



HEGGIES

REPORT 10-8766-R1

Revision 0

SAH Day Surgery Hornsby Redevelopment Environmental Assessment - Acoustics

PREPARED FOR

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1 INTRODUCTION

The purpose of this report is to clarify and identify issues that are likely to impact upon the cost of the project and to propose conceptual measures deal with these.

The results of environmental noise logging are presented, together with environmental (external) noise criteria for the development's emissions and relevant information to enable the report to support the Part 3A /DA submission.

1.1 The Proposed Works

The proposed works consists of the following elements.

The Sydney Adventist Hospital (the SAN) wishes to develop 3,187 square metres of land it owns at 1A Northcote Road, Hornsby, for a new medical facility. Part of the site is currently used as medical day surgery. Redevelopment and expansion of the site is intended to complement the SAN's substantial medical facilities at Wahroonga and capitalise on the location's synergy with Hornsby Hospital.

1.2 Staged Approach

The staged approach to the proposed works will not alter the conclusions reached in this report.



2 POTENTIAL NOISE TO NEARBY SENSITIVE RECEIVERS

2.1 Most Sensitive Receivers

The four most sensitive receivers have been identified and shown in **Figure 1**.

Figure 1 Location of the Most Sensitive Receivers



The following noise sources will need to be addressed in terms of impact upon nearby sensitive receivers.

2.2 Operational Noise

Potential operational noise to the nearby environment will be:

- Fixed mechanical plant
- Visitor /patient vehicles (traffic noise)

The criteria for noise emissions to the environment (from fixed and moveable plant and vehicular movements) are contained in **Section 3**.

2.2.1 Fixed Mechanical Plant

Following the installation of noise loggers, in and around the site, appropriate noise criteria for the control of noise to the environment has been determined – **Section 3** refers.

It is likely that noise from the proposed facility will be adequately controlled through conventional means – such as attenuators, acoustic louvres, barriers, enclosures, and the careful location and orientation of air inlets /outlets and items of plant.



2.2.2 Visitor /Patient Vehicles

The entry / exit routes for visitor / patient vehicles in relation to sensitive receivers, is essentially unchanged and, because of the low speed of vehicles, noise emissions are unlikely to be problematic. (**Section 5** refers.)

2.2.3 Outdoor Terraced Areas

Noise levels from conversational speech from people using the outdoor terraced areas will be less than the background noise at the nearest residential receivers and will not give rise to an adverse impact.

2.3 Construction Noise

Construction often requires the use of heavy machinery which can generate significant noise and vibration emissions at nearby buildings and receivers. For some equipment, there is limited opportunity to mitigate the noise and vibration levels in a cost-effective manner and hence the potential impacts should be minimised by using feasible and reasonable management techniques.

At any particular location, the potential noise and vibration impacts can vary greatly depending on factors such as the relative proximity of sensitive receivers, the overall duration of the construction works, the intensity of the noise and vibration emissions, the time at which the construction works are undertaken and the character of the noise or vibration emissions. (**Section 6** refers.)



3 ENVIRONMENTAL NOISE SURVEY

3.1 Logger Locations

Environmental noise logging was conducted out at two locations on the site from Tuesday 1 June to Tuesday 8 June 2010 (**Figure 2** refers) to establish noise criteria for the control of noise to the environment.

- Location 1 Front of carpark, Northcote Road. (SVAN Type 1, “957 Sound and Vibration Analyser”, Serial Number 20644).
- Location 2 Side of carpark, next to existing Day Surgery building. (SVAN Type 1, “957 Sound and Vibration Analyser”, Serial Number 20669).

All loggers were calibrated before and after measurement and the measured drift in calibration, on each logger, was less than 0.5 dB.

Figure 2 Site and Noise Logging Locations (Map)





3.2 Noise Environment

The noise environment at the logging locations was predominantly controlled by distant and local road traffic with very little, if any, noise from nearby commercial or hospital plant or activities.

3.3 Survey Results

The full, 7-day, graphical results of the survey are shown in **Appendices A** and **B**, and are summarised in **Figure 3**, and **Figure 4**.

The statistical descriptors shown on the graphs are:

- **LA1** The noise level exceeded for 1% of the sample time (15 minutes) and representative of the highest noise level events (eg passing heavy vehicles, aircraft, etc).
- **LA10** The noise level exceeded for 10% of the sample time (15 minutes) and is typically described as the average maximum noise level.
- **LAeq** The LAeq is the energy-average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.
- **LA90** The LA90 is the level of noise exceeded for 90% of the sample time (15 minutes). The LA90 noise level is described as the average minimum background sound level or simply the “background level”.

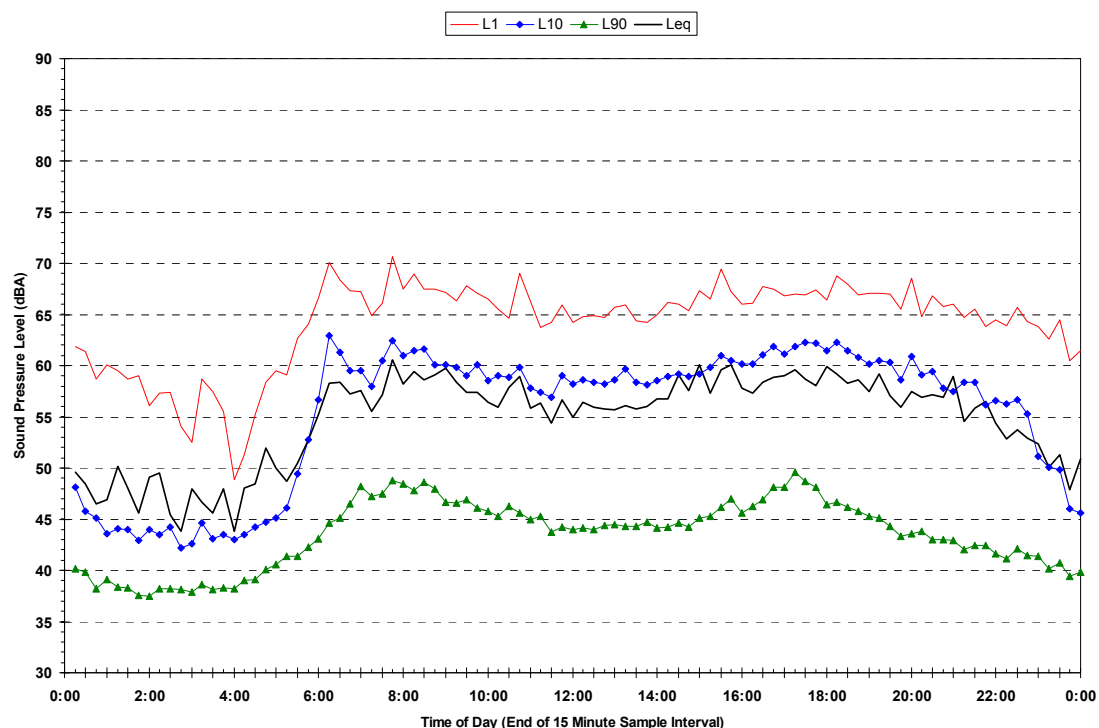
The median values of the LA1, LA10 and LA90 levels are shown, together with the logarithmic average of the LAeq levels – for each 15 minute period of the entire long-term monitoring.

3.3.1 Spurious and Uncharacteristic Data

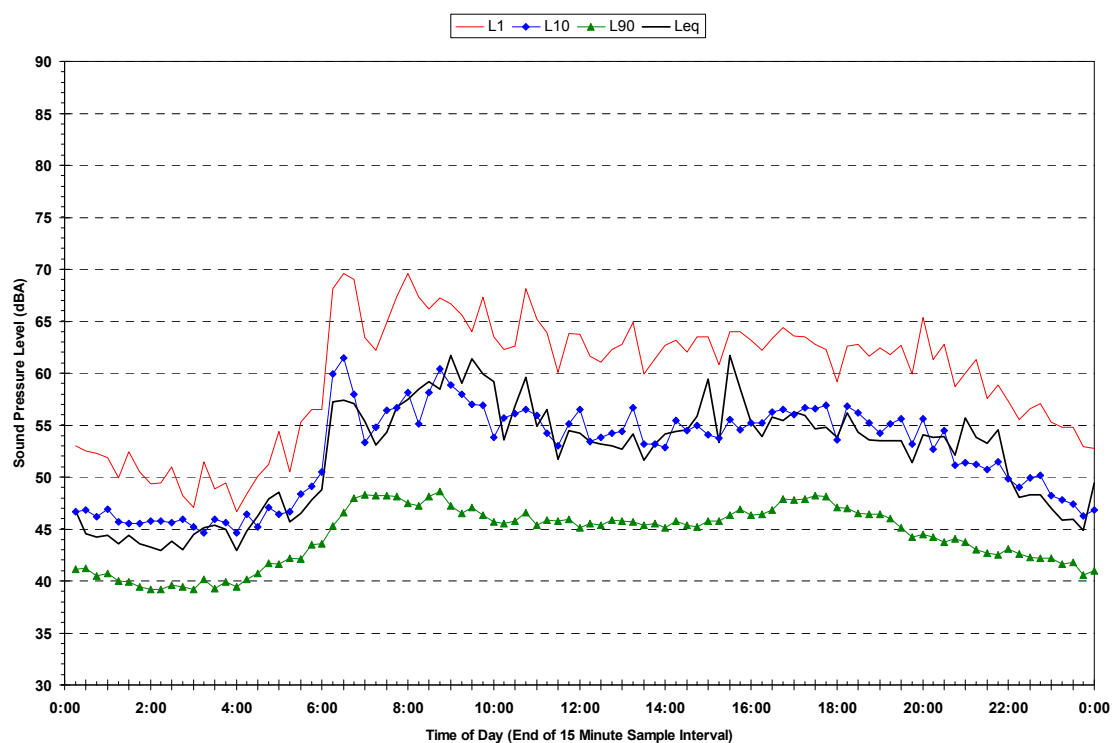
The full, 7-day, graphical results shown in **Appendices A** and **B** include occasional “spikes” at some of the loggers. It is clear (because of the levels involved) that these events are spurious and uncharacteristic – and were probably caused by very loud noises, of very short duration, very close to the logger microphones. As such, these peculiar events have been excluded from the data presented in, and **Figure 4**, and also excluded from the data used to determine the noise emission criteria.



