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Eastern Creek Retail Centre, Stage 1

DA Noise Impact Assessment

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1 INTRODUCTION

Acoustic Logic Consultancy Pty Ltd has been engaged to conduct an acoustic assessment for the purpose of assessing the potential impacts on the acoustic amenity of the proposed Eastern Creek Retail Centre, Stage 1 for both external and internal noise sources as part of the Planning Application submission. The noise sources investigated are as follows:

- Environmental noise impact on the future site, including surrounding traffic noise from surrounding roadways.
- Noise emissions from the site including mechanical plant noise to surrounding receivers.
- Noise emissions from the use of the proposed loading dock located on the proposed site.
- Noise emissions from the use of the proposed child care centre located on the site.

Environmental noise will be covered first as it will potentially impact the future development. Unattended and attended noise monitoring was conducted in order to determine the existing traffic noise levels around the perimeter of the site.

Detailed design of the mechanical plant will be provided as part of the CC submission for each stage of the project. This study will set the goal assessment criteria applicable to the project based on the Environmental Protection Authority (EPA) requirements, other council and relevant statutory/regulatory requirements.

This report reviews the recommendations and findings of the Eastern Creek Business Hub report conducted by PKA Consulting (dated August 2012), with regard to the proposed modifications to SSD 5175. The report also includes the requirements of the projects Development Consent including item B8 'Operational Noise'.

1.1 SITE DESCRIPTION

Figure 1 below illustrates the location of the proposed Eastern Creek Retail Centre, Stage 1 and the location of noise monitoring and measurements.



Figure 1 – Site Location and Measurement Positions

The existing environmental noise sources affecting the site are as follows:

- The development is affected by environmental noise predominantly from traffic noise from Rooty Hill Road to the west of the site.
- Other surrounding boundaries including existing residential properties as detailed in Figure 1 above.

The environmental noise source outlined above has varying degrees of impact upon the proposed development which will be outlined in this report.

2 EXISTING ACOUSTIC ENVIRONMENT

Environmental noise impacting the site is a result of traffic noise from the surrounding perimeter roadways and other surrounding land existing land uses.

2.1 TOPOGRAPHY

The topography of the site and surrounding land includes a drop of 2.5m to the loading dock which is below road level. The remainder of the site is generally flat.

3 ACOUSTIC SURVEY

As part of this assessment an acoustic survey of the proposed development site has been conducted.

The acoustic survey included attended and unattended noise logging which is detailed in this section of the report.

3.1 ENVIRONMENTAL NOISE LEVELS

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.

3.2 ATTENDED NOISE MEASUREMENTS

Attended noise level measurements conducted as part of this assessment are detailed in this section of the report. All noise levels undertaken as part of this assessment were conducted in conjunction with the requirements of AS1055.

3.2.1 Measurement Equipment

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.

3.2.2 Measurement Period

Noise measurements was conducted at the locations detailed in Figure 1 in Section 2 above during the following period:

1. Peak afternoon conditions between 4.30pm and 6pm on the 20th of January, 2017.

3.3 UNATTENDED NOISE MONITORING

Unattended noise monitoring conducted as part of this assessment is detailed in this section of the report. The results of unattended noise logging are included in Appendix A.

3.3.1 Unattended Monitoring Period

Unattended noise monitoring was conducted at the site during the period of 18th to 25th January, 2017 in order to measure the existing background and environmental noise levels at the site.

The noise level monitors were located at the following locations:

1. Location – The western side of the site with proximity to Rooty Hill Road which was selected as being representative location for the residential receivers opposite the site to the west.

3.3.2 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 noise 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. Periods of adverse weather conditions during the during the measurement period have not be used in this assessment.

3.4 RESULTS OF THE ACOUSTIC SURVEY

An acoustic survey was undertaken at the proposed site in order to determine the existing acoustic environment. The unattended monitor results will be used to determine the variation between day, evening and night time noise levels. Attended measurements will be compared with the unattended monitoring data during the same measurement period so that relative differences between the attended and unattended locations can be formed thereby providing a comprehensive study of existing noise levels around the proposed site.

3.4.1 Existing Background Noise Levels

Background noise levels during day time are dominated by general vehicular traffic movements. The NSW Environmental Protection Authority (EPA) Industrial Noise Policy (INP) 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 INP and the results of unattended noise monitoring.

Table 1 – Measured Ambient Noise Levels

Location	Description	Day Noise Level 7am to 6pm (dB(A)L ₉₀)	Evening Noise Level 6pm to 10pm (dB(A)L ₉₀)	Night Noise Level 10pm to 7am (dB(A)L ₉₀)
Logger Location	Background L _{90,15min}	50	46	34

In addition to the background levels obtained at the unattended monitoring position presented above, attended noise monitoring was conducted at 2 locations around the perimeter of the subject site as detailed in Figure 1 of Section 1 above. The results of the attended noise measurements are presented in Table 2 below.

Table 2 – Measured Attended Environmental Noise Levels

Location	Time Period	Measured Noise level dB(A) L _{eq} (15 min)
Location 1 – Rooty Hill Road	Peak Afternoon Period	62
Location 2 – Beggs Road	Peak Afternoon Period	59

4 NOISE EMISSION LIMITS – NOISE GENERATED ON THE SITE

The NSW Environmental Protection Authority (EPA) Industrial Noise Policy (INP) provides guidelines for assessing noise impacts from development sites. The recommended assessment objectives vary depending on the potentially affected receivers, the time of day, and the type of noise source. The EPA's Industrial Noise Policy has two requirements which both have to be complied with, namely an amenity criterion and an intrusiveness criterion. In addition, the EPA 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 NSW Road Noise Policy.

4.1 EPA INTRUSIVENESS CRITERION

The EPA 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.

4.2 EPA AMENITY CRITERION

The EPA 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 of the INP 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 – EPA Recommended Amenity Noise Levels

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

4.3 SLEEP AROUSAL

To minimise the potential for sleep arousal the $L_{1(1 \text{ minute})}$ 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.

4.4 SUMMARY OF ASSESSMENT CRITERIA FOR PROPOSED SITE

The EPA's INP 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.

Table 4 – Noise Objectives for Surrounding Receivers

Location	Day time Noise Objective dB(A) L_{eq}	Evening Noise Objective dB(A) L_{eq}	Night time Noise Objective dB(A) L_{eq}	Noise Objective for Intermittent Activities dB(A) $L_{1(1 \text{ Min})}$ (Background + 15 dB(A))
Project Site	55	45	39	49

Noise level criteria are to be applied to commercial traffic levels generated from vehicle movements on the site only, as presented by the Industrial Noise Policy. Noise levels generated from the movement of vehicles entering and exiting the site on ramps are generally required to comply with levels presented in the presented tables for surrounding receivers.

5 MECHANICAL PLANT TREATMENTS

A detailed mechanical noise assessment will be conducted once plant selections and services drawings have been finalised as part of the construction documentation to ensure noise levels comply with the criteria detailed in this report. Details will be provided as part of the CC submission of the project.

