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Prepared for: Architectus

**33 CROSS STREET, DOUBLE BAY
MIXED USE DEVELOPMENT**

**PROJECT APPLICATION
ENVIRONMENTAL NOISE ASSESSMENT**

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1. INTRODUCTION

Acoustic Logic Consultancy Pty Ltd has been engaged by Architectus to conduct a Concepts Plan, Environmental Noise Study for the purpose of assessing the potential impacts on the acoustic amenity of the proposed 33 Cross Street mixed use development, Double Bay for both external and internal noise sources as part of the Planning Application submission. The noise sources investigated are as follows:

- Existing environmental noise impact on the future site including surrounding traffic noise noise from surrounding roadways.
- Noise emissions associated with traffic generated from the site.
- Noise emissions from the site including mechanical plant noise.

Environmental noise will be covered first as it will potentially impact the future development. Unattended and attended noise monitoring was conducted in order to determine the existing traffic noise levels around the perimeter of the site.

The final part of the report will address noise generated from the development to surrounding properties. At this early stage no detailed design has been conducted for mechanical plant. This cursory study will set the goal assessment criteria applicable to the project based on Environmental Protection Authority (EPA), Woollahra Council requirements and other relevant statutory/regulatory requirements.

2. SITE DESCRIPTION

Figure 1 below illustrates the location of the 33 Cross Street mixed use development, Double Bay.



Figure 1 – Site Location and Measurement Positions

The existing environmental noise sources affecting the site are as follows:

- The development is affected by environmental noise including traffic noise on the site perimeter roadways including Cross Street and other surrounding streets such as William Street to the north.

It is anticipated that the future acoustic environment impacting the proposed 33 Cross Street Development will not be altered significantly.

The environmental noise source outlined above has varying degrees of impact upon the proposed development which will be outlined in Section 3 of this Report.

3. EXISTING ACOUSTIC ENVIRONMENT

Environmental noise impacting the site is a result of traffic noise from the surrounding perimeter roadways which is the main source of noise impacting upon the proposed development.

Surrounding street including Cross Street and William Street carry medium to low volumes of traffic. Other surrounding streets such as Transvaal Avenue carries low traffic volumes and will not significantly impact the proposed site.

3.1 TOPOGRAPHY

The topography of the site and surrounding land of the proposed development is generally flat in the immediate area surrounding the development site and the acoustic assessment has taken this topography into account.

4. ACOUSTIC SURVEY

As part of this assessment an acoustic survey of the proposed 33 Cross Street development site has been conducted.

The acoustic survey included attended and unattended noise logging which is detailed in this section of the report.

4.1 ENVIRONMENTAL NOISE LEVELS

Environmental noise constantly varies in level, due to fluctuations in local noise sources including road traffic. Accordingly, a 15 minute measurement interval is normally utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters.

In the case of environmental noise three principle measurement parameters are used, namely L_{10} , L_{90} and L_{eq} .

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement intervals.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source depends on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the measurement period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of industrial noise.

4.2 ATTENDED NOISE MEASUREMENTS

Attended noise level measurements conducted as part of this assessment are detailed in this section of the report.

4.2.1 Measurement Equipment

Attended noise measurements were obtained using a CEL-593 Type 1 Sound Level Analyser, set to A-weighted fast response. The sound level meter was calibrated before and after the measurements using a RION NC-73 Sound Level Calibrator. No significant drift was recorded.

4.2.2 Measurement Period

Noise monitoring was conducted at the locations detailed in Figure 1 in Section 2 above during the following periods:

1. Peak afternoon conditions between 4.30pm and 6pm on the 17th of December, 2008

4.3 UNATTENDED NOISE MONITORING

Unattended noise monitoring conducted as part of this assessment is detailed in this section of the report. The results of unattended noise logging are included in Appendix A.

4.3.1 Unattended Monitoring Period

Unattended noise monitoring was conducted during the period of 11th December to 17th December 2008 in order to measure the existing background noise levels.

The noise level monitor was located to the rear of the site, screened from traffic noise sources on Cross Street to obtain minimum background noise levels at the site. The location of noise monitoring is detailed in Figure 1 in Section 2 above.

4.3.2 Monitoring Equipment

Unattended noise measurements were obtained using an Acoustic Research Laboratories Pty Ltd noise logger. The logger was programmed to store 15-minute statistical noise levels throughout the monitoring period. The noise monitors were calibrated at the beginning and the end of the measurement using a Rion NC-73 calibrator. No significant drift was detected. All measurements were taken on A-weighted fast response mode. Periods of adverse weather conditions during the evening of Friday 12th and during the day on Saturday 13th December during the measurement period have not been used in this assessment.

4.4 RESULTS OF THE ACOUSTIC SURVEY

An acoustic survey was undertaken at the proposed 33 Cross Street mixed use development site in order to determine the existing acoustic environment. The unattended monitor results will be used to determine the variation between day, evening and night time noise levels. Attended measurements will be compared with the unattended monitoring data during the same measurement period so that relative differences between the attended and unattended locations can be formed thereby providing a comprehensive study of existing noise levels around the proposed site.

