# CARDINAL FREEMAN VILLAGE

Supporting Documentation

# Appendix Q

**Acoustic Report**

Prepared by **Acoustic Logic**

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Prepared for: Aevum Limited

# CARDINAL FREEMAN VILLAGE CONCEPT PLAN

# NOISE IMPACT ASSESSMENT AND BCA ACOUSTIC REQUIREMENTS

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TABLE OF CONTENTS

## 1. INTRODUCTION

Acoustic Logic Consultancy Pty Ltd has been engaged by Aevum Limited in order to conduct a Environmental Noise Study for the purpose of assessing the potential impacts on the acoustic amenity of the proposed residents of the development (from external noise sources) and neighbouring properties from noise generated by the site. The noise sources investigated are as follows:

- The site perimeter roadways including Clissold Street and Queen Street.
- Noise emissions from the loading dock.
- Internal mechanical plant noise such as air conditioning plant noise and fan noise.
- Construction noise

The final part of the report will address inter development noise from occupants. At this early stage no detailed design has been conducted for mechanical plant. This study will set the goal assessment criteria applicable to the project based on Council and other relevant statutory/regulatory requirements.

## 2. PROPOSED DEVELOPMENT

The proposed redevelopment on the site consists of the following:

Redevelopment of existing senior apartments and Aged Care beds with approximately 360 new Independent Living Units and Aged Care beds:

- 230 Independent Living Units and Assisted Living Units
- 130 new residential Aged Care Beds

This redevelopment programme results in approx. 175 additional units / beds in the village.

## 3. SITE DESCRITPION

Cardinal Freeman Village occupies a full suburban block bounded by four streets; Clissold, Queen, Victoria and Seaview Street, In Ashfield. The existing village provides independent and assisted living accommodation to more than 330 residents. Figure 1 presents a site map of the village


Figure 1 – Site Map

### 3.1 SURROUNDING NOISE SOURCES

Noise sources with the potential to impact the site are as follows:

- Traffic noise from the surrounding perimeter roadways are the main source of noise impacting upon the proposed development. Queen Street carries medium to low volumes of traffic and mainly acts as a conduit for traffic exiting Liverpool Road and accessing local roads and residences. Clissold Street carries low volumes of traffic and is deemed as a local road.
- The development is serviced by a loading dock that is accessed by trucks from Clissold Street. It is noted that the loading dock will only by used between 7am and 6pm Monday to Saturday; and 8am to 6pm Sundays and public holidays.

## 4. BACKGROUND NOISE LEVELS

Existing background noise levels were measured in the vicinity as indicated in Figure 1 (Section 1) of the proposed development. The location was selected in order to characterise the existing background noise levels within and surrounding the proposed development.

### 4.1 ENVIRONMENTAL NOISE DESCRIPTORS

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

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

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

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

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

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

## 4.2 MONITORING PERIOD

Unattended noise monitoring was conducted during the period of 7th April 2009 to 15th April 2009 in order to measure the existing background noise levels.

## 4.3 MONITORING EQUIPMENT

Unattended noise measurements were obtained using an Acoustic Research Laboratories Pty Ltd noise logger. The logger was programmed to store 15-minute statistical noise levels throughout the monitoring period. The noises monitors were calibrated at the beginning and the end of the measurement using a Rion NC-73 calibrator. No significant drift was detected. All measurements were taken on A-weighted fast response mode. There were no significant periods of adverse weather conditions during the measurement period.

## 4.4 MONITORING LOCATION

Figure 1 in Section 1 of this document presents an illustration of the site. Additionally unmanned noise monitoring positions have been presented.

## 4.5 EXISTING BACKGROUND NOISE LEVELS

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

Table 1 – Measured Ambient Noise Levels

| Location | Description | Day Noise Level 7am to 6pm (dB(A)) | Evening Noise Level 6pm to 10pm (dB(A)) | Night Noise Level 10pm to 7am (dB(A)) |
|---|---|---|---|---|
| Subject Site | Background $L_{90,15min}$ | 38 | 37 | 30 |

# 5. INTERNAL NOISE CRITERIA

The determination of an acceptable level of traffic noise within the residential 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.

Assessment shall be conducted in accordance with Australian Standards AS2107-2000 *"Acoustics - Recommended Design Sound Levels and Reverberation Times for Building Interiors"* as well as AS3671-1989 *"Acoustics – Road Traffic Noise Intrusion – Building, Siting and Construction"*

AS2107-2000 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 $L_{eq}$ dB(A) or $L_{10}$ dB(A) traffic noise descriptor be used for the occupancy being assessed. On this basis an appropriate descriptor for bedrooms is the $L_{eq}$ between 10pm and 7am (known as $L_{eq(9hr)}$). This is taken as being the normal sleep period. For living rooms the $L_{eq}$ measured between 7am and 10pm is appropriate (this is known as $L_{eq(15hr)}$).

Based on AS2107-2000 and AS3671-1989 the following assessment criteria would apply to the proposed development.

Table 2 - Traffic Noise Criteria for All Spaces within the Development

| SPACE/ACTIVITY TYPE | NOISE LEVEL |
|---|---|
| Bedrooms | 40 dB(A) $L_{eq,(9hr)}$ |
| Living Areas | 45 dB(A) $L_{eq,(15hr)}$ |

# 6. NOISE GENERATED ON THE SITE – NOISE EMISSION CRITERIA

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

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

## 6.1 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 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.

## 6.2 AMENITY CRITERION

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

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

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

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

Table 3 – DECC Recommended Amenity Industrial Noise Levels

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

### 6.3 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.

### 6.4 SUMMARY OF ASSESSMENT CRITERIA FOR PROPOSED SITE

The intrusiveness, amenity and sleep arousal criteria for this project have been determined using these guidelines and the noise monitoring results. These are summarised below. We note that the formulation of the assessment criteria has been based on the lowest ambient levels determined from all monitoring data. The amenity criterion is applied when noise events are steady throughout the four hour period. For intermittent events, the intrusiveness criterion is still subject to application. Noise emissions from mechanical plant, loading docks and vehicles on site are to comply with the criteria below.

#### 6.4.1 DECC Day Period

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

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

| Location | Measured Noise Level dB(A) $L_{eq}$ * | Measured Noise Level dB(A) $L_{90}$ | Amenity Criterion dB(A) $L_{eq}$ | Intrusiveness Criterion dB(A) $L_{eq}$ |
|---|---|---|---|---|
| Residences on Clissold & Queen Street | 59 | 38 | 55 | 43 |

* Unless otherwise stated the existing noise level is due to transportation noise.

#### 6.4.2 DECC Evening Period

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

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

| Location | Measured $L_{eq}$ Noise Level dB(A)* | Measured Noise Level dB(A) $L_{90}$ | Amenity Criterion dB(A) $L_{eq}$ | Intrusiveness Criterion dB(A) $L_{eq}$ |
|---|---|---|---|---|
| Residences on Clissold & Queen Street | 58 | 37 | 45 | 42 |

* Unless otherwise stated the existing noise level is due to transportation noise.

### 6.4.3 DECC Night Period

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

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

| Location | Measured Noise Level dB(A) $L_{eq}$ | Measured Noise Level dB(A) $L_{90}$ | Amenity Criterion dB(A) $L_{eq}$ | Intrusiveness Criterion dB(A) $L_{eq}$ | Noise Objective for Intermittent Activities dB(A) $L_{1\ (1\ Min)}$ (Background + 15 dB(A)) | Measured Existing dB(A) $L_{1,\ 15\ min}$ |
|---|---|---|---|---|---|---|
| Residences on Clissold & Queen Street | 49 | 30 | 40 | 35 | 45 | 62 |

## 6.5 RECOMMENDATIONS

Detailed plant selections are not available at this stage, and as such it is not possible to carry out a detailed examination of the ameliorative measures that may be required in order to achieve the noise objectives as presented in the above tables. This may include selecting the quietest plant practicable, or treating the plant with enclosures, barriers, duct lining and silencers, etc as required to comply with the noise objectives presented in the above tables. Experience with similar projects indicates that it is possible to achieve the regulatory authority requirements with appropriate treatment determined at the Construction Certificate Stage.

## 7. ASSESSMENT CRITERIA – ADDITIONAL TRAFFIC GENERATION

For land use developments with the potential to create additional traffic on local roads the development should comply with the requirements detailed in the EPA ECRTN. Criteria applicable to the development are detailed below. It is noted that Queen Street is a Collector Road and Clissold Street is deemed as a Local Road. If existing noise levels exceed those in Table 8 a 2 dB increase in noise is allowed.

Table 8 - Criteria for Traffic Noise for New Developments

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

The investigation revealed that any increased traffic flows will cause an imperceptible increase in noise level.

# 8. CONSTRUCTION NOISE AND VIBRATION MANAGEMENT PLAN

This section presents the construction noise and vibration management plan that will be followed in order to manage noise and vibration emissions from the construction of the proposed residential development at the Cardinal Freeman Village Ashfield.

The site of the subject development is located in an existing residential area. In recognition of the requirement to minimise noise and vibration emissions from the site to surrounding land uses this study was commissioned. The principal objective is to undertake an evaluation of the work to be performed during on site and forecast the potential impact. The noise forecasts will be used to formulate and streamline effective regulation and mitigation measures.

