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# Macquarie Centre Redevelopment

## Stage 1 Concept DA Environmental Noise Impact Assessment

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# 1 INTRODUCTION

## 1.1 BACKGROUND

This report has been prepared on behalf of AMP Capital (AMPC) in support of a Stage 1 Development Application (DA) for the mixed use redevelopment of Macquarie Shopping Centre (Macquarie Centre). The Stage 1 DA seeks concept approval for the redevelopment of Macquarie Centre by establishing:

- Building envelopes and design parameters for future development on the site, including the proposed uses within the podium and tower components.
- The distribution of floor space across the site.
- Future pedestrian and vehicle connections to and within the site.

This report supports the proposed future expansion of Macquarie Centre in relation to acoustic assessment. In this report we have:

- Conducted an external noise impact assessment (primarily traffic noise) and recommended acoustic treatments to ensure that a reasonable level of amenity is achieved for future tenants.
- Determined noise emission goals for the development to meet Council and NSW EPA acoustic requirements.

This noise assessment is based on the preliminary architectural drawings below.

**Table 1 – Referenced Drawings**

| Consultant                                   | Drawing No. | Rev | Date     | Drawing No. | Rev | Date     |
|----------------------------------------------|-------------|-----|----------|-------------|-----|----------|
| AJ + C<br>Architecture<br>NH<br>Architecture | DA0000      | 1   | 26/11/15 | DA2004b     | 1   | 26/11/15 |
|                                              | DA1000      | 1   | 26/11/15 | DA2005      | 1   | 26/11/15 |
|                                              | DA1500      | 1   | 26/11/15 | DA2006      | 1   | 26/11/15 |
|                                              | DA2000      | 1   | 26/11/15 | DA2007      | 1   | 26/11/15 |
|                                              | DA2001      | 1   | 26/11/15 | DA2008      | 1   | 26/11/15 |
|                                              | DA2002      | 1   | 26/11/15 | DA3100      | 1   | 26/11/15 |
|                                              | DA2003      | 1   | 26/11/15 | DA3101      | 1   | 26/11/15 |
|                                              | DA2004      | 1   | 26/11/15 | DA3102      | 1   | 26/11/15 |
|                                              | DA2004a     | 1   | 26/11/15 | DA3103      | 1   | 26/11/15 |

## 2 SITE DESCRIPTION

Macquarie Centre is approximately 11.25 hectares in area and is located at the corner of Waterloo Road, Herring Road and Talavera Road, Macquarie Park. The site is legally described as Lot 100 in DP 1190494.

The site is bound by Herring Road to the north west, Talavera Road to the north east, commercial uses to the south east and Waterloo Road to the south west. Located within the Macquarie Park Corridor, the site has excellent access to public transport, situated immediately adjacent the Macquarie University Railway Station and the Herring Road Bus Station. Located between the M2 Hills Motorway and Epping Road, the site also enjoys excellent vehicle connectivity.

Macquarie Centre was originally constructed in 1981. The centre has undergone various stages of redevelopment and extensions. A major refurbishment occurred in 2000, 2003 and most recently in 2014, creating a fresh food court, David Jones expansion, addition of second full line supermarket (Coles), a value supermarket (Aldi), with new speciality food and convenience stores. Today Macquarie Centre is the largest shopping centre in NSW and the 8th largest shopping centre in Australia and includes a wide range of retail, entertainment and service offerings.

The shopping centre currently spans five levels accommodating 368 stores, including major retailers such as David Jones, Myer, Target, Big W, Aldi, Coles and Woolworths. The centre also houses a large number of mini major international retail stores including H&M, Zara, Uniqlo, Forever 21, GAP and Sephora. A number of entertainment offerings exist in the centre including a cinema complex and ice skating rink. The site currently has a gross floor area of 170,850m<sup>2</sup> and accommodates 4,755 car spaces.

## 2.1 DEVELOPMENT PROPOSAL

The Stage 1 DA seeks concept approval for the mixed use redevelopment of Macquarie Centre under s.83B of the *Environmental Planning & Assessment Act 1979*. The first stage will seek concept approval only for:

- Mixed use development to enable a range of land uses. The final mix of land uses will be subject to and determined under the relevant Stage 2 detailed DAs.
- Building envelopes for the proposed basement, expanded podium and tower forms.
- The four tower envelopes fronting Herring Road will have maximum heights ranging from 90m and 120m above existing ground level. The building envelope for Tower 1 is of sufficient dimensions to accommodate alternate tower forms.
- Maximum additional gross floor area (GFA) of 148,000sqm.
- The new retail podium along Herring Road will replace the existing structure. This will provide an active frontage with separate pedestrian entries to Herring Road and the creation of a vibrant atrium space.
- The creation of 'Station Plaza' between the train station and shopping centre, framed by active uses and a landmark building known as the "Shard".
- The building envelopes for the proposed basement and upper levels of the expanded podium will accommodate a maximum of 2,175 additional car spaces.
- New vehicle and pedestrian access points.

The Stage 1 DA does not seek approval for

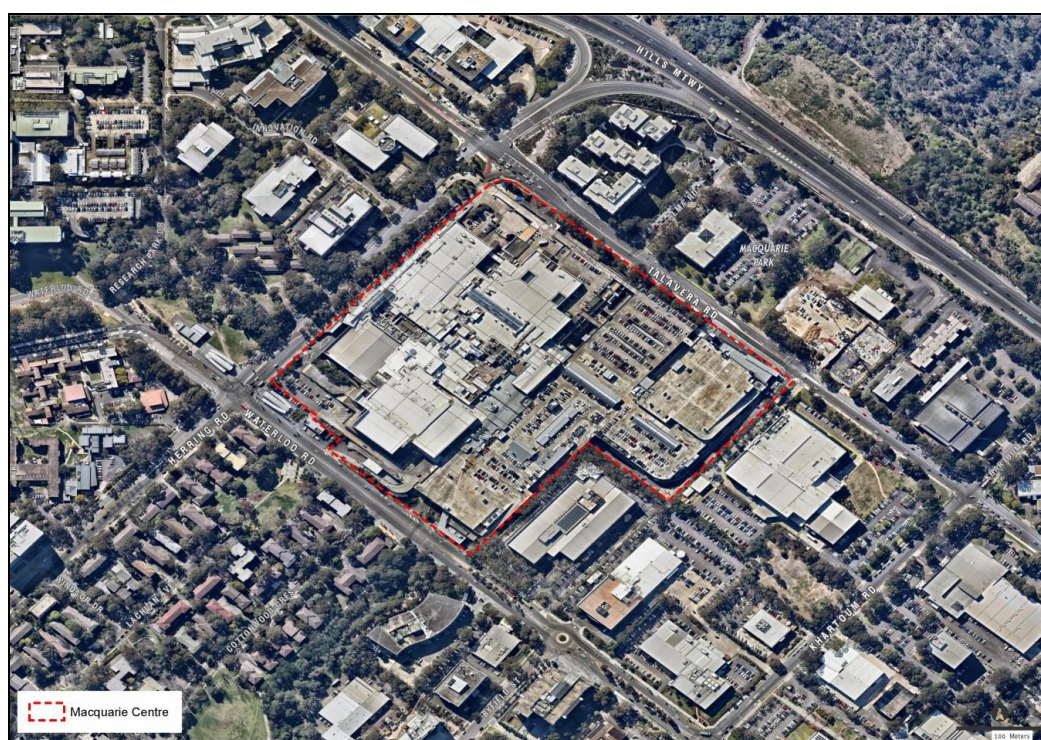
- Any works, including demolition, excavation, construction and public domain improvements.
- The final arrangement of land uses.
- Layout, mix and number of residential units.
- A specific number of car spaces (as this will be determined having regard to the final mix of land uses).
- The design of the building exteriors including facades and roofs.
- Public domain and landscape design.

Such approvals will be sought via subsequent development applications following receipt of development consent for the Stage 1 DA.

The overview of the indicative mix of land uses within the proposed building envelopes is identified in table 2 below.

**Table 2 – Overview of Indicative Mix of Land Uses**

| Component         | Proposed                                                                                                                                                                                                                                                                                                   |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Basement          | Loading docks, car parking and associated vehicle circulation, waste rooms, utilities, future connection to existing train station (subject to consent from RailCorp) and retail premises.                                                                                                                 |
| Podium            | Retail premises, commercial premises, food and drink premises, entertainment facilities, recreation facilities (indoor), recreation area, car parking and associated vehicle circulation, community uses (subject to further discussions with Council) and communal open space associated with the towers. |
| Tower 1           | Mixed use development comprising commercial premises and/or residential accommodation and/or serviced apartments above a retail podium.                                                                                                                                                                    |
| Towers 2, 3 and 4 | Mixed use development comprising residential accommodation and/or serviced apartments above a retail podium.                                                                                                                                                                                               |



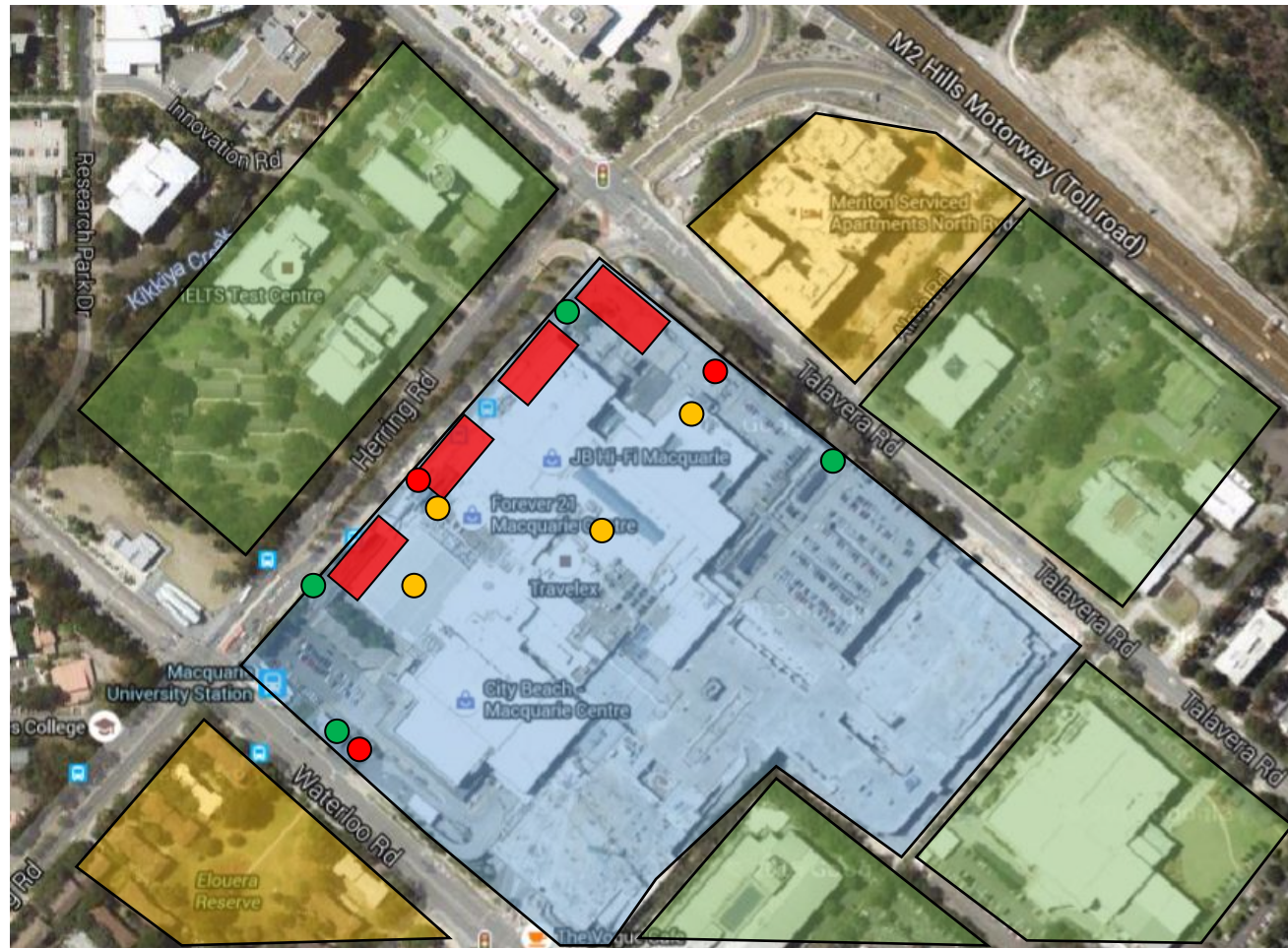
**FIGURE 1: AERIAL PHOTOGRAPH**

Figure 2 below details the site, surrounding noise sources and measurement positions.

The subject site is located at Herring Road to the north west of the site which carries medium volumes of traffic. The site is bound by Talavera Road (to the north) and Waterloo Road (to the south), these roads all carrying medium volumes of traffic. The site is located approximately 200 metres to the south west of the M2 motorway which generates high traffic volumes. The site is located approximately 60 metres to the south from the M2 motorway link road which also generates high traffic volumes.

Noise potentially generated by the site will mainly consist of noise emissions from mechanical plant. Noise sensitive developments surrounding the site are as follows:

- Residential properties at 88 Talavera Road, to the north of the site;
- Commercial properties at 66-80 Talavera Road, to the north east of the site;
- Commercial property at 101 Waterloo Road along the south eastern site boundary;
- Commercial property at 10-14 Talavera Road along the south eastern site boundary.
- Residential properties at 173 Herring Road, to the north west of the site.
- Commercial property at 142-150 Herring Road along the south eastern site boundary.



-  Attended traffic noise measurement locations
-  Attended mechanical plant noise measurement locations
-  Unattended noise measurement location
-  Subject site
-  Approximate location of proposed residential towers
-  Potentially affected commercial properties
-  Potentially Affected residential properties

### 3 NOISE DESCRIPTORS

Traffic noise constantly varies in level, due to fluctuations in 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 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 at 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.

## 4 TRAFFIC NOISE ASSESSMENT

### 4.1 ACOUSTIC CRITERIA

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

#### 4.1.1 NSW SEPP Requirements

Condition 102 of the NSW State Environmental Planning policy states:

*“(1) 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,*

*(b) a place of public worship,*

*(c) a hospital,*

*(d) an educational establishment or child care centre.*

*(2) Before determining a development application for development to which this clause applies, the consent authority must take into consideration any guidelines that are issued by the Director-General for the purposes of this clause and published in the Gazette.*

*(3) 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 pm and 7 am,*

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

#### 4.1.2 Ryde City Council DCP Criteria

The Ryde City Council DCP does not set out any specific criteria for environmental noise intrusion.

#### 4.1.3 Australian Standard AS2107:2000 Criteria

The Australian Standard AS2107-2000 “Recommended Design Sound Levels and Reverberation Times for Building Interiors” recommends 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. Traffic noise criteria for AS2107-2000 is presented in the table below, based on developments near major roadways.

**Table 3 - AS2107:2000 Internal Traffic Noise Criteria**

| Space Activity Type | Noise Level dB(A) $L_{eq}(1hr)$ |          |
|---------------------|---------------------------------|----------|
|                     | SATISFACTORY                    | MAXIMUM* |
| Living Areas        | 35                              | 45       |
| Sleeping Areas      | 30                              | 40       |
| Retail/Commercial   | 45                              | 50       |
| Lobby               | 45                              | 55       |

\*Recommendations nominated in section 4.1.4 below will comply with the Maximum design criterion above.

#### 4.1.4 Summary of Internal Traffic Noise Criteria

Based on the requirements of NSW SEPP, Ryde City Council DCP and AS2107-2000 the following assessment criteria would apply to the proposed development.

