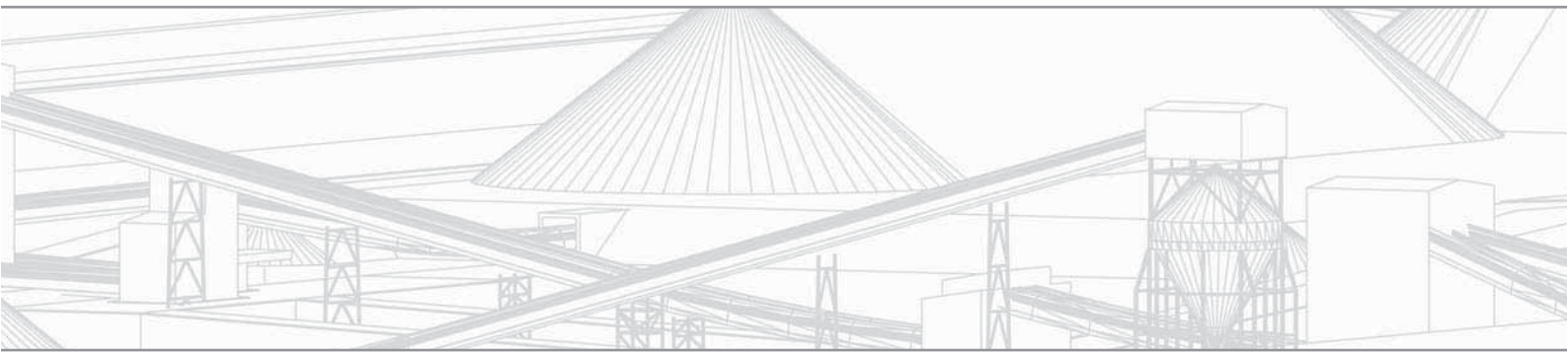
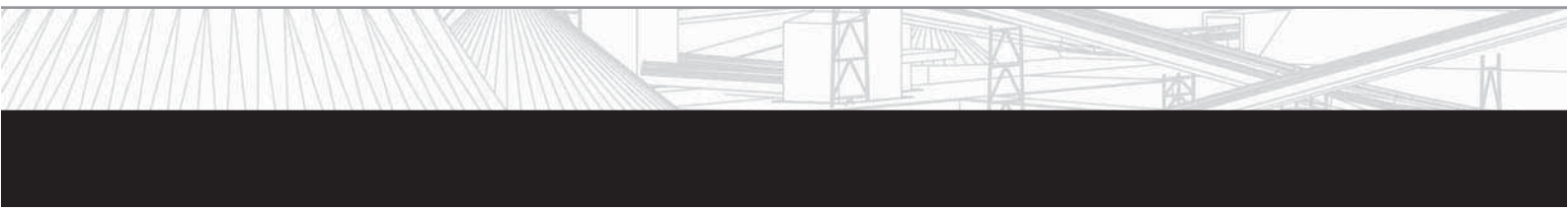


APPENDIX D

NOISE IMPACT ASSESSMENT



ANVIL HILL COAL MINE

MODIFICATION TO PROJECT APPROVAL

ACOUSTICS AND AIR

REPORT NO. 07257-EW
VERSION C

WILKINSON MURRAY

ANVIL HILL COAL MINE

MODIFICATION TO PROJECT APPROVAL

REPORT NO. 07257-EW
VERSION C

MARCH 2008

PREPARED FOR

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1 INTRODUCTION

1.1 Background

Project Approval (06_0014) was granted by the Minister for Planning on 7 June 2007 to construct and operate the Anvil Hill open cut coal mine (Anvil Hill Mine). The Project Approval is supported by the "Anvil Hill Project Environmental Assessment" (Umwelt, 2006) dated August 2006 (Anvil Hill EA).

Anvil Hill Mine is owned by Xstrata Mangoola Pty Limited (Xstrata) and is located near Wybong, approximately 20 kilometres (km) west of Muswellbrook and approximately 10 km north of Denman in the Muswellbrook Local Government Area.

The Anvil Hill Mine will extract coal from an undeveloped coal reserve of approximately 150 Million tonnes (Mt). Up to 10.5 Million tonnes per annum (Mtpa) Run of Mine coal will be extracted and processed for a period of up to 21 years from the granting of a mining lease.

1.2 Proposed Modification

Xstrata proposes to apply to the Minister for Planning for a modification to the Project Approval under section 75W of the Environmental Planning & Assessment Act 1979 (EP&A Act) to allow the following Early Works to commence concurrently with the required Wybong Road Upgrade:

- The commencement of the Northern Access Road and associated intersection;
- Establish a temporary site office and compound;
- Excavate a borrow pit for the supply of select material for civil works and disposal of unsuitable material;
- Establish a construction pad for the Coal Handling and Preparation Plant (CHPP); and
- Develop temporary access roads between the site office, borrow pit and CHPP pad.

The proposed modification is generally consistent with that currently approved, although the Modification would allow the Wybong Road Upgrade to occur concurrently and prior to the construction of the Bengalla Link Road (Stage 2). Following the construction of the Bengalla Link Road (Stage 2), the remainder of the construction and operation of the Anvil Hill Mine will access site via this road.

This report has been prepared as part of the Modification Environmental Assessment (Modification EA) to support the application for modification. It details the extent of potential noise impacts associated with the following activities:

- Construction traffic using the alternative access route, both from employees' cars and heavy vehicles; and
- Early works construction.

Noise and vibration impacts have been assessed in accordance with the NSW Government's *Environmental Criteria for Road Traffic Noise (ECRTN)* and the *RTA Environmental Noise Management Manual (ENNM)*. In addition, the Department of Environment & Climate Change (DECC) *NSW Industrial Noise Policy (INP)* and *Environmental Noise Control Manual (ENCM)* have been employed in the assessment of construction noise impacts.

Noise impacts have been assessed at residences identified in the Anvil Hill Project Approval with the exception of residences 75A, 138, 186A, and 186B. These residences have been acquired by Xstrata since granting of the Anvil Hill Project Approval.

2 TRAFFIC NOISE ASSESSMENT

2.1 Traffic Noise Criteria

Criteria for assessment of noise from traffic on public roads are set out in the *ECRTN*. The relevant criteria are set out in Table 2-1. In terms of the *ECRTN* road classifications, the Golden Highway would be considered a "freeway/arterial" road and Wybong Road, Kayuga Road and Aberdeen Street considered "local" roads.

Table 2-1 Criteria for Traffic Noise – Residences

Type of Development	Noise Level Criterion		Where Criteria are already Exceeded
	Daytime (0700-2200hrs)	Night-time (220-0700hrs)	
Land use developments with potential to create additional traffic on existing freeways/arterials	$L_{Aeq,15hr}$ 60dBA	$L_{Aeq,9hr}$ 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	

