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REPORT 13424R0

Revision 1

Road Traffic and Rail Noise Impact Assessment 171-189 Parramatta Road Granville NSW

PREPARED FOR:
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11 September 2014

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Road Traffic and Rail

Noise Impact Assessment

171-189 Parramatta Road

Granville NSW

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DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
13424R0	Revision 0	11 September 2014	Desmond Raymond	Rodney Stevens	Rodney Stevens
13424	Revision 1	23 September 2014	Desmond Raymond	Rodney Stevens	Rodney Stevens

TABLE OF CONTENTS

1 INTRODUCTION

Rodney Stevens Acoustics Pty Ltd has been engaged by Mr. Richard Wykes on behalf of Catylis Properties Pty Ltd to prepare a Road Traffic and Rail Noise Impact Assessment for the proposed mixed use development at 171-189 Parramatta Road, Granville NSW.

This assessment addresses the impact of existing road traffic noise from the Parramatta Road and rail noise from nearby rail corridor adjacent to the proposed mixed development and will form part of the Development Application submission to Council.

Specific acoustic terminology is used in this report. An explanation of common acoustic terms is provided in Appendix C.

2 PROJECT AREA AND SENSITIVE RECEIVERS

The site at 171-189 Parramatta Road, Granville, is to be re-developed as a mixed use development consisting of commercial/retail on the ground floor and residential premises above. The site has been identified as being affected by noise from trains on City Rail's Western Rail Line, which is approximately 15 to 20 m from the western boundary of the development. The site will also be affected by traffic on Parramatta Road and to a lesser extent from traffic on the M4 motorway. Victoria Street at the rear of the development carries very little traffic.

The development site and its surrounding environment are mainly influenced by road traffic noise on Parramatta Road and the nearby rail corridor. Figure 2-1 shows an aerial image of the site area and the surrounding environment

Figure 2-1 Project Area and Surrounding Environment Site Plan

The proposed site layouts of the mixed development site are presented in Figure 2-2 and Figure 2-3 below.

Figure 2-2 Street Block View – South West

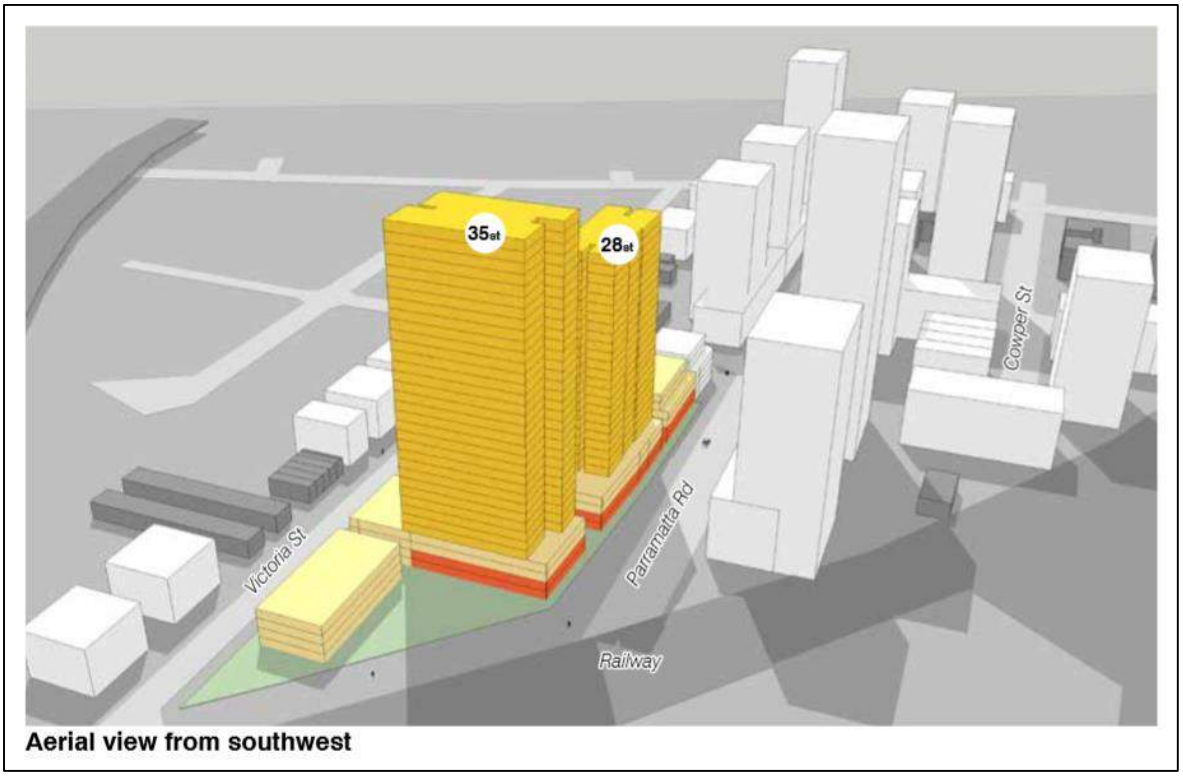


Image courtesy of Catylis Properties Pty Ltd

Figure 2-3 Street Block View – North East

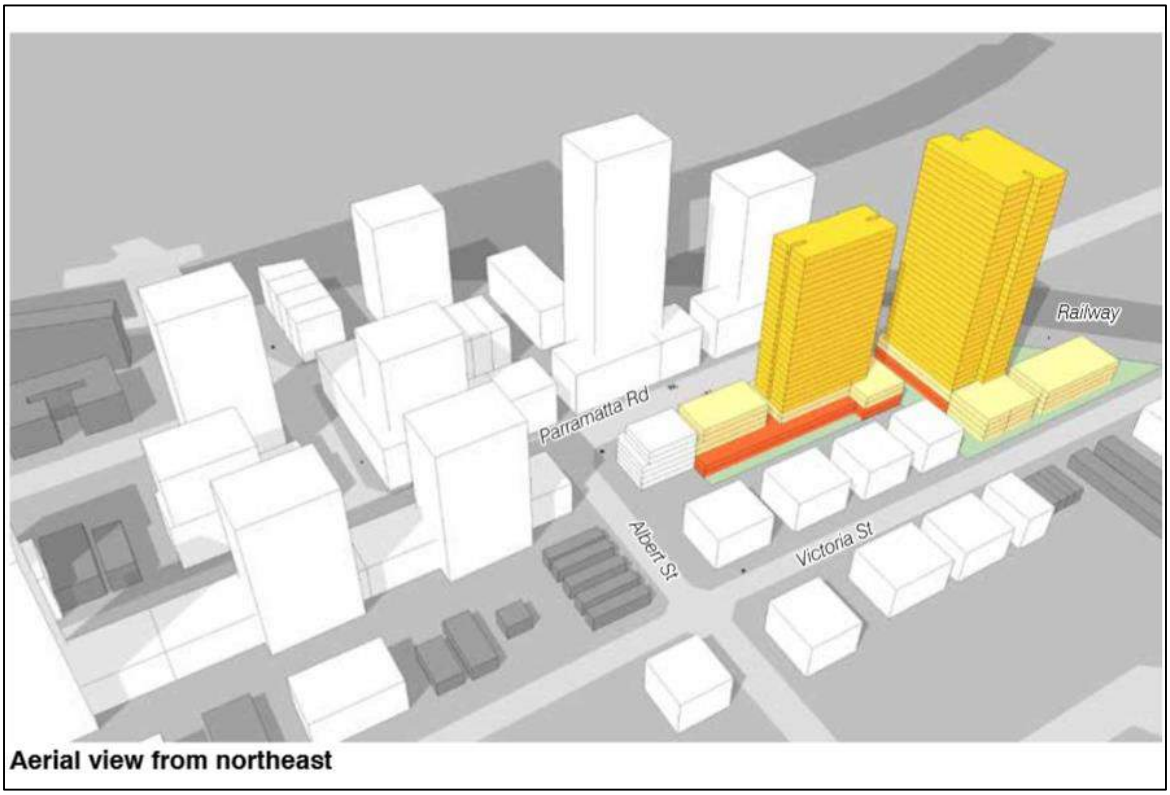


Image courtesy of Catylis Properties Pty Ltd

Figure 2-4 Street Block View – East View

Image courtesy of Catylis Properties Pty Ltd

3 ASSESSMENT CRITERIA

3.1 Road Traffic Noise Assessment Criteria

The site has been identified as being affected by noise from traffic on Parramatta Road and to a lesser extent from the M4 motorway which is on an embankment approximately 5 m high and about 110 to 140 m north of the development.

For building development impacted upon by transportation noise, it is customary to use the guidelines provided in the Australian Standards in order to control the acoustic amenity inside the development. These standards are:

- AS3671 – 1989: Acoustics - Road Traffic Noise Intrusion – Building Siting and Construction, and
- AS/NZS 2107:2000- Acoustics - Recommended Design Sound Levels and Reverberation Times for Building Interiors.

The procedure provided in AS3671 is usually adopted for the selection of building envelope construction required to achieve the internal sound levels recommended in AS2107.

The Parramatta Development Control Plan states under Section 4.3.3 Acoustic Amenity “To ensure that the siting and design of buildings minimises noise impacts from abutting major roads and other noise-generating land uses.”

Section 4.3.3 requires the use of Australian Standards AS3671 and AS2107 with AS1055 Parts 1, 2 and 3 for measurement procedures.