**Table 4 - Traffic Noise Criteria for All Spaces**

| Space/Activity Type | Noise Level dB(A) $L_{eq}$                                            |
|---------------------|-----------------------------------------------------------------------|
| Bedrooms            | 35 dB(A) $L_{eq}(9hour)$ – SEPP<br>40 dB(A) $L_{eq}(1hourr)$ – AS2107 |
| Living Areas        | 40 dB(A) $L_{eq}(15hour)$ – SEPP<br>45 dB(A) $L_{eq}(1hour)$ –AS2107  |
| Retail/Commercial   | 50 $L_{eq}(1hourr)$                                                   |
| Lobby               | 55 $L_{eq}(1hourr)$                                                   |

## 4.2 TRAFFIC AND MECHANICAL NOISE MEASUREMENTS

Traffic measurements were taken along the Herring Road façade, Talavera Road façade and the Waterloo Road façade of the proposed development. Both short term (attended) and long term (unattended) measurements were conducted.

In conjunction with traffic noise measurements, attended measurements of existing mechanical plant on the Macquarie Centre rooftop which could potentially affect the amenity of future residents were conducted around the proposed site

### 4.2.1 Measurement Location

The long-term noise monitors that were setup on Herring Road, Talavera Road and Waterloo Road all had a full view of the roads without any obstructions, as indicated in Figure 2.

Supplementary attended measurements were taken at various locations of the site, as shown in Figure 1.

### 4.2.2 Measurement Period

The long-term noise monitor was conducted from 6<sup>th</sup> November until the 13<sup>th</sup> November 2015.

The attended measurements were taken on 12<sup>th</sup> and 13<sup>th</sup> November 2015.

### 4.2.3 Measurement Equipment

The long term monitoring was conducted using an Acoustic Research Laboratories Pty Ltd noise logger. The logger was set to A-weighted fast response and was programmed to store 15-minute statistical noise levels throughout the monitoring period. The monitor was calibrated at the start and end of the monitoring period using a Rion NC-73 calibrator. No significant drift was noted.

Attended measurements were undertaken using a Norsonic 140 sound level analyser, set to A-weighted fast response. The sound level analyser was calibrated before and after the measurements, no significant drift was noted.

#### 4.2.4 Measurement Results

##### 4.2.4.1 Unattended Noise Monitor Results

Table 5 below shows measured results from unattended noise monitoring on the proposed site. For detailed location see Figure 2. Detailed results from noise monitoring can be found in Appendix 1.

**Table 5 – Unattended Noise Monitor Results**

| Location                                             | Time Period        | Traffic Noise Level                                                                           |
|------------------------------------------------------|--------------------|-----------------------------------------------------------------------------------------------|
| Herring Road (at façade)                             | Day - (7am-10pm)   | 65 dB(A) <sub>L<sub>Aeq</sub></sub> (15hr)<br>66 dB(A) <sub>L<sub>Aeq</sub></sub> (worst 1hr) |
|                                                      | Night - (7am-10pm_ | 58 dB(A) <sub>L<sub>Aeq</sub></sub> (9hr)<br>60 dB(A) <sub>L<sub>Aeq</sub></sub> (worst 1hr)  |
| Talavera Road (at façade)<br>with view of M2Motorway | Day - (7am-10pm)   | 62 dB(A) <sub>L<sub>Aeq</sub></sub> (15hr)<br>63 dB(A) <sub>L<sub>Aeq</sub></sub> (worst 1hr) |
|                                                      | Night - (10pm-7am) | 60 dB(A) <sub>L<sub>Aeq</sub></sub> (9hr)<br>61 dB(A) <sub>L<sub>Aeq</sub></sub> (worst 1hr)  |
| Waterloo Road (at boundary)                          | Day - (7am-10pm)   | 64 dB(A) <sub>L<sub>Aeq</sub></sub> (15hr)<br>65 dB(A) <sub>L<sub>Aeq</sub></sub> (worst 1hr) |
|                                                      | Night - (10pm-7am) | 59 dB(A) <sub>L<sub>Aeq</sub></sub> (9hr)<br>62 dB(A) <sub>L<sub>Aeq</sub></sub> (worst 1hr)  |

Note: Results presented in the table above include a façade reflection correction of -2.5dB(A)

##### 4.2.4.2 Attended Traffic Noise Measurements

Table 6 below shows measured results from Attended traffic measurements which were conducted around the proposed site. For detailed location see Figure 2.

**Table 6 – Attended Noise Measurements**

| Location                                                                               | Time            | Measured Results                            |
|----------------------------------------------------------------------------------------|-----------------|---------------------------------------------|
| Herring Road<br>(Approximately 4m from the kerb at<br>north west boundary)             | 8:00am – 9:00am | 65 dB(A) <sub>L<sub>aq</sub></sub> (15mins) |
| Herring Road – Bus Stops<br>(Approximately 4m from the kerb at<br>north west boundary) |                 | 69 dB(A) <sub>L<sub>aq</sub></sub> (15mins) |
| Talavera Road – At northern façade<br>with view of M2 Motorway and Link<br>Road        | 5.00pm – 6.00pm | 65 dB(A) <sub>L<sub>aq</sub></sub> (15mins) |
| Waterloo Road – at boundary                                                            | 5.00pm – 6.00pm | 64 dB(A) <sub>L<sub>aq</sub></sub> (15mins) |

Note: Results presented in the table above include a façade reflection correction of -2.5dB(A)

#### 4.2.4.3 Attended Mechanical Noise Measurements

Table 7 below shows measured results from Attended measurements of existing mechanical plant on the Macquarie Centre rooftop which were conducted around the proposed site. For detailed location see Figure 2.

**Table 7 – Attended Noise Measurements**

| Location                                                                                     | Time              | Measured Results                           |
|----------------------------------------------------------------------------------------------|-------------------|--------------------------------------------|
| Plant near Herring Road – Behind Macquarie Centre Sign (at approximately 10 metres distance) | 10.00am – 11.00am | 66 dB(A) <sub>L<sub>aq</sub>(15mins)</sub> |
| Plant above Cinemas – Cooling towers (at approximately 20 metres distance)                   |                   | 65 dB(A) <sub>L<sub>aq</sub>(15mins)</sub> |
| Chillers and Cooling towers in Centre of Rooftop (at approximately 20 metres distance)       | 11.00am – 12.00pm | 62 dB(A) <sub>L<sub>aq</sub>(15mins)</sub> |
| Fans on Talavera Road Side of Rooftop (at approximately 10 metres distance)                  |                   | 66 dB(A) <sub>L<sub>aq</sub>(15mins)</sub> |

Note: Results presented in the table above include a façade reflection correction of -2.5dB(A)

#### 4.2.5 Summary of Measurement Results

The following table presents the resultant noise levels at the proposed façades of the development. The noise levels are based on the manned noise measurement results adjusted by the difference with the noise monitor results of time periods and distance attenuation.

**Table 8 – Resultant Noise Measurement Results**

| Location                                          | Time Period        | Traffic Noise Level                                                                           |
|---------------------------------------------------|--------------------|-----------------------------------------------------------------------------------------------|
| Herring Road (at façade)                          | Day - (7am-10pm)   | 65 dB(A) <sub>L<sub>Aeq</sub> (15hr)</sub><br>66 dB(A) <sub>L<sub>Aeq</sub> (worst 1hr)</sub> |
|                                                   | Night – (7am-10pm_ | 58 dB(A) <sub>L<sub>Aeq</sub> (9hr)</sub><br>60 dB(A) <sub>L<sub>Aeq</sub> (worst 1hr)</sub>  |
| Talavera Road (at façade) with view of M2Motorway | Day - (7am-10pm)   | 62 dB(A) <sub>L<sub>Aeq</sub> (15hr)</sub><br>63 dB(A) <sub>L<sub>Aeq</sub> (worst 1hr)</sub> |
|                                                   | Night - (10pm-7am) | 60 dB(A) <sub>L<sub>Aeq</sub> (9hr)</sub><br>61 dB(A) <sub>L<sub>Aeq</sub> (worst 1hr)</sub>  |
| Waterloo Road (at boundary)                       | Day - (7am-10pm)   | 64 dB(A) <sub>L<sub>Aeq</sub> (15hr)</sub><br>65 dB(A) <sub>L<sub>Aeq</sub> (worst 1hr)</sub> |
|                                                   | Night - (10pm-7am) | 59 dB(A) <sub>L<sub>Aeq</sub> (9hr)</sub><br>62 dB(A) <sub>L<sub>Aeq</sub> (worst 1hr)</sub>  |

Note: Results presented in the table above include a façade reflection correction of -2.5dB(A)

### 4.3 EVALUATION OF NOISE INTRUSION

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. **Any external walls and roof design that are proposed to be of heavy masonry elements will not require upgrading. Any lightweight constructions will need to be reviewed and assessed at a later stage.**

The predicted noise levels through windows and doors for typical developments 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.

**Table 9— Typical Glazing Construction Recommendations**

| Façade        | Room         | Glazing requirements*                 |
|---------------|--------------|---------------------------------------|
| Herring Road  | Bedrooms     | 10.38mm Laminated with acoustic seals |
|               | Living Rooms | 6.38mm Laminated with acoustic seals  |
| Talavera Road | Bedrooms     | 10.38mm Laminated with acoustic seals |
|               | Living Rooms | 6.38mm Laminated with acoustic seals  |
| Waterloo Road | Bedrooms     | 10.38mm Laminated with acoustic seals |
|               | Living Rooms | 6.38mm Laminated with acoustic seals  |
| Remaining     | Bedrooms     | 10.38mm Laminated with acoustic seals |
|               | Living Rooms | 6.38mm Laminated with acoustic seals  |

**Note:** These glazing thicknesses are to be reviewed at CC stage when plans are finalised.

**Table 10 – Typical Retail/Commercial Glazing Recommendations**

| Facade | Area              | Glazing requirements              |
|--------|-------------------|-----------------------------------|
| All    | Retail/Commercial | 6mm toughened with acoustic seals |

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. **These glazing thicknesses are to be reviewed at CC stage when plans are finalised.**

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 and the values nominated in the table below. Where nominated, this will require the use of acoustic seals equal to Schlegel Q-Ion series (*acoustic bulb seal*) around the full perimeter of operable frames. The frame will need to be sealed into the building opening using a flexible polyurethane sealant equal to Selleys Proseries Fireblock. **Note that mohair seals and/or mohair/plastic fin combination seals in windows and doors are not acceptable where acoustic seals are required.**

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 below. Also, the glazing installer should certify that the window/doors have been constructed and installed in a manner equivalent to the tested samples.

**Table 11 - Minimum STC of Glazing (with Acoustic Seals)**

| Glazing Assembly  | Minimum STC of Installed Window |
|-------------------|---------------------------------|
| 6mm Toughened     | 29                              |
| 6.38mm laminated  | 31                              |
| 10.38mm laminated | 35                              |

#### **4.3.1 External Doors**

Any glass door should be constructed using glazing thickness set out in table 9. Full perimeter acoustic seals around the doors are required. Any timber external doors (this includes apartment entry doors along external corridor areas) 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.

Entry doors to units within internal corridor areas shall be of a minimum 35mm solid core timber construct with gaps minimised.

#### **4.3.2 Roof/Ceiling**

Any proposed concrete slab roof are 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.

#### **4.3.3 External Walls**

External walls composed of concrete or masonry elements will not require upgrading. There should not be vents on the internal skin of external walls. All penetrations in the internal skin of external walls should be acoustically sealed. **Any lightweight constructions will need to be reviewed and assessed at a later stage.**

#### 4.4 MECHANICAL VENTILATION

As internal noise levels cannot be achieved with windows open it is required that an alternative outside air supply system or air conditioning 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

The nearest potentially affected receivers are:

- Residential properties at 88 Talavera Road, to the north of the site;
- Commercial properties at 66-80 Talavera Road, to the north east of the site;
- Commercial property at 101 Waterloo Road along the south eastern site boundary;
- Commercial property at 10-14 Talavera Road along the south eastern site boundary.
- Residential properties at 173 Herring Road, to the north west of the site.
- Commercial property at 142-150 Herring Road along the south eastern site boundary.

#### 5.1 UNATTENDED BACKGROUND NOISE MONITORING

Unattended noise monitoring was conducted at the location shown in figure 2 during the period of 6<sup>th</sup> to 13<sup>th</sup> November 2015 using an Acoustic Research Laboratories Pty Ltd noise monitor. The monitor 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. Measurements were taken on A-frequency weighting and fast time weighting.

The results of noise monitoring are included in Appendix 1. Measured background noise levels are presented below.

**Table 12 – Measured Background Noise Levels**

| Location                                 | Period/Time       | Background Noise Level dB(A)<br>L <sub>90</sub> |
|------------------------------------------|-------------------|-------------------------------------------------|
| Herring Road/Talavera Road -<br>Boundary | Day (7am-6pm)     | 59                                              |
|                                          | Evening(6pm-10pm) | 55                                              |
|                                          | Night(10pm-7am)   | 48                                              |
| Waterloo Road - Boundary                 | Day (7am-6pm)     | 57                                              |
|                                          | Evening(6pm-10pm) | 52                                              |
|                                          | Night(10pm-7am)   | 47                                              |

## 5.2 ACOUSTIC OBJECTIVES

Section 2.14.3 of the Ryde City Council DCP 2014 states the following with regards to noise emissions:

*“The noise of an air conditioner, pump, or other mechanical equipment must not exceed the background noise level by more than 5dB(A) when measured in or on any premises in the vicinity of the item. This may require the item to have a sound proofed enclosure.”*

With regards to noise emissions from general use within the development, noise emissions from the facility will have to comply with the requirements of the NSW EPA Industrial Noise Policy.

### 5.2.1 NSW EPA Industrial Noise Policy

The NSW EPA Industrial Noise Policy, has two criteria which need to be satisfied namely Intrusiveness and Amenity. These are described below:

- *Intrusiveness Criteria* - This 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.
- *Amenity Criteria* - This guideline is intended to limit the absolute noise level from all “industrial” noise sources such as mechanical plant 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.

Noise levels are to be assessed at the property boundary or nearby dwelling, or at the balcony or façade of an apartment.

#### 5.2.1.1 Intrusiveness Criterion

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

Background noise levels adopted are presented in Section 5.1. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

**Table 13 – Intrusiveness Noise Emission Goals**

| Location              | Period/Time       | Intrusiveness Noise Emission Goal<br>dB(A) $L_{eq}(15min)$ |
|-----------------------|-------------------|------------------------------------------------------------|
| Herring/Talavera Road | Day (7am-6pm)     | 64                                                         |
|                       | Evening(6pm-10pm) | 60                                                         |
|                       | Night(10pm-7am)   | 53                                                         |
| Waterloo Road         | Day (7am-6pm)     | 62                                                         |
|                       | Evening(6pm-10pm) | 57                                                         |
|                       | Night(10pm-7am)   | 52                                                         |

#### 5.2.1.2 Amenity Criterion

The guideline is intended to limit the absolute noise level from all 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. This site is categorised by the residential receivers as suburban.

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.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays.

