



ENVIRONMENTAL NOISE REPORT

**ST BRIGID'S COLLEGE
EARLY LEARNING CENTRE**

20th October 2017



For

SALEEBBA ADAMS ARCHITECTS

**16 Churchill Ave
SUBIACO WA 6008**

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Report Version	Author	Notes	Date
B	Benjamin Farrell	Updated due to design changes	20 th October 2017



Gabriels Hearne Farrell Pty Ltd is a Member Firm of the Association of Australian Acoustical Consultants. The report author is a full member of the Australian Acoustical Society.

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1. INTRODUCTION

Gabriels Hearne Farrell Pty Ltd was commissioned to undertake modelling of the potential environmental noise emissions from the proposed Early Learning Centre at St Brigid's College. This report considers the following noise sources:

- Children within the external play areas;
- Noise emissions from the new mechanical plant (condensing units),
- Noise emissions from vehicles; and,
- Noise break-out from internal play spaces.

The purpose of the assessment was to ensure that the proposed development has the capability of complying with the Environmental Protection (Noise) Regulations 1997.

This report is based on the Revision E architectural drawings issued October 12, 2017.

2. BACKGROUND

The development of the proposed Early Learning Centre will involve refurbishment and additions to existing 'Lesmurdie House'. The outdoor play area will be located on the eastern and northern side of the buildings, and the new air-conditioning condensers will be positioned at the southern end of the development (refer to Figure 1 below).



Figure 1 – Site context

The nearest residences are located to the west on Warlingham Drive. These residences are positioned up the hill, approximately 6 to 7 metres higher than the finished floor level of the Early Learning Centre. It is worth noting that there is generally no solid fences along the boundary of these residences, except at 23 Warlingham Dr. There are also residences on the eastern side of Lesmurdie Road.

The college has advised that the Early Learning Centre will operate between 8:30 am and 3 pm, Monday to Friday. The staff will arrive at 8 am at the earliest.

There is no new mechanical services proposed for this project, the existing condensing units and exhaust fans will remain as is.

3. NOISE LEVEL CRITERIA

In Western Australia, noise transmission from one property to another is governed by the Environmental Protection (Noise) Regulations 1997. These regulations establish 'Assigned Levels' which are the noise levels that cannot be exceeded at surrounding noise sensitive premises.

3.1 'Assigned Levels' for the residences on Warlingham Dr

The 'Assigned Levels' for the existing residences on Warlingham Rd are provided in Table 1 below. There is no *influencing factor* given that there are no major roads or commercial premises within a 100 m and 450 m radius around the residences.

Part of premises receiving noise	Time of day	Assigned Level (dB)		
		L _{A10}	L _{A1}	L _{Amax}
Noise sensitive premises: highly sensitive area	7 am to 7 pm Monday to Saturday	45	55	65
	9 am to 7 pm Sunday and public holidays	40	50	65
	7 pm to 10 pm all days	40	50	55
	10 pm to 7 am Monday to Saturday and 10 pm to 9 am on Sundays and public holidays	35	45	55

Table 1 – Assigned Levels for residences on Warlingham Dr

The table above refer to three types of 'Assigned Levels':

L_{Amax} - the noise level which is not to be exceeded at any time.

L_{A1} - the noise level which is not to be exceeded for more than 1% of the time (eg for more than 144 seconds over a 4 hour period).

L_{A10} - the noise level which is not to be exceed for more than 10% of the time (eg for more than 24 minutes over a 4 hour period).

Note – The 'Assigned Levels' in Table 1 will also be applicable to the residences on the eastern side of Lesmurdie Rd

3.2 Noise Character

Regulation 7 requires that the noise emission must be 'free' of annoying characteristics, namely tonality (eg whining, droning), modulation (like a siren), and impulsiveness (eg thumping). Where noise emissions do exhibit the above noise characteristics, an adjustment is made to the measured/calculated noise level:

<i>Tonality</i>	5 dB is added to the measured level
<i>Modulation</i>	5 dB is added to the measured level
<i>Impulsiveness</i>	10 dB is added to the measured level

In our experience of child care facilities, the following penalties for 'noise character' apply:

<i>Children playing</i>	No penalty. It is generally accepted within the industry that 'tonality' is not measurable in relation to outdoor play areas due to the other ambient noise that is present during the day time (eg distant traffic).
<i>Car door slamming</i>	10 dB penalty, due to 'impulsiveness'
<i>Car driving</i>	5 dB penalty, due to 'tonality'

The above adjustments only apply where the 'noise character' is audible and measurable at both the noise source and noise receiver.

