WILPINJONG COAL PROJECT

APPENDIX D

Construction, Operation and Transportation Noise and Blasting Impact Assessment

REPORT 30-1313-R1
Revision 0

Wilpinjong Coal Project
Construction, Operation and Transportation Noise and Blasting Impact Assessment

Prepared for

Wilpinjong Coal Pty Limited
Level 9, 1 York Street
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18 May 2005

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Reference	Status	Date	Prepared	Checked	Authorised
30-1313-R1	Revision 0	18 May 2005	Glenn Thomas	Mark Blake	Glenn Thomas

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1 INTRODUCTION

1.1 Assessment Requirements

Wilpinjong Coal Pty Limited (WCPL) proposes to develop the Wilpinjong Coal Project (the Project) utilising open-cut mining methods to extract up to 13 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal. Up to 9.7 Mtpa of product coal would be transported from the site by rail. The Project would include a Coal Handling and Preparation Plant (CHPP) with a nominal capacity of 1,200 tonnes per hour (tph). The Project is located approximately 40 km north-east of Mudgee NSW, and has an anticipated mine life of 21 years. The Regional Location and Project Locality Plans are attached as **Appendix A1** and **Appendix A2**, respectively.

Richard Heggie Associates Pty Ltd (Heggies) has been engaged by WCPL to evaluate and assess the potential noise and vibration impacts associated with the Project.

The assessment has been guided by NSW Department of Infrastructure, Planning and Natural Resources (DIPNR) Director General's Requirements attached as **Appendix A3**, which includes the NSW Department of Environment and Conservation's (DEC) and Mid-Western Regional Council's (formerly Mudgee Shire Council) assessment requirements.

The dominant sources of noise and vibration emissions from the Project may be grouped in the areas described below for the purposes of impact assessment. The estimated timing of the Project activities for each of these assessment areas is based on the planned development schedule. The actual timing of each activity and the associated noise emissions is dependent on actual mine production and progression.

On-Site Construction Noise

Construction Year 1: Construction activities would include establishing the temporary construction camp, mine access road and facilities area, CHPP and rail spur/loop, coal handling and train loading infrastructure together with the development of an initial box cut in the south-eastern section of Pit 1 (**Appendix A4**).

On-Site Operating Noise

Appendices B3 to B7 present the general arrangements for the operational years 3, 9, 13, 14 and 21. Appendix C1 shows the localities in the vicinity of the Project.

Operation Year 3: Representative of open-cut operations early in the Project life. In this year of operation, Project noise sources would include Pit 1 and Pit 2, CHPP and train loading system operation.

Operation Year 9: Representative of the nearest open-cut operations to the Cumbo locality and receivers south of the village of Wollar. In this year of operation, Project noise sources would include Pit 2, Pit 3 and Pit 4, CHPP and train loading system operation.

Operation Year 11: Representative of the nearest open-cut operations to the Slate Gully, Wollar and Araluen localities. In this year of operation, Project noise sources would include Pit 3 and Pit 4, CHPP and train loading system operation.

Operation Year 13: Representative of the nearest open-cut operations to receivers to the north-east of the Project area. In this year of operation, Project noise sources would include Pit 3, Pit 4 and Pit 5, CHPP and train loading system operations.

Operation Year 14: Representative of the nearest open-cut operations to noise sensitive receivers to the immediate north and west of the Project operations in the Wilpinjong and Murragamba localities, respectively. In this year of operation, Project noise sources would include Pit 5 and Pit 6, CHPP and train loading system operations.

Operation Year 21: Representative of the nearest open-cut operations to Moolarben and Cumbo localities. In this year of operation, Project noise sources would include Pit 5 and Pit 6, CHPP and train loading system operations.

On-Site Blast Emissions

Construction Year 1: Initial Box-cut blasting.

Operation Years 1 to 21: Open-cut overburden blasting.

Off-Site Road Transportation Noise

Employee and Materials Road Traffic: Project related vehicle movements on Wollar Road in the vicinity of the Project.

Off-Site Rail Transportation Noise and Vibration

Product Coal Rail Traffic: Project related train movements on the Gulgong - Sandy Hollow railway and the Main Northern railway. Train movements within the Project site are included in the on-site operating noise.

Cumulative Mine Noise Effects

Cumulative Mine Operations: Combined effects of the Project and existing consented mining in the vicinity of the Project.

1.2 Approval Requirements

The Project General Arrangement Plan is attached as **Appendix A4**. The main activities associated with development of the Project would include:

- Development and operation of an open cut mine within the Mining Lease Application (MLA 1) area to produce coal for domestic electricity generation and export markets.
- Selective highwall mining of the Ulan Seam within the MLA 1 area.
- CHPP and mine facilities area.
- Water management infrastructure including the relocation of Cumbo Creek.
- Water supply bores and associated pump and pipeline system.
- Placement of mine waste rock (i.e. overburden, interburden/partings and coarse rejects) predominantly within mined-out voids.
- Placement of tailings within a combination of out-of-pit and in-pit tailings storages.

- Development and rehabilitation of final mine landforms and establishment of woodland vegetation in areas adjacent to the Project.
- A mine access road, temporary construction camp access road, internal access roads and haul roads.
- Closure of Wilpinjong Road and Bungulla Road.
- Realignment of two sections of Ulan-Wollar Road (including the relocation of two road-rail crossings).
- Relocation of the existing 11 kilovolt (kV) electricity transmission line.
- An on-site temporary construction camp to accommodate up to 100 people during the construction phase.
- A rail spur and rail loop.
- Coal handling and train loading infrastructure.
- Transportation of product coal to market via train.
- Enhancement and Conservation Areas.

The Proposed Mine Schedule is attached as **Appendix B2**. The proposed Project Hours of Construction and Operation are presented in **Table 1**.

Table 1 Project Hours of Construction and Operation

Development	Construction Year 1		Operation Years 1 to 21
	Duration	Period	Period
Mine Access Road and Mine Facilities Area	6 months	7.00 am to 6.00 pm up to 7 days per week	24 hours 7 days per week
Coal Handling and Preparation Plant (CHPP) and ROM coal handling areas			
Rail Spur and Loop, product coal stockpiles/handling areas and train loading infrastructure			
Initial Box-cut and CHPP water supply storage Excavation in Pit 1			N/A
Surface Blasting	Initial Box-cut 9.00 am to 5.00 pm Monday to Saturday[1]		Open-cut Overburden 9.00 am to 5.00 pm Monday to Saturday[1]
Road Traffic (Employee & Materials)	Generally 6.00 am to 7.00 pm		24 hours 7 days per week
Rail Traffic (Saleable Coal)	N/A		24 hours 7 days per week

Note 1: Surface blasting may be conducted outside of these periods in accordance with the applicable blast emission assessment criteria provided in the DEC's Environmental Noise Control Manual 1994.

1.3 Noise and Vibration Assessment Procedures

The NSW DEC has regulatory responsibility for the control of noise from "scheduled premises" under the Protection of the Environment Operations Act 1997. In implementing the NSW Industrial Noise Policy 2000 (INP), the DEC has two (2) broad objectives:

- Controlling intrusive noise impacts in the short-term.
- Maintaining noise level amenity for particular landuses over the medium to long-term.

On-Site Construction Noise

The assessment of impacts from on-site construction works follows procedures set out in the DEC's Environmental Noise Control Manual (ENCM) 1994 Chapter 171 Noise Control Guideline - Construction Site Noise.

On-Site Operating Noise

The INP provides non-mandatory procedures for setting acceptable $L_{Aeq(15minute)}$ intrusive and $L_{Aeq(period)}$ amenity noise levels for various localities and guidelines for assessing noise impacts from on-site noise sources.

The assessment of sleep arousal from on-site operations is consistent with the DEC's "Sleep Disturbance Noise Criteria Guideline" dated 22 June 2004 where $L_{A1(60second)}$ noise level from any specific noise source (ideally) should not exceed the background noise level by more than 15 dBA.

On-Site Blast Emissions

Australian Standard AS 2187.2 1993 "*Explosives Storage, Transport and Use – Part 2: Use of Explosives*" provides guideline criteria for evaluating the effects of transient blast emissions on structures.

The NSW DEC currently adopts the Australia and New Zealand Environment Council Committee (ANZECC) "*Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration*" dated September 1990 for assessing potential disturbance to people in dwellings from blast emissions during daytime hours.

The assessment of blast emission impacts outside the hours advocated by ANZECC is guided by the DEC's ENCM 1994 Chapter 154 Noise Control Guideline - Blasting.

Off-Site Road Traffic Noise

The DEC Environmental Criteria for Road Traffic Noise 1999 (ECRTN) provides non-mandatory procedures for setting acceptable L_{Aeq} noise levels on arterial, collector and local roads, as well as guidelines for assessing noise impacts from off-site road traffic.

Off-Site Rail Traffic Noise Emissions

The Australian Rail Track Corporation Ltd (ARTC) operates the Gulgong - Sandy Hollow and Main Northern railways. Noise emissions from the railway are regulated via ARTC's Environmental Protection Licence (EPL No 3142, review date 1 July 2005).

Off-Site Rail Traffic Vibration Emissions

German Standard DIN 4150-3 1999 "*Structural Vibration Part 3: Effects of Vibration on Structures*" provides guideline criteria for evaluating the long-term effects of vibration on structures.

Cumulative Mine Noise Emissions

The INP also provides non-mandatory cumulative noise assessment guidelines to address existing and successive industrial development by setting acceptable (and maximum) cumulative $L_{Aeq(period)}$ amenity levels for all industrial (ie. non-transport related) noise in an area.

The INP does NOT set acceptable cumulative $L_{Aeq(15minute)}$ intrusive criteria for all industrial noise sources in an area, but rather seeks to control cumulative noise via its amenity criteria.

2 PROJECT OVERVIEW

2.1 Land Ownership

The Land Ownership Plan (**Appendix B1**) identifies the nearest potentially affected sensitive receivers. Individual dwellings are labelled in **Appendix E1** to **Appendix E6**. These are summarised in **Table 2**.

Table 2 Nearest Potentially Affected Sensitive Receivers

Locality	Reference/ Land Owner	LEP Zoning	INP Noise Amenity Area	ENM Model Co-ordinates[1]		
				East (m)	North (m)	Elevation (m)
Cumbo	54 GC & EM Batty	1A Rural	Rural	8993	4339	534
	3 DT Maranda			9624	4780	490
	29 JH & ME Kattau			11640	4422	443
	6 WC & VM Langshaw			11665	4771	432
	89A KM Newing			11943	2912	475
	89B KM Newing			12023	2922	468
	59 RW & DG Langshaw			12267	3716	470
	87 J & D Conden			12929	2539	430
	90 CA & CD Pattullo			13213	3184	438
	4 EJ & JE Robinson			13946	5997	400
	49 RSM & LD Harkin			14628	4436	454
	60A RWB & NJ & DB Reid			16175	4256	442
	30 WF Gaffney			Vacant Land		
	94 GM & KL McKenzie					
	91 GK & JCM Gordon					
	48 JR & BM Evans					
Wollar (south of the village of Wollar)	60B RWB & NJ & DB Reid	1A Rural	Rural	19370	4439	370
	150A E Tindale & A McDonald & W Wilson (St Luke's Anglican Church)			19644	5367	362
Wollar	900 St Laurence O'Toole Catholic Church	2V Residential	Suburban	19322	5742	370
	901 Wollar Primary School			19539	6180	366
Araluen	128 WG Pongratz	1C1 Rural	Rural	19913	8126	350
	28A BP & FV & MJ & JM Power			19749	7918	360
	28B BP & FV & MJ & JM Power			19798	7801	360
	125 AC & FM Bayliss			19788	8297	357
	123A A & M Zivkovic			19632	8797	351
	123B A & M Zivkovic			19639	8893	350
	26 K & VC Christiansen			19426	9160	355
	25 SE & JE Pettit			19263	8737	357
	23A PA & ID Bloomfield	1A Rural	Rural	18368	9288	389
	23B PA & ID Bloomfield			18843	8715	366
	24 JA & TS Peach			Vacant Land		

Table 2 (Continued) Nearest Potentially Affected Sensitive Receivers

Locality	Reference/ Land Owner	LEP Zoning	INP Noise Amenity Area	ENM Model Co-ordinates[1]		
				East (m)	North (m)	Elevation (m)
Slate Gully	31A DE & AM Conradt	1C1 Rural	Rural	18467	8378	390
	31B DE & AM Conradt			18715	8357	390
	53 RW & JL Reynolds			17868	8368	395
	52A CR Long			17953	7825	410
	52B CR Long			18049	7999	420
	51 P Bailey			17652	7715	402
	55 SC & M Fox			17645	8421	387
	56 GJ & GR Rogers			17885	8762	380
	40 CG & EK Plummer			Vacant Land		
	58 FN Maher					
	31 DE & AM Conradt					
	24 SE & JE Pettit					
Wilpinjong (north-east of the Project area)	45 JAW Smith	1A Rural	Rural	17480	10805	355
	WB Cumbo Land Pty Ltd			18524	10802	350
Wilpinjong	14 SJ Close	1A Rural	Rural	10693	11882	390
	WA Cumbo Land Pty Ltd			10535	11676	385
	WC Cumbo Land Pty Ltd			10031	10948	422
Murragamba	32A Ulan Coal Mines Ltd	1A Rural	Rural	5908	13466	433
	32B Ulan Coal Mines Ltd			6796	14239	417
	32C Ulan Coal Mines Ltd			8144	13788	411
	42 DJ Little and AK Salter			6155	14795	424
	44 GC & JK Helm			7808	11028	460
	37 CN & HL Davies			5204	12946	433
	34 SE Birt & KM Hayes			5429	12241	453
	35 MJ Carlisle			4755	10879	474
	20 BW & HJ Best			6298	9757	480
	43 M & E McKinna			7320	8044	516
	5 EM & DH & C Power			Vacant Land		
Moolarben	68B EC Mayberry	1A Rural	Rural	5755	5970	500
Goulburn River National Park and Munghorn Gap Nature Reserve	NSW NPWS	8A	National Parks and Nature Reserves	N/A	N/A	N/A

Note 1: To convert to MGA co-ordinates add 758,000 m E and add 6,410,000 m N.

In addition, vibration predictions have been undertaken for three Aboriginal heritage sites (Section 6.4). The locations of these sites are shown in **Table 3**.

Table 3 Aboriginal Heritage Sites

Aboriginal Heritage Site	ENM Model Co-ordinates[1]		
	East (m)	North (m)	Elevation (m)
WCP 72	13739	7366	433
WCP 152	10479	6911	475
WCP 153	10560	7441	480

Note 1: To convert to MGA co-ordinates add 758,000 m E and add 6,410,000 m N.

2.2 Initial Construction

Initial construction activities would be undertaken generally during daytime hours up to seven days per week. Construction activities during Year 1 of the Project would be focussed on development of the following Project infrastructure components:

- On-site temporary construction camp to accommodate construction personnel and temporary access road.
- Mine access road (including realignment of the intersection of Wilpinjong Road and Wollar Road, and de-gazettal and closure of Wilpinjong Road and Bungulla Road).
- Relocation of the existing 11kV electricity transmission line.
- Mine facilities area.
- CHPP and ROM coal handling areas.
- CHPP water supply storage (and initial tailings disposal area), water supply bores and associated pump and pipeline system.
- Product coal stockpiles/handling area and train loading infrastructure.
- 3.8 km long rail spur and rail loop.

The provisional construction fleet list is presented in **Table 4**.

Table 4 Provisional Construction Mobile Equipment Fleet - Year 1

Mobile Plant	Primary purpose	Total Number
20 t Crane	CHPP & Mine Facilities Area Construction, Coal Handling Infrastructure Construction, Rail Spur and Loop Construction	1 1 1
50 t Mobile Crane	CHPP & Mine Facilities Area Construction, Coal Handling Infrastructure Construction Rail Spur and Loop Construction	1 1 -
Delivery Trucks	Rail Spur and Loop Construction	2
D8 Dozer	Rail Spur and Loop Construction	2
186 t Excavator	Rail Spur and Loop Construction	2
Plate Compactor	Rail Spur and Loop Construction	2
Track Laying Machine	Rail Spur and Loop Construction	1

Source: Thiess (2004)

2.3 Open-cut

Six pits have been delineated to extract the open cut mineable reserves over the 21 year mine life as shown on the conceptual mine plans for Years 1, 3, 9, 13, 14 and 21 attached as **Appendices B3 to B7**.

Construction

Mining is scheduled to commence with the development of an initial box cut in the south-eastern section of Pit 1. Waste rock material excavated would be used in the construction of various mine and rail infrastructure components. After completing this excavation, mining operations would relocate to the northern end of Pit 1.

Operation

The general sequence of open cut mining operations for the Project would be as follows (**Appendices B8 and B9**):

- Vegetation clearing and topsoil/subsoil stripping. Stripped topsoil and subsoil would be used directly in progressive rehabilitation or placed in temporary stockpiles.
- Drilling and blasting of overburden, with some waste rock "throw blast" into the adjacent mined-out strip.

- Dozer pushing of blasted overburden into the adjacent mined-out strip to expose the upper ply of the Ulan Seam. Exposed coal would then be selectively mined and hauled by trucks to the ROM coal stockpiles.
- Interburden/parting material would then be ripped, pushed or excavated and hauled to expose the underlying working sections of the Ulan Seam.
- Progressive rehabilitation of the mine waste rock emplacements.

The proposed mine fleet for the Project is presented in **Table 5**.

Table 5 Proposed Operation Module Equipment Fleet

Mobile Plant	Primary Purpose	Total Number	
		Year 1	Years 2 - 21
Excavator (186 t)	Overburden Excavation/Loading, Coal Mining/Loading	2	4
Haul Truck (91 t)	Overburden/Coal/Rejects Haulage	1	1
Haul Truck (136 t)	Coal Haulage	5	9
D8 Dozer	Excavator Support	1	2
D10 Dozer	Overburden Ripping/Pushing, Waste Rock Management	1	2
D11 Dozer	Overburden Ripping/Pushing, Coal Mining	2	2
D11 Dozer	Product Coal Handling	1	1
D11 Dozer	Overburden Ripping/Pushing	1	2
Front End Loader	Product Coal Handling	2	2
Grader	Overburden Contouring, Road Grading	1	1
Water Truck	Dust Suppression	1	2
Drill	Overburden Drilling	1	1
Water Pump	Pit Dewatering	2	4

Source: Thiess (2004)

Blasting

Overburden material that is not able to be efficiently ripped and excavated by mobile plant would be drilled and blasted with some overburden material being thrown into the adjacent mined out pit.

Blast sizes would typically be around 280,000 bank cubic metres (bcm) using a mixture of ammonium nitrate and fuel oil (ANFO) (dry holes) and emulsion blends (wet holes). It is estimated that an average of one blast per week would be required.

2.4 Coal Handling and Preparation Plant

Construction

The CHPP would be constructed in the first half of Year 1 of the Project and commissioned during the second half.

Operation

The CHPP would operate up to 24 hours per day, seven days per week with a design capacity of approximately 1,200 tph ROM coal feed.

ROM coal would be reclaimed from the ROM dump hopper to the primary sizer. The primary sizer would operate with a top particle size output of 300 mm.

The CHPP would comprise a de-sliming unit and a single module of 1,100 tph capacity dense medium cyclones and spirals.

2.5 Train Loading System and Rail Spur/Loop

Construction

The train loading system and rail spur/loop would be constructed in the first half of Year 1 of the Project. The train loading infrastructure would be designed to load trains at a rate of 4,000 tph.

Operation

Product coal would be loaded on to nominal 8,500 t trains 24 hours a day, seven days per week. An average of four (and a maximum of six) trains would be loaded each day.

The product coal would then be transported to either the Bayswater/Liddell rail unloader (domestic coal) or the Port of Newcastle (export coal) located approximately 155 km and 260 km respectively from the Project.

2.6 Site Access

Construction

It is anticipated that up to 250 people (with an average of approximately 200 persons) would be employed during the initial construction phase (ie. Year 1) of the Project.

An on-site temporary construction camp would be established upon commencement of the Project and accessed via the Ulan-Wollar Road. An existing access track from the north off Ulan-Wollar Road would be temporarily utilised during the initial construction and development activities to provide for direct access for employees transiting between the temporary construction camp and the Project site. Nominal shift times for construction staff would be between 7 am to 6 pm up to 7 days per week.

Operation

Upon the commencement of mining in Year 1 up to 84 people would be employed. In the order of 162 people would be employed at peak production including a mixture of direct WCPL employees and contractors.

Nominal shift start and finish times during mining operations would be as follows:

- Administration Personnel - 7.00 am to 5.00 pm weekdays.
- Open Cut (Day) Personnel - 6:30 am to 7.00 pm.
- Open Cut (Night) Personnel - 6:30 pm to 7.00 am.

The primary access to the Project site would be via the mine access road connecting the mine facilities area to Wollar Road.

3 EXISTING NOISE AND METEOROLOGICAL ENVIRONMENT

3.1 Noise Environment

Background noise surveys to characterise and quantify the acoustical environment in the area surrounding the Project were conducted in two programmes between 5 August and 4 September 2004. Nine unattended noise loggers were positioned at selected representative dwellings commencing Thursday 5 and Thursday 19 August 2004, for the first and second campaigns respectively.

In order to supplement the unattended logger measurements and to assist in identifying the character and duration of background noise sources, operator-attended daytime, evening and night-time surveys were also conducted at all nine logging locations. The measurement methodology and analysis procedures are described in **Appendix C2**. The operator-attended measurement results are summarised in **Table 6**.

Table 6 Operator-Attended Background Noise Environment August 2004 (dBA re 20 µPa)

Site Name	Locality	Reference/ Landowner	Measured $L_{A90(15minute)}$ Background Level[4]			Estimated $L_{Aeq(15minute)}$ Industrial Noise[4]		
			Day	Evening	Night-time	Day	Evening	Night-time
NO4	Cumbo	6 Langshaw	26	28	27	Not discernible		
NO6	Wollar	900 St Laurence O'Toole Catholic Church	29	26	26	Not discernible		
NO8	Araluen	139 Woolford	25	28	25	Not discernible		
NO5	Slate Gully	WG Cumbo P/L[3]	26	25	23	Not discernible		
NO7	Wilpinjong (north-east of the Project area)	WB Cumbo P/L	26	31	29	Not discernible		
NO3	Wilpinjong	WF Cumbo P/L[1,3]	32	39	34	Not discernible		
NO1	Murragamba	42 Little/Salter	26	26	29	26	29	30
NO2		34 Birt/Hayes[2]	26	36	26	Not discernible		

Note 1: Significant cricket and insect noise particularly during evening period.
Note 2: Regular diesel generator noise during evening period.
Note 3: Mine-owned dwellings no longer tenanted.
Note 4: Daytime 7.00 am to 6.00 pm, Evening 6.00 pm to 10.00 pm and Night-time 10.00 pm to 7.00 am.

Note, distant noise emissions from the existing Ulan Coal Mines were only detected by the operator at property 42 Little/Salter in the Murragamba locality. No further industrial noise (ie. non-transport related noise) was detected at any of the remaining monitoring locations.

The unattended background noise logger data from each monitoring location, together with the on-site weather conditions are presented graphically on a daily basis in **Appendices C3** to **C11**. The background noise data was then processed in accordance with the requirements of the NSW INP (2000) to derive the Rating Background Levels (RBLs) presented in **Table 7**.

Table 7 Unattended Background Noise Environment August 2004 (dBA re 20 µPa)

Locality	Reference/ Landowner	Rating Background Level[1,2,3] All Noise Sources			LAeq(period)[3] All Noise Sources		
		Daytime	Evening	Night-time	Daytime	Evening	Night-time
Cumbo	6 Langshaw (dwelling)	27	22	22	51	41	41
	6 Langshaw (25 m from road)	27	23	23	51	44	41
Wollar	900 St Laurence O'Toole Catholic Church (boundary)	31	26	27	64	42	50
Araluen	139 Woolford (dwelling)	25	24	24	43	39	41
Slate Gully	WG Cumbo P/L (potential dwelling site)	25	22	22	50	44	40
Wilpinjong (north-east of the Project area)	WB Cumbo P/L (dwelling)	27	28	23	52	41	39
Wilpinjong	WF Cumbo P/L (75 m from Railway)	28	34[4]	27	53	51	51
Murragamba	42 Little/Salter (dwelling)	26	24	24	54	38	42
	34 Birt/Hayes (dwelling)	28	43[4]	23	46	49	30

Note 1: Measured noise levels less than 31 dBA may have a signal to noise ratio less than 5 dBA.
Note 2: In accordance with the NSW INP (2000), if the RBL is below 30 dBA, then 30 dBA shall be the assumed RBL.
Note 3: Daytime 7.00 am to 6.00 pm, Evening 6.00 pm to 10.00 pm and Night-time 10.00 pm to 7.00 am.
*Note 4: Refer to Note 1 and Note 2 in **Table 6**.*

Based on the observations made during the operator-attended monitoring it is concluded that the RBLs presented in **Table 7** are representative of the background noise environment for all localities except during the evening at WF Cumbo P/L and 34 Birt/Hayes as noted in **Table 6**.

Noise Environment for Project Assessment Purposes

For the purposes of assessing potential noise impacts from the Project, the background noise levels have been distilled into nine distinct localities that are summarised in **Table 8**.

The Rating Background Levels (RBLs) adopted for assessment purposes are representative of the background noise environment, with RBLs ranging from 30 dBA at night-time to 31 dBA during the daytime. Furthermore, industrial noise amenity levels (ie. non-transport related noise) from other mines in the locality are minimal. The RBLs are typical for a rural environment where there is minimal industrial noise and relatively low use transport corridors.

Table 8 Noise Environment for Project Assessment Purposes (dBA re 20 µPA)

Receiver Area	Property Owner	Rating Background Level[1,2,3] All Noise Sources			Estimated LAeq(period)[3] Industrial Noise Amenity		
		Daytime	Evening	Night-time	Daytime	Evening	Night-time
Cumbo	6 Langshaw	30	30	30	<44	<39	<34
Wollar (south of the village of Wollar)	-	30	30	30	<44	<39	<34
Wollar	900 St Laurence O'Toole Catholic Church	31	30	30	<49	<39	<34
Araluen	139 Woolford	30	30	30	<44	<39	<34
Slate Gully	WG Cumbo P/L[4]	30	30	30	<44	<39	<34
Wilpinjong (north-east of the Project area)	WB Cumbo P/L	30	30	30	<44	<39	<34
Wilpinjong	WF Cumbo P/L[4]	30	30	30	<44	<39	<34
Murragamba	42 Little/Salter	30	30	30	<44	<39	<34
	34 Birt/Hayes	30	30	30	<44	<39	<34
Moolarben	-	30	30	30	<44	<39	<34

Note 1: Measured noise levels less than 31 dBA may have a signal to noise ratio less than 5 dBA.
Note 2: In accordance with the NSW INP (2000), if the RBL is below 30 dBA, then 30 dBA shall be the assumed RBL.
Note 3: Daytime 7.00 am to 6.00 pm, Evening 6.00 pm to 10.00 pm and Night-time 10.00 pm to 7.00 am.
Note 4: WF and WG are mine-owned and no longer tenanted.