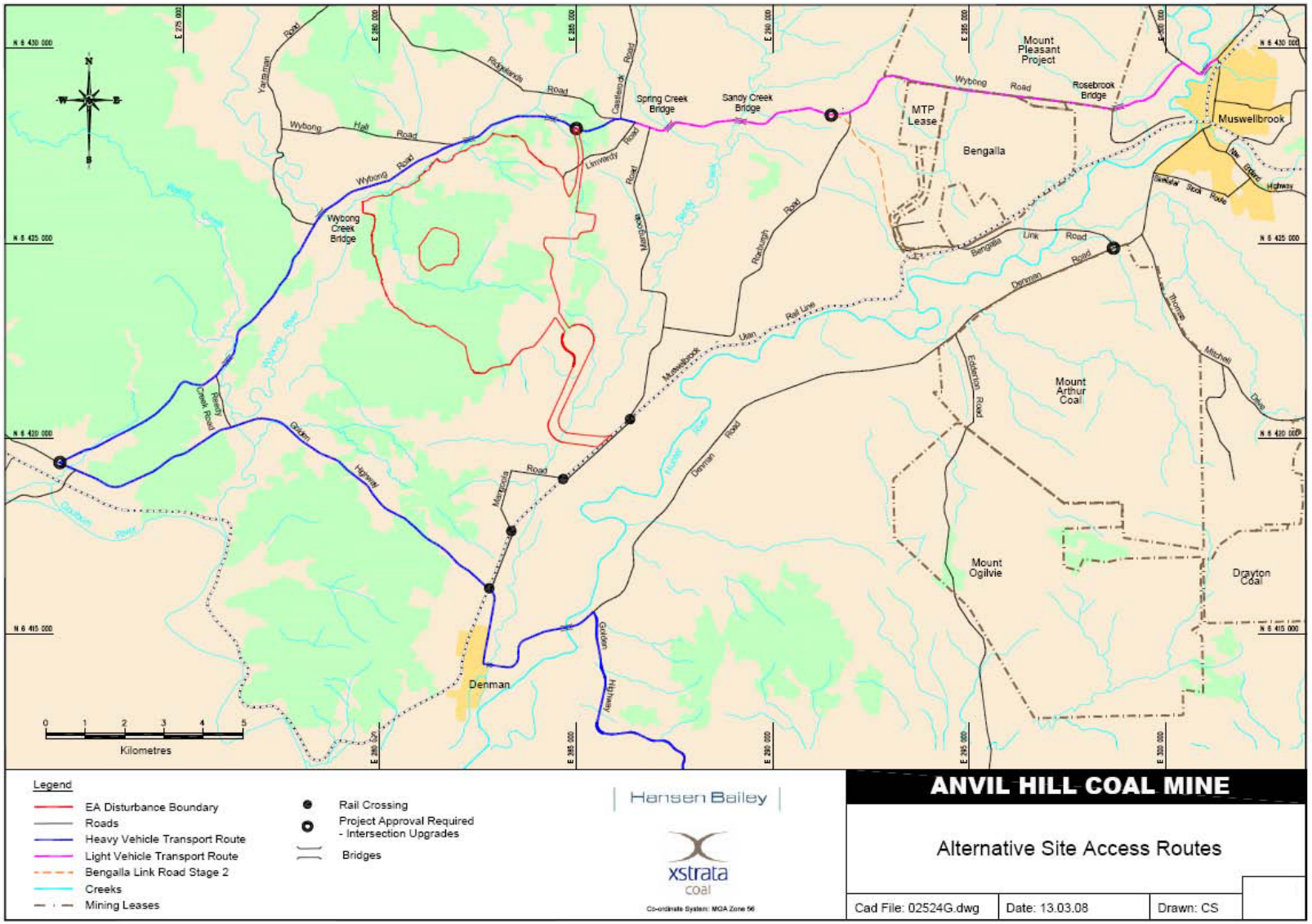
2.2 Proposed Construction Traffic Routes

Two routes are proposed for the duration of the Early Works anticipated to take approximately 8 months. The proposed routes are shown in Figure 2-1 below.

Route A (heavy vehicle route) would carry all heavy vehicles arriving to and departing from the Anvil Hill Mine. A proportion of light traffic (35%) would also utilise this route. Traffic would arrive from the Golden Highway and turn right onto Wybong Road before arriving on site via the Anvil Hill Mine Northern access road.

Route B (light vehicle route) would be used for the transportation of employees and construction workers to and from site. Traffic would arrive from the New England Highway and turn into Aberdeen Street at Muswellbrook. From here traffic would travel over Kayuga Bridge on Kayuga Road and turn left onto Wybong Road before entering the site via the Northern access road.

Figure 2-1 Proposed Construction Traffic Routes



2.3 Existing Traffic Flows

Construction activities would be limited to 0700hrs to 1800hrs from Monday to Friday and 0800hrs to 1200hrs on Saturdays. The appropriate hours for assessment of traffic noise under the *ECRTN* are shown in Table 2-2 below.

Table 2-2 Appropriate ECRTN Assessment Periods

Road	Classification	Period of Assessment	
		Daytime	Night time
Wybong Rd	Local	1800-1900hrs	0600-0700hrs
Kayuga Rd	Local	1800-1900hrs	0600-0700hrs
Aberdeen St	Local	1800-1900hrs	0600-0700hrs
Golden Hwy	Arterial/Freeway	0700-2200hrs	2200hrs-0700hrs

Existing traffic counts were undertaken by PB in 2006 and 2007 at various locations on the local road network covering both proposed construction traffic routes. Counters were in position for at least one week and capable of segregating flows into the Ausroads vehicle classification system. Traffic counter locations are shown in Figure 2-2 as supplied by PB.

Figure 2-2 Traffic Counter Locations

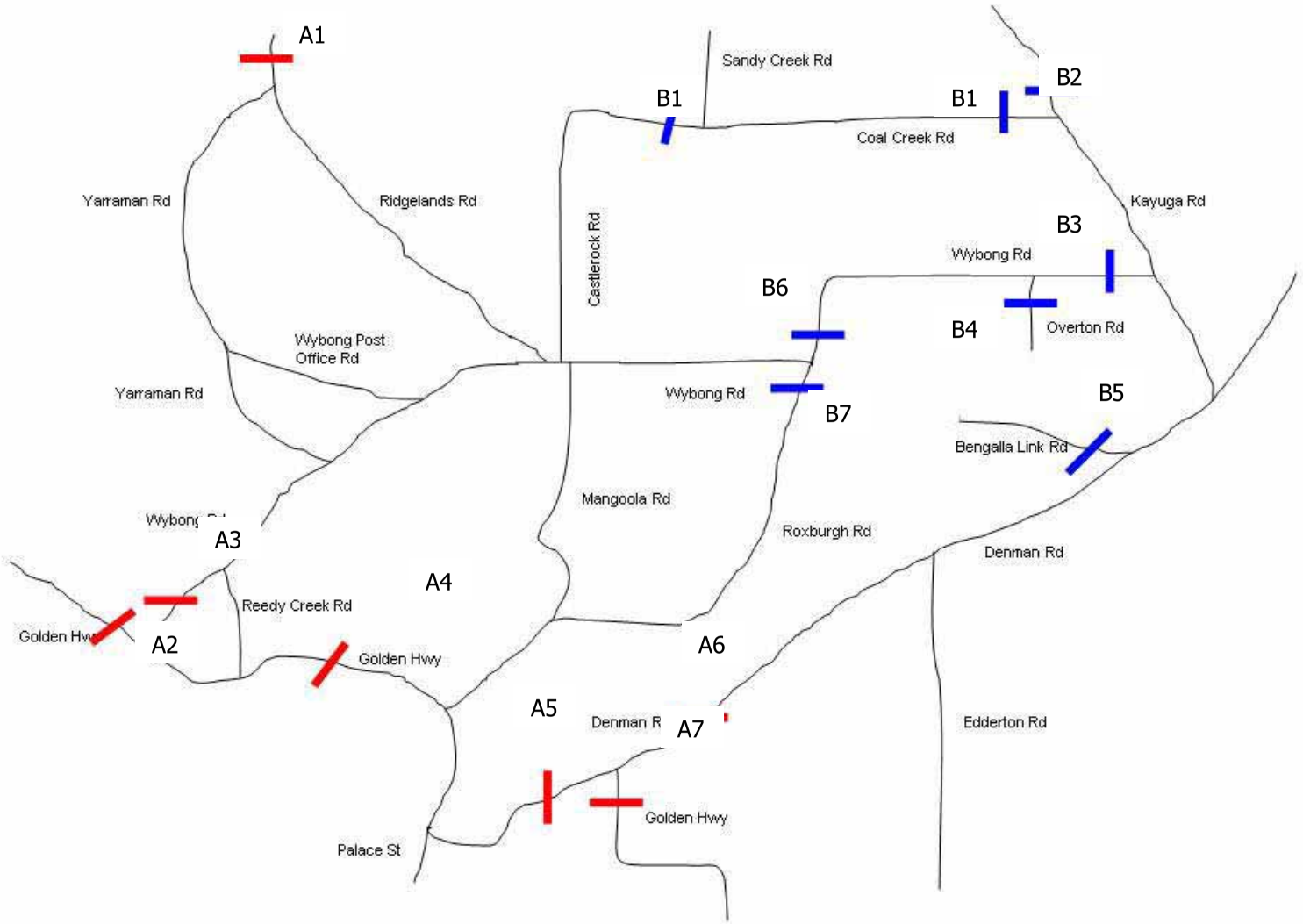


Table 2-3 and Table 2-4 outline the measured traffic flows on various roads under assessment for the periods outlined in Table 2-2 above for Route A and Route B respectively. The total traffic volume for each period under assessment is provided as a five day hourly average. The following conservative assumptions have been made in deriving existing traffic flows:

- Traffic flows on Aberdeen Street and Kayuga Road are identical and comprised of measured flows from counters B1, B2 and B3.
- Traffic flows on Wybong Road west of Roxburgh Road are the combined flows of counters B6 heading west only and B7 heading north only.
- There is no net gain or reduction in traffic flow from Mangoola Road, either from Wybong Road or the Golden Highway.
- There is no net gain or reduction in traffic flow from Yarraman Road.

