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Noise Impact Assessment

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1 INTRODUCTION

This report presents an analysis of acoustic impacts associated with the proposed Wollongong Private Hospital development at 360-364 Crown Street Wollongong.

In this report we will:

- Conduct an external noise impact assessment (primarily traffic noise) and recommend acoustic treatments to ensure that a reasonable level of amenity is achieved for future tenants.
- Identify potential noise sources generated by the site, and determine noise emission goals for the development to meet Council acoustic requirements to ensure that nearby developments are not adversely impacted.

2 SITE DESCRIPTION / PROPOSED DEVELOPMENT

The proposed development consists of a hospital building with 7 levels of facilities, as well as one story of plantroom and 3 basement levels of car parking and a loading dock.

Potential noise impacts on the site are primarily traffic noise from surrounding roadways, most notably Princes Highway (Crown Street), which carries medium to heavy flows of traffic.

Noise potentially generated by the site will consist of:

- Noise emissions from the car park entry/exit ramp.
- Noise emissions from usage of the loading dock.
- Noise emissions from mechanical plant.

Noise impacts associated with these noise sources will be investigated.

The nearest potentially affected noise receivers are:

- The commercial property to the west of the site on the Princes Highway.
- The residential property to the west of the site on the Princes Highway.
- Residential property to the east of the proposed site within proximity to the proposed loading dock.

Refer to Figure 1 below, which is an aerial photo of the proposed development.



Figure 1 – Proposed Development

3 NOISE DESCRIPTORS

Traffic noise constantly varies in level, due to fluctuations in traffic speed, vehicle types, road conditions and traffic densities. Accordingly, it is not possible to accurately determine prevailing traffic noise conditions by measuring a single, instantaneous noise level. To accurately determine the effects of traffic noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters. These parameters are used to measure how much annoyance would be caused by a particular noise source.

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 interval.

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 will depend 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 traffic noise.

Current practice favours the L_{eq} parameter as a means of measuring traffic noise, whereas the L_{10} parameter has been used in the past and is still incorporated in some codes. For the reasons outlined above, the L_{90} parameter is not used to assess traffic noise intrusion.

4 NOISE IMPACT ASSESSMENT

Significant noise sources in the vicinity of the site are as follows:

- Princes Highway, on the southern property boundary, which carries medium to heavy traffic flows.

Noise impacts should comply with the requirements of the Australian Standard AS2107:2000.

1.1 NOISE MEASUREMENTS

Measurement of traffic noise was conducted using hand held measurements at the boundary of the site to the Princes Highway.

Hand-held measurements were obtained using a Norsonics Type 140 Precision Sound Level Analyser. The Precision Sound Level Analyser was calibrated at the beginning and the end of the measurement using a Norsonics Type 1251 Precision Sound Level Calibrator. No significant drift was noted. All measurements were conducted on A-weighted fast response mode. There were no significant periods of adverse weather conditions during the measurement period.

Traffic noise measurements were conducted on 16 May 2013 and are presented in the table below.

Table 1 – Measured Traffic Noise Levels

Location	Measured Noise Level dB(A)L_{eq}
Princes Highway	67

4.1 ACOUSTIC OBJECTIVES

The determination of an acceptable level of traffic noise within the residential/commercial spaces requires consideration of the activities carried out within the space and the degree to which noise will interfere with those activities

As sleep is the activity most affected by traffic noise, bedrooms are the most sensitive rooms. Higher levels of noise are acceptable in living areas without interfering with activities such as reading, listening to television, etc. Noise levels in utility spaces such as kitchens, bathrooms, laundries, etc can be higher.

As Wollongong Council does not have any specific criteria for traffic noise, assessment shall be conducted in accordance with Australian Standards AS 3671-1989 "Acoustics – Road Traffic Noise Intrusion – Building, Siting and Construction" and AS2107-2000 "Recommended Design Sound Levels and Reverberation Times for Building Interiors".

The Australian Standards recommend maximum design sound levels for different areas of occupancy in the residential development while AS 3671 -1989 "Road Traffic Noise Intrusion - Building Siting and Construction" recommends that an appropriate L_{eq} or L_{10} traffic noise descriptor be used for the occupancy being assessed.

Based on AS2107-2000 and AS 3671-1989 the following assessment criteria would apply to the proposed development.

Table 1 - Internal Traffic Noise Criteria

Space/Activity Type	Noise Level dB(A) L_{eq}
Casualty areas	45
Corridors and lobby spaces	50
Consulting rooms	45
Delivery suites	50
Intensive care wards	45
Kitchens, sterilizing and service areas	55
Laboratories	50
Nurses' stations	45
Office areas	45
Operating theatres	45
Surgeries	45
Wards	40
Waiting rooms, reception areas	50

4.2 RECOMMENDATIONS

Traffic noise intrusion into the proposed development is assessed using the measured external noise levels reported above as a basis. Internal noise levels will primarily be as a result of noise transfer through the windows and doors as these are relatively light building elements that offer less resistance to the transmission of sound. Noise transfer through the masonry elements will not be significant and need not be considered further.

A preliminary review of traffic noise intrusion has revealed that compliance with acoustic guidelines is achievable with medium-heavy single glazing with acoustic seals.

The recommended acoustic construction to the external façade of the project to treat environmental noise is a minimum of 6.38mm laminated glazing to all facades of the project.

Thicker glass may be required for structural, thermal or other requirements.

In addition to meeting the minimum glazing thickness requirements given, the design of the window mullions, perimeter seals and the installation of the windows/doors in the building openings shall not reduce the STC rating of the glazing assembly below the values nominated in the tables above.

The window/door suppliers should provide evidence that the systems proposed have been tested in a registered laboratory with the recommended glass thicknesses and comply with the minimum listed STC requirements. Also, the glazing installer should certify that the window/doors have been constructed and installed in a manner equivalent to the tested samples.

Table 4.4 - Minimum STC of Glazing (with Acoustic Seals)

Glazing Thickness	Acoustic Seals	Minimum STC of Installed Window
6.38mm Laminated	Yes	30

5 NOISE EMISSION ASSESSMENT

Noise emissions goals for the site will be developed to ensure that the amenity of nearby land users (both new occupants in the development and residents in nearby properties) is not adversely affected.

Criteria for the following noise sources will be calculated:

- Mechanical plant noise.
- Noise from the car park ramp and loading dock.

5.1 BACKGROUND NOISE MONITORING

Long term monitoring was conducted using two monitors installed on site, one in close proximity to the Princes Highway, the other towards the centre of the site. Monitoring has previously been conducted on the site during the period of 25 January to 1 February 2010 using an Acoustic Research Laboratories noise monitor set to A-weighted fast response. The monitor was calibrated at the start and end of the monitoring period using a Rion NC-73 calibrator. No significant drift was noted. Noise logger data is provided in Appendix 1.

Additional attended background noise monitoring was conducted at the site on the 16th May, 2013 to establish if the previously measured background noise levels are acoustically acceptable for the site.

Measured background noise levels are presented below at locations indicated in Figure 1 above.

Table 2 - Measured Ambient Noise Levels (monitoring)

Location	Description	Day Noise Level 7am to 6pm (dB(A)L ₉₀)	Evening Noise Level 6pm to 10pm (dB(A)L ₉₀)	Night Noise Level 10pm to 7am (dB(A)L ₉₀)
1	Background L _{90,15min}	45	42	35
2	Background L _{90,15min}	42	40	36

Table 3 - Measured Ambient Noise Levels (Attended Measurements)

Location	Description	Measured Attended Day Time Background Noise Level (dB(A) _{L₉₀})	Previously Recorded Background Noise Level (dB(A) _{L₉₀})	Comments
1	Background L _{90,15min}	47	45	Based on the results of attended background noise levels the previously conducted monitoring remain accurate for the site
2	Background L _{90,15min}	42	42	

5.2 ACOUSTIC OBJECTIVES

As the Wollongong Council DCP does not set out any specific noise emission criteria, noise emissions generated by the site will be assessed using the criteria set out in the Environmental Protection Authority (EPA) Industrial Noise Policy:

Noise emissions to Residential Receivers are to be assessed using the Industrial Noise Policy criteria, as set out below.

Table 4 - Noise Emission Requirements – Residential Receivers

Receiver Type	Time of Day	Intrusiveness Noise Objective dB(A) _{L_{eq}(15min)}	Amenity Noise Objective dB(A) _{L_{eq}(Lt)}
Suburban	Day	47	55
	Evening	45	45
	Night	41	40

Noise emissions to Commercial/Industrial Receivers are to be assessed using only the Industrial Noise Policy “Amenity” criteria, as set out below.

Table 5 - Noise Emission Requirements – Commercial/Industrial Receivers (Amenity Only)

Receiver Type	Time of Day	Amenity Noise Objective (Suburban Areas) dB(A) _{L_{eq}(Lt)}
Commercial	When in use	65

5.3 ASSESSMENT

Noise emissions from the site will be assessed against the acoustic objectives presented in Section 5.2.