**Table 14 – EPA Amenity Noise Levels**

| Type of Receiver       | Time of day        | Recommended Acceptable Noise Level<br>dB(A) $L_{eq(period)}$ |
|------------------------|--------------------|--------------------------------------------------------------|
| Residential – Suburban | Day (7am-6pm)      | 55                                                           |
|                        | Evening (6pm-10pm) | 45                                                           |
|                        | Night (10pm-7am)   | 40                                                           |
| Commercial Premises    | When in use        | 65                                                           |

### 5.2.2 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.

### 5.2.3 Protection of the Environmental Operation Act Regulation

Protection of the Environmental Operations regulation limits the noise levels associated within the operation of domestic air conditioning criteria during night time periods which is presented below:

*Protection of the Environmental Operations (Noise Control) Regulation 2000-Sect 52*

52 *Air Conditioners*

*(1) A person must not cause or permit an air conditioner to be used on residential premises in such a manner that it emits noise that can be heard within a habitable room in any other residential premises (regardless of whether any door or window to that room is open):*

- (a) before 8 am or after 10 pm on any Saturday, Sunday or public holiday, or*
- (b) before 7 am or after 10 pm on any other day.*

#### 5.2.4 Summary of Noise Emission Objectives

Based on the requirements stated in the sections above, the Table 15 and 16 below provides a summary of the assessment criteria applicable to the future residential development at the project site. The assessment criteria are also based on the ambient noise monitoring conducted at the site.

**Table 15 – Environmental Noise Emission Criteria (Herring Road and Talavera Road Boundary)**

| Time of day | Measured Background Noise Level dB(A)<br>L <sub>90</sub> (15minutes) | Amenity Criteria dB(A) L <sub>eq</sub> (period) | Intrusiveness Criteria Background + 5 dB(A)<br>L <sub>eq</sub> (15minutes) | EPA Criteria for Residential Condensers | EPA Criteria for Sleep Disturbance dB (A) L <sub>1</sub> (1minute) |
|-------------|----------------------------------------------------------------------|-------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------------------------------|
| Day         | 59                                                                   | 55                                              | 64                                                                         | N/A                                     | N/A                                                                |
| Evening     | 55                                                                   | 45                                              | 60                                                                         | N/A                                     | N/A                                                                |
| Night       | 48                                                                   | 40                                              | 53                                                                         | Inaudible within neighbouring premises  | 63                                                                 |

**Table 16 – Environmental Noise Emission Criteria (Waterloo Road Boundary)**

| Time of day | Measured Background Noise Level dB(A)<br>L <sub>90</sub> (15minutes) | Amenity Criteria dB(A) L <sub>eq</sub> (period) | Intrusiveness Criteria Background + 5 dB(A)<br>L <sub>eq</sub> (15minutes) | EPA Criteria for Residential Condensers | EPA Criteria for Sleep Disturbance dB (A) L <sub>1</sub> (1minute) |
|-------------|----------------------------------------------------------------------|-------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------------------------------|
| Day         | 57                                                                   | 55                                              | 62                                                                         | N/A                                     | N/A                                                                |
| Evening     | 52                                                                   | 45                                              | 57                                                                         | N/A                                     | N/A                                                                |
| Night       | 47                                                                   | 40                                              | 52                                                                         | Inaudible within neighbouring premises  | 62                                                                 |

### 5.3 ASSESSMENT OF NOISE EMISSION

As mechanical plant has not yet been selected at this stage, a complete assessment of mechanical noise emissions can not be conducted at this time. Generally, this is undertaken at CC stage, once the plant selections have been undertaken. Notwithstanding, compliance with the mechanical noise emission criteria presented in section 5.2.5 is both practical and reasonable with the use of one or more of (but not limited to) the following:

- Acoustic Barriers/Screens;
- Internally lined ductwork;
- External Lagging;
- Silencers etc.

#### 5.3.1 Noise – Air-conditioners

As air conditioning plant has not yet been selected, a complete assessment of air-conditioning noise emissions can not be conducted at this time. Generally, this is undertaken at CC stage, once the plant selections have been undertaken. Notwithstanding, compliance with the air conditioning noise emission criteria presented in section 5.2.5 is both practical and reasonable with the use of one or more of (but not limited to) the following acoustic treatments:

- Acoustic Barriers/Screens;
- Internally lined ductwork;
- External Lagging;
- Silencers etc.

## 6 CONCLUSION

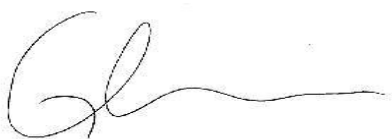
This report presents preliminary acoustic assessment for the proposed mixed use re-development of the Macquarie Centre located at Herring Road, Macquarie Park

Noise intrusion impact from traffic noise onto the future occupants of the development has been assessed in accordance with State of Environment Planning Policy (Infrastructure), City of Ryde Council DCP's and Australian Standards 2107:2000 . The typical acoustic treatments in principle necessary to achieve these guidelines have been presented within this report.

Noise emission criteria for the development site have been determined based on the site noise logging and City of Ryde Council DCP, NSW EPA Industrial Noise Policy and Protection of the Environmental Operation Act Regulation. These requirements have been presented in Section 5.2.