Table 2-3 Existing Traffic Volumes Route A – Heavy Vehicle Route

	Daytime		Night-time	
	ALL	**%HV[1]**	**ALL**	**%HV[1]**
Aberdeen St / Kayuga Rd	94	6.4%	100	9.7%
Wybong Rd east of Bengalla Mine	65	7.4%	55	9.9%
Wybong Rd west of Bengalla Mine	46	7.8%	41	12.8%
Wybong Rd west of Roxburgh Rd	50	7.5%	48	10.9%

Note 1) HV = Heavy Vehicles

Table 2-4 Existing Traffic Volumes Route B – Light Vehicle Route

	Daytime		Night-time	
	ALL	**%HV[1]**	**ALL**	**%HV[1]**
Golden Hwy south of Denman Rd	1443	18.1%	262	28.6%
Golden Hwy west of Denman Rd	3260	13.6%	586	19.3%
Golden Hwy east of Wybong Rd	2235	14.4%	237	32.5%
Wybong Rd north of Golden Hwy	14	21.4%	22	13.6%

Note 1) HV = Heavy Vehicles

2.4 Proposed Construction Traffic Flows

2.4.1 Route A – Heavy Vehicle Route

This route is primarily for heavy vehicles although a proportion of construction workers would also travel to site this way.

The following assumptions have been made with regards to distribution of traffic flows:

- Heavy vehicle movements would be distributed evenly over the daytime period, with a maximum of 10% of the total daily movements occurring in any one hourly period. This would, however, mean that a small number of trucks could be utilising the local road network in order to arrive at site at 0700hrs. Technically this period would be classified as night-time in the ECRTN and that small number of potential movements has therefore been assessed as such. No other night-time movements are proposed beyond those identified as possibly occurring during 0600-0700hrs. It is assumed that any heavy vehicle movements during the night-time period would be one way (arrival) only as they would not depart from the site before 0700hrs.
- All light vehicle movements would take place in the periods 0600-0700hrs and 1800-1900hrs.

Taking into account the above assumptions, the maximum volumes of daily traffic that would use Route A are listed in Table 2-5 below during each month of the construction period for appropriate assessment periods.

Table 2-5 Route A Proposed Maximum Construction Traffic Movements

Month	Maximum Daily		0600-0700hrs		1800-1900hrs		0700-2200hrs	
	LV	HV	LV	HV	LV	HV	LV	HV
Month 1	2	0	1	0	1	0	1	0
Month 2	6	38	3	2	3	4	3	34
Month 3	16	56	8	3	8	6	8	50
Month 4	14	40	7	2	7	4	7	36
Month 5	12	2	6	1	6	1	6	1
Month 6	10	102	5	5	5	10	5	92
Month 7	8	12	4	1	4	1	4	11
Month 8	4	12	2	1	2	1	2	11

2.4.2 Route B – Light Vehicle Route

Route B would carry approximately 65% of construction workers' cars and no heavy vehicles movements associated with the Early Works are proposed. The approximate volume of daily traffic that would use Route B is listed in Table 2-6 below during each month of the construction period for appropriate assessment periods. Proposed volumes are shown as one way as employee's vehicles would remain on site for the duration of the shift. It is assumed that all traffic would arrive during the period 0600-0700hrs and depart during the period 1800-1900hrs. Any traffic flow between the nominated arrival and departure time would be negligible and as such no assessment is warranted at other times.

Table 2-6 Route B Proposed Construction Traffic Movements (1 way)

Month	LV
Month 1	3
Month 2	5
Month 3	15
Month 4	14
Month 5	12
Month 6	9
Month 7	7
Month 8	5

2.5 Assessment Methodology

Rather than undertake detailed noise modelling of each section of road it is considered appropriate to first determine if there is a significant increase (i.e. greater than 2dBA) in traffic noise levels during relevant assessment periods. This methodology is consistent with the approach outlined in the ECRTN, where an increase of up to 2dBA over existing levels is deemed to be acceptable.

As no changes are proposed to road alignment, traffic speed or pavement surface the increase in traffic noise levels becomes solely a function of the proportional increase in vehicle flows under the Calculation of Road Traffic Noise (CORTN) prediction algorithm, and hence increase in noise levels can be predicted without detailed modelling.

For those sections of road where an increase in traffic noise levels greater than 2dBA over existing levels is predicted, a further calculation would be undertaken to establish the distance from the road at which the appropriate criteria would be met.

2.6 Predicted Increase in Traffic Noise Levels

Using the existing and proposed traffic volumes from Section 2.3 and Section 2.4 the increase in basic traffic noise level can be calculated for all relevant section of road using the CoRTN (Calculation of Road Traffic Noise UK DoE Traffic Noise Prediction Method 1988) prediction algorithms. The following tables outline the predicted increase in traffic noise level during each month of the construction period. An increase of more than 2dBA would mean a potential exceedance of *ECRTN* and a more detailed model would be required to calculate specific noise levels at residences.

2.6.1 Route A – Heavy Vehicle Route 0600-0700hrs

Table 2-7 Wybong Road North of Golden Highway (Route A Counter A3)

Month	Existing Volume		Proposed Volume (Existing plus construction)		Increase in noise level (dBA)
	ALL	%HV	ALL	%HV	
Month 1	22	13.6	23	13.0	0.0
Month 2	22	13.6	27	18.5	1.5
Month 3	22	13.6	33	18.2	2.0
Month 4	22	13.6	31	16.1	1.5
Month 5	22	13.6	29	13.8	1.0
Month 6	22	13.6	32	25.0	3.0
Month 7	22	13.6	27	14.8	1.0
Month 8	22	13.6	25	16.0	0.5

During one month of the Early Works period the predicted increase in traffic noise levels for this section of the proposed route would potentially exceed ECRTN and further detailed analysis would be required to determine the distance from the road that the criterion would be met.

Table 2-8 Golden Highway East of Wybong Rd (Route A Counter A4)

Month	Existing Volume		Proposed Volume (Existing plus construction)		Increase in noise level (dBA)
	ALL	%HV	ALL	%HV	
Month 1	237	32.5	238	32.4	0
Month 2	237	32.5	242	32.6	0
Month 3	237	32.5	248	32.3	0
Month 4	237	32.5	246	32.1	0
Month 5	237	32.5	244	32.0	0
Month 6	237	32.5	247	33.2	0
Month 7	237	32.5	242	32.2	0
Month 8	237	32.5	240	32.5	0

There is no predicted increase in traffic noise on the highway and as such no further investigation is warranted.

Table 2-9 Golden Highway West of Denman Rd (Route A Counter A5)

Month	Existing Volume		Proposed Volume (Existing plus construction)		Increase in noise level (dBA)
	ALL	%HV	ALL	%HV	
Month 1	586	19.3	587	19.3	0
Month 2	586	19.3	591	19.5	0
Month 3	586	19.3	597	19.4	0
Month 4	586	19.3	595	19.3	0
Month 5	586	19.3	593	19.2	0
Month 6	586	19.3	596	19.8	0
Month 7	586	19.3	591	19.3	0
Month 8	586	19.3	589	19.4	0

There is no predicted increase in traffic noise on the highway and as such no further investigation is warranted.

Table 2-10 Golden Highway South of Denman Rd (Route A Counter A7)

Month	Existing Volume		Proposed Volume (Existing plus construction)		Increase in noise level (dBA)
	ALL	%HV	ALL	%HV	
Month 1	262	28.6	263	28.5	0
Month 2	262	28.6	267	28.8	0
Month 3	262	28.6	273	28.6	0
Month 4	262	28.6	271	28.4	0
Month 5	262	28.6	269	28.3	0
Month 6	262	28.6	272	29.4	0
Month 7	262	28.6	267	28.5	0
Month 8	262	28.6	265	28.7	0

There is no predicted increase in traffic noise on the highway and as such no further investigation is warranted.

2.6.2 Route A 1800-1900hrs

Table 2-11 Wybong Road North of Golden Highway (Route A Counter A3)

Month	Existing Volume		Proposed Volume (Existing plus construction)		Increase in noise level (dBA)
	ALL	%HV	ALL	%HV	
Month 1	14	21.4	15	20.0	0
Month 2	14	21.4	21	33.3	3
Month 3	14	21.4	28	32.1	4
Month 4	14	21.4	25	28.0	3
Month 5	14	21.4	20	15.0	0.5
Month 6	14	21.4	29	44.8	5
Month 7	14	21.4	19	21.1	1
Month 8	14	21.4	17	23.5	1

During four months over the Early Works period the predicted increase in traffic noise levels for this section of the proposed route would potentially exceed ECRTN and further detailed analysis would be required to determine the distance from the road that the criterion would be met.

