the existing MAN consent acquisition criteria. This methodology allows a full understanding of the potential noise impacts at residences from the combined Mt Arthur Coal operations.

4.3 Operational Noise Source Levels

Noise sources associated with plant and infrastructure operating as part of the proposal, and their typical L_{Aeq} noise levels, are shown in Table 4-3. These levels are indicative and based on measurements of existing mobile plant and infrastructure items. With regard to haul trucks, a figure of 113dBA has been adopted in the noise modelling. This figure is considered to be reliably achievable either with new trucks, or in some cases older trucks with some degree of noise attenuation. Fan sound power levels are based on manufacturers' data. Infrastructure sound power levels are shown in some cases with and without attenuation. Noise levels from locomotives and wagons are based on measurements of existing trains used by Mt Arthur Coal passing at 20kph.

Table 4-3 Modelled Typical Equipment Sound Power Levels

Equipment	Assumed L_{Aeq} Sound Power Level (dBA)
Haul Truck	113
Drill	114
Excavator	115
Wheeled Dozer	116
Water cart	113
Grader	109
Conveyors/ (Shielded on one side)	82 per metre / 79 per metre
Conveyor Drive	97
Coal Prep Plant Module	105
Crushers	120/110
Transfer Station & Conveyor Drive/(Cladded)	115/103
Purge / Surge Bin & Conveyor Drive/ (Cladded)	115/102
Stacker & Conveyor Drive	101
Reclaimer & Conveyor Drive	93
Blind Boring Shaft Rig	114
150 Tonne Crane	105

Equipment	Assumed L_{Aeq} Sound Power Level (dBA)
30 Tonne Excavator	115
Diesel Generator	120
275kW Fan	115
635KW Fan	116
Fan Casing Breakout	93
2 x Locomotives (20kph)	79.1 per metre
1280m Freight Wagons (20kph)	76.6 per metre
Rail Loadout Bin	106
Front End Loader	112
Stockpile Tracked Dozer	116

4.4 Modelled Scenarios

Items of mobile plant and infrastructure items modelled for each of the operational scenarios are outlined in Table 4-4 to Table 4-6, and their locations around the site shown in Figure 4-1 to Figure 4-3. For each year, a typical worst-case scenario is modelled, representing equipment locations expected to give rise to higher noise levels at the closest residences. It is proposed that drill rigs to be used to drill ventilation shafts will be powered by mains electricity from the local power grid; however in the event that this is not possible a diesel generator would be employed to power the drills. The use of diesel generators has been modelled as a worst-case for Y5 and Y15 when drilling of shafts is proposed. Infrastructure equipment at Saddlers ROM that is common to all operational years is outlined in Table 4-7. Whilst infrastructure items (existing and proposed) at MAN CHPP have noise mitigation measures in place, no extra attenuation is proposed for those infrastructure items at Saddlers ROM and hence the items are modelled with the higher sound power levels from Table 4-3 where relevant.

Table 4-4 Woodlands Hill Scenario - Y5 (Y10 EIS)

Equipment	Number
Blind Boring Shaft Rig	1
150 Tonne Crane	1
30 Tonne Excavator	1
Front End Loader	1
Diesel Generator	1
275kW Fan	4

Table 4-5 Glen Munro Scenario - Y10 (Y15 EIS)

Equipment	Number
Haul Trucks	4
Grader	1
Watercart	1
275kW Fan	4
Front End Loader	1

Table 4-6 Arrowfield Scenario – Y15 (Y21 EIS)

Equipment	Number
Blind Boring Shaft Rig	1
150 Tonne Crane	1
30 Tonne Excavator	1
Front End Loader	1
Diesel Generator	1
275kW Fan	2
635KW fan	2

Table 4-7 Saddlers ROM – All Years

Equipment	ALL
Transfer Station & Drive	3
Crusher and Dump Hopper	1
Crushing Station	1
Purge Bin & Drive	1
Conveyers	4
Stockpile Dozers	2

Additional mobile plant at the MAN CHPP and rail load out facility includes two dozers at each location.

Figure 4-1 Woodlands Hill Scenario - Y5

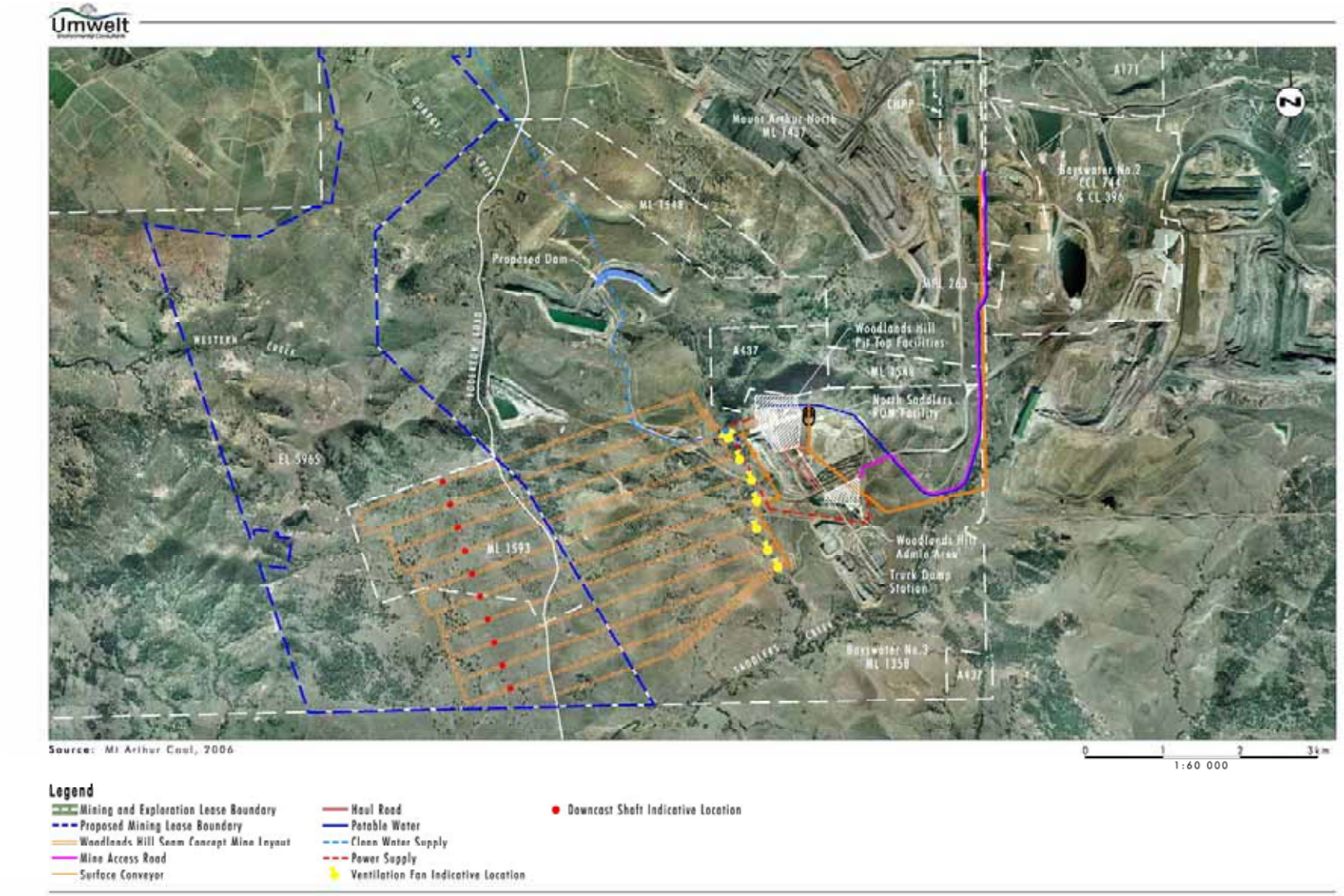


Figure 4-2 Glen Munro Scenario - Y10

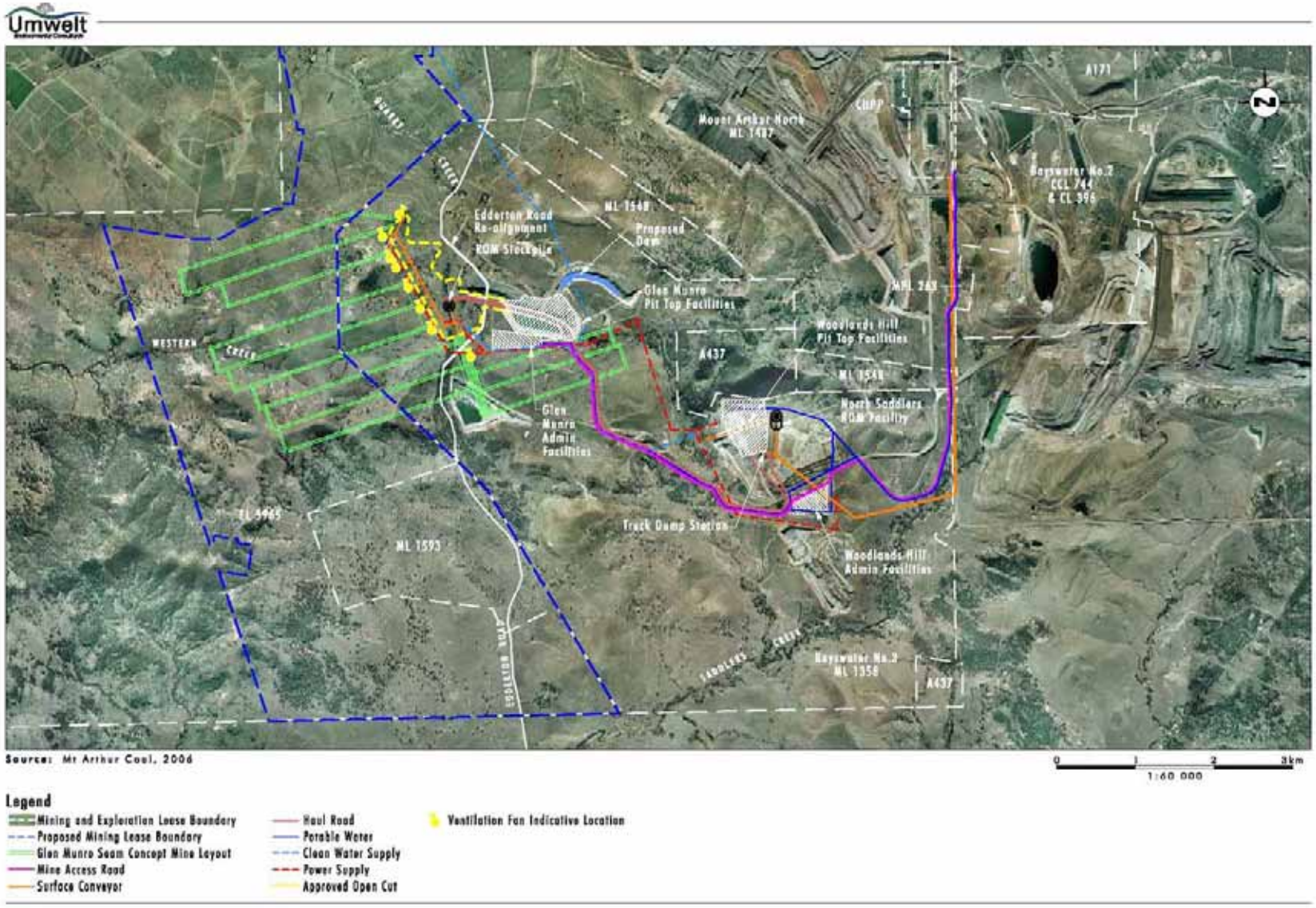
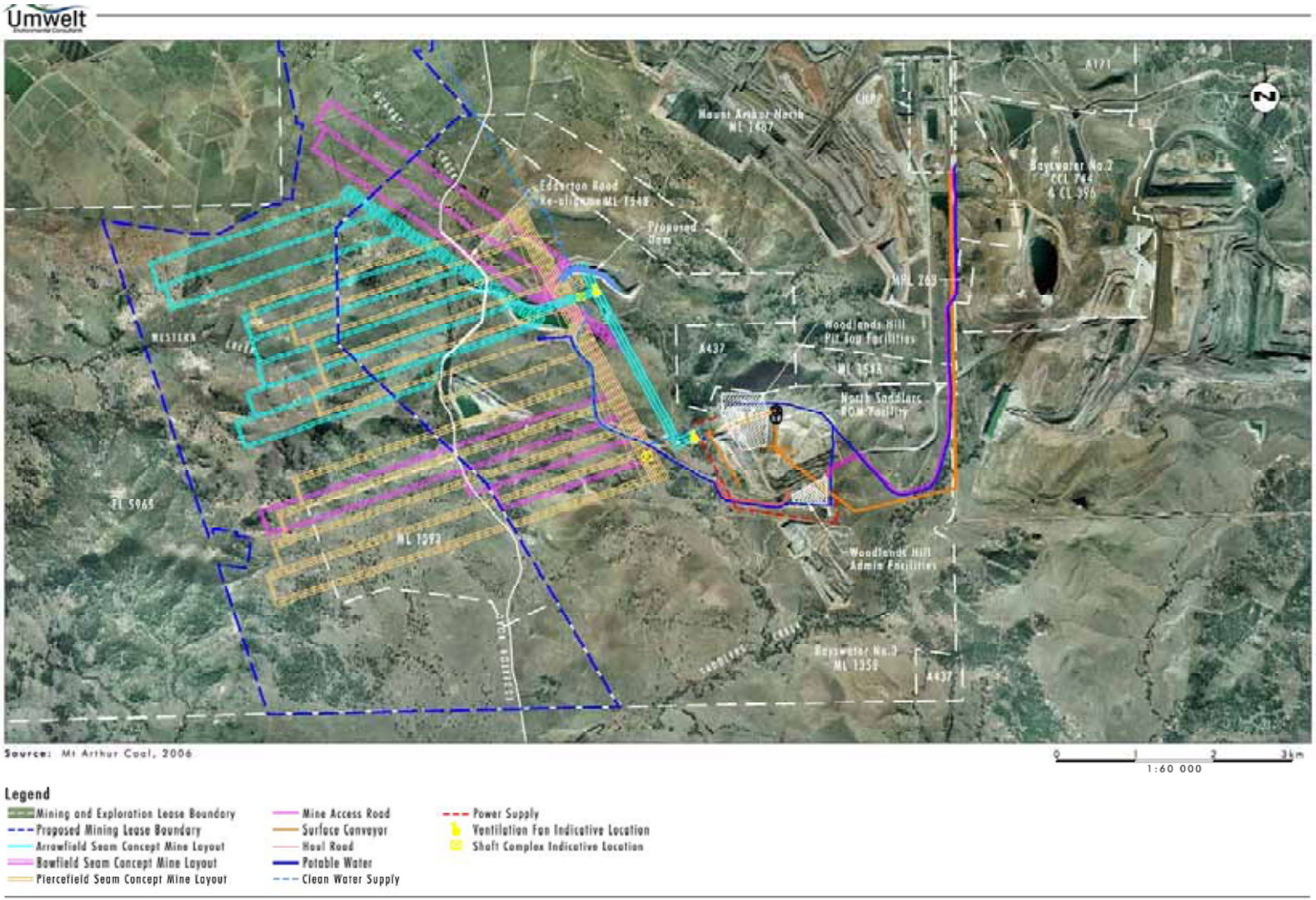


Figure 4-3 Arrowfield Scenario – Y15



4.5 Modelling Procedures

Plant locations are selected as representative "worst-case", and were positioned at points where they have the greatest potential for noise impacts at nearby residences when mining equipment will be operating. Plant that operates in the same vicinity for long periods, such as dozers and excavators, and all infrastructure items, are modelled as point sources. Items involved in transport of materials such as haul trucks, watercarts, graders, conveyers, rail locomotives and wagons are modelled with source points at 20-30m intervals along the routes.

