



ACOUSTIC IMPACT ASSESSMENT Proposed Youth Recreation Area at Rushcutters Bay Park New south Head Rd, Darling Point

Prepared for:
Woollahra Council
536 New South Head Road, Double Bay NSW 2028

Prepared by:

Karel Ruber
Noise & Vibration Engineering Consultant
B.Sc, M.Eng.Sc-Mechanical Noise & Vibration
MAAS, APESMA

File reference: 2018_07_#01
Date: 07/07/18

CONTENTS

1. INTRODUCTION	2
2. DESCRIPTION OF SITE, NOISE SOURCES AND MEASUREMENT LOCATIONS	3
2.1. Rushcutters Bay Park, Darling Point.....	3
2.2. Fernside Park, Waterloo	6
3. MEASUREMENTS.....	8
4. NOISE CRITERIA	9
4.1. Intrusive Noise	9
4.2. Amenity Criteria.....	9
5. RESULTS	12
5.1. Measurements at Fernside Park –noon time	12
5.2. Measurements at Fernside Park –evening	13
5.3. Measurements at Rushcutters Bay Park -afternoon	14
5.4. Summary of Results and Discussion	Error! Bookmark not defined.
5.5. Noise attenuation with distance.....	15
6. CONCLUSIONS	18
7. REFERENCES	18

This report has been prepared by KR- Acoustic Consultancy with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with the Client.

Information reported herein is based on the interpretation of data collected which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of Woollahra Council.

No warranties or guarantees are expressed or should be inferred by any third parties.

This report may not be relied upon by other parties without written consent from KR- Acoustic.

KR-Acoustic disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

1. INTRODUCTION

KR Acoustics Consulting has been commissioned by Woollahra Council to conduct an acoustic impact assessment of the noise generated by a proposed Youth Recreation Area which will include a Skateboard Park, to be located at the South West corner of the Rushcutters Bay Park. Throughout this document the names Youth Recreation Area and Skateboard Park are used interchangeably.

The report will address the view that ‘the sound from continuous heavy traffic along New South Head Road mitigates any noise actual or perceived from the proposed youth recreation facility.’

This report is based on noise measurement of a similar existing skateboard park- Fernside Skatepark in Waterloo.

Impulsive sound is defined as a single pressure peak or a single burst of multiple pressure peaks for durations usually less than one second. Impulsive sound can be generated as the result of impact of one moving object with another. Impact noise, which is very common in skateparks, is caused by the collision of skate wheels with concrete (or metal or wood) ramp surfaces.

According to the Council Noise Guide [1] in most situations the L_{Aeq} is the most appropriate noise descriptor to use when measuring noise impact on hearing. The A subscript denotes that A-weighting frequency filtering was applied to the measured Sound Pressure Levels (SPL) to simulate human hearing. The L_{Aeq} is the equivalent continuous level of noise under investigation (average). Another commonly used noise descriptor is L_{A90} which is the level of noise exceeded 90% of the measurement time (percentile). L_{A90} is much less sensitive to short time loud noise events, occurring occasionally during the measurement period, than L_{Aeq} and some other metrics. The L_{A90} metric is commonly used for estimating the background noise.

Impulsive noise used to be measured using the Impulse time weighting which is characterised by a short rise time (35ms) and a long decay time (1.5s). All time weighting (I = Impulse, F=Fast, S=Slow) were designed for analogue Sound Level Meters (SLMs) to allow more accurate readings of the noise by the indicator needle, which can fluctuate greatly and rapidly, when the measured noise is not constant.

Current integrating SLM record the data digitally and do not actually need the time weighting for the human operator real time sound level reading however time weighting are sometime used for backward compatibility with past measurements and noise limits.

Impulsive noise is penalised with up to 5dB which is added to the measured L_{Aeq} [1].

Noise impact (not Impact noise) is assessed against two criteria: Intrusiveness and Amenity. Intrusiveness is a relative criteria based on the existing background noise while the Amenity criteria is based on absolute limit for the specific area. The combined noise limits are the minimum (stricter) noise limits of the two criteria. More details about the two criteria are given in the Section 4.

This assessment was carried out in compliance with procedures listed in the Protection of the Environment Operations Act (POEO Act 2008) [2] the POEO (Noise Control) Regulation, 2008 and relevant Australian Standards.

2. DESCRIPTION OF SITE, NOISE SOURCES AND MEASUREMENT LOCATIONS

2.1. Rushcutters Bay Park, Darling Point

Rushcutters Bay Park is located in Darling Point Suburb bounded by Bayswater Road/New South Head Road to the south, New Beach Road to the east and Rushcutters Creek to the west-see Figure 1.

New South Head Road is a high volume main road with traffic around 40k vehicles per day (95% cars)-see Figure 2.