4.4.1 Existing Background Noise Levels

Background noise levels during day time are dominated by general vehicular traffic movements. The EPA NSW Industrial Noise Policy details specific steps in determining the background noise level for assessment of the day, evening and night time periods. Table 1 summarises the background determined at the monitoring location, based on the guidelines set out in the EPA NSW Industrial Noise Policy and the results of unattended noise monitoring.

Table 1 – Measured Ambient Noise Levels

Location	Description	Day Noise Level 7am to 6pm (dB(A))	Evening Noise Level 6pm to 10pm (dB(A))	Night Noise Level 10pm to 7am (dB(A))
Rear of 33 Cross Street Site	Background L _{90,15min}	43	40	34

In addition to the background levels obtained at the unattended monitoring position presented above, attended noise monitoring was conducted at 3 locations around the perimeter of the subject site as detailed in Figure 1 of Section 1 above. The results of the attended noise measurements are presented in Table 2 below.

Table 2 – Measured Attended Environmental Noise Levels

Location	Time Period	Measured Noise level dB(A) L _{eq} (15 min)
Location 1 – Rear of 33 Cross Street Site	Peak Afternoon Period 3.30pm to 6pm	54
Location 2 – Cross Street	Peak Afternoon Period 3.30pm to 6pm	66
Location 3 – Transvaal Avenue	Peak Afternoon Period 3.30pm to 6pm	63

5. NOISE EMISSION LIMITS – NOISE GENERATED ON THE SITE

The Environment Protection Authority (EPA) Industrial Noise Policy provides guidelines for assessing noise impacts from development sites. The recommended assessment objectives vary depending on the potentially affected receivers, the time of day, and the type of noise source. The EPA Industrial Noise Policy has two requirements which both have to be complied with, namely an amenity criterion and an intrusiveness criterion. In addition, the EPA in its Environmental Noise Control Manual states that noise controls should be applied with the general intent to protect residences from sleep arousal.

For land use developments with the potential to create additional traffic on local roads the development should comply with the requirements detailed in the EPA Environmental Criteria for Road Traffic Noise (ECRTN).

Woollahra Council's Development Control Plan (DCP) also includes criteria limiting noise impact on surrounding properties which is also assessed in this report.

5.1 WOOLLAHRA COUNCIL DCP REQUIREMENTS

Woollahra Council DCP includes noise emission limits using the L_{eq} descriptor. The Woollahra Council DCP criteria states that the L_{eq} noise level should not exceed the background noise level, that is Background + 0 dB(A).

5.2 EPA INTRUSIVENESS CRITERION

The EPA guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{eq} descriptor not exceed the background noise level by more than 5 dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

5.3 EPA AMENITY CRITERION

The EPA guideline is intended to limit the absolute noise level from all industrial noise sources to a level that is consistent with the general environment.

The EPA's Industrial noise policy sets out acceptable noise levels for various localities. Table 2.1 on page 16 of the policy indicates 4 categories to distinguish different residential areas. They are rural, suburban, urban and urban/industrial interface.

Table 5 provides the recommended ambient noise levels for the suburban residential receivers for the day, evening and night periods. For the purposes of this condition:

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays;
- Evening is defined as the period from 6pm to 10pm; and
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays.

Table 3 – EPA Recommended Amenity Industrial Noise Levels

Type of Receiver	Time of day	Recommended Acceptable Noise Level dB(A) L_{eq}
Residential	Day	55
	Evening	45
	Night	40

5.4 SLEEP AROUSAL

To minimise the potential for sleep arousal the L_1 (1 minute) noise level of any specific noise source does not exceed the background noise level (L_{90}) by more than 15 dB(A) outside a resident's bedroom window between the hours of 10pm and 7am. The L_1 noise level is the level exceeded for 1 per cent of the time and approximates the typical maximum noise level from a particular source. Where the typical repeatable existing L_1 levels exceed the above requirement then the existing L_1 levels form the basis for, sleep disturbance criteria.

5.5 SUMMARY OF ASSESSMENT CRITERIA FOR PROPOSED SITE

Woollahra Council DCP, intrusiveness, amenity and sleep arousal criteria for this project have been determined using these guidelines and the noise monitoring results. These are summarised below. We note that the formulation of the assessment criteria has been based on the lowest ambient levels determined from all monitoring data.

5.5.1 Day Period

The following table sets out the measured L_{eq} amenity and L_{90} background noise levels, and the assessment criteria based on the suburban criteria. The day period applies between 7am and 6pm Monday to Saturday; and 8am to 6pm Sundays and public holidays.

Table 4 – Measured L_{eq} & L_{90} Noise Levels and Criteria - Daytime

Location	Measured L_{eq} Noise Level dB(A)	Measured L_{90} Noise Level dB(A)	Amenity Criterion dB(A) L_{eq}	Intrusiveness Criterion dB(A) L_{eq}	Council DCP Criteria dB(A) L_{eq}
Location 1 – North of the 33 Cross Street Site	54	43	55	48	43
Location 2 – Cross Street	66	56	55	61	56
Location 3 – Transvaal Avenue	55	47	55	52	47

5.5.2 Evening Period

The following table sets out the measured L_{Aeq} and L_{90} background noise levels, and the assessment criteria based on the suburban criteria. The evening period applies between 6pm and 10pm.