The effective sound power level for each source point is assigned based on the number of items of plant using the route and the number of source points. The contributions of graders and watercarts are spread evenly over all haulage routes for each modelled scenario. Fan exhausts can be positioned facing any direction, provided they are not directed back towards the open cut pits used for underground access. This means that a directivity noise loss can be introduced by pointing fan exhausts away from residences. With regard to rail movement noise, two locomotives pulling 1280m of freight wagons are modelled.

4.6 Predicted $L_{Aeq,15min}$ Noise Levels at Residences from Underground Project

Calculated project specific noise levels for representative receiver locations are presented in Table 4-8 to Table 4-10 for each of the modelled scenarios. Predicted levels are broken into various operational components. The total predicted $L_{Aeq,15min}$ noise levels are then compared with the project-specific noise criteria.

Table 4-8 Predicted Noise Levels Woodlands Hill Scenario - Y5

Rcvr No.	Location	Predicted $L_{Aeq,15min}$ Noise Level (dBA)							
		WH Fans (1)	WH Plant	Saddlers ROM	ALL WH	CHPP	RAIL (2)	TOTAL	Project-Specific Noise Criteria
1	Webber Monitor	0(3)	18.9	23.9	25.1	25.5	24.6	**30**	37
2	Sth Mus. Residence	8.9	15.3	23.6	24.3	30.2	28.0	**33**	35
3	Sth Mus. Monitor	8.4	15.4	22.5	23.4	28.6	25.3	**31**	-
4	Antiene Residence	0(3)	15.8	19.6	21.1	33.9	40.3	**41**	38
5	Racecourse Rd Sth	0(3)	18.1	21.7	23.3	26.6	20.9	**29**	35
7	Denman Rd Monitor	0(3)	25.8	25.0	28.4	22.8	14.9	**30**	-
8	Denman Rd Residence	0(3)	22.1	15.7	23.0	22.4	14.3	**26**	35

Note: 1) No directivity loss has been assumed
2) Including train passby which occurs for less than 10% of the night time period
3) Results marked 0dBA include those results that are less than 0dBA

Table 4-9 Predicted Noise Levels Glen Munro Scenario - Y10

Rcvr No.	Location	Predicted $L_{Aeq,15min}$ Noise Level (dBA)							
		GM Fans	GM Plant	Saddlers ROM	ALL GM	MAN CHPP	RAIL (2)	TOTAL	Project-Specific Noise Criteria
1	Webber Monitor	15.9	18.7	23.9	25.5	25.5	24.6	**30**	**37**
2	Sth Mus. Residence	10.9	19	23.6	25.1	30.2	28.0	**33**	**35**
3	Sth Mus. Monitor	11.5	18.9	22.5	24.3	28.6	25.3	**31**	**-**
4	Antiene Residence	9.6	12.9	19.6	20.8	33.9	40.3	**41**	**38**
5	Racecourse Rd Sth	15.7	17	21.7	23.7	26.6	20.9	**29**	**35**
7	Denman Rd Monitor	21.4 (1)	21.6	25	27.8	22.8	14.9	**29**	**-**
8	Denman Rd Residence	23.7 (1)	22	15.7	26.3	22.4	14.3	**28**	**35**

Note: 1) Directivity loss calculated
2) Including train passby which occurs for less than 10% of the night time period

Table 4-10 Predicted Noise Levels Arrowfield Scenario – Y15

Rcvr No.	Location	Predicted $L_{Aeq,15min}$ Noise Level (dBA)							
		AF Fans	AF Plant	Saddlers ROM	ALL AF	MAN CHPP	RAIL (2)	TOTAL	Project-Specific Noise Criteria
1	Webber Monitor	14	8.5	23.9	24.4	25.5	24.6	**30**	**37**
2	Sth Mus. Residence	13.5	13	23.6	24.3	30.2	28.0	**33**	**35**
3	Sth Mus. Monitor	14.2	14	22.5	23.6	28.6	25.3	**31**	**-**
4	Antiene Residence	1.4	19.3	19.6	22.5	33.9	40.3	**41**	**38**
5	Racecourse Rd Sth	14.1	1	21.7	22.4	26.6	20.9	**29**	**35**
7	Denman Rd Monitor	13.4 (1)	11.3	25	25.5	22.8	14.9	**28**	**-**
8	Denman Rd Residence	12.7 (1)	8	15.7	17.9	22.4	14.3	**24**	**35**

Note: 1) Directivity loss calculated
2) Including train passby which occurs for less than 10% of the night time period

Calculated noise levels are within the project-specific noise criteria at all locations for all modelled scenarios with the exception of Antiene, where an exceedance of 3dBA is predicted. This exceedance is as a result of rail passbys. It is noted that there would be a maximum of 6 movements per night, with each train taking less than 5 minutes to pass by residences under typical operating conditions. This equates to an impact at residences for less than 10% of the night time period. At all other times the operational noise level is predicted be within the project-specific noise criterion at Antiene.

In addition to the impacts at the eight receiver locations shown above, impacts due to train noise only are predicted on five residences in East Antiene, identified in Section 3 and shown in Figure 3-1. Based on monitoring and modelling, East Antiene is not impacted by mining noise from Mt Arthur Coal, with predicted noise impacts derived from train movements. These impacts are predicted to occur for less than 10% of the night time period.

Predicted rail noise levels in east Antiene have been calculated and compared with both the project specific noise criterion and the assumed project-specific acquisition criterion and are shown in Table 4-11.

Table 4-11 Predicted $L_{Aeq,15\ min}$ Rail Noise Levels at East Antiene

Assessment Location	Predicted $L_{Aeq,15min}$ Noise Level (dBA)	Project-Specific Noise Criteria (dBA)	Assumed Acquisition Criteria (dBA)
East Antiene Location 1	48	39	44
East Antiene Location 2	43	39	44
East Antiene Location 3	39	39	44
East Antiene Location 4	39	39	44
East Antiene Location 5	38	39	44

There would be a moderate exceedance of the project specific noise criterion at East Antiene Location 2 and an appreciable exceedance at East Antiene Location 1. These exceedances are predicted for less than 10% of the night-time period when train movements occur and only under adverse weather conditions, i.e. during winter nights with inversion conditions. At Location 1 the calculated noise level exceeds the assumed acquisition criterion by 4 dBA in this worst case scenario.

Noise impacts due to rail passbys are calculated from measured noise levels of the existing trains and wagons used by Mt Arthur Coal travelling at 20 kph. While this represents a current typical operating scenario, and while Mt Arthur Coal currently utilise best available low noise rail technology, future advances in low noise rail or other technology may allow for variations to the operating conditions while maintaining or reducing rail noise impacts in Antiene. Mt Arthur Coal will continue to review opportunities to use improved noise management technology as part of ongoing improvement in rail noise management. Train noise levels will be a factor in Mt Arthur Coal's assessment of new rail contracts for rail transportation of product coal on the Antiene spur line.

4.7 Predicted $L_{Aeq,15min}$ Noise Levels at Residences from All Operations

In addition to approved Mt Arthur Coal operations, a recent project application has been submitted proposing to extend the currently approved MAN South Pit further south into the Bayswater No. 3 Mining Lease (WM Report 05038). This section of the report assesses the total noise impact from all existing and proposed operations against the project-specific noise criteria, and the consent conditions for current MAN operations (DA 144-05-2000).

Predicted noise levels are presented for the approved and proposed open cut operations (including the proposed South Pit Extension [SPE] and the approved MAN operations) and are combined with the proposed Underground Project operations to show the combined noise impacts of all Mt Arthur Coal operations.

Table 4-12 to Table 4-14 show predicted $L_{Aeq,15\ min}$ noise levels from all approved and proposed operations for the three Underground Project scenarios for worst case night time periods. For the purpose of this assessment, the noise levels assigned to the proposed Underground Project

includes noise from all existing infrastructure to be utilised by the project including the rail loading facility, Mt Arthur Coal trains travelling on the rail line (both the Antiene Rail Spur and Bayswater rail spur) and CHPP. Total noise levels are then compared to both the intrusive noise goals, and the acquisition criteria currently applying to MAN operations. Total predicted noise levels have been rounded to the nearest whole number. For reference the total noise level can also be compared with the noise level predicted from modelling undertaken during preparation of the original MAN EIS (URS, 2000) for each year and with the noise limits for the approved MAN operations.

Table 4-12 Combined $L_{Aeq,15min}$ Noise Levels Woodlands Hill Scenario (MAN Year 10 and SPE Year 5)

Ref	Location	$L_{Aeq,15min}$ Noise Levels (dBA)						
		Proposed Underground Project operations (2)	Proposed SPE Operations	Concurrent MAN Operations	Total Noise Level	Project-Specific Noise Criterion	MAN and Assumed Project Acquisition Criterion	MAN EIS Noise Level (1) for Corresponding Year
1	Webber Monitor	29.8	28.3	39.1	**40**	37	42	38
2	Sth Mus. Residence	32.9	28.6	34.9	**38**	35	40	33
3	Sth Mus. Monitor	31.1	28	35.4	**37**	-		35
4	Antiene Residence	41.2	29.1	32	**42**	38	43	38
5	Racecourse Rd Sth	29.0	26.1	38.1	**39**	35	40	39
7	Denman Rd Monitor	29.6	24.6	38.1	**39**	-		38
8	Denman Rd Residence	26.0	22.3	34.5	**35**	35	40	36

Note: 1) Noise levels estimated from EIS noise contours.
2) Underground Operations includes noise from rail infrastructure, all rail movements and from all MAN infrastructure (e.g. CHPP).

From Table 4-12, combined noise levels from all operations are predicted to exceed the project-specific noise criterion at all locations with the exception of Denman Road. Contributions from proposed Underground Project operations are generally small with the exception of Antiene, where rail passbys account for an increase in noise levels to 4dBA above the project-specific noise criterion. It is noted however that train movements are not a new impact on these residences and due to a recent upgrade of Mt Arthur Coal rolling stock which saw the adoption of low-noise technology, the noise impact of train movements actually represents a reduction of rail noise of approximately 4dBA compared to previous rail noise levels. Train movement noise will occur for less than 10% of the night-time period. Total noise levels are predicted to be within the current MAN and assumed Underground Project acquisition criteria at all receivers and are generally consistent with the noise levels predicted for the same operating year in the MAN EIS.

Table 4-13 Combined $L_{Aeq,15min}$ Noise Levels Glen Munro Scenario (MAN Year 15, SPE Year 10)

Ref	Location	$L_{Aeq,15min}$ Noise Levels (dBA)						
		Proposed Underground Project operations (2)	Proposed SPE operations	Concurrent MAN Operations	Total Noise Level	Project-Specific Noise Criterion	MAN and Assumed Project Acquisition Criterion	MAN EIS Noise Level (1) for Corresponding Year
1	Webber Monitor	30.0	29.7	36.2	**38**	37	42	39
2	Sth Mus. Residence	33.0	29.4	33.6	**37**	35	40	31
3	Sth Mus. Monitor	31.2	28.4	34.1	**37**	-		35
4	Antiene Residence	41.2	31.2	30.8	**42**	38	43	38
5	Racecourse Rd Sth	29.1	27.3	37.2	**38**	35	40	41
7	Denman Rd Monitor	29.1	25.8	37.9	**39**	-		39
8	Denman Rd Residence	28.0	23.4	36	**37**	35	40	37

Note: 1) Noise levels estimated from EIS noise contours.
2) Underground Operations includes noise from rail infrastructure, all rail movements and from all MAN infrastructure (e.g. CHPP).

From Table 4-13, combined noise levels from all operations are predicted to exceed the project-specific noise criterion at all locations. Again the contribution from proposed Underground Project operations in overall noise levels is small with the exception of rail movements at Antiene, which will occur for less than 10% of the night-time period under assessed worst case conditions. Total noise levels are predicted to be within current MAN and assumed Underground Project acquisition criteria at all receivers and are generally consistent with the noise levels predicted for the same operating year in the MAN EIS.

Table 4-14 Combined $L_{Aeq,15min}$ Noise Levels Arrowfield Scenario (MAN Year 21, SPE Year 15)

Ref	Location	$L_{Aeq,15mins}$ Noise Levels (dBA)						
		Proposed Underground Project operations[2]	Proposed SPE operations	Concurrent MAN Operations	Total Noise Level	Project-Specific Noise Criterion	MAN and Assumed Project Acquisition Criterion	MAN EIS Noise Level[1] for Corresponding Year
1	Webber Monitor	29.6	29.7	39	**40**	37	42	39
2	Sth Mus. Residence	32.9	29.4	34	**37**	35	40	31
3	Sth Mus. Monitor	31.1	28.5	35.2	**37**	-		35
4	Antiene Residence	41.2	32.8	31.5	**42**	38	43	38
5	Racecourse Rd Sth	28.8	27.2	37.7	**39**	35	40	41
7	Denman Rd Monitor	27.6	25.1	38.2	**39**	-		39
8	Denman Rd Residence	24.2	22.7	35.9	**37**	35	40	37

Note: 1) Noise levels estimated from EIS noise contours.
2) Underground Operations includes noise from rail infrastructure, rail movements and from all MAN infrastructure (e.g. CHPP).

From Table 4-14, noise levels from all operations are predicted to exceed the project-specific noise criterion at all locations. However the contribution from proposed Underground Project operations in overall noise levels is small with the exception of rail movements at Antiene, which will occur for less than 10% of the night-time period under assessed worst case conditions.

Total noise levels are predicted to be within current MAN and assumed Underground Project acquisition criteria at all receivers and are generally consistent with the noise levels predicted for the same operating year in the MAN EIS.

4.8 Cumulative Noise Assessment Methodology

A cumulative noise assessment has been undertaken for the worst-case night time period. The night time $L_{Aeq,9\ hr}$ amenity criterion of 40dBA for all residential receiver locations (refer to Section 3) is used as the basis for this assessment. Based on the premise that no residence would be exposed to more than two major industrial operations (i.e. Mt Arthur Coal operations and Bengalla, Drayton, Anvil Hill or Mount Pleasant depending on the location), and that noise impacts would be shared equally amongst those industrial sources, the default amenity criterion for noise impacts from the project would be 37dBA at each residence.

All noise modelling for this assessment has been based on assumed constant operation of all plant in positions most likely to give rise to noise impacts. This is considered appropriate for assessment of noise levels over a worst-case 15 minute period. With regard to amenity, the assessment is over the entire night time period and mining plant would not operate continuously in the most exposed locations. A reasonable method of assessing noise levels at residences over the entire nine hour period would be to investigate the relationship between measured 10th percentile $L_{Aeq,15\ min}$ noise levels and measured $L_{Aeq,9hr}$ levels using BarnOwl real time directional noise monitors located at four residential locations surrounding the project. Table 4-15 below shows both parameters measured at four locations in July 2006. This methodology is preferable to development of a noise model incorporating utilisation of multiple plant items over a period, as it uses location specific measured noise data as the basis for the assessment. Wilkinson Murray advocate using measured data where available, provided that it can be verified that the measured noise data is being emitted by the proposal, as is the case with data from directional noise monitors at Mt Arthur Coal.