The principal issues that will be addressed in this document are:

1. Specific activities that will be conducted and the associated noise sources.
2. Identification of all potentially affected sensitive receivers
3. The construction noise objective
4. The construction vibration objective
5. Appropriate noise and vibration objectives for each receiver
6. Noise and vibration monitoring, reporting and response procedures.
7. Assessment of potential noise and vibration from the proposed construction activities including noise from construction vehicles and any traffic diversions.
8. Description of specific mitigation treatments, management methods and procedures that will be implemented to control noise and vibration during construction
9. Procedures for notifying residents.
10. Contingency plans to be implemented in the event of non-compliances and/or noise complaints.

## 8.1 ACTIVITIES TO BE CONDUCTED AND THE ASSOCIATED NOISE SOURCES.

A description of each process and the associated equipment is presented below:

### 1. Demolition

This involves the removal of existing roof structure, light weight façade including glazing and doors, light weight partitions and internal soft finishes including kitchen and bathroom cupboards, doors and carpet.

### 2. Erection of Structure

This involves the construction of new building structure. The processes involved in this activity include the construction of bored piles to support the basement slab and structure, delivery of materials, erection of formwork, pouring of concrete, and stripping of formwork. All materials for form working and structural steel are transported to the work face using the site tower cranes and man/material hoists. Concrete will be pumped using concrete pumps.

### 3. External Finishes Works

This involves installation primarily of façade glazing and brickwork to the exterior of the building. This work will be implemented once the building structure is complete and formwork has been removed.

### 4. Internal Fitout and Finishes

This involves all internal fitout work from the installation of plasterboard ceilings, services installation to painting and joinery. All work covered under this section, will be contained within the building, with the facade providing a barrier to the direct transmission of noise to the exterior.

The A-weighted sound power levels for all the component parts of the above-described activities are outlined in Table 1 below.

Table 1 – Sound Power Levels

| CONSTRUCTION ACTIVITY | EQUIPMENT /PROCESS | SOUND POWER LEVEL dB(A) |
|---|---|---|
| 1 – Demolition | Angle grinders | 114 |
| | Bobcat | 105 |
| | Crane | 105 |
| | Truck | 108 |
| 2 - Erection of Structure | Angle grinders | 114 |
| | Electric Saw | 111 |
| | Drilling | 94 |
| | Hammering | 110 |
| | Concrete vibrator | 100 |
| | Cement mixing truck | 105 |
| | Concrete pumps | 107 |
| 3 - External Finishes Works | Angle grinders | 114 |
| | Electric Saw | 111 |
| | Drilling | 94 |
| | Hammering | 110 |
| | Crane | 105 |
| | Electric Hoist | 92 |
| 4 - Internal Fitout and Finishes | Hammering | 110 |
| | Drilling | 94 |
| | Impact drill | 112 |
| | Electric Saw | 94 |
| | Angle Grinders | 114 |

The noise levels presented in the above table are derived from the following sources, namely:

1. On-site measurements
2. Table D2 of Australian Standard 2436-1981
3. Data held by this office from other similar studies.

## 8.2 POTENTIALLY AFFECTED RECIEVERS

The site of the subject development is located in a mixed residential area on bounded by Clissold Street to the north, Queen Street to the west and residential buildings on the site to the south and east. As existing residents on the site are closest to the proposed redevelopment and construction works noise emissions to these locations will represent a worst case assessment.

Assessment location: Existing Buildings on Aevum Cardinal Freeman Village Site.

## 8.3 THE DEVELOPMENT, HOURS OF WORK AND CONSTRUCTION PERIOD

### 8.3.1 The Development

The proposed development will comprise of the redevelopment of existing senior apartments and Aged Care beds with approximately 360 new Independent Living Units and Aged Care beds:

- 230 Independent Living Units and Assisted Living Units
- 130 new residential Aged Care Beds

This redevelopment programme results in approx. 175 additional units / beds in the village.

### 8.3.2 Hours of work

It is proposed that the following hours of construction, including the delivery of materials to and from the site, shall be restricted as follows:

(1) between 7:00 am and 5:00 pm, Mondays to Fridays inclusive;

(2) between 8:00 am and 1:00 pm, Saturdays if:

(3) no work on Sundays and public holidays.

### 8.3.3 Construction Noise Objective

Construction noise shall comply with AS 2436-1981 “Guide to Noise Control on Construction”.

### 8.3.4 Construction Vibration Objective

Vibration caused by construction to comply with AS 2187 – 1992 - :SAA Explosives Code, Part 2 – Use of Explosives and AS 2670.2 – 1990 “Evaluation of human exposure to whole body vibration, part 2: continuous and shock induced vibrations in buildings”. These standards apply unless otherwise approved in the Construction Noise and Vibration Management Plan.

### 8.3.5 Summary Of noise and vibration objectives

The following present a summary of the noise and vibration assessment criteria applicable to the project. Compliance with Australian Standard 2436-1981 “Guide to Noise Control on Construction Maintenance and Demolition Site” for construction noise stipulates particular requirements in Section 3 that are to be followed.

Section 3 of AS 2436 states that care shall be taken in applying criteria that normally would be used to regulate noise emitted from industrial, commercial and residential premises to construction, particularly for those activities which are transitory and of short duration.

For the control and regulation of noise from construction sites AS2436 nominates the following:

1. That reasonable suitable noise criterion is established.

2. That all practicable measures be taken on the building site to regulate noise emissions, including the siting on noisy static processes parts of the site where they can be shielded, selecting less noisy processes, and if required regulating construction hours

3. The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the building site.

#### 8.3.5.1 Noise objectives

The following table details the appropriate noise objectives for each receiver nominated in section 3 of the report.

Table 2 – Noise Objective

| Receiver | Noise Objective |
|---|---|
| Residential Properties | AS 2436 |

### 8.3.6 Vibration objectives

Two sets of vibration criteria are required. They are namely;

1. Australian Standard 2187

2. Australian Standard 2670

The criteria and the application of these Standards is discussed in separate sections below;

#### 8.3.6.1 AS 2187

Australian Standard 2187-1993, "SAA Explosives Code, Part 2 - Use of Explosives" stipulates in Section 11 acceptable levels of ground vibration to limit the probability of structural damage and human discomfort. The criteria presented in this Standard are summarised below.

AS2187 RECOMMEND PEAK PARTICLE VELOCITY

| Type of building or structure | Particle velocity (Vp) mm/s |
|---|---|
| 1. Historical buildings and monuments, and buildings of special value and significance | 2 |

| | | | |
|---|---|---|---|
| 2. | House and low rise residential buildings: buildings not included in item 3 below | Commercial | 10 |
| 3. | Commercial and industrial buildings | | 25 |

This standard will be used principally for the determination the potential of structural damage to surrounding buildings. The Standard does not provide suitable criteria for the determination of acceptable levels of vibration for human comfort in sensitive areas, such as a dental surgery.

#### 8.3.6.2 AS 2670

Australian Standard 2670.2 - 1990 "Evaluation of human exposure to whole body vibration, part 2: continuous and shock induced vibrations in buildings(1 to 80Hz)", provides criteria for the assessment of annoyance of human beings subject to continuous and intermittent vibration.

The criteria set out in this standard will be used to determine the acceptability of vibration levels for human comfort and satisfactory work environment.

## 8.4 VIBRATION CRITERIA APPLICABLE FOR THIS PROJECT

### 8.4.1 Structural Damage

The structural vibration criteria applicable to this project will depend on the building type affected. For buildings adjoining the site the applicable criterion will be that peak particle velocities do not exceed 10mm/sec.

### 8.4.2 Human Comfort

Based on Australian Standard 2670.2 - 1990, the applicable human comfort criterion will be that vibration velocity levels do not exceed 0.5mm/sec RMS.

## 8.5 NOISE AND VIBRATION MONITORING, REPORTING AND RESPONSE PROCEDURES.

Noise and vibration monitoring will either consist of manned and/or unmanned measurements. Monitoring will be undertaken where noise and/or vibration levels generated are found to lead to complaints that are not able to be resolved via site management by the following process:

1. Determining the offending plant/equipment/process
2. Locating the plant/equipment/process further away from the affected receiver(s) if possible.
3. Implementing additional acoustic treatment in the form of localised barriers, silencers etc
4. Selecting alternative equipment/processes

Where monitoring is required and indicates exceedences of the noise limits immediate action should be taken to identify any further controls as required to reduce noise emissions so that the noise limits are complied with. Monitoring of the activities following the implementation of these additional controls will be undertaken to confirm compliance.

### 8.5.1 Reporting Requirements

The following shall be kept on site by the builder.

1. A register of complaints received/communication with the local community shall be maintained and kept on site with information as detailed in section 8.2.

2. Where noise/vibration complaints require noise/vibration monitoring, results from monitoring shall be retained on site at all times.