Table 5 – Measured L_{eq} & L_{90} Noise Levels and Criteria - Evening Period

Location	Measured L_{eq} Noise Level dB(A)	Measured L_{90} Noise Level dB(A)	Amenity Criterion dB(A) L_{eq}	Intrusiveness Criterion dB(A) L_{eq}	Council DCP Criteria dB(A) L_{eq}
Location 1 – North of the 33 Cross Street Site	53	40	45	45	40
Location 2 – Cross Street	64	51	45	56	51
Location 3 – Transvaal Avenue	54	45	45	50	45

5.5.3 Night Period

The night period (that is, between 10pm and 7am) is the period where noise emissions can have the most significant effect on residential amenity. In addition to the quasi-steady state criteria the L_1 noise emission level should not exceed the background noise level by more than 15 dB(A) to prevent sleep arousal from intermittent events. The night time period applies between 10pm and 7am.

Table 6 –Measured L_{eq} & L_{90} Noise Levels and Criteria - Night Time Period

Location	Measured L_{eq} Noise Level dB(A)	Measured L_{90} Noise Level dB(A)	Amenity Criterion dB(A) L_{eq}	Intrusiveness Criterion dB(A) L_{eq}	Council DCP Criteria dB(A) L_{eq}	Night time Sleep Disturbance dB(A) L_1 (1 Min)
Location 1 – North of the 33 Cross Street Site	53	34	40	39	34	49
Location 2 – Cross Street	60	41	40	46	41	56
Location 3 – Transvaal Avenue	54	38	40	43	38	53

5.6 RESULTING NOISE LEVEL CRITERIA

The criteria for the various monitoring locations have been considered and assessed for the surrounding receivers. Table 4 below details the noise level criterion for properties surrounding the 33 Cross Street development. In all cases, if a discrepancy in attended and unattended noise levels were obtained at two nearby locations within a residential grouping the more conservative noise level criterion has been adopted.

Table 7 – Noise Objectives for Surrounding Receivers

Location	Daytime Noise Objective dB(A) L_{eq}	Evening Noise Objective dB(A) L_{eq}	Night time Noise Objective dB(A) L_{eq}	Noise Objective for Intermittent Activities dB(A) L_1 (1 Min) (Background + 15 dB(A))
Properties on Cross Street	55	45	40	56
Properties on Transvaal Avenue	40	45	38	53
Neighbouring Properties to the North of the Site	43	40	34	49

Noise level criteria are to be applied to commercial traffic levels generated from vehicle movements on the site only, as presented by the Industrial Noise Policy. Noise levels generated from the movement of vehicles entering and exiting the site on ramps are generally required to comply with levels presented in the presented tables for surrounding receivers.

5.7 ASSESSMENT CRITERIA – ADDITIONAL TRAFFIC GENERATION

For land use developments with the potential to create additional traffic on local roads the development should comply with the requirements detailed in the EPA ECRTN. Criteria applicable to the development are detailed below. If existing noise levels exceed those in Table 8 a 2 dB increase in noise is allowed.

Table 8 - Criteria for Traffic Noise for New Developments

Time of day	Criteria for Acceptable Traffic Noise Level dB(A)
Day (7am to 10pm)	60 $L_{Aeq(1hr)}$ – Collector Road 55 $L_{Aeq(1hr)}$ – Local Road
Night (10pm to 7am)	55 $L_{Aeq(1hr)}$ – Collector Road 50 $L_{Aeq(1hr)}$ – Local Road

Attended traffic noise levels measurements were conducted at a number of locations surrounding the development including locations as detailed in the table below.

Table 9 - Criteria for Traffic Generation

Location	Criteria for Acceptable Traffic Noise Level dB(A) $L_{eq}(1hr)$	
	Day (7am to 10pm)	Night (10pm to 7am)
Cross Street	68	62
Transvaal Avenue	57	56

Note: Noise levels calculated to potentially worst affected residential facades from results of on site testing.

5.8 COMPLIANCE WITH CRITERIA

Based on experience with similar developments and the existing high traffic volumes and noise on surrounding roadways noise associated with additional traffic volumes will comply with criteria detailed above. For a significant increase in noise (2 dB(A) increase) from traffic associated with the site volumes would need to increased flows on surrounding streets by more than 40%. Based on the number of on site parking spaces associated with the 33 Cross Street development compliance with the traffic noise generation criteria will be achieved.

6. INTERNAL ENVIRONMENTAL ACOUSTIC OBJECTIVES

Currently there are no environmental noise level criteria as a DA for the project has not been received. Internal environmental noise level criteria have been developed for the project based on the Australian Standard AS2107:2000 recommendations.

6.1 TRAFFIC NOISE OBJECTIVES

Project internal environmental noise level criteria which have been used as the basis for this report are detailed in the table below. An internal noise level criterion has been based on developments near minor roads within the Australian Standard ASA2107:2000.

