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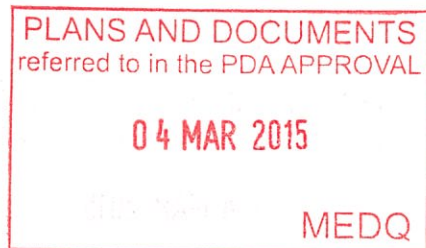
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Noise Impact Review



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DOCUMENT CONTROL REGISTER

Project Number	20141082.1
Project Name	KSD 2, Hamilton Harbour, Brisbane
Document Title	Noise Impact Review
Document Reference	20141082.1/0810D/R0/TS
Issue Type	Email
Attention To	Devine Limited Ms Jill McLauchlan

Revision	Date	Document Reference	Prepared By	Checked By	Approved By
0	8/10/2014	20141082.1/0810D/R0/TS	TS		

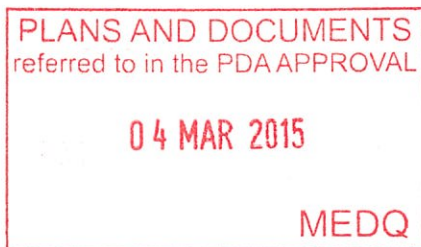


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1 INTRODUCTION

Acoustic Logic Consultancy Pty Ltd has been engaged to conduct an acoustic investigation of noise impacts associated with KSD2 development, located between Kingsford Smith Drive and Hercules Street, Hamilton. This review has been necessitated due to the change of KSD2 from a commercial site to a residential site and relies on the previous assessment carried out by Aecom for 483-485 Kingsford Smith Drive (ref: 600490478ISJCb.Residential.8RP.Rev2, dated 17 August 2009).

The following acoustic impacts have been addressed:

- Identification of target internal noise levels;
- Mitigation of noise impacts from external sources (e.g. traffic);
- Mechanical ventilation and other noise emissions.

The development is assessed against the relevant provisions of the former Brisbane City Plan 2014, the Environmental Protection Agency and other Australian statutory requirements.

2 SITE DESCRIPTION AND BUILDING LAYOUT

KSD2 development is a residential development incorporating car parking on levels B2-B1 and L1-L3, a residential tower (Level 4-19) and loading dock with gym, meeting room and pool on ground floor. The site is bounded by the following:

- To the South by Hercules Street and further to South East by Portside Development;
- To the North by Kingsford Smith Drive;
- To the West by KSD1 and Residential developments;
- To the East by empty lot. It is understood that this is a commercial development site and a road is constructed immediately to the East.

Figure 1 is an illustration of the proposed development site and the proximity of the above mentioned roadways and neighbouring properties. The following drawings by ML Design for the development have been supplied to ALC and used in the assessment:

Drawing No	Date	Drawing Title
DEVI0018_A-SK-033 [C] SVS Option 3	1/10/2014	Ground Floor
DEVI0018_A-SK-034 [B] SVS Option 3	19/09/2014	Level 01
DEVI0018_A-SK-035 [B] SVS Option 3	19/09/2014	Level 02
DEVI0018_A-SK-036 [B] SVS Option 3	19/09/2014	Level 03
DEVI0018_A-SK-037 [B] SVS Option 3	19/09/2014	Level 04
DEVI0018_A-SK-038 [B] SVS Option 3	19/09/2014	Typical Levels 05 to 19
DEVI0018_A-SK-039 [B] SVS Option 3	19/09/2014	Section & Development Analysis
DEVI0018_A-SK-050 [C] SVS Option 3	29/09/2014	Typical Unit A1
DEVI0018_A-SK-051 [C] SVS Option 3	29/09/2014	Typical Unit A2
DEVI0018_A-SK-052 [C] SVS Option 3	29/09/2014	Typical Unit A3
DEVI0018_A-SK-053 [C] SVS Option 3	29/09/2014	Typical Unit B1

LEGEND

KSD2	
Commercial Sites	
Residential Sites	

★ Noise measurement location
by ALC

★ Noise measurement location
by AECOM



Figure 1: KSD2 Site Survey and Measurement Positions

3 TRAFFIC NOISE INTRUSION

3.1 METHODOLOGY

Noise assessment was carried out for the extended site (KSD1, KSD2, Residential 1,2,3) by Aecom (ref: 600490478ISJCb.Residential.8RP.Rev2, dated 17 August 2009). Noise measurements were part of the noise impact assessment and were conducted by Aecom for a prolonged period adjacent to the development site at two locations, one adjacent to Harbour Road and another closed to Kingsford Smith Drive (refer to Figure 1).