4. NOISE MODELLING PROCEDURE

The noise emissions from the proposed Early Learning Centre have been modelled using the *SoundPLAN* 7.4 software with the *Concawe* algorithm. This software allows the input of topographical data, building heights and forms, meteorological conditions, and noise source data. The software produces noise contour plans, indicating the predicted noise level over a given area.

Note – the output noise levels from *SoundPLAN* are base noise levels not including adjustment for noise character.

4.1 Meteorological Conditions

The meteorological conditions used in the calculations were as follows (based on the requirements of the Department of Environment Regulation):

Daytime assessment

- Temperature – 20°C
- Relative Humidity – 50%
- Wind – 4 m/s in all directions simultaneously.
- Pasquil Stability Class - E

4.2 Topography and Building Form

The building form, height, and configuration were input into the noise model, based on the architectural drawings. Topography information was obtained from the Shire of Kalamunda online mapping tool.

All roads and carpark areas were input into the noise model as hard reflecting ground surface.

4.3 Noise Level Data

The following noise level data was input into the noise model.

4.3.1 *Children within the external play areas*

We have been advised that the total capacity of the Early Learning Centre is 60 children. For the purpose of the assessment we have assumed that 40 children will be outside at any given time (2/3 of the maximum capacity).

The Sound Power Levels of children playing within the external areas has been based on the document titled '*Guideline for Child Care Centre Acoustic Assessment*' published by the Association of Australian Acoustic Consultants:

Frequency (Hz)	63	125	250	500	1k	2k	4k	dB(A)
40 children in outdoor play area								
Total Sound Power	56	66	81	84	81	71	61	90

Table 2 – Sound Power Levels of children in external play areas

The above Sound Power Levels were input into the model as area sources.

Note – The above Sound Power Levels are for the modelling of L_{10} noise emissions. The assessment of L_1 and L_{max} noise levels in relation to the external play areas is not necessary given that the L_{10} criteria is the dominant factor. Measurements undertaken in existing child care external play areas demonstrate that the L_{Amax} levels are typically less than 15 dB above the L_{A10} level. Whereas the L_{Amax} criteria is 20 dB above the L_{A10} criteria. Also, the L_{A1} levels we have measured in play areas are typically no more than 10 dB above the L_{A10} level. As such, if the modelling indicates that the L_{A10} criteria is met, then the L_{A1} and L_{Amax} criteria will also be met. However, complying with the L_{Amax} criteria does not necessarily imply that the L_{A10} criteria will be met.

The above statements are demonstrated in Table 3 below – Noise level measurements undertaken at an existing Child Care Centre.

Measurement location	L_{A10}	L_{A1}	L_{Amax}
Children playing – at 3 metres	70.6	76.4	78.5
Children playing – at 2 metres	74.0	82.8	87.3

Table 3 – Noise level measurements undertaken at an existing child care centre

4.3.2 Mechanical plant (condensing units)

At this early stage of the project the mechanical plant has not been selected. For the purpose of the assessment we have assumed that the total Sound Power Level for the new condenser(s) will be 75 dB(A):

Frequency (Hz)	63	125	250	500	1k	2k	4k	dB(A)
A/C condenser								
Total Sound Power	80	78	76	75	68	65	58	75

Table 4 – Sound Power Level of air-conditioning condenser(s)

4.3.3 Cars within carpark / primary access road

The following noise source data has been used for the assessment of cars within the carpark. These Sound Power Levels have been determined based on our own controlled noise level measurements:

Frequency (Hz)	63	125	250	500	1k	2k	4k	dB(A)
Car driving slowly through carpark								
SWL	86.3	83.5	77.8	73.0	73.1	70.0	65.8	78
Car door slamming								
SWL	93.6	92.3	84.8	81.4	79.6	70.2	64.0	85

Table 5 – Sound Power Levels of cars within the carpark / primary access road

5. NOISE MODELLING OF CHILDREN WITHIN OUTDOOR PLAY AREAS AND MECHANICAL PLANT

The combined noise emissions from children within the outdoor play areas and the new mechanical plant has been modelled using the *SoundPLAN* 7.4 software, based on the noise source data established in Section 4.3.1 and 4.3.2 of this report.