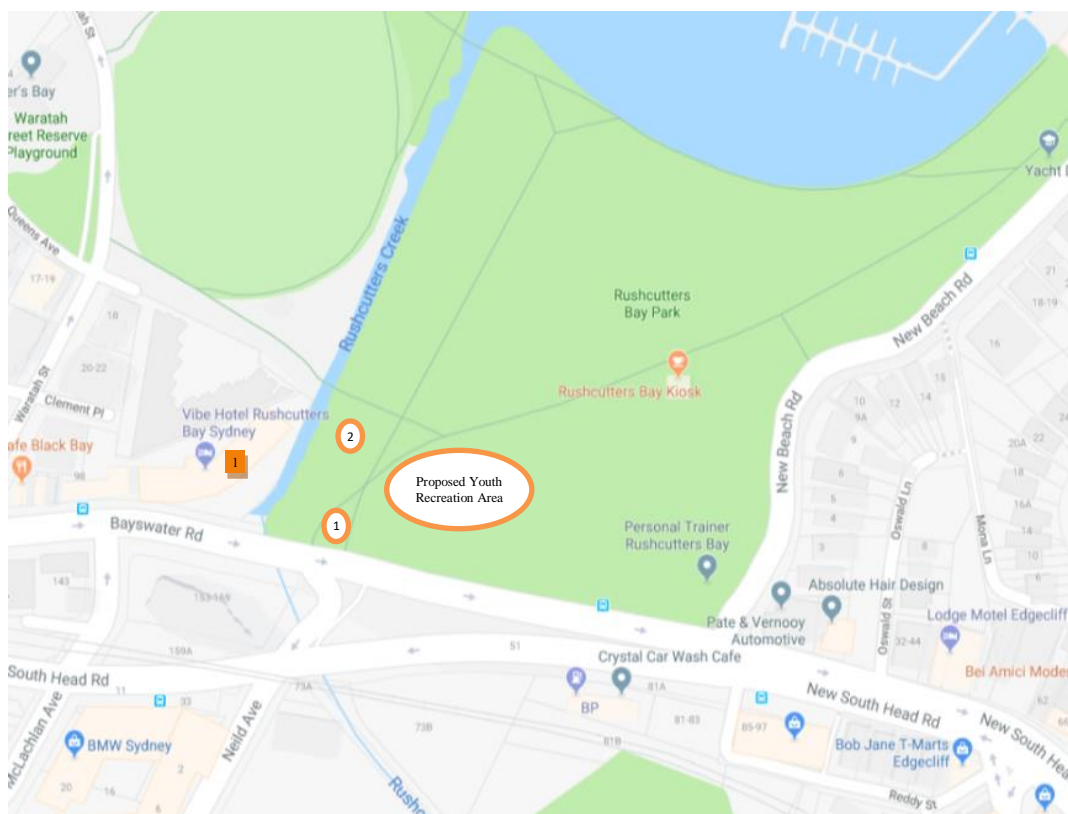


Figure 1: Rushcutters Bay Park and surroundings. Orange Circles mark the measurement locations

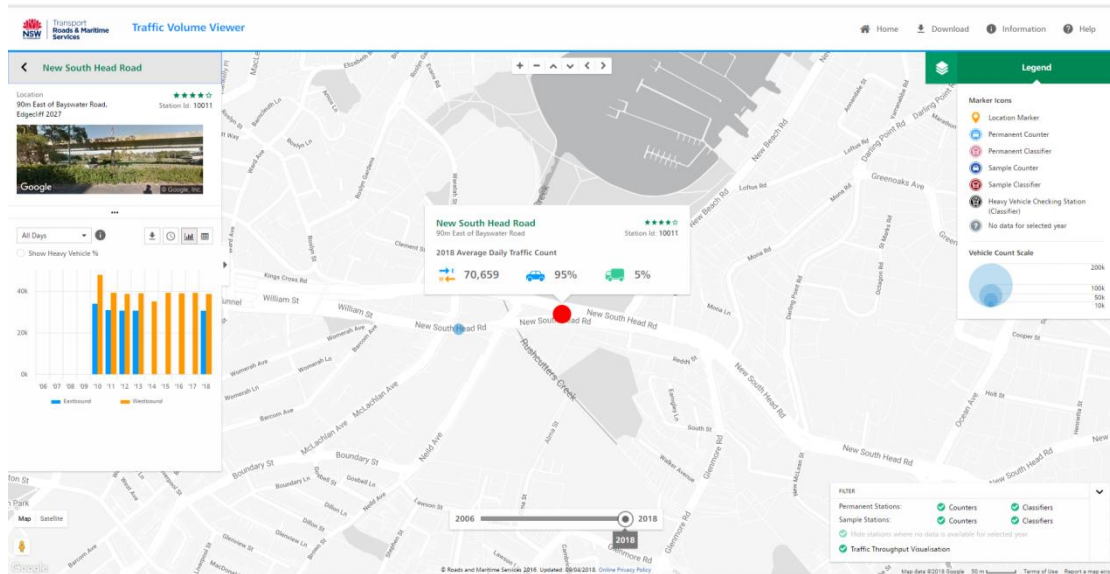


Figure 2: Traffic statistics for New South Head Road near the proposed youth recreation area in Rushcutters Bay Park

Measurement Position 1 was located 4 meters from the road and measurement Position 2 was located 30 m away from the road as shown in Figure 3. The Orange Oval marks the location of the proposed Youth Recreation Area and the Orange Square the nearest property potentially affected by the youth recreation area noise.



Figure 3: Rushcutters Bay Park- proposed Youth Recreation Area, sound measurement locations and the nearest premises potentially affected by noise.(Photography courtesy of Google)

The distance from the proposed park boundaries (assumed location) are 60m to Point 1H and also 60m to Point 2H at Vibe Hotel boundary. Point 1H distance to New South Head Road is 33m and Point 2H is 50m from the road.



Figure 4: Vibe Hotel Rushcutters Bay –East side, facing the proposed Youth Recreation Area

Rooms on the East side of the Vibe Hotel do not have balconies. There is a swimming pool on the roof of the hotel.