Acoustic Logic Consultancy (ALC) has carried out additional traffic noise measurements adjacent to Kingsford Smith Drive (refer to Figure 1) during a high traffic flow periods to substantiate the existing traffic noise level associated with this road and to validate the previous measurements carried out over a prolonged period.

In addition to traffic noise monitoring conducted at the site, a Calculation of Road Traffic Noise (CORTN) model was implemented using the average annual daily traffic (AADT) volumes for Kingsford Smith Drive. The traffic noise monitoring obtained were used for confirmation of the predicted noise levels obtained using data sourced from the CORTN model.

The above-mentioned data was inputted into SoundPlan™ to develop a traffic noise contour level model taking into account the elevations of the surrounding roadways and land uses and potential screening affects where applicable.

This SoundPlan™ permits accurate assessment of traffic noise levels impinging on the façade of the KSD2 development enabling the determination of acoustic ameliorative measures required to comply with the project acoustic objectives detailed within this assessment at relevant times of the day.

3.1.1 Traffic Volumes

Existing and future traffic volumes for Kingsford Smith Drive have been adopted from the previous assessment (ref: 600490478ISJCb.Residential.8RP.Rev2, dated 17 August 2009).

Table 1 – Traffic Data by AECOM (Source: BCC)

Road	2007		2021		Estimated Yearly Increase
	AADT	18 hour	AADT	18 hour	
Kingsford Smith Drive	69,000 (11%HV)	64,860 (11%HV)	77,000 (11%HV)	72,380 (11%HV)	<1%*

Notes

* Yearly increase from year 2021 til 2024 based on an increase from 2007 to 2021 (approx. 0.83%).

Based on the above, the traffic flow data used in the calculations of future (year 2024) traffic noise impact is presented in Table 2. Traffic volumes are presented as the AADT statistic in accordance with the CORTN model. The AADT traffic volumes were calculated considering estimated yearly increases, current or estimated future traffic volumes.

Table 2 – Future Traffic Volumes (Year 2024) Considered in the Calculations

Road	2024 AADT (% of Heavy Vehicles)	2024 18hour (% of Heavy Vehicles)
Kingsford Smith Drive	78,714 (11%)	73,991 (11%)

The future predicted level at 2024 forecasting the ten-year planning period details an AADT volumes of vehicles per day which will be used as a basis for this assessment in conjunction with measured noise levels.

Furthermore, the proposed development will have a loading dock and car park. As these are located indoors, noise associated with the usage of these spaces are not considered to have an adverse impact on the residents.

3.2 ASSESSMENT CRITERIA

For the purposes of this assessment, results obtained using SoundPlan™ have been compared to the applicable traffic noise intrusion assessment criteria as detailed in the following sections.

3.2.1 Traffic Noise

Noise impact assessment from road traffic on the development site was previously based generally on BCC City Plan 2000 (BCC NIAPSP and AS2107). Since then, Brisbane City Council has adopted City Plan 2014 and according to that, KSD2 is located in Noise Category 3 sub-category of the Transport noise corridor overlay (Queensland Development Code MP4.4).

According to QLD Development Code MP4.4 (later referenced as MP4.4), Category 3 would require 35 dB(A) transport noise reduction for habitable rooms and that the expected level of transport noise ($L_{A10,18hr}$ measured at 1m from the façade) for this Category would be 68-72 dB(A).

MP4.4 states that a noise assessment for State-controlled roads and Local Government roads must be undertaken in accordance with the Road Traffic Noise Management: Code of Practise (Department of Transport and Main Roads, 2008). The latter document refers to recommended limits in Australian Standard AS2107:2000 (“Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors”) by using the methods set out in the Australian Standard AS3671:1989 (“Acoustics – Road Traffic Noise Intrusion Building Siting and Construction”).