3.2 Meteorological Environment

Project Meteorological Conditions

The INP Section 5.3, Wind Effects, states:

> *"Wind effects need to be assessed where wind is a feature of the area. Wind is considered to be a feature where source to receiver wind speeds (at 10 m height) of 3 m/s or below occur for 30 percent of the time or more in any assessment period in any season."*

An assessment of existing wind conditions has been prepared from the on-site meteorological data recorded at the Project Site for the period June 2004 to February 2005. The dominant seasonal wind speeds and directions are presented as **Appendix C12** for daytime (7.00 am to 6.00 pm), evening (6.00 pm to 10.00 pm) and night-time (10.00 pm to 7.00 am).

The prevailing winds less than (or equal to) 3 m/s with a frequency of occurrence greater than (or equal to) 30% and considered to be relevant to the site in accordance with the INP are presented in **Table 9**, where the prevailing conditions used in noise modelling are underlined.

Table 9 Project Prevailing Wind Conditions in Accordance with NSW INP (2000)

Season	Winds ± 45° ≤3 m/s with Frequency of Occurrence ≥30%[1,2]		
	Daytime	Evening	Night-time
Summer	Nil	Nil	E (35%), ESE (34%)
Autumn	Nil	Nil[3]	Nil[3]
Winter	Nil	WNW (31%), W (31%)	Nil
Spring	Nil	Nil	Nil

Note 1: The prevailing seasonal wind conditions used in noise modelling are underlined.
Note 2: Based on available weather data June 2004 to February 2005.
Note 3: Based on TAPM wind simulation in the absence of on-site weather data.

The INP Section 5.2, Temperature Inversions, states:

> *"Assessment of impacts is confined to the night noise assessment period (10.00 pm to 7.00 am), as this is the time likely to have the greatest impact - that is, when temperature inversions usually occur and disturbance to sleep is possible."*

> *"Where inversion conditions are predicted for at least 30% (or approximately two nights per week) of total night-time in winter, then inversion effects are considered to be significant and should be taken into account in the noise assessment".*

An assessment of atmospheric stability conditions has also been prepared from the meteorological data set (described above). The winter evening and night-time frequency of occurrence of atmospheric stability classes are presented in **Table 10**, together with estimated Environmental Lapse Rates (ELR).

Table 10 Atmospheric Stability Frequency of Occurrence - Winter Evening and Night-time

Stability Class	Occurrence Percentage	Estimated ELR[1] ^{o}C/100 m	Qualitative Description
A	0%	<-1.9	Lapse
B	0%	-1.9 to-1.7	Lapse
C	0%	-1.7 to-1.5	Lapse
D	28%	-1.5 to-0.5	Neutral
E	12%	-0.5 to 1.5	Weak Inversion
F	58%	1.5 to 4.0	Moderate Inversion
G	2%	>4.0	Strong Inversion

Note 1: ELR (Environmental Lapse Rate).

In accordance with the NSW INP (2000) the frequency of occurrence of moderate to strong (ie. 1.5 to >4.0^{o}C/100 m) winter temperature inversions is greater than 30% during the combined evening and night-time period and therefore requires assessment.

In addition, the INP Section 5.2 *Temperature Inversions* also states:

> *"The drainage-flow wind default value should generally be applied where a development is at a higher altitude than a residential receiver, with no intervening higher ground (for example, hills). In these cases, both the specified wind and temperature inversion default values should be used in the noise assessment for receivers at the lower altitude."*

In this case all general localities with the exception of receivers to the immediate north-east of the Project area (Table 2) are positioned at higher elevation relative to the Project site and/or there is intervening topography between the site and noise sensitive receiver. As the Project is at a higher altitude than the receivers to the immediate north-east of the Project area (and with no intervening higher topography), this locality is assessed under drainage conditions.

Environmental Noise Model (ENM) Meteorology

The ENM noise modelling meteorological parameters presented in **Table 11** are based on the default inversion and wind speeds presented in the INP Section 5 Meteorological Conditions.

Table 11 Calm and Noise Enhancing Meteorological Modelling Parameters

Period	Meteorological Parameter	Air Temp	Relative Humidity	Wind Velocity	Temperature Gradient
Daytime	Calm	18°C	60%	0 m/s	0°C/100 m
Evening[1]	Wind only Winter	12°C	75%	West 3 m/s	0°C/100 m
Night-time[1]	Wind only Summer	12°C	75%	East 3 m/s	0°C/100 m
Night-time[2]	Inversion only Winter	6°C	90%	0 m/s	3°C/100 m
Night-time[3]	Inversion and Drainage	6°C	90%	West-Southwest 2 m/s	3°C/100 m

Note 1: INP default adverse wind speed 3 m/s.
Note 2: INP default temperature inversion 3°C/100 m.
Note 3: INP default temperature inversion 3°C/100 m and 2 m/s west-southwest drainage flow to receivers north-east of the Project area only (Table 2).

4 MINE NOISE ASSESSMENT METHODOLOGY

4.1 Construction and Operation Assessment Criteria

Construction

The assessment of potential noise impacts from on-site construction works remains according to the EPA's Environmental Noise Control Manual (ENCM) (1994) Chapter 171 Noise Control Guideline - Construction Site Noise (**Appendix D**). As the duration of the construction works is 6 months the guideline suggests that the construction noise emissions should generally not exceed the background noise level by more than 10 dBA.

Operation

The INP prescribes detailed calculation routines for establishing "Project specific" $L_{Aeq(15minute)}$ intrusive noise criteria and $L_{Aeq(period)}$ amenity noise criteria for a development at noise sensitive receivers.

In addition, "vacant land" is defined as a lot which is permitted to have (but does not yet have) a dwelling. Current DIPNR policy does not consider vacant land to be noise affected in the absence of a dwelling. In the event that the land owner establishes a dwelling, only then will it be considered as a noise sensitive receiver.

Sleep Disturbance

The DEC's "*Sleep Disturbance Noise Criteria Guideline*" dated 22 June 2004 suggests that the $L_{A1(60sec)}$ noise level from any specific noise (ideally) should not exceed the background noise level by more than 15 dBA. However, the issue of potential sleep disturbance is complex and still poorly understood in the literature.

The DEC's current guideline suggests the screening criteria for sleep disturbance to be an $L_{A1(60second)}$ level 15 dBA above the Rating Background Level (RBL) for the night-time period. A review of noise events from comparable coal mining operations shows that the maximum or $L_{A1(60second)}$ levels from mobile equipment (ie. dozers, haul trucks, trains etc) are typically no greater than 10 dBA above the $L_{Aeq(15minute)}$ intrusive level.

Hence, if the $L_{Aeq(15minute)}$ intrusive criteria (ie. background plus 5 dBA) are achieved then the DEC's sleep disturbance guideline criteria will also be met. This relationship enables the noise assessment process to focus on the setting of the appropriate INP-based criteria which aim to minimise annoyance at any noise sensitive receiver location.

Assessment Criteria

The INP-based intrusive and amenity noise assessment criteria at the nine assessment localities are presented in **Table 12**. These criteria are nominated for the purposes of assessing potential noise impacts from the Project. Note, the $L_{Aeq(15minute)}$ intrusive criteria are the controlling noise limits at all noise sensitive receivers.

Table 12 INP Project Specific Noise Assessment Criteria (dBA re 20 µPa)

Locality	Land Owner	Project Specific Noise Assessment Criteria					
		Intrusive $L_{Aeq(15minute)}$			Amenity $L_{Aeq(period)}$[1]		
		Day	Evening	Night-time	Day	Evening	Night-time
Cumbo	6 Langshaw	35	35	35	50	45	40
	Other Residential	35	35	35	50	45	40
Wollar (south of the village of Wollar)	Residential	35	35	35	50	45	40
	150A St Luke's Anglican Church (Tindale/ McDonald/Wilson) (Internal)	INP Place of Worship[2]			40	40	Not in use[3]
Wollar	900 St Laurence O'Toole Catholic Church (Internal)	INP Place of Worship[2]			40	40	Not in use[3]
	901 School (Internal)	INP School Classroom[2]			35	35	
	Residential	36	35	35	55	45	40
Araluen	60 Reid	35	35	35	50	45	40
	Other Residential	35	35	35	50	45	40
Slate Gully	Residential	35	35	35	50	45	40
Wilpinjong (north-east of the Project area)	WB Cumbo P/L	35	35	35	50	45	40
	Other Residential	35	35	35	50	45	40
Wilpinjong	Residential	35	35	35	50	45	40
Murragamba	34 Birt/Hayes	35	35	35	50	45	40
	42 Little/Salter	35	35	35	50	45	40
	Other Residential	35	35	35	50	45	40
Moolarben	Residential	35	35	35	50	45	40
Goulburn National Park and Munghorn Gap Nature Reserve	-	INP Passive Recreation Area[2]			50	50	50

Note 1: Daytime 07.00 am to 6.00 pm, Evening 6.00 pm to10.00 pm, Night-time 10.00 pm to 07.00 am.

Note 2: No intrusive criteria apply.

Note 3: It is understood that the churches and school are generally not utilised at night-time (i.e. between 10.00 pm and 6.00 am).

The INP states that these criteria have been selected to protect at least 90% of the population living in the vicinity of industrial noise sources from the adverse effects of noise for at least 90% of the time. Provided the criteria in the INP are achieved, it is unlikely that most people would consider the resultant noise levels excessive.

In those cases where the INP Project specific noise assessment criteria are not achieved, it does not automatically follow that all people exposed to the noise would find the noise unacceptable. In subjective terms, exceedances of the INP Project specific noise assessment criteria can be generally described as follows:

- Negligible noise level increase <1 dBA
  (Not noticeable by all people)
- Marginal noise level increase 1 dBA to 2 dBA
  (Not noticeable by most people)
- Moderate noise level increase 3 dBA to 5 dBA
  (Not noticeable by some people but may be noticeable by others)
- Appreciable noise level increase >5 dBA
  (Noticeable by most people)

In view of the foregoing, **Table 13** presents the methodology for assessing noise levels which may exceed the INP Project specific noise assessment criteria.

Table 13 Project Noise Impact Assessment Methodology

Assessment Criteria	Project Specific Criteria	Noise Management Zone		Noise Affectation Zone
		Marginal	Moderate	
Intrusive $L_{Aeq(15minute)}$	Rating background level plus 5 dBA	1 to 2 dBA above Project specific criteria	3 to 5 dBA above Project specific criteria	> 5 dBA above Project specific criteria
Amenity $L_{Aeq(period)}$	INP based on existing industrial level			

For the purposes of assessing the potential noise impacts, the management and affectation criteria are further defined as follows:

Noise Management Zone

Depending on the degree of exceedance of the Project specific criteria, noise impacts in the noise management zone could range from negligible to moderate (in terms of the perceived noise level increase). For noise sensitive receivers assessed as occurring within this zone, it is recommended that management procedures be implemented including:

- Noise monitoring on-site and within the community.
- Prompt response to any community issues of concern.
- Refinement of on-site noise mitigation measures and mine operating procedures where practicable.
- Discussions with relevant land owners to assess concerns.
- Consideration of acoustical mitigation at receivers where substantiated by monitoring results.
- Consideration of negotiated agreements with land owners.

Noise Affectation Zone

Exposure to noise levels corresponding to this zone may be considered unacceptable by some land owners particularly at night-time. For noise sensitive receivers assessed as occurring within this zone, it is recommended that WCPL explore the following:

- Discussions with relevant land owners to assess concerns and define responses.
- Implementation of acoustical mitigation at receivers.
- Negotiated agreements with land owners.

4.2 Mine Noise Mitigation Measures

The Noise Management Zone and Noise Affectation Zone procedures described in **Section 4.1** are in addition to ensuring that feasible and reasonable noise controls, as included in the predictive modelling, have been implemented for the Project including:

Noise Mitigation Investigations

During the initial assessment phase, a number of iterative steps were undertaken to ascertain potential unmitigated noise emissions and assess the feasibility and practicability of implementing noise management and mitigation measures to reduce Project noise emissions at receivers, including:

- Preliminary noise modelling of critical years to identify areas of affectation.
- Further modelling with various noise management and mitigation measures to assess their relative effectiveness.
- Consideration of various combinations of noise management and mitigation measures to minimise the potential noise affectation zone.
- Adoption by WCPL of a range of noise management and mitigation measures that significantly reduce the Project noise emissions during initial construction and mine operations. The actual timing of the implementation of the noise controls would be dependent on the actual production and mine progression.

A brief discussion of the noise mitigation and management controls adopted is provided below.

Construction Noise Controls

Construction activities (refer to **Section 2.2** of this report for a list of construction activities) will be confined to daytime hours in accordance with **Table 1** and are scheduled to be completed within a 6 month period.

Mine Operating Noise Controls

The Project's fixed plant and mobile equipment shall be commissioned to achieve the operating L_{Aeq} sound power levels (SWLs) presented in **Table 14**.

The maximum operating SWLs for mobile equipment are based on current "achievable" noise emission standards. Further reductions may be possible in the future. Initial cost estimates to install, maintain and service the "achievable" noise controls have been undertaken and included in the Project's operating budgets.

Subsequent detailed design studies may be required to refine individual SWLs and to prepare procurement specifications to ensure that the approved off-site environmental noise limits are achieved.

Table 14 Project Maximum Operating L_{Aeq} Sound Power Levels (dBA re 1pW)

Plant and Equipment	Make and Model (or equivalent)	Years 1 to 5	Year ≥6[1]
Mobile Equipment (Component SWLs)			
Excavators	186 t	114 dBA	112 dBA
Haul Trucks	136 t	118 dBA	113 dBA
	91 t	116 dBA	113 dBA
Dozers	D8	117 dBA	115 dBA
	D10	120 dBA	118 dBA
	D11	122 dBA	120 dBA
Graders	-	115 dBA	112 dBA
Water Trucks	20 kL	114 dBA	112 dBA
Front-end Loader	-	114 dBA	112 dBA
Blast Hole Drills	-	115 dBA	113 dBA
Coal Preparation and Handling Plant (Component SWLs)			
Primary Sizer	1200 tph	110 dBA	
Raw Coal Conveyor	1200 tph	95 dBA/100 m, Conveyor Drive 95 dBA	
Secondary/Tertiary Crushers	1200 tph	116 dBA	
CHPP Ground and Level 1	1100 tph	121 dBA	
CHPP Levels 2, 3 and roof[2]	1100 tph	112 dBA	
Reject Conveyor	1100 tph	95 dBA/100 m, Conveyor Drive 95 dBA	
Product Coal Conveyor	1200 tph	95 dBA/100 m, Conveyor Drive 95 dBA	
Stockpile Discharge	Capacity 1200 tph	103 dBA	
Train Loading System (Component SWLs)			
Reclaim Conveyor	4000 tph	100 dBA/100 m, Conveyor Drive 98 dBA	
Train Loadout Conveyor	4000 tph	100 dBA/100 m, Conveyor Drive 98 dBA	
Train Loadout Bin	200 t	114 dBA	
Locomotive Set[3]	4 of 82 Class	114 dBA	

Note 1: Or as determined by actual production/mine progression.
Note 2: Enclose CHPP Levels 2, 3 and roof or equivalent noise control to achieve SWL 112 dBA.
Note 3: Locomotive noise regulated by ARTC Environmental Protection Licence requirements.

No permanent out-of-pit mine waste rock emplacements are proposed however mine waste rock would be used for the construction of safety bunds and other contained infrastructure (e.g. ROM pad, rail/road embankments, water diversion/containment bunds, etc.). Beyond Year 1 overburden material would generally be hauled into adjacent open-cut voids and therefore remain "in pit".

Open-Cut Blasting Controls

Blasting activities would be confined to daytime hours in accordance with **Table 1**. A programme of monitoring will be implemented to ensure compliance with environmental limits and assist with the optimisation of blast designs as required.

Off-Site Road Transportation

The establishment of the on-site temporary construction camp to accommodate up to 100 people will minimise off-site vehicle movements during the construction phase.

During mine operations car pooling will be encouraged and it is anticipated that approximately 30% of the workforce would participate.

Off-Site Rail Transportation

Wherever possible WCPL will liaise with the ARTC to assist in meeting its regulatory noise requirements.

4.3 Mine Noise Modelling Procedure

The Project computer model was developed to incorporate the significant noise sources associated with the Project. Additional surrounding terrain and the location of nearby noise sensitive receivers were also included in the model.

The Project computer model was prepared using RTA Software's Environmental Noise Model (ENM for Windows, Version 3.06), a commercial software system developed in conjunction with the NSW DEC. The acoustical algorithms utilised by this software have been endorsed by the Australian and New Zealand Environment and Conservation Council (ANZECC) and all State Environmental Authorities throughout Australia as representing one of the most appropriate predictive methodologies currently available.

The following scenarios were assessed (based on planned production/mine progression) (localities in the vicinity of the Project are shown in Appendix C1):

Operation Year 3: Representative of open-cut operations early in the Project life (Appendix B3). In this year of operation, Project noise sources would include Pit 1 and Pit 2, CHPP and train loading system operation.

Operation Year 9: Representative of the nearest open-cut operations to the Cumbo locality and noise sensitive receivers to the south of Wollar (Appendix B4). In this year of operation, Project noise sources would include Pit 2, Pit 3 and Pit 4, CHPP and train loading system operation.

Operation Year 11: Representative of the nearest open-cut operations to the Slate Gully, Wollar and Araluen localities. In this year of operation, Project noise sources would include Pit 3 and Pit 4, CHPP and train loading system operation.

Operation Year 13: Representative of the nearest open-cut operations to receivers to the north-west of the Project area (Appendix B5). In this year of operation, Project noise sources would include Pit 3, Pit 4 and Pit 5, CHPP and train loading system operations.

Operation Year 14: Representative of the nearest open-cut operations to noise sensitive receivers to the immediate north and west of the Project operations in the Wilpinjong and Murragamba localities, respectively (Appendix B6). In this year of operation, Project noise sources would include Pit 5 and Pit 6, CHPP and train loading system operations.

Operation Year 21: Representative of the nearest open-cut operations to Moolarben and Cumbo localities (Appendix B7). In this year of operation, Project noise sources would include Pit 5 and Pit 6, CHPP and train loading system operations.

Modelling of mining operations includes all proposed plant items operating concurrently to simulate the overall maximum energy equivalent (ie. $L_{Aeq(15minute)}$) intrusive noise level. The model includes coal loading operations and train movement on the rail loop. A large proportion of the mobile equipment is operated in repeatable routines and a relatively smaller proportion of the emissions emanate from continuous fixed plant items.

The L_{Aeq} sound power levels presented in **Table 14** for each item of mobile equipment do not include noise emissions which emanate from reversing alarms. In the event that reversing alarm noise is considered to be a source of disturbance, the alarm noise level should be checked against the appropriate Department of Primary Industries (formerly the Department of Mineral Resources) requirements and the necessary mitigating action taken to achieve an acceptable noise reduction without compromising safety standards.

5 MINE NOISE IMPACT ASSESSMENT

5.1 Construction

Daytime construction activities will be carried out simultaneously with the development of the initial box-cut in the south-eastern section of Pit 1 during the first 6 months. Waste rock material excavated would be used in the construction of various mine and rail infrastructure components. The Year 1 construction scenario comprises the following:

- The construction equipment presented in **Table 4**.
- The mine operating equipment presented in **Table 5** for Year 1.

Construction activities would occur during the daytime only. As the duration of the construction works is 6 months, the guideline suggests that the construction noise emissions should generally not exceed the background noise level by more than 10 dBA. Therefore, the daytime $L_{A10(15minute)}$ intrusive noise assessment criterion is 40 dBA for residential receivers.

At the completion of Year 1, mobile and fixed plant utilisation will increase. Hence, the daytime noise emissions arising from the expanded mining operation in Year 2 is potentially greater by comparison to the daytime construction scenario in the first half of Year 1.

Year 3 operations have been assessed rather than Year 2 as mining operations are closer to the southern localities. The Year 3 daytime intrusive noise levels are well below 40 dBA at all localities (refer **Table 15**).

5.2 Operation Year 3

The predicted $L_{Aeq(15minute)}$ intrusive noise emissions from Year 3 operation to the nearest affected noise sensitive receivers are presented in **Table 15** together with the Project specific noise assessment criteria. Noise sensitive receivers WA and WC are owned by WCPL and will not be tenanted after Year 3 of the Project. Hence, WA and WC and not assessed for operational years subsequent to Year 3.

Table 15 Year 3 Operation $L_{Aeq(15minute)}$ Intrusive Noise Emissions (dBA re 20 µPa)

Locality	Reference/ Land Owner	Daytime	Evening	Night-time		Project Specific Criteria		
		Calm	3 m/s West Wind	3 m/s East Wind	Inversion 3°C/100 m	Day	Evening	Night-time
Cumbo	54 Batty	13	10	34	29	35	35	35
	3 Maranda	11	9	16	15			
	29 Kattau	13	13	21	24			
	6 Langshaw	14	13	16	18			
	89A Newing	15	15	28	35			
	89B Newing	16	15	27	35			
	59 Langshaw	19	19	27	**37**[1]			
	87 Cavanagh	16	19	17	33			
	90 Pattullo	15	25	15	**36**[1]			
	4 Robinson	23	29	22	34			
	49 Harkin	22	**37**[1]	20	**38**[2]			
	60A Reid	25	**36**[1]	22	**36**[1]			
Wollar (south of the village of Wollar)	150A St Luke's Anglican Church (Tindale/ McDonald/ Wilson)[4]	0	17	0	15	40	40	Not in Use
	60B Reid	12	30	8	29	35	35	35
Wollar	900 St Laurence O'Toole Catholic Church[4]	0	17	0	16	40	40	Not in Use
	901 School[4]	0	17	0	15	35	35	
	Village	7	30	3	28	36	35	35
Araluen	128 Pongratz	10	30	6	29	35	35	35
	28A Power	10	31	5	27			
	28B Power	9	31	5	27			
	125 Bayliss	11	32	7	29			
	123A Zivkovic	11	31	8	27			
	123B Zivkovic	12	31	8	28			
	26 Christiansen	7	14	4	11			
	25 Pettit	12	33	7	31			
	23A Bloomfield	15	35	10	33			
	23B Bloomfield	13	34	8	32			

Table 15 (Continued) Year 3 Operation $L_{Aeq(15minute)}$ Intrusive Noise Emissions (dBA re 20 µPa)

Locality	Reference/ Land Owner	Daytime	Evening	Night-time		Project Specific Criteria		
		Calm	3 m/s West Wind	3 m/s East Wind	Inversion 3°C/100 m	Day	Evening	Night-time
Slate Gully	31A Conradt	14	34	10	24	35	35	35
	31B Conradt	13	34	9	27			
	53 Reynolds	15	**36**[1]	10	34			
	52A Long	15	**36**[1]	11	34			
	52B Long	16	**36**[1]	12	34			
	51 Bailey	14	**37**[1]	10	32			
	55 Fox	14	**36**[1]	10	31			
	56 Rogers	14	**36**[1]	10	34			
Wilpinjong (north-east of the Project area)	45 Smith	22	**37**[1]	20	**40**[2]	35	35	35
	WB Cumbo P/L	17	34	14	**36**[1]			
Wilpinjong	14 Close	26	24	**39**[2]	**39**[2]	35	35	35
	WA Cumbo P/L	25	23	**40**[2]	**39**[2]			
	WC Cumbo P/L	28	25	**43**[3]	**40**[2]			
Murragamba	32A Ulan Coal	15	11	24	23	35	35	35
	32B Ulan Coal	15	11	27	26			
	32C Ulan Coal	17	14	29	28			
	44 Helm	17	13	31	27			
	37 Davies	11	8	24	22			
	34 Birt/Hayes	12	8	24	23			
	35 Carlisle	11	6	28	23			
	20 Best	11	7	28	22			
	43 McKinna	15	10	26	23			
Moolarben	68B Mayberry	7	3	17	12	35	35	35
Goulburn River National Park[4]	NSW NPWS	39	47	39	50	50	50	50

Note 1: Marginal Noise Management Zone 1 to 2 dBA above Project specific criteria (bold).
Note 2: Moderate Noise Management Zone 3 to 5 dBA above Project specific criteria (bold).
Note 3: Noise Affectation Zone >5 dBA above Project specific criteria (shaded).
Note 4: $L_{Aeq(period)}$ noise amenity level and criteria.
Note 5: Night-time Inversion 3°C/100 m plus 2 m/s west southwest drainage wind.

Winter Night-time Noise Contours

The Year 3 night-time $L_{Aeq(15minute)}$ intrusive noise contours during temperature inversion are presented as **Appendix E1**. Note, the calculation of the noise contours involves numerical interpolation of noise level arrays with a graphical accuracy of up to approximately ±2 dBA. This means that in some cases the contour locations presented in **Appendix E1** will differ from the values presented in **Table 15**, particularly where topographic effects are prominent. All noise sensitive receivers within the 30 dBA contours are shown.

Private Vacant Land

DIPNR does not consider vacant land to be noise affected in the absence of a dwelling. For indicative purposes, however, based on the noise contours presented above, exceedances of the Project specific criteria estimated over 25% of the vacant land area is summarised in **Table 16**. Note, the land owners entitlement to construct a dwelling is unknown.

Table 16 Year 3 Vacant Land with Project Specific Criteria Exceedances (>25% Land Area)

Locality	1 dBA to 2 dBA above Project Specific Criteria	3 dBA to 5 dBA above Project Specific Criteria	>5 dBA above Project Specific Criteria
Cumbo	94 McKenzie 91 Gordon 48 Evans	Nil	30 Gaffney

5.3 Operation Year 9

The predicted $L_{Aeq(15minute)}$ intrusive noise emissions from Year 9 operation to the nearest affected noise sensitive receivers are presented in **Table 17** together with the Project specific assessment criteria.

