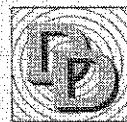


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ENVIRONMENTAL NOISE IMPACT
PROPOSED PLACE OF PUBLIC WORSHIP
AT 47-51 EDENSOR ROAD, CABRAMATTA, NSW

REPORT NUMBER: 4744 REV B

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* AIRCRAFT, ROAD TRAFFIC AND TRAIN NOISE CONTROL
* ARCHITECTURAL ACOUSTICS * INDUSTRIAL NOISE AND VIBRATION CONTROL
* ENVIRONMENTAL NOISE IMPACT INVESTIGATION AND CONTROL
* OCCUPATIONAL NOISE INVESTIGATIONS * QUIET PRODUCT DEVELOPMENT



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1.0 CONSULTING BRIEF

Day Design Pty Ltd was engaged by VT Architects Pty Ltd to investigate the environmental noise impact of the proposed Buddhist temple development at 47-51 Edensor Road, Cabramatta. This commission involves the following:

Scope of Work:

- Inspect the site and environs
- Measure the background noise levels at critical locations and times
- Establish acceptable noise level criterion
- Quantify noise emissions from Temple
- Calculate the level of noise emission, taking into account building envelope transmission loss, ground absorption, screen walls and distance attenuation
- Prepare a site plan identifying the development and nearby noise sensitive locations
- Provide recommendations for noise control (if necessary)
- Prepare an Environmental Noise Impact Report.

2.0 PROJECT DESCRIPTION & SUMMARY OF FINDINGS

The proposed development is a Buddhist temple at 47-51 Edensor Road, Cabramatta NSW. The development is a multilevel complex which comprises a car park with over a eighty car spaces, a main temple building, with two smaller adjacent temples, a caretaker's residence, Kitchen, Dining Hall, offices and a two storey Columbarium/Store. The proposed site is in a residential area with the premises most likely to be affected by the development to the east at 45 and 50 Edensor Road.

The normal operating hours of the temple are 9.00 am to 5.00 pm Monday to Sunday, with special events several days throughout the year. The special events include Chinese New Year, Buddha's Birthday and Ullambana, where up to 450 people are expected to visit throughout the day. Significantly higher noise levels are expected during these events as rituals and performances take place though out the complex, the operating hours for Chinese New Year Eve are 9 am to midnight.

As the normal operating hours are 9.00 am to 5.00 pm only the day time criterion will be considered for the noise from the car park, temple and temple air conditioner. Noise emissions from the caretaker's residence air conditioner are assessed to the night time criterion. Noise emissions for normal operation are calculated on the assumption that there is no amplified speech or music performed on the proposed development for standard operation.

The ambient noise has been monitored at the nearby residential premises and a computer model has been produced to predict the likely noise emission from the proposed development. Recommendations have been made in Section 7 of this report to limit noise to within acceptable limits set by the NSW Environment Protection Authority (EPA).



3.0 NOISE SURVEY INSTRUMENTATION

Noise level measurements and analysis were made with instrumentation as follows in Table 3.1:

Table 3.1 Noise Instrumentation

Description	Model No.	Serial No.
Infobyte Noise Logger	iM3	38
Condenser Microphone 0.5" diameter	MK 250	3156
Microphone Windscreen	Acoustically transparent foam	

An environmental noise logger is used to continuously monitor ambient noise levels and provide information on the statistical distribution of noise during an extended period of time. The Infobyte Noise Monitor iM3 is a Type 1 precision environmental noise monitor meeting all the applicable requirements of AS1259 for an integrating-averaging sound level meter.

All instrument systems had been laboratory calibrated using instrumentation traceable to Australian National Standards and certified within the last two years thus conforming to Australian Standards. The measurement system was also field calibrated prior to and after noise surveys. Calibration drift was found to be within 1 dB and is therefore acceptable. No adjustments for instrument drift during the measurement period were warranted.



4.0 MEASURED AMBIENT NOISE LEVELS

In order to assess the severity of a possible environmental noise problem in a residential area it is necessary to measure the ambient background noise level at the times and locations of worst possible annoyance. The lower the background noise level, the more perceptible the intrusive noise becomes and the more potentially annoying.