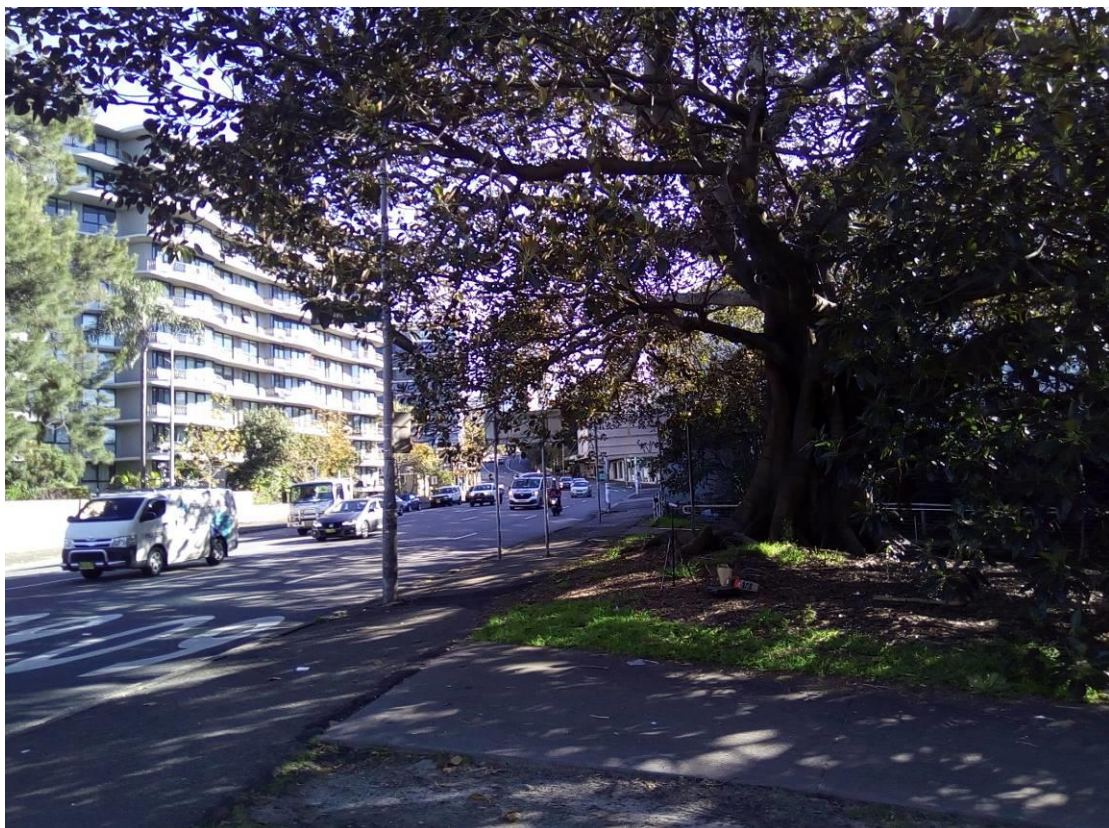


Figure 5: Measurement Position 1 in Rushcutters Bay Park, near New South Head Road



Figure 6: Measurement Point 2 in Rushcutters Bay Park, 30 m away from New South Head Road

2.2. Fernside Park, Waterloo

Fernside Skate Park which is located in Waterloo suburb contains smooth surface skating areas surrounded with buttery blocks, ledges and rails. It also includes blocks, ledges, banked ledges, manual pads, stairs, rails, flat bar, fly-out, corner bank, steep wall, a mini ramp and a half pipe.



Figure 7: Fernside youth recreation area, Waterloo. Sound measurement locations numbered inside Orange Circles. Measurement Position 2 is located near the Half Pipe (Photography courtesy of Google).

Google statistics Figure 8 shows that around noon there are moderate number of park users and skaters while in the evening between 6PM and 10 PM the number is much greater. It is unknown if the statistics refer to total visitors or only skater.

From personal observations during the measurements most of the visitors are skaters however skaters take turns in using the grounds therefore there are usually no more than 6-7 active skaters on the main grounds and only one at the time in the Half Pipe.

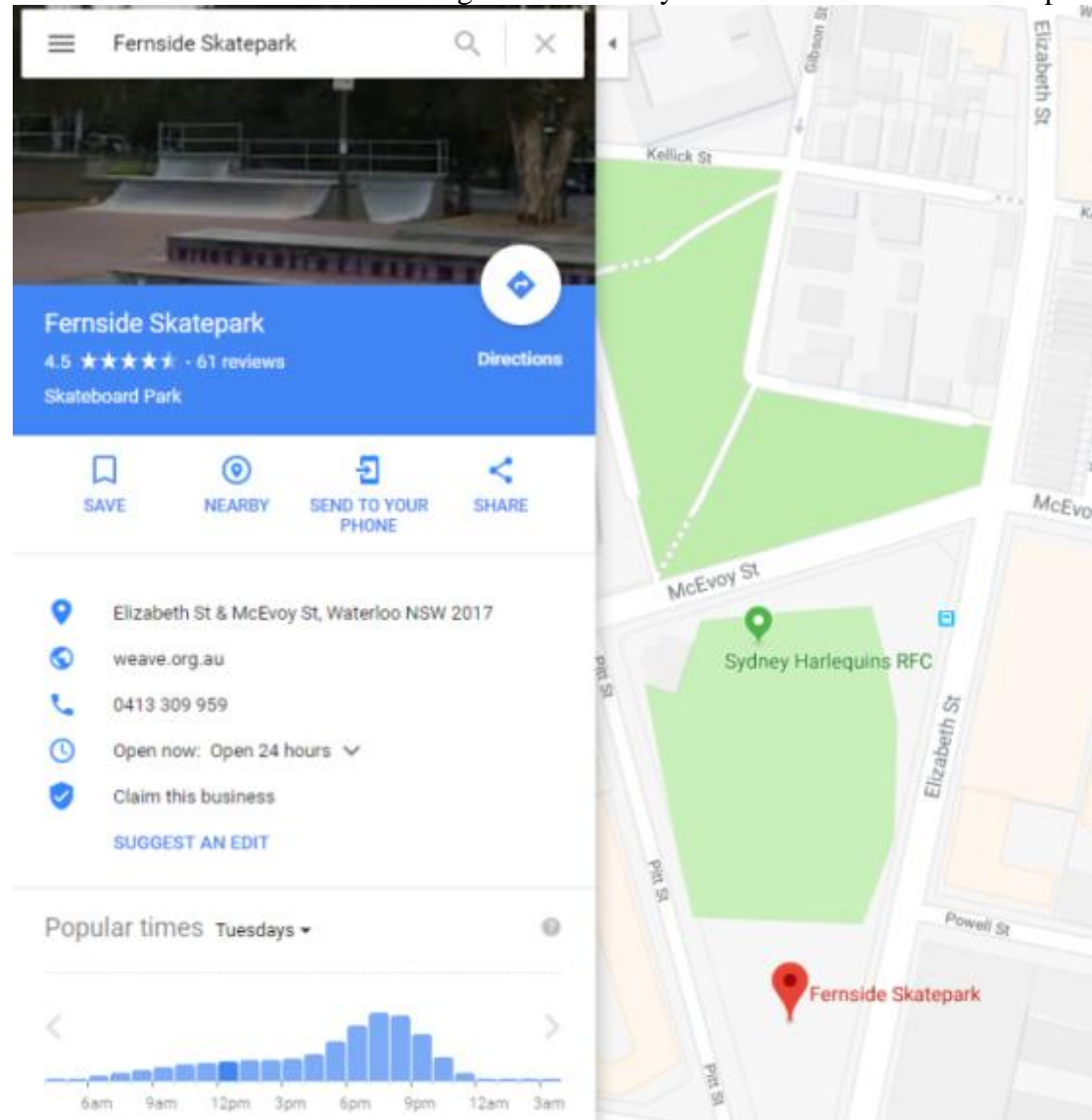


Figure 8: Google statistics for Fernside Skateboard Park

The information above was found at:

