MANAGING DIRECTORS
MATTHEW PALAVIDIS
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20140314.1/0909A/R0/RL

09/09/2014

High Quality Building Pty Ltd Email: jakub@ghazia.com

ATTN: MR JAKUB URGE

175-177 Cleveland Street, Redfern - Response to Council queries

This letter intends to address City of Sydney Council comments made in the letter referenced SSD 6371 - 175-177 Cleveland Street, Redfern and dated 28 August 2014.

With regards to the Noise (Construction and Operation) section our comments are as follows:

- *Wind speed and rain fall data*: Section 5.1 of our initial report details the methodology adopted to exclude data affected by inclement weather during the monitoring period as per the NSW EPA Industrial Noise Policy (INP). The periods of inclement weather were shown in Appendix 1 and taken into account for the calculations of the Rating Background Noise Levels.

- Measured background noise single octave band levels have been added in our revised report with reference 20140314.1/0809A/R1/RL and dated 8/09/2014.

- The letter from Council also stated that "*It is advised that the City does not accept wind levels corrected from gradient to ground level using the methodology published by Renzo Tonin referencing the Australian Standard for Wind loading on building*". Such methodology was not discussed in our report or used for our assessment. We believe this sentence has been added by Council by mistake.

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

Yours faithfully,

Acoustic Logic Consultancy Pty Ltd
Remi Larmandieu

175-177 Cleveland Street, Redfern

DA Noise Impact Assessment

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DOCUMENT CONTROL REGISTER

Project Number	20140314.1
Project Name	175-177 Cleveland Street, Redfern
Document Title	DA Noise Impact Assessment
Document Reference	20140314.1/0809A/R1/RL
Issue Type	Email
Attention To	High Quality Building Pty Ltd Mr Jakub Urge

Revision	Date	Document Reference	Prepared By	Checked By	Approved By
0	21/03/2014	20140314.1/2103A/R0/RL	RL		BW
1	8/09/2014	20140314.1/0809A/R1/RL	RL		BW

TABLE OF CONTENTS

1 INTRODUCTION

This report presents our assessment of the acoustic impacts associated with the proposed student accommodation at 175-177 Cleveland Street, Redfern.

In this report we will:

- Conduct an external noise impact assessment (primarily traffic and train noise) and recommend acoustic treatments in order to control traffic noise intrusion into the development

- Assess likely noise emissions from the operation of the development. These noise emissions will be assessed against acoustic controls typically adopted by Council. If necessary, acoustic treatments will be recommended in order to ensure that the amenity of nearby residents is not affected.

This report is based on architectural drawings provided by Ghazi Al Ali Architect, dated 11 December 2013.

2 SITE DESCRIPTION

The subject site is located along Cleveland Street in Chippendale. The site is bounded to the north by Cleveland Street, to the east by Woodburn Street and to the west by Eveleigh Street. A four-storey residential development and a two-storey commercial development bound the site to the south. Cleveland Street is a six lane road which carries heavy volumes of traffic (more than 40,000 daily vehicles according to the RMS). Eveleigh Street and Woodburn Street are both local two-lane streets with low traffic volumes.

The proposed development will consist of:

- A six– storey student accommodation building, with 40 bedrooms.
- 13 one-bedroom apartments.
- Communal areas at every floor.
- One communal open space on the rooftop.
- One basement level for car parking (entry ramp on Eveleigh Street).

Figure 1 below illustrates the site boundary and measurement locations.

The nearest potentially affected residential receivers are:

- The apartment building located to the east of the subject site across Eveleigh Street.
- Residents located to the south of the subject site at 6-8 Woodburn Street.
- Patrons from the hotel across Woodburn Street, to the east of the site.
- Residents across Cleveland Street.

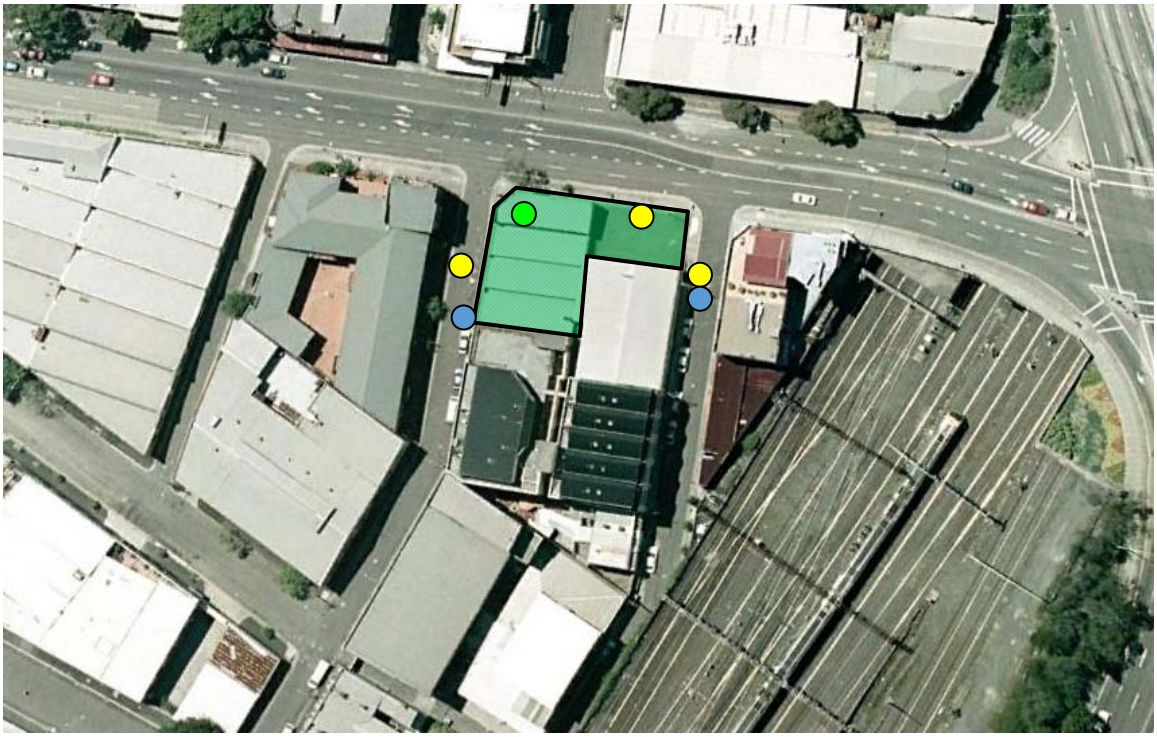


Figure 1: Site Survey and Monitoring Location

- Unattended noise measurement location
- Attended noise measurement locations
- Attended vibration measurement locations
- Subject site
- Potentially affected residential properties

3 ENVIRONMENTAL AND TRAFFIC NOISE DESCRIPTORS

Environmental noise constantly varies. Accordingly, it is not possible to accurately determine prevailing environmental noise conditions by measuring a single, instantaneous noise level.

