



BULLI SEAM OPERATIONS

APPENDIX I
NOISE IMPACT ASSESSMENT

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ACOUSTICS AND AIR

REPORT NO. 08257
VERSION B

WILKINSON  MURRAY

BULLI SEAM OPERATIONS

NOISE IMPACT ASSESSMENT

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VERSION B

JULY 2009

PREPARED FOR

ILLAWARRA COAL HOLDINGS PTY LTD
OLD PORT ROAD
PORT KEMBLA
NSW 2505

Wilkinson Murray Pty Limited

ABN 41 192 548 112 • Level 2, 123 Willoughby Road, Crows Nest NSW 2065, Australia • **Asian Office: Hong Kong**
t +61 2 9437 4611 • f +61 2 9437 4393 • e acoustics@wilkinsonmurray.com.au • w www.wilkinsonmurray.com.au

ACOUSTICS AND AIR

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I1 INTRODUCTION

Illawarra Coal Holdings Pty Ltd (ICHPL), a wholly owned subsidiary of BHP Billiton, is the proponent for the development of the Bulli Seam Operations (the Project). The Project provides for the continuation of existing underground coal mining operations at the Appin Mine and West Cliff Colliery.

The Appin Mine and West Cliff Colliery are located approximately 25 kilometres (km) north-west of Wollongong in New South Wales (NSW) (Figure I1-1).

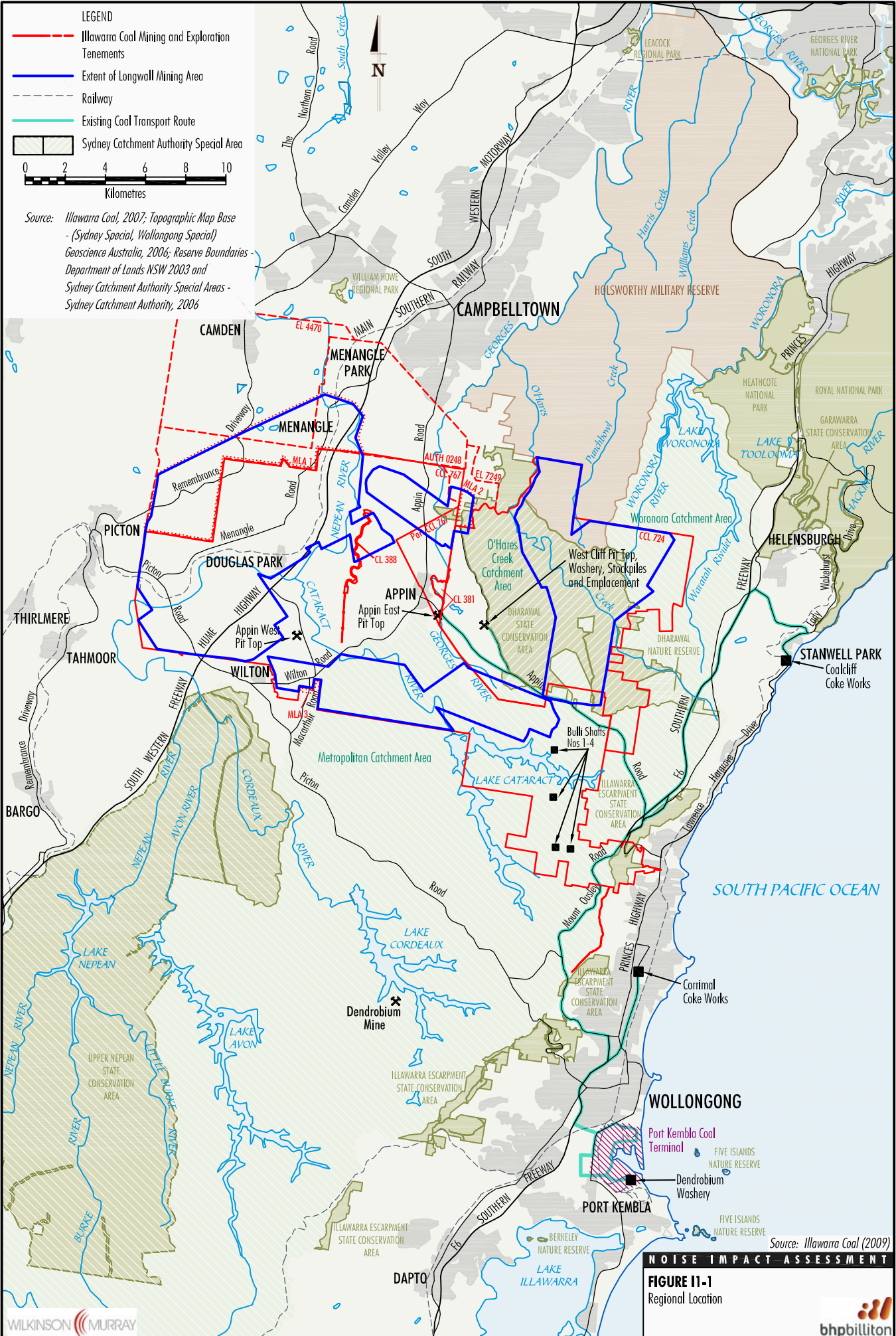
ICHPL also owns the Dendrobium Mine located approximately 10 km north-west of Wollongong.

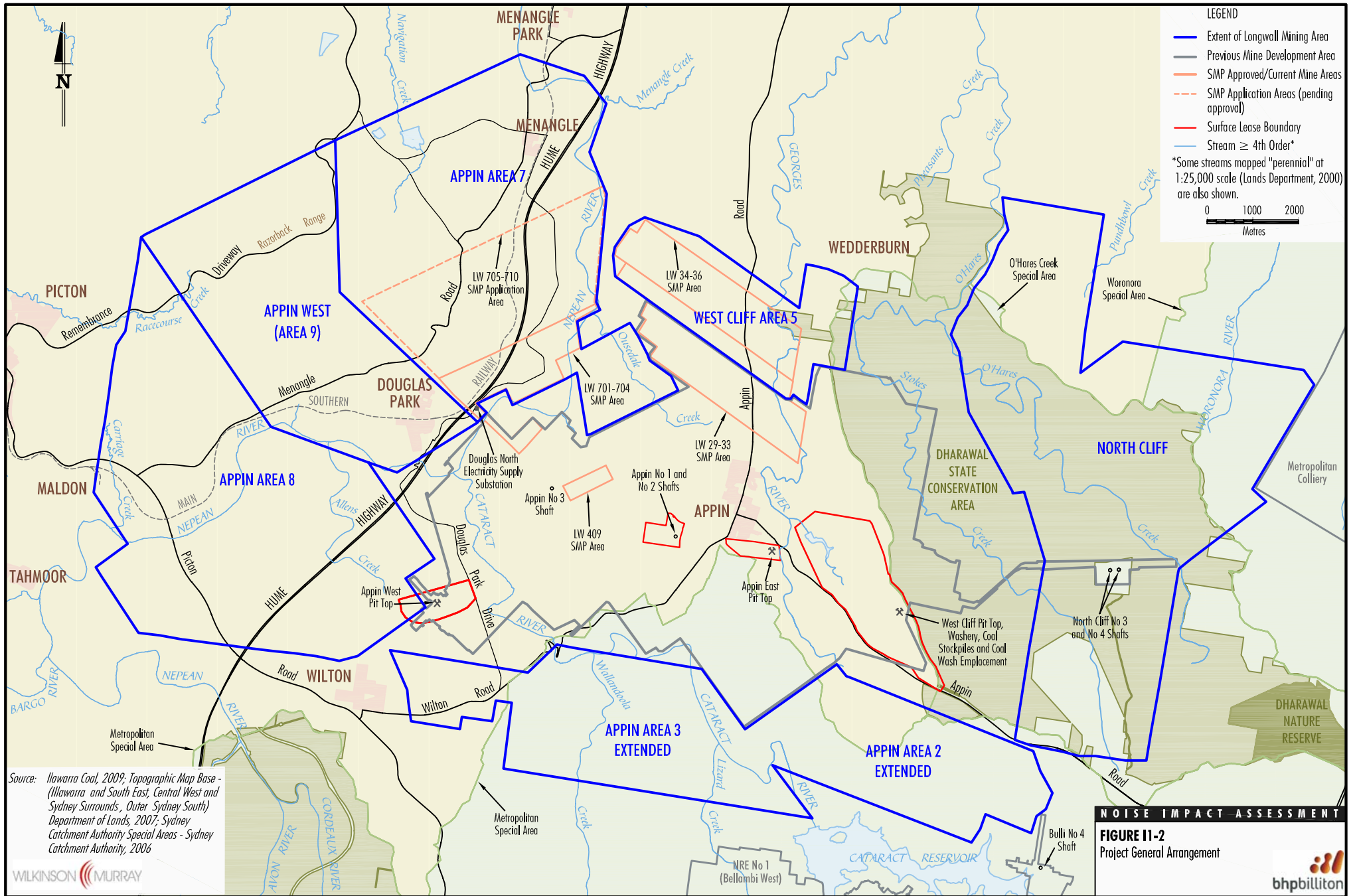
The main activities associated with development of the Project would include:

- continued development of underground mining operations within existing coal leases and new mining leases to facilitate a total run-of-mine (ROM) coal production rate of up to 10.5 million tonnes per annum (Mtpa);
- ongoing exploration activities within existing exploration tenements;
- upgrade of the existing West Cliff Washery to support the increased ROM coal production;
- continued mine gas drainage and capture for beneficial utilisation at the West Cliff Ventilation Air Methane Project (WestVAMP) and Appin-Tower Power Project;
- continued generation of electricity by the existing Appin-Tower Power Project (owned and operated by Energy Development Limited [EDL]) utilising coal bed methane drained from the Bulli Seam;
- upgrade of existing surface facilities and supporting infrastructure (e.g. service boreholes, ventilation shafts, gas drainage equipment, waste water treatment and waste water disposal);
- continued and expanded placement of coal wash at the West Cliff Coal Wash Emplacement;
- continued road transport of ROM coal from the Appin East pit top to the West Cliff Washery;
- continued road transport of ROM coal from Appin East pit top and West Cliff pit top via the public road network to the Dendrobium Washery at Port Kembla;
- continued road transport of product coal from the West Cliff Washery via the public road network to BlueScope Steelworks, Port Kembla Coal Terminal (PKCT), Corrimal and Coalcliff coke works and other customers;
- ongoing surface monitoring and rehabilitation (including rehabilitation of mine related infrastructure areas that are no longer required) and remediation of subsidence effects; and
- other associated minor infrastructure, plant, equipment and activities.

Figure I1-2 illustrates the Project area and surrounds. A detailed description of the Project is provided in Section 2 in the Main Report of the Environmental Assessment (EA).

In accordance with the Director-General's Environmental Assessment Requirements for the Project, this report addresses potential noise and blasting impacts, including the potential construction, operational, and off-site road traffic noise. This assessment has been undertaken in accordance with the NSW Department of Environment and Climate Change's (DECC) *NSW Industrial Noise Policy* (INP) (NSW Environment Protection Authority [EPA], 2000).





In addition, this assessment also considers the following guidelines where relevant:

- *Environmental Noise Control Manual* (ENCM) (EPA, 1994).
- *Environmental Criteria for Road Traffic Noise* (ECRTN) (EPA, 1999).
- *Interim Construction Noise Guideline* (DECC, 2009).
- *Assessing Vibration: A Technical Guideline* (DECC, 2006).

I2 EXISTING/APPROVED OPERATIONS AND PROJECT OVERVIEW

The following sub-sections describe key aspects of the existing/approved operations at the Appin Mine and West Cliff Colliery and key alterations associated with the Project that have potential to cause noise or vibration impacts at sensitive receivers. A detailed description of the Project is provided in Section 2 in the Main Report of the EA.

I2.1 Existing Surface Infrastructure

I2.1.1 West Cliff Pit Top

The existing West Cliff pit top is located off Appin Road to the east-southeast of Appin village (Figure I1-2). Existing surface infrastructure at the West Cliff pit top includes the following (Figure I2-1):

- drift portal;
- upcast ventilation shaft (No. 1) and fan house;
- downcast ventilation shaft (No. 2) and winder building;
- gas drainage, capture and beneficiation equipment, including WestVAMP;
- coal drift and conveyor;
- product coal bins;
- ROM and product coal stockpiles and handling areas;
- Coal Preparation Plant (CPP) and associated conveyors, transfer points and buffer bins;
- coal wash emplacements;
- product coal road transport loading facilities;
- internal haul roads;
- administration offices and bath house;
- stores and workshop facilities; and
- other ancillary infrastructure (e.g. diesel/oil tanks/storage, pumps and pipelines, compressors, gasometer structure and electrical substations).



I2.1.2 Appin East Pit Top

The existing Appin East pit top is located off Appin Road to the south-east of Appin village (Figure I1-2). Existing surface infrastructure at the Appin East pit top includes the following (Figure I2-2):

- men and materials drift and winder;
- downcast ventilation and main coal drift and drive house;
- coal handling infrastructure (e.g. conveyors, hoppers and bins);
- ROM coal bins, stockpile area and truck loading facilities;
- administration complex and bath house;
- workshop facilities, stores and storage areas;
- water management/treatment facilities (e.g. ponds/lagoons, dams, filter and dosing plants);
- internal haul roads; and
- other ancillary infrastructure (e.g. water/waste water/diesel/oil tanks, pumps and pipelines, compressors, electricity substation and explosives storage).

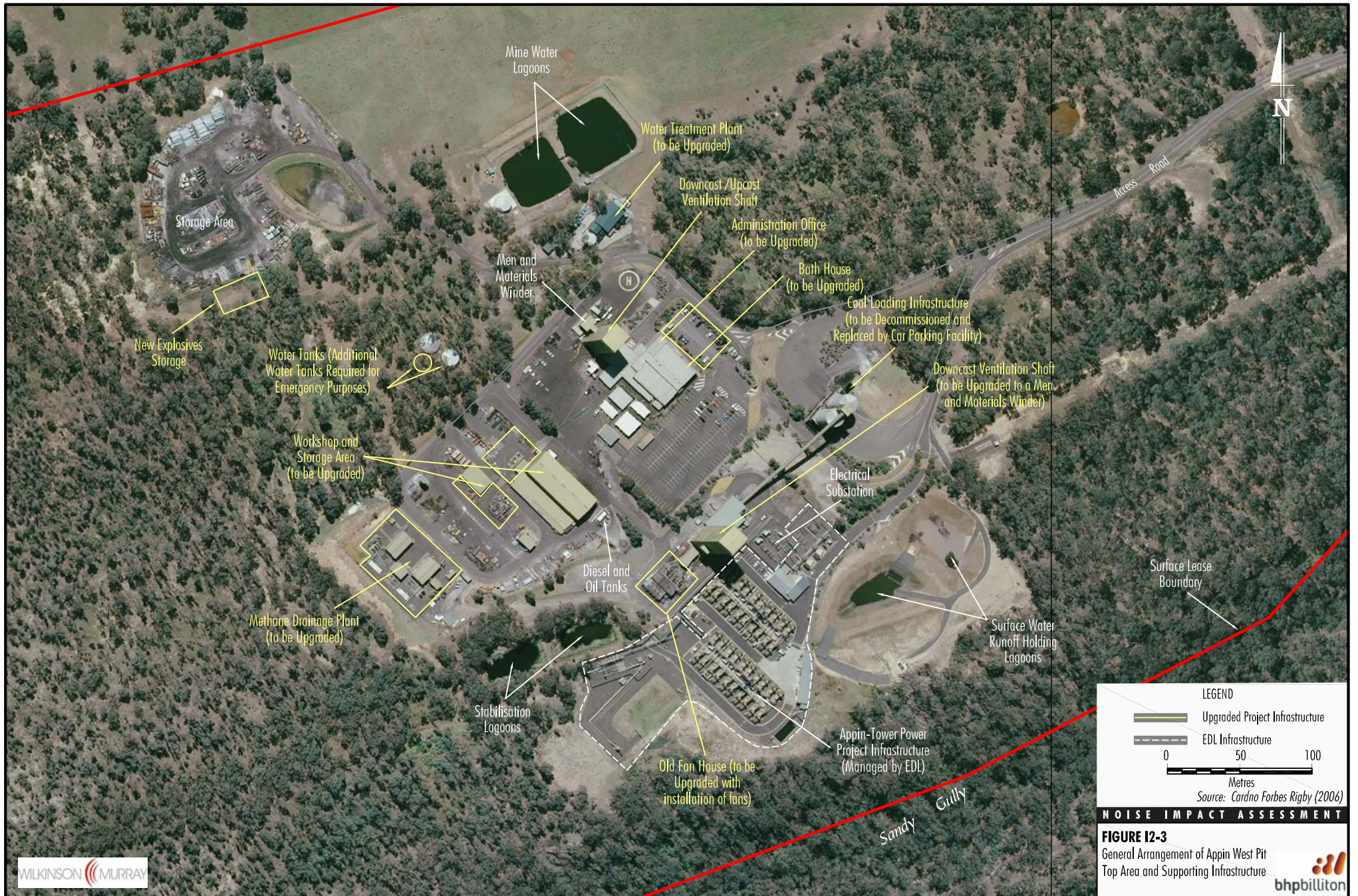
I2.1.3 Appin West Pit Top

The existing Appin West pit top is located off Douglas Park Drive approximately 4 km south of Douglas Park township (Figure I1-2).

The Appin West pit top currently provides access to the underground mining operations at the Appin Mine for personnel, mine equipment and supplies. Surface facilities at the Appin West pit top include the following (Figure I2-3):

- men and materials winder;
- two downcast ventilation shafts;
- administration office;
- employee facilities and bathhouse;
- workshop and storage areas;
- coal loading infrastructure (currently not in use);
- methane drainage plant including gas pipe system and exhaustor house;
- water management/treatment infrastructure (e.g. Reverse Osmosis treatment facility; water tanks; surface water runoff holding lagoons; and mine water and stabilisation lagoons);
- other ancillary infrastructure (e.g. diesel/oil tanks; pumps and pipelines; compressors; and electrical substation); and
- components of the Appin-Tower Power Project infrastructure (managed by EDL).





LEGEND

- Upgraded Project Infrastructure
- EDL Infrastructure

0 50 100
Metres

Source: Cardno Forbes Rigby (2006)

NOISE IMPACT ASSESSMENT

FIGURE I2-3
General Arrangement of Appin West Pit Top Area and Supporting Infrastructure



I2.1.4 Appin No.1 and No.2 Shafts and Fan Site

The existing Appin No. 1 and No. 2 shafts and fan site is located approximately 2 km west of the Appin East pit top (Figure I1-2) and consists of the following infrastructure (Figure I2-4):

- downcast ventilation shaft (Appin No.1);
- upcast ventilation shaft (Appin No. 2) and fan house;
- gas drainage plant including gas drainage pipe system and surface exhaust house;
- workshop and store rooms;
- water management infrastructure (e.g. water tanks and site runoff collection ponds); and
- electrical switchroom and switchyard.

Components of the Appin-Tower Power Project infrastructure (managed by EDL) are located adjacent to the Appin No. 1 and No. 2 shafts and fan site (Figure I2-4). The Appin-Tower Power Project generates electricity by utilising methane drained from the underground mining area. Some components of the Appin-Tower Power Project are also located adjacent to the Appin West pit top.

I2.1.5 Appin No.3 Shaft and Fan Site

The Appin No. 3 shaft (former Tower No. 3) and fan site is located approximately 4 km west of Appin village (Figure I1-2) and consists of the following infrastructure (Figure I2-4):

- upcast ventilation shaft and fan houses;
- workshop and switch room;
- water management/treatment infrastructure (e.g. water tank, septic tanks and retention pond); and
- electrical substation.

I2.1.6 North Cliff Shafts Site

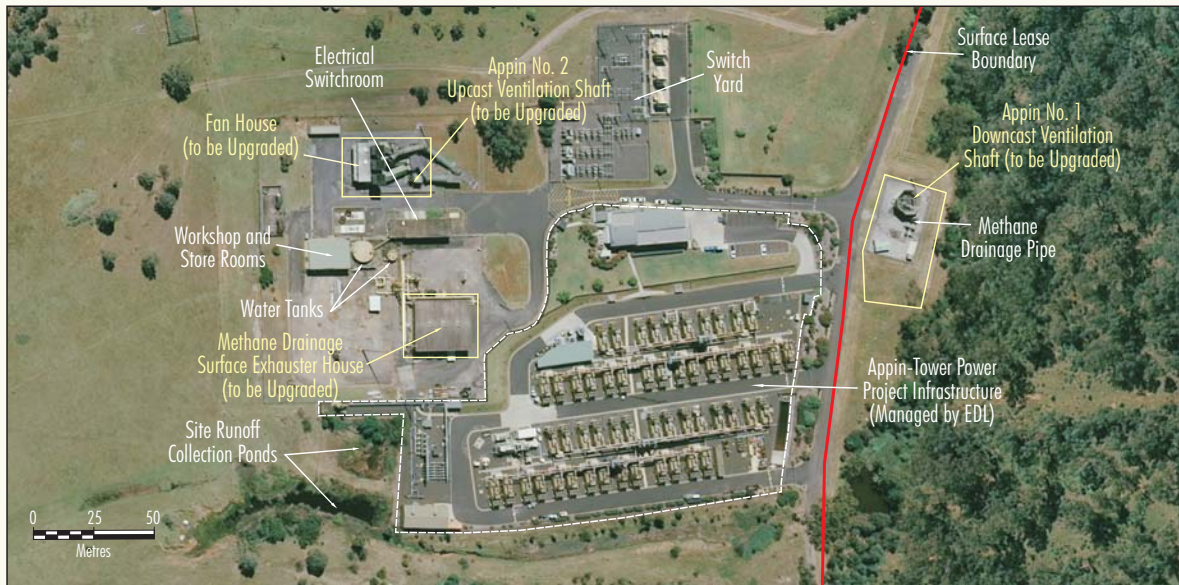
The existing North Cliff shafts are located approximately 5 km east of the West Cliff pit top (Figure I1-2) and consist of the following infrastructure (Figure I2-4):

- two shafts (No. 3 and No. 4) and associated winder houses (currently not in use);
- access and internal roads;
- shed; and
- spoil stockpile and sediment dam.

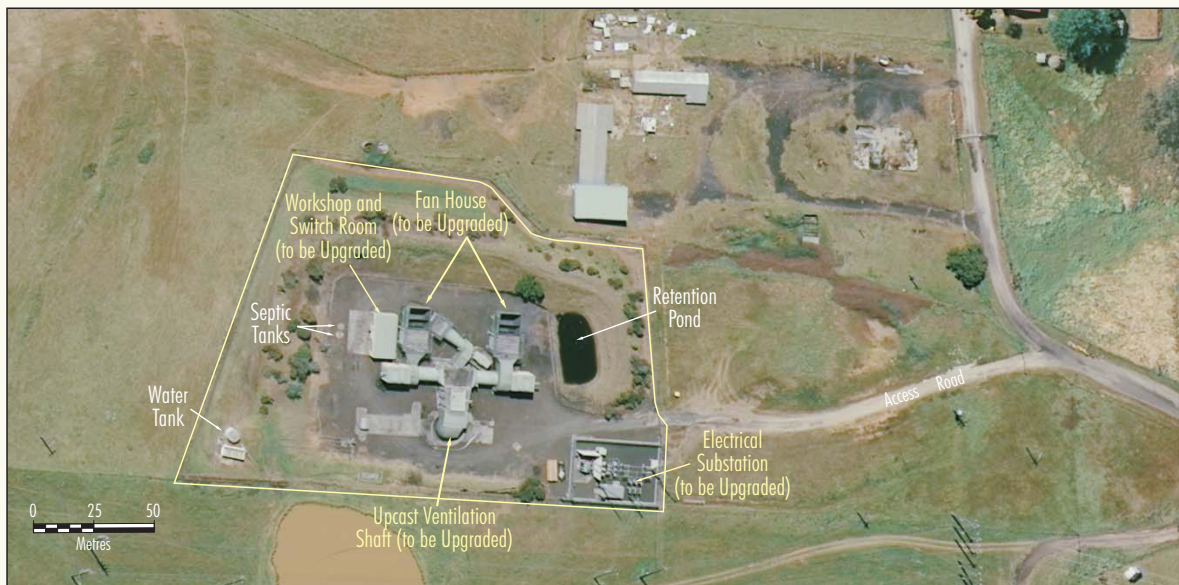
I2.2 Existing Mining Operations

Combined total ROM coal production capacity at the existing Appin Mine and West Cliff Colliery is up to approximately 7.5 Mtpa. ROM coal from the underground longwall operation is conveyed to the surface at either the Appin East or West Cliff pit tops. No ROM coal is brought to the surface at the Appin West pit top.

Figure I2-5 provides a materials handling schematic flowsheet.



Appin No 1 and No 2 Shafts



Appin No 3 Shaft

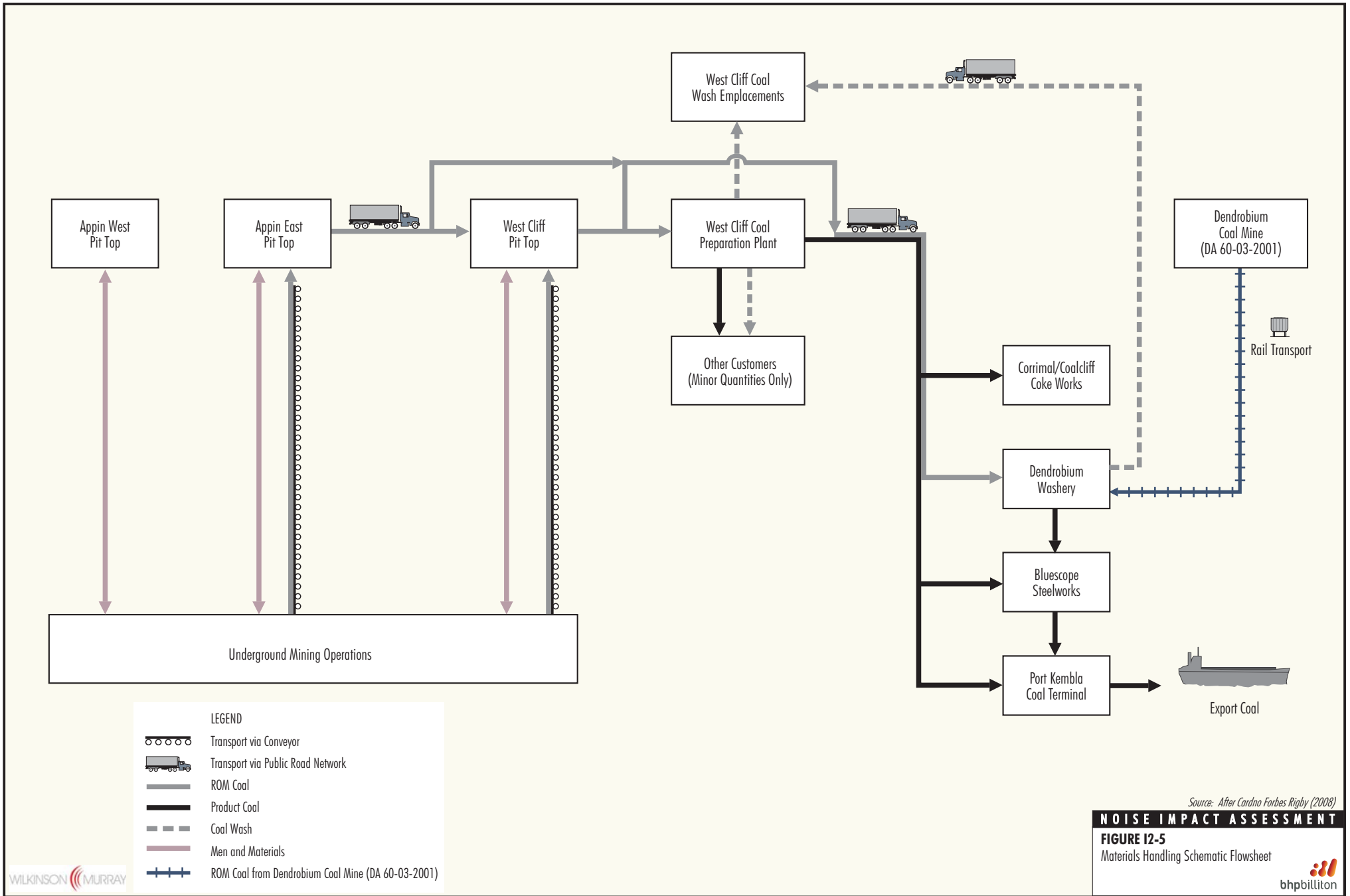


North Cliff Shafts

NOISE IMPACT ASSESSMENT

FIGURE I2-4
General Arrangement of Appin and North Cliff Shafts and Supporting Infrastructure





Source: After Cardno Forbes Rigby (2008)

NOISE IMPACT ASSESSMENT

FIGURE I2-5
Materials Handling Schematic Flowsheet



I2.2.1 ROM Coal Reclaim, Transportation and Washing

ROM coal from the Appin East pit top is either temporarily stockpiled or loaded directly into trucks for transport via road to the West Cliff Washery. Some ROM coal is also transported via the public road network to the Dendrobium Washery in Port Kembla.

ROM coal is either temporarily stockpiled and reclaimed or delivered directly to be crushed, screened and washed at the West Cliff Washery.

I2.2.2 Product Coal Stockpiling, Reclaim and Transport

The Appin Mine and West Cliff Colliery currently produce up to approximately 5.4 Mtpa of product coal (combined) for domestic and export markets. Product coal is either temporarily stockpiled at the West Cliff Colliery or loaded directly from the product coal bins into trucks.

Product coal from the West Cliff Washery is transported by public road to PKCT or to the BlueScope Steelworks. The transport of product coal to PKCT would continue 24 hours a day, seven days a week. Some product coal is also transported via public road to the Illawarra Coke Company's Corrimal and Coalcliff Coal Works.

I2.2.3 Coal Wash Management

Coal wash from the existing West Cliff and Dendrobium Washeries is currently accommodated within the existing West Cliff Coal Wash Emplacement, located within the Brennans Creek valley, adjacent to the West Cliff pit top. The existing West Cliff Coal Wash Emplacement has been developed over a number of stages and is currently approved to Stage 3 (Figure I2-1).

I2.2.4 Mine Ventilation

The existing ventilation systems at the Appin Mine and West Cliff Colliery consist of:

- five operational downcast ventilation shafts and associated air inlet arrangements;
- three operational upcast ventilation shafts including fan houses (i.e. West Cliff No.1, Appin No. 2 and Appin No.3);
- two disused ventilation shafts (North Cliff No.3 and No.4); and
- surface drifts located at the three pit tops.

Each of the operational upcast ventilation shaft fans currently vent to atmosphere at a rate of approximately 330 to 370 cubic metres per second (m³/s).

I2.2.5 Surface Goaf Gas Drainage

ICHPL has obtained a separate Project Approval for the West Cliff Colliery Surface Goaf Gas Drainage Project. The Surface Goaf Gas Drainage Project involves the extraction of gas from the goaf area during and following the extraction of Longwalls 32 to 34. ICHPL has also separately lodged an application for the Appin Mine Area 7 Goaf Gas Drainage Project (Cardno Forbes Rigby, 2008). These surface goaf gas drainage projects are discussed in Section I4.4.3 along with other potential sources of cumulative noise in the vicinity of the Project.

I2.3 Project Construction/Development Activities

Infrastructure that is required to support the Project would be progressively developed in parallel with ongoing mining operations. The key Project components that would be constructed during the Project development include:

- longwall mining machinery upgrades – including upgrading a range of underground equipment to allow an increase in production rate;
- upgrades of the underground materials handling and transport systems – including upgrades or replacement of conveyors, sizers, drives, winders and supporting systems;
- upgrade of the existing West Cliff Washery to support the increased ROM coal production (including the currently proposed West Cliff Washery Reliability Project [refer to Section I4.4.3]); and
- upgrades of the existing surface facilities and supporting infrastructure – involving replacing, upgrading or adding components generally within existing disturbance footprints as required.

Surface construction/development activities would generally be undertaken during daytime hours up to seven days per week.

I2.4 Project Mining Operations

Longwall coal mining operations would be undertaken at a rate of up to 10.5 Mtpa. The recoverable coal reserve for the Project based on the planned maximum production rate comprises approximately 306 million tonnes (Mt) of ROM coal. The Project would extend the life of the Appin Mine and West Cliff Colliery by some 30 years.

A description of the Project is provided in Section 2 in the Main Report of the EA.

Key components of the Project that have potential to alter the noise emissions of the existing Appin Mine and West Cliff Colliery include:

- Upgrades at the Appin East pit top including coal loader and bin upgrades.
- Upgrades at the West Cliff pit top including the West Cliff Washery (incorporating the West Cliff CPP Reliability Improvement Project), in line with increased ROM coal production.
- Upgrades at the Appin West pit top, including water treatment plant, fan house, methane drainage plant, men and materials winders and supporting infrastructure.
- Increased Project truck movements and operation of other mobile plant at pit tops.
- Project coal wash would be accommodated via an expansion of the existing West Cliff Coal Wash Emplacement (referred to as the West Cliff Stage 4 Coal Wash Emplacement) (Figure I2-1).
- The North Cliff No. 3 and No. 4 shafts would be recommissioned.
- Depending on ventilation requirements, existing upcast ventilation shafts may be upgraded to rates of up to approximately 550 m³/s at West Cliff, Appin No. 2 shaft, Appin No. 3 shaft and the North Cliff shafts.
- Upgrades to the methane drainage plant at the Appin No.1 and No. 2 shaft site.

If required, the installation of surface goaf gas drainage boreholes and associated surface infrastructure would be subject to preparation of supplementary specialist environmental assessment studies (including noise assessment). Section I4.9 of this report provides an indicative assessment framework and noise criteria for surface goaf gas drainage.

I2.5 Operating and Construction Hours

A summary of the operating and construction hours for the Project is provided in Table I2-1.

Table I2-1 Summary of Operating and Construction Hours

Project Phase	Component	Hours
Development/Construction	Underground Construction/Development	24 hours a day, seven days per week
	Surface Construction/Development	Generally daytime only, up to seven days per week
Operations	Mining operations	24 hours a day, seven days per week
	West Cliff Coal Wash Emplacement haulage and dumping	24 hours a day, seven days per week
	West Cliff Coal Wash Emplacement management (e.g. use of dozers on the emplacement)	Generally daytime only, up to seven days per week

Source: Section 2 of the Main Report of the EA

I2.6 Workforce

The existing mining operations at Appin Mine and West Cliff Colliery have a combined operational workforce (including ICHPL staff and on-site contractor's personnel) of approximately 875 people (Table I2-2). The operational workforce would be augmented during the Project. At full development (producing 10.5 Mtpa ROM coal), the Project would employ in the order of 1,170 people (Table I2-2).

It is anticipated that during the initial development of the Project (including upgrades of existing surface and underground infrastructure), an additional construction workforce of up to 100 people would be required in the short-term.

Table I2-2 Indicative Initial Development and Operational Workforce

Activity	Initial Development and Existing Mining Operations	Project at Full Development (Producing 10.5 Mtpa ROM Coal)
Appin Mine - Underground Mining Operators, Maintenance Supervisors and Management	473	653
West Cliff Colliery - Underground Mining Operators, Maintenance Supervisors and Management	321	429
West Cliff Washery - Personnel and Maintenance Staff	81	88
Project Construction/Development Activities	100	-
Total	975	1,170

Source: Section 2 of the Main Report of the EA

I3 EXISTING NOISE AND METEOROLOGICAL ENVIRONMENT

A description of the existing noise environment for areas in the vicinity of the existing Appin Mine and West Cliff Colliery facilities is provided in Section I3.1. Section I3.2 details how the meteorological environment is incorporated into the noise assessment.

I3.1 Existing Noise Environment

A total of seven background noise monitoring locations were selected to identify background noise levels in areas potentially impacted by the Project. The noise monitoring equipment used for these measurements consisted of environmental noise loggers set to A-weighting, fast response. The loggers continuously monitored noise over 15-minute sampling periods (see Attachment IA for further description of these terms). This equipment is capable of remotely monitoring and storing noise level descriptors for later detailed analysis. The equipment calibration was checked before and after the survey and no significant drift was noted.

The logger determines L_{A1} , L_{A10} , L_{A90} and L_{Aeq} levels of the ambient noise. L_{A1} , L_{A10} and L_{A90} are the levels exceeded for 1%, 10% and 90% of the sample time, respectively. L_{Aeq} is the energy average of the noise levels over the sample period (see Attachment IA for definitions). The L_{A1} is indicative of maximum noise levels due to individual noise events such as the occasional pass-by of a heavy vehicle. The L_{A90} level is often described as the "background" noise level during the relevant period.

The noise monitoring locations are shown on Figure I3-1, and Attachment IB provides a graphical presentation of the data recorded by the loggers.

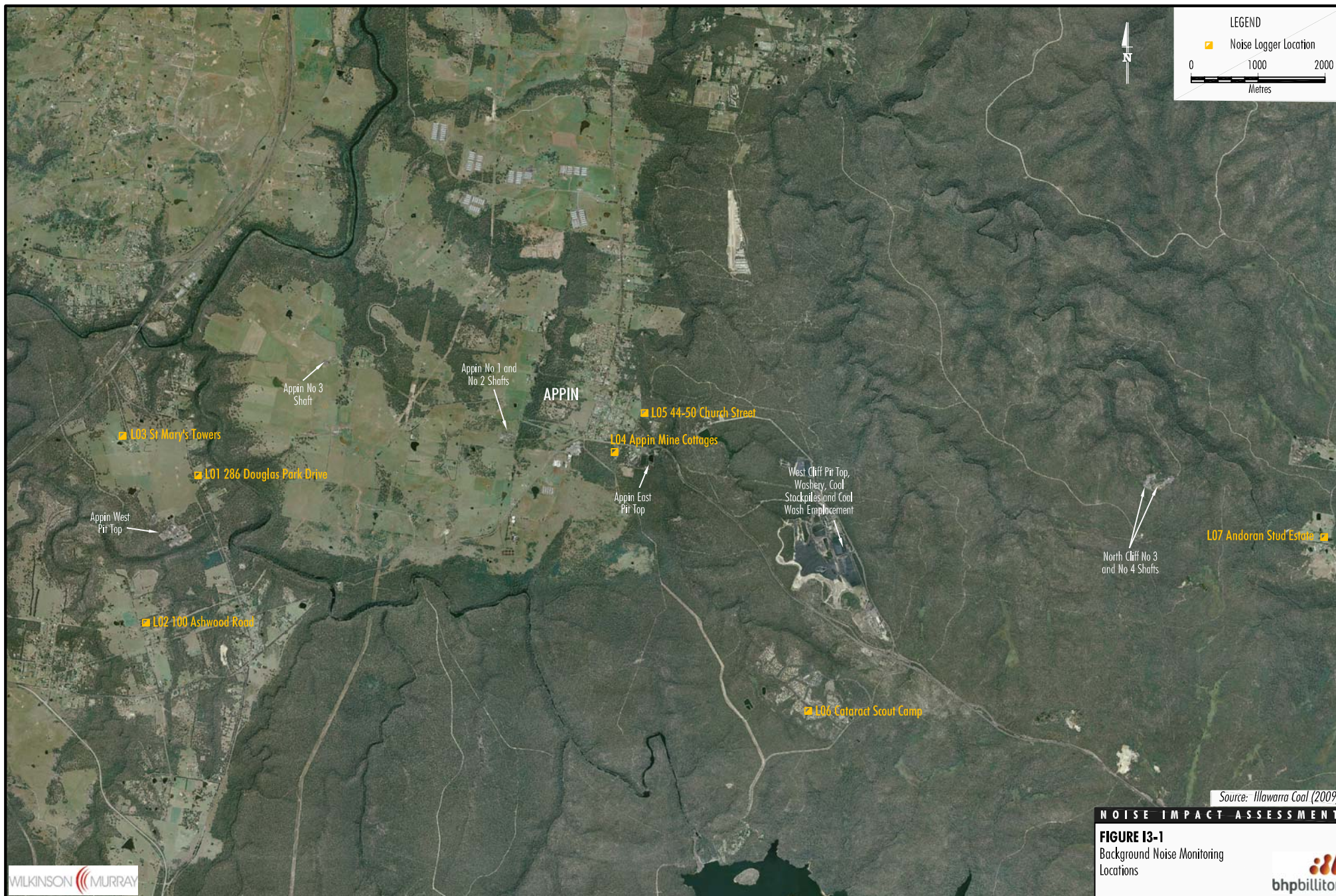
For assessment purposes the DECC's INP (EPA, 2000) sets out specific procedures for calculating a Rating Background Level (RBL). Using these procedures, the values shown in Table I3-1 were calculated from the measured data.

Table I3-1 Rating Background Levels from Noise Loggers

Logger ID (Figure I3-1)	Property Address	Measured RBL, dBA L_{A90}		
		Daytime (7am – 6pm)	Evening (6pm – 10pm)	Night (10pm – 7am)
L01	286 Douglas Park Drive	37.6	38.2	40.9
L02	100 Ashwood Road	34.0	35.4	37.0
L03	St Mary's Towers	37.5	39.2	39.8
L04	Appin Mine Cottages	40.7	40.5	40.5
L05	44-50 Church Street	37.1	40.5	36.5
L06	Cataract Scout Park	32.0	33.0	29.0
L07	Andoran Stud Estate, Darkes Forest Road	30.5	33.8	31.3

dBA = A-weighted decibels.

The levels shown in Table I3-1 are typical of suburban and semi-rural areas. Short-term attended monitoring at the times of deployment and retrieval of the loggers indicated no significant contribution from industrial sources, with the exception of location L04 where noise from the existing Appin Mine operations (Appin East pit top) was audible. Results from this site were not used in determining the RBLs used for this assessment (see discussion below).



Source: Illawarra Coal (2009)

NOISE IMPACT ASSESSMENT

FIGURE I3-1
Background Noise Monitoring
Locations



Where daytime RBL values are lower than evening or night-time values, as is often the case for the values in Table I3-1, this can be due to extraneous factors, notably insect noise, which are seasonal in nature. This is supported by periods of attended monitoring undertaken by Wilkinson Murray which indicated that insect noise may have been a feature at night-time at some monitoring locations. The DECC generally recommends (refer to the DECC's *Application notes - NSW Industrial Noise Policy*) that evening and night-time RBLs should be set equal to the daytime values for assessment purposes. This procedure is adopted in setting RBLs for the Project.

The measured RBL values were used to assign values at each residential receiver, based on proximity to the various loggers and similarity of their likely noise environment. Table I3-2 shows the RBL values adopted for each receiver in this study.

Table I3-2 RBL Values Adopted for Noise Assessment

Receiver Number	Receiver Area Description	Logger ID	Assigned RBL, L _{A90} dBA		
			Daytime (7am – 6pm)	Evening (6pm – 10pm)	Night (10pm – 7am)
1-7, 9-11, 13, 184, 188-189	Appin West Receivers south-west of Appin West	L02	34	34	34
185-187, 190	Appin West receivers near Hume Highway	L01 and L03	38	38	38
14-48, 50-56	All other Appin West Receivers	L01 and L03	38	38	38
57-58, 60, 63-64, 66-72, 74-76, 217, 218, 233, 279-282	Appin No. 3 Receivers	L02	34	34	34
78-80, 82-91, 199, 212-216, 226, 228-230, 232, 234, 235	Appin No. 1 and No. 2 Receivers	L02 and L05 (estimate)	35	35	35
93, 95-144, 146-160, 194-197, 200-209, 211, 236-278, 283-284	Appin Township	L05	37	37	37
165	Cataract Scout Park	L06	32	32	30
166-183	Darke Forest Receivers	L07	31	31	31

Note: Receivers 184-190 denote receivers representative of the Bingara Gorge future development area.

As would be expected, Table 3-2 indicates that calculated RBL values are lower in locations remote from potential noise sources. In locations such as Appin, RBLs are higher due to more noise sources in the suburban environment.

It is noted that RBLs were also determined by Hatch (2001) as part of a noise investigation at the Appin Mine. This investigation is discussed in Section I3.5. The RBLs determined at Glebe St, Appin by Hatch (2001) were 39 dBA (daytime), 39 dBA (evening) and 38 dBA (night-time). Adoption of the 37 dBA RBL for Appin for this assessment is therefore conservative.

I3.2 Meteorological Environment for Project Noise Assessment Purposes

The INP generally directs the use of a single set of adverse meteorological data to use in the assessment of noise impacts (EPA, 2000). However, for noise modelling in this and other projects, Wilkinson Murray has adopted a more rigorous approach where noise levels at sensitive receivers are calculated under a varied set of existing meteorological conditions, using meteorological data obtained from the locality. Data from the Appin station (operated by EDL and located adjacent to the Appin No. 1 and No. 2 shafts) were used for the Project. Measured statistical occurrences of these meteorological conditions are then applied to the noise results, and a 10th percentile exceedance noise level calculated (i.e. the level that is exceeded 10% of the time), which is then compared with relevant criteria.

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

Recorded meteorological data from the Appin station from 2007 to 2008 was used in the noise model. The data for wind direction and wind speed are classified into eight directional intervals and four speed intervals. Data on the standard deviation of wind direction (sigma-theta) is used to estimate temperature inversion strength using procedures outlined in the INP (EPA, 2000).

The above procedure considers all meteorological conditions at all receivers, and the conditions which determine the tenth percentile value will differ between receivers. For receivers in Appin, which are primarily affected by the plant at the Appin East pit top, the 10th percentile daytime noise levels correspond to wind speeds of approximately 2 metres per second (m/s) from the south-east. Night-time 10th percentile levels correspond to either those conditions or lower wind speeds of about 1.5 m/s from the south together with a temperature inversion strength of 3 degrees centigrade per 100 metres (m).

In accordance with the DECC's *Application notes - NSW Industrial Noise Policy* consideration of potential noise levels at sensitive receivers under calm conditions has also been conducted (refer Sections I4.6.1 and I4.8.1)

A description of the general meteorological environment of the Project area is provided in Section 5 in the Main Report of the EA.

I3.3 Complaints Summary

ICHPL maintains a complaints register as part of its environmental management and stakeholder relations initiatives. The details of noise-related complaints, including a description of the actions undertaken by ICHPL to address each complaint are provided in Table I3-3. A total of eight complaints were received between 2003 and June 2009 (Table I3-3). Table I3-4 describes a further five complaints, where the complainant raised a noise or vibration concern that was later attributed to underground mine subsidence.

Table I3-3 Noise and Vibration Complaints Summary from ICHPL Pit Tops and Ventilation Fans from June 2003 to June 2009

Complaint/Event Number	Entity Receiving the Complaint	Date Received	Location of Complainant	ICHPL Site	Nature of Complaint	Action taken by ICHPL
APNEV04110028	ICHPL	9 November 2004	Appin	Appin Mine	Excessive noise from beeper alarms on equipment operating on the coal stockpile at the Appin Mine.	'Beeping-type' reversing alarms were replaced with broad band tonal alarms on selected surface vehicles in 2005.
APNEV04110019	ICHPL	9 November 2004	Appin	Appin Mine	Excessive noise from beeper alarms on a front end loader (FEL) operating on the coal stockpile at the Appin Mine in the early hours of the morning and late at night.	'Beeping-type' reversing alarms were replaced with broad band tonal alarms on selected surface vehicles in 2005.
APNEV05030013	ICHPL	16 March 2005	The Lachlan Vale Road	Appin No. 1 & No. 2	Excessive vibration detected in the complainant's house. Vibration had been excessive for 3 to 4 weeks leading up to the complaint, but particularly excessive 16 March.	Complainant contacted by ICHPL. The complaint was found to be related to the Appin No. 1 and No. 2 shaft fans. Source of the vibration investigated by ICHPL. Solution to the excessive vibration was found to be adjusting the fan regulators.
APNEV05030014	ICHPL	16 March 2005	The Lachlan Vale Road	Appin No.1 & No. 2	Vibrations felt through the floor of dwelling causing excessive rattling and sleep deprivation of the complainant's neighbour.	ICHPL informed the complainant of the investigation described above.
APNEV05080009	ICHPL	19 August 2005	Northhamptondale Road	Appin No. 1 & No. 2	Ventilation fan noise had been loud over a period of a week, resulting in sleep deprivation. The noise level was found to be influenced by wind direction and prevailing weather conditions.	Following discussions with the complainant, a native tree screen was replanted with denser and more robust vegetation.
05-06 AEMR	ICHPL	9 March 2006	Brooks Point Road	Appin No. 3	Excessive vibrations caused by the Appin No. 3 shaft fan are being felt at the residence.	ICHPL replaced the windows at the dwelling as a short-term solution. ICHPL also contacted the fan manufacturer to investigate options to reduce the vibration from the ventilation fans. Implementation of vibration reduction measures on the fans was undertaken in 2006/07.
DGSEV07030041	ICHPL	1 April 2007	Brooks Point Road	Appin No. 3	Reports of excessive vibration caused by the Appin No. 3 shaft fan.	Vibration reduction measures implemented on the fans as described above.
APNEV07080050 (also reported to the DECC on 29 August 2007)	ICHPL and DECC	28 August 2007	Appin resident	Appin Mine	Noise from the coal bin at Appin Mine excessive and disturbing sleep. Complainant suggested that the noise was filling an empty bin with coal.	Coal bin control system maintains a 10% full level at all times to reduce noise from coal filling the bin. Control system was checked and the coal levels were found to be at 71% and 46% at the time of the complaint.

Source: ICHPL (2009)

Table I3-4 Subsidence-Related Noise and Vibration Complaints Summary from June 2003 to June 2009

Complaint/Event Number	Entity Receiving the Complaint	Date Received	Location of Complainant	ICHPL Site	Nature of Complaint	Action taken by ICHPL
DGSEV07030041	ICHPL	29 March 2007	Brooks Point Road	Appin Mine	Reports of 'explosion' type noise.	This event was potentially subsidence-related. ICHPL contacted the complainant and arranged for a discussion between the complainant and mine geologists
APNEV07040025	ICHPL	19 April 2007	Brooks Point Road	Appin Mine	Explosion type noises resulting in house movement between 9:30 am and 1:00 pm.	This event was potentially subsidence-related. ICHPL arranged for a discussion between the complainant and mine geologists.
WCFEV07110090	ICHPL	28 November 2007	Appin Road West Cliff	West Cliff Colliery	Explosion type noises heard every 15 to 30 minutes on 26/11/07 lasting approximately 3 hours.	This event was potentially subsidence-related. ICHPL investigated the complaint and informed the complainant that it was possibly related to subsidence.
N/A	ICHPL	3 June 2009	Brooks Point Road	Appin Mine	Explosion type noises experienced.	This event was potentially subsidence-related. ICHPL investigated the complaint and informed the complainant that it was possibly related to subsidence.
N/A	ICHPL	9 June 2009	Brooks Point Road	Appin Mine	Reports of bumping sounds similar to explosion type noises previously experienced.	This event was potentially subsidence-related. ICHPL investigated the complaint and informed the complainant that it was possibly related to subsidence.

Source: ICHPL (2009)

It is relevant to note that during the period from mid-2001 to mid-2003, some 13 complaints were received from a single resident in Appin. Records of these complaints are not available in a form suitable for inclusion in Table I3-3. However, during 2001, ICHPL commissioned a noise investigation of the Appin East pit top operations and subsequently implemented a number of noise reduction measures (as described in Section I3.5). Following the implementation of these measures, the persistent noise complaints from Appin residents ceased as shown by Table I3-3.

I3.4 Compliance Noise Monitoring Summary

Due to the long-term presence of the existing Appin Mine and West Cliff Colliery in the local area and the associated very low level of noise complaints from the local community (Section I3.3), compliance monitoring has not been undertaken regularly for the existing operations.