A summary of the recommended design sound levels contained in AS2107, for residential buildings near major roads, is shown below:

Table I – Design Sound Level For Residential Buildings Near Major Roads		
Type Of Occupancy/Activity	Sound Level, L_{eq}, dB(A)	
	Satisfactory	Maximum
Living areas	35	45
Sleeping areas	30	40

These criteria are generally consistent with the recommendations of SEPP (Infrastructure) 2007, which has superseded many of the previous policies and guidelines relating to the control of rail and road traffic noise intrusion, and Australian Standard AS/NZS 2107:2000 “Acoustics - Recommended design sound levels and reverberation times for building interiors”.

The criteria presented in SEPP (Infrastructure) 2007 are applicable to residential development and as such, do not relate specifically to commercial operations.

The recommended guidelines are as follows:

- The LAeq noise level between the hours of 10.00 pm and 7.00 am shall not exceed 35 dBA with a bedroom, and
- The LAeq noise level within any other habitable room (excluding a garage, kitchen, bathroom or hallway) shall not exceed 40 dBA at any time.

For the purpose of assessing the impact of traffic and rail noise inside the proposed development, the above noise criterion will be assessed.

3.2 Rail Noise Assessment Criteria

The site has been identified as being affected by noise from train movements on City Rail’s Western Rail Service. This rail corridor consists of four tracks which are on an embankment approximately 3 to 4 m high and about 15 to 20 m southwest of the development. There is also a steel rail bridge for the tracks to cross over Parramatta Road.

The noise impact from train movements can affect nearby buildings in two ways. First, noise produced by the train may be transmitted directly to the external façade of the building through the air medium. This is known as air-borne noise.

Second, train movements may also result in ground vibration, which is propagated through the building structure, and therefore referred to as structure-borne noise. Criteria for each of these forms of noise propagation will be discussed below.

Generally when a proposed development site is located within 60 m of a rail corridor, there is a requirement by Council that an acoustic report be prepared to assess the noise impact of the nearby railway on the proposed site. This assessment is generally based on the guidelines for train noise that was proposed by the Rail Infrastructure Corporation (RIC) of the State Rail Authority.

Internal noise criteria for residential developments adjacent to rail corridors are proposed in the RIC’s publication titled: “Guidelines for Councils – Consideration of Rail Noise and Vibration in the Planning Process”. A summary of this criterion in respect of air borne noise is shown below:

Table II – noise criteria for residential buildings adjacent to railways		
Internal Space	Time Period	Noise Level, $L_{eq(1\ hr)}$, dB(A)

Living and sleeping areas	Day (7 am to 10 pm)	40
	Night (10 pm to 7 am)	35

If noise levels with windows or doors open exceed these noise levels by more than 10 dB(A), then an alternate form of ventilating these rooms should be considered so that occupants may leave windows closed, if they so desire.

Floor vibration level in habitable rooms should be designed to comply with the criteria in British Standard BS 6472:1992 - "Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz)".

Appropriate sections of this standard has been reproduced and shown in Appendix B of this report. Curve 2 and curve 4 are for the day-time and Curve 1.4 is the night-time criterion for continuous vibration in residential buildings.

Assuming a train pass to last for 10s, and 213 trains in a 16 hour day, acceleration levels which are below 0.037m/s^2 r.m.s, are considered to have a low probability of adverse comment.

4 BASELINE NOISE SURVEY

4.1 Unattended Noise Monitoring

In order to characterise the existing acoustical environment of the area, unattended noise monitoring was conducted between the dates of 2 September and 9 September 2014. The logger location was representative of the façades of the proposed residential apartments to Parramatta Road and the nearby rail corridor. The logger location captures road traffic noise from Parramatta Road and surrounding local road, as well as rail noise from the nearby rail corridor to the south of the development site.

Data affected by adverse weather conditions have been removed from the calculations. The logger location was selected with consideration to other noise sources which may influence readings, security issues for noise monitoring equipment and gaining permission for access from residents and landowners.

Instrumentation for the survey comprised of a ARL RION environmental noise logger (serial number 810779) fitted with microphone windshields. Calibration of the logger was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dB(A). All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

To assess noise intrusion into the proposed residential apartments, the data obtained from the Logger Location has been processed to establish representative ambient noise levels at the proposed mixed development site.

The time periods used for this assessment are as defined in the NSW Environmental Protection Authority's (EPA) Road Noise Policy (RNP, 2011). Results are presented below in. The results of the ambient noise monitoring are shown in Table 4-1.

Table 4-1 Summarised Noise Exposure Levels

Location	Period	External Noise Levels dB(A)
Logger Location	Day Time 7:00 am - 10:00 pm	76 $L_{Aeq(15hour)}$
	Night Time 10:00 pm - 7:00 am	73 $L_{Aeq(9hour)}$

4.2 Rail Noise Survey

A noise survey of train passbys were conducted on 9 September 2014. This compromised of the measurement of 20 trains passbys measured at a distance of 20 meters from the nearest operating train track. The results of the attended rail noise monitoring are presented in Table 4-2.

Table 4-2 Rail Noise Exposure Levels

Measurement Point	Average Speed	No. Rail Carriages	Time of Measurement 5pm – 7pm	Conditions
Background	n/a	n/a	71 dB($L_{Aeq(15min)}$)	-
Rail Noise – Passenger Trains (21 train pass-bys)	50 – 70km/h	6 – 10	72 – 75 dB(A) (L_{Amax})	Wheel squeaks and horns present
Rail Noise – Freight Train	30 – 40km/h	26	78 – 80 dB(A) (L_{Amax})	Wheel squeaks present

The train pass bys were conducted on the South West Railway next to the proposed mixed development. The location was selected as the train tracks were positioned in line of sight to the noise monitoring equipment. This presented a similar noise exposure scenario to the proposed residential apartments in line of sight with the South Western rail corridor.

4.3 Rail Vibration

Shown in the table below is a summary of the results of the vibration survey conducted on site on January 2010.

TRAIN NO.	LOCATION	DIRECTION	ACCELERATION LEVEL, mm/s^2
1	171 Parramatta Road	Up [1]	17.4
2		Down [2]	15.1
3		Up [1]	14.1
4		Up [1]	15.0
5 (Freight – locos)		Up [1]	19.5
5 (Freight – trucks		Up [1]	18.0
5 (Freight (trucks)		Up [1]	17.6
6		Up [1]	15.3

All noise level results are rounded to the nearest whole decibel.

1 Trains travelling south towards the City

2 Trains travelling north towards Parramatta

Detailed results for the acceleration level measured during a train pass, as well the ambient acceleration level with no train movements, has been graphed and is shown in Appendix B. In these graphs it will be seen that the acceleration level from train passes are below Curve 1.4 as defined by BS 6472: 1992, which represents the night-time criterion for continuous vibration for residential buildings.

5 NOISE ASSESSMENT

This assessment predicts road traffic noise intrusion from Parramatta Road and rail noise from the nearby rail corridor to the proposed development.

Standard window glazing of a building will typically attenuate these noise levels by 20 dB(A) with windows closed and 10 dB(A) with windows open (allowing for natural ventilation). The predicted internal noise levels of the proposed residential units are presented in Table 5-1 for the windows open and windows closed scenarios. Standard window system (4 mm thick glass with aluminium frame) has been assumed for this prediction.

Table 5-1 Predicted Internal Road Traffic and Rail Noise Levels - Standard Glazing

Type of Occupancy	Descriptor	Internal Noise Level		Noise Criteria
		Windows Open	Windows Closed	
Northern Façade (M4 Motorway)				
Living Areas (Daytime)	$L_{Aeq,15hour}$	60 dB(A)	50 dB(A)	40 dB(A)
Living Areas (Night time)	$L_{Aeq,9hour}$	57 dB(A)	47 dB(A)	40 dB(A)
Sleeping Areas (Night time)	$L_{Aeq,9hour}$	57 dB(A)	47 dB(A)	35 dB(A)
Southern Façade (Parramatta Road)				
Living Areas (Daytime)	$L_{Aeq,15hour}$	66 dB(A)	56 dB(A)	40 dB(A)
Living Areas (Night time)	$L_{Aeq,9hour}$	63 dB(A)	53 dB(A)	40 dB(A)
Sleeping Areas (Night time)	$L_{Aeq,9hour}$	63 dB(A)	53 dB(A)	35 dB(A)
Western Façade (Rail Corridor)				
Living Areas (Daytime)	$L_{Aeq,15hour}$	65 dB(A)	55 dB(A)	40 dB(A)
Living Areas (Night time)	$L_{Aeq,9hour}$	65 dB(A)	55 dB(A)	40 dB(A)
Sleeping Areas (Night time)	$L_{Aeq,9hour}$	65 dB(A)	55 dB(A)	35 dB(A)

Type of Occupancy	Descriptor	Internal Noise Level		Noise Criteria
		Windows Open	Windows Closed	
		Eastern Façade		
Living Areas (Daytime)	$L_{Aeq,15hour}$	54 dB(A)	44 dB(A)	40 dB(A)
Living Areas (Night time)	$L_{Aeq,9hour}$	52 dB(A)	42 dB(A)	40 dB(A)
Sleeping Areas (Night time)	$L_{Aeq,9hour}$	52 dB(A)	42 dB(A)	35 dB(A)

The predicted internal noise levels indicate that road traffic noise and rail noise impact on the proposed residential units will potentially exceed the noise criteria with windows opened and closed. When windows are opened, road traffic and rail noise in the Living Areas and Sleep Areas will exceed the criteria. When windows are closed, road traffic noise in the Living Areas and Sleep Areas will exceed the criteria. Measured L_{max} noise levels were used to predicted noise levels on the southern façade as this best represents rail noise emissions from the nearby rail corridor. Measured L_{max}, L_{Aeq} and L_{90} are presented in Appendix A.