Table 17 Year 9 Operation $L_{Aeq(15minute)}$ Intrusive Emissions (dBA re 20 µPa)

Locality	Reference/ Land Owner	Daytime	Evening	Night-time		Project Specific Criteria		
		Calm	3 m/s West Wind	3 m/s East Wind	Inversion 3°C/100 m	Day	Evening	Night-time
Cumbo	54 Batty	11	8	34	25	35	35	35
	3 Maranda	10	9	17	15			
	29 Kattau	18	18	33	30			
	6 Langshaw	19	19	31	27			
	89A Newing	17	17	30	34			
	89B Newing	17	17	29	34			
	59 Langshaw	21	21	31	**36**[1]			
	87 Cavanagh	16	18	25	32			
	90 Pattullo	16	22	25	34			
	4 Robinson	28	30	**39**[2]	**38**[2]			
	49 Harkin	28	**37**[1]	**37**[1]	**39**[2]			
	60A Reid	29	**38**[2]	32	**39**[2]			
Wollar (south of the village of Wollar)	150A St Luke's Anglican Church (Tindale/ McDonald/ Wilson)[4]	0	20	0	13	40	40	Not in Use
	60B Reid	12	34	9	29	35	35	35
Wollar	900 St Laurence O'Toole Catholic Church[4]	0	15	0	11	40	40	Not in Use
	901 School[4]	0	17	0	12	35	35	
	Village	8	30	6	25	36	35	35
Araluen	128 Pongratz	9	32	6	27	35	35	35
	28A Power	9	32	6	25			
	28B Power	9	32	6	24			
	125 Bayliss	10	33	6	27			
	123A Zivkovic	11	32	8	24			
	123B Zivkovic	11	32	9	26			
	26 Christiansen	8	15	6	12			
	25 Pettit	11	35	8	31			
	23A Bloomfield	14	**37**[1]	11	32			
	23B Bloomfield	12	**36**[1]	9	31			

Table 17 (Continued) Year 9 Operation $L_{Aeq(15minute)}$ Intrusive Emissions (dBA re 20 µPa)

Locality	Reference/ Land Owner	Daytime	Evening	Night-time		Project Specific Criteria		
		Calm	3 m/s West Wind	3 m/s East Wind	Inversion 3°C/100 m	Day	Evening	Night-time
Slate Gully	31A Conradt	13	34	10	19	35	35	35
	31B Conradt	12	**36**[1]	9	22			
	53 Reynolds	15	**39**[2]	12	32			
	52A Long	16	**39**[2]	13	33			
	52B Long	16	**39**[2]	13	33			
	51 Bailey	16	**39**[2]	14	29			
	55 Fox	15	**39**[2]	13	30			
	56 Rogers	14	**38**[2]	12	32			
Wilpinjong (north-east of the Project area)[5]	45 Smith	22	**37**[1]	21	**39**[2]	35	35	35
	WB Cumbo P/L	15	34	12	**36**[1]			
Wilpinjong	14 Close	23	22	**37**[1]	**36**[1]	35	35	35
Murragamba	32A Ulan Coal	13	10	25	23	35	35	35
	32B Ulan Coal	14	11	26	25			
	32C Ulan Coal	17	14	29	28			
	44 Helm	12	9	33	27			
	37 Davies	8	5	25	24			
	34 Birt/Hayes	8	5	27	24			
	35 Carlisle	7	3	27	21			
	20 Best	8	5	27	19			
	43 McKinna	11	7	23	16			
Moolarben	68B Mayberry	5	2	21	10	35	35	35
Goulburn River National Park[4]	NSW NPWS	33	42	39	42	50	50	50

Note 1: Marginal Noise Management Zone 1 to 2 dBA above Project specific criteria (bold).
Note 2: Moderate Noise Management Zone 3 to 5 dBA above Project specific criteria (bold).
Note 3: Noise Affectation Zone >5 dBA above Project specific criteria (shaded).
Note 4: $L_{Aeq(period)}$ noise amenity level and criteria.
Note 5: Night-time Inversion 3°C/100 m plus 2 m/s west southwest drainage wind.

Winter Evening Noise Contours

The Year 9 evening $L_{Aeq(15minute)}$ intrusive noise contours during westerly winds are presented as **Appendix E2**. Note, the calculation of the noise contours involves numerical interpolation of a noise level array with a graphical accuracy of up to approximately ±2 dBA. This means that in some cases the contour locations presented in **Appendix E2** will differ from the values presented in **Table 17**, particularly where topographic effects are prominent. All noise sensitive receivers within the 30 dBA contours are shown.

Private Vacant Land

DIPNR does not consider vacant land to be noise affected in the absence of a dwelling. For indicative purposes, however, based on the noise contours presented above, exceedances of the Project specific criteria estimated over 25% of the vacant land area is summarised in **Table 18**. Note, the land owners entitlement to construct a dwelling is unknown.

Table 18 Year 9 Vacant Land with Project Specific Criteria Exceedances (>25% Land Area)

Locality	1 dBA to 2 dBA above Project Specific Criteria	3 dBA to 5 dBA above Project Specific Criteria	>5 dBA above Project Specific Criteria
Cumbo	94 McKenzie	Nil	30 Gaffney
Slate Gully	Nil	31 Conradt 40 Plummer 58 Maher	Nil

5.4 Operation Year 11

The predicted $L_{Aeq(15minute)}$ intrusive noise emissions from Year 11 operation to the nearest affected noise sensitive receivers are presented in **Table 19** together with the Project specific assessment criteria.

Table 19 Year 11 Operation $L_{Aeq(15minute)}$ Intrusive Emissions (dBA re 20 µPa)

Locality	Reference/ Land Owner	Daytime	Evening	Night-time		Project Specific Criteria		
		Calm	3 m/s West Wind	3 m/s East Wind	Inversion 3°C/100 m	Day	Evening	Night-time
Cumbo	54 Batty	16	7	35	25	35	35	35
	3 Maranda	13	8	18	14			
	29 Kattau	22	16	**37**[1]	30			
	6 Langshaw	20	15	35	28			
	89A Newing	21	15	34	34			
	89B Newing	21	15	33	33			
	59 Langshaw	24	19	34	35			
	87 Cavanagh	20	16	27	31			
	90 Pattullo	20	19	27	34			
	4 Robinson	33	28	**40**[2]	**37**[1]			
	49 Harkin	30	**36**[1]	35	**37**[1]			
	60A Reid	29	34	29	**38**[2]			
Wollar (south of the village of Wollar)	150A St Luke's Anglican Church (Tindale/ McDonald/ Wilson) [4]	1	14	0	12	40	40	Not in Use
	60B Reid	16	30	13	27	35	35	35
Wollar	900 St Laurence O'Toole Catholic Church[4]	1	13	0	11	40	40	Not in Use
	901 School[4]	1	15	0	13	35	35	
	Village	14	28	11	26	36	35	35
Araluen	128 Pongratz	16	32	12	28	35	35	35
	28A Power	16	30	13	25			
	28B Power	16	31	13	25			
	125 Bayliss	17	33	13	31			
	123A Zivkovic	18	34	14	25			
	123B Zivkovic	18	32	14	27			
	26 Christiansen	15	15	12	13			
	25 Pettit	18	35	14	32			
	23A Bloomfield	22	**38**[2]	18	33			
	23B Bloomfield	19	**37**[1]	16	33			
Slate Gully	31A Conradt	21	**37**[1]	17	31	35	35	35
	31B Conradt	20	**36**[1]	17	31			
	53 Reynolds	23	**39**[2]	20	33			
	52A Long	23	**38**[2]	20	33			
	52B Long	24	**38**[2]	20	33			
	51 Bailey	24	**37**[1]	21	30			
	55 Fox	24	**39**[2]	20	30			
	56 Rogers	22	**39**[2]	19	32			

Table 19 (Continued) Year 11 Operation $L_{Aeq(15minute)}$ Intrusive Emissions (dBA re 20 µPa)

Locality	Reference/ Land Owner	Daytime	Evening	Night-time		Project Specific Criteria		
		Calm	3 m/s West Wind	3 m/s East Wind	Inversion 3°C/100 m	Day	Evening	Night-time
Wilpinjong (north-east of the Project area)[5]	45 Smith	31	**39**[2]	28	**47**[3]	35	35	35
	WB Cumbo P/L	24	**37**[1]	21	**44**[3]			
Wilpinjong	14 Close	26	21	**37**[1]	**36**[1]	35	35	35
Murragamba	32A Ulan Coal	17	9	27	23	35	35	35
	32B Ulan Coal	18	10	30	26			
	32C Ulan Coal	20	13	32	28			
	44 Helm	17	8	34	27			
	37 Davies	13	5	27	24			
	34 Birt/Hayes	13	4	28	24			
	35 Carlisle	13	3	30	22			
	20 Best	13	3	31	22			
	43 McKinna	16	6	29	16			
Moolarben	68B Mayberry	10	0	25	10	35	36	35
Goulburn River National Park[4]	NSW NPWS	38	43	43	44	50	50	50

Note 1: Marginal Noise Management Zone 1 to 2 dBA above Project specific criteria (bold).
Note 2: Moderate Noise Management Zone 3 to 5 dBA above Project specific criteria (bold).
Note 3: Noise Affectation Zone >5 dBA above Project specific criteria (shaded).
Note 4: $L_{Aeq(period)}$ noise amenity level and criteria.
Note 5: Night-time Inversion 3°C/100 m plus 2 m/s west southwest drainage wind.

Winter Evening Noise Contours

The Year 11 evening $L_{Aeq(15minute)}$ intrusive noise contours during westerly winds are presented as **Appendix E3**. Note, the calculation of the noise contours involves numerical interpolation of a noise level array with a graphical accuracy of up to approximately ±2 dBA. This means that in some cases the contour locations presented in **Appendix E3** will differ from the values presented in **Table 19**, particularly where topographic effects are prominent. All noise sensitive receivers within the 30 dBA contours are shown.

Private Vacant Land

DIPNR does not consider vacant land to be noise affected in the absence of a dwelling. For indicative purposes, however, based on the noise contours presented above, exceedances of the Project specific criteria estimated over 25% of the vacant land area is summarised in **Table 20**. Note, the land owners entitlement to construct a dwelling is unknown.

Table 20 Year 11 Vacant Land with Project Specific Criteria Exceedances (>25% Land Area)

Locality	1 dBA to 2 dBA above Project Specific Criteria	3 dBA to 5 dBA above Project Specific Criteria	>5 dBA above Project Specific Criteria
Cumbo	Nil	30 Gaffney	Nil
Slate Gully	Nil	31 Conradt 40 Plummer 58 Maher	Nil
Araluen	24 Peach	Nil	Nil

5.5 Operation Year 13

The predicted $L_{Aeq(15minute)}$ intrusive noise emissions from Year 13 operation to the nearest affected noise sensitive receivers are presented in **Table 21** together with the Project specific assessment criteria.

Table 21 Year 13 Operation $L_{Aeq(15minute)}$ Intrusive Emissions (dBA re 20 µPa)

Locality	Reference/ Land Owner	Daytime	Evening	Night-time		Project Specific Criteria		
		Calm	3 m/s West Wind	3 m/s East Wind	Inversion 3°C/100 m	Day	Evening	Night-time
Cumbo	54 Batty	10	7	31	24	35	35	35
	3 Maranda	8	6	13	12			
	29 Kattau	10	10	23	24			
	6 Langshaw	11	11	22	23			
	89A Newing	14	13	26	33			
	89B Newing	14	14	25	33			
	59 Langshaw	18	18	25	34			
	87 Cavanagh	15	18	18	30			
	90 Pattullo	13	22	19	34			
	4 Robinson	21	28	26	32			
	49 Harkin	19	35	24	**36**[1]			
	60A Reid	22	33	19	34			
Wollar (south of the village of Wollar)	150A St Luke's Anglican Church (Tindale/ McDonald/ Wilson) [4]	0	14	0	13	40	40	Not in Use
	60B Reid	9	27	5	27	35	35	35

Table 21 (Continued)Year 13 Operation $L_{Aeq(15minute)}$ Intrusive Emissions (dBA re 20 µPa)

Locality	Reference/ Land Owner	Daytime	Evening	Night-time		Project Specific Criteria		
		Calm	3 m/s West Wind	3 m/s East Wind	Inversion 3°C/100 m	Day	Evening	Night-time
Wollar	900 St Laurence O'Toole Catholic Church[4]	0	13	0	14	40	40	Not in Use
	901 School[4]	0	15	0	13	35	35	
	Village	5	28	2	13	36	35	35
Araluen	128 Pongratz	8	32	5	28	35	35	35
	28A Power	8	28	5	25			
	28B Power	8	28	5	24			
	125 Bayliss	9	33	5	28			
	123A Zivkovic	10	29	7	24			
	123B Zivkovic	10	28	6	26			
	26 Christiansen	8	14	5	12			
	25 Pettit	11	30	8	28			
	23A Bloomfield	14	**38[2]**	10	30			
	23B Bloomfield	12	**36[1]**	8	30			
Slate Gully	31A Conradt	12	**36[1]**	8	23	35	35	35
	31B Conradt	12	**36[1]**	8	25			
	53 Reynolds	14	**36[1]**	11	32			
	52A Long	14	**36[1]**	10	32			
	52B Long	15	**36[1]**	11	32			
	51 Bailey	13	34	10	29			
	55 Fox	14	35	11	30			
	56 Rogers	14	**36[1]**	11	32			
Wilpinjong (north-east of the Project area)[5]	45 Smith	27	**40[2]**	24	**43[3]**	35	35	35
	WB Cumbo P/L	19	**37[1]**	16	**40[2]**			
Wilpinjong	14 Close	35	33	**42[3]**	**42[3]**	35	35	35
Murragamba	32A Ulan Coal	13	10	28	28	35	35	35
	32B Ulan Coal	16	13	29	29			
	32C Ulan Coal	20	18	30	30			
	44 Helm	14	10	35	27			
	37 Davies	9	6	27	27			
	34 Birt/Hayes	10	6	28	25			
	35 Carlisle	8	4	28	25			
	20 Best	9	5	29	19			
	43 McKinna	12	8	29	19			
Moolarben	68B Mayberry	5	1	21	10	35	35	35
Goulburn River National Park[4]	NSW NPWS	45	47	46	48	50	50	50

Note 1: Marginal Noise Management Zone 1 to 2 dBA above Project specific criteria (bold).
Note 2: Moderate Noise Management Zone 3 to 5 dBA above Project specific criteria (bold).
Note 3: Noise Affectation Zone >5 dBA above Project specific criteria (shaded).

Note 4: $L_{Aeq(period)}$ noise amenity level and criteria.
Note 5: Night-time Inversion 3°C/100 m plus 2 m/s west southwest drainage wind.

Winter Evening Noise Contours

The Year 13 evening $L_{Aeq(15minute)}$ intrusive noise contours during west wind are presented as **Appendix E4**. Note, the calculation of the noise contours involves numerical interpolation of a noise level array with a graphical accuracy of up to approximately ±2 dBA. This means that in some cases the contour locations presented in **Appendix E4** will differ from the values presented in **Table 21**, particularly where topographic effects are prominent. All noise sensitive receivers within the 30 dBA contours are shown.

Private Vacant Land

DIPNR does not consider vacant land to be noise affected in the absence of a dwelling. For indicative purposes, however, based on the noise contours presented above, exceedances of the Project specific criteria estimated over 25% of the vacant land area are summarised in **Table 22**. Note, the land owners entitlement to construct a dwelling is unknown.

Table 22 Year 13 Vacant Land with Project Specific Criteria Exceedances (>25% Land Area)

Locality	1 dBA to 2 dBA above Project Specific Criteria	3 dBA to 5 dBA above Project Specific Criteria	>5 dBA above Project Specific Criteria
Cumbo	Nil	30 Gaffney	Nil
Slate Gully	40 Plummer	31 Conradt 58 Maher	Nil

5.6 Operation Year 14

The predicted $L_{Aeq(15minute)}$ intrusive noise emissions from Year 14 operation to the nearest affected noise sensitive receivers are presented in **Table 23** together with the Project specific assessment criteria.

Table 23 Year 14 Operation $L_{Aeq(15minute)}$ Intrusive Emissions (dBA re 20 µPa)

Locality	Reference/ Land Owner	Daytime	Evening	Night-time		Project Specific Criteria		
		Calm	3 m/s West Wind	3 m/s East Wind	Inversion 3°C/100 m	Day	Evening	Night-time
Cumbo	54 Batty	10	7	31	23	35	35	35
	3 Maranda	8	7	13	13			
	29 Kattau	10	10	13	18			
	6 Langshaw	11	11	13	15			
	89A Newing	12	14	24	32			
	89B Newing	13	14	23	32			
	59 Langshaw	17	18	22	34			
	87 Cavanagh	14	20	14	30			
	90 Pattullo	12	23	11	34			
	4 Robinson	16	28	14	25			
	49 Harkin	14	35	12	35			
	60A Reid	21	33	17	33			
Wollar (south of the village of Wollar)	150A St Luke's Anglican Church (Tindale/ McDonald/ Wilson) [4]	0	14	0	13	40	40	Not in Use
	60B Reid	9	27	5	26	35	35	35
Wollar	900 St Laurence O'Toole Catholic Church[4]	0	13	0	15	40	40	Not in Use
	901 School[4]	0	15	0	14	35	35	
	Village	3	2	0	27	36	35	35
Araluen	128 Pongratz	7	28	2	27	35	35	35
	28A Power	6	28	2	25			
	28B Power	6	28	2	25			
	125 Bayliss	7	28	3	27			
	123A Zivkovic	8	28	4	24			
	123B Zivkovic	8	28	3	26			
	26 Christiansen	4	11	0	7			
	25 Pettit	8	29	4	28			
	23A Bloomfield	11	32	6	30			
	23B Bloomfield	9	31	5	29			
Slate Gully	31A Conradt	9	32	5	23	35	35	35
	31B Conradt	10	31	5	24			
	53 Reynolds	11	34	6	32			
	52A Long	11	33	7	32			
	52B Long	13	33	8	32			
	51 Bailey	11	34	6	29			
	55 Fox	10	34	6	30			
	56 Rogers	10	33	5	32			
Wilpinjong (north-east of the Project area)[5]	45 Smith	20	33	18	32	35	35	35
	WB Cumbo P/L	13	31	9	30			

Table 23 (Continued) Year 14 Operation $L_{Aeq(15minute)}$ Intrusive Emissions (dBA re 20 µPa)

Locality	Reference/ Land Owner	Daytime	Evening	Night-time		Project Specific Criteria		
		Calm	3 m/s West Wind	3 m/s East Wind	Inversion 3°C/100 m	Day	Evening	Night-time
Wilpinjong	14 Close	**51**[3]	**55**[3]	**50**[3]	**54**[3]	35	35	35
Murragamba	32A Ulan Coal	16	12	30	28	35	35	35
	32B Ulan Coal	17	15	34	32			
	32C Ulan Coal	23	21	**36**[1]	**36**[1]			
	44 Helm	17	14	34	28			
	37 Davies	11	8	29	27			
	34 Birt/Hayes	12	8	30	25			
	35 Carlisle	10	5	30	24			
	20 Best	11	7	29	17			
	43 McKinna	13	10	29	19			
Moolarben	68B Mayberry	6	2	18	11	35	35	35
Goulburn River National Park[4]	NSW NPWS	33	43	36	42	50	50	50

Note 1: Marginal Noise Management Zone 1 to 2 dBA above Project specific criteria (bold).
Note 2: Moderate Noise Management Zone 3 to 5 dBA above Project specific criteria (bold).
Note 3: Noise Affectation Zone >5 dBA above Project specific criteria (shaded).
Note 4: $L_{Aeq(period)}$ noise amenity level and criteria.
Note 5: Night-time Inversion 3°C/100 m plus 2 m/s west southwest drainage wind.

Summer Night-time Noise Contours

The Year 14 night-time $L_{Aeq(15minute)}$ intrusive noise contours during easterly winds are presented as **Appendix E5**. Note, the calculation of the noise contours involves numerical interpolation of a noise level array with a graphical accuracy of up to approximately ±2 dBA. This means that in some cases the contour locations presented in **Appendix E5** will differ from the values presented in **Table 23**, particularly where topographic effects are prominent. All noise sensitive receivers within the 30 dBA contours are shown.

Private Vacant Land

DIPNR does not consider vacant land to be noise affected in the absence of a dwelling. For indicative purposes, however, based on the noise contours presented above, exceedances of the Project specific criteria estimated over 25% of the vacant land area are summarised in **Table 24**. Note, the land owners entitlement to construct a dwelling is unknown.

Table 24 Year 14 Vacant Land with Project Specific Criteria Exceedances (>25% Land Area)

Locality	1 dBA to 2 dBA above Project Specific Criteria	3 dBA to 5 dBA above Project Specific Criteria	>5 dBA above Project Specific Criteria
Murragamba	Nil	5 Power	Nil

5.7 Operation Year 21

The predicted $L_{Aeq(15minute)}$ intrusive noise emissions from Year 21 operation to the nearest affected noise sensitive receivers are presented in **Table 25** together with the Project specific assessment criteria.

Table 25 Year 21 Operation $L_{Aeq(15minute)}$ Intrusive Emissions (dBA re 20 µPa)

Locality	Reference/ Land Owner	Daytime	Evening	Night-time		Project Specific Criteria		
		Calm	3 m/s West Wind	3 m/s East Wind	Inversion 3°C/100 m	Day	Evening	Night-time
Cumbo	54 Batty	15	13	32	25	35	35	35
	3 Maranda	15	15	18	19			
	29 Kattau	13	16	14	18			
	6 Langshaw	14	17	15	18			
	89A Newing	13	15	24	32			
	89B Newing	13	16	23	32			
	59 Langshaw	17	22	22	34			
	87 Cavanagh	14	22	14	30			
	90 Pattullo	12	24	11	33			
	4 Robinson	16	25	14	22			
	49 Harkin	14	35	11	35			
	60A Reid	21	33	17	33			
Wollar (south of the village of Wollar)	150A St Luke's Anglican Church (Tindale/ McDonald/ Wilson) [4]	0	13	0	12	40	40	Not in Use
	60B Reid	9	26	4	25	35	35	35
Wollar	900 St Laurence O'Toole Catholic Church[4]	0	12	0	13	40	40	Not in Use
	901 School[4]	0	14	0	13	35	35	
	Village	3	27	0	26	36	35	35

Table 25 (Continued) Year 21 Operation $L_{Aeq(15minute)}$ Intrusive Emissions (dBA re 20 µPa)

Locality	Reference/ Land Owner	Daytime	Evening	Night-time		Project Specific Criteria		
		Calm	3 m/s West Wind	3 m/s East Wind	Inversion 3°C/100 m	Day	Evening	Night-time
Araluen	128 Pongratz	6	28	1	26	35	35	35
	28A Power	5	28	1	25			
	28B Power	5	28	1	24			
	125 Bayliss	7	28	2	26			
	123A Zivkovic	8	28	4	24			
	123B Zivkovic	8	28	3	26			
	26 Christiansen	4	11	0	7			
	25 Pettit	8	29	3	28			
	23A Bloomfield	10	31	5	30			
	23B Bloomfield	8	30	4	29			
Slate Gully	31A Conradt	9	31	4	19	35	35	35
	31B Conradt	9	30	4	22			
	53 Reynolds	10	33	6	32			
	52A Long	11	33	6	31			
	52B Long	12	33	8	31			
	51 Bailey	10	34	6	29			
	55 Fox	10	34	5	30			
	56 Rogers	9	33	5	31			
Wilpinjong (north-east of the Project area)[5]	45 Smith	20	33	18	**36**[1]	35	35	35
	WB Cumbo P/L	13	30	10	32			
Wilpinjong	14 Close	29	33	34	**38**[2]	35	35	35
Murragamba	32A Ulan Coal	13	10	28	26	35	35	35
	32B Ulan Coal	14	12	29	30			
	32C Ulan Coal	19	18	29	30			
	44 Helm	17	15	33	29			
	37 Davies	10	6	27	25			
	34 Birt/Hayes	10	6	26	23			
	35 Carlisle	9	5	29	21			
	20 Best	12	9	26	18			
	43 McKinna	17	14	26	21			
Moolarben	68B Mayberry	8	6	17	13	35	35	35
Goulburn River National Park[4]	NSW NPWS	31	40	30	40	50	50	50

Note 1: Marginal Noise Management Zone 1 to 2 dBA above Project specific criteria (bold).
Note 2: Moderate Noise Management Zone 3 to 5 dBA above Project specific criteria (bold).
Note 3: Noise Affectation Zone >5 dBA above Project specific criteria (shaded).
Note 4: $L_{Aeq(period)}$ noise amenity level and criteria.
Note 5: Night-time Inversion 3°C/100 m plus 2 m/s west southwest drainage wind.

Summer Night-time Noise Contours

The Year 21 night-time $L_{Aeq(15minute)}$ intrusive noise contours during easterly winds are presented as **Appendix E6**. Note, the calculation of the noise contours involves numerical interpolation of a noise level array with a graphical accuracy of up to approximately ±2 dBA. This means that in some cases the contour locations presented in **Appendix E6** will differ from the values presented in **Table 25**, particularly where topographic effects are prominent. All noise sensitive receivers within the 30 dBA contours are shown.

Private Vacant Land

DIPNR does not consider vacant land to be noise affected in the absence of a dwelling. For indicative purposes, however, based on the noise contours presented above, exceedances of the Project specific criteria estimated over 25% of the vacant land area are summarised in **Table 26**. Note, the land owners entitlement to construct a dwelling is unknown.

Table 26 Year 21 Vacant Land with Project Specific Criteria Exceedances (>25% Land Area)

Locality	1 dBA to 2 dBA above Project Specific Criteria	3 dBA to 5 dBA above Project Specific Criteria	>5 dBA above Project Specific Criteria
Murragamba	Nil	5 Power	Nil

6 BLAST EMISSION IMPACT ASSESSMENT

6.1 Assessment Criteria

Building Damage Criteria

Australian Standard 2187.2-1993 *"Explosives - Storage, Transport and Use - Part 2: Use of Explosives"* (AS 2187.2-1993) nominates structural damage assessment criteria as presented in **Table 27**.

Table 27 Blast Emission Structural Damage Assessment Criteria (AS 2187)

Structure Type	PVS Vibration Level[1]	Airblast Level (dB re 20 µPa)
Sensitive (and Heritage)	5 mm/s	133 dB(Linear) Peak
Residential	10 mm/s	133 dB(Linear) Peak
Commercial/Industrial	25 mm/s	133 dB(Linear) Peak

Note 1: PVS - Peak Vector Sum vibration velocity.

Archaeological/Geological Damage Criteria

Three rock shelters that contain rock art have been identified by the Aboriginal cultural heritage survey. The sites (WCP 72, WCP 153 and WCP 152 as shown in **Appendix B1**) are in sandstone/conglomerate rock formations and are located outside of the Project disturbance area. Two of the shelters occur in rock tors on slopes and the third is situated at the base of a high escarpment.

There are no regulatory criteria nominated in Australia for the assessment of damage to archaeological/geological structures from vibration. Research however has been undertaken by the US Army Corps of Engineers into the effects of large surface blasts on the dynamic stability of nearby unlined tunnels of various diameters in sandstone and granite (Dowding 1985). The results of the research indicated that intermittent rock fall or observable damage was not observed until vibration levels exceeded 460 mm/s.

The German Standard DIN 4150-3 "*Structural Vibration Part 3: Effects of Vibration on Structures*" dated February 1999 does not specifically include criteria for assessing the "short-term" (ie. blasting) effects of vibration on geological structures. However the DIN 4150-3 does include guideline vibration velocity of 80 mm/s for evaluating the effects of "short-term" vibration on buried clay and concrete pipework. The application of this criterion to geological structures is considered conservative and introduces a 5-fold safety factor by comparison to the observable damage value of 460 mm/s (as described above).

