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Bringelly Road Business Hub (SSD 6324)

Construction Noise and Vibration Management Plan

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TABLE OF CONTENTS

1 INTRODUCTION

This document presents the noise and vibration management plan to be implemented to manage noise and vibration emissions from the proposed construction process associated with the Bringelly Road Business Hub (SSD 6324), Leppington development site.

This report includes the assessment of noise and vibration associated with the works required to complete the required infrastructure on the site. The report does not include any building works which includes bulk earthworks associated with the development of individual allotments following completion of the Estate. This report has been developed in response to the projects Director General's Environmental Assessment Requirements.

In recognition of the requirement to minimise noise emissions from the site to neighbouring land uses this study has been undertaken. The principal objective is to undertake detailed evaluation of all work to be performed during the construction work processes of the development phase and to 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 noise sensitive receivers,
3. Hours of work,
4. Noise objective specified in the conditions of consent,
5. Appropriate noise objectives for each identified potentially affected noise sensitive receiver,
6. Noise monitoring, reporting and response procedures,
7. Assessment of potential noise from the proposed activities,
8. Contingency plans to be implemented in the event of non-compliances and/or noise complaints.
9. Compliance with Councils' Code for the Control and Regulation of Noise on Building Sites
10. Compliance with Australian Standard 2436-1981" Guide to Noise Control on Construction, Maintenance and Demolition Sites" and Environmental Protection Authority (EPA).
11. Activities to be conducted and the associated noise sources

2 SITE LOCATION

The Bringelly Road Business Hub (SSD 6324), Leppington development site is located on Bringelly Road within the vicinity of Cowpastures Road, Leppington. The surrounding properties to the development site include open lands and residential receivers (to the north east and east).

The site location is detailed in the figure below.

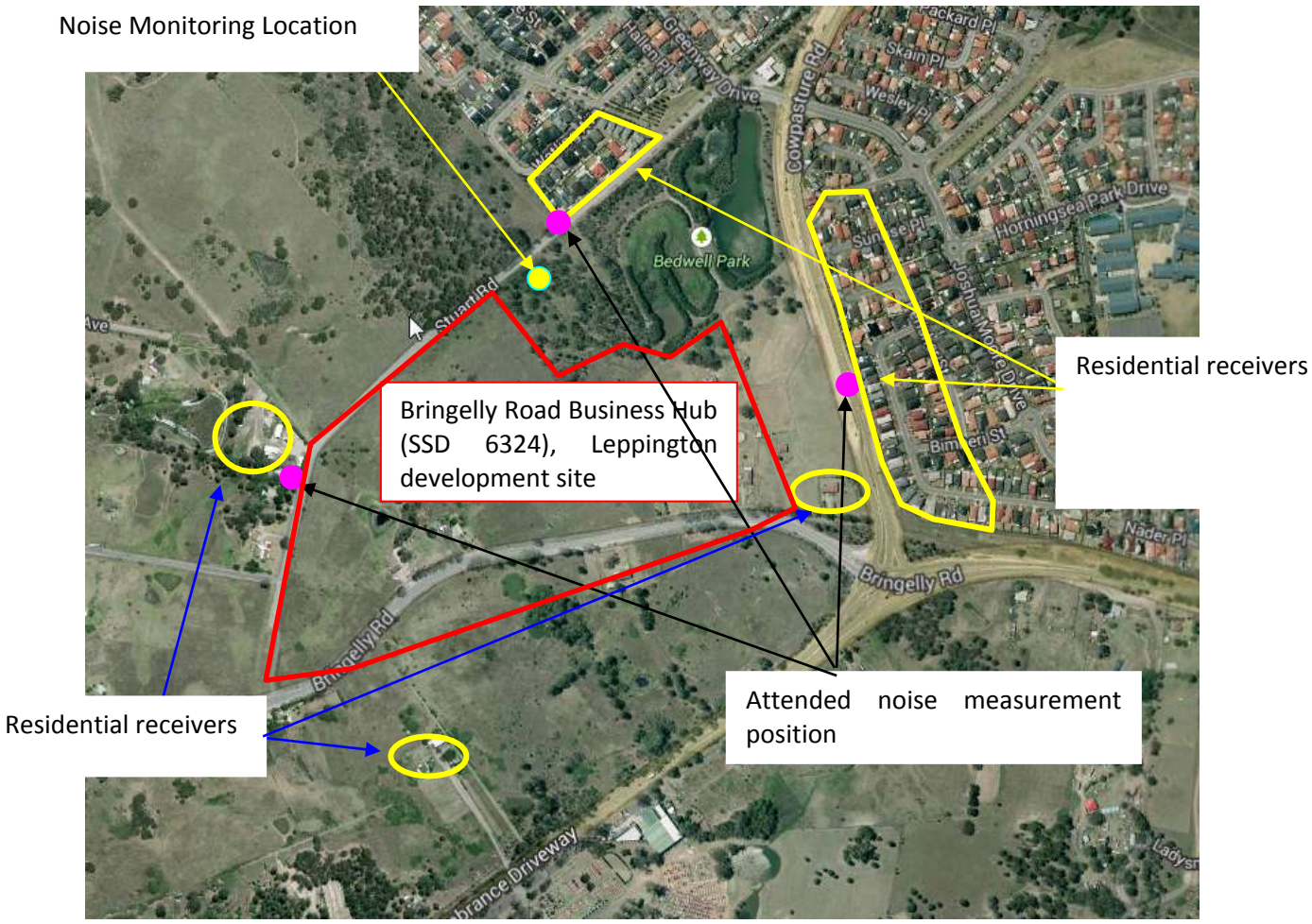


Figure 1 Site Map

3 PROJECT DESCRIPTION

The development involves the construction of the Bringelly Road Business Hub at the location detailed in Figure 1 above. The existing site predominantly consists of undeveloped lands.

3.1 CONSTRUCTION TRAFFIC

Construction traffic access to the site will occur from Stuart Road as well as Bringelly Road.

Heavy vehicle traffic will include large rigid and articulated trucks. Heavy vehicle trips expected each day will vary and these will be distributed during the day without any peak hour period. It is anticipated that there would be an average of up to 10 truck movements every hour.

Given the existing traffic movements on the existing road network, it is considered that the expected number of vehicle movements departing or accessing the site will have minimal adverse impacts in surrounding residents.

4 CONSTRUCTION NOISE CRITERIA

The Director General's Environmental Assessment Requirements includes a requirement for a construction noise and vibration assessment to be conducted.

The relevant section of DGR includes the following:

> **Noise**
>
> *Identify the main noise generating sources and activities at all stages of construction. Outline measures to minimise and mitigate the potential noise impacts on surrounding occupiers of land.*
>
> - *Relevant Policies and Guidelines:*
> - *NSW Industrial Noise Policy (EPA)*
> - *Interim Construction Noise Guideline (EPA)*

This report further satisfies this condition of the Director Generals Requirements.

It is proposed to adopt criteria from the New South Wales Construction Noise Guideline developed by The NSW Environmental Protection Authority (EPA) and with the Australian Standard AS2436-1981 *"Guide to Noise Control on Construction Maintenance and Demolition Sites"*.

4.1 NSW EPA "INTERIM CONSTRUCTION NOISE GUIDELINE" (ICNG)

The NSW Environmental Protection Authority has developed a construction noise guideline specifically to manage construction noise impacts.

The guideline provides two methods of assessment which are detailed in the following sections.