Table 4-15 Assessment of measured L_{Aeq} noise levels

Location	10% $L_{Aeq,15min}$ (dBA)	$L_{Aeq,9hr}$ (dBA)	Difference (dBA)
Sth Muswellbrook	35.9	31.9	4
Webber	39.5	35.8	3.7
Denman Rd West	37.9	34.5	3.4
Shepherd Ave	33.8	29.2	4.6
Average			4

The average difference at the four locations is 4dBA. It is therefore reasonable to apply a reduction of 4dBA to predicted $L_{Aeq,15\ min}$ noise levels to calculate approximate $L_{Aeq,9hr}$ noise levels.

However with the exception of Antiene the total predicted Underground Project noise level over 15 minutes with all plant operational is already less than 37dBA and therefore it is reasonable to conclude that those residences other than Antiene would comply with the amenity criterion without further assessment. Table 4-16 shows the calculated worst-case Underground $L_{Aeq,9hr}$ operational noise level at Antiene (without rail noise).

Table 4-16 Operational $L_{Aeq,9hr}$ Amenity Noise Levels at Antiene

Receiver No	Location	$L_{Aeq,15min}$	$L_{Aeq,9hr}$
4	Antiene Residence	34	30

With regard to Antiene, the dominant noise source would however be from rail movements. It is also considered appropriate to assess rail noise amenity at those new residences east of Antiene identified in Section 3.

Table 4-17 shows the rail noise $L_{Aeq,9hr}$ level for six movements over the nine hour night time period, based on the previously calculated noise level for one passby in a fifteen minute period at those residences.

Table 4-17 Rail $L_{Aeq,9hr}$ Amenity Noise Level

Receiver No	Location	$L_{Aeq,15min}$	$L_{Aeq,9hr}$
4	Antiene Residence	40.3	32.5
East Antiene Location 1	East Antiene	49.2	41.4
East Antiene Location 2	East Antiene	44.3	36.5
East Antiene Location 3	East Antiene	41.4	33.6
East Antiene Location 4	East Antiene	40.9	33.1
East Antiene Location 5	East Antiene	40.4	32.6

Calculated noise levels from Table 4-16 and Table 4-17 can then be combined to determine total night time amenity noise levels at the locations. With regard to the residences east of Antiene, based on a review of noise contours from a recent assessment for the proposed Mt Arthur South Pit Extension, (WM Report 05038) it is reasonable to conclude that these residences would not be significantly impacted by operational noise. Any noise from mining operations would be at least 10dBA below predicted rail noise levels and as such can be excluded from the calculation. Table 4-18 shows predicted total MAU $L_{Aeq,9\ hr}$ noise levels.

Table 4-18 Total $L_{Aeq,9hr}$ Noise Level

Receiver No	Location	$L_{Aeq,9hr}$ Noise Levels (dBA)			
		MAU	RAIL	TOTAL	Criteria
4	Antiene Residence	30	32.5	34	37
East Antiene Location 1	East Antiene	N/A	41.4	41	37
East Antiene Location 2	East Antiene	N/A	36.5	37	37
East Antiene Location 3	East Antiene	N/A	33.6	34	37
East Antiene Location 4	East Antiene	N/A	33.1	33	37
East Antiene Location 5	East Antiene	N/A	32.6	33	37

Calculated noise levels are within the amenity criterion with the exception of Location 1, where an exceedance of 4dBA is predicted.

4.9 Cumulative Noise Assessment

By applying the difference between measured $L_{Aeq,15\ min}$ and $L_{Aeq,9hr}$ noise levels derived in Table 4-15 to the calculated noise levels from Table 4-12 to Table 4-14, a reasonable estimate of amenity noise levels for all approved and proposed operations is shown for the three modelled scenarios. In addition the component for rail passby noise has been added separately, as there would be a maximum of six passbys per night. In this case the calculated $L_{Aeq,9hr}$ rail noise levels derived using methodology from Section 4-8 are used.

In all cases predicted $L_{Aeq,9hr}$ noise levels at residences are within the adopted cumulative amenity criterion.

Table 4-19 Combined $L_{Aeq,9\ hr}$ Noise Levels Woodlands Hill Scenario (MAN Year 10, SPE Year 5)

Ref	Location	$L_{Aeq,9hr}$ Noise Levels (dBA)					
		Proposed Underground Project operations (no rail)	Proposed SPE operations	Concurrent MAN Operations	Rail Passby	Total Noise Level	Cumulative Amenity Criterion (Mt Arthur Coal Operations)
1	Webber Monitor	24.3	24.3	35.1	16.8	**36**	**37**
2	Sth Mus Residence	27.2	24.6	30.9	20.2	**33**	**37**
3	Sth Mus Monitor	25.8	24	31.4	17.5	**33**	**-**
4	Antiene Residence	30.1	25.1	28	32.5	**36**	**37**
5	Racecourse Rd Sth	24.3	22.1	34.1	13.1	**35**	**37**
7	Denman Rd Monitor	25.5	20.6	34.1	7.2	**35**	**-**
8	Denman Rd Residence	21.7	18.3	30.5	6.5	**31**	**37**

Table 4-20 Combined $L_{Aeq,9hr}$ Noise Levels Glen Munro Scenario (MAN Year 15, SPE Year 10)

Ref	Location	$L_{Aeq,9hr}$ Noise Levels (dBA)					
		Proposed Underground Project operations (no rail)	Proposed SPE operations	Concurrent MAN Operations	Rail Passby	Total Noise Level	Cumulative Amenity Criterion (Mt Arthur Coal Operations)
1	Webber Monitor	24.5	25.7	32.2	16.8	**34**	**37**
2	Sth Mus. Residence	27.4	25.4	29.6	20.2	**33**	**37**
3	Sth Mus. Monitor	26.0	24.4	30.1	17.5	**32**	**-**
4	Antiene Residence	30.1	27.2	26.8	32.5	**36**	**37**
5	Racecourse Rd Sth	24.4	23.3	33.2	13.1	**34**	**37**
7	Denman Rd Monitor	25.0	21.8	33.9	7.2	**35**	**-**
8	Denman Rd Residence	23.8	19.4	32	6.5	**33**	**37**

Table4-21 Combined $L_{Aeq,9\ hr}$ Noise Levels Arrowfield Scenario (MAN Year 21, SPE Year 15)

Ref	Location	$L_{Aeq,9hr}$ Noise Levels (dBA)					
		Proposed Underground Project operations (no rail)	Proposed SPE operations	Concurrent MAN Operations	Rail Passby	Total Noise Level	Cumulative Amenity Criterion (Mt Arthur Coal Operations)
1	Webber Monitor	24.0	25.7	35	16.8	**36**	**37**
2	Sth Mus. Residence	27.2	25.4	30	20.2	**33**	**37**
3	Sth Mus. Monitor	25.8	24.5	31.2	17.5	**33**	**-**
4	Antiene Residence	30.2	28.8	27.5	32.5	**36**	**37**
5	Racecourse Rd Sth	24.0	23.2	33.7	13.1	**35**	**37**
7	Denman Rd Monitor	23.3	21.1	34.2	7.2	**35**	**-**
8	Denman Rd Residence	19.7	18.7	31.9	6.5	**32**	**37**

4.10 Potential for Sleep Disturbance

Although the INP does not specifically address sleep disturbance, the DECC have published a *Noise Guide for Local Government* which states:

> *Where sleep disturbance is being assessed, $L_{A1,60\ seconds}$ or L_{Amax} noise level is most appropriate, and the measurement position might be outside the bedroom window. Sleep may be disturbed if the source noise level exceeds the background noise by more than 15dBA.*

This approach is consistent with that recommended in the DECC's Environmental Noise Control Manual (1985), which has now largely been superseded.

The MAN EIS noise report identified two short-term noise sources that may have the potential to disturb sleep, namely:

- Bulldozer reversing alarm 115dBA
- Shovel bucket door banging 120dBA

During preparation of the MAN EIS, calculations were undertaken to establish maximum noise levels at nearest affected residences based on the above sound power levels. Predicted noise levels were found to be below the sleep disturbance criterion. It follows that since proposed Underground Project operations are further from residences than MAN EIS operations and that there are no other night-time noise sources predicted to be at a higher level than those assessed for MAN, maximum noise levels would not be higher than those calculated in the MAN EIS. The exception to this is noise from rail infrastructure and movements which was not addressed in the MAN EIS. Assessment of the potential for sleep disturbance at both Antiene and those residences east of Antiene discussed in Section 3 is therefore required. The maximum sound power levels from two locomotives passing at 20kph and a train ignition/shunting from parked trains when starting from rest are shown in Table 4-2.

Table 4-22 Measured L_{Amax} Sound Power Level of 20kph Locomotives

Item	L_{Amax} SWL (dBA)
Locomotives	116
Ignition/Shunting	100

Clearly the greatest potential for sleep disturbance would be due to a train passing at the closest point to each residence. Maximum noise levels at the residences from trains passing at the closest point are calculated using ENM and shown in Table 4-23.

Table 4-23 Calculated External L_{Amax} Noise Level at Residences

Location	Goal (dBA)	Calculated External L_{Amax} (dBA)
Antiene	48	47
East Antiene Location 1	49	61
East Antiene Location 2	49	53
East Antiene Location 3	49	49
East Antiene Location 4	49	47
East Antiene Location 5	49	46

Calculated L_{Amax} levels from rail passby noise are within the criterion at all residences with the exception of East Antiene Locations 1 and 2.

Further guidance on the potential for "awakenings" is given in Appendix B of the DECC's *Environmental Criteria for Road Traffic Noise (ECRTN)* in which it is concluded that:

- *"maximum internal [to the bedroom] noise levels below 50-55dBA are unlikely to cause awakening reactions",* and
- *"One or two noise events per night, with maximum internal noise level of 65-70dBA are not likely to affect health and wellbeing significantly".*

Although this document was written with respect to road traffic noise the findings are based on a review of international sleep disturbance research and it is considered appropriate to apply the same findings to the potential for sleep disturbance from train passbys, given that the character of emergent noise over ambient background levels from trains would be similar to that of passing heavy vehicles. With that in mind the predicted internal maximum noise level at the above residences, allowing bedroom windows to be open for ventilation, can be compared to the ECRTN "awaking reactions" goals and are shown in Table 4-24 below.

Table 4-25 Comparison with ECRTN Awakening Reactions Goals (Internal)

Location	Goal (dBA)	Calculated Internal L_{Amax} (dBA)
Antiene	50-55	37
East Antiene Location 1	50-55	51
East Antiene Location 2	50-55	43
East Antiene Location 3	50-55	39
East Antiene Location 4	50-55	37
East Antiene Location 5	50-55	36

All calculated internal maximum noise levels are within the range of levels that are unlikely to cause awakening reactions during the night time period. Impacts on sleep disturbance during the day time period would be less than those predicted for the worst-case night time period as there would be no elevation of noise levels due to temperature inversions and therefore rail passbys would be unlikely to cause awakening reactions should any shift workers reside in the Antiene area.

4.11 Potential Noise Impacts during Construction

Construction activities for the Underground Project include the construction of additional stockpiling at the existing MAN CHPP, the construction of new ROM and pit top facilities in and adjacent to Saddlers and Belmont Pits and other minor infrastructure including the passing lane on the Antiene Rail Spur. Given that likely sound power levels of construction plant at these locations would be no greater than is currently active or proposed; the impacts from construction activities at these locations would be no greater than impacts that have already been assessed for operational noise impacts. Calculated noise levels from operational plant at residences are low enough to preclude any further assessment of construction noise, given that construction plant would be expected to have equivalent or likely lower sound power levels than operational or infrastructure plant.

4.12 Potential Vibration Impacts

Potential vibration impacts associated with underground mining operations are assessed separately in the EA Subsidence Assessment, and therefore no further consideration is warranted. With regard to impacts from blasting, there are not proposed to be any blasts of a size to warrant assessment at residences.

5 TRAFFIC NOISE ASSESSMENT

The Underground Project has potential to generate additional traffic on public roads as a result of staff arrivals and departures, and also from heavy vehicle deliveries of supplies. Potential noise impacts at residences from two scenarios have been addressed in this assessment:

- impacts during the infrastructure construction period; and
- impacts during the peak operational period of the proposal.

Existing and proposed project traffic volumes have been sourced from counts and projections provided in a transport study undertaken by Transport and Urban Planning Pty Ltd for the project.

5.1 Road Traffic Noise Criteria

Criteria for the assessment of noise from traffic on public roads are set out in the DECC's *Environmental Criteria for Road Traffic Noise (ECRTN)*.

In terms of the *ECRTN* road classifications, Denman Road east of Thomas Mitchell Drive and Thomas Mitchell Drive itself would be considered "collector" roads taking traffic from West Muswellbrook to the Highway. Denman Road west of Thomas Mitchell Drive would be classified as a "local" road. The New England Highway would be considered a "freeway or arterial road".

Table 5-1 *ECRTN* Criteria for Residences

Type of Development	Noise Level Criterion		Where Criteria are already Exceeded
	Daytime	Night Time	
Land use developments with potential to create additional traffic on collector roads	$L_{Aeq,1hr}$ 60dBA	$L_{Aeq,1hr}$ 55dBA	In all cases, the redevelopment should be designed so as not to increase existing noise levels by more than 2dB. Where feasible & reasonable, noise levels from existing roads should be reduced to meet the noise criteria. In many instances this may be achievable only through long-term strategies…
Land use developments with potential to create additional traffic on local roads	$L_{Aeq,1hr}$ 55dBA	$L_{Aeq,1hr}$ 50dBA	
Land use developments with potential to create additional traffic on existing freeways/arterials	$L_{Aeq,15hr}$ 60dBA	$L_{Aeq,9hr}$ 55dBA	

Note: 1) Daytime is 7.00am – 10.00pm; Night Time is 10.00pm – 7.00am.