Notwithstanding, a number of noise surveys have been undertaken at the Appin Mine to determine compliance. A discussion of the most recent compliance monitoring conducted at Appin Mine, Appin No. 1 and No. 2 shafts, Appin No. 3 shaft and Appin West pit top is presented below.

Due to the remote location of the West Cliff Colliery from private receivers in Appin, there is no record of compliance monitoring being undertaken for this pit top.

Appin Mine

Attended noise monitoring was undertaken by Hatch (2001) as part of establishing background noise levels in Appin for noise investigations at the Appin Mine (refer to Section I3.5). Attended monitoring was undertaken at Glebe Close and also on the corner of Illawarra and Toggerai Streets.

At Glebe Close, only occasional event noise from the mine was noted, such as coal entering a bin, FEL operation and workshop noise. Similarly at the corner of Illawarra and Toggerai Streets, only occasional mine noise was noted. As discussed in Hatch (2001), this does not mean that noise from the Appin Mine is not discernable at all times, rather that meteorological conditions during the surveys did not enhance the propagation of noise towards Appin.

Noise modelling undertaken by Hatch (2001) indicated that exceedances of INP derived project specific criteria were likely under adverse conditions (see discussion in Section I3.5).

Appin No. 1 & No. 2 Shafts

Following reports of excessive noise at the Appin No. 1 and No. 2 shafts during 2005 (Table I3-3), compliance monitoring was undertaken by Hatch (2006). A combination of attended and unattended monitoring was undertaken.

The report concluded that noise levels from the Appin No. 1 and No. 2 shafts were likely to be in exceedance of the relevant INP amenity criteria for rural receivers at the boundary of the nearest receiver. The report also noted that despite the noise levels recorded, complaints from nearby receivers were not apparent.

As noted in Table I3-3, in response to a noise complaint received from the Northhamptondale Road resident, ICHPL replanted an existing vegetation screen between the shafts and the residence. No further complaints have been received from this resident.

Appin No. 3 Shaft

Following reports of excessive vibration at the Appin No. 3 shaft fans during 2006/2007 (Table I3-3), ICHPL undertook works on the Appin No. 3 shaft fans in late 2007. The noise attenuators were replaced and evasees repaired. Noise monitoring was undertaken at the nearest receivers to determine compliance with the INP Amenity criteria for rural receivers.

Noise monitoring concluded that whilst there were occasional exceedances of INP amenity criteria, these were due to extraneous noise such as vehicular traffic and a thunderstorm and there were no exceedances of criteria attributed to the Appin No. 3 shaft (Brienen Environment and Safety, 2007).

Appin West Pit Top

Compliance noise monitoring was reported in the 2006 to 2007 Annual Environmental Management Report (AEMR) for the Appin Mine. Monitoring was conducted at three locations, with two of these locations being residences on Douglas Park Drive and the other being on-site in the northern margin of the lease.

These surveys indicated that in the absence of the fan (which was not in service during the surveys), noise from Appin West pit top did not exceed background noise levels by greater than 5 dBA (Illawarra Coal, 2007).

13.5 Appin Mine Noise Management Improvements

During mid-2001 to mid-2003, some 13 noise complaints were received by ICHPL from a resident of Glebe Close, Appin (BHP Billiton, 2002 and 2003).

As an outcome of consultation with the EPA (now the DECC), ICHPL commissioned Hatch to undertake a noise investigation at the Appin Mine (Appin East pit top).

The noise investigation included:

- measurement of baseline noise levels in Appin and calculation of RBLs;
- determination of project specific noise levels;
- noise modelling of existing Appin Mine operations;
- comparison of modelled noise levels from the Appin Mine with the project specific noise levels; and
- recommendations for noise management measures where the project specific noise levels were found to be exceeded.

An overview of the outcomes of the study is presented below.

Rating Background Levels and Project Specific Noise Levels

Unattended monitoring was undertaken at Glebe Close, Appin in 2001. This site was considered appropriate for background noise monitoring because noise from the Appin Mine was not discernable during the period monitored. Monitoring was undertaken over a two week period.

In addition, attended monitoring was undertaken at Glebe Close and also on the corner of Illawarra and Toggerai Streets as described in Section I3.4. Attended monitoring at Glebe Close determined

that the major sources of background noise were traffic noise, birds and other animals, wind in vegetation and other typical suburban noise (Hatch, 2001). Only occasional 'event' noise from the mine was noted, such as coal entering a bin, FEL operation and workshop noise.

At the corner of Illawarra and Toggerai Streets, noise levels were found to be 5 to 6 dBA higher than at Glebe Close, with the dominant noise sources being traffic noise (on Appin Road), wind in vegetation and occasional mine noise.

RBLs were determined in accordance with INP methodology. The RBLs were found to be 39 dBA (daytime), 39 dBA (evening) and 38 dBA (night-time). The resulting $L_{Aeq(15\text{minute})}$ intrusive noise criteria were therefore 44 dBA (daytime), 44 dBA (evening) and 43 dBA (night-time). In addition, the amenity noise criteria were considered to be suburban under the INP. These criteria were endorsed by the EPA following review of the noise investigation report.

Determination of Actual Noise Levels from the Appin Mine

Hatch (2001) undertook noise modelling to determine the likely actual noise levels at residences in Appin from the Appin Mine during adverse meteorological conditions. This modelling included point source calculations for Glebe Close and the corner of Illawarra Street and Toggerai Street. Modelling determined that Appin Mine noise exceeded the project specific noise levels under adverse meteorological conditions (i.e. temperature inversion and source to receiver wind).

Noise Management Measures Implemented

Following noise modelling conducted by Hatch (2001), a number of potential noise management measures were proposed. For each potential measure, an estimate of the noise reduction effectiveness was provided by Hatch and engineering feasibility was investigated by ICHPL in order to identify feasible and reasonable noise management measures.

As a result of the noise investigation (Hatch, 2001), and following investigation of feasibility of potential noise reduction measures by ICHPL, ICHPL implemented the following noise management measures:

- engineering control systems on the coal bin so that the bin always contains a minimum of 10% coal by volume, to maintain a 'plug' of coal to dampen noise from filling the bin;
- installation of noise dampening material on the striker plate at the top of the coal bin;
- installation of additional cladding and noise dampening doors on the conveyor drivehouse;
- installation of low tone reversing alarms on mobile plant;
- replacement of metal clips on the surface conveyor belt joints with vulcanised joints to eliminate noise from the metal clips striking the rollers;
- restriction of FEL use to generally daytime only; and
- modifications to the surface men and materials elevator and Appin winder rollers to reduce rattling/vibration type noise.

In addition to the above, a coal washery was in operation at Appin Mine during this time (i.e. 2001 to 2003). This washery was decommissioned and removed from the site in 2003, thus removing noise associated with this infrastructure.

I4 MINING OPERATIONS NOISE IMPACT ASSESSMENT

The Appin Mine and West Cliff Colliery are large existing industrial facilities that have been operating in the local area for an extended period. Suburban and rural receivers are in some cases located in close proximity to these existing industrial facilities.

The operational noise assessment provided below therefore includes consideration of both existing/approved Appin Mine and West Cliff Colliery noise emissions, as well as assessment of the proposed continuation of these operations for the next 30 years with the associated Project upgrades of surface facilities. This approach allows analysis of any change in noise emissions associated with the Project for comparative purposes with noise contributions of the existing Appin Mine and West Cliff Colliery under adverse meteorological conditions.

I4.1 Operational Noise Criteria

The INP recommends two criteria, "Intrusiveness" and "Amenity" (EPA, 2000), both of which are relevant for the assessment of noise from the existing/approved operations and the Project. Consideration has also been given to the DECC's sleep disturbance assessment requirements (Section I4.1.3).

I4.1.1 Intrusiveness Criteria

An intrusiveness criterion applies for residential receivers only. The intrusiveness criterion is a target noise level that the L_{Aeq} noise level from the source being assessed, when measured over 15 minutes, should not exceed the RBL by more than 5 dBA. Measured RBL values are described in Section I3.1, and resulting criteria are shown in Table I4-1. As described in Section I3.2, where the noise level from the source varies over time due to changes in operating conditions, meteorological conditions or other factors, the upper 10th percentile of 15 minute L_{Aeq} noise levels can be used for comparison with the criterion.

Table I4-1 Intrusiveness Project Specific Noise Levels

Receiver Number	Receiver Area Description	Day Project Specific Criteria $L_{Aeq}(15 \text{ minute})$ (dBA)	Evening Project Specific Criteria $L_{Aeq}(15 \text{ minute})$ (dBA)	Night-time Project Specific Criteria $L_{Aeq}(15 \text{ minute})$ (dBA)
1-7, 9-11, 13, 184, 188- 189	Appin West Receivers south-west of Appin West	39	39	39
185-187, 190	Appin West receivers near Hume Highway	43	43	43
14-48, 50-56	All other Appin West Receivers	43	43	43
57-58, 60, 63-64, 66-72, 74-76, 217, 218, 233, 279-282	Appin No. 3 Receivers	39	39	39
78-80, 82-91, 199, 212-216, 226, 228-230, 232, 234, 235	Appin No. 1 and No. 2 Receivers	40	40	40
100-144, 146-160, 194-197, 200-209, 211, 236-278, 283-284	Appin Township	42	42	42
165*	Cataract Scout Park	37	37	35
166-183	Darkes Forest Receivers	36	36	36

Notes: Receivers 12, 93-99, 145, 161-164, 191-193, 220-225 and 227 are not required to be compared with intrusive criteria.
 Receivers 184-190 denote receivers representative of the Bingarra Gorge future development area.
 Receivers 93 and 95-99 are ICHPL owned and are not assessed under the intrusiveness criteria.
 * Scout Park caretaker conservatively assessed against intrusive criteria.

As noted in Section I3.1, RBLs were previously determined at Glebe St, Appin by Hatch (2001). Although these data recorded by Hatch are not used for determination of RBLs for this assessment, it is relevant to note that the resulting intrusiveness criteria used by Hatch was 44 dBA in the daytime and evening and 43 dBA at night-time (i.e. 1 to 2 dBA higher than the intrusiveness criteria used for the Appin township in this assessment). The criteria used in Hatch (2001) were previously accepted by the DECC.

The intrusiveness criteria adopted in the Appin township in this assessment is conservative (i.e. more stringent) in comparison with the criteria used by Hatch (2001).

I4.1.2 Amenity Criteria

The intrusiveness criteria presented in Table I4-1 are based on an energy average sound pressure level over a 15 minute period. The INP also provides amenity criteria, which are based on the setting of the area (e.g. rural, suburban, urban, industrial, etc.) and the function of the receiver (e.g. residential, commercial property, industrial premises, school, church etc.) (EPA, 2000). Given the nature of the area surrounding the Project surface facilities, it is considered that the "rural" amenity criteria would generally apply. However, for residences within Appin township, the "suburban" criterion has been adopted. Other landuses in Appin also have different applicable amenity criteria (e.g. industrial and commercial areas).

Amenity criteria also apply to recreation areas. The Cataract Scout Park and William Woods Park in Appin are classified as an "active recreation" area for this purpose. Areas of land to the east and south-east of Appin that are zoned "Regional Open Space Recreation" under the Wollondilly Local Environment Plan (LEP) have been classified as passive recreation areas. Relevant amenity criteria are shown in Table I4-2.

Table I4-2 INP Amenity Criteria

Receiver Area	Indicative Noise Amenity Area	Time of Day	Recommended Acceptable L _{Aeq(period)} (dBA)	Recommended Maximum L _{Aeq(period)} (dBA)
Appin Township (Locations 100-138, 152-160, 194-197, 200-209, 211, 212, 236-278, 283-284)	Suburban ¹	Day	55	60
		Evening	45	50
		Night	40	45
Rural residential receivers (Locations 1-7, 9-11, 13-48, 50-58, 60, 63, 64, 66-72, 74-76, 78-80, 82-91, 93, 95-99, 139-144, 146-151, 165-190, 199, 213-218, 226, 228-230, 232-235, 279-282)	Rural	Day	50	55
		Evening	45	50
		Night	40	45
Cataract Scout Park (Locations 161-164) William Woods Park – Appin (Location 220)	Active Recreation	When in use	55	60
Regional Open Space Recreation Areas (Locations 94, 191 and 192)	Passive recreation	When in use	50	55
Anglican Church Appin (Location 193)	Place of Worship-internal	When in use	40	45
	Place of Worship-external ²	When in use	50	55
Industrial (Locations 12, 145, 221-225, 227)	Industrial	When in use	70	75
Appin Township	Commercial	When in use	65	70

Source: EPA (2000).

¹ It is likely that some of the nearest receivers to the existing Appin East pit top are within the urban and/or urban/industrial interface noise amenity zone, as applicable to existing developments. However, the suburban amenity zone has been conservatively nominated for this assessment.

² Based on 10 dBA correction of internal criteria in general accordance with the INP.

* Scout Park caretaker conservatively assessed against rural residential criteria.

Amenity criteria are based on the energy average noise level over the entire day, evening or night period (rather than a 15 minute interval as for the intrusiveness criteria), and include all industrial noise rather than noise from the Project only. Hence, amenity criteria are used to assess the impact of cumulative noise (i.e. from multiple industrial noise sources including the Project).

I4.1.3 Sleep Disturbance Criteria

The DECC's *Application Notes – NSW Industrial Noise Policy* provides guidance regarding the interpretation of sleep disturbance criteria and assessment of sleep disturbance. The relevant excerpt is below:

Sleep disturbance

Peak noise level events, such as reversing beepers, noise from heavy items being dropped or other high noise level events, have the potential to cause sleep disturbance. The potential for high noise level events at night and effects on sleep should be addressed in noise assessments for both the construction and operational phases of a development. The INP does not specifically address sleep disturbance from high noise level events.

DEC reviewed research on sleep disturbance in the NSW Environmental Criteria for Road Traffic Noise (ECRTN) (EPA, 1999). This review concluded that the range of results is sufficiently diverse that it was not reasonable to issue new noise criteria for sleep disturbance.

From the research, DEC recognised that current sleep disturbance criterion of an LA1, (1 minute) not exceeding the LA90, (15 minute) by more than 15 dB(A) is not ideal. Nevertheless, as there is insufficient evidence to determine what should replace it, DEC will continue to use it as a guide to identify the likelihood of sleep disturbance. This means that where the criterion is met, sleep disturbance is not likely, but where it is not met, a more detailed analysis is required.

The detailed analysis should cover the maximum noise level or LA1, (1 minute), that is, the extent to which the maximum noise level exceeds the background level and the number of times this happens during the night-time period. Some guidance on possible impact is contained in the review of research results in the appendices to the ECRTN. Other factors that may be important in assessing the extent of impacts on sleep include:

- *how often high noise events will occur*
- *time of day (normally between 10pm and 7am)*
- *whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods).*

The LA1, (1 minute) descriptor is meant to represent a maximum noise level measured under 'fast' time response. DEC will accept analysis based on either LA1, (1 minute) or LA, (Max).

A review of noise measurements conducted at a location close to ICHPL's existing Appin Mine and West Cliff Colliery indicates that the maximum noise levels ($L_{A1(1 \text{ minute})}$) are typically no greater than 9 dBA above the $L_{Aeq(15 \text{ minute})}$ noise levels. Noise from existing/approved operations was found to be relatively constant, with no clear change in the noise environment at night-time. If $L_{A1(1 \text{ minute})}$ is less than 10 dBA above $L_{Aeq(15 \text{ minute})}$ from the same noise source, then the INP intrusiveness criterion would be more stringent than the most conservative sleep disturbance criterion of background plus 15 dBA as described above.

Therefore it is considered that the INP intrusive and amenity criteria would be the controlling criteria for the Project, and further assessment of sleep disturbance is not required.

I4.2 Interpretation of Criteria

The INP states that intrusive and amenity criteria are non-mandatory noise level targets that have been selected to protect at least 90% of the population living in the vicinity of the industrial noise sources from the adverse effects of noise for at least 90% of the time (EPA, 2000). 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 project specific noise levels are not achieved, it does not automatically follow that all people exposed to the noise would find it unacceptable. In subjective terms, exceedances of the project specific noise assessment criteria can be generally described as follows:

- 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).

Table I4-3 summarises the above descriptions.

Table I4-3 Interpretation of Operational Noise Criteria

Assessment Criteria	Project Specific Noise Levels	Noise Management Zone		Noise Affection Zone
		Marginal	Moderate	
Intrusive $L_{Aeq}(15 \text{ minute})$	Table I4-1	1 to 2 dBA above project specific noise levels	3 to 5 dBA above project specific noise levels	> 5 dBA above project specific noise levels
Amenity $L_{Aeq}(\text{period})$	Table I4-2			

I4.3 Construction Noise

Project surface construction activities would largely be indistinguishable from operational activities given that similar plant items are generally employed and construction activities would occur in similar areas adjacent to operational activities. Surface construction activities would be generally undertaken during daytime hours only.

The proposed construction mobile fleet comprises:

- 50 tonne (t) mobile crane (sound power level 105 dBA);
- 30 t mobile crane (sound power level 105 dBA);
- 30 t excavator (sound power level 105 dBA);
- two concrete delivery trucks (sound power level 107 dBA); and
- two semi-trailer low loaders (sound power level 105 dBA).

It is noted that the full construction mobile fleet would only be utilised for construction at the West Cliff pit top and half of the fleet is expected to be used for Appin East and Appin West pit tops and the ventilation shaft locations. The estimated total sound power level from the full construction mobile fleet is 114 dBA and for half the fleet is 111 dBA.

This fleet list is considered to be very conservative as it is unlikely that all of the items in the fleet list would be operating concurrently during construction activity. Construction activities would in practice be conducted in a staged manner.

The scenarios modelled for operational noise, as described in Section I4.4.2, contain plant with a higher total sound power level than would typically be the case for construction plant. The total sound power level from daytime operation noise for each pit top is (for the existing/approved scenario):

- West Cliff pit top – 127 dBA;
- Appin West pit top – 118 dBA;
- Appin East pit top – 117 dBA;
- Appin No. 3 shaft – 113 dBA; and
- Appin No. 1 & No. 2 shafts – 111 dBA.

Hence, the calculated noise levels would be a conservative estimate of levels applying during construction. The North Cliff shafts are considered to be sufficiently remote (approximately 2 km) from receivers not to warrant assessment for construction noise.

The *Interim Construction Noise Guideline* (DECC, 2009) provide recommended noise management levels as described in Table I4-4.

Table I4-4 Construction Noise Guidelines within Recommended Standard Hours

Time of Day	Management Level $L_{Aeq}(15 \text{ minute})$	How to Apply
Recommended Standard Hours: Monday to Friday 7.00 am to 6.00 pm Saturday 8.00 am to 1.00 pm	Noise affected RBL + 10 dBA	The noise affected level represents the point above which there may be some community reaction to noise: <ul style="list-style-type: none"> • Where the predicted or measured L_{Aeq} (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
No work on Sundays or public holidays	Highly noise affected 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise: <ul style="list-style-type: none"> • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: <ol style="list-style-type: none"> 1. Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences. 2. If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

Source: DECC (2009)

This report provides an assessment of operational noise against the project specific intrusiveness noise levels, which is defined as the RBL + 5 dBA (Table I4-1). It is noted that the construction noise management level for 'noise affected' receivers is RBL + 10 dBA, which equals the level at which receivers would be noise affected under the project specific intrusiveness noise levels (i.e. >5dBA above the criteria). Hence, conservatively assuming that construction activities have a similar sound power level to operational activities, the receivers in the affectation zone for operational noise (refer to Sections I4.6 and I4.8) would be the same for construction noise under the draft guideline.

From analysis of the operational noise levels, no receiver would exceed the 'highly noise affected' noise level in the *Interim Construction Noise Guideline* (DECC, 2009). It should be noted that this assessment is conservative as the estimated sound power level for construction activities is generally lower than the sound power level for operations at each location.

Given the above and that construction activities would be generally undertaken during daytime hours, when people are generally less sensitive to intrusive noise, further assessment of noise levels occurring during construction phase of this Project is not considered necessary. Notwithstanding, it is recommended that general noise management measures be applied to minimise the potential for noise emissions during construction (Section I4.11).

I4.4 Noise Modelling Methodology

I4.4.1 Noise Model Procedures

Operational noise levels at sensitive receivers were calculated using the Environmental Noise Model (ENM). This model has been endorsed by the DECC for environmental noise assessment. The ENM takes account of the location of noise sensitive receivers and surrounding terrain. In addition, the model takes into account noise attenuation due to geometric spreading of sound over distance, atmospheric absorption, shielding, and the effect of acoustically soft ground. It can also be used to predict noise levels under various meteorological conditions, defined by a combination of temperature gradient, wind speed and wind direction. A summary of the inputs used in noise modelling is shown in Table I4-5.

Table I4-5 Noise Modelling Inputs

Modelling Inputs	Source of Data
Sensitive Receiver locations	From surveys undertaken locally and detailed aerial photography.
Topography	Contours for mining landforms (conceptual mine plan) and local topography.
Noise Source Levels	From measurements of existing plant at the Appin Mine and West Cliff Colliery. Where new plant items are proposed, manufacturers data or measurements from other similar operations. Where the proponent has made a commitment to achieve certain noise emission levels from specific plant items, these values are assumed in modelling.
Meteorological Data	From measurements at Appin (EDL) meteorological station 2007 to 2008.

Calculations were undertaken under a variety of meteorological conditions using the methodology described in Section I3.2. Noise levels were calculated under a total of 19 conditions for daytime and evening operations, and 22 conditions at night, at a total of 270 receivers surrounding the proposal.

Plant that operates in the same vicinity for long periods, such as dozers and excavators, and all fixed plant infrastructure items, were modelled as point sources. Items involved in transport of materials such as haul trucks, watercarts and graders were modelled with source points at 40 to 50 m intervals along their respective routes. The effective sound power level for each source point was assigned based on the number of items of plant using the route and the number of source points. The contributions of graders and watercarts are spread evenly over haulage routes.

It should be noted that the calculations described above rely on predictions produced by the ENM model. This model is based on simple assumed vertical profiles of temperature and wind speed, and does not accurately model more complex situations. However, recent validation of measured noise levels from other large-scale mining operations has shown good correlation with predicted noise levels as a 10th percentile exceedance level.

I4.4.2 Assessment Scenarios

Two scenarios were assessed, as follows:

1. Existing and approved operations - this represents existing surface infrastructure outlined in Section I.2.2 operating at up to 7.5 Mtpa ROM, plus approved operations in the West Cliff Stage 3 Coal Wash Emplacement area. The model includes noise reduction measures included in noise modelling for the Stage 3 approval, as described in Section I4.5.
2. Project worst case - this comprises continued mining at up to 10.5 Mtpa ROM coal and worst case activities at all locations operating concurrently (West Cliff pit top, Appin East pit top, Appin West pit top, North Cliff shafts, Appin No. 1 and No. 2 shafts and Appin No. 3 shaft).

The fleet lists used for modelling of the scenarios described above are provided in Attachment IC.

I4.4.3 Potential Cumulative Industrial Noise Sources

A review of Environment Protection Licences (EPLs) was undertaken to identify potential industrial facilities that could result in some cumulative industrial noise in the local area. In addition, other ICHPL development proposals were also considered for their potential to contribute to cumulative noise impacts.

The results of this review and the developments that were considered in the cumulative amenity criteria modelling are summarised in Table I4-6.

In addition to the projects in Table I4-6, consideration was also given to the cumulative noise generation associated with minor gravel extraction operations located in the local area (e.g. on eastern Appin Road) and other major mining operations (i.e. Metropolitan Colliery, Tahmoor Colliery and NRE No. 1 Colliery).

It is considered that the size and scale of minor gravel extraction operations and other miscellaneous industrial developments do not warrant cumulative modelling. Other mining operation surface facilities are located remote from the major Appin Mine and West Cliff Colliery surface facilities to warrant any further consideration for cumulative noise calculations.

Table I4-6 Potential Cumulative Noise Sources

Development	Approval Status	EPL Licence Status	EPL Noise Conditions	Considered in Model
Illawarra Coal Projects				
West Cliff CPP Reliability Project ¹	Exhibition period ended 3 July 2009 and ICHPL responded to submissions on 7 July 2009	-	-	Yes
West Cliff Gas Drainage Project	Approved	-	-	No
Appin Gas Drainage Project	Exhibition period ends 7 August 2009	-	-	No
Endeavour Project	Director-General Requirements issued January 2006	-	-	No
Other Industrial Developments				
Various Industrial Facilities with an EPL	Existing facilities	EPL5357 – Energy Developments Limited Tower Coal Seam Methane Generation (Douglas Park Drive, Douglas Park)	No	Yes
		EPL5482 – Energy Developments Limited Appin Coal Seam Methane Generation (Northampton Dale Road, Appin No. 1 and No. 2 Shafts)	No	Yes
		EPL126 – Baines Masonry (Appin)	No	No
		EPL4705 – Baines Transport (Appin)	No	No
		EPL212 – Blue Circle Cement (Maldon)	Yes	No
		EPL3991 – Menangle Sand and Soil (Menangle)	Yes	No
		EPL10555 – Sydney Water Sewage Treatment Plant (Picton)	Yes	No
		EPL11636 – Ingham's Enterprises (Appin)	No	No
		EPL12231 – L.V. Rawlinson and Associates, Blossom Lodge (Appin)	No	No
		EPL12547 – L.V. Rawlinson and Associates, Ferndale (Appin)	No	No
		EPL12498 – Allied Mills Australia (Maldon)	Yes	No
EPL12577 – Hi-Quality Environmental Services Rosalind Park Quarry (Menangle Park)	Yes	No		
EPL12990 – Environmental Treatment Solutions (Appin)	No	No		
Camden Gas developments (Camden Gas Project)	Spring Farm and Menangle Park expansion approved in 2007	EPL12003 – AGL Rosalind Gas Plant (Gilead)	Yes	No
Leafs Gully power station	Undergoing assessment (Exhibition ended 24 April 2009)	-	-	No
Wilton Quarry	DGRs issued 2 May 2008	-	-	No

¹ Considered as part of West Cliff Washery upgrades for the Project.

The Appin-Tower Power Project infrastructure was considered cumulatively given its proximity to ICHPL infrastructure at the Appin No. 1 and No. 2 shafts and the Appin West pit top.

In regards to the Endeavour Project, this proposal would enable coal to be conveyed underground between the Appin Mine and West Cliff Colliery mining operations, thus eliminating the need to handle coal at the Appin East pit top and transport the coal via road to the West Cliff Washery. It is understood that this project is not currently considered to be economically viable by ICHPL. Since the proposal would have the effect of eliminating major noise sources at Appin East pit top (including trucking of ROM coal), it has not been considered cumulatively as the existing scenarios would be worst-case.

14.5 Existing Noise Reduction Measures

ICHPL has existing noise control commitments in relation to the West Cliff Stage 3 Coal Wash Emplacement described in the Dendrobium Mine consent (DA 60-03-2001). These commitments involve the implementation of noise reduction kits on mobile plant, and form the basis upon which the Stage 3 noise modelling was undertaken by Renzo Tonin Associates (2001).

Relevant extracts below from the *Application for Approval of West Cliff Emplacement Stage 3 (Volume 2)* (Cardno Forbes Rigby, 2007a) are provided below:

Noise levels were modelled considering typical worst case scenarios, where either most or all plant operate simultaneously, depending on the likelihood of such an occurrence. That is, if it is likely that all plant may be operating concurrently, then all plant were also modelled concurrently. The predicted noise levels assume noise control treatments (in this case noise control kits for mobile plant) are fully implemented.

In accordance with ICHPL's Statement of Commitments for the West Cliff Stage 3 Emplacement (Appendix 3 of DA 60-03-2001) (Commitment [f]), ICHPL has prepared an Emplacement Management Plan (Cardno Forbes Rigby, 2007b). The Emplacement Management Plan contains the following noise commitments:

The emplacement will continue to develop down the valley and therefore operations will gradually move closer to the residential fringes of Appin. If in the future, noise emissions from the Stage 3 coal wash emplacement operations were to cause adverse impacts, further investigations will be undertaken and attenuation measures shall be introduced.

Noise complaints will continue to be recorded and if a notable increase is identified, IC will undertake further investigations.

if noise impacts are identified in the future, items of plant may be fitted with 'noise control kits' that achieve a minimum noise reduction of 5dB(A).

...Such 'noise control kits' comprise:

- High performance 'residential-grade' exhaust mufflers,*
- Additional engine cowling / enclosure lined inside with sound absorbent industrial-grade foam and*
- Air intake and discharge silencers / louvers.*

The existing noise control commitments have been incorporated into the Project modelling by using the maximum sound power levels for key fleet items used in noise modelling for the West Cliff Stage 3 Coal Wash Emplacement (Renzo Tonin Associates, 2001) for the existing/approved scenario and for the Project worst case scenario (i.e. including the West Cliff Stage 4 Coal Wash Emplacement).

In addition to the above, in general accordance with standard existing operational practice at Appin Mine and West Cliff Colliery, the following activities would generally be undertaken during daytime hours only:

- Surface construction activities (e.g. upgrades to coal handling infrastructure).
- Coal wash spreading, compaction and land forming at the West Cliff Coal Wash Emplacement (e.g. use of dozers, grader, vibratory roller and excavator).
- Use of the FEL and bobcat at Appin East pit top.
- Use of the FEL and forklift at Appin West pit top.

The above restrictions have also been applied to both the existing/approved scenario and for the Project worst case scenario.

I4.6 Noise Impact Assessment – Existing/Approved Operations

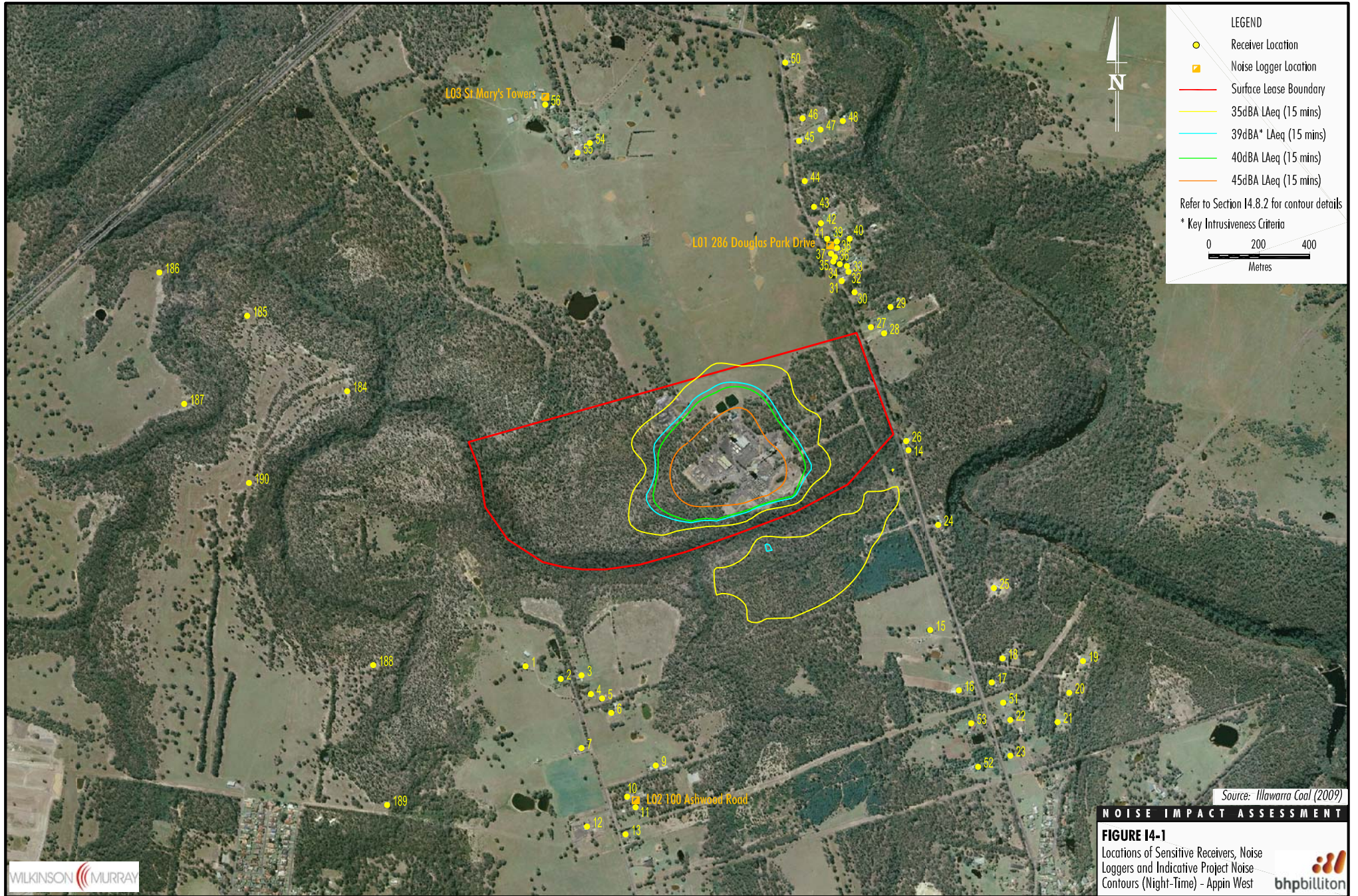
The existing/approved scenario detailed in Section I4.4.2 was modelled using the procedures outlined in Section I4.4.1. The total 10th percentile $L_{Aeq(15 \text{ minute})}$ intrusive noise levels were calculated for 247 of the identified 270 sensitive receivers surrounding the Project (with the remaining 23 receivers being considered under the amenity criteria only [Section I4.6.3]). This procedure was undertaken for the day, evening and night-time cases for the existing/approved scenario. Receiver locations are shown on Figures I4-1 to I4-6.

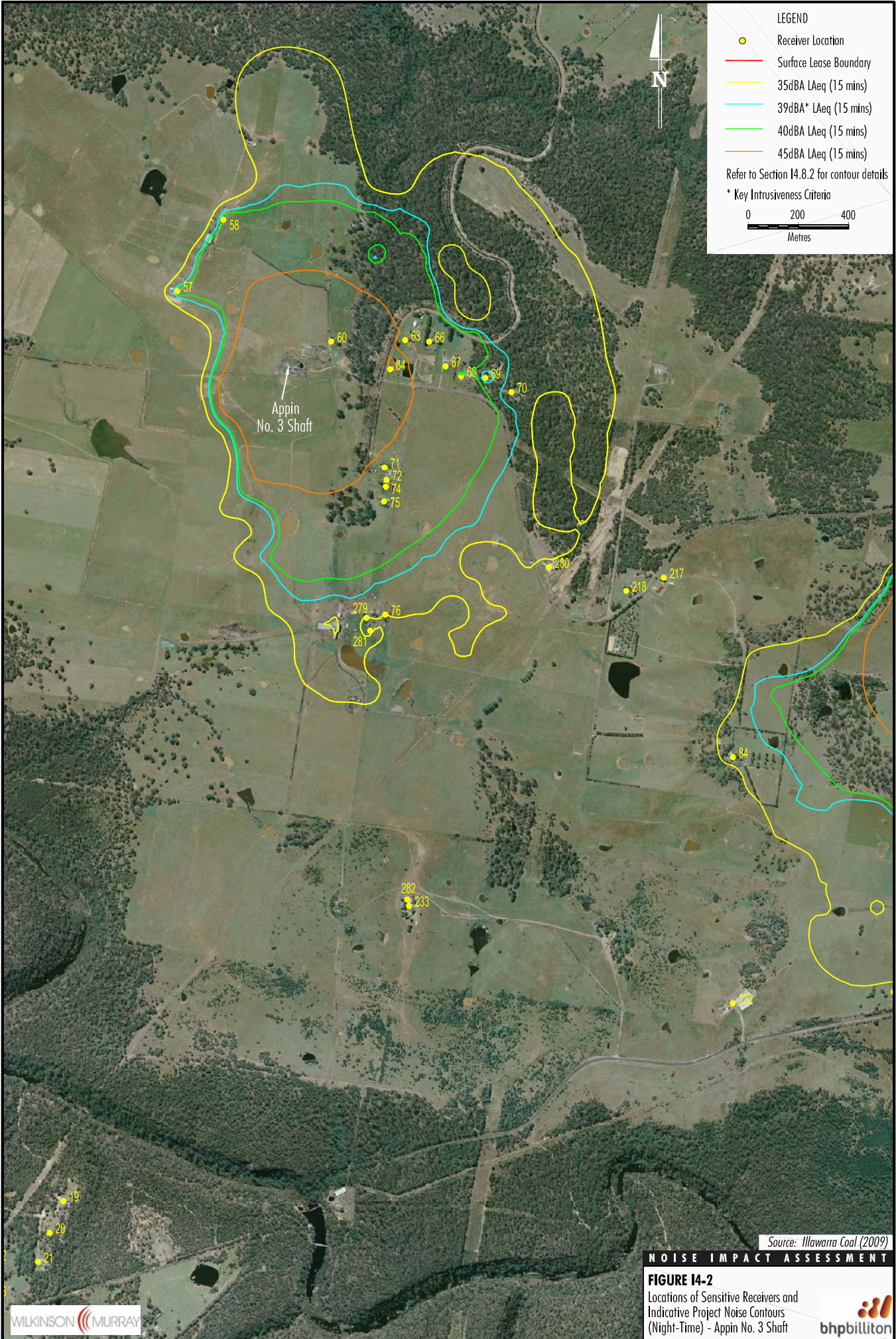
The predicted total 10th percentile $L_{Aeq(15 \text{ minute})}$ intrusive noise levels are presented in Attachment ID. Amenity $L_{Aeq,Period}$ noise 10th percentile levels are also presented (for comparison with the relevant amenity criteria) in Attachment ID.

I4.6.1 Existing/Approved Impacts – Intrusive Criteria

Table I4-7 summarises the sensitive receivers where the intrusiveness criteria are anticipated to be exceeded for the existing/approved scenario.

A full list of the predicted existing/approved noise levels under 10th percentile conditions is presented in Attachment ID.





LEGEND

- Receiver Location
- Surface Lease Boundary
- 35dB(A) LAeq (15 mins)
- 39dB(A)* LAeq (15 mins)
- 40dB(A) LAeq (15 mins)
- 45dB(A) LAeq (15 mins)

Refer to Section I4.8.2 for contour details

* Key Intrusiveness Criteria

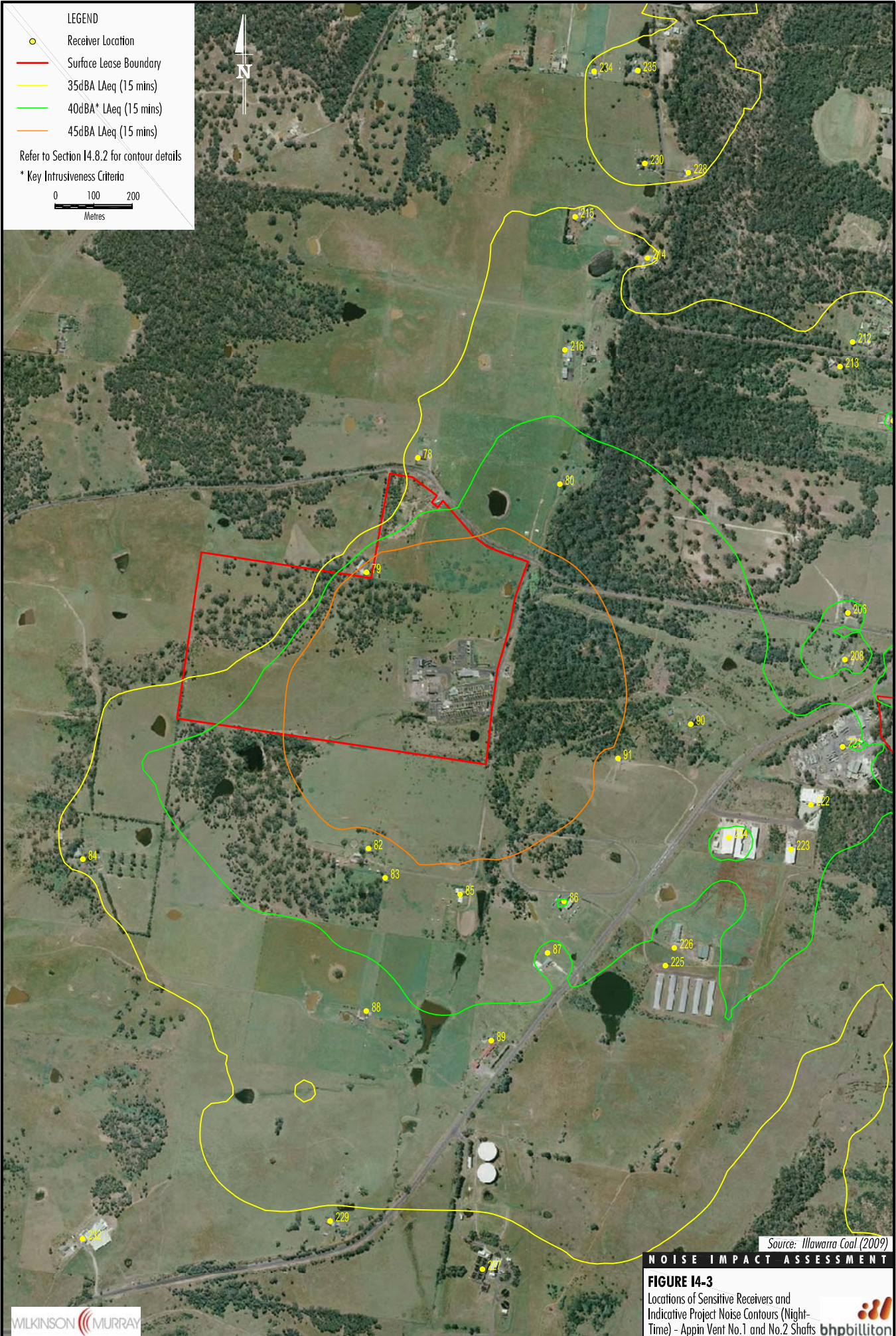
0 200 400
Metres

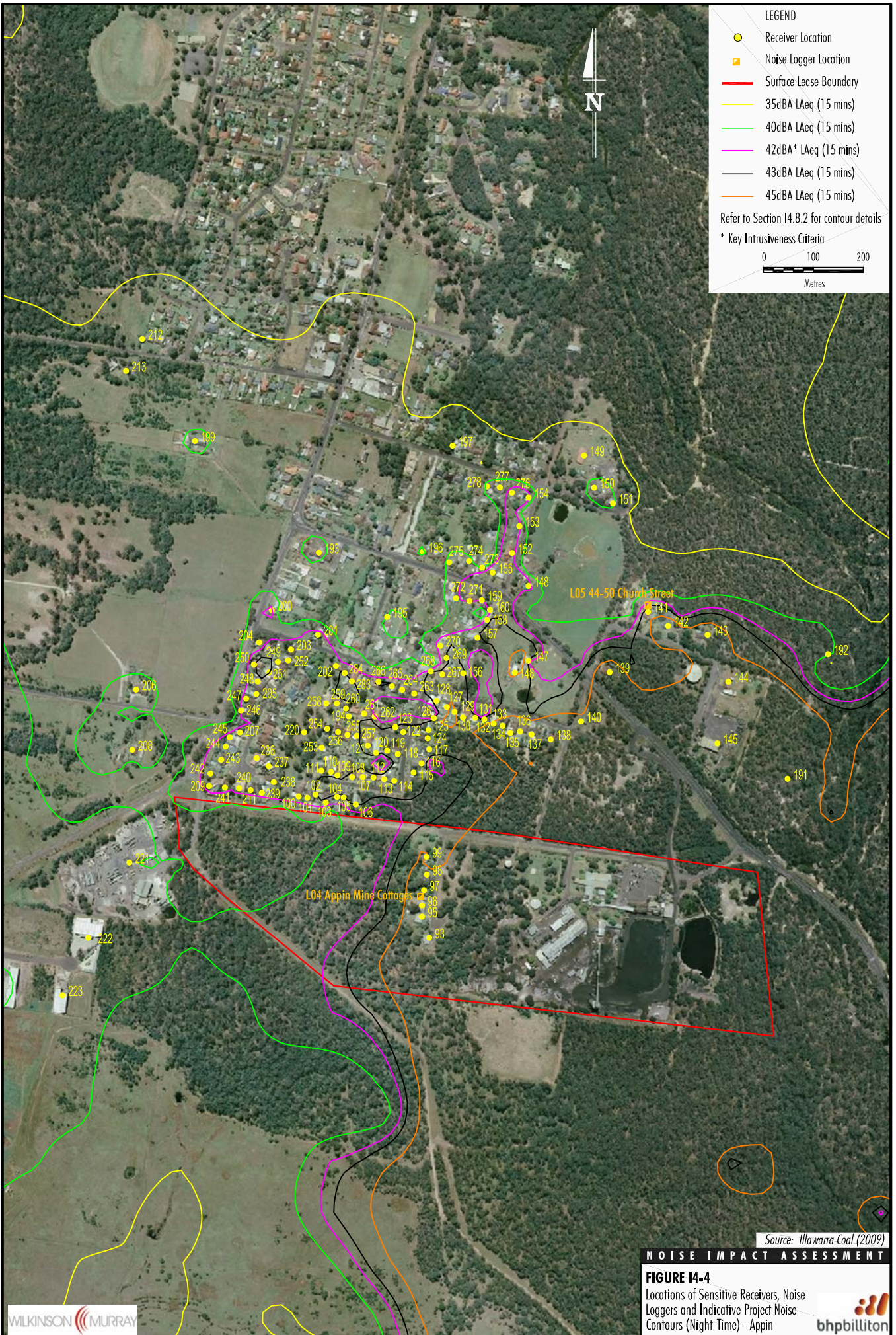
Source: Illawarra Coal (2009)

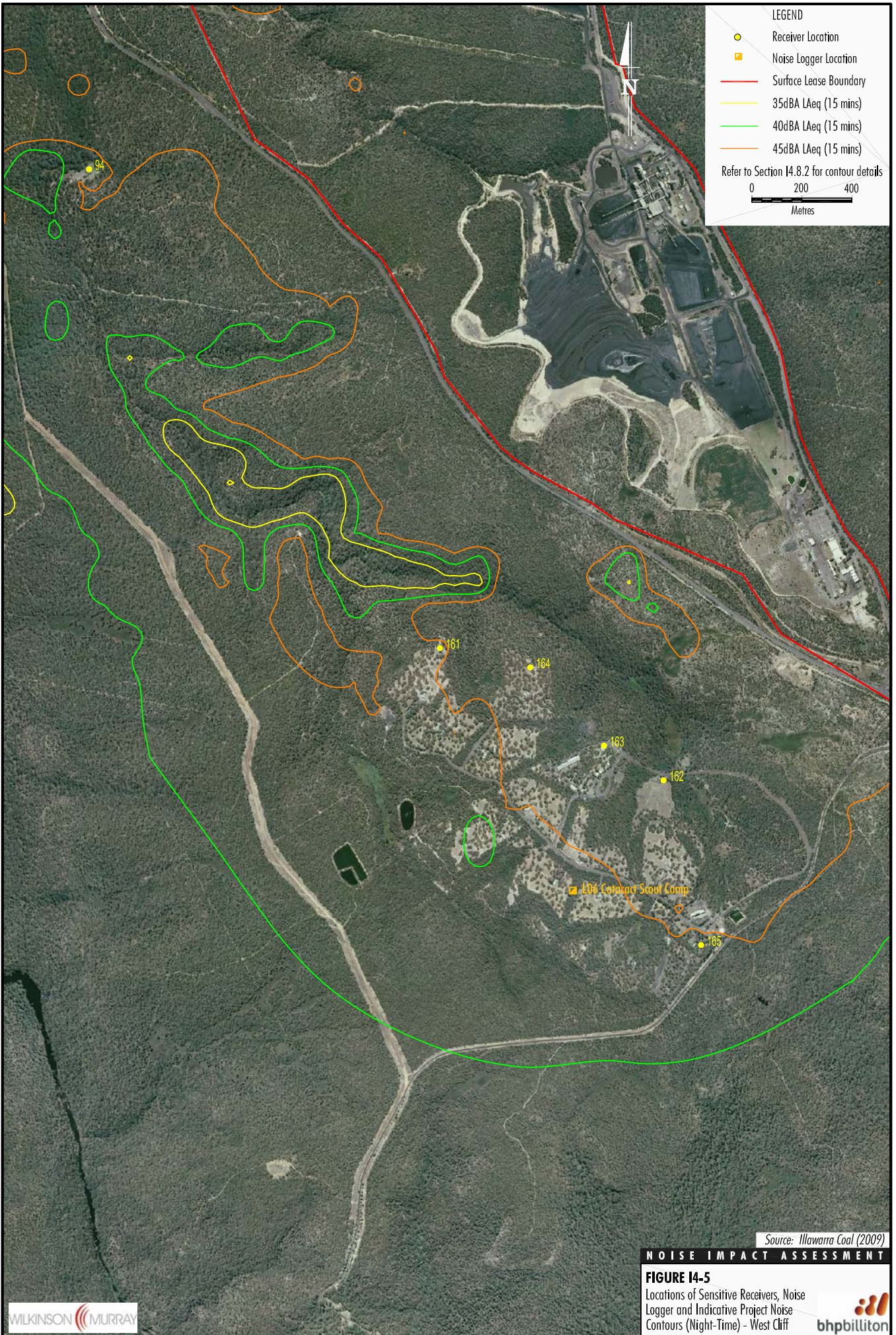
NOISE IMPACT ASSESSMENT

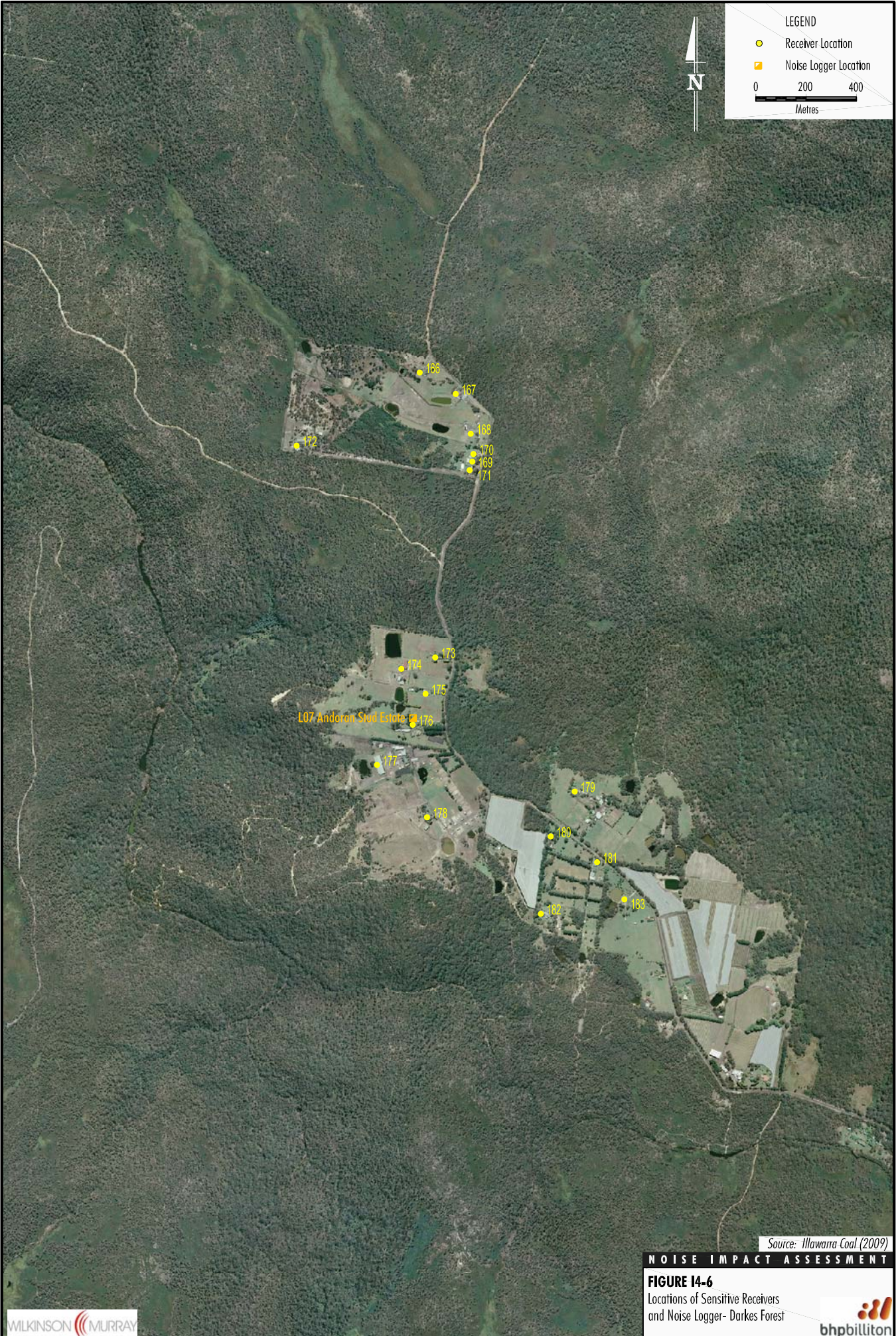
FIGURE I4-2
Locations of Sensitive Receivers and
Indicative Project Noise Contours
(Night-Time) - Appin No. 3 Shaft











LEGEND

- Receiver Location
- Noise Logger Location

0 200 400
Metres

Source: Mlawarra Coal (2009)

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FIGURE I4-6
Locations of Sensitive Receivers
and Noise Logger - Darkes Forest



Table I4-7 Sensitive Receivers where Project Specific Intrusiveness Criterion Exceedance is Predicted for the 10th Percentile of the Existing/Approved Scenario

Primary Noise Source	Receivers Located within Noise Management Zone				Receivers Located within Noise Affection Zone	
	1-2 dBA Above Project Specific Noise Levels		3-5 dBA Above Project Specific Noise Levels		>5 dBA Above Project Specific Noise Levels	
	Day/Evening	Night	Day/Evening	Night	Day/Evening	Night
Appin West pit top	14, 26	-	-	-	-	-
Appin No. 3 shaft fan	76, 279	76, 279	69, 70	69, 70	57, 58, 60, 63, 64, 66-68, 71, 72, 74, 75	57, 58, 60, 63, 64, 66-68, 71, 72, 74, 75
Appin No. 1 and No. 2 shaft fans	86, 90, 216	78, 86, 90, 216	80, 82, 83, 85, 91	80, 82, 83, 85, 91	79	79
Appin East pit top, with some contribution from West Cliff Coal Wash Emplacement	104-108, 112, 113, 118-123, 125-128, 131, 132, 156-158, 160, 194, 195, 200-203, 249-252, 254-262, 264-270, 283-284	100-105, 108-111, 121, 123, 156-158, 160, 194, 195, 200-203, 249-252, 266, 268-271, 283-284	114-117, 124, 129, 130, 133-136, 139, 141, 142, 146, 147	106, 107, 112-120, 122, 124-134, 141, 142, 146, 147, 199, 267	137, 138, 140, 143, 144	135-140, 143, 144
West Cliff pit top	165 ¹	-	-	-	-	165 ¹
Total No. Receivers	59	72	23	36	18	22

Notes: Receivers 12, 93-99, 145, 161-164, 191-193, 220-225 and 227 are not required to be compared with intrusiveness criteria.