Table 2-12 Golden Highway East of Wybong Rd (Route A Counter A4)

Month	Existing Volume		Proposed Volume (Existing plus construction)		Increase in noise level (dBA)
	ALL	%HV	ALL	%HV	
Month 1	2235	14.4	2236	14.4	0
Month 2	2235	14.4	2272	15.7	0.5
Month 3	2235	14.4	2293	16.2	0.5
Month 4	2235	14.4	2278	15.7	0.5
Month 5	2235	14.4	2243	14.4	0
Month 6	2235	14.4	2332	17.8	0.5
Month 7	2235	14.4	2250	14.8	0
Month 8	2235	14.4	2248	14.8	0

Predicted increases in traffic noise are within ECRTN allowance at all times on the highway and as such no further investigation is warranted.

Table 2-13 Golden Highway West of Denman Rd (Route A Counter A5)

Month	Existing Volume		Proposed Volume (Existing plus construction)		Increase in noise level (dBA)
	ALL	%HV	ALL	%HV	
Month 1	3260	13.6	3261	13.6	0
Month 2	3260	13.6	3297	14.4	0
Month 3	3260	13.6	3318	14.8	0.5
Month 4	3260	13.6	3303	14.5	0
Month 5	3260	13.6	3268	13.6	0
Month 6	3260	13.6	3357	15.9	0.5
Month 7	3260	13.6	3275	13.8	0
Month 8	3260	13.6	3273	13.8	0

Predicted increases in traffic noise are within ECRTN allowance at all times on the highway and as such no further investigation is warranted.

Table 2-14 Golden Highway South of Denman Rd (Route A Counter A7)

Month	Existing Volume		Proposed Volume (Existing plus construction)		Increase in noise level (dBA)
	ALL	%HV	ALL	%HV	
Month 1	1443	18.1	1444	18.1	0
Month 2	1443	18.1	1480	19.9	0.5
Month 3	1443	18.1	1501	20.7	0.5
Month 4	1443	18.1	1486	20.0	0.5
Month 5	1443	18.1	1451	18.1	0
Month 6	1443	18.1	1540	22.9	1
Month 7	1443	18.1	1458	18.7	0
Month 8	1443	18.1	1456	18.7	0

Predicted increases in traffic noise are within ECRTN allowance at all times on the highway and as such no further investigation is warranted.

2.6.3 Route B 0600-0700hrs

Table 2-15 Wybong Road West of Roxburgh Road (Route B Counter B6+B7)

Month	Existing Volume		Proposed Volume (Existing plus construction)		Increase in noise level (dBA)
	ALL	%HV	ALL	%HV	
Month 1	47.6	10.9	50.6	5.2	0
Month 2	47.6	10.9	52.6	5.2	0
Month 3	47.6	10.9	62.6	5.2	0.5
Month 4	47.6	10.9	61.6	5.2	0.5
Month 5	47.6	10.9	59.6	5.2	0.5
Month 6	47.6	10.9	56.6	5.2	0
Month 7	47.6	10.9	54.6	5.2	0
Month 8	47.6	10.9	52.6	5.2	0

Predicted increases in traffic noise are within ECRTN allowance at all times on the road and as such no further investigation is warranted.

Table 2-16 Wybong Road West of Bengalla Mine (Route B Counter B6)

Month	Existing Volume		Proposed Volume (Existing plus construction)		Increase in noise level (dBA)
	ALL	%HV	ALL	%HV	
Month 1	40.8	12.7	43.8	11.9	0
Month 2	40.8	12.7	45.8	11.4	0
Month 3	40.8	12.7	55.8	9.3	0.5
Month 4	40.8	12.7	54.8	9.5	0.5
Month 5	40.8	12.7	52.8	9.8	0.5
Month 6	40.8	12.7	49.8	10.4	0.5
Month 7	40.8	12.7	47.8	10.9	0.5
Month 8	40.8	12.7	45.8	11.4	0

Predicted increases in traffic noise are within ECRTN allowance at all times on the road and as such no further investigation is warranted.

Table 2-17 Wybong Road East of Bengalla Mine (Route B Counter B3)

Month	Existing Volume		Proposed Volume (Existing plus construction)		Increase in noise level (dBA)
	ALL	%HV	ALL	%HV	
Month 1	54.8	9.9	57.8	9.3	0.5
Month 2	54.8	9.9	59.8	9.0	0.5
Month 3	54.8	9.9	69.8	7.7	1.0
Month 4	54.8	9.9	68.8	7.8	1.0
Month 5	54.8	9.9	66.8	8.1	1.0
Month 6	54.8	9.9	63.8	8.5	0.5
Month 7	54.8	9.9	61.8	8.7	0.5
Month 8	54.8	9.9	59.8	9.0	0.5

Predicted increases in traffic noise are within ECRTN allowance at all times on the road and as such no further investigation is warranted.

Table 2-18 Kayuga Road / Aberdeen Street (Route B Counter B1+B2+B3)

Month	Existing Volume		Proposed Volume (Existing plus construction)		Increase in noise level (dBA)
	ALL	%HV	ALL	%HV	
Month 1	99.6	9.7	102.6	9.5	0
Month 2	99.6	9.7	104.6	9.3	0
Month 3	99.6	9.7	114.6	8.5	0
Month 4	99.6	9.7	113.6	8.5	0
Month 5	99.6	9.7	111.6	8.7	0
Month 6	99.6	9.7	108.6	8.9	0
Month 7	99.6	9.7	106.6	9.1	0
Month 8	99.6	9.7	104.6	9.3	0

There is no predicted increase in traffic noise on the road and as such no further investigation is warranted.

2.6.4 Route B 1800-1900hrs

Table 2-19 Wybong Road West of Roxburgh Road (Route B Counter B6+B7)

Month	Existing Volume		Proposed Volume (Existing plus construction)		Increase in noise level (dBA)
	ALL	%HV	ALL	%HV	
Month 1	50.4	7.5	53.4	3.8	0
Month 2	50.4	7.5	55.4	3.8	0
Month 3	50.4	7.5	65.4	3.8	0.5
Month 4	50.4	7.5	64.4	3.8	0.5
Month 5	50.4	7.5	62.4	3.8	0.5
Month 6	50.4	7.5	59.4	3.8	0.5
Month 7	50.4	7.5	57.4	3.8	0.5
Month 8	50.4	7.5	55.4	3.8	0

Predicted increases in traffic noise are within ECRTN allowance at all times on the road and as such no further investigation is warranted.

Table 2-20 Wybong Road West of Bengalla Mine (Route B Counter B6)

Month	Existing Volume		Proposed Volume (Existing plus construction)		Increase in noise level (dBA)
	ALL	%HV	ALL	%HV	
Month 1	46	7.8	49	7.3	0.5
Month 2	46	7.8	51	7.1	0.5
Month 3	46	7.8	61	5.9	1
Month 4	46	7.8	60	6.0	1
Month 5	46	7.8	58	6.2	1
Month 6	46	7.8	55	6.5	0.5
Month 7	46	7.8	53	6.8	0.5
Month 8	46	7.8	51	7.1	0.5

Predicted increases in traffic noise are within ECRTN allowance at all times on the road and as such no further investigation is warranted.

Table 2-21 Wybong Road East of Bengalla Mine (Route B Counter B3)

Month	Existing Volume		Proposed Volume (Existing plus construction)		Increase in noise level (dBA)
	ALL	%HV	ALL	%HV	
Month 1	64.6	7.4	67.6	7.1	0.0
Month 2	64.6	7.4	69.6	6.9	0.0
Month 3	64.6	7.4	79.6	6.0	0.5
Month 4	64.6	7.4	78.6	6.1	0.5
Month 5	64.6	7.4	76.6	6.3	0.5
Month 6	64.6	7.4	73.6	6.5	0.5
Month 7	64.6	7.4	71.6	6.7	0.5
Month 8	64.6	7.4	69.6	6.9	0.0

Predicted increases in traffic noise are within ECRTN allowance at all times on the road and as such no further investigation is warranted.

Table 2-22 Kayuga Road / Aberdeen Street (Route B Counter B1+B2+B3)

Month	Existing Volume		Proposed Volume (Existing plus construction)		Increase in noise level (dBA)
	ALL	%HV	ALL	%HV	
Month 1	94.2	6.4	97.2	6.2	0.0
Month 2	94.2	6.4	99.2	6.0	0.0
Month 3	94.2	6.4	109.2	5.5	0.5
Month 4	94.2	6.4	108.2	5.5	0.5
Month 5	94.2	6.4	106.2	5.6	0.5
Month 6	94.2	6.4	103.2	5.8	0.0
Month 7	94.2	6.4	101.2	5.9	0.0
Month 8	94.2	6.4	99.2	6.0	0.0

Predicted increases in traffic noise are within ECRTN allowance at all times on the road and as such no further investigation is warranted.

