# Appendix 4

TTM Consulting – *Report on Access to Rainbow Beach Estate, May 2006*

TRAFFIC . PARKING . ACOUSTICS

**23 May 2006**

TTM Ref: 31824let2
Your Ref:

Tony Green
Luke and Company Pty Ltd
98 William Street
Port Macquarie, NSW 2444

Dear Tony,

***Proposed Access to Rainbow Beach Estate off Ocean Drive, Port Macquarie, NSW***

I refer to our previous discussions regarding the above development and access arrangements off Ocean Drive. TTM have carried out an analysis of this access, namely Ocean Dr/ Abel Tasman Dr intersection to assess the suitability and interaction of other intersections within your site. This assessment is further described below.

The proposed development and neighbouring sites have been analysed in accordance with the RTA *Guide to Traffic Generating Developments* (2002). Based on the proposed access locations in relation to the surrounding road network, a proportion (119 dwellings) of the subject site has been allocated to enter/ exit the site via the subject roundabout . The traffic generated by the site and neighbouring development have been established as follows:

| Description | Description | Peak Generation Rate | Peak Traffic Volume |
|---|---|---|---|
| Proposed Development | 119 Dwellings | 0.85 trips/ 100sqm | 83 |
| Neighbouring Development | 281 Single Apartments | 0.5 trips/ 100sqm | 140 |
| | 383 Units | 0.4 trip[s/ 100sqm | 153 |
| | 7,200sqm Commercial | 2 trips/ 100sqm | 437 |

Given the location of the subject site with respect to the town centre and surrounding residential development, the distribution of primary trips was estimated as follows:

- 85% of the traffic generated from the Abel Tasman Dr southern leg (into the site) will travel to and from the northeast along Ocean Dv.
- 25% of the traffic generated from the Abel Tasman Dr northern leg will travel to and from the southwest along Ocean Dv.
- Directional splits AM: 80% Out / 20% In
  PM: 40% Out / 60% In

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Based on the traffic generation and distribution estimates, the Ocean Dr/ Abel Tasman Dr intersection was analysed using aaSidra in order to evaluate the operational performance and queuing affects for projected 2016 traffic conditions.

Ocean Dr forecast traffic flows were established from SMEC's traffic model of the Hastings Council area (SMEC 2003) Figure 5-2 *Traffic Growth on Ocean Drive.* To ensure the assessment is as practical as possible, traffic to and from the northern leg of Abel Tasman Dr is assumed as 30% of the traffic volume from the southern leg. This assumption was based on the estimated number of dwellings serviced by Abel Tasman Dr.

It is understood that the RTA propose upgrading Ocean Drive to a four lane arterial dual carriageway in the vicinity of the site. As such, the analysis carried out as part of this task has been based on a two lane roundabout with two lane approach and departure legs along Ocean Drive. The schematic layout of the proposed roundabout is depicted below:

The analysis results (refer attached) indicate that the 95$^{th}$ percentile queue on the southern approach will be 28 meters. This analysis also demonstrated that the intersection will operate at an acceptable level of service with no capacity issues.

It is recommended that a minimum intersection spacing distance of 50 meters (with 30 meters of free queue area) be provided between the Ocean Dr/ Abel Tasman Dr intersection and the internal intersection. To achieve this, it is recommended that the first intersection along the Abel Tasman Dr southern leg be aligned with the neighbouring development link road intersection to create a combined four way intersection (as opposed to s staggered T). It is further recommended that this new four way intersection be controlled by a single lane roundabout.

The attached sketch illustrates the above recommendations schematically.

Based on our analysis, we therefore recommend that the proposed development will cause an insignificant impact on traffic flows at the Ocean Dr/ Abel Tasman Dr roundabout and surrounding road network to the site.

Please do not hesitate contacting the undersigned should you have any queries or require further clarification on the enclosed.

Yours faithfully,

**Marc Mrsic**
Manager, TTM Traffic (GC)

# Movement Summary

akcelik & associates
aaTraffic SIDRA

## Port Mac - Ocean Drive / Abel Tasman Dr AM

Roundabout

### Vehicle Movements

| Mov No | Turn | Dem Flow (veh/h) | Cap (veh/h) | Deg of Satn (v/c) | Aver Delay (sec) | Level of Service | 95% Back of Queue (m) | Eff. Stop Rate | Aver Speed (km/h) | Oper Cost ($/h) |
|---|---|---|---|---|---|---|---|---|---|---|
| Abel Tasman Sth | | | | | | | | | | |
| 1 | L | 67 | 837 | 0.535 | 19.1 | LOS B | 28 | 1.87 | 50.2 | 185 |
| 1 | T | 1 | 837 | 0.535 | 19.1 | LOS B | 28 | 1.87 | 50.2 | 185 |
| 1 | R | 379 | 837 | 0.535 | 19.1 | LOS B | 28 | 1.87 | 50.2 | 185 |
| **Approach** | | **448** | **837** | **0.535** | **19.1** | **LOS B** | **28** | **1.87** | **50.2** | **185** |
| Ocean Dr East | | | | | | | | | | |
| 4 | L | 94 | 464 | 0.203 | 10.2 | LOS B | 8 | 1.20 | 58.7 | 33 |
| 5 | T | 525 | 2597 | 0.203 | 8.9 | LOS A | 8 | 1.08 | 60.4 | 179 |
| 6 | R | 8 | 44 | 0.205 | 16.0 | LOS B | 8 | 1.42 | 53.0 | 4 |
| **Approach** | | **629** | **3105** | **0.203** | **9.2** | **LOS A** | **8** | **1.10** | **60.0** | **216** |
| Abel Tasman Dr - North | | | | | | | | | | |
| 7 | L | 34 | 652 | 0.209 | 18.5 | LOS B | 8 | 1.74 | 50.6 | 55 |
| 7 | T | 1 | 652 | 0.209 | 18.5 | LOS B | 8 | 1.74 | 50.6 | 55 |
| 7 | R | 100 | 652 | 0.209 | 18.5 | LOS B | 8 | 1.74 | 50.6 | 55 |
| **Approach** | | **136** | **652** | **0.209** | **18.5** | **LOS B** | **8** | **1.74** | **50.6** | **55** |
| Ocean Dr - West | | | | | | | | | | |
| 10 | L | 25 | 95 | 0.274 | 11.6 | LOS B | 12 | 1.37 | 56.6 | 9 |
| 11 | T | 525 | 1925 | 0.273 | 10.4 | LOS B | 12 | 1.29 | 57.9 | 181 |
| 12 | R | 16 | 62 | 0.274 | 17.4 | LOS B | 12 | 1.53 | 51.8 | 7 |
| **Approach** | | **569** | **2083** | **0.273** | **10.6** | **LOS B** | **12** | **1.31** | **57.7** | **197** |
| **All Vehicles** | | **1782** | **6676** | **0.535** | **12.9** | **LOS B** | **28** | **1.41** | **55.7** | **654** |