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

Yours faithfully,

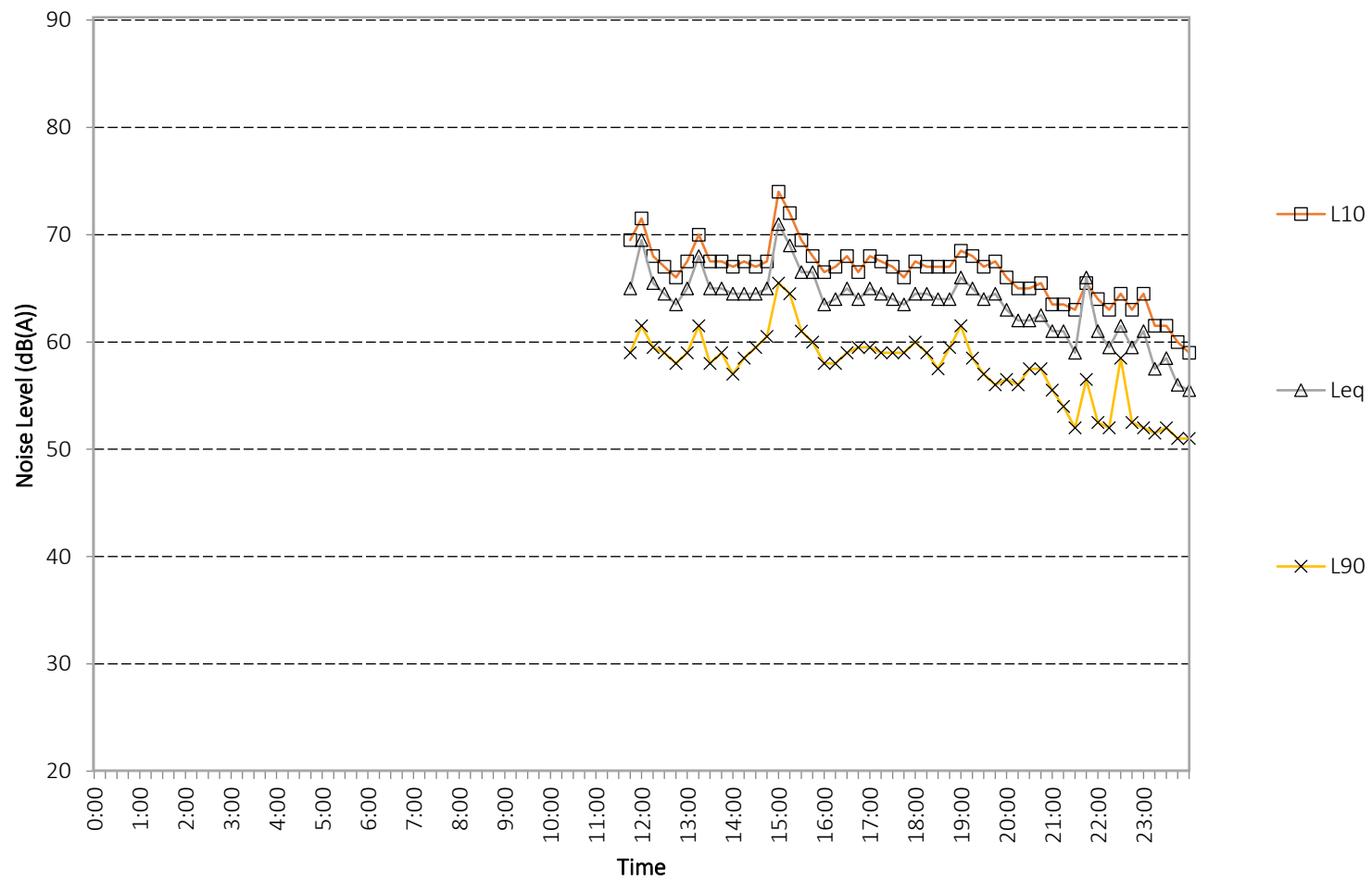


Acoustic Logic Consultancy Pty Ltd  
Glen Campbell

# APPENDIX 1

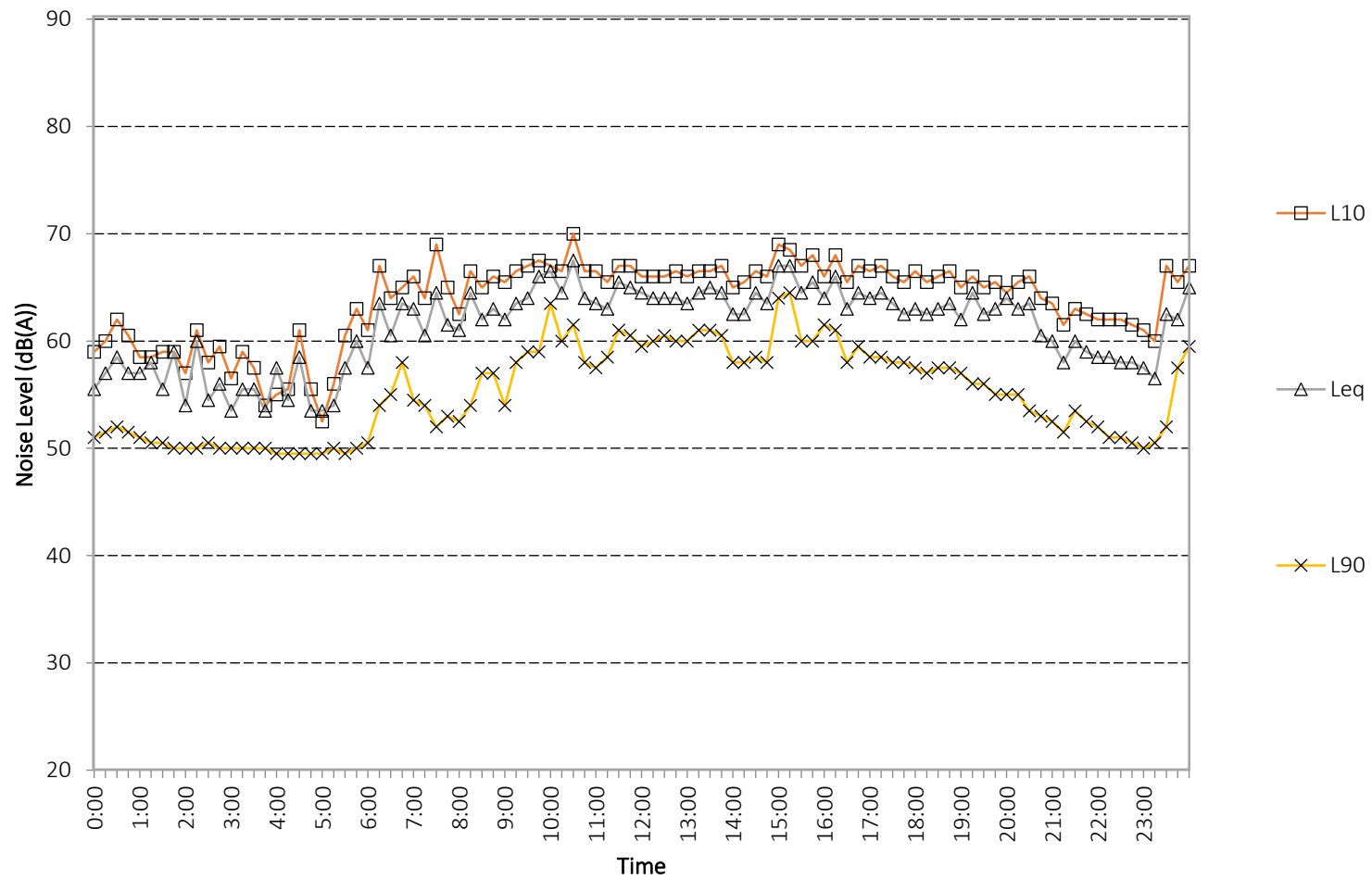
## Unattended Noise Monitoring Data

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Friday November 6, 2015

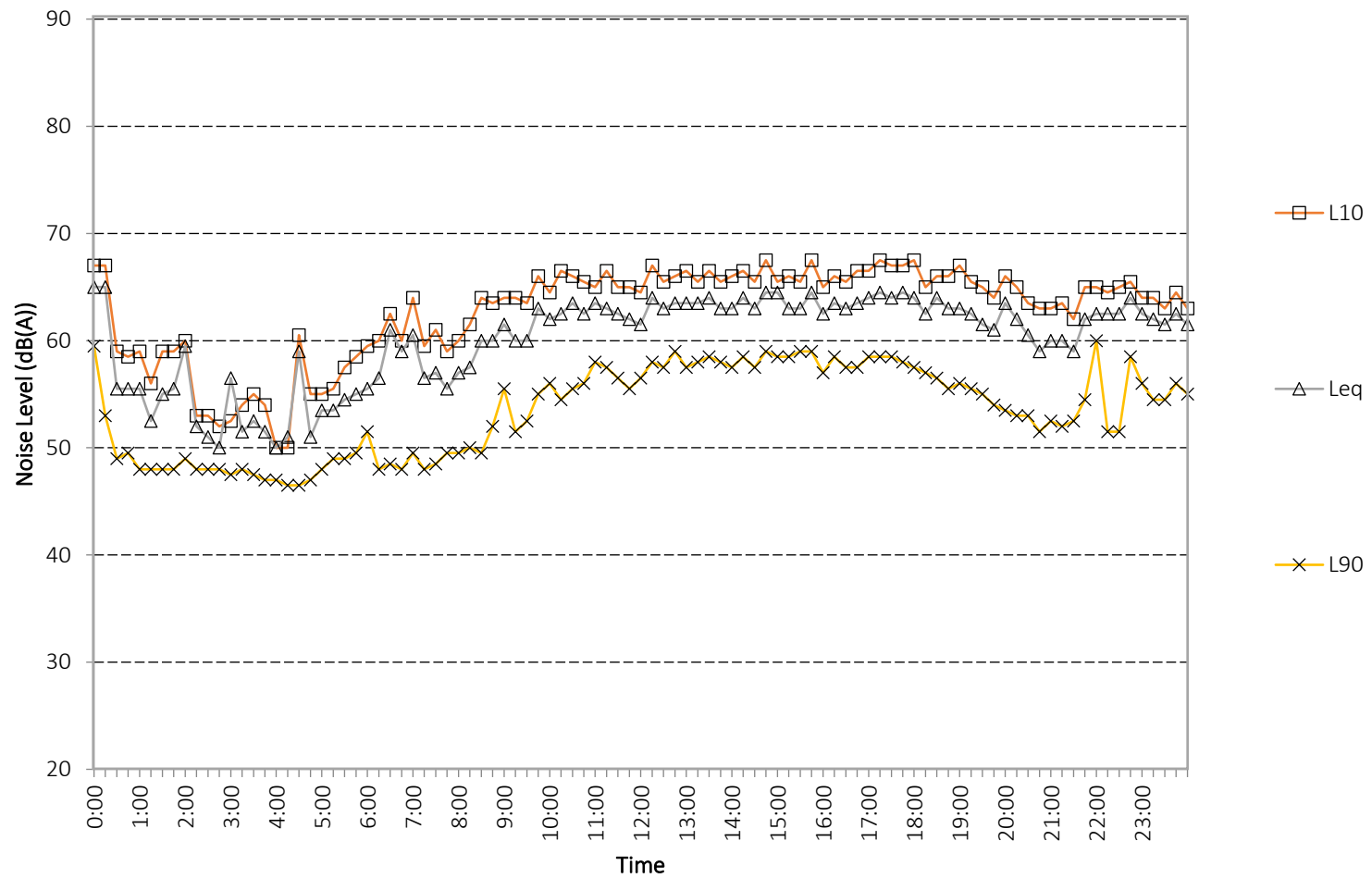


## Waterloo Road

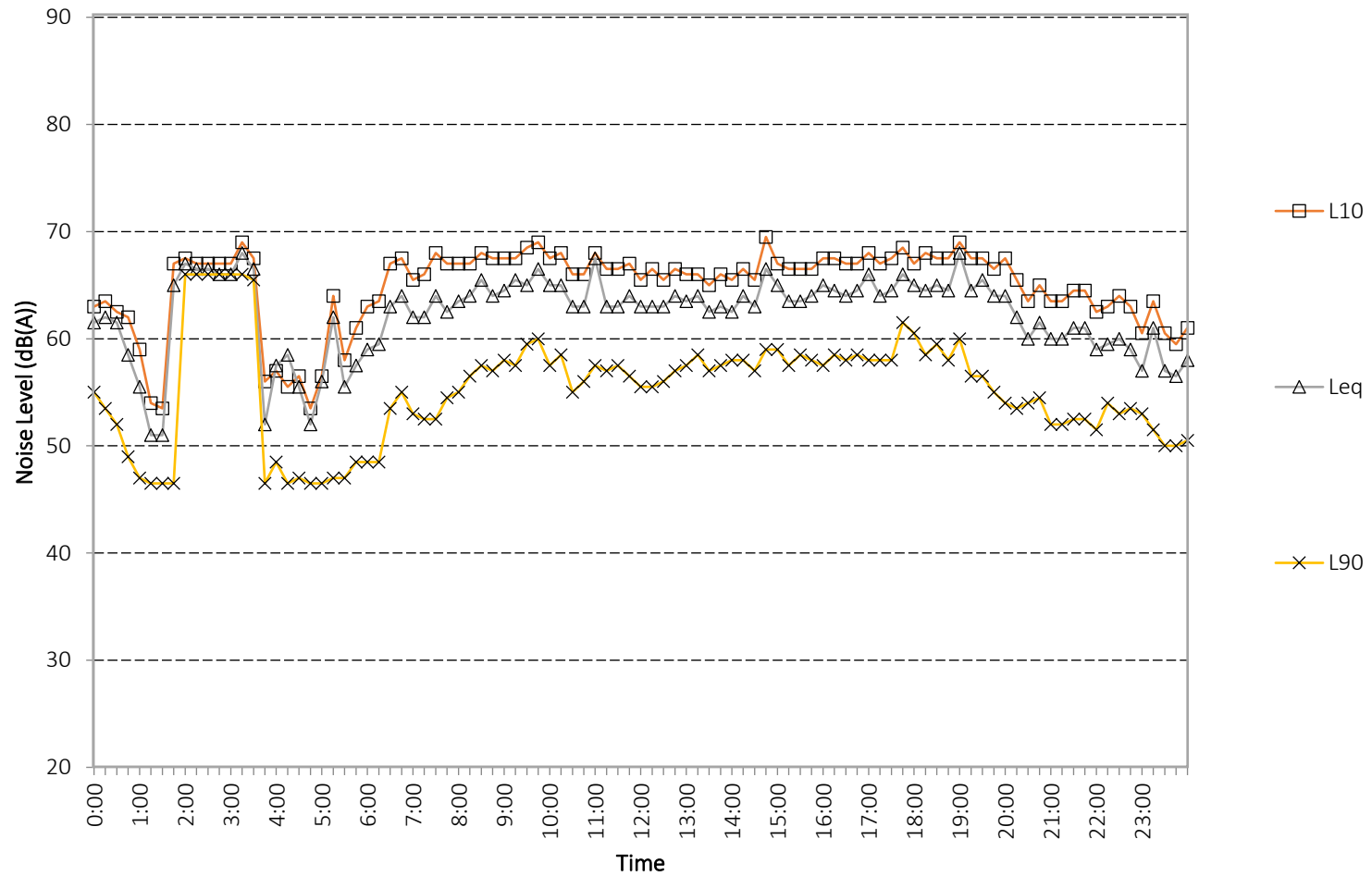
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Waterloo Road  
Sunday November 8, 2015

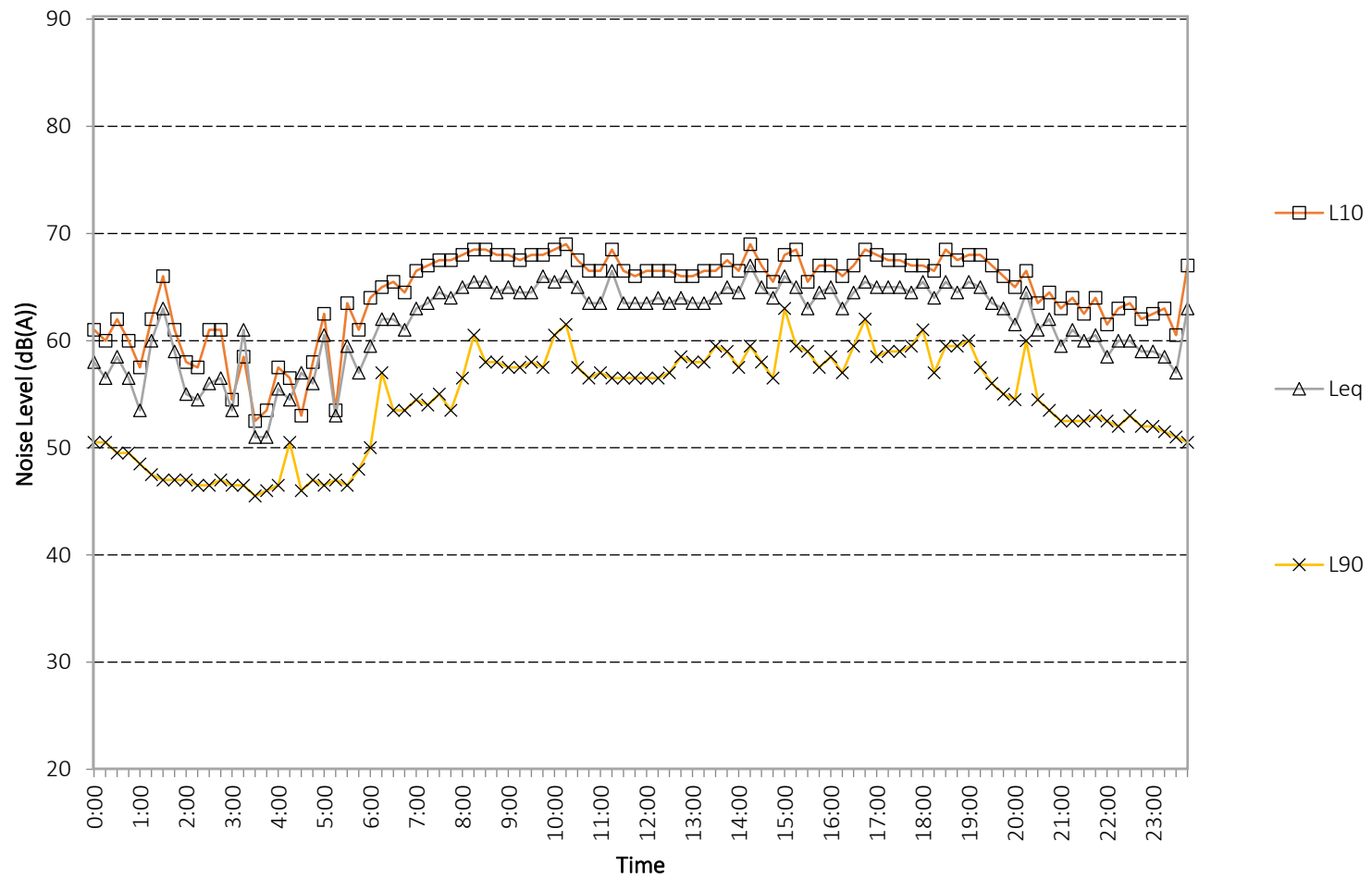


Waterloo Road  
Monday November 9, 2015



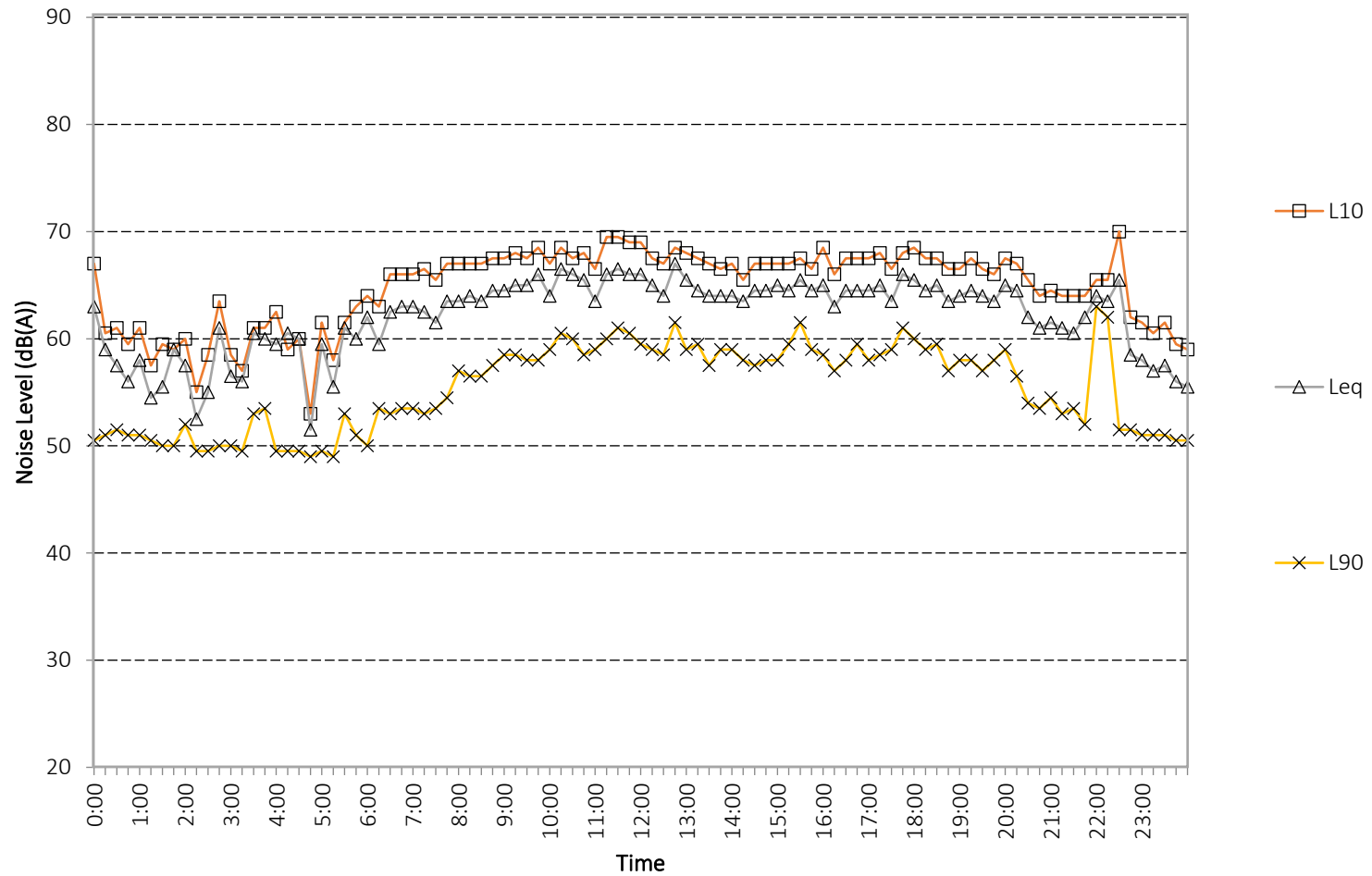
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Tuesday November 10, 2015



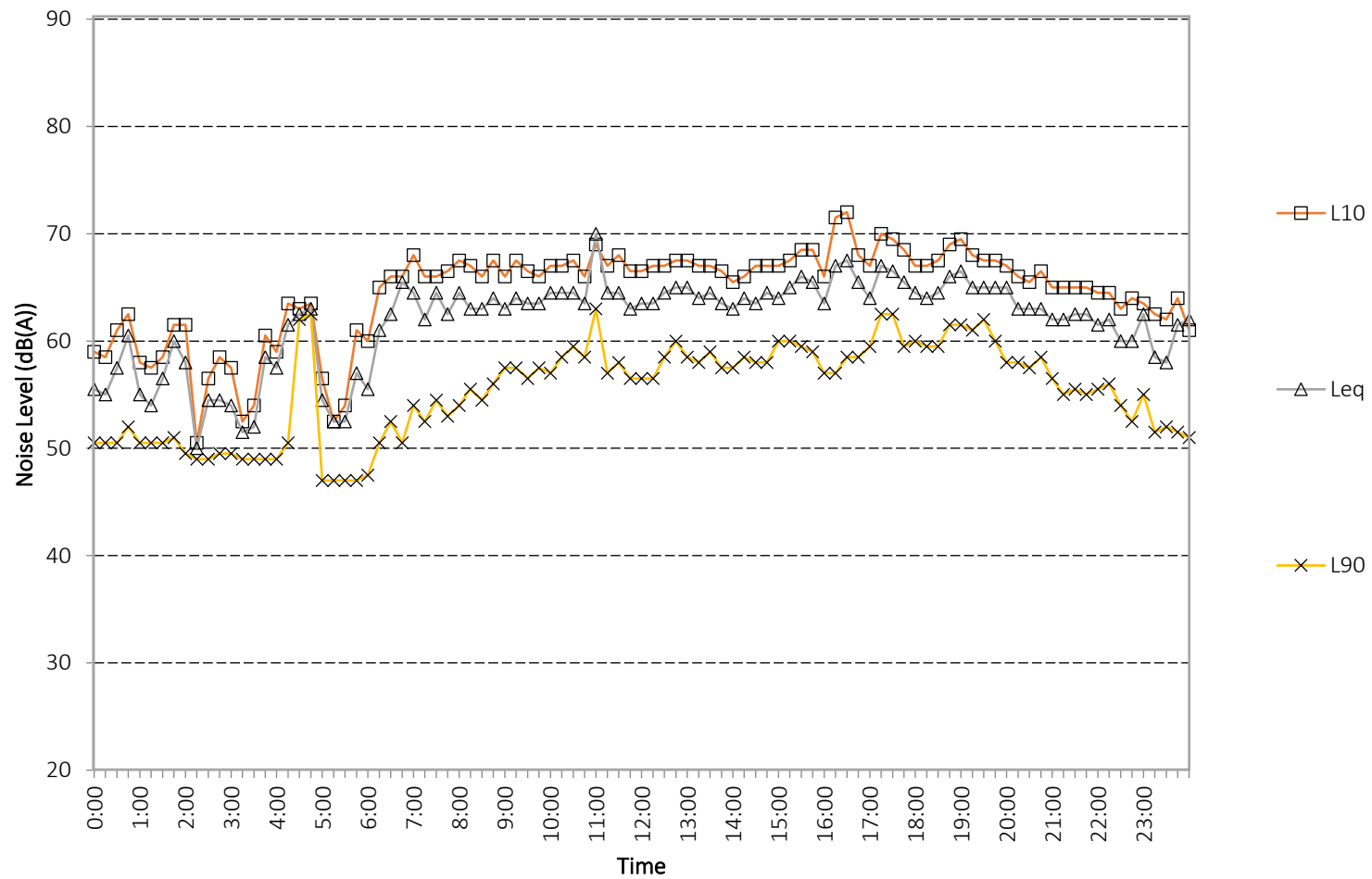
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Wednesday November 11, 2015