Considering that a number of facades of KSD2 would be shielded from traffic noise to some extent and as such, the noise impact would greatly vary from one façade to another, we have followed AS2107 to set a noise limit for traffic noise inside the habitable areas of this development. AS2107 provides recommended internal noise levels and reverberation times based on the type and use of a space. During daytime, AS2107 noise levels have been applied to living areas and at night time levels to sleeping areas. This is also in line with AS3671: “Acoustics – Road Traffic Noise Intrusion Building Siting and Construction” which states that the choice of value for T (i.e. integration period) including the period and the time of day must be relevant and will depend on the type of activity for which the building is designed. We note that the previous assessment for this building carried out by Aecom adopted also AS2107 for the design criteria.

Table 3 – Recommended Residential Indoor Noise Levels (Source: AS2107)

Type of Occupancy	Internal Noise Level, dB(A) L_{eq}	
	Satisfactory	Maximum
<i>Apartments near major roads</i>		
- Living areas	35	45
- Sleeping areas	30	40
- Work areas	35	45
- Apartment common areas (e.g. foyer, lift lobby)	45	55

3.2.2 Loading Dock and Car Parking

Loading dock and car parking are located on ground level, indoors, and as such, noise impact associated with the usage of these spaces have not been considered.

3.2.3 Descriptors

A set of offset parameters for correlating noise descriptors based on unattended noise monitoring location A (refer to Section 6.1.3) are presented in Table 4.

Table 4 – Descriptor Offset Parameters

Descriptor / Parameter	$L_{10\ 18\ \text{Hour}}$ Subtracted from Offset Parameter dB(A)
$L_{10\ 18\ \text{hour}}$	0.0
Average $L_{Aeq\ 24\ \text{hour}}$	-3.0
$L_{Aeq\ 1\ \text{hour night (max)}}$	-1.0
$L_{Aeq\ 1\ \text{hour day (max)}}$	0.0
$L_{Aeq\ 1\ \text{hour evening (max)}}$	0.0

3.3 TRAFFIC NOISE MONITORING

The glazing assemblies required to reduce traffic noise is recommended based on noise levels measured adjacent to the site (unattended and attended).

3.3.1 Time and Location of Measurements

Unattended noise monitoring for a prolonged time period was carried out by Aecom adjacent to the site (as part of KSD1, KSD2 (then commercial), Residential 1,2,3 developments), ref: 600490478ISJCb.Residential.8RP.Rev2, dated 17 August 2009. Locations of these measurements are indicated in Figure 1.

Attended noise monitoring was carried out by ALC adjacent to Kingsford Smith Drive (refer to Figure 1) during a high traffic flow periods (daytime peak hours on 18th and 19th of September 2014) to substantiate the existing traffic noise level associated with this road and to confirm the previous measurements carried out over a prolonged period by Aecom.

Refer to Section 6.1.3 for background noise monitoring at the development site, conducted for a prolonged period for the previous assessment.

3.3.2 Measurement Equipment

Attended noise measurements were obtained using a Norsonics 140 Precision Sound Level Analyser, set to A-weighted fast response. The sound level meter was calibrated before and after the measurements using a Norsonics 1251 Sound Level Calibrator. No significant drift was recorded.

Refer to Aecom report for details regarding the measurement equipment used for the unattended noise monitoring.

3.4 MEASURED TRAFFIC NOISE LEVELS

Measurements from attended traffic noise measurements are presented in Table 5 below.

Table 5 – Traffic Noise Levels

Measurement Location	Time of Day	Noise Level dB(A) $L_{eq\ 15min}$
Location A (≈9m from Kingsford Smith Drive)	Morning	72.5
	Lunch	72.6
Location B (≈12m from Kingsford Smith Drive)	Morning Peak	71.1
	Lunch	69.8
	Afternoon	71.2

The following peak hour traffic noise levels were measured by Aecom ($L_{Aeq,1hr,max}$) at approximately 30 metres from Kingsford Smith Drive:

- Day: 62.2 dB(A);
- Evening: 62 dB(A); and
- Night: 61 dB(A).

Refer to Section 6.1.3 for noise monitoring adjacent to the development site, conducted for a prolonged period by Aecom which include all relevant descriptors at the measurement location.

3.5 TRAFFIC NOISE PREDICTIONS

The traffic noise levels presented above have been used to substantiate predicted noise level contours in SoundPlan™ from data presented in previous Sections of this report.