3. Any noise exceedences occurring including, the actions taken and results of follow up monitoring.

4. A report detailing complaints received and actions taken shall be submitted as part of the three monthly report. Results of noise monitoring/vibration conducted during that period shall be included

### 8.5.2 Response Procedures

Complaints associated with noise and vibration generated by site activities shall be recorded on a Noise Complaint Form. The person(s) responsible for complaint handling and contact details for receiving of complaints shall be established on site prior to construction works commencing. A sign shall be displayed at the site indicating the Site Manager and the general public and their contact telephone number

If a noise complaint is received the complaint should be recorded on a Noise Complaint Form. The complaint form should list:

- The name and address of the complainant (if provided).
- The time and date the complaint was received.
- The nature of the complaint and the time and date the noise was heard.
- The name of the employee who received the complaint.
- Actions taken to investigate the complaint, and a summary of the results of the investigation.
- Indicate what operations were occurring on site at the time of the complaint.
- Required remedial action, if required
- Monitoring conducted if required.
- Validation of the remedial action.
- Summary of feedback to the complainant.

## 8.6 ASSESSMENT OF POTENTIAL NOISE AND VIBRATION

Noise generated by plant and equipment throughout the duration of the project will be managed to comply with AS2436.

The following tables present a summary of noise levels which will occur at the nearest potentially affected residents to the south.

| MONDAY TO FRIDAY | | | | |
|---|---|---|---|---|
| PERIOD HOURS | ACTIVITIES | LEVEL OF NOISE AT AFFECTED OCCUPANCY $L_{10}$ dB(A) | CODE PERMISSIBLE EXCEEDENCE ABOVE B'GROUND | COMPLIES YES/NO |
| 07.00 to 08.00 | 1, 2, 3 | 55 - 85 | AS2436 | Yes[1] |
| 08.00 to 09.00 | 1, 2, 3 | 55 - 85 | AS2436 | Yes[1] |
| 09.00 to 10.00 | 1, 2, 3 | 55 - 85 | AS2436 | Yes[1] |
| 10.00 to 11.00 | 1, 2, 3 | 55 - 85 | AS2436 | Yes[1] |
| 11.00 to 12.00 | 1, 2, 3 | 55 - 85 | AS2436 | Yes[1] |
| 12.00 to 13.00 | 1, 2, 3 | 55 - 85 | AS2436 | Yes[1] |
| 13.00 to 14.00 | 1, 2, 3 | 55 - 85 | AS2436 | Yes[1] |
| 14.00 to 15.00 | 1, 2, 3 | 55 - 85 | AS2436 | Yes[1] |
| 15.00 to 16.00 | 1, 2, 3 | 55 - 85 | AS2436 | Yes[1] |
| 16.00 to 17.00 | 1, 2, 3 | 55 - 85 | AS2436 | Yes[1] |

Note 1: It is noted that noise emissions will be managed to strictly comply with AS2436.

| MONDAY TO FRIDAY | | | | |
|---|---|---|---|---|
| PERIOD HOURS | ACTIVITIES | LEVEL OF NOISE AT AFFECTED OCCUPANCY $L_{10}$ dB(A) | CODE PERMISSIBLE EXCEEDENCE ABOVE B'GROUND | COMPLIES YES/NO |
| 07.00 to 08.00 | 4 | 35 - 65 | AS2436 | Yes[1] |
| 08.00 to 09.00 | 4 | 35 - 65 | AS2436 | Yes[1] |
| 09.00 to 10.00 | 4 | 35 - 65 | AS2436 | Yes[1] |
| 10.00 to 11.00 | 4 | 35 - 65 | AS2436 | Yes[1] |
| 11.00 to 12.00 | 4 | 35 - 65 | AS2436 | Yes[1] |
| 12.00 to 13.00 | 4 | 35 - 65 | AS2436 | Yes[1] |
| 13.00 to 14.00 | 4 | 35 - 65 | AS2436 | Yes[1] |
| 14.00 to 15.00 | 4 | 35 - 65 | AS2436 | Yes[1] |
| 15.00 to 16.00 | 4 | 35 - 65 | AS2436 | Yes[1] |
| 16.00 to 17.00 | 4 | 35 - 65 | AS2436 | Yes[1] |

Note 1: It is noted that noise emissions will be managed to strictly comply with AS2436. Includes the improvement afforded by glazed façade installed and closed on site.

| SATURDAY | | | | |
|---|---|---|---|---|
| PERIOD HOURS | ACTIVITIES | LEVEL OF NOISE AT AFFECTED OCCUPANCY $L_{10}$ dB(A) | CODE PERMISSIBLE EXCEEDENCE ABOVE B'GROUND | COMPLIES YES/NO |
| 08.00 to 09.00 | 1, 2, 3 | 55 – 85 | AS2436 | Yes[1] |
| 09.00 to 10.00 | 1, 2, 3 | 55 – 85 | AS2436 | Yes[1] |
| 10.00 to 11.00 | 1, 2, 3 | 55 – 85 | AS2436 | Yes[1] |
| 11.00 to 12.00 | 1, 2, 3 | 55 – 85 | AS2436 | Yes[1] |
| 12.00 to 13.00 | 1, 2, 3 | 55 - 85 | AS2436 | Yes[1] |

Note 1: It is noted that noise emissions will be managed to strictly comply with AS2436.

| SATURDAY | | | | |
|---|---|---|---|---|
| PERIOD HOURS | ACTIVITIES | LEVEL OF NOISE AT AFFECTED OCCUPANCY $L_{10}$ dB(A) | CODE PERMISSIBLE EXCEEDENCE ABOVE B'GROUND | COMPLIES YES/NO |
| 08.00 to 09.00 | 4 | 35 - 65 | AS2436 | Yes[1] |
| 09.00 to 10.00 | 4 | 35 - 65 | AS2436 | Yes[1] |
| 10.00 to 11.00 | 4 | 35 - 65 | AS2436 | Yes[1] |
| 11.00 to 12.00 | 4 | 35 - 65 | AS2436 | Yes[1] |
| 12.00 to 13.00 | 4 | 35 - 65 | AS2436 | Yes[1] |

Note 1: It is noted that noise emissions will be managed to strictly comply with AS2436. Includes the improvement afforded by glazed façade installed and closed on site.

### 8.6.1 Vibration

There are no potentially significant sources of vibration that may impact upon the adjoining residents. Where complaints are received associated with vibration the complaints procedure listed in section 4.14 will be followed and where required vibration monitoring will be implemented. It is also recommended that a dilapidation survey of the existing buildings around the site be conducted to ensure that any impact from works on site can assessed.

## 8.7 MITIGATION TREATMENTS, MANAGEMENT METHODS

### 8.7.1 Control of construction noise

As a part of the noise management plan a detailed study has been undertaken of each of the proposed activities that will occur as a part of the demolition, excavation and construction works on this project. The execution of this work will facilitate the formulation of noise control strategies for this project.

The flow chart that follows illustrates the process followed to assess construction activities.

### 8.7.2 Noise control methods

The determination of appropriate noise control measures will be dependant on the particular activities and construction appliances. This section provides an outline of available methods.

### 8.7.3 Selection Of Alternate Appliance Or Process

Where a particular activity or construction appliance is found to generate noise levels that exceed the criteria, it may be possible to select an alternative approach or appliance. For example; the use of a hydraulic hammer on certain areas of the site may potentially generate high levels of noise. By carrying this activity by use of pneumatic hammers, bulldozers ripping and/or milling machines lower levels of noise will result.