**Figure 3 Existing Background Noise Levels –
Logger Location 1: Front of Carpark, Northcote Road**



**Figure 4 Existing Background Noise Levels –
Logger Location 2: Side of Carpark, next to Existing Day Surgery**





3.3.2 Summary of Existing Noise Levels

The data obtained from the noise monitoring has been processed in accordance with the procedures set out in the NSW DECCW Industrial Noise Policy (INP) and are presented in **Table 1**.

To assess the impact of industrial noise from the proposed development, data obtained from Logger 1 has also been processed in accordance with the time periods given in the NSW DECCW Industrial Noise Policy (INP). The results of this analysis are presented in **Table 1**.

Table 1 Measured Ambient Noise Levels Corresponding to Defined INP Periods

Location	Measurement Descriptor	Measured Noise Level - dBA re 20 μ Pa		
		Daytime 7.00 am - 6.00 pm	Evening 6.00 pm - 10.00 pm	Night-time 10.00 pm - 7.00 am
Logger 1	LAeq	58	57	52
	RBL (Background)	43	42	38
Logger 2	LAeq	57	54	50
	RBL (Background)	45	42	39



4 OPERATIONAL NOISE

4.1 Site Activity Noise

Noise emissions from on-site activities associated with the proposed development (such as on-site vehicle movements, air-conditioning equipment, exhaust fans and other mechanical plant) must be controlled to avoid impacting upon the acoustic amenity of nearby premises which, in this case, are predominantly residential.

Responsibility for the control of such noise emission (which is classified as “industrial noise”) in New South Wales is vested in Local Government and the Department of Environment, Climate Change and Water (DECCW).

The DECCW oversees the Industrial Noise Policy (INP) which provides a framework and process for deriving noise criteria designed to:

- Control the *intrusive* noise impacts for residents and other sensitive receivers in the short term; and
- Maintain noise level *amenity* for particular land uses for residents and sensitive receivers in other land uses

4.2 Assessing Intrusiveness

The intrusiveness criterion essentially requires that the equivalent continuous noise level (L_{Aeq}) of the source should be no more than 5 dBA above the background noise over any 15 minute period.

In instances where “industrial noise” from a site occurs in short bursts followed by much longer periods of relative quiet (which is unlikely to be the case here) the impact of the industrial noise must be assessed on the basis of the level of that noise against the background noise during the period that the activity occurs. (The alternative approach – of determining the (L_{Aeq}) level of the industrial noise “averaged” over the whole day, evening or night period – would potentially underestimate the impact of the activity.)

For steady-state noise sources (ie where the industrial noise is fairly uniform, over the whole day, evening or night period – as is the case here) the intrusiveness criterion requires that the equivalent continuous noise level (L_{Aeq}) of the source should be no more than 5 dBA above the Rated Background Level (RBL). The RBL is established through environmental monitoring **Section 3.3.2** refers.

4.3 Assessing Amenity

The amenity criterion is based on land use and associated activities (and their sensitivity to noise emission). The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. The criterion relates only to other industrial-type noise sources and does not include road, rail or community noise.

The existing noise level from industry is measured. If it approaches the criterion value, then noise levels from new industrial-type noise sources (including air-conditioning mechanical plant and vehicle movement) need to be controlled so that the cumulative effect does not significantly exceed the criterion. If, on the other hand, the existing level of industrial noise is below the criterion value, then noise levels from new industrial-type are controlled so that the cumulative effect approaches the criterion.

(For areas of high road traffic, there are further considerations that influence the selection of the noise criterion – but that is not the case here.)



4.4 Area Classification

We have deemed this area to fall under the “Suburban Area” classification. The INP characterises a suburban area as, inter alia, “an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry”.

4.5 Project Specific Noise Levels

Having defined the area type, the processed results of the unattended noise monitoring have been used to generate project-specific noise criteria.

In this case (since the noise from hospital equipment and activity is, and will be, fairly steady) the project-specific noise levels, which are shown in bold in **Table 2** below, are the lower of the intrusive and amenity criteria.

Where the noise source contains annoying characteristics (such as prominent tonal components, impulsiveness, intermittency, irregularity and dominant low-frequency content) adjustments are applied to the level of noise that is received at the assessment point before comparison with the criteria.

Table 2 Criteria for Noise Emissions to Nearby Sensitive Receivers

Time of Day			Noise Level dBA re 20 µPa				
			ANL ¹ (Period)	Measured RBL LA90(Period) ²	Measured LAeq(Period)	INP Criteria	
						Intrusive	Amenity
						LAeq(15minute) Criterion for New Sources	LAeq(Period) Criterion for New Sources ³
Logger Location 1, front of carpark, Northcote Road							
Day	7.00 am - 6.00 pm	55	43	58	48	48	
Evening	6.00 pm - 10.00 pm	45	42	57	47	47	
Night	10.00 pm - 7.00 am	40	38	52	43	42	
Logger Location 2, side of carpark, Northcote Road							
Day	7.00 am - 6.00 pm	55	45	57	50	47	
Evening	6.00 pm - 10.00 pm	45	42	54	47	44	
Night	10.00 pm - 7.00 am	40	39	50	44	40	

Note 1: ANL: Acceptable Noise Level for a “Suburban” area

Note 2: RBL: Rating Background Level

Note 3: Assuming existing noise levels are unlikely to decrease

Note 4: Project Specific Criteria are shown in bold

Note 5: The Amenity criteria given assume the measured noise (LAeq) is comprised entirely of industrial noise, so as to result in conservative (ie more stringent) levels.



4.6 Summarised Criteria

Since the criteria at the noise logging locations (**Table 2**) are very similar, the following criteria (based on the more stringent of those determined above) are proposed for the closest off-site receivers:

- Day 47 dBA
- Evening 44 dBA
- Night 40 dBA

4.7 Discussion

Since the majority of the plant can be expected operate continuously, it is likely that controlling noise to the night-time criterion will be the governing factor in terms of noise control treatment. Compliance to the night-time criterion will also ensure compliance with the daytime and evening criteria.

Specific noise control measures will be developed during the design stages to ensure compliance with the noise criteria.

It is likely that noise from new hospital plant would be adequately controlled through conventional means – such as attenuators, acoustic louvres, barriers, enclosures, and the location and orientation of air inlets /outlets and items of plant.

Since the noise logging was not conducted at the adjacent receiver locations, the data obtained should be treated as indicative of the levels likely to exist at those premises. As such, further logging should be conducted, during the design stage, to verify the design criteria established in **Section 4.6**.



5 ROAD TRAFFIC NOISE

5.1 Environmental Criteria for Road Traffic Noise (ECRTN)

The NSW DECCW's "*Environmental Criteria for Road Traffic Noise*" (ECRTN, May 1999) sets noise goals for road traffic noise. The policy document provides road traffic noise criteria for proposed road or commercial land use developments as well as noise goals for other sensitive land uses. The relevant criteria relating to land use developments with potential to create additional traffic on "*existing local roads*" roads is summarised in **Table 3**.

Table 3 ECRTN Guidelines for Road Traffic Noise at Residences

Type of Development	Criteria		Where Criteria are Already Exceeded
	Day (7am to 10pm)	Night (10pm to 7am)	
Land use developments with potential to create additional traffic on existing local roads	L _{Aeq} (1hr) 55 dBA	L _{Aeq} (1hr) 50 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 dB.

Definitions: Land use development with potential to create additional traffic on existing roads implies increases to the magnitude of the traffic flow and/or changes to the traffic mix brought about by new land use developments or significant alterations to existing land use developments, which may not involve any construction to the road. This category does not cover minor changes that are not subject to either development consent or amendment to an EPA licence.

The over-riding criteria limits requires that traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB.



5.2 Predicted Traffic Noise Impact

Access points to the site are similarly to the existing locations, albeit that the existing Balmoral Street ramp is for deliveries only.

Although there will be more vehicles entering and existing the carpark, the noise levels from such movements should not be increased and should not adversely impact the area.

Appendix B of the Traffic and Accessibility Impact Assessment report provides details of the change in traffic flows for Northcote and Palmerston Roads during the am and pm peak periods (7.00am to 8.00am and 4.15pm to 5.15pm respectively). The data has been analysed in **Table 4** and **Table 5** to predict the change in traffic noise during these periods.