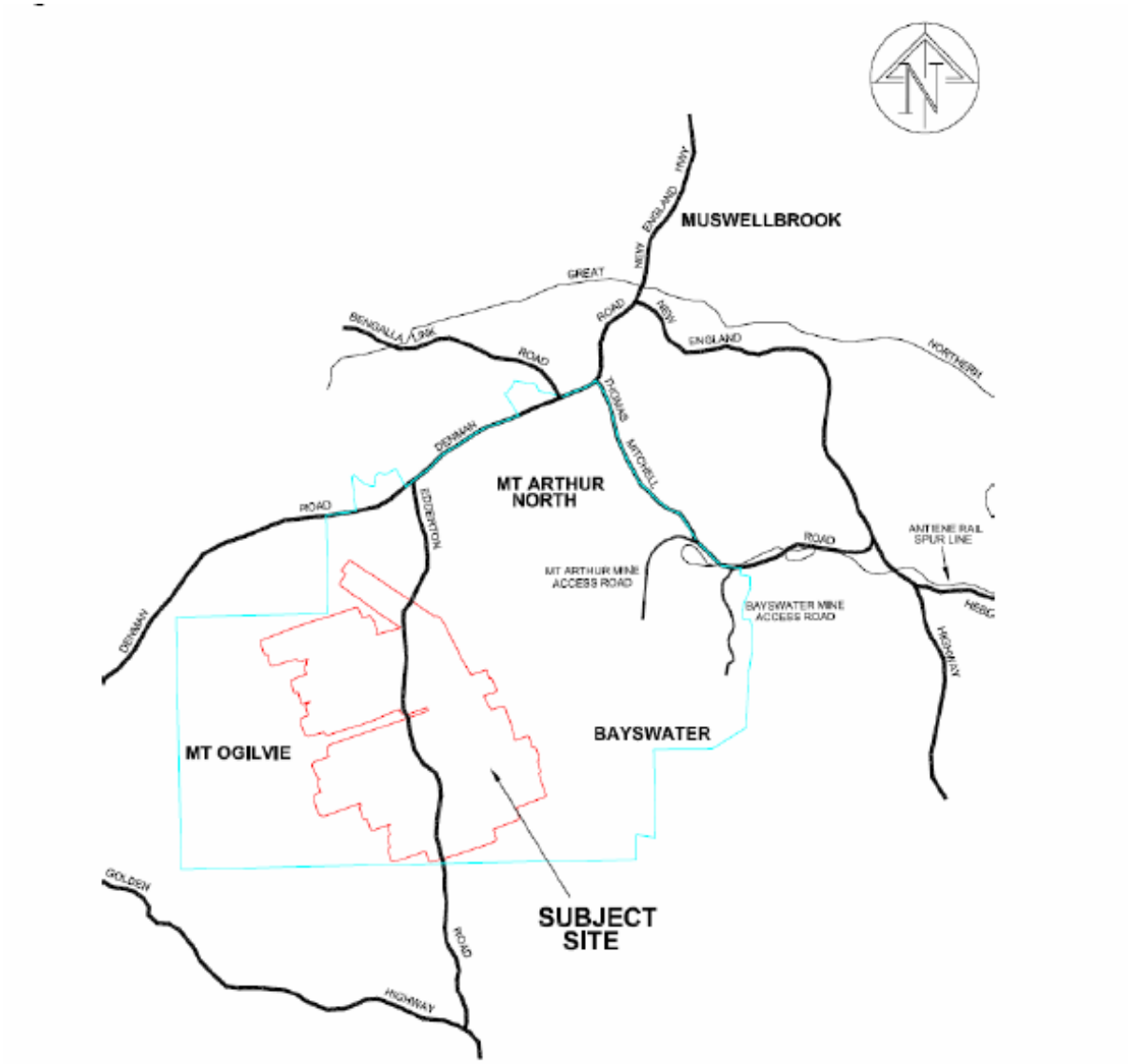
5.2 Local Road Network

The local road network that supports existing and proposed traffic is shown in Figure 5-1. The principal road network that is adjacent to and/or provides access to Mt Arthur Coal includes:

- New England Highway;
- Denman Road;
- Thomas Mitchell Drive;
- Edderton Road; and
- Mt Arthur Coal Access Road and Bayswater Access Road.

Access to the site would be primarily via the existing Mt Arthur Coal Access Road from Thomas Mitchell Drive, both during construction and operational periods.

Figure 5-1 Local Road Network



However, in terms of noise impacts there are no private residences with exposure to traffic on Edderton Road, Mt Arthur Coal Access Road or Bayswater Access Road and they are not included in this assessment. This is also true of the industrial area of Thomas Mitchell Drive, north of the Mt Arthur Coal Access Road. These parts of the local road network have thus been excluded from any further analysis. Also there are relatively small numbers of proposed traffic movements generated by the proposal in comparison to counts taken on the New England Highway. As a result there would be negligible effect on noise levels at those residences exposed to traffic noise from the Highway and no further assessment is warranted.

5.3 Predicted Traffic Noise Impacts during Infrastructure Construction Phase

Construction of the Underground Project is expected to take approximately two years. During the construction phase of the Underground Project, employment levels will peak in the second year. At this time it is expected that up to 420 vehicle trips will be made into and out of the mine on a weekday (i.e. 420 in / 420 out) including 20 heavy vehicles (i.e. 20 in / 20 out).

Peak hours during construction are expected to be 6.00-7.00am and 6.00-7.00pm which will coincide with the majority (67%) of the employee / contractor trips into (AM) and out of the mine (PM). Some 268 vehicle trips are expected during these hours.

Construction traffic will consist of:

- construction worker trips and project employee trips, estimated to be a maximum of 400 vehicle trips per day into and out of the mine (based on 85% driver rate) which will be predominantly light vehicles; and
- up to 20 deliveries per day into and out of the mine which will be heavy vehicles (Austroads Class 3 and above). Most of these (85%) are expected to use New England Highway and Thomas Mitchell Drive with 15% using Denman Road and Thomas Mitchell Drive.

Table 5-2 and Table 5-3 show the existing traffic flows and additional construction traffic generated by the proposal during the peak periods when construction workers would be using the local road network. To establish existing flows intersection counts were undertaken during 2006 and 2007 by Transport and Urban Planning Pty Ltd.

Table 5-2 Construction Traffic 6.00-7.00am

Location	Existing Traffic		Additional Traffic	
	ALL	% HV	ALL	% HV
Thomas Mitchell Drive, south of Access Road	402	11.4	98	0[1]
Thomas Mitchell Drive, south of Denman Road	685	6.1	170	0[1]
Denman Road, east of Thomas Mitchell Drive	769	4.3	154	0[1]
Denman Road, west of Thomas Mitchell Drive	376	9.3	16	0[1]

Note: 1) It is assumed that all heavy vehicle deliveries will occur between 7am and 6pm

Table 5-3 Construction Traffic 6.00-7.00pm

Location	Existing Traffic		Additional Traffic	
	ALL	% HV	ALL	%HV
Thomas Mitchell Drive, south of Access Road	132	8.3	98	0[1]
Thomas Mitchell Drive, south of Denman Road	194	9.8	170	0[1]
Denman Road, east of Thomas Mitchell Drive	312	5.4	154	0[1]
Denman Road, west of Thomas Mitchell Drive	222	9.9	16	0[1]

Note: 1) It is assumed that all heavy vehicle deliveries will occur between 7am and 6pm

Using flows in the Tables above, the maximum changes in noise levels on the subject roads during the proposed construction period are calculated and presented in Table 5-4. Noise levels are calculated using CoRTN (Calculation of Road Traffic Noise UK DoE Traffic Noise Prediction Method 1988) prediction algorithms for the hours during which the majority of workers would arrive and leave.

Table 5-4 Maximum increase in Traffic Noise Level – Construction Phase

Location	Increase in Traffic Noise Levels (dBA)	
	6.00-7.00am	6.00-7.00pm
Thomas Mitchell Drive, south of Access Road	0.5	1.5
Thomas Mitchell Drive, south of Denman Road	0.5	2
Denman Road, east of Thomas Mitchell Drive	0.5	1.5
Denman Road, west of Thomas Mitchell Drive	0	0

The increase in noise levels on all roads under assessment during the peak period of the construction phase is predicted to be within the *ECRTN* allowance of 2dBA at all times and no further assessment is warranted.

5.4 Predicted Traffic Noise Impacts during Operational Phase

The Underground Project is expected to have a 21 year life with the maximum activity levels occurring towards the end of the mine plan.

The traffic generation of the proposed underground mine based on the maximum activity levels is estimated to be:

- 244 employee trips into and out of the mine on a weekday based on 85% driver ratio. These would be light vehicles.
- 18 visitor trips into and out of the mine per day, which would also be light vehicles; and
- Up to 60 delivery / maintenance trips into and out of the mine per day. Thirty of these are estimated to be heavy vehicles with thirty light vehicles.

The maximum traffic generation will occur at shift time changes associated with underground miners and other workers. The proposed hours of operation are 24 hours, seven (7) days per week. The likely shift change times for the project which have been adopted for the purposes of this assessment are:

- Miners – three shifts from 12midnight-8.00am, 8.00am-4.00pm and 4.00pm-12midnight;
- ROM Facility Workers – two shifts from 6.30am-6.50pm and 6.30pm-6.50am;
- Management and Administration Staff – who will typically start between 6.30am and 8.00am and finish between 3.30pm and 6pm.

Given that there are three shifts it is appropriate to assess each in terms of increase in noise levels on the local roads identified in Section 5.2. The study by Transport and Urban Planning Pty Ltd indicates that the hours in which the majority of operational traffic would be on the local road network would commence forty five minutes before, and end 15 minutes after the start of each shift.

Table 5-5 to Table 5-7 show the existing traffic flows and additional operational traffic generated by the proposal during the three proposed shift changes. Intersection counts are used to establish existing flows for the 7.15-8.15am and the 3.15-4.15pm shift changes. For the 11.15pm-12.15am shift change no intersection counts were available and 2004 traffic counts published by the RTA are used as an alternative. These counts do not show the proportion of heavy vehicles on an hourly basis, rather an overall daily percentage. This daily percentage has been applied to the counted hours of 11.00pm-12.00am and 12.00-1.00am. Existing flows between 11.15pm and 12.15am were then calculated on a pro rata basis.

Table 5-5 Operational Traffic 7.15-8.15am

Location	Existing Traffic		Additional Traffic	
	ALL	% HV	ALL	% HV
Thomas Mitchell Drive, south of Access Road	189	25.9	78	20.5
Thomas Mitchell Drive, south of Denman Road	326	18.4	106	3.8
Denman Road, east of Thomas Mitchell Drive	434	14.5	96	4.2
Denman Road, west of Thomas Mitchell Drive	300	11.7	10	0

Table 5-6 Operational Traffic 3.15pm-4.15pm

Location	Existing Traffic		Additional Traffic	
	ALL	% HV	ALL	% HV
Thomas Mitchell Drive, south of Access Road	209	13.9	78	20.5
Thomas Mitchell Drive, south of Denman Road	524	9.2	106	3.8
Denman Road, east of Thomas Mitchell Drive	660	7.7	96	4.2
Denman Road, west of Thomas Mitchell Drive	326	13.2	10	0

Table 5-7 Operational Traffic 11.15pm-12.15am

Location	Existing Traffic		Additional Traffic	
	ALL	%HV	ALL	%HV
Thomas Mitchell Drive, south of Access Road	24	19.4	18	0[1]
Thomas Mitchell Drive, south of Denman Road	19	13.7	32	0[1]
Denman Road, east of Thomas Mitchell Drive	26	10	29	0[1]
Denman Road, west of Thomas Mitchell Drive	16	2.0	3	0[1]

Note: 1) It is assumed that all operational traffic would be light vehicles at this time.

Using flows in the Tables above, the maximum changes in noise levels on the subject roads during the proposed peak operational periods are calculated and presented in Table 5-8. Noise levels are calculated using CoRTN (Calculation of Road Traffic Noise UK DoE Traffic Noise Prediction Method 1988) prediction algorithms for the hours during which he majority of workers would arrive and leave.

Table 5-8 Maximum increase in Traffic Noise Levels – Operational Phase

Location	Increase in Traffic Noise Levels (dBA)		
	7.15-8.15am	3.15-4.15pm	11.15pm-12.15am
Thomas Mitchell Drive, south of Access Road	1.5	1.5	1.5
Thomas Mitchell Drive, south of Denman Road	1	0.5	2.5
Denman Road, east of Thomas Mitchell Drive	0.5	0.5	3.5
Denman Road, west of Thomas Mitchell Drive	0	0	0.5

The increase in noise levels on all local roads during the peak period of the operational phase during the hours 7.15-8.15am and 3.15-4.15pm is predicted to be within the *ECRTN* allowance. During the period 11.15pm-12.15am however, there would be an exceedance of *ECRTN* allowance criteria on Thomas Mitchell Drive south of Denman Road and on Denman Road east of Thomas Mitchell Drive. Hence, further detailed investigation of traffic noise levels on these roads is warranted. Table 5-9 shows the distance at which the *ECRTN* criteria would be exceeded at those locations for residences with a typical angle of view to the road and where the road is not in cutting. It is noted that the speed limit on Denman Road changes from 100kph to 80kph approximately 200m east of Thomas Mitchell Drive and therefore two distances are shown.

Table 5-9 Distances at which *ECRTN* criteria are exceeded

Location	*ECRTN* Criterion (dBA)	Distance (m)
Thomas Mitchell Drive, south of Denman Road [(1)]	55	50
Denman Rd, east of Thomas Mitchell Dve [(2)] (80kph Speed Limit)	55	30
Denman Rd, east of Thomas Mitchell Dve [(2)] (100kph Speed Limit)	55	50

Note: 1) Chipseal surface assumed
2) Dense Graded Asphaltic Concrete surface assumed

There are no residences on Denman Road east of Thomas Mitchell Drive within 50m of the road where it is a 100km/h zone and none within 30m of the road where it is a 80km/h zone. There are no residences on Thomas Mitchell Drive within 50m of the road. Therefore there are no residences at which predicted traffic noise levels, including operational traffic associated with the Underground Project, would exceed relevant criteria.

5.5 Cumulative Traffic Noise Impacts

A mine at Mount Pleasant was approved in 1999 and traffic from that mine is proposed to share part of the local road network with traffic generated by the MAU proposal. The EIS for Mount Pleasant did not specify shift start and finish times, rather nominating a window between 6.00-8.00am or 6.00-8.00pm for the two shifts. It is possible the morning shift at Mount Pleasant would coincide with that proposed for the Underground Project. Additionally the recently approved Anvil Hill Project would have a shift change at 7.30am, which would also put extra vehicles on the local road network during the proposed Underground Project morning shift. Although the Anvil Hill Environmental Assessment proposes 7.00-8.00am as the time during which impacts would be expected it is considered appropriate to conservatively assess this as additional traffic during the 7.15-8.15am period for the Underground Project.

The Mount Pleasant Mine proposal was approved in December 1999 and it has been assumed to start operations before the Underground Project. Operational traffic from Mount Pleasant would therefore be regarded as existing traffic. The Mount Pleasant EIS outlines the distribution of mine traffic as shown in Table 5-10. Those routes relevant to the assessment of cumulative noise impacts are in bold.

Table 5-10 Mount Pleasant Traffic Distribution

Direction	Proportion	Approach Route (to/from)
South via Bengalla Link Road	38%	Muswellbrook via Denman Road (E)
	25%	Via Thomas Mitchell Drive (S)
	3%	Edderton Road via Denman Road (W)
North via Mount Pleasant Western Link Road	7%	Scone via Blairmore Lane
	5%	Scone via Dartbrook Road
	9%	Aberdeen via Dartbrook Link Road
	3%	Local rural areas via Dartbrook Link Road
	3%	Local rural areas via Kayuga Road
West via Wybong Road	4%	Denman via Roxburgh Road
	3%	Sandy Hollow via Wybong Road (W)

The Anvil Hill Project does not stipulate what proportion of proposed traffic on Denman Road would turn into Thomas Mitchell Drive, so for the purposes of this report, the same proportion as identified in the Mount Pleasant EIS is used. This is considered appropriate as the composition of the respective workforces would be from similar residential locations.

Table 5-11 illustrates the anticipated change in cumulative traffic volumes during the proposed 7.15-8.15am shift change.