¹ Scout Park caretaker conservatively assessed against intrusiveness criteria.

In total, 132 of the receivers modelled are predicted to exceed the project specific noise levels for existing/approved operations under adverse conditions (10th percentile).

In summary the noise model results indicate the following intrusive criteria exceedances under existing/approved scenario under 10th percentile meteorological conditions:

- No private receivers around the Appin West pit top are predicted to experience marginal noise exceedances at night-time, however two receivers are predicted to experience a marginal noise exceedance (1-2 dBA) during daytime.
- At night-time, two private receivers around the Appin No. 3 shaft are predicted to experience marginal noise exceedances (1-2 dBA), two receivers moderate noise exceedances (3-5 dBA) and 12 receivers are predicted to be noise affected.
- At night-time, four private receivers around the Appin No. 1 and No. 2 shafts are predicted to experience marginal noise exceedances (1-2 dBA), five receivers moderate noise exceedances (3-5 dBA) and one receiver is predicted to be noise affected.
- At night-time, 66 private receivers around Appin are predicted to experience marginal noise exceedances (1-2 dBA), 29 receivers moderate noise exceedances (3-5 dBA) and eight receivers are predicted to be noise affected.
- There are no private receivers near the West Cliff pit top, however the Scout Camp caretaker's residence, if compared against intrusive criteria, would be considered to be noise affected.

The DECC INP Application Notes indicate that where exceedances occur under adverse conditions, consideration should also be given to the number of exceedances that may potentially occur under calm conditions. Noise modelling under calm meteorological conditions was undertaken, with the results presented in Attachment ID.

Comparison of calm meteorological conditions modelling results to the applicable criteria indicated compliance for the majority of receivers, with only eight receivers predicted to experience marginal exceedances (1-2 dBA), 12 receivers moderate exceedances and nine receivers are predicted to be noise affected. The majority of exceedances under calm conditions are located in Appin and proximal to the Appin No. 3 shaft and Appin No. 1 and No. 2 shafts.

I4.6.2 Existing/Approved - Intrusive Noise Contours

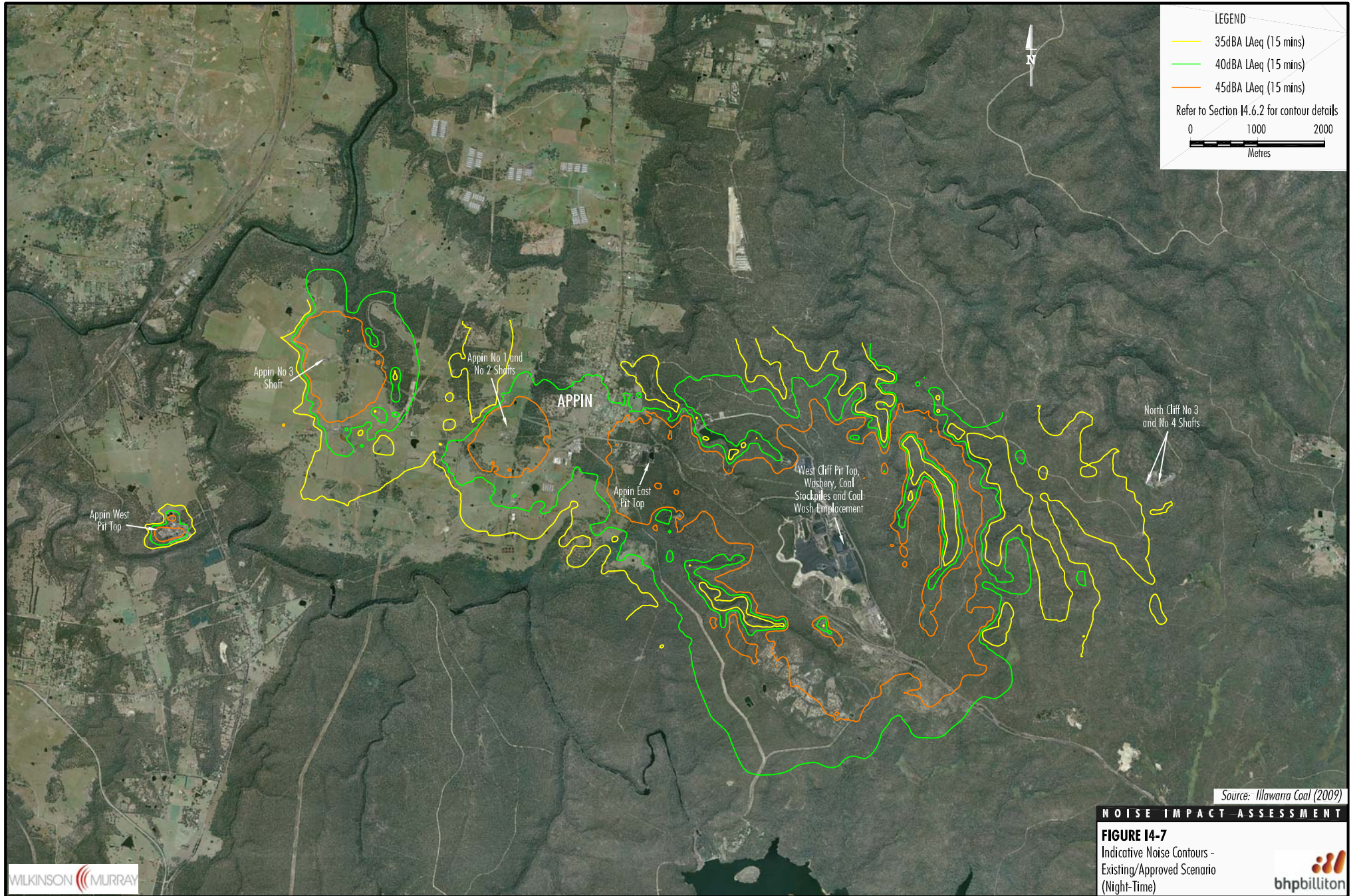
Noise contours for the existing/approved night-time operations were calculated using a selection of key worst-case meteorological conditions to approximate 10th percentile noise levels. Contours that approximate predicted 35 dBA, 40 dBA and 45 dBA cumulative 10th percentile $L_{Aeq(15 \text{ minute})}$ night-time intrusive noise levels are shown on Figure I4-7.

It is noted from review of night-time contours for the existing/approved scenario that there are a number of additional residences in Appin (approximately 39 residences) that are likely to marginally (by 1-2 dBA) exceed the intrusiveness criteria under adverse meteorological conditions. These residences were not specifically included as receivers in this assessment. Given that the potential exceedances at these receivers are marginal and relate to existing/approved operations (i.e. rather than the Project that is the subject of this assessment), it is not considered necessary to individually calculate noise levels at each of these receivers. Figure I4-8 provides a close-up of the existing/approved contours (as described above) in Appin.

I4.6.3 Existing/Approved Amenity Assessment and Cumulative Impacts

Potential sources of cumulative industrial noise were reviewed in Section I4.4.3. The only other significant existing source of industrial noise (other than ICHPL operations) that has been identified that warrants evaluation is the Appin-Tower Power Project (owned and operated by EDL) which has components at the Appin West pit top and at the Appin No. 1 and No. 2 shafts (see Section I2.1).

Noise from the EDL facilities were modelled, and the night-time $L_{Aeq,Period}$ was calculated and added to the $L_{Aeq,Period}$ noise level from the Project. Results of this analysis for all noise-sensitive receivers are also presented in Attachment ID and are summarised in Table I4-8.



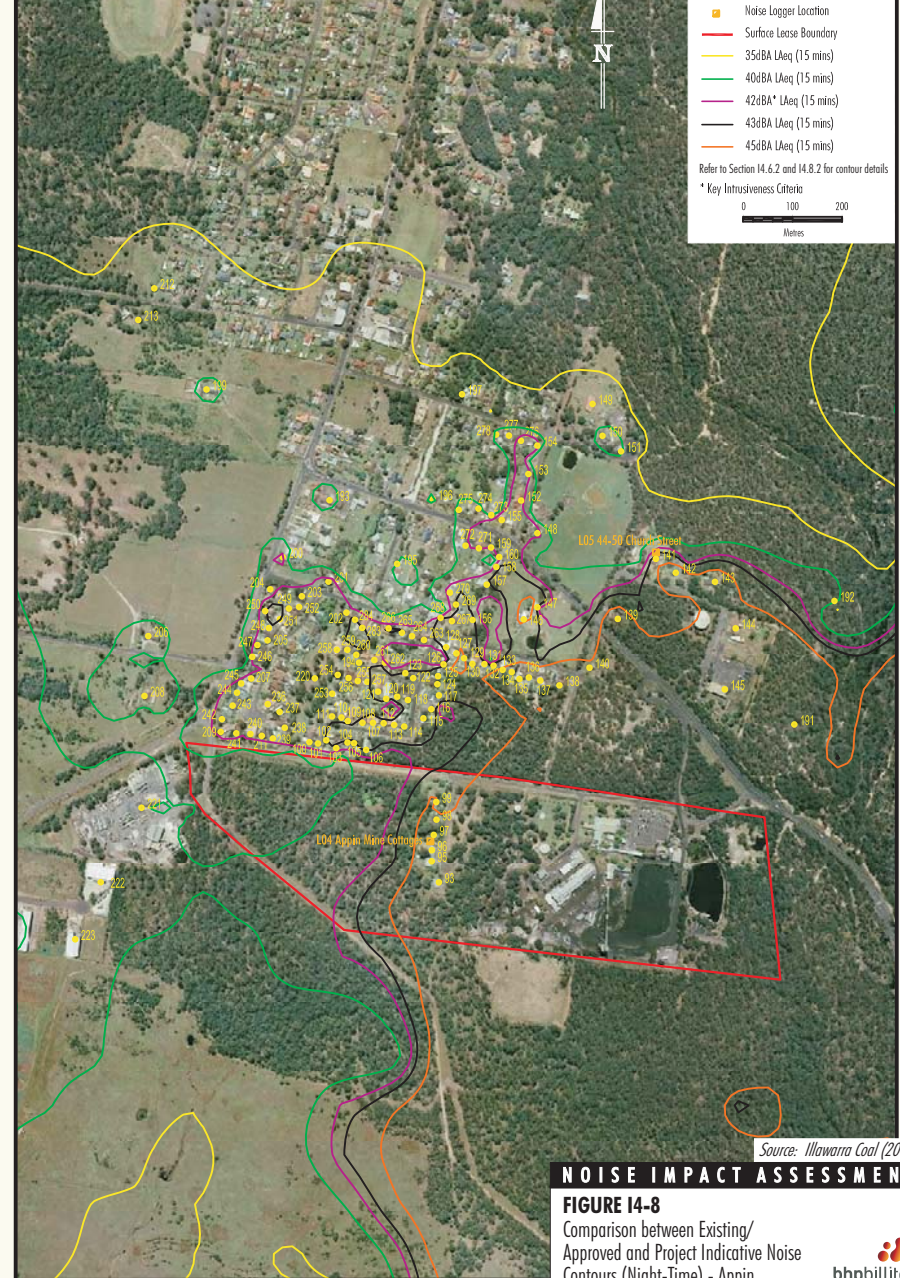
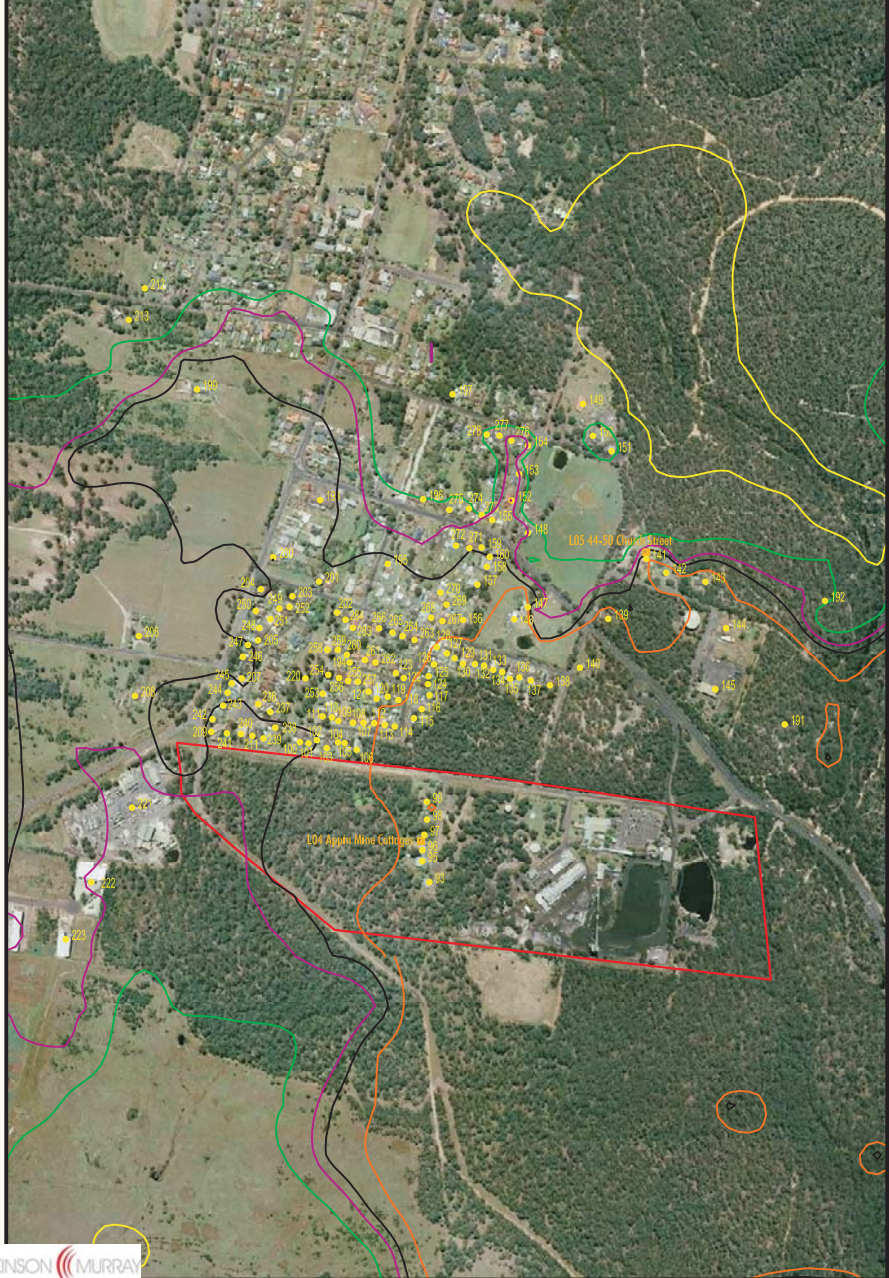
Source: Illawarra Coal (2009)

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FIGURE 14-7
Indicative Noise Contours -
Existing/Approved Scenario
(Night-Time)

Existing/Approved Noise Contours (Night-Time)

Project Noise Contours (Night-Time)



LEGEND

- Receiver Location
- Noise Logger Location
- Surface Lease Boundary
- 35dBA LAeq (15 mins)
- 40dBA LAeq (15 mins)
- 42dBA* LAeq (15 mins)
- 43dBA LAeq (15 mins)
- 45dBA LAeq (15 mins)

Refer to Section 14.6.2 and 14.8.2 for contour details
 * Key Intrusiveness Criterion

0 100 200
 Metres

Source: Illawarra Coal (2009)

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FIGURE I4-8

Comparison between Existing/
 Approved and Project Indicative Noise
 Contours (Night-Time) - Appin



Table I4-8 Sensitive Receivers where Acceptable Amenity Criterion Exceedance is Predicted for the 10th Percentile of the Existing/Approved Scenario

Receiver Area	Indicative Noise Amenity Area	Time of Day	10 th Percentile Existing/Approved			Recommended Acceptable L _{Aeq(period)} (dBA)
			Number of Receivers Located within Noise Management Zone		Number of Receivers Located within Noise Affection Zone	
			1-2 dBA above Criteria	3-5 dBA above Criteria	>5 dBA above Criteria	
Appin Township (Locations 100-138, 152-160, 194-209, 211, 212, 225-230, 232-235, 236-278, 283-284)	Suburban ¹	Day	-	-	-	55
		Evening	138	-	-	45
		Night	103-112, 119-123, 156-158, 160, 194, 195, 199-203, 205, 206, 208, 236, 237, 244, 245, 247-271, 283-284	113-118, 124-134	135-138	40
Rural residential receivers (Locations 1-7, 9-48, 50-58, 60, 63, 64, 66-72, 74-76, 78-80, 82-91, 93, 95-99, 139-151, 165-190, 213-218, 279-282)	Rural	Day	79	-	60	50
		Evening	66, 71, 72, 91, 93, 144	63, 64, 140	60, 79	45
		Night	70, 83, 86, 87, 216	57, 68, 69, 74, 75, 80, 82, 85, 90, 96-99, 139, 141-143, 146, 147	58, 60, 63, 64, 66, 67, 71, 72, 79, 91, 93, 95, 140, 144	40
Cataract Scout Park (Locations 161-164) William Woods Park – Appin (Location 220)	Active Recreation	When in use	-	-	-	55
Regional Open Space Recreation Areas (Locations 94, 191 and 192)	Passive recreation	When in use	191	-	-	50
Anglican Church Appin (Location 193 ¹)	Place of Worship-external	When in use	-	-	-	50
Appin Township (Locations 221-224)	Industrial	When in use	-	-	-	70
Appin Township	Commercial	When in use	-	-	-	65

¹ Note receiver 193 is approximately 50 m west of the church, however because the predicted noise levels are at least 9 dBA less than the relevant amenity criterion, the location is considered sufficiently accurate to conclude that compliance with the relevant amenity criterion would be achieved.

This analysis of the existing/approved scenario indicates that for the cumulative existing/approved operations (including EDL operations):

- two privately-owned residential receivers exceed the recommended daytime amenity criteria for rural areas (50 dBA $L_{Aeq,Period}$);
- no receivers exceed the recommended daytime amenity criteria for suburban areas;
- some 12 privately-owned residential receivers exceed the recommended evening amenity criteria for suburban and rural areas (45 dBA $L_{Aeq,Period}$);
- some 113 privately-owned residential receivers exceed the recommended night-time amenity criteria for suburban and rural areas (40 dBA $L_{Aeq,Period}$);
- six ICHPL-owned residences exceed the recommended night-time amenity criteria for rural areas;
- some 16 privately-owned residential receivers exceed the INP's night-time amenity recommended maximum noise levels, for suburban and rural areas;
- although not explicitly assessed through point source calculations, given the location of potential commercial receivers in Appin, the recommended amenity criterion for commercial areas when in use (65 dBA $L_{Aeq,Period}$) would not be exceeded;
- no receivers exceed the recommended amenity criterion for industrial areas when in use (70 dBA $L_{Aeq,Period}$);
- no receivers exceed the recommended amenity criterion (external) for place of worship when in use (50 dBA $L_{Aeq,Period}$);
- no locations exceed the recommended amenity criterion for active recreational areas when in use (55 dBA $L_{Aeq,Period}$);
- one location (land zoned open space under the LEP near the West Cliff Coal Wash Emplacement) exceeds the recommended amenity criterion for passive recreational areas when in use (50 dBA $L_{Aeq,Period}$) (note that this area is heavily vegetated, has limited access and the frequency of use is not known); and
- noise associated with the Appin-Tower Power Project is significantly lower than that from the existing Appin Mine in all cases, and is not expected to contribute to any additional exceedances of the amenity criterion.

I4.6.4 Summary of the Existing/Approved Operations Noise Compliance with Applicable Criteria

In summary, noise modelling of existing/approved operations indicates:

- a total of approximately 132 receivers are predicted to exceed the project specific intrusiveness noise levels under adverse meteorological conditions;
- it is estimated that approximately 39 additional residences in Appin that were not specifically included as receivers in the modelling would also marginally (by approximately 1-2 dBA) exceed the night-time project specific intrusiveness noise levels (in the area south of Appin Road and in the vicinity of the intersection of Appin Road and Wilton Road);
- assessment of calm meteorological conditions indicated that compliance is achieved at most receivers, with some 29 receivers exceeding the Project specific intrusiveness noise levels;
- a total of approximately 113 privately-owned receivers exceed the residential night-time recommended acceptable amenity criteria (rural or suburban) under adverse meteorological conditions;

- some 16 privately owned receivers exceed the residential night-time recommended maximum amenity criteria (rural or suburban) under adverse meteorological conditions;
- one recreational area exceeds the relevant passive recreational area amenity criterion;
- the above results are considered to be typical of a group of large industrial facilities in close proximity to residential receivers; and
- complaints are very infrequent, with only eight complaints being received in relation to the ventilation fans or pit top activities in the past seven years.

14.7 Project Noise Reduction Measures

Following examination of the existing/approved noise modelling results presented in Section I4.6, ICHPL commissioned Wilkinson Murray to investigate potential noise reduction measures at the Appin Mine.

The initial investigations involved a site inspection to identify potential noise reduction measures, followed by review of acoustical effectiveness of the potential measures by Wilkinson Murray and assessment of practicality/feasibility of implementation by ICHPL.

As a result of this initial investigation, a number of noise reduction measures were adopted for the Project by ICHPL as described in Table I4-9.

In addition to the above, it is envisaged that further Project noise reduction measures would be identified as part of the ongoing noise reduction programme (Section I4-10).

Table I4-9 Project Noise Reduction Measures

Equipment	Description of Noise Issue	Noise Reduction Measure to be Implemented	Resulting Sound Power Level
Appin No. 1 and No. 3 shaft upgrades	Sound Power Level of the upgraded upcast shafts (at a rating of 550 m ³ /s) would be 115 dBA if left unmitigated.	Best practice noise mitigation would be adopted for the upgraded shafts, resulting in a lower sound power level for the installed shaft components.	107 dBA
West Cliff and North Cliff shaft upgrades	Sound Power Level of the upgraded upcast shafts (at a rating of 550 m ³ /s) would be 115 dBA if left unmitigated.	Standard noise mitigation would be adopted for the upgraded shafts, resulting in a lower sound power level for the installed shaft components.	110 dBA
Appin East pit top drivehouse building	Existing operational practice is to leave the doors on the drivehouse building open, resulting in 'break-out' noise.	The existing doors on the Appin East pit top drivehouse building would be closed for the Project, resulting in a noise sound power level reduction of 4 dBA for this building.	106 dBA
Appin East pit top drift winder	Whilst the winder is enclosed in a cladded building, small gaps in the eaves exist resulting in 'break-out' noise.	Small gaps in the eaves of the Appin East pit top drift winder building would be cladded for the Project, resulting in a noise sound power level reduction of 6 dBA for this building.	103 dBA
Appin East pit top bin	The existing striker plate ¹ at the Appin East pit top bin is steel resulting in significant noise when coal hits the plate.	The existing striker plate at the Appin East pit top bin (and the striker plate for the new bin to be constructed for the Project) would be replaced for the Project with noise dampening type material resulting in a noise sound power level reduction of 3 dBA for each bin.	99 dBA per bin

¹ Note that the existing striker plate incorporated a polyurethane coating as part of previous noise reduction measures (see Section I3.5). This material has since worn away, leaving just the steel plate. A more durable material and/or a different physical arrangement would be used as part of the Project noise reduction measures.

I4.8 Noise Impact Assessment – Project Worst Case Operations

The Project worst case scenario detailed in Section I4.4.2 was modelled using the procedures outlined in Section I4.4.1. The total 10th percentile $L_{Aeq(15 \text{ minute})}$ intrusive noise levels were calculated for each of the identified 270 sensitive receivers surrounding the Project. This procedure was undertaken for the day, evening and night-time cases for the Project worst case scenario. Receiver locations are shown on Figures I4-1 to I4-6.

I4.8.1 Project Worst Case Potential Impacts – Intrusive Criteria

Table I4-10 presents a comparison between the Project worst case and existing/approved scenarios of the sensitive receivers where the intrusiveness criteria are anticipated to be exceeded.

In general noise associated with the Project resulted in a slight reduction in noise levels at most receivers in comparison with the modelled existing/approved noise levels. Fourteen receivers which are predicted to exceed the project specific intrusiveness noise levels under adverse meteorological conditions for the existing/approved scenario are predicted to achieve compliance under the Project scenario.

In Appin noise levels at the majority of receivers are reduced by approximately 1 dBA. Noise levels at a limited number of private residences located in the east of Appin are predicted to increase by up to 1 dBA, with one receiver increasing by 2 dBA during daytime operations, which is considered to be a minor increase. This is considered to be because of the proximity of the West Cliff Stage 4 Coal Wash Emplacement.

In summary, modelled results indicate the following:

- At Appin No. 3 shaft, noise levels are predicted to be lower for the Project relative to the existing/approved scenario, with noise affected receivers under the intrusiveness criteria reduced from 12 to two; and overall exceedances of the criteria reduced from 16 to 12.
- At Appin No. 1 and No. 2 shafts, noise levels are predicted to be lower for the Project compared with the existing/approved scenario, with the number of exceedances of project specific intrusiveness noise levels reduced from 10 to six.
- Noise levels in Appin were found to be generally lower relative to the existing/approved scenario, with the exception of a limited number of receivers on the eastern side of Appin. One receiver drops from noise affected to a moderate (3-5 dBA) exceedance, some 14 receivers drop from moderate (3-5 dBA) to marginal (1-2 dBA) exceedances, whilst a further six receivers are predicted to achieve compliance for the Project that did not achieve compliance in the existing/approved scenario.

Modelling results providing comparison between the existing/approved and Project worst case noise are provided in Table I4-10. A full list of the predicted Project worst case noise levels is presented in Attachment ID.

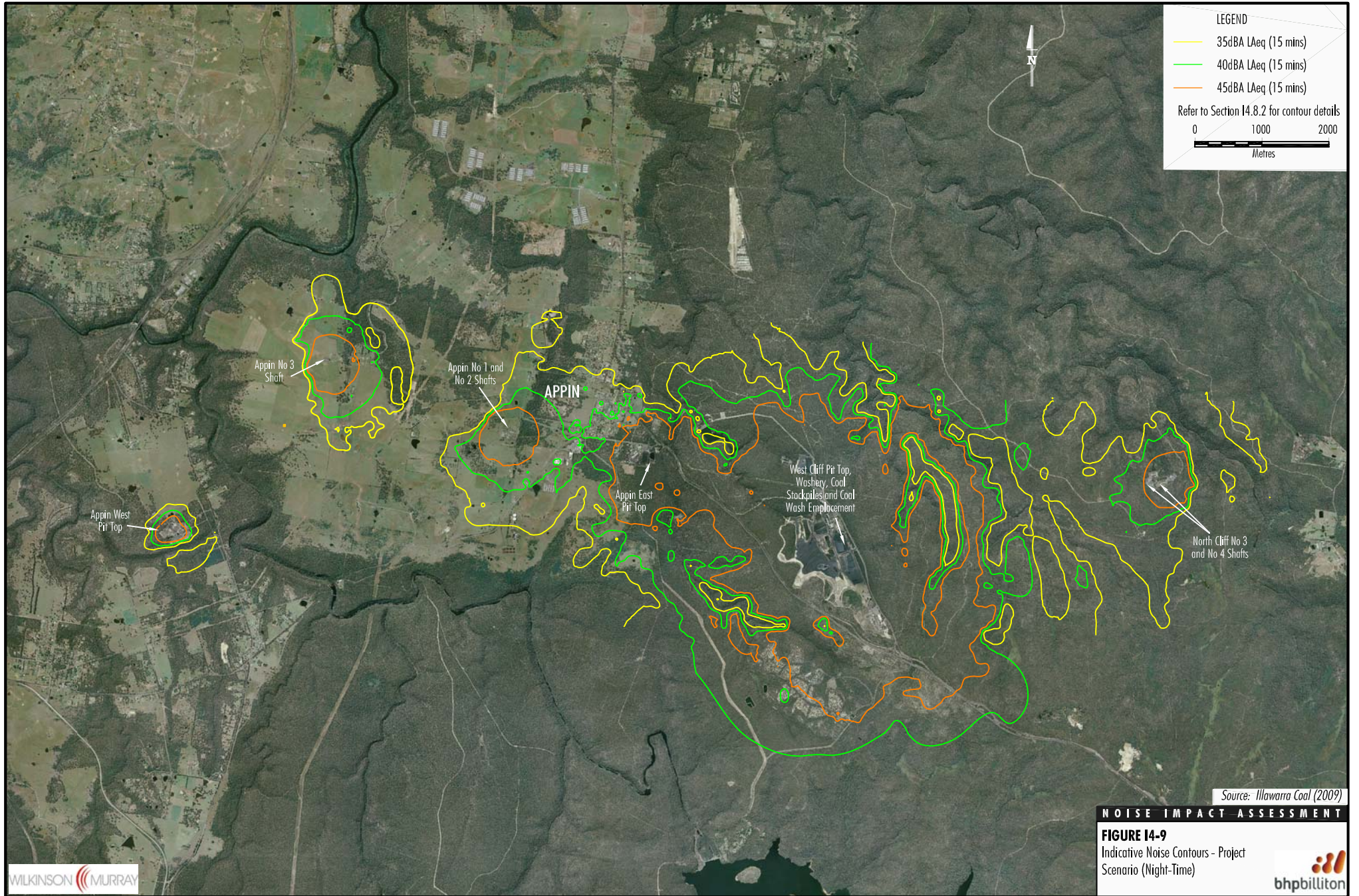
As discussed in Section I4.6.1, the DECC INP Application Notes indicate that where exceedances occur under adverse conditions, consideration should also be given to the number of exceedances that may potentially occur under calm conditions. Noise modelling under calm meteorological conditions was undertaken for the Project scenario, with the results presented in Attachment ID.

Table I4-10 Project Specific Intrusiveness Criterion Exceedances – Summary of Project Changes

Primary Noise Source	Receivers Located within Noise Management Zone				Receivers Located within Noise Affectionation Zone		Summary Comparison Between Existing/Approved and Project Worst Case Scenarios
	1-2 dBA above Project Specific Noise Levels		3-5 dBA above Project Specific Noise Levels		>5 dBA above Project Specific Noise Levels		
	Existing/ Approved	Project Worst Case Additional Receivers	Existing/ Approved	Project Worst Case Additional Receivers	Existing/ Approved	Project Worst Case Additional Receivers	
Appin West pit top	14, 26	No Additional Receivers	-	No Additional Receivers	-	No Additional Receivers	No change in noise levels due to Project.
Appin No. 3 shaft fan	76, 279	58, 67, 68, 71, 72, 74, 75 Compliance (76, 279)	69, 70	57, 63, 66 Compliance (69, 70)	57, 58, 60, 63, 64, 66-68, 71, 72, 74, 75	No Additional Receivers Reduced to Noise Management Zone (57, 58, 63, 66-68, 71, 72, 74, 75)	Net reduction in noise levels due to Project.
Appin No. 1 and No. 2 shaft fans	78, 86, 90, 216	82, 83, 85, 91 Compliance (78, 86, 90, 216)	80, 82, 83, 85, 91	No Additional Receivers Reduced within Noise Management Zone (82, 83, 85, 91)	79	No Additional Receivers	Net reduction in noise levels due to Project.
Appin East pit top, with some contribution from West Cliff Coal Wash Emplacement	100-105, 108-111, 121, 123, 156-158, 160, 194, 195, 200-209, 211, 236-266, 268-271, 283-284	106, 107, 112, 118-120, 122, 126, 131, 132, 148, 199, 267, Compliance (195, 204, 206, 208, 263, 271)	106, 107, 112-120, 122, 124-134, 141, 142, 146, 147, 199, 267	135 Reduced within Noise Management Zone (106, 107, 112, 118-120, 122, 125, 126, 128, 131, 132, 199, 267)	135-140, 143, 144	142 Reduced to Noise Management Zone (135)	Net reduction in noise levels due to Project.
West Cliff pit top	-	No Additional Receivers	-	No Additional Receivers	165 ¹	No Additional Receivers	No change in noise levels due to Project.
Total No. Receivers/Summary of Change	74	24 Additional, 12 Compliant	36	4 Additional, 18 Reduced within NM Zone, 2 Compliant	22	1 Additional receiver, 11 Reduced to NM Zone	

Notes: Receivers 12, 93, 95-99, 145, 161-164, 191-193, 220-225 and 227 are not required to be compared with intrusive criteria. Receivers 93 and 95-99 are ICHPL owned.

Receiver 94 assessed against amenity passive recreation area criteria only.
¹ Scout Park caretaker conservatively assessed against intrusiveness criteria.



LEGEND

- 35dBA LAeq (15 mins)
- 40dBA LAeq (15 mins)
- 45dBA LAeq (15 mins)

Refer to Section 14.8.2 for contour details



Appin No 3 Shaft

Appin No 1 and No 2 Shafts

APPIN

Appin West Pit Top

Appin East Pit Top

West Cliff Pit Top, Washery, Coal Stockpiles and Coal Wash Employment

North Cliff No 3 and No 4 Shafts

Source: Illawarra Coal (2009)

NOISE IMPACT ASSESSMENT

FIGURE 14-9
Indicative Noise Contours - Project Scenario (Night-Time)

Comparison of noise levels under calm meteorological conditions for the Project to the applicable criteria indicated compliance for the majority of receivers, with only 10 receivers predicted to experience marginal exceedances (1-2 dBA), five receivers moderate exceedances and two receivers are predicted to be noise affected. This is a reduction relative to the existing/approved scenario, with 13 exceedances under the existing/approved scenario complying with criteria for the Project, including a reduction of noise affected receivers from nine to two.

I4.8.2 Project Worst Case Potential Impacts – Intrusive Noise Contours

Noise contours for the Project worst case night-time operations were calculated using a selection of key meteorological conditions to approximate 10th percentile noise levels. Contours that approximate predicted 35 dBA, 40 dBA and 45 dBA cumulative 10th percentile $L_{Aeq(15\text{ minute})}$ intrusive noise levels are shown on Figure I4-9.

In addition, Figures I4-1 to I4-5 present the Project worst case contours on a close-up aerial photograph for the Appin West pit top, Appin No. 3 shaft, Appin No. 1 and No. 2 shafts, Appin East pit top and West Cliff pit top, respectively. Figure I4-8 shows a comparison of noise contours between the existing/approved and Project scenarios in Appin.

It is noted from review of these contours that the key contour to determine marginal exceedances of project specific noise levels in Appin (43 dBA contour) has contracted closer to the Appin East pit top relative to the existing/approved contours (Figure I4-8).

As described in Section I4.6.2, some 39 additional residences not specifically included as receivers in the modelling would experience potential marginal exceedances (i.e. 1-2 dBA) of project specific noise levels from review of the existing/approved contours. From review of the Project-worst case scenario noise contours, there are no additional residences not specifically included as receivers that exceed project intrusiveness noise levels (Figure I4-8).

I4.8.3 Project Worst Case Amenity Assessment and Cumulative Impacts

Noise from the Appin-Tower Power Project (owned and operated by EDL) located at Appin West pit top and Appin No. 1 and No. 2 shafts and fan site was modelled using the procedures described above, and the day, evening and night-time $L_{Aeq,Period}$ was calculated and added to the $L_{Aeq,Period}$ noise level from the Project. Table I4-11 provides a comparison of the amenity noise results between the cumulative Project worst case and the existing/approved scenarios.

Analysis of the existing/approved scenario and the Project worst case indicates that for the cumulative assessment (including EDL operations):

- analysis of Project model predictions against the amenity criteria show a general decrease in noise levels relative to the existing/approved scenario results;
- some 40 receivers that exceed the relevant amenity criteria for the existing/approved scenario would comply with criteria for the Project;
- six receivers drop from noise affected to the noise management zone;
- some 15 receivers drop from moderate (3 to 5 dBA) exceedances to marginal (1 to 2 dBA) exceedances; and
- there are no new receivers exceeding the amenity criteria for the Project.

Results of this analysis for all noise-sensitive receivers are also presented in Attachment ID.

Table I4-11 Amenity Criterion Exceedances – Summary of Project Changes

Receiver Area	Indicative Noise Amenity Area	Time of Day	Number of Receivers Located within Noise Management Zone				Number of Receivers Located within Noise Affection Zone		Recommended Acceptable $L_{Aeq(Period)}$ (dBA)
			1-2 dBA above Criteria		3-5 dBA above Criteria		>5 dBA above Criteria		
			Existing/ Approved	Additional Project Worst Case	Existing/ Approved	Additional Project Worst Case	Existing/ Approved	Additional Project Worst Case	
Appin Township (Locations 100-138, 152-160, 194-209, 211, 212, 225-230, 232-235, 236-278, 283-284)	Suburban ¹	Day	-	No Additional Receivers	-	No Additional Receivers	-	No Additional Receivers	55
		Evening	138	No Additional Receivers	-	No Additional Receivers	-	No Additional Receivers	45
		Night	103-112, 119-123, 156-158, 160, 194, 195, 199-203, 205, 206, 208, 236, 237, 244, 245, 247-271, 283, 284	113, 117, 118, 124-128, 130-132 Compliance (109-111, 160, 195, 199, 205, 206, 208, 236, 237, 244, 245, 247-249, 252-253, 263, 264, 271)	113-118, 124-134	135 Reduced within NM Zone (113, 117, 118, 124-128, 130-132)	135-138	No Additional Receivers Reduced to NM Zone (135)	40
Rural residential receivers (Locations 1-7, 9-48, 50-58, 60, 63, 64, 66-72, 74-76, 78-80, 82-91, 93, 95-99, 139-151, 165-190, 213-218, 279-282)	Rural	Day	79	60 Compliance (79)	-	145	60	-	50
		Evening	66, 71, 72, 91, 93, 144	95 Compliance (66, 71, 72, 91)	63, 64, 140	79 Compliance (63, 64)	60, 79	No Additional Receivers Reduced to NM Zone (79)	45
		Night	70, 83, 86, 87, 216	63, 66, 71, 82, 85, 90, 141 Compliance (70, 83, 87, 216)	57, 68, 69, 74, 75, 80, 82, 85, 90, 96-99, 139, 141-143, 146, 147	64, 91, Compliance (57, 68, 69, 74, 75) Reduced within NM Zone (82, 85, 90, 141)	58, 60, 63, 64, 66, 67, 71, 72, 79, 91, 93, 95, 140, 144	139 Compliance (58, 67, 72) Reduced to NM Zone (63, 64, 66, 71, 91)	40

Table I4-11 (Continued) Amenity Criterion Exceedances – Summary of Project Changes

Receiver Area	Indicative Noise Amenity Area	Time of Day	Number of Receivers Located within Noise Management Zone				Number of Receivers Located within Noise Affection Zone		Recommended Acceptable $L_{Aeq(Period)}$ (dBA)
			1-2 dBA above Criteria		3-5 dBA above Criteria		>5 dBA above Criteria		
			Existing/ Approved	Additional Project Worst Case	Existing/ Approved	Additional Project Worst Case	Existing/ Approved	Additional Project Worst Case	
Cataract Scout Park (Locations 161-164) William Woods Park – Appin (Location 220)	Active Recreation	When in use	-	<i>No Additional Receivers</i>	-	<i>No Additional Receivers</i>	-	<i>No Additional Receivers</i>	55
Regional Open Space Recreation Areas (Locations 94, 191 and 192)	Passive recreation	When in use	191	<i>No Additional Receivers</i>	-	191	-	<i>No Additional Receivers</i>	50
Anglican Church Appin (Location 193)	Place of Worship-external	When in use	-	<i>No Additional Receivers</i>	-	<i>No Additional Receivers</i>	-	<i>No Additional Receivers</i>	50
Appin Township (Locations 221-224)	Industrial	When in use	-	<i>No Additional Receivers</i>	-	<i>No Additional Receivers</i>	-	<i>No Additional Receivers</i>	70
Appin Township	Commercial	When in use	-	<i>No Additional Receivers</i>	-	<i>No Additional Receivers</i>	-	<i>No Additional Receivers</i>	65

I4.8.4 Summary of Potential Impacts of the Project compared with Existing/Approved Noise Emissions

- The installation of best practice noise reduced fans at the Appin No. 3 and Appin No. 1 and No. 2 shafts markedly reduce noise at nearby receivers, reducing the overall number of predicted exceedances of criteria.
- In Appin, the noise reduction measures at the Appin East pit top result in a net noise reduction for the majority of Appin receivers. A limited number of receivers on the eastern fringe of Appin are predicted to experience a slight increase in noise due to the proximity of the West Cliff Stage 4 Coal Wash Emplacement. Overall, the number of predicted noise exceedances is reduced for the Project.
- These improvements in the noise emissions result in the following improvements in compliance with noise criteria:
 - Forty receivers that exceed the relevant amenity criteria for the existing/approved scenario comply under the Project scenario.
 - Fourteen receivers that exceed project specific intrusiveness noise levels for the existing/approved scenario comply under the project scenario. In addition, some 39 residences (not specifically included as receivers) that the existing/approved contours indicate would experience marginal exceedances of project specific intrusiveness noise levels would comply for the Project.

I4.9 Surface Goaf Gas Drainage Assessment Framework

As provided in Section 2 in the Main Report of the EA, if required, the installation of additional surface goaf gas drainage boreholes and associated surface infrastructure would be subject to preparation of supplementary specialist environmental assessment studies. The studies and any associated management measures would be detailed in a Surface Goaf Gas Drainage Management Plan.

The preparation of a Surface Goaf Gas Drainage Management Plan would include a targeted noise assessment to determine background noise levels at nearest private receptors and assess compliance of the construction and operation of the infrastructure with applicable construction and operational noise criteria.

The general components of the noise assessment that would be undertaken as a component of the Surface Goaf Gas Drainage Management Plan would include:

- identification of potential receivers (and additional background noise monitoring to establish RBLs if required);
- establishment of applicable noise criteria and assessment of predicted compliance;
- review and amendment of the proposal if required (e.g. in the event that the criteria are predicted to be exceeded and mitigation/management options are limited); and
- periodic noise monitoring and review.

This process is described further below.

Identification of Potential Receivers and Applicable RBLs

Potential noise sensitive receivers in the vicinity of the proposed surface goaf gas drainage infrastructure would be identified (e.g. residences).

The background monitoring conducted for this study indicates that RBLs in the vicinity of the Project surface facilities range from 30 dBA to approximately 38 dBA, depending on the receiver location and surrounding landuses (Section I3.1). Where required, additional background noise monitoring would be undertaken in accordance with the INP to determine applicable RBLs for potential receivers.

Establishment of Applicable Noise Criteria and Assessment and Review of Compliance

Construction noise criteria at sensitive receivers would be established in accordance with the *Interim Construction Noise Guideline* (DECC, 2009) or subsequent revisions.

For example, the applicable $L_{Aeq(15\text{ min})}$ construction noise criterion would be 10 dBA above the RBL level under the *Interim Construction Noise Guideline* (DECC, 2009) for standard construction hours and the operational $L_{Aeq(15\text{ minute})}$ criteria would be the RBL plus 5 dBA under the INP (Section I4.1).

Example RBLs and applicable construction noise and operational noise criteria are provided in Table I4-12.

Table I4-12 Worked Example – Indicative Noise Criteria for Surface Goaf Gas Drainage Infrastructure

Location	Aspect	Day	Evening	Night
Residence A	RBL	31	31	30
	Construction Noise Management Level	41 ¹	36 ²	35 ²
	Operational Noise Intrusiveness Criteria	36	36	35
Residence B	RBL	38	38	38
	Construction Noise Management Level	48 ¹	43 ²	43 ²
	Operational Noise Intrusiveness Criteria	43	43	43

¹ Assuming inside standard construction hours. (Note; 'Highly noise affected' level is 75 dBA) (DECC, 2009).

² Outside of recommended standard construction hours (DECC, 2009).

Applicable amenity criteria would also be established in accordance with the INP and the *Interim Construction Noise Guideline* (DECC, 2009) for any applicable receivers (e.g. industrial receivers).

Assessment of potential construction and operational noise would be conducted in accordance with the *Interim Construction Noise Guideline* (DECC, 2009) or subsequent revisions and the INP where applicable.

In the event that exceedances of the applicable noise criteria are predicted at a nearby receiver, ICHPL would either:

- implement additional at source or on-site noise controls (e.g. noise barriers or controls at the receiver [e.g. double-glazing and air conditioning]) to achieve compliance;
- relocate some or all components of the surface goaf gas drainage infrastructure further from the receiver to achieve compliance; or
- obtain a landholder agreement with the receiver to cover the period of predicted noise exceedance to the satisfaction of the Director-General of the NSW Department of Planning (DoP).

I4.10 Noise Reduction Programme

The Appin Mine and West Cliff Colliery are significant existing industrial facilities in the Appin area. Longwall mining commenced at the Appin Mine in 1969. Suburban and rural receivers are, in some cases, located in close proximity to these facilities. The INP includes a discussion of the application of noise control policies to existing industrial facilities (EPA, 2000). Relevant extracts (Chapter 10) are provided below (EPA, 2000).

Many existing industrial sources were designed for higher noise emission levels than the criteria outlined in this policy. In other cases industries may have been in existence before neighbouring noise-sensitive developments and even before noise control legislation was introduced. The range of mitigation measures available for these sites may be either extremely limited or costly.

Applications for extensions to existing premises often provide an opportunity to redress issues that relate to the whole site. The need for reduced noise from existing sites must be weighed against the wider economic, social and environmental considerations. Where noise emissions from the site exceed the project-specific noise levels, the regulatory authorities and the noise-source manager need to negotiate achievable noise limits for the site. The project-specific noise levels should not be applied as mandatory noise limits. The project-specific noise levels supply the initial target levels and drive the process of assessing all feasible and reasonable control measures. Achievable noise limits result from applying all feasible and reasonable noise control measures. For sites with limited mitigation measures the achievable noise limits may sometimes be above the project-specific noise levels.

In many instances the site will be required to reduce its noise emissions progressively to achieve the specified noise limits by specified dates. This will require noise to be managed as an integral part of site upgrades. However, the development of formal operating practices to reduce noise generation often need not be linked to site upgrades, and where feasible these operating practices should be applied at the earliest opportunity. The measures required to achieve the noise limits would usually be set out in a noise reduction program, with mitigation measures staged over time. The noise reduction program would typically be attached as a licence condition. Efforts should be aimed at achieving a reduction in noise in a manner that provides the greatest benefit to residents without undue impact on the existing business. This may be accomplished by prioritizing the various noise-control measures.

In general accordance with the INP, ICHPL would implement a noise reduction programme with the objective of identifying feasible and reasonable noise mitigation options. The noise reduction programme would build on the initial investigation undertaken by ICHPL and Wilkinson Murray (Section I4.7) and would be developed having regard to the INP including (EPA, 2000):

The noise reduction program is reached through agreement between proponent and regulator and will typically have a statutory basis through conditions on a licence or notice. It will document the actions required to achieve the noise limits. The measures will generally be source- and site-specific, but could include the following elements:

- *the aim and scope of the program*

- *identification of noise levels and targets for the site*
- *an upper limit for new equipment*
- *an upper limit for partial upgrades of the site*
- *plans to eliminate problematic characteristics that have been identified, such as tonal and low frequency noise*
- *a sound power limit for relevant sections of the site*
- *operating practices to reduce noise emissions*
- *training and awareness initiatives*
- *an ongoing monitoring program to evaluate noise-emission levels*
- *communicating with the affected community via one or more of a complaints handling process, liaison group, newsletters etc.*

Often the range of planning instruments that can be applied to existing sites is limited. For example, planning approaches (for example, spatial separation between source and receiver and attention to noise reduction in designs for residential and industrial buildings) that could avoid impacts are generally not available at this stage. Operational procedures and immediate cost-effective measures that can minimise noise with minimal impact on the noise source should be identified and implemented.

I4.11 General Noise Monitoring and Management Measures

General noise monitoring and management recommendations are provided below. Where relevant these aspects would apply to the general Project construction and operational activities. If relevant, some aspects of these recommendations may also apply to surface goaf gas drainage (Section I4-9).

Construction Noise Management Plan

It is recommended that a Construction Noise Management Plan (CNMP) be developed for construction activities associated with the Project. The CNMP should describe the following elements:

- a description of the general noise management measures that would be implemented to minimise noise generation during construction;
- a protocol for community consultation and complaint response regarding construction activities;
- applicable construction times/noise limits; and
- a protocol for the ongoing management of construction noise, including ICHPL responsibilities for noise monitoring, review and implementation of the CNMP.