2.7 Summary of Traffic Noise Impacts

Both routes have been assessed and the increase in traffic noise levels calculated at each section for relevant ECRTN assessment periods, namely the worst affected hour of day time and night-time for local roads and the entire daytime and night-time period for arterial roads.

Traffic noise levels for Route A are within the ECRTN allowance criteria for all sections of the Golden Highway but may exceed ECRTN allowances on Wybong Road for up to 4 months of the

daytime assessment period (1800-1900hrs), and one month during the night time assessment period (0600-0700hrs); largely as a result of the very low existing traffic volumes.

On Route B the traffic noise levels would comply with ECRTN allowances on all sections of the route for the entire proposed construction period. Further analysis would therefore be required on the Wybong Road section of Route A to quantify traffic noise levels and thus establish if any residences would be adversely impacted.

2.8 Prediction of Traffic Noise Levels at Residences (Detailed Model)

Given that an increase in traffic noise levels of up to 5dBA is predicted for some of the proposed construction period on Wybong Road east of the Anvil Hill Mine northern access road (heavy vehicle route), it is appropriate to calculate noise levels at private residences on Wybong Road. Noise contours are obtained for the relevant sections of road under assessment using procedures based on the CoRTN (Calculation of Road Traffic Noise UK DoE Traffic Noise Prediction Method 1988) prediction algorithms. The standard prediction procedures were modified in the following ways.

- L_{Aeq} values were calculated from the L_{A10} values predicted by the CoRTN algorithms using the well-validated approximation $L_{Aeq,1hr} = L_{A10,1hr} - 3$.
- Noise source heights were set at 0.5m for cars and heavy vehicle tyres, 1.5m for heavy vehicle engines and 3.6m for heavy vehicle exhausts, representing typical values for Australian vehicles. Noise from a heavy vehicle exhaust was assessed as 8dBA lower than the noise from the engine.

The models were implemented using *ROADent* software, based on road points at 10m intervals. Where there are no barriers present, ground was taken to be 50% soft. This has previously been found to give a good correlation with measured noise levels in similar situations. With barriers, hard ground is assumed, as required under the CoRTN procedures.

The existing road surface is modelled as chipseal with a CoRTN correction of 2.5dBA, with speeds of both light and heavy vehicles modelled at posted speed limits.

Traffic volumes derived in Section 2.4 are modelled with the month that gives rise to the highest increase in traffic noise, Month 6 taken as the worst-case. Given that the difference in ECRTN criteria between the night-time and daytime assessment periods is 5dBA and that the difference between the increase in daytime and night-time traffic noise levels is 1dBA; it is appropriate to assess the night-time period as having the greatest potential noise impact.

Contours are calculated for night-time and the ECRTN criterion is shown superimposed on aerial photography over relevant sections of the proposed Heavy Vehicle Route in Appendix B. Noise contours representing Month 6 night-time (0600-0700hrs) proposed volumes are shown in blue (50dBA). There are two non mine-owned residences within this contour. The noise contour for daytime would be wholly contained within this night-time contour.

3 CONSTRUCTION NOISE IMPACTS

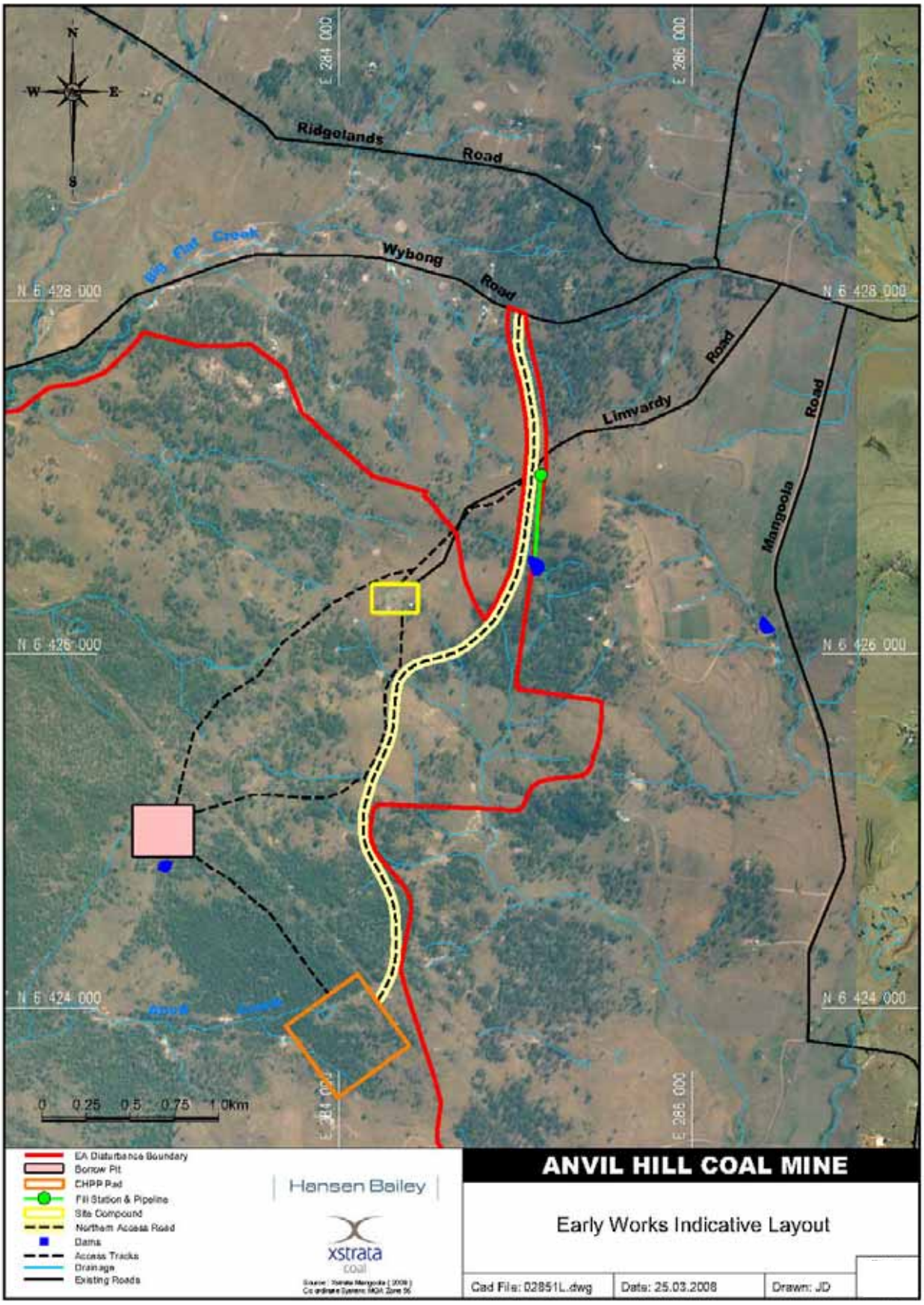
3.1 Proposed Construction Works

The following construction activities are proposed as part of the Early Works:

- Northern component of the Mine Access Road;
- Establishment of site office and compound;
- Excavation of Borrow Pit, waste material emplacement and associated sediment control;
- Establishment of a construction pad for the CHPP; and
- Development of temporary access roads between the site office, borrow pit and CHPP pad.

The location of the proposed works is shown in Figure 3-1 below.

Figure 3-1 Proposed Construction Location



The typical construction plant required for each of the above proposed activities is outlined in Table 3-1 below.

Table 3-1 Indicative Construction Fleet

Item	Description	Capacity	Quantity
NORTHERN ACCESS ROAD			
1	Excavator	45 ton	1
2	Excavator	25 ton	2
3	Excavator	20 ton	2
4	Dozer	D6	1
5	Scraper	631	2
6	Grader	140	1
7	Grader	120	1
8	Roller	10t	2
9	Compactor	825	1
10	Dozer	D8	1
11	Dozer	D9	1
11	Watercart	40,000L	2
ESTABLISH SITE OFFICE AND COMPOUND / CHPP PAD			
1	Excavator	12 ton	2
2	Grader	120	1
3	Roller		1
4	Bogey Truck	13 ton	2
5	Watercart	40,000L	1
BORROW PIT			
1	Excavator	65 ton	1
2	Dozer	D10	1
3	Articulated Trucks	D 400	2
4	Mobile Crusher		1
5	Screener		1
6	Watercart	40,000L	1
PATTERSON'S DAM			
1	Diesel Pump		1

For the purposes of modelling it has been assumed that construction would take place over an approximately eight month time frame and in many cases the above activities would not be concurrent; however for the purposes of this report it has conservatively been assumed that all construction activities occur simultaneously. Assumed sound power levels for construction plant are shown in Table 3-2. These levels are based on measurements taken during similar operations for other projects.