To accurately determine the environmental 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.

In analysing 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 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 15 minute 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 environmental noise.

4 NOISE INTRUSION ASSESSMENT

4.1 OBJECTIVES

4.1.1 Sydney Development Control Plan 2012

Section 4.2 of the Sydney DCP 2012 relates to objectives and provisions for residential flat developments. Part 4.2.3.11 of this section of DCP 2012 outlines the following acoustic controls for new developments affected by traffic noise:

(7) The repeatable maximum $L_{Aeq(1hour)}$ for residential buildings and serviced apartments must not exceed the following levels:

(a) for closed windows and doors:

i) 35dB for bedrooms (10pm-7am); and

ii) 45dB for main living areas (24 hours).

(b) for open windows and doors:

i) 45dB for bedrooms (10pm-7am); and

ii) 55dB for main living areas (24 hours).

(8) Where natural ventilation of a room cannot be achieved, the repeatable maximum $L_{Aeq(1hour)}$ level in a dwelling when doors and windows are shut and air conditioning is operating must not exceed:

(a) 38dB for bedrooms (10pm-7am); and

(b) *48dB for main living areas (24 hours).*

Map 16 of the traffic volume maps for the Infrastructure SEPP on the RTA website, classifies Cleveland Street and the surrounding areas as roads with > 40,000 AADT and hence mandatory under clause 102 of the State Environmental Planning Policy (SEPP Infrastructure) 2007.

4.1.2 State Environmental Planning Policy (SEPP Infrastructure) 2007

Clause 102 of the NSW SEPP for road traffic noise stipulates,

"This clause applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transit way or any other road with an annual average daily traffic volume of more than 40,000 vehicles (based on the traffic volume data published on the website of the RTA) and that the consent authority considers is likely to be adversely affected by road noise or vibration:

(a) a building for residential use,

If the development is for the purposes of a building for residential use, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:

(a) in any bedroom in the building – 35 dB(A) at any time between 10 pm and 7am,

(b) anywhere else in the building (other than a garage, kitchen, bathroom or hallway) – 40 dB(A) at any time."

Clause 87 of the NSW SEPP for rail traffic noise stipulates,

This clause applies to development for any of the following purposes that is on land in or adjacent to a rail corridor and that the consent authority considers is likely to be adversely affected by rail noise or vibration:

(a) a building for residential use,

If the development is for the purposes of a building for residential use, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:

(a) in any bedroom in the building – 35 dB(A) at any time between 10.00 pm and 7.00 am,

(b) anywhere else in the building (other than a garage, kitchen, bathroom or hallway) – 40 dB(A) at any time.

4.1.3 Australian Standard AS 2107:2000

Australian Standard 2107 – "*Recommended Design Sound Levels and Reverberation Times for Building Interiors*", will be used to establish the internal noise level criteria for common areas of the proposed student housing.

Table 1 – Recommended Design Internal Noise Levels

Space /Activity Type	Recommended design Sound Level dB(A)L_{eq}	
	Satisfactory	Maximum
Internet/Communal/Study/ Common Areas	40	45

4.1.4 Project Criteria

A summary of the projects internal noise level criteria incorporating all relevant legislative requirements are detailed in the table below.

Table 2 – Internal noise Level Summary

Space /Activity Type	Project Internal Noise Level Criteria
Internet/Communal/Study/ Common Areas	45 dB(A) $L_{eq\ (24hr)}$
Sleeping Areas	35 dB(A) $L_{eq\ (9\ hr)}$ and 35 dB(A) $L_{eq\ (1\ hr)}$ between 10pm and 7am
Living Areas	40 dB(A) $L_{eq\ (9\ hr)}$ and 45 dB(A) $L_{eq\ (1\ hr)}$ between 10pm and 7am

4.2 ENVIRONMENTAL NOISE MEASUREMENTS

Measurement of external noise was conducted using long term unattended noise monitoring and short term attended noise measurements.

Long term monitoring was conducted using an unattended noise monitor installed within the existing building, along the northern boundary of the site. The monitor was installed with a clear unrestricted view of Cleveland Street. Monitoring was conducted between 28th March, 2014 and 4th April, 2014 using an Acoustic Research Laboratories noise monitor, set to an A-weighted fast response mode. 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.

Attended short term measurements of traffic noise was also undertaken by this office, to validate the unattended noise monitoring. These measurements were undertaken on the 4th April 2014 between 4:30pm and 5:30pm, a period of peak traffic activity along Cleveland Street. Measurements were conducted using a Norsonics type 140 Precision Sound Analyser. The analyser was set to fast response and calibrated before and after the measurements using a Norsonics Sound Calibrator type 1251. No significant drift was noted.

The traffic noise levels listed in the table below, were determined based on the unattended logging data and attended noise measurements. In determination of acoustic treatments, the measured levels are adjusted for distance and orientation.

Table 3 – Measured Traffic Noise Levels

Location	Traffic Noise Levels dB(A)$L_{eq(period)}$	
	Daytime (7am-10pm)	Night time (10pm-7am)
Cleveland Street (approx. 4m from the curb)	70	66

4.3 RECOMMENDED CONSTRUCTIONS

Internal noise levels will primarily be as a result of noise transfer through the windows and doors and roof, as these are relatively light building elements that offer less resistance to the transmission of sound.

The predicted noise levels through the windows, doors and roof are discussed below. The predicted noise levels have been based on the measured level and spectral characteristics of the external noise, the area of building elements exposed to traffic noise, the absorption characteristics of the rooms and the noise reduction performance of the building elements.

Calculations were performed taking into account the orientation of windows, barrier effects (where applicable), the total area of glazing, facade transmission loss and the likely room sound absorption characteristics. In this way the likely interior noise levels can be predicted.

In all cases, the selected glazing type (refer below) reduces internal noise levels to within the nominated criteria for the various space types.

4.3.1 Glazing Constructions

The following tables list the recommended glazing assemblies for this project to achieve the internal traffic noise requirements. All external windows and doors listed are required to be fitted with Q-lon type acoustic seals. (**Mohair Seals are unacceptable**).

The glazing thicknesses recommended are those needed to satisfy acoustic requirements and do not take into account other requirements such as structural, safety or other considerations. These additional considerations may require the glazing thickness to be increased beyond the acoustic requirement.