Noise Monitoring Programme

It is recommended that a Noise Monitoring Programme (NMP) be developed for the Project that would be implemented during construction and operation of the Project. The NMP should describe the following elements:

- applicable Project Approval noise criteria/limits;
- noise monitoring to be undertaken for the Project (i.e. monitoring locations, frequencies, parameters and specifications);
- a summary of relevant Project noise mitigation/management measures;
- procedures to be followed in the event of an exceedance of applicable noise criteria should they occur; and
- complaint response protocols.

The NMP should detail specific actions for responding to exceedances of Project Approval criteria and complaints should they occur. The results of monitoring conducted under the NMP should be used to optimise noise controls and validate noise modelling predictions.

Exceedances of Criteria

In the event of an exceedance of Project Approval noise criteria during construction or operations, and depending on the degree of exceedance, additional noise mitigation and management measures may need to be considered. Such measures may include:

- additional targeted noise monitoring (on-site or in the community);
- prompt response to any community complaints or concerns;
- refinement of on-site noise operating procedures, where practicable; and
- consideration of additional acoustical controls (on noise sources or at receivers) where practicable and/or negotiated agreements with relevant landholders.

I5 BLASTING IMPACT ASSESSMENT

I5.1 Blasting Criteria

I5.1.1 Amenity Criteria

For assessment of annoyance due to blasting, the DECC adopts the *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (Australian and New Zealand Environment and Conservation Council [ANZECC], 1990). The DECC's ENCM (EPA, 1994) Chapter 154 Noise Control Guideline – Blasting also provides guidance with respect to blasting.

A summary of the blasting annoyance and discomfort criteria is provided in Table I5-1.

Table I5-1 Blasting Criteria

Time of Blasting	5% Exceedance Airblast Level (dBL)	5% Exceedance PPV Ground Vibration (mm/s)
Monday to Saturday 9.00 am – 3.00 pm	115	5
Monday to Saturday 6.00 am - 9.00 am and 3.00 pm - 8.00 pm	105	2
Sunday, Public Holidays 6.00 am - 8.00 pm	95	1
Any Day – 8.00 pm to 6.00 am	95	1

dBL = linear decibels.

mm/s = millimetres per second.

I5.1.2 Structural Damage Criterion

For assessment of damage due to ground vibration, Australian Standard (AS) 2187.2-1993 *Explosives – Storage, Transport and Use – Part 2 Use of Explosives* specifies recommended levels for vibration to protect typical buildings from damage. These are:

- “Structures that may be particularly susceptible to ground vibration” – 5 mm/s.
- “Houses and low-rise residential buildings; commercial buildings not included below” – 10 mm/s.
- “Commercial and industrial buildings or structures of reinforced concrete or steel construction” – 25 mm/s.

Blast overpressure at sufficiently high levels may in itself cause structural damage to some building elements such as windows. However, this occurs at peak overpressure levels of about 133 dBA and above, well in excess of criteria for annoyance (Table I5-1) and therefore airblast pressure criteria for structural damage are not considered any further.

I5.2 Blasting Assessment Methodology

Given that the blasting under assessment in this report would take place underground, it is not considered necessary to assess impacts from blast overpressure. Airblast overpressure propagating from underground (e.g. from shafts and drifts) would be negligible due to the attenuation associated with the underground workings. Consequently the assessment focuses on blast vibration.

The following formulae for prediction of blast vibration have been derived from numerous blast measurements, at other existing operations (in the NSW mining industry), and represent the 5% exceedance vibration levels for blasts conducted using standard procedures.

Peak Particle Velocity (PPV) Vibration (mm/s)

$$PPV (5\%) = 3440 \times (SD_1)^{-1.75}$$

where SD_1 is the ground vibration scaled distance:

$$SD_1 = \frac{\text{Distance from Blast (m kg}^{-0.5}\text{)}}{\sqrt{MIC}}$$

and MIC is the maximum instantaneous charge in kilograms (kg) Ammonium Nitrate Fuel Oil (ANFO) equivalent.

15.3 Proposed Blasting

Explosives are not required for general underground coal mining. However, on occasion, development works or the longwall mining operation intercept geological structures in the Bulli Seam that require the use of explosive charges to break up the feature, and avoid damage to underground mining equipment. The explosive charges required for such management are very small, and explosive use is infrequent. Such blasts may be undertaken at any time as required (i.e. 24 hours, 7 days). For calculations a charge of 14 kg ANFO equivalent was adopted.

15.4 Blasting Impact Assessment

For underground blasting, at the nearest receivers the distance to the blast would be governed largely by the depth of the blast, which has been taken as generally greater than 400 m. In this case, at a distance of 400 m the predicted 5% exceedance PPV is 0.97 mm/s. This is below the most stringent criteria (Table I5-1), and is therefore considered acceptable.

16 ROAD TRAFFIC NOISE IMPACT ASSESSMENT

The Project has potential to generate additional traffic on public roads as a result of coal haulage, coal wash transportation, personnel arrivals and departures, and also deliveries of supplies. An assessment of traffic noise impacts has been prepared in accordance with the ECRTN (EPA, 1999).

Existing and proposed traffic volumes used in the traffic noise assessment were sourced from the Road Transport Assessment (Appendix K of the EA) (Traffix, 2009).

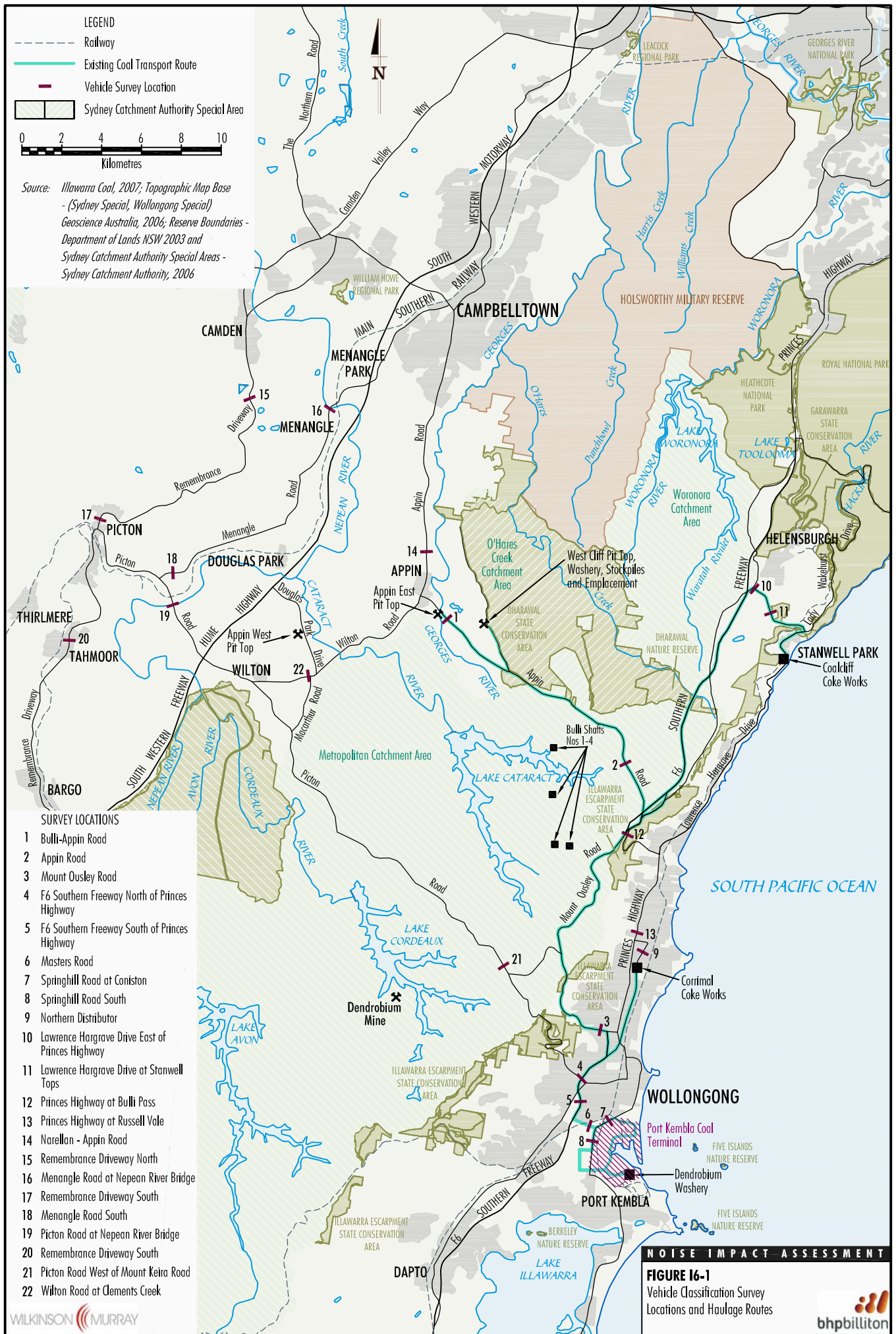
16.1 Road Traffic Noise Criteria

The local road network that supports existing and proposed traffic is shown in **Figure I6-1**. Road segments identified in the Road Transport Assessment (Appendix K of the EA) which would potentially be impacted by the Project are listed in Table I6-1. This table also lists the relevant ECRTN road classification (EPA, 1999).

Table I6-1 Relevant Roads, ECRTN Classification and Assessment Periods

Site*	Road	ECRTN (EPA, 1999)	
		Classification	Key Assessment Period
1	Bulli-Appin Road, Appin near Kings Fall Bridge	Sub-Arterial	10.00 pm to 7.00 am
2	Appin Road north of Princes Highway	Sub-Arterial	10.00 pm to 7.00 am
3	Mount Ousley Road at Mount Pleasant	Arterial	10.00 pm to 7.00 am
4	F6 Southern Freeway north of Princess Highway interchange at West Wollongong	Arterial	10.00 pm to 7.00 am
5	F6 Southern Freeway south of Princes Highway near footbridge	Arterial	10.00 pm to 7.00 am
6	Masters Road at Mount St. Thomas	Arterial	10.00 pm to 7.00 am
7	Springhill Road at Coniston	Arterial	10.00 pm to 7.00 am
8	Springhill Road north of Five Islands Road	Arterial	10.00 pm to 7.00 am
-	Northern Distributor, Towradgi, south of Towradgi Road	Arterial	10.00 pm to 7.00 am
-	F6 Southern Freeway (North)	Arterial	10.00 pm to 7.00 am
10	Lawrence Hargrave Drive east of Princes Highway	Sub- Arterial	10.00 pm to 7.00 am
12	Princes Highway at Bulli Pass	Arterial	10.00 pm to 7.00 am
13	Princes Highway north of Bellambi Lane, Russell Vale	Arterial	10.00 pm to 7.00 am
14	Narellan-Appin Road north of Appin township, south of Brian Road	Sub-Arterial	10.00 pm to 7.00 am
15	Remembrance Driveway north of Finns Road	Sub-Arterial	10.00 pm to 7.00 am
16	Menangle Road at Nepean River Bridge	Collector	6.00 pm to 7.00 am
17	Remembrance Driveway 0.5 km north of Regreme Road	Collector	6.00 pm to 7.00 am
18	Menangle Road east of Picton-Oakdale Road	Collector	6.00 am to 7.00 am
19	Picton Road at Nepean River Bridge	Collector	6.00 pm to 7.00 am
20	Remembrance Driveway 0.8 km south of Tahmoor Post Office	Collector	6.00 am to 7.00 am
21	Picton Road west of Mount Keira Road	Sub-Arterial	10.00 pm to 7.00 am
22	Wilton Road at Clements Creek	Collector	6.00 pm to 7.00 am
-	Douglas Park Drive	Collector	6.00 pm to 7.00 am
-	Macarthur Road	Collector	6.00 pm to 7.00 am

* Site numbering is consistent with Road Transport Assessment (Traffix, 2009)



LEGEND

- Railway
 - Existing Coal Transport Route
 - Vehicle Survey Location
 - Sydney Catchment Authority Special Area
- 0 2 4 6 8 10
Kilometres

Source: Illawarra Coal, 2007; Topographic Map Base - (Sydney Special, Wallongong Special) Geoscience Australia, 2006; Reserve Boundaries - Department of Lands NSW 2003 and Sydney Catchment Authority Special Areas - Sydney Catchment Authority, 2006

SURVEY LOCATIONS

- 1 Bulli-Appin Road
- 2 Appin Road
- 3 Mount Ousley Road
- 4 F6 Southern Freeway North of Princes Highway
- 5 F6 Southern Freeway South of Princes Highway
- 6 Masters Road
- 7 Springhill Road at Coniston
- 8 Springhill Road South
- 9 Northern Distributor
- 10 Lawrence Hargrave Drive East of Princes Highway
- 11 Lawrence Hargrave Drive at Stanwell Tops
- 12 Princes Highway at Bulli Pass
- 13 Princes Highway at Russell Vale
- 14 Narellan - Appin Road
- 15 Remembrance Driveway North
- 16 Menangle Road at Nepean River Bridge
- 17 Remembrance Driveway South
- 18 Menangle Road South
- 19 Picton Road at Nepean River Bridge
- 20 Remembrance Driveway South
- 21 Picton Road West of Mount Keira Road
- 22 Wilton Road at Clements Creek

NOISE IMPACT ASSESSMENT

FIGURE 16-1
Vehicle Classification Survey Locations and Haulage Routes



Criteria for assessment of noise from traffic on public roads are set out in the ECRTN (EPA, 1999). The relevant criteria for the roads under assessment are set out in Table I6-2.

Table I6-2 Traffic Noise Criteria – Residences

Type of Development	Noise Level Criterion		Where Criteria are already Exceeded
	Daytime (7.00 am to 10.00 pm)	Night-Time (10.00 pm to 7.00 am)	
Landuse developments with potential to create additional traffic on freeways/arterials*	$L_{Aeq(15 \text{ hour})}$ 60 dBA	$L_{Aeq(9 \text{ hour})}$ 55 dBA	Where feasible, existing noise levels should be mitigated to meet the noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating times of use; using clustering; using 'quiet' vehicles; and using barriers and acoustic treatments. In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 decibels (dB).
Landuse developments with potential to create additional traffic on collector road	$L_{Aeq(1 \text{ hour})}$ 60 dBA	$L_{Aeq(1 \text{ hour})}$ 55 dBA	Where feasible and reasonable, existing noise levels should be mitigated to meet the noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating times of use; using clustering; using 'quiet' vehicles; and using barriers and acoustic treatments. In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB.

Source: EPA (1999).

*Freeway/arterial roads include sub-arterial roads.

Traffic noise levels at receivers that are located in close proximity to collector and arterial roads in NSW commonly exceed the ECRTN criterion, even in rural areas.

16.2 Assessment Methodology

Rather than undertake detailed noise modelling of each section of road it is considered appropriate to first determine if there is a significant increase (i.e. greater than 2 dBA) in traffic noise levels during relevant assessment periods. This methodology is consistent with the approach outlined in the ECRTN, where an increase of up to 2 dBA over existing levels is deemed to be acceptable, where the noise level criterion is already exceeded and has previously been accepted by the DECC for similar assessments. Each of the key roads identified in Table I6-1 were analysed to determine whether there is potential for a significant increase (i.e. greater than 2 dBA) in traffic noise levels for relevant assessment periods, due to the Project.

The increase in traffic noise levels was calculated using the *Calculation of Road Traffic Noise* (CoRTN) (United Kingdom Department of Transport, 1988) prediction algorithm. This methodology allows for the increase in noise levels to be predicted without detailed modelling. This methodology is recognised by the DECC for use in road traffic noise assessments.

For those sections of road where the predicted increase in traffic noise levels is greater than 2 dBA over existing levels, a detailed noise model has been used. This allows calculation of the actual noise levels rather than the change in noise levels, and these can be compared with criteria in the ECRTN (Table I6-2).

In accordance with the ECRTN, traffic noise impacts for Douglas Park Drive and Macarthur Road were assessed using the Project peak hour traffic volumes. Under the ECRTN, traffic noise in the early morning (i.e. before 7.00 am) is considered under the more stringent night-time criteria.

I6.3 Predicted Project Road Traffic Movements

Anticipated employee and heavy vehicle movements for two scenarios over the life of the Project were assessed in the Road Transport Assessment (Appendix K of the EA) and are shown in Table I6-3.

From Table I6-3 it can be seen that Year 3 of the Project would be the worst-case with regard to potential noise impacts at residences, because Project-related traffic movements are a higher proportion of overall traffic movements in this year.

Table I6-3 Project Road Traffic Movements per Weekday

Site	Road	Existing ICHPL Vehicle Movements	Existing Vehicle Movements ¹	Vehicle Movements Year 3 ²	Additional ICHPL Vehicle Movements Year 3	Vehicle Movements Year 10 ²	Additional ICHPL Vehicle Movements Year 10
1	Bulli-Appin Road, Appin near Kings Fall Bridge	948	8,330	8,651	865	9,156	865
2	Appin Road north of Princes Highway	1,853	10,247	11,191	805	12,771	805
3	Mount Ousley Road at Mount Pleasant	1,344	46,348	54,158	559	68,409	559
4	F6 Southern Freeway north of Princess Highway interchange at West Wollongong	1,335	78,964	85,727	568	96,979	568
5	F6 Southern Freeway south of Princes Highway near footbridge	1,335	76,421	82,957	568	93,829	568
6	Masters Road at Mount St. Thomas	950	26,539	26,539	635	26,539	635
7	Springhill Road at Coniston	566	16,172	16,504	698	17,014	698
8	Springhill Road north of Five Islands Road	384	42,025	43,581	290	46,025	290
-	Northern Distributor, Towradgi, south of Towradgi Road	9	32,452	34,405	8	37,557	8
-	F6 Southern Freeway (North)	56	42,709	50,012	35	63,373	35
10	Lawrence Hargrave Drive east of Princes Highway	9	4,443	5,404	8	7,250	8
12	Princes Highway at Bulli Pass	456	11,096	12,353	229	14,511	229
13	Princes Highway north of Bellambi Lane, Russell Vale	456	26,288	27,333	229	28,981	229
14	Narellan-Appin Road north of Appin township, south of Brian Road	150	10,003	10,181	75	10,453	75
15	Remembrance Driveway north of Finns Road	43	11,191	12,590	24	15,025	24
16	Menangle Road at Nepean River Bridge	43	6,631	7,684	24	9,586	24
17	Remembrance Driveway 0.5 km north of Regreme Road	43	3,652	3,652	24	3652	24
18	Menangle Road east of Picton-Oakdale Road	43	2,991	3,667	24	4979	24
19	Picton Road at Nepean River Bridge	129	8,282	9,507	73	11692	73
20	Remembrance Driveway 0.8 km south of Tahmoor Post Office	43	7,573	7,573	24	7573	24
21	Picton Road west of Mount Keira Road	348	11,213	12,426	429	14494	429
22	Wilton Road at Clements Creek	129	2,125	2,125	73	2125	73

Source: Traffix (2009).

¹ Includes existing ICHPL vehicle movements.² Vehicle movements include total predicted average weekday traffic movements (including existing traffic from the Appin Mine and West Cliff Colliery) and assumed background traffic growth rates provided by Traffix (2009).

16.4 Road Traffic Noise Impact Assessment

16.4.1 Arterial Roads, Sub-Arterial Roads (ECTRAN assessment period 10.00 pm to 7.00 am) and Collector Roads (ECTRAN assessment period 6.00 pm to 7.00 am)

Using the traffic count data from the Road Transport Assessment (Appendix K) with the assumptions outlined below, the predicted increase in traffic noise levels due to the Project during Years 3 and 10 is shown in Table I6-4. Predicted increases in traffic noise levels are shown rounded to the nearest 0.1 dBA.

For arterial, sub arterial and collector roads, Wilkinson Murray has adopted the most conservative possible approach by assuming:

- All ICHPL vehicle movements are heavy vehicle movements, including existing and Project movements.
- Existing traffic is assumed to be all light vehicles (except for the mine traffic component).

Table I6-4 shows increases in L_{Aeq} traffic noise levels in Years 3 and 10 of the Project. The maximum predicted increase is 1.3 dBA, which is within the relevant criteria for arterial, sub arterial and collector roads (Table I6-2), and is considered acceptable.

Table I6-4 Predicted Project Increase in Traffic Noise Levels

Site	Road	ECTRAN Classification (EPA, 1999)	Predicted increase in L_{Aeq} Noise Level Compared with Existing Vehicle Movements (dBA)	
			Year 3	Year 10
1	Bulli-Appin Road, Appin near Kings Fall Bridge	Sub-Arterial	1.3	1.0
2	Appin Road north of Princes Highway	Sub-Arterial	0.9	0.5
3	Mount Ousley Road at Mount Pleasant	Arterial	0.2	0.2
4	F6 Southern Freeway north of Princess Highway interchange at West Wollongong	Arterial	0.2	0.1
5	F6 Southern Freeway south of Princes Highway near footbridge	Arterial	0.2	0.1
6	Masters Road at Mount St. Thomas	Arterial	0.5	0.5
7	Springhill Road at Coniston	Arterial	0.9	0.8
8	Springhill Road north of Five Islands Road	Arterial	0.2	0.2
-	Northern Distributor, Towradgi, south of Towradgi Road	Arterial	0.0	0.0
-	F6 Southern Freeway (North)	Arterial	0.0	0.0
10	Lawrence Hargrave Drive east of Princes Highway	Sub- Arterial	0.0	0.0
12	Princes Highway at Bulli Pass	Arterial	0.4	0.3
13	Princes Highway north of Bellambi Lane, Russell Vale	Arterial	0.2	0.2
14	Narellan-Appin Road north of Appin township, south of Brian Road	Sub-Arterial	0.2	0.2
15	Remembrance Driveway north of Finns Road	Sub-Arterial	0.1	0.0
16	Menangle Road at Nepean River Bridge	Collector	0.1	0.1
17	Remembrance Driveway 0.5 km north of Regreme Road	Collector	0.2	0.2
18	Menangle Road east of Picton-Oakdale Road	Collector	0.2	0.1
19	Picton Road at Nepean River Bridge	Collector	0.2	0.2
20	Remembrance Driveway 0.8 km south of Tahmoor Post Office	Collector	0.1	0.1
21	Picton Road west of Mount Keira Road	Sub-Arterial	0.7	0.6
22	Wilton Road at Clements Creek	Collector	0.7	0.56

I6.4.2 Douglas Park Drive and Macarthur Road

No daily traffic data are available for Douglas Park Drive or Macarthur Road (Figure I6-1). Peak hour traffic survey data from Traffix (2009) was compared with additional traffic generated by the Project. Project traffic on these roads is predominantly associated with light vehicle movements for shift changes. Therefore the Project would result in traffic noise impacts on these roads predominantly during shift changes along with minor heavy vehicle deliveries associated with the Project. No trucking associated with delivery of coal occurs on Douglas Park Drive or Macarthur Road.

The Road Transport Assessment assessed the worst case traffic impacts over peak hours for two different shift change options. As such, this traffic noise assessment has assessed the predicted increase in traffic noise for both shift change options, below:

- 1/3 of the workforce changeover at:
 - 8.00 am to 9.00 am;
 - 4.00 pm to 5.00 pm;
 - 12.00 am to 01.00 am; or
- 1/2 of the workforce changeover at 5.00 am to 6.00 am and 5.00 pm to 6.00 pm.

A workforce changeover at 8.00 am to 9.00 am would require the replacement workforce to arrive between 7.00 am and 8.00 am. For conservatism, the additional Project workforce is assessed against the lower of the two existing traffic volumes for these hours. The results are shown in Tables I6-5 and I6-6, below.

Table I6-5 Predicted Increase in Traffic Noise Levels at Douglas Park Drive and Macarthur Road (Three Shift Option)

Site	Road	ECRTN Classification	ECRTN Assessment Period	Existing Traffic (Assessment Period) ¹		Year 3 Additional Traffic (Assessment Period) ²		Increase In Traffic Noise Level (dBA) – Year 3	Year 10 Additional Traffic (Assessment Period) ²		Increase in Traffic Noise Level (dBA) – Year 10
				LV	HV*	LV	HV		LV	HV	
-	Douglas Park Drive	Collector	7.00 am – 8.00 am	152	15	136	8	2.5	136	8	2.5
-	Douglas Park Drive	Collector	15.00 pm - 16.00 pm	164	16	136	8	2.4	136	8	2.4
-	Douglas Park Drive	Collector	11.00 pm - 12.00 am	13	1	136	0	9.1	136	0	9.1
-	Macarthur Road	Collector	7.00 am – 8.00 am	164	16	65	4	1.2	65	4	1.2
-	Macarthur Road	Collector	15.00 pm - 16.00 pm	176	18	65	4	1.1	65	4	1.1
-	Macarthur Road	Collector	11.00 pm - 12.00 am	14	1	65	0	6.1	65	0	6.1

¹ Peak hour survey data from Traffix (2009) scaled to hourly distributions observed from surveyed Wilton Road data (Transport and Traffic Associates, 2008 in Traffix [2009]).

² From Traffix (2009) estimated peak hour movements.

* Based on vehicle classification data for nearby Wilton Road (i.e. approximately 10% Heavy Vehicles).

LV = light vehicle.

HV = heavy vehicle.

Table I6-6 Predicted Increase in Traffic Noise Levels at Douglas Park Drive and Macarthur Road (Two Shift Option)

Site	Road	ECRTN Classification	ECRTN Assessment Period	Existing Traffic (Assessment Period) ¹		Year 3 Additional Traffic (Assessment Period) ²		Increase In Traffic Noise Level (dBA) – Year 3	Year 10 Additional Traffic (Assessment Period) ²		Increase in Traffic Noise Level (dBA) – Year 10
				LV	HV*	LV	HV		LV	HV	
-	Douglas Park Drive	Collector	4.00 am – 5.00 am	21	2	204	0	8.5	204	0	8.5
-	Douglas Park Drive	Collector	5.00 pm – 6.00 pm	169	17	204	8	2.9	204	8	2.9
-	Macarthur Road	Collector	4.00 am – 5.00 am	22	2	98	0	5.7	98	0	5.7
-	Macarthur Road	Collector	5.00 pm – 6.00 pm	180	18	98	4	1.5	98	4	1.5

¹ Peak hour survey data from Traffix (2009) scaled to hourly distributions observed from surveyed Wilton Road data (Transport and Traffic Associates, 2008).

² From Traffix (2009) estimated peak hour movements.

* Based on vehicle classification data for nearby Wilton Road (i.e. approximately 10% Heavy Vehicles).

The calculated change in road traffic noise level due to the Project exceeds the ECRTN 2 dBA allowance for Douglas Park Drive and Macarthur Road.

The offset distances at which ECRTN criteria would be achieved were calculated for the relevant sections of road under assessment using procedures based on the CoRTN prediction algorithms. The standard prediction procedures were modified in the following way:

- L_{Aeq} values were calculated from the L_{A10} values predicted by the CoRTN algorithms using the well-validated approximation $L_{Aeq} = L_{A10} - 3$.

This relationship between L_{Aeq} and L_{A10} has been considered acceptable by the DECC for previous similar road traffic noise assessments.

Table I6-7 shows the calculated offset distance at which appropriate noise criteria would be met for the existing, Year 3 and Year 10 of the Project for the three shift option.

Table I6-7 Offset Distance to Meet ECRTN Criteria (Three Shift Option)

Site	Road	Type	ECRTN Assessment Period	ECRTN Criterion (dBA) $L_{Aeq}(1 \text{ hour})$	Offset Distance to Meet ECRTN Criterion (m)		
					Existing	Project Year 3	Project Year 10
-	Douglas Park Drive	Collector	11.00 pm - 12.00 am	55	17	105	105
-	Douglas Park Drive	Collector	7.00 am – 8.00 am	60	60	95	95
-	Douglas Park Drive	Collector	3.00 pm – 4.00 pm	60	60	95	95
-	Macarthur Road	Collector	11.00 pm - 12.00 am	55	12	45	45
-	Macarthur Road	Collector	7.00 am – 8.00 am	60	45	60	60
-	Macarthur Road	Collector	3.00 pm - 4.00 pm	60	50	60	60

Table I6-8 shows the calculated offset distance at which appropriate noise criteria would be met for the existing and Years 3 and 10 of the Project, for the two shift option.

Table I6-8 Offset Distance to Meet ECRTN Criteria (Two Shift Option)

Site	Road	Type	ECRTN Assessment Period	ECRTN Criterion (dBA) L _{Aeq} (1 hour)	Offset Distance to meet ECRTN Criterion (m)		
					Existing	Project Year 3	Project Year 10
-	Douglas Park Drive	Collector	4.00 am – 5.00 am	55	28	150	150
-	Douglas Park Drive	Collector	5.00 pm – 6.00 pm	60	65	110	110
-	Macarthur Road	Collector	4.00 am – 5.00 am	55	20	65	65
-	Macarthur Road	Collector	5.00 pm - 6.00 pm	60	50	65	65

I6.4.3 Summary

- Exceedances of the allowable 2 dBA increase under the ECRTN are predicted at two roads, namely Douglas Park Drive and Macarthur Road, (Tables I6-5 and I6-6).
- For the three shift option, the offset distance to meet compliance with the ECRTN traffic noise goals for Douglas Park Drive would increase (relative to existing noise levels) from 60 m to 105 m and for Macarthur Road would increase from 50 m to 60 m.
- For the two shift option, the offset distance to meet compliance with the ECRTN traffic noise goals for Douglas Park Drive would increase (relative to existing noise levels) from 65 m to 150 m and for Macarthur Road would increase from 50 m to 65 m.

I6.5 Road Vibration

Vibration caused by road traffic would be assessed in terms of criteria for human comfort using a Vibration Dose Value (VDV), as defined in the DECC document *Assessing Vibration: A Technical Guideline* (DECC, 2006). As a conservative “screening” test, for night-time vibration at residences that document suggests a preferred vibration level of 0.14 mm/s root mean square (rms), and a maximum value of 0.28 mm/s. (These actually represent the values that would be acceptable if vibration were present continuously throughout the night.) Note that this criterion is significantly more stringent than criteria for building damage, even for the most susceptible structures.

Typical vibration levels from heavy vehicles on a well-maintained road, at 10 to 20 m setback distance, are well below the relevant human comfort ‘screening test’ level. Higher levels would be found only where the road contains potholes or other significant discontinuities. In these cases, maintenance of the road surface would be the appropriate response.

I6.6 Road Transport Noise and Vibration Management Measures

It is recommended that ICHPL implement the following transport noise and transport vibration management measures:

- heavy vehicle deliveries should be scheduled during daytime hours, where practicable;
- encourage the mine operational workforce and Project construction workforce to car-pool and minimise workforce related light vehicle movements; and
- prompt notification of local government authorities or the RTA regarding any noticeable deterioration in road pavement condition.

17 CONCLUSIONS

17.1 General

- The Appin Mine and West Cliff Colliery are existing large industrial facilities that have been operating in the local area for an extended period. Suburban and rural receivers are in some cases located in close proximity to these existing industrial facilities.
- ICHPL has undertaken a number of noise management improvements at the Appin Mine in recent years to improve noise performance.
- Review of ICHPL's complaints register indicates that noise complaints are very infrequent. Only eight noise/vibration complaints related to pit top activities or ventilation fans have been received over the past seven years.
- Intrusive project specific noise levels have been determined based on background noise surveys (RBL plus 5 dBA) in accordance with INP methodology.
- Wilkinson Murray has assessed two noise scenarios, existing/approved operations and Project worst case operations.
- Noise levels have been modelled under a varied set of meteorological conditions. Calculations indicate that under neutral meteorological conditions noise levels at receivers are greatly reduced in most cases, relative to noise levels under adverse meteorological conditions.

17.2 Existing/Approved Operational Noise

- Modelling results indicate that noise levels from existing/approved operations under adverse meteorological conditions exceed the project specific noise levels at a number of receivers around the Appin West and Appin East pit tops and at the Appin No. 1 and No. 2 shafts and the Appin No. 3 shaft. Most exceedances at these receivers are in the range of 1 to 4 dBA.
- For existing/approved operations, 132 of the receivers modelled are predicted to exceed the project specific intrusiveness noise levels under adverse meteorological conditions. From review of noise contours and detailed aerial photography, it is estimated that an additional 39 residences not specifically included as receivers in Appin would also marginally (by approximately 1-2 dBA) exceed night-time project specific intrusiveness noise levels under adverse meteorological conditions.
- Cumulative noise emissions have also been calculated for comparison with the INP amenity criteria. In summary for the existing/approved operations:
 - some 113 privately-owned residential receivers exceed the recommended night-time amenity criteria for suburban and rural areas;
 - some 16 privately-owned residential receivers exceed the INP's night-time amenity recommended maximum noise levels, for suburban and rural areas; and
 - one location (land zoned open space under the LEP near the West Cliff Coal Wash Emplacement) exceeds the recommended amenity criterion for passive recreational areas when in use.

17.3 Project Construction Noise

- Project construction activities at the surface would be undertaken generally during daytime hours only.
- Construction noise levels would be a function of the operational sound power levels of the construction fleet proposed at each pit top/ventilation shaft location. The daytime operational sound power levels for operations at each pit top/ventilation shaft are higher than the sound power levels for the proposed Project construction fleets.
- The *Interim Construction Noise Guideline* (DECC, 2009) is applicable, with the recommended acceptable noise levels being the RBL plus 10 dBA, which is less stringent than the intrusiveness criteria which apply to operational noise.
- Given operational noise levels are assessed under the more stringent intrusiveness criteria and that construction activities would be undertaken generally during daytime hours (when people are generally less sensitive to intrusive noise) further assessment of noise levels occurring during Project construction is not considered necessary.

17.4 Project Operational Noise

- The Project would extend the life of the Appin Mine and West Cliff Colliery by some 30 years.
- Following analysis of modelling results for the existing/approved operations, an initial noise reduction investigation was undertaken and additional noise reduction measures were identified at Appin East pit top (operational improvements) and at the Appin No. 1 and No. 2 and the Appin No. 3 shafts (installation of quieter fans). These measures have been adopted by ICHPL and have been included in the Project noise modelling.
- The installation of best practice noise reduced fans at the Appin No. 3 and Appin No. 1 and No. 2 shafts as a component of Project upgrades would reduce the number of receivers where noise exceedances are predicted.
- The noise improvement measures at Appin East pit top would also result in a net noise reduction for the majority of Appin receivers. A limited number of receivers on the eastern fringe of Appin are predicted to experience a slight increase in noise due to the proximity of the West Cliff Stage 4 Coal Wash Emplacement. Overall, the number of receivers where noise exceedances are predicted would be reduced by the Project.
- These improvements in the noise emissions would result in the following predicted improvements in compliance with applicable intrusiveness and amenity noise criteria:
 - forty receivers that exceed the relevant amenity criteria for the existing/approved scenario would comply under the Project scenario (i.e. non-compliances reduced from approximately 113 to 73 receivers); and
 - fourteen receivers that exceed project specific intrusiveness noise levels for the existing/approved scenario comply under the Project scenario. In addition, some 39 residences (not specifically included as receivers) that the existing/approved contours indicate would experience marginal exceedances of project specific intrusiveness noise levels would comply for the Project. In total, the number of exceedances of intrusiveness criteria would be reduced from approximately 171 to 118 by the Project.

17.5 Noise Reduction Programme

- ICHPL would implement a noise reduction programme with the objective of identifying additional reasonable and feasible noise mitigation measures for consideration over the life of the Project. ICHPL has commenced investigations in relation to the noise reduction programme.

17.6 Blasting

- Vibration levels due to Project underground blasting are predicted to be within relevant guidelines at the surface.

17.7 Road Traffic Noise

- Increases in traffic noise levels associated with the Project are generally below the allowable 2 dBA increase (including coal haulage routes on public roads). However, exceedances of the allowable 2 dBA increase under the ECRTN are predicted for the Project at two roads, namely Douglas Park Drive and Macarthur Road due to workforce shift movements. Traffic noise analysis included consideration of two workforce shift configurations, two and three shifts daily.
- Exceedances of the allowable 2 dBA increase under the ECRTN are predicted at two roads, namely Douglas Park Drive and Macarthur Road, (Tables I6-5 and I6-6).
- For the three shift option, the offset distance to meet compliance with the ECRTN traffic noise goals for Douglas Park Drive would increase (relative to existing noise levels) from 60 m to 105 m and for Macarthur Road would increase from 50 m to 60 m.
- For the two shift option, the offset distance to meet compliance with the ECRTN traffic noise goals for Douglas Park Drive would increase (relative to existing noise levels) from 65 m to 150 m and for Macarthur Road would increase from 50 m to 65 m.

17.8 Road Transport Vibration

- Typical vibration levels from heavy vehicles on a well-maintained road, at 10 to 20 m setback distance, are well below the relevant human comfort 'screening test' level. Higher vibration levels would be found only where the road contains potholes or other significant discontinuities. In these cases, maintenance of the road surface would be the appropriate response.

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Note

All materials specified by Wilkinson Murray Pty Limited have been selected solely on the basis of acoustic performance. Any other properties of these materials, such as fire rating, chemical properties etc. should be checked with the suppliers or other specialised bodies for fitness for a given purpose.

Quality Assurance

We are committed to and have implemented AS/NZS ISO 9001:2000 "Quality Management Systems – Requirements". This management system has been externally certified and Licence No. QEC 13457 has been issued.

AAAC

This firm is a member firm of the Association of Australian Acoustical Consultants and the work here reported has been carried out in accordance with the terms of that membership.

Version	Status	Date	Prepared by	Checked by
A	Draft	27 May 2009	William Chan	Rob Bullen
B	Final	31 July 2009	William Chan	Rob Bullen

ATTACHMENT IA

GLOSSARY OF TERMS

GLOSSARY OF TERMS

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

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

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

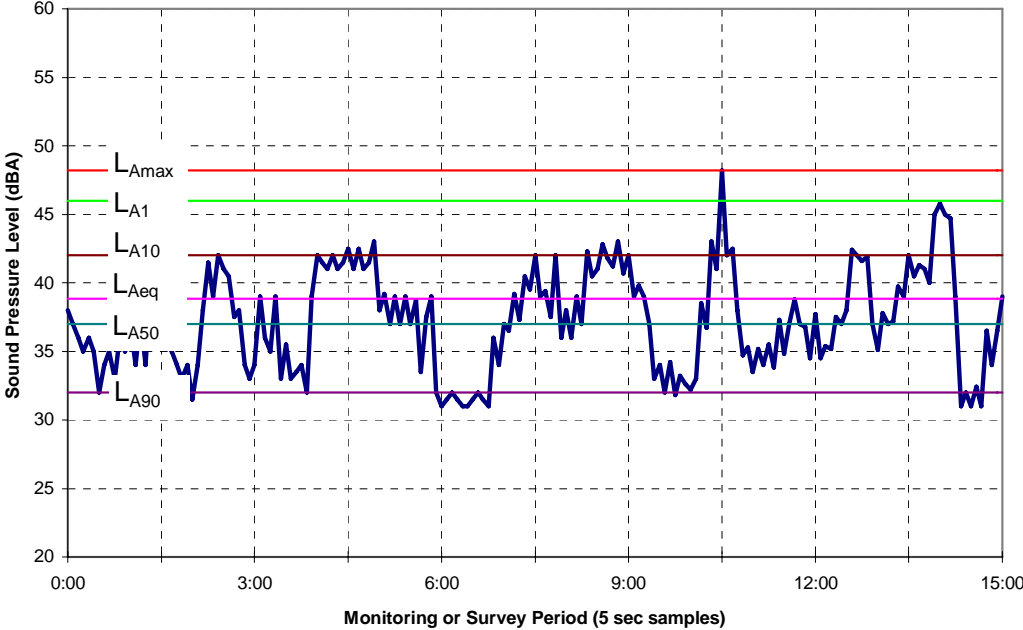
L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

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

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

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

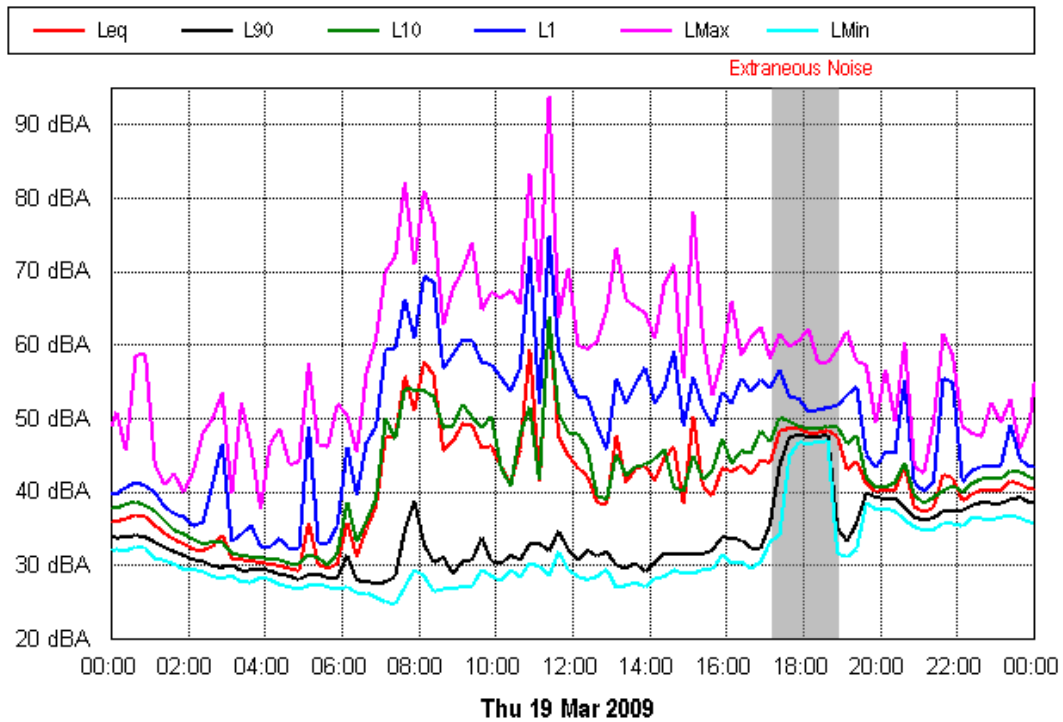
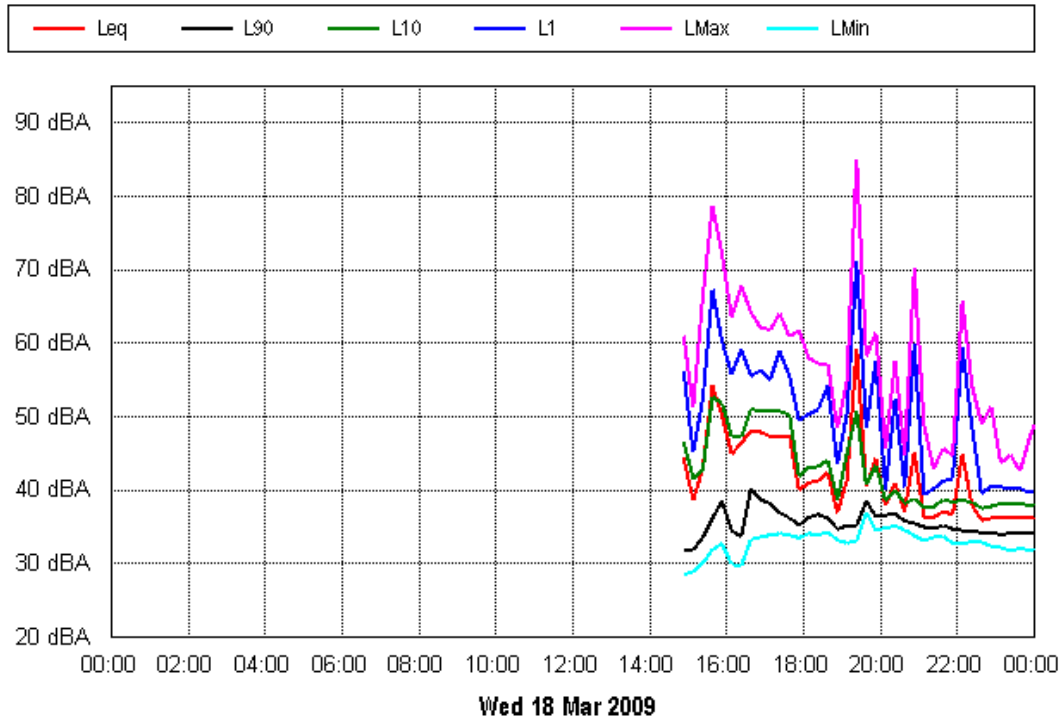
RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night-time.