Residential Disturbance Daytime Criteria

The ground vibration and airblast levels which cause concern or discomfort to residents are generally lower than the relevant building damage limits.

The DEC advocates the use of the ANZECC guidelines for assessing potential residential disturbance arising from blast emissions. The ANZECC guidelines for control of blasting impact at residences are as follows:

- The recommended maximum level for airblast is 115 dB Linear.
- The level of 115 dB Linear may be exceeded in up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 120 dB Linear at any time.
- The recommended maximum for ground vibration is 5 mm/s, Peak Vector Sum (PVS) vibration velocity. It is recommended however, that 2 mm/s (PVS) be considered as the long-term regulatory goal for the control of ground vibration.
- The PVS level of 5 mm/s may be exceeded in up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 10 mm/s at any time.
- Blasting should generally only be permitted during the hours of 9.00 am to 5.00 pm Monday to Saturday. Blasting should not take place on Sundays and public holidays.
- Blasting should generally take place no more than once per day.

AS 2187.2-1993 does not include human comfort criteria for ground vibration. It does however make mention of human comfort level for airblast in saying that "a limit of 120 dB for human comfort is commonly used". This is consistent with the ANZECC guidelines.

Residential Disturbance Evening and Night-time Criteria

The assessment of blast emission impacts outside the hours advocated by the ANZECC remains according to the DEC Environmental Noise Control Manual 1994 Chapter 154 Noise Control Guidelines – Blasting presented in **Table 28**. Note, the suggested time of blasting has been modified to be consistent with the ANZECC guidelines.

Table 28 Evening and Night-time Blast Emission Assessment Criteria

Time of Blasting	5% Exceedance Airblast Level (dB Linear)	5% Exceedance PPV Ground Vibration (mm/s)
Monday to Saturday 9.00 am - 5.00 pm	115	5
Monday to Saturday 6.00 am - 9.00 am and 5.00 pm - 8.00 pm	105	2
Sunday, Public Holidays 6.00 am - 8.00 pm	95	1
Any Day 8.00 pm - 6.00 am	95	1

6.2 Proposed Blasting Practices

As discussed in **Section 2.3** it is estimated an average of one blast per week would be required. However, the actual number of blasts in any week would be dependent on mine production.

Assessment of the potential impacts of ground-borne vibration and airblast emissions arising from the overburden blasting has been based on the blast design parameters presented in **Table 29**.

Table 29 Provisional Overburden Blast Design Parameters

Parameter	Typical Ranges
Bench Height	5 m to 8 m
Burden and Spacing	6 m to 7 m and 7 m to 8 m
Hole Diameter	229 mm
Number of Holes	Typically 715 holes
Holes per Delay	Typically 1 hole
Explosive Type	95% ANFO (Dry) or 5% Emulsion Blends (Wet)
Explosive Mass	25 kg/m or 38 kg/m
Maximum Instantaneous Charge	MIC 855 kg (5 holes within 8 msec) or approximately 171 kg per blast hole
Powder Factor	Typically 0.20 kg/m^3

Source: Thiess (2004)

6.3 Blast Emissions Predictions

In order to determine emissions at the nearest potentially affected sensitive receivers, measured ground vibration and airblast levels from other open-cut blasting monitoring programmes were collated (ie. the Wambo Coal Mine). The available ground vibration and airblast data was processed to determine the 5% exceedance site laws. By adopting the suggested blast design, levels of blast vibration and airblast can be predicted using the relevant site law in each case.

The site specific prediction formulae used are as follows:

$$PVS\ (5\%) = 28.5\ (R/Q^{1/2})^{-0.61}$$

$$SPL\ (5\%) = 156.4 - 17.3(\log_{10}R - 0.33\ \log_{10}Q)$$

where

PVS (5%) = 5% exceedance Peak Vector Sum vibration velocity (mm/s)
SPL (5%) = 5% exceedance peak airblast noise level (dB Linear)
R = Distance between charge and receiver (m)
Q = Charge mass per delay (kg)

The relevant site laws have been used to predict ground vibration and airblast emissions at a selection of the nearest potentially affected sensitive receivers as presented in **Table 30**.

Table 30 Predicted Open-Cut 5% Exceedance Blast Emissions (MIC 855 kg)

Locality	Reference/Land Owner	Operating Year/Pit	PVS Vibration mm/s	Peak Linear Airblast (dB re 20 µPa)
Cumbo	29 Kattau	Year 9 (Pit 2)	2.2	116
	4 Robinson	Year 9 (Pit 2)	2.8	119
	49 Harkin	Year 9 (Pit 3)	1.9	115
Wollar (south of the village of Wollar)	150A St Luke's Anglican Church (Tindale/McDonald/Wilson)	Year 10 (Pit 3)	1.6	112
Wollar	900 St Laurence O'Toole Catholic Church	Year 11 (Pit 3)	1.6	113
	901 School	Year 11 (Pit 3)	1.6	112
Araluen	23A Bloomfield	Year 13 (Pit 3)	1.9	115
Slate Gully	51 Bailey	Year 11 (Pit 3)	2.7	119
	55 Fox	Year 12 (Pit 3)	2.5	118
Wilpinjong (north-east of the Project area)	45 Smith	Year 13 (Pit 3)	2.3	117
Wilpinjong[2]	14 Close	Year 14 (Pit 6)	5.0	127
Murragamba	32C Ulan Coal Ltd	Year 17 (Pit 6)	1.7	113
	44 Helm	Year 17 (Pit 6)	2.3	117
	20 Best	Year 21 (Pit 5)	1.7	113
	43 McKinna	Year 21 (Pit 5)	2.4	118
Moolarben	68B Mayberry	Year 21 (Pit 5)	2.5	113
Munghorn Gap Nature Reserve	WCP 72	Year 7 (Pit 2)	22.2[1]	-
	WCP 152	Year 21 (Pit 5)	43.1[1]	-
	WCP 153	Year 21 (Pit 5)	63.3[1]	-

Note 1: Predicted vibration levels based on AS 2187.2-1993 Equation J7.2 applicable to nearfield blasting in open-cut mines.
Note 2: WCPL-owned dwellings WA and WC excluded as they will not be tenanted when Pits 5 and 6 will be operational

6.4 Blast Emission Impact Assessment - Residential Receivers

The following assessments are derived from the predicted blast emissions and the assessment criteria presented in **Table 30**.

Building Damage Criteria

The blast emission levels are well below the building damage criteria of 10 mm/s and 133 dB Linear at all dwellings. Similarly, all blast emission levels are well below the relevant damage criteria for heritage structures (ie. Churches) of 5 mm/s and 133 dB Linear.

Human Comfort Vibration Criteria

The vibration velocities are below the 5 mm/s criterion at all dwellings with the exception of 14 Close which is equal to the 5 mm/s criterion. The recommended long-term regulatory target of 2 mm/s would be achieved at all dwellings except at the nearest dwellings to the north-east of the Project area and the Cumbo, Slate Gully, Wilpinjong, Murragamba and Moolarben localities where the predicted vibration levels are as shown.

The target of 2 mm/s would be achieved at the nearest dwellings to the north-east of the Project area and the Cumbo, Slate Gully, Murragamba and Moolarben localities by detonating no more than approximately 342 kg (or 2 blast holes) within 8 m/s in the delay sequence (or equivalent blast design modification). Changes to the blast design to achieve the 2 mm/s criterion at 14 Close (Wilpinjong) would not be practicable.

Human Comfort Airblast Criterion

The airblast levels are below the 115 dBL airblast criterion at all dwellings except at the nearest dwellings to the north-east of the Project area and the Cumbo, Slate Gully, Wilpinjong and Murragamba localities where the predicted airblast levels are as shown.

The 115 dBL airblast criterion would be achieved at the nearest dwellings to the north-east of the Project area and the Cumbo, Slate Gully and Murragamba localities by detonating no more than approximately 171 kg (or 1 blast hole) within 8 milliseconds (msec) in the delay sequence (or equivalent blast design modification). Changes to the blast design to achieve the airblast criterion at 14 Close (Wilpinjong) would not be practicable.

6.5 Blast Emission Impact Assessment - Rock Art Sites

Archaeological/Geological Damage Criteria

Vibration velocities are below the 80 mm/s archaeological/geological damage criterion of the three archaeological sites.

Flyrock Damage Assessment

It is noted that the orientation and characteristics of these rock shelters are likely to minimise the potential for flyrock damage. All three sites are located in rock shelters with some overhang, that protects the art from above.

The rock shelter at WCP72 is orientated to the east, facing away from potential blasting in Pit 2. The rock art associated with WCP152 and WCP153 would be partially screened by the open cut highwall, intervening vegetation and other natural rock structures that are located between the shelters and the open cut mining area in Pit 5.

Given the location and nature of these rock art sites and surrounds, it is considered that the potential for flyrock damage occurring at these sites would be limited. Notwithstanding, for blasts within 500 m of these sites, appropriate stemming length and burden spacing would be incorporated into the blast design in order to reduce flyrock as far as practicable.

7 ROAD TRANSPORTATION NOISE ASSESSMENT

7.1 Road Noise Assessment Criteria

As discussed in **Section 2.6** subsequent to construction, the primary access to the Project site would be via the mine access road connecting the mine facilities area to Wollar Road. This road is designated by the NSW Road Traffic Authority (RTA) as Main Road 208 (MR 208).

Based on the DEC's "*Environmental Criteria for Road Traffic Noise*" policy (ECRTN) dated May 1999, the Wollar Road (MR 208) is classified as a collector road. The guideline noise assessment criteria are presented in **Table 31**.

Table 31 EPA Guideline Noise Assessment Criteria for Traffic on Collector Road

Road	Policy	Descriptor	Noise Criteria
Wollar Road (MR 208)	Landuse developments with the potential to create additional traffic on collector road	Daytime $L_{Aeq(1hour)}$	60 dBA
		Night-time $L_{Aeq(1hour)}$	55 dBA

Note, in all cases (where the nominated criteria are already exceeded), traffic associated with the development should not lead to an increase in the existing noise traffic levels of more than 2 dBA.

7.2 Existing and Project Operating Road Traffic

Existing traffic flows have been determined for three sections of Wollar Road namely (see plan in **Appendix A2**):

- Section A - West of Wilpinjong Road.
- Section B - West of Cooyal.
- Section C - East of Ulan Road

Existing traffic noise measurements were conducted on Section A (Location 6 Langshaw) at an offset distance of 25 m from Wollar Road (refer **Section 3.1**). Sections B and C were used for assessment purposes. The unattended traffic noise data together with the on-site weather data and traffic counts are presented as **Appendix C10**. The traffic noise data was then processed in accordance with the requirements of the DEC's ECRTN to derive the hourly traffic noise levels presented in **Table 32**.

Table 32 Existing Traffic Noise 25 m from Wollar Road (Section A - West of Wilpinjong Road)

Peak Period	Hour Ending	Light Vehicles	Heavy Vehicles	Existing LAeq(1hour)[1]	Noise Criteria
Night-time	7.00 am	6	2	49 dBA	55 dBA
Daytime (Morning)	8.00 am	7	3	51 dBA	60 dBA
	9.00 am	15	1	53 dBA	
Daytime (Afternoon)	5.00 pm	9	3	52 dBA	60 dBA
	6.00 pm	11	1	52 dBA	
	7.00 pm	8	0	48 dBA	

Note 1: Noise levels include 2.5 dB correction from free field to façade.

Based on the above measurements it is concluded existing daytime and night-time traffic noise levels are currently below the guideline assessment criteria at a distance of 25 m from Wollar Road.

To determine the cumulative noise levels along the Wollar Road (Sections A, B and C) the daytime (morning and afternoon) and night-time peak hourly vehicle movements are presented in **Table 33**.

Table 33 Wollar Road (MR 208) Estimated Peak Hourly Vehicle Movements

Peak Period	Existing Vehicles		Project Operation		Cumulative Vehicles	
	Light	Heavy	Light	Heavy	Light	Heavy
Section A – West of Wilpinjong Road						
Night-time 6.00 am – 7.00 am	6	2	51	1	57	3
Daytime (Morning) 7.00 am – 8.00 am	7	3	40	1	47	4
Daytime (Afternoon) 6.00 pm – 7.00 pm	8	0	80	2	87	2

Table 33 (Continued) Wollar Road (MR 208) Estimated Peak Hourly Vehicle Movements

Peak Period	Existing Vehicles		Project Operation		Cumulative Vehicles	
	Light	Heavy	Light	Heavy	Light	Heavy
Section B - West of Cooyal						
Night-time 6.00 am - 7.00 am	14	2	51	1	65	3
Daytime (Morning) 7.00 am - 8.00 am	20	3	40	1	60	4
Daytime (Afternoon) 6.00 pm - 7.00 pm	20	2	80	2	99	4
Section C - East of Ulan Road						
Night-time 6.00 am - 7.00 am	25	3	51	1	76	4
Daytime (Morning) 7.00 am - 8.00 am	36	4	40	1	76	5
Daytime (Afternoon) 6.00 pm - 7.00 pm	34	4	40	1	114	6

7.3 Road Noise Predictions

The peak hour $L_{Aeq(1hour)}$ road traffic noise levels were predicted with reference to the US Environmental Protection Agency Report 550/9-74-004 dated March 1974, but including modifications based on equations in Appendix A-13 and certain amendments recommended in the UK Calculation of Road Traffic Noise (CORTN). This method takes into account vehicle volume, vehicle speed, vehicle type, passby duration, intervening topography (assuming no barriers) and receiver location and facade reflection.

The calculated peak hourly daytime (afternoon only) and night-time traffic noise levels are presented in **Table 34.** It should be noted that the night-time peak hourly Project vehicle movements would occur between 6.00 am and 7.00 am in the morning and the daytime peak hourly Project vehicle movements would occur between 6.00 pm and 7.00 pm.

Table 34 Wollar Road (MR 208) Estimated Peak $L_{Aeq(1hour)}$ Noise Levels

Distance from Road	Existing Vehicles		Project Operation		Vehicles Cumulative	
	Night-time 6.00 am-7.00 am	Daytime 6.00 pm - 7.00 pm	Night-time 6.00 am-7.00 am	Daytime 6.00 pm - 7.00 pm	Night-time 6.00 am-7.00 am	Daytime 6.00 pm - 7.00 pm
Section A - West of Wilpinjong Road						
25 m	50 dBA	46 dBA	55 dBA	57 dBA	56 dBA	57 dBA
50 m	46 dBA	42 dBA	51 dBA	53 dBA	52 dBA	53 dBA
75 m	43 dBA	40 dBA	48 dBA	50 dBA	49 dBA	51 dBA
Section B - West of Cooyal						
25 m	51 dBA	52 dBA	55 dBA	57 dBA	56 dBA	58 dBA
50 m	47 dBA	48 dBA	51 dBA	53 dBA	52 dBA	54 dBA
75 m	45 dBA	46 dBA	48 dBA	50 dBA	50 dBA	52 dBA
Section C - East of Ulan Road						
25 m	54 dBA	55 dBA	55 dBA	57 dBA	57 dBA	59 dBA
50 m	50 dBA	51 dBA	51 dBA	53 dBA	53 dBA	55 dBA
75 m	47 dBA	48 dBA	48 dBA	50 dBA	51 dBA	52 dBA

7.4 Road Noise Impact Assessment

The following assessments are derived from the predicted traffic noise levels and the DEC's guideline noise assessment criteria presented in **Table 31** of daytime 60 $L_{Aeq(1hour)}$ and night-time 55 $L_{Aeq(1hour)}$.

Section A - West of Wilpinjong Road

Peak hour daytime cumulative noise levels increase by up to 11 dBA but remain below the criterion at 25 m from the road.

Peak hour night-time cumulative noise levels increase by up to 6 dBA and are marginally (1 dBA) above the 55 $L_{Aeq(1hour)}$ criterion at 25 m from the road. However, the criterion would be achieved at distances greater than 25 m.

Section B - West of Cooyal

Peak hour daytime cumulative noise levels increase by up to 6 dBA but remain below the criterion at 25 m or more from the road.

Peak hour night-time cumulative noise levels increase by up to 5 dBA and are marginally (1 dBA) above the 55 $L_{Aeq(1hour)}$ at 25 m from the road. However, the criterion would be achieved at distances greater than 25 m. .

Section C - East of Ulan Road

Peak hour daytime cumulative noise levels increase by up to 4 dBA but remain below the criterion at 25 m and greater or more from the road.

Peak hour night-time cumulative noise levels increase by up to 3 dBA and are marginally (2 dBA) above the 55 $L_{Aeq(1hour)}$ criterion at 25 m from the road. However, the criterion would be achieved at distances greater than 25 m.

Summary

Traffic noise impacts on all three sections of Wollar Road are considered acceptable at distances 25 m and greater from the roadway where peak cumulative daytime levels are below the 60 $L_{Aeq(1hour)}$ criterion. At night-time peak cumulative noise level is no more than 2 dBA above the 55 $L_{Aeq(1hour)}$.

8 RAIL TRANSPORTATION NOISE AND VIBRATION ASSESSMENT

8.1 Rail Traffic Noise Assessment Criteria

As stated in **Section 1.3**, the ARTC operates the Gulgong - Sandy Hollow and Main Northern railways. Noise emissions from the railways are regulated via ARTC's EPL 3142. The EPL Section L6 does not nominate specific environmental noise limits but notes that:

> *"It is an objective of this licence to progressively reduce noise levels of railway operations to appropriate goals through the implementation of Pollution Reduction Programs (PRPs)."*

At present the Gulgong - Sandy Hollow and Main Northern railways are not subject to a PRP. EPL 3142 Section U1.1 however does provide further guidance in relation to pollution studies and reduction programs for other parts of its rail network as follows:

> ***U1.1 Objectives of PRPs***
>
> *In developing the PRPs, the licensee must work towards the goals of 65 dB(A)Leq, (daytime - 7am-10pm), 60 dB(A)Leq, (night-time - 10pm-7am) and 85 dB(A) (24hr) max pass-by noise, at one metre from the facade of affected residential properties. If it is not possible for these goals to be reached by feasible and reasonable mitigation measures, the PRP must aim, through feasible and reasonable measures to:*
>
> - *reduce operational rail noise emissions and the associated noise impact on the community where traffic levels are anticipated to remain constant; or*
> - *stabilise operational rail noise emissions and the associated noise impact on the community where traffic levels are anticipated to increase."*

Based on the foregoing, the guideline noise assessment criteria for the Gulgong - Sandy Hollow and Main Northern railways are presented in **Table 35**.

Table 35 ARTC's Guideline Noise Assessment Criteria

Railway	Licence Holder	Descriptor	Rail Traffic Goal
Gulgong - Sandy Hollow Main Northern railways	ARTC EPL 3142	Daytime $L_{Aeq(15hour)}$	65 dBA
		Night-time $L_{Aeq(9hour)}$	60 dBA
		Maximum L_{Amax}	85 dBA

8.2 Gulgong - Sandy Hollow Railway

8.2.1 Existing, Consented and Project Rail Traffic

The numbers of existing, consented, proposed and cumulative freight train movements are presented in **Table 36**, together with the estimated operating conditions whilst travelling on the Gulgong - Sandy Hollow railway in the vicinity of the site.

Table 36 Existing, Consented and Proposed Freight Train Movements

Status	Train Type	Period	Average Passbys	Peak Passbys	Train Length[3] (m)	Train Speed (kph)	Throttle Setting (Notch)
Consented	Ulan Coal [1]	Daytime	6	6	1542	60	4
	Ulan Stage 2[2]		2	2	650	60	4
Existing	FCorp Ore		2	2	850	60	4
	FCorp Ore		1	1	418	60	4
Proposed	Wilpinjong Coal		6	8	1500	60	4
Cumulative			**17**	**19**			
Consented	Ulan Coal [1]	Night-time	2	2	1542	60	4
	Ulan Stage 2[2]		2	2	650	60	4
Existing	FCorp Ore		0	0	850	60	4
	FCorp Ore		1	1	418	60	4
Proposed	Wilpinjong Coal		2	4	1500	60	4
Cumulative			**7**	**9**			

Note 1: Source: Kinhill (1998).
Note 2: Approval to operate Underground Mine Number 4 was granted in October 1985 as part of Stage 2 of the Ulan Coal Mine. Underground Mine Number 4 and associated infrastructure are not currently operating.
Note 3: Approximate train length.

8.2.2 Rail Traffic Noise Predictions

Calculation of the daytime and night-time equivalent continuous noise levels and the maximum passby levels have been conducted using a computer prediction model developed by Richard Heggie Associates Pty Ltd. This model has previously been accepted by the DEC.

The prediction model uses characteristic noise levels for the various sources (locomotive engine and exhaust noise as a function of throttle notch, wheel/rail noise as a function of train speed, and wagon type, etc) at a fixed reference distance. The model then makes adjustments for the train length and distance from the track (assuming no barriers) and facade reflection. Parameters including the daytime $L_{Aeq(15hour)}$, night-time $L_{Aeq(9hour)}$ and maximum passby level (L_{Amax}) can then be determined by summing the effects of the individual noise sources and by incorporating the number of train events.

The calculated daytime $L_{Aeq(15hour)}$, night-time $L_{Aeq(9hour)}$ and maximum (L_{Amax}) passby noise levels for the existing, consented and cumulative train movements are presented in **Table 37**. Project train movements are considered on an average and peak basis (Section 2.5).

Table 37 Predicted Train Noise Emissions (dBA re 20 µPa)

Distance to Receiver	Daytime Existing and Consented Trains[1]			Daytime Cumulative Trains[2]		
	Average $L_{Aeq(15hour)}$	Peak $L_{Aeq(15hour)}$	Passby L_{Amax}	Average $L_{Aeq(15hour)}$	Peak $L_{Aeq(15hour)}$	Passby L_{Amax}
30 m	64	64	85	65	65	85
60 m	61	61	81	62	62	81
90 m	59	59	78	60	61	78

Distance to Receiver	Night-time Existing and Consented Trains[1]			Night-time Cumulative Trains[2]		
	Average $L_{Aeq(9hour)}$	Peak $L_{Aeq(9hour)}$	Passby L_{Amax}	Average $L_{Aeq(9hour)}$	Peak $L_{Aeq(9hour)}$	Passby L_{Amax}
30 m	63	63	85	64	65	85
60 m	60	60	81	61	62	81
90 m	59	59	78	59	60	78

Note 1: Train noise emissions from existing freight trains and pre-Project consented rail traffic.
Note 2: Train noise emissions from cumulative rail traffic.

8.2.3 Rail Traffic Noise Impact Assessment

The following assessments are derived from the predicted rail traffic noise levels and the ARTC's guideline noise assessment criteria presented in **Table 35** of daytime 65 $L_{Aeq(15hour)}$, night-time 60 $L_{Aeq(9hour)}$ and maximum passby 85 dBA.

Daytime Noise

A comparison of the existing and consented average $L_{Aeq(15hour)}$ noise emissions with the cumulative train noise emissions indicates that existing and consented rail traffic noise levels would increase marginally (by 1 dBA) and meet the daytime 65 dBA criterion at a distance of 30 m (and greater). Similarly, existing peak $L_{Aeq(15hour)}$ noise emissions would increase marginally (by 1 dBA to 2 dBA) and meet the daytime 65 dBA criterion at a distance of 30 m (and greater).

Night-time Noise

A comparison of the existing and consented average $L_{Aeq(9hour)}$ noise emissions with the cumulative train noise emissions indicates that existing and consented rail traffic noise levels would increase marginally (by 1 dBA) and meet the night-time 60 dBA criterion at a distance of 70 m (and greater) (as determined by supplementary modelling). Similarly, existing peak $L_{Aeq(9hour)}$ noise emissions would increase marginally (by 1 dBA to 2 dBA) and meet the night-time 60 dBA criterion at a distance of 80 m (and greater) (as determined by supplementary modelling).

Passby Noise

As is the case for the existing and consented train noise emissions, the maximum (L_{Amax}) noise criterion of 85 dBA would be achieved by train movements at a distance of 30 m (and greater).

8.3 Main Northern Railway

8.3.1 Existing and Project Rail Traffic

The numbers of existing, proposed and cumulative freight train movements are presented in **Table 38** together with the estimated operating conditions whilst travelling on the Main Northern Railway on route to the Bayswater/Liddell rail unloader (as shown in **Appendix A1**). As the majority of Project coal would be unloaded at Bayswater/Liddell, it is considered that maximum cumulative impacts on the Main Northern Railway would occur between Muswellbrook and the Bayswater/Liddell rail spur turnout. Hence, this section of the Main Northern Railway has been assessed. Both domestic and export coal would be transported along this section of the Main Northern Railway.

Table 38 Existing and Proposed Freight Train Movements

Existing/ Proposed	Train Type	Period	Average Passbys	Peak Passbys	Train Length[2] (m)	Train Speed (kph)	Throttle Setting (Notch)
Existing[1]	Passenger	Daytime	2	2	375	80	4
	Freight		9	9	750	60	4
	Coal		18	18	750/1500	60	4
Proposed	Wilpinjong Coal		6	8	1500	60	4
Cumulative			**35**	**37**			
Existing[1]	Passenger	Night-time	2	2	375	80	4
	Freight		5	5	750	60	4
	Coal		10	10	750/1500	60	4
Proposed	Wilpinjong Coal		2	4	1500	60	4
Cumulative			**19**	**21**			

Note 1: Mt Owen Operations Environmental Impact Statement (Umwelt, 2003).
Note 2: Approximate train length.

8.3.2 Rail Traffic Noise Predictions

Calculation of the daytime and night-time equivalent continuous noise levels and the maximum passby levels have been conducted using a computer prediction model developed by Richard Heggie Associates Pty Ltd.

The calculated daytime $L_{Aeq(15hour)}$, night-time $L_{Aeq(9hour)}$ and maximum (L_{Amax}) passby noise levels for existing and cumulative train movements are presented in **Table 39**.

Table 39 Predicted Existing and Cumulative Train Noise Emissions (dBA re 20 µPa)

Distance to Receiver	Daytime Existing Trains[1]			Daytime Cumulative Trains[2]		
	Average $L_{Aeq(15hour)}$	Peak $L_{Aeq(15hour)}$	Passby L_{Amax}	Average $L_{Aeq(15hour)}$	Peak $L_{Aeq(15hour)}$	Passby L_{Amax}
30 m	65	65	88	66	66	88
60 m	62	62	85	63	63	85
90 m	60	60	82	61	62	82

Distance to Receiver	Night-time Existing Trains[1]			Night-time Cumulative Trains[2]		
	Average $L_{Aeq(9hour)}$	Peak $L_{Aeq(9hour)}$	Passby L_{Amax}	Average $L_{Aeq(9hour)}$	Peak $L_{Aeq(9hour)}$	Passby L_{Amax}
30 m	64	64	88	64	65	88
60 m	61	61	85	61	62	85
90 m	59	59	82	60	60	82

Note 1: Train noise emissions from existing pre-Project rail traffic.
Note 2: Train noise emissions from cumulative rail traffic.