Table 4 – Recommended Glazing Constructions

Level	Facade	Space	Glazing Thickness	Acoustic seals
Lower Ground Floor	Eveleigh Street	Living areas	6.38mm laminated	Yes
		Sleeping areas	10mm float	Yes
Ground floor	Cleveland Street	Internet/Communal /Study	10.38mm laminated	Yes
	Eveleigh Street	Living areas	6.38mm laminated	Yes
		Sleeping areas	10mm float	Yes
	Rear	Living areas	6mm float	Yes
		Sleeping areas	6mm float	Yes
	Woodburn Street	Studio	10.38mm laminated	Yes
Level 01 to Level 03	Cleveland Street	Communal rooms	10.38mm laminated	Yes
		Studios	12.38mm laminated	Yes
	Eveleigh Street	Living areas	6.38mm laminated	Yes
		Sleeping areas	10mm float	Yes

Level	Facade	Space	Glazing Thickness	Acoustic seals
	Rear	Living areas	6mm float	Yes
		Sleeping areas	6mm float	Yes
	Woodburn Street	Studio	10.38mm laminated	Yes
Level 04	Cleveland Street	Communal rooms	10.38mm laminated	Yes
		Studios	12.38mm laminated	Yes
	Woodburn Street	Studio	10.38mm laminated	Yes

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 table above. Note that mohair type seals will **NOT be acceptable** for the windows requiring acoustic seals.

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 5 – Minimum STC of Glazing (with Acoustic Seals)

Glazing Assembly	Minimum STC of Installed Window
6mm float	29
6.38mm laminated	31
10mm float	33
10.38mm laminated	35
12.38mm laminated	37

4.3.2 External Doors

Any glass door should be constructed using glazing thickness set out in Table 4. Full perimeter acoustic seals around the doors are required. Any timber external doors shall be a minimum 40mm solid core timber with Raven RP10 to the top and sides and Raven RP38 to the underside of the door.

4.3.3 Roof / Ceiling

The proposed concrete slab roof is acoustically acceptable. No details of ceiling construction or corner junctions are required as the necessary acoustic performance is achieved by the concrete. Penetrations in all sleeping area ceilings (such as for light fittings etc.) must be acoustically treated and sealed gap free with a flexible sealant.

4.3.4 External Walls

Masonry walls are acoustically acceptable and will not require additional ameliorative treatments.

4.4 MECHANICAL VENTILATION

Internal noise levels cannot be achieved with windows open. Hence it is required that an alternative outside air supply system be installed in accordance with AS 1668.2 requirements. Any mechanical ventilation system that is installed should be acoustically designed such that the acoustic performance of the recommended constructions are not reduced by any duct or pipe penetrating the wall/ceiling/roof. Noise emitted to the property boundaries by any ventilation system shall comply with Council requirements.

5 NOISE EMISSION ASSESSMENT

Noise emissions from the subject development should be assessed to ensure that the amenity of nearby land users is not adversely affected.

Potential noise sources which should be assessed are:

- Noise generated by future mechanical plant and equipment servicing the proposed development.

5.1 BACKGROUND NOISE MONITORING

Background noise levels at the site have been measured based on the unattended noise logging undertaken by this office as outlined in section 4.2.

The measured background noise levels have been corrected for meteorological conditions (excessive wind and/or rain), as required by section 3.4 of the EPA Industrial Noise Policy. Weatherzone data for observations recorded at Observatory Hill, indicate little to no rain during the unattended monitoring period. Exceedances of the 5m/s average wind speed limit of the EPA were noted and corrected for in determining the background noise levels.

Measured background noise levels are presented below. Refer to Appendix 1 for unmanned noise monitoring data.

Table 6 - Measured Background Noise Levels

Location	Background noise level dB(A)$L_{90(period)}$		
	Daytime (7am – 6pm)	Evening (6pm – 10pm)	Night (10pm – 7am)
Monitor Location – Refer to Figure 1	51	49	45

5.2 MEASURED BACKGROUND NOISE SPECTRUM

A background noise measurement was also conducted on site to determine the existing background noise spectrum. A 15 minute measurement was conducted on the 4th April 2014, between 4.30pm and 5.30pm.

Table 7 – Background Noise Single Octave Band Levels, dB

	31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	dB(A)
Background Noise Spectrum	60	63	59	53	51	50	46	41	34	56

The measurement period was not affected by inclement weather (i.e. wind speed > 5 m/s or any rain).

5.3 NOISE EMISSION CRITERIA

City of Sydney Council's Standard Conditions of Development Consent (revision 2 April 2012) document outlines noise emission requirements for mechanical plant and equipment.

However, City of Sydney Council have also informed us that noise emissions from mechanical plant and equipment will also have to comply with the requirements of the NSW EPA Industrial Noise Policy, a change which will be included in an updated Standard Conditions of Consent document in the near future.

5.3.1 City of Sydney Standard Conditions of Development Consent (April 2012)

(67) NOISE - MECHANICAL PLANT AND EQUIPMENT

Noise associated with the use of mechanical plant and equipment must not give rise to any one or more of the following:

> *(a) Transmission of "offensive noise" as defined in the Protection of the Environment Operations Act 1997 to any affected receiver.*
>
> *(b) A sound pressure level at the boundary of any affected receiver that exceeds the background ($L_{A90,\ 15minutes}$) noise level by more than 5dB. The background noise level must be measured in the absence of noise emitted from the use in accordance with Australian Standard AS1055.*

Note: The method of measurement of vibration being carried out in accordance with "assessing Vibration; Technical Guidelines" – DEC (EPA) AS1055 for sound level measurements.

(67) AIR CONDITIONERS IN RESIDENTIAL BUILDINGS

The air conditioner/s must comply with the requirements of Protection of the Environment Operations (Noise Control) Regulation 2008 and shall not:

> *(a) emit noise that is audible within a habitable room in any other residential property (regardless of whether any door or window to that room is open):*
>
> *(i) before 8.00am and after 10.00pm on any Saturday, Sunday or public holiday; or*
>
> *(ii) (ii) before 7.00am and after 10.00pm on any other day; or*
>
> *(b) emit a sound pressure level when measured at the boundary of any other residential property, at a time other than those specified in (i) and (ii) above, which exceeds the background (LA90, 15minutes) by more than 5dB(A). The source noise level must be measured as a LAeq 15 minute.*

With respect to condition 67, we note that the POEO Act does not provide a numerical/specific guidelines as to what constitutes as "offensive noise". Given this, the "background + 5dB" noise criterion should be complied with.