ATTACHMENT IB
NOISE LOGGER GRAPHS

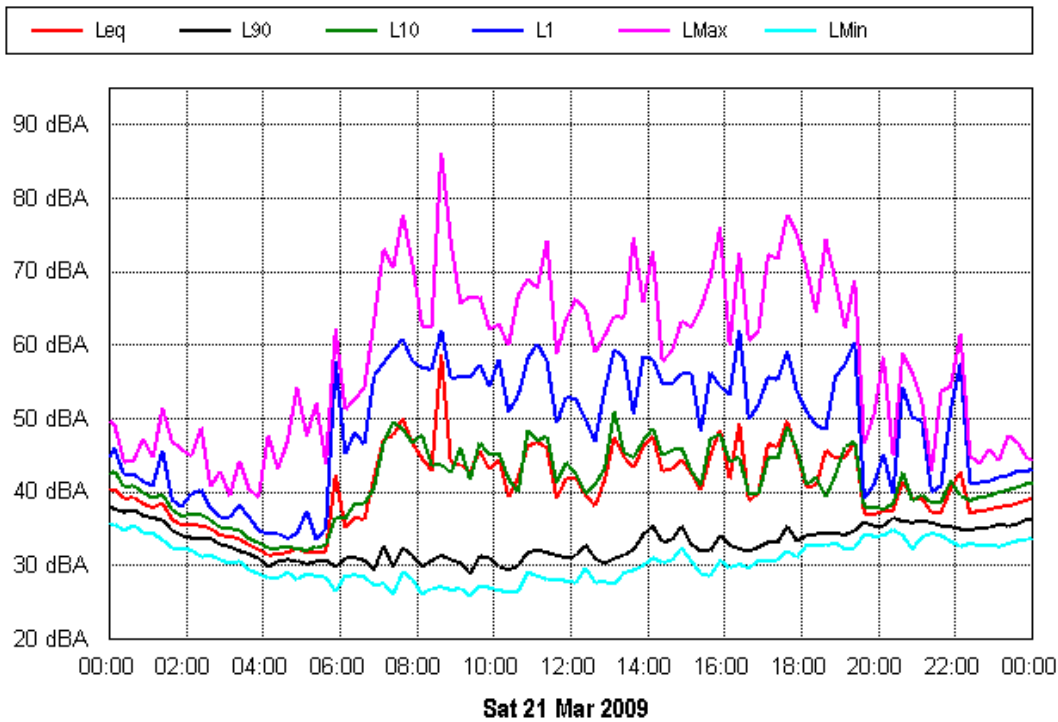
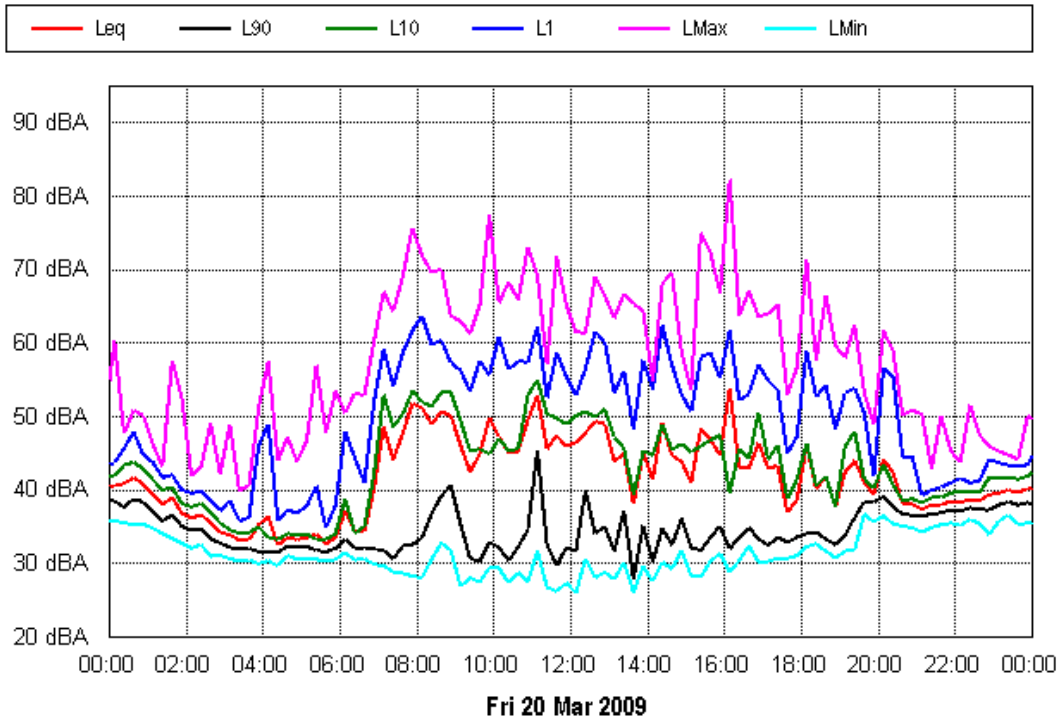
Location: L07 - Andoran Stud Estate, Darkes Forest Rd

Data shaded: Extraneous; Wind; Rain



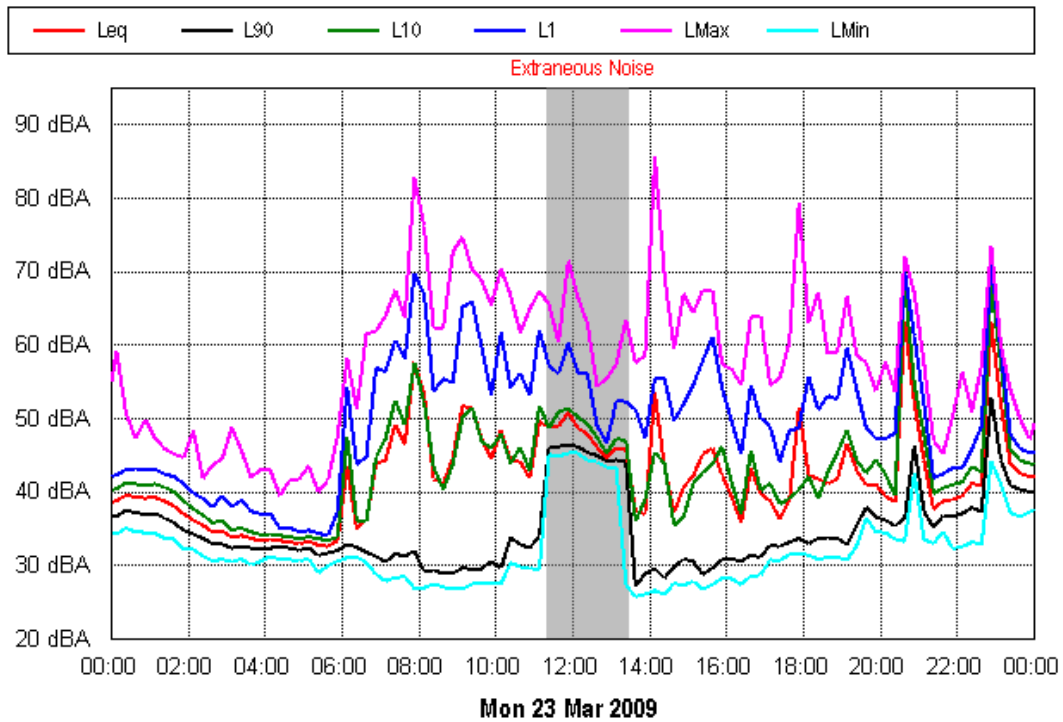
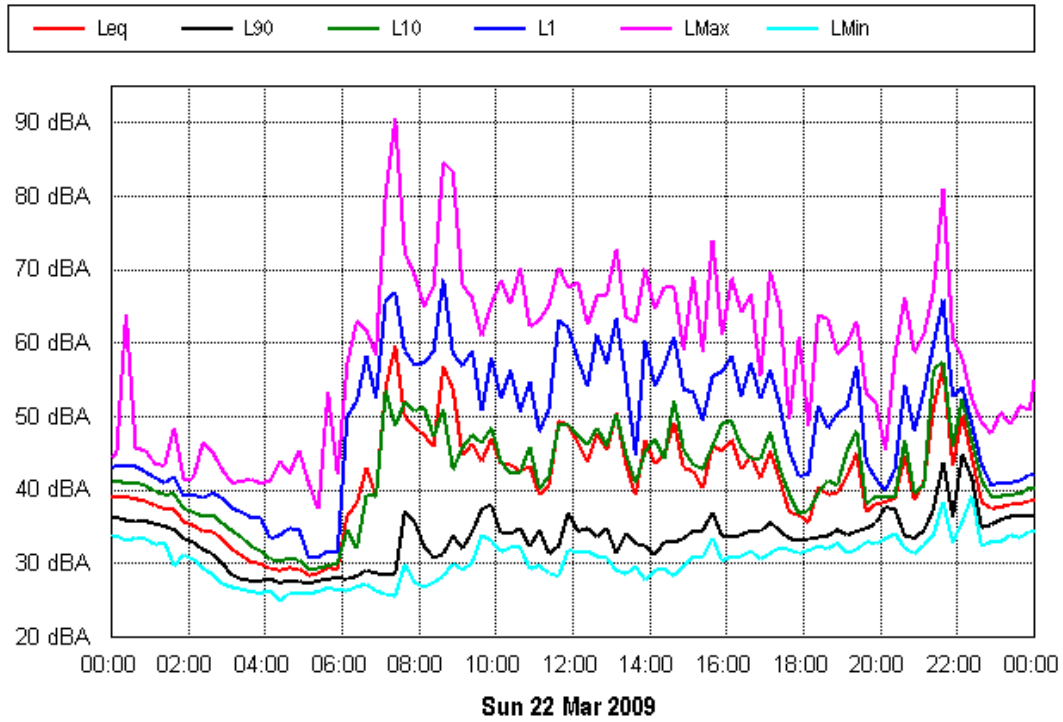
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Data shaded: Extraneous; Wind; Rain



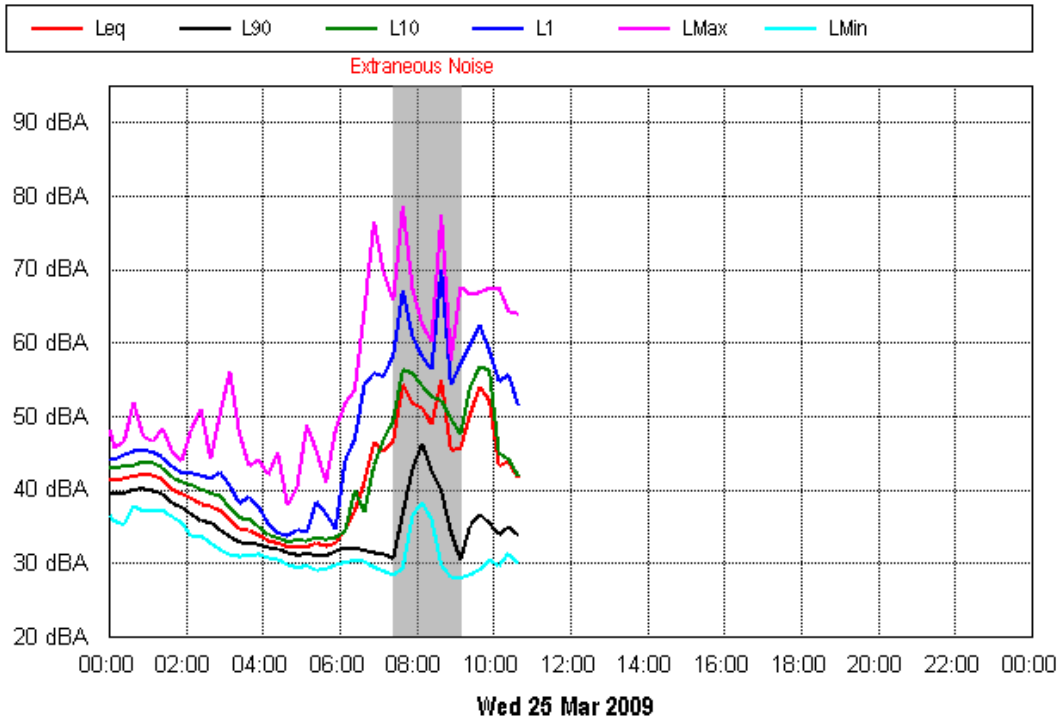
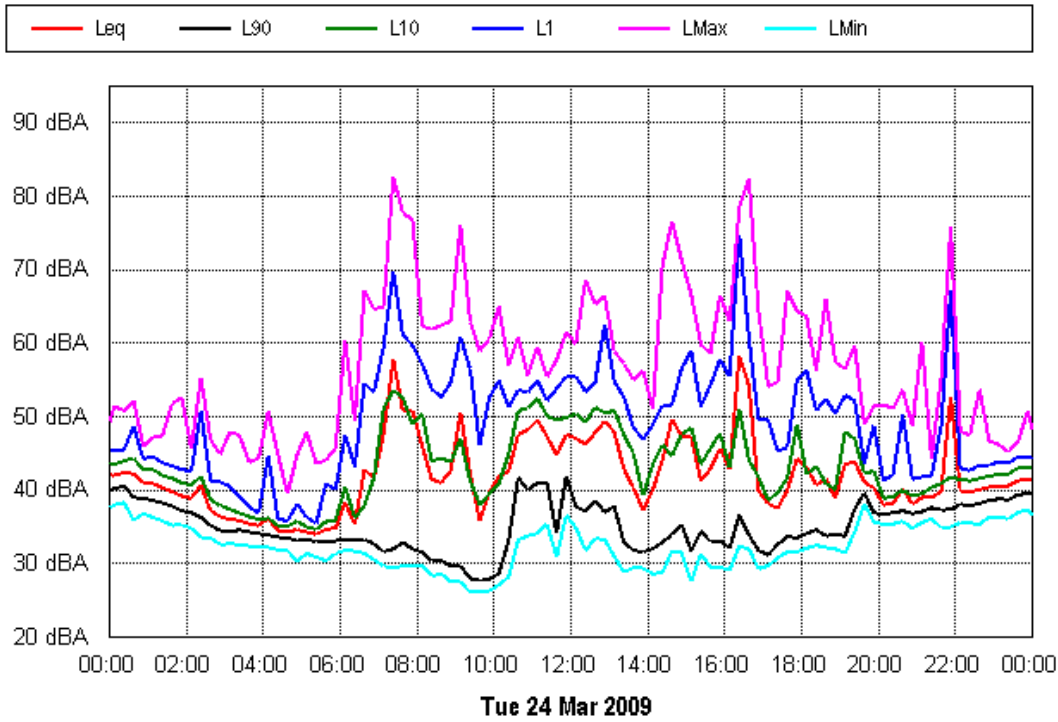
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Data shaded: Extraneous; Wind; Rain



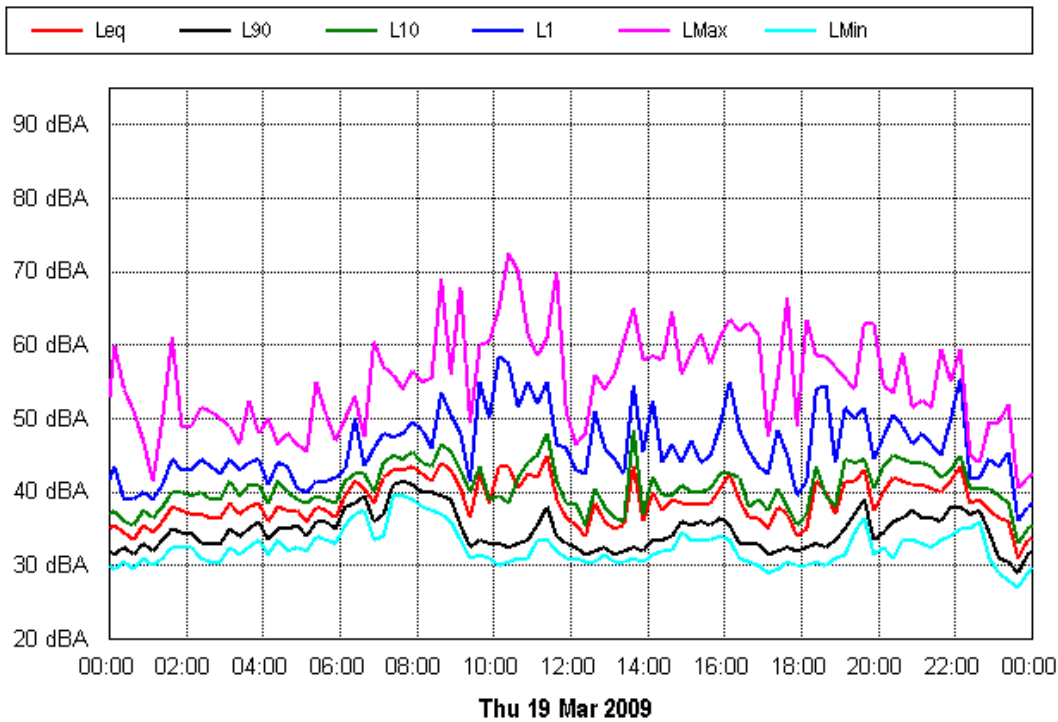
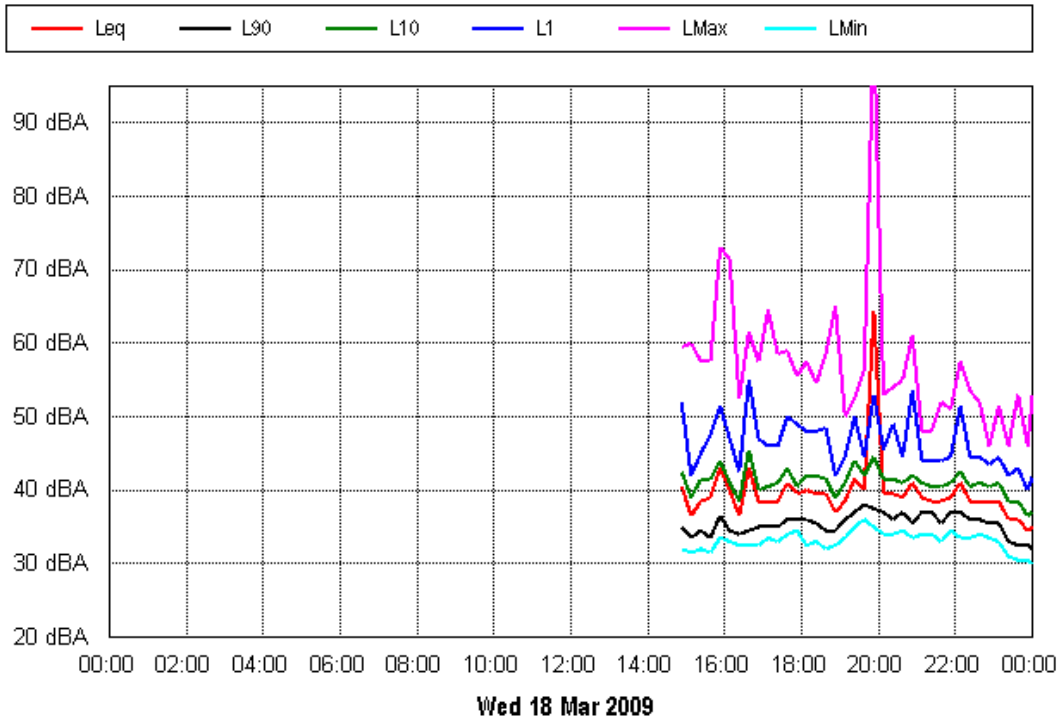
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Data shaded: Extraneous; Wind; Rain



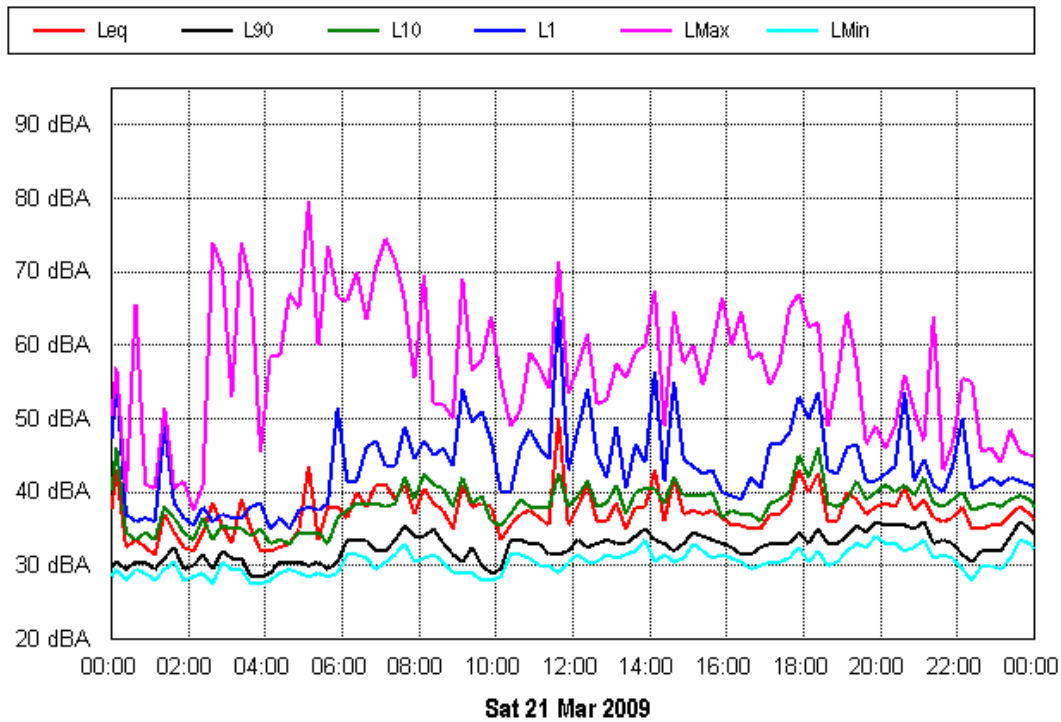
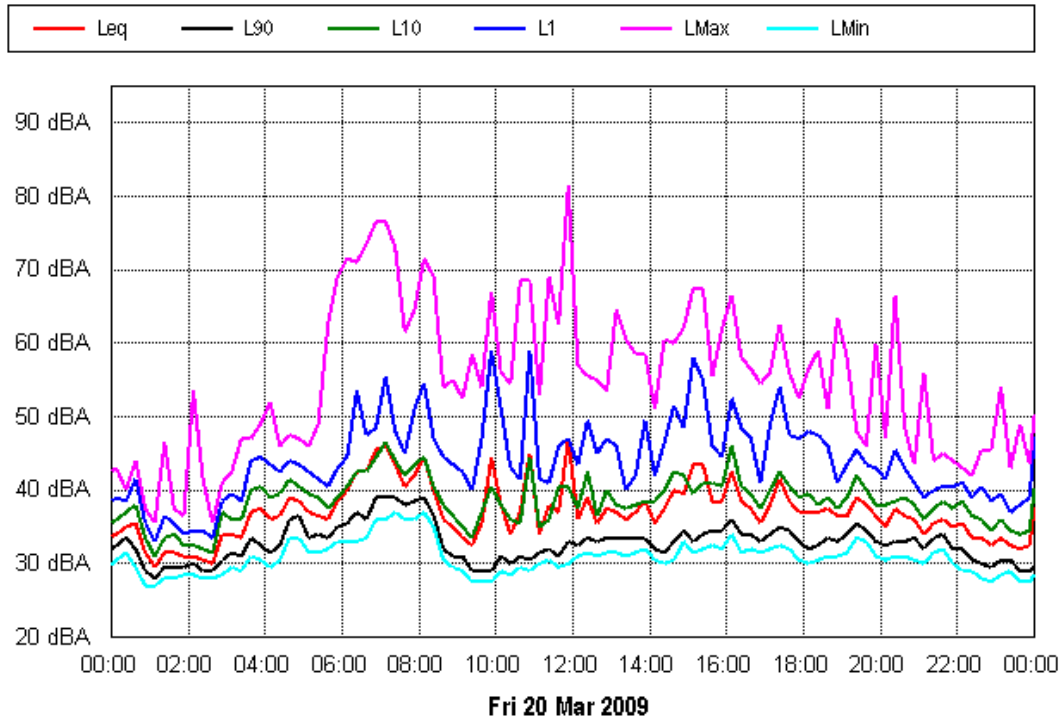
Location: L06 - Cataract Scout Park

Data shaded: Extraneous; Wind; Rain



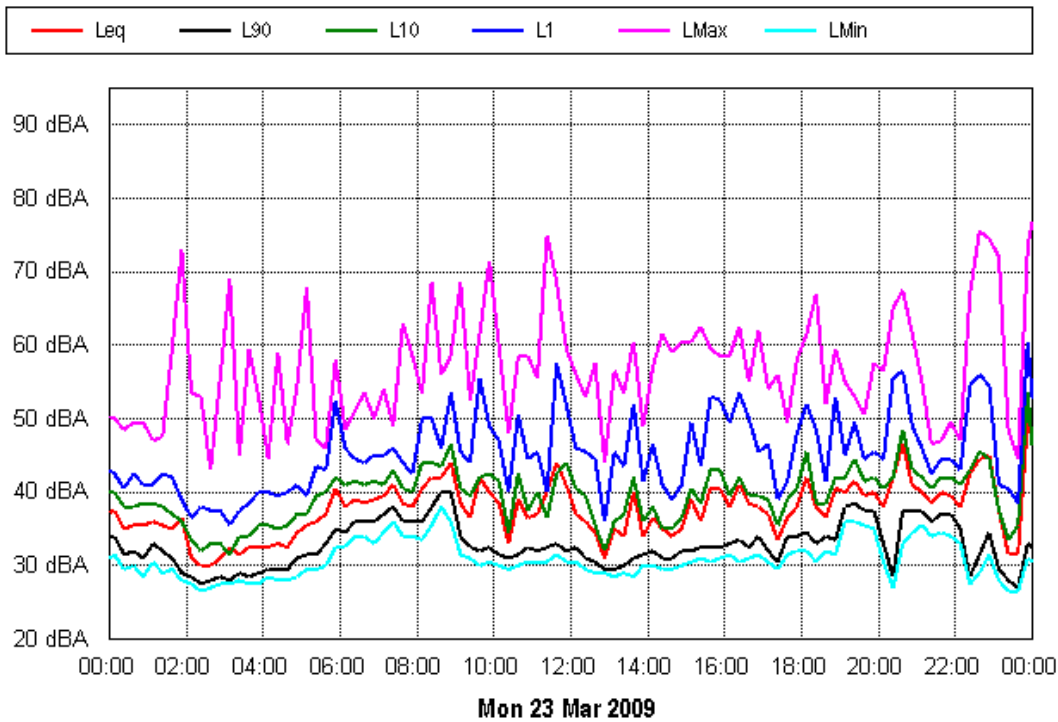
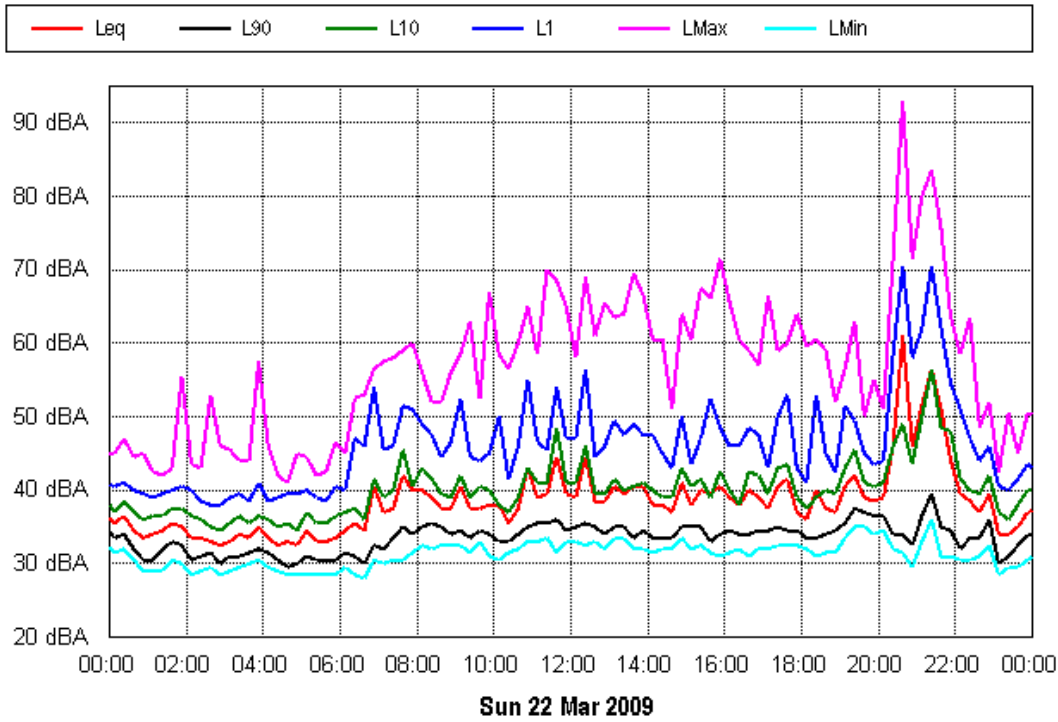
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Data shaded: Extraneous; Wind; Rain



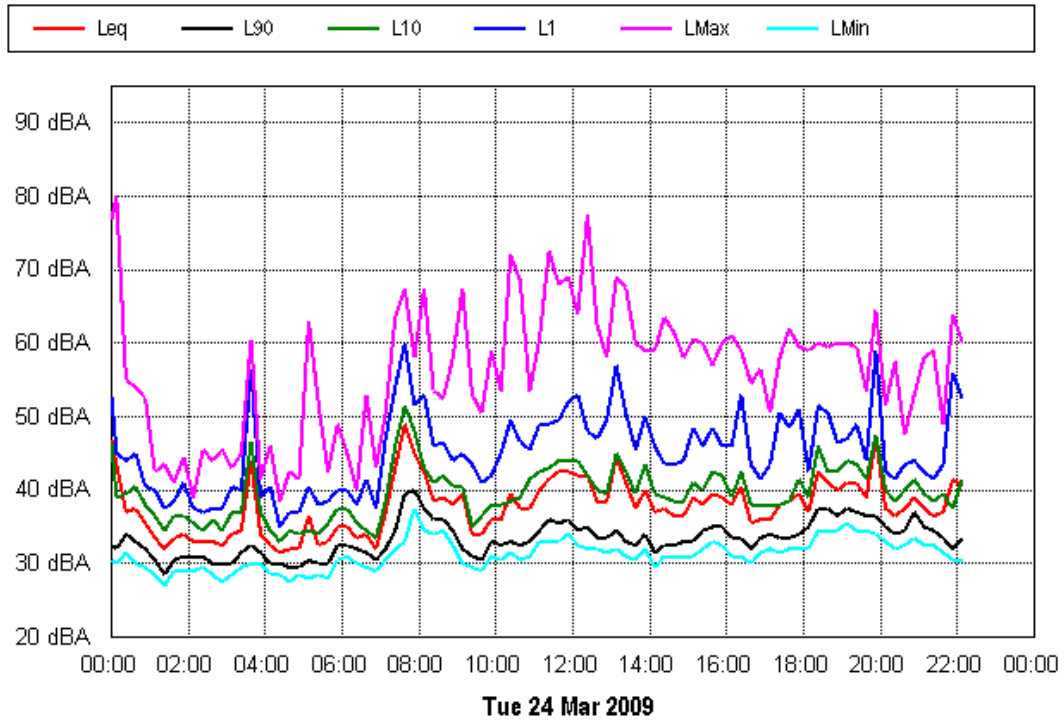
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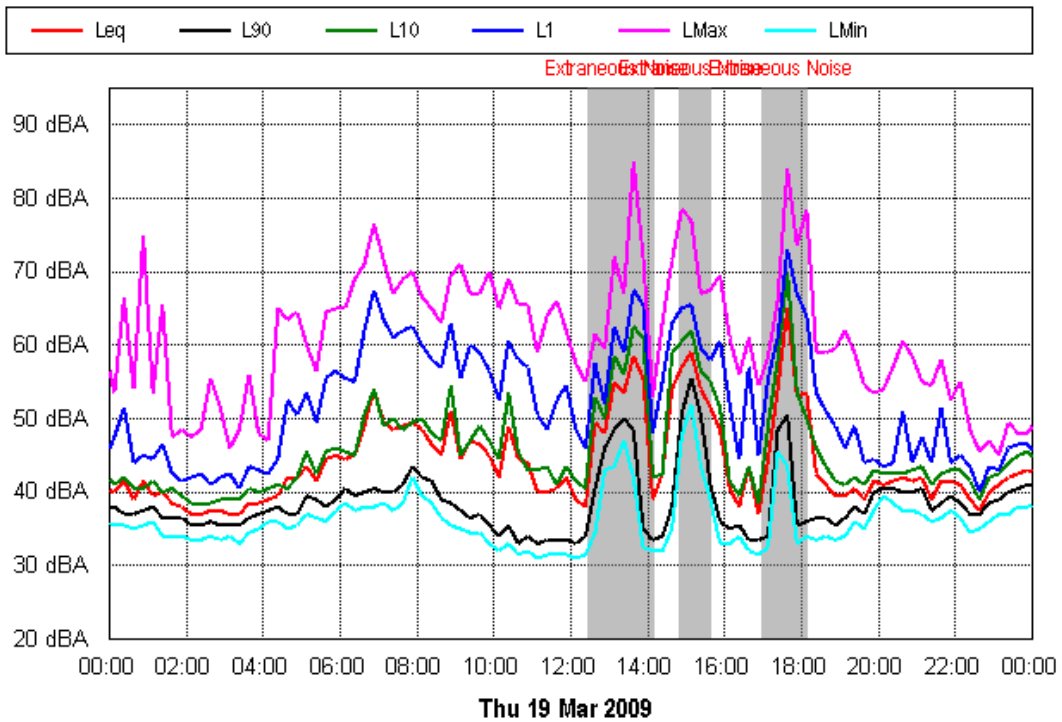
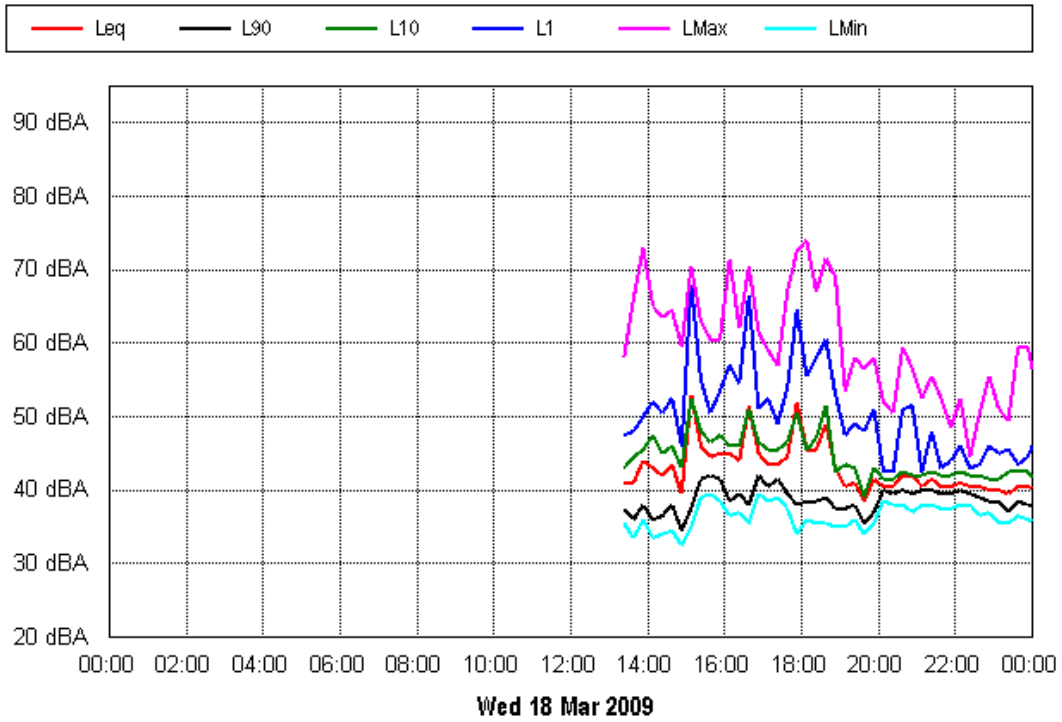
Location: L06 - Cataract Scout Park

Data shaded: Extraneous; Wind; Rain



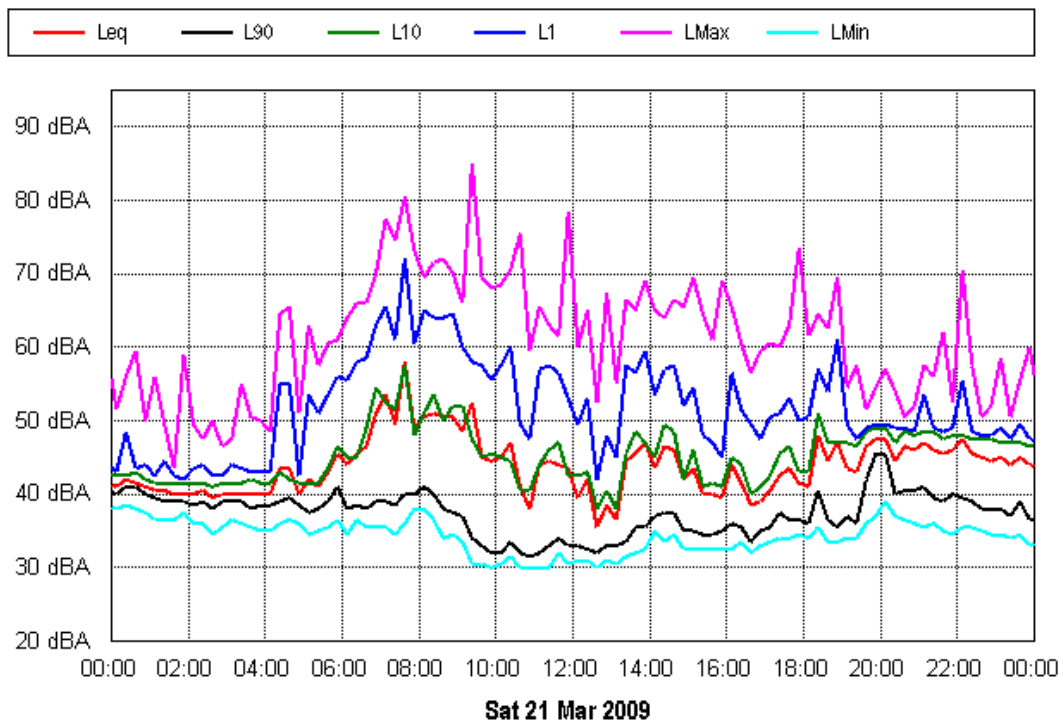
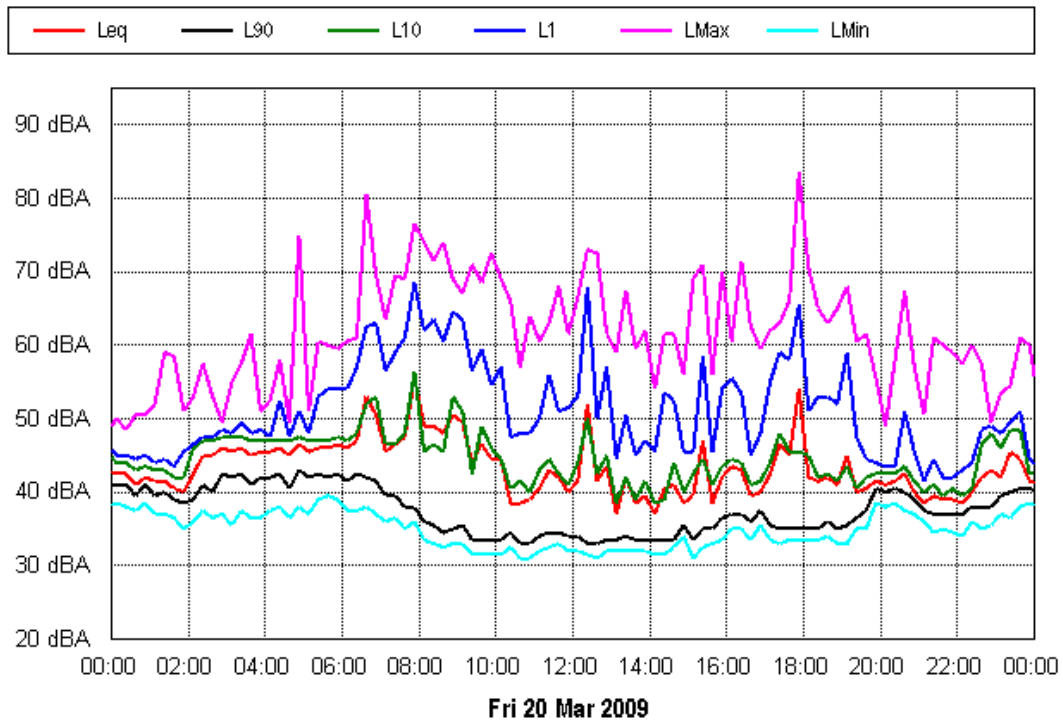
Location: L02 - 100 Ashwood Rd

Data shaded: Extraneous; Wind; Rain



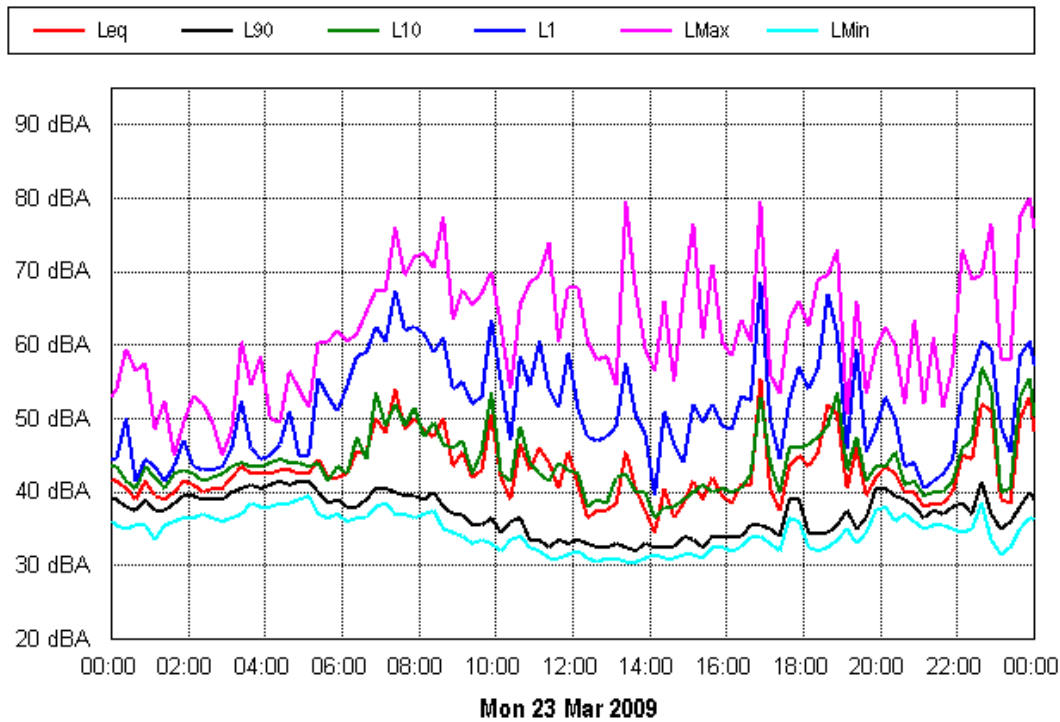
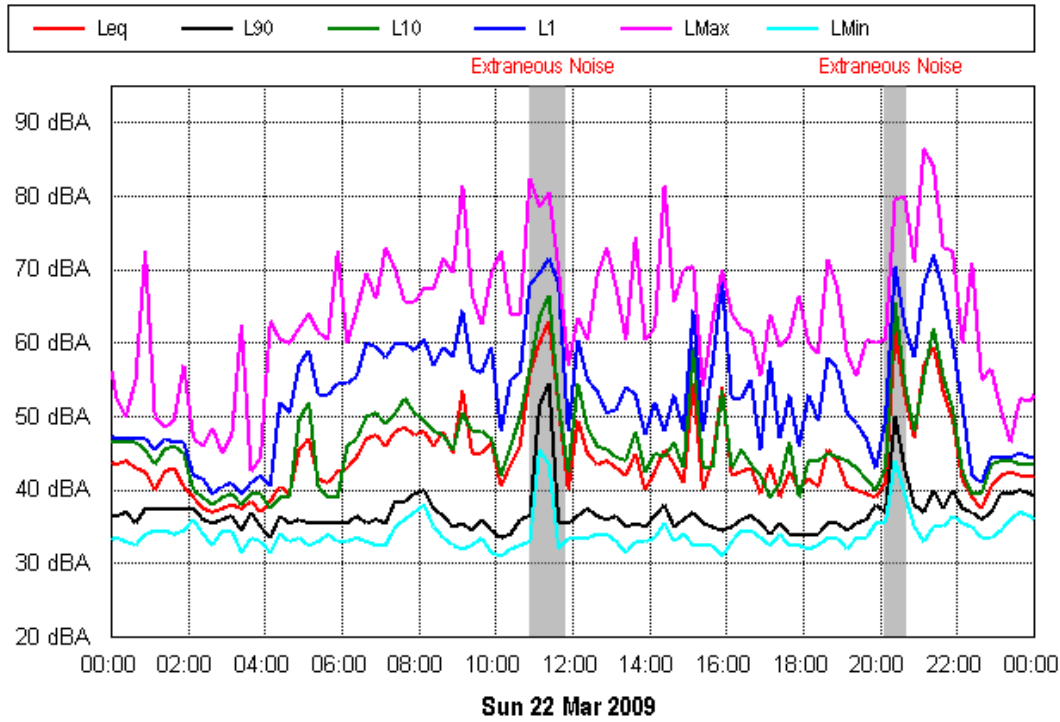
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Data shaded: Extraneous; Wind; Rain



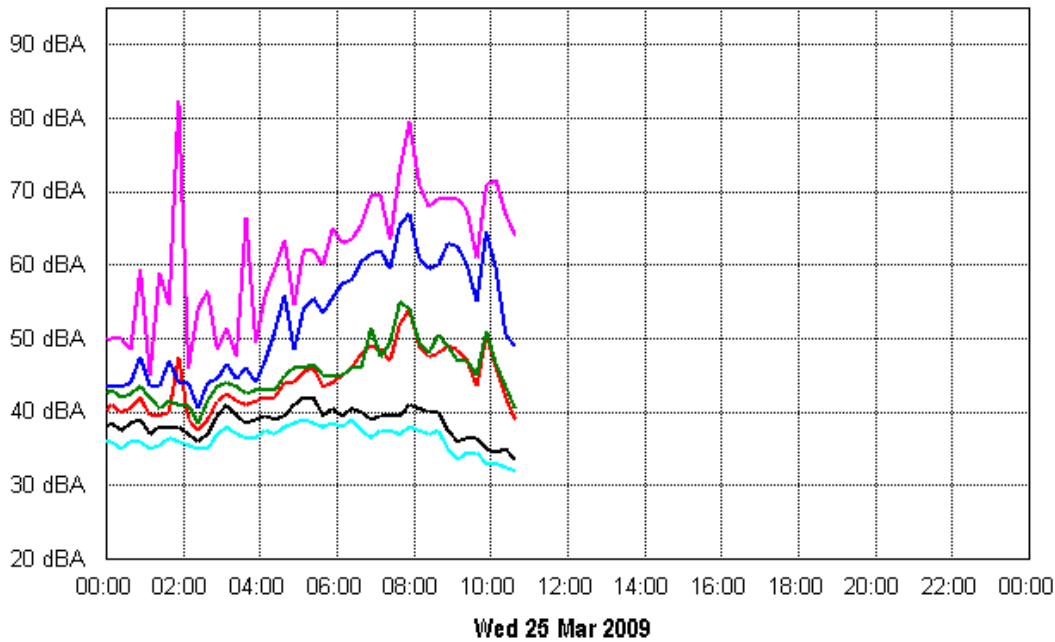
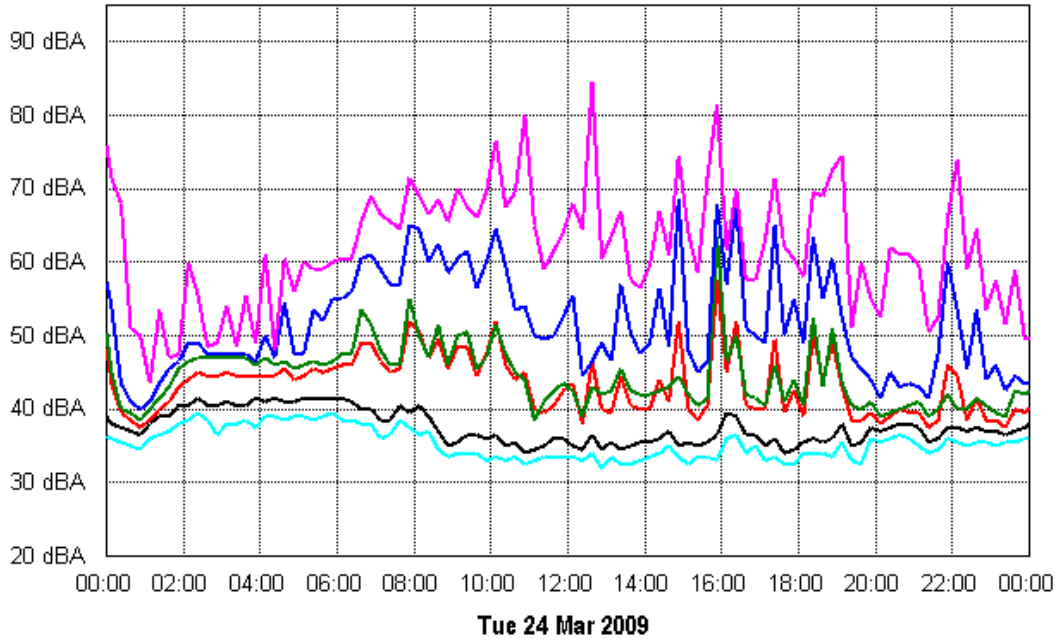
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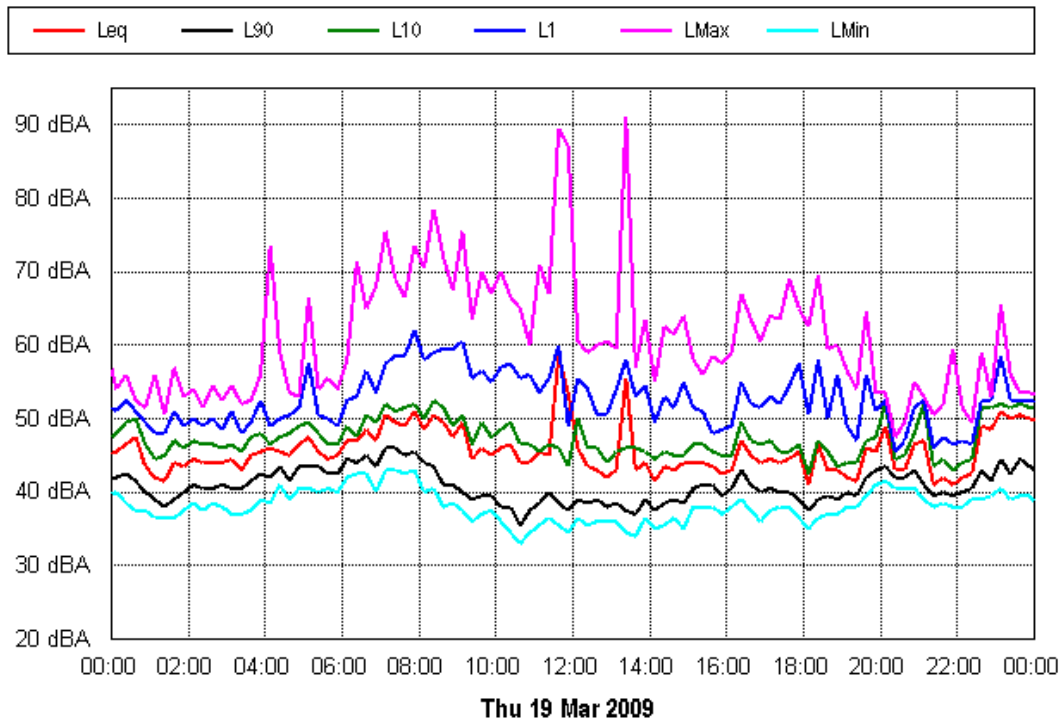
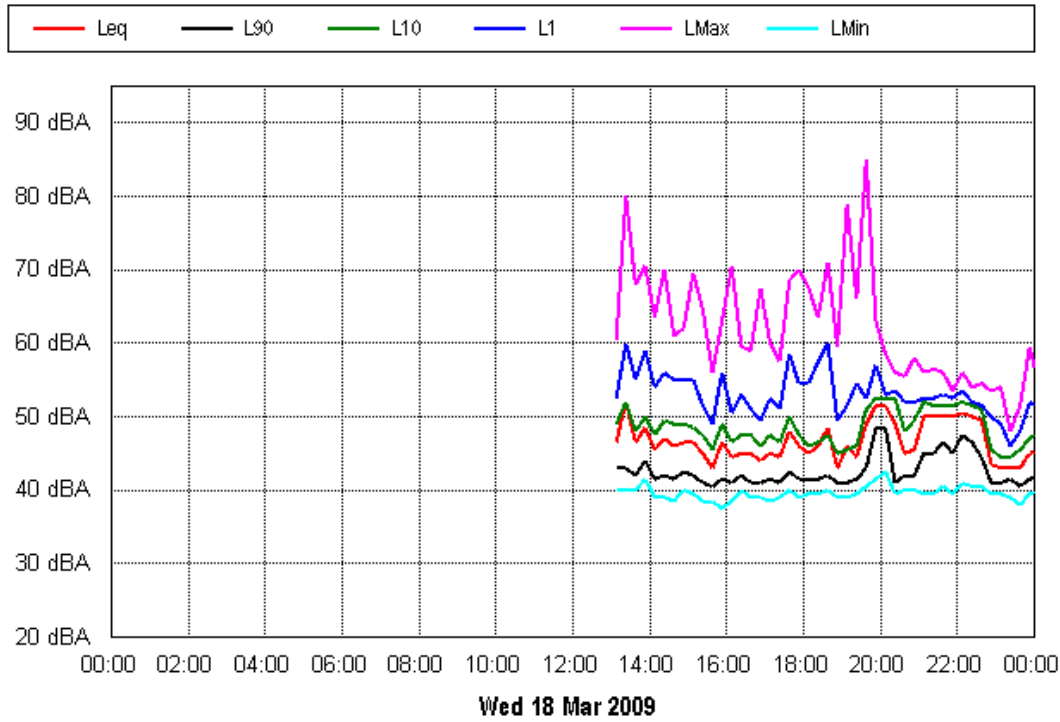
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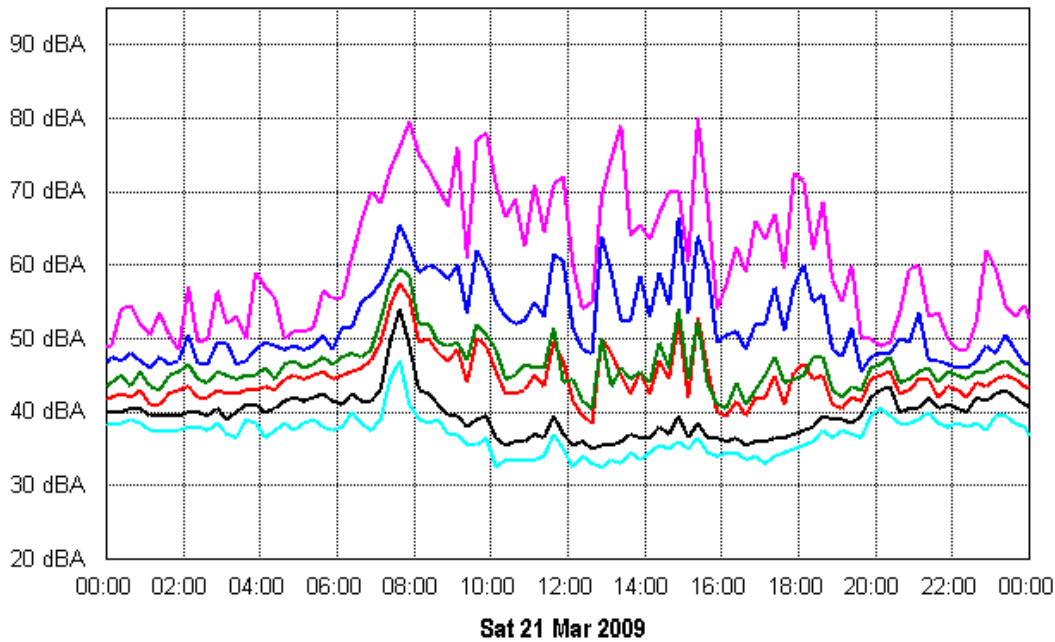
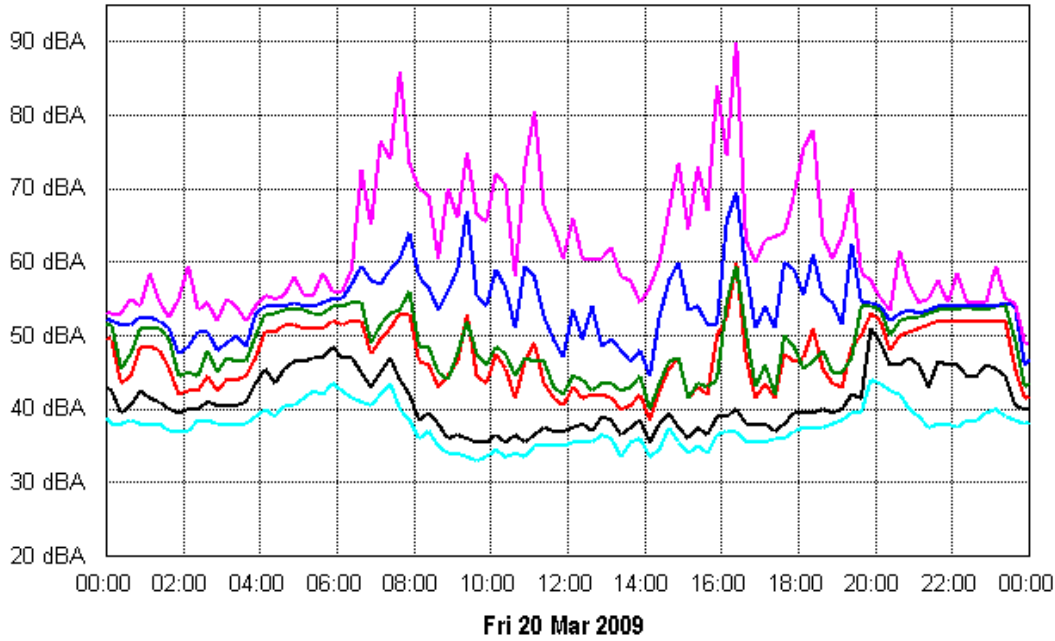
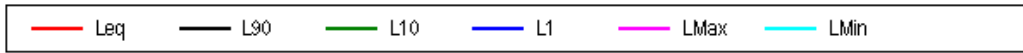
Location: L03 - St Mary's Towers