Table 4 Change in Traffic Noise for AM Traffic Flows

Northcote Road			Palmerston Road		
Future Traffic	Increase on Existing Flow	Increase in Noise Level	Future Traffic	Increase on Existing Flow	Increase in Noise Level
398	8	0.1 dB	436	3	0.0 dB

Table 5 Change in Traffic Noise for PM Traffic Flows

Northcote Road			Palmerston Road		
Future Traffic	Increase on Existing Flow	Increase in Noise Level	Future Traffic	Increase on Existing Flow	Increase in Noise Level
626	17	0.1 dB	503	0	0.0 dB

It is seen that traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB.



6 CONSTRUCTION NOISE

6.1 Construction Noise Guidelines

In accordance with the DECCW's Interim Construction Noise Guideline (ICNG), **Table 6** presents the specific criteria as "LAeq(15minute) Noise Management Levels (NMLs)" that have been adopted for noise sensitive residential receivers.

Table 6 Specific LAeq(15minute) NMLs for Residential Receivers

Time of Day	Management Level, LAeq(15minute) ¹	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. 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. 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. 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.

Note 1: Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.



In addition, the ICNG presents the NMLs for noise at other sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed, as shown in **Table 7**.

Table 7 Noise at Sensitive Land Uses (other than residences) using Quantitative Assessment

Land use	Noise Management level, LAeq (15 min) (applies when properties are being used)
Classrooms at schools and other educational institutions	Internal noise level 45 dB(A)
Hospital wards and operating theatres	Internal noise level 45 dB(A)
Places of worship	Internal noise level 45 dB(A)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 65 dB(A)
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External noise level 60 dB(A)
Community centres	Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS2107 for specific uses.

The ICNG also indicate the NMLs for commercial or industrial uses of land:

- industrial premises: external LAeq (15 min) 75 dB(A)
- offices, retail outlets: external LAeq (15 min) 70 dB(A)
- other businesses that may be very sensitive to noise, where the noise level is project specific as discussed below.

Unattended noise survey for the nearest residential receivers has been undertaken between 8 June and 17 June 2010. The LA90 background noise levels and the construction noise management levels are summarised in **Table 8**.

Table 8 Background Noise Levels and Construction Noise Management Levels for each Sensitive Receiver

Receiver	LA90 Background Noise Levels (RBL) - Daytime	Construction NMLs ¹ - LAeq (15 minute)	
		Noise Affected	Highly Noise Affected
2 Northcote Road	44 dBA	54 ² dBA /	75 ³ dBA
107 Palmerston Road	44 dBA	54 ² dBA	75 ³ dBA
53 Palmerston Road	-	70 ⁴ dBA	
West Boundary of Hornsby Ku-ring-gai Hospital	-	55 ⁵ dBA	

Note 1: The construction NMLs are based on DECCW's Interim Construction Noise Guideline (ICNG) July 2009.

Note 2: Based on RBL + 10 dBA for residential receivers.

Note 3: For the "highly noise affected" residential receivers

Note 4: Based on the NMLs for sensitive land use (e.g. hospitals).

Note 5: Based on the NMLs for commercial or industrial buildings.



6.2 Methodology and Assumptions

The noise level at the nearest sensitive receiver will be calculated based on the maximum sound power levels from the equipment and the distance between the construction site and the nearest sensitive receivers. Furthermore, the calculated noise levels will inevitably depend on the number of plant items and equipment operating at any one time and their precise location relative to the receiver of interest.

In practice, the noise levels will vary due to the fact that plant and equipment will move about the work sites and will not all be operating concurrently. In some cases, reductions in noise levels will occur when plant are located in cuttings or behind embankments or buildings.

Maximum sound power levels for equipment assumed in the modelling are presented in **Table 9**.

Table 9 Summary of Sound Power Level is used for Construction Equipment

Plant Item	L _{Amax} Sound Power Level (dBA)
Rockbreaker	122
Dump Truck	108
Excavator (approx 30T)	110
Front End Loader	111
Compactor	105
Scraper	110
Grader	110
Water Cart	108
Concrete Saw	118
Mobile Crane	110
Generator	104
Bored Piling Rig	110
Concrete Pump	109
Compressor	105
Vibratory Roller	114

The sound power levels given in **Table 9** are maximum noise emission levels for plant that will, or may, be used on this project in typical operation. To assess the impact of the likely noise emissions, it is necessary to convert these levels to equivalent L_{Aeq}(15minute) noise emissions. From numerous field studies on large construction projects, the measured difference values between the L_{Amax} and L_{Aeq}(15minute) noise levels have been found to be up to 10 dBA depending on the mixture of the plant, intensity of operation and location of the plant relative to the receiver.

In the present study, where the equipment is generally confined to the site and the receivers are relatively close, adjustments of 2 dBA to typically 5 dBA have been applied to convert the L_{Amax} noise levels shown in **Table 9** to L_{Aeq} noise levels for comparison with the construction noise design goals.

The proposed equipment used at the station sites will be a subset of that presented in **Table 9**, with the station noise models using sound power levels (SWLs) per activity and plant operating loads and cycles, based on the maximum noise levels presented in **Table 9**.



Based on these parameters, the $L_{Aeq}(15\text{minute})$ SWL for each major noise generating activity is estimated as follows:

- Excavation using Rockbreakers - 120 dBA
- Building Construction - 110 dBA

6.3 Predicted Construction Noise

A summary of the predicted $L_{Aeq}(15\text{minute})$ noise levels at the nearest affected receivers adjacent to the construction works are provided in **Table 10**.



Table 10 Predicted Construction Noise

Receiver	Type of Building	Distance from the site (m)		Predicted LAeq(15 minute) Noise Level (dBA)				Noise Criteria LAeq(15 minute) (dBA) ¹	
				Earthworks (including Rockbreaker)		Building Construction		Noise Affected	Highly Noise Affected
		Near Point	Far Point	Near Point	Far Point	Near Point	Far Point		
2 Northcote Road	Residential	28	81	83	74	73	64	54 ²	75 ³
107 Palmerston Road	Residential	35	124	81	70	71	60		
53 Palmerston Road	Commercial	2	63	106	76	96	66	70 ⁴	
West Boundary of Hornsby Ku-ring-gai Hospital	Hospital	32	128	82	70	72	60	55 ⁵	

Note 1: The construction noise criteria is based on DECCW's Interim Construction Noise Guideline (ICNG) July 2009.

Note 2: Based on RBL + 10 dBA for residential receivers.

Note 3: For the "highly noise affected" residential receivers

Note 4: Based on the NMLs for sensitive land use (e.g. hospitals).

Note 5: Based on the NMLS for commercial or industrial buildings.



Table 10 indicates that $L_{Aeq}(15\text{minute})$ construction noise levels in the range of 70 dBA to 106 dBA are expected at the most noise affected receivers for typical earthworks (including rockbreakers). The NMLs are exceeded by up to 36 dBA at the most affected receivers.

In addition, noise levels in the range of 60 dBA to 96 dBA are expected at the most affected receivers for typical building construction works. The NMLs are exceeded by up to 26 dBA at the most affected receivers.

The surrounding receivers are thus identified as potentially being “highly noise affected” during typical earthworks or building construction works and, as such, should be managed in accordance with the DECCW’s Interim Construction Noise Guideline as shown in **Table 1**.

6.4 Potential Noise Control Measures

Several guideline documents, including DECCW’s *‘Interim Construction Guideline’*, Transport Infrastructure Development Corporation’s *‘Construction Noise Strategy (Rail Projects)’* and Australian Standard AS 2436-1981 *‘Guide to noise control on construction, maintenance and demolition sites’*, provide guidance on the control and management of noise emissions from construction projects, including:

- Scheduling construction works having regard to the nature of construction activities (including transport, blasting and tonal or impulsive noise-generating works)
- The intensity and duration of noise and vibration impacts
- The nature, sensitivity and impact to potentially-affected human receivers and structures
- The need to balance timely conclusion of noise and vibration-generating works with periods of receiver respite
- The monitoring and mitigating construction noise and vibration, with a particular focus placed on those activities identified as having the greatest potential for adverse noise or vibration impacts, and a broader, more generic approach developed for lower-risk activities.

Examples of approaches from these strategies and guidelines that would be implemented (where feasible and reasonable) on this project are given in Table 11 Potential Noise Control Measures:



Table 11 Potential Noise Control Measures

Item	Description
Construction Hours	Works will be carried out within standard Construction Hours.
Deliveries	Deliveries will be carried out within standard Construction Hours.
Site Layout	Where possible, plant will be located and orientated to direct noise away from sensitive receivers. The existing building will, where possible, increase acoustic shielding to the adjacent receivers.
Quietest Suitable Equipment	Plant and equipment will be selected to minimise noise emission, in so far as possible whilst maintaining efficiency of function. Residential grade silencers will be fitted and all noise control equipment will be maintained in good order.
Reversing Alarms	Mobile plant and trucks operating on site for a significant portion of the project will have reversing alarm noise emissions minimised in so far as possible, recognising the need to maintain occupational safety.
Fixed Plant	Fixed plant will be provided with noise controls to comply with the NSW Industrial Noise Policy.
PA System	No public address system will be used at this site.
Noise Barriers	Hoardings will be provided around the boundary of the site prior to the commencement of the works.
Vibration Buffer Zones	General safe working distances for rockbreaking and vibratory compaction. Monitoring should be carried out to confirm these buffer zones at locations where buildings are closest.
Vibration Monitoring	Vibration monitoring will be carried out where vibration intensive activities (eg rockbreaking or vibratory compaction) are required to be carried out within the established buffer zones, or where there is considered to be a risk that levels may exceed the relevant structural damage criteria.
Truck Noise (off site)	All trucks regularly used for the project are to have mufflers and any other noise control equipment in good working order. Trucking routes will use main roads where feasible.
Community Liaison	Community liaison would form a critical element in the management of the impacts. If provided with adequate warning, affected sensitive receivers are sometimes willing to accept excessive noise for a short period of time or be willing to be relocated in the short-term whilst construction activities are conducted at the near point to the residence.
Training	Site induction training will include a noise awareness component.