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# Movement Summary

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aaTraffic SIDRA

## Port Mac - Ocean Drive / Abel Tasman Dr PM

Roundabout

### Vehicle Movements

| Mov No | Turn | Dem Flow (veh/h) | Cap (veh/h) | Deg of Satn (v/c) | Aver Delay (sec) | Level of Service | 95% Back of Queue (m) | Eff. Stop Rate | Aver Speed (km/h) | Oper Cost ($/h) |
|---|---|---|---|---|---|---|---|---|---|---|
| Abel Tasman Sth | | | | | | | | | | |
| 1 | L | 33 | 828 | 0.271 | 17.5 | LOS B | 11 | 1.66 | 51.8 | 91 |
| 1 | T | 1 | 828 | 0.271 | 17.5 | LOS B | 11 | 1.66 | 51.8 | 91 |
| 1 | R | 189 | 828 | 0.271 | 17.5 | LOS B | 11 | 1.66 | 51.8 | 91 |
| **Approach** | | **224** | **828** | **0.271** | **17.5** | **LOS B** | **11** | **1.66** | **51.8** | **91** |
| Ocean Dr East | | | | | | | | | | |
| 4 | L | 284 | 1111 | 0.256 | 10.2 | LOS B | 11 | 1.19 | 58.8 | 100 |
| 5 | T | 525 | 2057 | 0.256 | 8.9 | LOS A | 11 | 1.07 | 60.4 | 179 |
| 6 | R | 25 | 102 | 0.255 | 15.9 | LOS B | 10 | 1.42 | 53.1 | 11 |
| **Approach** | | **836** | **3269** | **0.256** | **9.5** | **LOS A** | **11** | **1.13** | **59.6** | **291** |
| Abel Tasman Dr - North | | | | | | | | | | |
| 7 | L | 17 | 729 | 0.096 | 17.1 | LOS B | 3 | 1.60 | 52.1 | 28 |
| 7 | T | 1 | 729 | 0.096 | 17.1 | LOS B | 3 | 1.60 | 52.1 | 28 |
| 7 | R | 50 | 729 | 0.096 | 17.1 | LOS B | 3 | 1.60 | 52.1 | 28 |
| **Approach** | | **70** | **729** | **0.096** | **17.1** | **LOS B** | **3** | **1.60** | **52.1** | **28** |
| Ocean Dr - West | | | | | | | | | | |
| 10 | L | 75 | 299 | 0.254 | 10.7 | LOS B | 11 | 1.25 | 57.7 | 27 |
| 11 | T | 525 | 2066 | 0.255 | 9.4 | LOS A | 11 | 1.15 | 59.2 | 180 |
| 12 | R | 50 | 196 | 0.255 | 16.5 | LOS B | 11 | 1.45 | 52.5 | 21 |
| **Approach** | | **652** | **2561** | **0.255** | **10.1** | **LOS B** | **11** | **1.19** | **58.4** | **228** |
| **All Vehicles** | | **1782** | **7387** | **0.271** | **11.0** | **LOS B** | **11** | **1.23** | **57.7** | **637** |

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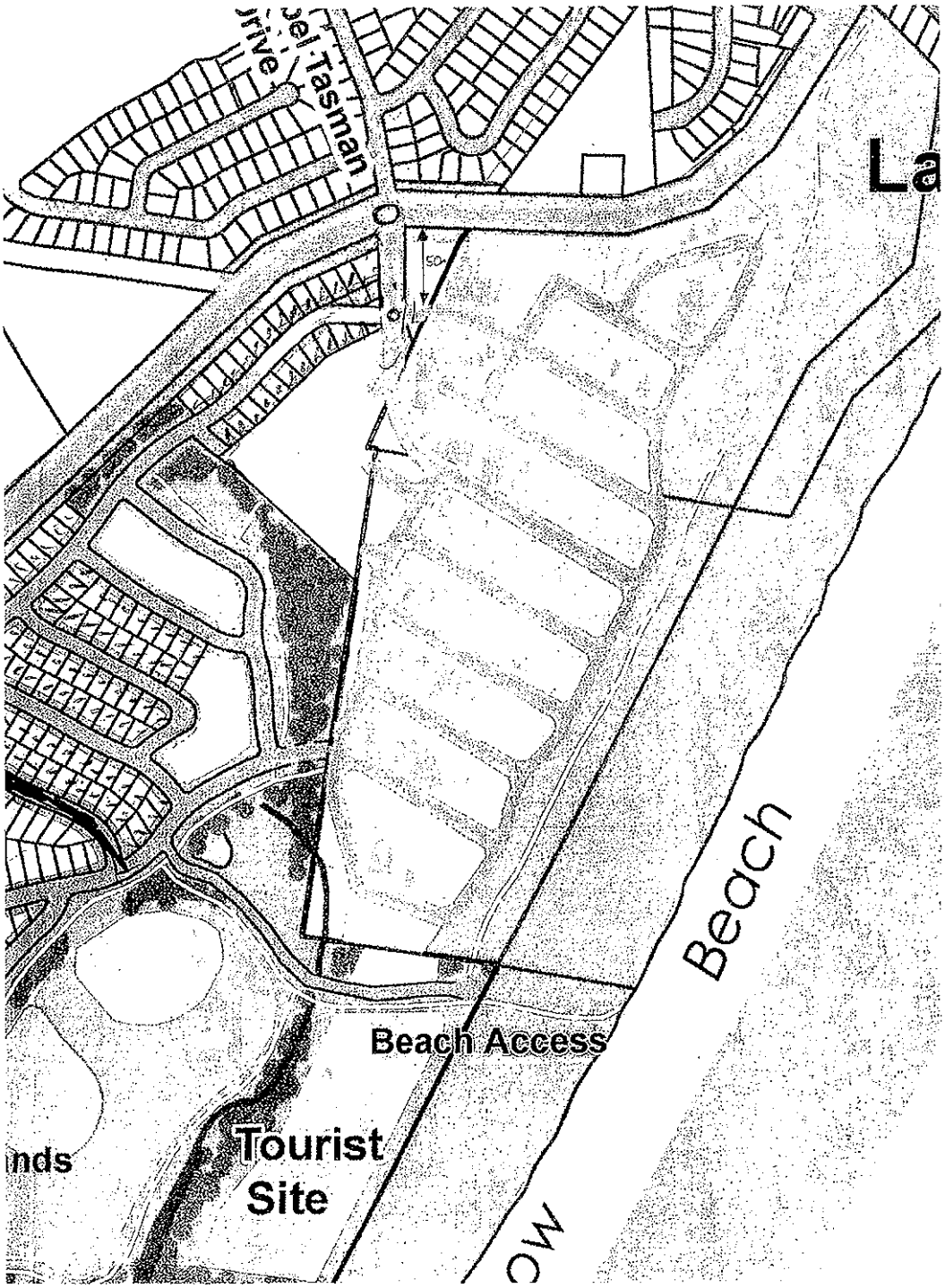
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# Appendix 5