Data shaded: Extraneous; Wind; Rain



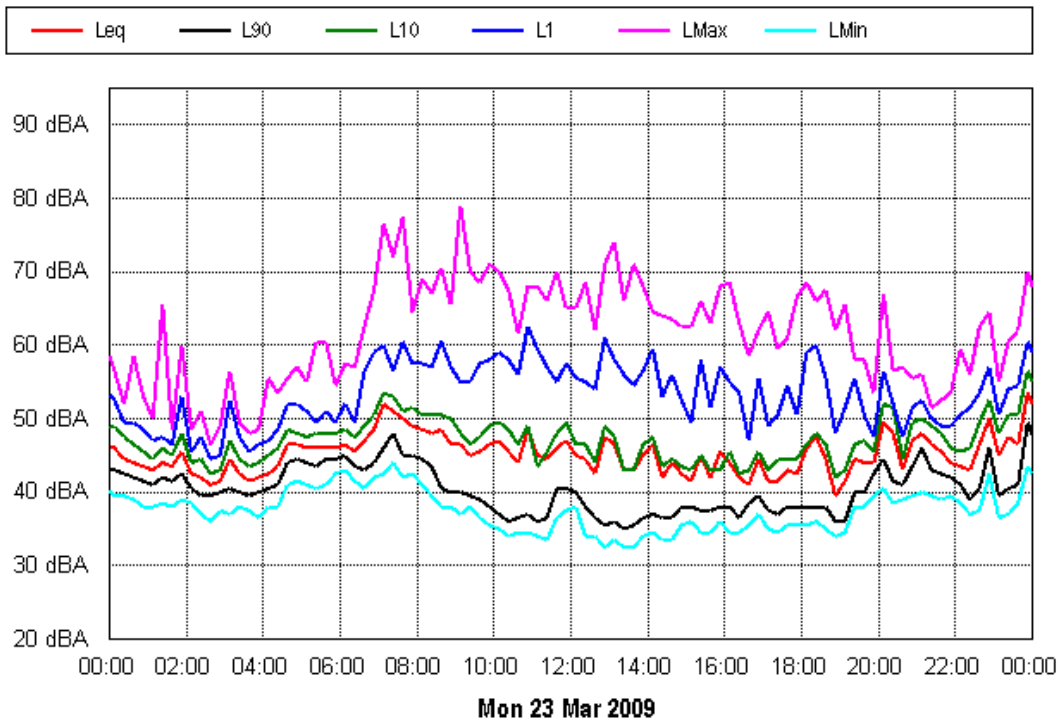
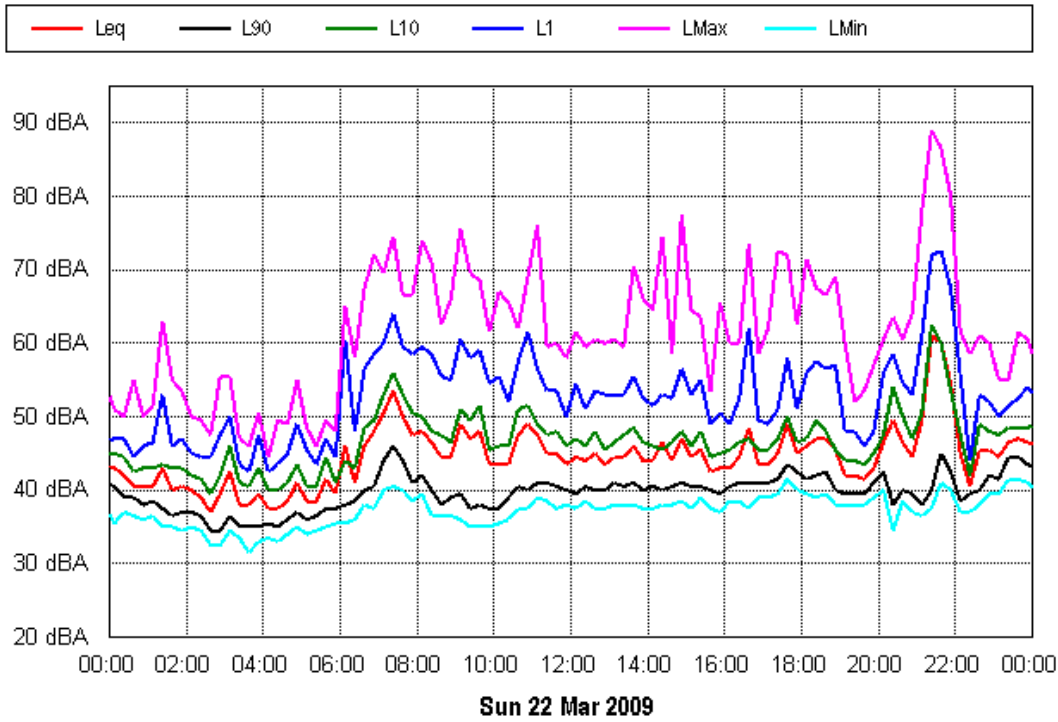
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Data shaded: Extraneous; Wind; Rain



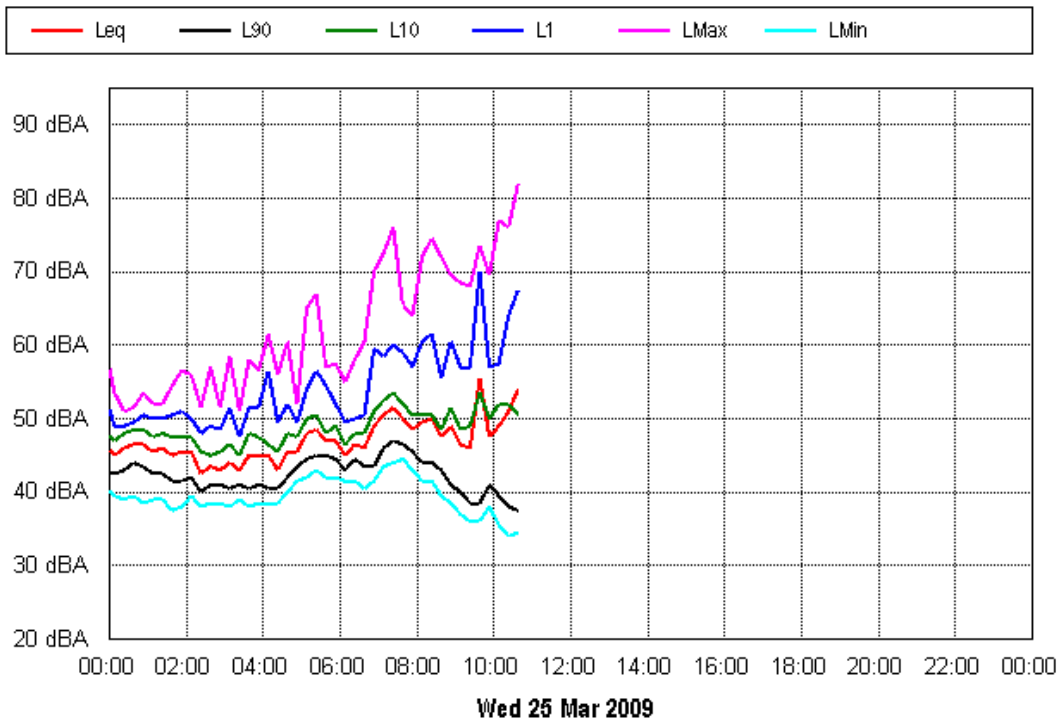
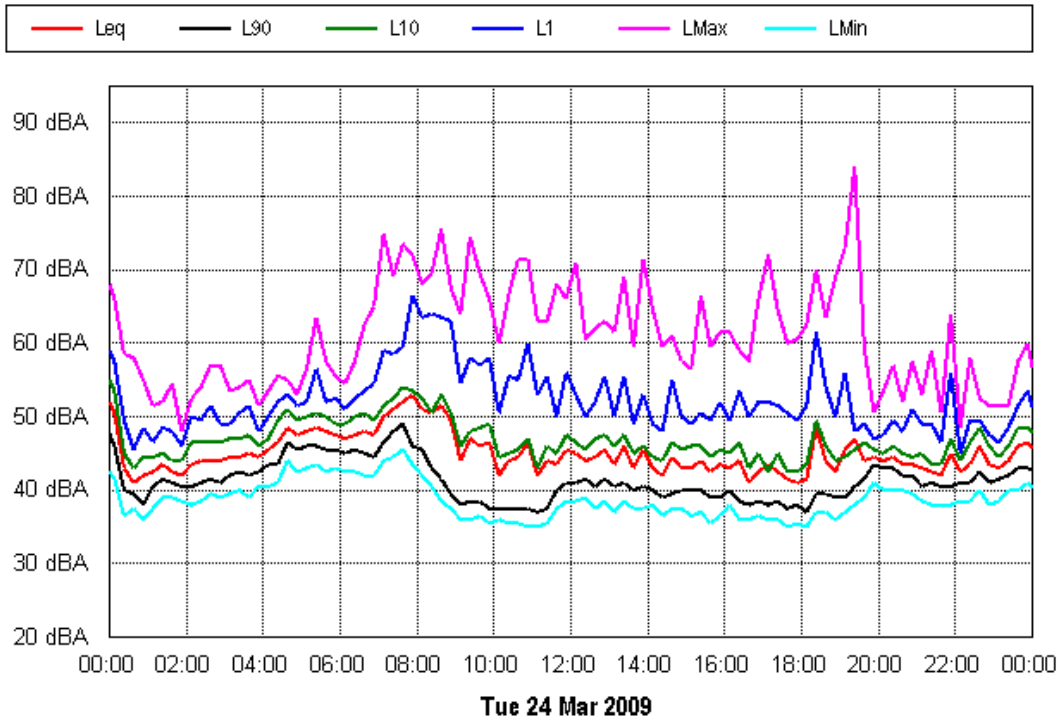
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Data shaded: Extraneous; Wind; Rain



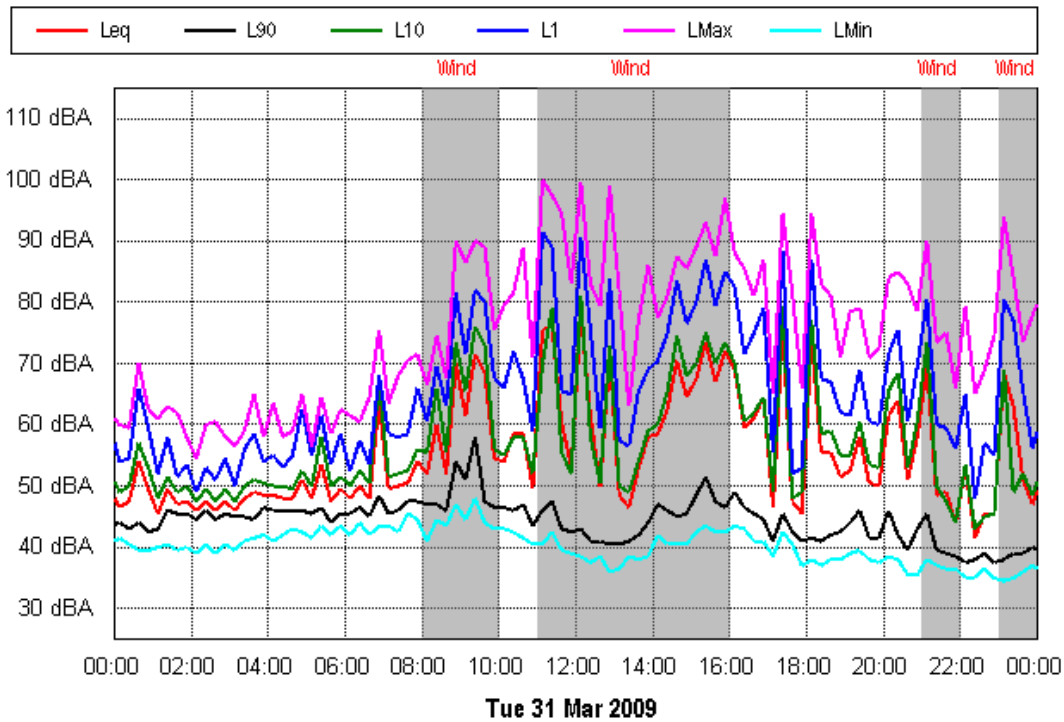
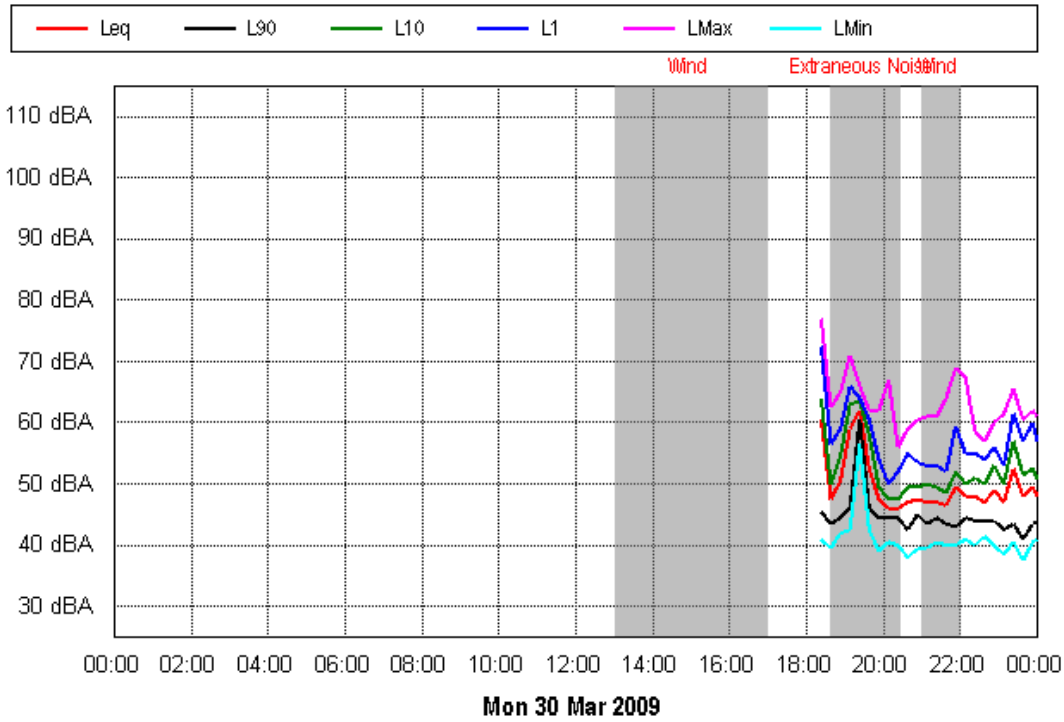
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Data shaded: Extraneous; Wind; Rain



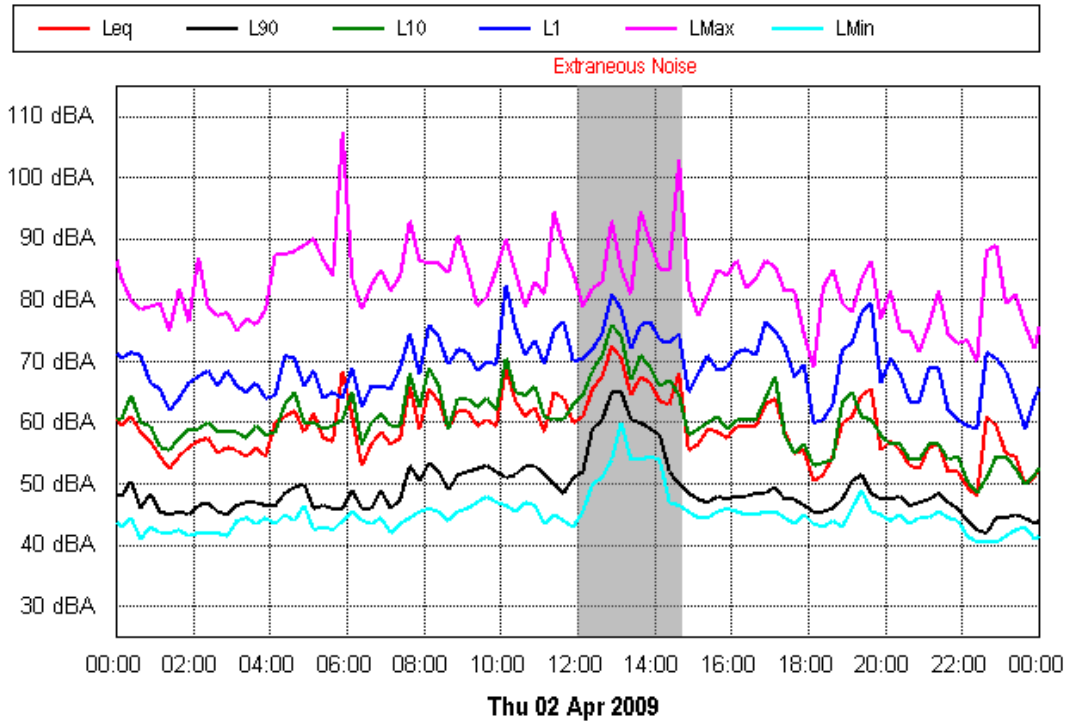
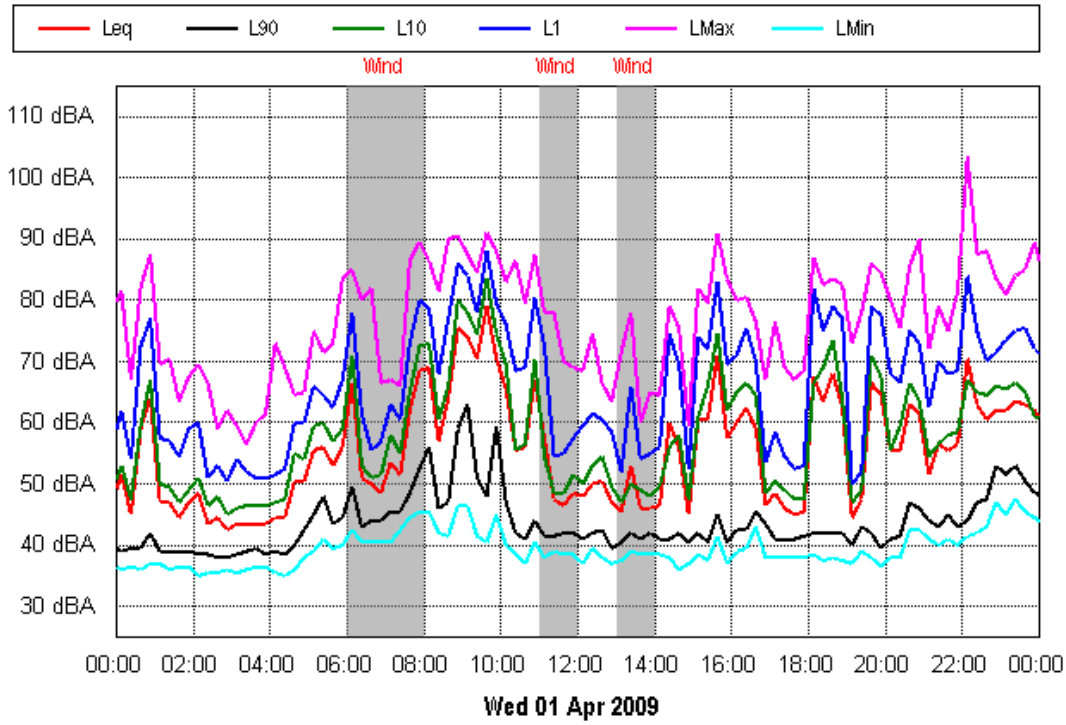
Location: L05 – 44-55 Church St

Data shaded: Extraneous; Wind; Rain



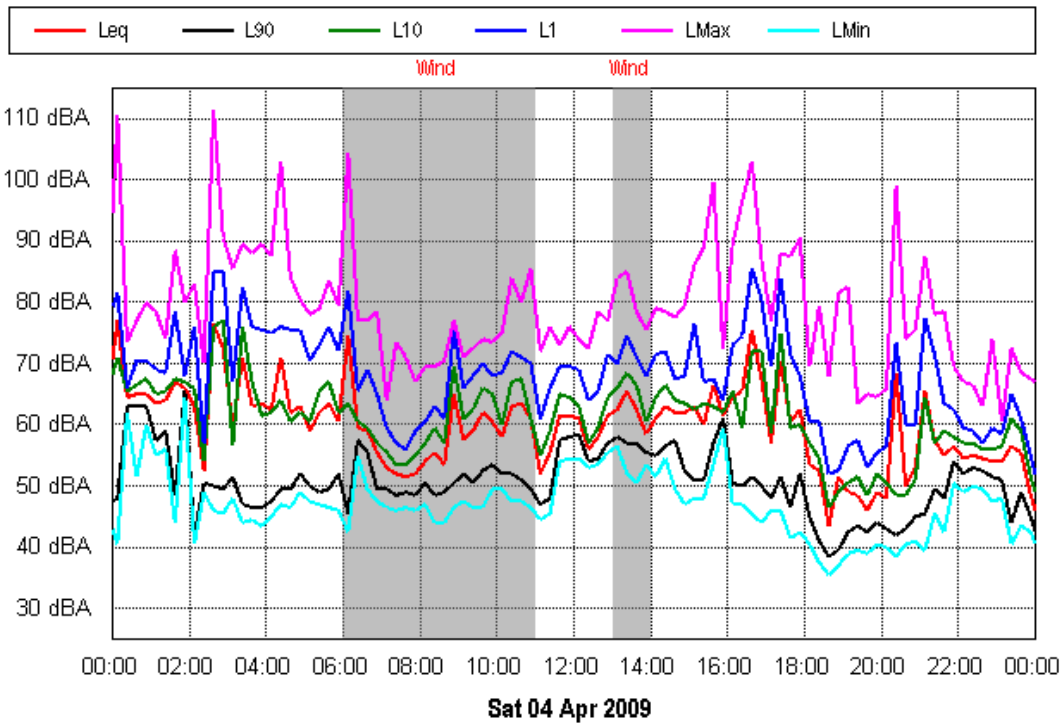
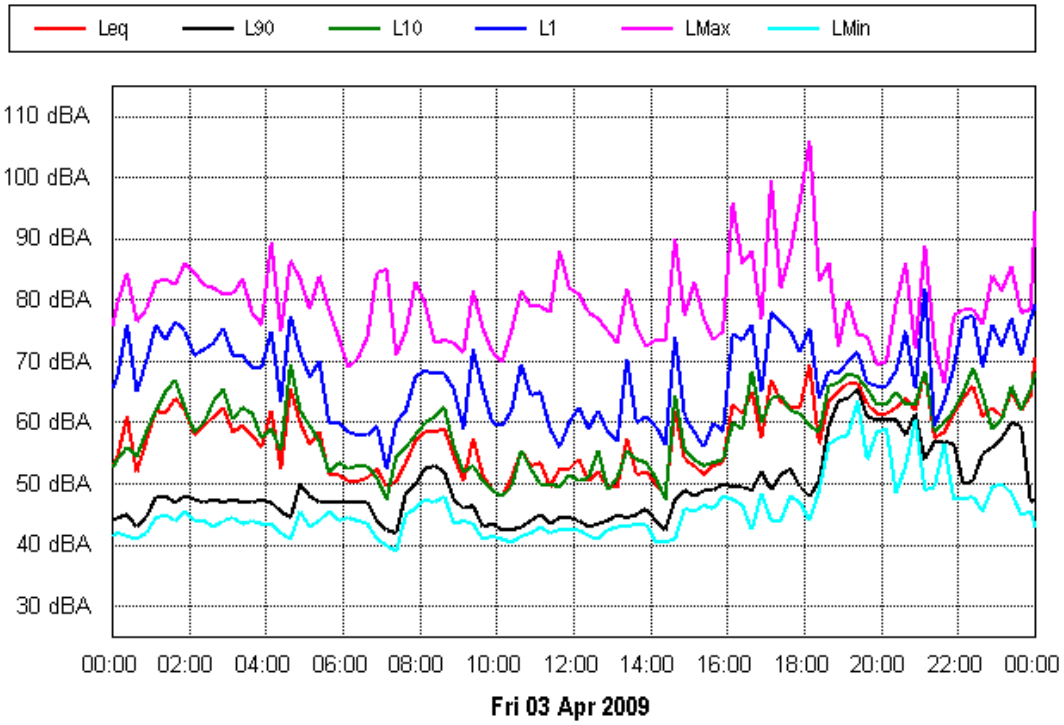
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Data shaded: Extraneous; Wind; Rain



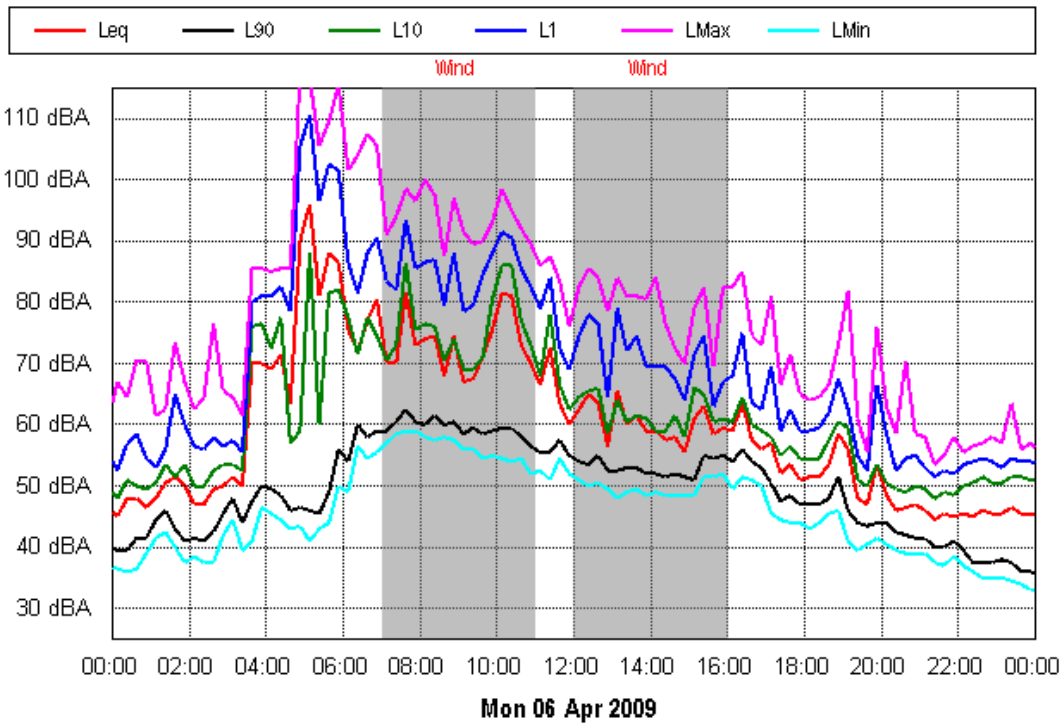
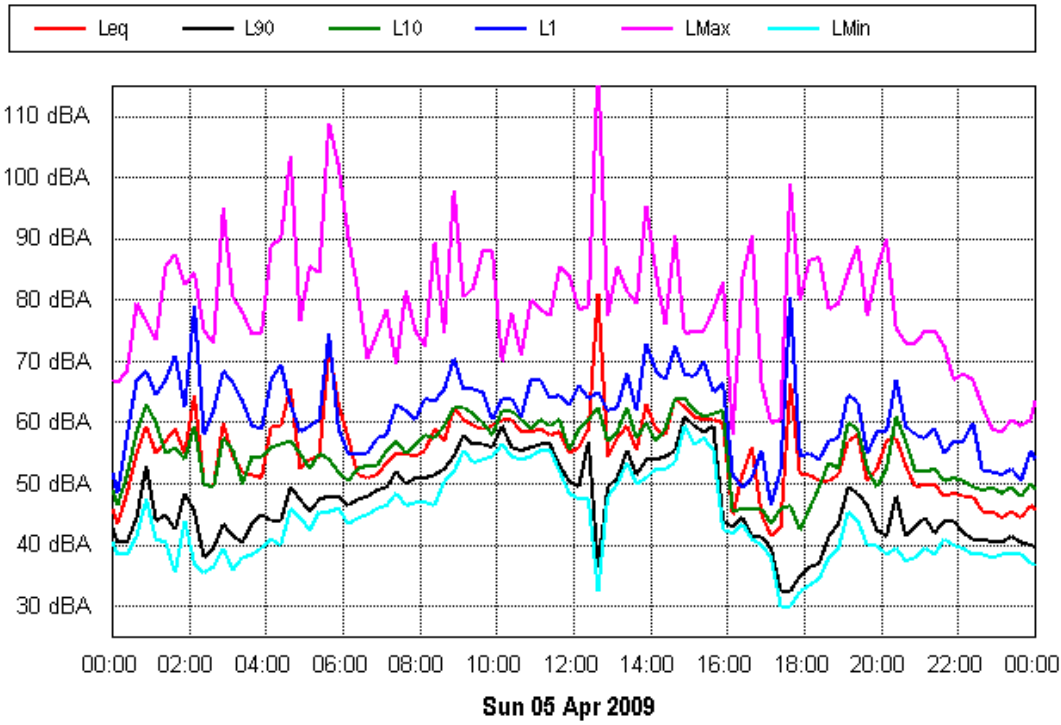
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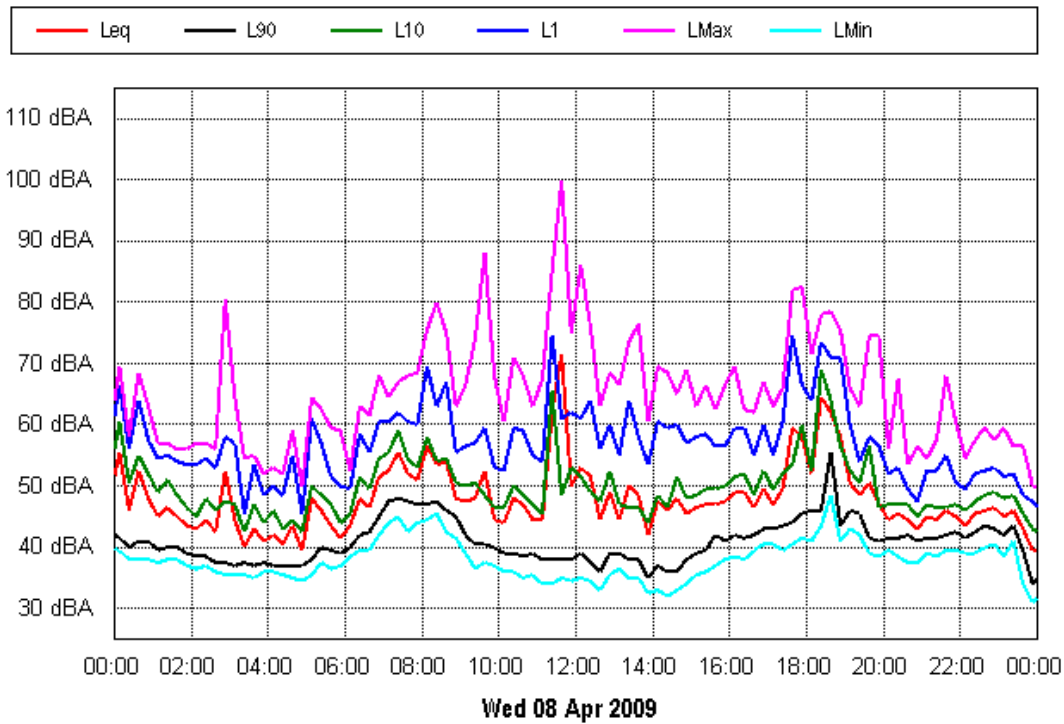
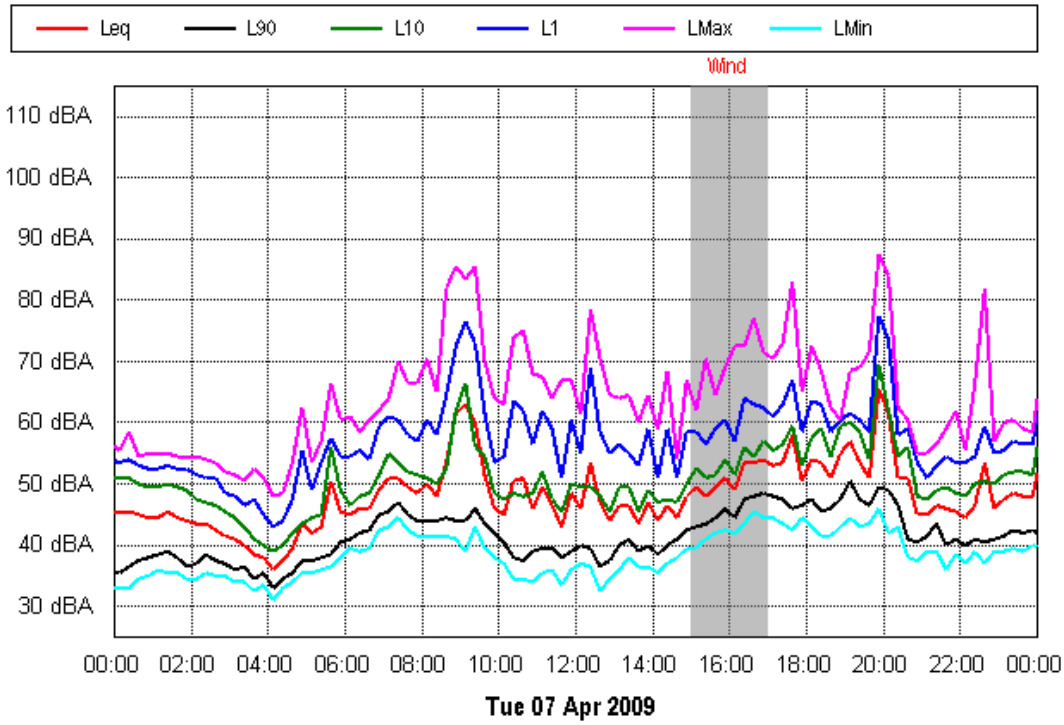
Location: L05 - 44-55 Church St

Data shaded: Extraneous; Wind; Rain



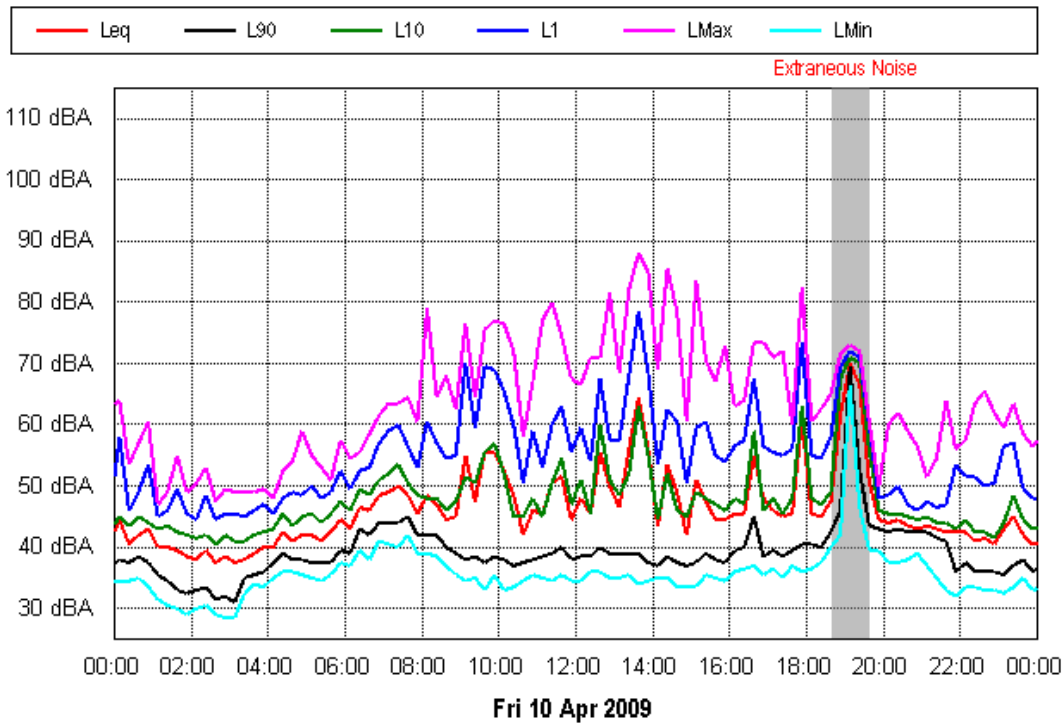
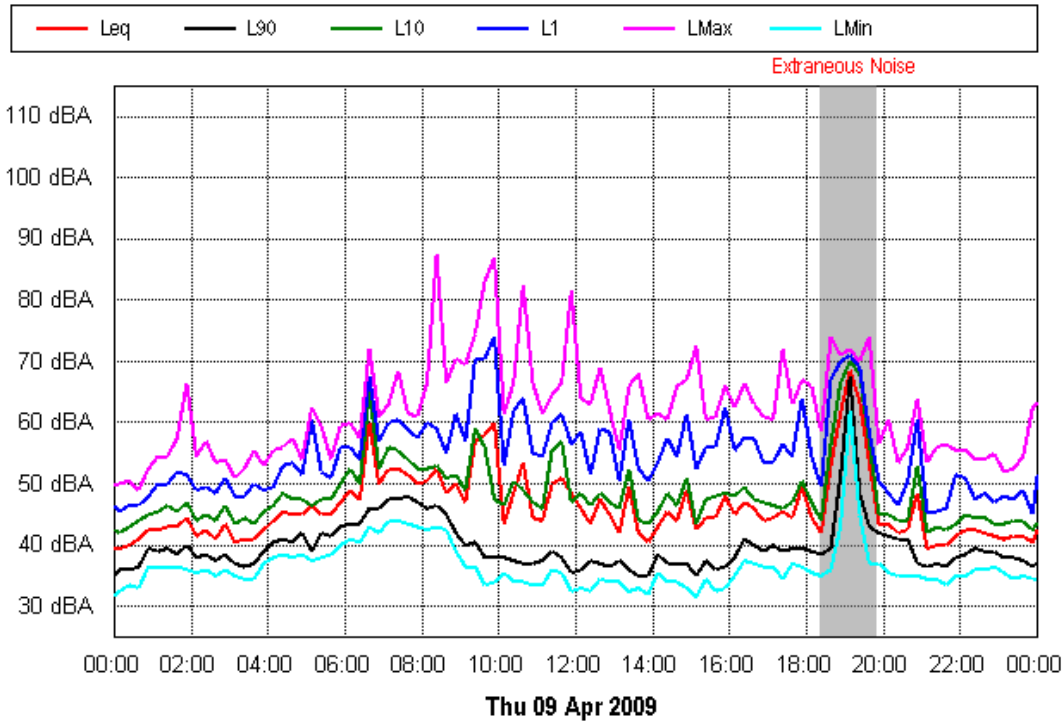
Location: L05 - 44-55 Church St

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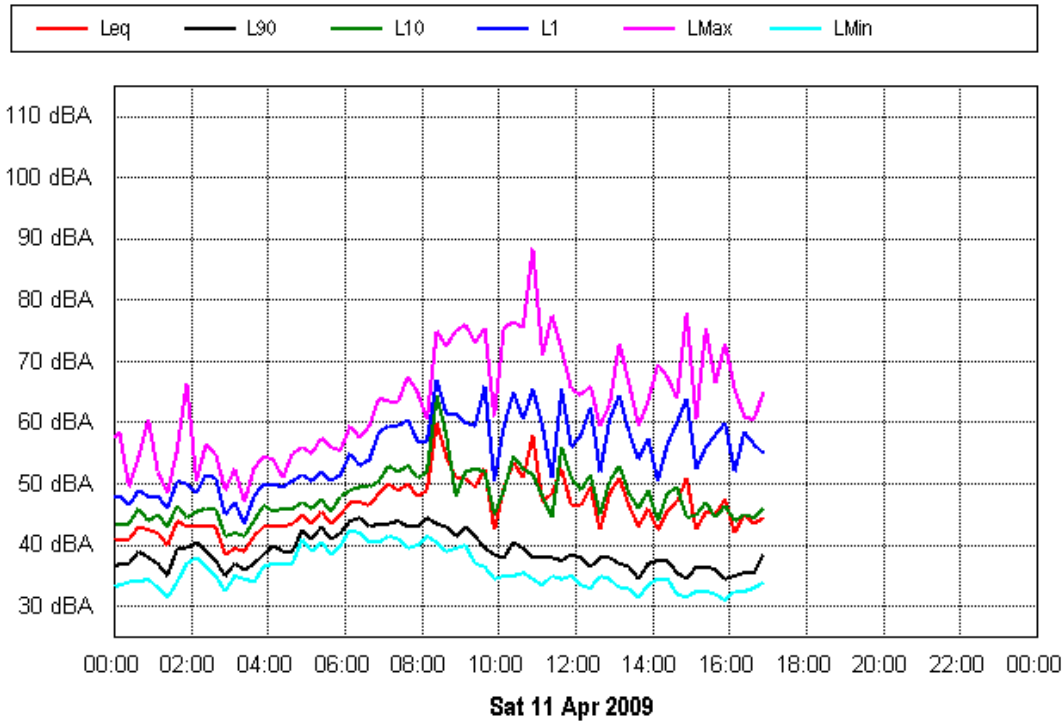
Location: L05 - 44-55 Church St

Data shaded: Extraneous; Wind; Rain



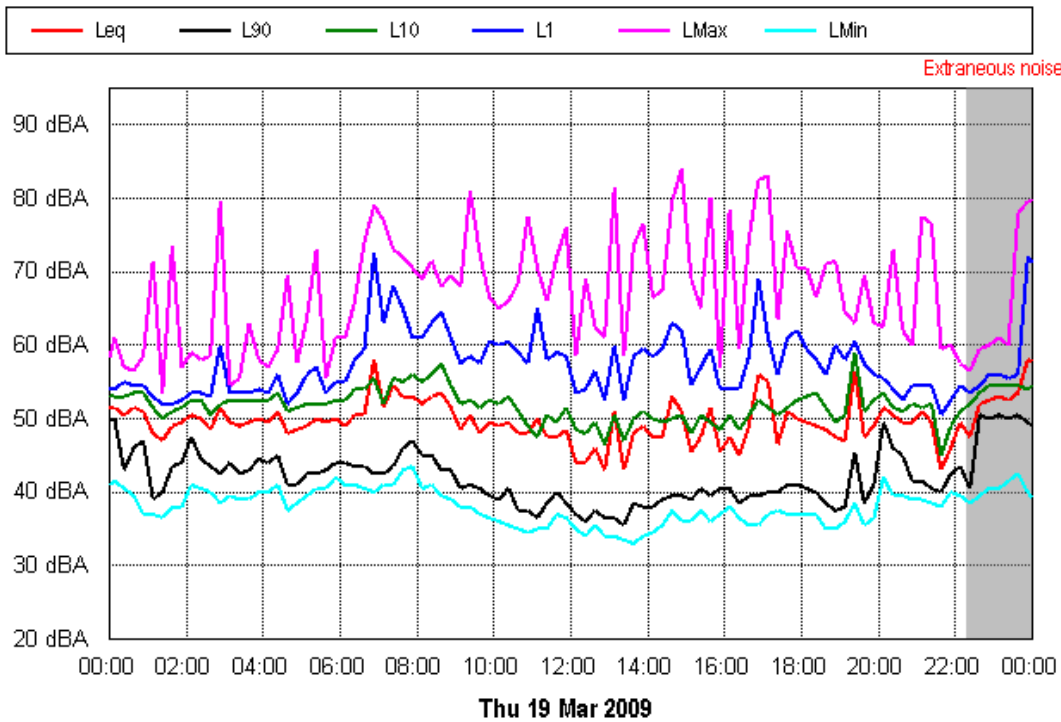
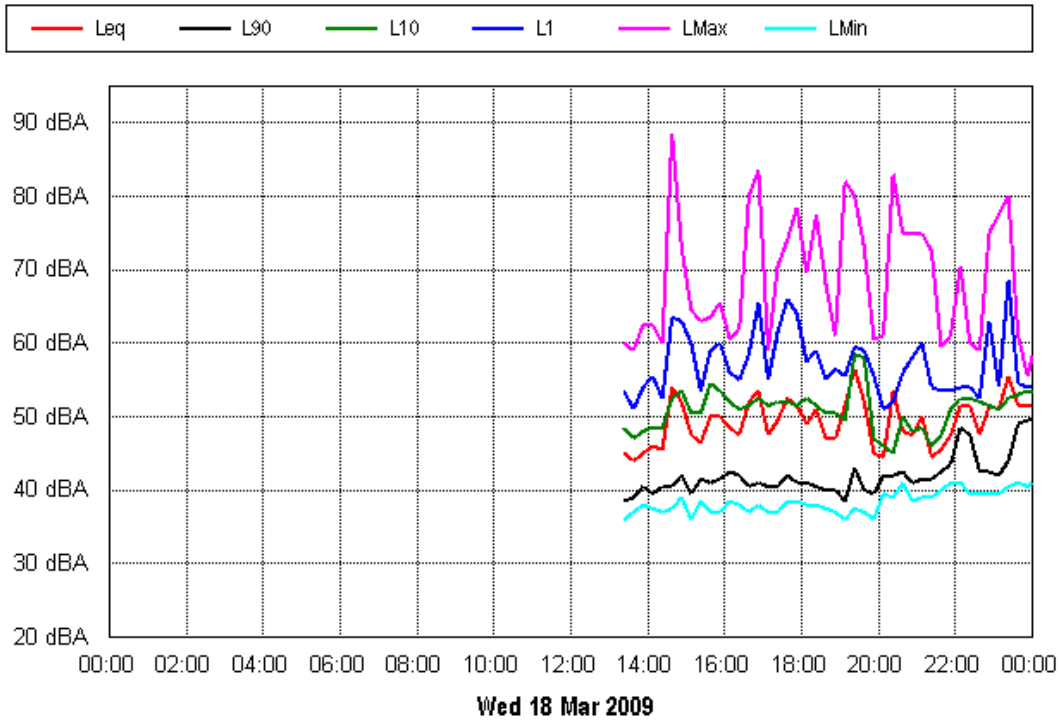
Location: L05 - 44-55 Church St

Data shaded: Extraneous; Wind; Rain



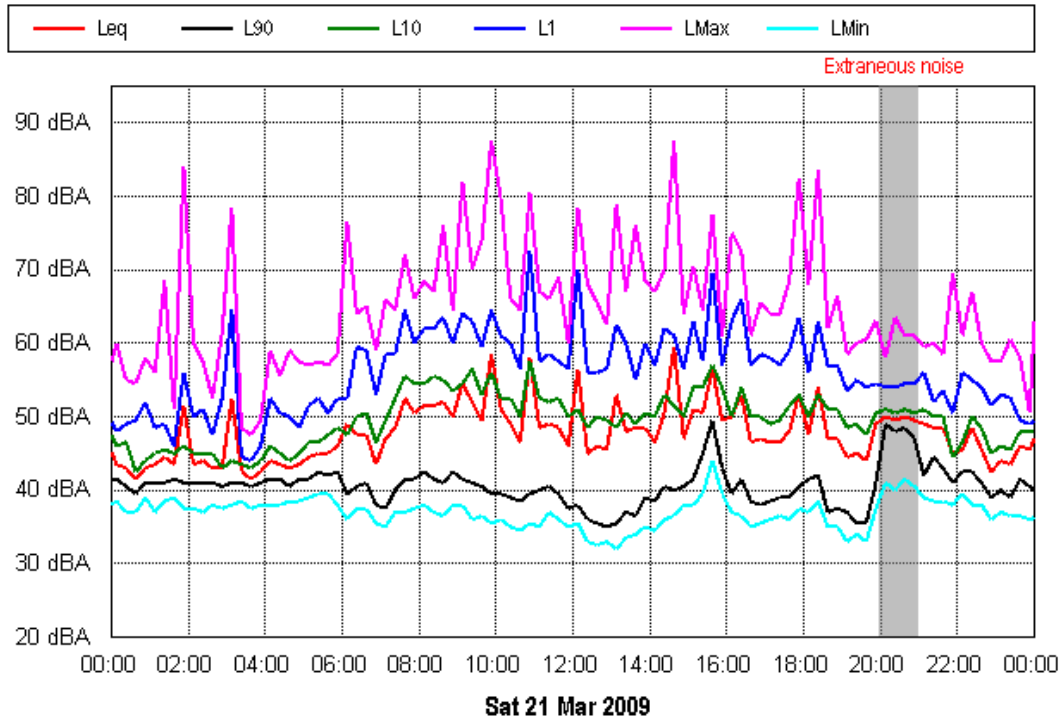
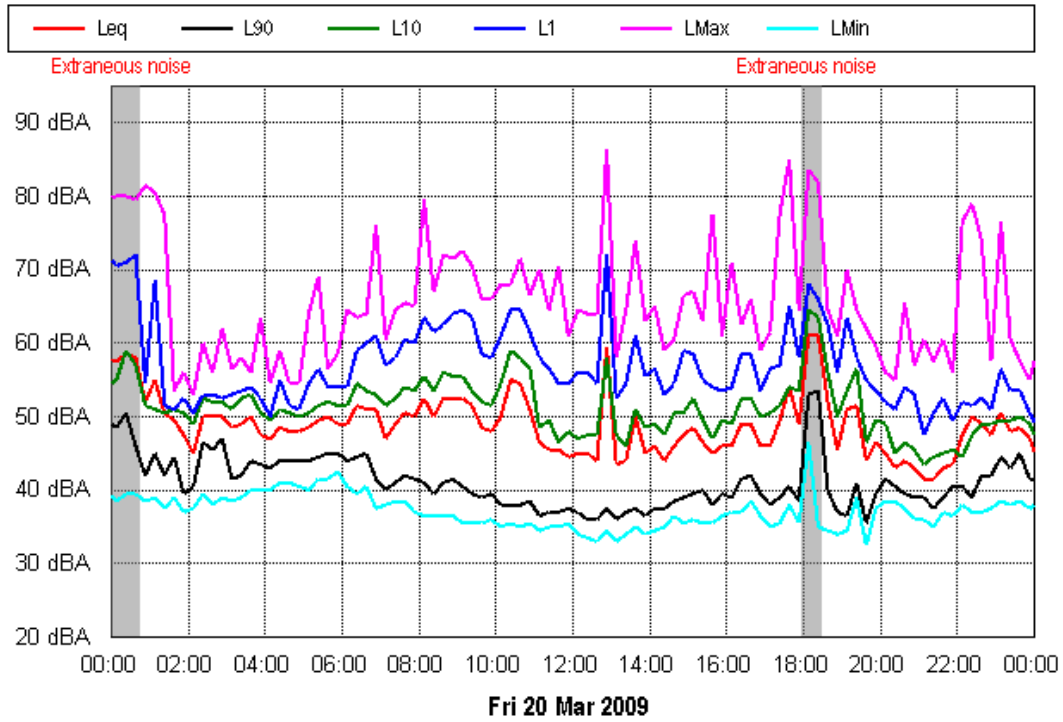
Location: L01 - 286 Douglas Park Dr