Table 5-11 Cumulative Traffic 7.15-8.15am

Location	Existing Traffic		Additional Traffic	
	ALL	%HV	ALL	%HV
Thomas Mitchell Drive, south of Access Road	233	21.6	123	18.1
Thomas Mitchell Drive, south of Denman Road	370	16.6	151	6.2
Denman Road, east of Thomas Mitchell Drive	501	13.0	164	7.3
Denman Road, west of Thomas Mitchell Drive	412	9.4	123	5.4

Existing traffic flows are taken from the intersection counts undertaken during 2006 and 2007 by Transport and Urban Planning Pty Ltd, combined with approved Mount Pleasant flows over that period. Additional traffic would be the combined flows of the proposed Underground Project and the approved Anvil Hill Project. As before, the change in noise levels for each of the roads is calculated using the CoRTN (Calculation of Road Traffic Noise UK DoE Traffic Noise Prediction Method 1988) prediction algorithm. Table 5-12 shows the calculated cumulative increase in traffic noise levels.

Table 5-12 Cumulative Increase in Traffic Noise Levels

Location	Increase in Traffic Noise Levels (dBA)
Thomas Mitchell Drive, south of Access Road	1.5
Thomas Mitchell Drive, south of Denman Road	1
Denman Road, east of Thomas Mitchell Drive	1
Denman Road, west of Thomas Mitchell Drive	1

The cumulative increase in traffic noise levels is within the *ECRTN* allowance criterion for all roads under consideration.

6 RAIL NOISE ASSESSEMENT (MAIN LINE)

The Underground Project will generate additional rail movements on the Muswellbrook-Newcastle main line. This assessment of rail noise impacts due to train movements on the main line does not include rail movements on the Antiene rail spur which are addressed under operational noise impacts in Section 4 of this report.

6.1 Rail Noise Criteria

The DECC have recently published an *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects.* Table 6-1 shows the trigger noise levels at which an assessment of rail noise impacts would be undertaken.

Table 6-1 Airborne Rail Traffic Noise Trigger Levels For Residential Land Uses

Type of development	Noise trigger levels dBA		Comment
	Daytime (7.00am-6.00pm)	Night time (10.00pm-7.00am)	
New rail line development	Development increases existing rail noise levels *and* resulting rail noise levels exceed:		These numbers represent external levels of noise that trigger the need for an assessment of the potential noise impacts from a rail infrastructure project. An 'increase' in existing rail noise levels is taken to be an increase of 2dBA or more in L_{Aeq} in any hour or an increase of 3dBA or more in L_{Amax}.
	60 $L_{Aeq,15hr}$	55 $L_{Aeq,9hr}$	
	80 L_{Amax}	80 L_{Amax}	
Redevelopment of existing rail line	Development increases existing rail noise levels *and* resulting rail noise levels exceed:		
	65 $L_{Aeq,15hr}$	60 $L_{Aeq,9hr}$	
	85 L_{Amax}	85 L_{Amax}	

Note: 1) Specified noise trigger levels refer to noise from rail transportation only and do not include ambient noise from other sources. However, they refer to noise from all rail traffic at the receiver location, not only noise due to the specific rail project under consideration.
2) The noise level values represent external levels except where otherwise stated.
3) 'Residential' typically means any residential premises located in a zone as defined in a planning instrument that permits new residential land use as a primary use. Where there is doubt as to the status of the residential land use, the relevant planning authority should be consulted.

It is important to note that to trigger an assessment of rail noise impacts, both the absolute level of rail noise defined in the table and an increase in rail noise must be predicted. An increase in existing rail noise levels is defined as an increase of 2dBA or more in L_{Aeq} or an increase of 3dBA or more in L_{Amax}.

6.2 Existing and proposed rail movements

Daily train movements on the Muswellbrook to Newcastle line are taken from ARTC counts undertaken in April 2007 and outlined in Table 6-2 below.

Table 6-2 Rail Movements April 2007

Operation	Day (0700-2200hrs)	Night (2200-0700hrs)
Coal	13	18
Freight	2	2
Passenger	8	2

However since June 2007, ARTC advise that the total number of coal movements has increased to approximately 50-52. Table 6-3 shows the pro-rata increase in coal trains.

Table 6-3 Estimated Current Rail Movements

Operation	Day (0700-2200hrs)	Night (2200-0700hrs)
Coal	20	29
Freight	2	2
Passenger	8	2

6.3 Predicted Increase in Noise Levels

The existing approval for trains from Mt Arthur Coal using the Bayswater Rail Loading facility sets out the following limit on rail movements on the spur.

> 6.1 (c) The peak number of train movements along the Bayswater Rail Loop are limited to 18 per day, except in the event that Drayton mine does not utilise all of its 7 million tonnes per annum, the applicant may take up the spare capacity, with a total limit of 30 train movements per day along the Bayswater rail loop and Antiene rail spur.

It is proposed that the Underground Project would increase the currently approved number of movements from 18 to a maximum of 24 daily. The increase in existing noise LAeq levels as a result of 6 additional movements is shown in Table 6-4 for both daytime and night-time. The following assumptions have been made for this calculation:

- 6 additional movements would be evenly distributed between daytime and night time;
- Passenger trains are removed from this analysis as their contribution to overall L_{Aeq} levels would be negligible; and
- The difference in L_{Aeq} levels between individual coal trains and freight trains would be negligible.

Table 6-4 Calculated Increase in Rail Noise Levels

Operation	Total Number of movements (coal + freight)	Number of proposed additional movements	Increase in Noise Levels (dBA)
Day (0700-2200hrs)	22	3	0.6
Night (2200-0700hrs)	31	3	0.4

As a worst-case sensitivity analysis, if the total number of additional movements is assumed to take place entirely in either the daytime or the night-time period, and using existing counts pre April 2007, the noise increase would be as shown in Table 6-5.

Table 6-6 Calculated Increase in Rail Noise Levels

Operation	Total Number of movements (coal + freight)	Number of proposed additional movements	Increase in Noise Levels (dBA)
Day (0700-2200hrs)	15	6	1.5
Night (2200-0700hrs)	20	6	1.1

In both cases the predicted increase in noise levels is less than the 2dBA required to trigger further assessment of rail noise impacts. With regard to maximum L_{Amax} noise levels there would be no increase in the existing levels as the proposed trains would be the same type as are currently in operation.

7 NOISE MANAGEMENT

Mt Arthur Coal has an extensive noise management program in place for its existing operations and has applied many examples of best practice to achieve compliance with its current approved noise criteria.

Noise modelling indicates that the Underground Project is predicted to comply with the project specific noise goals at all locations except Antiene, where noise levels from train passbys at night are expected to result in exceedances of the project-specific noise goals. These exceedances will only occur for less than 10% of the night time period while Mt Arthur Coal trains are travelling on the line. At all other times, the operational noise level is predicted to be within the project specific noise criteria at Antiene.

In east Antiene, noise levels from rail passbys at night are expected to result in an exceedance of the assumed project-specific acquisition criteria at one residence (Location 1). Again, these exceedances are predicted to occur for less than 10% of the night-time period and only during adverse weather conditions. Mt Arthur Coal has engaged with this landholder regarding potential noise impacts from the project.

Noise impacts due to rail passbys are calculated from measured noise levels of the existing trains and wagons used by Mt Arthur Coal travelling at 20 kph. While this is representative of a typical operating scenario, and while Mt Arthur Coal currently utilise best available low noise rail technology, future advances in low noise rail or other technology may allow for variations to the operating conditions while maintaining or reducing rail noise impacts in Antiene. Mt Arthur Coal will continue to review opportunities to use improved noise management technology as part of ongoing improvement in rail noise management. Train noise levels will be a factor in Mt Arthur Coal's assessment of new contracts for rail transportation of Mt Arthur coal on the Antiene spur line.

To this end, to minimise the impact of rail passby noise, Mt Arthur Coal commit to manage rail noise impacts to meet the assumed project-specific acquisition criteria at all locations (except Location 1) for the 15 minute periods when Mt Arthur Coal trains are passing on the line. This may be achieved through implementation of a range of controls, including use of low noise rail or other technology, and/or through operational controls on rail speed. To date, this approach has resulted in a reduction in rail noise impacts at residences in east Antiene of approximately 4dBA from those previously experienced and has proved an effective means of controlling rail noise from train movements associated with Mt Arthur Coal.

Mt Arthur Coal will also aim to limit potential operational noise impacts associated with the combined underground and open cut operations through continued application of best practice noise management measures. Key measures currently being successfully implemented at Mt Arthur Coal and that will be applied to future operations include:

- Planning controls such as considering seasonal influences on noise impacts during annual operational planning, to avoid exposed areas in high risk periods;
- Operational controls such as separate day and night time dumping areas, use of shielded dumping areas in adverse weather conditions and use of real-time noise monitoring data to assist operational staff in proactive management of noise impacts;
- Engineering controls including noise attenuation equipment on higher risk (ie. noisy) mobile and stationary equipment; and
- Use of real-time and directional noise monitoring equipment to provide high quality data to assess compliance and assist with minimising impacts.

Mt Arthur Coal has an extensive noise monitoring system in place, including real-time directional noise monitoring and targeted noise monitoring. This system will provide adequate coverage to manage and assess compliance of the Underground Project with the project-specific noise goals. The monitoring system will be subject to ongoing reviews over the life of the project, with any changes undertaken in consultation with DECC and DoP. In order to assess the compliance of rail passby noise with the assumed project-specific acquisition goals, Mt Arthur Coal will undertake annual rail noise monitoring in east Antiene for a period of three years. Following the initial three year period, the monitoring program will be reviewed to assess the need for ongoing monitoring.

8 CONCLUSION

Noise and vibration impacts from the proposed Underground Project have been assessed in accordance with the Director General's Requirements for the Environmental Assessment, the *NSW Industrial Noise Policy (INP)*, appropriate environmental standards and, where relevant, the Minister's development consent conditions for the existing operations. The following conclusions can be drawn from that analysis:

- Based on directional noise measurements at five residences and subsequent comparison with noise levels predicted using the ENM noise model and temperature inversion data from the Bengalla inversion tower, it was shown that predicted noise levels were overestimated. A calibration exercise demonstrated that calculating noise levels using a temperature inversion strength of 4°C/100m provided a more accurate prediction of noise levels than using the Bengalla meteorological data, while still over-predicting measured levels. This approach is more conservative than that outlined in the *INP*, where a temperature inversion strength of 3°C/100m is recommended.

- Noise impacts from proposed Underground Project operations, upgrading of the existing CHPP, and rail loading and movements were modelled. Modelling of train movements included all movements associated with all of Mt Arthur Coal's approved and proposed operations. Calculated noise levels for the above operations alone were shown to be generally within the project-specific noise criterion for the project for all modelled scenarios. The exception to this is at Antiene, where an exceedance of 3dBA is predicted as a worst-case during less than 10% of the night-time period when trains are travelling on the line.

- When considered in conjunction with noise from existing Mt Arthur Coal operations and proposed operations in the South Pit Extension, predicted operational noise levels from the combined Mt Arthur Coal operational at previously-identified residences generally exceed the project-specific noise criterion. However, the current MAN and assumed project-specific acquisition criterion is not predicted to be exceeded at any of these residences.

- Five new residential locations were identified east of the proposal, near the New England Highway. These locations are predicted to be impacted by rail noise but not by noise from mining operations. Noise levels from rail passbys are generally within assumed project-specific acquisition criterion at those locations, with the exception of one residence, where levels during rail passbys at night are predicted to be up to 4dBA above the assumed project-specific acquisition criterion. This impact will occur for less than 10% of the night-time period and due to adoption of new train technology and a commitment from Mt Arthur Coal to manage train noise impacts, the passby noise associated with each train movement will be reduced from that previously experienced.

- Calculated cumulative noise levels over the entire night-time period are within the relevant cumulative amenity criterion at all residences, with the exception of one residence in East Antiene which is predicted to be affected by rail movement noise only.

- Proposed traffic movements were assessed, both specific to this proposal and cumulative with other approved and proposed operations using the local road network. The assessment found that the relevant noise goals will be met for all traffic impact periods.

- Impacts from additional train movements on the main Muswellbrook to Newcastle line were found to be negligible and no further assessment warranted under the Interim Rail Noise Guidelines recently published by DECC.

Mt Arthur Coal has an extensive noise management program in place for its existing operations and strives for best practice management of noise impacts and, where possible, to manage noise impacts to the project-specific noise goals for the project. The only aspect of the Underground Project that is predicted to result in exceedances of the project-specific noise goals is train movements. To minimise the impact of train movement noise Mt Arthur Coal propose to manage rail noise impacts to meet the assumed project-specific acquisition criteria at all locations (except Location 1) for the 15 minute periods when Mt Arthur Coal trains are passing on the line. This is predicted to occur for less than 10% of the night-time period during adverse weather conditions and may be achieved through implementation of a number of controls, including use of low noise rail or other technology, or through operational controls on rail speed. This will not only reduce noise impacts associated with the Underground Project but will also reduce the impacts of noise from train movements from Mt Arthur Coal by approximately 4dBA.

Version	Status	Date	Prepared by	Checked by
A	Draft	2 March 2007	Tim Dean	Rob Bullen
B	Draft	2 April 2007	Tim Dean	Rob Bullen
C	Draft	1 May 2007	Tim Dean	Rob Bullen
D	Draft	30 June 2007	Tim Dean	Rob Bullen
E	Draft	22 August 2007	Tim Dean	Rob Bullen
F	FINAL	11 October 2007	Tim Dean	Rob Bullen

APPENDIX A

GLOSSARY OF TERMS

GLOSSARY

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 overleaf, 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.

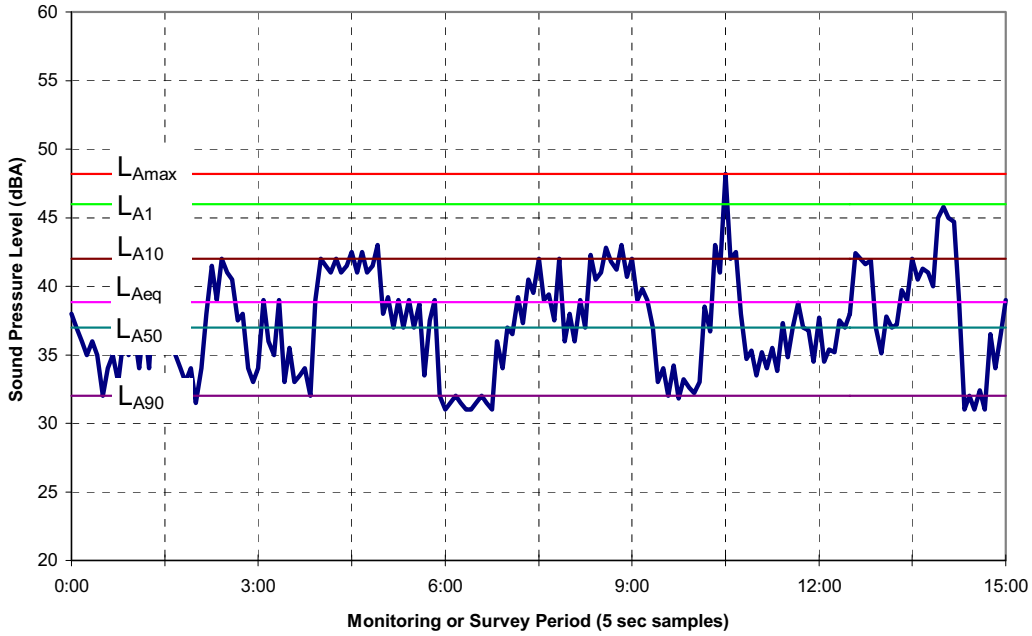
L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise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

L_{A50} – The L_{A50} level is the noise level which is exceeded for 50% of the sample period. During the sample period, the noise level is below the L_{A50} level for 50% of the time.