The above approaches would be included in a comprehensive site and activity-specific Construction Noise and Vibration Management Plan for the Project which would be prepared prior to commencing site activities.



7 CONCLUSION

The results of environmental noise logging are presented, together with environmental (external) noise criteria for the development's emissions.

Specific noise control measures will be developed during the design stages to ensure noise from fixed plant complies with the noise criteria. It is likely that plant noise would be adequately controlled through conventional means such as attenuators, acoustic louvres, barriers, enclosures, and the location and orientation of air inlets /outlets and items of plant. As such, it is anticipated that operational noise will not cause adverse impact at nearby sensitive receivers.

It is seen that traffic arising from the development will not cause and adverse impact on the area.

The proposed construction activities are likely to exceed the construction noise goals by clear margins, resulting in anticipated high noise impacts at the nearest noise affected receivers. Accordingly particular effort should be directed towards the implementation of all reasonable noise mitigation and management strategies and noise monitoring at the nearest and most affected sensitive receivers is recommended during the construction works.

A comprehensive site and activity-specific Construction Noise and Vibration Management Plan for the Project would be prepared prior to commencing site activities, to control and manage noise emissions from construction activities.

The staged approach to the proposed works will not alter the conclusions reached in this report.

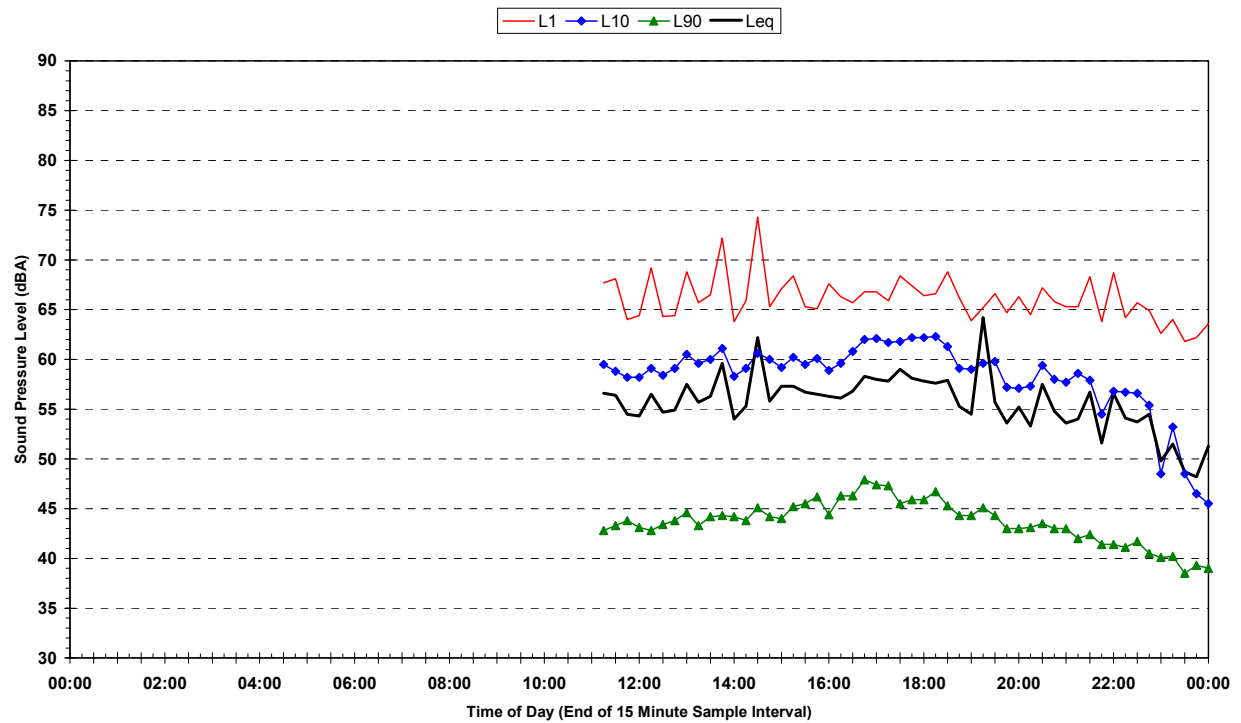
Appendix A

Report 10-8766-R1

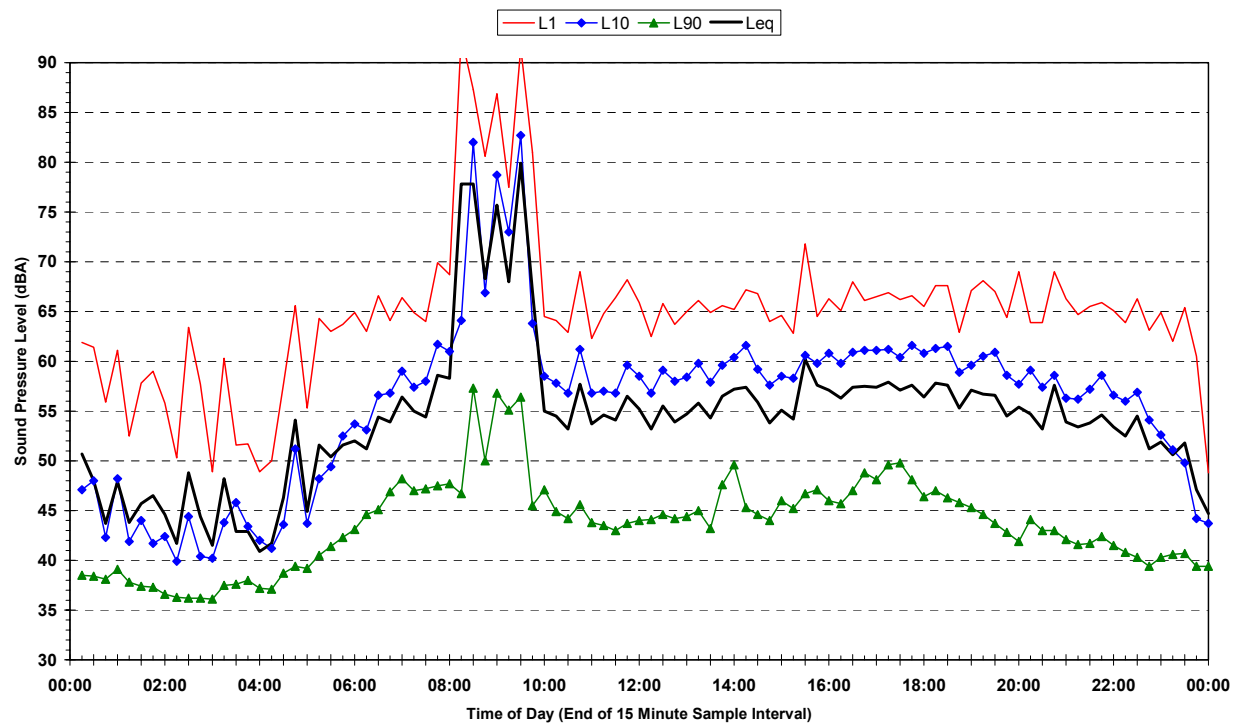
Page 1 of 4

Existing Background Noise Levels –
Logger Location 1: Front of Carpark

Statistical Ambient Noise Levels
20644 - Tuesday 1 June 2010



Statistical Ambient Noise Levels
20644 - Wednesday 2 June 2010



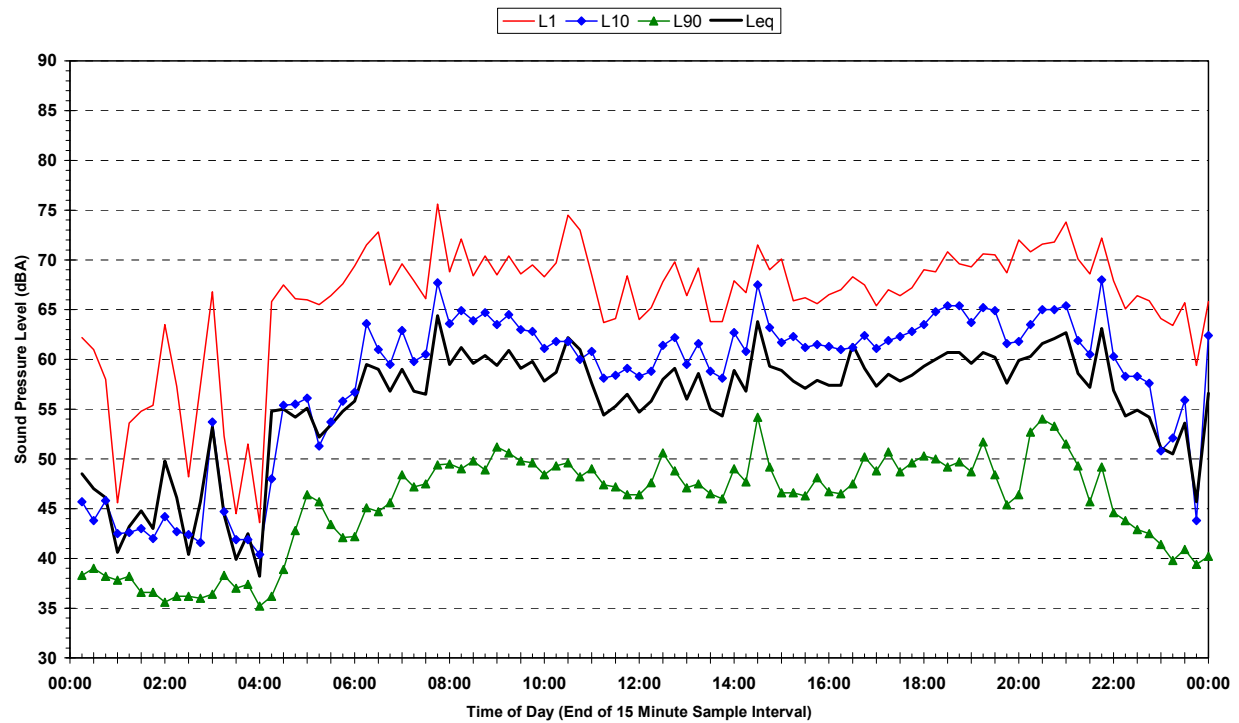
Appendix A

Report 10-8766-R1

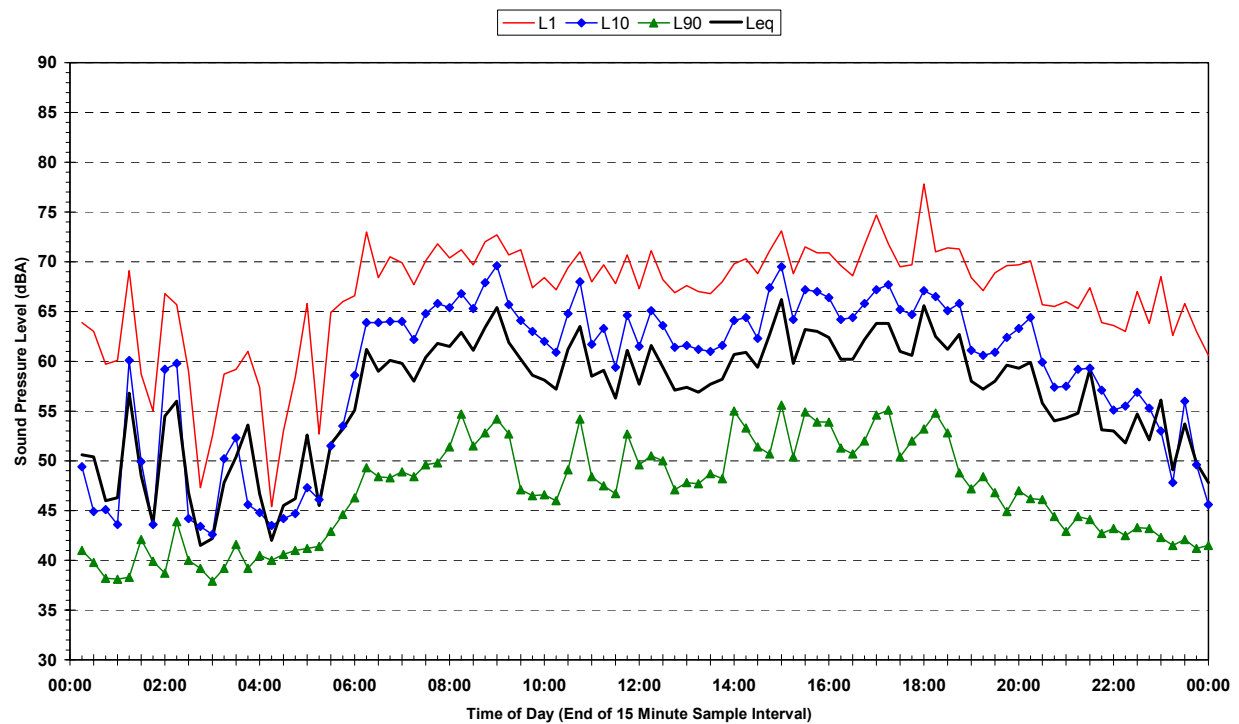
Page 2 of 4

Existing Background Noise Levels –
Logger Location 1: Front of Carpark

Statistical Ambient Noise Levels
20644 - Thursday 3 June 2010



Statistical Ambient Noise Levels
20644 - Friday 4 June 2010



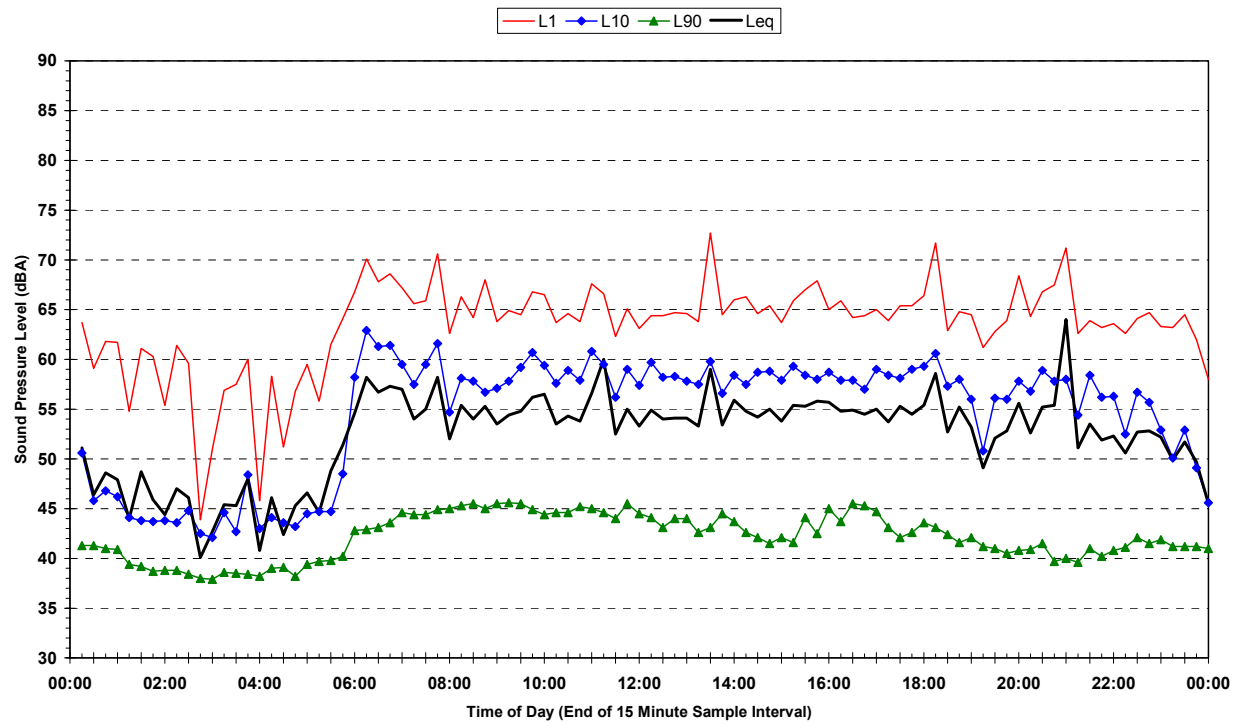
Appendix A

Report 10-8766-R1

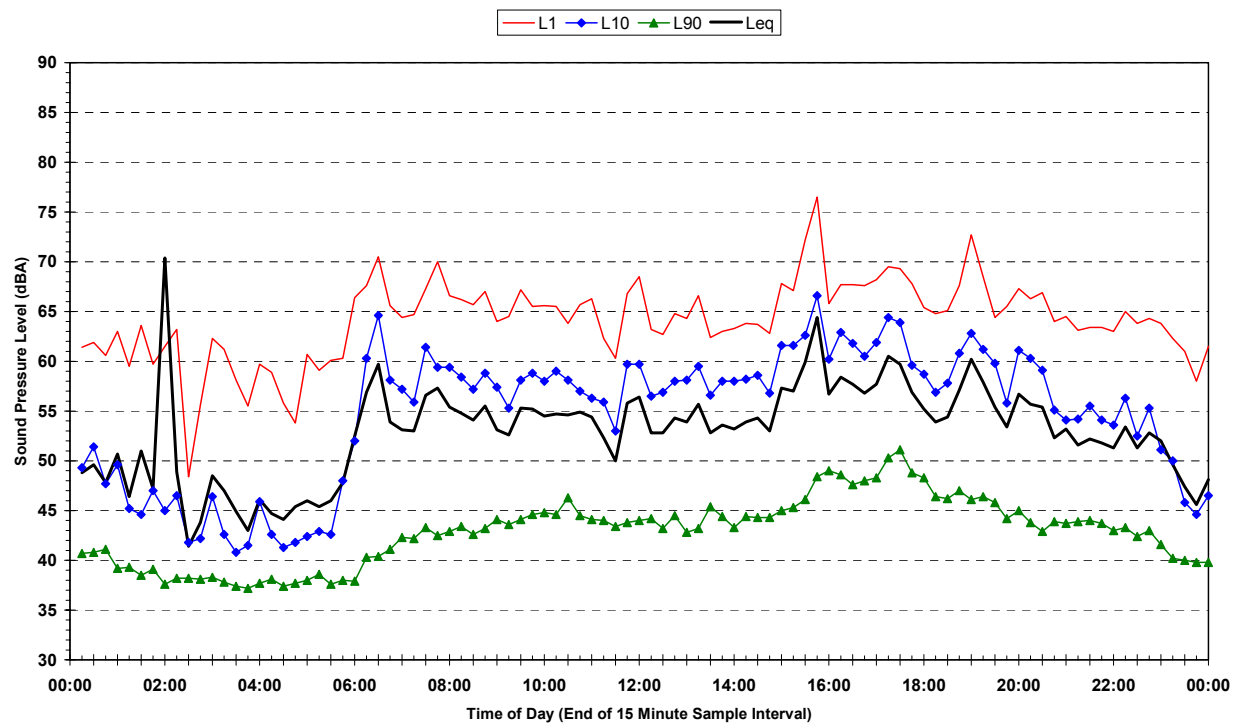
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Existing Background Noise Levels –
Logger Location 1: Front of Carpark