6 RECOMMENDATIONS

Based on the above predicted road traffic and rail noise impacts (refer Table 5-1) the following noise control measures are recommended for the residential units on all façades.

- Windows and doors in the facade of residential units facing or with line of sight of Parramatta Road and the rail corridor, and facing east and west will need to be closed to meet internal noise levels. Therefore, alternative ventilation methods which meet the ventilation requirements of the BCA and Australian Standard AS 1668.2:2002 will be required and design input should be sought from an appropriately qualified mechanical services consultant.

Based on the predicted internal noise levels, residential units on all façades should have the following minimum Rw rating as indicated in Table 6-1.

Table 6-1 In-principle Glazing Recommendations

Location	Minimum Glazing Rw Rating
Ground Level to Level Four	
Northern Façade (M4 Motorway)	
Living Rooms	Rw 27
Bedrooms	Rw 32

Southern Façade (Parramatta Road)	
Living Rooms	Rw 33
Bedrooms	Rw 38
Western Façade (Railway Corridor)	
Living Rooms	Rw 32
Bedrooms	Rw 37
Eastern Façade	
Living Rooms	Rw 24
Bedrooms	Rw 29
Level Four and above	
Northern Façade (M4 Motorway)	
Living Rooms	Rw 33
Bedrooms	Rw 38
Southern Façade (Parramatta Road)	
Living Rooms	Rw 36
Bedrooms	Rw 45
Western Façade (Railway Corridor)	
Living Rooms	Rw 35
Bedrooms	Rw 42
Eastern Façade	
Living Rooms	Rw 28
Bedrooms	Rw 33

Note *: glazing system are for reference only. Any glazing system to be installed for the development is to achieve the minimum Rw rating indicated above

Rw ratings provided rely on the acoustic performance of the window glazing and frame. Rw ratings should be checked with glazing manufacturers and frames should be selected and installed to preclude degrading the performance of the glazing.

It is also recommended that glazing specifications are reviewed at the detailed design stage, most notably if changes to the glazing area are made throughout the design.

The glazing recommendations have been based on the concept design of the proposed mixed development. Once the floor plans and building plans have been finalised, the glazing requirements should be re-assessed based on the location of the living areas and the bedrooms of the residential apartments.

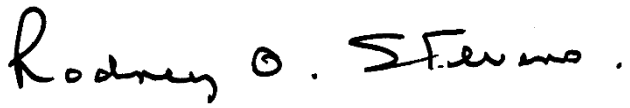
7 CONCLUSION

Rodney Stevens Acoustics has been engaged by Catylis Properties Pty Ltd to perform a road traffic and rail noise assessment of the proposed mixed development at 171-189 Parramatta Road Granville as part of the DA submission.

A noise assessment comprising road traffic and rail noise calculations has been conducted. External and internal noise levels have been considered and assessed against the relevant acoustic criteria. In-principal recommendations of improved glazing and mechanical ventilation of habitable rooms have been made in Section 6.

This assessment only considers road traffic and rail noise ingress for the purposes of DA lodgement and does not identify or assess noise impact from other noise sources which may be present in the vicinity of the proposed development.