<https://www.google.com.au/maps/place/Fernside+Skatepark/@-33.9010257,151.2079274,17.75z/data=!4m5!3m4!1s0x0:0xf7d2c3c231b1f251!8m2!3d-33.902211!4d151.205273>



Figure 9: Fernside Skateboard Park Position 1



Figure 10: Fernside Skateboard Park Position 2

3. MEASUREMENTS

Measurements were taken on 5/07/18 at two sites in 2-4 locations on each site, as described above, with a Type 1 Integrating Sound Level Meters (SLM) SVAN 979 s/n 21014 which was within annual calibration period.

The length of the measurement varied between 15 minutes and shorter periods. The 15 minutes sections were in some cases divided in shorter section for analysis of specific events or noise conditions changes. The height of the microphone above the ground was 1.2m-1.5m.

Measurements at Fernside Park were taken at noon and again in the evening when the number of skaters is the greatest. Measurements at Rushcutters Bay Park were made in the afternoon.

In parallel to the measurements, the SPL was also logged and stored every second at Fernside at noon measurements and at Rushcutters Bay in the afternoon. In the evening the measurements at Fernside were logged at a rate of every 10ms which provided better insight into the short impulse noise of skateboard impacts. The SLM also recorded the sound simultaneously with the measurement and the logging for identification of events and extraneous noise during the post analysis process.

The SLM calibration was verified before and after measurements using Type 1 Calibrator SV30A s/n 17442.

All noise methodologies and equipment used complied with Australian Standards:

- 61672.1-2004 “Electroacoustics—Sound level meters; Part 1: Specifications”
- AS1055.1 “Acoustics – Description and Measurement of Environmental Noise”

4. NOISE CRITERIA

The EPA Noise Policy for Industry ,2017 [3] sets two separate noise criteria to meet environmental noise objectives: one to account for **Intrusive noise** and the other to protect the **Amenity** of particular land uses.

4.1. Intrusive Noise

Noise is identified as ‘intrusive’ if it is noticeably louder than the background noise and considered likely to disturb or interfere with those who can hear it.

According to the Council Noise Guide [1] The sound pressure level created by the operation of machinery such as air conditioning and refrigeration plants, measured at any point at the boundary of the premises, is considered to be intrusive if it exceeds 5 dBA above background noise. Local Councils can define their own noise limits - Woollahra council requires that the noise limit during night time (10PM -7 AM) should not exceed background noise.

4.2. Amenity Criteria

To limit continuing increases in noise levels, The EPA Noise Policy for Industry [3] recommends that the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in

Table 1. Those limits are also often used by Local Councils as noise limits not only for Industrial noise sources.

Table 1- Amenity noise levels specified in the EPA Noise Policy for Industry. Most relevant items are marked in bold and blue font.

Receiver	Noise amenity area	Time of day	L _{Aeq} , dB(A)
(see Table 2.3 to determine which residential receiver category applies)			Recommended amenity noise level
Residential	Rural	Day	50
		Evening	45
		Night	40
Suburban		Day	55
		Evening	45
		Night	40
Urban		Day	60
		Evening	50
		Night	45
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks	See column 4	See column 4	5 dB(A) above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
School classroom – internal	All	Noisiest 1-hour period when in use	35 (see notes for table)
Hospital ward	All	Noisiest 1-hour	35
internal	All	Noisiest 1-hour	50
external			
Place of worship – internal	All	When in use	40
Area specifically reserved for passive recreation (e.g. national park)	All	When in use	50
Active recreation area (e.g. school playground, golf course)	All	When in use	55
Commercial premises	All	When in use	65
Industrial premises	All	When in use	70
Industrial interface (applicable only to residential noise amenity areas)	All	All	Add 5 dB(A) to recommended noise amenity area

Assuming the Youth Recreation Area will not be operating during night time the resulting limits are between 65dB during the day and 55dB during evening.

4.2.1. High Traffic Noise

From [3] Section 2.4.1: When the level of transport noise, road traffic noise in particular, may be high enough to make noise from an industrial source effectively inaudible, even though the L_{Aeq} noise level from that industrial noise source may exceed the project amenity noise level. In such cases the project amenity noise level may be derived from the $L_{Aeq, period}$ (traffic) minus 15 dB(A).

$$\begin{aligned} &\text{High traffic project amenity noise level for industrial developments} \\ &= \\ &L_{Aeq, period}(\text{traffic}) \text{ minus } 15 \text{ dB(A)} \end{aligned}$$

The NSW Road Noise Policy [4] specifies limits between 55dB and 60dB for new roads or redevelopment/increased traffic of existing roads respectively-see image below.

2.3 Noise assessment criteria

2.3.1 Noise assessment criteria – residential land uses

Table 3 sets out the assessment criteria for residences to be applied to particular types of project, road category and land use. These criteria are for assessment against façade-corrected noise levels when measured in front of a building façade as recommended in **Table 7**. In **Table 3**, freeways, arterial roads and sub-arterial roads are grouped together and attract the same criteria.