These noise emissions are assessed against the L_{10} criteria given that the noise will be present for more than 10% of the time (ie more than 24 minutes over a 4 hour period). The relevant 'Assigned Level' is L_{10} 45 dB(A).

The results of the noise modelling are presented as a noise contour plan (Simulation 1) in Appendix A. The noise contour plans present the base noise levels, not adjusted for 'tonality'. The noise contours are generated at 1.5 metres above ground level. The specific points shown on the noise contour plan identify the noise level reaching the façade of the surrounding houses (excluding the reflection off the façade itself).

The results of the assessment are provided below:

<i>Receiver location</i>	<i>Predicted Noise Level</i>	<i>Adjusted Noise Level*</i>
13 Warlingham Rd	L ₁₀ 32 dB(A)	L ₁₀ 37 dB(A)
21 Warlingham Rd	L ₁₀ 29 dB(A)	L ₁₀ 34 dB(A)
23 Warlingham Rd	L ₁₀ 33 dB(A)	L ₁₀ 38 dB(A)
25 Warlingham Rd	L ₁₀ 35 dB(A)	L ₁₀ 40 dB(A)
225 Lesmurdie Rd	L ₁₀ 35 dB(A)	L ₁₀ 40 dB(A)
20 Woodview	L ₁₀ 36 dB(A)	L ₁₀ 41 dB(A)
13 Woodview	L ₁₀ 35 dB(A)	L ₁₀ 40 dB(A)

Table 6 – Simulation 1 results

* - including +5dB penalty for 'tonality'

The adjusted noise levels are compliant with the 'Assigned Level' of L₁₀ 45 dB(A). If all sixty children were playing outside, the noise level would increase by up to 1.7 dB. Even with this increase the noise emissions would still comfortably comply with the 'Assigned Level'.

Detailed analysis of the modelling results indicates that the total/combined Sound Power Level of the new condensers can be up to 83 dB(A) without contravening the Environmental Protection (Noise) Regulations 1997.

6. NOISE EMISSIONS FROM VEHICLES

The noise emissions from vehicles within the car parking areas and access road have been assessed. Two scenarios have been considered:

- Simulation 2 – Noise emissions from cars driving slowly in the driveways, and;
- Simulation 3 – Noise emissions from car doors slamming.

6.1 Simulation 2 – Cars driving along the access road

Simulation 2 demonstrates the potential noise emissions if four cars drive slowly along the access way at the same time.

The results are presented as a noise contour plan in Appendix A, with a summary provided below:

<i>Receiver location</i>	<i>Predicted Noise Level</i>	<i>Adjusted Noise Level*</i>
13 Warlingham Rd	L ₁₀ 32 dB(A)	L ₁₀ 37 dB(A)
21 Warlingham Rd	L ₁₀ 36 dB(A)	L ₁₀ 41 dB(A)
23 Warlingham Rd	L ₁₀ 36 dB(A)	L ₁₀ 41 dB(A)
25 Warlingham Rd	L ₁₀ 37 dB(A)	L ₁₀ 42 dB(A)
225 Lesmurdie Rd	L ₁₀ 27 dB(A)	L ₁₀ 32 dB(A)
20 Woodview	L ₁₀ 28 dB(A)	L ₁₀ 33 dB(A)
13 Woodview	L ₁₀ 27 dB(A)	L ₁₀ 32 dB(A)

Table 7 – Simulation 2 results

* - including +5dB penalty for 'tonality'

The adjusted noise levels are compliant with the 'Assigned Level' of L₁₀ 45 dB(A).

6.2 Simulation 3 – Cars doors slamming

Simulation 3 demonstrates the potential noise emissions if four car doors are slammed simultaneously (1 door slamming on four separate cars). This noise event is assessed against the $L_{\max}$ criteria given that the noise is present for less than 1% of the time (it is a very short term noise event).