Table 10 – Traffic Noise Level Objectives

Room Type	Time Period	Internal Noise Level criteria
Retail/Commercial Areas	Day time	50 dB(A) L_{Aeq} (15 hour)
Office Areas	Day time	45 dB(A) L_{Aeq} (15 hour)
Hotel Areas	Day time	50 dB(A) L_{Aeq} (15 hour)
Residential Bedrooms	Nigh time	35 dB(A) L_{Aeq} (9 hour)
Residential Living Areas	Day time	40 B(A) L_{Aeq} (15 hour)

6.2 COMPLIANCE WITH INTERNAL NOISE LEVELS

Experience with similar projects indicates that compliance with internal noise level criteria detailed in this section of the report is both possible and practical. The external façade of the future development will be acoustically treated where necessary to ensure internal noise levels comply with specified noise levels. Acoustic treatment will include the upgrading of glazing and other façade elements based on noise level measurements conducted at the site. Masonry and other high mass elements of the façade will not require additional acoustic treatments.

7. MECHANICAL PLANT TREATMENTS

As detailed plant selections have not been conducted at this time a acoustic assessment of noise impact can not be conducted.

A detailed mechanical noise assessment will be conducted once plant selections and services drawings have been finalised as part of the construction documentation. Based on experience with similar development acoustic treatments are both possible and practical using acoustic treatments such as lining of ductwork, acoustic silences, variable speed controllers, time switches, acoustic screens etc.

8. DOUBLE BAY CENTRE DEVELOPMENT CONTROL PLAN 2002

Design of the retail and commercial areas of the 33 Cross Street development including restaurants and cafés will be developed to minimise the acoustic impact to existing and future residential properties.

The acoustic treatments and controls will be developed in conjunction with the recommended controls detailed within the 'Double Bay Centre Development Control Plan 2002 which includes:

- Locating external areas including balconies, courtyards, terraces and the like in a location such that noise transmission is minimised.
- Install noise barriers is appropriate
- Limit deliveries and waste removal to day time hours
- Incorporate acoustic treatments and controls to restaurant and café areas as appropriate. It is noted that noise associated with future restaurants and cafes will be assessed once tenancy uses are finalised.

9. LEVEL 4 BAR/RESTAURANT/POOL AREA

A preliminary acoustic assessment of the proposed Level 4 bar, restaurant and pool area has been conducted and based on the currently detailed setbacks noise level criteria detailed in this report will be complied with providing some noise management controls are adopted. Details of noise management controls will be provided as part of the operating documentation and may include a number of the following controls:

1. Time limits on the operation of the swimming pool.
2. Time limits on the opening hours of the external areas of the restaurant and bar.
3. Limiting times when music can be played on the external areas.
4. Limit in the level of recorded music on external areas.
5. Time when the external façade should be closed.

10. CONCLUSION

This report provides the results of Environmental Noise Study for the proposed 33 Cross Street mixed use development, Double Bay. Noise at the site has been measured and noise goals have been set in accordance with the requirements of the relevant statutory/regulatory authorities including Woollahra Council DCP and the EPA.

Determination of noise assessment criteria based on the Woollahra Council DCP, the EPA's Industrial Noise Policy and ECRTN have been determined based on both unattended and attended noise monitoring conducted at the proposed development.

We trust this information is satisfactory. Please contact us should you have any further queries.

Report prepared by,

A handwritten signature in black ink that reads "B.G. White." The signature is written in a cursive, slightly slanted style.

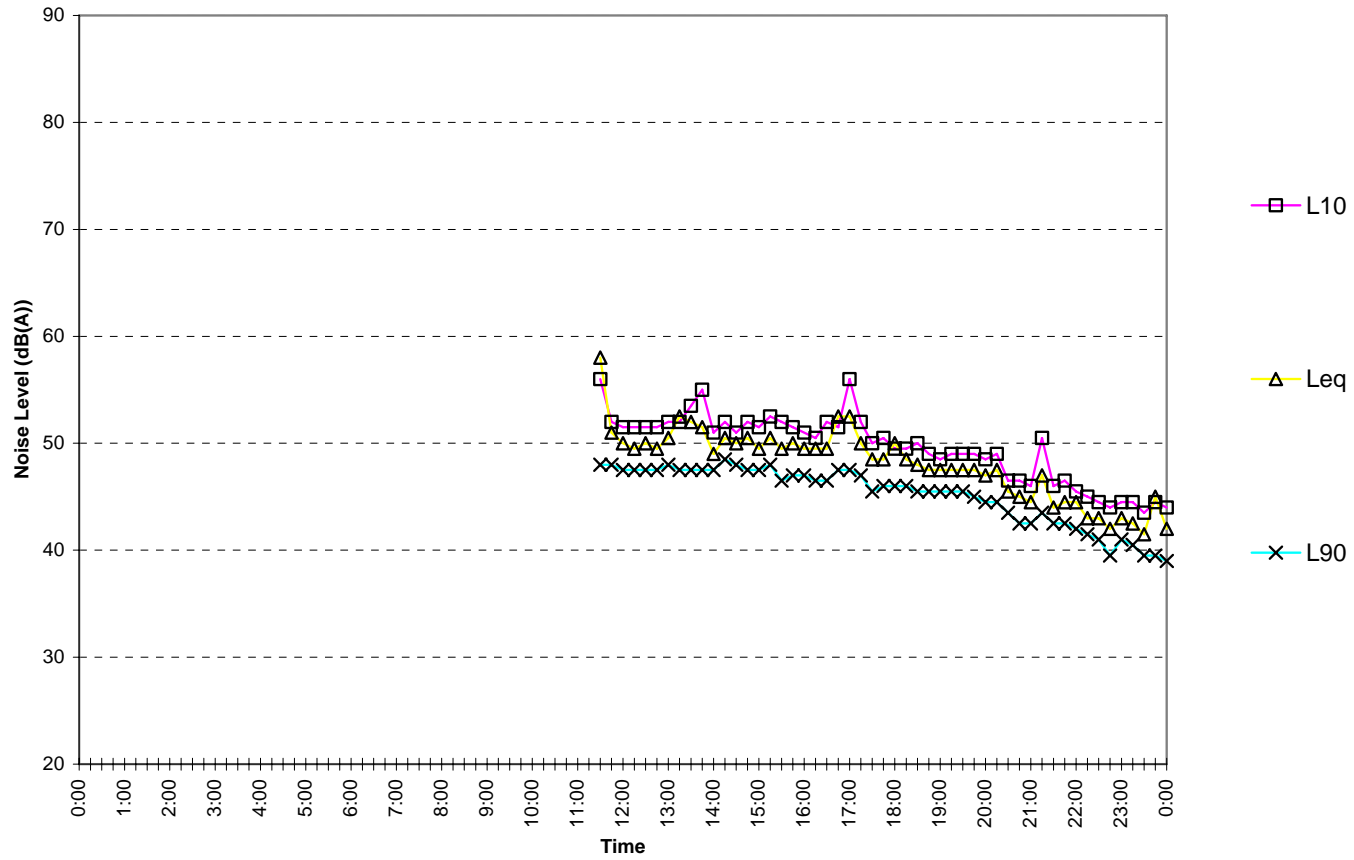
ACOUSTIC LOGIC CONSULTANCY PTY LTD
Ben White