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.

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 10^{th} percentile (lowest 10^{th} percent) background level (L_{A90}) for each period.

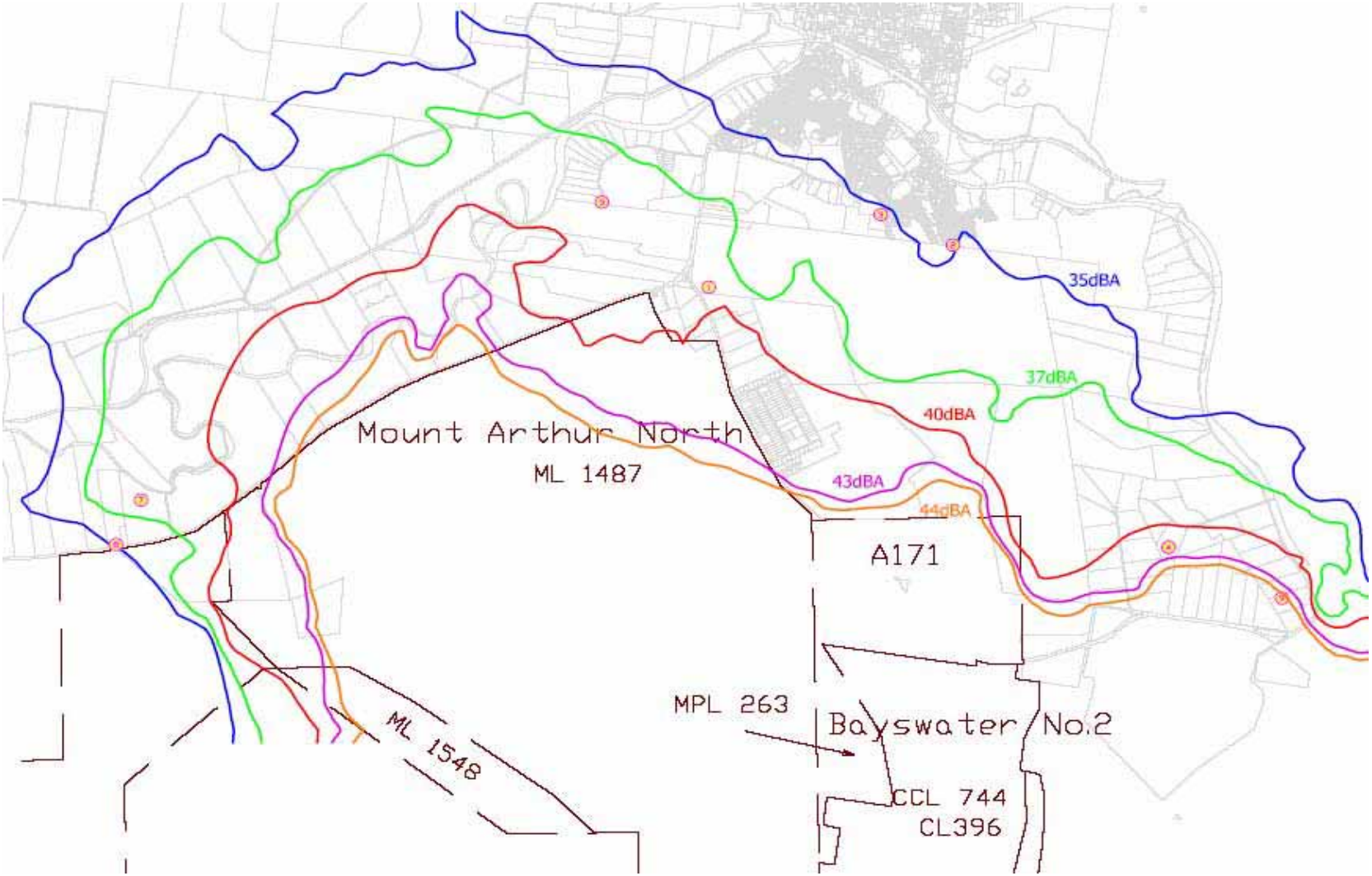
RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period **–** daytime, evening and night time.


60
55
50
45
40
35
30
25
20
Sound Pressure Level (dBA)
LAmax
LA1
LA10
LAeq
LA50
LA90
0:00
3:00
6:00
9:00
12:00
15:00
Monitoring or Survey Period (5 sec samples)