As part of this extended hours assessment an investigation into the compliance of potential noise impacts from the proposed development with the quantitative noise level criteria has been conducted in the first instance. Compliance with the quantitative criteria represents compliance with the guideline and no further assessment is required.

In the event noise levels are not expected to comply with the quantitative criteria, a further qualitative assessment will be conducted.

4.1.1 EPA Construction Noise Guideline - Quantitative Assessment Method

This quantitative assessment method outlined in the ICGN specifies criteria which can be used in the effort of minimising noise from construction related activities. The quantitative noise levels presented in the guideline are detailed in the following tables.

Table 1 - ICGN Recommended Construction Noise Management Levels – Normal Hours (Quantitative)

Receiver	Management Level	External Sound Level, $L_{eq\ 15\ min}$ dB(A)	Where Applied
Residential	Noise Affected Level[1]	Background + 10dB(A)	Externally
	Highly Noise Affected Level[2]	75dB(A)	Externally
Commercial Office	Noise Affected Level	70dB(A)	Externally (When in use)

1: Where the predicted or measured L_{Aeq} (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. (EPA CNG, 2008).

2: Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided. (EPA CNG, 2008).

Table 2 - ICGN Recommended Construction Noise Management Levels – Outside Normal Hours (Quantitative)

Receiver	Management Level	External Sound Level, $L_{eq\ 15\ min}$ dB(A)	Where Applied
Residential	Noise Affected Level[1]	Background + 5dB(A)	Externally
	Highly Noise Affected Level[2]	Negotiate with Community	Externally
Commercial Office	Noise Affected Level	70dB(A)	Externally (When in use)

4.2 SLEEP DISTURBANCE AT RESIDENCES

The EPA Construction Noise Guideline includes the following guidance for the assessment of sleep disturbance from construction activities during night time hours:

> *Where construction works are planned to extend over more than two consecutive nights, and a quantitative assessment method is used, the analysis should cover the maximum noise level, and the extent and the number of times that the maximum noise level exceeds the RBL. Some guidance indicating the potential for sleep disturbance is in the NSW Environmental Criteria for Road Traffic Noise (ECRTN) (EPA 1999).*
>
> *Factors that may be important in assessing the extent of impact on sleep include how often high noise events occur at night, the predicted maximum noise levels at night, whether there are times when there is a clear change in the noise environment (such as during early morning shoulder periods), and the degree of maximum noise levels above the background noise level at night.*

As the proposed development is not proposing night time works the potential for sleep disturbance is not required to be discussed.

4.2.1 Qualitative Assessment

The guidelines qualitative assessment method in which construction noise is assessed on a case by case basis with regard to various activities which are to be conducted on the site. This assessment method was developed for smaller scale projects.

Essentially this method of assessment requires that the proponent take into consideration and employ all reasonable and feasible measures to ensure that the impact on noise receivers is minimised. This is generally conducted in the following manner:

- The assessment of noise producing equipment such as rock-hammers and sheet piles for lower noise producing methods of construction/excavation to determine which activities/processes will emit noise exceeding the management levels;
- The drafting of a noise management plan outlining all reasonable and feasible mitigation methods for the reduction of noise impact including:
    - The implementation of a complaints handling register and community consultation system;
    - Employee (builders, contractors etc) education in effective noise reducing techniques and site etiquette; and
    - The operation of plant in a quiet and efficient manner (ie turning off machinery when not in use, ensuring plant is maintained, etc).
    - Physical barriers, etc

4.3 AUSTRALIAN STANDARD 2436-1981 "GUIDE TO NOISE CONTROL ON CONSTRUCTION MAINTENANCE AND DEMOLITION SITE"

The Australian Standard 2436-1981 "Guide to Noise Control on Construction Maintenance and Demolition Site" 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:

- That reasonable suitable noise criterion is established.
- 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
- The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the building site.

4.4 PROPOSED NOISE LEVEL OBJECTIVES

Based on the detailed standard above the following procedure will be used to assess noise emissions:

- Predict noise levels produced by typical construction activities at the sensitive receivers based on the quantitative noise level criteria of the EPA.
- Where noise emissions exceed the EPA quantitative noise goals, a qualitative assessment including an investigation and implement o all practical and reasonable techniques to limit noise emissions will be conducted.
- If the noise goal is still exceeded after applying all practical engineering controls to limit noise emissions investigate management and other techniques to mitigate noise emissions.

4.5 CONSTRUCTION HOURS

Construction hours should be carried out in accordance with recommended construction hours detailed in the standard hours for construction sites as detailed within the EPA's Construction Noise Guidelines which details the following:

- 7am to 6pm Monday to Friday; and
- 8am to 1pm Saturday.

4.6 CONSTRUCTION NOISE PROCEDURES

Based on these criteria the following procedure will be used to assess noise emissions:

- Predict noise levels produced by typical construction activities at the sensitive receivers.
- If noise levels exceed "background + 10 dB(A)" noise goal at sensitive receiver locations, investigate and implement all practical techniques to limit noise emissions. For residential receivers, a background + 10 dB(A) goal has been adopted at all times. When these noise levels can not be met all possible and practical acoustic treatments/management controls will be investigated.
- If the noise goal is still exceeded after applying all practical engineering controls to limit noise emissions, review the management techniques to mitigate noise emissions in accordance with AS2436.

5 STUDY OVERVIEW

This report presents evaluation of potential noise emissions from the Bringelly Road Business Hub (SSD 6324), Leppington development site relating to construction works (including demolition, excavation and construction) of the internal roads and warehouses.

The aim of this study is to undertake an analysis of noise impact arising from site activities undertaken in normal construction hours, i.e.

1. 7am - 6pm on weekdays.
2. Between 8:00 am and 1:00 pm, Saturdays;
3. No work on Sundays and public holidays
4. Unless otherwise approved by local council.

Activities will be carefully managed and appropriate noise mitigating measures will be strictly implemented where required. The formulation of noise management plans for the various activities will arise from the assessment carried out in this report and the strict enforcement of all determined control measures.

6 BACKGROUND NOISE LEVELS

In order to assess noise impact from this development it is first required to determine the prevailing noise environment in the absence of construction noise at all potentially affected receiver locations.

Background noise levels in this area are principally determined by traffic on the surrounding roadways including Bringelly Road and Cowpasture Road which carry medium to high traffic volumes during most hours of the day.

Noise level measurements conducted at the site as part of this investigation are detailed below.

Measurements were performed generally in accordance with the Australian Standard AS 1055 - "Description and measurement of environmental noise - General Procedures".

6.1 MEASUREMENT LOCATION

Environmental noise levels were measured in the vicinity of the subject development. The measurement locations were determined to be representative existing background noise levels.

6.2 TIME OF MEASUREMENTS

Attended noise measurements were conducted at the site during a typical daytime period of 3.30pm to 5pm on the 4th August, 2014.

6.3 MEASUREMENT EQUIPMENT

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

6.4 NOISE MONITORING

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.

The monitor was located at a representative location to the receivers as well as being a secure position such that the logger would not be damaged.

The background noise monitor period is from 4th to 10th August 2014.

The results of logging have been used in conjunction with the attended noise measurements to develop suitable noise level criteria during the construction stage of the project.

6.5 NOISE DESCRIPTORS

Environmental noise constantly varies in level. Typically environmental noise is dominated by traffic noise which varies due to fluctuations in vehicle environmental speed, vehicle types, road conditions and environmental densities. Accordingly, it is not possible to accurately determine prevailing environmental noise conditions by measuring a single, instantaneous noise level. To accurately determine the effects of environmental noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters. 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 by the source.