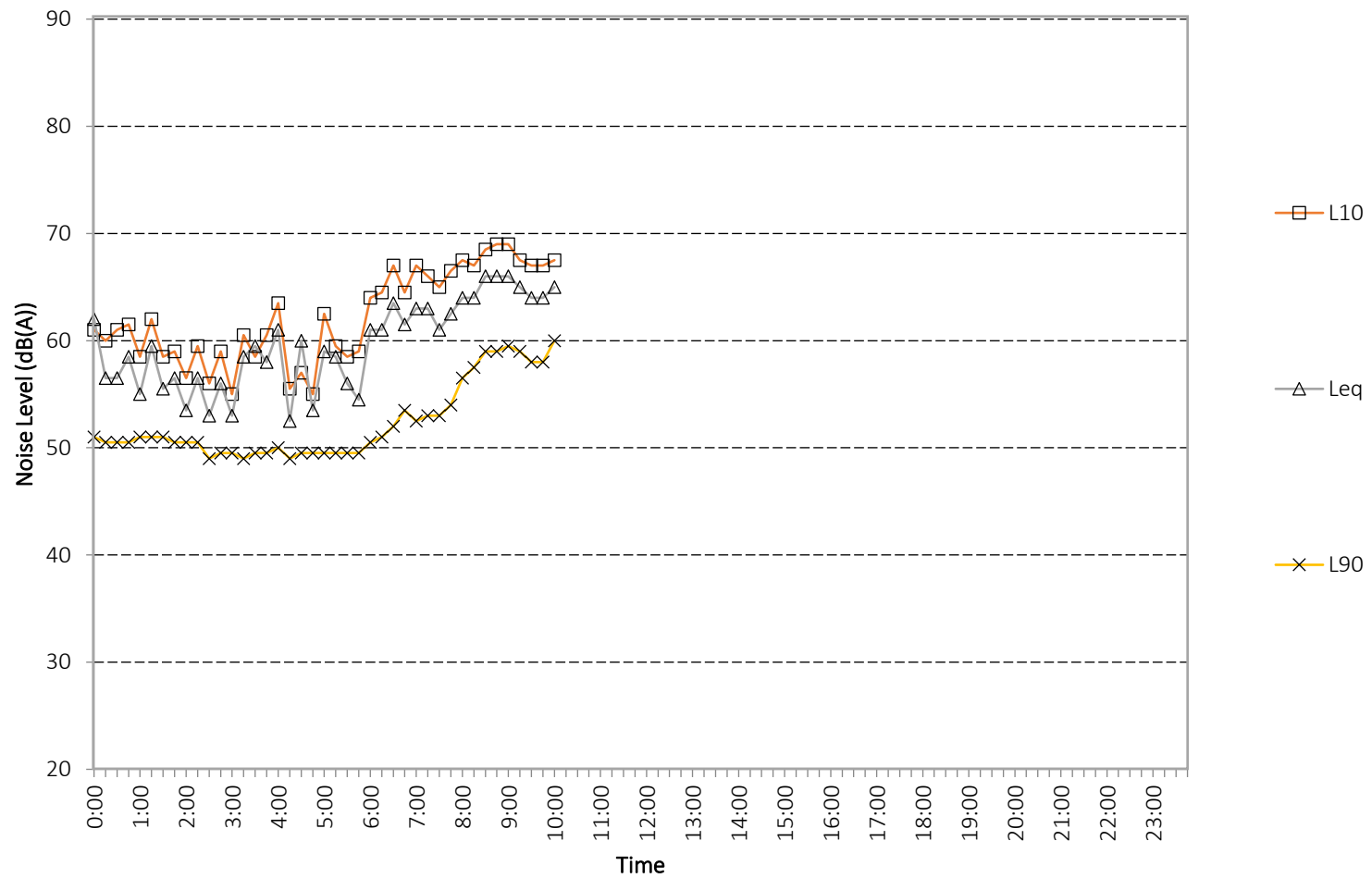
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Thursday November 12, 2015

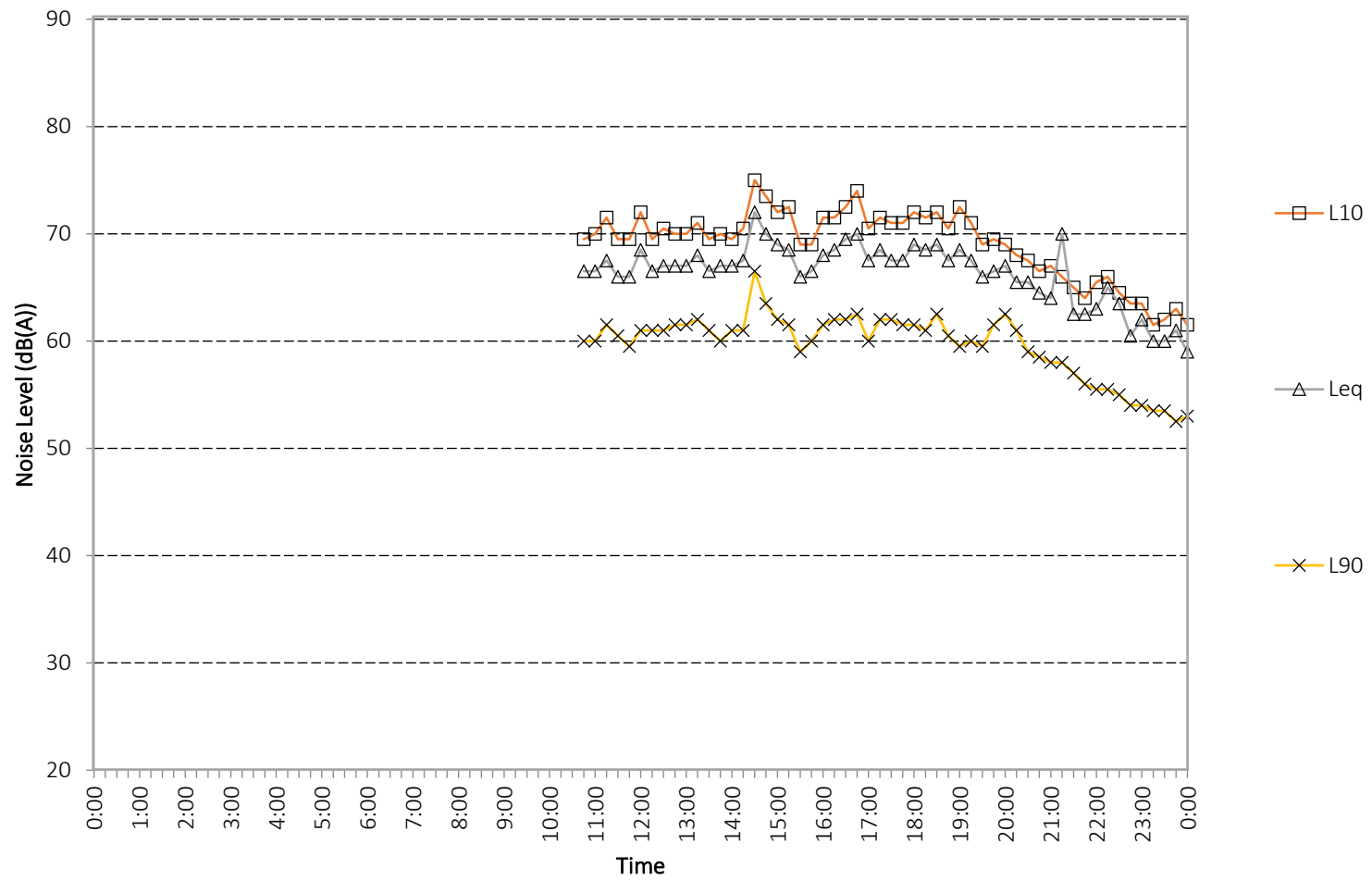


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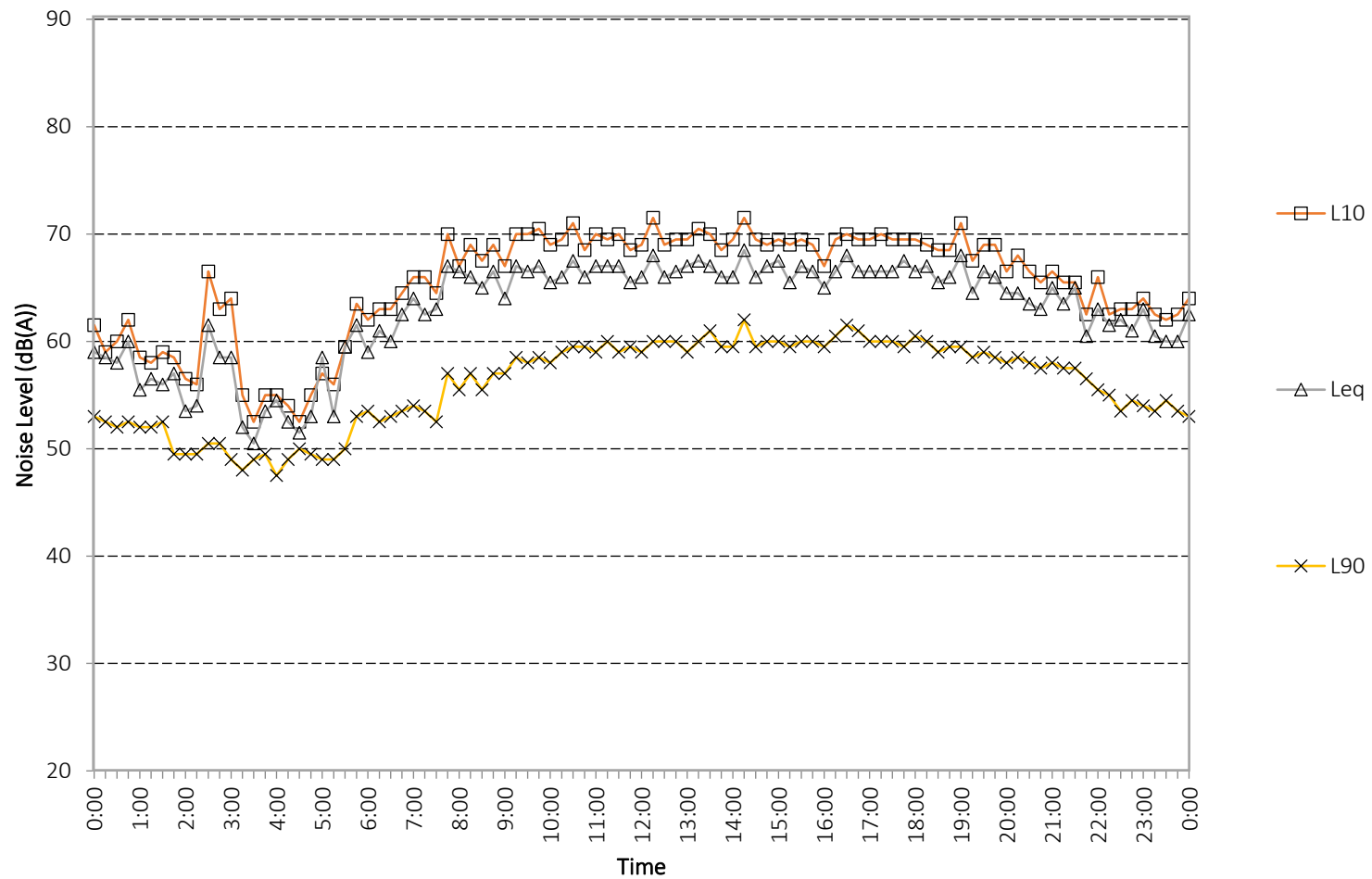
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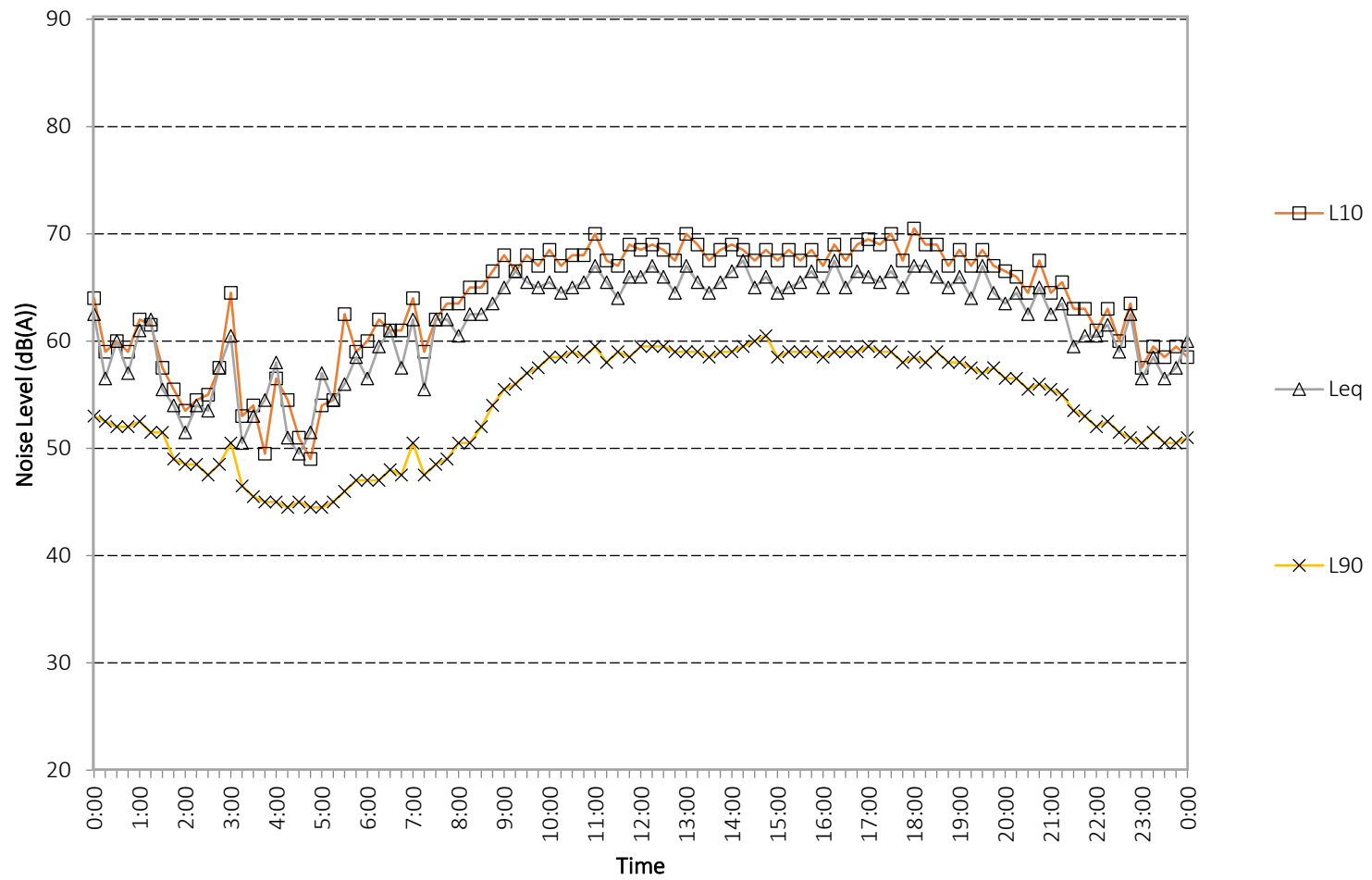
Herring Road  
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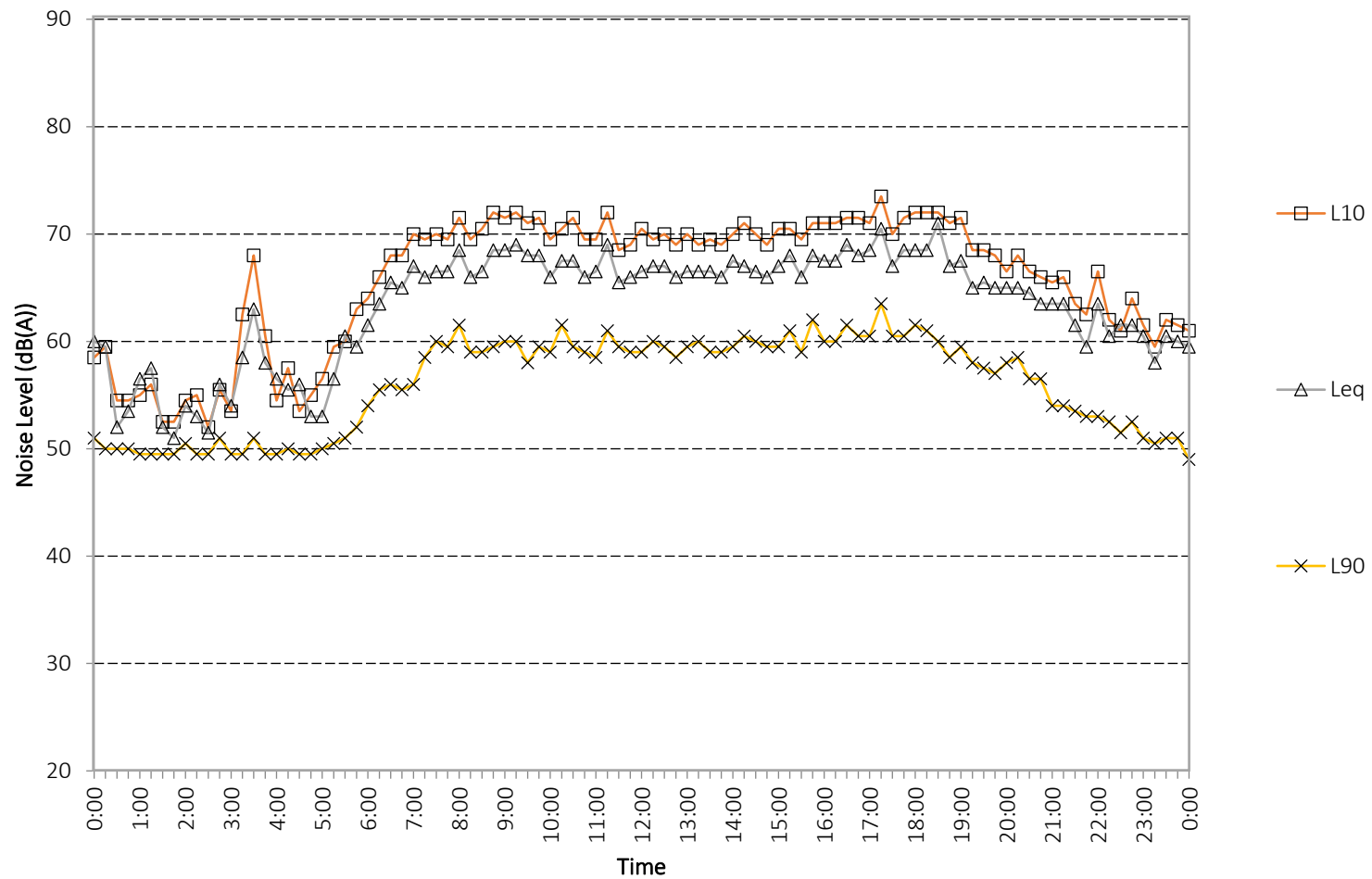
Herring Road  
Saturday November 7, 2015



