





SHUTE HARBOUR

# **Road Traffic Noise Assessment**

Shute Harbour Marina Development Pty Ltd



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## SHUTE HARBOUR MARINA RESORT ROAD TRAFFIC NOISE ASSESSMENT

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### 1. INTRODUCTION

Cardno (Qld) Pty Ltd (Cardno) has been commissioned by Shute Harbour Marina Development Pty Ltd (the Proponent) to determine the potential noise impacts from road traffic noise associated with Proserpine-Shute Harbour Road on the proposed Shute Harbour Marina Resort (SHMR).

The Queensland Coordinator General has declared the SHMR a significant project which requires an Environmental Impact Statement (EIS) in accordance with Part 4 of the *State Development and Public Works Organisation Act 1971*. A Terms of Reference has been issued for the EIS. The EIS will form the basis of Local, State and Federal approvals for the project and environmental consultant Cardno has been appointed to co-ordinate and prepare the EIS.

Under Section 4.8 of the Terms of Reference, a noise report must be completed by a suitably qualified noise consultant to assess:

- road traffic noise at the proposed residential development; and
- off-site noise impacts from increased road transportation.

The Applicant proposes a tourism-orientated development at Shute Harbour encompassing:

- 117 individual residential allotments;
- managed resort accommodation;
- open parkland, boardwalk, marina and retail outlets; and
- 3 storey car park.

Proserpine-Shute Harbour Road is a State-controlled road, shown existing on Figure 1, which will be upgraded as part of the SHMR to that shown on Figure 2.

This report has been prepared to determine lots and/or precincts of the proposed SHMR that have the potential to be affected by noise and recommend appropriate methods for noise attenuation to meet the relevant acoustic quality objectives.

This acoustic assessment was undertaken in accordance with the Department of Main Roads (DMR) *Road Traffic Noise Management – Code of Practice* (Code of practice).



### 2. SITE DESCRIPTION

The SHMR site is situated on the Whitsunday Shire coastline, on Queensland's central coast. The project area is located 10km south-west of Airlie Beach, 35km north-east of the Bruce Highway and a 30 minute or 2 hour drive from the Proserpine and Mackay airports respectively.

The SHMR will be established on reclaimed land encompassing 45.2 hectares of lease land including seabed and land under a permit to occupy. The property description of lease land is Lot 2 on SP117389, Mount Rooper, Whitsunday Shire.

The SHMR site is bound by:

- Proserpine-Shute Harbour Road, a State-controlled Road, to the north, with land on the opposite side of the road forming the Conway National Park;
- an existing motel, residential dwelling and the Shute Harbour Quay Transit Terminal to the east;
- a marina salvage operation to the west; and
- the Great Barrier Reef Marine Park seaward of the landward boundary to the south.



### 3. ACOUSTIC ASSESSMENT METHODOLOGY

To determine the potential acoustic impacts on the proposed development, an assessment was undertaken comprising the following elements.

- 1. The plans of the proposed residential development were reviewed to determine the locations of potential noise sensitive receivers adjacent to the road.
- 2. A site visit was undertaken to determine the nature of the surrounding land uses, the nature of the noise sources at the site and to measure background Sound Pressure Levels ("SPL's") at the site.
- 3. A 48-hour minimum unattended SPL monitoring was undertaken at the site using a noise logger to determine the daytime and night time background SPL located 5 metres from the roadway of Proserpine-Shute Harbour Road.
- 4. The appropriate acoustic quality objectives were determined in accordance with the relevant Local Government Planning Scheme, Code of Practice and Australian Standards.
- Modelling of predicted future traffic noise at the site was undertaken using the Propagation of Environmental Noise Model Version 1.9.8 (PEN3d2000), developed by ASK Software Engineers Pty Ltd which is based on 'the Calculation of Road Traffic Noise (CORTN)' equation.

PEN3d2000 is capable of calculating sound pressure levels (SPLs) for receivers at a variety of heights from multiple noise sources while accounting for site specific environmental characteristics such as ground level contours and weather conditions.