The relevant 'Assigned Level' is $L_{\max}$ 65 dB(A).

The results are presented as a noise contour plan in Appendix A, with a summary provided below:

Receiver location	Noise Level	Adjusted Noise Level*
13 Warlingham Rd	$L_{\max}$ 38 dB(A)	$L_{\max}$ 48 dB(A)
21 Warlingham Rd	$L_{\max}$ 44 dB(A)	$L_{\max}$ 54 dB(A)
23 Warlingham Rd	$L_{\max}$ 43 dB(A)	$L_{\max}$ 53 dB(A)
25 Warlingham Rd	$L_{\max}$ 44 dB(A)	$L_{\max}$ 54 dB(A)
225 Lesmurdie Rd	$L_{\max}$ 32 dB(A)	$L_{\max}$ 42 dB(A)
20 Woodview	$L_{\max}$ 32 dB(A)	$L_{\max}$ 42 dB(A)
13 Woodview	$L_{\max}$ 33 dB(A)	$L_{\max}$ 42 dB(A)

Table 8 – Simulation 3 results

* - including +10dB penalty for 'impulsiveness'

The adjusted noise levels comfortably comply with the 'Assigned Level' of $L_{\max}$ 65 dB(A).

7. NOISE BREAK-OUT FROM INTERNAL SPACES

