Appendix B5

Construction Noise Assessment

MANGOOLA COAL

ELECTRICITY TRANSMISSION LINE RELOCATION
CONSTRUCTION NOISE ASSESSMENT

ACOUSTICS AND AIR

REPORT NO. 08190-E
VERSION B

WILKINSON MURRAY

MANGOOLA COAL

ELECTRICITY TRANSMISSION LINE RELOCATION
CONSTRUCTION NOISE ASSESSMENT

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JULY 2010

PREPARED FOR

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1 INTRODUCTION

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

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

Xstrata Mangoola, on behalf of TransGrid, intends to construct an 11.1 kilometre section of 500kV electricity transmission line (ETL) which would traverse the western boundary of the approved project disturbance area. This new section of the ETL will replace an existing nine kilometre section of line which currently bisects the approved project disturbance area. .

The construction activities associated with the ETL works are proposed between 7am-6pm, seven days a week.

Wilkinson Murray Pty Ltd has conducted an assessment of noise impacts associated with the construction of this line.

2 DESCRIPTION OF CONSTRUCTION ACTIVITES

The new section of the ETL will replace an existing nine kilometre section of line which currently bisects the approved project disturbance area. Of this 11.1 kilometre section, approximately 5.8 kilometres is within the approved project disturbance boundary, 3.4 kilometres is located outside the approved project disturbance boundary to the south, and 1.9 kilometres is located outside the approved project disturbance boundary to the north. The northern section of the line outside the approved project disturbance area spans a distance of 400 metres across the Big Flat Creek Conservation Area, an approved Aboriginal Cultural Heritage Offset Area and an ecological offset area.

The relocated ETL will comprise 32 new towers. Following completion of the new line, 24 towers comprising the existing ETL will be decommissioned, dismantled and removed. Upon completion of the line, the easement for the existing ETL will be relinquished and a new easement will be created over the route of the relocated ETL. The new easement will have a width of 70 metres along its length.

The construction and operation of the new ETL will take place in six phases with details on each phase provided in the section below. These phases are:

1. clearing;
2. access tracks;
3. construction of;
    - foundations;
    - erection of towers;
    - tower earthing;
    - stringing;
4. connection of power lines;
5. operation and maintenance; and
6. Removal of existing line.

The relocated ETL will have the following general characteristics:

- tower heights will vary from between approximately 46 metres and 66 metres;
- A combination of eight tension towers and 24 suspension towers.
- spans between each tower will varies between approximately 110 metres and 500 metres; and
- The amount of clearing undertaken within the easement is dependent on the conductor weight, length of span, ambient and conductor temperature, as well as being influences by the topography in general and where each individual tower is sited.

A 70 metre easement will be established for the relocated ETL. The foundation disturbance footprint of each tower of the relocated ETL will comprise a base area of approximately 25 x 25 metres, and the conductors above will have a width of approximately 20 metres within the easement.

The remainder of the easement may require clearing, depending on the nature of the vegetation contained within the easement and the clearance profile required due to conductor parabolic sag (related to the distance between the towers and influenced by the topography where individual towers are sited) and sway from the effect of wind. After construction is completed and the new section is energised the easement will revert to the responsibility of TransGrid as owners of the relocated ETL.

2.1 Construction

The construction of relocated ETL will comprise four elements:

- foundations;
- tower erection;
- tower earthing; and
- Stringing.

Construction traffic will access the locality of the relocated ETL using normal construction traffic routes as approved as part of the overall Mangoola Coal project, and managed in accordance with the approved Construction Traffic Management Plan.

2.1.1 Foundations

Concrete required for foundations will be transported from the concrete batching plant (if still on site during the construction of the ETL) in the approved project disturbance area to the relocated ETL route using designated access tracks as noted above.

Foundations will be excavated using a 30 tonne excavator (or similar) for tension towers. The excavator will dig footings under each of the four tower legs to a depth of 15 to 20 metres. Spoil will be spread over the 25 x 25 metre foundation disturbance area for that tower.