Based on experience with similar development acoustic treatments are both possible and practical using acoustic treatments such as lining of ductwork, acoustic silences, variable speed controllers, time switches, acoustic screens etc. General requirements for a number of potential plant items on the site are expanded on below.

5.1 CHILLERS / AIR HANDLING UNITS

Units can be located on roof tops with an acoustic screen or in basement areas or roof top plant areas, with acoustic treatment to intake and exhaust as necessary.

These units would predominantly operate during the day, with the potential to operate with extended hours. Acoustic treatment to these units may be required to ameliorate noise impact to the surrounding residents and to comply with the criteria specified in this report and verified at CC stage.

5.2 SUPPLY / EXHAUST FANS

Supply and exhaust fans may be located within the underground plant rooms or in rooftop plant areas. These units typically emit high noise levels and require acoustic treatment such as silencers and internal lined ductwork. Silencer requirements would be determined once fan selections have been completed at CC stage.

5.3 CONDENSER UNITS

Condensing units typically emit relatively low noise levels and with careful selection, it is possible that no further acoustic treatment would be necessary.

5.4 MINOR PLANT

Other minor plant items, such as bathroom or kitchen exhaust fans, will be required. These items typically emit relatively low noise levels and may require minimal acoustic treatment of a standard nature, such as internally lining of ductwork.

5.5 ACOUSTIC SCREENING

In the event acoustic screening is required to treat plant noise levels the screening would need to include a solid barrier (such as FC Sheet, masonry or the like) installed to the minimum height of the plant which may be installed on the roof of the proposed development.

6 ASSESSMENT OF LOADING DOCK ACTIVITIES

This section of the report presents the assessment of noise associated with the operation of the loading docks associated with the project. The assessment was conducted in conjunction with the EPA criteria presented in this report.

The location of the proposed loading dock is detailed in the Figure below.

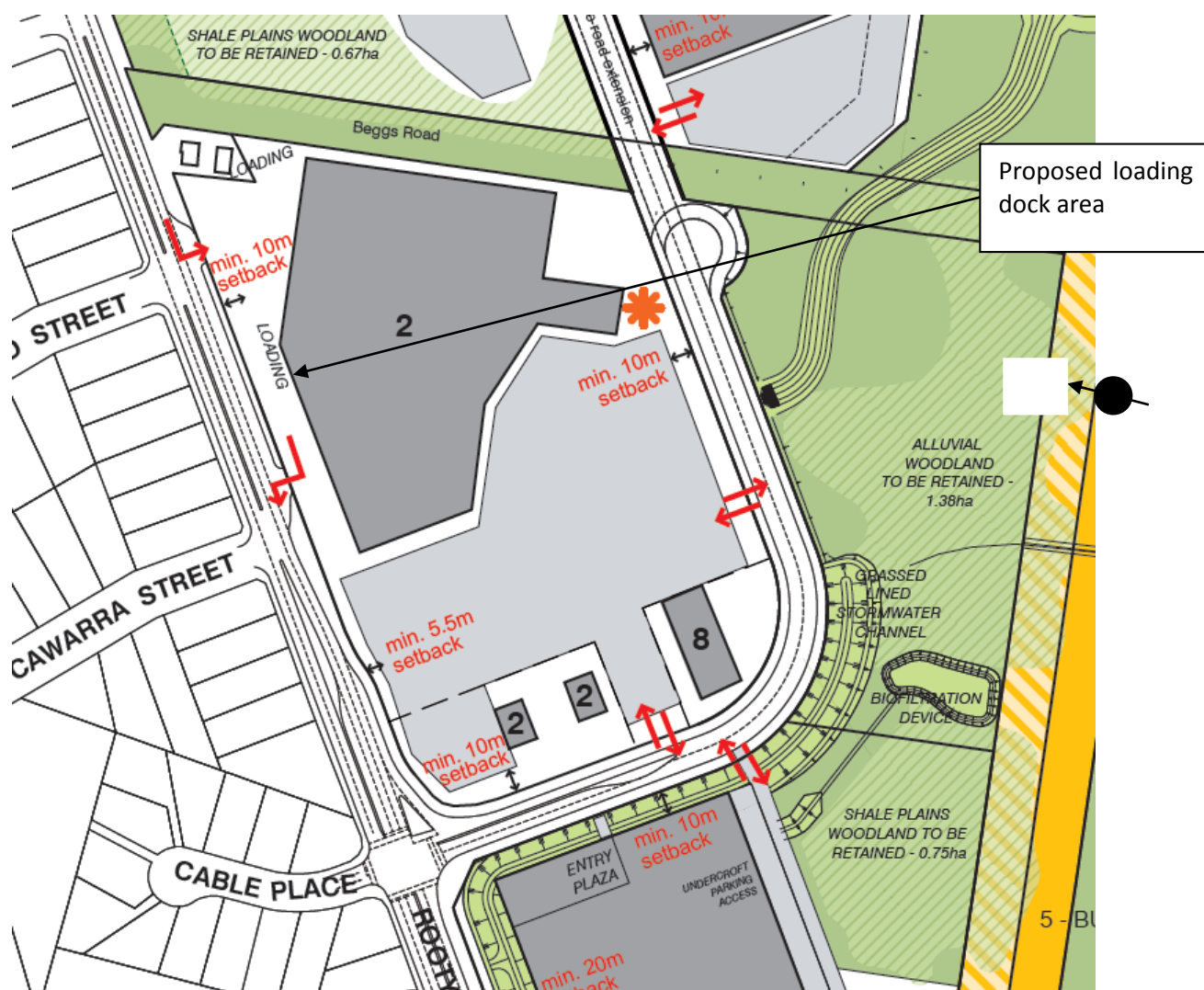


Figure 2 – Location of the proposed loading dock

Acoustic assessment of noise generated by the loading dock has been undertaken and the proposed dock has been assessed and compliance with the relevant criteria providing suitable time control measures are implemented based on the proposed uses within the loading dock. Details of the required acoustic mitigations will be provided at the DA stage of the project.

6.1 POTENTIAL LOADING DOCK NOISE SOURCES

The potentially significant loading dock noise sources are listed in Table 5 below long with noise emission levels. The emission levels in Table 5 have been obtained from noise monitoring carried out at similar loading dock facilities. Noise measurements were obtained using a Norsonics SA 110 sound level meter, set to fast response. The sound level meter was calibrated before and after the measurements using a Rion NC-73 calibrator. No significant drift was recorded.

Table 5 - Noise Source Emission Levels

Noise Source	Sound Emission Level dB(A) at 7m	Type of Noise Source
Truck Reversing alarm	75 ⁽¹⁾	Quasi-Steady, tonal
Trucks Manoeuvring/Reversing (including medium size non-reticulated trucks)	75	Quasi-Steady
Truck Brakes	89	Transient
Truck Door Closing	75	Transient
Truck Starting	72	Transient

(1) A 5 dB(A) penalty has been applied to this source to account for the tonal characteristic of noise produced.