APPENDIX A

UNATTENDED NOISE MONITORING RESULTS

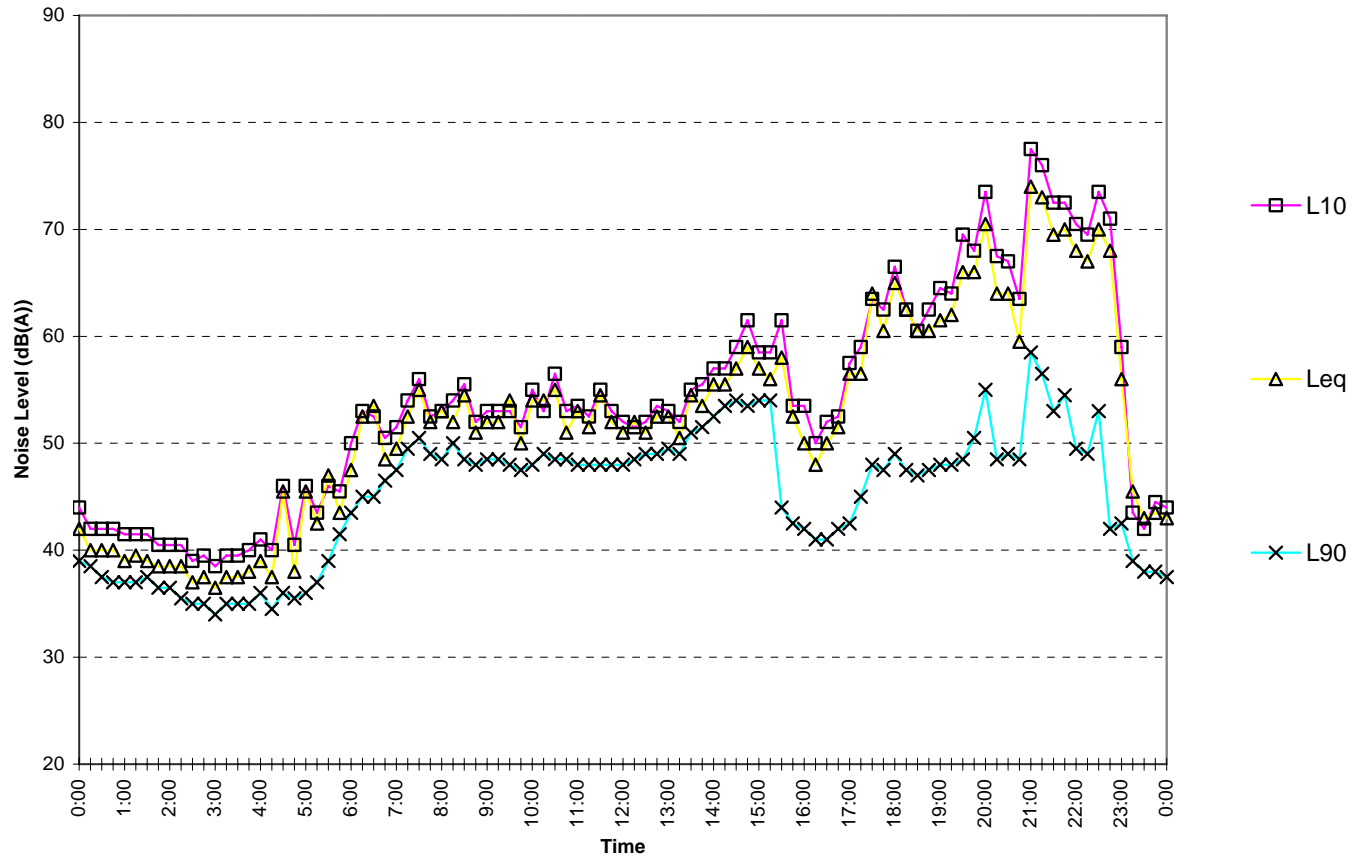
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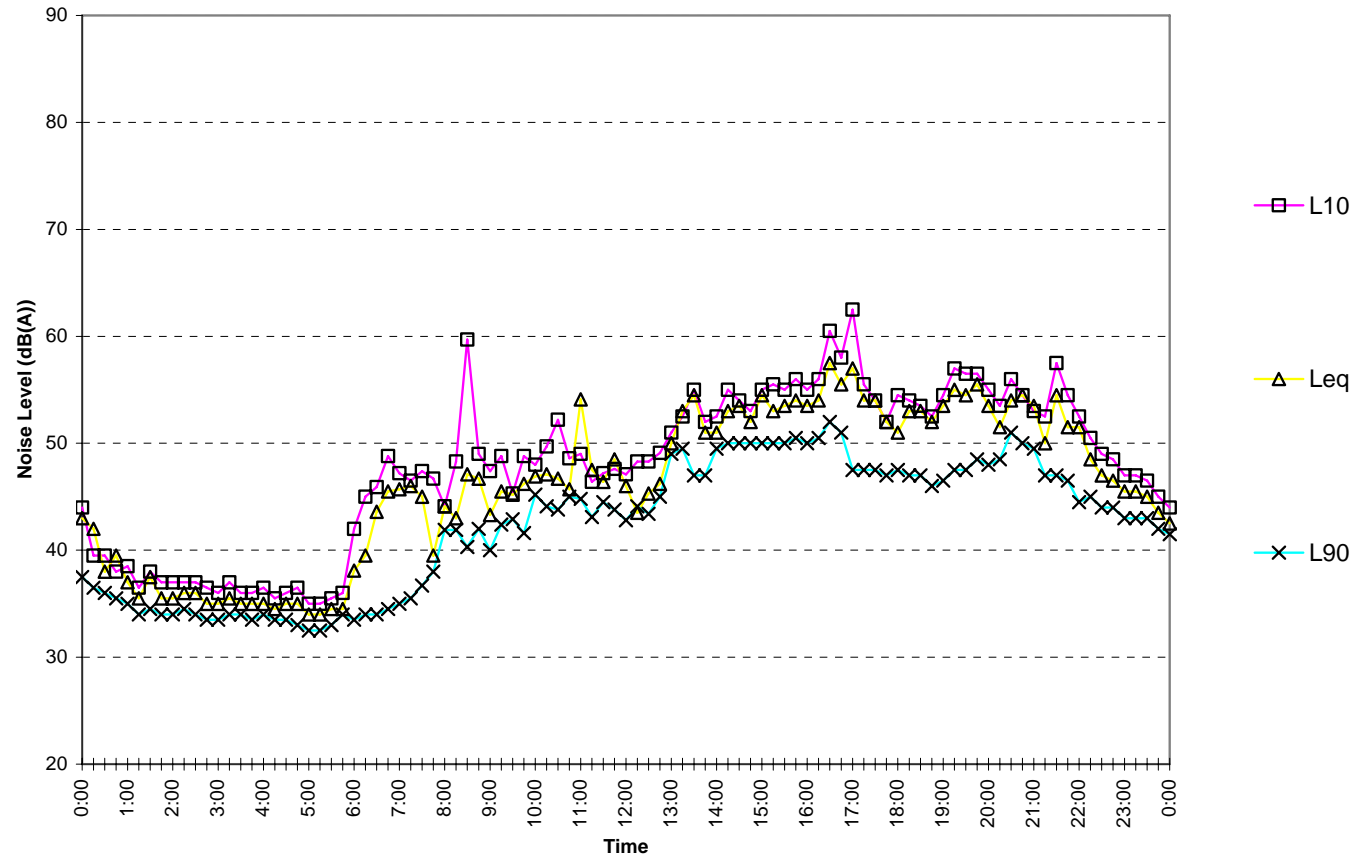