A boring machine will be used to excavate foundations for suspension towers (that is, towers used on straight sections of the relocated ETL). Completing the foundations will require the use of formwork, steel reinforcement, concrete, excavator, wacker packer, bobcat and backhoe.

2.1.2 Tower erection

All materials required for tower erection will be delivered to one of two laydown areas by semi-trailer. The steel sections will be assembled, i.e. bolted together at each of the actual tower sites. This work will only be undertaken during the day time.

An 80-100 tonne crane will erect the tower sections. Specialised 8x8 crane trucks for movement of materials and equipment will be used for the duration of the construction and dismantling of the ETL.

2.1.3 Tower earthing

After the completion of the tower erection, each tower will have an earthing system installed. The design is ongoing, but will most likely require a conductor buried below the ground level around the tower plus additional earth rods if required to ensure electrical resistance is minimised and safety requirements are met. The earthing system is connected to each tower leg.

2.1.4 Stringing

Stringing refers to the process where lines that carry electricity, known as conductors, are connected to the tower structures. During this phase, earth wires are also connected to the towers.

Stringing is undertaken in suspension and is controlled using a tension stringing technique to avoid damage to the conductors and for general clearance of the ground. Conductors are delivered to the site in drums. A winch truck is used with the draw wire to thread it through the towers.

The draw wire is used to pull through the conductor off the drums and into the air across the spans of the section being pulled through. A brake is used at the other end to maintain tension in the draw wire / conductors and avoid contact with the ground. After each section of conductors have been run out for an agreed section length, the conductor and earth wires are sagged to the final tension and the ends are clamped into each suspension tower, or terminated at each tension tower. Sheaves are then removed from the tower.

2.1.5 Connection (under outage conditions)

Connection refers to the process where the relocated ETL conductors are connected to the existing Bayswater to Mount Piper 500kV line.

The changeover process takes approximately 10 to 15 days, and is completed in six separate phases. Equipment required in undertaking this process includes trucks, cranes, winches and Elevated Work Platforms (EWPs).

A crew will work at each end of the new section of the ETL at the point where it connects to the existing ETL. The existing ETL will be de-energised and one conductor at a time will be transferred to the relocated ETL and terminated at the new tension towers located at either end of the relocated ETL. Conductors and earth wires will be tensioned by anchoring them to concrete blocks until the transfer process is complete.

2.1.6 Decommissioning and Removal of Existing ETL

Once the relocated ETL is connected and operational, the towers and conductors that form the existing ETL will be removed.

The first stage in dismantling the existing ETL involves removing the conductor and earthwire from the towers. This is done by using a crane to lower the conductor to the ground along the full length of the easement, stripping the fittings and for safety reasons recoiling the conductor slowly along the ground. The conductor is then recycled.

Next, the towers are dismantled at each tower site using a 100 tonne crane or similar by unbolting and lowering the tower sections to the ground for dis-assembly at each tower site. The members are then bundled and old bolts collected in bins and removed from the site. Outside of the approved project disturbance area, towers will be cut off at approximately half a metre below the ground surface and the tower foundations remain in the ground. Inside the approved project disturbance area, the foundations are left intact and clearly marked for safety reasons. Disposal of the existing ETL will be in accordance with TransGrid procedures. This will entail removal of waste materials from the site and recycling of steel and other suitable materials.

2.1.7 **Construction Workforce and Hours of Operation**

The construction workforce for the ETL requires a maximum of 50 workers on site at any one time, based on an approximately eleven month construction timeframe.

Construction of the ETL will occur during daylight hours that are between 7:00am and 6:00pm, seven days a week.

CONSTRUCTION NOISE GOALS

3.1 Construction Noise Criteria

The NSW Department of Environment, Climate Change and Water (DECCW) have recently issued an *Interim Construction Noise Guideline* which sets criteria for various types of construction activities regulated by DECCW. The proposed construction works for the subject assessment are considered to be "scheduled development work that will enable scheduled activities to be carried out (section 47 of the Act)" and as such are appropriately assessed under the Interim Guideline. Given the Mangoola Mine is classified as a major project, it is considered that a quantitative assessment of potential construction noise impact is appropriate. The appropriate noise management levels for construction outside normal hours are shown in Table 3-1 below.