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

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

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

6.6 MEASURED NOISE LEVELS

Table 3 lists the measured L_{eq} dB(A) noise levels that were recorded at the site and will be used as the basis of this report.

Table 3 - Measured Background Noise

MONITORING LOCATION	$L_{90\ (15\ min)}$ dB(A)
Location 1 – Stuart Road East	44
Location 2 – Stuart Road West	42
Location 3 - Cowpasture Road	56
Noise Monitoring Location (Daytime hours)	38

7 POTENTIALLY AFFECTED NOISE SENSITIVE RECEIVERS

The Bringelly Road Business Hub proposed development site is located on Bringelly Road within the vicinity of Cowpasture Road, Leppington as detailed in Figure 1 of this report.

The surrounding properties to the development site include the following:

1. Residential properties to the northeast, east, south and west of the site as identified in Figure 1 of this report.

8 CONSTRUCTION ACTIVITIES AMELIORATIVE MEASURES

The analysis indicates that most of the construction work activities will not adversely impact the surrounding receivers, with the exception of the following:

- High noise activities such as hammering, sawing and concrete pumping and the like.

Recommendations are made to reduce noise emissions to the noise goals, and to implement other measures to minimise noise emissions where practicable:

- In the event noise levels at receivers exceed criteria the following recommended treatments may be used to minimise noise from hydraulic hammering:
    - Acoustically screen activities from surrounding receivers by using building structures or a specifically constructed screen.
    - Acoustic testing to plant and equipment to confirm if site noise levels comply with nominated manufacturing noise levels.
    - Regular maintenance of equipment.
    - Locating concrete pumps at a maximum distance from neighbouring residential receivers.

9 VIBRATION ASSESSMENT

Construction vibration criteria associated with works on the proposed Bringelly Road Business Hub site when measured at the potentially affected receivers should not exceed the following sets of vibration criteria to ensure no architectural or structural damage to surrounding buildings. These standards have been selected as they are widely used in the assessment of vibration associated with construction activities within Australia, namely:

- German Standard DIN 4150-3 (1999-02): "Structural Vibration – Effects of Vibration on Structures"; and
- British Standard BS 6472:1992 "Guide to Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz).

The criteria and the application of these Standards are discussed in separate sections below.

9.1 GERMAN STANDARD DIN 4150-3 (1999-02)

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (1999-02) are presented in the Table below.

It is noted that the peak velocity is the absolute value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

Table 4 – DIN 4150-3 (1999-02) Safe Limits for Building Vibration

TYPE OF STRUCTURE		PEAK PARTICLE VELOCITY (mms^{-1})			
		At Foundation at a Frequency of			**Plane of Floor of Uppermost Storey**
		< 10Hz	**10Hz to 50Hz**	**50Hz to 100Hz**	**All Frequencies**
1	Buildings used in commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (eg buildings that are under a preservation order)	3	3 to 8	8 to 10	8

9.2 BRITISH STANDARD BS 6472:1992

British Standard BS 6472:1992 develops criteria relating to levels of building vibration that may be expected to give rise to "adverse comment", in the frequency range most applicable to impacts associated with construction, which is 1 to 80Hz. These threshold values are used as criteria for assessing the loss of amenity and are presented below in Table 3.

Table 5 – BS 6472:1992 Criteria to Avoid "Adverse Comment"

Type of Occupancy	Time of Day	Peak Particle Velocity (mms^{-1}) between 1Hz to 80Hz Likely to Cause *"Adverse Comment"*			
		Continuous Vibration		Intermittent Vibration and Impulsive Vibration Excitation with Several Occurrences per day	
		Vertical	Horizontal	Vertical	Horizontal
Residential	Day	0.3 to 0.6	0.8 to 0.6	8.4 to 12.6	24 to 36
	Night	0.2	0.6	2.8	8
Offices	Day	0.6	1.6	18	51
	Night	0.6	1.6	18	51
Workshops	Day	1.2	3.2	18	51
	Night	1.2	3.2	18	51

The limits indicate that people in buildings are significantly less susceptible to horizontal vibration than to vertical vibration. Furthermore, Section 4.1 of BS 6472 notes that situations can exist where vibration magnitudes above those generally corresponding to minimal "adverse comment" levels can be tolerated, particularly for temporary disturbances and infrequent and intermittent events such as those associated with construction projects.

10 CALCULATED NOISE AND VIBRATION IMPACTS

This section of the report predicts the potential noise and vibration impact on the surrounding residential receivers based on the expected equipment to be operated on the site.

10.1 VIBRATION IMPACT

Based on the distances between the boundary of the proposed site and the surrounding residential receiver's vibration will not exceed the project criteria as detailed in this report.

10.2 NOISE EMISSION ASSESSMENT

Noise generated by plant and equipment throughout the duration of the project will be managed to generally comply with the background +10dB(A)+ 5 dB(A) or criterion (as applicable), and where this noise goal may be exceeded noise will be managed in strict compliance with the EPA Interim Construction Noise Guideline and AS2436.

Predictions of noise levels impacting surrounding receivers from excavation processes have been assessed.

The excavation and construction activities which will potentially be operational on the site which have been assessed as being operational simultaneously.

10.3 ASSESSMENT OF POTENTIAL NOISE EMISSIONS

Noise impact assessment will be determined from the processes and equipment with the potential to generate high levels of noise. The A-weighted sound power levels for all the component parts of the above-described activities are outlined in the table below.

Table 6 - Excavation and Construction Activities – Sound Power Levels

ACTIVITY	EQUIPMENT /PROCESS	SOUND POWER LEVEL – AVERAGE MAXIMUM dB (A)
Excavation Activities	Excavators with Hammers	115
	Excavators without hammers	105
	Bobcat	105
	Trucks	108
	Scissor Lift	100
	Excavators	105
Construction Activities	Drilling	94
	Hammering	110
	Concrete Vibrator	100
	Cement Mixing Truck	105
	Concrete Pumps	107

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 for other similar studies.

10.4 POTENTIALLY AFFECTED RECEIVERS

A survey of potentially affected sensitive residential receivers has been conducted and identified the following locations which have been indicated in the table below.

Table 7 – List of Nearest Receivers

Receiver Number	Description
1	Residential Receivers to the northeast of the site
2	Residential Receiver to the east of the site
3	Residential Receiver to the south of the site
4	Residential Receiver to the west of the site

10.5 NOISE EMISSION ASSESSMENT

Noise generated by plant and equipment throughout the duration of the project will be managed to generally comply with the background + 10dB criterion, and where this noise goal may be exceeded noise will be managed in strict compliance with the EPA Interim Construction Noise Guideline and AS2436 as detailed within the DGR requirements.

Noise level predictions have been conducted to the potentially worst affected façades of the surrounding receivers over a typical 15min working period.

10.5.1 Receiver 1 – Residential Receiver to the Northeast of the Site

The northern residential receiver is a significant distance from the proposed site boundary (approximately 40m from the closest boundary of the site). The construction noise levels have been predicted based on the proximity of the receiver to the proposed site. The predictions also included distance losses and the equipment noise levels as tabled above.

The following table presents a summary of airborne noise levels which will occur externally at the residential receiver to the north of the site.