Table 3 Road traffic noise assessment criteria for residential land uses

Road category	Type of project/land use	Assessment criteria – dB(A)	
		Day (7 a.m.–10 p.m.)	Night (10 p.m.–7 a.m.)
Freeway/ arterial/ sub-arterial roads	1. Existing residences affected by noise from new freeway/arterial/sub-arterial road corridors	L_{Aeq} , (15 hour) 55 (external)	L_{Aeq} , (9 hour) 50 (external)
	2. Existing residences affected by noise from redevelopment of existing freeway/arterial/sub-arterial roads	L_{Aeq} , (15 hour) 60 (external)	L_{Aeq} , (9 hour) 55 (external)
	3. Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments		
Local roads	4. Existing residences affected by noise from new local road corridors	L_{Aeq} , (1 hour) 55 (external)	L_{Aeq} , (1 hour) 50 (external)
	5. Existing residences affected by noise from redevelopment of existing local roads		
	6. Existing residences affected by additional traffic on existing local roads generated by land use developments		

Note: Land use developers must meet internal noise goals in the Infrastructure SEPP (Department of Planning NSW 2007) for sensitive developments near busy roads (see **Appendix C10**).

Figure 11: Extract from NSW Road Noise Policy

In conclusion the Amenity criteria depends on many factors like the time of the day, the classification of the area and the classification of the Youth Recreation Area development, among other things. In light of the above setting the amenity noise level limit was set to $L_{Aeq}=60\text{dBA}$

5. RESULTS

The following graphs were created with the Svan PC++ software provided by the manufacturer of the SVAN SLMs used for the measurements. The software allows selection and analysis of contiguous and non-contiguous blocks of data including calculations of sound level indicators such as L_{Aeq} for the selected data, zooming to shorter time spans and simultaneous sound playback among other capabilities.

5.1. Measurements at Fernside Park –noon time

Measurements made with 1 sec logging rate are shown below. The graphs show the levels of L_{Apeak} , L_{AFmax} and L_{Aeq} displaying large variations in amplitude and time, as expected from skateboard noise.

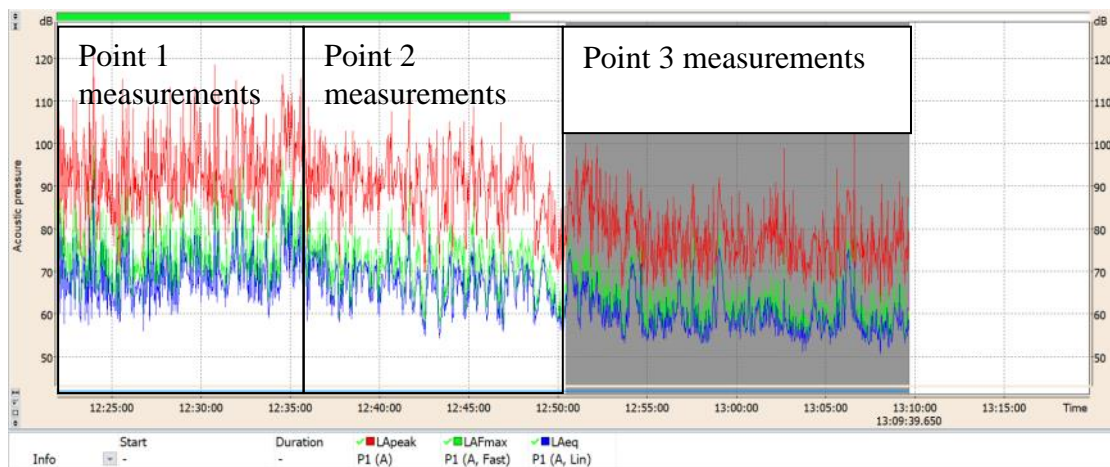


Figure 12: Grey area-measurements at Point 3, 30 m from the grounds

At Point 1 L_{Aeq} =72.4dBA, at Point 2 L_{Aeq} =67.4dBA and at Point 3 L_{Aeq} =61.7dBA. Most of the high peaks are caused by skateboard impact with concrete surfaces. The others are extraneous noises. Listening to sound playback for Point 3 with the cursor simultaneously tracing the graphs, extraneous noises (airplanes, loud vehicle noise, operator coughing, etc.) were identified and excluded from the calculation. The Results in Figure 13 show the included time ranges in grey. The L_{Aeq} level has been reduced to 57.4dBA.

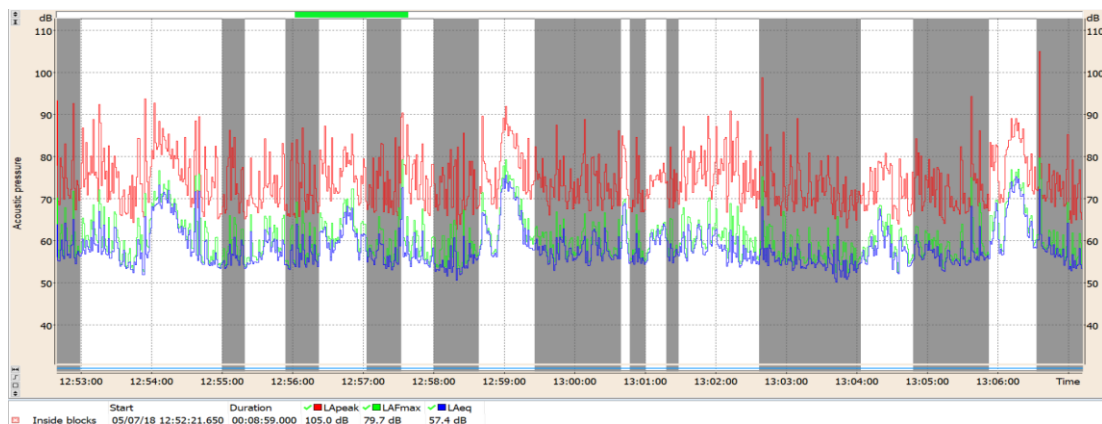


Figure 13: Fernside Skateboard Park Point 3 noon time measurements excluding extraneous noises

5.2. Measurements at Fernside Park –evening



Figure 14: Grey area- measurements at Point 3 evening measurements (30 m from the grounds)

At Point 4 L_{Aeq} =70.5dBA on average and at Point 3 L_{Aeq} =60.9dBA
Excluding extraneous noise the L_{Aeq} at Point is reduced to 59.7dBA