8.3.3 Rail Noise Impact Assessment

The following assessments are derived from the predicted train noise levels and the ARTC's guideline noise assessment criteria presented in **Table 35** of daytime 65 $L_{Aeq(15hour)}$, night-time 60 $L_{Aeq(9hour)}$ and maximum passby L_{Amax} 85 dBA.

Daytime Noise

A comparison of the existing average and peak $L_{Aeq(15hour)}$ noise emissions with the cumulative train noise emissions indicates that existing noise levels would increase marginally (by 1 dBA to 2 dBA) and meet the daytime 65 dBA criterion at a distance of 35 m (and greater) (as determined by supplementary modelling).

Night-time Noise

A comparison of the existing average and peak $L_{Aeq(9hour)}$ noise emissions with the cumulative train noise emissions indicates that existing noise levels would increase marginally (by 1 dBA) and meet the night-time 60 dBA criterion at a distance of 90 m (and greater).

Passby Noise

As is currently the case, maximum (L_{Amax}) noise criterion of 85 dBA would be achieved by train movements at a distance of 60 m (and greater).

8.4 Railway Vibration

8.4.1 Assessment Criteria and Train Movements

German Standard DIN 4150-3 1999 "*Structural Vibration Part 3: Effects of Vibration on Structures*" provides criteria for evaluating the long-term (or continuous) effects of vibration on structures as presented in **Table 40**.

Table 40 Continuous Vibration Criteria for Long-term Effects on Structures (DIN 4150-3)

Line	Type of Structure	Vibration velocity in horizontal plane
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	10.0 mm/s
2	Dwellings and buildings of similar design and/or occupancy	5.0 mm/s
3	Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value (eg. listed buildings under preservation order)	2.5 mm/s

8.4.2 Predicted Vibration Levels and Assessment

The vibration levels arising from locomotive powered freight trains can be predicted based on the "Generalized Ground Surface Vibration Curves" presented in the "*Transit Noise and Vibration Impact Assessment*" dated April 1995 prepared for the US Department of Transportation. It is noteworthy that the predicted levels of vibration using these curves compare favourably with the measured levels presented in United Collieries Extension EIS dated 2002.

The predicted peak vibration velocities are presented in **Table 41** together with the relevant assessment criteria.

Table 41 Predicted Train Generated Peak Component Vibration Levels

Distance to Receiver	Train Passby Speed		
	30 km/hr	60 km/hr	90 km/hr
30 m	0.4 mm/s	0.8 mm/s	1.1 mm/s
60 m	0.2 mm/s	0.3 mm/s	0.5 mm/s
90 m	0.1 mm/s	0.2 mm/s	0.3 mm/s

The predicted peak component vibration levels are well below the most stringent damage criterion of 2.5 mm/s applicable to sensitive structures such as churches at a distance of 30 m or more.

Similarly, the vibration levels are also well below the damage criterion of 5 mm/s applicable to dwellings at a distance of 30 m or more.

9 CUMULATIVE MINE NOISE IMPACT ASSESSMENT

The Project Location Figure (**Appendix A2)** shows the extent of existing mining operations in the vicinity of the Project site. Existing mining operations include the Ulan Coal Mines involving open-cut and underground operations. A summary of the development consent conditions with respect to noise is attached as **Appendix F**.

As discussed in **Section 3.1** low levels of industrial noise were detected from the Ulan Coal Mines at Location 42 Little/Salter (Murragamba). This indicates that the Ulan Coal Mines may be audible in the vicinity of the Project under certain weather conditions, however noise impacts remain low with minimal effect on the background noise level of 30 dBA for Murragamba locality.

It is noted that a 2 Mtpa underground mining operation comprising Underground Mine No. 4, a new CHPP, rail loop and train loading facility was approved in October 1985 as part of Stage 2 of the Ulan Coal Mines (hereafter referred to as Ulan Stage 2). Other components of Ulan Stage 2 were developed (ie. the Stage 2 open cut commenced in 1982 and Underground Mine No. 3 commenced in 1986 [Kinhill, 1998]) and form part of the existing Ulan Coal Mines development. The Underground Mine No. 4 and associated surface facilities that comprised part of Ulan Stage 2 were not developed.

Given that this is an underground operation and that it would be located approximately 8 km north-west of the most westerly boundary of Project open cut operations, the contribution of the proposed activities to noise in the Wilpinjong area would be expected to be negligible.

In order to assess any cumulative noise impacts, it is important to distinguish between the INP's first and second environmental noise control objectives as follows:

Intrusive Noise Criteria $L_{Aeq(15minute)}$

The INP's first objective, that the intrusive noise emission from any single source does not exceed the background level by more than 5 dBA, relates to individual industrial sites where the intrusive noise limit is generally specified in the Development Consent and/or Environment Protection Licence.

There is no established procedure (or regulatory requirement) to derive intrusive $L_{Aeq(15minute)}$ noise criteria for the cumulative operation of existing and/or approved industrial developments in a locality.

Noise Amenity Criteria $L_{Aeq(period)}$

The INP's second objective, that the $L_{Aeq(period)}$ amenity level (ie. non-transport related) does not to exceed the specified "acceptable" or "maximum" noise level appropriate for the particular locality and landuse, is aimed at restricting the potential cumulative increase in amenity noise levels otherwise known as "background creep".

The INP based acceptable and maximum noise amenity criteria for the Murragamba locality are summarised in **Table 42**.

Table 42 NSW INP (2000) Project Specific Noise Assessment Criteria (dBA re 20 µPa)

Locality	Landuse	Amenity $L_{Aeq(period)}$[1] Acceptable			Amenity $L_{Aeq(period)}$[1] Maximum		
		Day	Evening	Night	Day	Evening	Night
Murragamba	Rural Residential	50	45	40	55	50	45

Note 1: Daytime 7.00 am to 6.00 pm, Evening 6.00 pm to 10.00 pm, Night-time 10.00 pm to 7.00 am.

Cumulative Mine Noise Assessment

The potential for the simultaneous operation of adjoining mine developments to exceed the acceptable and maximum noise amenity criteria can be assessed on a worst case scenario basis by adding the anticipated intrusive noise limits from the Wilpinjong Coal Project together with the approved noise limits from the Ulan Coal Mines and Ulan Stage 2 Consents. The cumulative intrusive level is then adjusted (by -3 dBA) to the equivalent amenity level for comparison with the criteria presented in **Table 42**. Note, this is clearly a worst case assessment as it assumes that all three mines simultaneously emit their maximum noise emission to a common locality during calm or adverse (ie. noise enhancing) weather conditions.

There are no specific approved noise limits for Ulan Stage 2. However, the Ulan Stage 2 noise assessment indicates that the criteria against which noise impacts were assessed was 35 dBA at night and 45 dBA during the day (**Kinhill Stearns Engineers, 1983**).

The cumulative mine noise amenity levels during calm and adverse weather conditions are presented in **Table 43** for the Murragamba locality only.

Table 43 Calm/Adverse Cumulative Noise Amenity Levels - Murragamba Area

Locality	Operating Period	Wilpinjong Project LAeq(15minute)		Ulan Coal Noise[1] LAeq(15minute)		Ulan Stage 2[2] LAeq(15minute)		Cumulative LAeq(period) Amenity Level		Cumulative LAeq(period) Amenity Criteria	
		Calm	Adverse	Calm	Adverse	Calm	Adverse	Calm	Adverse	Acceptable	Maximum
Murragamba	Daytime	35	40	43	48	43	48	43	48	50	55
	Evening	35	40	43	48	43	48	43	48	45	50
	Night-time	35	40	38	43	33	38	38	43	40	45

Note 1: The $L_{A10(15minute)}$ noise limits specified in the Ulan Coal Mines Consent (Stage 4 - 1999) have been adjusted to represent equivalent LAeq(15minute) intrusive noise levels.
Note 2: The noise criteria specified in the Ulan Stage 2 EIS have been adjusted to represent equivalent $L_{Aeq(15minute)}$ intrusive noise levels.

The calm cumulative noise levels from the Project, the Ulan Coal Mines and Ulan Stage 2 are below the relevant amenity criteria for industrial noise (ie. non-transport related) during the daytime, evening and night-time during calm conditions.

Similarly, the adverse noise enhanced cumulative noise levels from the Project, Ulan Coal Mines and Ulan Stage 2 are below the relevant maximum amenity criteria for industrial noise. Furthermore, the likelihood that all three mines simultaneously emit their maximum noise emissions under noise enhancing weather conditions to any one receiver is minimal.

10 SUMMARY OF FINDINGS

10.1 Construction Noise Impact Assessment

Construction activities associated with Mine Access Road and Facilities Areas, CHPP and Coal Spur/Loop and Coal Handling Infrastructure would be carried out simultaneously with the development of the initial box-cut in Pit 1 over a 6 month period. Construction activities would occur during the daytime.

As the duration of the construction works is 6 months, the background noise level should generally not be exceeded by more than 10 dBA. Therefore, the daytime $L_{A10(15minute)}$ intrusive noise assessment criterion is 40 dBA for residential receivers.

At the completion of the construction activity, mobile and fixed plant utilisation will increase the daytime noise. Hence, noise arising from the expanded mining operation in Year 3 would be greater by comparison to the daytime construction scenario in the first half of Year 1. The Year 3 daytime intrusive noise levels would be well below 40 dBA at all localities.

10.2 Operating Noise Impact Assessment

Assessment Methodology and Criteria

The INP-based intrusive and amenity noise assessment criteria at the nine assessment localities are presented in **Table 44**. These criteria are nominated for the purposes of assessing potential noise impacts from the Project. Note, the $L_{Aeq(15minute)}$ intrusive criteria are the controlling noise limits at all residential receivers.

Table 44 INP Project Specific Noise Assessment Criteria (dBA re 20 µPa)

Locality	Land Owner	Project Specific Noise Assessment Criteria					
		Intrusive LAeq(15minute)			Amenity LAeq(period)[1]		
		Day	Evening	Night-time	Day	Evening	Night-time
Cumbo	6 Langshaw	35	35	35	50	45	40
	Other Residential	35	35	35	50	45	40
Wollar (south of the village of Wollar)	Residential	35	35	35	50	45	40
	150A St Luke's Anglican Church (Tindale/ McDonald/Wilson) (Internal)	INP Place of Worship[2]			40	40	Not in use[3]
Wollar	900 St Laurence O'Toole Catholic Church (Internal)	INP Place of Worship[2]			40	40	Not in use[3]
	901 School (Internal)	INP School Classroom[2]			35	35	
	Residential	36	35	35	55	45	40
Araluen	60 Reid	35	35	35	50	45	40
	Other Residential	35	35	35	50	45	40
Slate Gully	Residential	35	35	35	50	45	40
Wilpinjong (north-east of the Project area)	WB Cumbo P/L	35	35	35	50	45	40
	Other Residential	35	35	35	50	45	40
Wilpinjong	Residential	35	35	35	50	45	40
Murragamba	34 Birt/Hayes	35	35	35	50	45	40
	42 Little/Salter	35	35	35	50	45	40
	Other Residential	35	35	35	50	45	40
Moolarben	Residential	35	35	35	50	45	40
Goulburn National Park and Munghorn Gap Nature Reserve	-	INP Passive Recreation Area[2]			50	50	50

Note 1: Daytime 07.00 am to 6.00 pm, Evening 6.00 pm to 10.00 pm, Night-time 10.00 pm to 07.00 am.

Note 2: No intrusive criteria apply.

Note 3: It is understood that the churches and school are generally not utilised at night-time (i.e. between 10.00 pm and 6.00 am).

In view of the foregoing, **Table 45** presents the methodology for assessing noise levels which may exceed the INP Project specific noise assessment criteria.

Table 45 Project Noise Impact Assessment Methodology

Assessment Criteria	Project Specific Criteria	Noise Management Zone		Noise Affectation Zone
		Marginal	Moderate	
Intrusive $L_{Aeq(15minute)}$	Rating background level plus 5 dBA	1 to 2 dBA above Project specific criteria	3 to 5 dBA above Project specific criteria	>5 dBA above Project specific criteria
Amenity $L_{Aeq(period)}$	INP based on existing industrial level			

Noise Impact Summary on Privately and Mine Owned Dwellings

Based on the predicted $L_{Aeq(15minute)}$ intrusive noise emissions for Years 3, 9, 11, 13, 14, and 21, **Table 46** presents a summary of all known dwellings where the Project specific criteria are anticipated to be exceeded.

Table 46 Dwellings within Noise Management and Affectation Zones

General Locality	Period[1]	Noise Management Zone		Noise Affectation Zone
		1 dBA to 2 dBA above Project Specific Criteria	3 dBA to 5 dBA above Project Specific Criteria	>5 dBA above Project Specific Criteria
Cumbo	Evening/Night-time	59 Langshaw 90 Pattullo 29 Kattau	4 Robinson 49 Harkin 60A Reid	Nil
Wollar (south of the village of Wollar)	Evening/Night-time	Nil	Nil	Nil
Wollar	Evening/Night-time	Nil	Nil	Nil
Araluen	Evening/Night-time	23B Bloomfield	23A Bloomfield	Nil
Slate Gully	Evening/Night-time	31A Conradt 31B Conradt	51 Bailey 52A Long 52B Long 53 Reynolds 55 Fox 56 Rogers	Nil
Wilpinjong (north-east of the Project area)	Evening/Night-time	Nil	Nil	45 Smith WB Cumbo P/L
Wilpinjong	Evening/Night-time	Nil	WA Cumbo P/L	14 Close WC Cumbo P/L
Murragamba	Evening/Night-time	32C Ulan Coal Ltd	Nil	Nil
Moolarben	Evening/Night-time	Nil	Nil	Nil

*Note 1: Meteorological conditions in accordance with **Table 11**.*

Noise Impact Summary on Private Vacant Land

DIPNR does not consider vacant land to be noise affected in the absence of a dwelling. For indicative purposes however, based on the noise contours attached as **Appendices E1, E2, E3, E4, E5** and **E6**, **Table 47** presents a summary of private land owners where the Project specific criteria are estimated to be exceeded over 25% of the vacant land area. Note, the land owners' current entitlement to construct a dwelling is unknown.

Table 47 Private Vacant Land within Noise Management and Affectation Zone (>25% Land Area)

Locality	1 dBA to 2 dBA above Project Specific Criteria	3 dBA to 5 dBA above Project Specific Criteria	>5 dBA above Project Specific Criteria
Cumbo	94 McKenzie 91 Gordon 48 Evans	Nil	30 Gaffney
Slate Gully	Nil	31 Conradt 40 Plummer 58 Maher	Nil
Araluen	24 Peach	Nil	Nil
Murragamba	Nil	5 Power	Nil

Procedure for General Terms of Approval

It is recommended noise limits for General Terms of Approval (GTA) be determined on a land owner by land owner basis according to the following procedure:

- Where the predicted noise emission is less than (or equal to) the Project specific criteria then the Project specific criteria is the GTA noise limit.
- Where the predicted noise emission is within the noise management zone then the predicted noise level is applied as the achievable GTA noise limit.
- Where the predicted noise emission is within the noise affectation zone then the upper limiting level applying to the noise management zone is the GTA noise limit.

Based on the above procedure the recommended GTA operating noise limits are presented in **Table 48**. The operating noise limits reflect the achievable noise emissions, including the noise mitigation measures, presented in this assessment.

Table 48 Potentially Affected Receivers - Recommended Operating Noise Limits

Locality	Reference/ Land Owner	NSW INP (2000) Noise Amenity Area	$L_{Aeq(15minute)}$ Intrusive Noise Level	
			Calm[2]	Noise Enhancing[3,4,5,6]
			Daytime	Evening/Night-time
Cumbo	Other Residential	1A Rural	35 dBA	35 dBA
	29 JH & ME Kattau		35 dBA	37 dBA
	59 RW & DG Langshaw		35 dBA	37 dBA
	90 CA & CD Pattullo		35 dBA	36 dBA
	4 EJ & JE Robinson		35 dBA	40 dBA
	49 RSM & LD Harkin		35 dBA	39 dBA
	60A RWB & NJ & DB Reid		35 dBA	39 dBA
Wollar (south of the village of Wollar)	Residential	1A Rural	35 dBA	35 dBA
	150A E Tindale & A McDonald & W Wilson (St Luke's Anglican Church) (Internal Amenity)[1]		40 dBA	40 dBA
Wollar	Residential	1A Rural	36 dBA	35 dBA
	900 St Laurence O'Toole Catholic Church (Internal Amenity)[1]		40 dBA	40 dBA
	901 School (Internal Amenity)[1]		35 dBA	35 dBA
Araluen	Other Residential	1C1 Rural	35 dBA	35 dBA
	23A PA & ID Bloomfield	1A Rural	35 dBA	38 dBA
	23B PA & ID Bloomfield		35 dBA	37 dBA
Slate Gully	31A DE & AM Conradt	1C1 Rural	35 dBA	37 dBA
	31B DE & AM Conradt		35 dBA	36 dBA
	53 RW & JL Reynolds		35 dBA	39 dBA
	52A CR Long		35 dBA	39 dBA
	52B CR Long		35 dBA	39 dBA
	51 P Bailey		35 dBA	39 dBA
	55 SC & M Fox		35 dBA	39 dBA
	56 GJ & GR Rogers		35 dBA	39 dBA
Wilpinjong (north-east of the Project area)	45 JAW Smith	1A Rural	35 dBA	40 dBA
	WB Cumbo Land Pty Ltd		35 dBA	40 dBA
Wilpinjong	14 SJ Close	1A Rural	40 dBA	40 dBA
	WA, WC Cumbo Land Pty Ltd		35 dBA	40 dBA
Murragamba	32C Ulan Coal Mines Ltd	1A Rural	35 dBA	36 dBA
	Other Residential		35 dBA	35 dBA
Moolarben	Residential	1A Rural	35 dBA	35 dBA
Goulburn River National Park/Munghorn Gap Nature Reserve[1]	NSW NPWS	8A National Park	50 dBA	50 dBA

Note 1: $L_{Aeq(period)}$ noise amenity level criteria.
Note 2: Annual wind speed ≤ 0.5 m/s and temperature gradient ≤ 0.5°C/100 m.
Note 3: Winter wind speed ≤ 3 m/s west (± 45°) and temperature gradient ≤ 0.5°C/100 m.
Note 4: Summer wind speed ≤ 3 m/s east (± 45°) and temperature gradient ≤ 0.5°C/100 m.
Note 5: Winter wind speed ≤ 0.5 m/s and temperature gradient ≤ 3.0°C/100 m.
Note 6: Winter wind speed ≤ 2 m/s west southwest (± 45°) and temperature gradient ≤ 3.0°C/100 m receivers to the north-east of the Project area only.

10.3 Blast Emission Impact Assessment

Blast emission impacts have been assessed against the building damage criteria presented in AS 2187.2-1993, recommended archaeological/geological damage criteria based on DIN 4150.3-1999 and the human comfort criteria advocated by the NSW DEC (or ANZECC) during the daytime.

Building Damage Criteria

The blast emission levels are well below the building damage criteria of 10 mm/s and 133 dB Linear at all dwellings. Similarly, all blast emission levels are well below the relevant damage criteria for heritage structures (ie. Churches) of 5 mm/s and 133 dB Linear.

Human Comfort Vibration Criteria

The vibration velocities are below the 5 mm/s criterion at all dwellings with the exception of 14 Close which is equal to the 5 mm/s criterion. The recommended long-term regulatory target of 2 mm/s would be achieved at all dwellings except at the nearest dwellings to the north-east of the Project area and the Cumbo, Slate Gully, Wilpinjong, Murragamba and Moolarben localities where the predicted vibration levels are as shown.

The target of 2 mm/s would be achieved at the nearest dwellings to the north-east of the Project area and the Cumbo, Slate Gully, Murragamba and Moolarben localities by detonating no more than approximately 342 kg (or 2 blast holes) within 8 m/s in the delay sequence (or equivalent blast design modification). Changes to the blast design to achieve the 2 mm/s criterion at 14 Close (Wilpinjong) would not be practicable.

Human Comfort Airblast Criterion

The airblast levels are below the 115 dBL airblast criterion at all dwellings except at the nearest dwellings to the north-east of the Project area and the Cumbo, Slate Gully, Wilpinjong and Murragamba localities where the predicted airblast levels are as shown.

The 115 dBL airblast criterion would be achieved at the nearest dwellings to the north-east of the Project area and the Cumbo, Slate Gully and Murragamba localities by detonating no more than approximately 171 kg (or 1 blast hole) within 8 msec in the delay sequence (or equivalent blast design modification). Changes to the blast design to achieve the airblast criterion at 14 Close (Wilpinjong) would not be practicable.

Archaeological/Geological Damage Criteria

Vibration velocities are below the 80 mm/s archaeological/geological damage criterion at the three archaeological sites.

Flyrock Damage Assessment

It is noted that the orientation and characteristics of these rock shelters are likely to minimise the potential for flyrock damage. All three sites are located in rock shelters with some overhang, that protects the art from above.

The rock shelter at WCP72 is orientated to the east, facing away from potential blasting in Pit 2. The rock art associated with WCP152 and WCP153 would be partially screened by the open cut highwall, intervening vegetation and other natural rock structures that are located between the shelters and the open cut mining area in Pit 5.

Given the location and nature of the rock art sites and surrounds, it is considered that the potential for flyrock damage occurring at these sites would be minimal.

10.4 Road Noise Impact Assessment

The primary access to the Project site would be via the mine access road connecting the mine facilities area to Wollar Road. Based on the DEC's "*Environmental Criteria for Road Traffic Noise*" policy (ECRTN) dated May 1999, the Wollar Road (MR 208) is classified as a collector road. The guideline noise assessment criteria are presented in **Table 49**.

Table 49 DEC Guideline Noise Assessment Criteria for Traffic on Collector Roads

Road	Policy	Descriptor	Noise Criteria
Wollar Road (MR 208)	Landuse developments with the potential to create additional traffic on collector road	Daytime $L_{Aeq(1hour)}$	60 dBA
		Night-time $L_{Aeq(1hour)}$	55 dBA

Existing and Project related vehicles movements and associated traffic noise levels have been determined for three sections of Wollar Road and the cumulative traffic noise impacts are summarised as follows:

Section A - West of Wilpinjong Road

Peak hour daytime cumulative noise levels increase by up to 11 dBA but remain below the criterion at 25 m from the road.

Peak hour night-time cumulative noise levels increase by up to 6 dBA and are marginally (1 dBA) above the 55 $L_{Aeq(1hour)}$ criterion at 25 m from the road. However, the criterion would be achieved at distances greater than 25 m.

Section B - West of Cooyal

Peak hour daytime cumulative noise levels increase by up to 6 dBA but remain below the criterion at 25 m or more from the road.

Peak hour night-time cumulative noise levels increase by up to 5 dBA and are marginally (1 dBA) above the 55 $L_{Aeq(1hour)}$ at 25 m from the road. However, the criterion would be achieved at distances greater than 25 m. .

Section C - East of Ulan Road

Peak hour daytime cumulative noise levels increase by up to 4 dBA but remain below the criterion at 25 m and greater or more from the road.

Peak hour night-time cumulative noise levels increase by up to 3 dBA and are marginally (2 dBA) above the 55 $L_{Aeq(1hour)}$ criterion at 25 m from the road. However, the criterion would be achieved at distances greater than 25 m.

Summary

Traffic noise impacts on all three sections of Wollar Road are considered acceptable at distances 25 m and greater from the roadway where peak cumulative daytime levels are below the 60 $L_{Aeq(1hour)}$ criterion. At night-time peak cumulative noise level is no more than 2 dBA above the 55 $L_{Aeq(1hour)}$.

10.5 Rail Noise and Vibration Impact Assessment

The ARTC operates for the Gulgong - Sandy Hollow and Main Northern railways. Noise emissions from the railway are regulated via ARTC's EPL 3142, with the guideline noise assessment criteria presented in **Table 50**.

Table 50 ARTC's Guideline Noise Assessment Criteria

Railway	Licence Holder	Descriptor	Rail Traffic Goal
Gulgong - Sandy Hollow Main Northern railways	ARTC EPL 3142	Daytime $L_{Aeq(15hour)}$	65 dBA
		Night-time $L_{Aeq(9hour)}$	60 dBA
		Maximum L_{Amax}	85 dBA

Gulgong - Sandy Hollow Railway

Existing and Project related train movements and associated rail noise levels have been determined for the Gulgong - Sandy Hollow railway. Predicted cumulative rail noise impacts are summarised as follows:

Daytime Noise

A comparison of the existing and consented average $L_{Aeq(15hour)}$ noise emissions against the cumulative train noise emissions indicates that existing and consented rail traffic noise levels would increase marginally (by 1 dBA) and meet the daytime 65 dBA criterion at a distance of 30 m from the track. Similarly, existing peak $L_{Aeq(15hour)}$ noise emissions would increase marginally (by 1 dBA to 2 dBA) and meet the daytime 65 dBA criterion at a distance of 30 m from the track.

Night-time Noise

A comparison of the existing and consented average $L_{Aeq(9hour)}$ noise emissions with the cumulative train noise emissions indicates that existing and consented rail traffic noise levels would increase marginally (by 1 dBA) and meet the night-time 60 dBA criterion at a distance of 70 m (and greater) (as determined by supplementary modelling). Similarly, existing peak $L_{Aeq(9hour)}$ noise emissions would increase marginally (by 1 dBA to 2 dBA) and meet the night-time 60 dBA criterion at a distance of 80 m from the track (as determined by supplementary modelling).

Passby Noise

As is the case for the existing and consented train noise emissions, the maximum (L_{Amax}) noise criterion of 85 dBA would be achieved by train movements at a distance of 30 m from the track.

Main Northern Railway

Similarly, existing and Project related train movements and associated rail noise levels have been determined for the Main Northern Railway. Predicted cumulative rail noise impacts are summarised as follows:

Daytime Noise

A comparison of the existing average and peak $L_{Aeq(15hour)}$ noise emissions against the cumulative train noise emissions indicates that existing noise levels would increase marginally (by 1 dBA to 2 dBA) and meet the daytime 65 dBA criterion at a distance of 35 m from the track (as determined by supplementary modelling).

Night-time Noise

A comparison of the existing average and peak $L_{Aeq(9hour)}$ noise emissions against the cumulative train noise emissions indicates that existing noise levels would increase marginally (by 1 dBA) and meet the night-time 60 dBA criterion at a distance of 90 m from the track.

Passby Noise

As is currently the case, maximum (L_{Amax}) noise criterion of 85 dBA would be achieved by train movements at a distance of 60 m from the track.

Railway Vibration

Rail vibration impacts have been assessed in accordance with DIN 4150-3 1999 which provides guideline criteria for evaluating the long-term (or continuous) effects of vibration on structures.