Noise sources that require assessment are:

- Cars entering and leaving via the car park access ramp along the Princess Highway.
- Trucks accessing the loading dock from Urunga Parade.
- Mechanical plant servicing the development.

5.3.1 Car Park Ramp

This section will present the assessment of the car park ramp, located at the south-western corner of the site, adjacent to the Princes Highway.

The nearest potentially affected receivers are:

- The commercial property adjacent to the western boundary of the site on the Princes Highway;
- The residential property to the west of the site on the Princes Highway.

Noise emissions from vehicles using the carpark access ramp will be predicted at the boundary of the commercial and the residential properties within the vicinity of the proposed Wollongong Private Hospital site.

Predictions take into account the screening effect of the boundary fence along the eastern property boundary of the site (which will partially screen vehicle noise from the driveway).

Noise emissions will be predicted based on the following assumptions:

- Cars produce a sound power level of 84dB(A)_{Leq}.
- During the peak Day and Evening period, up to 317 cars (full capacity of the carpark) will use the driveway in a 1 hour period. This represents a potentially worst case conditions, compliance under these conditions represents compliance at all other times and day and evening time period.
- During the peak Night period, up to 159 cars (half capacity of the carpark) will use the driveway in a 1 hour period. This represents a potentially worst case conditions, compliance under these conditions represents compliance at all other times of the night time period.
- The cars are driving past at an approximate speed of 10km/h.

The predicted noise level at the residential property to the west of the driveway, is presented below.

Table 6 – Predicted Noise Level at 368 Princes Highway (Residential)

Time	Predicted Level – dB(A)$L_{eq}(15min)$	Amenity Criteria - dB(A)$L_{eq}(Period)$	Complies
Day	41	47	Yes
Evening	41	45	Yes
Night	36	40	Yes

The predicted noise level at the commercial property west of the driveway, is presented below.

Table 7 – Predicted Noise Level at 366 Princes Highway (Commercial)

Time	Predicted Level – dB(A)$L_{eq}(15min)$	Amenity Criteria - dB(A)$L_{eq}(Period)$	Complies
When in use	41	65	Yes

Noise emissions from the use of the driveway are satisfactory at both the commercial and the residential properties located to the west of the proposed Wollongong Private Hospital project.

5.3.2 Loading Dock

This section will present the assessment of the loading dock, located at the north of the Wollongong private hospital site, with access from Urunga Parade.

The nearest potentially affected receiver is the residential property located to the east of the site on Urunga Parade. Compliance at this location represents compliance at all other surrounding receivers.

Noise emissions from the loading dock will be predicted at the boundary of the residential property to the east of the project site on Urunga Parade.

Noise emissions will be predicted based on the following:

- Maximum truck size is (12.5m) and produces a sound power level of 100dB(A) L_{eq} .
- The loading dock will be in use from 7am till 4pm on weekdays only.
- There will be at most, either one in-bound or one outbound movement in any each 15 minute period.
- The trucks are moving at an approximate speed of 5km/h.
- Predicted noise level in Table 7 below takes into account installation of the construction recommendations presented in Section 5.4 below.

As the loading dock is used only between 7am and 4pm, assessment is only required against daytime acoustic criteria.

The predicted noise level at the potentially worst affected residential receiver to the east of the site, is presented below.

Table 8 – Predicted Loading Dock Noise Level (Residential)

Time	Predicted Level – dB(A)$L_{eq(15min)}$	Intrusiveness Criteria - dB(A)$L_{eq(15min)}$	Complies
When in use	45	47	Yes

5.3.3 Mechanical Plant

Mechanical plant items are not typically selected at selected at DA stage.

Detailed review of all external mechanical plant should be undertaken at construction certificate stage (once plant selections and locations are finalised). Acoustic treatments should be determined in order to control plant noise emissions to the levels set out in section 5.2 of this report.

All plant can be satisfactorily attenuated to levels complying with noise emission criteria through appropriate location and (if necessary) standard acoustic treatments such as noise screens, enclosures, in-duct treatments (silencers/lined ducting) or similar.

5.4 RECOMMENDATIONS

The constructions required in order to comply with the noise emission criteria outlined in Section 6.1 are outlined below.

- In order for noise from the loading dock to comply with noise emission requirements, a 1.8 metre high fence must be erected along the portion of the eastern boundary of the site that is adjacent to loading dock. The fence should be constructed from a solid material including a lapped a caped timber fence, of Colorbond or masonry construction or the like.
- Detailed assessment of all mechanical plant should be conducted at CC stage to determine acoustic treatments (if any) required to ensure plant noise does not exceed acoustic criteria.

6 CONCLUSION

This report provides the results of Environmental Noise Study for the proposed Wollongong Private Hospital development located at 360-364 Crown Street Wollongong. Noise at the site has been measured and noise goals have been set in accordance with the requirements of the local council and relevant statutory/regulatory authorities.

Traffic noise has been assessed and acoustic criteria for internal noise levels have been presented in Section 4.

Determination of noise assessment criteria based on the EPA's Industrial Noise Policy and Wollongong City Centre DCP have been determined based on both unmanned and manned noise monitoring conducted at the proposed development.

Noise emissions from vehicles using the carpark ramp and loading dock have been assessed and will comply with the objectives set out in Section 5.1 provided the acoustic treatments recommended in Section 5.3 have been implemented.

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

Yours faithfully,



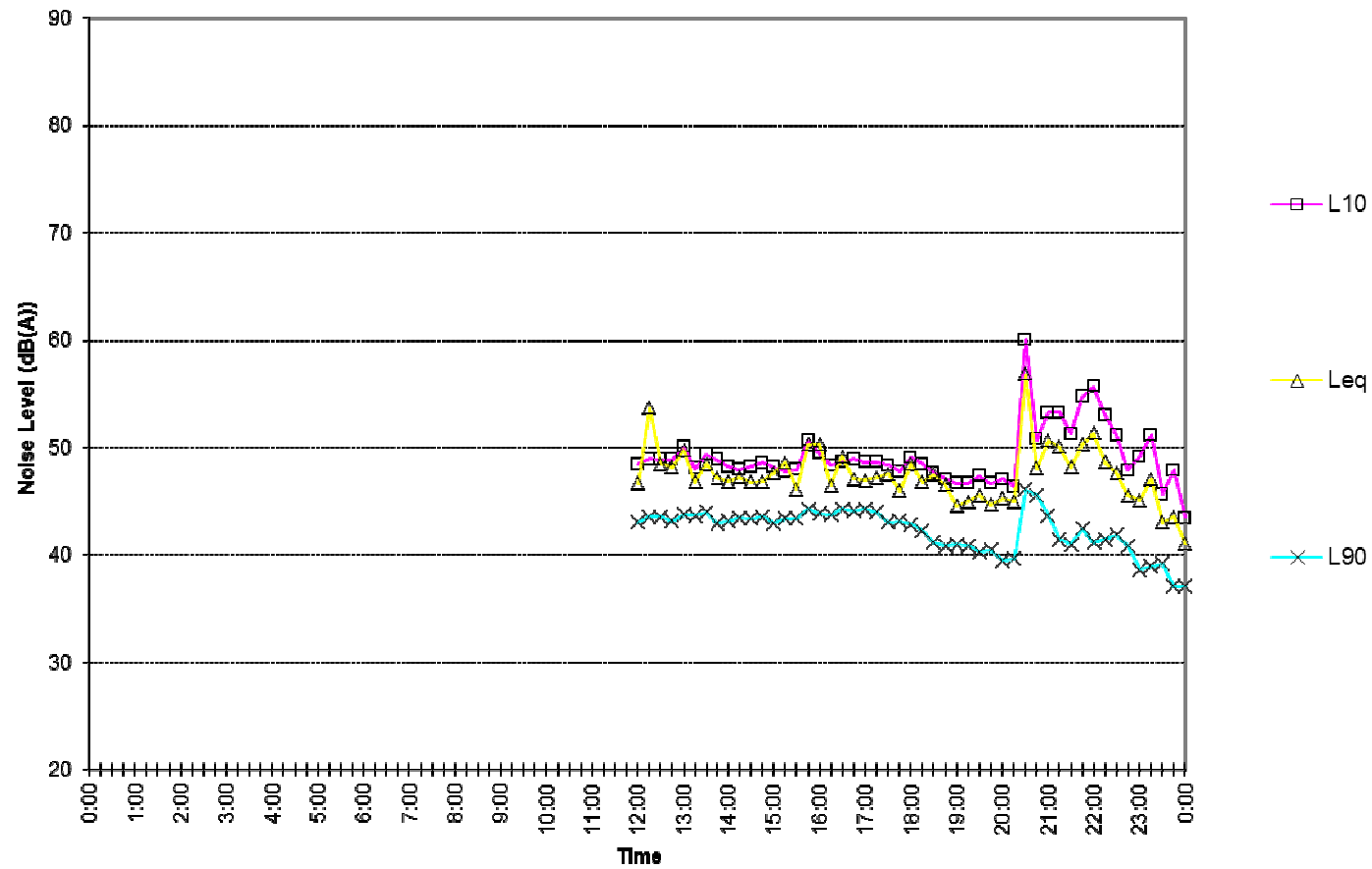
Acoustic Logic Consultancy Pty Ltd
Ben White