Table 3-1 Construction Noise Guidelines

Time of Day	Management Level $L_{Aeq\ (15\ min)}$ *	How to Apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. 1. Where the predicted or measured LAeq (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. 2. 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.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. 1. 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: 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.
Outside Recommended Standard Hours	Noise affected RBL + 5 dB(A)	A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level.

	• Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements see Section 7.2.2.

The draft guideline glossary defines RBL:

> ***"Rating Background Level*** *– the overall single-figure background noise level for each assessment period. Determination of the rating background level is by the method described in the NSW Industrial Noise Policy (INP). This approach aims to result in the noise management level being met for at least 90% of the time periods (15 minutes each) over which reactions of annoyance can occur."*

It is also noted that the definition of Rating Background Level in the *INP* includes the clause:

> *"Where the RBL is found to be less than 30dBA, it is to be set to 30dBA."*

In the Noise and Blasting Assessment for the Mangoola Coal Mine, 8 representative locations were chosen to conduct ambient noise monitoring. The RBL at each location was found to be below 30dBA for day, evening and night. The appropriate noise management levels for all residences potentially impacted by noise impacts from proposed ETL construction works is therefore;

- Recommended standard hours 40 dBA.
- Outside Standard Hours 35 dBA

3.1.1 Proposed Construction Plant

Representative plant items proposed the ETL are shown in Table 3-2 for the purposes of modelling. Sound power levels for typical plant items measured during similar operations are also indicated. Sources from negligible items such as crew vehicles are not listed. The various scenarios would represent plant items active in a typical worst-case 15 minute period.

Typical equipment expected to require transportation to the site is:

- Two 8x8 trucks with crane;
- 15-20 four wheel drive vehicles;
- One 80-100 tonne crane;
- Two Franna cranes;
- Two winch and brake stringing equipment;
- Two multi winch trucks;
- Two 30 tonne excavators;
- Two 75m Elevated Work Platforms (EWPs);
- Two bobcats;

- One backhoe; and
- One boring machine.

Table 3-2 presents typical sound power levels of construction plant that will be used for the ETL.

Table 3-2 Representative Construction Plant Noise Levels

Plant Item	Number	SWL (per item) LAeq, 15min (dBA)
30t excavator	2	107
80-100 tonne crane	1	110
Bobcat	2	105
8x8 trucks with crane	2	112
Multi winch trucks	2	110
Franna Cranes	2	108
Cement Truck	-	109
Semi Trailer	-	108
Backhoe	1	100
Bored Piling rig 20t	1	106

Based on the above data and equipment the overall typical maximum sound power level of total works around each tower site is estimated to be 118 dBA (that is a sound pressure level of 93 dBA).

During site establishment up to 30 semi-trailer loads of specialised plant and equipment, stores and containers will be delivered to a depot (most likely located in Muswellbrook). In addition, construction access will be required for the tower steel and bolts, any reinforced steel for foundations, and to remove the decommissioned towers.

3.2 Modelling Procedures

Noise predictions for the boring were predicted using the Cadna A noise prediction software. The software takes into account the following:

- Equipment Noise Levels and Location,
- Ground Topography,
- Ground and Air Absorption, and
- Distance attenuation.

As a result of the modelling the noise contribution from tower construction has been predicted to determine the noise contribution to surrounding selected residences. In the construction source noise level of 118 dBA has been located at tower nearest each residence. Therefore the noise levels presented in the following table at the nearest residences are a worst case scenario when construction occurs in proximity to these residences. For much of the construction period of 11 months construction activities would be remote from residences.

Table 3-3 presents these results.