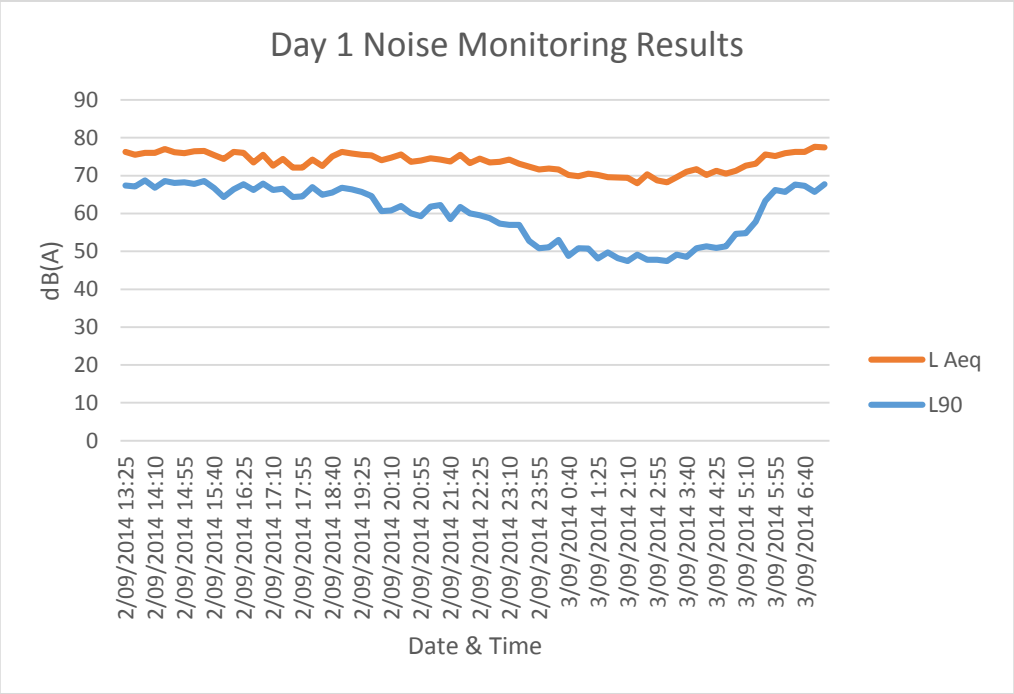
Approved:-

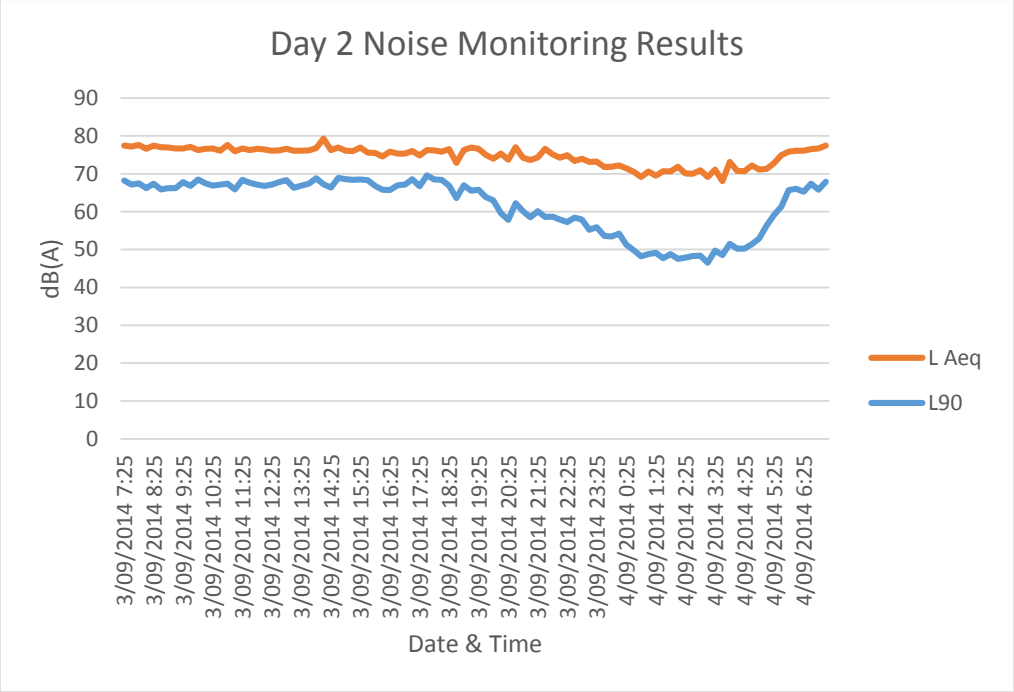


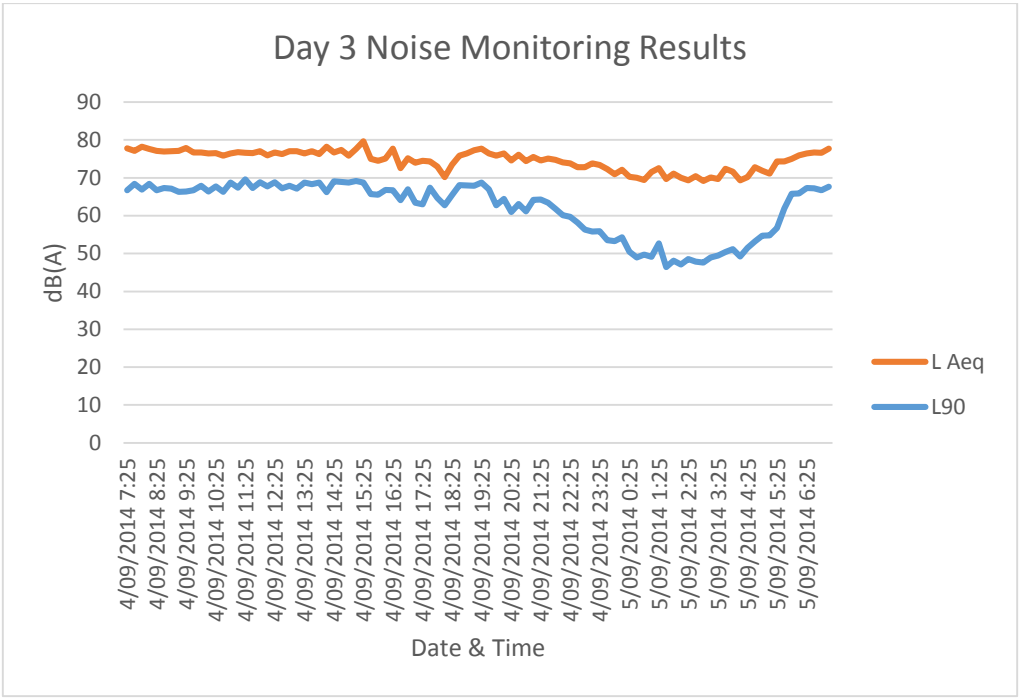
Rodney Stevens - MAAS

Principal

Appendix A – Noise Monitoring Results



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5/09/2014 2:25
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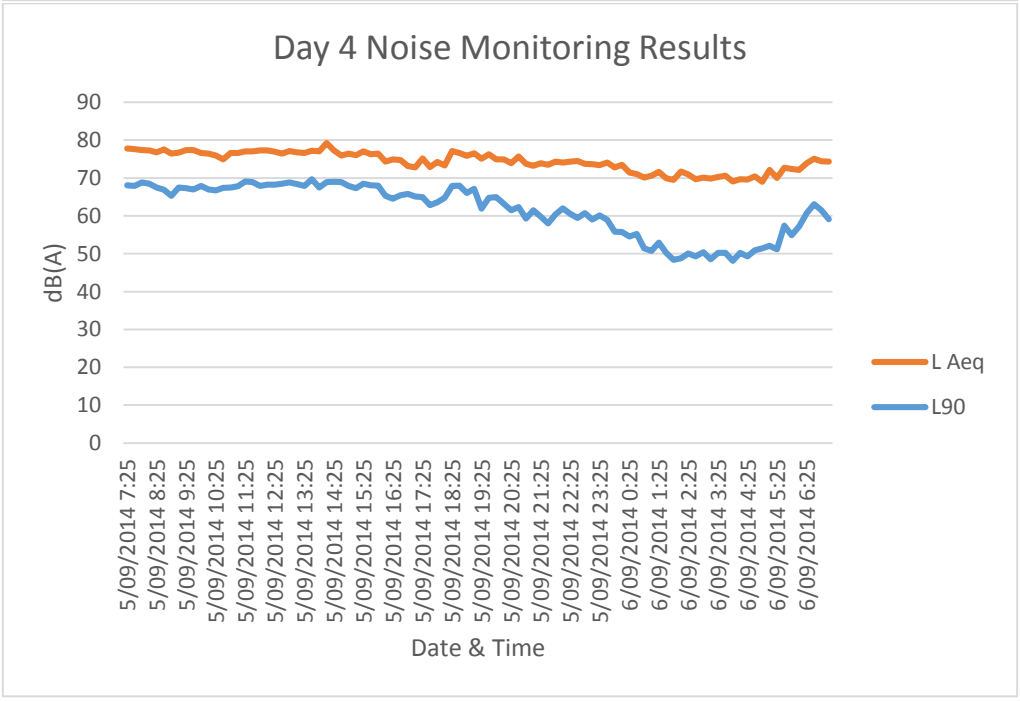
Date & Time
L Aeq
L90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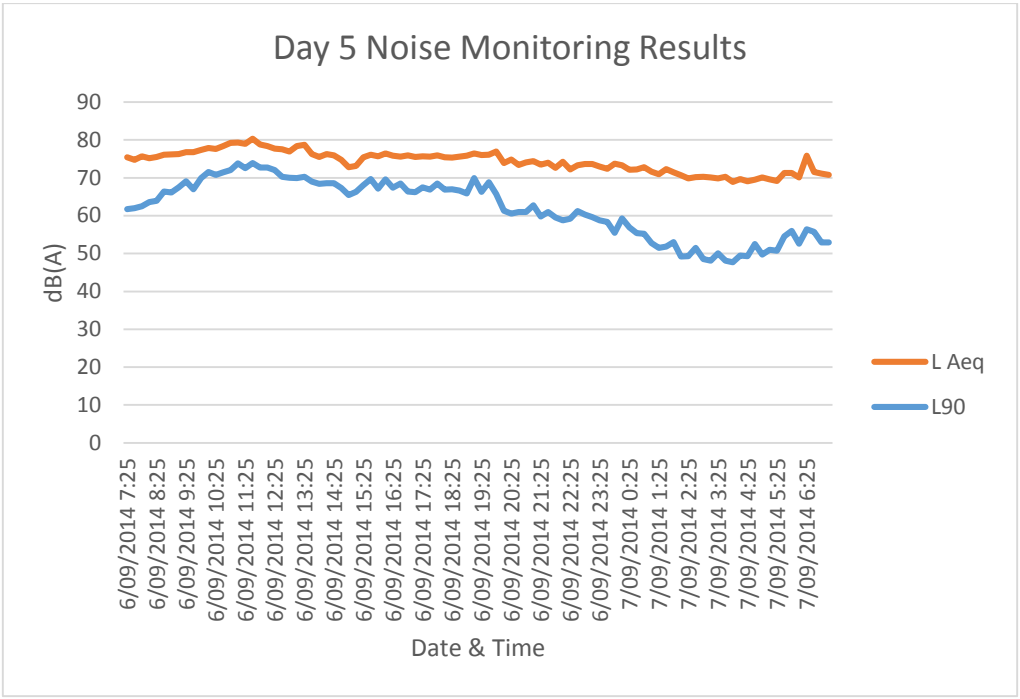
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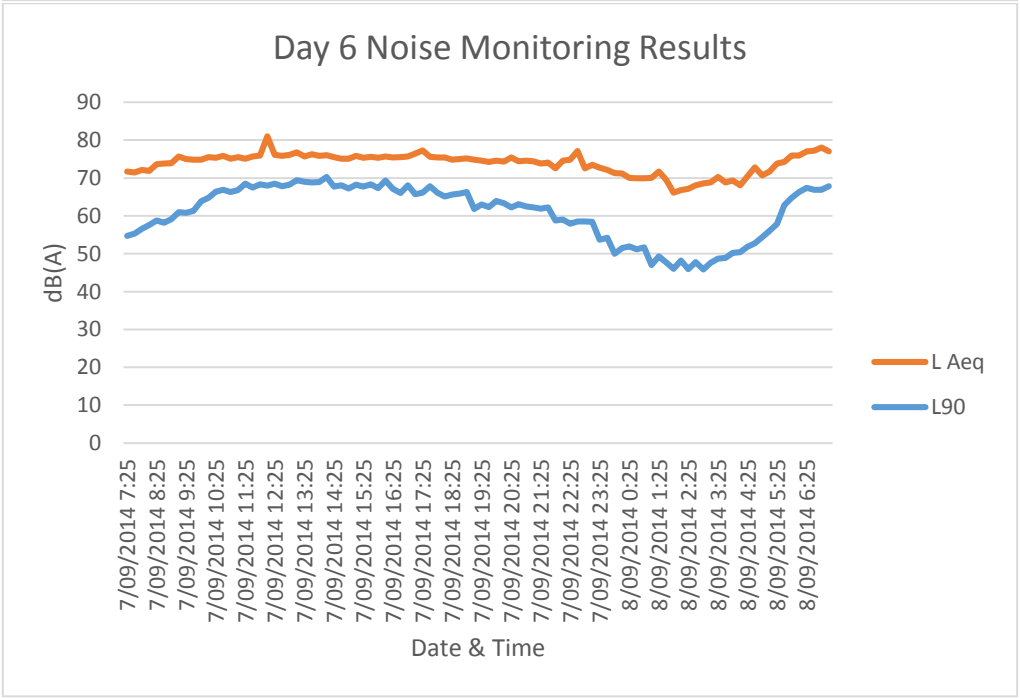
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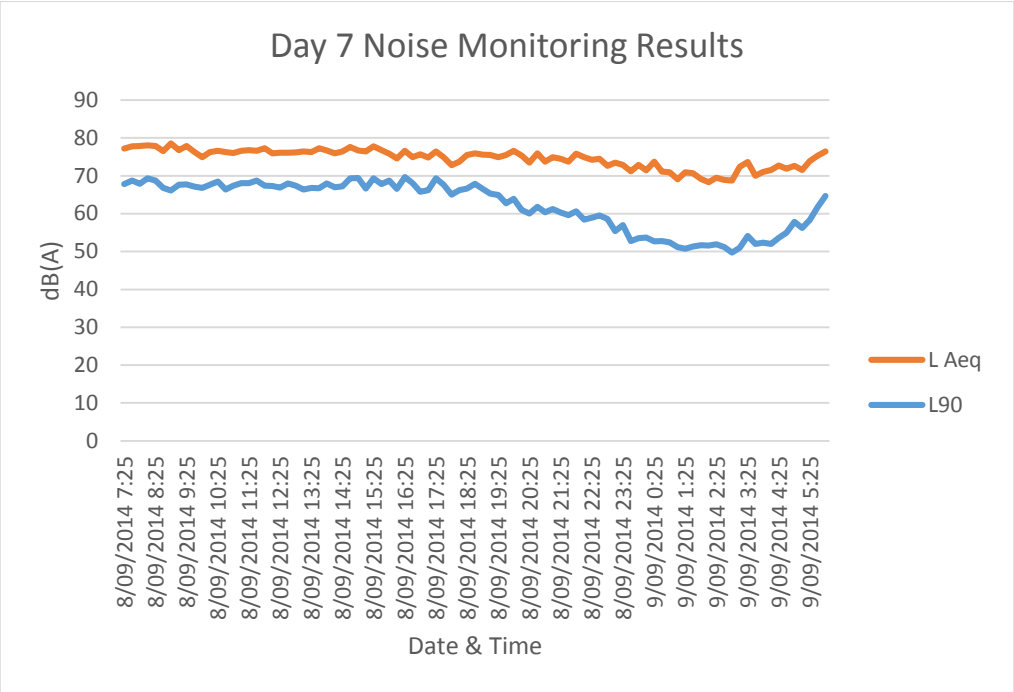
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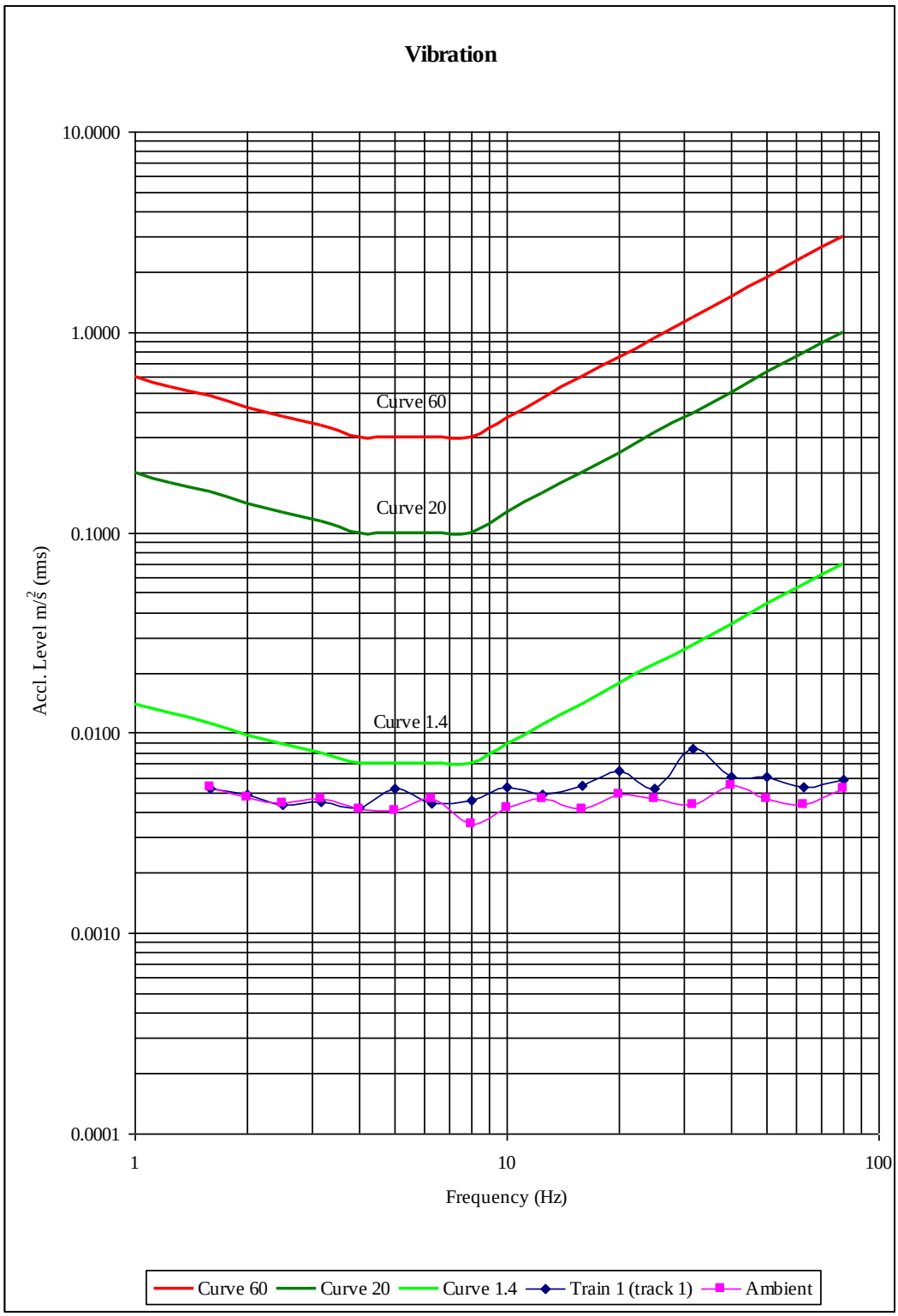
Date & Time
L Aeq
L90