APPENDIX 1

MEASURED AMBIENT NOISE LEVELS

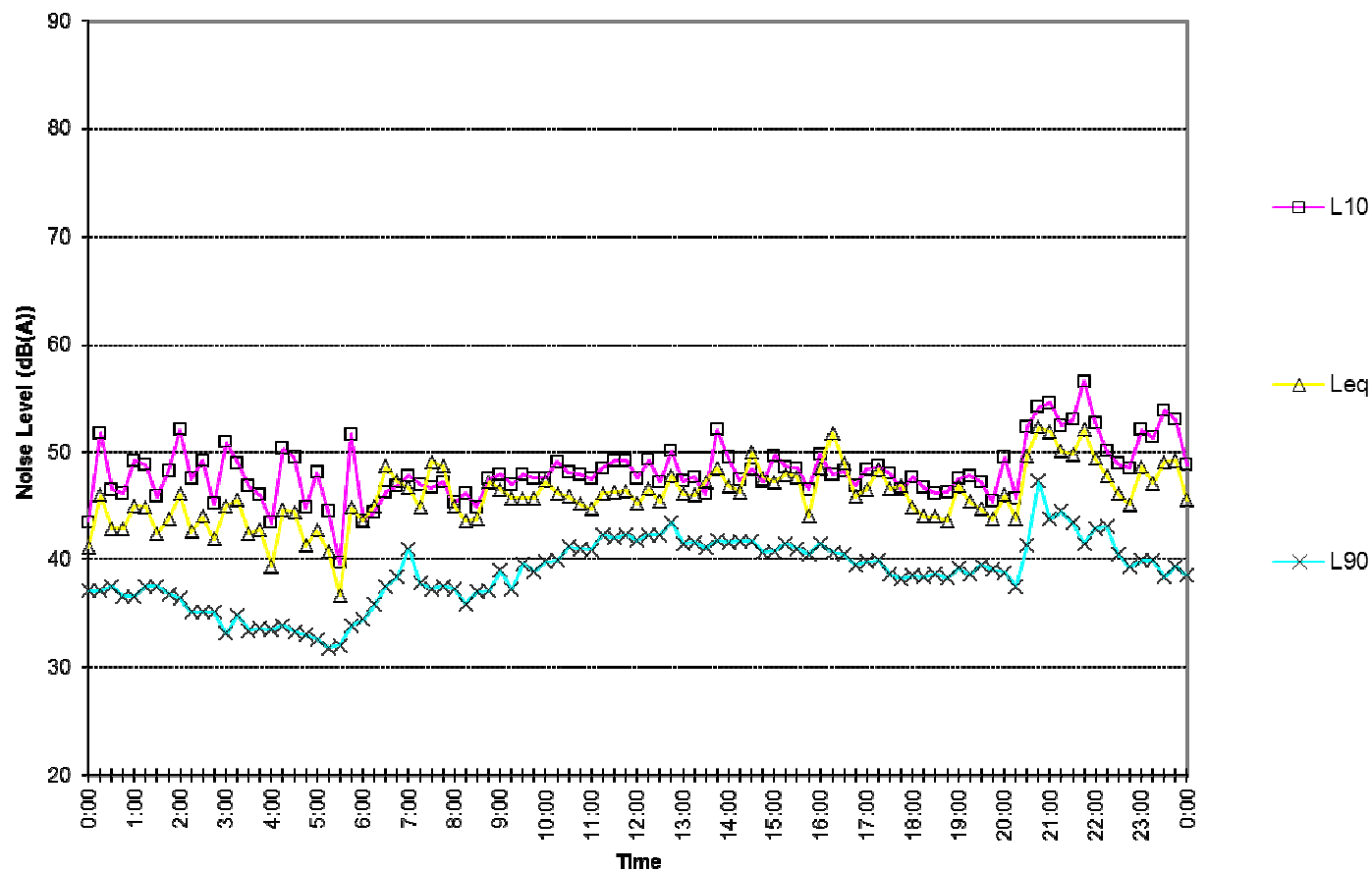
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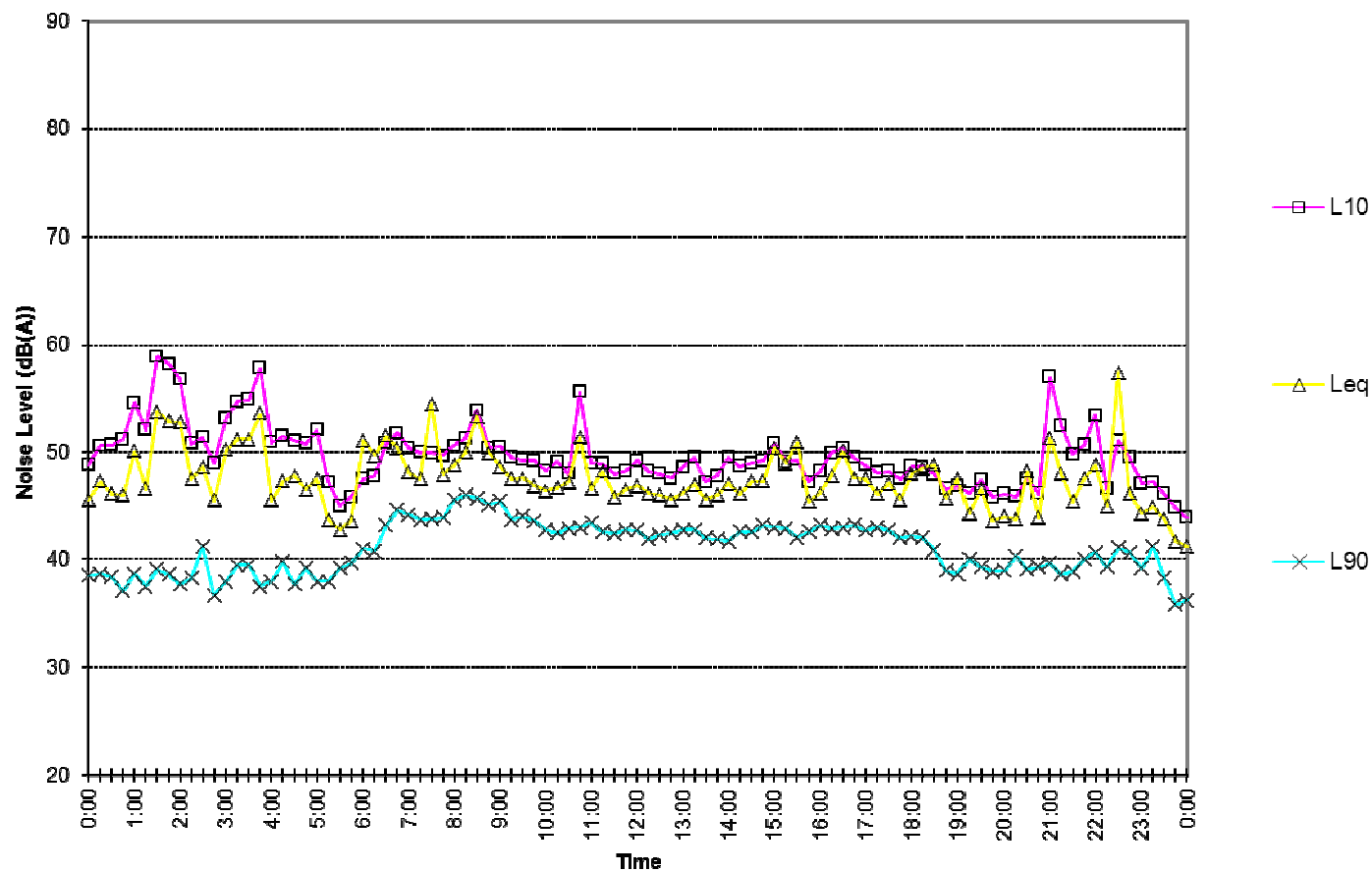
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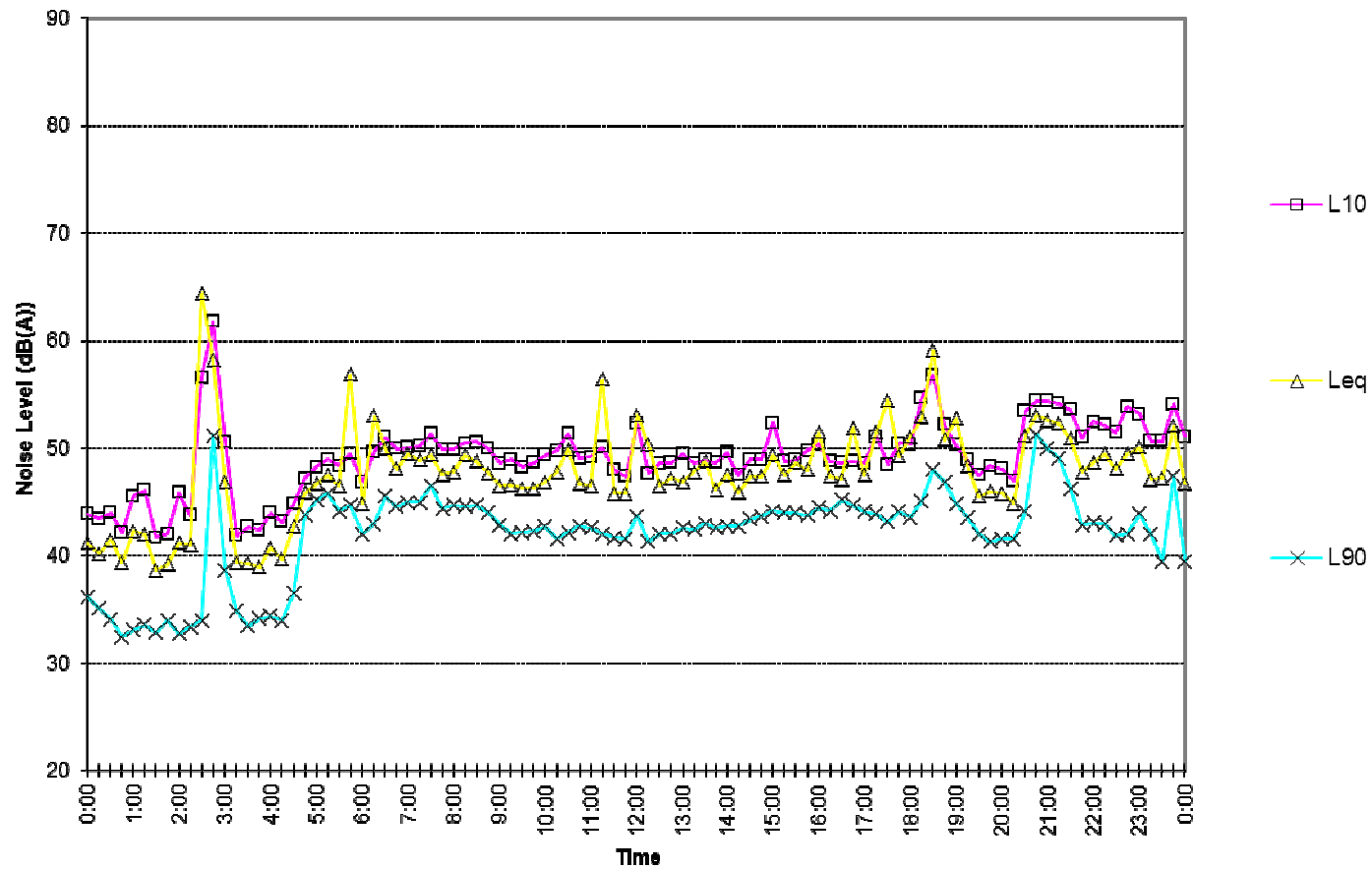