Data shaded: Extraneous; Wind; Rain



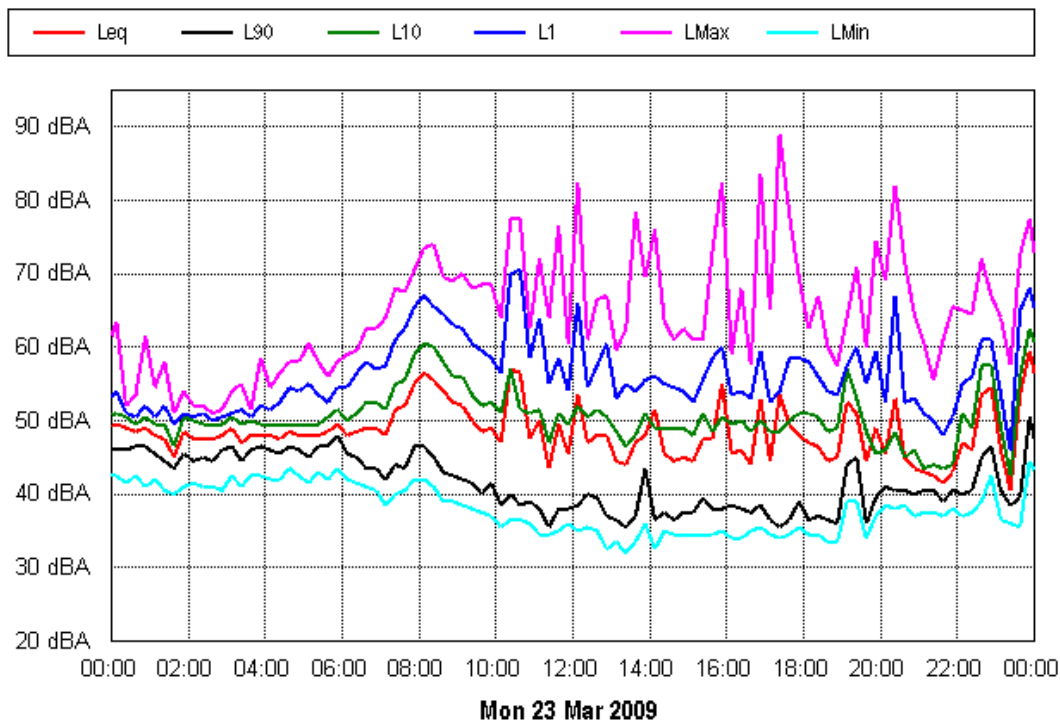
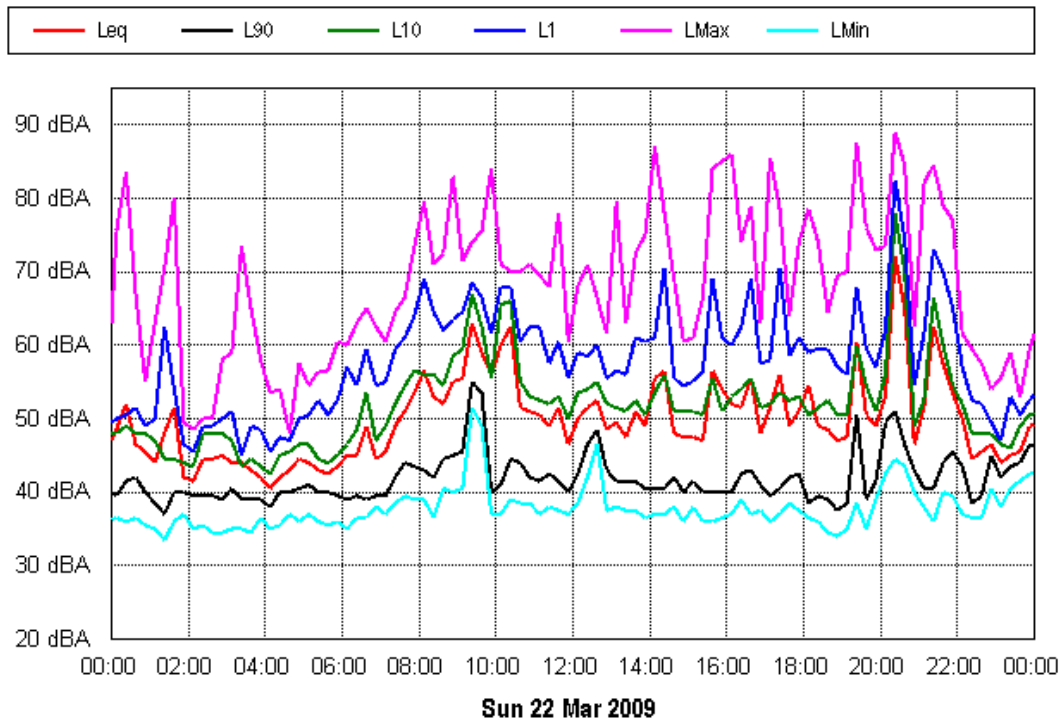
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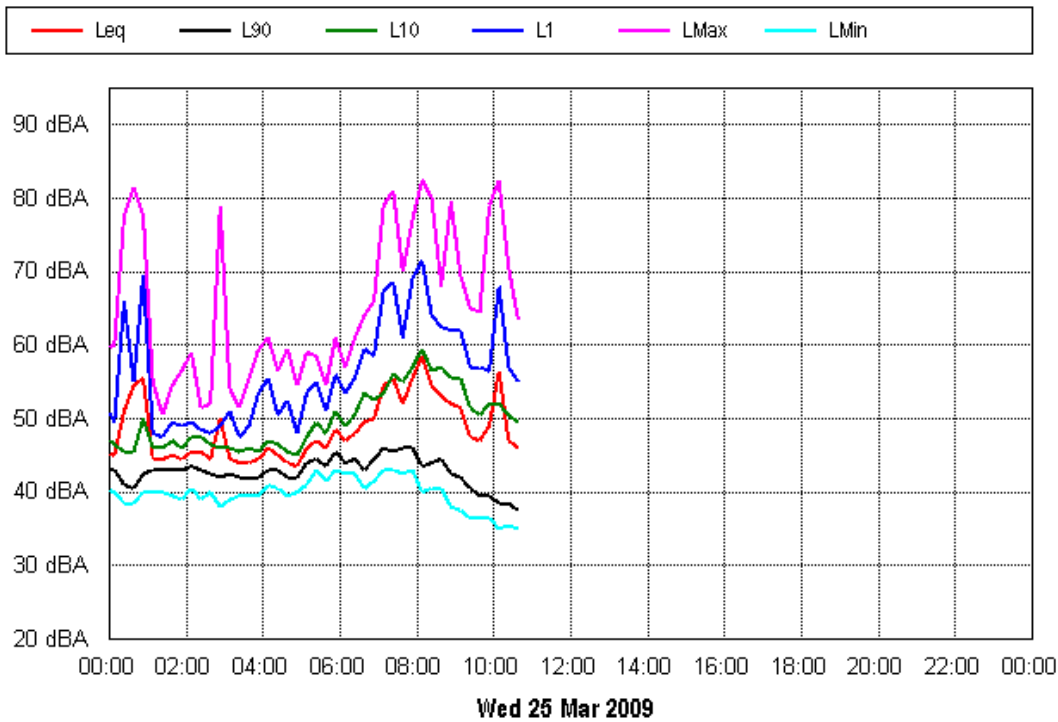
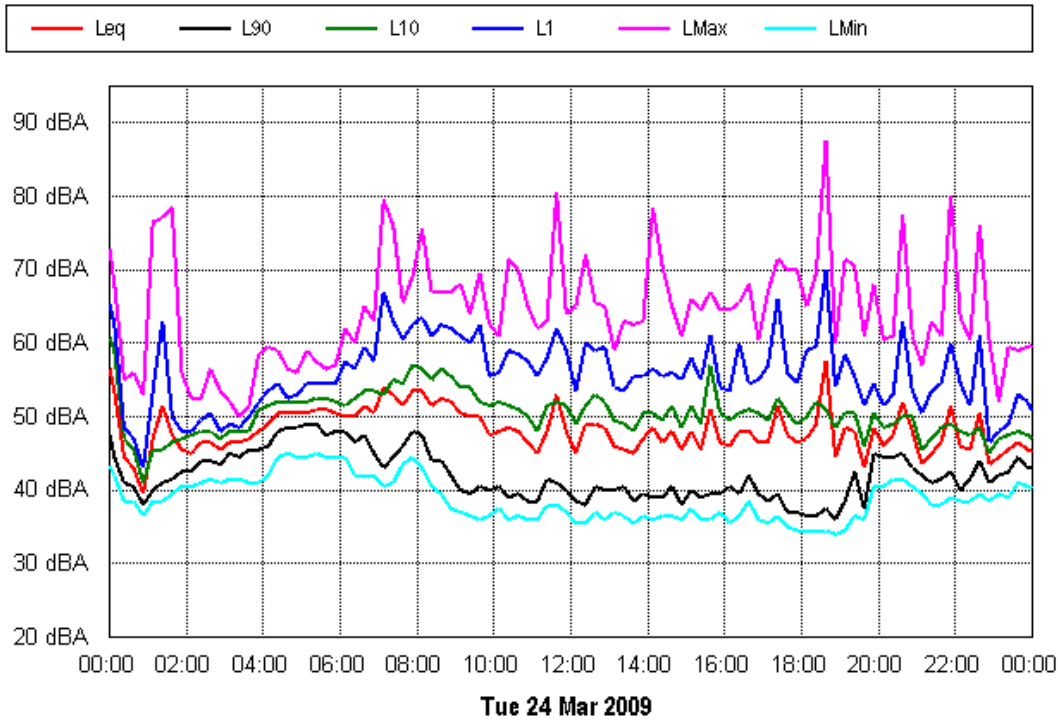
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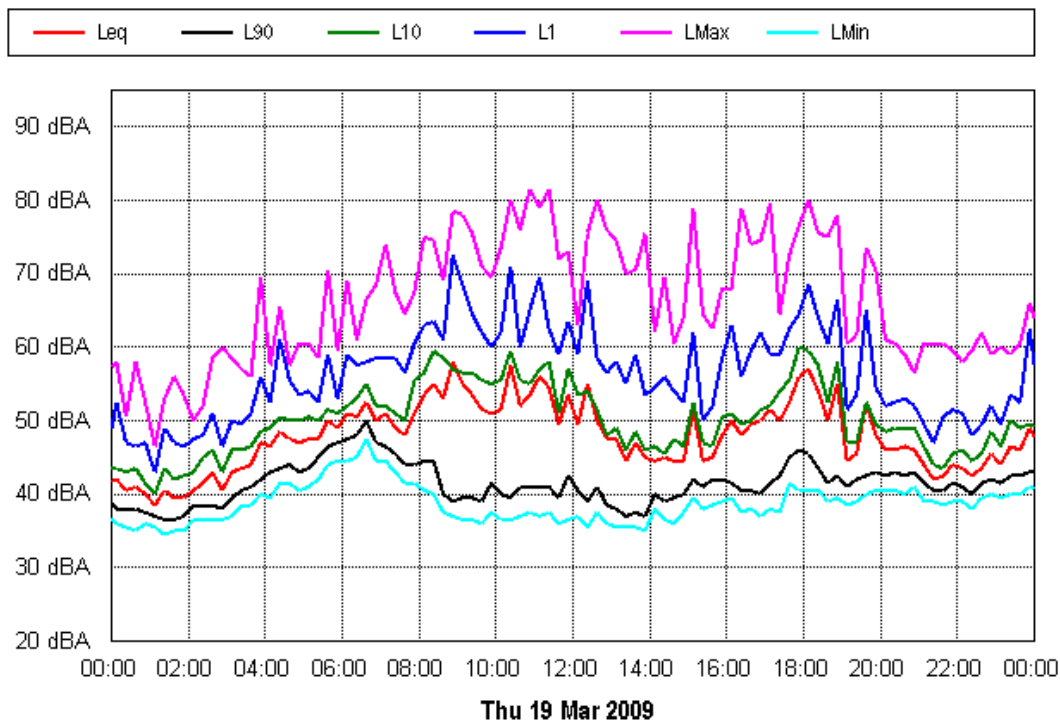
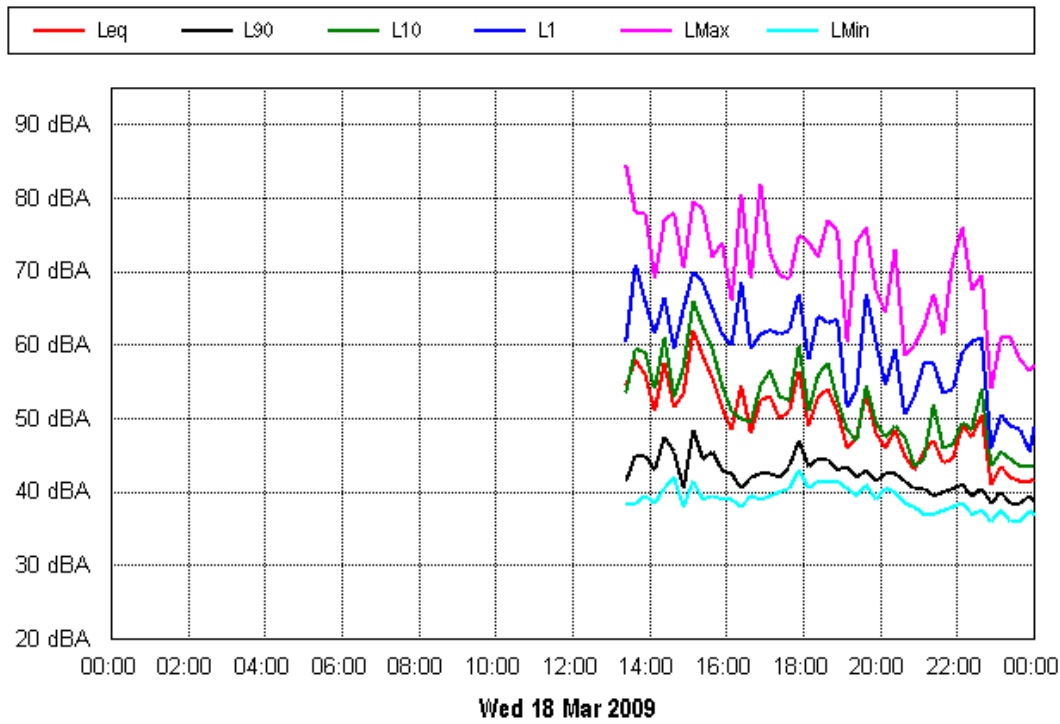
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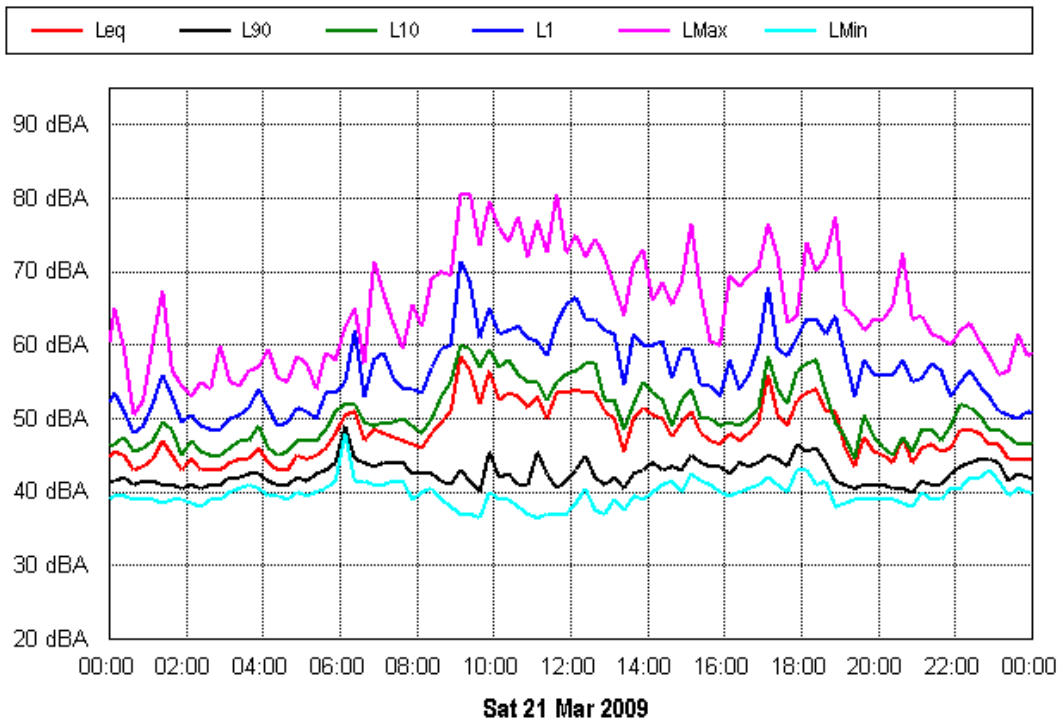
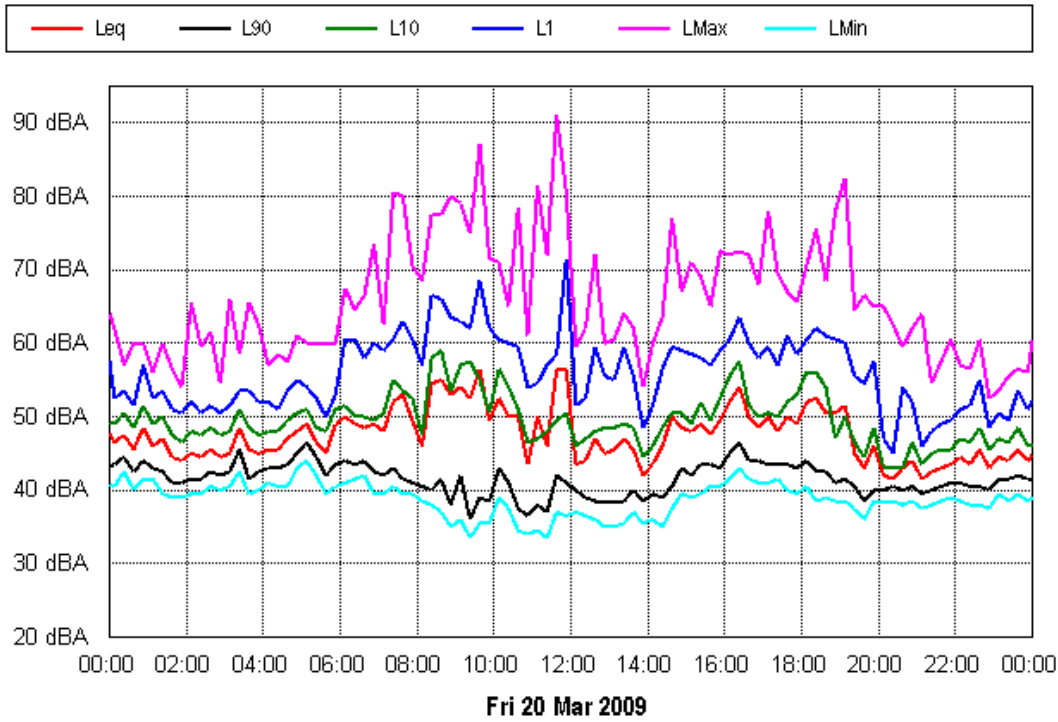
Location: L04 - Appin Mine Cottages

Data shaded: Extraneous; Wind; Rain



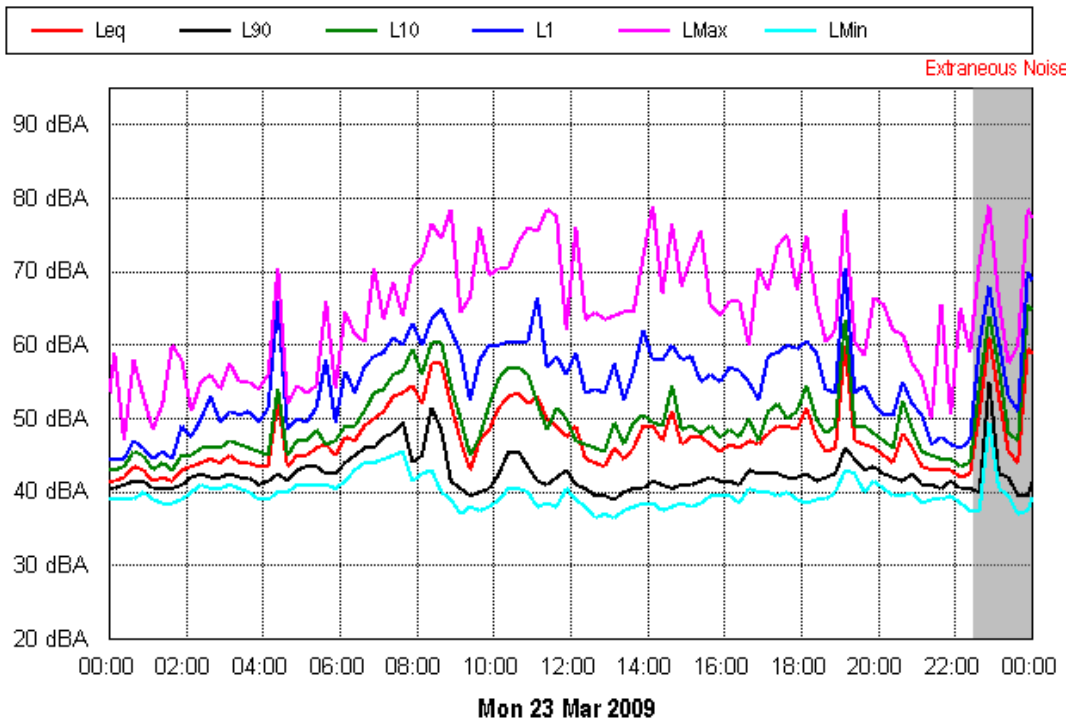
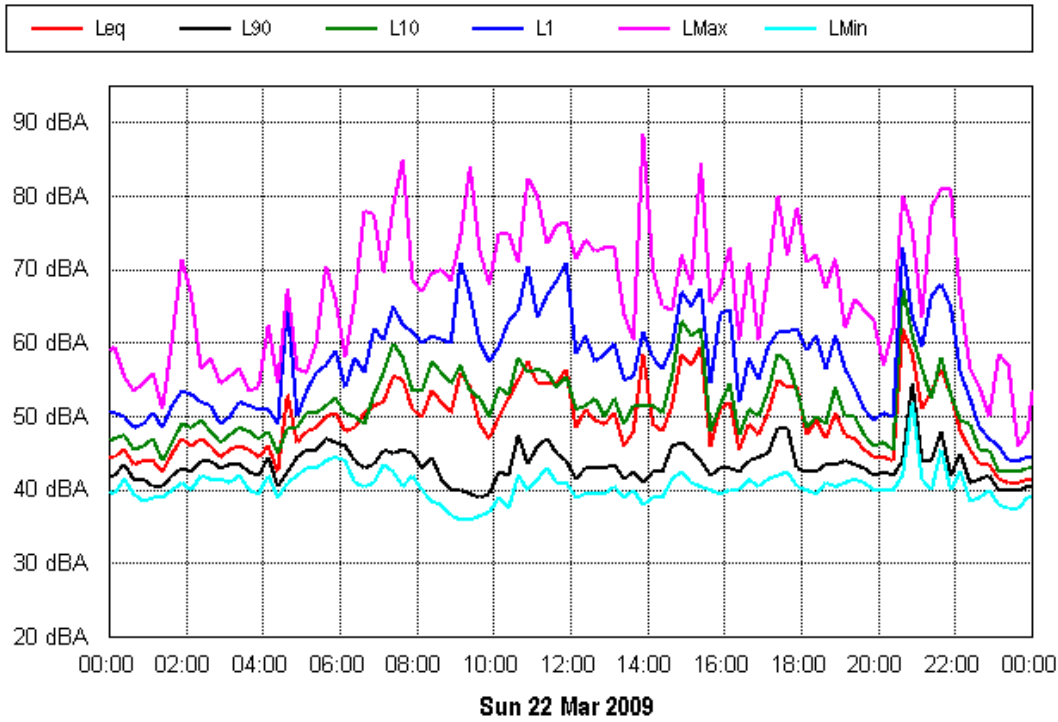
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Data shaded: Extraneous; Wind; Rain



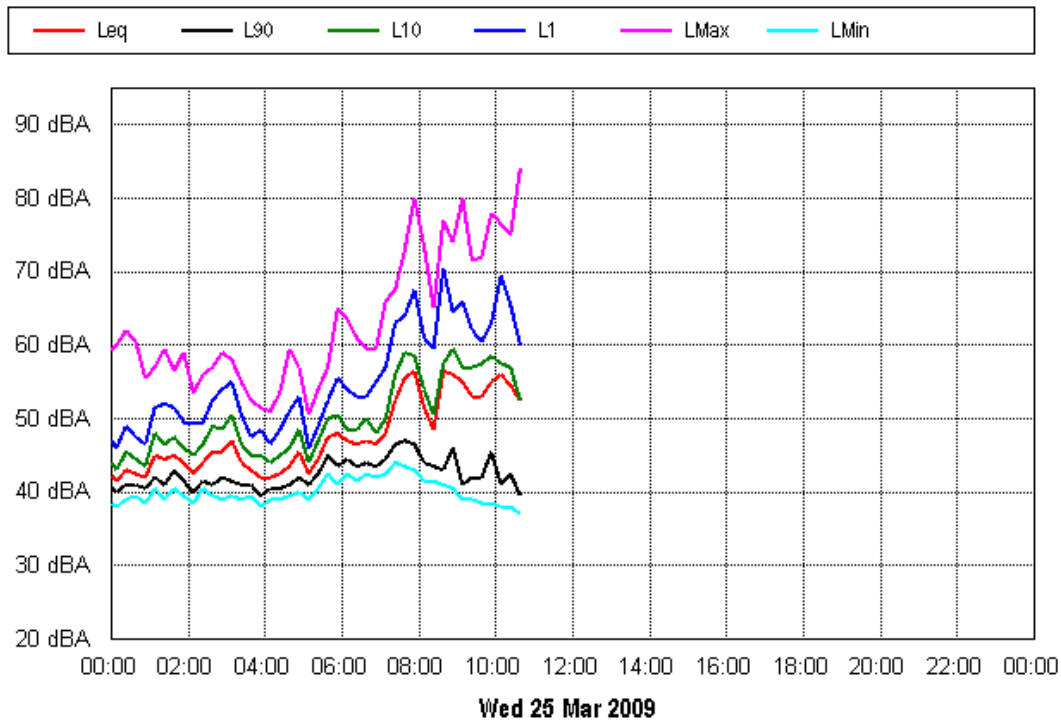
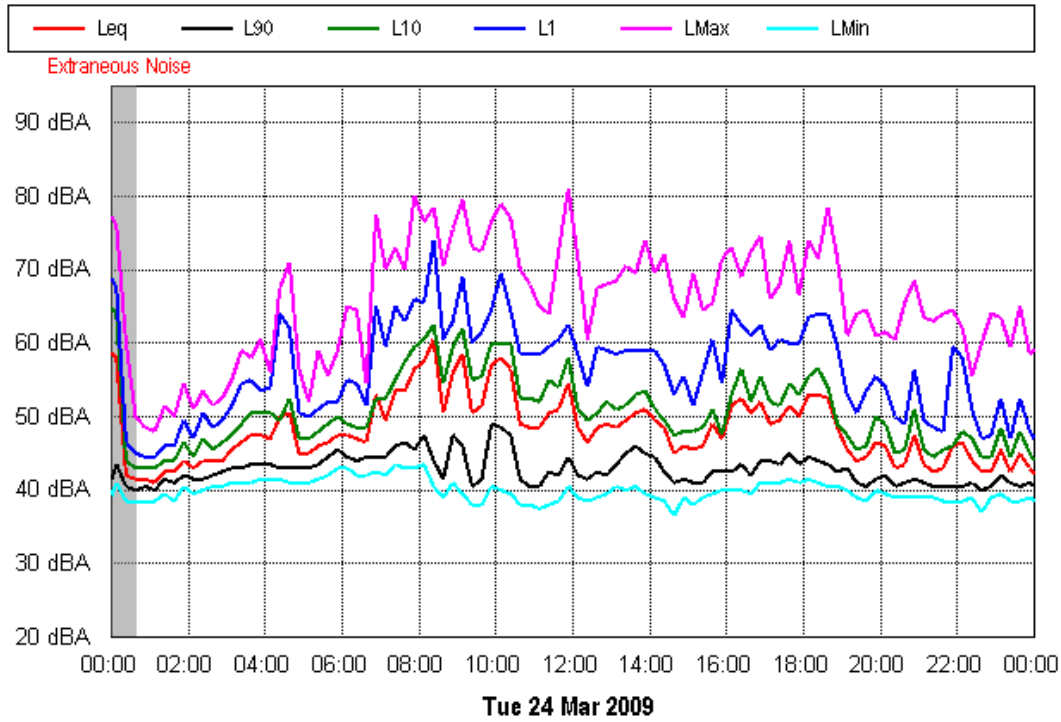
Location: L04 - Appin Mine Cottages

Data shaded: Extraneous; Wind; Rain



Location: L04 - Appin Mine Cottages

Data shaded: Extraneous; Wind; Rain





ATTACHMENT IC
DETAILED DESCRIPTION OF NOISE MODEL INPUTS

Assessment Scenarios

This attachment outlines the various plant and infrastructure items included in the noise model for each of the Assessment Scenarios outlined in Section I4.4.2.

Table IC-1 – Existing/Approved Plant

Location	Item	Sound Power Level Per Item (dBA)	Included in night model
Appin No.1 & No.2	Methane Drainage	102	Yes
Appin No.1 & No.2	Upcast Vent	110	Yes
Appin No. 3	Vent Shaft No 3	113	Yes
Appin East	Coal Loader Bins x2	102	Yes
Appin East	Compressors	102	Yes
Appin East	Conveyor	82 per metre	Yes
Appin East	Drift Winder	109	Yes
Appin East	Drive House	110	Yes
Appin East	Men Materials Drift	88	Yes
Appin East	Substation	79	Yes
Appin East	Trucks Transport x2	105	Yes
Appin East	Utes x2	85	Yes
Appin East	Workshop	80	Yes
Appin East	FEL	112	No
Appin East	Bobcat	107	No
Appin West	Fan House	94	Yes
Appin West	FEL	112	No
Appin West	Forklift	106	No
Appin West	Existing Men Materials	88	Yes
Appin West	Methane Drainage	95	Yes
Appin West	Osmosis Facility	86	Yes
Appin West	Substation	79	Yes
Appin West	Utes x2	85	Yes
Appin West	Workshop 1	80	Yes
Appin West	Workshop 2	80	Yes
West Cliff	Bobcat 1	104	Yes
West Cliff	Bobcat 2	104	Yes
West Cliff	Coal Prep Plant	122	Yes
West Cliff	Compressor house	98	Yes
West Cliff	Compressor Station	105	Yes
West Cliff	Conveyor 1	82 per metre	Yes
West Cliff	Conveyor 10	82 per metre	Yes
West Cliff	Conveyor 11	82 per metre	Yes
West Cliff	Conveyor 12	82 per metre	Yes

Location	Item	Sound Power Level Per Item (dBA)	Included in night model
West Cliff	Conveyor 14	82 per metre	Yes
West Cliff	Conveyor 13	82 per metre	Yes
West Cliff	Conveyor 2	82 per metre	Yes
West Cliff	Conveyor 3	82 per metre	Yes
West Cliff	Conveyor 4	82 per metre	Yes
West Cliff	Conveyor 5	82 per metre	Yes
West Cliff	Conveyor 6	82 per metre	Yes
West Cliff	Conveyor 7	82 per metre	Yes
West Cliff	Conveyor 8	82 per metre	Yes
West Cliff	Conveyor 9	82 per metre	Yes
West Cliff	Downcast / men Sliding	88	Yes
West Cliff	Drive House 1	95	Yes
West Cliff	Drive House 10	95	Yes
West Cliff	Drive House 2	95	Yes
West Cliff	Drive House 3	95	Yes
West Cliff	Drive House 4	95	Yes
West Cliff	Drive House 5	95	Yes
West Cliff	Drive House 6	95	Yes
West Cliff	Drive House 7	95	Yes
West Cliff	Drive House 8	95	Yes
West Cliff	Drive House 9	95	Yes
West Cliff	Emplacement 3 Dozer 1	113	No
West Cliff	Emplacement 3 Dozer 2	113	No
West Cliff	Emplacement 3 Grader	107	No
West Cliff	Emplacement 3 Haul Trucks x4	109	Yes
West Cliff	Emplacement 3 Haul Trucks x4	109	Yes
West Cliff	Emplacement 3 Vib Roller	110	No
West Cliff	Emplacement 3 Excavator	105	No
West Cliff	Fan House	110	Yes
West Cliff	FEL 1	112	Yes
West Cliff	FEL 2	112	Yes
West Cliff	FEL 3	112	Yes
West Cliff	FEL 4	112	Yes
West Cliff	FEL 5	112	Yes
West Cliff	FEL 6	112	Yes
West Cliff	FEL 7	112	Yes
West Cliff	FEL 8	112	Yes
West Cliff	Pump house	93	Yes
West Cliff	Rom Coal Bins	112	Yes

Location	Item	Sound Power Level Per Item (dBA)	Included in night model
West Cliff	Substation	79	Yes
West Cliff	Trucks Route 1 x6	105	Yes
West Cliff	Trucks Route 2 x7	105	Yes
West Cliff	Upcast vent	109	Yes
West Cliff	Utes1 x2	85	Yes
West Cliff	Utes2 x2	85	Yes
West Cliff	Emplacement 3 Water Cart	104	Yes
West Cliff	WestVamp	113	Yes
West Cliff	Workshop 1	80	Yes
West Cliff	Workshop2	80	Yes

Table IC-2 – Project Worst Case Plant

Location	Item	Sound Power Level Per Item (dBA)	Included in night model
Appin No.1 & No.2	Methane Drainage	102	Yes
Appin No.1 & No.2	Upcast Vent	107	Yes
Appin No. 3	Vent Shaft No 3	107	Yes
Appin East	Coal Loader Bins x3	99	Yes
Appin East	Compressors	102	Yes
Appin East	Conveyor	82 per metre	Yes
Appin East	Drift Winder	103	Yes
Appin East	Drive House	106	Yes
Appin East	Men Materials Drift	88	Yes
Appin East	Substation	79	Yes
Appin East	Trucks Stockpile x1	105	No
Appin East	Trucks Transport x4	105	Yes
Appin East	Utes x2	85	Yes
Appin East	Workshop	80	Yes
Appin East	FEL	112	No
Appin East	Bobcat	107	No
Appin West	Fan House	94	Yes
Appin West	FEL	112	No
Appin West	Forklift	106	No
Appin West	Existing Men Materials	88	Yes
Appin West	Men Materials Upgrade	88	Yes
Appin West	Methane Drainage	95	Yes
Appin West	Osmosis Facility	86	Yes
Appin West	Substation	79	Yes

Location	Item	Sound Power Level Per Item (dBA)	Included in night model
Appin West	Utes x2	85	Yes
Appin West	Workshop1	80	Yes
Appin West	Workshop2	80	Yes
North Cliff	Upcast Vent	110	Yes
West Cliff	Bobcat 1	104	Yes
West Cliff	Bobcat 2	104	Yes
West Cliff	Coal Prep Plant	122	Yes
West Cliff	Compressor house	98	Yes
West Cliff	Compressor Station	105	Yes
West Cliff	Conveyor 1	82 per metre	Yes
West Cliff	Conveyor 10	82 per metre	Yes
West Cliff	Conveyor 11	82 per metre	Yes
West Cliff	Conveyor 12	82 per metre	Yes
West Cliff	Conveyor 13	82 per metre	Yes
West Cliff	Conveyor 14	82 per metre	Yes
West Cliff	Conveyor 2	82 per metre	Yes
West Cliff	Conveyor 3	82 per metre	Yes
West Cliff	Conveyor 4	82 per metre	Yes
West Cliff	Conveyor 5	82 per metre	Yes
West Cliff	Conveyor 6	82 per metre	Yes
West Cliff	Conveyor 7	82 per metre	Yes
West Cliff	Conveyor 8	82 per metre	Yes
West Cliff	Conveyor 9	82 per metre	Yes
West Cliff	Downcast / men Sliding	88	Yes
West Cliff	Drive House 1	95	Yes
West Cliff	Drive House 10	95	Yes
West Cliff	Drive House 2	95	Yes
West Cliff	Drive House 3	95	Yes
West Cliff	Drive House 4	95	Yes
West Cliff	Drive House 5	95	Yes
West Cliff	Drive House 6	95	Yes
West Cliff	Drive House 7	95	Yes
West Cliff	Drive House 8	95	Yes
West Cliff	Drive House 9	95	Yes
West Cliff	Emplacement 4 Dozer 1	113	No
West Cliff	Emplacement 4 Dozer 2	113	No
West Cliff	Emplacement 4 Grader	107	No
West Cliff	Emplacement 4 Haul Trucks x4	109	Yes
West Cliff	Emplacement 4 Haul Trucks x4	109	Yes
West Cliff	Emplacement 4 Vib Roller	110	No

Location	Item	Sound Power Level Per Item (dBA)	Included in night model
West Cliff	Emplacement 4 Excavator	105	No
West Cliff	Fan House	110	Yes
West Cliff	FEL 1	112	Yes
West Cliff	FEL 2	112	Yes
West Cliff	FEL 3	112	Yes
West Cliff	FEL 4	112	Yes
West Cliff	FEL 5	112	Yes
West Cliff	FEL 6	112	Yes
West Cliff	FEL 7	112	Yes
West Cliff	FEL 8	112	Yes
West Cliff	Pump house	93	Yes
West Cliff	Rom Coal Bins	112	Yes
West Cliff	Substation	79	Yes
West Cliff	Trucks Route 1 x6	105	Yes
West Cliff	Trucks Route 2 x7	105	Yes
West Cliff	Upcast vent	110	Yes
West Cliff	Utes 1 x2	85	Yes
West Cliff	Utes 2 x2	85	Yes
West Cliff	Emplacement 4 Water Cart	104	Yes
West Cliff	WestVamp	113	Yes
West Cliff	Workshop 1	80	Yes
West Cliff	Workshop 2	80	Yes

ATTACHMENT ID
PROJECT OPERATIONAL NOISE RESULTS

Table ID-1 – Predicted Noise Levels At Receivers

Receiver No	Description*	Predicted Day/Evening Level (dBA)		Predicted Night Level (dBA)		Criteria (dBA)		
		Existing/Approved	Project Worst Case	Existing/Approved	Project Worst Case	Day	Evening	Night
1	Ashwood Road-A	38	38	26	26	39	39	39
2	Ashwood Road-B	39	39	27	27	39	39	39
3	160 Ashwood Rd	39	39	27	27	39	39	39
4	160 Ashwood Rd	38	38	26	27	39	39	39
5	160 Ashwood Rd	38	38	26	27	39	39	39
6	150 Ashwood Rd	38	38	26	27	39	39	39
7	Ashwood Road-C	36	36	26	26	39	39	39
9	140 Ashwood Rd	37	37	25	25	39	39	39
10	110 Ashwood Rd	36	36	26	26	39	39	39
11	100 Ashwood Rd	36	36	26	25	39	39	39
13	90 Ashwood Rd	35	35	26	25	39	39	39
14	200 Douglas Park Drive	45	45	28	32	43	43	43
15	125 Douglas Park Drive	40	40	28	28	43	43	43
16	95 Douglas Park Drive	37	37	28	27	43	43	43
17	10 Whitticase Lane	37	37	28	27	43	43	43
18	25 Whitticase Lane	37	37	28	27	43	43	43
19	45 Whitticase Lane	35	35	28	27	43	43	43
20	45 Whitticase Lane	35	35	28	27	43	43	43
21	40 Whitticase Lane	35	35	28	27	43	43	43
22	90 Douglas Park Drive	36	36	28	27	43	43	43
23	80 Douglas Park Drive	35	35	25	26	43	43	43

Receiver No	Description*	Predicted Day/Evening Level (dBA)		Predicted Night Level (dBA)		Criteria (dBA)		
		Existing/Approved	Project Worst Case	Existing/Approved	Project Worst Case	Day	Evening	Night
24	140 Douglas Park Drive	42	42	28	30	43	43	43
25	120 Douglas Park Drive	37	37	27	27	43	43	43
26	200 Douglas Park Drive	44	45	30	33	43	43	43
27	250 Douglas Park Drive	39	39	29	29	43	43	43
28	250 Douglas Park Drive	39	39	29	28	43	43	43
29	260 Douglas Park Drive	36	36	28	28	43	43	43
30	270 Douglas Park Drive	38	38	29	29	43	43	43
31	274 Douglas Park Drive	39	39	28	28	43	43	43
32	276 Douglas Park Drive	38	38	28	28	43	43	43
33	278 Douglas Park Drive	37	37	28	28	43	43	43
34	280 Douglas Park Drive	37	37	28	28	43	43	43
35	282 Douglas Park Drive	36	36	28	27	43	43	43
36	284 Douglas Park Drive	36	36	28	27	43	43	43
37	286 Douglas Park Drive	36	36	27	27	43	43	43
38	286 Douglas Park Drive	36	36	27	27	43	43	43
39	290 Douglas Park Drive	34	34	27	26	43	43	43
40	288 Douglas Park Drive	36	36	27	27	43	43	43
41	292 Douglas Park Drive	33	33	27	26	43	43	43
42	300 Douglas Park Drive	31	31	26	26	43	43	43
43	306 Douglas Park Drive	30	30	26	26	43	43	43
44	314 Douglas Park Drive	32	32	27	26	43	43	43
45	330 Douglas Park Drive	38	38	27	28	43	43	43

Receiver No	Description*	Predicted Day/Evening Level (dBA)		Predicted Night Level (dBA)		Criteria (dBA)		
		Existing/Approved	Project Worst Case	Existing/Approved	Project Worst Case	Day	Evening	Night
46	340 Douglas Park Drive	38	38	27	27	43	43	43
47	330 Douglas Park Drive	37	37	27	27	43	43	43
48	320 Douglas Park Drive	38	38	27	27	43	43	43
50	360 Douglas Park Drive	37	37	27	27	43	43	43
51	100 Douglas Park Drive	36	36	28	27	43	43	43
52	75 Douglas Park Drive	34	35	25	25	43	43	43
53	85 Douglas Park Drive	36	36	28	27	43	43	43
54	St Mary's Towers Monastery	27	27	28	25	43	43	43
55	St Mary's Towers Monastery	27	27	28	25	43	43	43
56	St Mary's Towers Monastery	27	27	27	25	43	43	43
57	Brooks Point Road-A	46	41	48	42	39	39	39
58	Brooks Point Road-B	46	40	47	41	39	39	39
60	Brooks Point Road-C	57	51	57	51	39	39	39
63	430 Brooks Point Road	49	43	49	43	39	39	39
64	440 Brooks Point Road	50	44	51	45	39	39	39
66	426 Brooks Point Road	47	41	48	42	39	39	39
67	420 Brooks Point Road	46	40	47	41	39	39	39
68	410 Brooks Point Road	45	39	46	40	39	39	39
69	406 Brooks Point Road	44	38	44	38	39	39	39
70	400 Brooks Point Road	42	37	43	37	39	39	39
71	Quarter Sessions Road-A	47	41	47	41	39	39	39
72	Quarter Sessions Road -B	47	41	47	41	39	39	39

Receiver No	Description*	Predicted Day/Evening Level (dBA)		Predicted Night Level (dBA)		Criteria (dBA)		
		Existing/Approved	Project Worst Case	Existing/Approved	Project Worst Case	Day	Evening	Night
74	Quarter Sessions Road -C	46	40	46	40	39	39	39
75	Quarter Sessions Road -D	45	40	46	40	39	39	39
76	Quarter Sessions Road -E	40	35	40	35	39	39	39
78	130 The Lachlan Vale Road	40	38	41	39	40	40	40
79	The Lachlan Vale Road -A	50	47	51	48	40	40	40
80	The Lachlan Vale Road -B	45	43	45	43	40	40	40
82	60-80 Northhamptondale Road	44	41	44	42	40	40	40
83	Northhamptondale Road-A	43	41	44	41	40	40	40
84	289 The Lachlan Vale Road	38	37	39	37	40	40	40
85	90 Northhamptondale Road	43	41	44	41	40	40	40
86	635 Wilton Road	42	39	42	39	40	40	40
87	635 Wilton Road	40	38	40	38	40	40	40
88	Wilton Road -A	36	35	37	36	40	40	40
89	775 Wilton Road	38	36	39	37	40	40	40
90	875 Wilton Road	42	40	42	40	40	40	40
91	865 Wilton Road	44	42	44	42	40	40	40
93	ICHPL mine cottage-A	47	47	48	47	N/A		
95	ICHPL-B	46	46	47	47	N/A		
96	ICHPL-C	46	46	47	47	N/A		
97	ICHPL-D	46	46	47	47	N/A		
98	ICHPL-E	46	46	47	47	N/A		
99	ICHPL-F	46	46	47	46	N/A		

Receiver No	Description*	Predicted Day/Evening Level (dBA)		Predicted Night Level (dBA)		Criteria (dBA)		
		Existing/Approved	Project Worst Case	Existing/Approved	Project Worst Case	Day	Evening	Night
100	21 McNamara Place	41	42	43	43	42	42	42
101	19 McNamara Place	41	42	43	43	42	42	42
102	17 McNamara Place	42	42	43	43	42	42	42
103	15 McNamara Place	42	42	44	44	42	42	42
104	13 McNamara Place	43	42	44	43	42	42	42
105	11 McNamara Place	43	43	44	43	42	42	42
106	9 McNamara Place	43	43	45	44	42	42	42
107	8 McNamara Place	43	43	45	44	42	42	42
108	10 McNamara Place	43	43	44	44	42	42	42
109	12 McNamara Place	42	42	44	43	42	42	42
110	14 McNamara Place	42	42	44	43	42	42	42
111	16 McNamara Place	42	42	44	43	42	42	42
112	6 McNamara Place	44	44	45	44	42	42	42
113	4 McNamara Place	44	44	45	45	42	42	42
114	7 McNamara Place	45	44	46	45	42	42	42
115	12 McNamara Place	45	45	46	45	42	42	42
116	10 McNamara Place	45	45	46	45	42	42	42
117	8 McNamara Place	45	45	46	45	42	42	42
118	1 Neal Place	44	44	45	44	42	42	42
119	3 Neal Place	44	44	45	44	42	42	42
120	5 Neal Place	44	44	45	44	42	42	42
121	7 Neal Place	43	43	44	44	42	42	42

Receiver No	Description*	Predicted Day/Evening Level (dBA)		Predicted Night Level (dBA)		Criteria (dBA)		
		Existing/Approved	Project Worst Case	Existing/Approved	Project Worst Case	Day	Evening	Night
122	2 Neal Place	44	44	45	44	42	42	42
123	4 Neal Place	44	44	44	44	42	42	42
124	6 Glebe Close	45	45	46	45	42	42	42
125	4 Glebe Close	44	44	45	44	42	42	42
126	2 Glebe Close	44	44	45	44	42	42	42
127	27 Toggerai Street	44	44	45	45	42	42	42
128	25 Toggerai Street	44	44	45	44	42	42	42
129	29 Toggerai Street	45	44	46	45	42	42	42
130	31 Toggerai Street	45	44	46	45	42	42	42
131	33 Toggerai Street	44	44	45	44	42	42	42
132	35 Toggerai Street	44	44	45	44	42	42	42
133	37 Toggerai Street	45	45	45	45	42	42	42
134	39 Toggerai Street	46	46	47	46	42	42	42
135	41 Toggerai Street	47	47	48	47	42	42	42
136	43 Toggerai Street	47	48	48	48	42	42	42
137	45 Toggerai Street	48	48	48	48	42	42	42
138	2 Illawarra Street	49	50	49	49	42	42	42
139	38 Illawarra Street	47	49	48	48	42	42	42
140	Toggerai Street-A	52	52	52	51	42	42	42
141	44-50 Church Street	45	46	45	45	42	42	42
142	52-58 Church Street	47	48	47	48	42	42	42
143	60 Church Street	48	49	48	48	42	42	42

Receiver No	Description*	Predicted Day/Evening Level (dBA)		Predicted Night Level (dBA)		Criteria (dBA)		
		Existing/Approved	Project Worst Case	Existing/Approved	Project Worst Case	Day	Evening	Night
144	George Street-A	50	50	50	49	42	42	42
146	Toggerai Street-B	46	46	46	46	42	42	42
147	Toggerai Street-C	46	47	46	47	42	42	42
148	18 Burke Street	42	43	42	42	42	42	42
149	62 Burke Street	41	42	41	41	42	42	42
150	62 Burke Street	42	42	42	42	42	42	42
151	62 Burke Street	41	42	42	41	42	42	42
152	19 Burke Street	42	42	42	42	42	42	42
153	17 Burke Street	41	42	42	42	42	42	42
154	2 Burke Street	41	42	42	42	42	42	42
155	30 Appin-Bulli Road	41	42	42	42	42	42	42
156	30 Toggerai Street	44	44	44	44	42	42	42
157	23 Burke Street	43	43	44	43	42	42	42
158	29 Burke Street	43	43	43	43	42	42	42
159	27 Bulli-Appin Road	42	42	42	42	42	42	42
160	29 Burke Street	43	43	43	42	42	42	42
165	Scout Camp-E	39	39	41	41	37	37	35
166	Darkes Forest Rd-A	25	28	25	28	36	36	36
167	Darkes Forest Rd-B	25	27	25	28	36	36	36
168	Darkes Forest Rd-C	25	27	25	28	36	36	36
169	Darkes Forest Rd-D	25	27	26	28	36	36	36
170	Darkes Forest Rd-E	25	27	25	28	36	36	36

Receiver No	Description*	Predicted Day/Evening Level (dBA)		Predicted Night Level (dBA)		Criteria (dBA)		
		Existing/Approved	Project Worst Case	Existing/Approved	Project Worst Case	Day	Evening	Night
171	Darkes Forest Rd-F	25	27	26	28	36	36	36
172	Darkes Forest Rd-G	24	29	25	30	36	36	36
173	Darkes Forest Rd-H	25	28	26	28	36	36	36
174	Darkes Forest Rd-I	25	28	26	28	36	36	36
175	Darkes Forest Rd-J	25	28	26	28	36	36	36
176	Darkes Forest Rd-K	25	28	26	28	36	36	36
177	Darkes Forest Rd-L	25	27	26	28	36	36	36
178	Darkes Forest Rd-M	25	27	25	27	36	36	36
179	Darkes Forest Rd-N	19	20	19	20	36	36	36
180	Darkes Forest Rd-O	23	24	23	24	36	36	36
181	Darkes Forest Rd-P	19	19	18	20	36	36	36
182	Darkes Forest Rd-Q	20	21	20	21	36	36	36
183	Darkes Forest Rd-R	18	18	17	18	36	36	36
184	Bingara Gorge-A	32	32	21	23	39	39	39
185	Bingara Gorge-B	32	32	25	24	43	43	43
186	Bingara Gorge-C	31	31	25	23	43	43	43
187	Bingara Gorge-D	31	31	20	22	43	43	43
188	Bingara Gorge-E	27	27	18	19	39	39	39
189	Bingara Gorge-F	24	25	18	19	39	39	39
190	Bingara Gorge-G	33	33	23	24	43	43	43
194	12 Neal Place	43	43	44	43	42	42	42
195	62 Kennedy Street	42	42	43	42	42	42	42

Receiver No	Description*	Predicted Day/Evening Level (dBA)		Predicted Night Level (dBA)		Criteria (dBA)		
		Existing/Approved	Project Worst Case	Existing/Approved	Project Worst Case	Day	Evening	Night
196	14 Appin-Bulli Road	40	41	41	41	42	42	42
197	15 King Street	40	40	41	40	42	42	42
199	41 Appin Road	42	42	43	42	40	40	40
200	22 Wilton Road	43	42	44	44	42	42	42
201	2 Toggerai Street	43	43	44	43	42	42	42
202	7 Toggerai Street	43	43	44	43	42	42	42
203	2 St James Place	43	42	44	43	42	42	42
204	1 Toggerai Street	42	41	43	42	42	42	42
205	14 St James Place	42	42	43	43	42	42	42
206	14 The Lachlan Vale Road	41	41	43	42	42	42	42
207	22 St James Place	41	41	43	43	42	42	42
208	15 The Lachlan Vale Road	41	41	43	42	42	42	42
209	32 St James Place	41	42	43	43	42	42	42
211	25 St James Place	41	41	43	43	42	42	42
212	33 Macquariedale Road	37	36	37	36	40	40	40
213	50 Macquariedale Road	38	36	38	36	40	40	40
214	115 Macquariedale Road	38	36	39	37	40	40	40
215	120 Macquariedale Road	38	36	39	37	40	40	40
216	110 Macquariedale Road	41	39	42	40	40	40	40
217	265 The Lachlan Vale Road	35	30	35	30	39	39	39
218	280 The Lachlan Vale Road	36	30	36	30	39	39	39
226	820 Wilton Road	39	36	39	36	40	40	40

Receiver No	Description*	Predicted Day/Evening Level (dBA)		Predicted Night Level (dBA)		Criteria (dBA)		
		Existing/Approved	Project Worst Case	Existing/Approved	Project Worst Case	Day	Evening	Night
228	145 Macquariedale Road	37	34	37	35	40	40	40
229	725 Wilton Road	35	34	36	34	40	40	40
230	130 Macquariedale Road	37	36	38	36	40	40	40
232	425 Wilton Road	29	29	29	29	40	40	40
233	389 Wilton Road	33	30	33	30	39	39	39
234	160 Macquariedale Road	36	35	37	35	40	40	40
235	180 Macquariedale Road	36	35	37	35	40	40	40
236	17 St James Street	42	42	43	43	42	42	42
237	19 St James Street	42	42	44	43	42	42	42
238	21 St James Street	41	42	43	43	42	42	42
239	23 St James Street	41	42	43	43	42	42	42
240	27 St James Place	41	41	43	43	42	42	42
241	34 St James Place	41	42	43	43	42	42	42
242	30 St James Place	41	42	43	43	42	42	42
243	28 St James Place	41	42	43	43	42	42	42
244	26 St James Place	42	42	44	43	42	42	42
245	24 St James Place	42	42	43	43	42	42	42
246	18 St James Place	42	42	43	43	42	42	42
247	16 St James Place	42	42	43	43	42	42	42
248	12 St James Place	42	42	44	43	42	42	42
249	6 St James Place	43	42	44	43	42	42	42
250	10 St James Place	43	42	44	43	42	42	42

Receiver No	Description*	Predicted Day/Evening Level (dBA)		Predicted Night Level (dBA)		Criteria (dBA)		
		Existing/Approved	Project Worst Case	Existing/Approved	Project Worst Case	Day	Evening	Night
251	8 St James Place	43	43	44	44	42	42	42
252	4 St James Place	43	42	44	43	42	42	42
253	18 McNamara Place	42	42	44	43	42	42	42
254	15 Neal Place	43	43	44	43	42	42	42
255	11 Neal Place	43	43	44	43	42	42	42
256	13 Neal Place	43	43	44	43	42	42	42
257	9 Neal Place	43	43	44	43	42	42	42
258	18 Neal Place	43	43	44	43	42	42	42
259	16 Neal Place	43	43	44	43	42	42	42
260	14 Neal Place	43	43	44	43	42	42	42
261	10 Neal Place	43	43	44	43	42	42	42
262	8 Neal Place	43	43	44	43	42	42	42
263	23 Toggerai Street	42	41	43	42	42	42	42
264	21 Toggerai Street	43	42	44	43	42	42	42
265	19 Toggerai Street	43	43	44	43	42	42	42
266	17 Toggerai Street	43	43	44	43	42	42	42
267	26 Toggerai Street	44	43	45	44	42	42	42
268	24 Toggerai Street	43	43	44	43	42	42	42
269	26 Toggerai Street	43	43	44	43	42	42	42
270	24A Toggerai Street	43	43	43	43	42	42	42
271	25 Appin-Bulli Road	42	42	43	42	42	42	42
272	23 Appin-Bulli Road	42	42	42	42	42	42	42

Receiver No	Description*	Predicted Day/Evening Level (dBA)		Predicted Night Level (dBA)		Criteria (dBA)		
		Existing/Approved	Project Worst Case	Existing/Approved	Project Worst Case	Day	Evening	Night
273	28 Appin-Bulli Road	41	41	41	41	42	42	42
274	26 Appin-Bulli Road	41	41	41	41	42	42	42
275	22 Appin-Bulli Road	40	41	41	41	42	42	42
276	4 King Street	41	42	42	42	42	42	42
277	8 King Street	41	41	41	41	42	42	42
278	10 King Street	40	41	41	41	42	42	42
279	Quarter Sessions Road-F	40	35	40	35	39	39	39
280	350 The Lachlan Vale Road	38	32	38	32	39	39	39
281	Quarter Sessions Road-G	38	33	39	33	39	39	39
282	389 Wilton Road	33	30	33	30	39	39	39
283	11 Toggerai St	43	43	44	43	42	42	42
284	9 Toggerai St	43	43	44	43	42	42	42

* Data from Google Maps (2009). Addresses are approximate. For modelled location see Figures I4-1 to I4-6.