6.2 PREDICTED NOISE LEVELS AT MOST AFFECTED RECEIVERS

Noise levels at the residences were predicted based on the noise emission levels in Table 5, which are typical for this type of development.

Table 6 summaries the predicted noise levels at the nearest residence to the north (town houses) of the proposed loading dock and within the proposed development. The noise levels below assume the acoustic treatments detailed in this report are adopted.

Table 6 – Assessment of Loading Dock Noise Emissions

Location/Activity	Receiver	Predicted Noise Level at Residence $L_{eq,15min}$	Noise Level Criteria at Residence $L_{eq,15min}$
Truck Loading/Unloading ⁽¹⁾ Within the Loading Dock	Worst affected residence opposite on Rooty Hill Road	Day - 47 dB(A) Evening– 47 dB(A) Night – Not in operation	Day - 55 dB(A) Evening– 50 dB(A) Night – Not in operation

1 - These activities include activities such as the delivery truck being idle in the dock, movement of pallet trucks, operation of compactors, etc.

6.3 RECOMMENDED LOADING DOCK DEVELOPMENT CONTROLS TO THE LOADING DOCK

Generally, the noise levels associated with the proposed loading dock can comply with the relevant noise level criteria at all surrounding receivers and providing suitable acoustics treatments and controls are included on the site there will be no negative impacts on the amenity of surrounding receivers. Details of the specific treatments and controls will be provided at the DA stage of the project.

7 CHILDCARE CENTRE

As part of the proposed development there is a childcare centre to be installed to the south eastern corner of the site.

This section of the report details the assessment of environmental noise impact into the proposed child care centre.

7.1 INTERNAL NOISE CRITERIA

Internal noise levels within the child care centre will be designed to comply with the requirements of the Australian Standard AS2107:200.

Australian Standard 2107:2000 details the following control for external noise intrusion to childcare facility. The applicable criteria from that standard are as follows:

Table 7 – Recommended Design Sound Level

Type of Occupancy/Activity	Recommended Design Sound Level dB(A) $L_{eq, 1hour}$
Sleeping Rooms	35
Indoor Play Areas	40

The recommended acoustic treatments to the building façade to ensure internal noise levels comply with the criteria above is 6.38mm laminated glass to the perimeter of the proposed childcare centre.

7.2 NOISE EMISSION PREDICTIONS

The assessment of noise emissions from the proposed child care centre has been assessed in conjunction with the proposed development conditions including the following:

1. The centre will cater for up to 50 children within the centre.

7.2.1 Noise Source Data

This section of the report details the source noise data which has been used as the basis of this report and the recommended treatments are those required to comply with the noise level criteria detailed in the Sections above.

7.2.1.1 Outdoor Play Area Noise Measurements

Outdoor play area noise measurements were undertaken at a typical Child Care Centre for the purpose of using a source noise level in this assessment. Noise measurements were taken of the 3 to 6 year age group with 8 kids at play which have then been corrected to the sound power level for 1 child and used as the basis of the noise source in this assessment. This group represents the most active of the age groups and hence are likely to generate the maximum noise levels. Although noise measurements have not been conducted for the 0-2 year age group, it would be expected that they would be likely to generate lower levels of sound than the older age group.

The noise level recorded by this play group has been corrected for the sound power level of 1 child at play and then corrected for the assessment of the proposed number of children within the development of 50 children within the centre total.

7.2.1.2 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 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.

7.2.1.3 Measured Noise Levels

The measured activity noise levels from the 8 children playing are listed below in table below.

Table 8 - Measured Children Activity Noise Levels dB(A) L_{A10}

LOCATION	Activity	Distance	NOISE LEVEL dB(A) SPL
Outdoor Play Area	Bikes + Sandpit play	3m	66
	Blocks + Sandpit play	4m	64
	Stepping Blocks + Sandpit play	4m	57
	Play gym + Sand pit play	3-4m	65

The noise levels detailed above will be used as the basis of noise emissions from the proposed site.

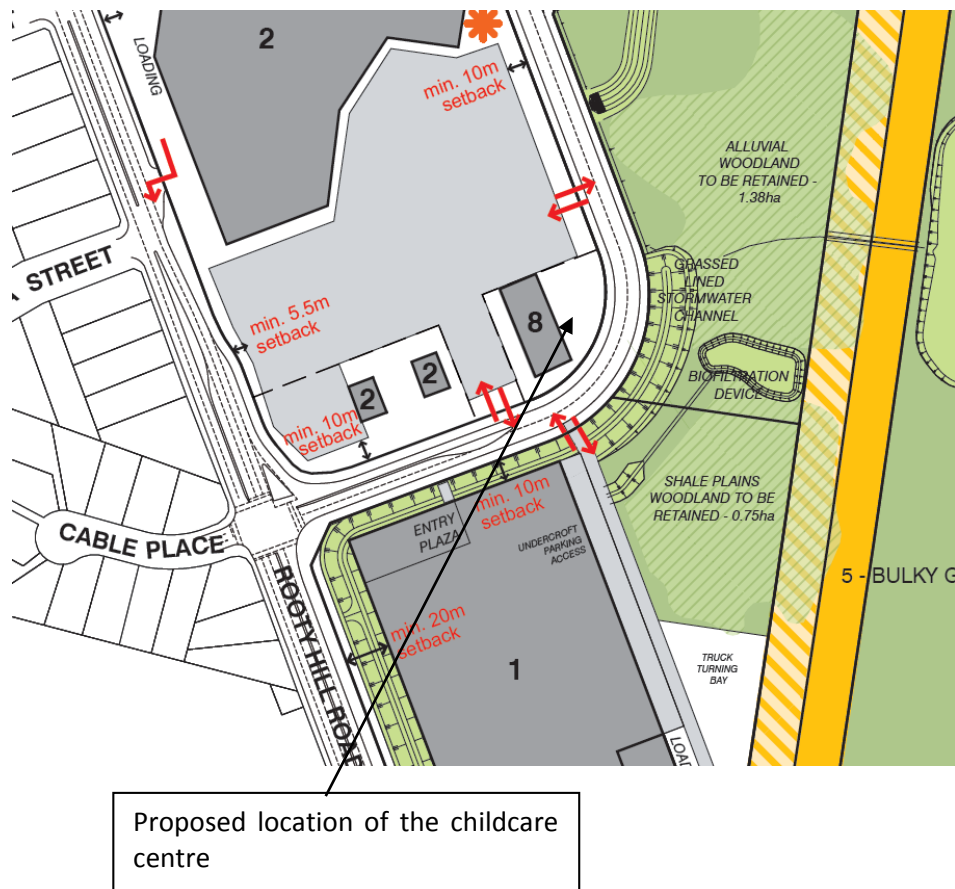
7.2.2 Predicted Noise Levels

7.2.2.1 Outdoor Noise

Noise emissions from the play areas are predicted based on the following assumptions:

- The measured typical kids' play noise data above
- Play areas are assumed to be operating at the nominated capacity, and the children are distributed evenly across the outdoor play area.
- Outdoor playing time may be restricted. Details will be provided at the DA stage of the project.
- The recommended constructions and management controls presented in Section 6 of this report have been implemented in the building.