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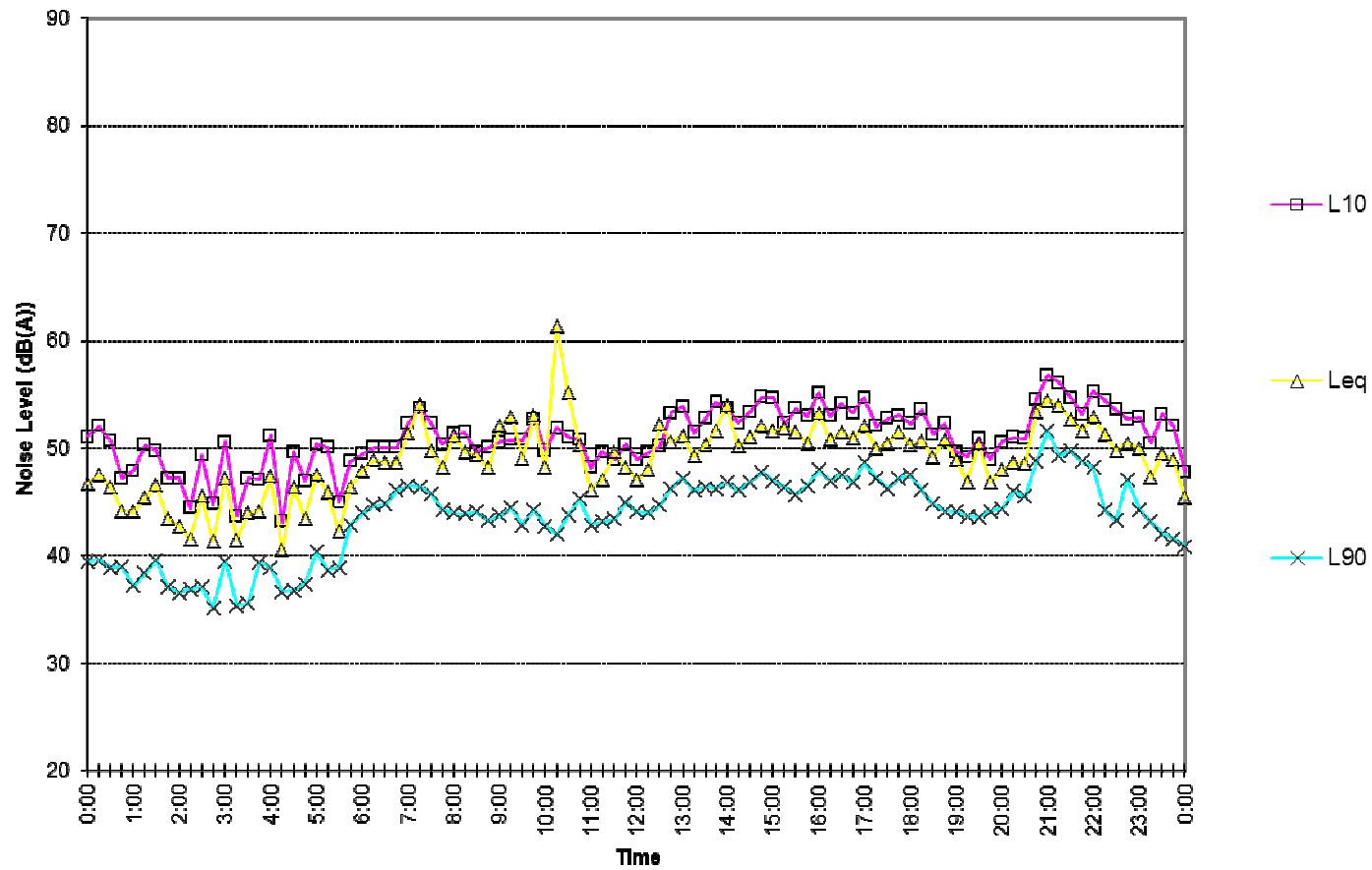
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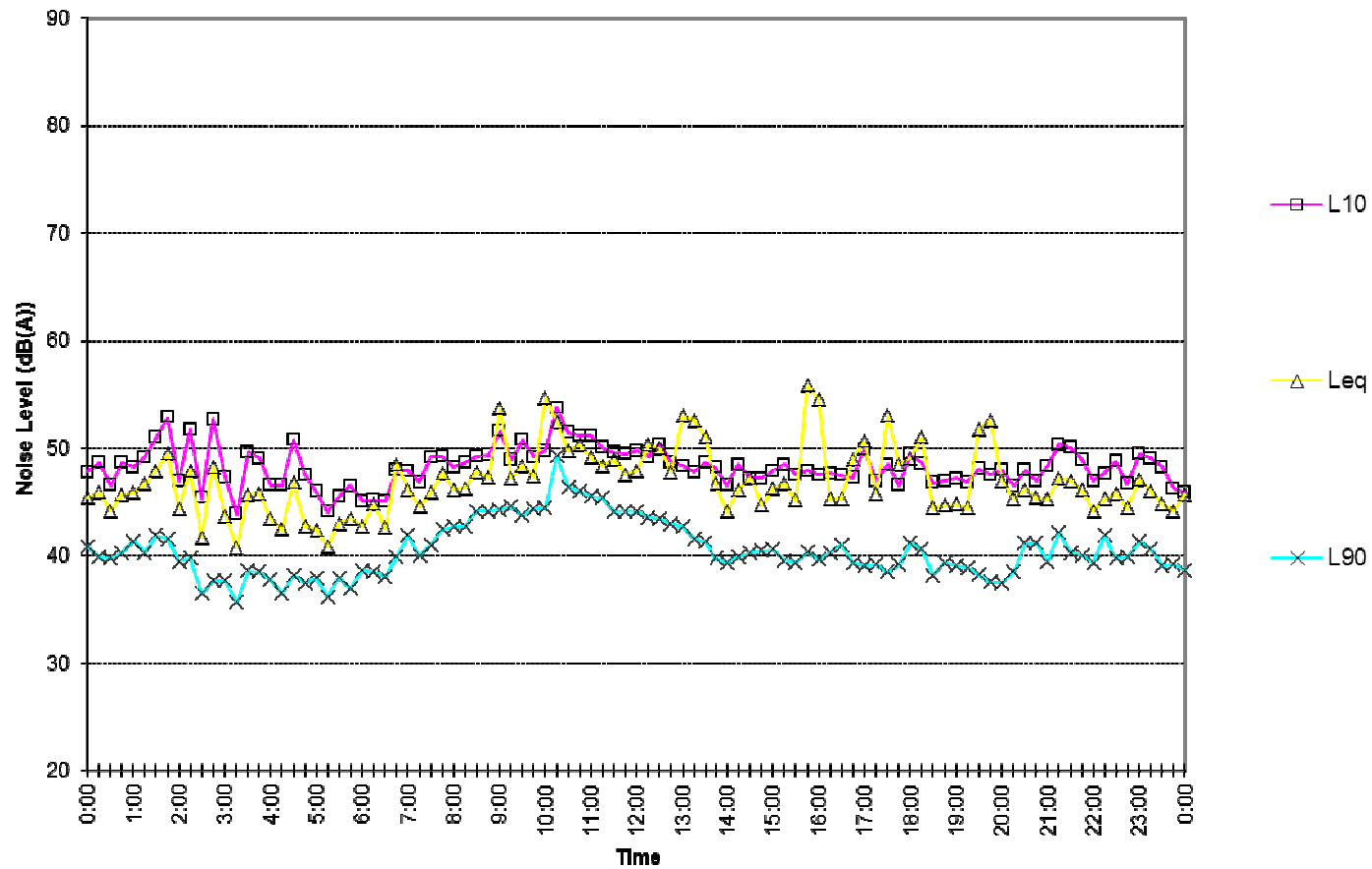
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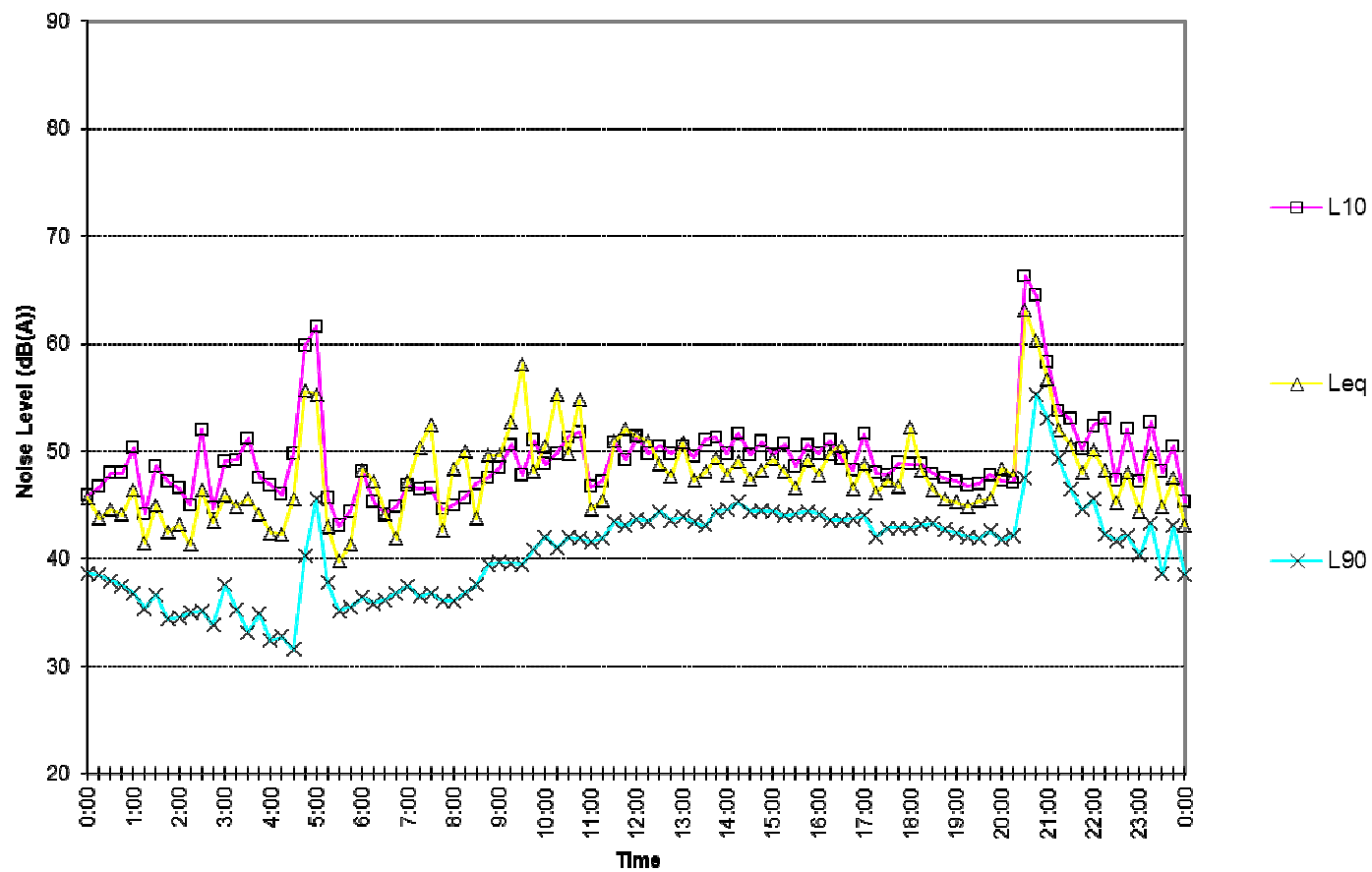