### 8.7.4 Acoustic Barriers

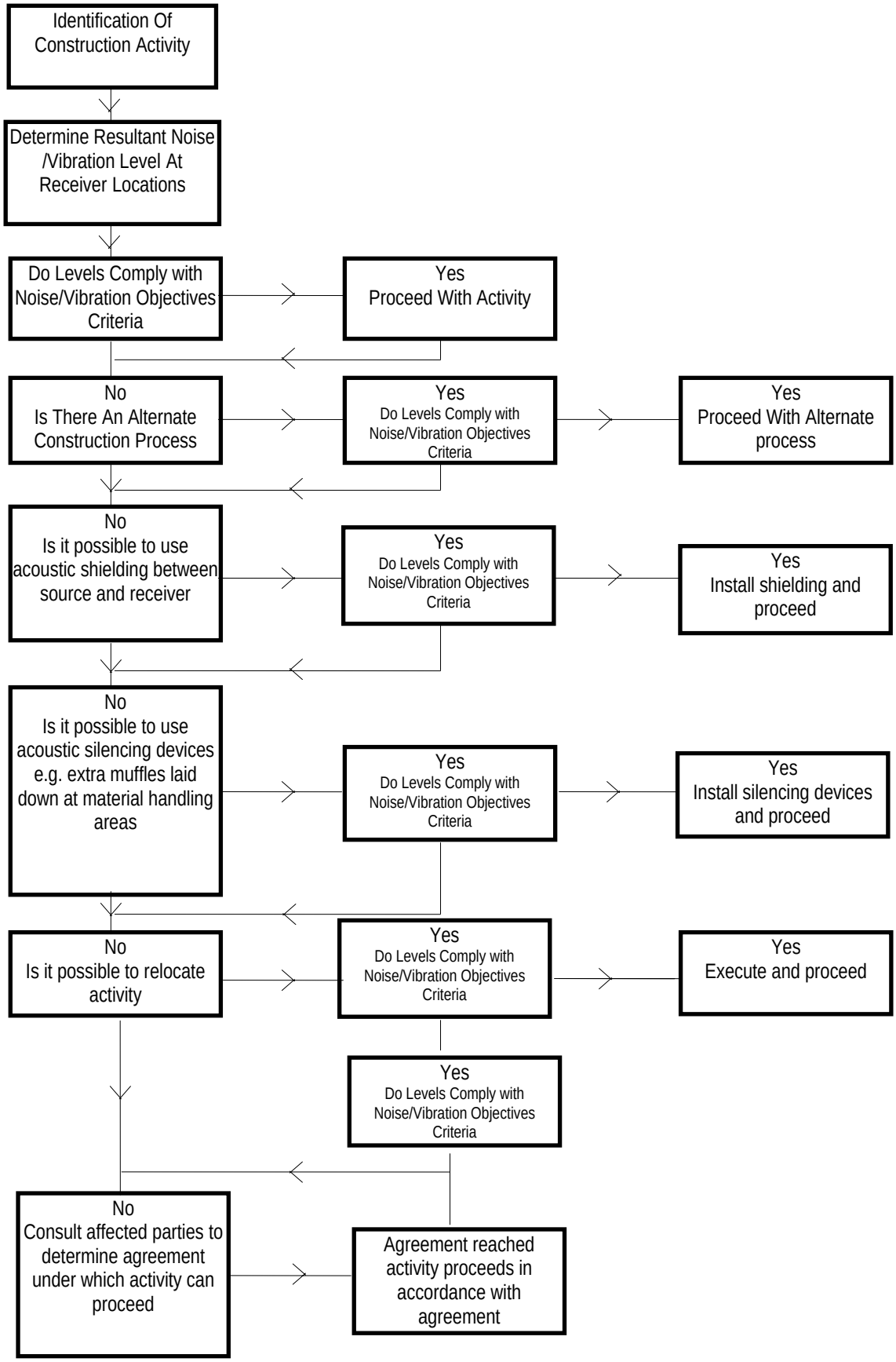
Barriers or screens can be an effective means of reducing noise. Barriers can be located either at the source or receiver.

The placement of barriers at the source is generally only effective for static plant (tower cranes). Placing barriers at the source cannot effectively attenuate equipment which is on the move or working in rough or undulating terrain.

Barriers can also be placed between the source and the receiver. The degree of noise reduction provided by barriers is dependent on the amount by which line of sight can be blocked by the barrier. If the receiver is totally shielded from the noise source reductions of up to 15 dB(A) can be effected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8 dB(A) may be achieved. Where the barrier does not obstruct line of sight, generally no noise reduction will occur.

As barriers are used to provide shielding and do not act as an enclosure, the material they are constructed from should have a noise reduction performance which is approximately 10dB(A) greater than the maximum reduction provided by the barrier. In this case the use of a material such as 10 or 15mm plywood would be acceptable for the barriers.

CONTROL OF NOISE



### 8.7.5 Silencing Devices

Where construction process or appliances are noisy, the use of silencing devices may be possible. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts.

### 8.7.6 Material Handling

The installation of rubber matting over material handling areas can reduce the sound of impacts due to material being dropped by up to 20dB(A).

### 8.7.7 Treatment Of Specific Equipment

In certain cases it may be possible to specially treat a piece of equipment to dramatically reduce the sound levels emitted.

### 8.7.8 Establishment of Site Practices

This involves the formulation of work practices to reduce noise generation. This includes locating fixed plant items as far as possible from residents as well as rotating plant and equipment to provide respite to receivers.

## 8.8 PROCEDURES - NOTIFYING RESIDENTS

As a part of the on-going process of compliance on this project it is proposed to undertake a programme of community consultation. Continual communication is required between all parties, which may be potentially impacted upon, the builder and the regulatory authority. On this basis it is recommended that the Site Manager liase directly with potentially affected parties. This will include being contactable to address any specific concerns with those parties as soon as possible. This also establishes a dynamic response process, which allows for the adjustment of control methods and criteria for the benefit of all parties.

The objective in undertaking a consultation process is to:

- Inform and educate the groups about the project and the noise controls being implemented.
- Increase understanding of all acoustic issues related to the project and options available.
- Identify group concerns generated by the project, so that they can be addressed.
- To ensure that this process is effective, regular scheduled meetings will be required for a finite period, until all issues have been addressed and all parties embrace the evidence of successful implementation.
- An additional step in this process is to inform residents specifically where construction activities are likely to affect their amenity from noise and/or vibration.

## 8.9 CONTINGENCY PLANS

Where non-compliances or noise complaints are raised the following methodology will be implemented.

1. Determining the offending plant/equipment/process

2. Locating the plant/equipment/process further away from the affected receiver(s) if possible.

3. Implementing additional acoustic treatment in the form of localised barriers, silencers etc where practical.

4. Selecting alternative equipment/processes where practical

## 8.10 COUNCILS' CODE – CONTROL/REGULATION OF NOISE

Council does not have a code for the control and regulation of noise on building sites. Therefore it is proposed that AS2436 detailed in this report will be the overriding requirement for control of noise and vibration from building works during the currently approved hours.

# 9. BCA ACOUSTIC REQUIREMENTS

The acoustic requirements of the BCA are directed toward the provision of sound isolation between sole occupancy or aged care units. The overall objective is to acoustically isolate noise sources in one occupancy and prevent them from intruding upon an adjoining occupancy. As such, the requirements cover the following:

- Sound isolation requirements for party walls.
- Sound isolation through the floor/ceiling of one apartment to another apartment located directly above and below.
- Acoustic separation of hydraulics pipes, where they serve or pass through more than one occupancy.
- Impact sound isolation of wet areas (bathrooms, kitchens) where they adjoin living spaces (bedrooms, living rooms, etc.) of an adjoining apartment.
- Sound separation of apartments from public corridors, plant rooms public stairwells, lift shaft, plant rooms etc.

Suitable constructions for Independent Living Units and Residential Care Beds to meet Building Code of Australia requirements will be provided as the project stages advance.

Final selections of base wall types and floor coverings and are not available at this and will be subject to alteration as the project progresses. As such, recommended constructions to meet the requirements of the BCA will be provided in the individual project applications.

## 10. CONCLUSION

In this report we have:

- Identified potential noise impacts (road traffic noise) on future residents and identified acoustic criteria (internal noise levels) to maintain amenity
- Identified potential operational noise emissions from vehicle, loading dock and mechanical noise and determined criteria to ensure that the amenity of nearby properties is maintained.
- Identified construction noise sources, reviewed appropriate criteria and presented a frame work to ensure construction activities will not adversely impact nearby properties
- Identified requirements of the BCA, both Class 2/3 and Class 9c (aged care) and determined indicative constructions meet requirements.

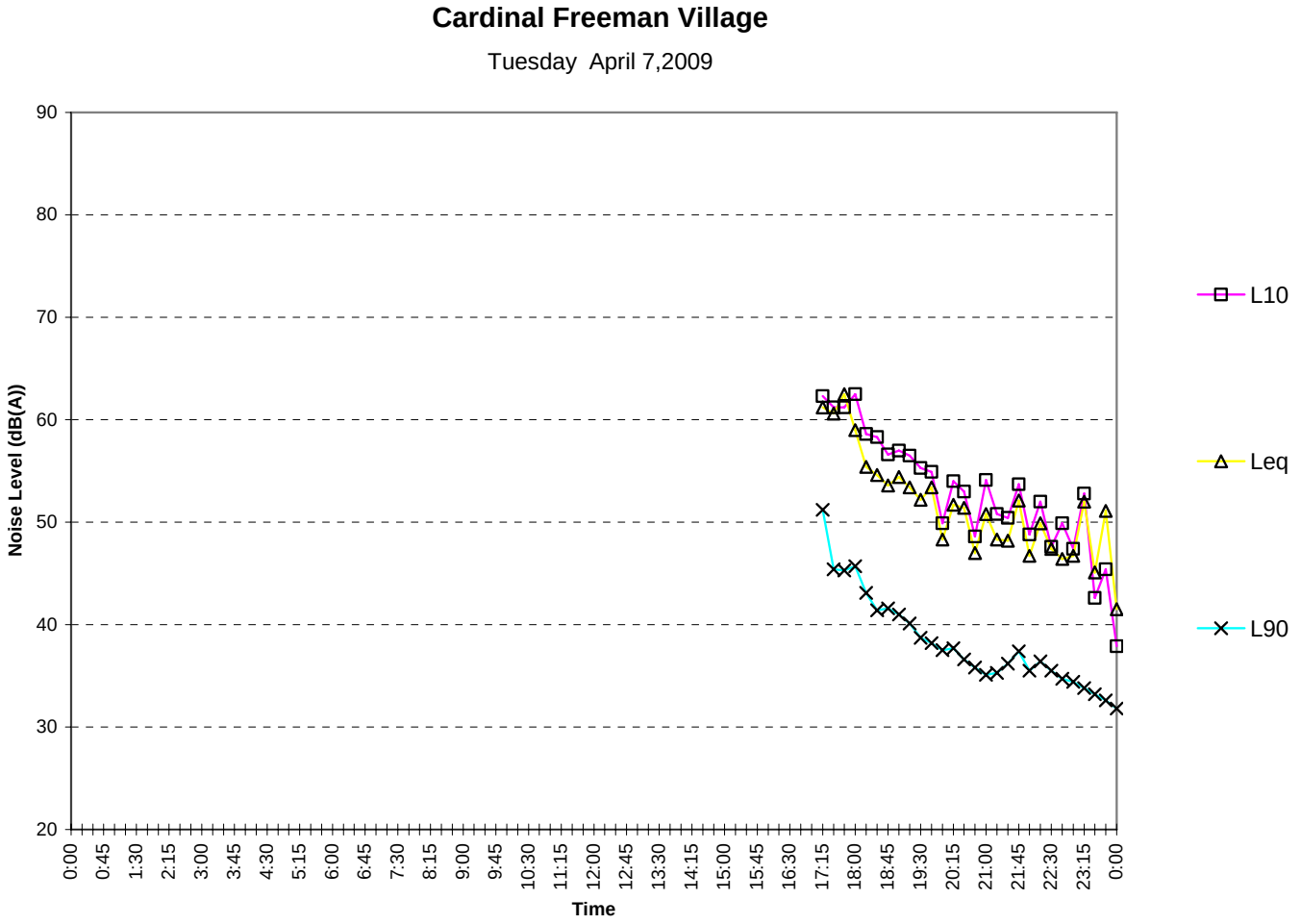
Provided that the acoustic goals presented in this report are achieved (with specific treatments/ management controls determined in design development) noise impacts on both future residents and nearby properties will be achieved.