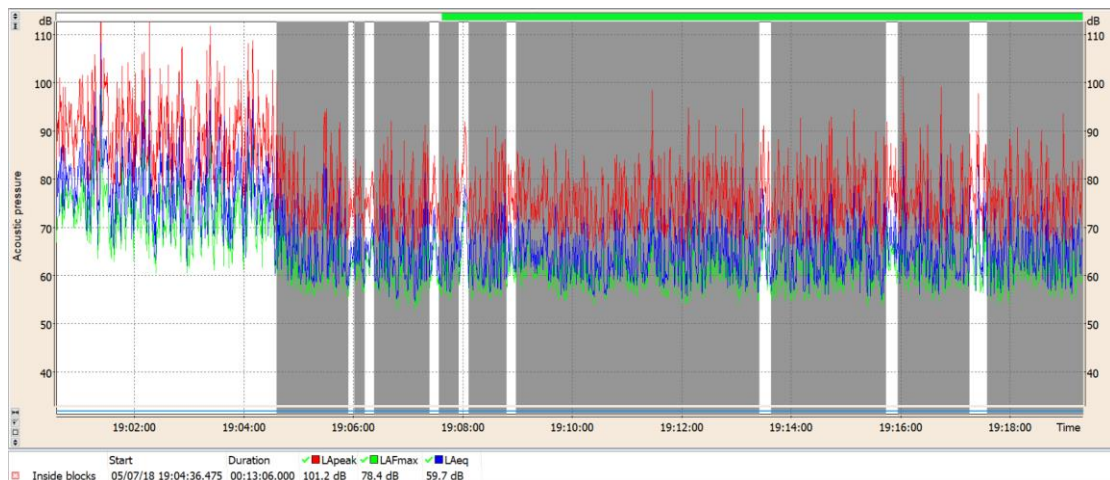


Figure 15: Fernside Skateboard Park Point 3 evening measurements excluding extraneous noises

When the logging was performed with 10ms time resolution the during a skate impact noise the maximum instantaneous values of L_{AFmax} are lower than the maximum instantaneous values of L_{Aeq} because of the time weighting of Fast setting. However integrating over a total period of 6.040s which included approximately 22 impacts, the maximum L_{AFmax} is 66.1dBA while the L_{Aeq} is 60.6dBA-see Figure 16.

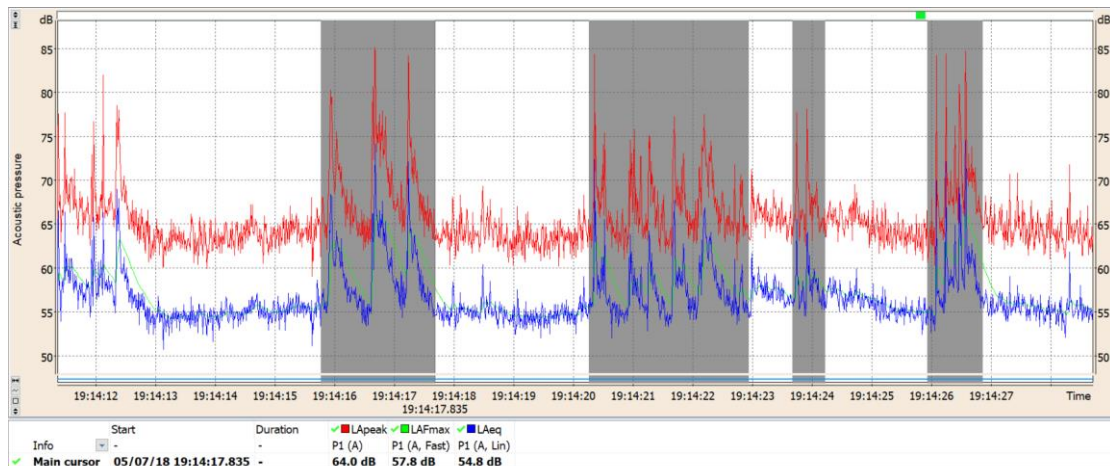


Figure 16: Sound level analysis for approximately 22 impacts in 4 groups of impact events

If the quiet times between impacts are included the L_{Aeq} is reduced in this case by 1.6dB to a value of 59.0dBA - Figure 17

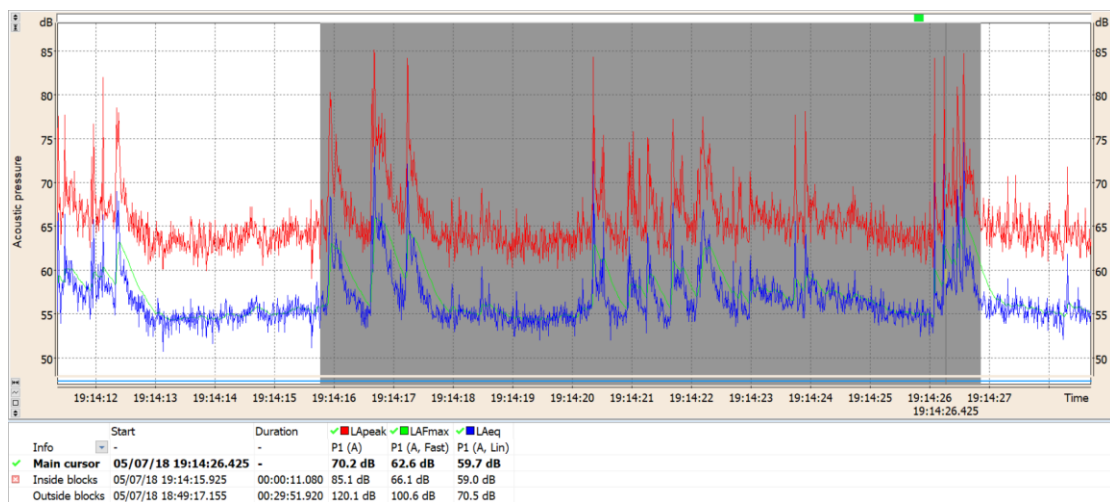


Figure 17: Sound level analysis for approximately 22 impacts including periods of quiet between groups of impacts

Figures 16 and 17 above demonstrate how the L_{Aeq} and other sound indicators can vary depending on the noise characteristics such as the rate of impacts, the amplitude of the noise (varies with the distance and skater characteristics) and the length of quiet time included in the analysis.