Table 3-2 Proposed Construction Fleet Sound Power Levels

Item	Sound Power Level (L_{Aeq} dBA)
Excavator (large)	116
Excavator (small)	110
Dozer	112
Scraper	114
Grader	109
Roller	107
Compactor	108
Watercart	112
Bogey Truck	108
Articulated Trucks	110
Mobile Crusher	115
Screener	109
Diesel Pump	108

3.2 Modelling Procedures

Noise levels at residences identified in the Anvil Hill Project Conditions of Approval are calculated for each of the activities identified in Section 3.1 using the ENM model. This model has been endorsed by the NSW Department of Environment & Climate Change (DECC) for environmental noise assessment. The ENM model takes account of noise attenuation due to geometric spreading, atmospheric absorption, shielding and the effect of acoustically soft ground. It can also be used to predict noise levels under various meteorological conditions, defined by a combination of temperature gradient, wind speed and wind direction.

Noise levels are calculated under a total of 41 meteorological conditions with typical plant sound power levels and octave band spectra. A statistical data set representing the proportional occurrence of these conditions at the Wybong Road weather station over the winter daytime period was then applied to the calculated noise levels. The noise level exceeded for 10% during daytime is then calculated.

Construction noise from each of the proposed scenarios is calculated separately and results from each phase then added to establish a worst-case cumulative noise level at each residence. With regard to the northern access road, noise levels are calculated at four progressive locations along the road and the maximum noise level at each residence taken as a worst case. Table 3-3 outlines calculated noise levels at each residence in terms of both individual construction activities and the cumulative noise level from all proposed activities. Noise levels

are then compared with the daytime criterion at each residence from the Anvil Hill Project Approval.

Table 3-3 Calculated Construction Noise Levels at Residences

Residence	Predicted $L_{Aeq,15\ min}$ Noise Level (dBA)									
	Northern Access Road					Borrow Pit	Office and Compound	Patterson's Dam	Total	Criterion
	P1	P2	P3	P4	Max					
66	23.8	21.8	28.8	29.9	29.9	22.4	22.8	9.6	**31.3**	40
74	19.1	21.6	20.5	15.4	21.6	20.9	15.4	11.9	**25.0**	36
104	25.4	25.1	18.8	22.7	25.4	24.1	17.6	15.3	**28.4**	36
110	11.2	14	23.4	23.9	23.9	20.4	18.3	10.3	**26.4**	38
111	29.4	23.4	29.2	34.4	34.4	17.1	23.1	2.4	**34.8**	35
128	6.3	10.4	19.9	20.5	20.5	5.7	18.9	-0.1	**22.9**	37
130	25	16	22.6	23.4	25	25.6	17.7	15.6	**28.9**	39
139	11.2	13	25.1	26.1	26.1	14.5	17.9	5	**27.0**	38
144	2	3	17.5	15.2	17.5	4.2	12.9	-0.1	**19.0**	37
148	23	24.1	21.6	23.1	24.1	25.6	17.9	16.7	**28.6**	39
162	28.7	23.7	31.4	33.2	33.2	13.2	23.1	-0.1	**33.6**	35
164	19.6	22.4	20.5	15.1	22.4	25.3	16.5	15.8	**27.7**	36
168	28.1	23	27.4	31	31	20.4	21.2	10.4	**31.8**	34
171	3.7	6.7	18.9	10.9	18.9	6.8	14.4	-0.1	**20.5**	37
174B	23.3	22.1	32	32.4	32.4	15.7	22.2	0	**32.9**	35
175	24.3	23.6	33.7	32.1	33.7	17.4	23.6	1.7	**34.2**	35
178	17.8	19.7	18.5	17.5	19.7	23.5	15.5	14.5	**25.8**	34
180	11.8	11.5	24.8	18.8	24.8	21.1	19.1	11.7	**27.2**	40
182	27.1	19.5	17.2	15.9	27.1	25.7	11.9	16.3	**29.7**	33
184	24.4	22.7	20.3	19.3	24.4	22.6	15.6	11.6	**27.1**	37
185	21.7	21.7	21.5	19.3	21.7	22.6	14.3	13.6	**25.8**	35
187	21.8	21.6	20.6	19.3	21.8	22.7	13.9	14.3	**25.9**	35
189	22.5	21.4	20	18.4	22.5	23.2	16	14.2	**26.6**	36
190	28.8	28.5	28.3	26.9	28.8	26.2	22.3	16.9	**31.4**	35
191	25.7	22.7	22.4	20.5	25.7	23.9	17.5	15.5	**28.5**	36
192	25.5	23.7	23.2	21.5	25.5	24.9	18.8	16.4	**28.9**	36
193	26.3	26.4	23.5	22.2	26.4	24.8	16.9	15.2	**29.1**	36
198	26.7	22	22.7	21	26.7	21.4	18.6	8.9	**28.4**	34
199	23.2	21.6	20.4	18.1	23.2	22.6	14.3	12.5	**26.4**	37
200	21.7	22.3	21.6	16.4	22.3	19.6	14.5	10.3	**24.8**	36
201A	21.5	22.5	19.4	18	22.5	22.5	13.2	13.7	**26.0**	34

Residence	Predicted $L_{Aeq,15\ min}$ Noise Level (dBA)									
	Northern Access Road					Borrow Pit	Office and Compound	Patterson's Dam	Total	Criterion
	P1	P2	P3	P4	Max					
205	6	7.7	12.9	8.9	12.9	7.9	18.4	-0.1	**19.8**	37
227	25.8	25.2	18.4	15.3	25.8	22.7	17.5	11.7	**28.0**	34
240	28.2	20.2	18.2	16.5	28.2	25.2	10.5	14.3	**30.1**	32
251	27.4	23.7	28.9	34.2	34.2	20	25.2	9.3	**34.9**	35
269B	13	13	13	8.8	13	16.2	5.6	7.6	**18.5**	33
294	22.1	21.3	19.8	17.6	22.1	21.7	12.3	11.7	**25.3**	35
116A	22.1	21.1	21.4	22.3	22.3	23.9	12.3	14.8	**26.7**	36
116B	22.1	21.1	22.4	22.3	22.4	23.8	13	14.8	**26.7**	36
125A	29.4	21.2	19.7	17.7	29.4	25.8	21.5	14.6	**31.5**	36
125B	26.9	20	17.2	15.7	26.9	24.6	21.5	12.6	**29.7**	33
125C	27.5	23.1	19.8	18.1	27.5	26.6	16.6	16.8	**30.5**	35
134A	22.3	16.2	20.4	20.3	22.3	24.1	17	15.4	**27.1**	36
134B	12.2	16	20.1	20.7	20.7	20.5	17.6	10.9	**24.8**	36
174A	22.7	22.1	31.5	32.4	32.4	16.1	22.2	0	**32.9**	35
183A	24.5	24.4	20.9	19.4	24.5	23.5	16.9	14.2	**27.6**	35
183B	24.5	24.5	21.2	19.5	24.5	23.5	17	14.2	**27.7**	35
183C	25.5	24.5	21.3	20.2	25.5	23.6	15.9	13.8	**28.1**	36
241A	27.8	23	19.2	18.1	27.8	26	20.5	17.6	**30.7**	34
241B	28.6	22	18.5	17.5	28.6	25.3	16.9	14.7	**30.6**	35
241C	28.7	22.2	18.6	17	28.7	25.6	16	15.2	**30.7**	35
45B	25.1	15.9	23.5	22.4	25.1	26.5	18.9	16.5	**29.5**	40
59B	14.8	12.4	22.3	12.8	22.3	13.7	4.2	5.2	**23.0**	39
116C	22.1	21.1	21.4	21.9	22.1	23.8	12.4	14.8	**26.5**	36
116D	22.1	21.1	21.9	22.2	22.2	23.8	13	15	**26.6**	36
116E	22.1	21.1	21.2	22.2	22.2	23.8	12.7	15	**26.6**	36
116F	22.1	21.1	21.3	21.9	22.1	23.8	12.7	15	**26.6**	36
116G	22	20.6	21.3	20.6	22	23.8	13	15	**26.5**	36
125E	29.2	22.4	21.2	16.7	29.2	27.5	21.5	9.7	**31.9**	36
201B	21.5	22.4	19.6	17.8	22.4	22.5	12.9	13.7	**26.0**	34
96A	29.9	22.9	25.2	30.7	30.7	20.4	21.7	10	**31.6**	34
96B	28.2	23	27.4	31.2	31.2	20.4	21.2	10.4	**32.0**	34

Noise levels are generally dominated by construction of the northern access road which would be expected given that this element of proposed works require the greatest amount of plant available. Several residences to the south and west would have construction noise levels dominated by construction of the borrow pit, however the levels from those operations are

predicted to be generally in the order of 20-25dBA which would likely be inaudible. As discussed earlier it is unlikely that all proposed activities would be concurrent and the calculated cumulative level is therefore conservative and indeed would likely be significantly lower for much of the construction period. Nevertheless calculated worst case noise levels comply with Anvil Hill Mine Project Conditions of Approval noise criteria at all residences under assessment.