Table 8 – Predicted Construction Noise Levels to Residential Receiver to the Northeast

EQUIPMENT /PROCESS	EXTERNAL SOUND LEVEL dB(A) $L_{Aeq\ (15min)}$	RECEIVER GOAL NOISE LEVEL dB(A) $L_{Aeq\ (15min)}$	COMMENTS
Excavation Activities	Up to 66	Background + 10 dB(A) or 54 dB(A)	Management of activities within close proximity to the receiver required where possible and practice
Construction Activities	Up to 62		

10.5.2 Receiver 2 – Residential Receiver to the East of the Site

The eastern residential receiver is a significant distance from the proposed site boundary (in excess of 60m from the proposed works). The construction noise levels have been predicted based on the proximity of the receiver to the proposed site. The predictions also included distance losses and the equipment noise levels as tabled above.

The following table presents a summary of airborne noise levels which will occur externally at the residential receiver to the east of the site.

Table 9 – Predicted Construction Noise Levels to Residential Receiver to the East

EQUIPMENT /PROCESS	EXTERNAL SOUND LEVEL dB(A) $L_{Aeq\ (15min)}$	RECEIVER GOAL NOISE LEVEL dB(A) $L_{Aeq\ (15min)}$	COMPLIANCE
Excavation Activities	Up to 63	Background + 10 dB(A) or 54 dB(A)	Management of activities within close proximity to the receiver required where possible and practice
Construction Activities	Up to 60		

10.5.3 Receiver 3 – Residential Receiver to the South of the Site

The southern residential receiver is a significant distance from the proposed site boundary (in excess of 100m). The construction noise levels have been predicted based on the proximity of the receiver to the proposed site. The predictions also included distance losses and the equipment noise levels as tabled above.

The following table presents a summary of airborne noise levels which will occur externally at the residential receiver to the south of the site.

Table 10 – Predicted Construction Noise Levels to Residential Receiver to the South

EQUIPMENT /PROCESS	EXTERNAL SOUND LEVEL dB(A) $L_{Aeq\ (15min)}$	RECEIVER GOAL NOISE LEVEL dB(A) $L_{Aeq\ (15min)}$	COMPLIANCE
Excavation Activities	Up to 57	Background + 10 dB(A) or 66 dB(A)	Management of activities within close proximity to the receiver required where possible and practice
Construction Activities	Up to 54		

10.5.4 Receiver 4 – Residential Receiver to the West of the Site

The southern residential receiver is a significant distance from the proposed site boundary (in excess of 30m). The construction noise levels have been predicted based on the proximity of the receiver to the proposed site. The predictions also included distance losses and the equipment noise levels as tabled above.

The following table presents a summary of airborne noise levels which will occur externally at the residential receiver to the south of the site.

Table 11 – Predicted Construction Noise Levels to Residential Receiver to the West

EQUIPMENT /PROCESS	EXTERNAL SOUND LEVEL dB(A) $L_{Aeq\ (15min)}$	RECEIVER GOAL NOISE LEVEL dB(A) $L_{Aeq\ (15min)}$	COMMENTS
Excavation Activities	Up to 67	Background + 10 dB(A) or 52 dB(A)	Management of activities within close proximity to the receiver required where possible and practice
Construction Activities	Up to 63		

10.5.5 Proposed Monitoring Equipment

Monitoring of the proposed construction should be conducted as follows:

Noise - Noise measurements/monitoring should be conducted during periods with the potentially greatest impact to neighbouring receivers. In the event compliance with noise goals is achieved no additional monitoring is required unless alternative work practices are adopted. If exceedances are found noise monitoring should be conducted during periods when this process is in operation.

Vibration- Vibration measurements/monitoring should be conducted at potentially worst affected receivers during periods impact is greatest from construction activities, when activities may have the potential to impact surrounding receivers. If this is found to be compliant no additional monitoring is required. If exceedances are likely continuous noise monitoring should be conducted during the period when this activity is in operation.

11 NOISE AND VIBRATION MONITORING, REPORTING AND RESPONSE PROCEDURES

Noise and vibration monitoring will either consist of manned and/or unmanned measurements.

Active monitoring will be conducted by Acoustic Logic during the construction work phase of the project if required. In the event complaints are received from neighbours the following process will be followed:

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.

11.1 DISCUSSION

Based on the location of the proposed development and the proposed activities to be conducted on the site noise and vibration is expected to generally comply with the criteria detailed in this report.

12 REPORTING REQUIREMENTS

The following shall be kept on site by the builder.

1. A register of complaints received/communication with the local community with information as detailed below.

2. Where noise/vibration complaints require noise/vibration monitoring, results from monitoring.

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 presented.

5. All monitoring and reporting shall be conducted in conjunction with the conditions of consent.

12.1 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:

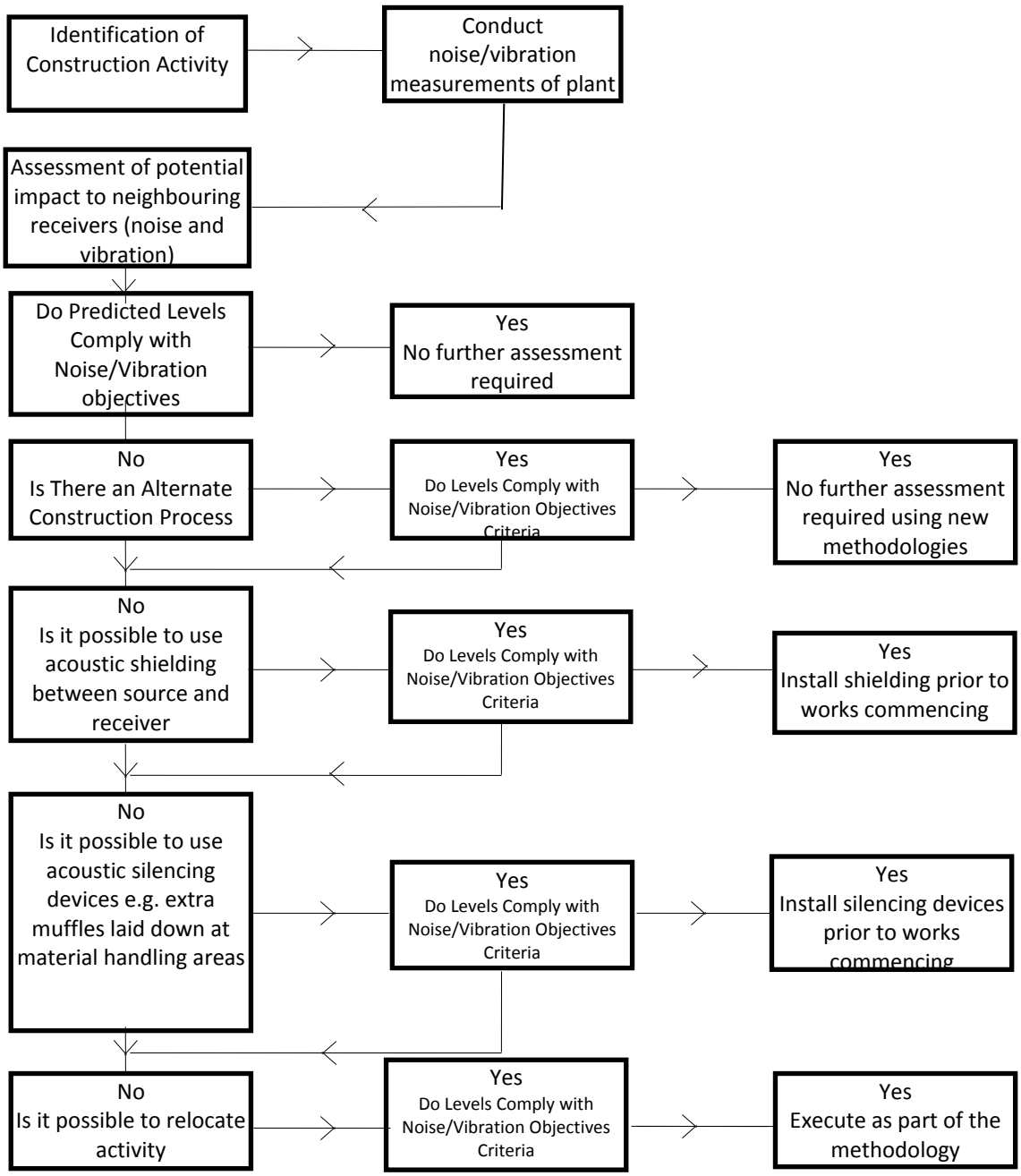
- The name and address of the complainant (if provided).
- The time and date the complaint was received.
- The nature of the complaint and the time and date the noise was heard.
- The name of the employee who received the complaint.
- Actions taken to investigate the complaint and a summary of the results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