Table 3-3: Predicted Noise Contribution from ETL Construction Activities at Residences - dBA

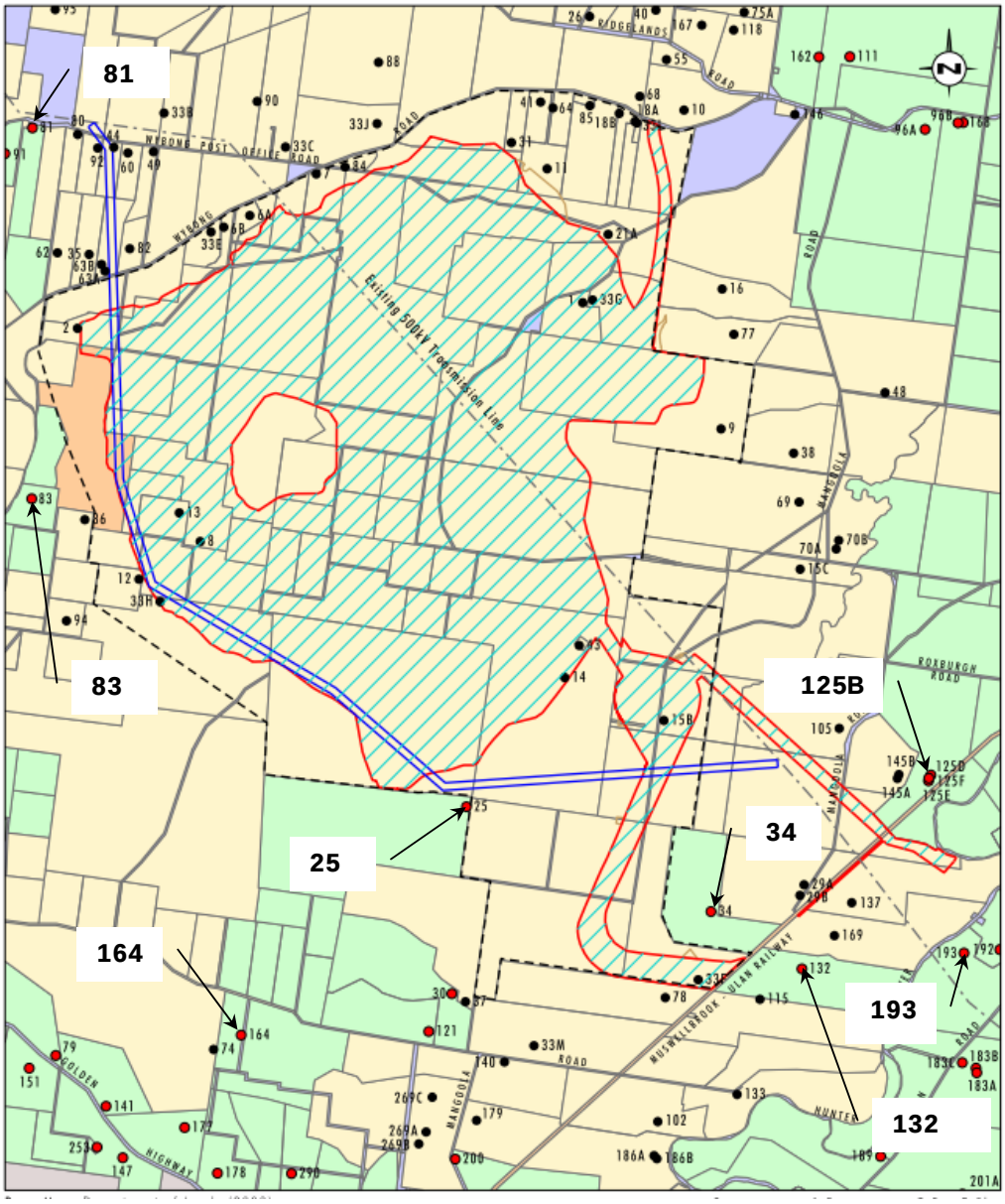
Residence Number	Construction Noise Levels Mangoola Design - dBA	Compliance / Exceedance Std Hrs / Non Std Hrs
25	60	20 dBA / 25 dBA
34	35	Compliance
81	45	5 dBA / 10 dBA
83	25	Compliance
164	34	Compliance
132	38	Compliance / 3 dBA
132B	41	1 dBA / 6 dBA
193	34	Compliance
125B	33	Compliance

A review of the results of noise predictions indicates that the residences likely to be affected by construction noise are those in close proximity of the ETL being residences 25 and 81 (refer to Figure 3-1). Residences 25 and 81 are already in the acquisition zone for significant noise impacts associated with the Mangoola Coal Project (i.e. 46 dBA and 43 dBA, respectively). It should also be noted that residence 25 is not permanently occupied. Assuming an alternative agreement with these affected landowners cannot be reached, the use of localised barriers to shield noise from the engines of the construction equipment, i.e. approximately 4 metres high and located between the equipment and the residence, should be considered to improve the acoustic amenity of these residences. Such barriers can provide reductions of noise in the order of 10 dBA.