4 CONCLUSION

Wilkinson Murray has assessed noise impacts at residences as a result of the Early Works associated with a proposed modification to the Anvil Hill Project Approval.

Alternative transport routes for both light and heavy vehicles have been proposed to undertake the Early Works. Traffic noise on the route that would carry the majority of employees' vehicles is predicted to increase by a maximum of 1dBA which is within ECRTN allowances. On the heavy vehicle route traffic noise levels on Wybong Road west of the northern access road are predicted to increase by up to 5dBA as a worst case during the proposed construction period. Noise contours indicating the area of land that would be exposed to noise levels exceeding the ECRTN 50dBA night time criterion have been calculated. There are 13 residential dwellings within the traffic noise contours. 11 of these are owned by Xstrata Mangoola. Given criteria are predicted to be exceeded for several weeks over the eight month Early Works period, it is considered that any traffic noise impacts would be short-term in nature. As such the impacts would be considered acceptable.

Several components of Early Works are proposed and noise levels from these activities have been calculated and results compared to Anvil Hill Project Conditions of Approval noise criteria. Noise from each of the proposed construction activities comply with the criteria. Cumulative noise levels from all construction activities are also found to comply with the criteria. It is unlikely that the various activities under consideration would be concurrent and the methodology undertaken in this assessment is therefore considered conservative.

5 RECOMMENDATIONS

The following recommendations are put forward with regard to management of construction noise impacts:

- A construction noise monitoring program would be put in place. This would involve attended measurement of construction activities at the closest residential receivers at weekly intervals. Measured noise levels would then be compared to Anvil Hill Project Approval Criteria, both in terms of $L_{Aeq,15min}$ and L_{Amax}. Results would be available to the community on request.
- Any off-site works close to residences would be monitored at the time of such works separately to the above item.
- Mobile plant would be assessed on a regular basis to ensure compliance with sound power levels put forward in this report. Where practicable, low noise emitting plant would be selected over other plant.
- Existing complaints system regularly updated to address any affected resident's issues, including a process for timely investigation of such issues by an independent accredited acoustical consultant where relevant.
- Regular updates to the community consultative committee to inform residents of results of monitoring and to act as a conduit for any resident's concerns.

Version	Status	Date	Prepared by	Checked by
A	DRAFT	10 March 2008	Tim Dean	Rob Bullen
B	DRAFT	17 March 2008	Tim Dean	Rob Bullen
C	FINAL	25 March 2008	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.

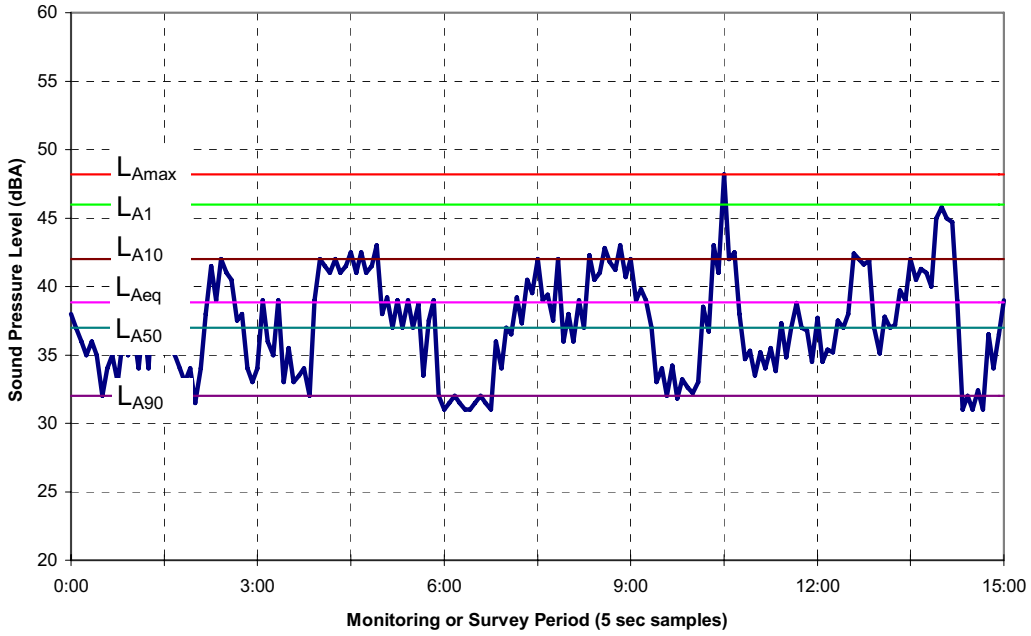
L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise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