The predicted peak component vibration levels are well below the most stringent damage criterion of 2.5 mm/s applicable to sensitive structures at a distance of 30 m or more. Similarly, vibration levels are also well below the damage criterion of 5 mm/s applicable to dwellings at a distance of 30 m or more.

10.6 Cumulative Mine Noise Impact Assessment

The NSW INP (2000) provides cumulative noise assessment guidelines that address existing and successive industrial development by setting acceptable (and maximum) cumulative $L_{Aeq(period)}$ amenity levels for all industrial (ie. non-transport related) noise in an area. The INP based acceptable and maximum noise amenity criteria for the Murragamba locality are summarised in **Table 51**.

Table 51 NSW INP (2000) Project Specific Noise Assessment Criteria (dBA re 20 µPa)

Locality	Landuse	Amenity $L_{Aeq(period)}$[1] Acceptable			Amenity $L_{Aeq(period)}$[1] Maximum		
		Day	Evening	Night-time	Day	Evening	Night-time
Murragamba	Rural Residential	50	45	40	55	50	45

Note 1: Daytime 7.00 am to 6.00 pm, Evening 6.00 pm to 10.00 pm, Night-time 10.00 pm to 7.00 am.

It is noted that a 2 Mtpa underground mining operation comprising Underground Mine No. 4, a new CHPP, rail loop and train loading facility was approved in October 1985 as part of Stage 2 of the Ulan Coal Mines (hereafter referred to as Ulan Stage 2). The Underground Mine No. 4 and associated surface facilities that comprised part of Ulan Stage 2 were not developed.

Given that this is an underground operation and that it would be located approximately 8 km north-west of the most westerly boundary of Project open cut operations, the contribution of the proposed activities to noise in the Wilpinjong area would be expected to be negligible.

The potential for the simultaneous operation of adjoining mine developments to exceed the amenity criteria can be assessed on a worst case scenario basis by adding the anticipated intrusive noise limits from the Wilpinjong Coal Project to the approved noise limits from the Ulan Coal Mines and Ulan Stage 2 Consents. The cumulative intrusive level is then adjusted to the equivalent amenity level for comparison with the criteria presented in **Table 51**. Note, this is clearly a worst case assessment as it assumes that all three mines simultaneously emit their maximum noise emission to a common locality during calm or adverse (ie noise enhancing) weather conditions.

Cumulative noise levels from the Project, Ulan Coal Mines and Ulan Stage 2 are below the relevant amenity criteria for industrial noise (ie non-transport related) during the daytime, evening and night-time during calm conditions.

Similarly, the adverse noise enhanced cumulative noise levels from the Project, Ulan Coal Mines and Ulan Stage 2 are below the relevant maximum amenity criteria for industrial noise. Furthermore, the likelihood that all three mines simultaneously emit their maximum noise emissions under noise enhancing weather conditions to any one receiver is minimal.

Appendix A1

Report 30-1313-R1

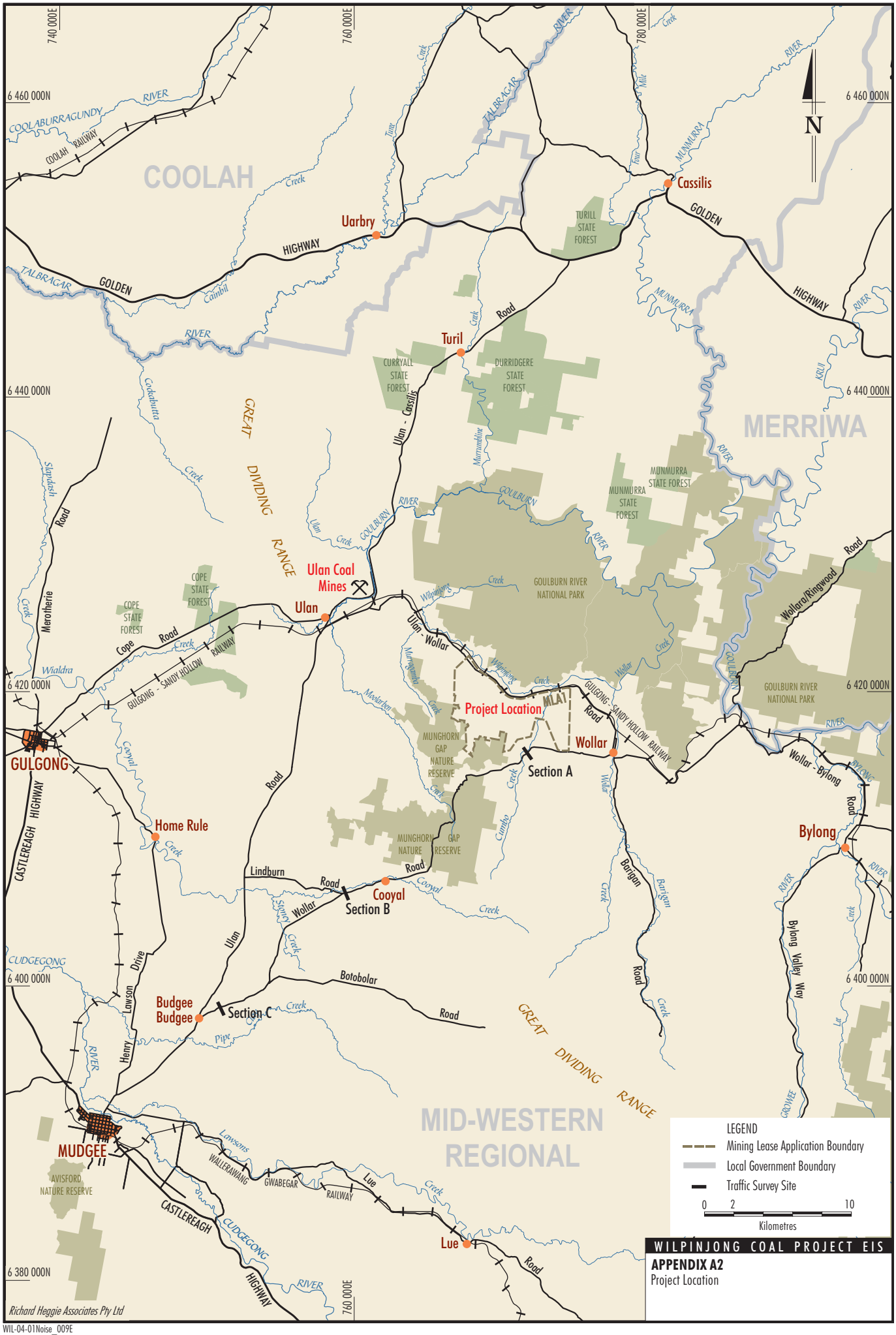
Regional Location

WIL-04-01 Noise_022B

Appendix A2

Report 30-1313-R1

Project Location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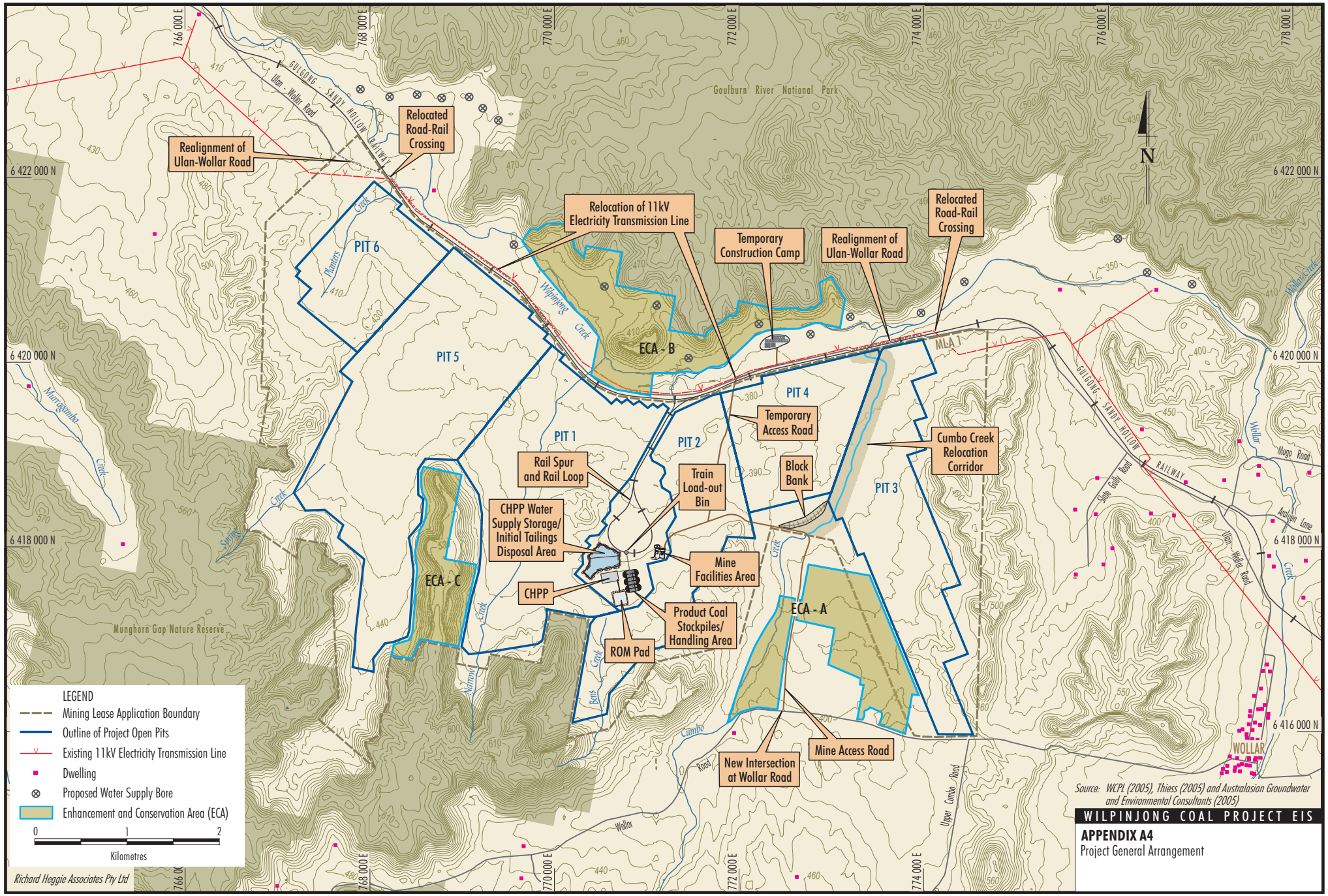
760 000E
780 000E
6 460 000N
6 440 000N
6 420 000N
6 400 000N
6 380 000N
N
COOLAH
MERRIWA
MID-WESTERN REGIONAL
Cassilis
Uarbry
Turil
Ulan Coal Mines
Ulan
Project Location
MLA1
Wollar
Section A
Cooyal
Section B
Budgee Budgee
Section C
Home Rule
GULGONG
MUDGEE
Bylong
Lue
COOLABURRAGUNDY RAILWAY
COOLAH RAILWAY
GOLDEN HIGHWAY
TALBRAGAR
RIVER
Creek
Road
TURILL STATE FOREST
CURRYALL STATE FOREST
DURRIDGERE STATE FOREST
MUNMURRA STATE FOREST
GOULBURN RIVER NATIONAL PARK
COPE STATE FOREST
MUNGHORN GAP NATURE RESERVE
AVISFORD NATURE RESERVE
GREAT DIVIDING RANGE
Ulan - Cassilis Road
Ulan - Wollar Road
Wollara/Ringwood Road
Cope Road
GULGONG - SANDY HOLLOW RAILWAY
Wollar - Bylong Road
Lindburn Road
Botobolar Road
CASTLEREAGH HIGHWAY
CUDGEGONG
Bylong Valley Way
LEGEND
Mining Lease Application Boundary
Local Government Boundary
Traffic Survey Site
0 2 10
Kilometres
WILPINJONG COAL PROJECT EIS
APPENDIX A2
Project Location
Richard Heggie Associates Pty Ltd
WIL-04-01Noise_009E

REFER TO ATTACHMENT 1 OF THE EIS

Appendix A4

Report 30-1313-R1

Project General Arrangement



Source: WCPL (2005), Thiess (2005) and Australasian Groundwater and Environmental Consultants (2005)

WILPINJONG COAL PROJECT EIS

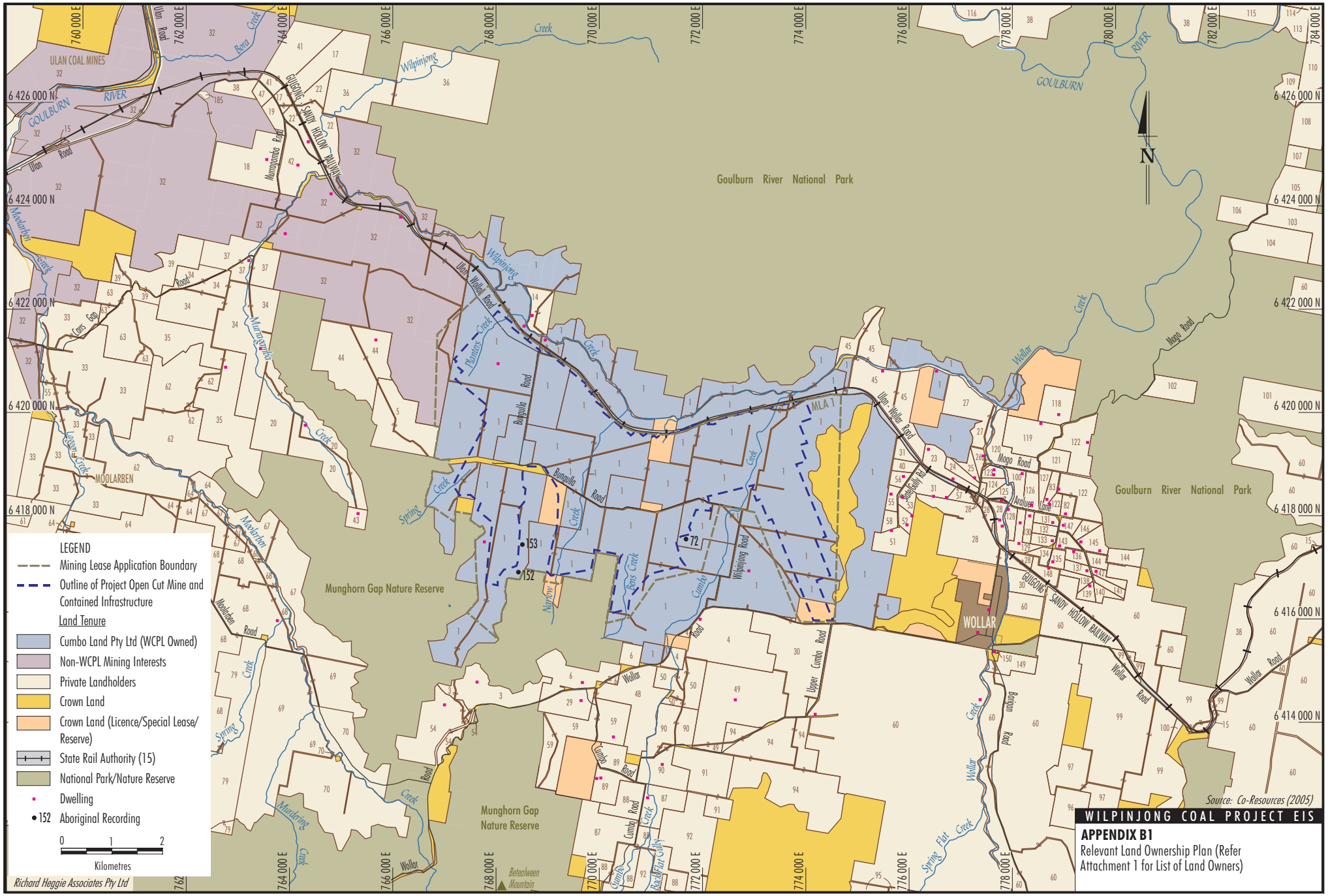
APPENDIX A4
Project General Arrangement

WIL-04-01 Noise_010l

Appendix B1

Report 30-1313-R1

Relevant Land Ownership Plan


LEGEND
Mining Lease Application Boundary
Outline of Project Open Cut Mine and Contained Infrastructure
Land Tenure
Cumbo Land Pty Ltd (WCPL Owned)
Non-WCPL Mining Interests
Private Landholders
Crown Land
Crown Land (Licence/Special Lease/ Reserve)
State Rail Authority (15)
National Park/Nature Reserve
Dwelling
152 Aboriginal Recording
0 1 2
Kilometres
Richard Heggie Associates Pty Ltd
Goulburn River National Park
Munghorn Gap Nature Reserve
ULAN COAL MINES
MOOLARBEN
WOLLAR
MLA 1
Source: Co-Resources (2005)
WILPINJONG COAL PROJECT EIS
APPENDIX B1
Relevant Land Ownership Plan (Refer Attachment 1 for List of Land Owners)

1	Cumbo Land Pty. Ltd.
3	DT Maranda
4	EJ & JE Robinson
5	EM & DH & C Power
6	WC & VM Langshaw
14	SJ Close
15	State Rail Authority
17	PF Renshaw
18	TR & NC Simpson
19	JOJ & SJ Borrowdale
20	BW & HJ Best
22	LA Green
23	PA & ID Bloomfield
24	JA & TS Peach
25	SE & JE Pettit
26	K & VC Christiansen
27	BC McDermott
28	BP & FV & MJ & JM Power
29	JH & ME Kattau
30	WF Gaffney
31	DE & AM Conradt
32	Ulan Coal Mines Limited
33	MJ & PM Swords
34	SE Birt & KM Hayes
35	MJ Carlisle
36	C & C Dalglish
37	CN & HL Davies
38	State Of N.S.W.
39	BJ & MR Wallis
40	CG & EK Plummer
41	M & J Transport & Investments Pty. Ltd.
42	DJ Little & AK Salter
43	M & E McKinna
44	GC & JK Helm
45	JAW Smith
47	DA Herring
48	JR & BM Evans
49	RSM & LD Harkin
50	LD Thompson & RJ Hopper
51	P Bailey
52	CR Long
53	RW & JL Reynolds
54	GC & EM Batty
55	SC & M Fox
56	GJ & GR Rogers
57	F Nagy
58	FN Maher
59	RW & DG Langshaw
60	RWB & NJ & DB Reid
61	J Szymkarczuk
62	MJ Swords
63	MJ & H Swords
64	DJ & Y Rayner
66	M Bloom & R Beheit
67	K & RE Mayberry
68	EC Mayberry
69	DJ & JG Stokes
70	JW & JG O'Sullivan
71	J Asztalos
78	KO Bishop
79	C Mayberry
80	RB Cox
81	D Chinner
82	RJ & LM Jackson
83	G & DJ Hayes
85	MB Cox
87	J & D Conden
88	CB Parker
89	KM Newing
90	CA & CD Pattullo
91	GK & JCM Gordon
92	JL & DE Rheinberger
94	GM & KL McKenzie
95	TW Marskell
96	BJ & LP Egan
97	SA Marks
98	DJ Dean & JM Drabbe
100	TJ & VE Rheinberger
101	NAB Pierce
102	W Filipczyk
103	MR Molloy
104	WB & PA Deane
105	ELM Toombs
106	JA Sales
107	RJ Lee
108	R Campbell
109	MO Vaisey
110	GS & JR Smiles
112	B Ritchie
113	AJ Brett & S & D Hilt
114	BJ Hughes & CA Beinssen & K Aslett
115	E & T Schoenfelder
116	PD & JE Griffiths
117	SA McHugh
118	DS & D Ponton
119	TJ & JA Peach
120	JT & JW Fitzpatrick
121	MJ Fitzpatrick
122	PN Hardiman
123	A & M Zivkovic
124	A Zivkovic
125	AC & FM Bayliss
126	SA & DL Emery
127	P & DJ Standen
128	WG Pongratz
129	KM Reynolds
130	L Batty & D Hirons
131	MR Field
132	SL Cook
133	P & J Harty
134	CL Ammann
135	R & K Roser
136	M & R Bryson
137	A Daniel
138	P & M & B Woolford
139	P & M Woolford
140	A Camilleri
141	C Hull
142	D & S Williams
143	R Bale & K Lawes
144	G & J Hibberd
145	H Andrews
146	D & B Spearpoint
147	D Currington
148	P Noonan
149	K Cross & J Richardson
150	E Tindale & A McDonald & W Wilson
185	Council of the Shire of Mudgee

Source: Co-Resources (2005)

WILPINJONG COAL PROJECT EIS

ATTACHMENT 1

Relevant Land Ownership List (Refer Appendix B1 for Land Ownership Plan)

Appendix B2

Report 30-1313-R1

Proposed Development Schedule

Proposed Development Schedule

Project Component	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21
Temporary Construction Camp and Temporary Access Road																					
Construction of Mine Access Road and Closure of Wilpinjong Road and Bungulla Road																					
Relocation of Existing 11kV Electricity Transmission Line																					
Construction of Mine Facilities Area																					
Construction of Coal Handling and Preparation Plant (CHPP) and ROM Coal Handling Areas																					
Development of Project Water Supply Borefield and CHPP Water Supply Storage																					
Product Coal Stockpiles/Handling Area and Train Loading Infrastructure Development																					
Construction of Rail Spur and Rail Loop																					
Pit 1 - Open Cut Mining																					
Commission the Coal Handling and Preparation Plant																					
Pit 2 - Open Cut Mining																					
Realignment of Ulan-Wollar Road (North-East)																					
Cumbo Creek Relocation Corridor Development (within Pit 3)																					
Pit 3 - Open Cut Mining																					
Pit 4 - Open Cut Mining																					
Realignment of Ulan-Wollar Road (North-West)																					
Pit 5 - Open Cut Mining																					
Pit 6 - Open Cut Mining																					
Rail Transport of Product Coal																					
Completion of Open Cut Mining																					

Source: WCPL (2005)

WILPINJONG COAL PROJECT EIS

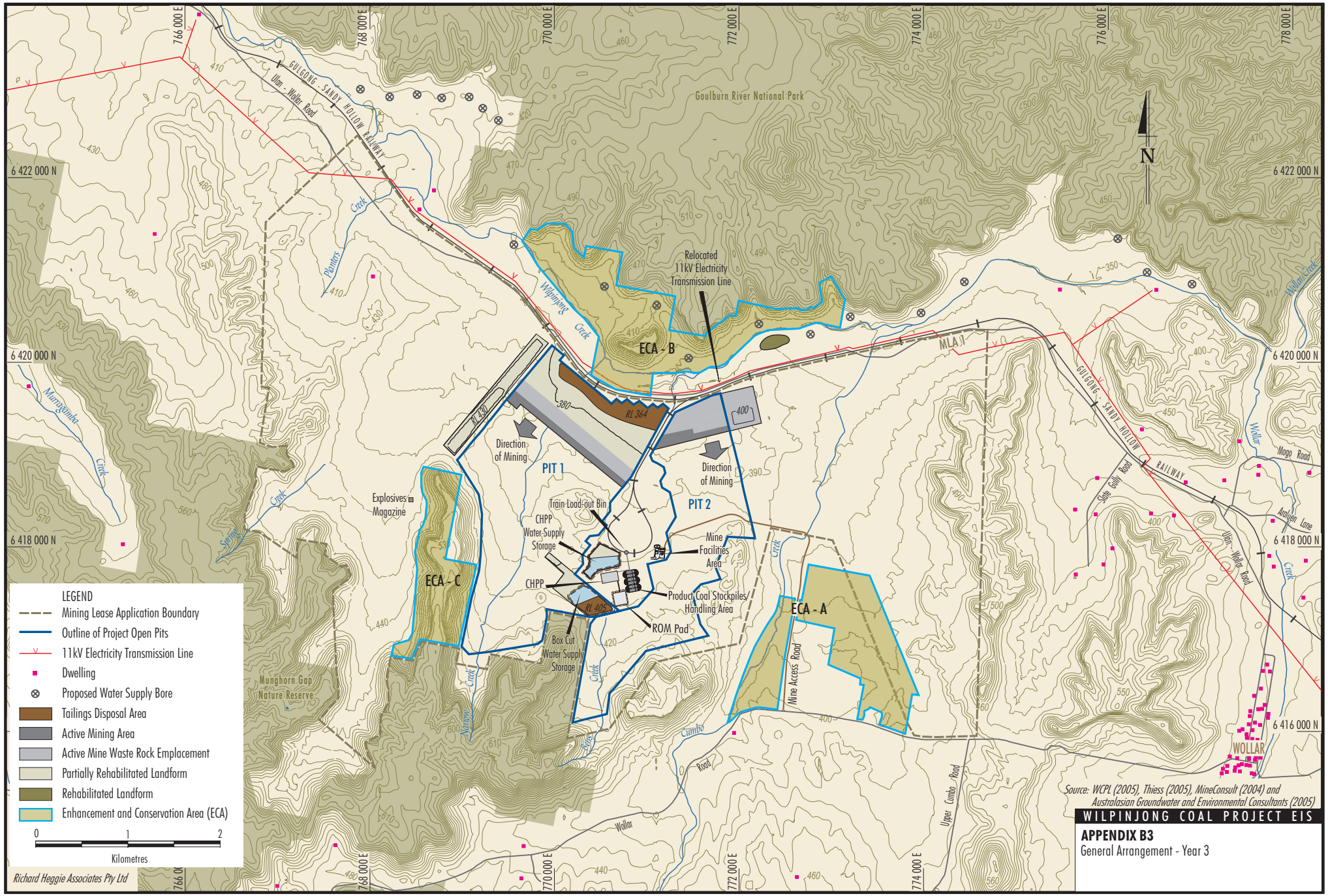
APPENDIX B2
Proposed Development Schedule