Appendix B – Vibration Monitoring Results

Address: 171-189 Parramatta Rd., Granville

Meas. Location: Approx.15 m from nearest track



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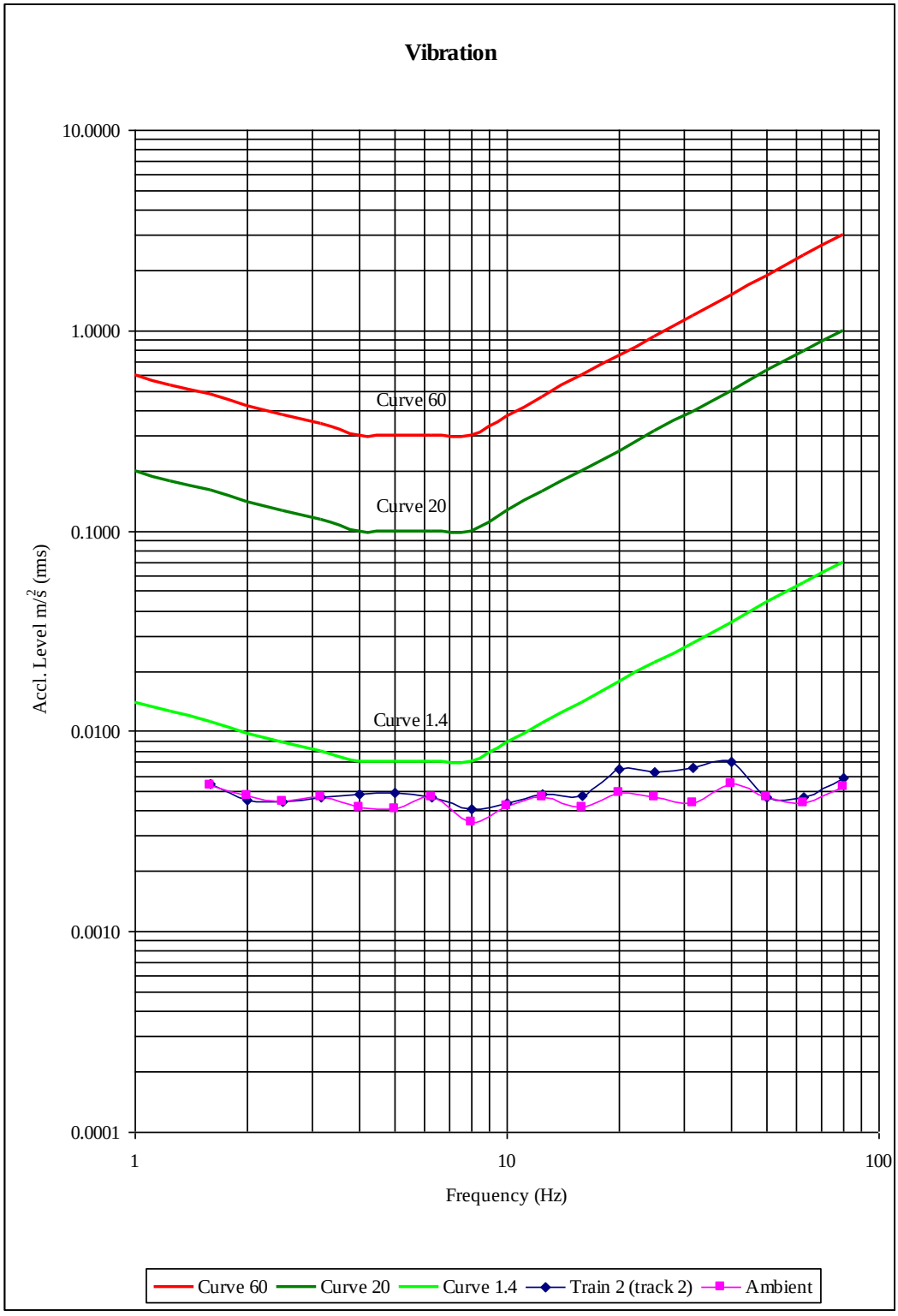