Report prepared by,

ACOUSTIC LOGIC CONSULTANCY PTY LTD
Thomas Aubusson

# APPENDIX 1

# MEASURED AMBIENT NOISE LEVELS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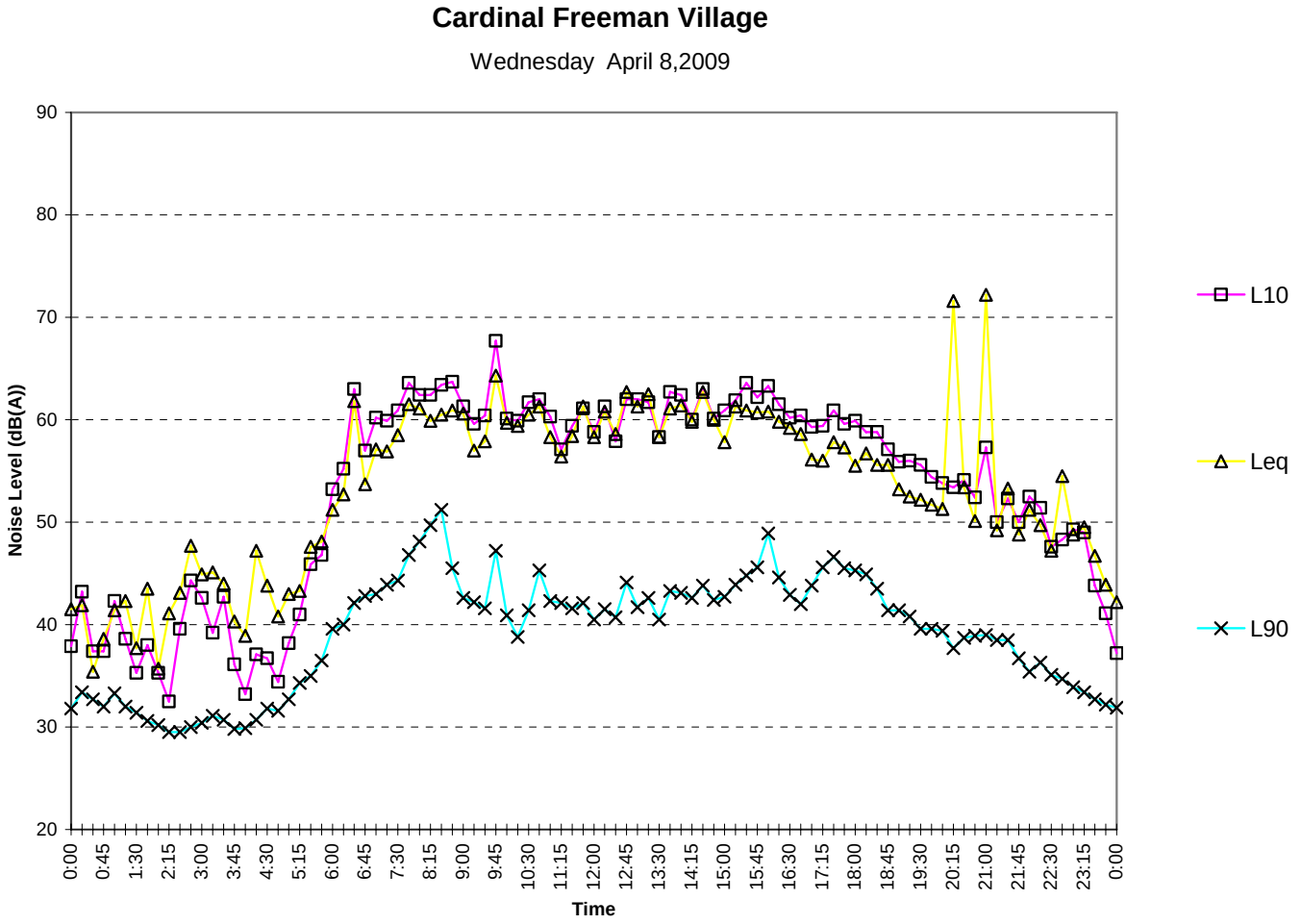
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