ROUTE A (HEAVY VEHICLE) NOISE CONTOURS

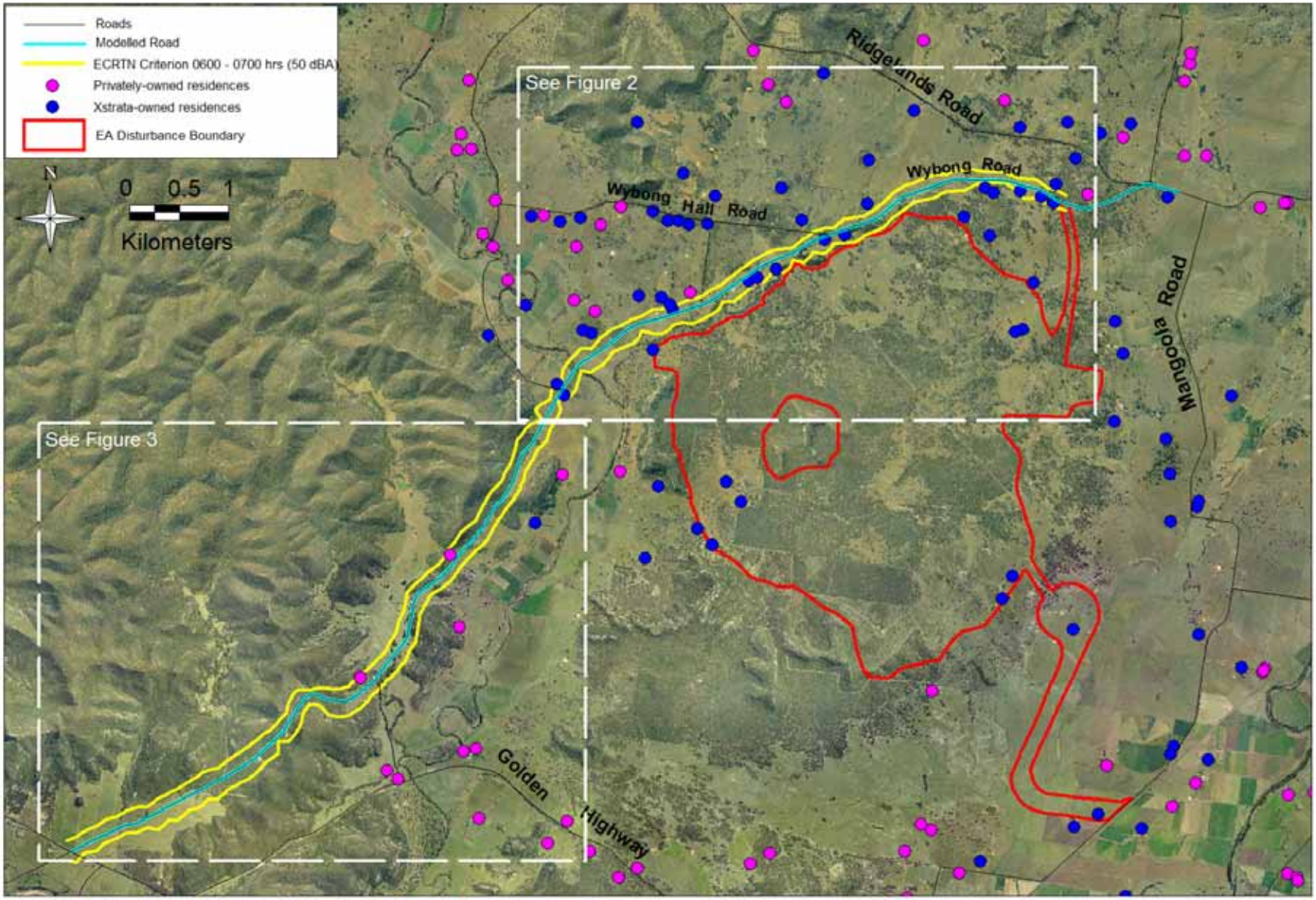


Figure 1: Modelled Area and 50 dBA ECRTN Criterion

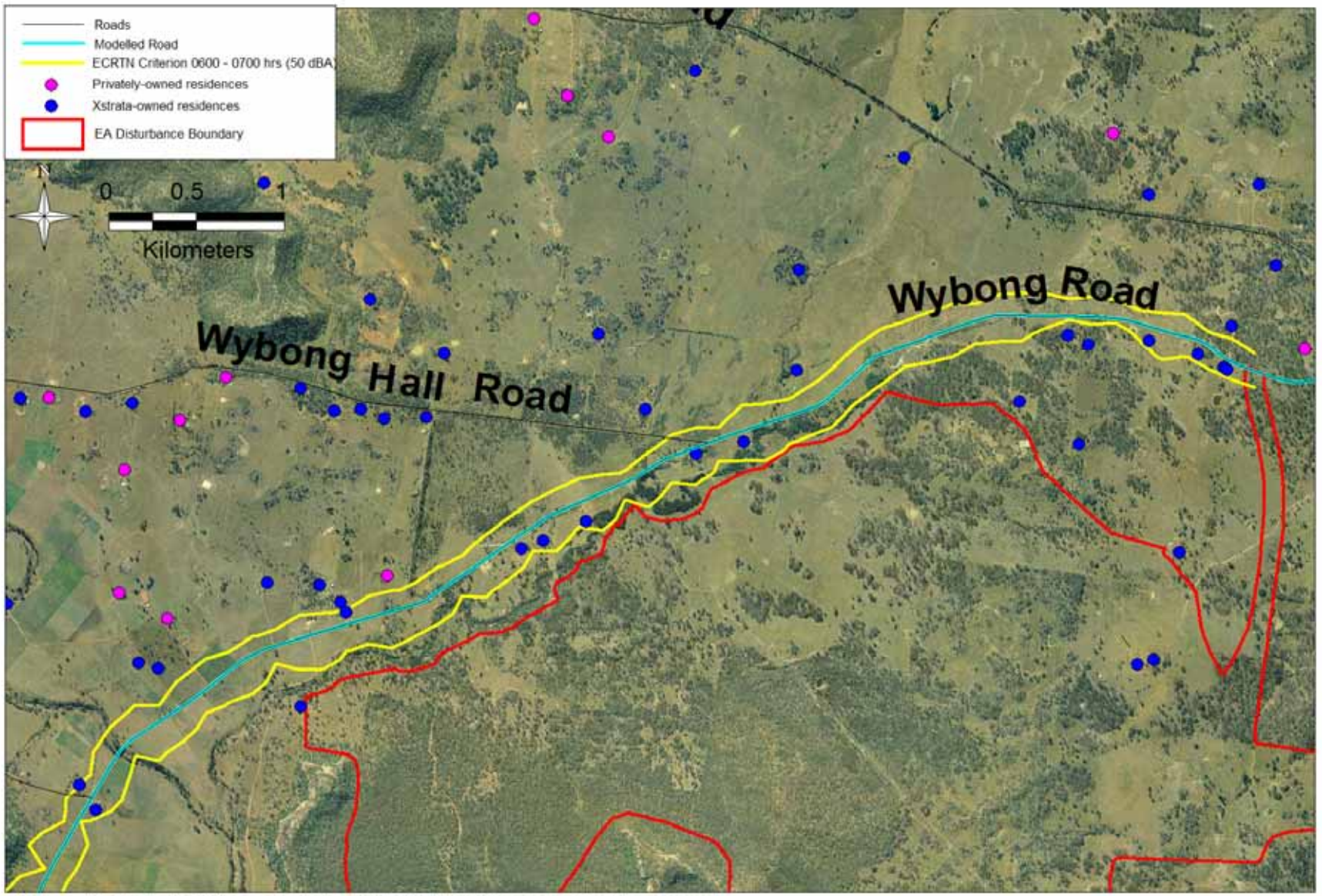


Figure 2: Modelled Area and 50 dBA ECRTN Criterion - Northern Inset

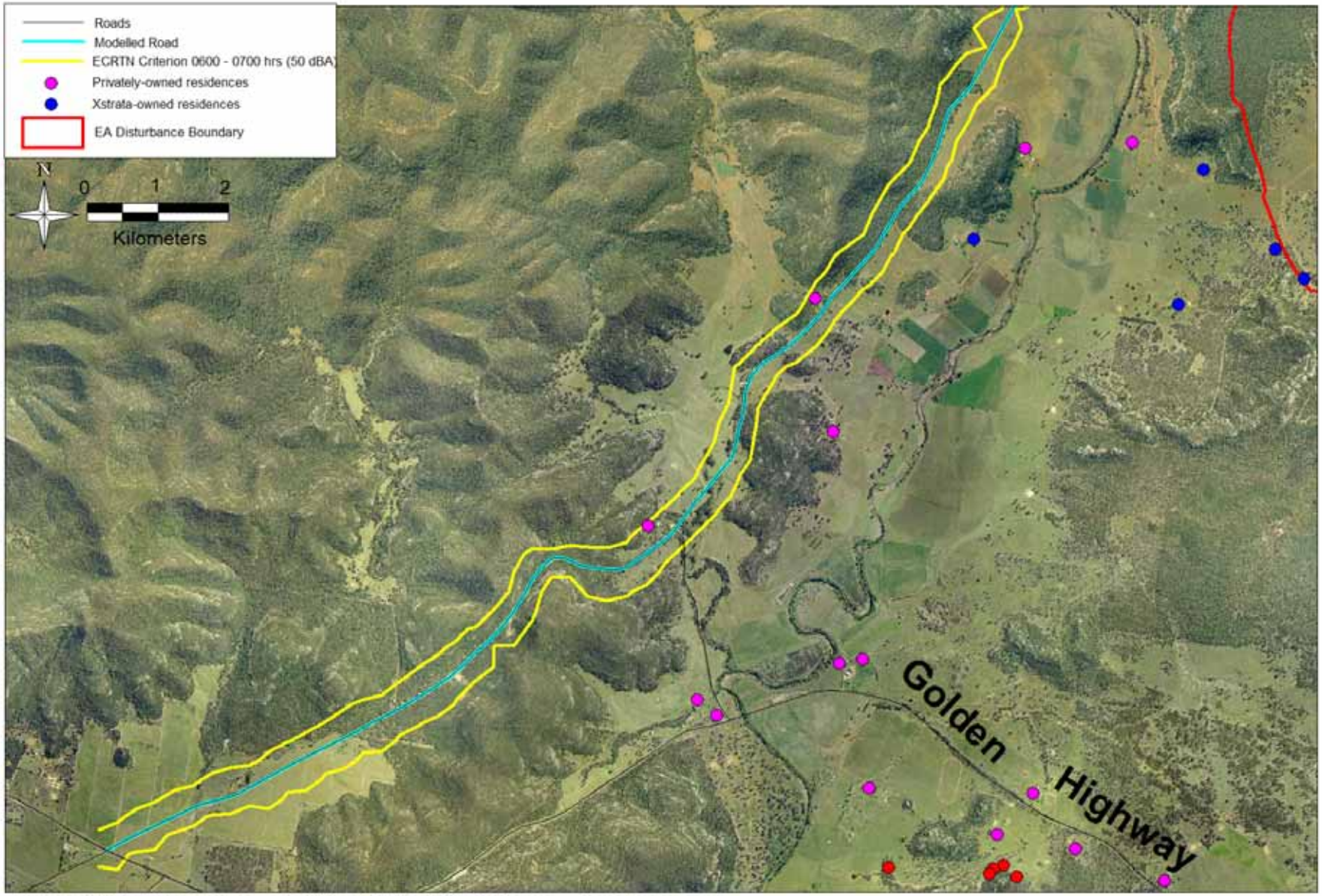


Figure 3: Modelled Area and 50 dBA ECRTN Criterion - Southern Inset