Noise and Sound Services - *Road Traffic Noise Assessment - March 2006*

Noise and Sound Services

# Road Traffic Noise Assessment

For:

## Rainbow Beach North
## Ocean Drive, Bonny Hills
## NSW 2445.

March 2006

**Report No. nss20819 – Final**

**Prepared for:**

**Luke and Company Pty Limited**
**98, William Street,**
**Port Macquarie,**
**NSW 2444**

**Prepared by:**


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# CONTENTS

# 1. INTRODUCTION

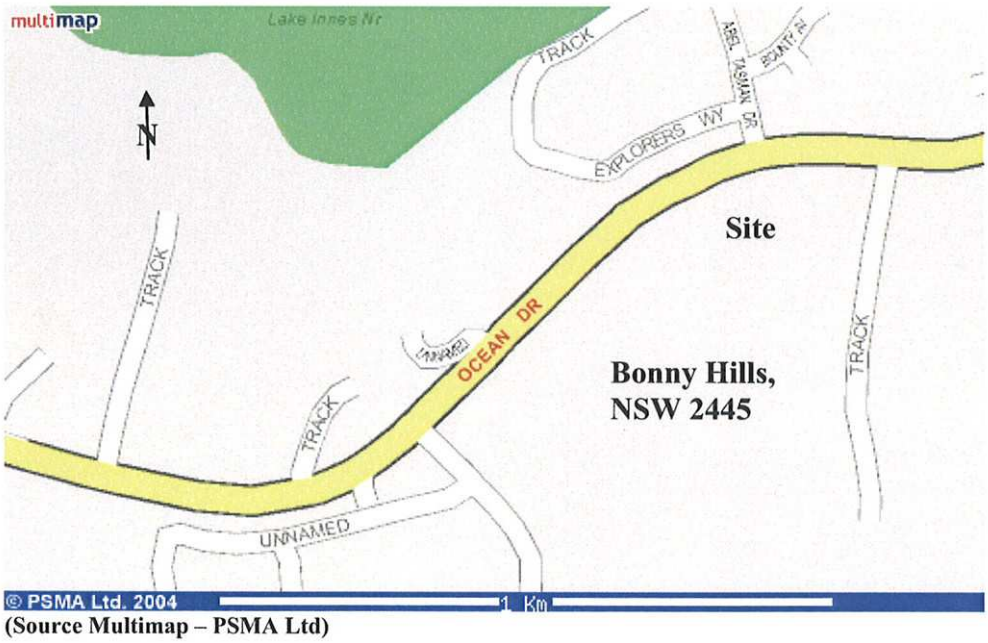
Noise and Sound Services was requested by Luke and Company Pty Limited of 98, William Street, Port Macquarie, NSW 2444 to carry out a road traffic noise study at the site of a proposed residential housing estate at Rainbow Beach North, Ocean Drive, Bonny Hills, NSW 2445.

The purpose of the survey is to assess the road traffic noise levels and advise on residential housing noise mitigation measures from external road traffic to accompany the development application to Hastings Council.

# 2. SITE AND DEVELOPMENT DESCRIPTION

## 2.1 Site Description

The site at Ocean Drive, Bonny Hills is currently a greenfield farm area opposite Able Tasman Drive as shown in Figure 1 below. The proposed development site is opposite the *Surfside Resort'* Motel, Ocean Drive.



**(Source Multimap – PSMA Ltd)**

***Figure 1 Site Plan.***

The proposed development residential boundary is approximately 20 metres from the nearest road carriageway of Ocean Drive. Further details of the site are shown in the general layout plan drawings by *'Luke and Company Pty Limited'* LAC ref 4509NI dated October 2005.

It is likely that the road in this area will be upgraded to dual carriageway and a typical cross section would likely involve 2 traffic lanes in each direction with a 4 metre wide median strip with a cycleway in each direction. This scenario is outlined in Figure 3 below.

### 2.2 Development Description

The proposed development is for 100 lots of single storey residential homes. Details of the proposed dwellings have not been decided at the time of preparation of this report.

## 3. CRITERIA

This section of the report reviews the specific criteria given in National Standards and State noise criteria relating to road traffic noise.

### 3.1 Environmental Criteria for Road Traffic Noise

The NSW Government have issued guideline criteria in The Environmental Criteria for Road Traffic Noise, May 1999 (EPA 99/3).

For new residential developments affected by freeway/arterial traffic noise, the external criteria ($L_{Aeq\ (15\ hour)}$) is 55 dBA for day time (7:00 am to 10:00 pm) and ($L_{Aeq\ (9\ hour)}$) 50 dBA for night time (10:00 pm to 7:00 am).