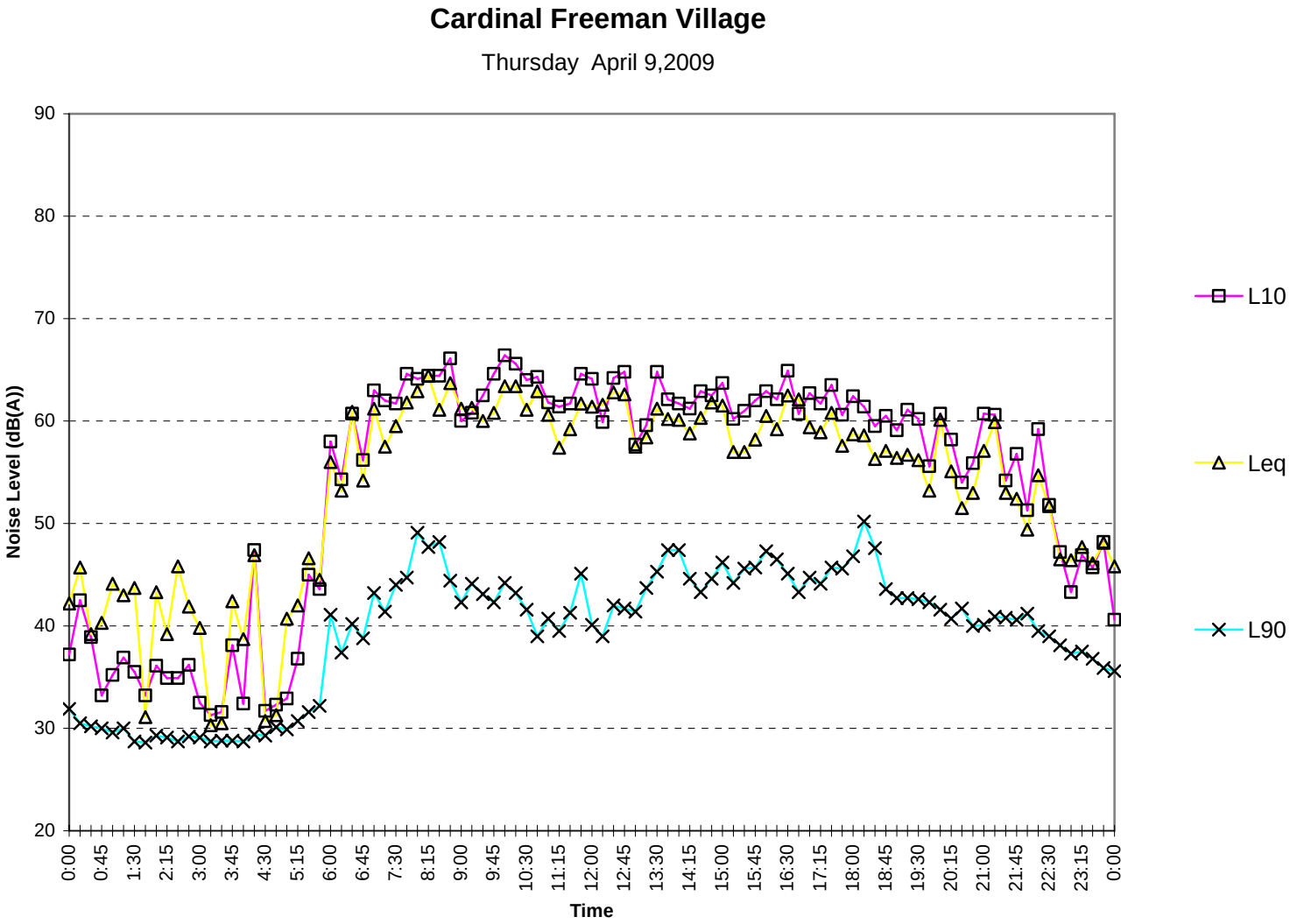
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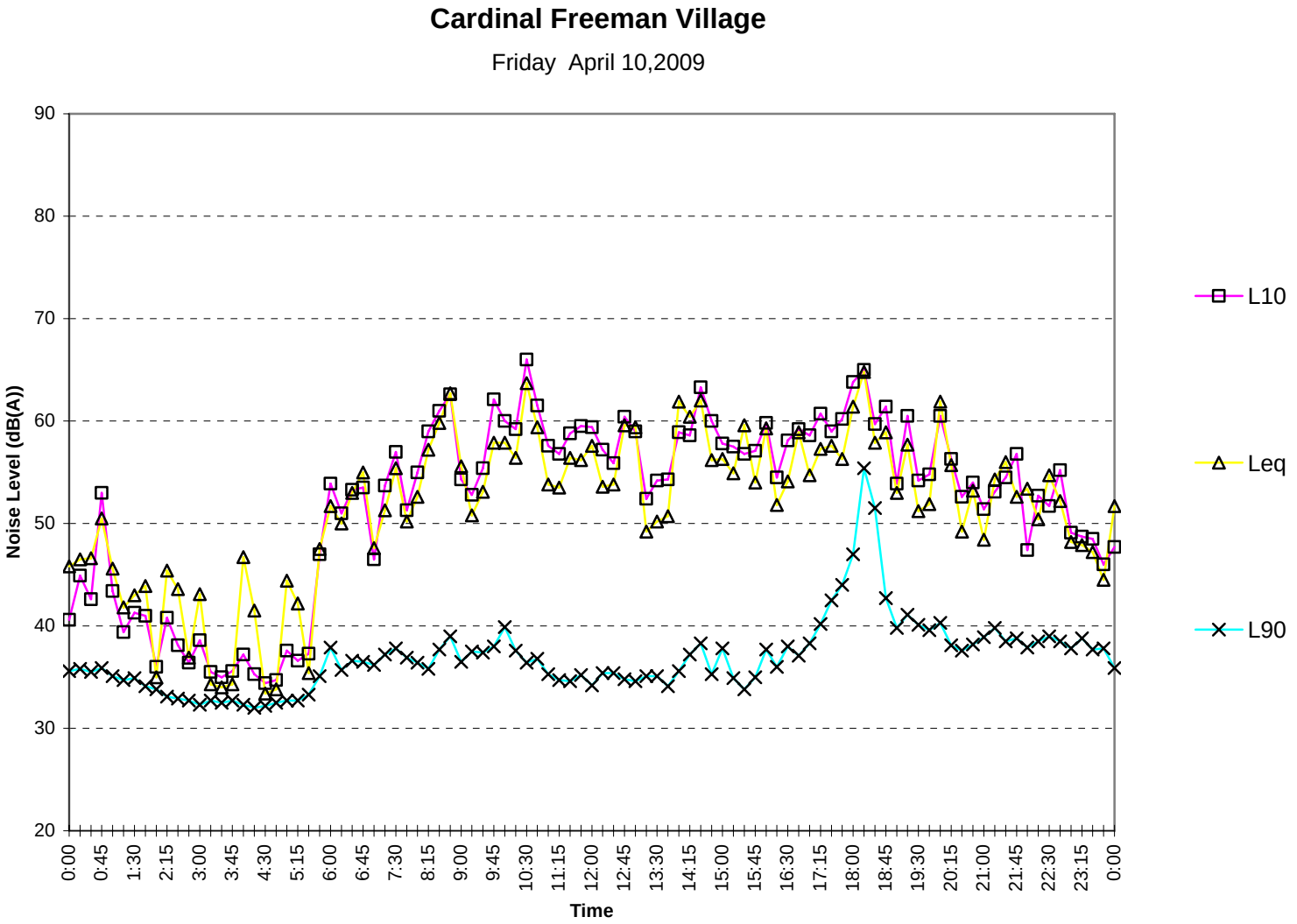
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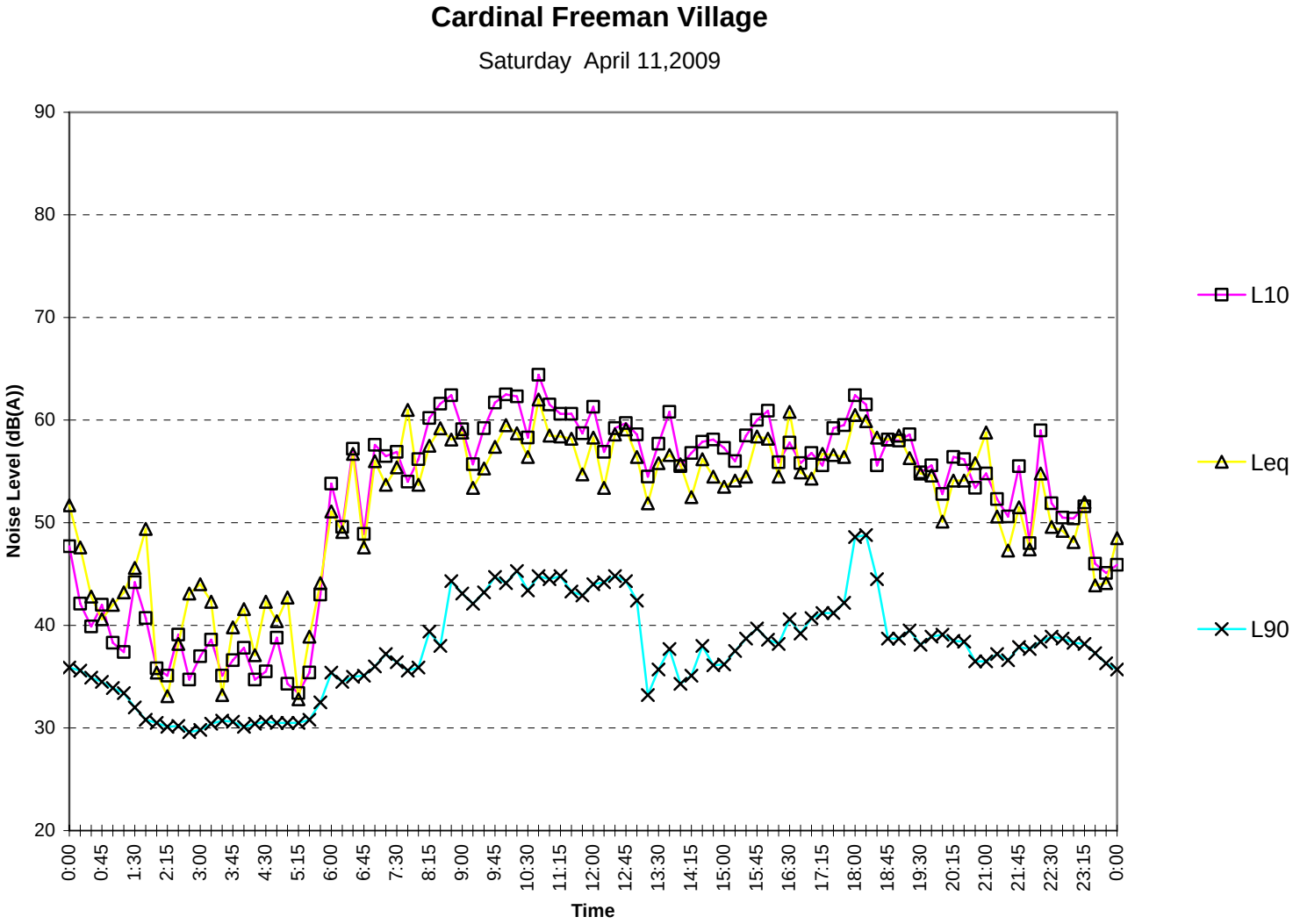