Herring Road  
Sunday November 8, 2015

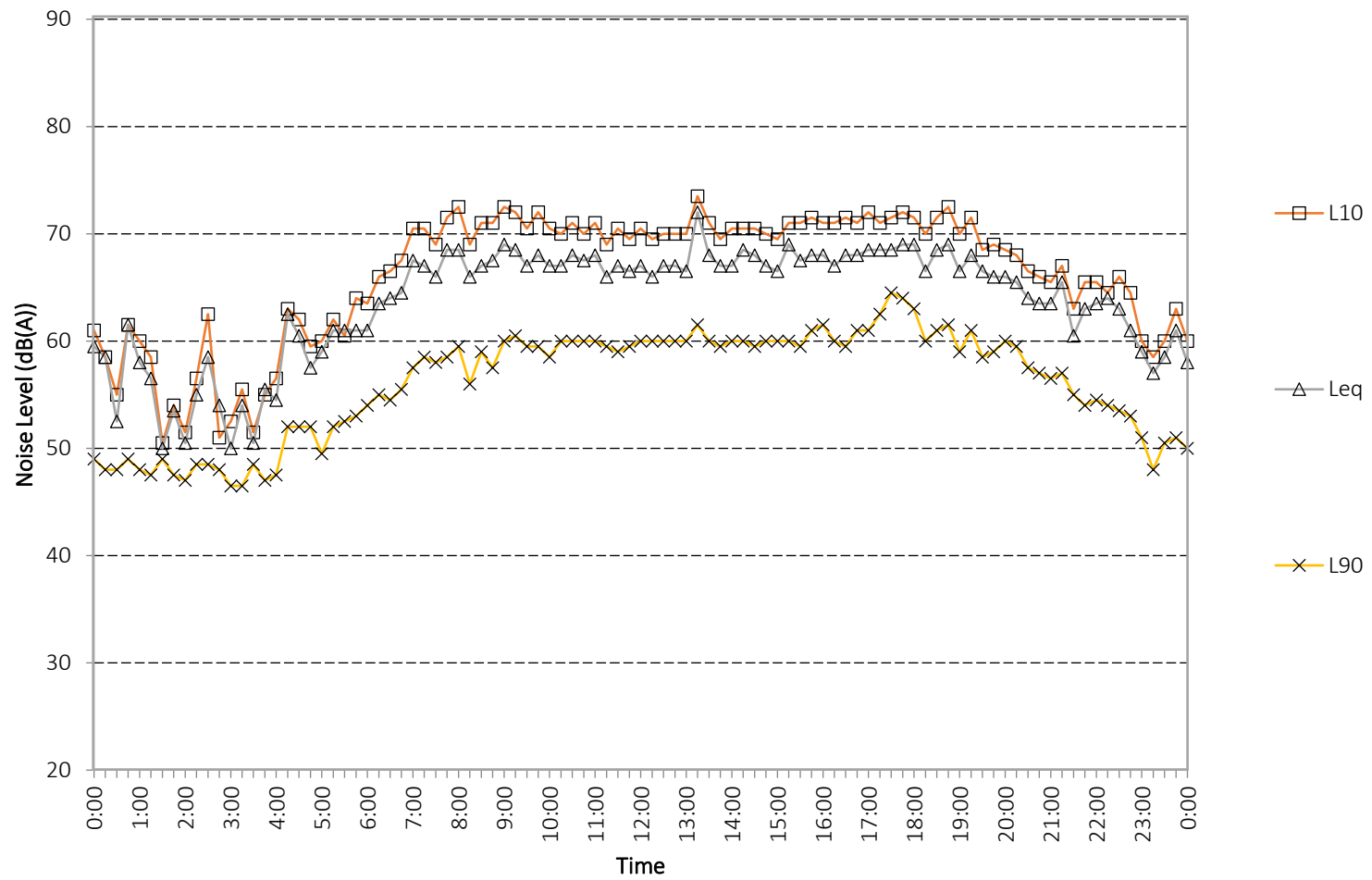


Herring Road  
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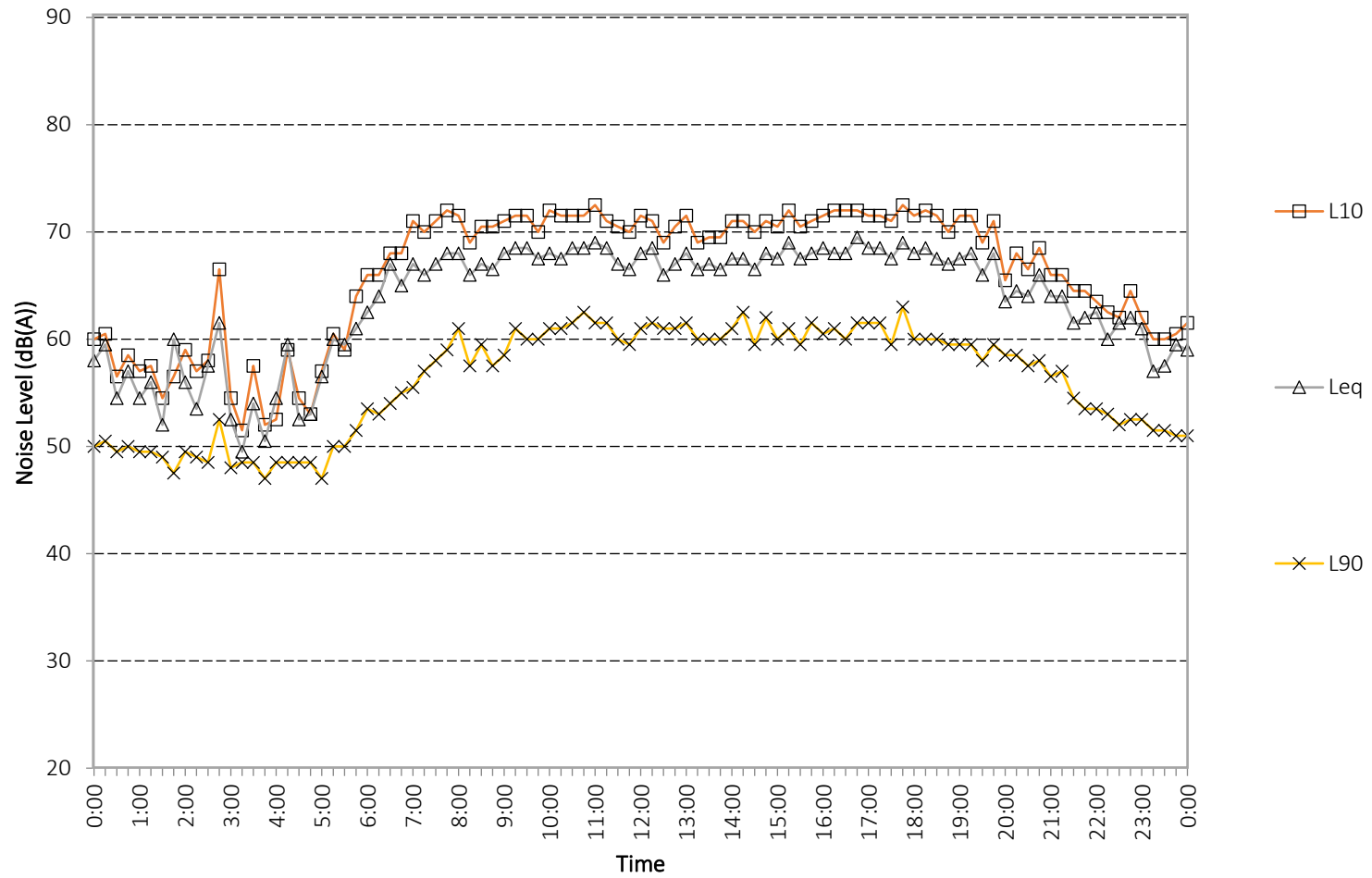
## Herring Road