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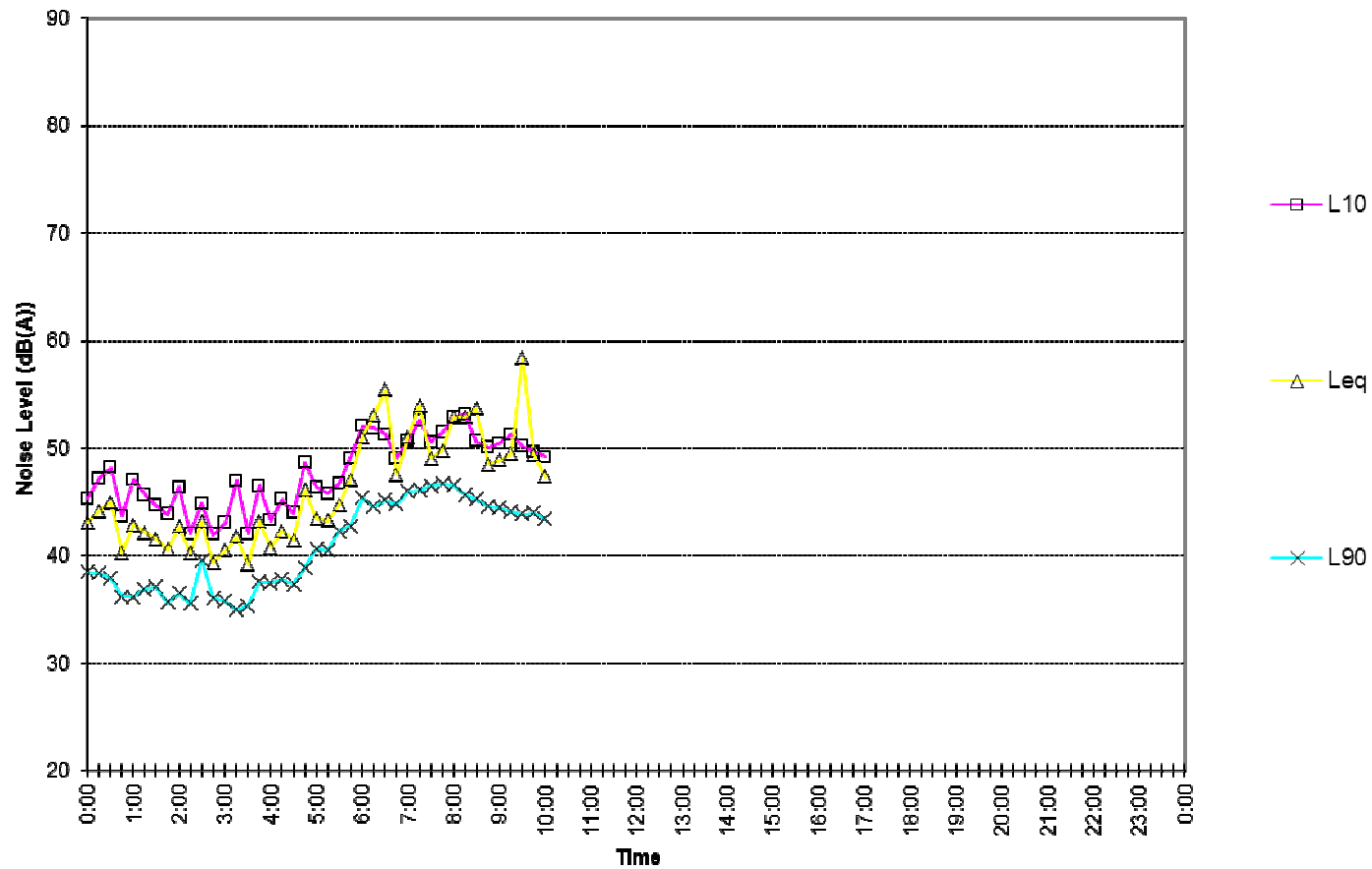
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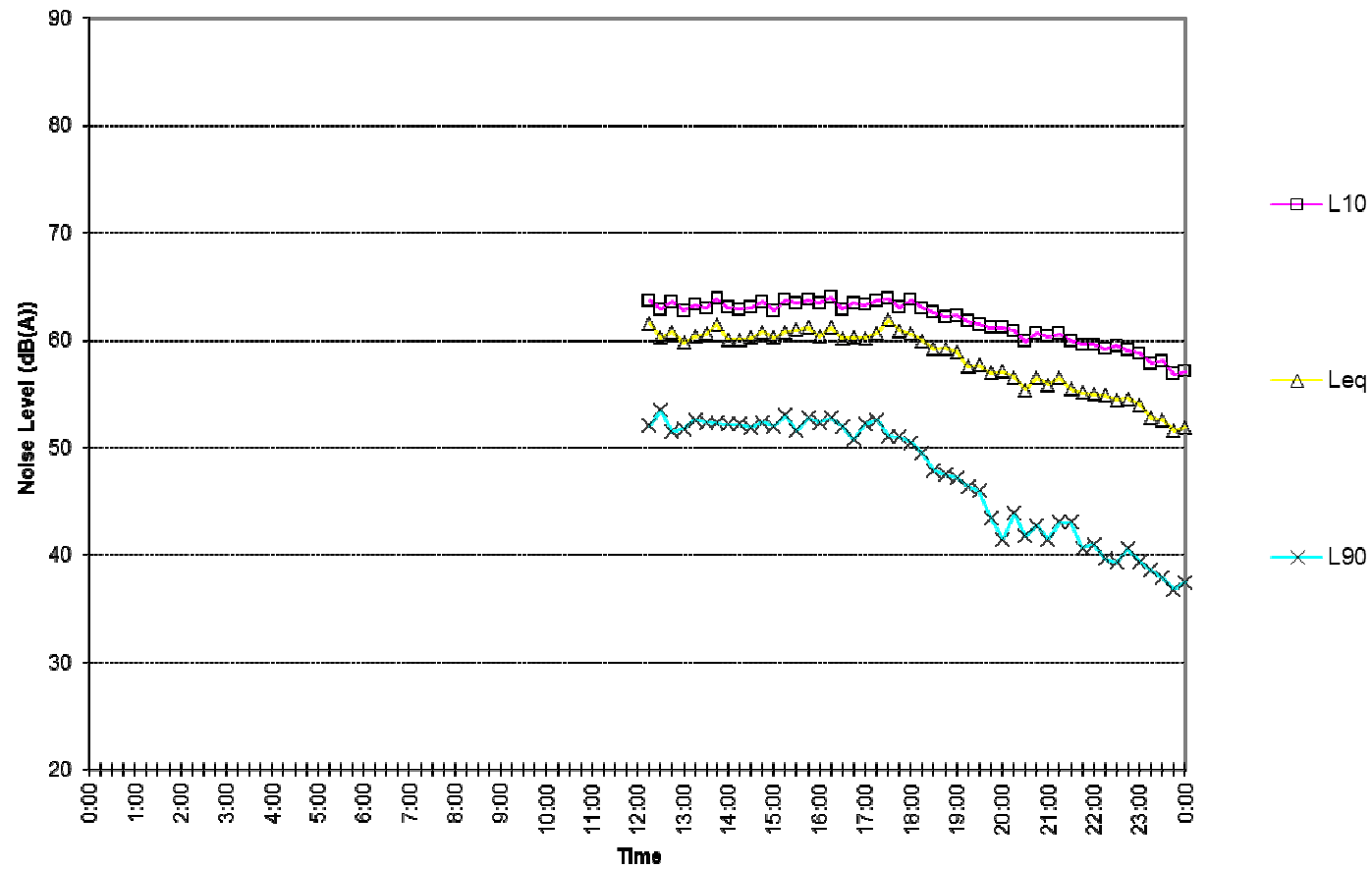
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Monday February 1, 2010