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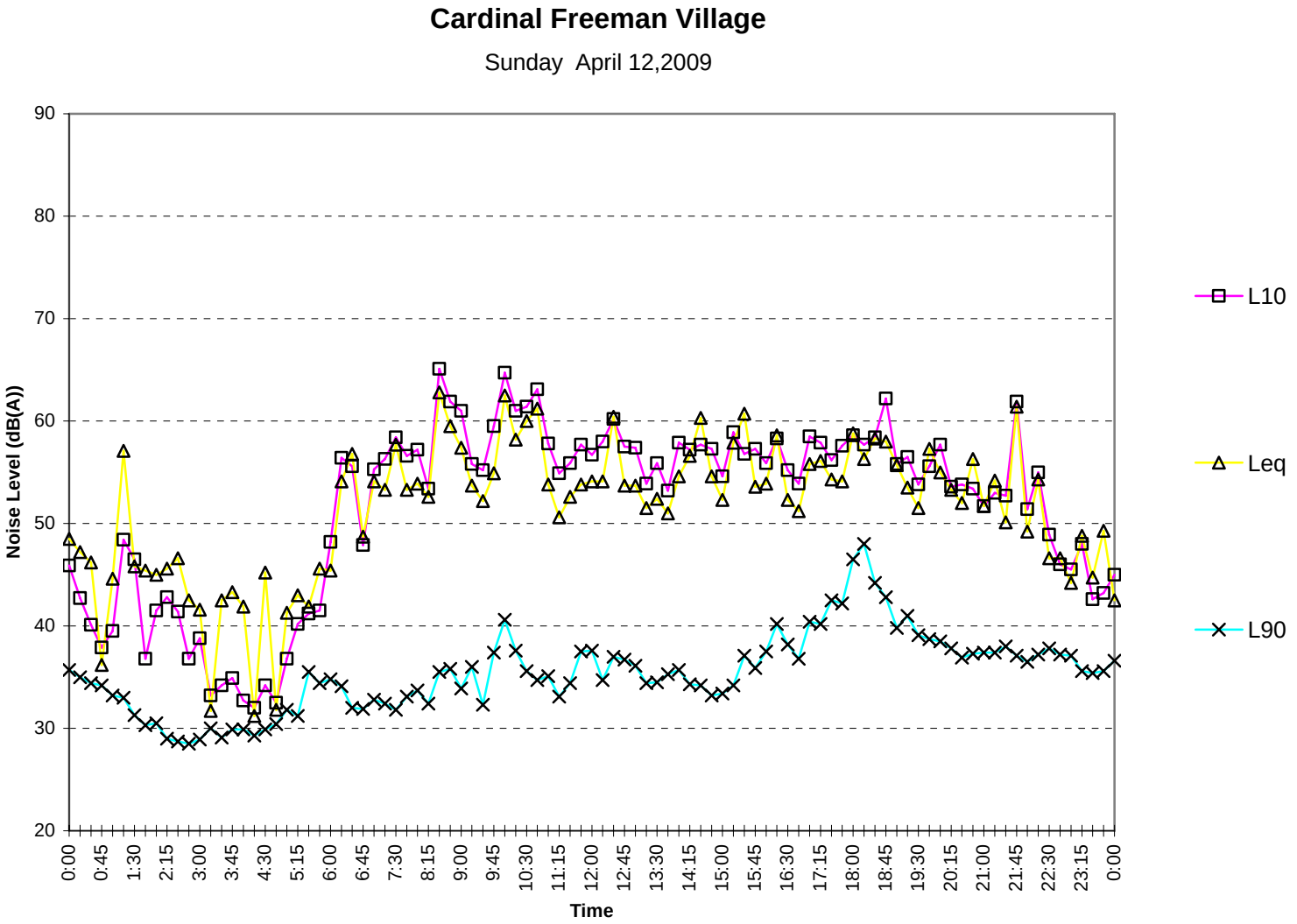
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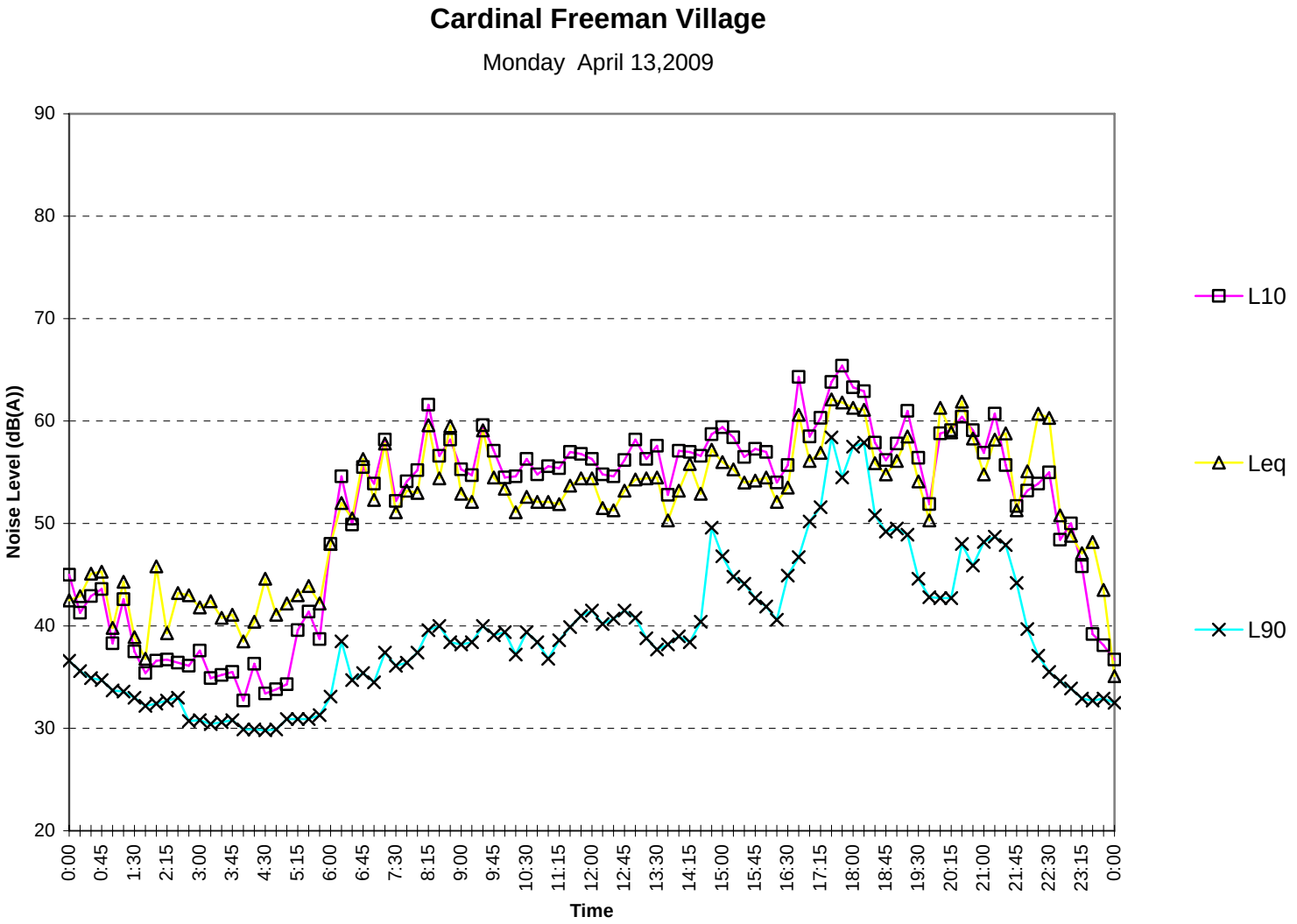
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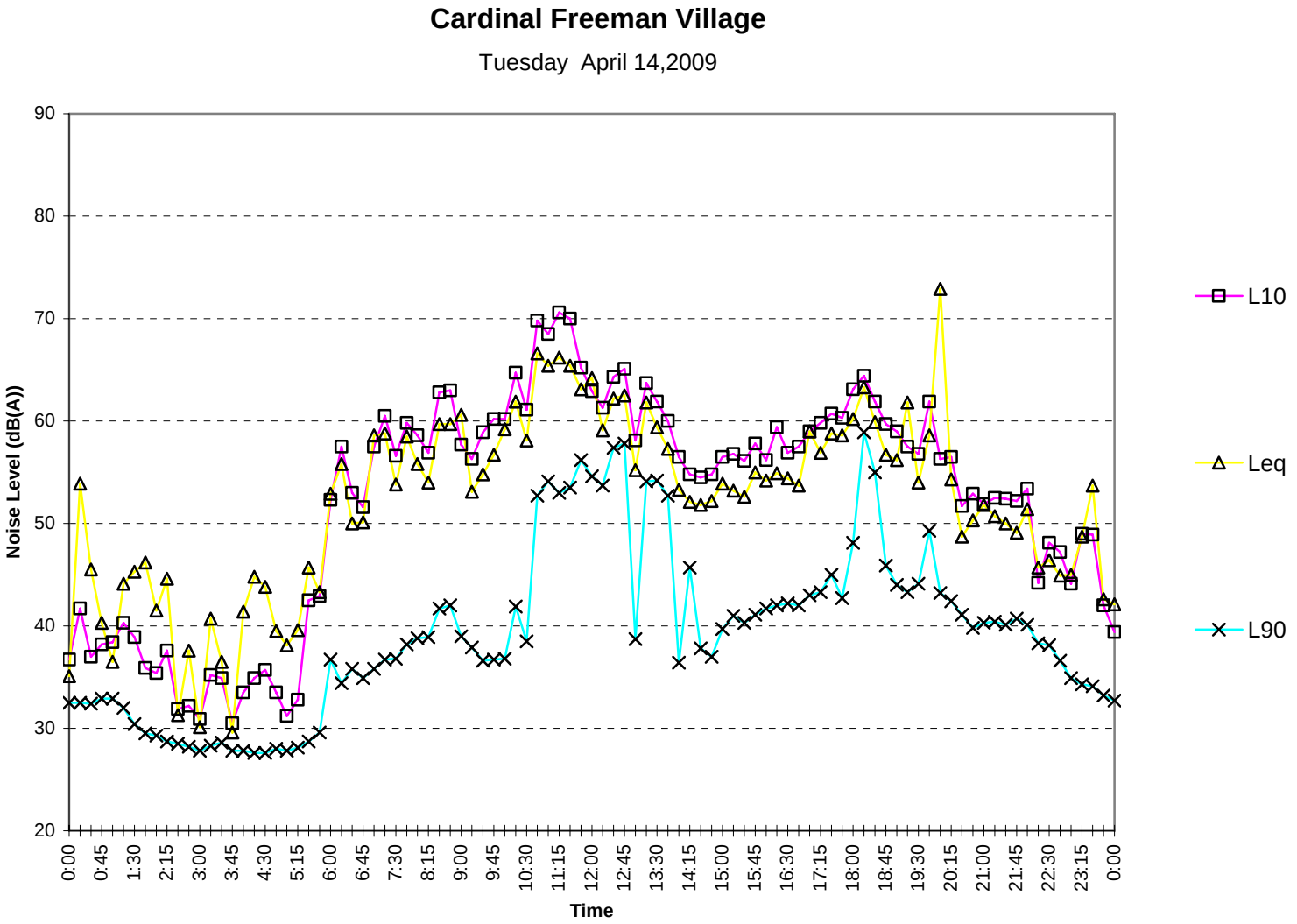