5.4 RECOMMENDATIONS

5.4.1 External 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 the table below.

Table 8 – Noise Emission Goals

Location	Time of Day	Measured Background noise level dB(A)$L_{90(period)}$	COS Condition 67 & 68 External Noise Emission Criterion dB(A)$L_{eq(15mins)}$	COS Condition 68 Criteria for Residential Condensers
At the boundary of any surrounding affected receiver	**Daytime (7am – 6pm)**	51	56	N/A
	Evening (6pm – 10pm)	49	54	N/A
	Night (10pm – 7am)	45	46	Inaudible within habitable room of any surrounding affected residential receivers

Table 9 – Criteria for Residential Receivers – Acoustic Objectives dB(A)$L_{eq(15minutes)}$ (Background + 5dB)

Location	Time Period	31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A-wt
Boundary of any surrounding residential receiver	Daytime (7am – 6pm)	60	63	59	53	51	50	46	41	34	**56**
	Evening (6pm – 10pm)	58	61	57	51	49	48	44	39	32	**54**
	Night (10pm – 12am)	54	57	53	47	45	44	40	35	28	**50**

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.

6 CONCLUSION

Potential noise impacts associated with the proposed residential development at 175-177 Cleveland Street, Chippendale have been assessed.

Noise impacts from environmental noise sources (traffic noise) on future occupants of the development have been assessed in accordance with the Sydney DCP 2012 and SEPP acoustic requirements. The acoustic mitigation measures to ensure compliance with these guidelines, have been set out in section 4.3.

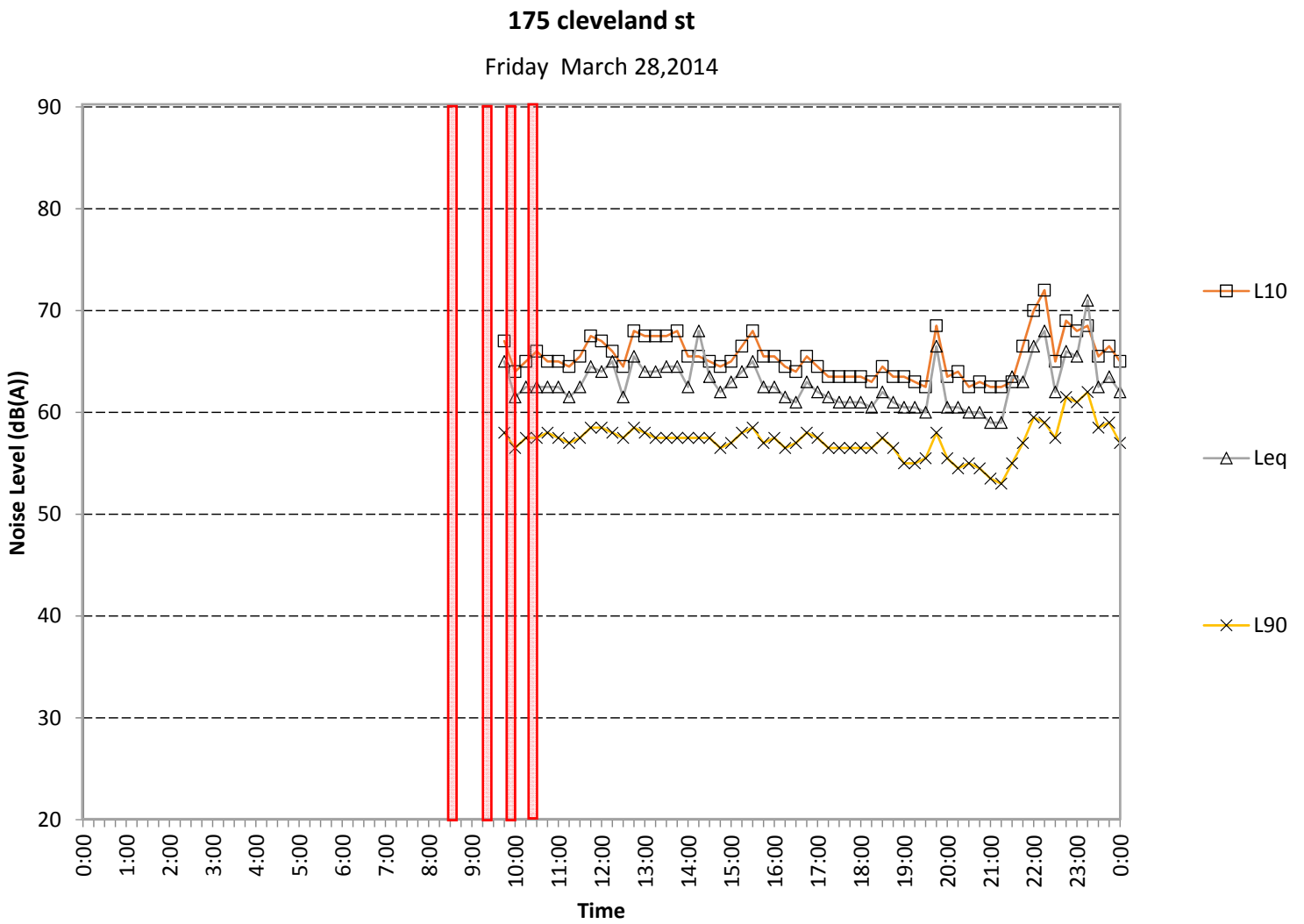
Noise emissions objectives for the site have also been determined, based on on-site noise logging and noise emission guidelines typically adopted by Council. This is outlined in section 5 above.