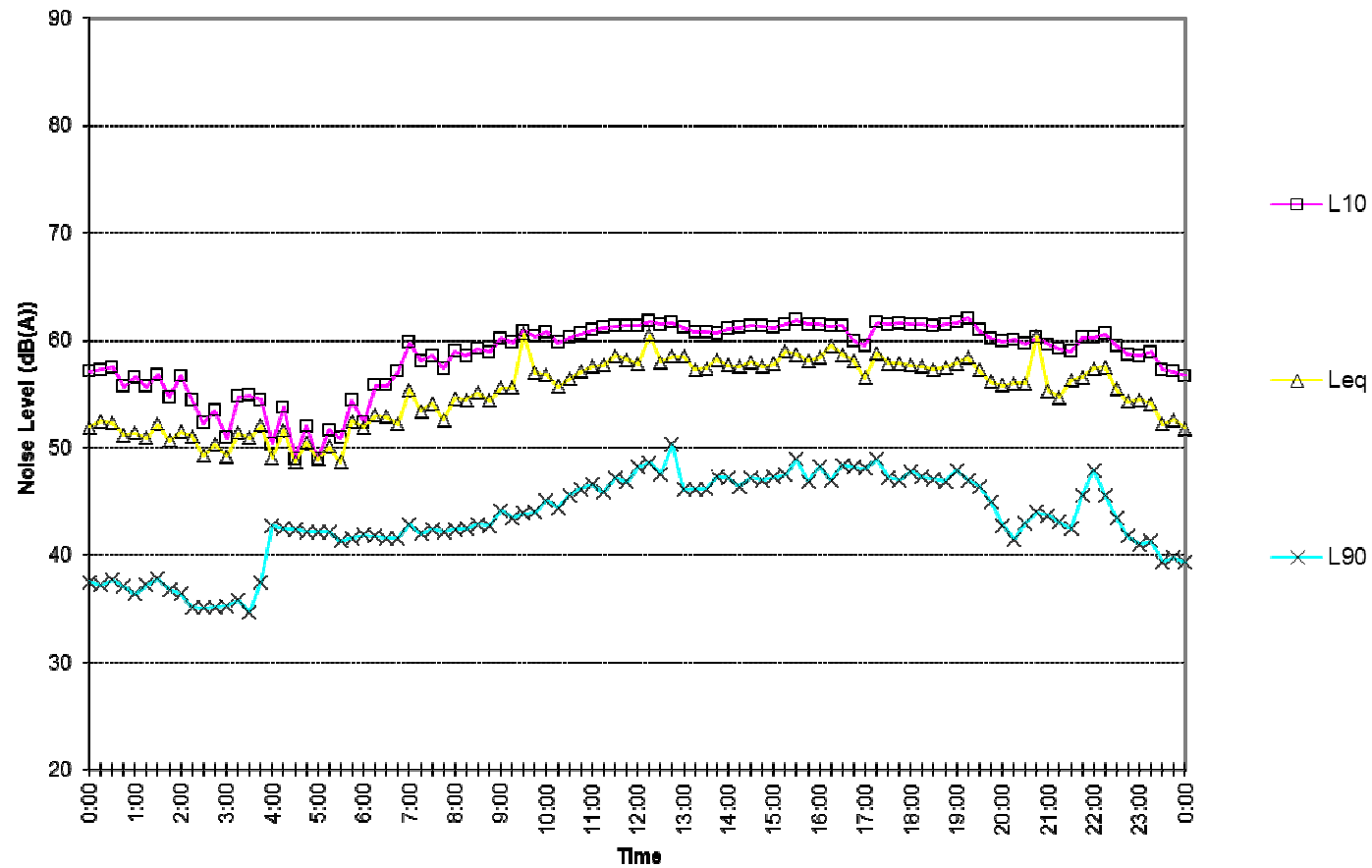


Wollongong Private Hospital - Location 1

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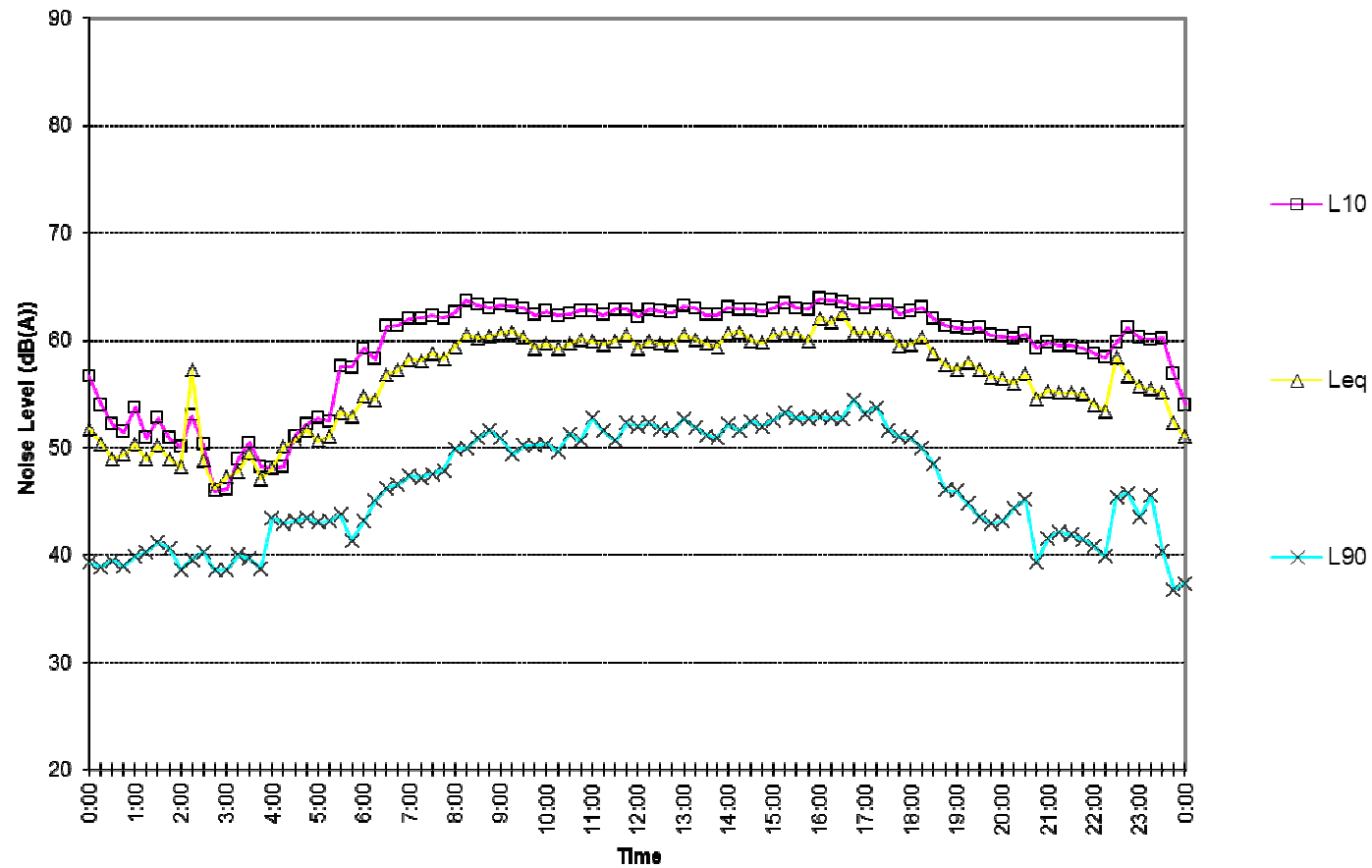