5.3. Measurements at Rushcutters Bay Park -afternoon

Measurements were made at Position 1 and 2 Figure 3 Traffic during that time was intermittent with dense traffic separated by gaps in the traffic when no cars passed the measurement point.



Figure 18: LApeak, LAFmax and LAeq typical of Traffic Noise at Rushcutters Bay Park Position 1

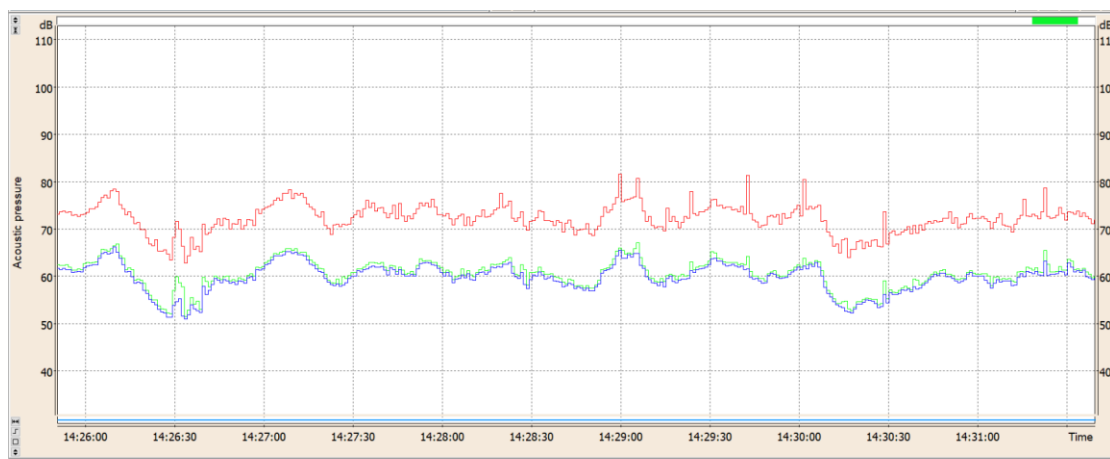


Figure 19: LApeak, LAFmax and LAeq typical of Traffic Noise at Rushcutters Bay Park Position 2

During the gaps in the traffic the noise was dominated by the traffic further away at the other side of New South Head Road. At positions 2, 30m away from the road $L_{Aeq} = 61.0$ dBA and the background noise $L_{A90} = 55.4$ dBA.

5.3.1. Noise attenuation with distance

Rushcutters Bay Park position 2 is about 30 m from the road and the same distance from the nearest building of the hotel and also 30 m distance to the proposed Youth Recreation Area boundary. From [2] EPA, Noise Guide for Local Government:

The following relationship can be used to quantify distance attenuation:

$SPL_x = SPL_y - 20 \log(dx/dy)$ for a point source (e.g. skaters)

$SPL_x = SPL_y - 10 \log(dx/dy)$ for a line source (e.g. heavy traffic along a road)

where:

SPL_x = SPL at distance x from the source in metres (predicted)

SPL_y = SPL at distance y from the source in metres (measured)

dx = distance in metres to location x from the source

dy = distance in metres to location y from the source

Assuming that Youth Recreation Area is a point source, at a distance of about 60m from the closest point of the hotel, the skateboard noise is expected to be attenuated by 6dB compared to the noise measured 30m from Fernside Skateboard Park. The background noise at the Point 2H boundary of the hotel which is approximately 50m from New South Head Road is expected to be 2.2dB lower than at measurement Point 2 at Rushcutters Bay Park while at Point 1H which is 33m away from the road the level is only 0.4dB lower.

5.3.2. Summary of measurement results and calculations

Table 2: Summary of measurement results and calculations

Site	Position #	Meas. Saved -Date & time	(Min) Measuring Distance [m]	Number of Skaters	L _{Aeq} [dB]	L ₉₀ [dB]
Fernside	1	12:36:59 PM	1	4-5	72.2	57.3
Fernside	2	12:51:59 PM	2	1	67.4	56.8
Fernside	3	1:06:59 PM	30	2-4	57.4	53.4
Rushcutters	1	1:57:45 PM	4		70.5	62.3
Rushcutters	1	2:14:52 PM	4		70.2	63.0
Rushcutters	1	2:16:57 PM	4		70.8	66.0
Rushcutters	2	2:33:30 PM	30		61.0	55.4
Fernside	4	7:04:17 PM	1	4-7	73.3	60.7
Fernside	3	7:19:17 PM	30	4-8	59.7	54.3
Estimated Skateboard Noise at Points 1H & 2H @60m from the grounds					52.6	
Estimated Skateboard Noise at Points 1H & 2H + 5 dB Impulsive noise penalty					57.6	
Estimated Traffic/Background Noise at Point 1H Hotel Boundary (@ 60m from the grounds and @ 33m from the road)					60.6	55.0
Estimated Traffic/Background Noise at Point 2H Hotel Boundary (@ 60m from the grounds and @ 50m from the road)					58.8	53.2

At this point it is worthwhile mentioning that while instrumentation accuracy is within 1dB, the variability of the Traffic and Skateboard noise can be in order of plus minus several dB. Considering the above and also according to The EPA Noise Policy for Industry [3], Noise Levels should be rounded to the nearest integer.

The L_{Aeq} of the predicted noise at Point 1H from traffic and Skateboard Park is the same, namely 60.6dBA which is rounded to 61dBA. This means the combined noise effect will be equivalent to L_{Aeq}= 62dBA. At location 2H the equivalent noise will be 61dBA.