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

Yours faithfully,

Acoustic Logic Consultancy Pty Ltd
Remi Larmandieu

APPENDIX 1: NOISE LOGGING DATA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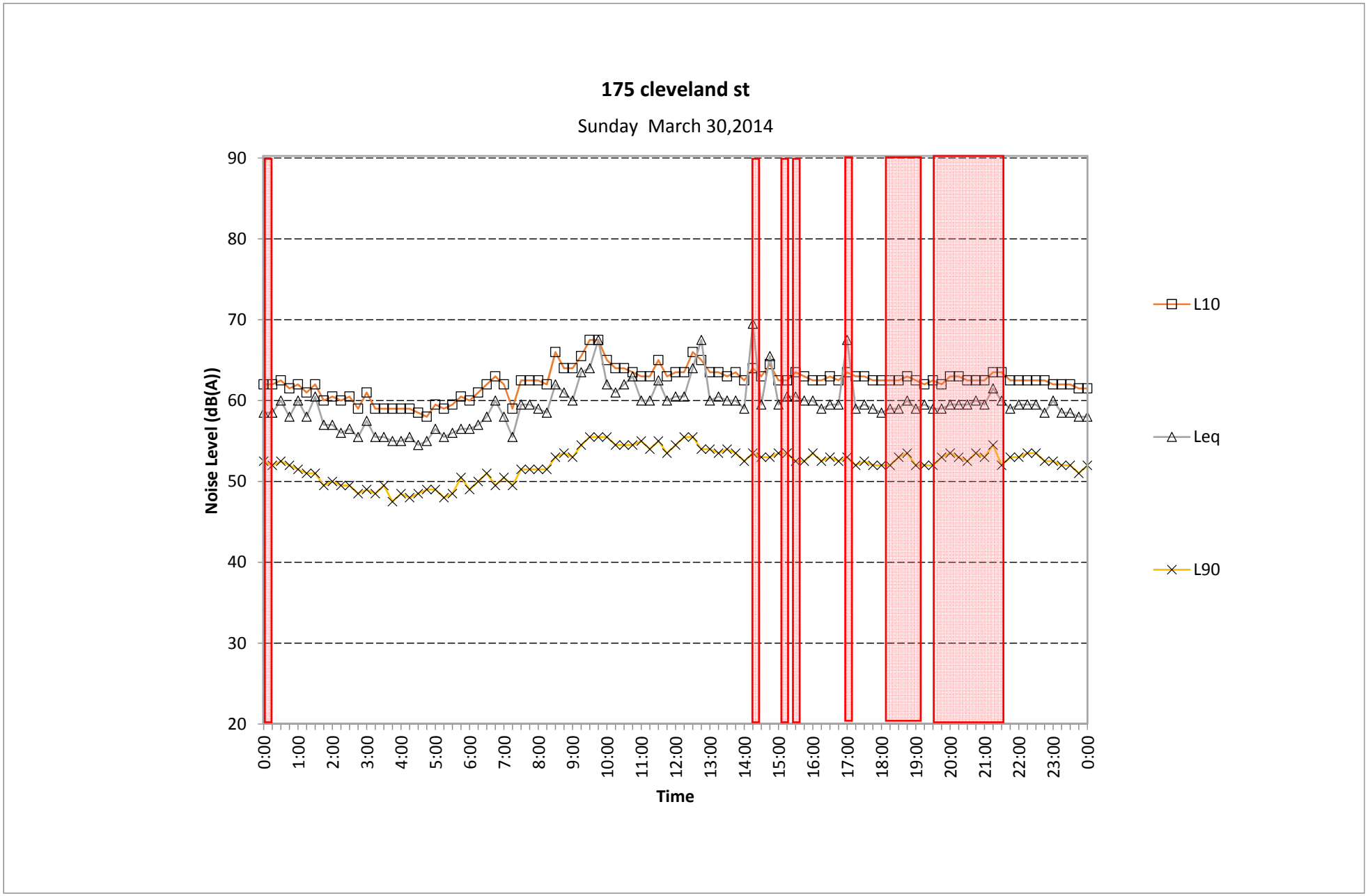