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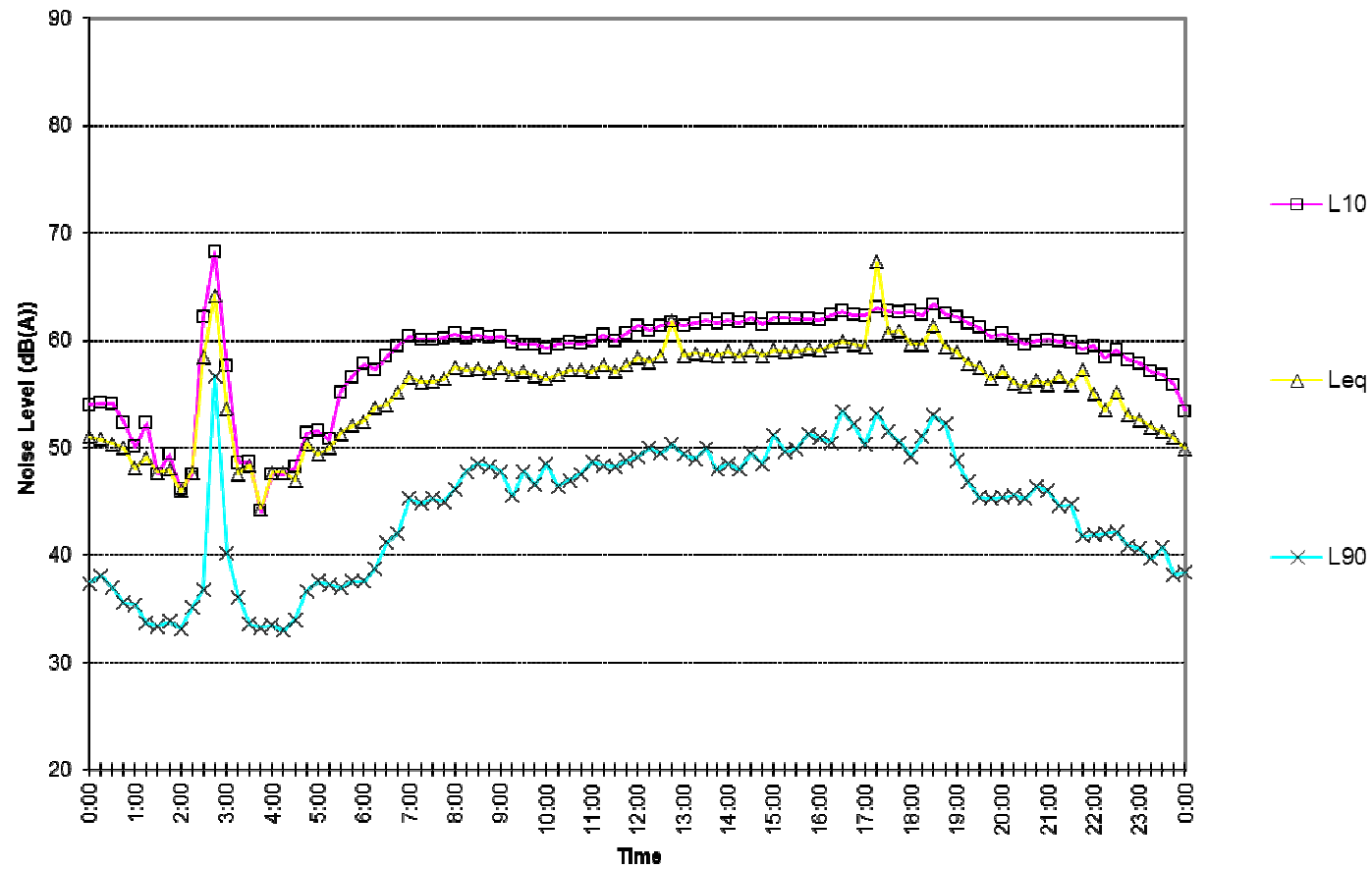
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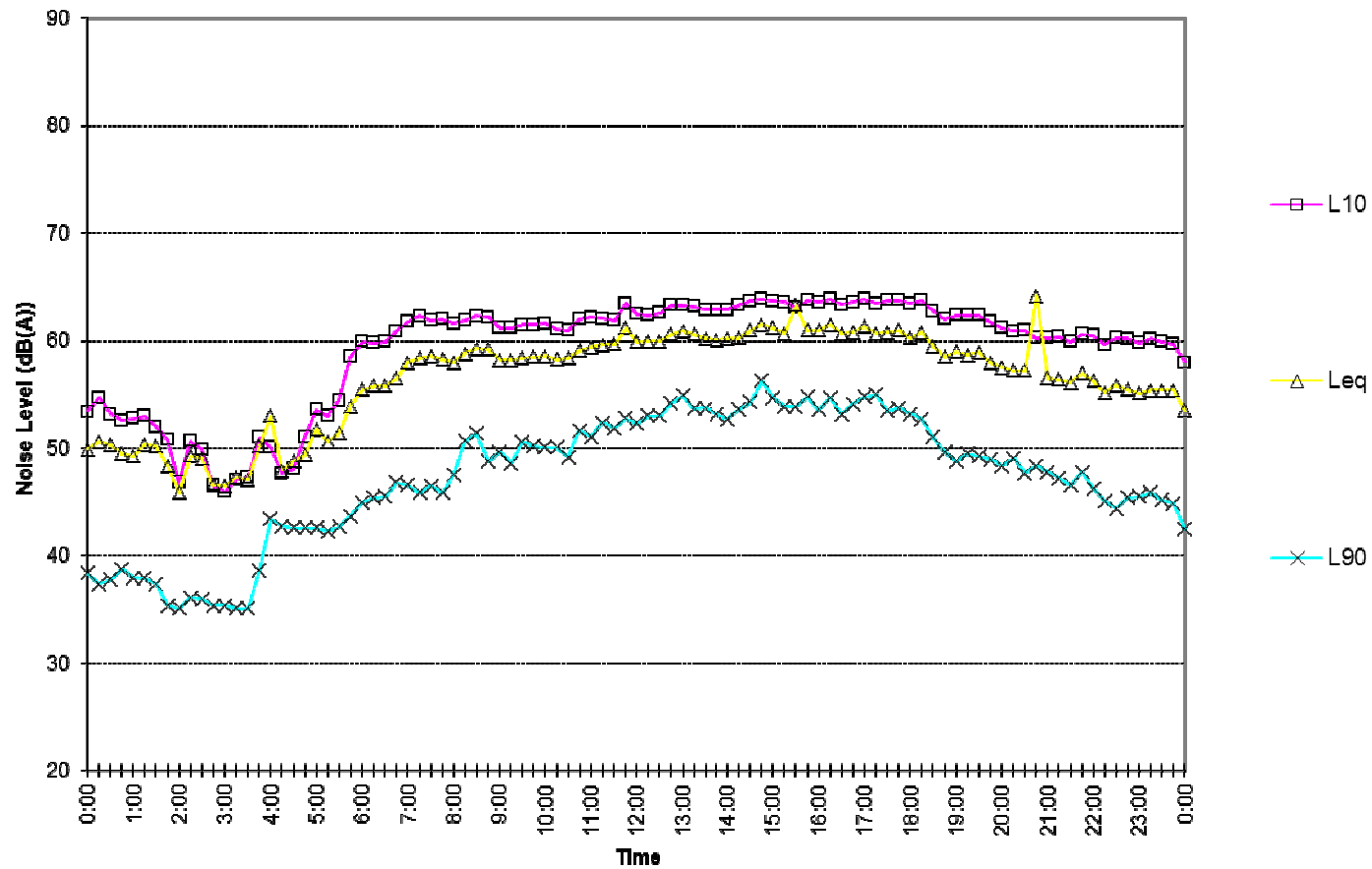