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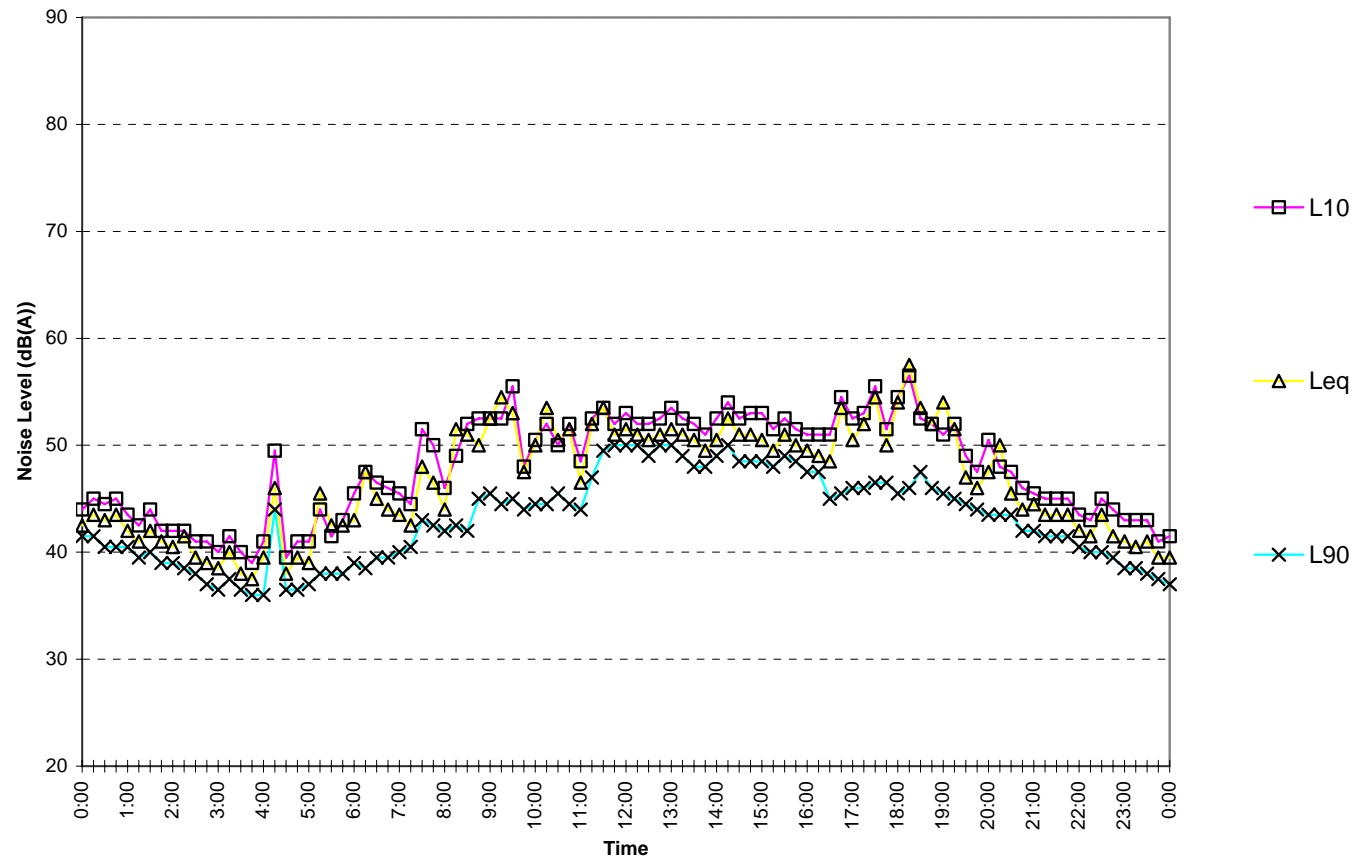
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Saturday December 13,2008