Statistical Ambient Noise Levels
20644 - Saturday 5 June 2010



Statistical Ambient Noise Levels
20644 - Sunday 6 June 2010



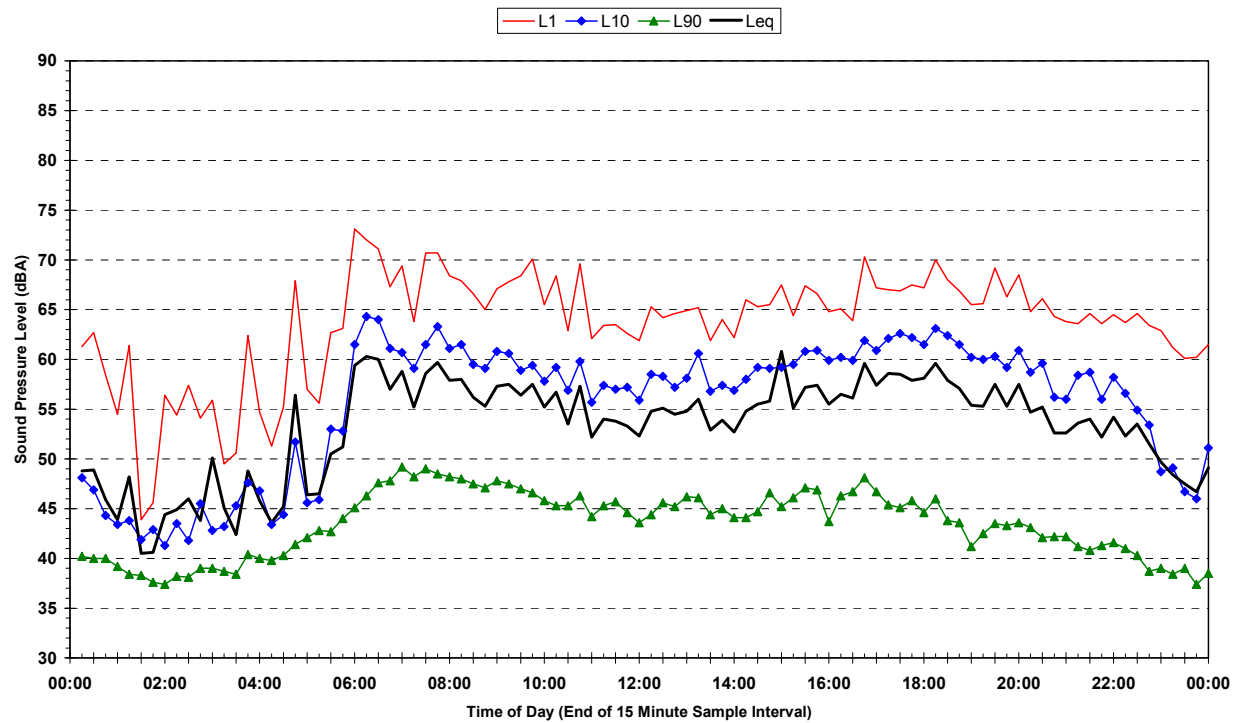
Appendix A

Report 10-8766-R1

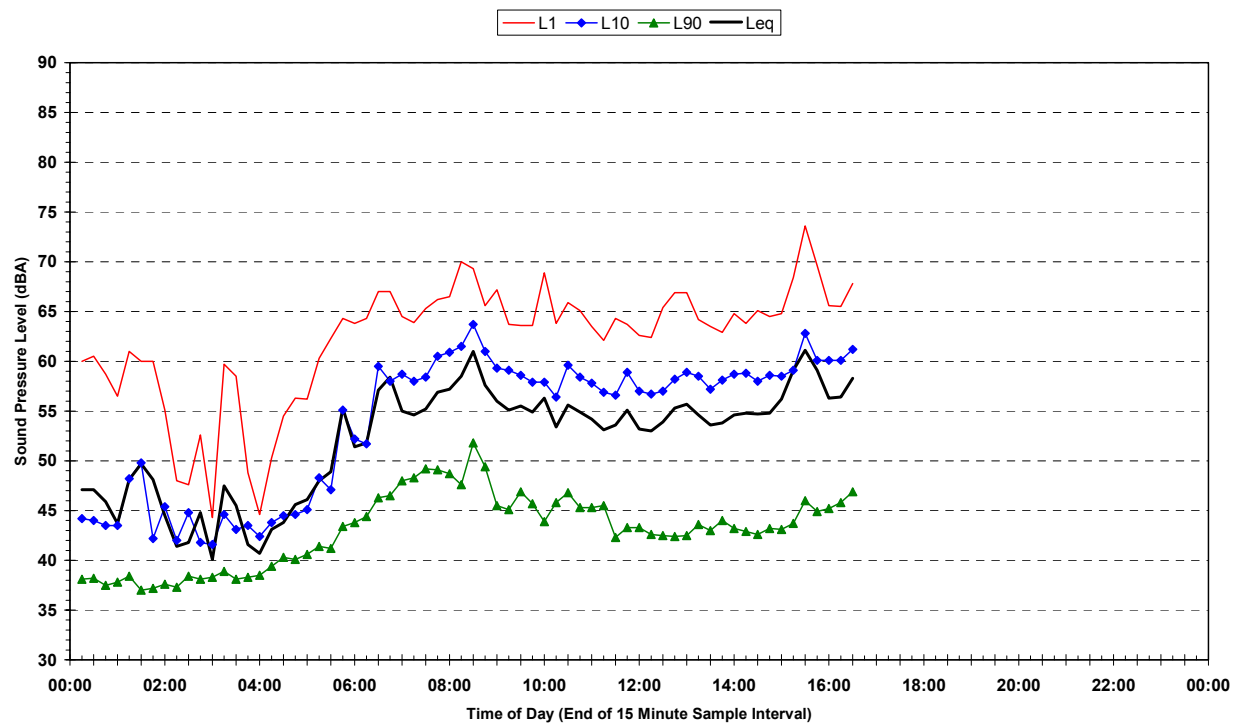
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Existing Background Noise Levels –
Logger Location 1: Front of Carpark