At times amplified music may be played within the indoor play areas. It is important that the external windows and doors of these areas are kept shut whilst loud music is being played. Our calculations suggest that the maximum allowable music volume within the indoor spaces is L_{eq} 80 dB(A) in order to ensure compliance with the 'Assigned Levels' are maintained.

8. CONCLUSION

The potential noise emissions from the proposed Early Learning Centre at St Brigid's College have been assessed using the *SoundPlan 7.4* software. The noise modelling indicates that the noise emissions from the proposed facility will comply with the Environmental Protection (Noise) Regulations 1997.

Regards,

Benjamin Farrell
Director M.A.A.S.



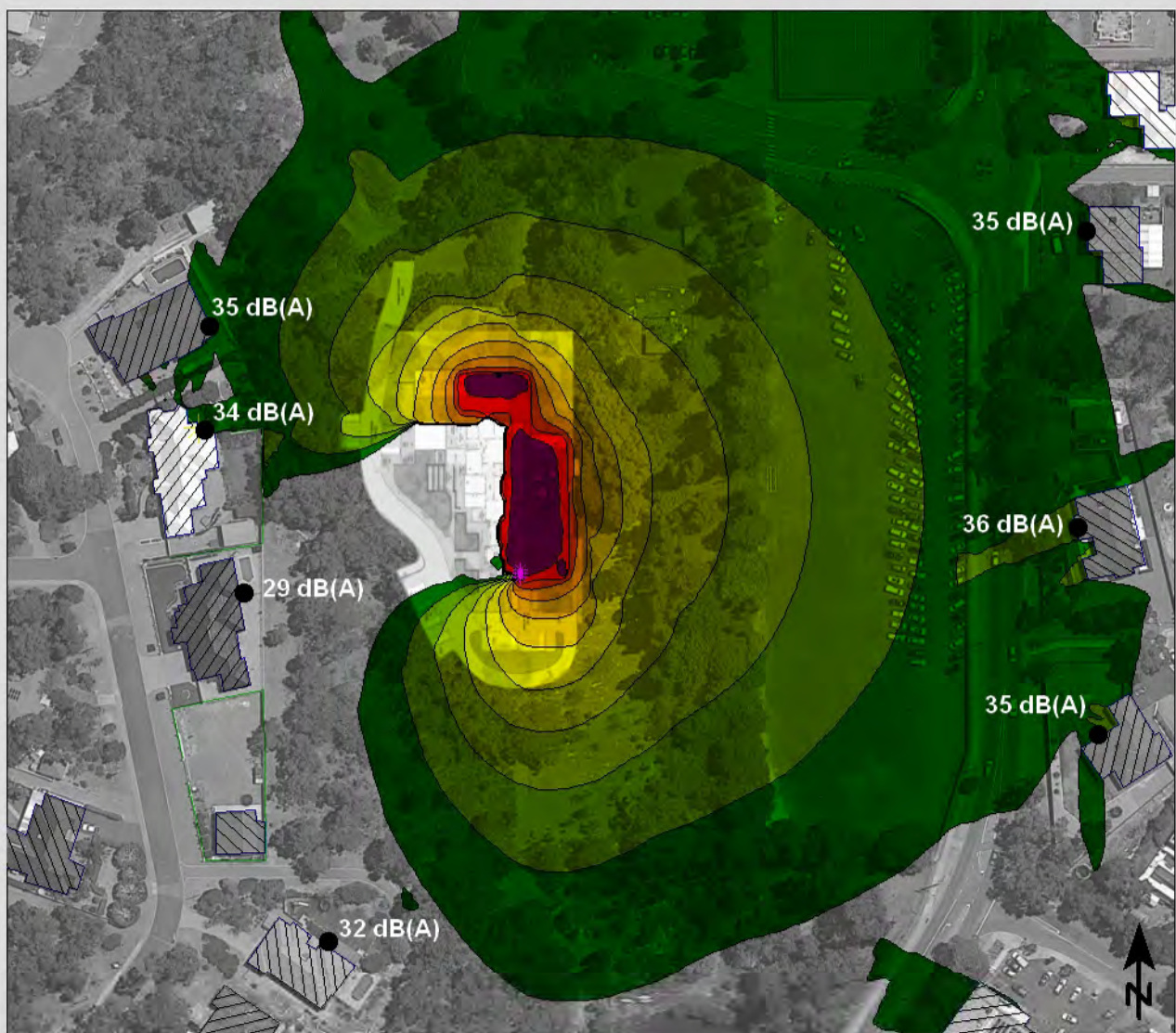
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ATTACHMENTS