At all other residences compliance is likely for standard hours with the exception of an exceedance of 3 dBA at residence 132 which is predicted for periods outside standard hours. Residence 132B is also predicted to have a 1 dBA exceedance of the criteria for standard hours and a 6 dBA exceedance of the criteria for non standard hours.

Whilst these exceedances are not large it is noted that the predicted exceedance are predicted at either end of the ETL. As such it would be prudent to schedule works at these locations, where feasible in standard working hours.

Figure 3-1 Receiver Locations



4 CONCLUSION

Noise levels from ETL daytime construction activities have been calculated and results compared to noise management levels derived from the NSW Department of Environment, Climate Change and Water (DECCW)'s Interim Construction Noise Guideline. Predicted noise from construction would exceed criteria at some residences over the proposed at either ends of the ETL route when works are conducted outside standard construction hours.

Given that there are predicted to be exceedances of the Interim NSW Construction Noise Guideline following work practices are recommended:

- Assuming alternative negotiations with residences 25 and 81 cannot be reached, the installation of a 4 metre high localised noise barrier at these affected residences should be considered;
- Liaising with affected residences and informing them of the project schedule and when in particular noisier activities would be taking place;
- Provision of a current hot-line number and email address for enquiries or complaints and keeping a register of complaints and follow-up actions initiated as a result of any complaint, which could involve the use of Mangoola Coal's existing register.

Version	Status	Date	Prepared by	Checked by
A	Final	23/04/10	Brian Clarke	RB
B	Final	19/07/10	Brian Clarke	RB

APPENDIX A

GLOSSARY OF TERMS

GLOSSARY

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

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

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

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

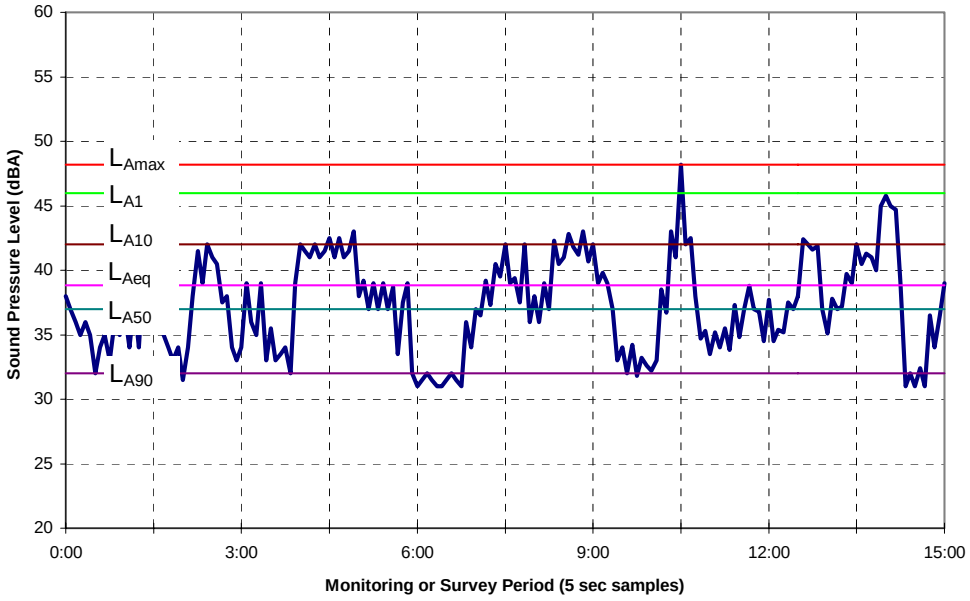
L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise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