This model was calibrated before use by running the model with current (2006) DMR Average Annual Daily Traffic (AADT) data for road section 851 Proserpine – Shute Harbour Road (presented in Appendix A) and the measured 2007 ambient SPLs at the site.

Predicted traffic volumes (development and background) were determined by Cardno Eppell Olsen (CEO) in their report accompanying the EIS and were based on a historical growth of approximately 3.5% over 10 years (refer to Appendix B for CEO data predictions). In comparison traffic counting was also undertaken by CEO and an AADT of 2178 with 11.9% heavy vehicles was recorded.

Using the traffic data and growth predictions, the design traffic volumes for a 10 year planning horizon were calculated from the expected date of occupancy, and the model was run using traffic data to predict future road traffic noise impacts on the proposed residential development. Traffic data used in the modelling program is presented in Table 1. The new road design has been modelled as per Drawing 7900/48/01-200.

The results of the modelling were assessed against the following guidelines:

- Code of Practice;
- Australian Standard AS/NZS 2107:2000 Acoustics Recommended Design Sound Levels and Reverberation Times for Building Interiors (AS 2107); and
- Australian Standard AS/NZS 3671:1989 Acoustics Road Traffic Noise Intrusion Building Siting and Construction (AS 3671).
- 6. Appropriate noise mitigation measures were discussed and recommended to limit impacts from road traffic if required.



#### Table 1 Traffic Data Parameters

Pre-Development				
Parameter	Value			
AADT (24 hours) (2006) Both directions	2671			
AADT (24 hours) (2007)	2764			
AADT (18 hours) (2007) Validation purposes	2593			
Validation Monitoring Height	1.35m			
Traffic Speed (2006)	60km/hr			
Contours	Existing			
Wind	< 5m/s			
Percentage heavy vehicles (2006)	10%			
Road Texture (pre and post development)	Impervious (Dense Graded Asphalt)			
Post Developme	nt			
AADT (24 hours) (2022)#	8010			
AADT (18 hours) (2022)	7866			
Percentage heavy vehicles (2022)	10%			
Traffic Speed (2022)	60km/hr			
Contours	Design			
Proserpine-Shute Harbour Road	Design			
Wind	5m/s			
Predictive Heights 1 <sup>st</sup> storey	1.8m			
Predictive Heights 2 <sup>nd</sup> storey	4.6m			
Predictive Heights 3 <sup>rd</sup> storey (hotel)	7.4m			
Predictive Heights 4 <sup>th</sup> storey	10.2m			
Predictive Heights 5 <sup>th</sup> storey	12.8m			
Benched out	Car park at 9m			
Receptors	All dwellings			
	Hotel facades and formal open space (including pool facilities)			
	Public open space including boardwalk and parklands			

# CEO (2008) Draft Traffic Impact Assessment. Brisbane.



### 4. ACOUSTIC QUALITY OBJECTIVES

### 4.1 External Acoustic Quality Objective

The acoustic quality objective for dwellings adjacent to Proserpine-Shute Harbour Road which is a State controlled road is specified in the Code of Practice and detailed in Table 2.

#### Table 2 Acoustic Quality Objectives for Dwellings

Night Time Background Sound Pressure Level (dB(A), L <sub>A90,8hour</sub> )	Free Field Acoustic Criteria (dB(A), L <sub>A10,18hour</sub> )	
>40 dB(A)	60	
<40dB(A)	57	

The results of background sound level monitoring (presented in Section 5) indicate that the  $L_{A90,8hour}$  SPL is consistently below 40 dB(A) and therefore the applicable external acoustic quality objective for SPL  $L_{A10,18hour}$  for new residential development adjacent to Proserpine-Shute Harbour Road is 57dB(A) (or 60 dB(A) when façade corrected).

Further, the acoustic quality objectives for any proposed balconies and formal external open areas are as stated below in Table 3.

#### Table 3 Balconies and Formal Open Space Acoustic Quality Objectives

Night Time Background Sound Pressure Level (L <sub>A90,18hour</sub> )	Free Field Acoustic Criteria (dB(A), L <sub>A10,18hour</sub> )	
> or = 45 dB(A)	60	
< or = 45dB(A)	57	

The  $L_{A90,18hour}$  SPL measured for the time period specified above was determined to be slightly above 45 dB(A) and therefore the applicable balcony and formal open space acoustic quality objective is 60dB(A) (or 63 dB(A) when façade corrected).