The average daily traffic volumes as obtained in the aforementioned source are presented in Section 3.1.1 in addition to predicted 10-year planning period which has been used in the Calculation of Road Traffic Noise CoRTN and SoundPlan™ models and substantiated with attended traffic noise monitoring. These traffic volumes were used to validate the traffic volume at the monitoring location.

The CoRTN predictions associated with the 2014 AADT are presented in the following Tables. It is noted that the measured noise level and CoRTN model used to substantiate existing traffic flows falls within +/-1dB for Kingsford Smith Drive.

Table 6 – Kingsford Smith Drive – 2014 CoRTN Model

Parameter	Traffic Volume Validation
Calculated Traffic Volume	Refer to Section 3.1.1
Percentage of Heavy Vehicles	
Estimated Traffic Speed	
Road Gradient	1%
Relative Road Level	0m
Relative Level of Receiver	1.5m
Angle of View	180°
Ground Type	Hard
Barrier Effects	Zero

The following CoRTN parameters have been implemented into SoundPlan™ for surrounding roadways based on the above mentioned traffic volumes. It should be noted that screening effects, distance attenuation and other topographical attributes are accounted for in the SoundPlan™ model.

Also, we are aware of the future realignment of Kingsford Smith Drive (widened toward the development site). Road traffic noise validation with current alignment was used and the road alignment changed for the future predictions, assuming same road surface, future AADT traffic volumes as per Aecom previous assessment and same vehicle behaviour (i.e. accelerating off line at the Hercules/KSD intersection).

Table 7 – Ultimate AADT Traffic Flow CoRTN Parameters

Parameter	Kingsford Smith Drive 2024
Calculated Traffic Volume	78,714
Percentage of Heavy Vehicles	11%
Estimated Traffic Speed	60 km/h

Note: Absorption, distance, screening effects, topography and directivity determined by SoundPlan™ model.

Refer to Section 5.1 for traffic noise impact on the development façade.

4 AIRCRAFT NOISE INTRUSION

According to BCC City Plan 2014, the building is located outside of the ANEF20-25 aircraft noise contours (approximately 500 metres) and as such, aircraft noise has not been assessed.

5 EVALUATION OF NOISE INTRUSION

5.1 TRAFFIC NOISE IMPACT

Calculations of traffic noise impact on the KSD2 development were undertaken to determine acoustic ameliorative measures required to comply with the project acoustic objectives during relevant times of the day. Refer to Section 3 for assumptions, traffic volumes and criteria adopted for the development.

Estimated traffic noise levels (façade noise maps) at the development are presented in Appendix One.

Taking into account traffic data (Section 3), the orientation of the building, location of windows, barrier effects (*where applicable*), the total area of glazing, facade transmission loss and room sound absorption characteristics, likely interior noise levels have been predicted in order for the development to comply with the noise criteria in Table 3.

In order for the development to comply with the noise criteria in Table 3 (with external windows and doors closed), minimum acoustic requirements of the building envelope are presented in Section 5.3.

5.2 LOADING DOCK AND CAR PARKING

Refer to Section 3.2.2 for comments.

5.3 BUILDING ENVELOPE

5.3.1 Glazed Windows and Doors

Calculations were undertaken taking into account the orientation of windows, barrier effects (*where applicable*), the total area of glazing, facade transmission loss and room sound absorption characteristics. In this way the likely interior noise levels can be predicted. Calculations were based on the current drawings as listed in Section 2.

The recommended glazing assemblies are presented in Table 8 in order to satisfy the project acoustic objectives adopted for the development (as in Table 3). Thicker glazing may be required for structural, safety or other purposes. Where required to use thicker glazing than that scheduled, this may also be acoustically acceptable. Refer to Figure 2 for glazing type markups.

It is recommended that only window systems having test results indicating compliance with the required ratings obtained in a certified laboratory (laboratory test data performed in accordance with Australian Standard AS 1191-1985) be used where windows with acoustic seals have been

recommended. Only glazing systems having laboratory test data indicating compliance with the specification transmission loss requirements will be accepted.

It is noted that **full height glazing systems** (with external windows and doors closed) have been used to conduct the assessment. Minimum acoustic requirements may be subject to changes, should the glazing system area be changed and unit layouts be changed.