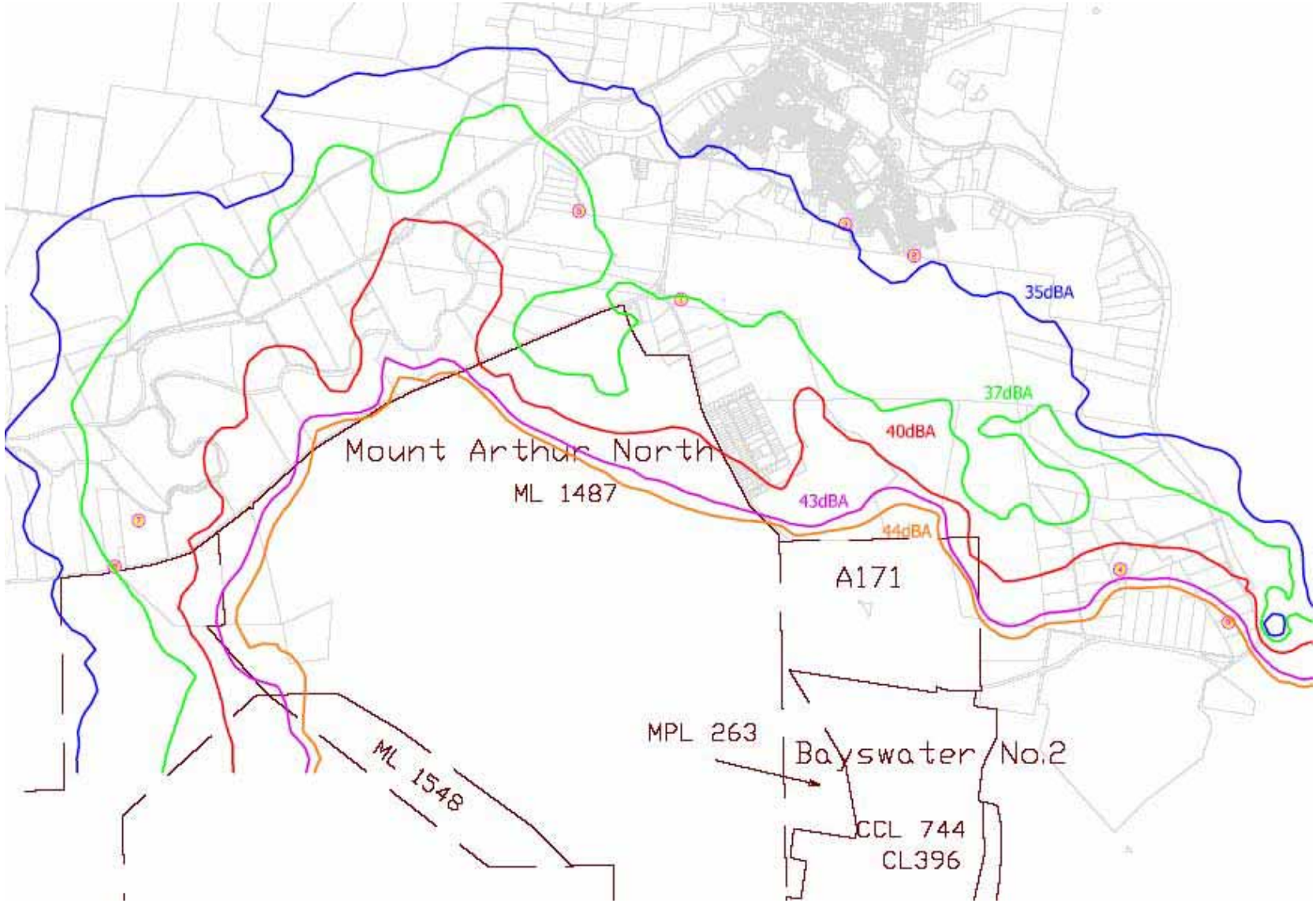
APPENDIX B

NOISE CONTOURS

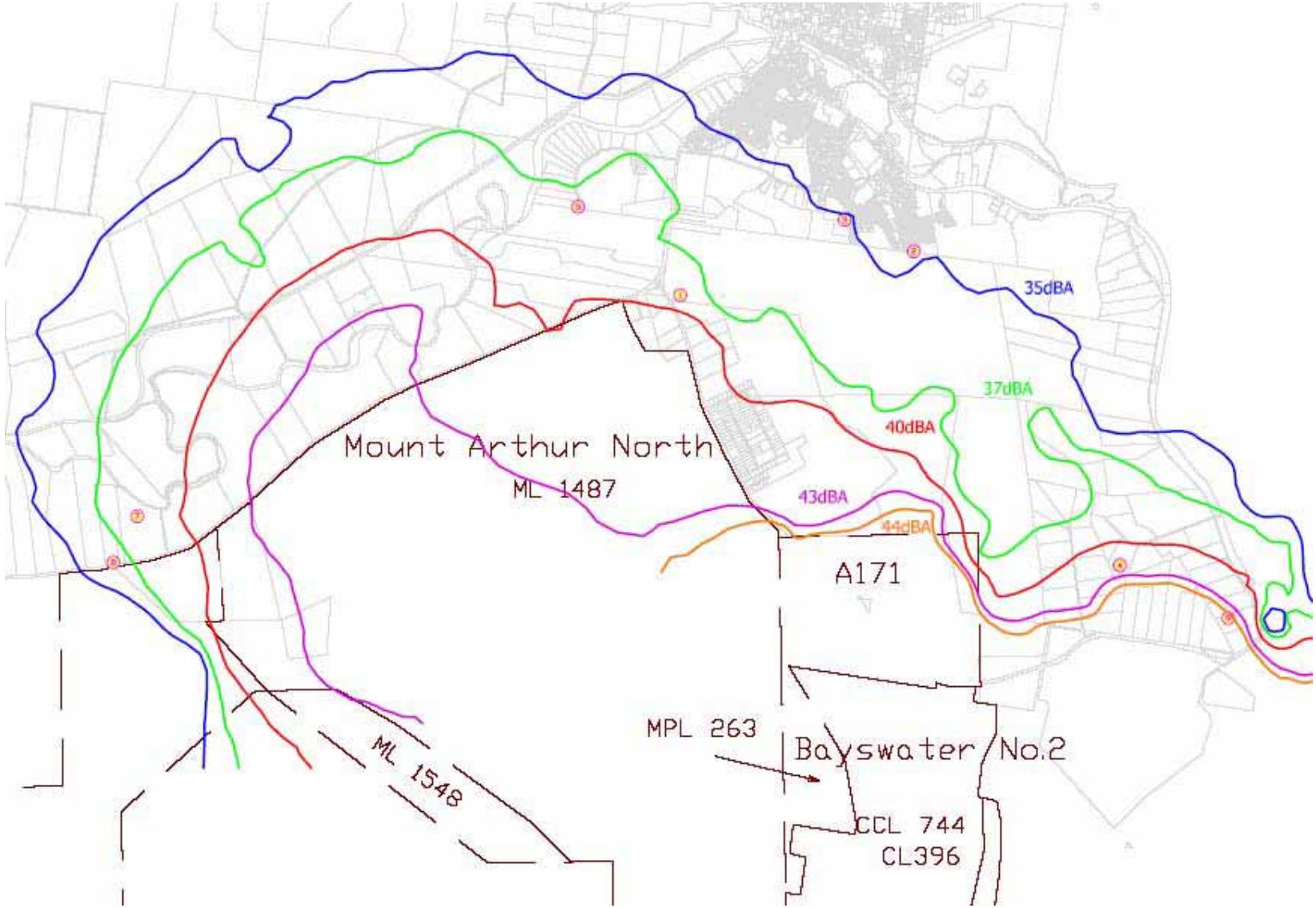
Noise Contours Year 5



Noise Contours Year 10



Noise Contours Year 15

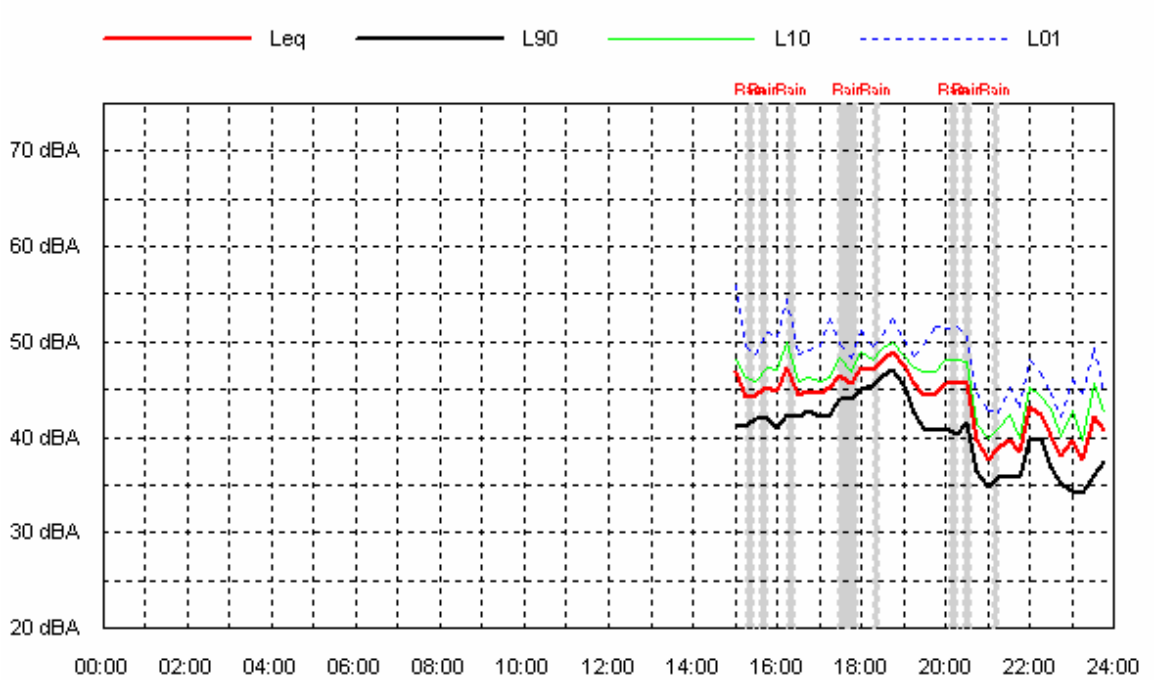


APPENDIX C

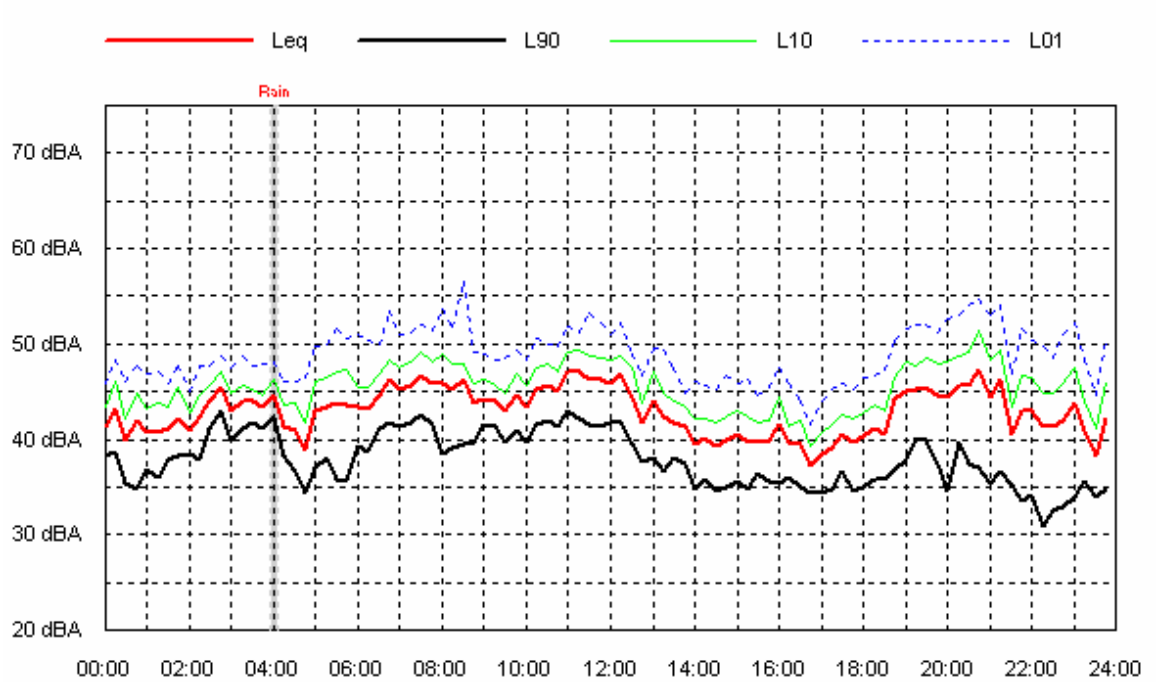
NOISE MEASUREMENT RESULTS

Measurement Location: Horder

Thursday, 13 April 06

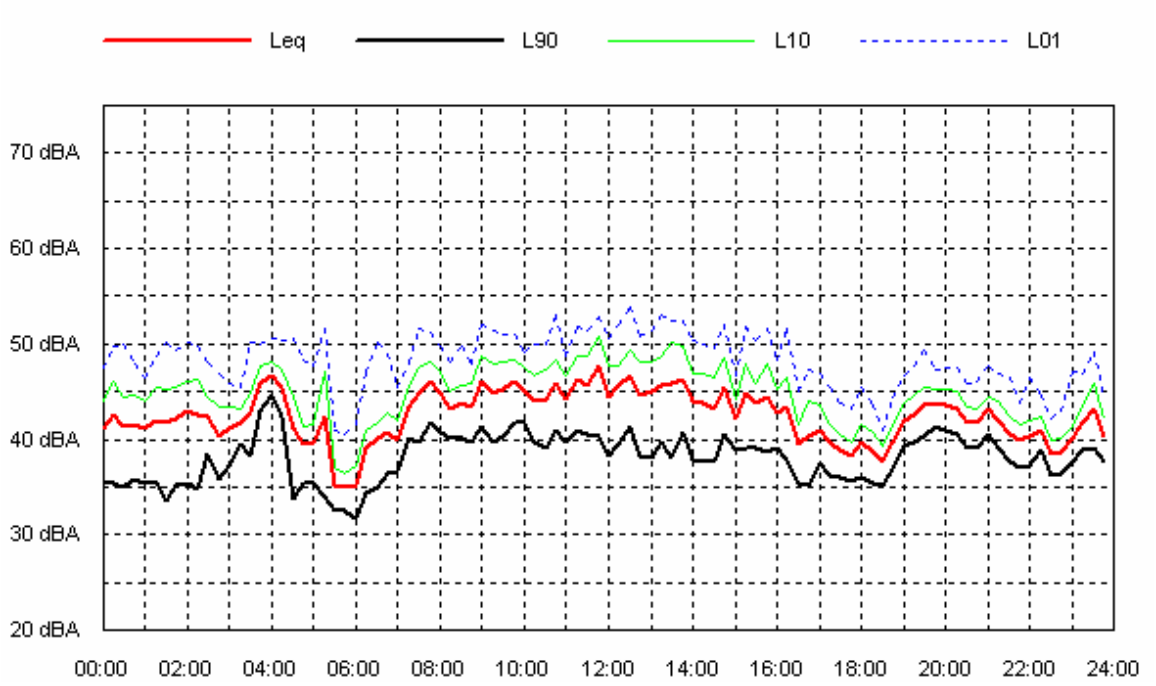


Friday, 14 April 06

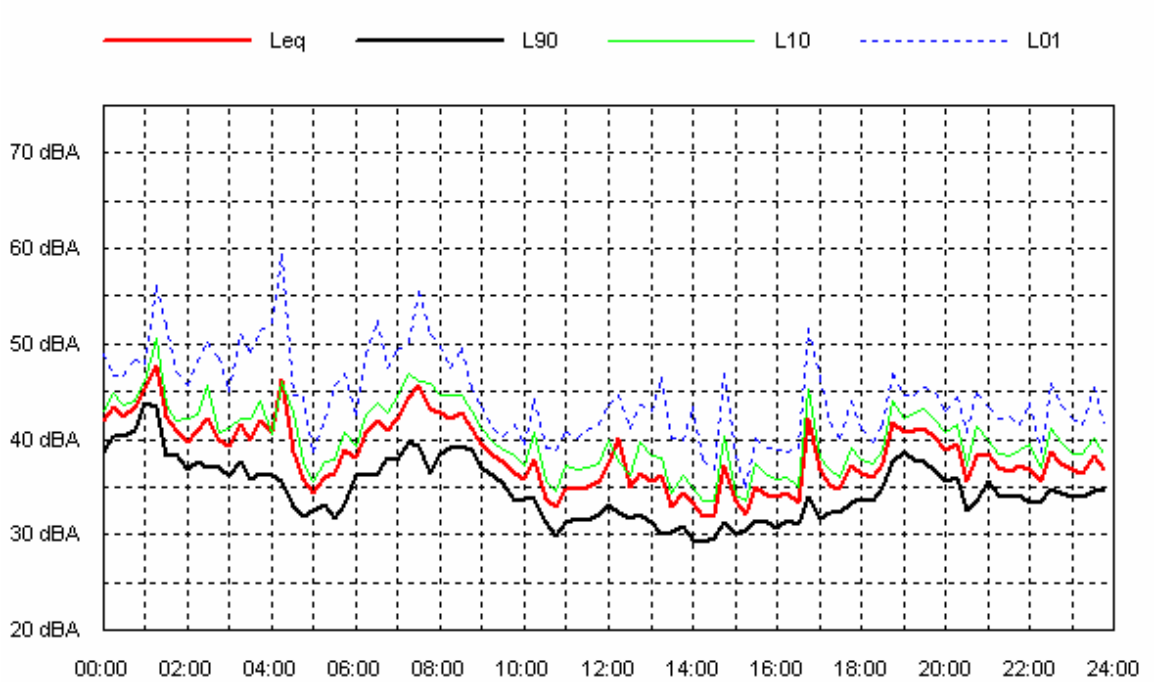


Measurement Location: Horder

Saturday, 15 April 06



Sunday, 16 April 06



Measurement Location: Horder

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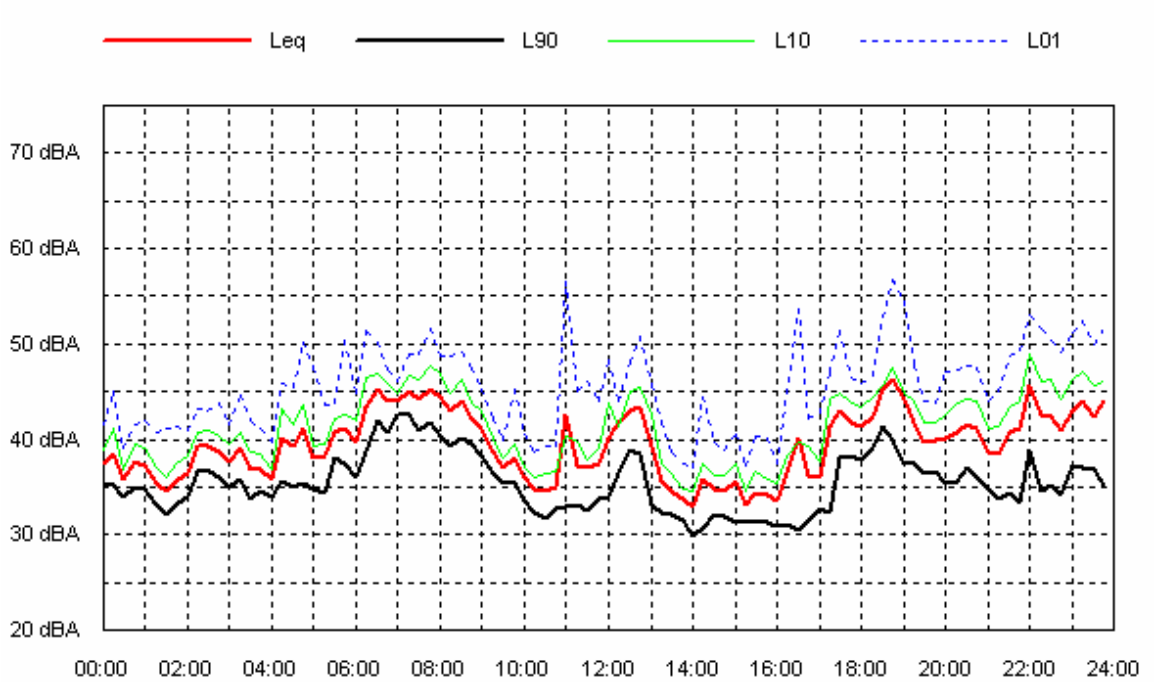

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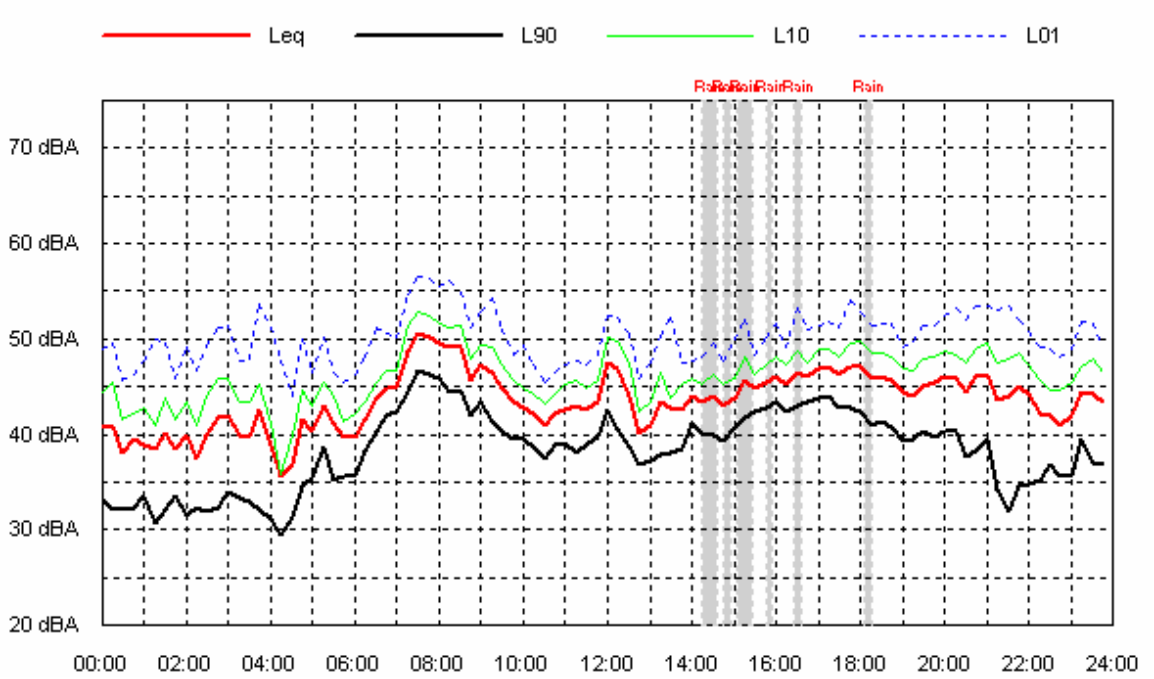