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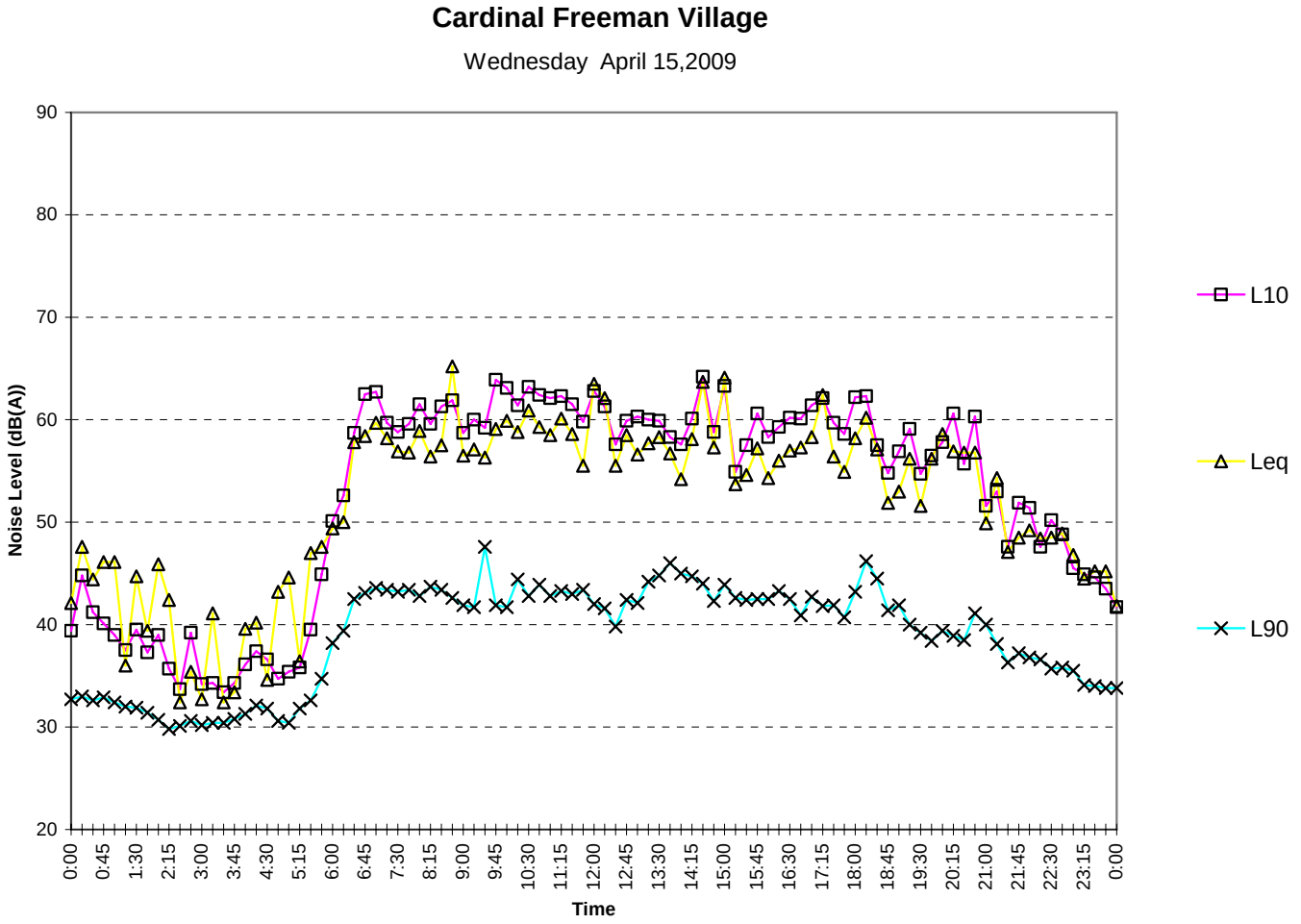
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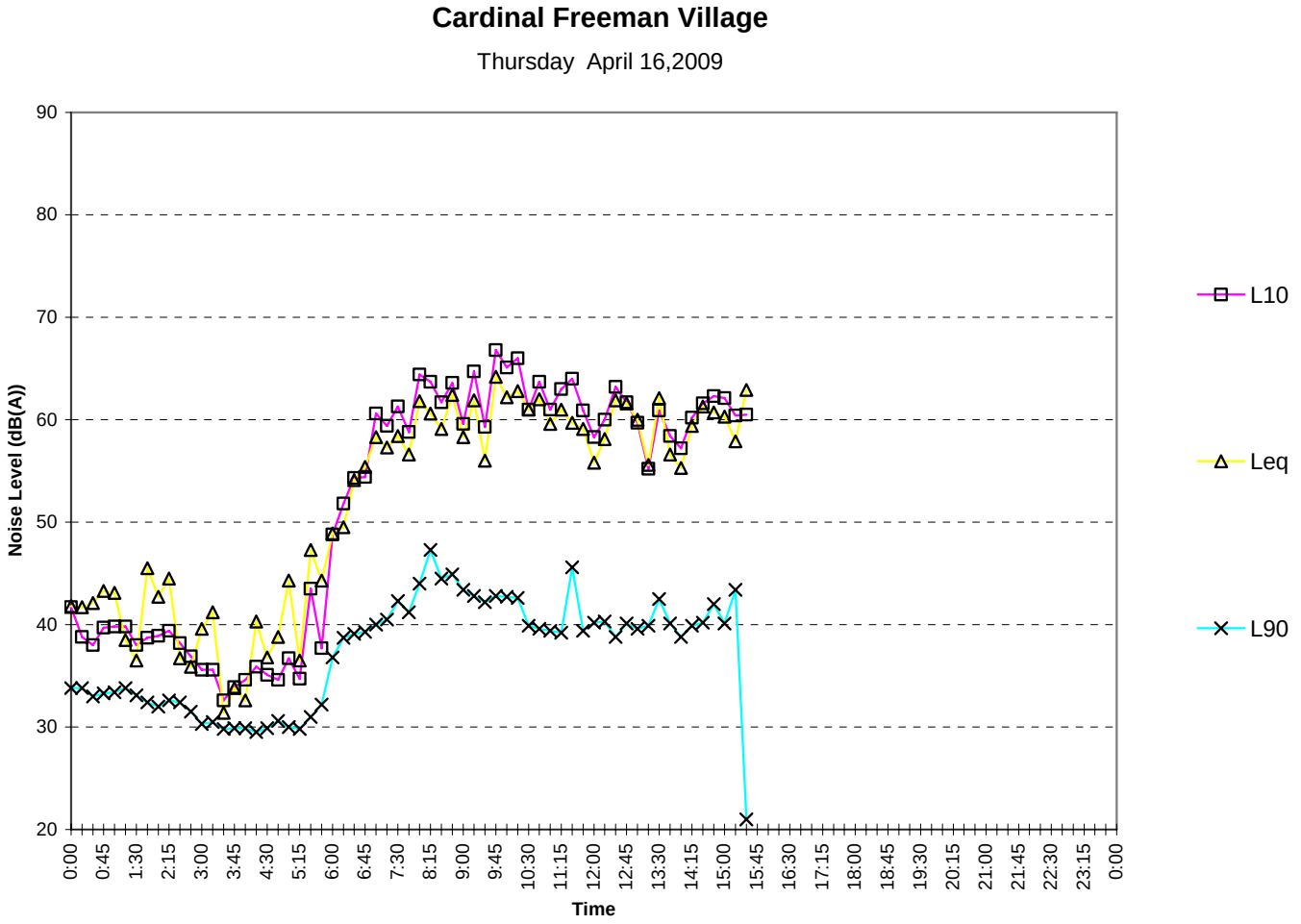
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