12.2 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 construction work on this project. The execution of this work will facilitate the formulation of noise control strategies for this project.

The flow charts that follow illustrate the process followed to assess construction activities prior to the start of work on site and well as the ongoing investigation into noise during the construction period.

Chart 1 – Initial Assessment of Procedures



13 NOISE CONTROL METHODS

The determination of appropriate additional noise control measures will be dependent on the particular construction appliances identified as exceeding noise level criteria and requiring future acoustic treatments to those already identified in this report. This section provides an outline of available methods which have previously been used on similar construction sites and may be possible on this site.

13.1 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.

13.2 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. A double paled or lapped and capped fencing construction is recommended for such barriers.

13.3 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.

13.4 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. Examples of specific treatments include the following:

1. Wrapping of hydraulic hammers.

2. Screening of areas of impact from excavation equipment.

3. Treatment to saw or impact equipment using shrouds.

13.5 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.

14 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 liaise directly with potentially affected parties. 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.

15 CONTINGENCY PLANS

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 a 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.

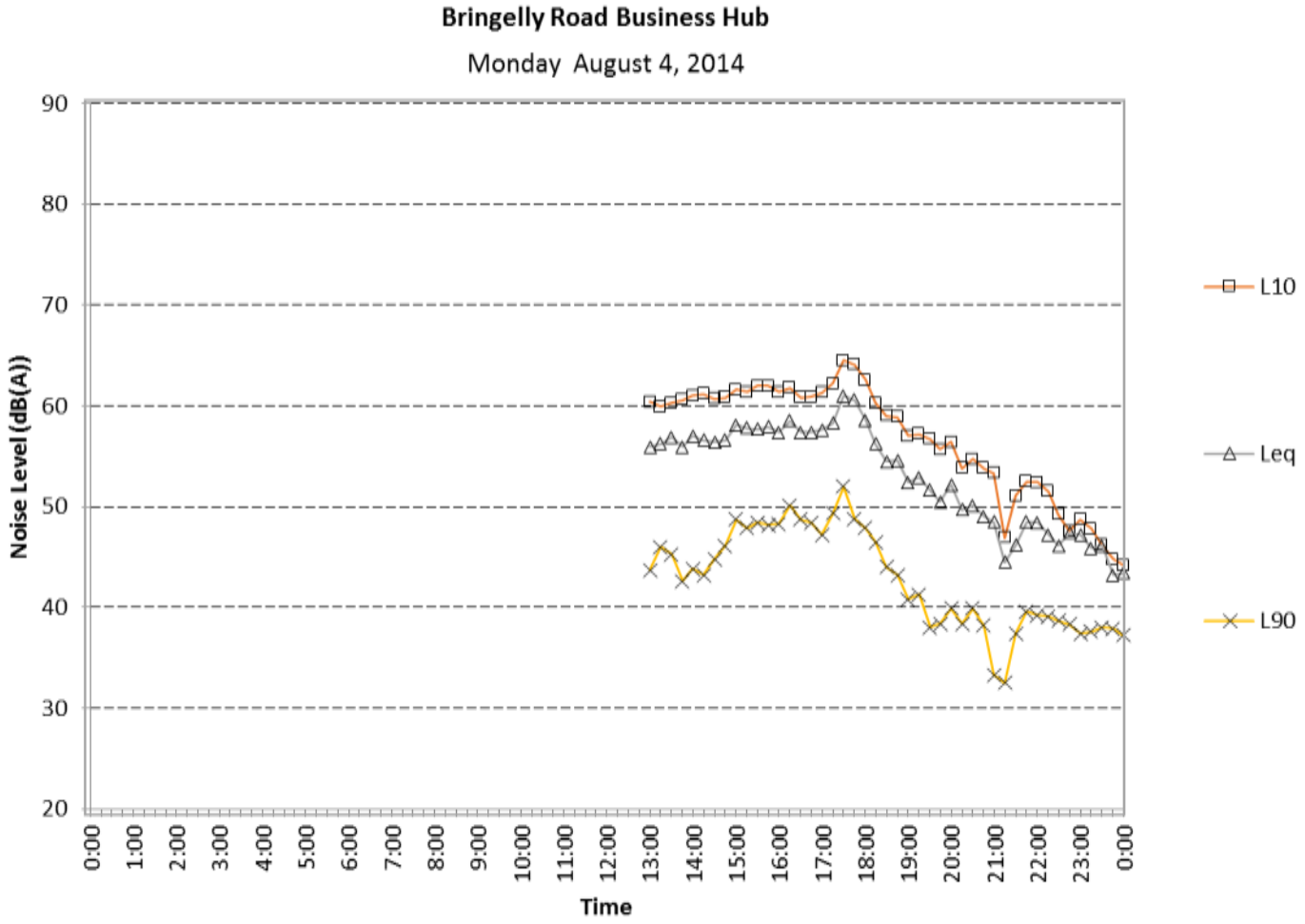
16 CONCLUSION

This document presents the noise and vibration management plan for activities proposed to be conducted at the Bringelly Road Business Hub (SSD 6324), Leppington development site during the construction period of the development. The report has been developed in conjunction with the Director Generals Requirements as well as the EPA construction noise guidelines and relevant Australian, British and German standards.