- APPENDIX A NOISE CONTOUR PLANS

ENVIRONMENTAL NOISE ASSESSMENT ST BRIGID'S COLLEGE - EARLY LEARNING CENTRE



SIMULATION 1 (Revision B)

- 40 CHILDREN PLAYING IN OUTDOOR PLAY AREAS (TOTAL SOUND POWER LEVEL OF 90 dB(A))
- THREE NEW AIR-CONDITIONING CONDENSERS, EACH WITH A SOUND POWER LEVEL OF 70 dB(A)

METEOROLOGICAL CONDITIONS

TEMPERATURE: 20 DEGREES C

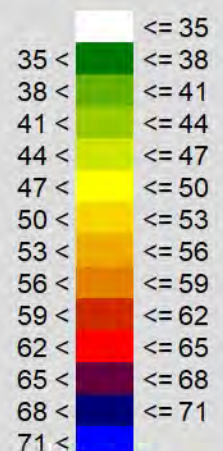
HUMIDITY: 50%

WIND SPEED: 4 m/s

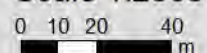
WIND DIRECTION: ALL DIRECTIONS AT ONCE

PASQUIL STABILITY CLASS: E

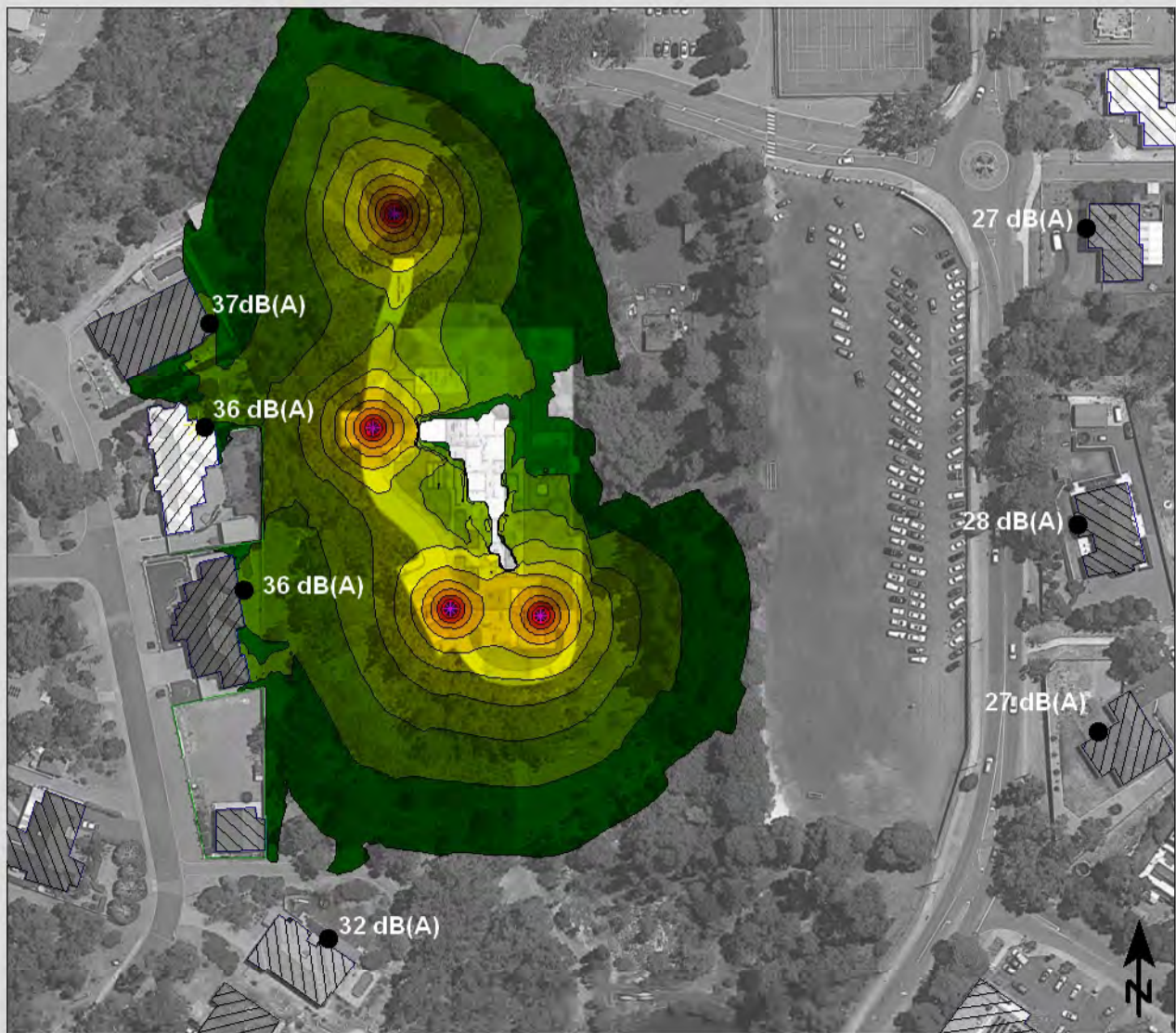
Noise level
dB(A)



Scale 1:2000



ENVIRONMENTAL NOISE ASSESSMENT ST BRIGID'S COLLEGE - EARLY LEARNING CENTRE



SIMULATION 2 (Revision B)

- FOUR VEHICLES DRIVING ALONG ACCESS ROAD

Noise level
dB(A)

<= 35	
35 <	<= 38
38 <	<= 41
41 <	<= 44
44 <	<= 47
47 <	<= 50
50 <	<= 53
53 <	<= 56
56 <	<= 59
59 <	<= 62
62 <	<= 65
65 <	<= 68
68 <	<= 71
71 <	