Richard Heggie Associates Pty Ltd

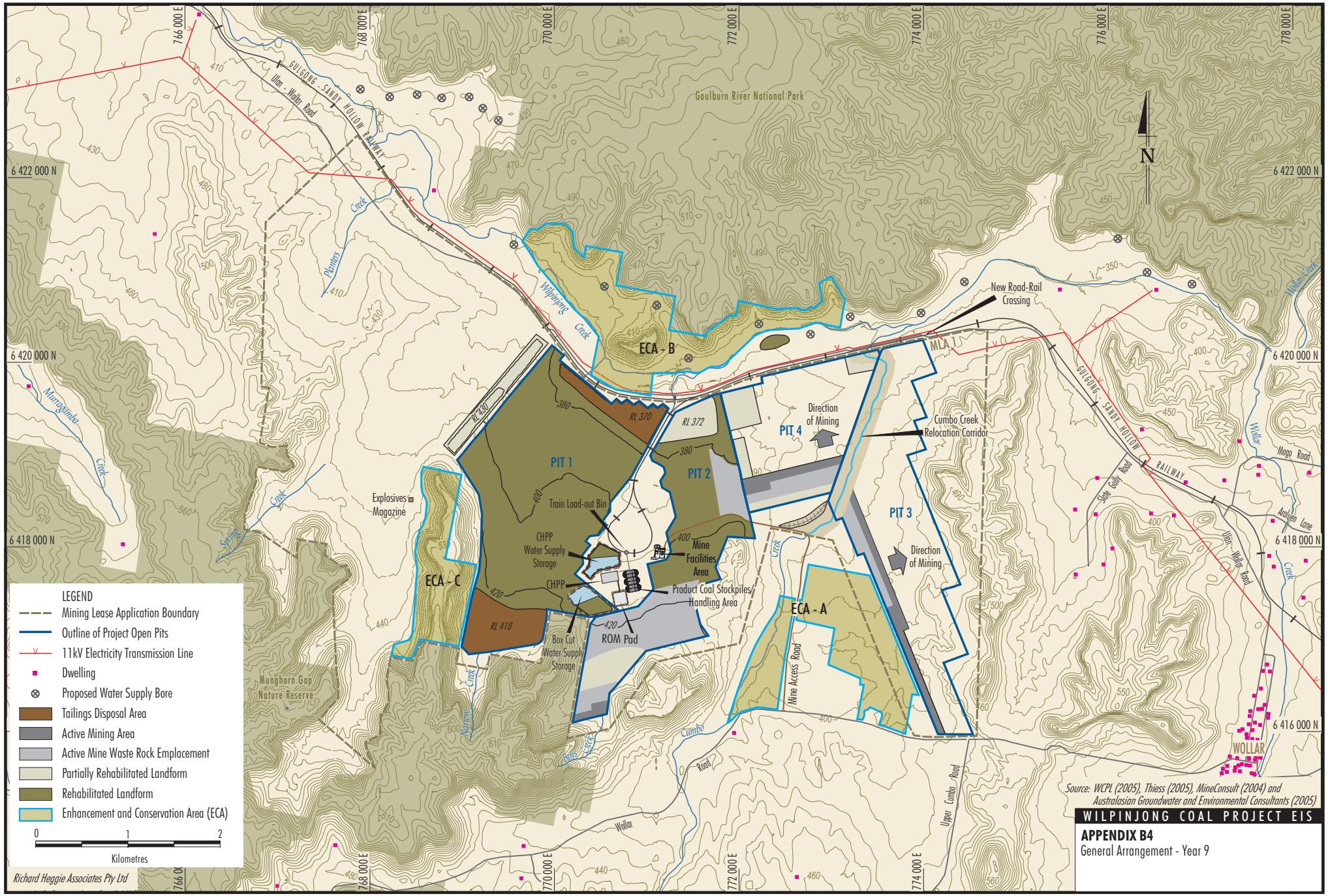
Appendix B3 to B7

Report 30-1313-R1

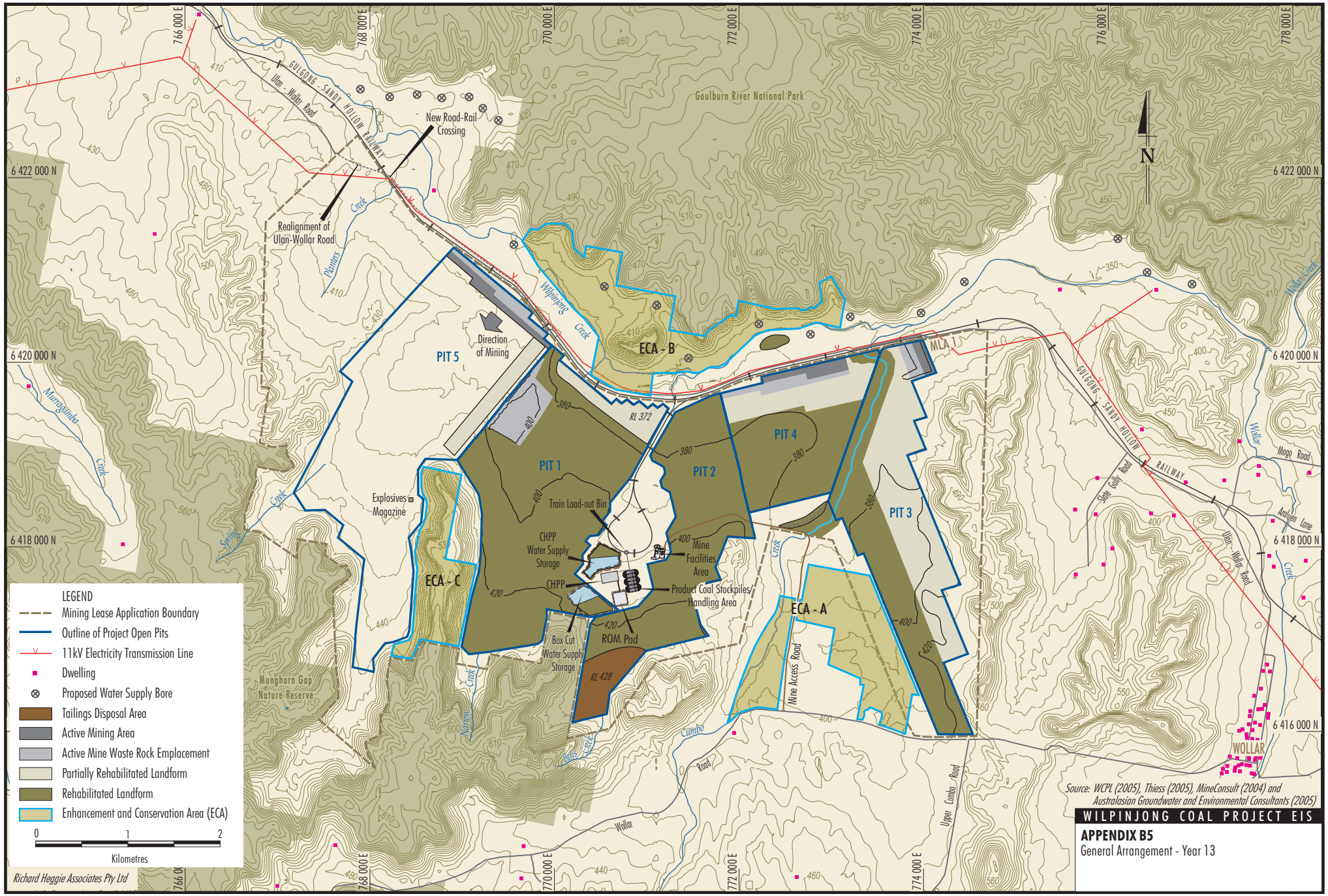
General Arrangement
Years 3, 9, 13, 14 and 21



WIL-04-01 Noise_017H



WIL-04-01 Noise_018H



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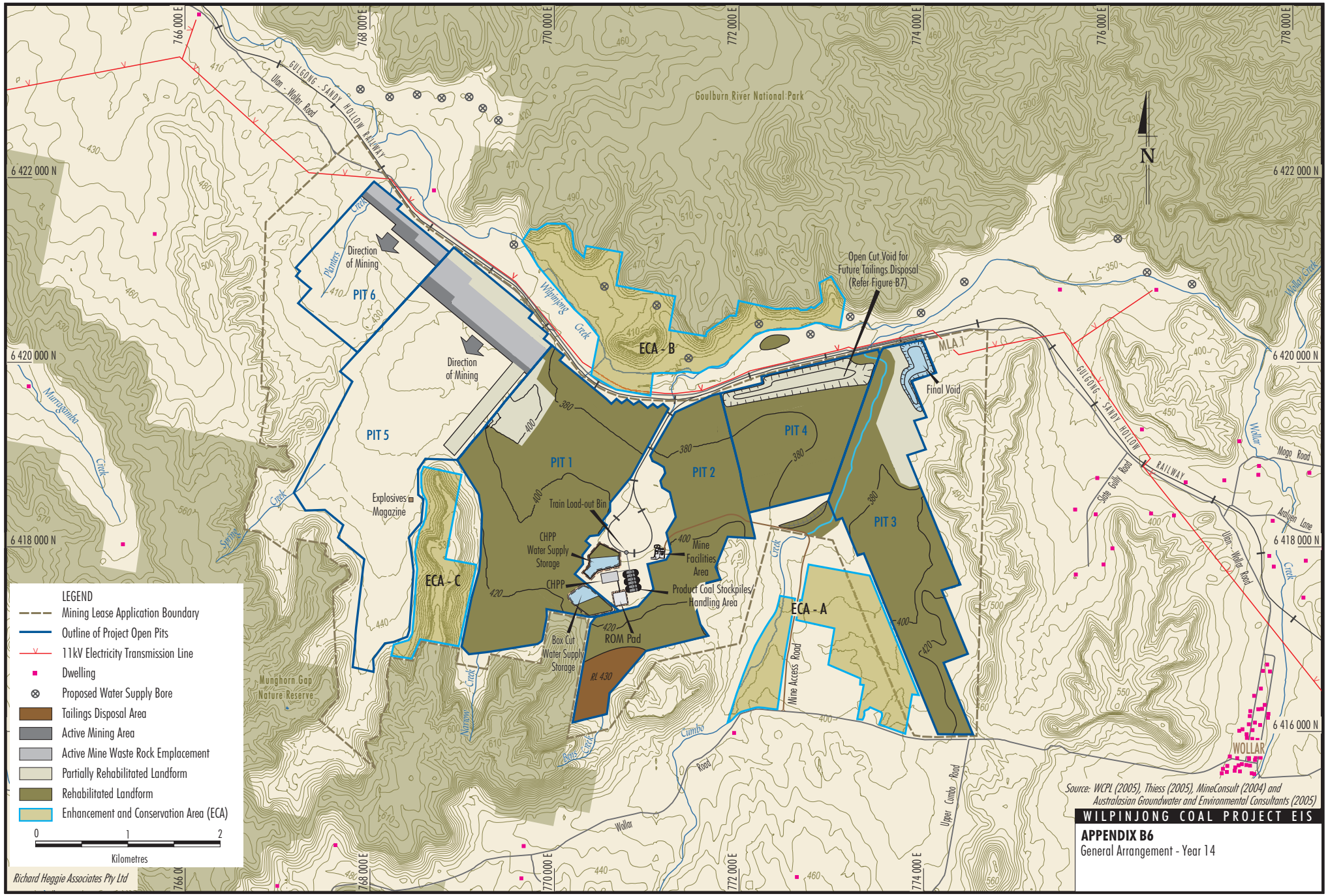
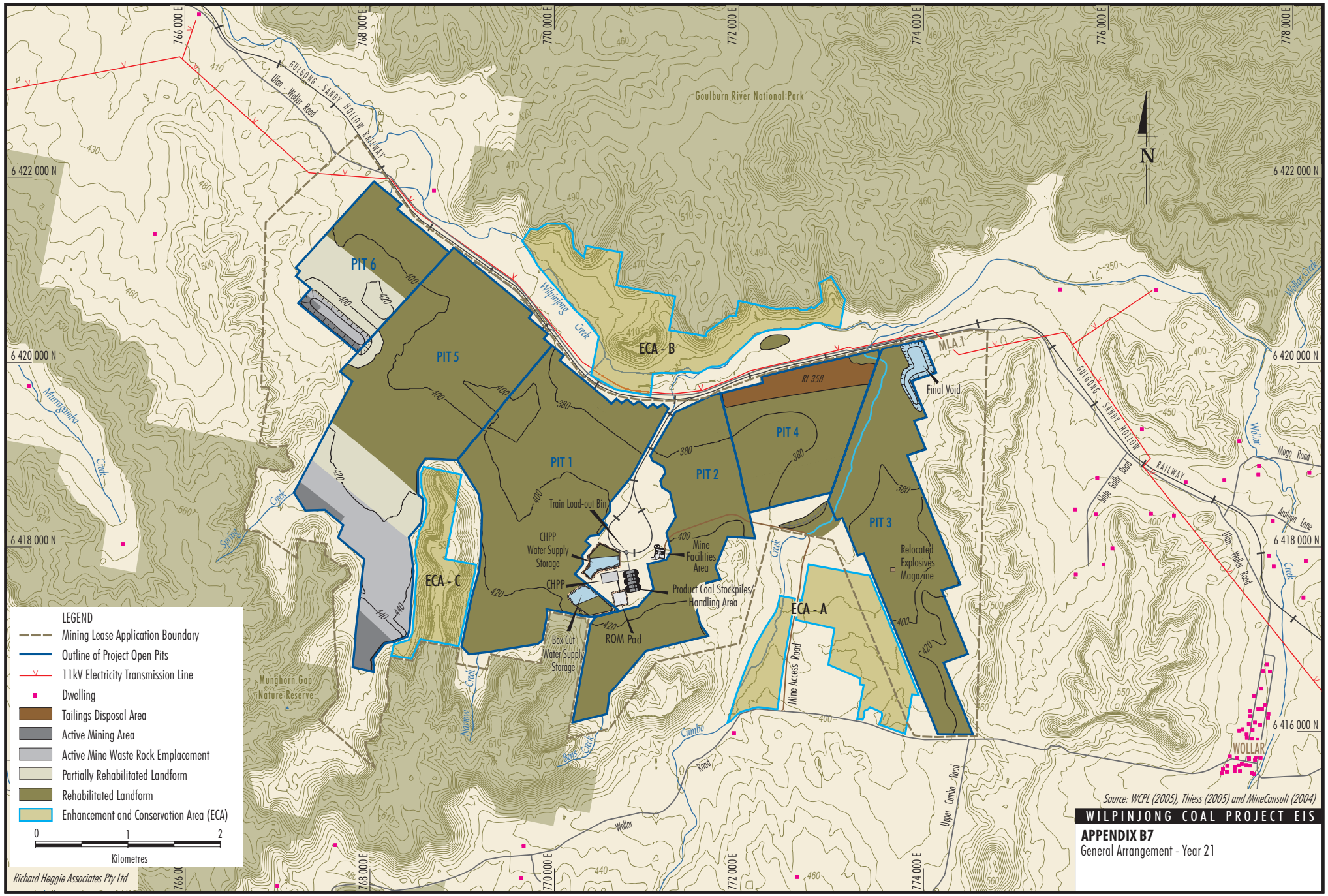


WIL-04-01 Noise_020H



WILPINJONG COAL PROJECT EIS

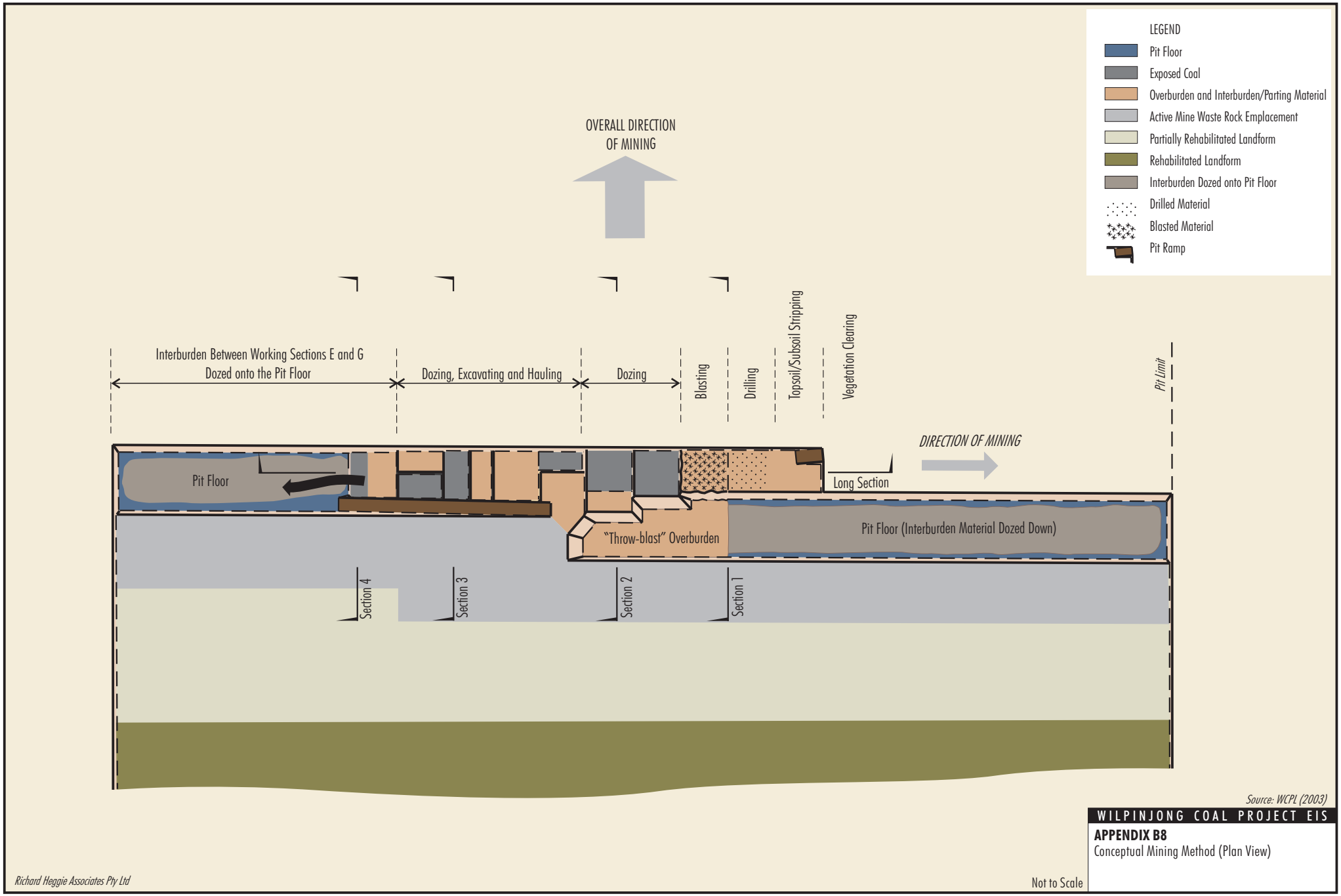
APPENDIX B7
General Arrangement - Year 21

WIL-04-01 Noise_021H

Appendix B8

Report 30-1313-R1

Conceptual Mining Method (Plan View)



Source: WCPL (2003)

WILPINJONG COAL PROJECT EIS

APPENDIX B8

Conceptual Mining Method (Plan View)

Richard Heggie Associates Pty Ltd

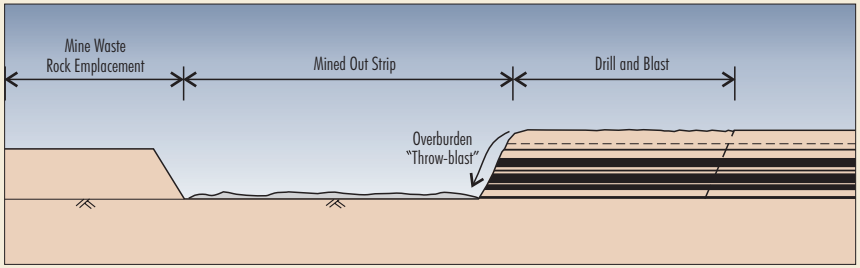
Not to Scale

WIL-04-01 Noise_012C

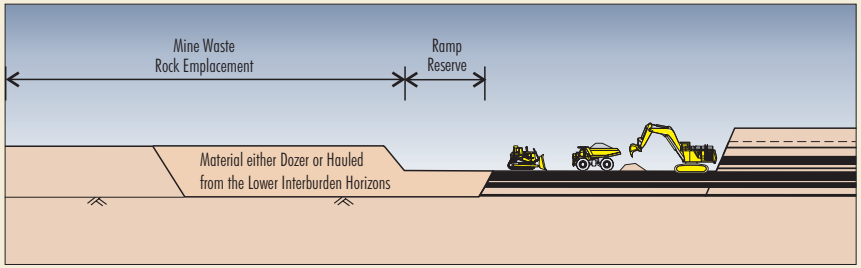
Appendix B9

Report 30-1313-R1

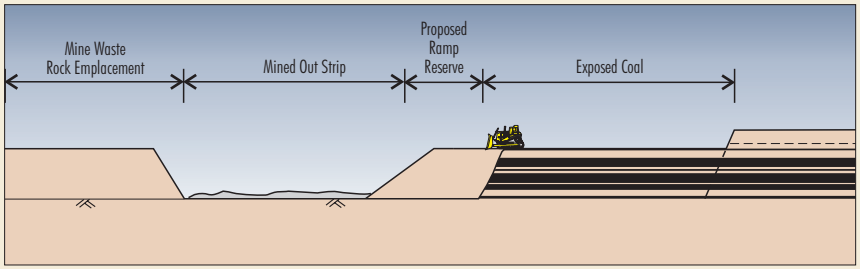
Conceptual Mining Method (Section View)



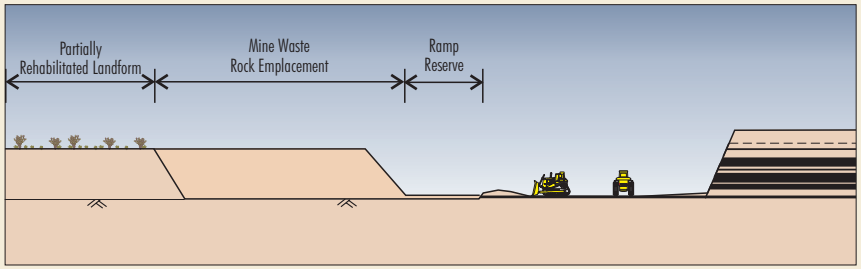
Section 1 - Drilled And Blasted (Including Throw-blast)



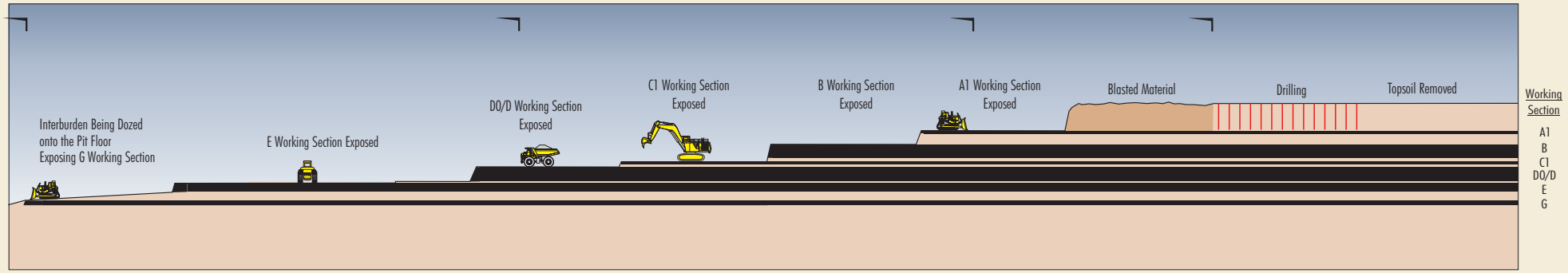
Section 3 - D Working Section Exposed



Section 2 - Dozer Pass



Section 4 - Dozer Exposing G Working Section



Section 4 | Section 3 | Section 2 | Section 1

Long Section

Source: WCPL (2003)

Richard Heggie Associates Pty Ltd

Not to Scale

WILPINJONG COAL PROJECT EIS

APPENDIX B9

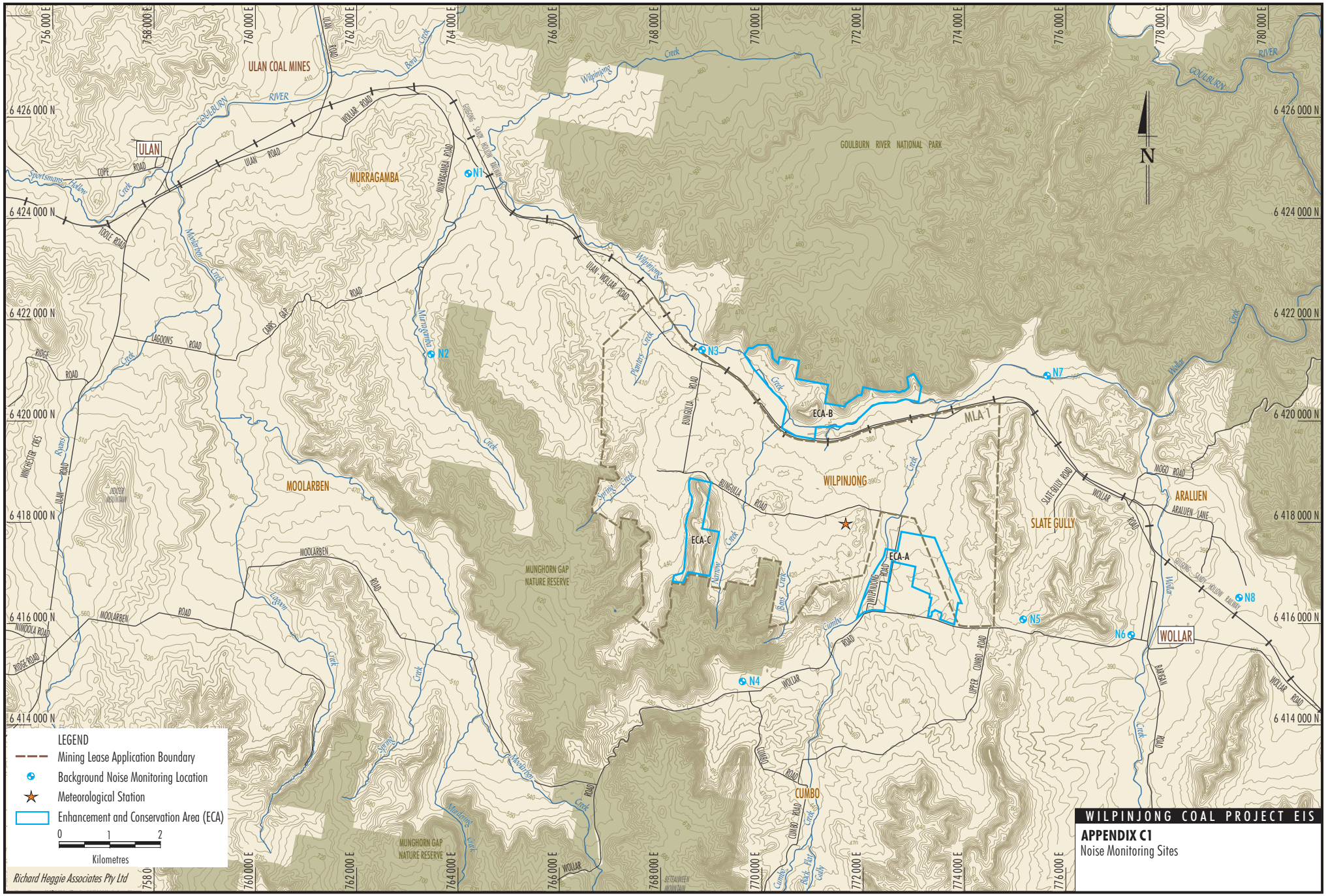
Conceptual Mining Method (Section View)

WIL-04-01 Noise_013C

Appendices C1

Report 30-1313-R1

Noise Monitoring Sites



WIL-04-01 Noise_014E

[AVAILABLE UPON REQUEST]

[AVAILABLE UPON REQUEST]

WILPINJONG COAL PROJECT

Site Specific Wind Conditions - June 2004 to January 2005

Table 1 Seasonal Frequency of Occurrence Wind Speed Intervals - Daytime

Period	Calm (<0.5 m/s)	Wind Direction ±(45°)	Wind Speed Percentage		
			0.5 to 2 m/s	2 to 3 m/s	0.5 to 3 m/s
Summer	1	ENE	6	9	15
Autumn	1	ESE	6	12	18
Winter	6	WNW	10	8	18
Spring	1	ENE	6	6	12

Table 2 Seasonal Frequency of Occurrence Wind Speed Intervals - Evening

Period	Calm (<0.5 m/s)	Wind Direction ±(45°)	Wind Speed Percentage		
			0.5 to 2 m/s	2 to 3 m/s	0.5 to 3 m/s
Summer	2	E	11	11	22
Autumn	1	SE	4	11	15
Winter	12	W	21	10	31
Spring	7	WSW	17	8	25

Table 3 Seasonal Frequency of Occurrence Wind Speed Intervals - Night-time

Period	Calm (<0.5 m/s)	Wind Direction ±(45°)	Wind Speed		
			0.5 to 2 m/s	2 to 3 m/s	0.5 to 3 m/s
Summer	17	E	22	13	35
Autumn	1	ESE	5	18	23
Winter	29	W	19	10	29
Spring	26	ESE	16	5	21

Site Specific Atmospheric stability Conditions - June 2004 to February 2004

Table 4 Frequency of Occurrence of Atmospheric Stability Classes - Daytime

Stability Class	Frequency of Occurrence Winter	Estimated ELR °C/100 m	Qualitative Description
A	30%	<-1.9	Lapse
B	14%	-1.9 to-1.7	Lapse
C	33%	-1.7 to-1.5	Lapse
D	23%	-1.5 to-0.5	Neutral
E	1%	-0.5 to 1.5	Weak Inversion
F	0%	1.5 to 4.0	Moderate Inversion
G	0%	>4.0	Strong Inversion

Note: ELR (Environmental Lapse Rate)

Table 5 Frequency of Occurrence of Atmospheric Stability Classes - Evening and Night-time

Stability Class	Frequency of Occurrence Winter	Estimated ELR oC/100 m	Qualitative Description
A	0%	<-1.9	Lapse
B	0%	-1.9 to-1.7	Lapse
C	0%	-1.7 to-1.5	Lapse
D	28%	-1.5 to-0.5	Neutral
E	12%	-0.5 to 1.5	Weak Inversion
F	58%	1.5 to 4.0	Moderate Inversion
G	2%	>4.0	Strong Inversion

Note: ELR (Environmental Lapse Rate)

CHAPTER 171

NOISE CONTROL GUIDELINE

CONSTRUCTION SITE NOISE

Where there is likelihood of annoyance due to noise from construction sites, conditions such as the following may be specified in a development consent or building application.