The ambient L_{90} background noise level is a statistical measure of the sound pressure level that is exceeded for 90% of the measuring period (typically 15 minutes).

The Rating Background Level (RBL) is defined by the EPA as the median value of the (lower) tenth percentile of L_{90} ambient background noise levels for day, evening or night periods, measured over a number of 7 days during the proposed days and times of operation.

The places of worst possible annoyance are 45 and 50 Edensor Road Cabramatta. These residences are shown on the attached location Plan 4744 Figure 1. The times of worst possible annoyance will be from 9 am to 5 pm when the development is operating.

Ambient L_{90} background noise levels were measured at location "A" shown on the Site Plan over seven days from 4 pm on Tuesday 13th of December 2011 to 5 pm on Tuesday 20th of December 2011. These levels are presented in the attached Figure 2 and also in Table 4.1 below.

Table 4.1 Rating Background Level

Noise Measurement Location	Time Period	Rating Background Level
Location 'A' – 47-51 Edensor Road, Cabramatta	Day (7 am to 6 pm)	46 dBA
	Evening (6 pm to 10 pm)	50 dBA
	Early Night (10 pm to 12 am)	40 dBA
	Night (10 pm to 7 am)	32 dBA

Meteorological conditions during the testing typically consisted of clear skies with rain on 12 and 20 December and temperature of approximately 13 to 28 °C. Recorded data during periods of rain was excluded from the background noise levels. Atmospheric conditions at all other times were ideal for noise monitoring. Noise measurements used for determining the background noise were therefore considered reliable and typical for the receptor area.



5.0 ACCEPTABLE NOISE LEVELS

5.1 NSW Industrial Noise Policy

The NSW Environment Protection Authority (EPA) published the NSW Industrial Noise Policy in January 2000. The policy is specifically aimed at assessing noise from industrial noise sources scheduled under the Protection of the Environment Operations Act 1997.

The proposed development is not a 'scheduled premises' under the Protection of the Environment Operations Act 1997 as a place of worship is not required to hold a licence under that Act for operations at the site.

The appropriate regulatory authority (Council) may, by notice in writing given to such a person, prohibit the person from causing, permitting or allowing:

- any specified activity to be carried on at the premises, or
- any specified article to be used or operated at the premises,

or both, in such a manner as to cause the emission from the premises, at all times or on specified days, or between specified times on all days or on specified days, of noise that, when measured at any specified point (whether within or outside the premises,) is in excess of a specified level. It is an offence to contravene a noise control notice. However, prior to being issued with a noise control notice, no offence has been committed.

The Industrial Noise Policy provides a useful framework to assess noise emission from non-scheduled premises, whether that premises produces offensive or non-offensive noise.

The Protection of the Environment Operations Act 1997 defines "Offensive Noise" as noise:

- (a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:
 - (i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or
 - (ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or
- (b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances prescribed by the regulation.

The limits set out in the NSW Industrial Noise Policy were used as a guide for determining whether predicted levels of noise were considered offensive or not.

5.2 Residential Receptor Noise Intrusiveness Criteria

The EPA states in Section 2.1 of its NSW Industrial Noise Policy (January 2000) that the L_{eq} level of noise intrusion from broad-band industrial noise sources may be up to 5 dBA above the L_{90} background noise level at the receptor.



The Rating Background Level at 47-51 Edensor Road, Cabramatta was 32 dBA at night, 40 dBA in the early night, 50 dBA in the evening and 46 dBA during the daytime. Therefore the acceptable L_{eq} noise intrusiveness criteria for **broadband noise** in this area is $(32 + 5 =) 37$ dBA at night, $(40 + 5 =) 45$ dBA in the evening, $(50 + 5 =) 55$ dBA in the evening and $(46 + 5 =) 51$ dBA during the day.

Where a noise source contains certain characteristics, such as tonality, impulsiveness, intermittency or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level. Correction factors may be applied to the noise annoyance criteria to determine the project specific criteria.

In this case the noise is of a steady broadband nature without annoying characteristics, therefore no modifying factors are applicable.