Scale 1:2000

0 10 20 40
m

METEOROLOGICAL CONDITIONS

TEMPERATURE: 20 DEGREES C

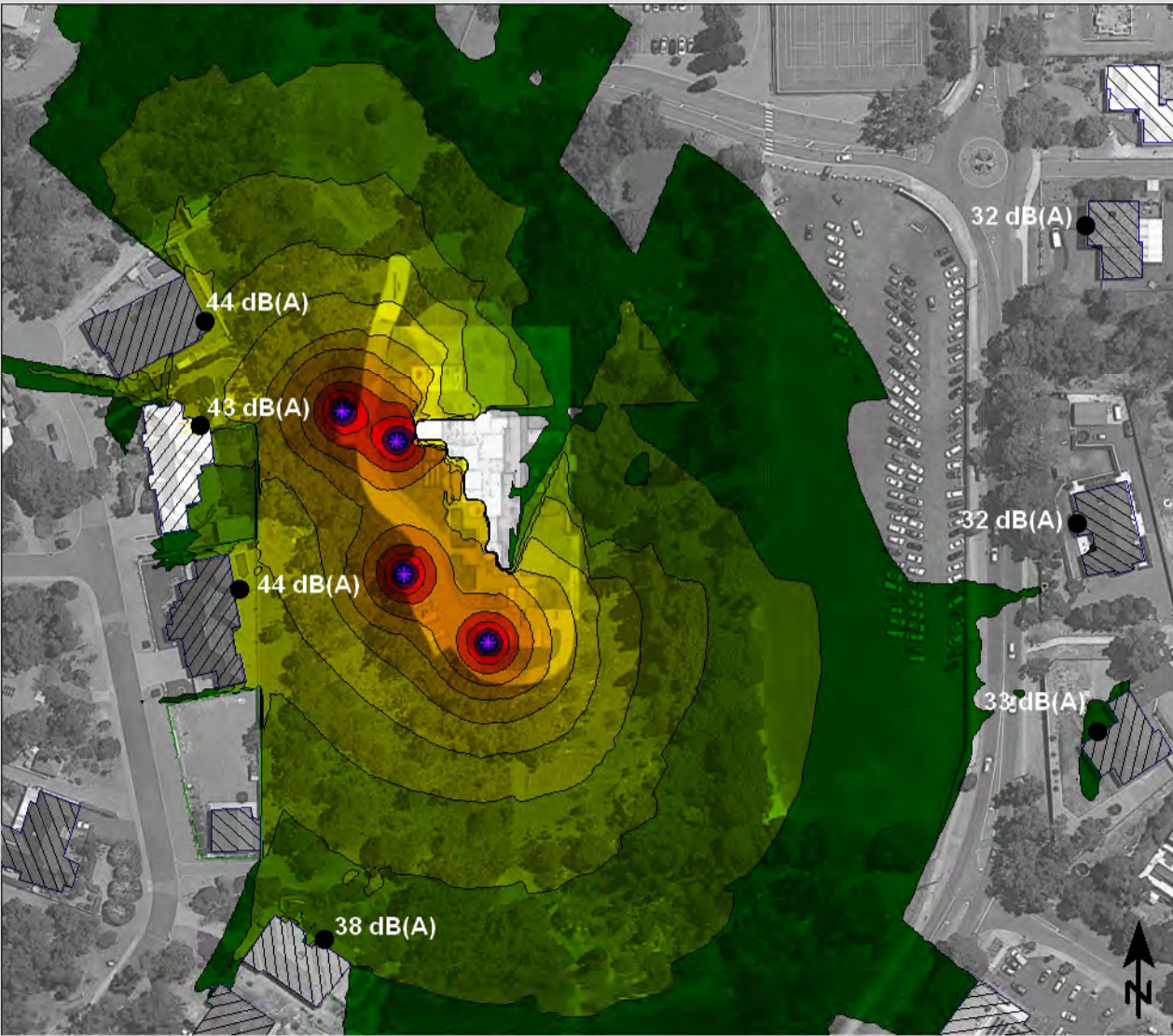
HUMIDITY: 50%

WIND SPEED: 4 m/s

WIND DIRECTION: ALL DIRECTIONS AT ONCE

PASQUIL STABILITY CLASS: E

ENVIRONMENTAL NOISE ASSESSMENT
ST BRIGID'S COLLEGE - EARLY LEARNING CENTRE



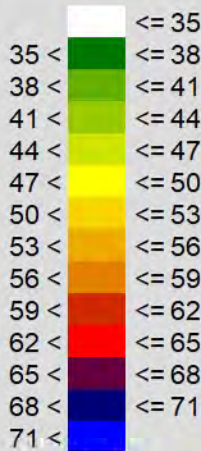
SIMULATION 3 (Revision B)

- FOUR CAR DOORS SLAMMING SIMULTANEOUSLY

METEOROLOGICAL CONDITIONS

TEMPERATURE: 20 DEGREES C
HUMIDITY: 50%
WIND SPEED: 4 m/s
WIND DIRECTION: ALL DIRECTIONS AT ONCE
PASQUIL STABILITY CLASS: E

Noise level
dB(A)



Scale 1:2000