- The proposed outdoor play areas are detailed in the figure below.



The noise level at the nearest residents was predicted using the above data and by taking into account any expected noise reduction provided by the building fabric, distance losses, directivity, barrier effects, number of children playing etc.

Table below shows the predicted noise levels from the children in outdoor play area.

Table 9 - Predicted Noise Levels from Outdoor Play (Day time only as this is when external play area will be used)

Receptor	Predicted Noise Level $L_{eq, 15min}$ dB(A)	Criteria $L_{eq, 15min}$ dB(A)	Complies
Residential development to the west of the site	44 External	55 External	Yes

7.3 RECOMMENDED CHILDCARE CENTRE TREATMENTS AND CONTROL

The following building and management controls are required to control noise impact from the proposed child care centre on the proposed development.

- Children's outdoor play area to be operational between 8am and 6pm on any given day.
- Minimum 6.38mm laminated glazing with acoustic seals around perimeter is required, with minimum Rw of 30.
- Signs reminding staff and visitors to minimise noise at all times shall be installed at ingress/egress points from the child care centre.
- Management is to ensure children are supervised at all times to minimise noise generated by the children whenever practical and possible.
- Install a contact phone number at the front of the centre so that any complaints regarding centre operation can be made.

8 PAD SITES

This section of the report details the assessment for the potential for noise from the PAD sites to the residential receivers to the west of the site. The proposed PAD sites may include takeaway outlets with carpark and take out services which has been detailed in this section of the report.

The location of the proposed PAD sites is detailed in the figure below.

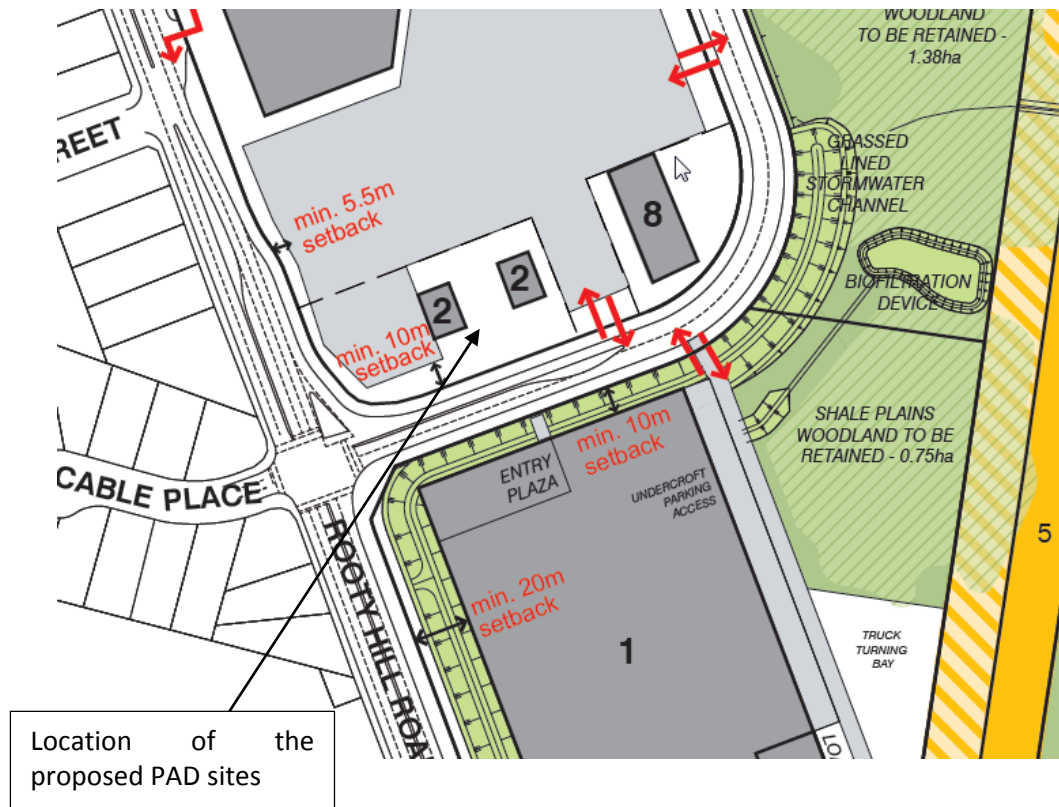


Figure 3 – Proposed PAD Sites

8.1 NOISE SOURCES

Based on the proposed operations which are proposed as part of the PAD sites the potentially worst case noise levels from the operation of the proposed takeaway out lets includes vehicle noise (ie cars entering and exiting) and noise from the ordering stations. The potentially worst case noise levels from these operations are detailed in the table below.

Table 10 – PAD Sites Noise Levels

Noise Source	Sound Emission Level dB(A) at 5m	Type of Noise Source
Vehicle noise (accelerating away worst case)	65	Quasi-Steady
Amplified peach from ordering stations	60 ⁽¹⁾	Quasi-Steady, potentially tonal

(1) A 5 dB(A) penalty has been applied to this source to account for the tonal characteristic of noise produced.

8.2 NOISE LEVEL PREDICTIONS

Based on the expected source noise levels from the site and detailed in Table 10 above the following noise levels have been assessed at the affected residential relievers to the west of the site:

The following is a sample calculation used to predict the noise level the affected residential receiver from vehicles accelerating away for the POD sites.

Vehicles Noise

1. Source noise level (Sound Pressure Level) @ 5m: 65 dB(A)
 2. Distance correction to residence (70m): -23 dB
 3. Time correction for noise being in operation 5min in every 15min period: - 4 dB
- Resultant Noise level at façade (Criteria 39 dB(A) worst case): **38 dB(A)**

Ordering stations noise

4. Source noise level (Sound Pressure Level) @ 5m: 60 dB(A)
 5. Distance correction to residence (70m): -23 dB
 6. Time correction for noise being in operation 5min in every 15min period: - 4 dB
- Resultant Noise level at façade (Criteria 39 dB(A) worst case): **33 dB(A)**

Based on the calculations above the accumulative noise levels from simulations operations is 39dB(A) as is complaint with night time noise level criteria.

9 CONCLUSION

This report provides the results of Environmental Noise Study for the proposed Eastern Creek Retail Centre, Stage 1. Noise at the site has been measured and noise goals have been set in accordance with the requirements of the relevant statutory/regulatory authorities including Local Council and the Environmental Protection Authority.

Based on the assessment detailed in this report the proposed development will comply with all relevant noise and vibration criteria.

The findings and recommendations of the previously conducted Eastern Creek Business Hub report conducted by PKA Consulting (dated August 2012) remain applicable notwithstanding the proposed modifications to the project.