5.3 Residential Noise Amenity Criterion

Depending on the type of area in which the noise is being made, there is a certain reasonable expectancy for noise amenity. Table 2.1 of the NSW Industrial Noise Policy provides a schedule of recommended L_{eq} industrial noise levels that under normal circumstances should not be exceeded. If successive developments occur near a residential area, each one allowing a criterion of background noise level plus 5 dBA, the ambient noise level will gradually creep higher.

Compliance with the Noise Amenity levels in Table 2.1 will limit ambient noise creep. For example in an urban residential area, the L_{eq} noise emission level may not exceed 60 to 65 dBA in the daytime (7 am to 6 pm), 50 to 55 dBA in the evening (6 pm to 10 pm) and 45 to 50 dBA during the night (10 pm to 7 am).

Wherever the existing L_{eq} noise level from industrial noise sources approaches or exceeds the Amenity criterion at a critical receptor location, the intrusive L_{eq} noise from the noise source in question must be reduced to a level that may be as much as 10 dBA below the existing L_{eq} industrial noise level.

The existing L_{eq} noise level at 47-51 Edensor Road, Cabramatta was 59 dBA during the daytime, 70 dBA in the evening and 52 dBA. Therefore the noise amenity criterion is 60 to 65 dBA in the daytime, 60 dBA in the evening and 45 to 50 dBA at night.

5.4 NSW Environmental Noise Control Manual

The EPA published the NSW Environmental Noise Control in 1985. While the Environmental Noise Control Manual has largely been superseded, it provides a useful guideline for the noise assessment of special events.

Chapter 162 of the Environmental Noise Control Manual provides the following noise control guideline in relation to intrusive noise from open air entertainment:

"On special occasions such as New Year's Eve or Australia Day, it is recommended that the LA_{10} level may be increased by up to 5 dB and the operating time extended to no later than 12:30 am."



Based on these guidelines, it is reasonable to allow a tolerance of 5 dBA to the intrusiveness noise criteria in Section 5.2 above for the Chinese New Year events held at the proposed development.

5.5 Adjustment for Duration

The EPA states in Section 4.2 of its NSW Industrial Noise Policy (January 2000) that depending on the duration of a noise in a 24 hour period the acceptable noise level at the receptor may be increased. The Chinese New Year's Eve celebrations include lion dance performances which last for less than 15 minutes once a year. According to Table 4.2 of the Industrial Noise Policy, the daytime and evening noise criteria may be increased by 7 dB for an event with a duration of 6 to 15 minutes and 15 dB for an event with a duration of 1.5 to 6 minutes.

We have applied a total increase of 12 dBA in the noise criteria (7 dB increase due to a single and short duration event and 5 dB due to a special event, refer Section 5.4 of this report) to the lion dance performances.

5.6 Project Specific Noise Criteria

When all the above factors are considered, we find that the most stringent noise criterion is the Noise Intrusiveness Criteria (Section 5.2) for the *normal operation* of the proposed temple as follows:

Normal operation

- 51 dBA for broadband noise sources during the day,
- 55 dBA for broadband noise sources in the evening,
- 37 dBA for broadband noise sources at night (for assessing the noise emission from the air conditioner at the caretaker's residence.)

The recommended noise criteria for *special events*, with a 5 dB tolerance (Section 5.5), are as follows:

Special events

- 56 dBA for broadband noise sources during the day,
- 60 dBA for broadband noise sources in the evening,
- 67 dBA for Lion Dancing noise during evening,
- 50 dBA for broadband noise sources during early night (10 pm to 12:30 am).

During the day and in the evening, these criteria apply at the nearest residential property boundaries where impact is likely to occur. For upper floors, the noise is assessed outside the nearest window or balcony door. The night-time noise criterion is assessed outside the nearest window or balcony door.



6.0 TEMPLE COMPLEX NOISE EMISSION

The main sources of noise from these premises are the car park, kitchen and Dining hall and people talking around and in the temples, which operate continually from 9 am to 5 pm every weekday.

Group prayer sessions are held during the 1st and 15th day of every lunar month which involves chanting, with the use of a small drum and chimes. We have been advised that the typical attendance for the fortnightly celebrations will not exceed 50 people at any one time. To assess the impact this amount of people will have on neighbouring residences we have assumed that typically no more than 25 people will visit the temple in a 15 minute period.

Calculations have been made based on drawings provided by VT Architecture dated 5 October 2012 see attached Figure 3.