This applies particularly to non-scheduled premises such as commercial buildings where a long construction time is not likely.

The criteria may not be applicable to long-term construction such as coal mines which may take several years.

Variations should be made according to local conditions.

Level Restrictions

i. Construction period of 4 weeks and under.

The L_{A10} level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background level by more than 20 dBA.

ii Construction period greater than 4 weeks and not exceeding 26 weeks.

The L_{A10} level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background level by more than 10 dBA.

Time Restrictions

Monday to Friday 7.00 am to 6.00 pm

Saturday 7.00 am to 1.00 pm if inaudible on residential premises, otherwise 8.00 am to 1.00 pm

No construction work to take place on Sunday or Public Holidays.

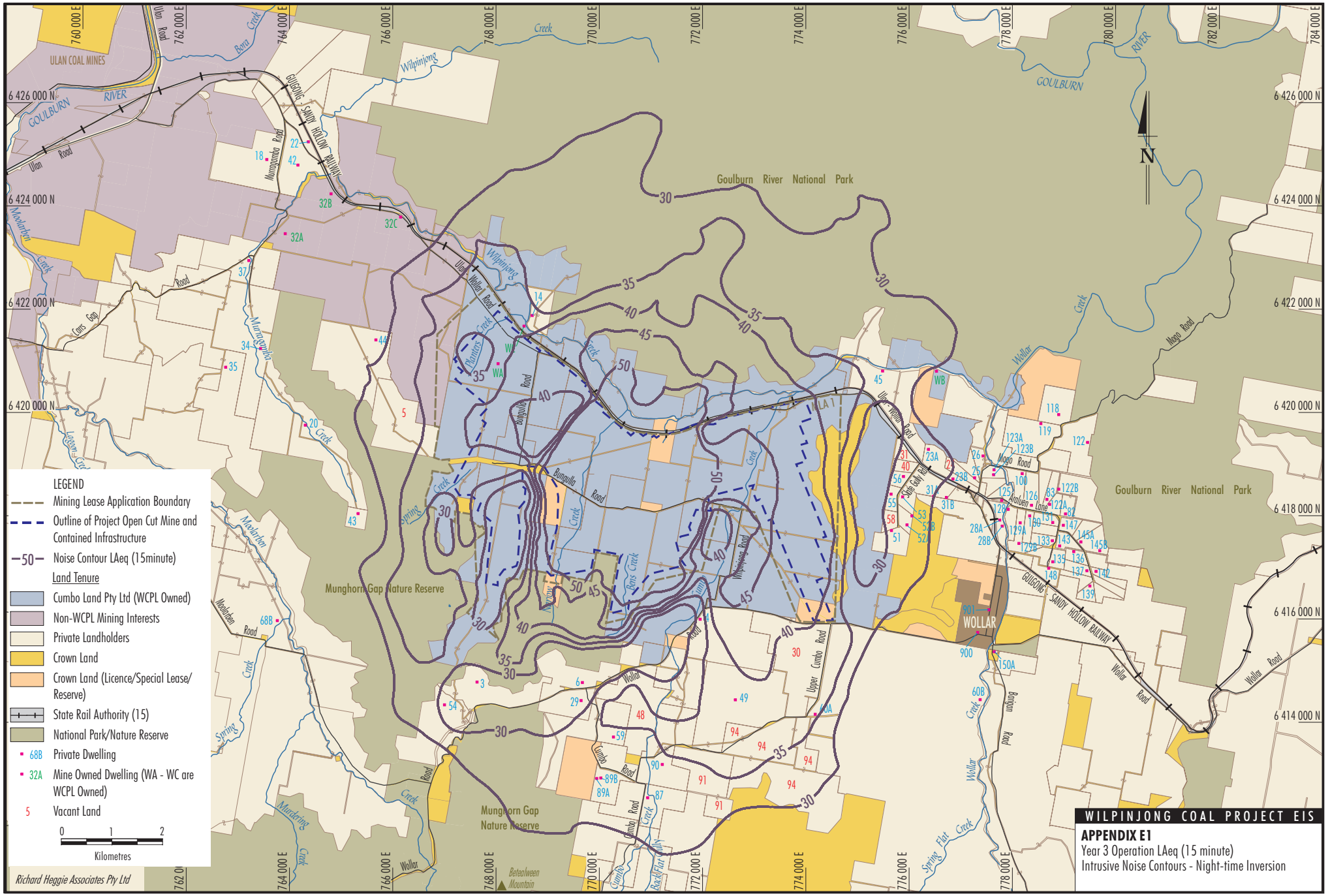
Silencing

All possible steps should be taken to silence construction site equipment. It is particularly important that silenced equipment should be used on road or rail works where 24 hour operation is necessary.

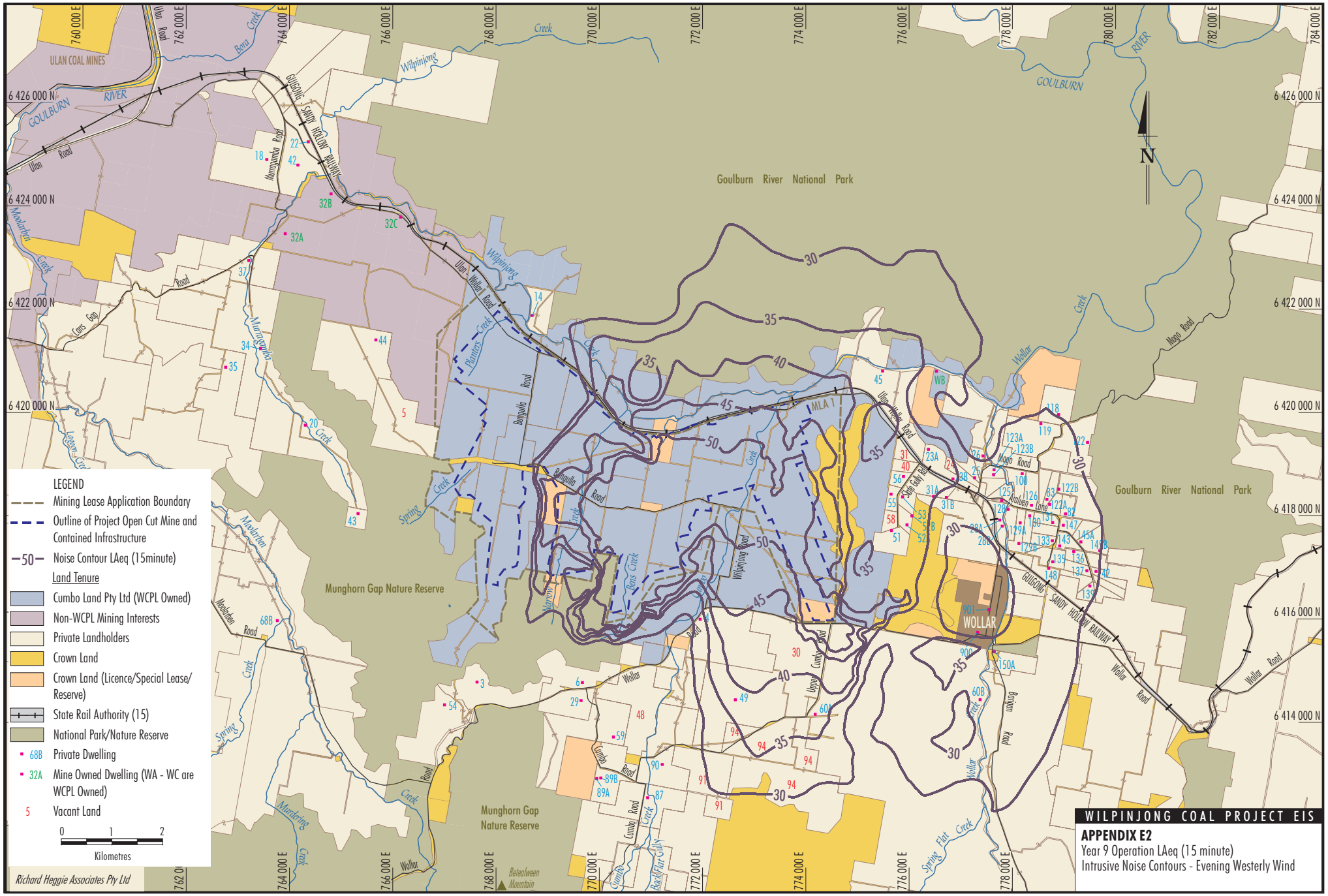
Appendices E1 to E6

Report 30-1313-R1

$L_{Aeq(15minute)}$ Intrusive Noise Contours
Mine Operating Years 3, 9, 11, 13, 14 and 21



WIL-04-01 Noise_003D



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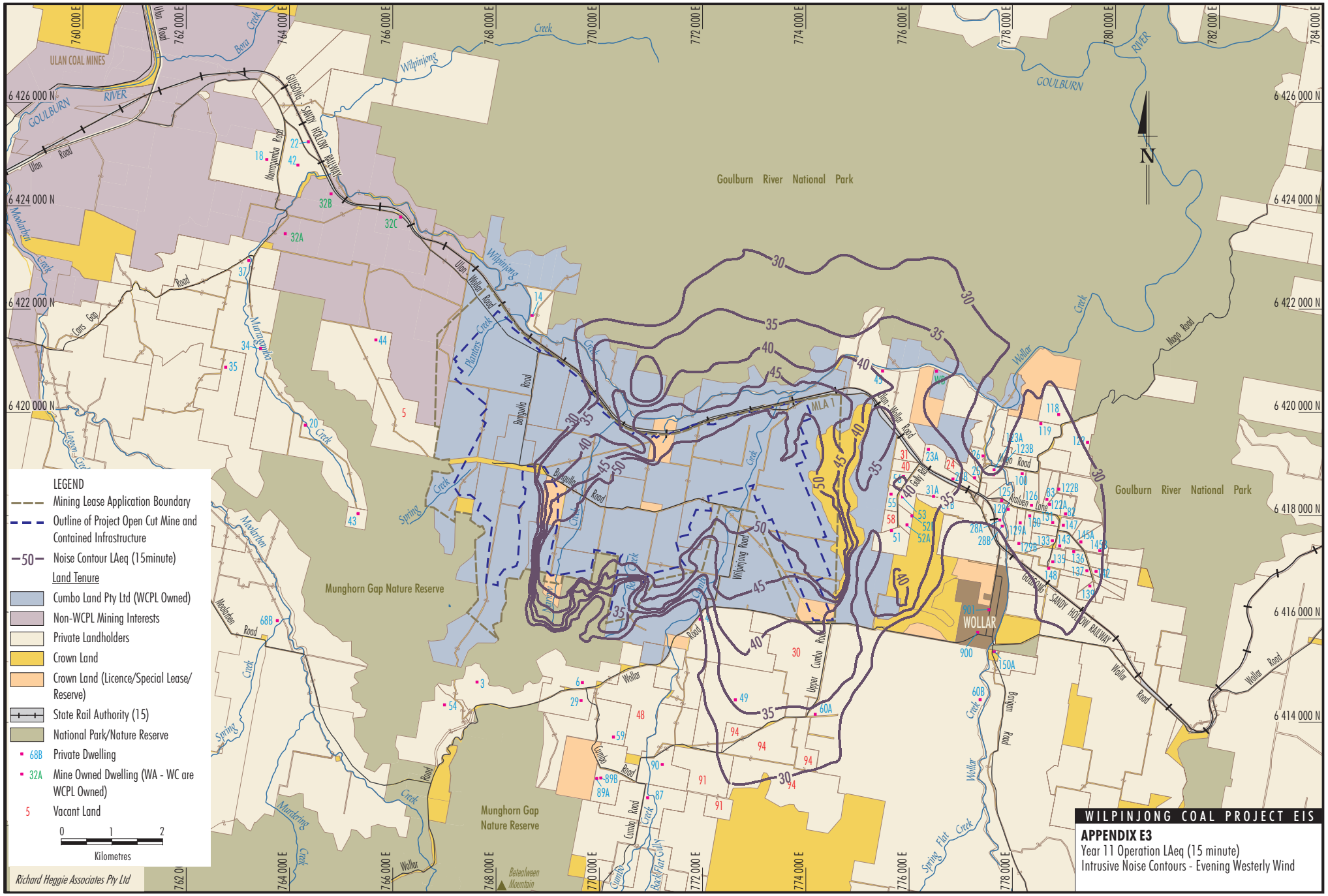

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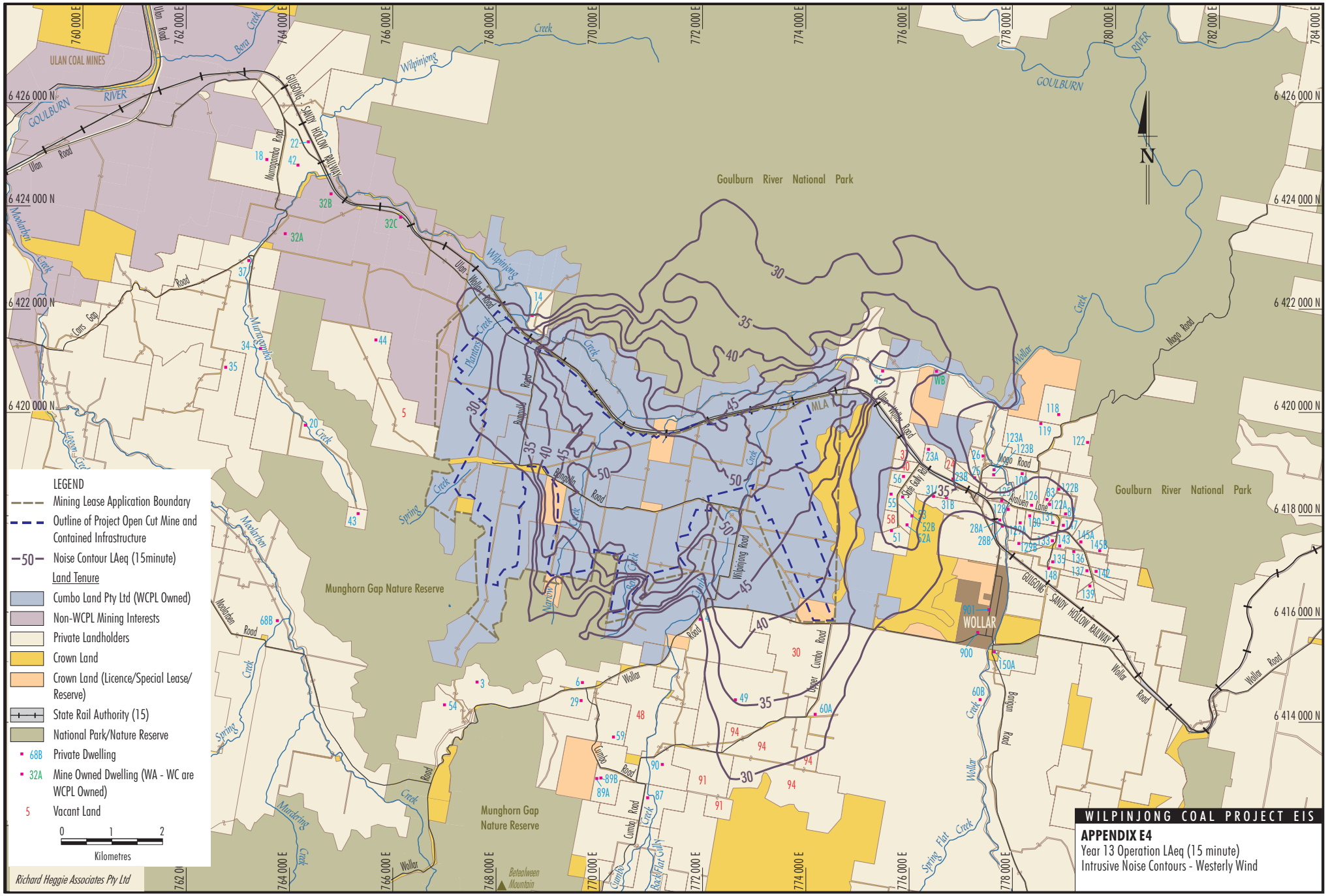
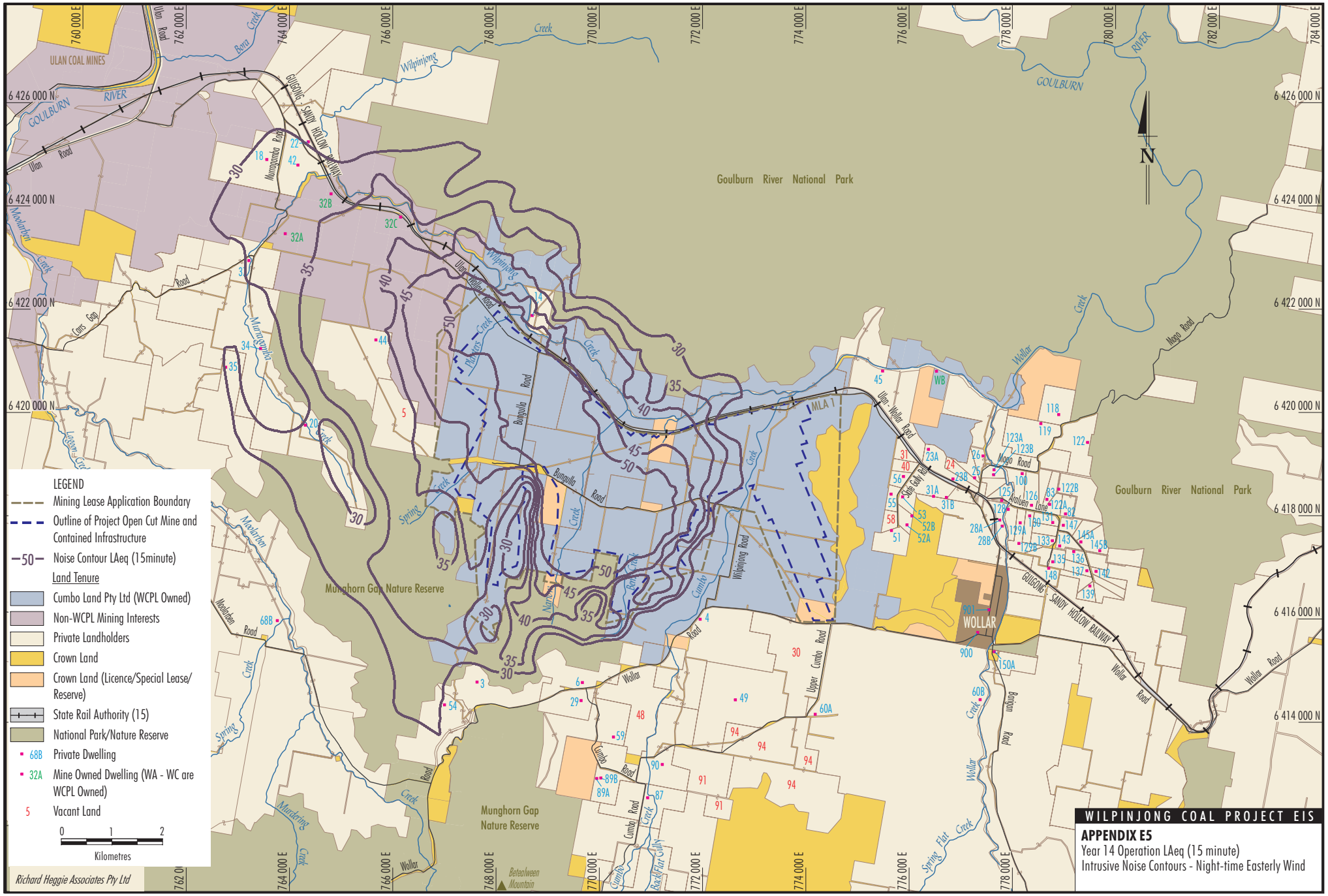


WILPINJONG COAL PROJECT EIS

APPENDIX E4
Year 13 Operation LAeq (15 minute)
Intrusive Noise Contours - Westerly Wind

WIL-04-01 Noise_006E



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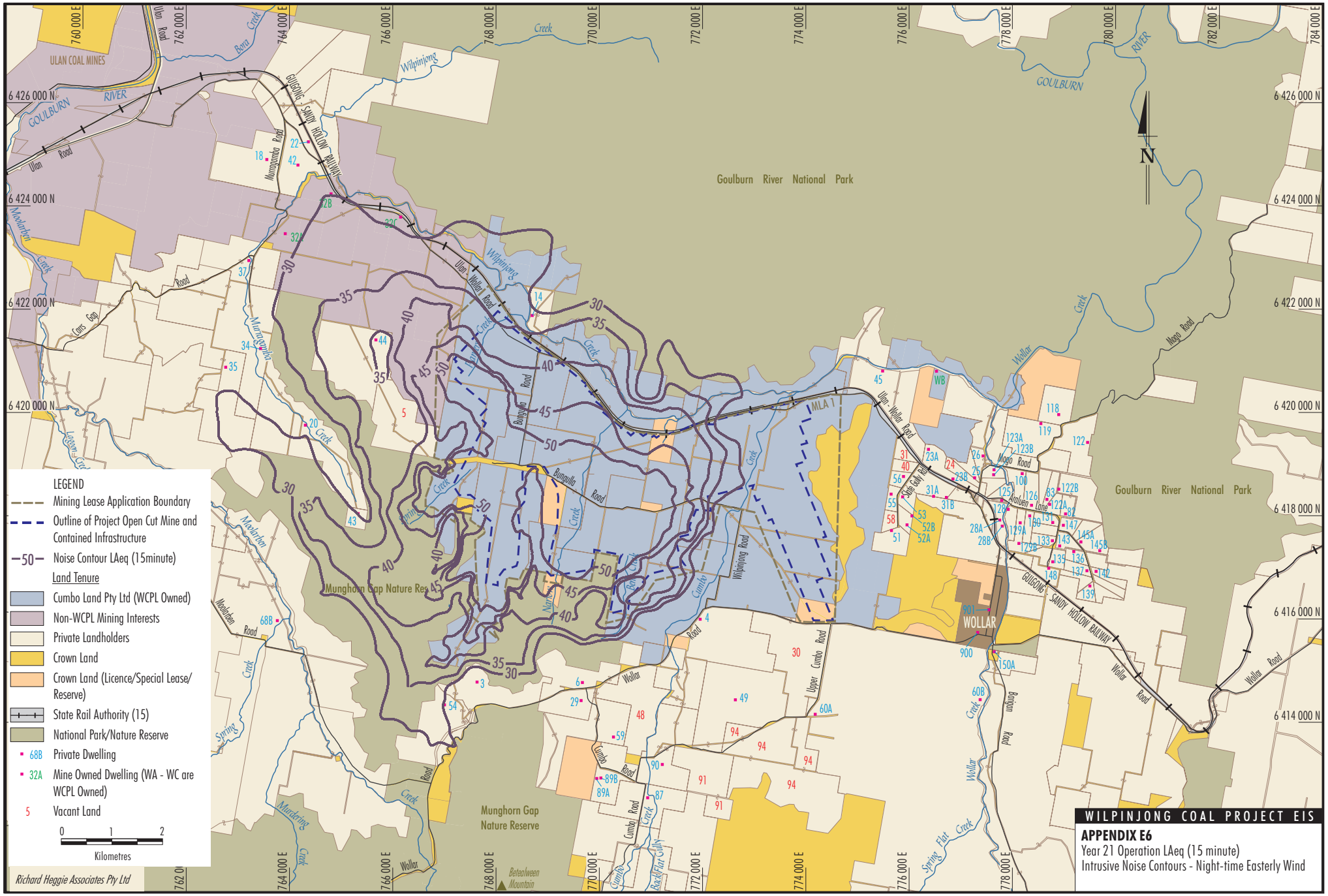

WIL-04-01 Noise_008E

Appendix F

[AVAILABLE UPON REQUEST]