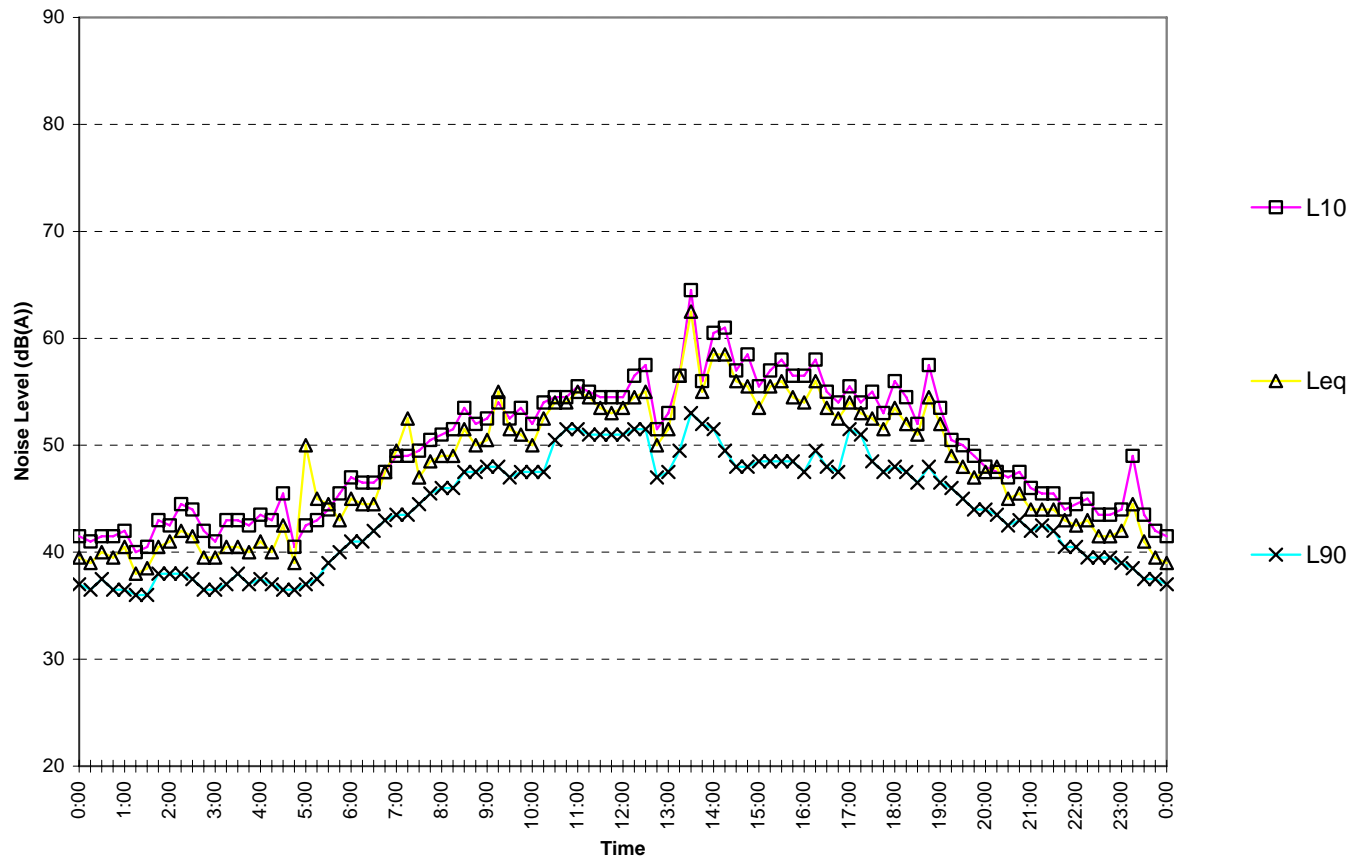
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Sunday December 14,2008