Knowing the sound power level of a noise source (see Sections 6.1 to 6.5 below), the sound pressure level (as measured with a sound level meter) can be calculated at a remote location using suitable formulae to account for distance losses, sound barriers, atmospheric effects, etc.

6.1 Car park Noise Emission

For the purpose of assessing the maximum typical level of noise emission from the car park at receptor location B, we have assumed a flow of cars equivalent to 20 cars in 15 minutes leaving the car park. The L_{eq} sound power level and spectrum of such a traffic noise was measured by Day Design at a previous location is given in table 6.1.1 below:

Table 6.1.1 L_{eq} Noise Levels of a Car park

Description	SWL dBA	Sound Power Levels (dB)							
		at Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
L_{eq} noise level of car door slam, ignition and drive away (L_{eq} , 15min)	70	74	71	67	66	65	63	58	53

The predicted L_{eq} level of noise from the car park, for noise sources at the nearest residential premises is 57 dBA with an existing standard 1.5 metre sound barrier along the eastern boundary of the development. This level exceeds the noise criterion of 51 dBA and will require noise controls as recommended in Section 7.

For the purpose of assessing the maximum typical level of noise emission from the car park driveway entrance at receptor location D, we have assumed a flow of cars equivalent to 20 cars in 15 minutes leaving the car park through the driveway. The L_{eq} sound power level and spectrum of such a traffic noise was measured by Day Design at a previous location is given in Table 6.1 below:



Table 6.1.2 Noise Levels of a Car at 20 - 30 Kph on driveway

Description	SWL dBA	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
L_{max} noise level of car at 20 Km/hr	92	98	92	90	88	88	83	80	76
L_{eq} 15 minute for 20 cars	74	77	71	68	66	66	62	58	54

The predicted L_{eq} level of noise from the car park drive way, for noise sources at the nearest residential premises at 50 Edensor Road is 47 dBA. This is less than the noise criterion of 51 dBA and is therefore acceptable.

6.2 Temples and Terrace Noise Emission

For the purpose of assessing the maximum typical level of noise emission from the temple and terrace, we have assumed a group of 26 people with musical instruments within the temple and 24 on the terrace. Based on information in Harris¹ and in our noise level database gathered over many years, we calculate the sound power levels shown in Table 6.2 below.

Table 6.2.1 L_{eq} Noise Levels of people in conversation

Description	SWL dBA	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
L_{eq} level of 1 male, normal speech	67	50	60	67	68	60	57	51	45
L_{eq} level of 50 males, normal speech (50 % talking)	82	64	74	81	82	73	71	65	59
"Wooden Fish" Drum	82	72	67	91	73	72	66	60	47
Large Drum and Bell	87	92	99	91	80	72	79	78	64

The predicted L_{eq} level of noise from people talking inside the temples and on the terrace *with the temple doors open*, for noise sources at the nearest residential premises at 45 Edensor Road is 44 dBA. This is less than the noise criterion of 51 dBA in Section 5.6 of this report and is therefore acceptable.

¹ Handbook of Acoustical Measurements and Noise Control, Third Edition, Cyril M. Harris, McGraw-Hill Inc, New York, (Page 16.2)



6.3 Kitchen and Dining Hall Noise Emission

For the purpose of assessing the maximum typical level of noise emission from the Kitchen and Dining Hall, we have assumed a group of 50 people within the Dining Hall and 5 people within the Kitchen. The Dining Hall Kitchen will be serviced by a Kitchen exhaust fan, which will be operating during festival days and the 1st and 15th day of each lunar month during the daytime. Calculations have been based on the kitchen exhaust fan being located on the external wall of the kitchen. The plant has not yet been selected; therefore typical Kitchen exhaust fan has been assumed for this noise assessment. Based on information in Harris² and in our noise level database gathered over many years, we calculate the sound power levels shown in Table 6.3 below.