Statistical Ambient Noise Levels
20644 - Monday 7 June 2010



Statistical Ambient Noise Levels
20644 - Tuesday 8 June 2010



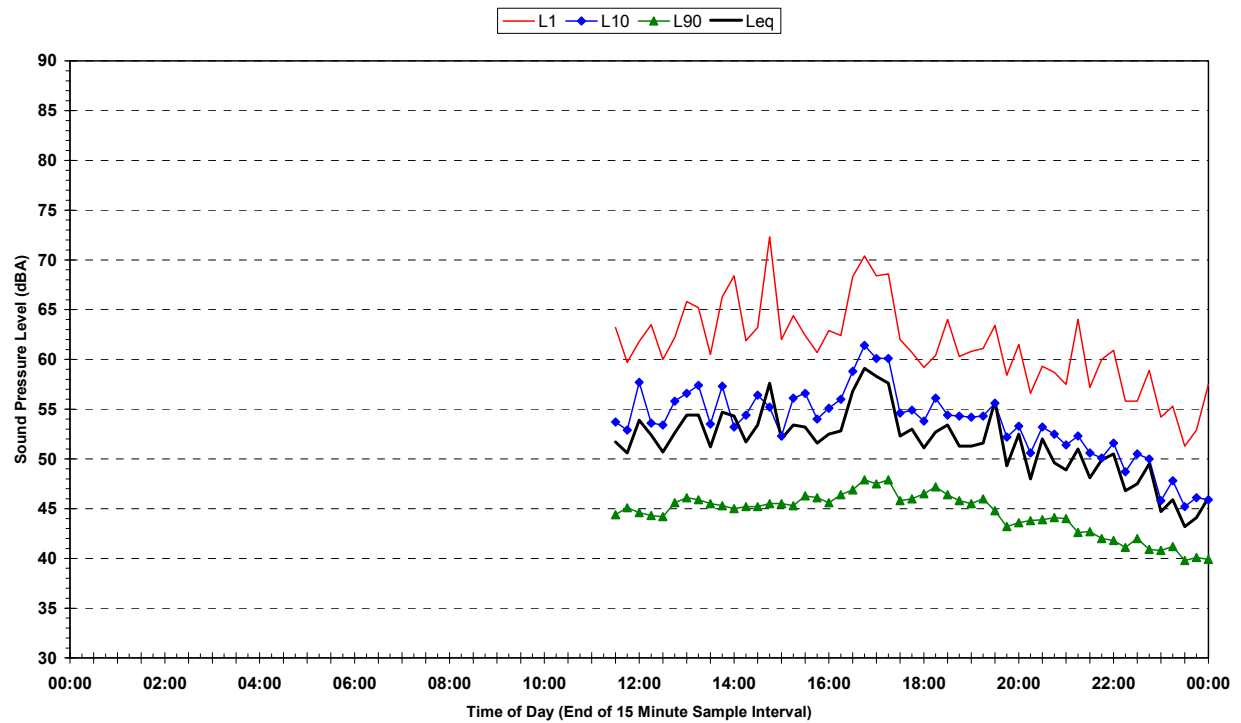
Appendix B

Report 10-8766-R1

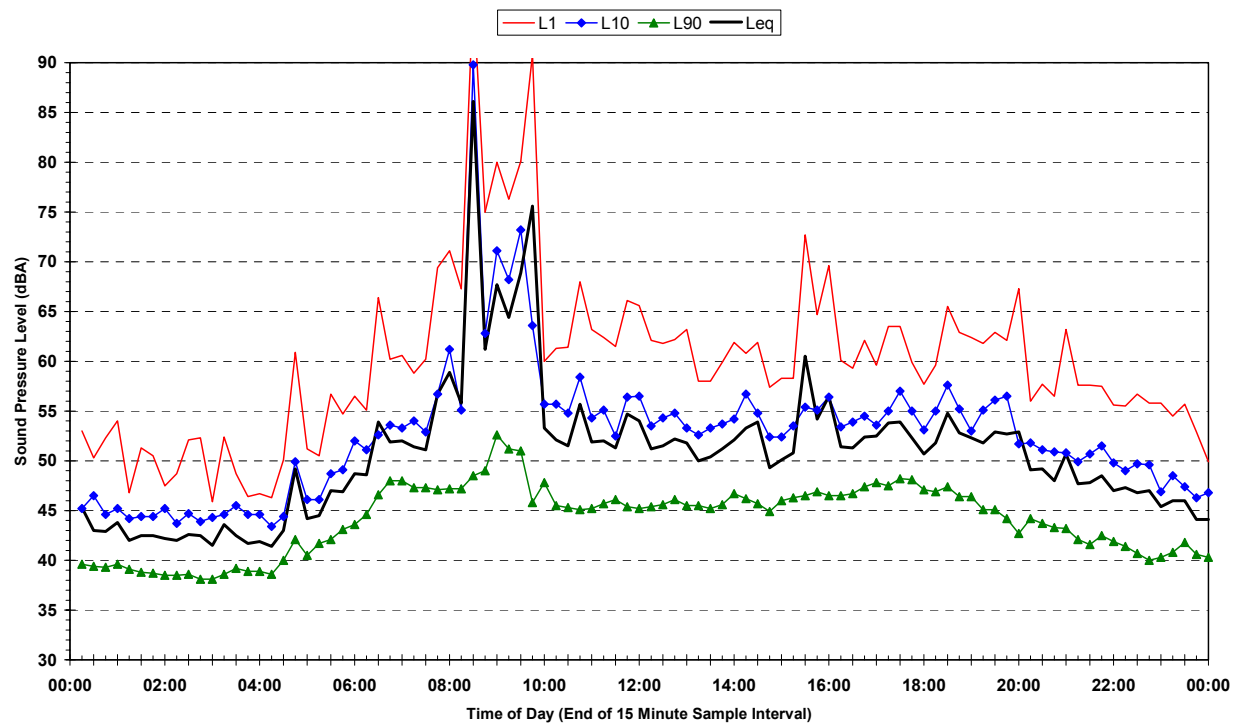
Page 1 of 4

Existing Background Noise Levels –
Logger Location 2: Side of Carpark

Statistical Ambient Noise Levels
20669 - Tuesday 1 June 2010



Statistical Ambient Noise Levels
20669 - Wednesday 2 June 2010



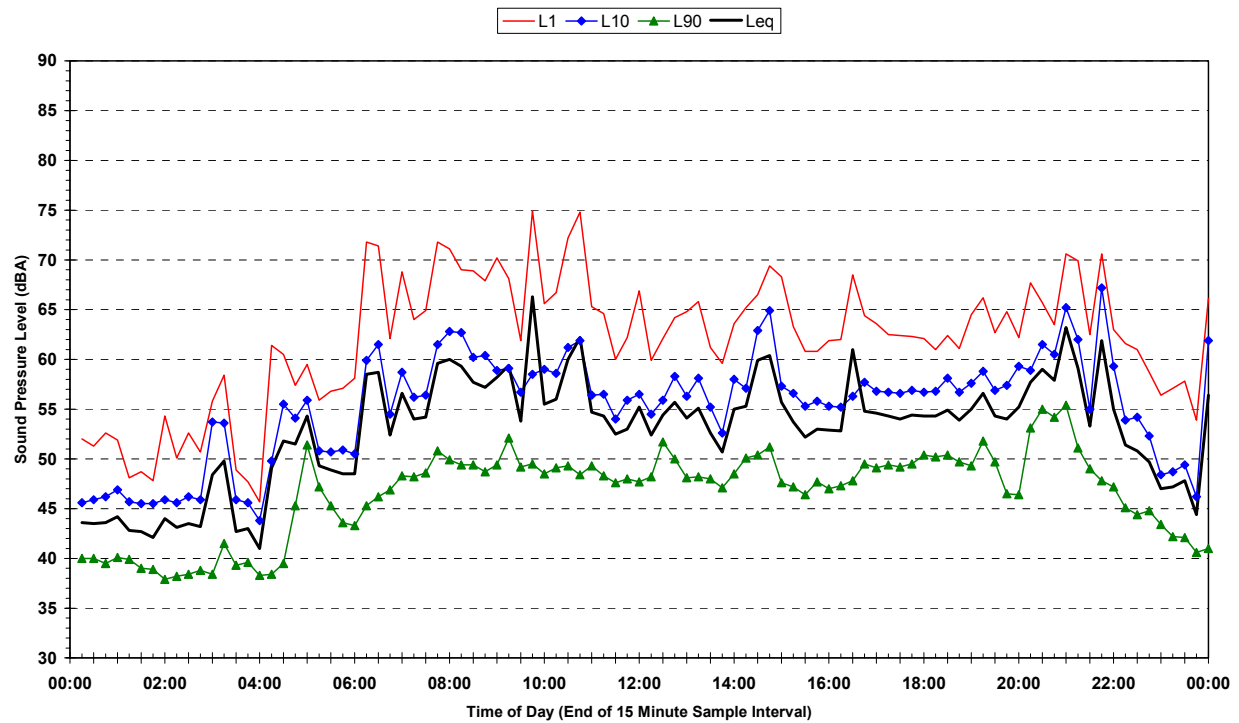
Appendix B

Report 10-8766-R1

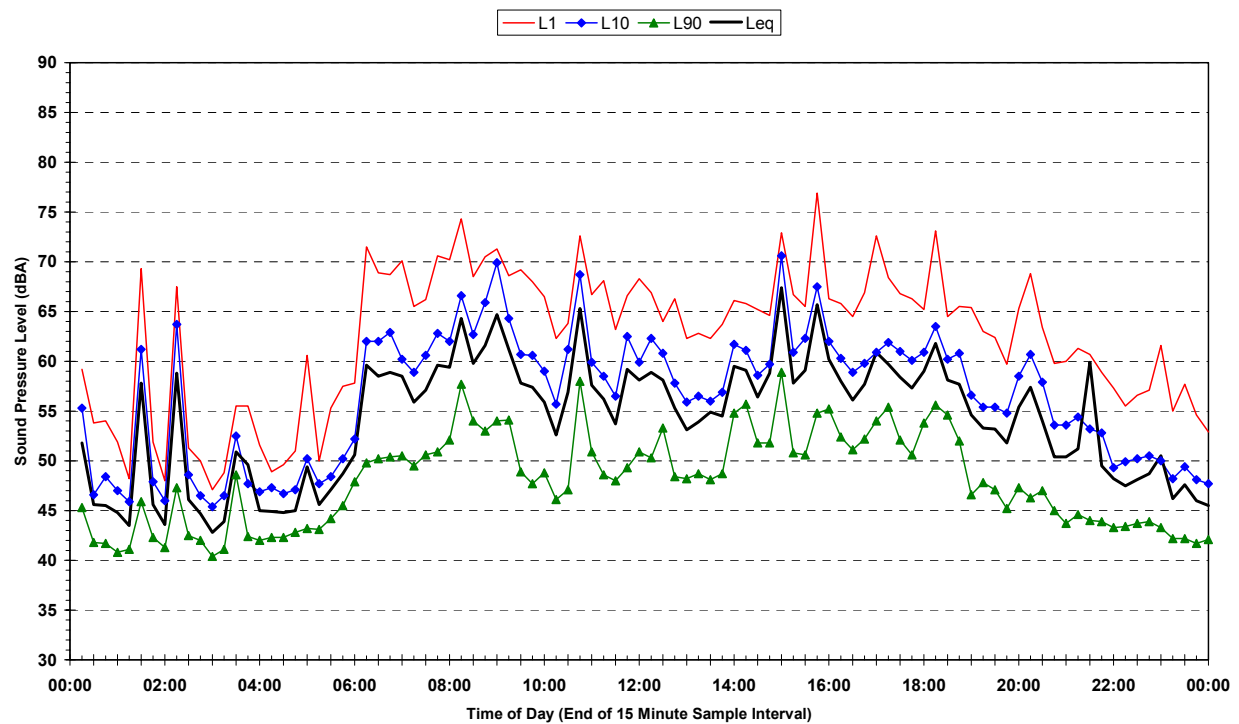
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Existing Background Noise Levels –
Logger Location 2: Side of Carpark