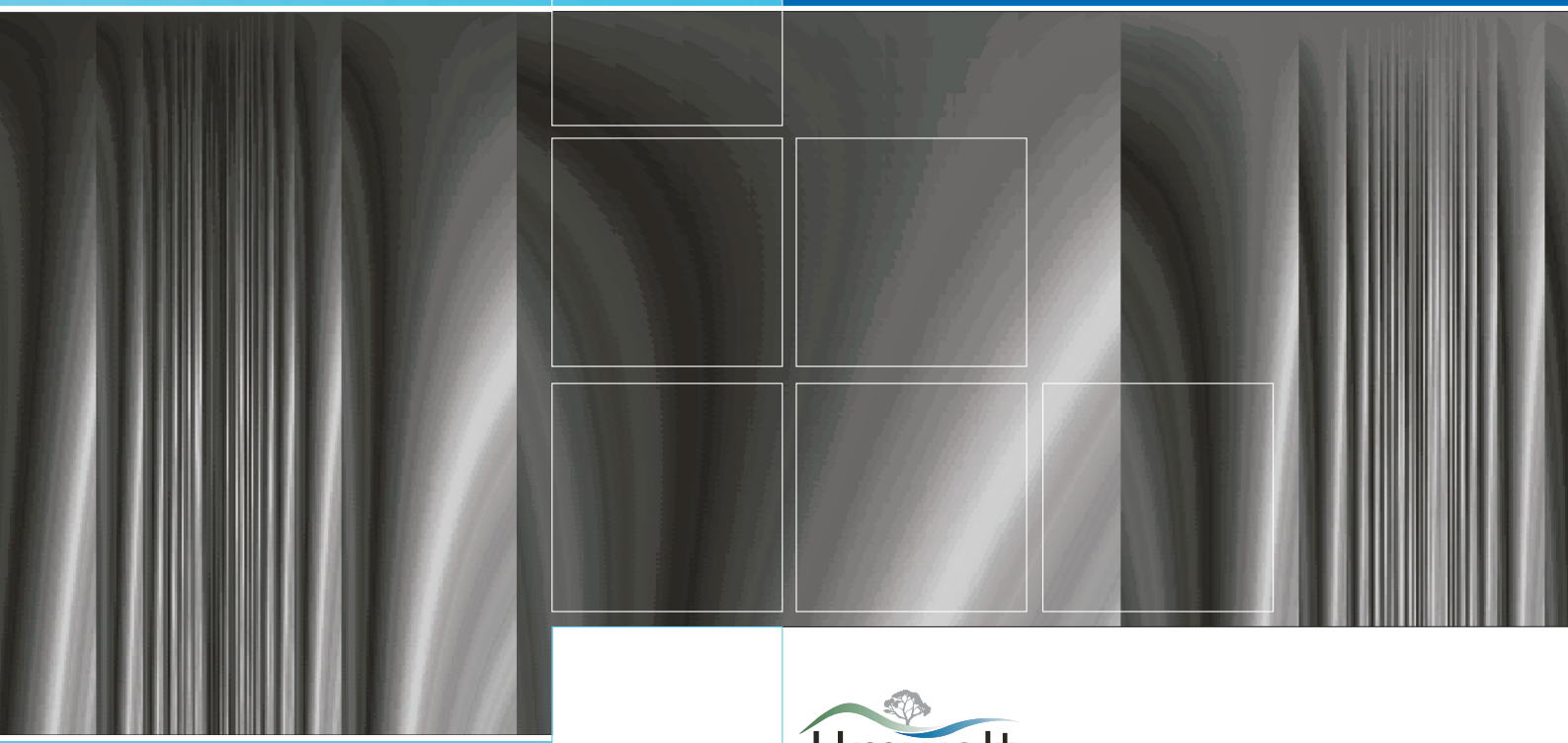
L_{A50} – The L_{A50} level is the noise level which is exceeded for 50% of the sample period. During the sample period, the noise level is below the L_{A50} level for 50% of the time.

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

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

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


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



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