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

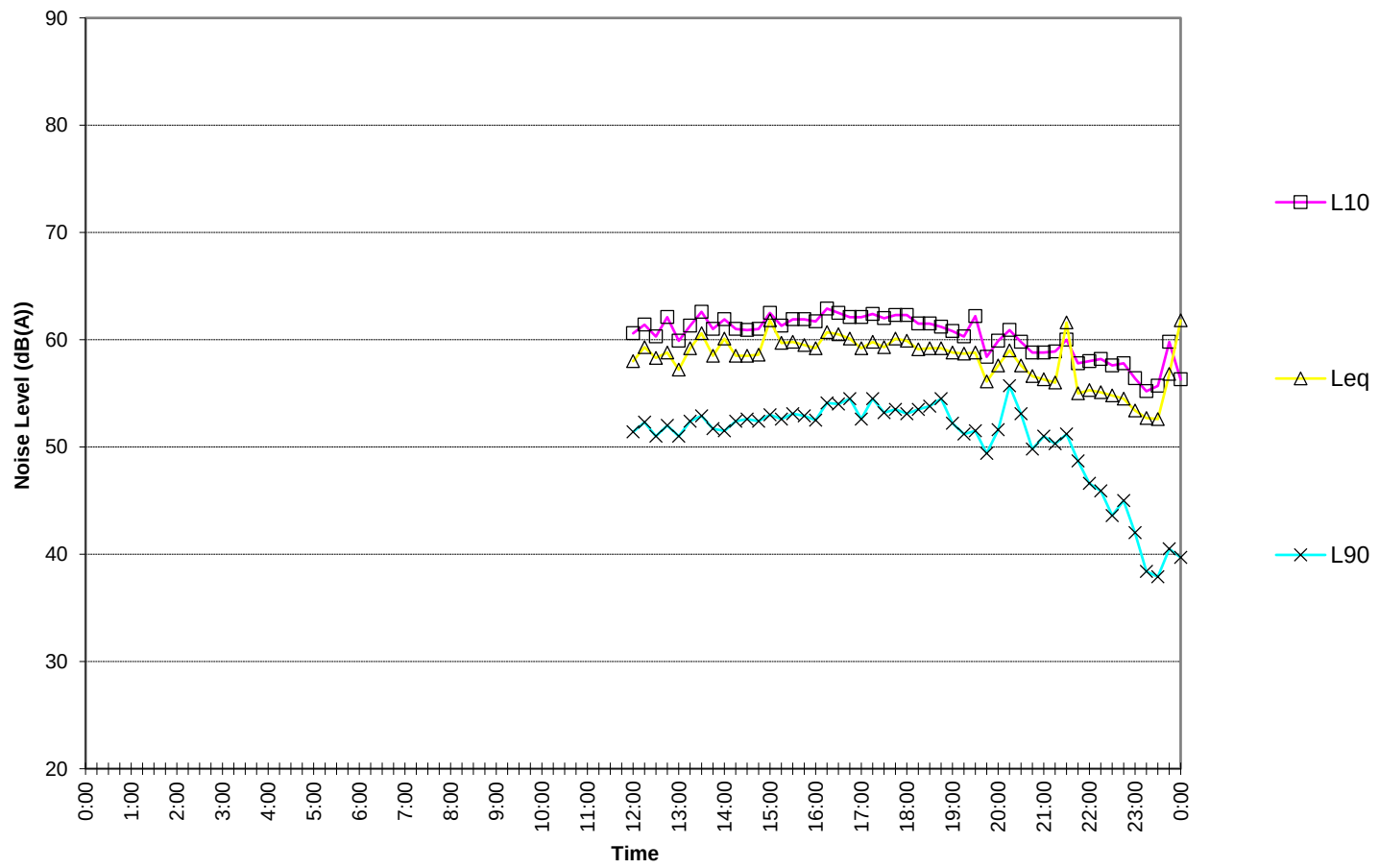
Report prepared by,

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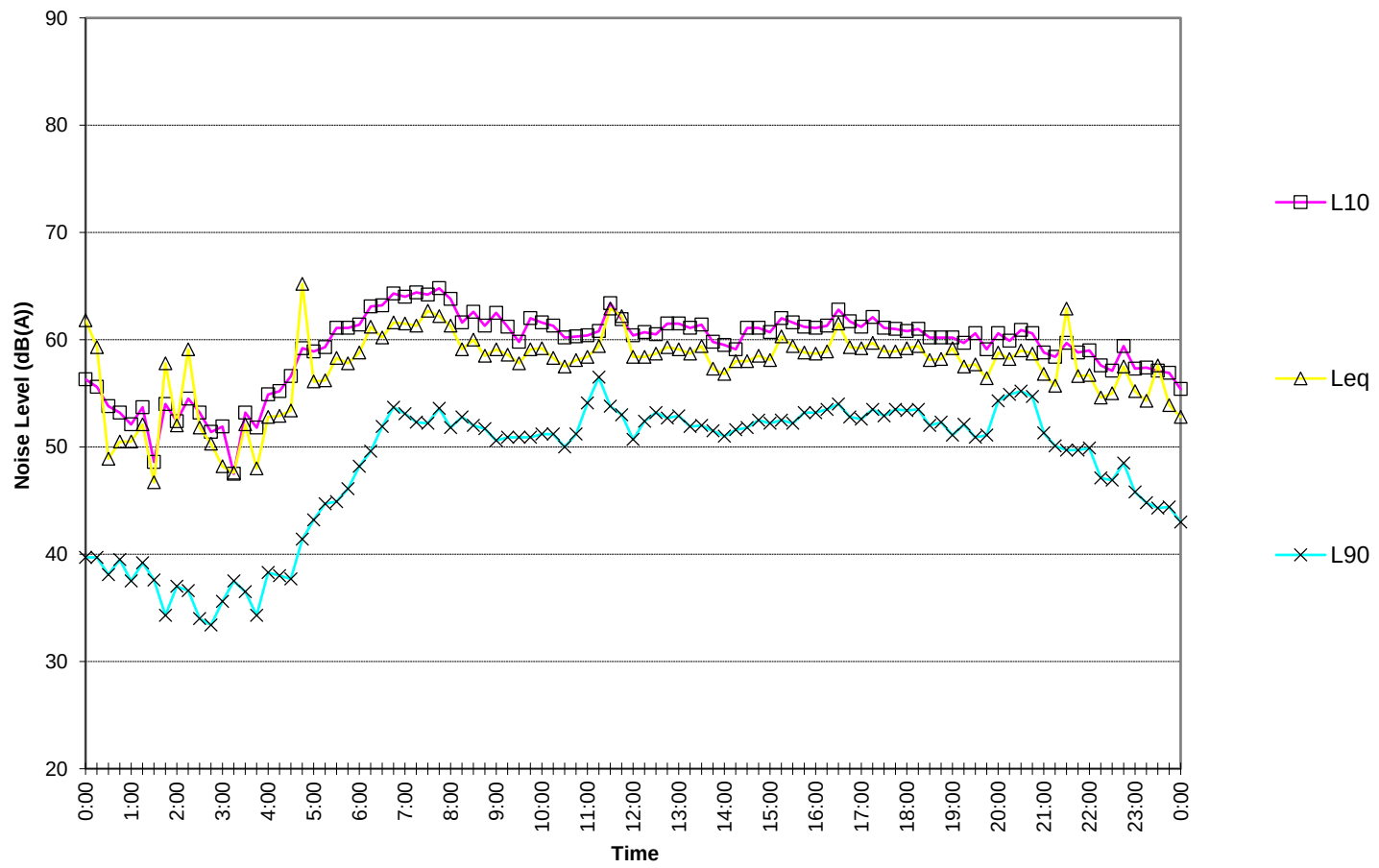
ACOUSTIC LOGIC CONSULTANCY PTY LTD
Ben White