Regards

ACOUSTIC LOGIC CONSULTANCY PTY LTD
Ben White

Appendix A – Noise Logging Results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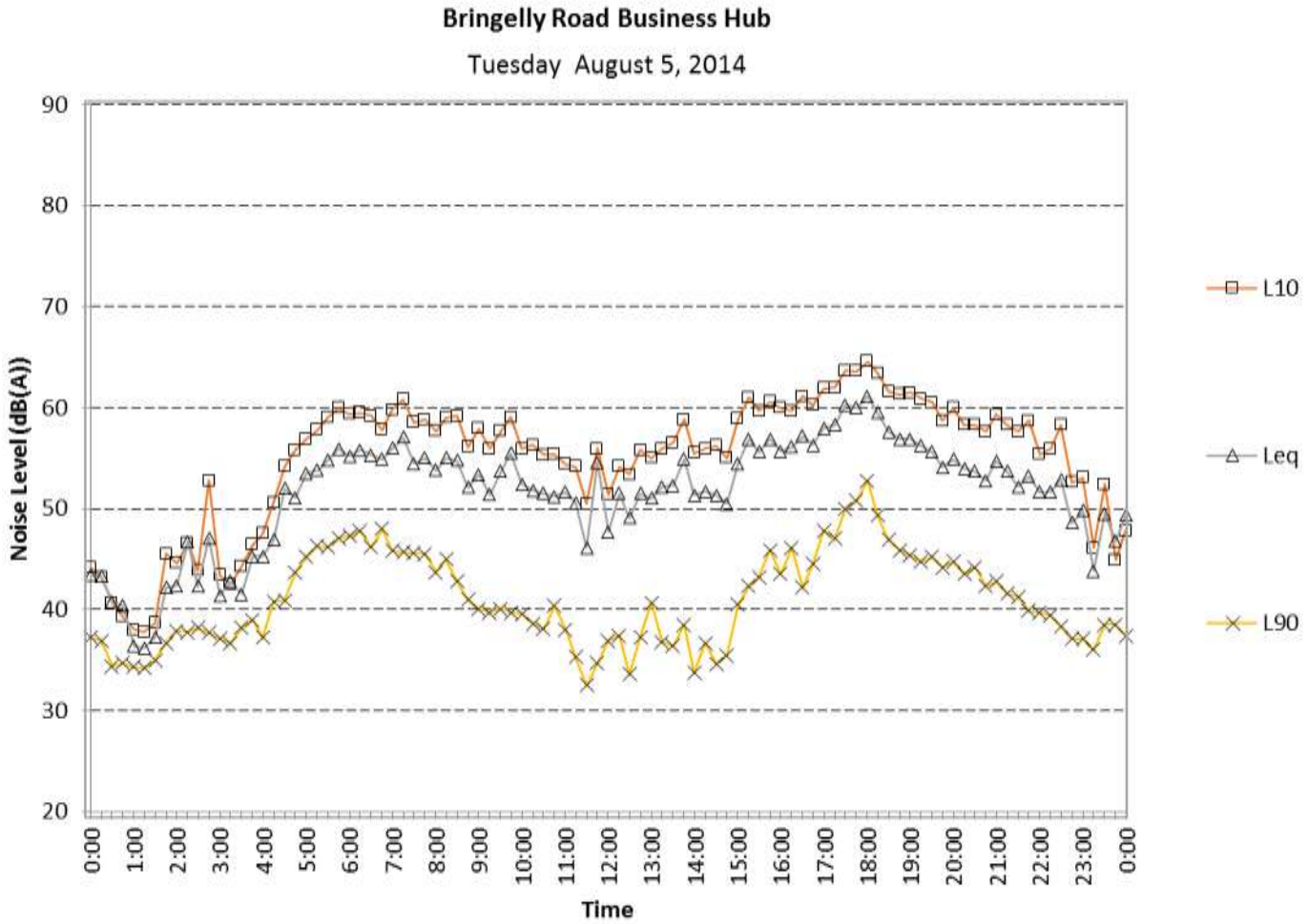
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Noise Level (dB(A))
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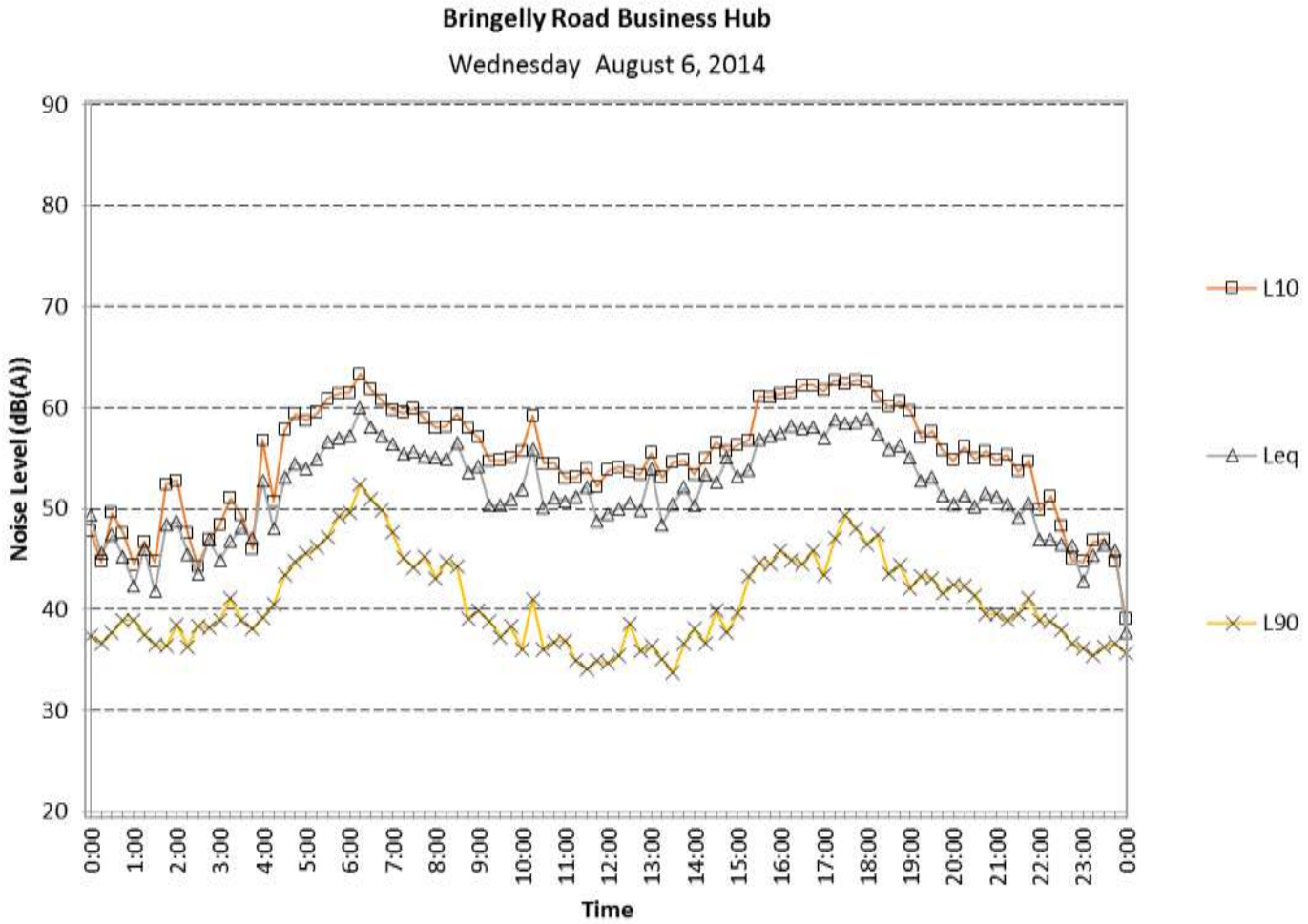
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Noise Level (dB(A))