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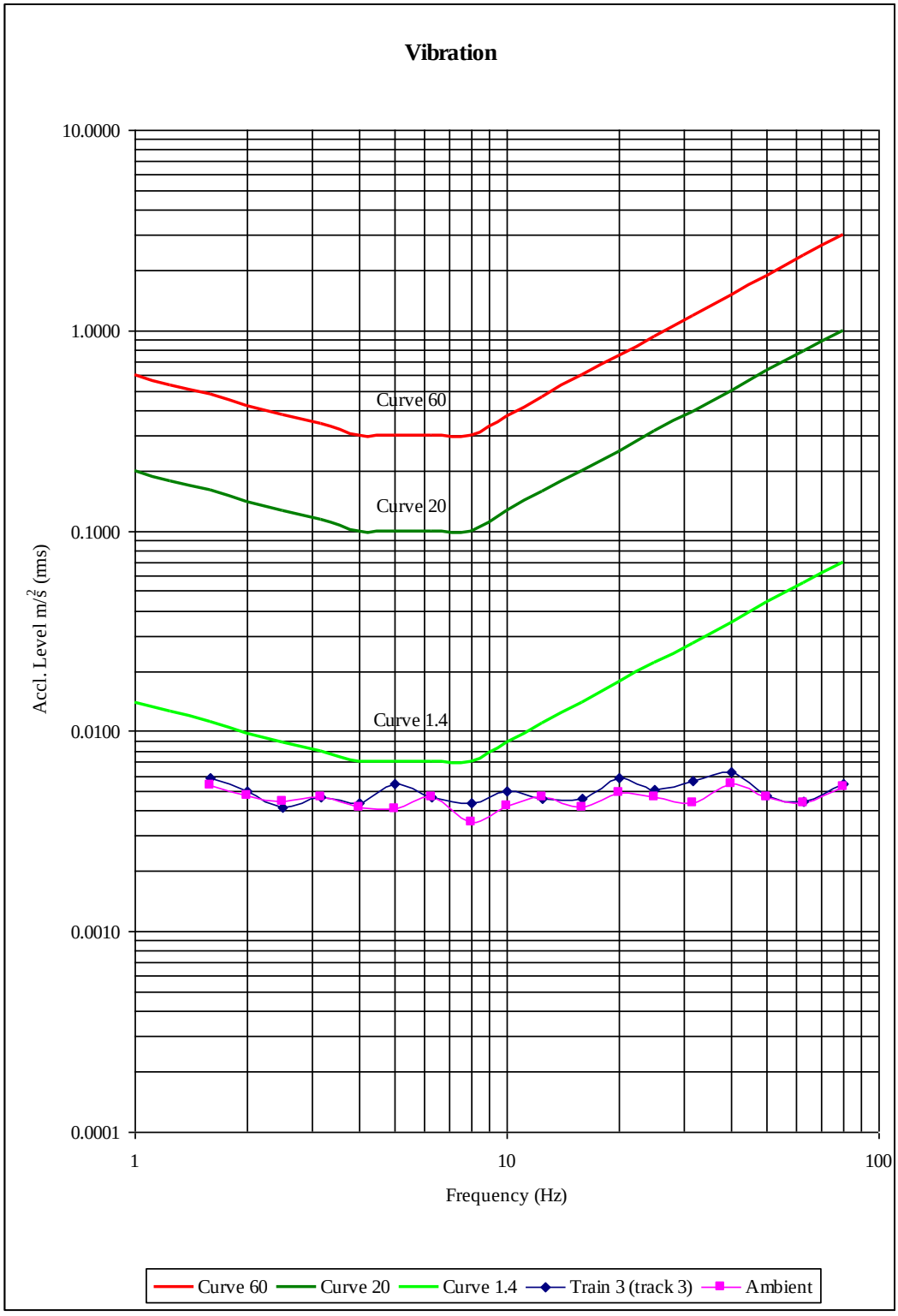
Meas. Location: Approx.15 m from nearest track



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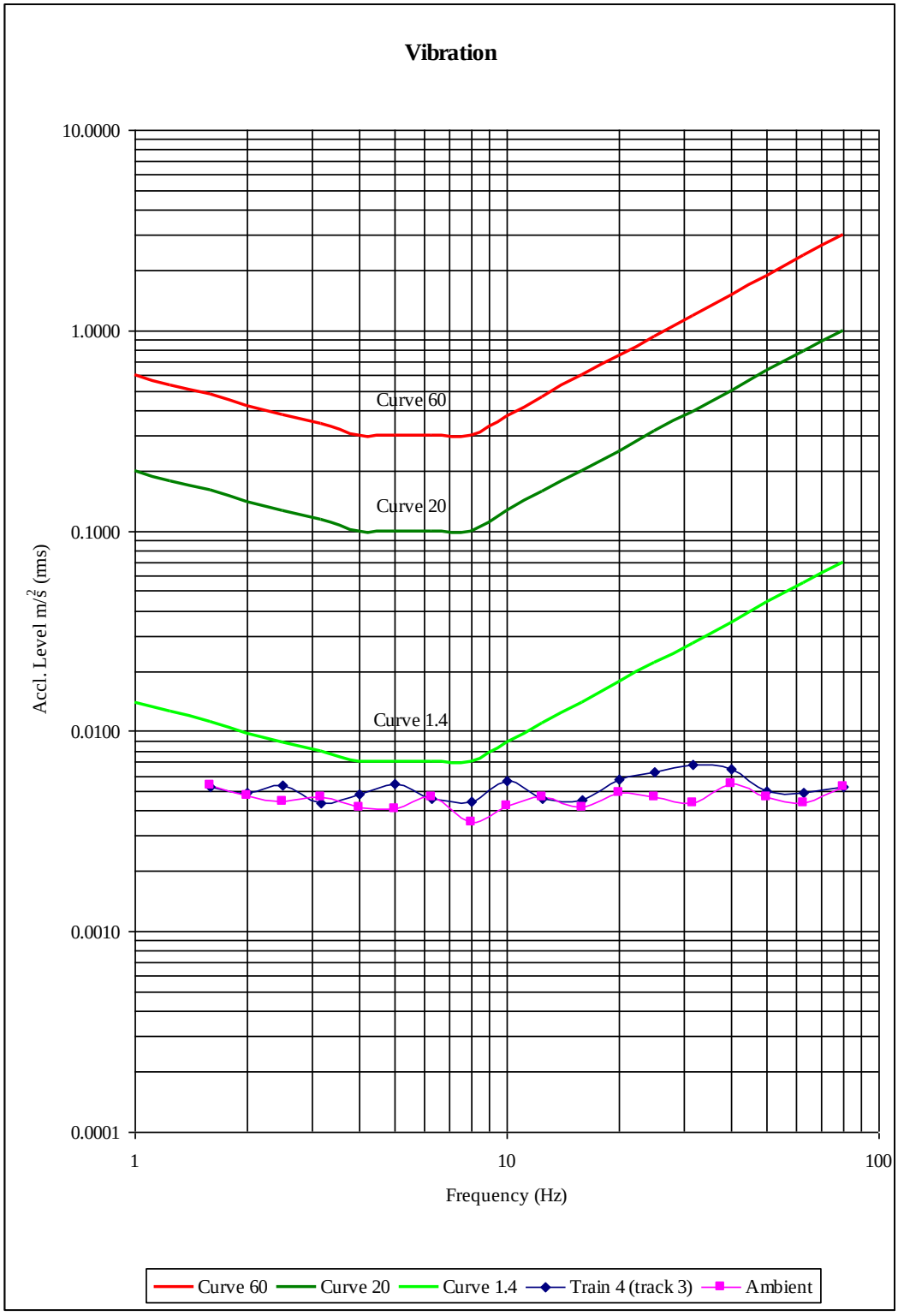
Meas. Location: Approx.15 m from nearest track