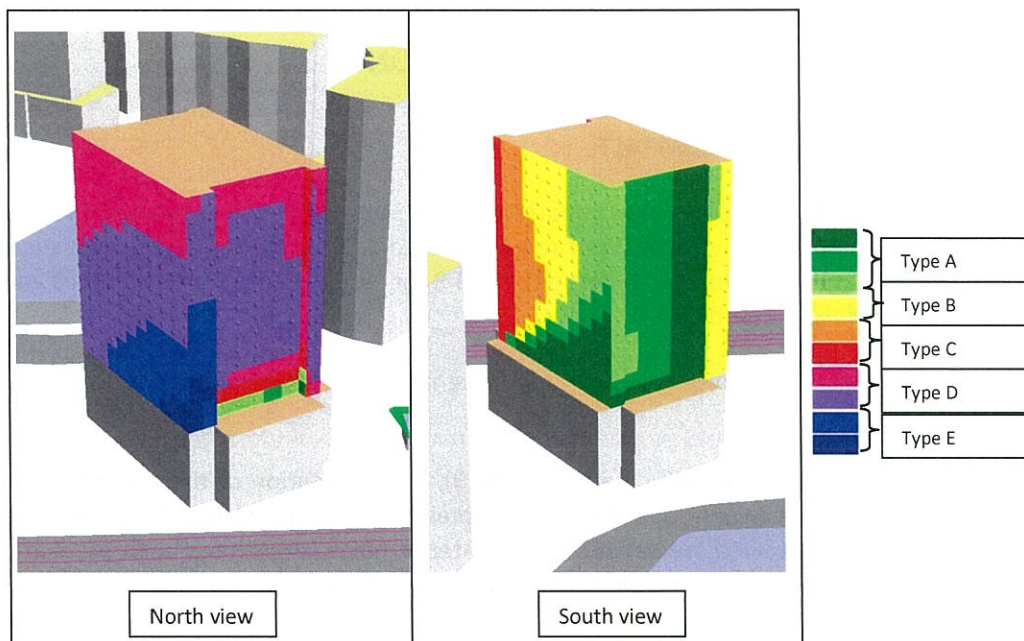


Figure 2: Glazing Type Markup

Table 8 – Minimum Requirements for Glazed Doors and Window Systems

Glazing Type	Space*	Minimum Typical Glazing Thickness	Acoustic Seals Requirement	Minimum Acoustic Performance
Type A	Bed	8mm	Yes	Refer to Table 9
	Living	6mm	Yes	
Type B	Bed	10mm	Yes	
	Living	6mm	Yes	
Type C	Bed	12.38mm laminated	Yes	
	Living	8.38mm laminated	Yes	
Type D	Bed	12mm/10mm airgap/10.76mm lam	Yes	
	Living	10.38mm laminated	Yes	
Type E	Bed	10.38mm lam/100mm airgap/10mm	Yes	
	Living	12.38mm laminated	Yes	

* Assuming typical bedroom glazing width of 3m and living room glazing width 3.2m

In addition to complying with the minimum scheduled glazing thickness, the acoustic performance of the glazing fitted into openable frames and fixed into the building opening should not be lower than the values listed in Table 9 for all spatial uses. Where nominated, this will require the use of acoustic seals around the full perimeter of openable frames and the frame will need to be sealed into the building opening using a flexible 100% polyurethane sealant. **It is noted that mohair or mohair/plastic fin combination seals are not acceptable.**

Table 9 – Minimum Glazing Requirements

Glazing System	Minimum Installed Transmission loss, dB							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8Khz
Proprietary system with 6mm glass	19	22	24	27	33	28	34	36
Proprietary system with 8mm glass	21	25	27	29	33	28	32	36
Proprietary system with 10mm glass	21	25	28	34	33	34	41	44
Proprietary system with 8.38mm lam glass	22	25	30	33	37	34	45	51
Proprietary system with 10.38mm lam glass	22	27	31	34	36	37	49	52
Proprietary system with 12.38mm lam glass	23	30	30	35	36	38	49	52
Proprietary system with 12mm/10mm airgap/10.76mm lam glass	26	29	33	41	43	46	55	61
Proprietary system with 10.38mm lam/100mm airgap/10mm glass	28	33	37	46	53	57	75	84

5.3.2 Roof Construction

The roof of the residential Tower is nominated as concrete construction and is acoustically satisfactory in order to meet the project acoustic objectives.