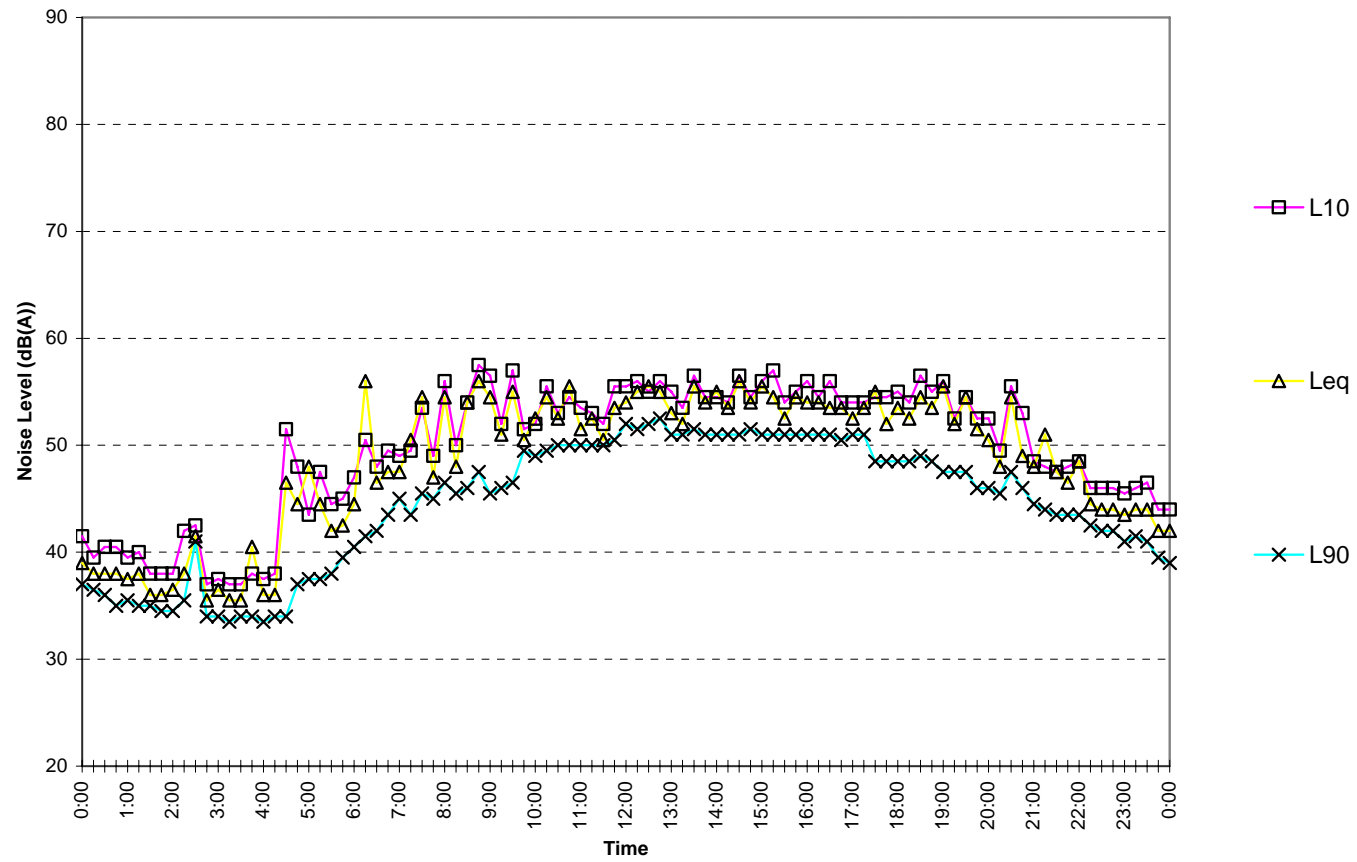
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Monday December 15,2008



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Tuesday December 16,2008



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Wednesday December 17,2008