Appendix A – Noise Logging Results

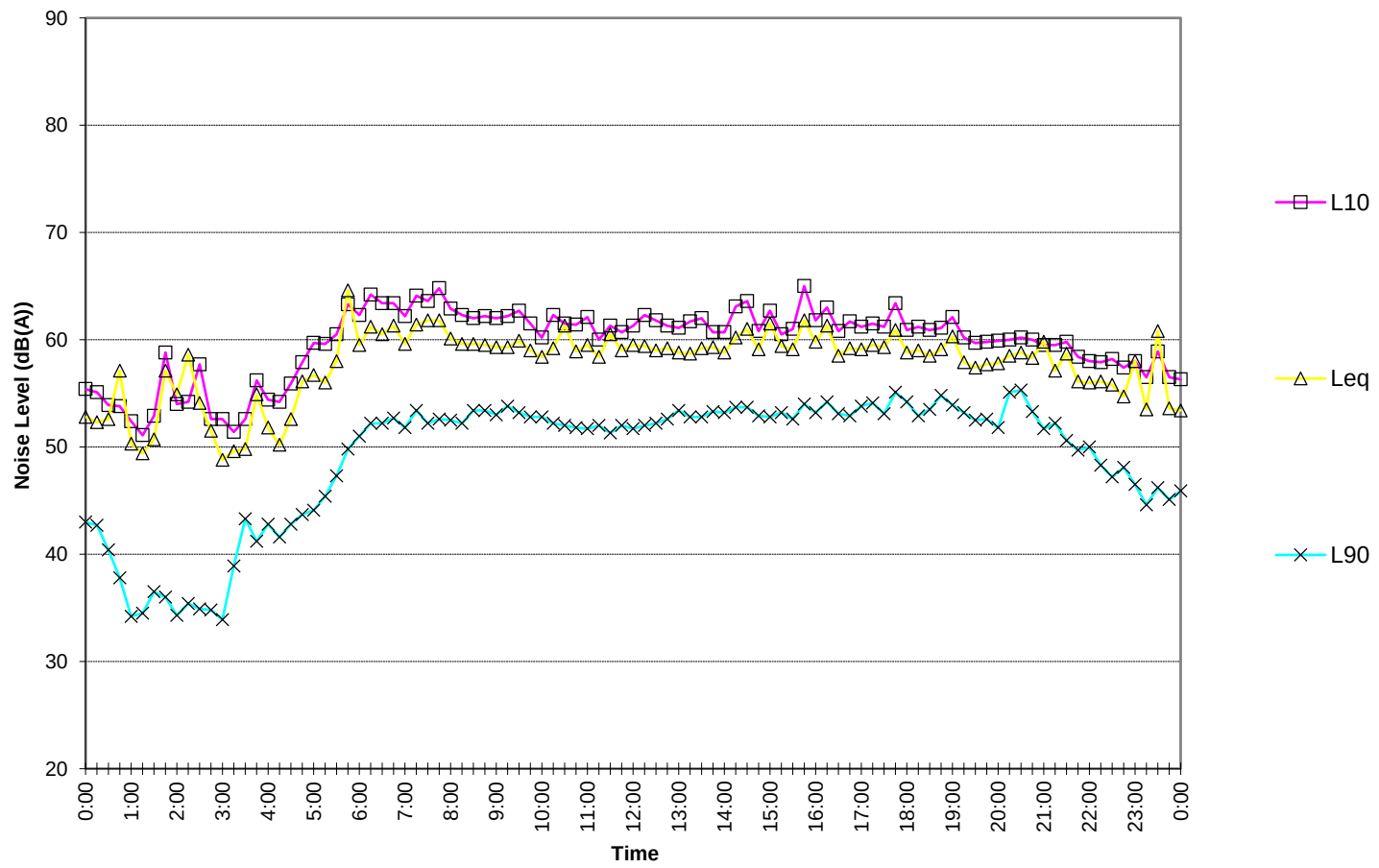
Rooty Hill Village
Wednesday January 18, 2017



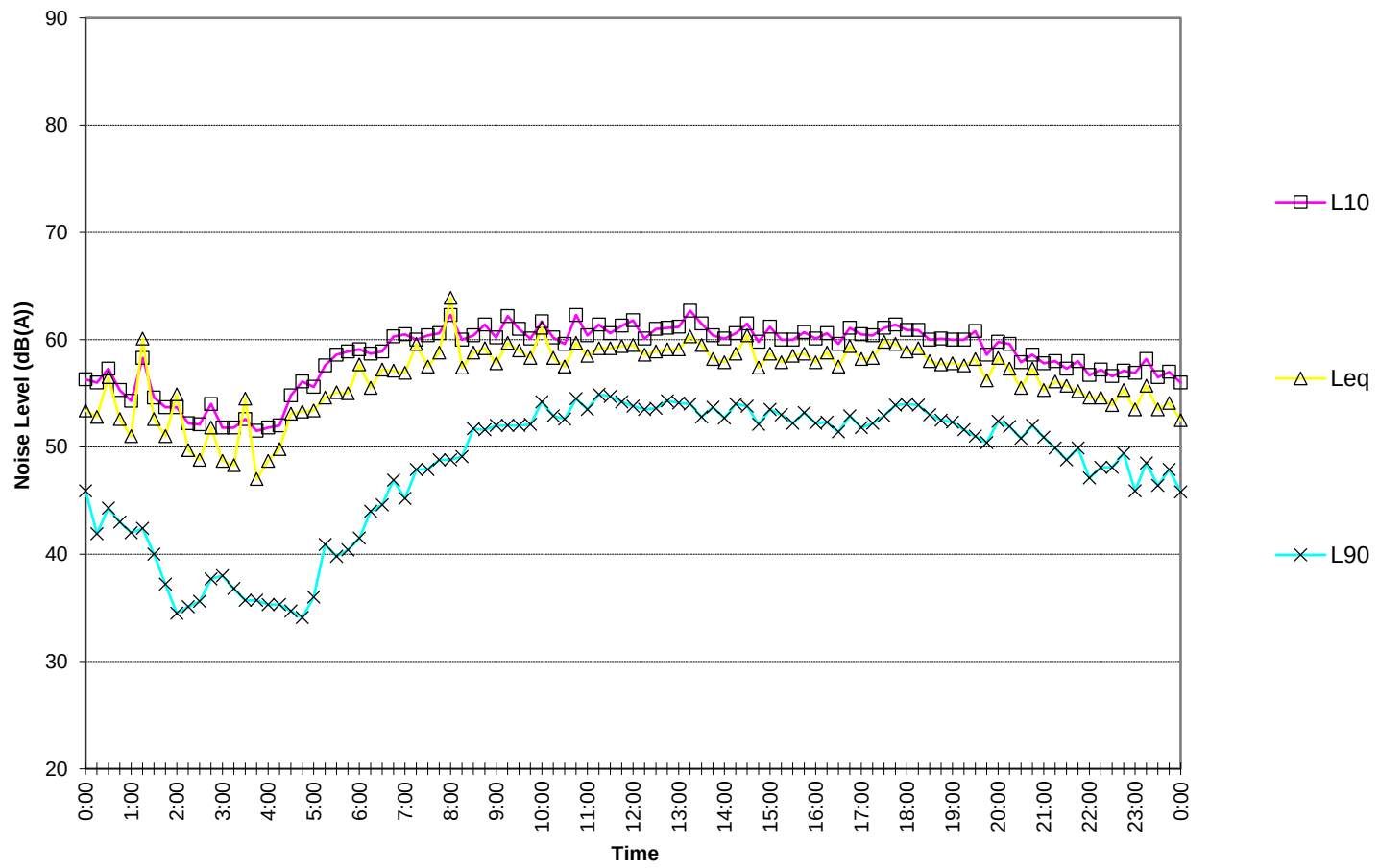
Rooty Hill Village
Thursday January 19, 2017