Tuesday November 10, 2015

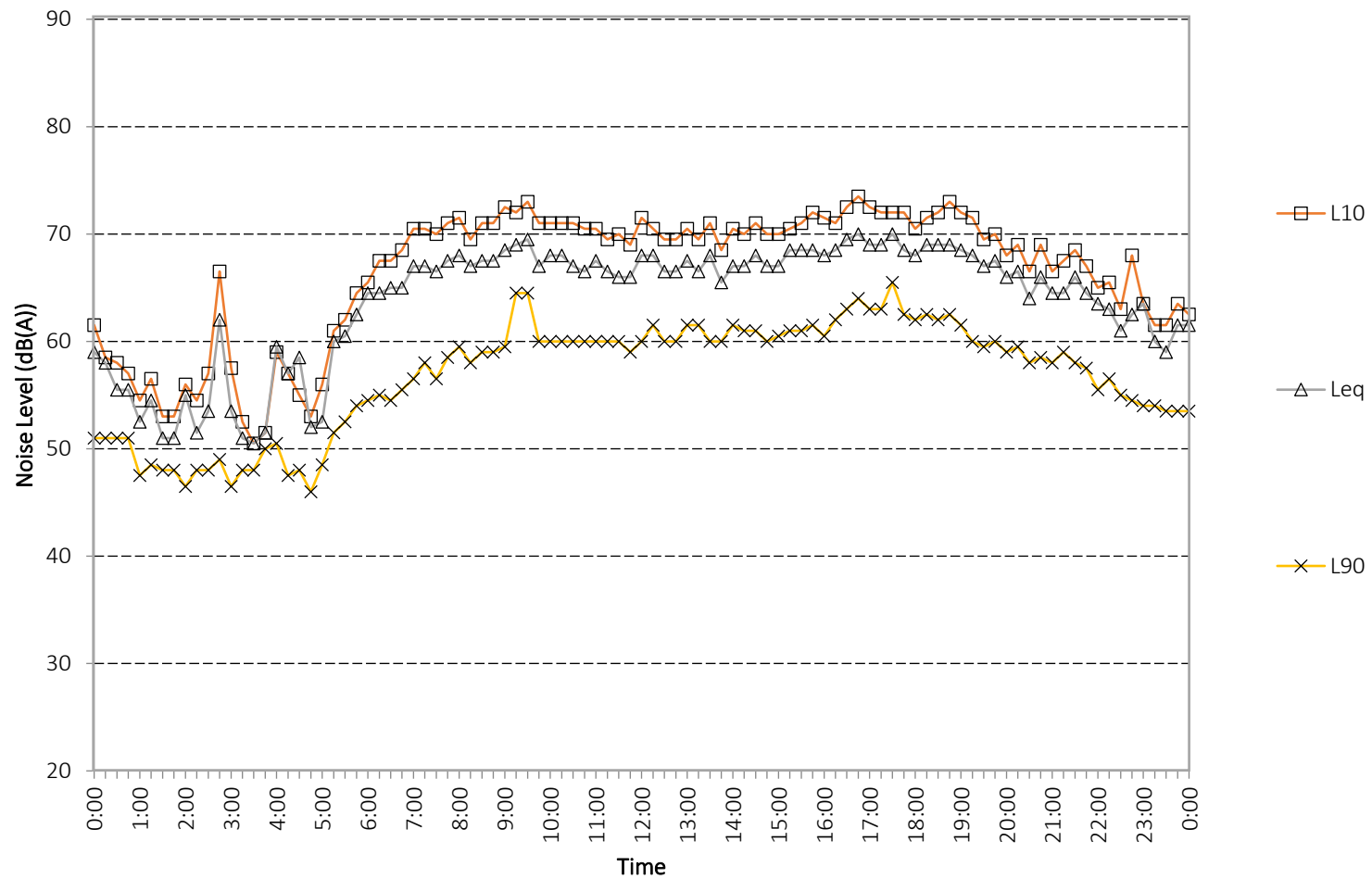


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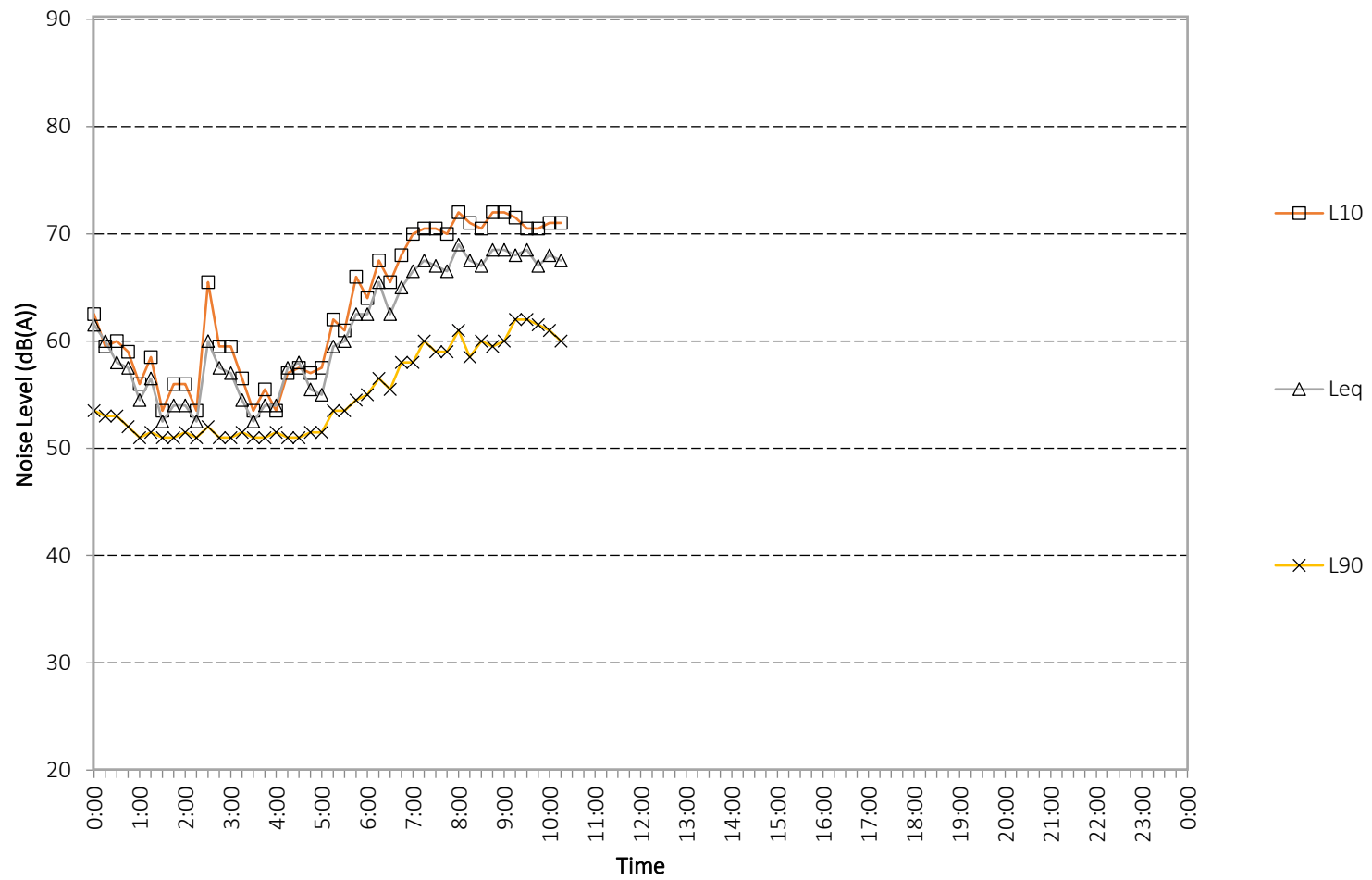
Wednesday November 11, 2015



Herring Road  
Thursday November 12, 2015

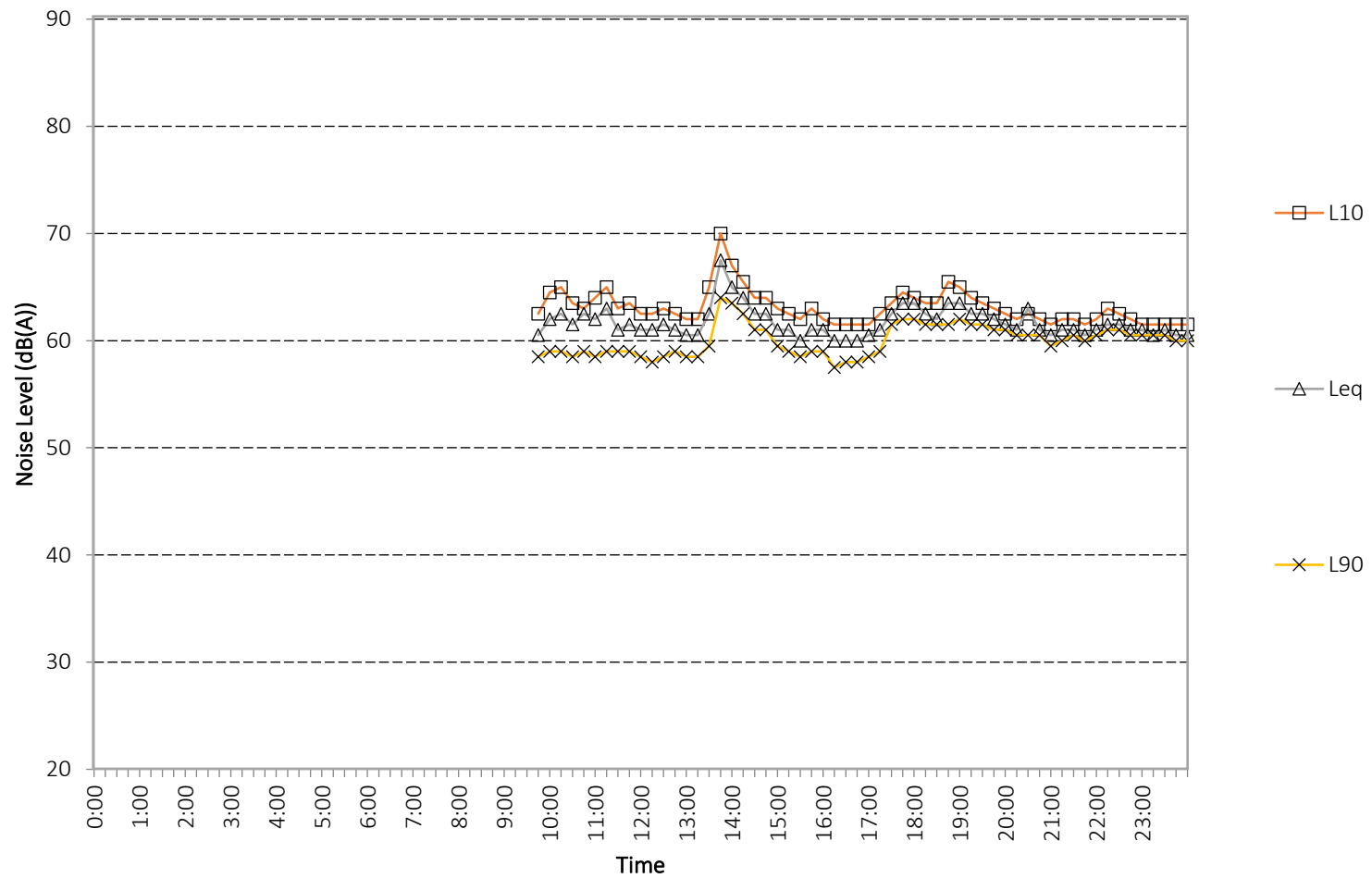


Herring Road  
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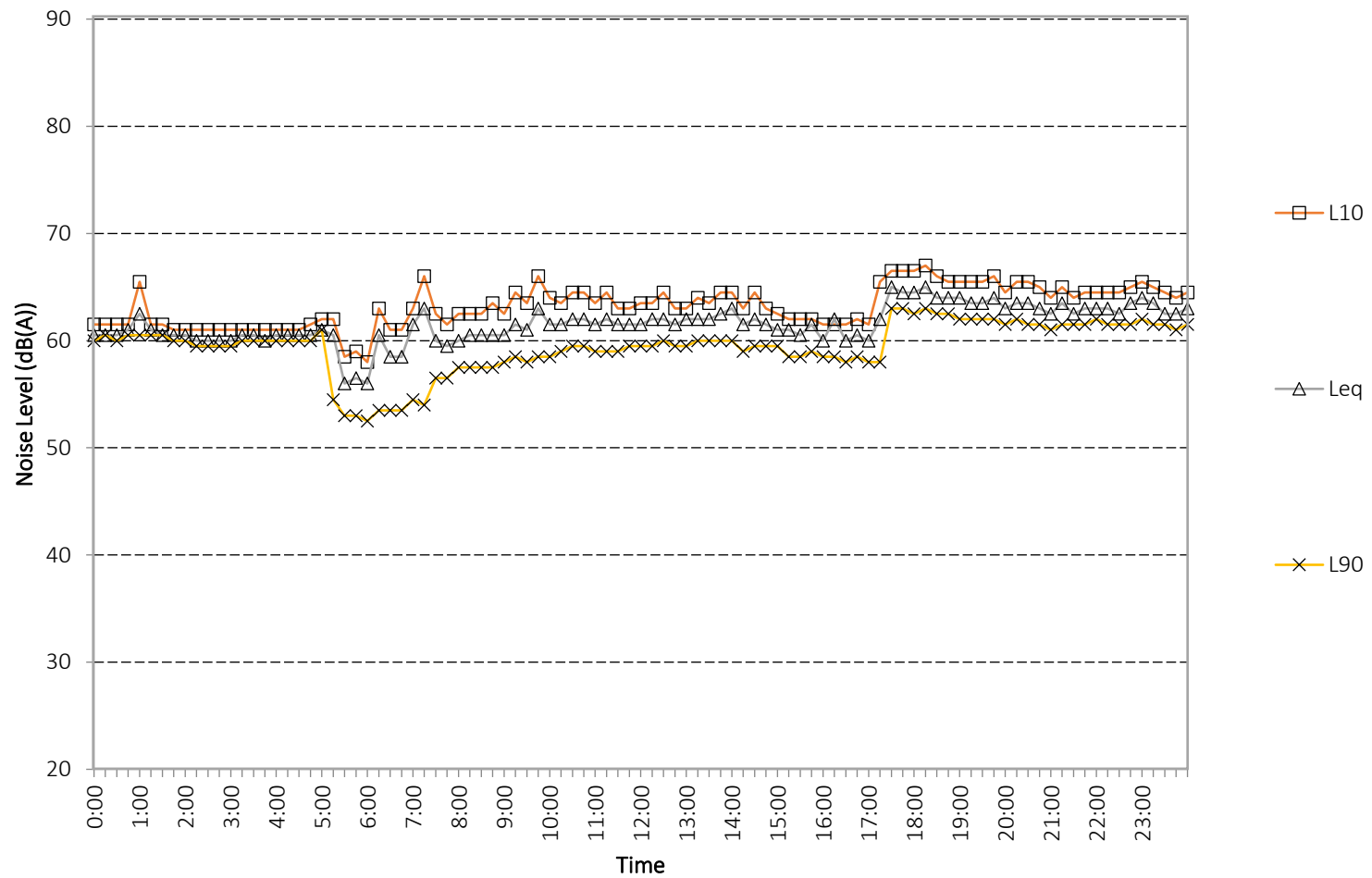


## Talavera Road

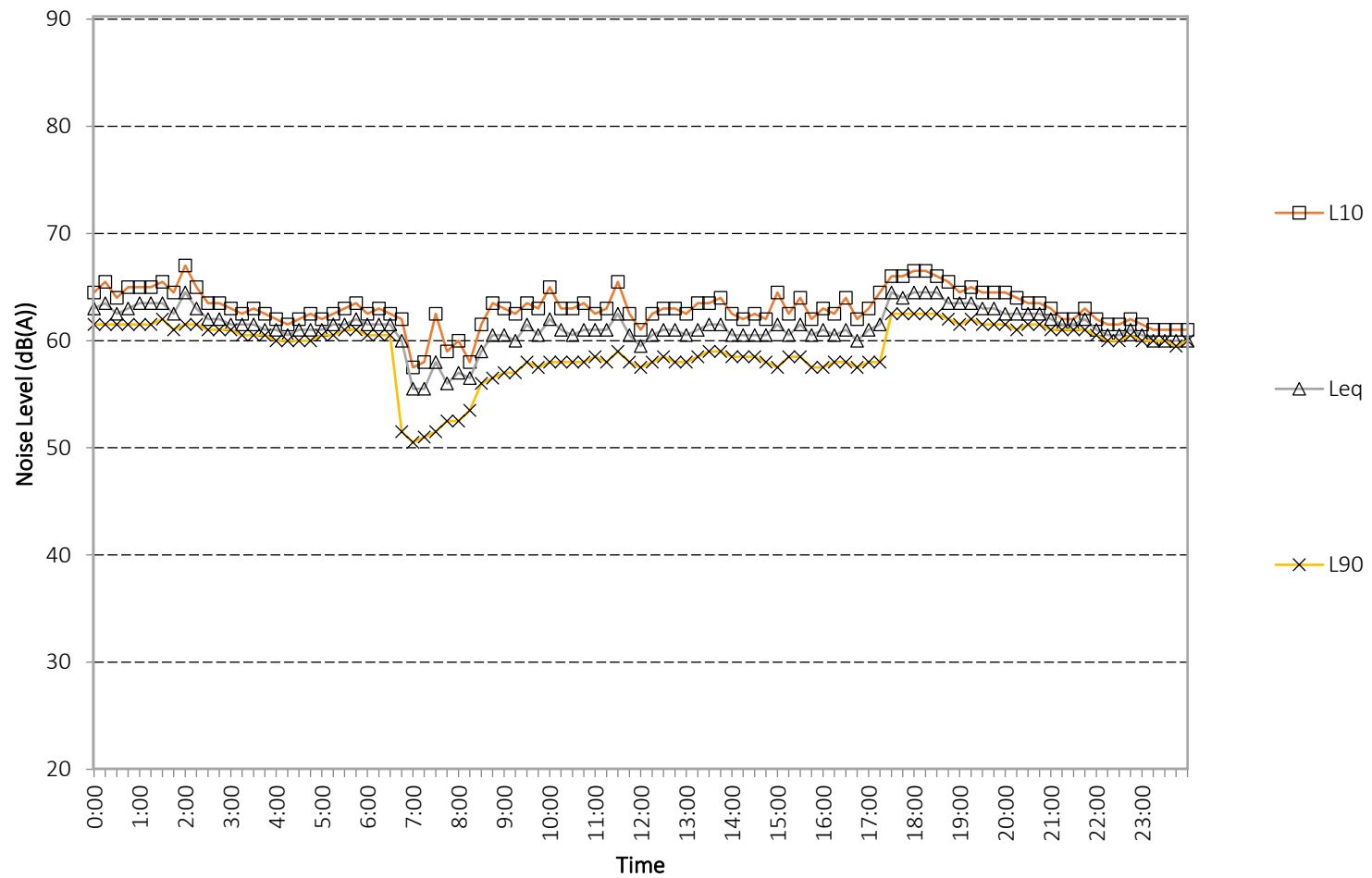
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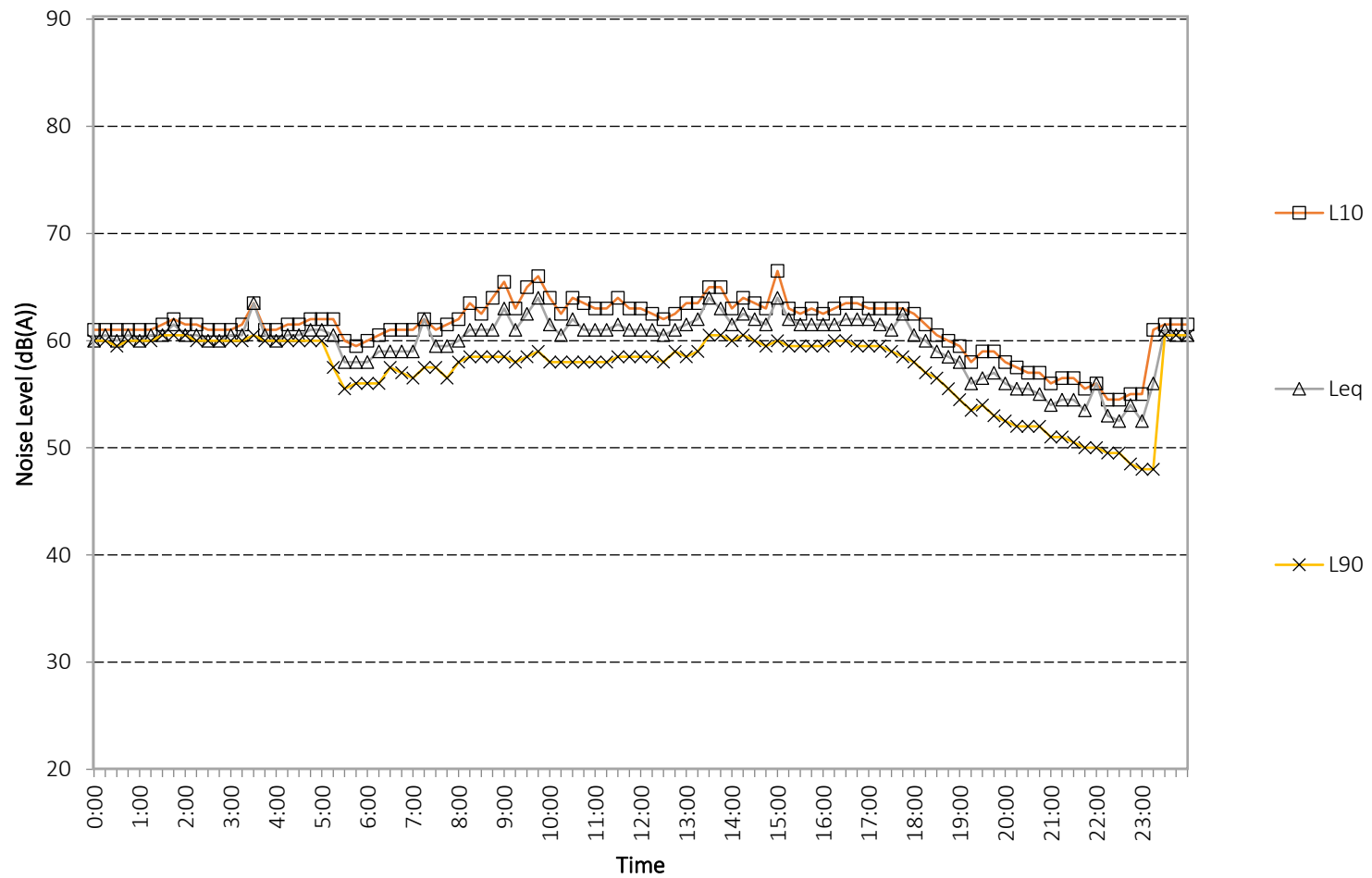
Talavera Road  
Saturday November 7, 2015