Where criteria are already exceeded the document provides the following advice: *"Where feasible and reasonable, existing noise levels should be reduced to meet the noise criteria via judicious design and construction of the development. Location, internal layouts, building materials and construction should be chosen so as to minimise noise impacts."*

### 3.2 RTA Environmental Noise Management Manual

The RTA Environmental Noise Management Manual (publication number RTA-Pub.01.142) dated December 2001 defines sites as "noise affected" if day time road traffic noise levels ($L_{Aeq\ (15\ hour)}$) exceed 60 dBA and night time road traffic noise levels ($L_{Aeq\ (9\ hour)}$) exceed 55 dBA. Sites are not given priority for treatment by the RTA unless day time road traffic noise levels ($L_{Aeq\ (15\ hour)}$) are at least 65 dBA or night time road traffic noise levels ($L_{Aeq\ (9\ hour)}$) are at least 60 dBA (Section 8, page 52). Noise levels less than 65 dBA (day time) and 60 dBA (night time) are not regarded as 'acute' (page 98).

The RTA Environmental Noise Management Manual states that the maximum internal noise levels below 50 - 55 dBA are unlikely to cause awakening reactions (Practical Note, page 90).

### 3.3 Australian Standard AS 2107

The Australian Standard AS 2107 – 2000 *'Acoustic – Recommended Design Sound Levels and Reverberation Times for Building Interiors'* provides recommended design sound levels for different areas of occupancy in buildings. This includes recommended internal design sound levels from continuous road traffic noise for houses near minor and major roads as shown in Table 1 below.

**TABLE 1. RECOMMENDED DESIGN SOUND LEVEL FOR BUILDINGS. FROM AS 2107 (2000)**

| Type of Occupancy | Recommended Design Sound Level ($L_{Aeq,}$) dBA | |
|---|---|---|
| | Satisfactory | Maximum |
| **Houses near Minor Roads** | | |
| Living Areas | 30 | 40 |
| Sleeping Areas | 30 | 35 |
| Work Areas | 35 | 40 |
| Apartment Common Areas | 45 | 55 |
| **Houses near Major Roads** | | |
| Living Areas | 35 | 45 |
| Sleeping Areas | 30 | 40 |
| Work Areas | 35 | 45 |
| Apartment Common Areas | 45 | 55 |

Site specific road traffic noise goals ($L_{Aeq,\ 15\ minute}$) are set at 35 dBA for sleeping areas and 40 dBA for living areas.

## 4. NOISE MEASUREMENT RESULTS

### 4.1 Instrumentation

The instrumentation used during the noise survey consisted of a noise logger and a sound level meter.

The logger was an 'Acoustic Research Laboratories Pty Ltd' - Type 1 Environmental Noise Logger (serial number 194550). This logger conforms to Australian Standard 1259 "Acoustics - Sound Level Meters", (1990) as a type 1 precision sound level meter and has an accuracy suitable for field use.

The sound level meter was a Brüel and Kjær model 2250 (serial no. 2446904). This meter conforms to Australian Standard AS IEC 61672.1-2004 : '*Electroacoustics - Sound level meters – Specifications*' as a class 1 precision sound level meter and has an accuracy suitable for both field and laboratory use.

The logger and meter calibration were checked before and after the measurement period with a Brüel and Kjær acoustical calibrator, model 4231 (serial no. 2385023). No significant system drift occurred over the measurement periods.

The logger, sound level meter and calibrator have been checked, adjusted and aligned to conform to the Brüel and Kjær factory specifications and issued with conformance certificates within the last 24 months. The internal test equipment used is traceable to the National Measurement Laboratory at C.S.I.R.O., Lindfield, NSW, Australia.

## 4.2 Measurement Procedure

The acoustical measurements were carried out in accordance with Australian Standards AS 1055. "*Acoustics –Description and measurement of environmental Noise*", (1997) and AS 2702 "*Acoustics –Methods for the Measurement of Road Traffic Noise*", (1984) as required by Australian Standard AS 3671 "*Acoustics – Road Traffic Noise Intrusion – Building Siting and Construction*" (1989).

Free field road traffic noise measurements were carried out at the site at approximately 10 metres (attended measurements) and 15 metres (unattended measurements) from the edge of the road, Ocean Drive. Short term attended measurements and a traffic count was carried out on Thursday 15 December 2005 and unattended logger measurements were carried out between Wednesday 14 December and Sunday 18 December 2005 (see Appendix A for full results). The 'A' frequency weighting and 'fast' time weighting were used exclusively. The weather was mild, sunny and dry with negligible wind.

## 4.3 Measurement Results

At a distance of 10 metres from the roadway the short term day time energy average road traffic noise level ($L_{Aeq,\ 1\ hour}$) was **64 dBA.** At a distance of 20 metres from the roadway the day time energy average road traffic noise level ($L_{Aeq,\ 15\ hour}$) was **61 dBA** and the day time energy average road traffic noise level ($L_{Aeq,\ 9\ hour}$) was **54 dBA.** Full details of the measurement results are shown in Appendix A below.

## 5. DISCUSSION AND CALCULATIONS

This section of the report discusses the measurement results for the proposed residential development and details formula used to predict external and internal noise levels in various rooms of the future dwellings.

### 5.1 External Noise Levels – Existing

The NSW Government have issued guideline criteria in The Environmental Criteria for Road Traffic Noise, May 1999 (EPA 99/3).

The free field external road traffic noise level at a 20 metre position from the road was found to be 61 dBA. The free field external noise levels were taken at the proposed façade of the development (18 to 20 metre set back from Ocean Drive).

*Note: - Façade reflections will increase this level by approximately 2.5 dB when measured close to a solid partition rather than in the free field.*

### 5.2 External Noise Levels – Future

Figure 2 below shows a sample measurement based on the assessment carried out as described in Section 4 above. Historic data is based on traffic counts undertaken by the RTA. Forecast road traffic flows are estimated from SMEC Australia Pty Ltd's traffic model of the Hastings Council Area (SMEC 2003) in terms of Annual Average Daily Traffic (AADT).