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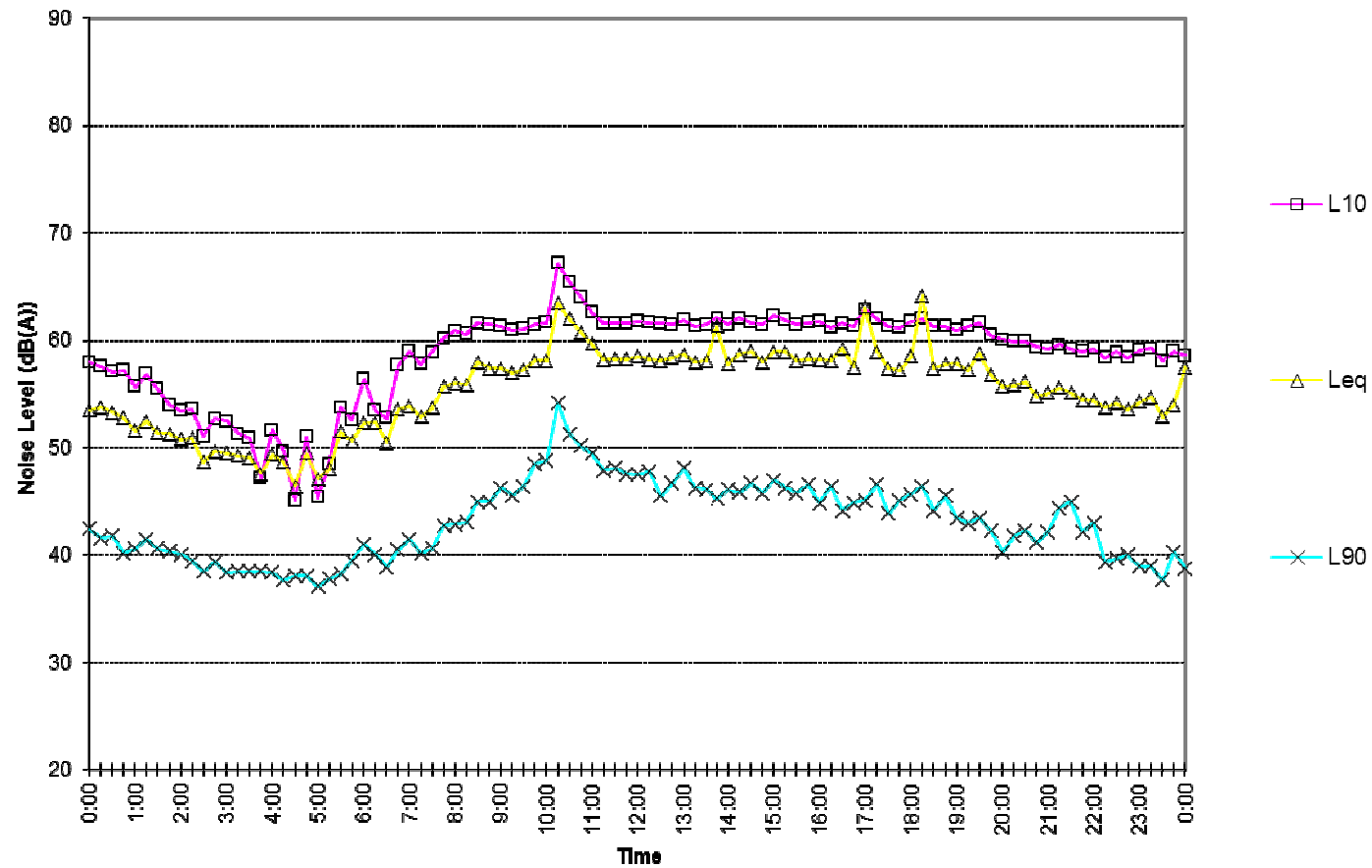


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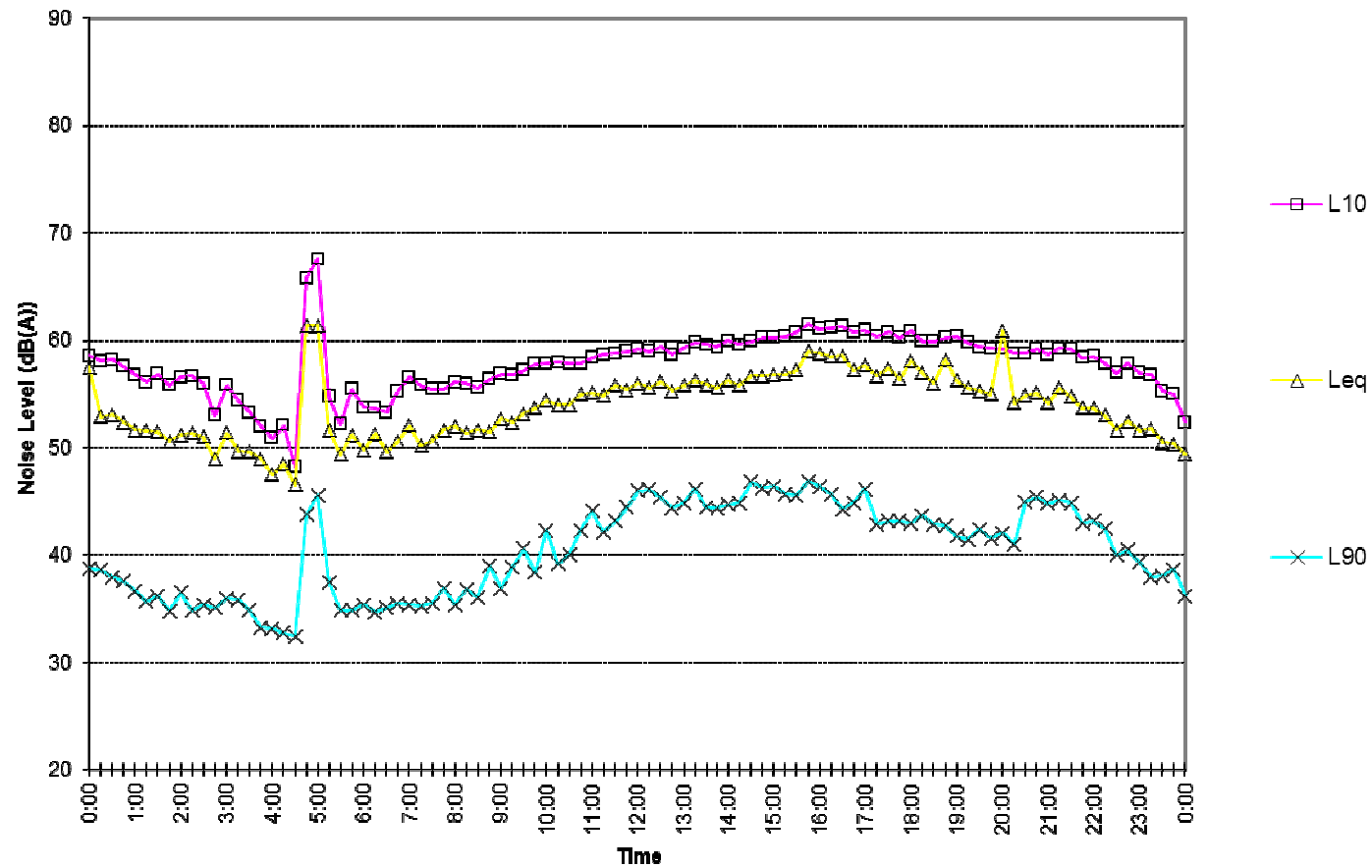
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Wollongong Private Hospital - Location 1

Sunday January 31, 2010



Wollongong Private Hospital - Location 1
Monday February 1, 2010