5.4 OUTDOOR RECREATIONAL AREA

Outdoor recreational area (pool and bbq) is proposed to be located at the North Eastern side of the development on ground level. The recreation area would have a significant noise impact from traffic on Kingsford Smith Drive. As such, in order to reduce the impact on the amenity of the outdoor pool area, a noise barrier would be required. Sections of pool area that would comply with a proposed criteria of 63 dB(A) $L_{10,18\text{hour}}$.

6 NOISE EMISSION ASSESSMENT

This section of the report addresses potential noise emissions from the various parts of the development which may have potential to sensitive receivers in the vicinity of the proposed development. Noise emissions from the development will be addressed according to the following noise sources:

- Noise associated with the loading dock located on the ground floor;
- Car parking on the ground floor; and
- Noise objectives for mechanical plant.

6.1 EXISTING ACOUSTIC ENVIRONMENT

Long term unattended noise monitoring was conducted at the site by Aecom to establish existing ambient noise levels to be used as a basis of the assessment. In all cases the determined levels were conservatively set below the minimum repeatable background noise levels.

6.1.1 Time and Location of Noise Monitoring

Refer to Section 3.3.1.

6.1.2 Measurement Equipment

Refer to Section 3.3.2.

6.1.3 Background Noise Levels

The existing background noise levels within the area as determined by long term monitoring are presented in Table 10 (by Aecom, ref: ref: 600490478ISJCb.Residential.8RP.Rev2). The locations are presented in Figure 1.

Table 10 – Summary of Logged Noise Levels (Source: Aecom)

Descriptor	Measured Sound Pressure Level, dB(A)	
	Location A (Closer to Kingsford Smith Drive)	Location B (Harbour Road/Hercules Street)
L _{Aeq,24hr}	59	57
L _{A10,18hr}	62	59
L _{A90(6am-6pm)} , Day	55	53
L _{A90(6pm-10pm)} , Evening	56	56
L _{A90(10pm-6am)} , Night	48	48
L _{Aeq,1hr,max(6am-6pm)} , Day	62	61
L _{Aeq,1hr,max(6pm-10pm)} , Evening	62	65 ¹
L _{Aeq,1hr,max(10pm-6am)} , Night	61	57

Note: 1. Elevated noise level due to car park movements associated with Swim School located on adjacent site

6.2 NOISE EMISSIONS

6.2.1 Loading Dock and Car Park Noise Emissions

Loading dock and car parking are located indoors, and as such, noise impact associated with the usage of these spaces are not expected to have adverse impact on adjacent developments.

6.2.2 Mechanical Noise Emissions

A detailed assessment of noise emissions from mechanical plant is not possible to be undertaken as a detailed design of the systems which is required in order to obtain estimates of noise source emissions is not available. Mechanical plant noise limits have been proposed by Aecom in the previous assessment (ref: 600490478ISJCb.Residential.8RP.Rev2, dated 17 August 2009):

- Mechanical Plant Noise Emission (property boundaries):
 - $L_{Aeq,adj,day} = 50 \text{ dB(A)}$;
 - $L_{Aeq,adj,night} = 50 \text{ dB(A)}$.
- Pool and Spa Pumps (property boundaries):
 - $L_{Aeq,adj,day} = 50 \text{ dB(A)}$;
 - $L_{Aeq,adj,night} = 50 \text{ dB(A)}$.

7 CONCLUSION

This report presents our assessment of traffic noise intrusion into the proposed KSD2 residential development located between Kingsford Smith Drive and Hercules Street, Hamilton.

It is concluded that with the installation of the proposed constructions detailed in Section 5, noise levels within the proposed development will achieve the requirements of the adopted project acoustic objectives.

A noise emission assessment for the development has been presented and noise objectives formulated to ensure noise associated with the general operation of the development do not have a detrimental acoustic impact on the surrounding amenity.

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

Yours faithfully,



Acoustic Logic Consultancy Pty Ltd
Tarmo Saar

APPENDIX ONE SOUNDPLAN™ MODELS