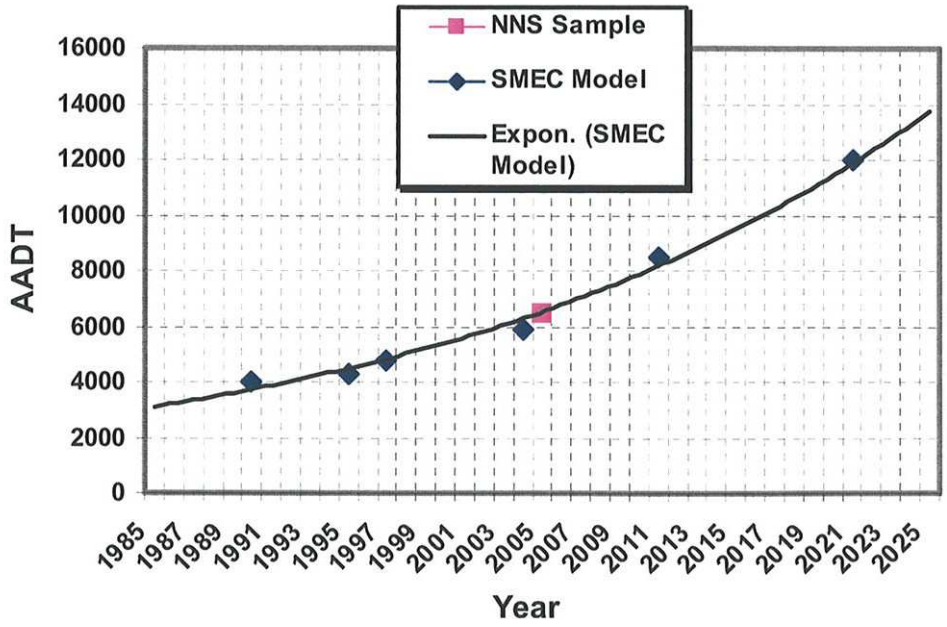



***Figure 2. Noise and Sound Services (NNS) Measurement and***

***Predicted Future Road Traffic Growth.***

It is predicted that road traffic flows could increase by approximately 85% by the year 2020. This will give an increase in road traffic noise levels of 2.5 dB (from 10 $\log_{10}$ (1.85)) giving a total day time noise level of 63 dBA to 64 dBA at 18 to 20 metres.

## 5.2 Internal Noise Levels

The internal noise level ($L_{p2}$) in various rooms of the future dwellings of the proposed development can be found at a later stage. This will use the formula:

$$\mathbf{L_{p2} = L_{p1} - R_w + 10\ Log_{10}\ (S/A) - K + 6\ dBA}$$

Where:

$L_{p1}$ is the external noise level;
$R_w$ is the weighted sound reduction index of the partition;
S is the area of the partition (window or glazed door);
A is the room acoustic absorption;
K is an angle of view correction.

By applying this formula the selection of the weighted sound reduction index ($R_w$) for the windows and glazed doors in the external façades of the proposed development can be found. The glazed areas are normally the weakest acoustic partition in the building façades. This is because walls, such as double brick or brick veneer construction have a minimum $R_w$ of 40 dB and ceiling / roof structures such as sheet metal or tiles with sarking and one layer of 10 mm thick plasterboard have a minimum $R_w$ of 35 dB.

# 6. RECOMMENDATIONS

## 6.1 External Noise Levels

The external day time noise level ($L_{Aeq,\ 15\ hour}$) of 61 dBA is 6 dB over the 55 dBA NSW Government Environmental Criteria for Road Traffic Noise, and the night time noise level ($L_{Aeq,\ 9\ hour}$) of 54 dBA is 4 dB over the 50 dBA criterion. These noise levels could increase to ($L_{Aeq,\ 15\ hour}$) 64 dBA and ($L_{Aeq,\ 9\ hour}$) 59 dBA by the year 2020. Hence mitigation measures are recommended.

It is recommended that an earth mound (bund) is constructed along the proposed site, 10 metres set back from the roadway, to act as an acoustic barrier. These earth mounds can be landscaped with grass, shrubs and trees to improve the visual aesthetics. An alternative to complete earth mounds are complete concrete walls or timber lapped and capped fences. Walls constructed of two materials could also

be considered e.g. a concrete wall or wooden fence constructed above earth mounds to the required heights.

With the heights of the acoustic barrier considered below in this report, the type of barrier (i.e. earth mound, lapped and capped timber fence or block wall) is not critical to the overall 'A' frequency weighted noise attenuation.

The height of the mound has been calculated in accordance with the International Standard ISO 9613-2 1996(E) '*Acoustic – Attenuation of sound during propagation outdoors Part 2 General method of calculation*'. To obtain a 6 dB reduction in road traffic pneumatic tyre noise (predominately at a frequency centred on 1 kHz) a minimum 1.8 metre high barrier would be required.

To obtain a 9 dB reduction in road traffic pneumatic tyre noise (predominately 1 kHz), a minimum 2.2 metre high barrier would be necessary. The barrier must contain no holes or gaps including beneath any fences or walls. The barrier height required is relative to the elevation of the receiver ground as shown in Figure 3 below.

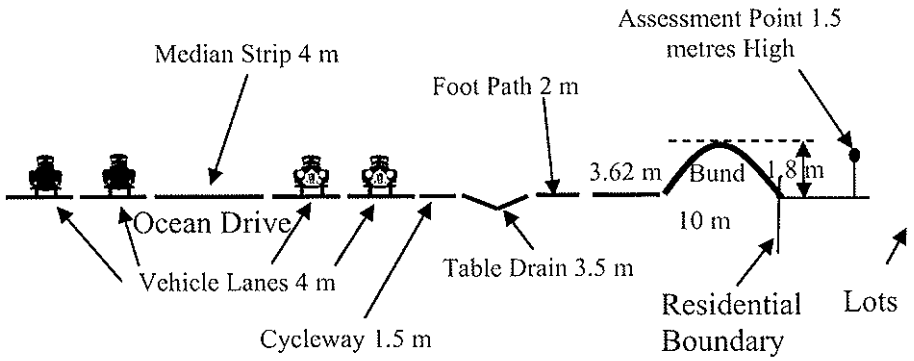



***Figure 3. Earth Mound Barrier Height (Schematic). Not to Scale.***

The earth mound barrier would need to prevent line of sight from a 1.5 metre high measurement point at the proposed residential boundary (including benching) to a point 1 metre high from the vehicle lane roadway level. The 1 metre height is the standardised height for road traffic noise assessments.