Statistical Ambient Noise Levels
20669 - Thursday 3 June 2010



Statistical Ambient Noise Levels
20669 - Friday 4 June 2010



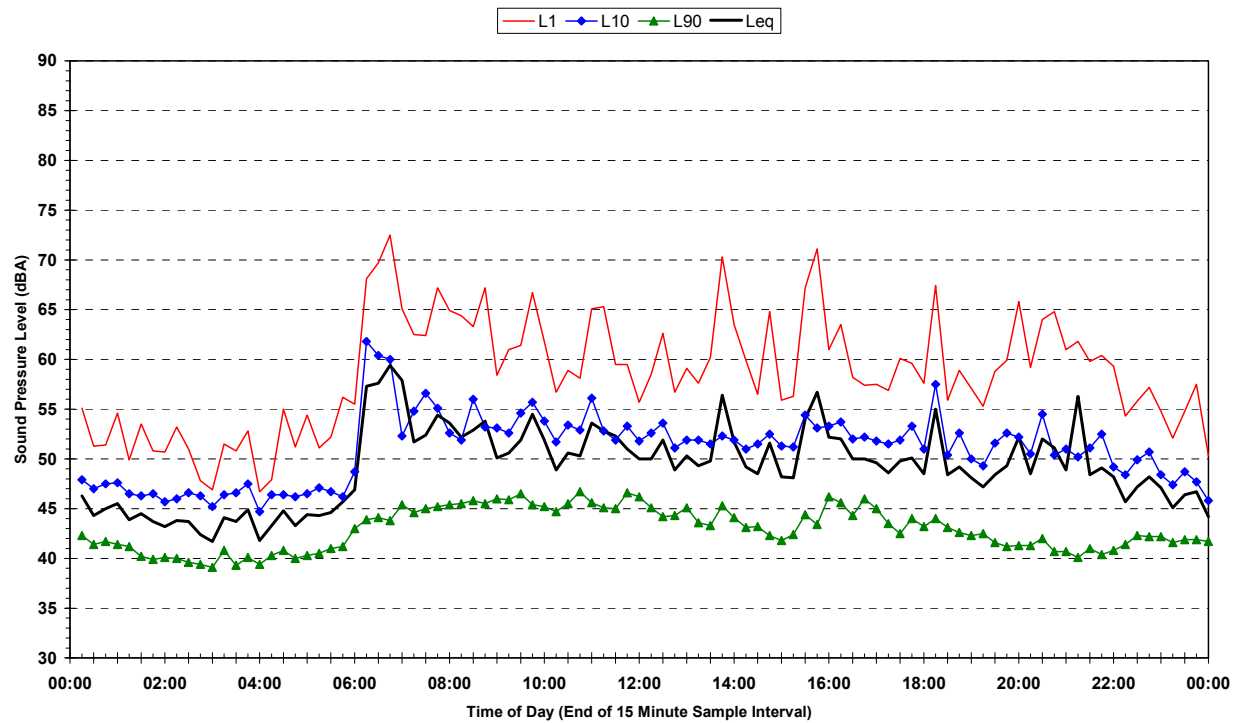
Appendix B

Report 10-8766-R1

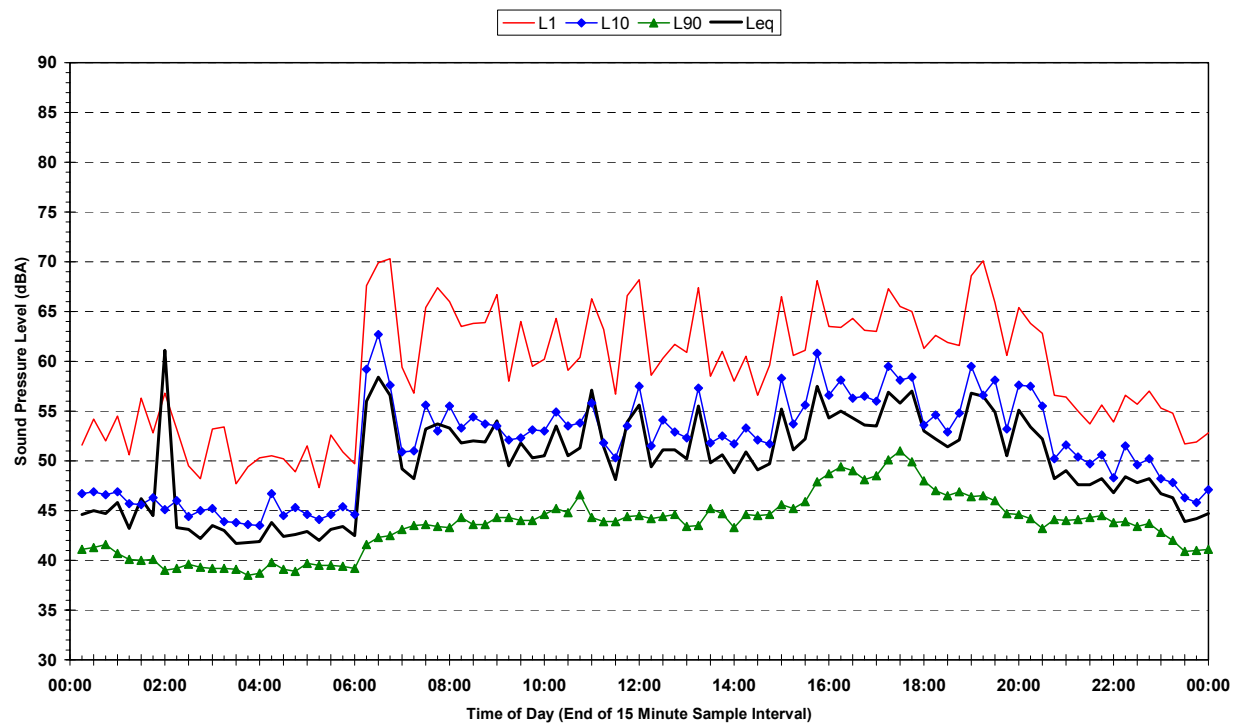
Page 3 of 4

Existing Background Noise Levels –
Logger Location 2: Side of Carpark

Statistical Ambient Noise Levels
20669 - Saturday 5 June 2010



Statistical Ambient Noise Levels
20669 - Sunday 6 June 2010



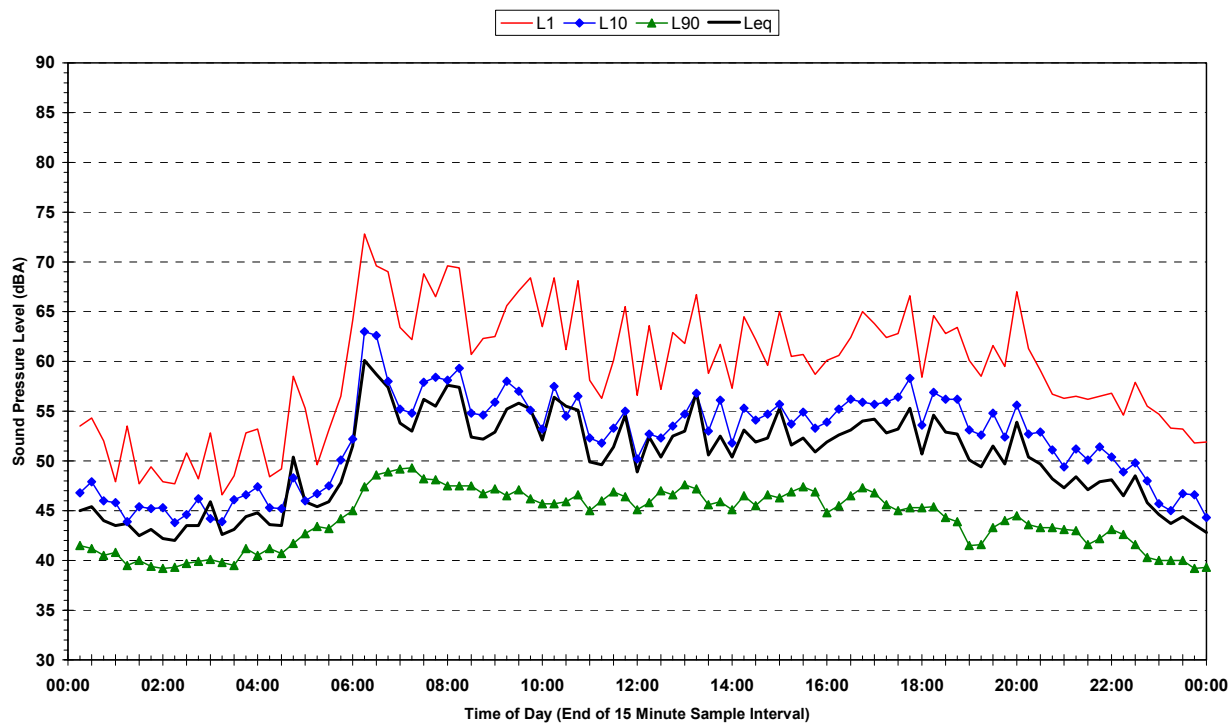
Appendix B

Report 10-8766-R1

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Existing Background Noise Levels –
Logger Location 2: Side of Carpark

Statistical Ambient Noise Levels
20669 - Monday 7 June 2010



Statistical Ambient Noise Levels
20669 - Tuesday 8 June 2010