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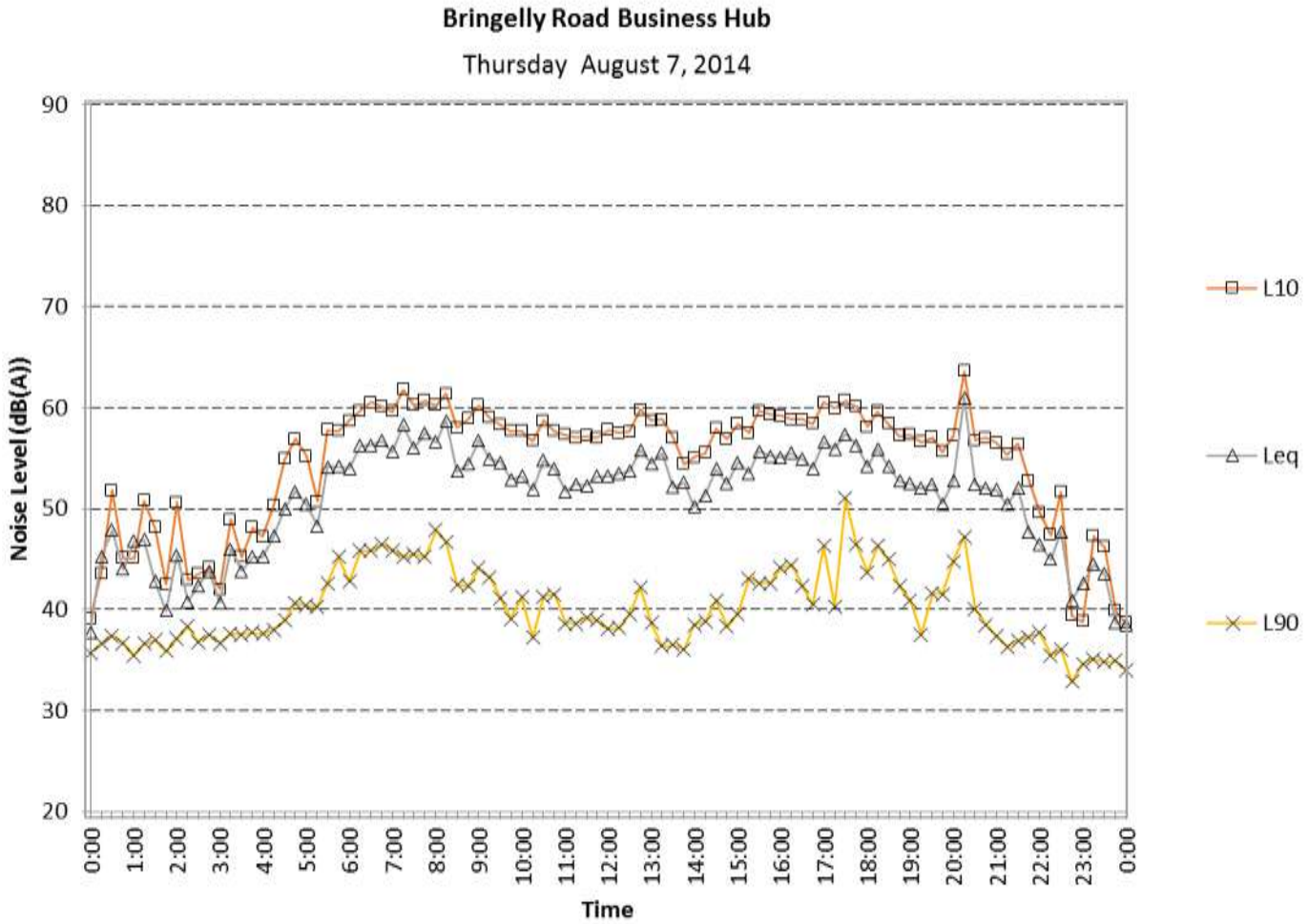
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Noise Level (dB(A))
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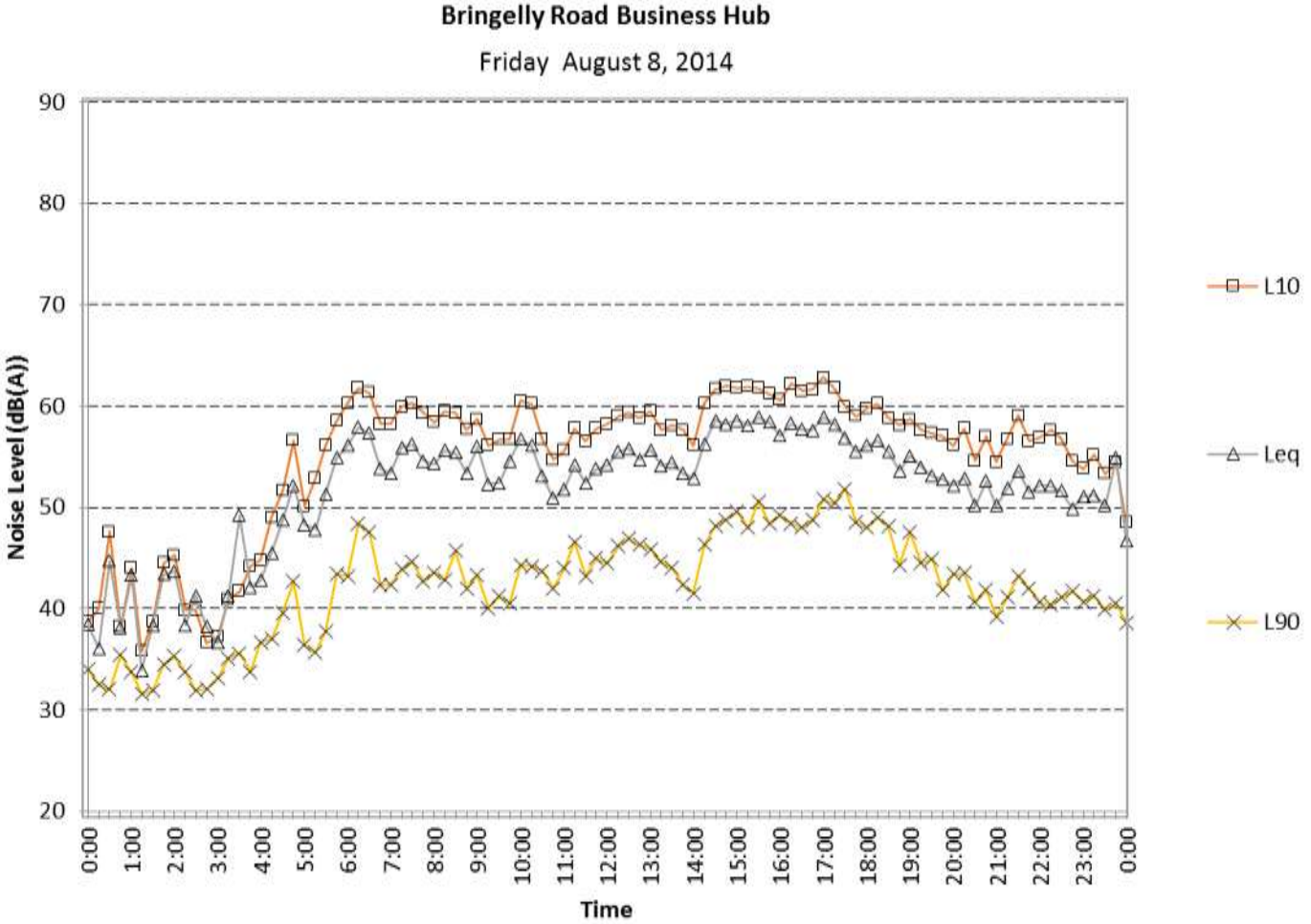
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Friday August 8, 2014
Noise Level (dB(A))
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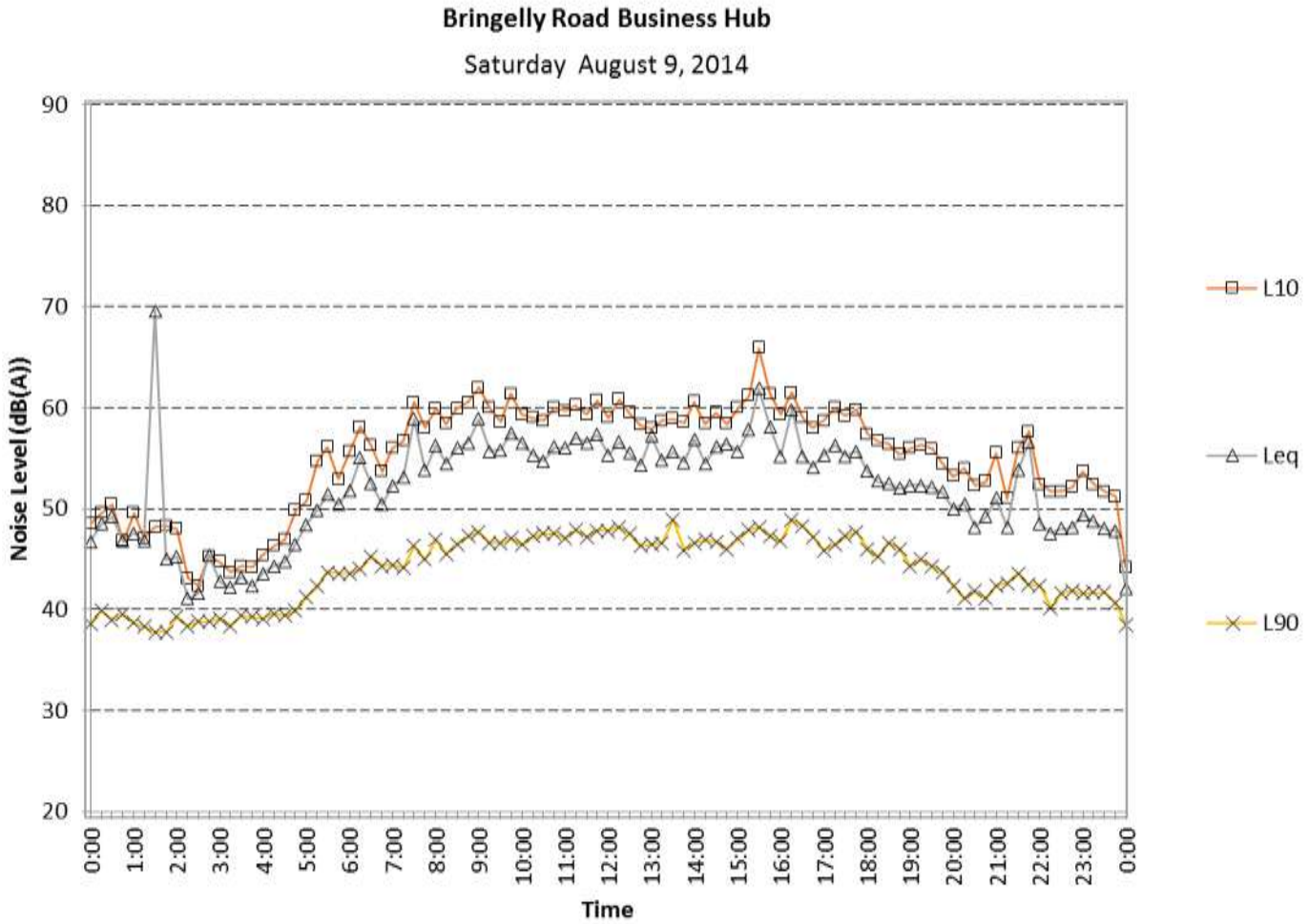