The current road surface is not low noise asphalt. If the road surface is changed to a low noise open grade asphalt a 3 dB to 5 dB reduction in the overall 'A' frequency weighted noise level could be expected. In this case, the earth mound can be reduced to 1.8 metres high for a total of 9 dB road traffic noise reduction.

As summary of the acoustic barrier height recommendations are shown in Table 2 below.

**TABLE 2. SUMMARY OF ACOUSTIC BARRIER HEIGHT RECOMMENDATIONS.**

| Situation | Required Barrier Height (metres) | Predicted Noise Reduction (dB) |
|---|---|---|
| Existing Traffic Flows and Existing Road Surface | 1.8 | 6 |
| Existing Traffic Flows with Open Grade Asphalt Road Surface | 1.2 | 3 |
| Traffic flows for Year 2020 and Existing Road Surface | 2.2 | 9 |
| Traffic flows for Year 2020 with Open Grade Asphalt Road Surface | 1.8 | 6 |

Access to the site should, where practicable, not provide direct line-of-sight between the road at Ocean Drive and any of the proposed residences at Rainbow Beach North. If this is unavoidable road traffic noise levels will need to be reduced to meet the internal design goals.

## 6.2 Internal Noise Levels

To meet the internal design goals as given in Table 1 above, all windows and glazed doors may need to be assessed once the architectural design of the proposed residences to be constructed has been carried out.

## 7. SUMMARY AND CONCLUSIONS

Noise from road traffic movements has been measured in the vicinity of a proposed residential housing estate at Rainbow Beach North, Ocean Drive, Bonny Hills, NSW 2445. The measurements have been used to predict external noise levels at the proposed development.

An earth mound barrier, or alternatives as given in the recommendations above, should be constructed between the road at Ocean Drive and the proposed residences at Rainbow Beach North. To meet the NSW Environmental Criteria for Road Traffic Noise, for predicted traffic flows in the year 2020, the earth mound barrier should be 2.2 metres high if the current road surface is maintained or 1.8 metres high if the road surface is replaced with a 'quiet' open grade asphalt surface.

| Date | Prepared by: | Status |
|---|---|---|
| 24 February 2006 | Ken Scannell MSc MAAS MIOA | Draft |
| 27 March 2006 | Ken Scannell MSc MAAS MIOA | Final |

***Important Note.*** *All products and materials suggested by 'Noise and Sound Services' are selected for their acoustical properties only. All other properties such as airflow, aesthetics, chemical, corrosion, combustion, construction details, decomposition, expansion, fire rating, grout or tile cracking, loading, shrinkage, ventilation, etc are outside of 'Noise and Sound Services' field of expertise and* ***must be*** *checked with the supplier or suitably qualified specialist before purchase.*

# APPENDIX A – MEASURED SOUND PRESSURE LEVELS

Environmental noise levels can vary considerably with time; therefore it is not adequate to use a single number to fully describe the acoustic environment. The preferred, and now generally accepted, method of recording and presenting noise measurements is based upon a statistical approach. For example, the $L_{A10}$ noise level is the level exceeded for 10% of the time, and is approximately the average maximum noise level. The $L_{A90}$ level is the level that is exceeded for 90% of the time, and is considered to be approximately the average of the minimum noise level recorded. This level is often referred to as the "background" noise level. The $L_{Aeq}$ level represents the average noise energy during the measurement period.

The acoustic environment of the proposed development at the site is predominantly influenced by traffic using Ocean Drive. In addition to the unattended (logger) measurements (see Figure A1 to A5 below for results), an attended site noise survey to determine the existing acoustic environment of the area and road traffic flows was carried out at the site. This was on Thursday 15 December 2005 between noon and 13:00 hours. The measurement procedure and the equipment used for the noise survey are given in section 4 of this report. All sound pressure levels in Table A1 below are rounded to the nearest whole decibel.

**TABLE A1 – OCEAN DRIVE - THURSDAY 15 DECEMBER 2005 – ATTENDED MEASUREMENT RESULTS.**

| Time | | Sound Pressure Level (dBA) | | | | | |
|---|---|---|---|---|---|---|---|
| Start | Finish | $L_{Aeq}$ | $L_{A1}$ | $L_{A10}$ | $L_{A50}$ | $L_{A90}$ | $L_{A99}$ |
| 12:00 | 12:15 | 64 | 73 | 69 | 55 | 47 | 44 |
| 12:15 | 12:30 | 64 | 74 | 69 | 54 | 47 | 45 |
| 12:30 | 12:45 | 65 | 75 | 70 | 56 | 47 | 45 |
| 12:45 | 13:00 | 64 | 74 | 69 | 55 | 47 | 44 |