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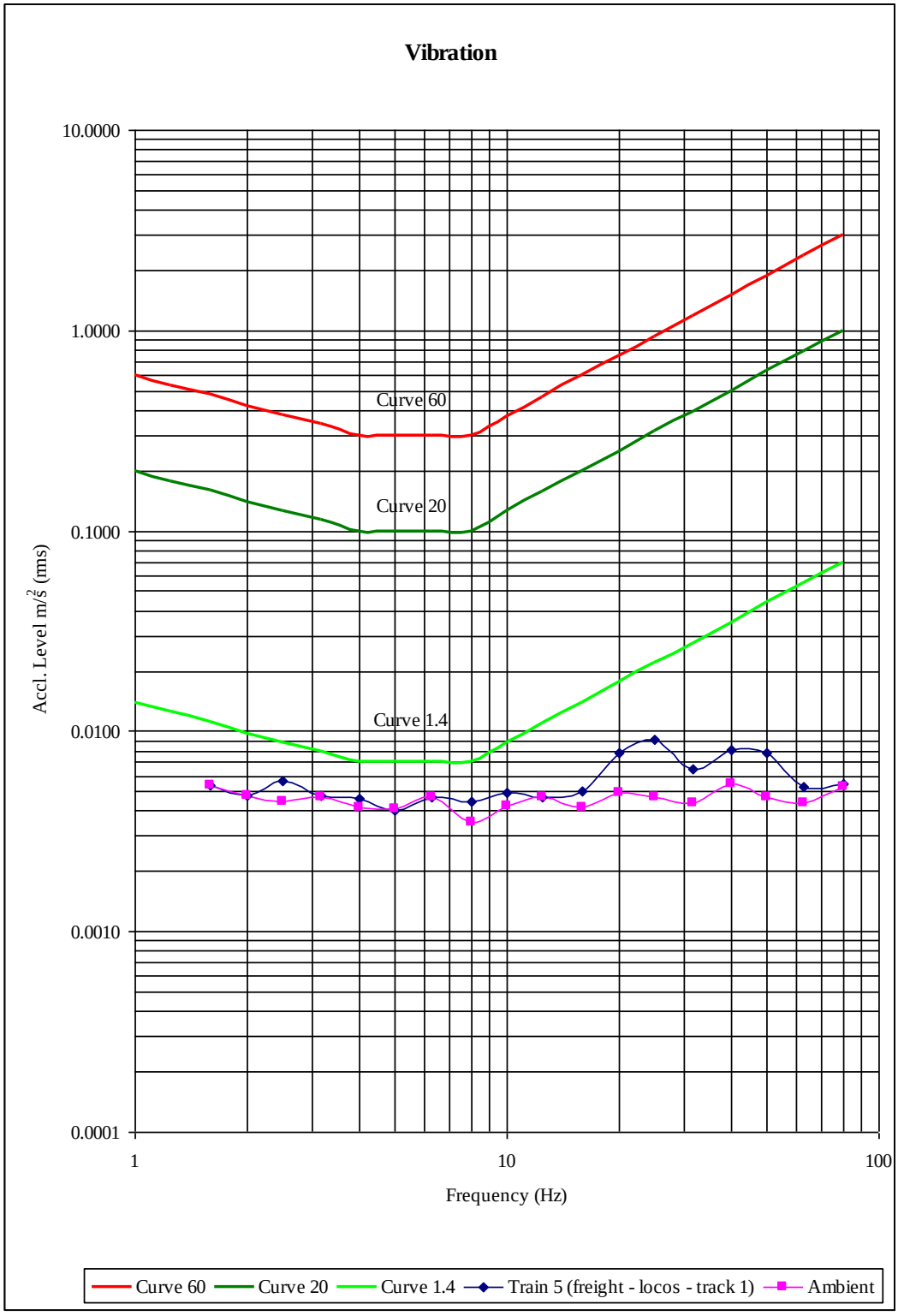
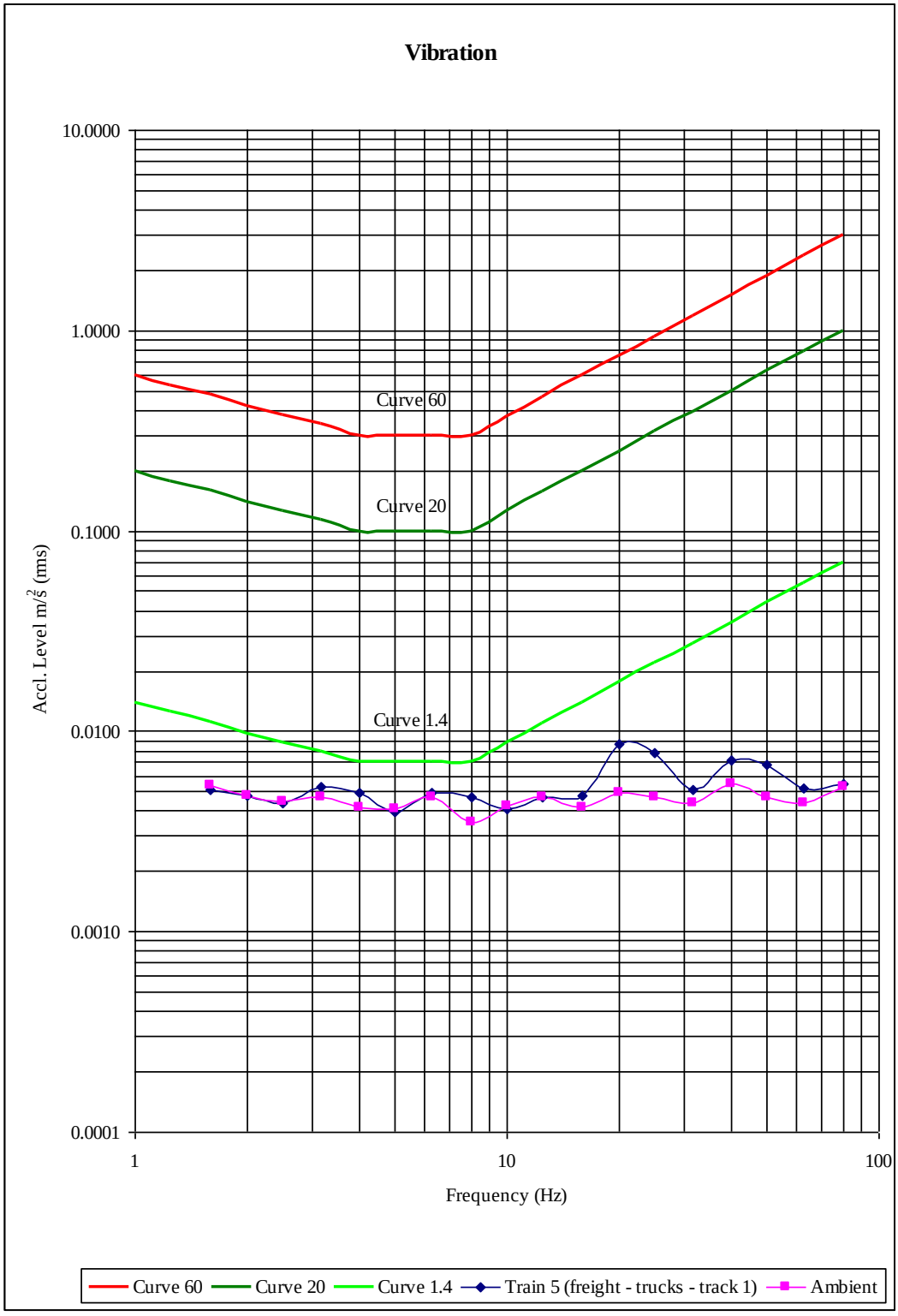
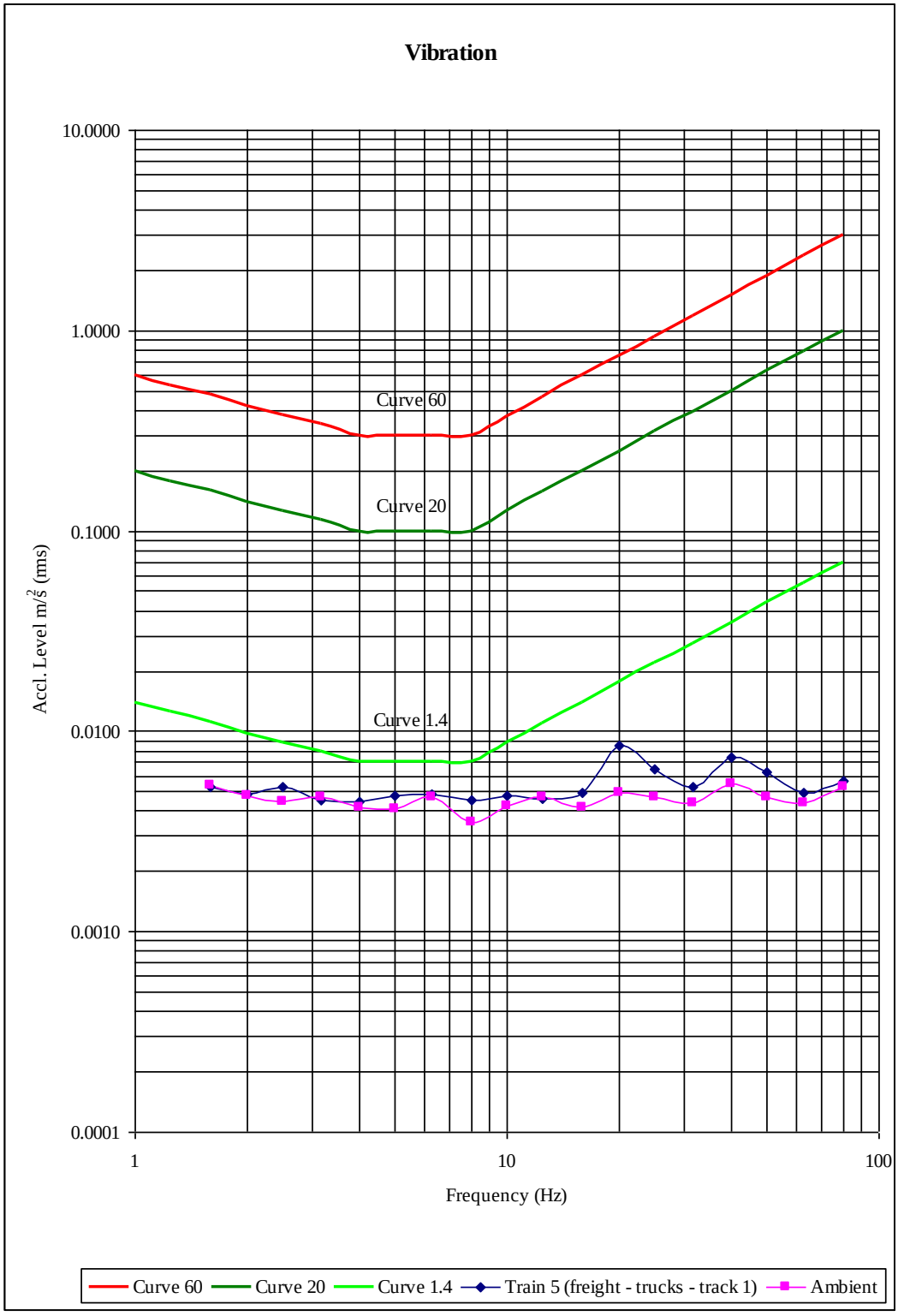
Meas. Location: Approx.15 m from nearest track