Table ID-2 – Predicted Cumulative Noise Levels At Receivers

Receiver No	Description*	Day/Evening			Night			Criteria (dBA)		
		Cumulative Level L_{Aeq} (dBA)	Cumulative + Existing/ Approved L_{Aeq} (dBA)	Cumulative Level + Project Worst Case L_{Aeq} (dBA)	Cumulative Level L_{Aeq} (dBA)	Cumulative + Existing/ Approved L_{Aeq} (dBA)	Cumulative Level + Project Worst Case L_{Aeq} (dBA)	Day	Evening	Night
1	Ashwood Road-A	30	38	38	31	31	31	50	45	40
2	Ashwood Road-B	30	39	39	31	31	31	50	45	40
3	160 Ashwood Rd	31	39	39	31	32	32	50	45	40
4	160 Ashwood Rd	31	38	38	31	31	32	50	45	40
5	160 Ashwood Rd	31	37	37	31	32	32	50	45	40
6	150 Ashwood Rd	31	37	37	31	31	32	50	45	40
7	Ashwood Road-C	29	35	35	29	30	30	50	45	40
9	140 Ashwood Rd	33	37	37	33	33	33	50	45	40
10	110 Ashwood Rd	30	37	37	30	30	31	50	45	40
11	100 Ashwood Rd	30	36	36	30	30	30	50	45	40
12	105 Ashwood Rd	29	35	35	28	29	29	70		
13	90 Ashwood Rd	29	35	35	28	29	29	50	45	40
14	200 Douglas Park Drive	37	44	44	37	37	37	50	45	40
15	125 Douglas Park Drive	33	38	38	33	34	34	50	45	40
16	95 Douglas Park Drive	31	36	36	31	32	32	50	45	40
17	10 Whitticase Lane	30	36	36	30	31	31	50	45	40
18	25 Whitticase Lane	31	36	37	31	32	32	50	45	40
19	45 Whitticase Lane	28	34	34	28	30	29	50	45	40
20	45 Whitticase Lane	28	35	35	28	30	30	50	45	40
21	40 Whitticase Lane	28	35	35	28	30	30	50	45	40
22	90 Douglas Park Drive	29	35	35	29	30	31	50	45	40
23	80 Douglas Park Drive	28	35	35	28	29	29	50	45	40
24	140 Douglas Park Drive	35	41	42	34	35	35	50	45	40
25	120 Douglas Park Drive	28	34	34	26	28	28	50	45	40

Receiver No	Description*	Day/Evening			Night			Criteria (dBA)		
		Cumulative Level LAeq (dBA)	Cumulative + Existing/ Approved LAeq (dBA)	Cumulative Level + Project Worst Case LAeq (dBA)	Cumulative Level LAeq (dBA)	Cumulative + Existing/ Approved LAeq (dBA)	Cumulative Level + Project Worst Case LAeq (dBA)	Day	Evening	Night
26	200 Douglas Park Drive	38	44	44	38	38	39	50	45	40
27	250 Douglas Park Drive	35	39	39	36	37	37	50	45	40
28	250 Douglas Park Drive	35	39	39	36	36	36	50	45	40
29	260 Douglas Park Drive	33	37	37	34	35	35	50	45	40
30	270 Douglas Park Drive	31	36	36	32	33	33	50	45	40
31	274 Douglas Park Drive	31	37	37	32	33	33	50	45	40
32	276 Douglas Park Drive	30	36	36	32	33	33	50	45	40
33	278 Douglas Park Drive	30	35	35	32	33	33	50	45	40
34	280 Douglas Park Drive	30	35	35	32	32	33	50	45	40
35	282 Douglas Park Drive	30	34	34	31	32	32	50	45	40
36	284 Douglas Park Drive	30	34	34	30	32	32	50	45	40
37	286 Douglas Park Drive	29	34	34	30	31	31	50	45	40
38	286 Douglas Park Drive	29	34	34	31	32	32	50	45	40
39	290 Douglas Park Drive	29	33	33	30	31	31	50	45	40
40	288 Douglas Park Drive	29	33	33	30	31	32	50	45	40
41	292 Douglas Park Drive	29	33	33	30	31	31	50	45	40
42	300 Douglas Park Drive	27	31	31	30	31	31	50	45	40
43	306 Douglas Park Drive	27	30	30	31	31	31	50	45	40
44	314 Douglas Park Drive	27	31	31	30	31	31	50	45	40
45	330 Douglas Park Drive	28	34	34	29	30	31	50	45	40
46	340 Douglas Park Drive	27	34	34	29	30	30	50	45	40
47	330 Douglas Park Drive	28	33	33	29	30	30	50	45	40
48	320 Douglas Park Drive	27	34	34	28	30	30	50	45	40
50	360 Douglas Park Drive	25	33	32	27	29	29	50	45	40
51	100 Douglas Park Drive	29	36	36	30	31	31	50	45	40
52	75 Douglas Park Drive	29	34	34	29	29	30	50	45	40

Receiver No	Description*	Day/Evening			Night			Criteria (dBA)		
		Cumulative Level L _{Aeq} (dBA)	Cumulative + Existing/ Approved L _{Aeq} (dBA)	Cumulative Level + Project Worst Case L _{Aeq} (dBA)	Cumulative Level L _{Aeq} (dBA)	Cumulative + Existing/ Approved L _{Aeq} (dBA)	Cumulative Level + Project Worst Case L _{Aeq} (dBA)	Day	Evening	Night
53	85 Douglas Park Drive	30	35	36	30	31	31	50	45	40
54	St Mary's Towers Monastery	21	26	25	23	26	26	50	45	40
55	St Mary's Towers Monastery	22	26	26	22	26	25	50	45	40
56	St Mary's Towers Monastery	20	26	25	21	25	25	50	45	40
57	Brooks Point Road-A	23	43	38	24	45	39	50	45	40
58	Brooks Point Road-B	22	45	39	23	46	40	50	45	40
60	Brooks Point Road-C	21	57	51	24	57	51	50	45	40
63	430 Brooks Point Road	21	48	42	23	48	42	50	45	40
64	440 Brooks Point Road	22	50	44	24	50	44	50	45	40
66	426 Brooks Point Road	22	46	41	24	47	41	50	45	40
67	420 Brooks Point Road	22	45	40	24	46	40	50	45	40
68	410 Brooks Point Road	22	44	38	24	44	39	50	45	40
69	406 Brooks Point Road	22	43	37	25	43	37	50	45	40
70	400 Brooks Point Road	21	41	35	24	41	36	50	45	40
71	Quarter Sessions Road-A	23	47	41	24	47	41	50	45	40
72	Quarter Sessions Road -B	23	46	40	24	46	40	50	45	40
74	Quarter Sessions Road -C	24	45	39	24	45	39	50	45	40
75	Quarter Sessions Road -D	22	45	39	23	45	39	50	45	40
76	Quarter Sessions Road -E	22	40	35	22	40	34	50	45	40
78	130 The Lachlan Vale Road	33	39	37	33	40	39	50	45	40
79	The Lachlan Vale Road -A	43	51	48	43	51	49	50	45	40
80	The Lachlan Vale Road -B	37	44	42	38	45	43	50	45	40
82	60-80 Northhamptondale Road	38	44	42	37	44	42	50	45	40
83	Northhamptondale Road-A	37	42	41	35	42	40	50	45	40
84	289 The Lachlan Vale Road	30	38	36	30	38	37	50	45	40

Receiver No	Description*	Day/Evening			Night			Criteria (dBA)		
		Cumulative Level LAeq (dBA)	Cumulative + Existing/ Approved LAeq (dBA)	Cumulative Level + Project Worst Case LAeq (dBA)	Cumulative Level LAeq (dBA)	Cumulative + Existing/ Approved LAeq (dBA)	Cumulative Level + Project Worst Case LAeq (dBA)	Day	Evening	Night
85	90 Northhamptondale Road	39	44	43	38	44	42	50	45	40
86	635 Wilton Road	38	42	41	37	42	41	50	45	40
87	635 Wilton Road	38	42	40	37	42	40	50	45	40
88	Wilton Road -A	34	37	36	33	37	36	50	45	40
89	775 Wilton Road	34	39	38	33	39	37	50	45	40
90	875 Wilton Road	39	43	42	38	43	42	50	45	40
91	865 Wilton Road	41	46	44	41	46	44	50	45	40
93	ICHPL mine cottage-A	28	47	47	27	47	46	50	45	40
94	Open Space Recreation Area	16	39	39	16	38	37	50		
95	ICHPL-B	28	45	46	27	46	46	50	45	40
96	ICHPL-C	28	45	45	27	45	45	50	45	40
97	ICHPL-D	28	45	45	27	45	45	50	45	40
98	ICHPL-E	28	44	44	27	45	45	50	45	40
99	ICHPL-F	28	44	44	27	44	44	50	45	40
100	21 McNamara Place	30	39	40	29	40	40	55	45	40
101	19 McNamara Place	30	39	40	29	40	40	55	45	40
102	17 McNamara Place	30	39	40	29	40	40	55	45	40
103	15 McNamara Place	29	39	40	29	41	41	55	45	40
104	13 McNamara Place	29	41	40	29	42	41	55	45	40
105	11 McNamara Place	29	41	40	28	42	41	55	45	40
106	9 McNamara Place	29	41	41	28	42	41	55	45	40
107	8 McNamara Place	29	40	40	28	42	41	55	45	40
108	10 McNamara Place	29	40	40	28	42	41	55	45	40
109	12 McNamara Place	29	40	40	29	41	40	55	45	40
110	14 McNamara Place	29	39	40	29	41	40	55	45	40
111	16 McNamara Place	30	39	40	29	41	40	55	45	40

Receiver No	Description*	Day/Evening			Night			Criteria (dBA)		
		Cumulative Level L_{Aeq} (dBA)	Cumulative + Existing/ Approved L_{Aeq} (dBA)	Cumulative Level + Project Worst Case L_{Aeq} (dBA)	Cumulative Level L_{Aeq} (dBA)	Cumulative + Existing/ Approved L_{Aeq} (dBA)	Cumulative Level + Project Worst Case L_{Aeq} (dBA)	Day	Evening	Night
112	6 McNamara Place	29	41	41	28	42	42	55	45	40
113	4 McNamara Place	29	41	41	28	43	42	55	45	40
114	7 McNamara Place	28	42	41	28	43	43	55	45	40
115	12 McNamara Place	28	42	42	27	44	43	55	45	40
116	10 McNamara Place	28	42	42	27	44	43	55	45	40
117	8 McNamara Place	28	42	42	27	43	42	55	45	40
118	1 Neal Place	28	41	41	28	43	42	55	45	40
119	3 Neal Place	29	41	41	28	42	41	55	45	40
120	5 Neal Place	29	41	41	28	42	41	55	45	40
121	7 Neal Place	29	40	40	28	42	41	55	45	40
122	2 Neal Place	28	41	41	28	42	41	55	45	40
123	4 Neal Place	28	41	41	28	42	41	55	45	40
124	6 Glebe Close	28	42	41	27	43	42	55	45	40
125	4 Glebe Close	28	41	41	27	43	42	55	45	40
126	2 Glebe Close	28	41	41	27	43	42	55	45	40
127	27 Toggerai Street	28	41	41	27	43	42	55	45	40
128	25 Toggerai Street	28	41	41	27	43	42	55	45	40
129	29 Toggerai Street	28	42	41	27	43	43	55	45	40
130	31 Toggerai Street	27	42	41	27	43	42	55	45	40
131	33 Toggerai Street	27	41	41	26	43	42	55	45	40
132	35 Toggerai Street	27	41	42	26	43	42	55	45	40
133	37 Toggerai Street	27	42	42	26	43	43	55	45	40
134	39 Toggerai Street	27	43	43	26	45	44	55	45	40
135	41 Toggerai Street	27	45	44	26	46	45	55	45	40
136	43 Toggerai Street	26	44	44	26	46	46	55	45	40
137	45 Toggerai Street	26	45	45	25	46	46	55	45	40

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138	2 Illawarra Street	26	46	46	25	47	47	55	45	40
139	38 Illawarra Street	25	44	45	24	45	46	50	45	40
140	Toggerai Street-A	25	48	48	25	49	49	50	45	40
141	44-50 Church Street	24	42	43	24	43	42	50	45	40
142	52-58 Church Street	24	43	44	24	44	45	50	45	40
143	60 Church Street	24	44	45	23	45	45	50	45	40
144	George Street-A	23	47	47	22	48	47	50	45	40
145	George Street-B	24	52	53	23	51	50	50	45	40
146	Toggerai Street-B	26	43	43	26	44	44	50	45	40
147	Toggerai Street-C	26	43	43	26	44	44	50	45	40
148	18 Burke Street	26	39	40	26	40	40	50	45	40
149	62 Burke Street	23	37	38	23	39	39	50	45	40
150	62 Burke Street	24	38	39	24	40	40	50	45	40
151	62 Burke Street	24	37	38	24	39	39	50	45	40
152	19 Burke Street	26	38	39	26	40	40	55	45	40
153	17 Burke Street	26	38	39	25	40	40	55	45	40
154	2 Burke Street	25	38	38	25	40	40	55	45	40
155	30 Appin-Bulli Road	26	38	39	26	40	40	55	45	40
156	30 Toggerai Street	27	41	41	27	42	41	55	45	40
157	23 Burke Street	27	40	40	27	42	41	55	45	40
158	29 Burke Street	27	40	40	26	41	41	55	45	40
159	27 Bulli-Appin Road	27	39	39	26	40	40	55	45	40
160	29 Burke Street	27	39	40	26	41	40	55	45	40
161	Scout Camp-A	21	41	40	20	40	40	55		
162	Scout Camp-B	16	41	41	16	41	41	55		
163	Scout Camp-C	16	42	42	15	42	42	55		

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164	Scout Camp-D	17	44	44	17	43	44	55		
165	Scout Camp-E	14	37	37	14	37	37	50	45	40
166	Darkes Forest Rd-A	9	22	25	8	22	26	50	45	40
167	Darkes Forest Rd-B	8	21	24	7	22	25	50	45	40
168	Darkes Forest Rd-C	8	22	24	7	22	24	50	45	40
169	Darkes Forest Rd-D	6	21	24	4	22	24	50	45	40
170	Darkes Forest Rd-E	7	21	24	6	22	24	50	45	40
171	Darkes Forest Rd-F	6	21	24	5	22	24	50	45	40
172	Darkes Forest Rd-G	7	21	25	6	22	26	50	45	40
173	Darkes Forest Rd-H	10	21	24	10	22	25	50	45	40
174	Darkes Forest Rd-I	11	21	24	10	22	25	50	45	40
175	Darkes Forest Rd-J	10	21	24	10	22	25	50	45	40
176	Darkes Forest Rd-K	10	21	23	9	22	24	50	45	40
177	Darkes Forest Rd-L	10	22	23	10	22	24	50	45	40
178	Darkes Forest Rd-M	8	21	23	8	21	23	50	45	40
179	Darkes Forest Rd-N	0	16	16	0	15	17	50	45	40
180	Darkes Forest Rd-O	4	19	20	4	19	20	50	45	40
181	Darkes Forest Rd-P	-1	15	17	-2	15	17	50	45	40
182	Darkes Forest Rd-Q	1	17	18	1	17	19	50	45	40
183	Darkes Forest Rd-R	-1	14	14	-2	13	15	50	45	40
184	Bingara Gorge-A	20	31	31	20	22	23	50	45	40
185	Bingara Gorge-B	23	30	31	23	25	25	50	45	40
186	Bingara Gorge-C	23	29	32	23	25	25	50	45	40
187	Bingara Gorge-D	23	29	29	23	24	24	50	45	40
188	Bingara Gorge-E	24	28	28	24	25	25	50	45	40
189	Bingara Gorge-F	21	27	27	22	23	23	50	45	40

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190	Bingara Gorge-G	24	31	31	23	25	25	50	45	40
191	Crown Reserve, east of 82 Appin Road	16	52	53	15	49	49	50		
192	Crown Reserve, east of 82 Appin Road	11	38	41	10	40	39	50		
193	Appin Anglican Church, 20 Appin-Bulli Road	29	39	39	29	41	40	50		
194	12 Neal Place	29	39	40	28	41	41	55	45	40
195	62 Kennedy Street	28	39	39	28	41	40	55	45	40
196	14 Appin-Bulli Road	27	37	38	27	39	39	55	45	40
197	15 King Street	26	37	37	26	38	38	55	45	40
199	41 Appin Road	29	39	38	30	41	40	50	45	40
200	22 Wilton Road	30	40	39	30	42	41	55	45	40
201	2 Toggerai Street	30	40	40	29	41	41	55	45	40
202	7 Toggerai Street	29	40	40	29	41	41	55	45	40
203	2 St James Place	30	40	39	30	41	41	55	45	40
204	1 Toggerai Street	30	39	38	30	40	40	55	45	40
205	14 St James Place	30	39	39	29	41	40	55	45	40
206	14 The Lachlan Vale Road	33	39	39	32	41	40	55	45	40
207	22 St James Place	29	39	39	26	40	40	55	45	40
208	15 The Lachlan Vale Road	33	40	40	32	41	40	55	45	40
209	32 St James Place	30	39	40	28	40	40	55	45	40
211	25 St James Place	30	39	39	28	40	40	55	45	40
212	33 Macquariedale Road	29	36	35	30	37	36	55	45	40
213	50 Macquariedale Road	29	37	36	30	38	36	50	45	40
214	115 Macquariedale Road	29	37	35	30	38	36	50	45	40
215	120 Macquariedale Road	27	36	34	28	38	36	50	45	40

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216	110 Macquariedale Road	31	40	38	32	41	39	50	45	40
217	265 The Lachlan Vale Road	20	34	30	20	34	30	50	45	40
218	280 The Lachlan Vale Road	21	34	29	21	34	29	50	45	40
220	William Woods Park	30	39	40	29	41	40	55		
221	900 Wilton Road	33	40	40	32	40	40	70		
222	17 Technology Drive	33	40	40	32	41	40	70		
223	Technology Drive-A	33	40	39	32	40	40	70		
224	4-6 Technology Drive	36	41	39	35	41	39	70		
225	820 Wilton Road	35	39	38	35	39	38	70		
226	820 Wilton Road	34	39	38	34	39	38	50	45	40
227	550 Wilton Road	28	34	33	27	33	33	70		
228	145 Macquariedale Road	27	34	32	28	36	34	50	45	40
229	725 Wilton Road	28	34	33	28	34	33	50	45	40
230	130 Macquariedale Road	24	35	34	25	37	35	50	45	40
232	425 Wilton Road	21	29	28	21	28	27	50	45	40
233	389 Wilton Road	27	33	31	27	32	30	50	45	40
234	160 Macquariedale Road	22	32	31	24	35	33	50	45	40
235	180 Macquariedale Road	23	32	31	24	35	33	50	45	40
236	17 St James Street	30	39	39	27	41	40	55	45	40
237	19 St James Street	30	39	39	28	41	40	55	45	40
238	21 St James Street	30	39	39	29	40	40	55	45	40
239	23 St James Street	30	39	39	28	40	40	55	45	40
240	27 St James Place	30	39	39	27	40	40	55	45	40
241	34 St James Place	30	39	40	28	40	40	55	45	40
242	30 St James Place	30	39	40	28	40	40	55	45	40
243	28 St James Place	30	39	40	27	40	40	55	45	40

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244	26 St James Place	28	39	40	26	41	40	55	45	40
245	24 St James Place	28	39	39	26	41	40	55	45	40
246	18 St James Place	30	39	39	27	40	40	55	45	40
247	16 St James Place	30	39	39	29	41	40	55	45	40
248	12 St James Place	30	39	39	30	41	40	55	45	40
249	6 St James Place	30	40	39	30	41	40	55	45	40
250	10 St James Place	31	40	39	30	41	41	55	45	40
251	8 St James Place	31	40	40	30	41	41	55	45	40
252	4 St James Place	30	40	39	30	41	40	55	45	40
253	18 McNamara Place	30	39	40	29	41	40	55	45	40
254	15 Neal Place	29	39	40	29	41	41	55	45	40
255	11 Neal Place	29	39	40	28	41	41	55	45	40
256	13 Neal Place	29	39	40	28	41	41	55	45	40
257	9 Neal Place	29	40	40	28	41	41	55	45	40
258	18 Neal Place	29	40	40	29	41	41	55	45	40
259	16 Neal Place	29	40	40	29	41	41	55	45	40
260	14 Neal Place	29	39	40	28	41	41	55	45	40
261	10 Neal Place	29	39	40	28	41	41	55	45	40
262	8 Neal Place	29	40	40	28	41	41	55	45	40
263	23 Toggerai Street	28	39	39	27	41	40	55	45	40
264	21 Toggerai Street	28	40	40	28	41	40	55	45	40
265	19 Toggerai Street	28	39	40	28	41	41	55	45	40
266	17 Toggerai Street	29	39	40	28	41	41	55	45	40
267	26 Toggerai Street	28	41	40	27	42	41	55	45	40
268	24 Toggerai Street	28	40	40	27	42	41	55	45	40
269	26 Toggerai Street	27	40	40	27	42	41	55	45	40

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270	24A Toggerai Street	28	40	40	27	41	41	55	45	40
271	25 Appin-Bulli Road	27	39	39	27	41	40	55	45	40
272	23 Appin-Bulli Road	27	39	39	27	40	40	55	45	40
273	28 Appin-Bulli Road	27	38	38	26	39	39	55	45	40
274	26 Appin-Bulli Road	27	38	38	26	39	39	55	45	40
275	22 Appin-Bulli Road	27	37	38	27	39	38	55	45	40
276	4 King Street	26	37	38	26	40	40	55	45	40
277	8 King Street	26	37	38	26	39	39	55	45	40
278	10 King Street	26	37	38	26	38	39	55	45	40
279	Quarter Sessions Road-F	20	40	35	20	40	34	50	45	40
280	350 The Lachlan Vale Road	20	34	29	21	34	29	50	45	40
281	Quarter Sessions Road-G	20	37	33	21	36	31	50	45	40
282	389 Wilton Road	27	33	31	27	32	30	50	45	40
283	11 Toggerai St	20	39	39	20	41	41	55	45	40
284	9 Toggerai St	20	39	39	20	41	41	55	45	40

* Data from Google Maps (2009). Addresses are approximate. For modelled location see Figures I4-1 to I4-6.

Table ID-3 – Predicted Cumulative Noise Levels at Receivers – Calm/Neutral Conditions

Receiver No	Description*	Day/Evening			Night			Criteria (dBA)		
		Cumulative Level L_{Aeq} (dBA)	Cumulative + Existing/ Approved L_{Aeq} (dBA)	Cumulative Level + Project Worst Case L_{Aeq} (dBA)	Cumulative Level L_{Aeq} (dBA)	Cumulative + Existing/ Approved L_{Aeq} (dBA)	Cumulative Level + Project Worst Case L_{Aeq} (dBA)	Day	Evening	Night
1	Ashwood Road-A	23	37	37	23	24	25	39	39	39
2	Ashwood Road-B	24	39	39	24	26	27	39	39	39
3	160 Ashwood Rd	24	39	39	24	26	27	39	39	39
4	160 Ashwood Rd	22	37	37	22	25	25	39	39	39
5	160 Ashwood Rd	23	34	34	23	24	25	39	39	39
6	150 Ashwood Rd	22	33	34	22	24	25	39	39	39
7	Ashwood Road-C	20	32	32	20	23	23	39	39	39
9	140 Ashwood Rd	25	33	33	25	26	26	39	39	39
10	110 Ashwood Rd	22	35	35	22	24	25	39	39	39
11	100 Ashwood Rd	22	34	34	22	23	24	39	39	39
13	90 Ashwood Rd	20	34	34	20	22	23	39	39	39
14	200 Douglas Park Drive	31	43	43	31	32	33	43	43	43
15	125 Douglas Park Drive	24	34	34	24	26	27	43	43	43
16	95 Douglas Park Drive	22	34	34	22	25	25	43	43	43
17	10 Whitticase Lane	21	34	34	21	24	25	43	43	43
18	25 Whitticase Lane	21	35	35	21	24	25	43	43	43
19	45 Whitticase Lane	19	33	33	19	23	23	43	43	43
20	45 Whitticase Lane	19	34	34	19	23	24	43	43	43
21	40 Whitticase Lane	19	34	34	19	23	24	43	43	43
22	90 Douglas Park Drive	21	34	34	21	24	25	43	43	43
23	80 Douglas Park Drive	22	34	34	22	24	25	43	43	43
24	140 Douglas Park Drive	27	40	40	28	29	30	43	43	43
25	120 Douglas Park Drive	20	29	29	20	23	23	43	43	43
26	200 Douglas Park Drive	33	43	43	33	34	34	43	43	43

Receiver No	Description*	Day/Evening			Night			Criteria (dBA)		
		Cumulative Level L_{Aeq} (dBA)	Cumulative + Existing/ Approved L_{Aeq} (dBA)	Cumulative Level + Project Worst Case L_{Aeq} (dBA)	Cumulative Level L_{Aeq} (dBA)	Cumulative + Existing/ Approved L_{Aeq} (dBA)	Cumulative Level + Project Worst Case L_{Aeq} (dBA)	Day	Evening	Night
27	250 Douglas Park Drive	28	36	36	28	29	29	43	43	43
28	250 Douglas Park Drive	27	36	36	27	29	29	43	43	43
29	260 Douglas Park Drive	26	33	33	26	27	28	43	43	43
30	270 Douglas Park Drive	28	34	34	28	29	29	43	43	43
31	274 Douglas Park Drive	28	34	34	28	29	29	43	43	43
32	276 Douglas Park Drive	28	33	33	28	29	29	43	43	43
33	278 Douglas Park Drive	27	32	32	27	28	28	43	43	43
34	280 Douglas Park Drive	27	32	32	27	28	28	43	43	43
35	282 Douglas Park Drive	27	32	32	27	28	28	43	43	43
36	284 Douglas Park Drive	27	31	31	27	28	28	43	43	43
37	286 Douglas Park Drive	27	31	31	27	28	28	43	43	43
38	286 Douglas Park Drive	26	31	31	26	27	28	43	43	43
39	290 Douglas Park Drive	26	30	30	26	27	27	43	43	43
40	288 Douglas Park Drive	26	30	30	26	27	27	43	43	43
41	292 Douglas Park Drive	26	30	30	26	27	27	43	43	43
42	300 Douglas Park Drive	21	28	28	21	24	24	43	43	43
43	306 Douglas Park Drive	19	27	27	19	23	23	43	43	43
44	314 Douglas Park Drive	18	25	25	18	22	22	43	43	43
45	330 Douglas Park Drive	17	27	27	17	21	21	43	43	43
46	340 Douglas Park Drive	16	27	27	16	21	21	43	43	43
47	330 Douglas Park Drive	16	26	26	16	21	21	43	43	43
48	320 Douglas Park Drive	16	26	26	16	21	21	43	43	43
50	360 Douglas Park Drive	13	24	24	13	20	19	43	43	43
51	100 Douglas Park Drive	21	35	35	21	24	25	43	43	43
52	75 Douglas Park Drive	21	33	33	21	24	25	43	43	43
53	85 Douglas Park Drive	21	34	34	21	24	25	43	43	43

Receiver No	Description*	Day/Evening			Night			Criteria (dBA)		
		Cumulative Level L _{Aeq} (dBA)	Cumulative + Existing/ Approved L _{Aeq} (dBA)	Cumulative Level + Project Worst Case L _{Aeq} (dBA)	Cumulative Level L _{Aeq} (dBA)	Cumulative + Existing/ Approved L _{Aeq} (dBA)	Cumulative Level + Project Worst Case L _{Aeq} (dBA)	Day	Evening	Night
54	St Mary's Towers Monastery	14	22	22	13	19	20	43	43	43
55	St Mary's Towers Monastery	14	22	22	14	19	20	43	43	43
56	St Mary's Towers Monastery	13	22	22	13	19	19	43	43	43
57	Brooks Point Road-A	18	42	36	18	42	36	39	39	39
58	Brooks Point Road-B	11	44	38	11	44	38	39	39	39
60	Brooks Point Road-C	8	57	51	8	57	51	39	39	39
63	430 Brooks Point Road	8	48	42	8	48	42	39	39	39
64	440 Brooks Point Road	8	50	44	8	50	44	39	39	39
66	426 Brooks Point Road	10	46	40	10	46	40	39	39	39
67	420 Brooks Point Road	9	45	39	9	45	39	39	39	39
68	410 Brooks Point Road	9	44	38	9	44	38	39	39	39
69	406 Brooks Point Road	10	42	37	10	42	37	39	39	39
70	400 Brooks Point Road	11	40	34	11	40	34	39	39	39
71	Quarter Sessions Road-A	10	46	40	10	46	40	39	39	39
72	Quarter Sessions Road -B	10	46	40	10	46	40	39	39	39
74	Quarter Sessions Road -C	10	45	39	10	45	39	39	39	39
75	Quarter Sessions Road -D	11	44	38	11	44	38	39	39	39
76	Quarter Sessions Road -E	16	40	34	16	39	33	39	39	39
78	130 The Lachlan Vale Road	31	38	36	31	38	36	40	40	40
79	The Lachlan Vale Road -A	36	50	47	36	50	47	40	40	40
80	The Lachlan Vale Road -B	36	43	41	36	43	41	40	40	40
82	60-80 Northhamptondale Road	31	43	41	31	43	41	40	40	40
83	Northhamptondale Road-A	30	41	39	30	41	39	40	40	40

Receiver No	Description*	Day/Evening			Night			Criteria (dBA)		
		Cumulative Level L _{Aeq} (dBA)	Cumulative + Existing/ Approved L _{Aeq} (dBA)	Cumulative Level + Project Worst Case L _{Aeq} (dBA)	Cumulative Level L _{Aeq} (dBA)	Cumulative + Existing/ Approved L _{Aeq} (dBA)	Cumulative Level + Project Worst Case L _{Aeq} (dBA)	Day	Evening	Night
84	289 The Lachlan Vale Road	27	37	35	27	37	35	40	40	40
85	90 Northhamptondale Road	32	43	40	32	42	40	40	40	40
86	635 Wilton Road	34	42	40	34	42	40	40	40	40
87	635 Wilton Road	31	40	38	31	40	38	40	40	40
88	Wilton Road -A	25	33	32	25	33	32	40	40	40
89	775 Wilton Road	24	37	35	24	37	35	40	40	40
90	875 Wilton Road	35	42	40	35	42	40	40	40	40
91	865 Wilton Road	39	45	43	39	45	43	40	40	40
93	ICHPL mine cottage-A	16	46	47	16	45	46	N/A		
95	ICHPL-B	16	45	45	16	44	44	N/A		
96	ICHPL-C	16	44	45	16	44	44	N/A		
97	ICHPL-D	16	44	45	16	44	43	N/A		
98	ICHPL-E	16	44	43	16	43	42	N/A		
99	ICHPL-F	16	43	43	16	42	41	N/A		
100	21 McNamara Place	16	36	37	16	35	35	42	42	42
101	19 McNamara Place	16	36	37	16	35	35	42	42	42
102	17 McNamara Place	16	36	37	16	35	35	42	42	42
103	15 McNamara Place	16	37	38	16	36	36	42	42	42
104	13 McNamara Place	16	38	38	16	37	36	42	42	42
105	11 McNamara Place	16	38	38	16	37	37	42	42	42
106	9 McNamara Place	16	39	39	16	38	37	42	42	42
107	8 McNamara Place	16	38	38	16	38	37	42	42	42
108	10 McNamara Place	16	38	38	16	37	36	42	42	42
109	12 McNamara Place	16	37	38	16	37	36	42	42	42
110	14 McNamara Place	16	37	37	16	36	36	42	42	42

Receiver No	Description*	Day/Evening			Night			Criteria (dBA)		
		Cumulative Level L _{Aeq} (dBA)	Cumulative + Existing/ Approved L _{Aeq} (dBA)	Cumulative Level + Project Worst Case L _{Aeq} (dBA)	Cumulative Level L _{Aeq} (dBA)	Cumulative + Existing/ Approved L _{Aeq} (dBA)	Cumulative Level + Project Worst Case L _{Aeq} (dBA)	Day	Evening	Night
111	16 McNamara Place	16	37	37	16	36	36	42	42	42
112	6 McNamara Place	16	39	39	16	38	37	42	42	42
113	4 McNamara Place	16	39	39	16	38	38	42	42	42
114	7 McNamara Place	16	40	40	16	39	38	42	42	42
115	12 McNamara Place	15	40	40	15	40	39	42	42	42
116	10 McNamara Place	15	40	40	15	40	39	42	42	42
117	8 McNamara Place	15	40	40	15	39	38	42	42	42
118	1 Neal Place	15	39	39	15	38	37	42	42	42
119	3 Neal Place	15	39	39	15	38	37	42	42	42
120	5 Neal Place	16	38	39	16	37	37	42	42	42
121	7 Neal Place	15	38	38	15	37	36	42	42	42
122	2 Neal Place	15	38	39	15	37	37	42	42	42
123	4 Neal Place	15	38	39	15	37	37	42	42	42
124	6 Glebe Close	15	40	40	15	39	38	42	42	42
125	4 Glebe Close	15	39	39	15	38	38	42	42	42
126	2 Glebe Close	15	39	39	15	38	37	42	42	42
127	27 Toggerai Street	14	39	39	14	38	37	42	42	42
128	25 Toggerai Street	14	39	39	14	38	37	42	42	42
129	29 Toggerai Street	15	40	40	15	39	38	42	42	42
130	31 Toggerai Street	14	40	40	14	39	38	42	42	42
131	33 Toggerai Street	14	39	40	14	38	38	42	42	42
132	35 Toggerai Street	14	40	40	14	39	38	42	42	42
133	37 Toggerai Street	14	40	41	14	39	39	42	42	42
134	39 Toggerai Street	14	42	42	14	41	40	42	42	42
135	41 Toggerai Street	14	43	43	14	42	41	42	42	42
136	43 Toggerai Street	14	43	43	14	42	41	42	42	42

Receiver No	Description*	Day/Evening			Night			Criteria (dBA)		
		Cumulative Level L _{Aeq} (dBA)	Cumulative + Existing/ Approved L _{Aeq} (dBA)	Cumulative Level + Project Worst Case L _{Aeq} (dBA)	Cumulative Level L _{Aeq} (dBA)	Cumulative + Existing/ Approved L _{Aeq} (dBA)	Cumulative Level + Project Worst Case L _{Aeq} (dBA)	Day	Evening	Night
137	45 Toggerai Street	14	44	44	14	43	42	42	42	42
138	2 Illawarra Street	14	45	44	14	43	43	42	42	42
139	38 Illawarra Street	13	42	43	13	41	41	42	42	42
140	Toggerai Street-A	14	46	46	14	45	44	42	42	42
141	44-50 Church Street	13	39	40	13	38	38	42	42	42
142	52-58 Church Street	12	40	42	12	39	39	42	42	42
143	60 Church Street	11	40	42	11	39	39	42	42	42
144	George Street-A	13	45	45	13	43	43	42	42	42
146	Toggerai Street-B	14	40	41	14	39	39	42	42	42
147	Toggerai Street-C	14	41	41	14	39	39	42	42	42
148	18 Burke Street	14	37	38	14	36	36	42	42	42
149	62 Burke Street	14	33	36	14	32	32	42	42	42
150	62 Burke Street	13	34	36	13	33	33	42	42	42
151	62 Burke Street	13	34	36	13	33	32	42	42	42
152	19 Burke Street	15	36	37	15	35	35	42	42	42
153	17 Burke Street	15	35	36	15	34	34	42	42	42
154	2 Burke Street	14	34	36	14	34	33	42	42	42
155	30 Appin-Bulli Road	14	36	37	14	35	35	42	42	42
156	30 Toggerai Street	14	38	39	14	37	37	42	42	42
157	23 Burke Street	15	38	39	15	37	37	42	42	42
158	29 Burke Street	15	37	38	15	36	36	42	42	42
159	27 Bulli-Appin Road	15	36	37	15	35	35	42	42	42
160	29 Burke Street	15	37	38	15	36	36	42	42	42
165	Scout Camp-E	9	35	35	9	35	35	37	37	35
166	Darkes Forest Rd-A	-3	19	21	-3	19	21	36	36	36
167	Darkes Forest Rd-B	-4	19	21	-5	18	21	36	36	36

Receiver No	Description*	Day/Evening			Night			Criteria (dBA)		
		Cumulative Level L _{Aeq} (dBA)	Cumulative + Existing/ Approved L _{Aeq} (dBA)	Cumulative Level + Project Worst Case L _{Aeq} (dBA)	Cumulative Level L _{Aeq} (dBA)	Cumulative + Existing/ Approved L _{Aeq} (dBA)	Cumulative Level + Project Worst Case L _{Aeq} (dBA)	Day	Evening	Night
168	Darkes Forest Rd-C	-3	18	21	-3	18	20	36	36	36
169	Darkes Forest Rd-D	-4	17	20	-4	17	20	36	36	36
170	Darkes Forest Rd-E	-4	17	20	-4	17	20	36	36	36
171	Darkes Forest Rd-F	-5	17	20	-5	16	20	36	36	36
172	Darkes Forest Rd-G	-3	19	22	-3	19	22	36	36	36
173	Darkes Forest Rd-H	-4	16	21	-4	16	21	36	36	36
174	Darkes Forest Rd-I	-4	17	22	-4	16	22	36	36	36
175	Darkes Forest Rd-J	-4	16	21	-5	16	21	36	36	36
176	Darkes Forest Rd-K	-5	16	19	-5	16	19	36	36	36
177	Darkes Forest Rd-L	-4	17	20	-4	17	20	36	36	36
178	Darkes Forest Rd-M	-7	16	19	-7	16	18	36	36	36
179	Darkes Forest Rd-N	-12	12	14	-12	12	14	36	36	36
180	Darkes Forest Rd-O	-9	15	17	-9	15	17	36	36	36
181	Darkes Forest Rd-P	-12	12	15	-12	11	15	36	36	36
182	Darkes Forest Rd-Q	-11	16	17	-11	15	17	36	36	36
183	Darkes Forest Rd-R	-15	9	12	-15	9	12	36	36	36
184	Bingara Gorge-A	15	29	29	15	19	20	39	39	39
185	Bingara Gorge-B	13	28	28	13	18	19	43	43	43
186	Bingara Gorge-C	14	26	32	14	18	18	43	43	43
187	Bingara Gorge-D	13	26	26	13	17	18	43	43	43
188	Bingara Gorge-E	15	26	26	15	18	18	39	39	39
189	Bingara Gorge-F	14	25	25	14	17	18	39	39	39
190	Bingara Gorge-G	14	29	29	14	18	19	43	43	43
194	12 Neal Place	15	37	37	15	36	35	42	42	42
195	62 Kennedy Street	16	36	36	16	35	34	42	42	42
196	14 Appin-Bulli Road	16	34	35	16	33	33	42	42	42

Receiver No	Description*	Day/Evening			Night			Criteria (dBA)		
		Cumulative Level L_{Aeq} (dBA)	Cumulative + Existing/ Approved L_{Aeq} (dBA)	Cumulative Level + Project Worst Case L_{Aeq} (dBA)	Cumulative Level L_{Aeq} (dBA)	Cumulative + Existing/ Approved L_{Aeq} (dBA)	Cumulative Level + Project Worst Case L_{Aeq} (dBA)	Day	Evening	Night
197	15 King Street	13	33	35	13	32	32	42	42	42
199	41 Appin Road	21	36	36	21	35	34	40	40	40
200	22 Wilton Road	19	37	37	19	36	35	42	42	42
201	2 Toggerai Street	17	37	37	17	36	35	42	42	42
202	7 Toggerai Street	17	37	37	17	36	35	42	42	42
203	2 St James Place	18	37	37	18	36	35	42	42	42
204	1 Toggerai Street	18	35	36	18	34	34	42	42	42
205	14 St James Place	17	36	37	17	35	35	42	42	42
206	14 The Lachlan Vale Road	22	36	36	22	35	35	42	42	42
207	22 St James Place	17	36	37	17	35	35	42	42	42
208	15 The Lachlan Vale Road	22	37	37	23	36	36	42	42	42
209	32 St James Place	18	37	37	19	36	36	42	42	42
211	25 St James Place	17	36	37	17	35	35	42	42	42
212	33 Macquariedale Road	20	35	34	20	35	33	40	40	40
213	50 Macquariedale Road	23	35	34	23	35	33	40	40	40
214	115 Macquariedale Road	23	35	33	23	35	33	40	40	40
215	120 Macquariedale Road	25	34	33	25	34	32	40	40	40
216	110 Macquariedale Road	29	38	36	29	38	36	40	40	40
217	265 The Lachlan Vale Road	14	34	29	14	34	28	39	39	39
218	280 The Lachlan Vale Road	13	32	27	13	32	27	39	39	39
226	820 Wilton Road	30	38	36	30	38	36	40	40	40
228	145 Macquariedale Road	18	30	29	18	29	28	40	40	40
229	725 Wilton Road	18	31	30	18	30	30	40	40	40
230	130 Macquariedale Road	22	33	32	22	33	31	40	40	40
232	425 Wilton Road	14	26	26	14	25	24	40	40	40
233	389 Wilton Road	19	30	28	19	28	25	39	39	39

Receiver No	Description*	Day/Evening			Night			Criteria (dBA)		
		Cumulative Level L_{Aeq} (dBA)	Cumulative + Existing/ Approved L_{Aeq} (dBA)	Cumulative Level + Project Worst Case L_{Aeq} (dBA)	Cumulative Level L_{Aeq} (dBA)	Cumulative + Existing/ Approved L_{Aeq} (dBA)	Cumulative Level + Project Worst Case L_{Aeq} (dBA)	Day	Evening	Night
234	160 Macquariedale Road	14	27	28	14	26	26	40	40	40
235	180 Macquariedale Road	14	27	28	14	27	26	40	40	40
236	17 St James Street	17	36	37	17	36	35	42	42	42
237	19 St James Street	17	36	37	17	36	35	42	42	42
238	21 St James Street	16	36	37	16	35	35	42	42	42
239	23 St James Street	17	36	37	17	35	35	42	42	42
240	27 St James Place	17	36	37	17	35	35	42	42	42
241	34 St James Place	18	36	37	18	35	35	42	42	42
242	30 St James Place	18	37	37	18	36	36	42	42	42
243	28 St James Place	18	37	37	18	36	35	42	42	42
244	26 St James Place	17	37	37	17	36	36	42	42	42
245	24 St James Place	17	36	37	17	36	35	42	42	42
246	18 St James Place	17	36	37	17	35	35	42	42	42
247	16 St James Place	17	36	36	17	35	35	42	42	42
248	12 St James Place	17	36	37	17	36	35	42	42	42
249	6 St James Place	19	37	37	19	36	35	42	42	42
250	10 St James Place	19	37	37	19	36	35	42	42	42
251	8 St James Place	19	37	37	19	36	35	42	42	42
252	4 St James Place	18	37	37	18	36	35	42	42	42
253	18 McNamara Place	16	37	37	16	36	35	42	42	42
254	15 Neal Place	16	37	37	16	36	35	42	42	42
255	11 Neal Place	15	37	37	15	36	35	42	42	42
256	13 Neal Place	15	37	37	15	36	35	42	42	42
257	9 Neal Place	15	37	38	15	36	36	42	42	42
258	18 Neal Place	16	37	37	16	36	35	42	42	42
259	16 Neal Place	15	37	37	15	36	35	42	42	42

Receiver No	Description*	Day/Evening			Night			Criteria (dBA)		
		Cumulative Level L _{Aeq} (dBA)	Cumulative + Existing/ Approved L _{Aeq} (dBA)	Cumulative Level + Project Worst Case L _{Aeq} (dBA)	Cumulative Level L _{Aeq} (dBA)	Cumulative + Existing/ Approved L _{Aeq} (dBA)	Cumulative Level + Project Worst Case L _{Aeq} (dBA)	Day	Evening	Night
260	14 Neal Place	15	37	37	15	36	35	42	42	42
261	10 Neal Place	15	37	37	15	36	35	42	42	42
262	8 Neal Place	15	37	38	15	36	36	42	42	42
263	23 Toggerai Street	14	37	38	14	36	36	42	42	42
264	21 Toggerai Street	14	37	38	14	36	36	42	42	42
265	19 Toggerai Street	15	37	37	15	36	36	42	42	42
266	17 Toggerai Street	15	37	37	15	36	35	42	42	42
267	26 Toggerai Street	14	38	38	14	37	36	42	42	42
268	24 Toggerai Street	14	38	38	14	37	36	42	42	42
269	26 Toggerai Street	14	37	38	14	36	36	42	42	42
270	24A Toggerai Street	16	37	38	16	36	36	42	42	42
271	25 Appin-Bulli Road	15	36	37	15	35	35	42	42	42
272	23 Appin-Bulli Road	15	36	37	15	35	35	42	42	42
273	28 Appin-Bulli Road	15	36	37	16	35	35	42	42	42
274	26 Appin-Bulli Road	16	35	36	16	34	34	42	42	42
275	22 Appin-Bulli Road	16	35	36	16	34	34	42	42	42
276	4 King Street	15	34	36	15	34	33	42	42	42
277	8 King Street	15	34	36	15	33	33	42	42	42
278	10 King Street	15	34	35	15	33	33	42	42	42
279	Quarter Sessions Road-F	12	39	34	12	39	33	39	39	39
280	350 The Lachlan Vale Road	9	31	26	9	31	26	39	39	39
281	Quarter Sessions Road-G	13	35	31	13	34	29	39	39	39
282	389 Wilton Road	19	30	28	19	28	25	39	39	39
283	11 Toggerai St	15	37	37	15	36	35	42	42	42
284	9 Toggerai St	15	37	37	15	36	35	42	42	42

* Data from Google Maps (2009). Addresses are approximate. For modelled location see Figures I4-1 to I4-6.