## FIGURE A1 TO A5 - UNATTENDED MEASUREMENT RESULTS.

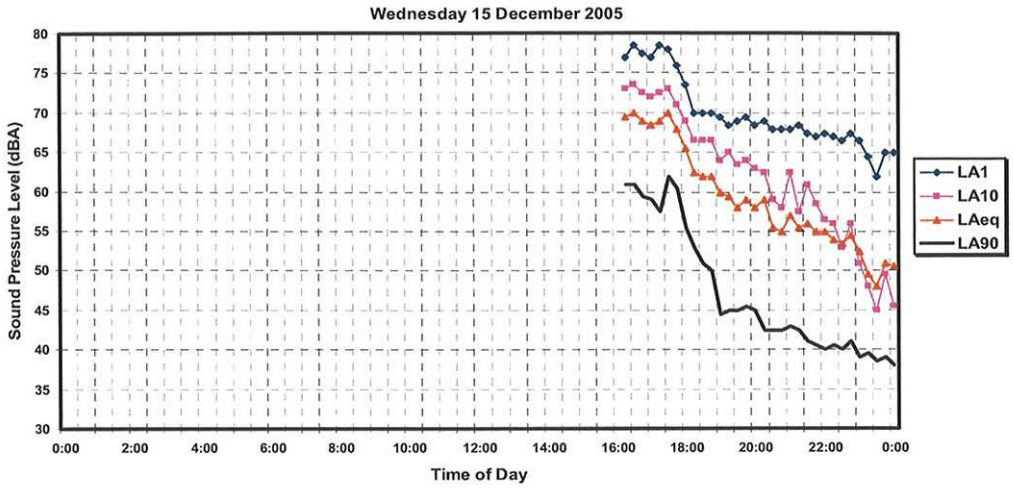



*Figure A1. Road Traffic Noise Levels Wednesday 15 December 2005.*

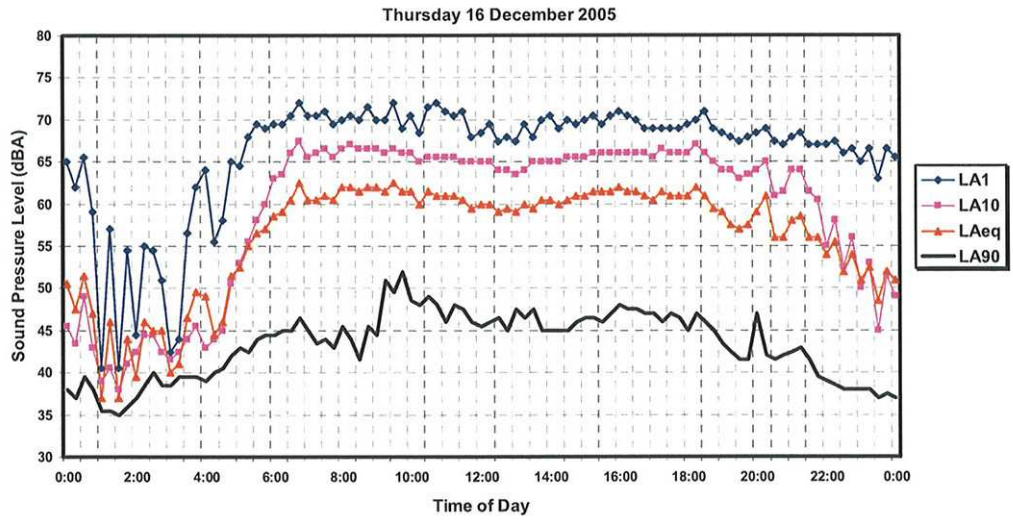



*Figure A2. Road Traffic Noise Levels Thursday 16 December 2005.*

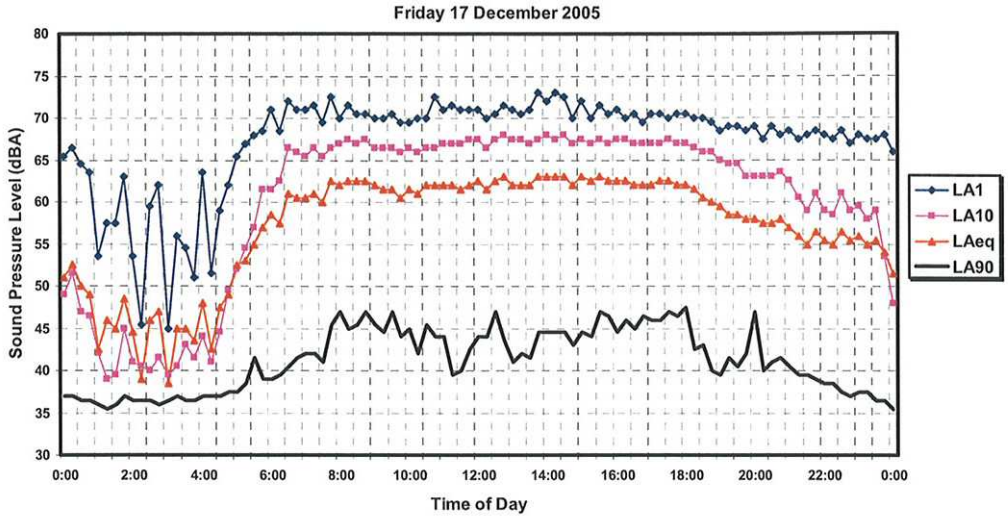



*Figure A3. Road Traffic Noise Levels Friday 17 December 2005.*

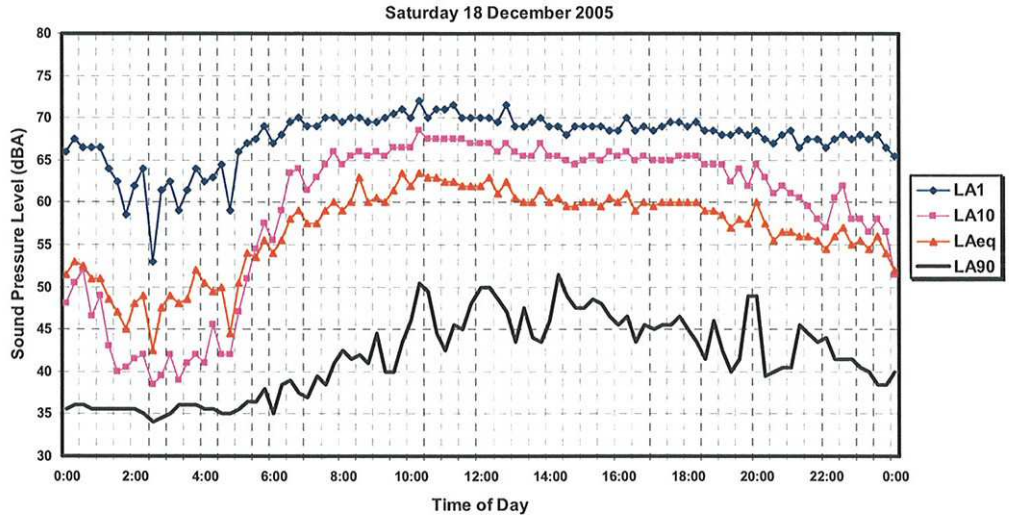



*Figure A4. Road Traffic Noise Levels Saturday 18 December 2005.*

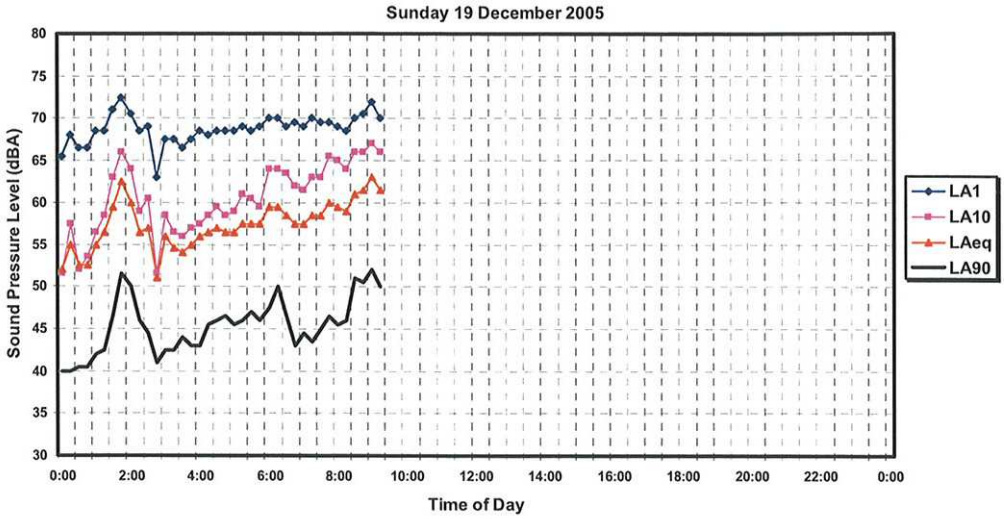



***Figure A5. Road Traffic Noise Levels Sunday 19 December 2005.***

# Appendix 6

Noise and Sound Services - *Correspondence* – October 2009

# NOISE AND SOUND SERVICES

*Specialists in Noise and Vibration Assessments Control and Training*
**Spectrum House, 1, Elegans Avenue, St Ives, NSW 2075**
**Tel: (02) 9449 6499. Fax: (02) 9402 5849. Mob: 0411 648153**
**E-mail noiseandsound@optusnet.com.au**
**A Member Firm of the Association of Australian Acoustical Consultants**
**ABN : 7277 134 9599.**


**Date:** **23 October 2009**

Michelle Hollis
Luke & Company Pty Ltd
98 William St, Port Macquarie
PO Box 669 Port Macquarie NSW 2444

**Our Ref nss21433**

Michelle

**Re: Road Traffic Noise Study - Ocean Drive, Rainbow Beach North**

We carried out a study for the potential to construct 100 lots of single-storey homes along Ocean Drive, Rainbow Beach North in 2006. This was to assess the road traffic noise levels and advise on residential housing noise mitigation measures from external road traffic to accompany a development application to Hastings Council.

Our recommendations were: Earth mounds (bunds) to be constructed along the proposed site, 10 metres set back from the roadway, to act as acoustic barriers. These earth mounds can be landscaped with grass, shrubs and trees to improve the visual aesthetics. An alternative to complete earth mounds are complete concrete walls or timber lapped and capped fences. Walls constructed of two materials could also be considered e.g. a concrete wall or wooden fence constructed above earth mounds to the required heights.

Access to the site should, where practicable, not provide direct line-of-sight between the road at Ocean Drive and any of the proposed residences at Rainbow Beach North. If this is unavoidable, the sound insulation of the proposed building façades (mainly the glazing) will need to be increased to meet the internal design goals based on the Australian Standard AS 2107 – 2000 *'Acoustic – Recommended Design Sound Levels and Reverberation Times for Building Interiors'* as given in Table 1 below.