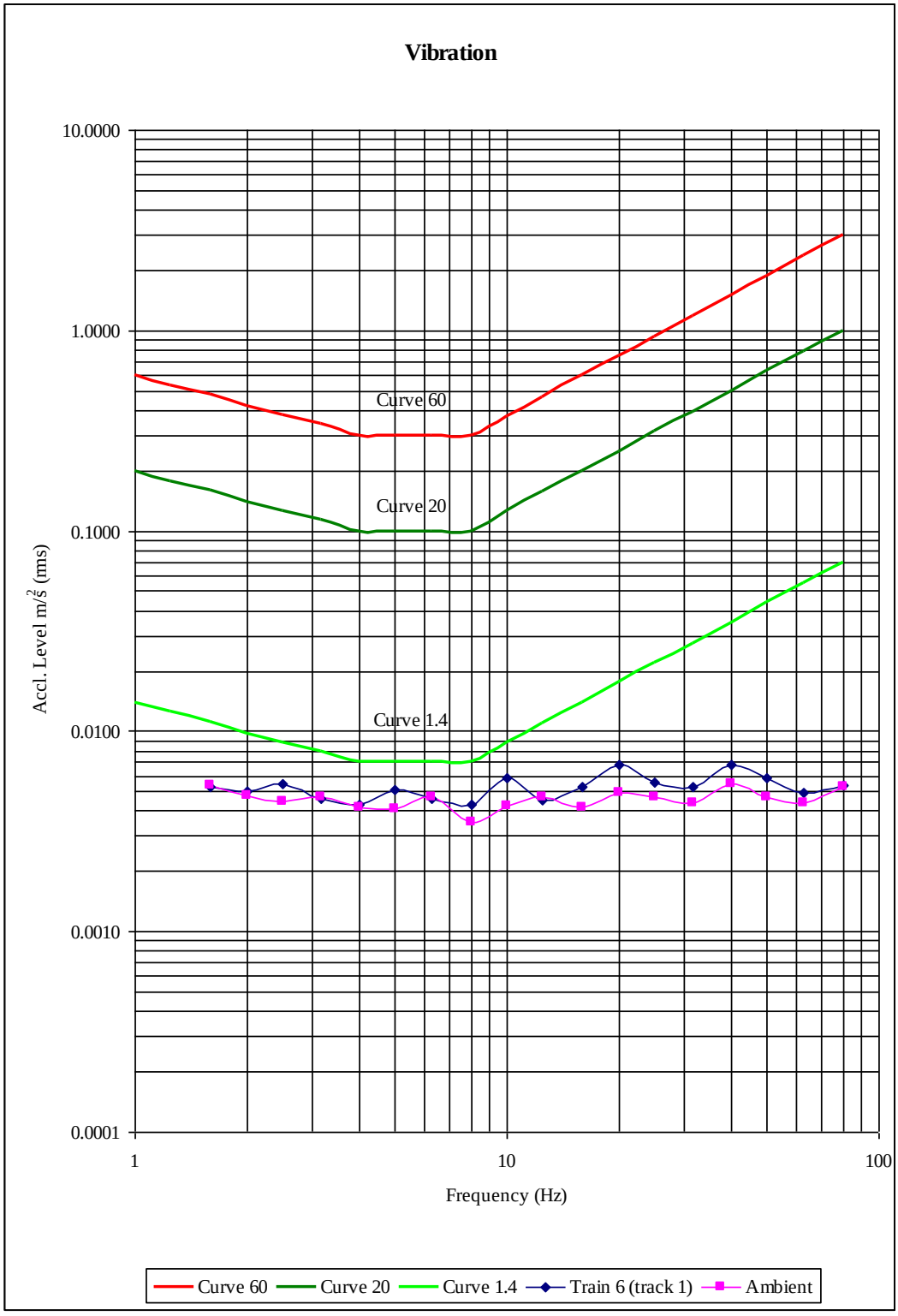
Address: 171-189 Parramatta Rd., Granville
Meas. Location: Approx.15 m from nearest track



Address: 171-189 Parramatta Rd., Granville
Meas. Location: Approx.15 m from nearest track

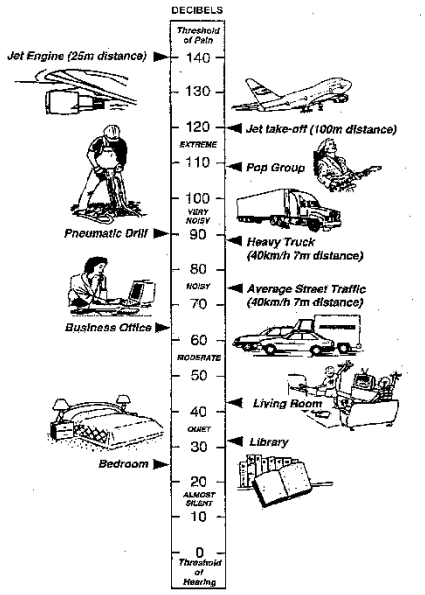


Address: 171-189 Parramatta Rd., Granville
Meas. Location: Approx.15 m from nearest track

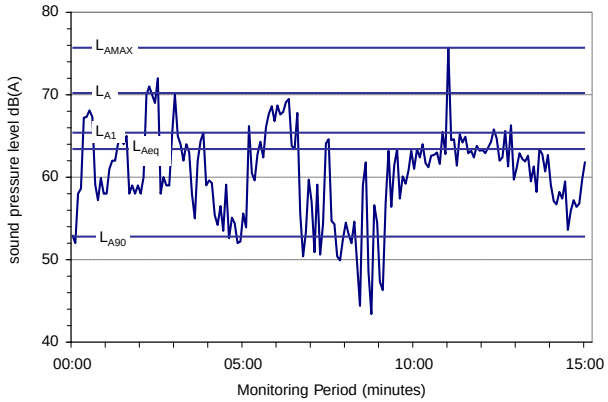


Appendix C – Acoustic Terminology

A-weighted sound pressure	The human ear is not equally sensitive to sound at different frequencies. People are more sensitive to sound in the range of 1 to 4 kHz (1000 – 4000 vibrations per second) and less sensitive to lower and higher frequency sound. During noise measurement an electronic '*A-weighting*' frequency filter is applied to the measured sound level *dB(A)* to account for these sensitivities. Other frequency weightings (B, C and D) are less commonly used. Sound measured without a filter is denoted as linear weighted dB(linear).
Ambient noise	The **total** noise in a given situation, inclusive of all noise source contributions in the near and far field.
Community annoyance	**Includes** noise annoyance due to: ▪ character of the noise (e.g. sound pressure level, tonality, impulsiveness, low-frequency content) ▪ character of the environment (e.g. very quiet suburban, suburban, urban, near industry) ▪ miscellaneous circumstances (e.g. noise avoidance possibilities, cognitive noise, unpleasant associations) ▪ human activity being interrupted (e.g. sleep, communicating, reading, working, listening to radio/TV, recreation).
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Cumulative noise level	The total level of noise from all sources.
Extraneous noise	Noise resulting from activities that are not typical to the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
Feasible and reasonable measures	Feasibility relates to engineering considerations and what is practical to build; reasonableness relates to the application of judgement in arriving at a decision, taking into account the following factors: ▪ Noise mitigation benefits (amount of noise reduction provided, number of people protected). ▪ Cost of mitigation (cost of mitigation versus benefit provided). ▪ Community views (aesthetic impacts and community wishes). ▪ Noise levels for affected land uses (existing and future levels, and changes in noise levels).
Impulsiveness	Impulsive noise is noise with a high peak of short duration or a sequence of these peaks. Impulsive noise is also considered annoying.
Low frequency	Noise containing major components in the low-frequency range (20 to 250 Hz) of the frequency spectrum.
Noise criteria	The general set of non-mandatory noise levels for protecting against intrusive **noise** (for example, background noise plus 5 dB) and loss of amenity (e.g. noise levels for various land use).

Noise level (goal)	A noise level that should be adopted for planning purposes as the highest acceptable noise level for the specific area, land use and time of day.
Noise limits	Enforceable noise levels that appear in conditions on consents and licences. The noise limits are based on achievable noise levels, which the proponent has predicted can be met during the environmental assessment. Exceedance of the noise limits can result in the requirement for either the development of noise management plans or legal action.
Performance-based goals	Goals specified in terms of the outcomes/performance to be achieved, but not in terms of the means of achieving them.
Rating Background Level (RBL)	The rating background level is the overall single figure background level representing each day, evening and night time period. The rating background level is the 10th percentile min L_{A90} noise level measured over all day, evening and night time monitoring periods.
Receptor	The noise-sensitive land use at which noise from a development can be heard.
Sleep disturbance	Awakenings and disturbance of sleep stages.
Sound and decibels (dB)	**Sound** (or noise) is caused by minute changes in atmospheric pressure that are detected by the human ear. The ratio between the quietest noise audible and that which should cause permanent hearing damage is a million times the change in sound pressure. To simplify this range the sound pressures are logarithmically converted to decibels from a reference level of 2 x 10-5 Pa. The picture below indicates typical noise levels from common noise sources.  dB is the abbreviation for decibel – a unit of sound measurement. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure.
Sound power Level (SWL)	The sound power level of a noise source is the sound energy emitted by the source. Notated as SWL, sound power levels are typically presented in *dB(A)*.

Sound Pressure Level (SPL)	The level of noise, usually expressed as SPL in *dB(A)*, as measured by a standard sound level meter with a pressure microphone. The sound pressure level in *dB(A)* gives a close indication of the subjective loudness of the noise.
Statistic noise levels	**Noise** levels varying over time (e.g. community noise, traffic noise, construction noise) are described in terms of the statistical exceedance level. A hypothetical example of A weighted noise levels over a 15 minute measurement period is indicated in the following figure:



Key descriptors:

L_{Amax} Maximum recorded noise level.

L_{A1} The noise level exceeded for 1% of the 15 minute interval.

L_{A10} Noise level present for 10% of the 15 minute interval. Commonly referred to the average maximum noise level.

L_{Aeq} Equivalent continuous (energy average) A-weighted sound pressure level. It is defined as the steady sound level that contains the same amount of acoustic energy as the corresponding time-varying sound.

L_{A90} Noise level exceeded for 90% of time (background level). The average minimum background sound level (in the absence of the source under consideration).

Threshold	The lowest sound pressure level that produces a detectable response (in an instrument/person).
Tonality	Tonal noise contains one or more prominent tones (and characterised by a distinct frequency components) and is considered more annoying. A 2 to 5 dB(A) penalty is typically applied to noise sources with tonal characteristics