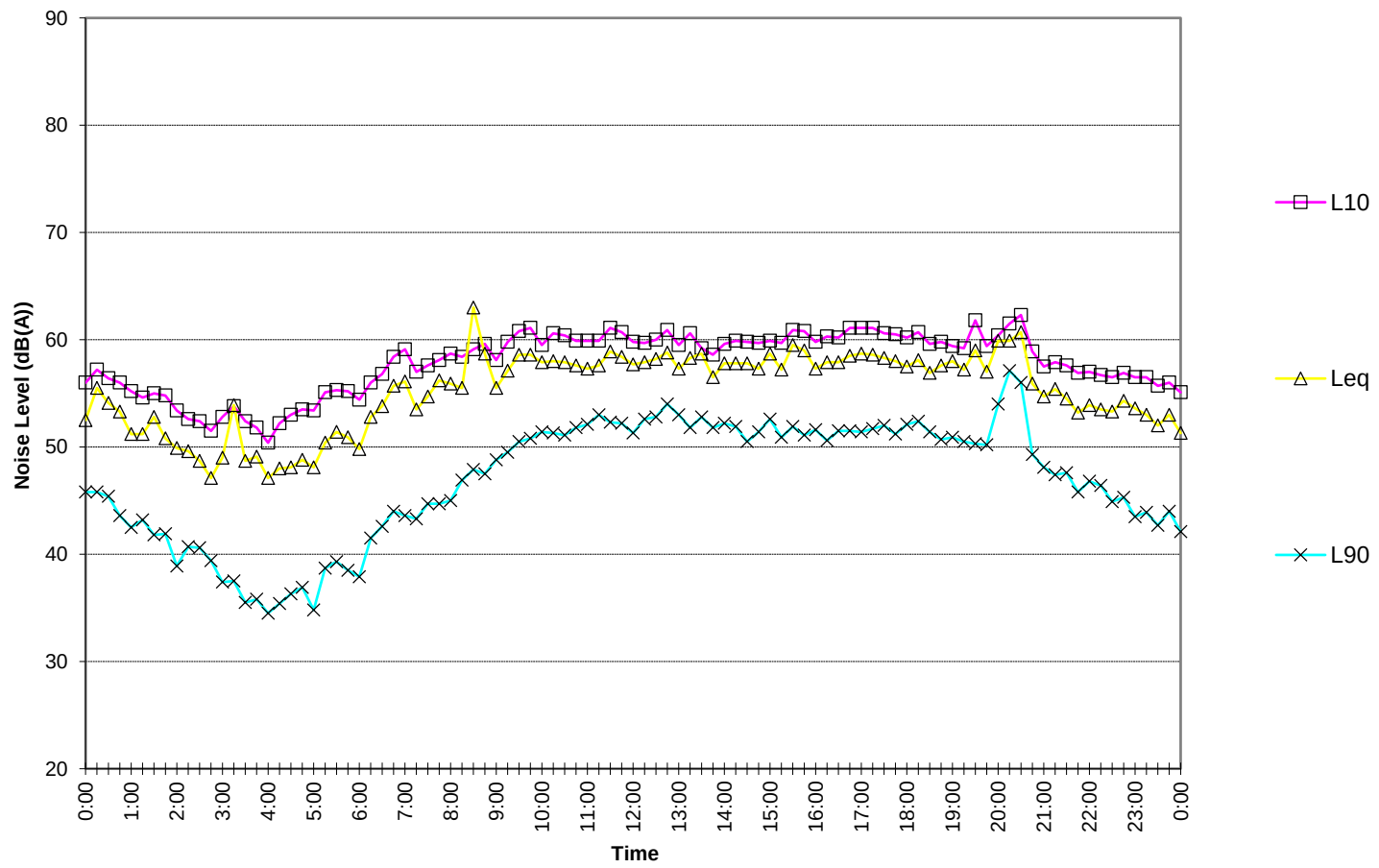
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Friday January 20, 2017