Measurement Location: Horder

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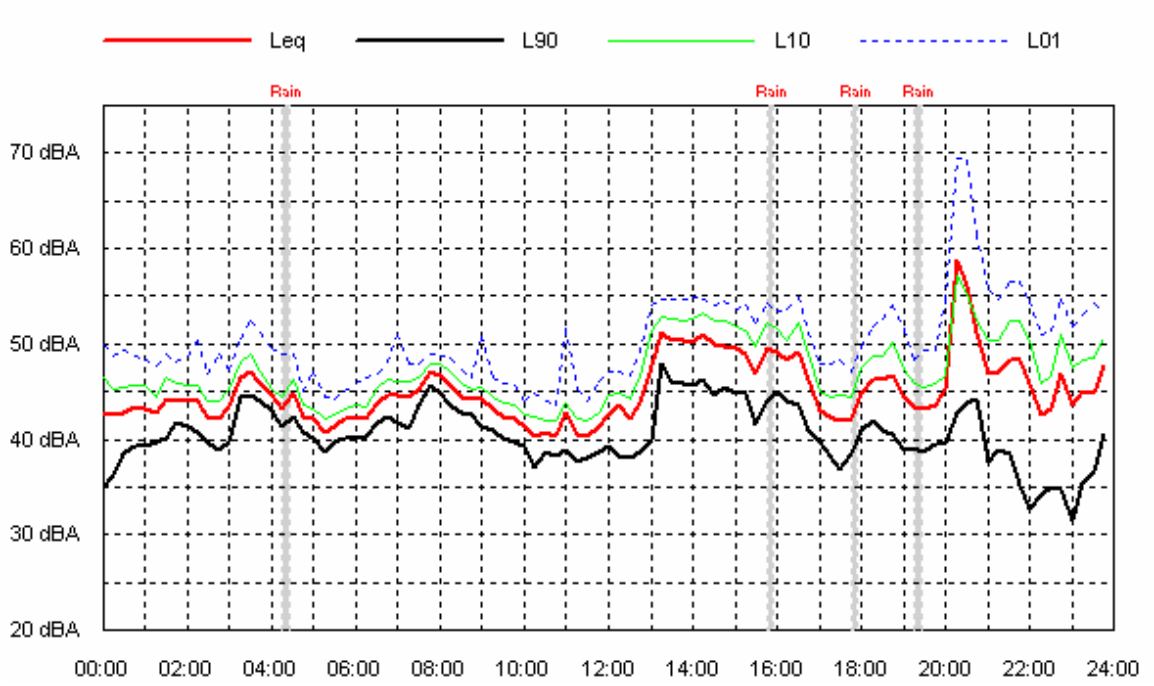
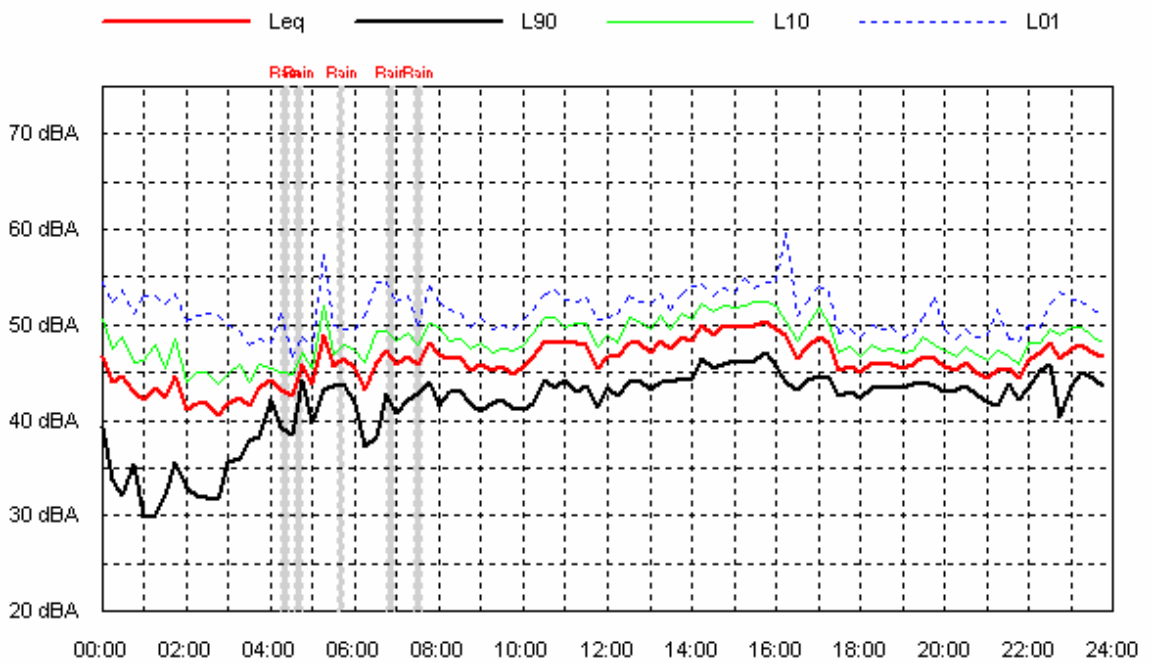
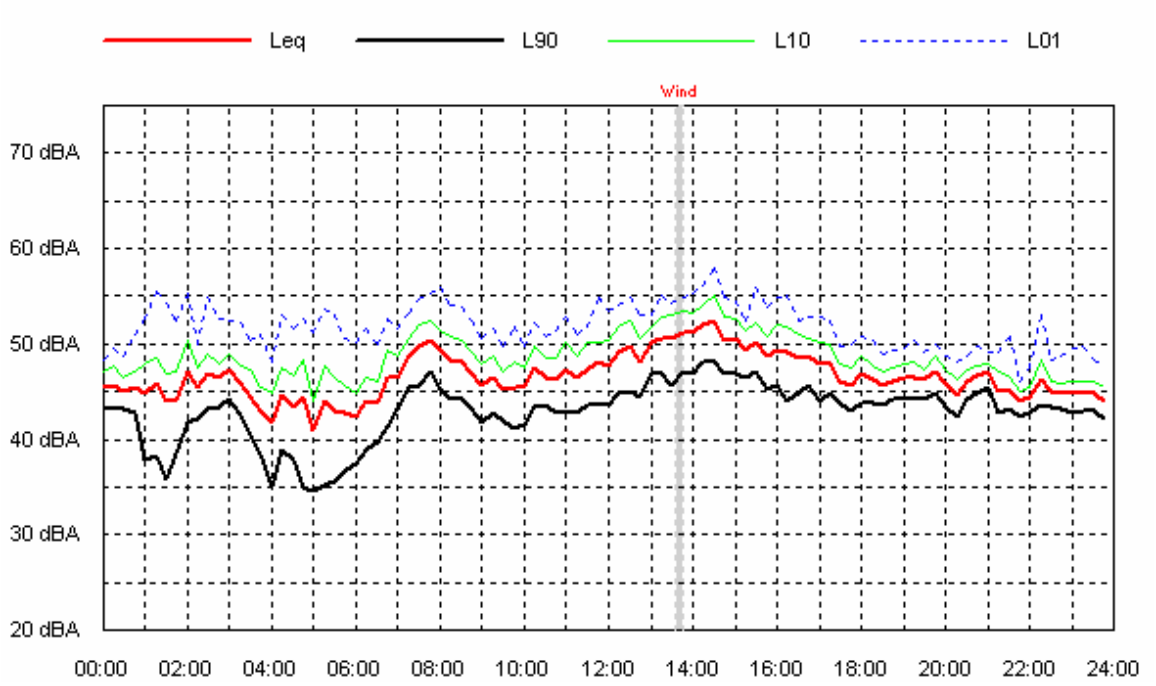


Thursday, 20 April 06

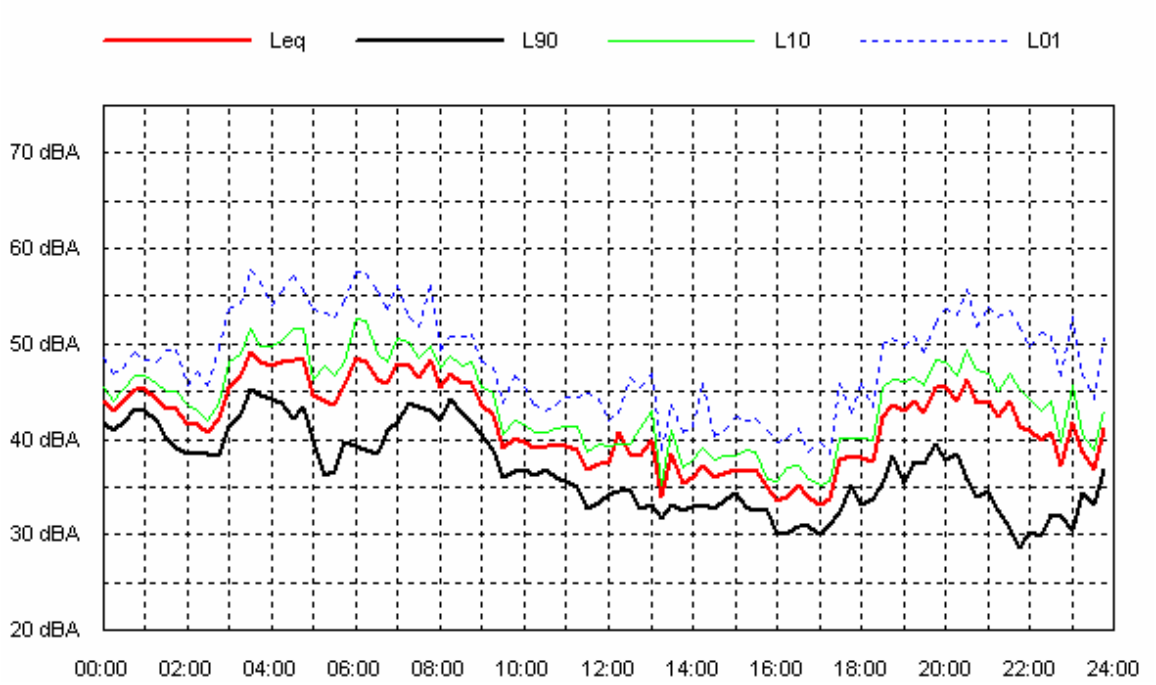


Measurement Location: Horder

Friday, 21 April 06

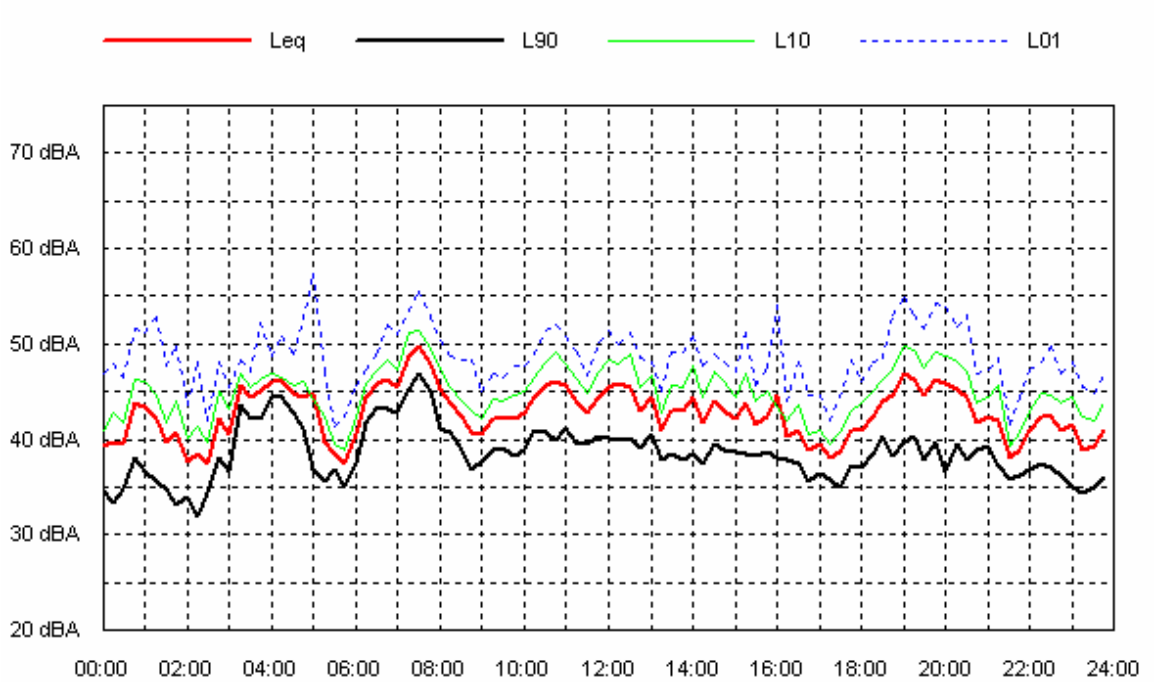


Saturday, 22 April 06

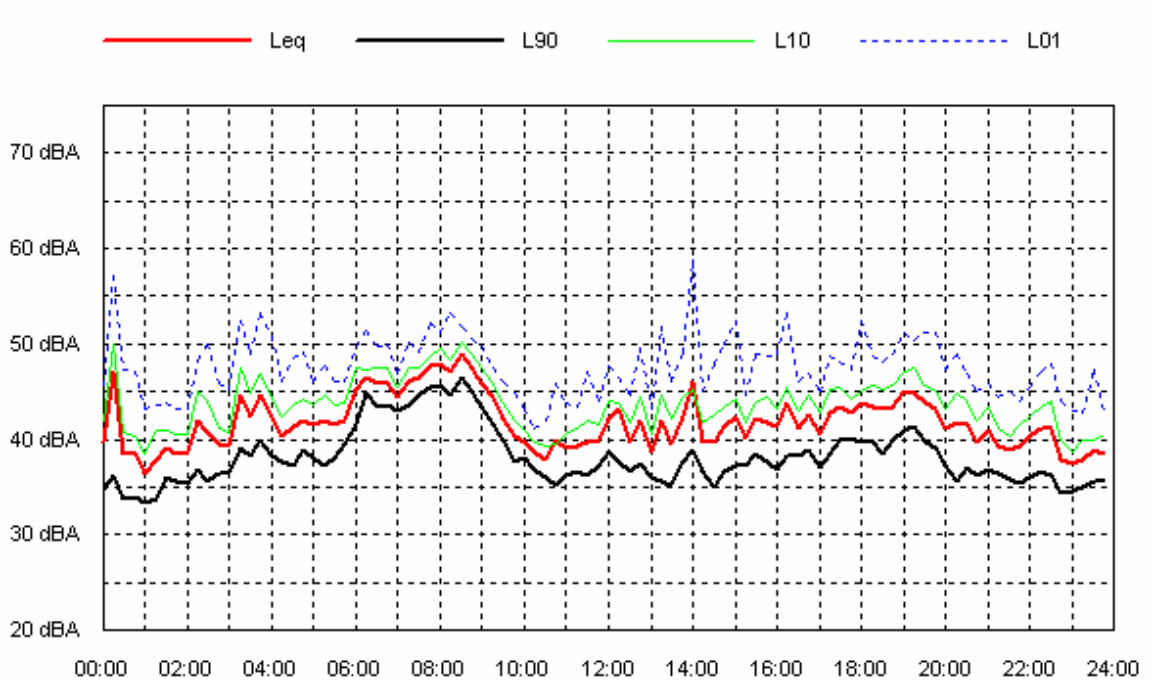


Measurement Location: Horder

Sunday, 23 April 06

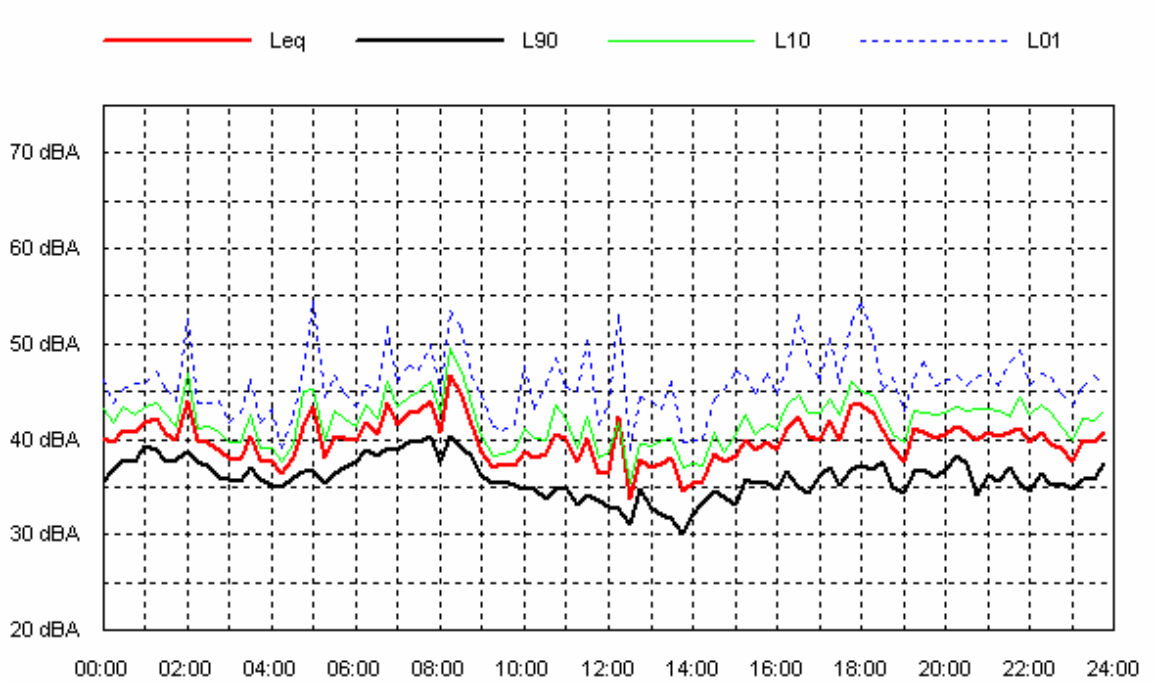


Monday, 24 April 06



Measurement Location: Horder

Tuesday, 25 April 06



Wednesday, 26 April 06