Table 3: Summary of Intrusive, Amenity and the combined project criteria vs the estimated noise levels for day time and evening

Boundary Location	Intrusiveness Noise Limits: $L_{A90}+5$ dBA	Amenity-Urban Noise Level Limits L_{Aeq} dB(A)	(Project) Resultant Noise Limits L_{Aeq} dB(A)	Estimated Skateboard Noise (including Impulsive noise penalty)
Point 1H	60	60	60	58
Point 2H	58	60	58	58

The estimated Skateboard Noise at Point 1H is 2dB below the limit while at Point 2H is just at the limit-for day time and evening.

Night time measurements were not performed near the Vibe Hotel Rushcutters Bay Park but from measurement performed in similar locations and available literature the night time background noise will be lower than 45dBA. Both Intrusive and Amenity limits will be infringed if the Youth Recreation Area will be operating during night time.

5.3.3. Discussion

The **Noise Intrusiveness Criteria** is related to the question Woollahra council asked: “Does the sound from continuous heavy traffic along New South Head Road mitigate any noise actual or perceived from the proposed youth recreation facility?”

The answer is **positive** in terms of compliance with the Noise Intrusiveness Criteria (and project noise criteria) – the noise from the current proposed location of the Youth Recreation Area does not exceed the limits.

However the Traffic noise is producing Intermittent noise which will only mask the Impulsive noise from the Youth Recreation Area some of the time. Given that both the traffic noise and youth recreation area noise are changing from one moment to the other, when Impact noise occurs, it will be often audible near the boundary of the hotel. This will be true even if the average Youth Recreation Area noise will be reduced by a couple of dB.

Differences in the Youth Recreation Area construction and number of people using the park may also introduce some changes from predicted levels to the actual levels that may be measured in the future.

6. CONCLUSIONS

A detailed noise and vibration assessment of the predicted noise for a proposed Youth Recreation Area in Rushcutters Bay Park has been carried out.

The assessment shows that the Youth Recreation Area noise can be acceptable with respect to the noise limits provided usage of the park after 10PM and before 7AM is not permitted. This criterion however does not guarantee inaudibility of the skateboard impact noise during the time of low to moderate traffic noise (or other low level background noise).

7. REFERENCES

- [1] EPA, Noise Guide for Local Government, (2013) 192.
<http://www.epa.nsw.gov.au/resources/noise/20130127NGLG.pdf>.
- [2] New South Wales Government, Protection of the Environment Operations (Noise Control) Regulation 2008, 2008 (2008) 1–111.
[http://www.legislation.nsw.gov.au/viewtop/inforce/subordleg+40+2008+cd+0+N/?dq=Regulations under Protection of the Environment Operations Act 1997 No 156](http://www.legislation.nsw.gov.au/viewtop/inforce/subordleg+40+2008+cd+0+N/?dq=Regulations+under+Protection+of+the+Environment+Operations+Act+1997+No+156).
- [3] EPA, Noise Policy for Industry, (2017).
- [4] NSW Department of Climate Change, NSW Road Noise Policy, Assessment. (2011).

8. Appendix A- Detailed location and features of the proposed Youth Recreation Area

The new information about the size, location and facilities of the Youth Recreation Area which was provided towards the completion of this report shows the approximately rectangular shape of the grounds being roughly 45deg rotated to the south boundary of the Rushcutters Bay Park (New South Head Road).

The distances assumed in the calculation are very close to the proposed Youth Recreation Area location – the “Kinked Ledge” feature at the closest boundary of the park corresponds to the 60m distance point from the two points (1H and 2H) on the closest boundary of the Hotel.



Figure 20: Youth Recreation Area location in Rushcutters Bay Park

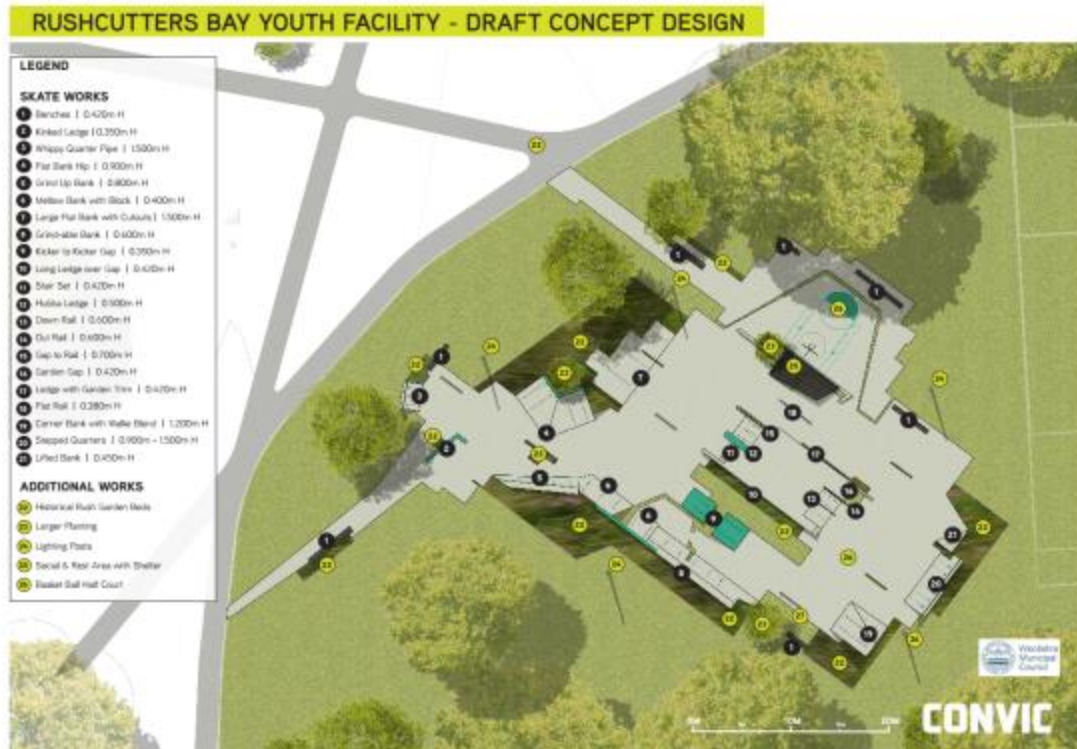


Figure 21: Details of the proposed Youth Recreation Area