**TABLE 1. RECOMMENDED DESIGN SOUND LEVEL FOR BUILDINGS. FROM AS 2107 (2000)**

| Type of Occupancy | Recommended Design Sound Level ($L_{Aeq,}$) dBA | |
|---|---|---|
| | Satisfactory | Maximum |
| ***Houses near Minor Roads*** | | |
| Living Areas | 30 | 40 |
| Sleeping Areas | 30 | 35 |
| Work Areas | 35 | 40 |
| Apartment Common Areas | 45 | 55 |
| ***Houses near Major Roads*** | | |
| Living Areas | 35 | 45 |
| Sleeping Areas | 30 | 40 |
| Work Areas | 35 | 45 |
| Apartment Common Areas | 45 | 55 |

Site specific road traffic noise goals ($L_{Aeq,\ 15\ minute}$) are set at 35 dBA for sleeping areas and 40 dBA for living areas.

To meet the internal design goals as given in Table 1 above, all building elements (mainly windows and glazed doors) will need to be assessed once the architectural design of the proposed residences to be constructed has been carried out.

Earth mound barrier, or alternatives as given in the recommendations above, should be constructed between the road at Ocean Drive and the propose residences at Rainbow Beach North. To meet the NSW Environmental Criteria for Road Traffic Noise, for predicted traffic flows in the year 2020, the earth mound barrier should be 2.2 metres high if the current road surface (as of 2006) is maintained or 1.8 metres high if the road surface is replaced with a 'quiet' open grade asphalt surface. A summary of the acoustic barrier height recommendations are shown in Table 2 below.

**TABLE 2. SUMMARY OF ACOUSTIC BARRIER HEIGHT RECOMMENDATIONS.**

| Situation | Required Barrier Height (metres) | Predicted Noise Reduction (dB) |
|---|---|---|
| Existing Traffic Flows and Existing Road Surface | 1.8 | 6 |
| Existing Traffic Flows with Open Grade Asphalt Road Surface | 1.2 | 3 |
| Traffic flows for Year 2020 and Existing Road Surface | 2.2 | 9 |
| Traffic flows for Year 2020 with Open Grade Asphalt Road Surface | 1.8 | 6 |

We have been given a copy of the 2009 Concept Plan and understand that it is proposed that the entire length of the residential areas will be provided with a 10 metre buffer strip.

We have reviewed our previous work and are of the opinion that the recommendations in our 2006 report (reference nss20819 dated 27 March 2006) will apply to the entire length of the residential development adjacent to Ocean Drive provided single-storey homes are still proposed. Accordingly, our recommendations from the 2006 report may be extrapolated to apply to the 2009 Concept Plan residential area fronting Ocean Drive.

If you require any further information or wish to discuss any issues in greater detail please feel free to contact us.

Yours sincerely

*Ken Scannell*

Ken Scannell MSc MAAS MIOA
Partner and Senior Acoustical Consultant