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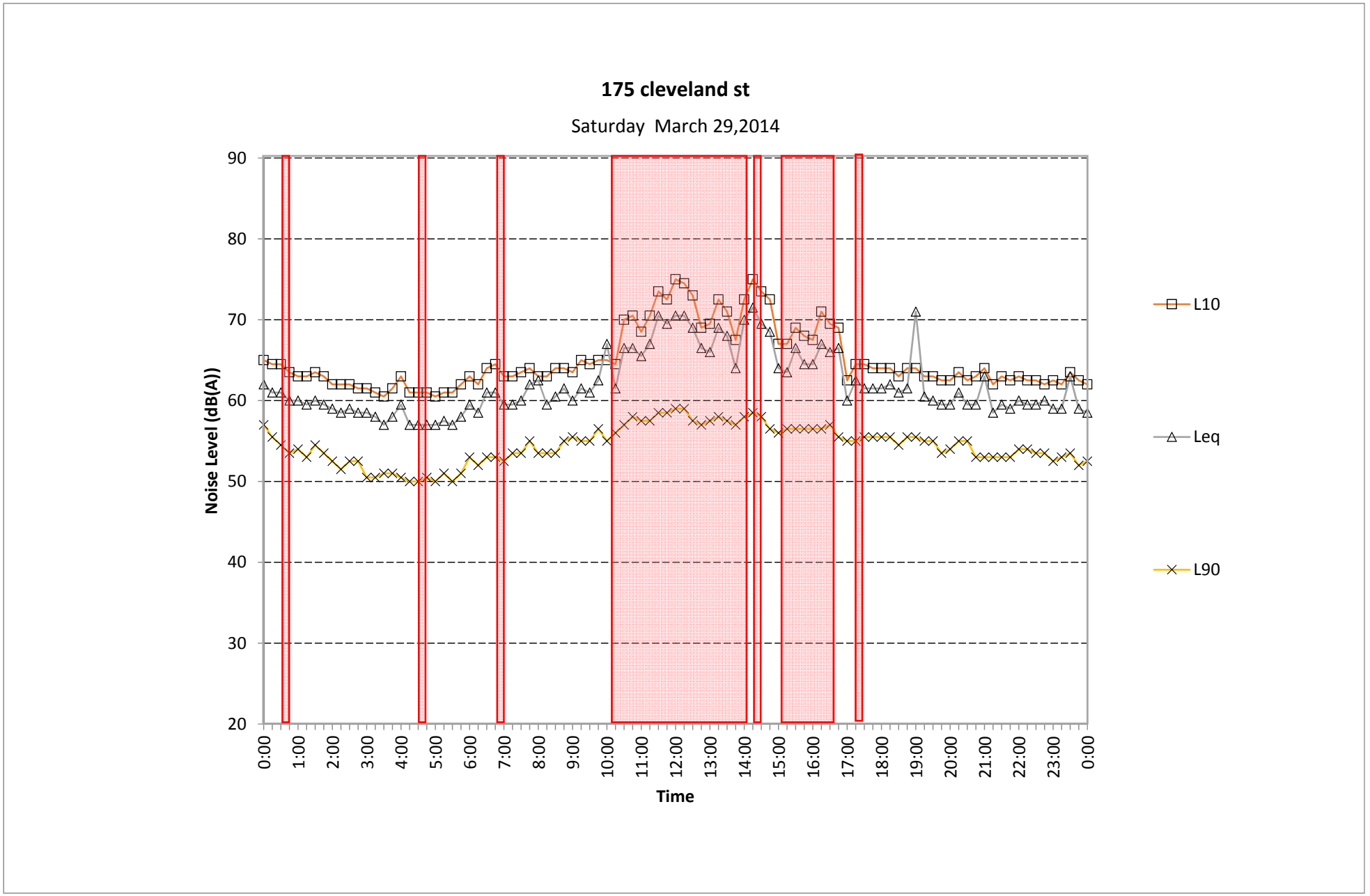
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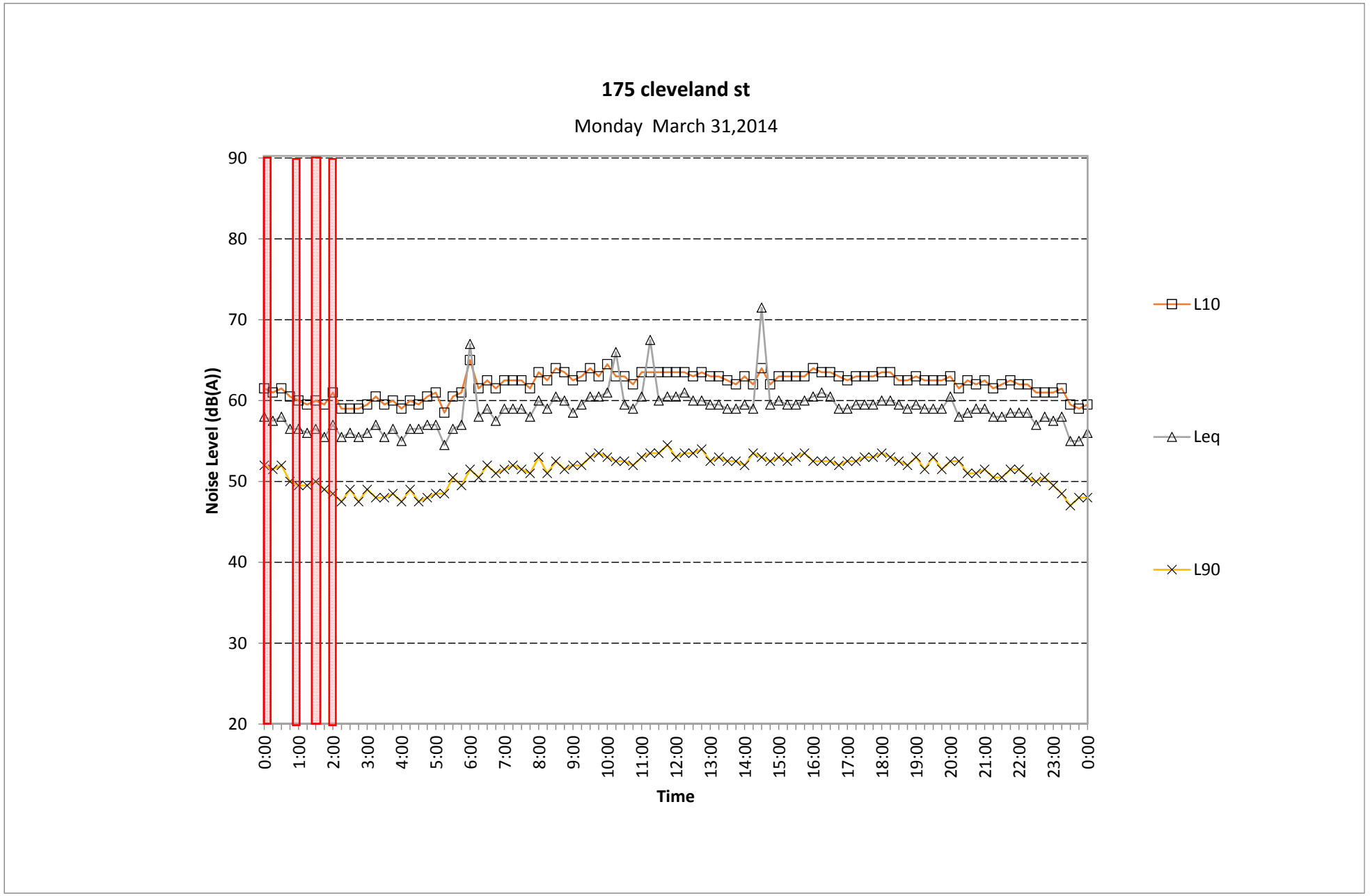
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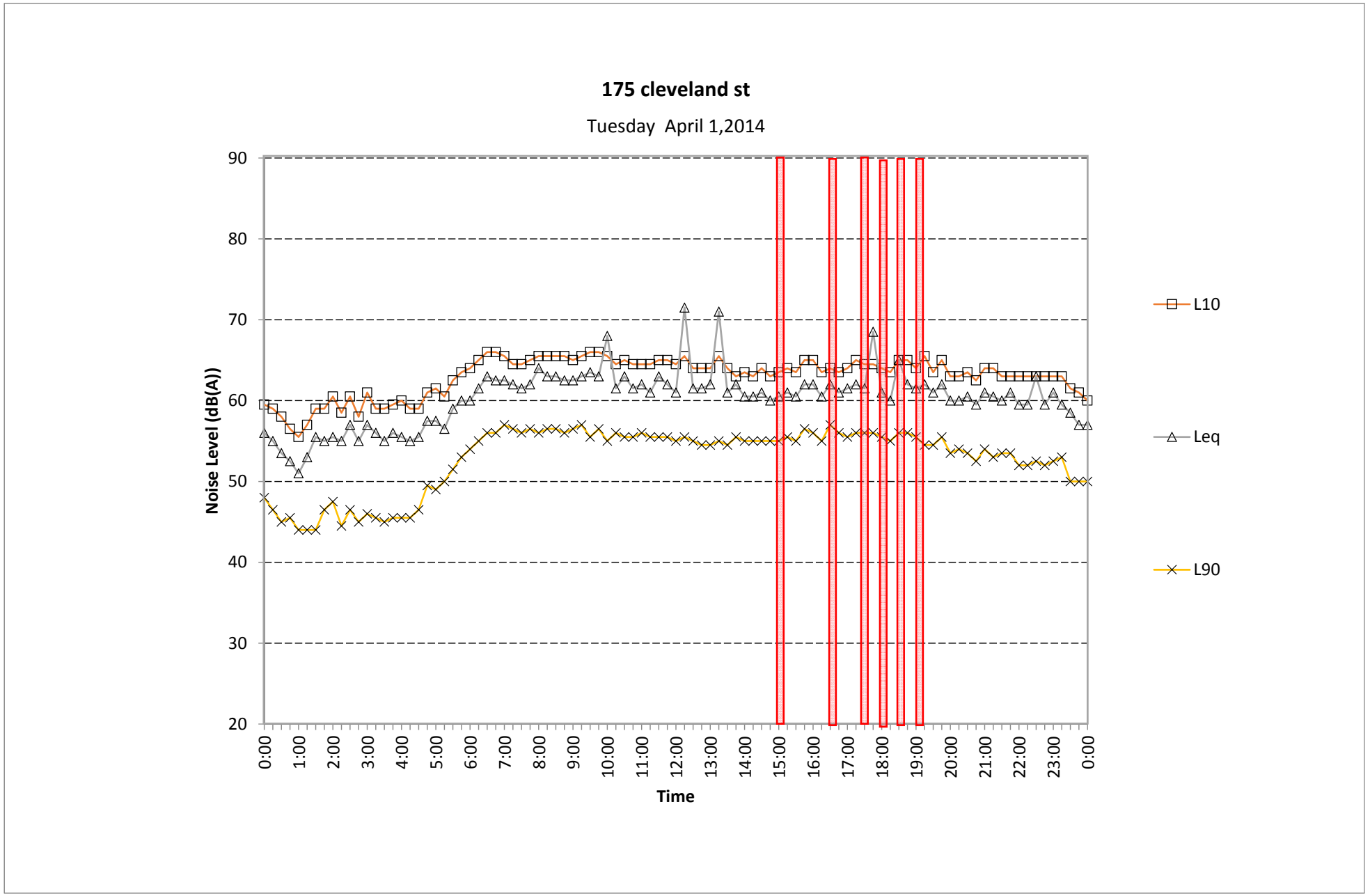