Table 6.3.1 L_{eq} Noise Levels of people in conversation

Description	SWL dBA	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
L_{eq} level of 1 male, normal speech	67	50	60	67	68	60	57	51	45
L_{eq} level of 25 males, normal speech (50 % talking)	79	61	71	78	79	70	88	62	56
L_{eq} level of 1 female, normal speech	64	55	61	63	64	59	52	45	41
L_{eq} level of 25 females, normal speech (50 % talking)	75	66	72	74	75	70	63	56	52
Typical Kitchen Exhaust Fan	87	86	86	85	83	82	79	75	69

The predicted L_{eq} level of noise from people talking inside the Dining Hall and Kitchen *with windows and doors open* and a kitchen exhaust fan, for noise sources at the nearest residential premises at 45 Edensor Road is 46 dBA. This is less than the noise criterion of 51 dBA in Section 5.6 of this report and is therefore acceptable.

² Handbook of Acoustical Measurements and Noise Control, Third Edition, Cyril M. Harris, McGraw-Hill Inc, New York, (Page 16.2)



6.4 Mechanical Plant

The temple, offices and caretakers residence will be serviced by an air conditioning system with the condensing units installed inside the car park. The plant has not yet been selected, therefore typical air conditioning units have been selected for this noise assessment. The sound power levels for the typical mechanical plant are shown in Table 6.4.1 below.

Table 6.4.1 Air Conditioning Condenser L_{eq} Sound Power Levels

Description	SWL dBA	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
Typical office or residential air conditioning condenser	70	76	76	68	66	64	65	55	48
Typical air conditioning condenser for temple	80	85	85	82	78	75	70	64	55

Assuming the condensers will be located in the car park next to stair cases 5 and 6 as shown on the attached site Plan 4744 Figure 3, the level of noise from the plant is calculated to be **43 dBA** at the nearest residential property to the east during day time. This is less than the noise criterion of **51 dBA** in Section 5 of this report and is therefore acceptable with the sound barrier wall recommended for car park noise in section 7 of this report. The level of noise from the typical condenser at the caretakers residence is calculated to be **33 dBA** at the nearest residential property to the east at night. This is less than the noise criterion of **37 dBA** for residential air conditioners in Section 5 of this report and is therefore acceptable with the sound barrier wall recommended in section 7 of this report.



6.5 Special Events

Special events throughout the year include:

Chinese New Year

Chinese New year is the first day of the lunar year, up to 450 people are expected to visit throughout the day and in the evening of the Eve of the New Year to celebrate the occasion. Celebrations for Chinese New Year operate from 9 am to midnight on the New Years Eve and 9 am to 5 pm on New Years Day. The peak attendance is expected in the evening, therefore noise levels will be highest during the evening and assessed against the evening criteria. Celebrations for Chinese New Year include Lion dancing with musical instruments and fireworks. The use of fireworks is subject to specific permission from council and therefore will not be assessed in the report.

Buddha's Birthday

Buddha's Birthday is celebrated on the 8th day of the 4th lunar month. Up to 250 people are expected throughout the day to celebrate the occasion, chanting will be performed in the main temple over the course of the entire day from 9 am to 5 pm. Buddha's Birthday ceremonies involve the use of a wooden "Fish Drum" and a hand held chime.

Ullambana

Ullambana is a weeklong event during the 7th lunar month where small groups congregate in the columbarium to perform ceremonies involving drums and gongs.

To assess the noise impact of the temple complex we have calculated the level of noise generated by 180 people arriving throughout the day. We calculate that up to 90 people may visit the temple complex within a 15 minute period. As the temple operates from 9 am to 5 pm for Ullambana celebrations, noise emissions from the temple are assessed against the daytime criteria. Ullambana ceremonies involve the use of a wooden "Fish Drum" and a hand held chime.

6.5.1 Special Event Car park Noise Emission

As Chinese New Year Eve is expected to have the peak attendance and the majority of visitors are expected in the evening, this scenario is used as a worst case scenario. It is therefore assumed that other times of the day during Chinese New Year will have less attendance and as a result will have lower noise levels.

For the purpose of assessing the maximum typical level of noise emission from the car park during special events at receptor location B, we have assumed a flow of cars equivalent to 75 cars in 15 minutes leaving the car park in the evening (75 cars for every 90 people) after celebrations and 20 arriving throughout the daytime.

The predicted L_{eq} level of noise from 20 cars in 15 minutes in the car park during the daytime, for noise sources at Location B is 48 dBA with the recommended sound barrier along the