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Noise Level (dB(A))
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Time
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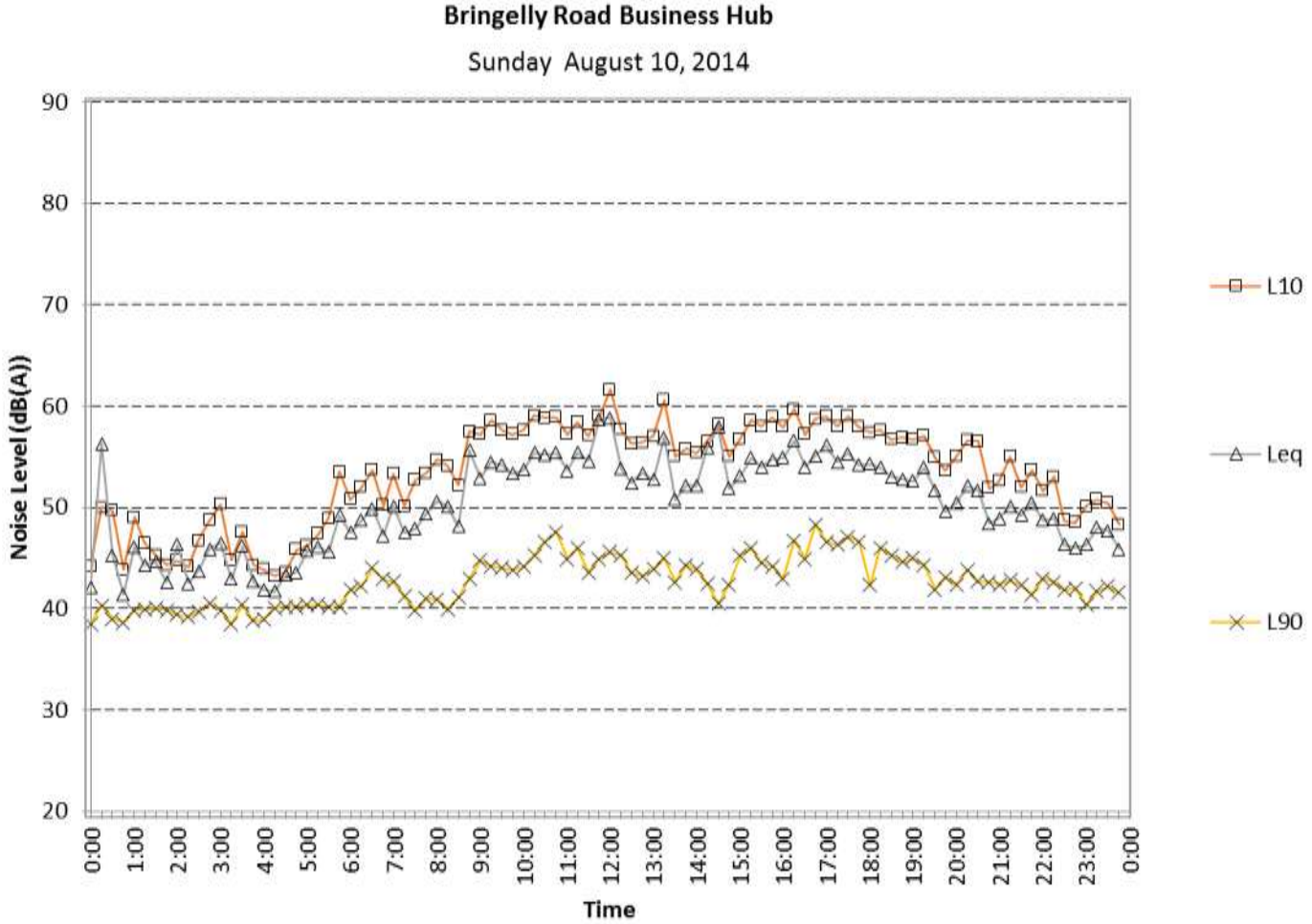
Bringelly Road Business Hub
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Time
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Appendix B – Site Plan