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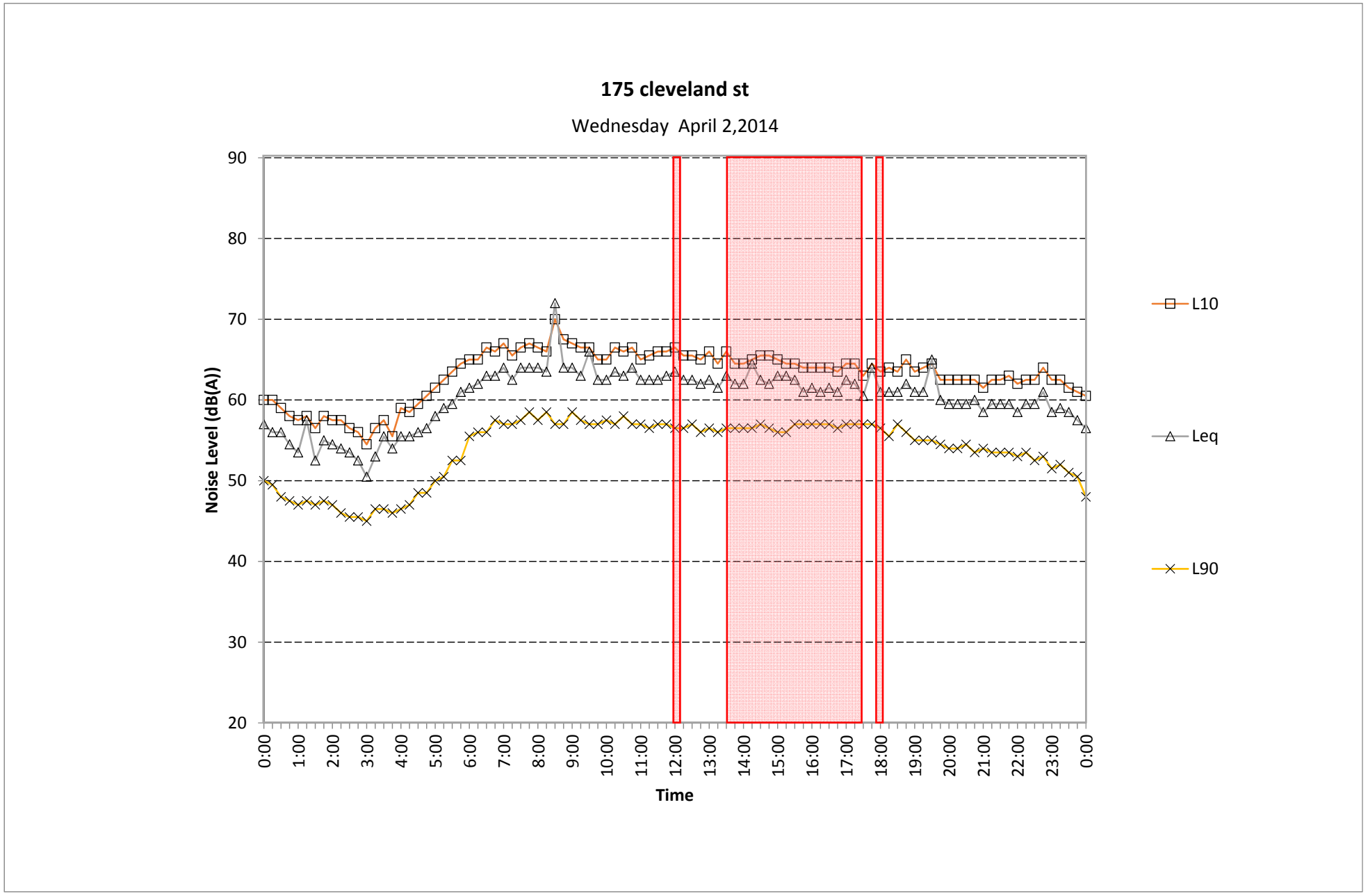
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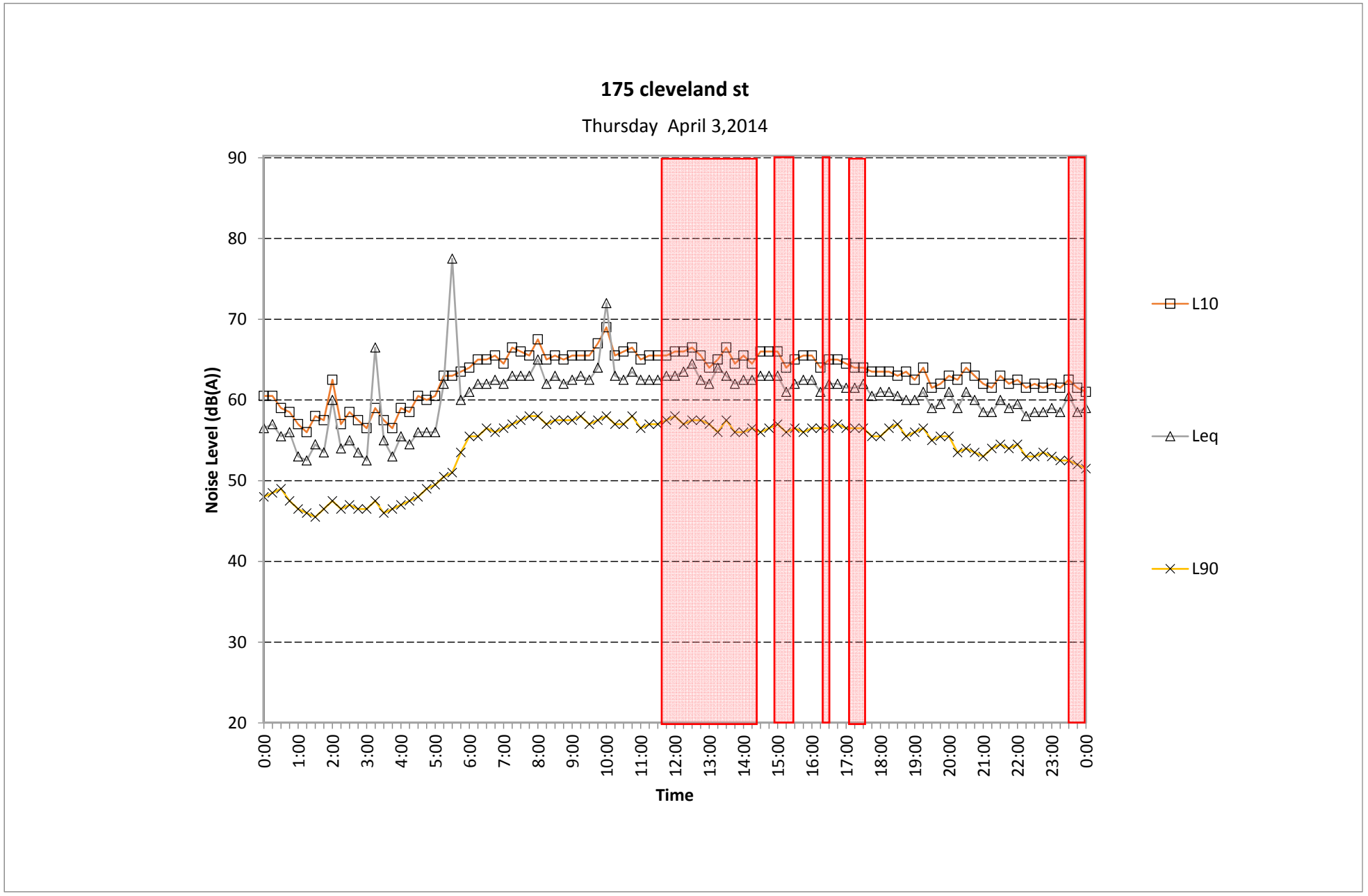
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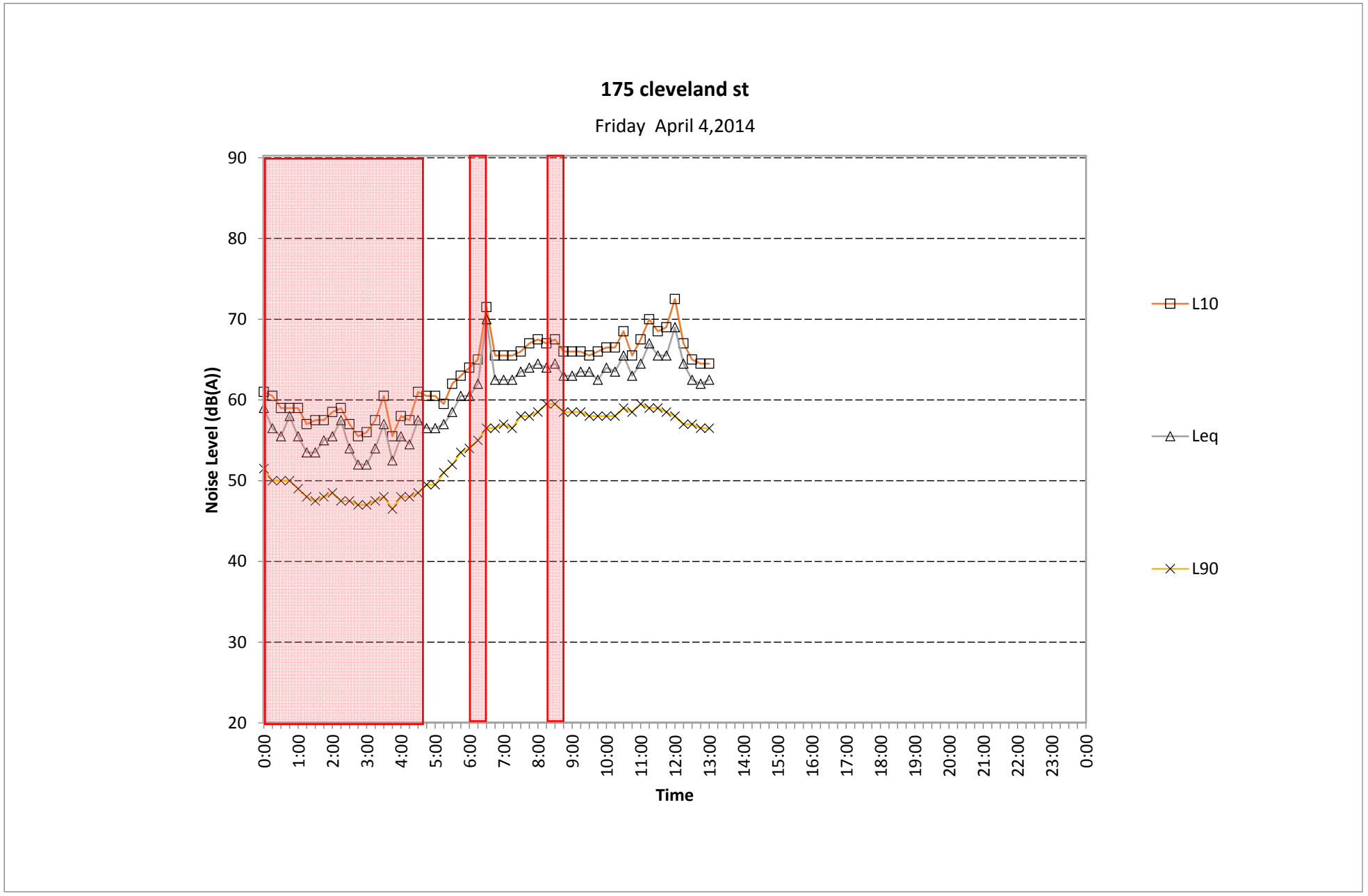
Leq
L90


175 cleveland st
Friday April 4,2014
Noise Level (dB(A))
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
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11:00
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15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time
L10
Leq
L90