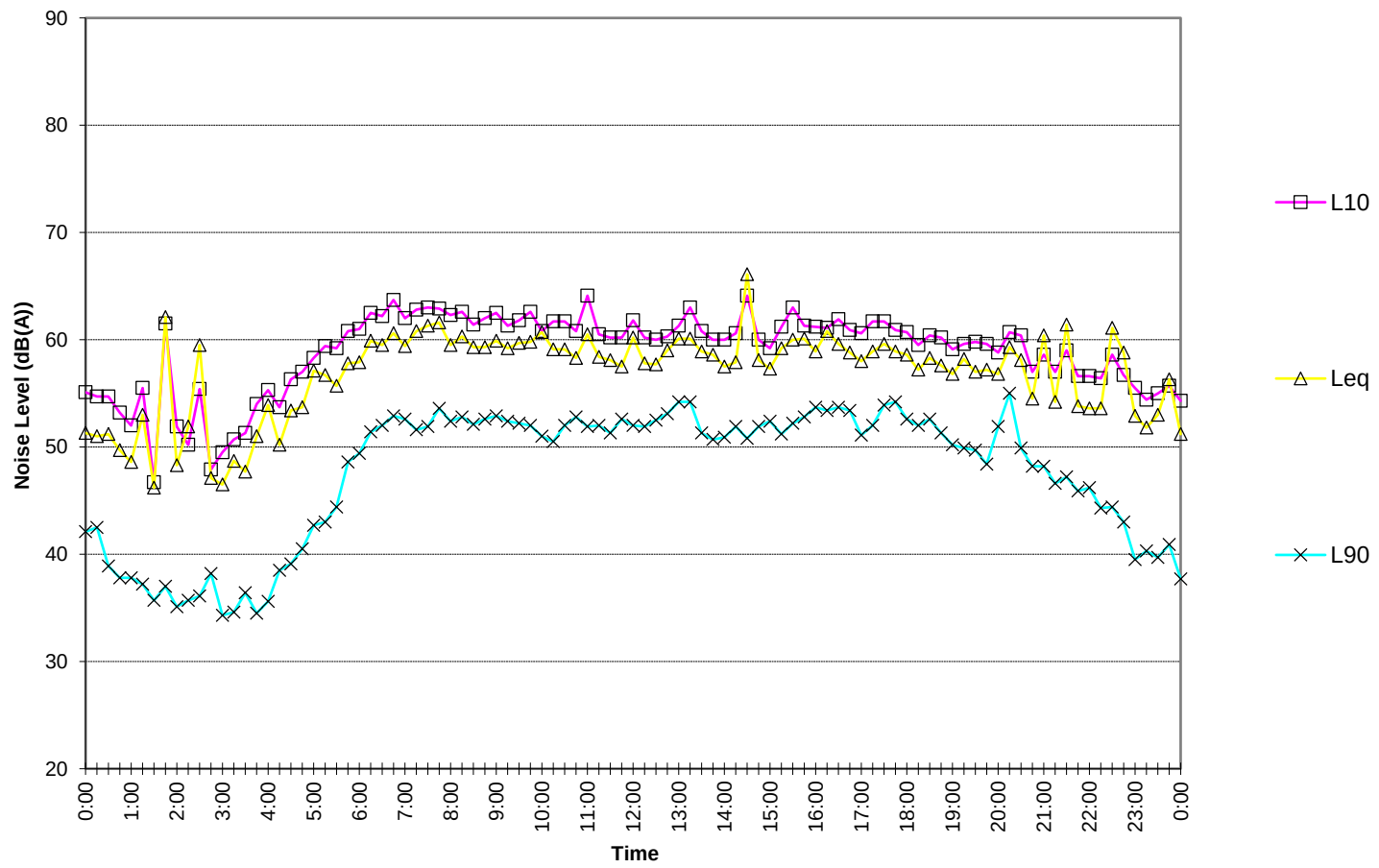
Rooty Hill Village
Saturday January 21, 2017



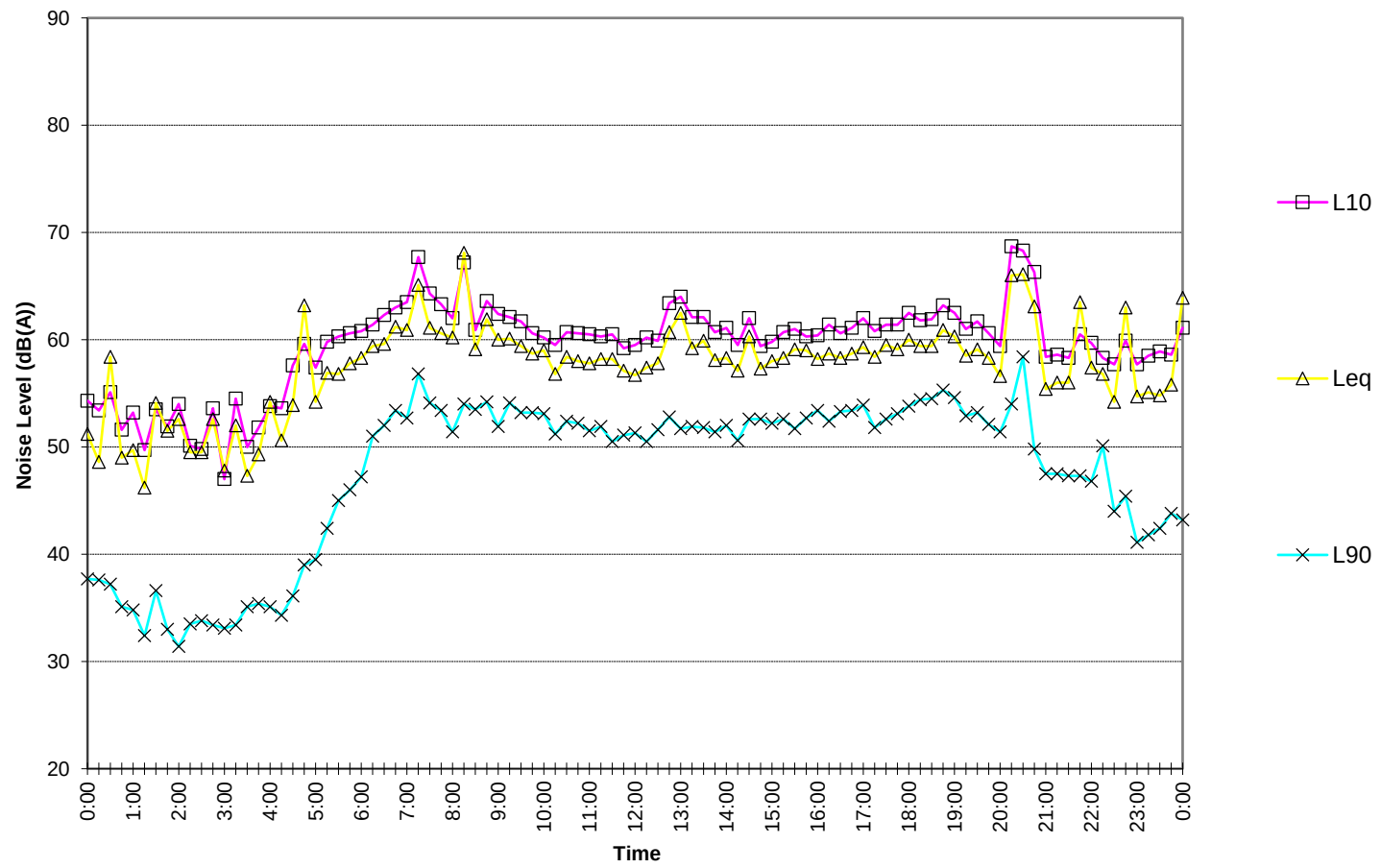
Rooty Hill Village
Sunday January 22, 2017



Rooty Hill Village
Monday January 23, 2017



Rooty Hill Village
Tuesday January 24, 2017



Rooty Hill Village
Wednesday January 25, 2017