Talavera Road  
Sunday November 8, 2015

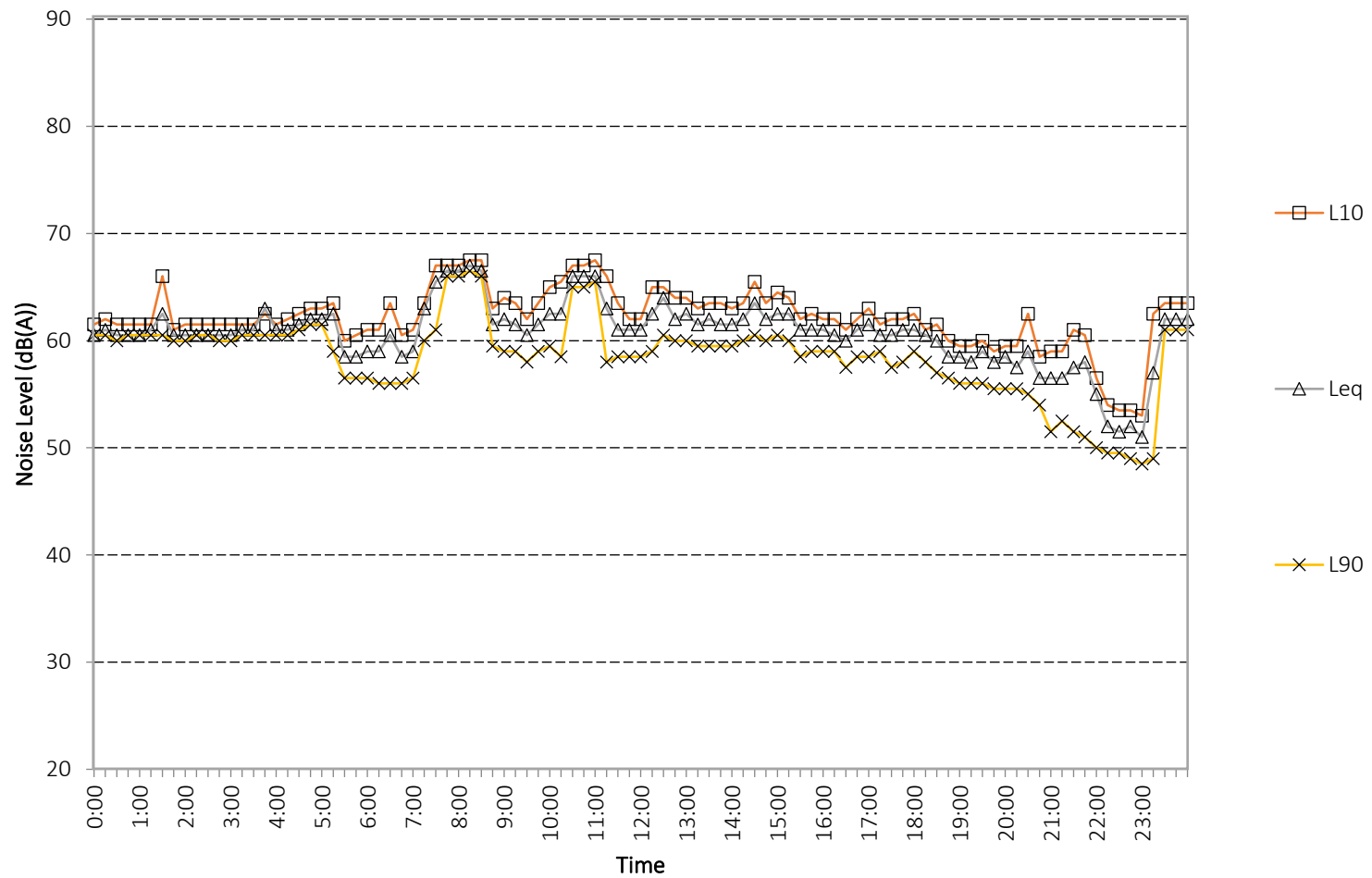


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Monday November 9, 2015



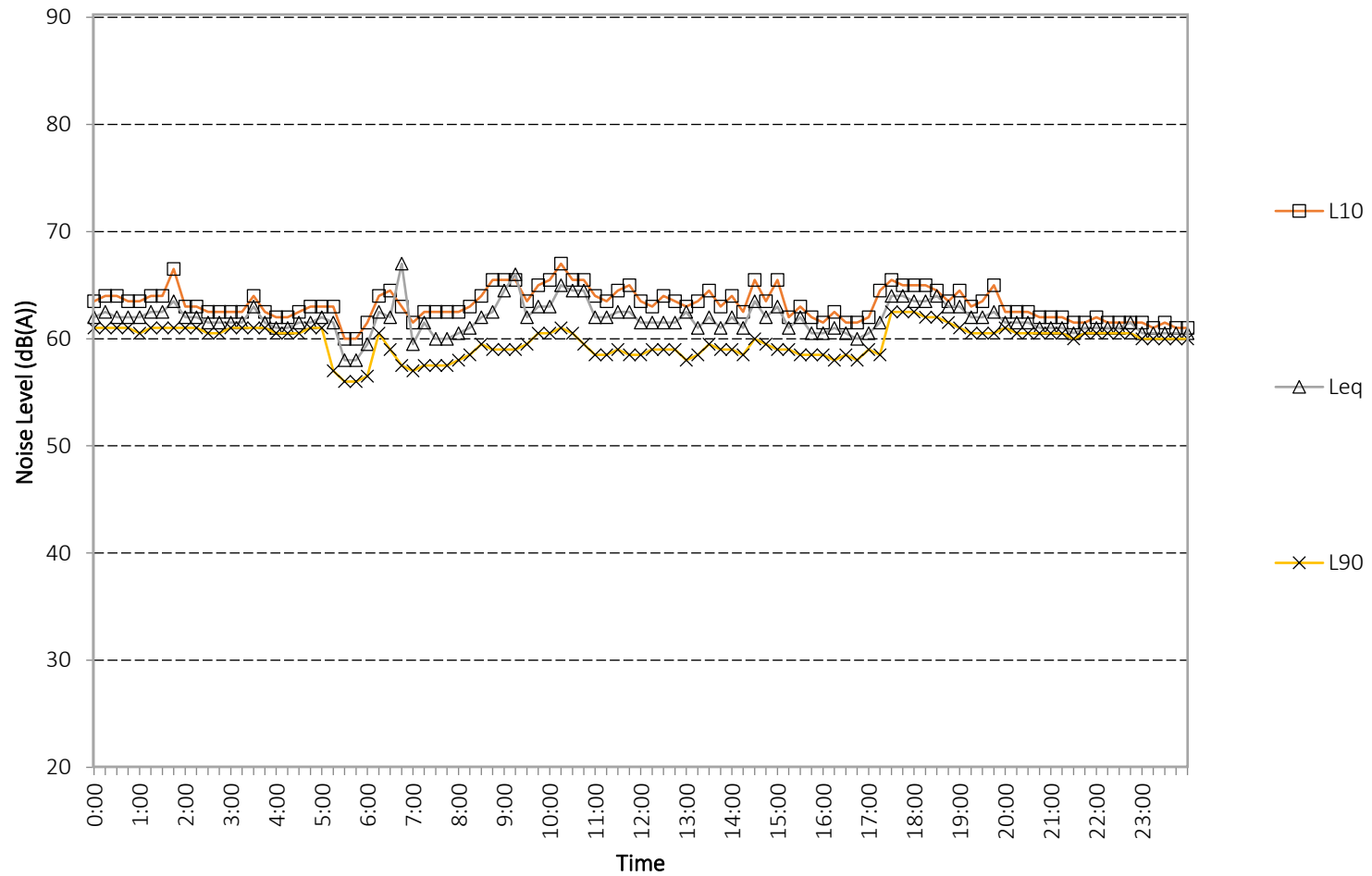
# Talavera Road

Tuesday November 10, 2015



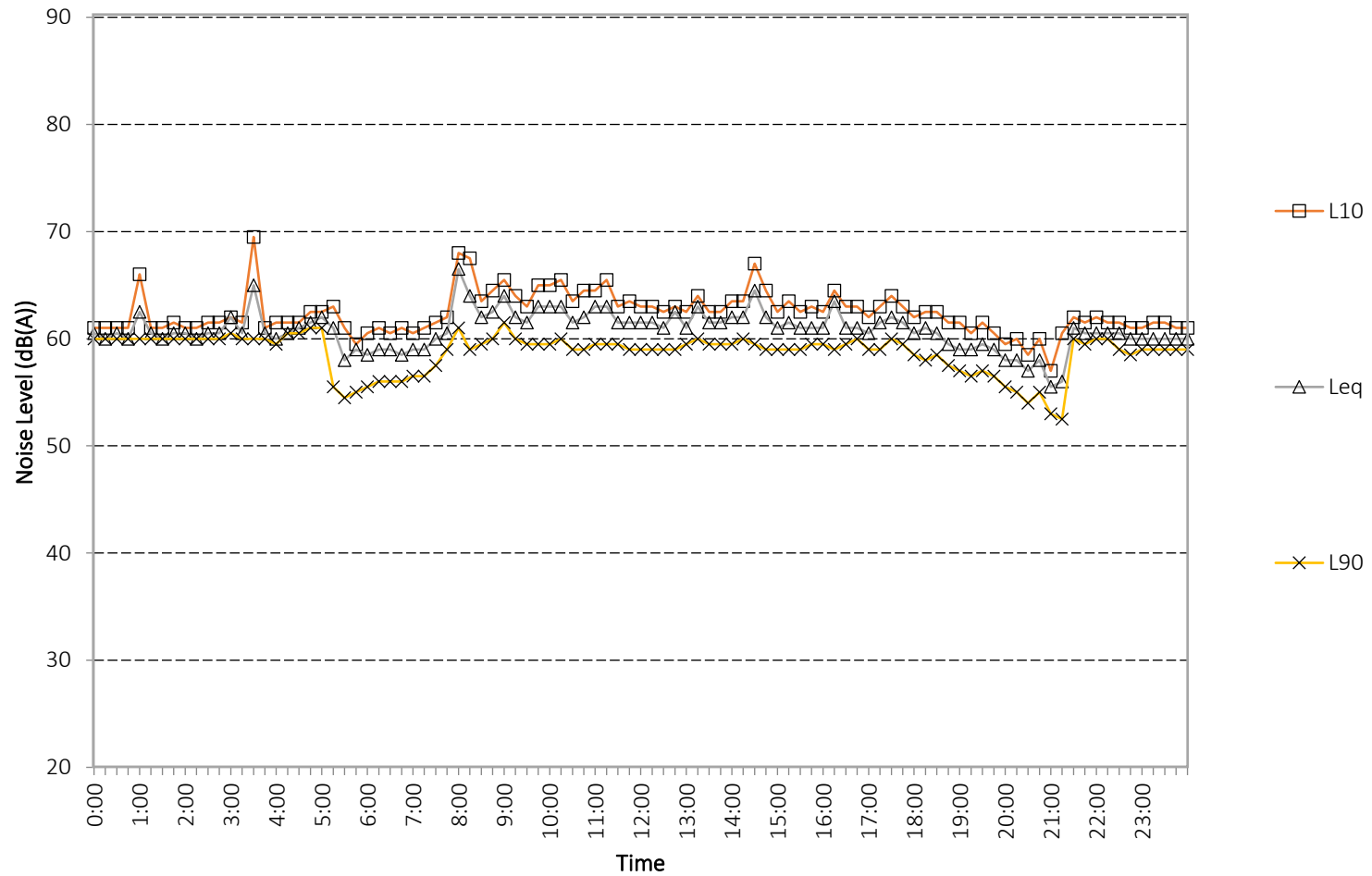
# Talavera Road

Wednesday November 11, 2015



# Talavera Road

Thursday November 12,2015



Talavera Road  
Friday November 13,2015