Where the above external criteria for residential developments adjacent to state controlled roads cannot be met, DMR require the internal maximum design criterion levels are complied with.

### 4.2 Acoustic Quality Objective for Recreational Areas

The acoustic quality objective for recreational areas, in this case boardwalks and parks, that are part of residential developments in accordance with the Code of Practice is 63 dB(A)  $L_{10 (12hour)}$  or less.



### 4.3 Internal Acoustic Quality Objective

Internal maximum design criterion levels are specified in Table 1 of AS 2107, of which the relevant criteria is presented in Table 4.

Type of Activity	Maximum Recommended design sound level, L <sub>Aeq</sub> , dB(A)
Dwellings	
Living and Work Areas	45
Sleeping Areas	40
Hotel	
Recreation Areas	50
Sleeping Areas	40
Washrooms and toilets	55

### Table 4 AS 2107 Internal Design Sound Levels

To prevent sleep disturbance occurring the Users Guide to the *Environmental Protection* (*Noise*) *Policy* 1997 cites a maximum frequency of 10 to 15 traffic noise events per night between L<sub>Amax</sub> 45-50 dB(A). The applicable limit is dependant upon the ambient acoustic environment with a higher level being more appropriate in areas of higher ambient noise levels. The Noise Area Categories as applied in AS1055.2-1997 Acoustics – Description and measurement of environmental noise, Part 2: Application to specific situations (AS 1055.2) are applicable in determining areas of higher ambient noise.

Where the ambient noise levels during the night period are within the range of R1 - R3 areas described in AS 1055.2, it is appropriate to use 45 dB(A) as the sleep disturbance limit that should not be regularly exceeded. The ambient noise level from background monitoring at night (when people are likely sleeping) is consistently below 40 dB(A), characterising the area as R3; an area with medium density transportation or some commerce or industry.

To ensure that no noticeable deterioration in noise levels occurs as a result of the development and in order to comply with AS 2107 and prevent sleep disturbance, the internal acoustic quality objective adopted for this assessment is 40 dB(A)  $L_{Aeq,T}$ .



### 5. BACKGROUND MONITORING RESULTS

Background noise levels for the site were monitored for a minimum 48-hour period (unattended) from 24 August to 29 August 2007 to determine daytime and night-time background SPLs. The SPLs were measured with a calibrated Rion NL-14 Sound Level Meter, the location of which is as illustrated on Figure 1. The sound level meter was positioned directly adjacent to the Proserpine-Shute Harbour Road at approximately 5m from the road carriageway, at a location 1.35m above ground level, within sparse roadside vegetation. Photos of the monitoring location in relation to the development and noise source are presented in Appendix C.

The measured noise levels over the monitoring period are averaged below in Table 5 with a graphical illustration presented in Appendix D. The climatic conditions at the time of monitoring were fine sunny days, with variable winds up to 25 knots but generally between 10-15 knots. From local observations weather conditions were representative of the month.

To determine daytime and night-time existing noise levels, the daytime period was taken as 6am - 12pm and night-time was taken as 10pm - 6am. As can be expected, the daytime SPL averages are greater than those of the night-time averages. A difference noted between the daytime L<sub>A10</sub> and night-time L<sub>A90</sub> value was 24.3 dB(A). The average maximum daytime and night time L<sub>Aeq,T</sub> values are exceedingly high when compared to the L<sub>A10(18hour)</sub> SPL as a result of the heavy vehicle traffic dominating road traffic noise early morning between 4am and 7am. During this time heavy vehicles travel to the Shute Harbour Transfit Facility to be transferred to and from developed and developing Whitsunday Islands (for example, Hamilton Island). This timeframe also includes waste transfer vehicles carting waste from Hamilton Island, for example, to mainland landfill.

Road Traffic Noise Descriptor	Time Period	SPL, dB(A)
L <sub>A10,18hr</sub>	6:00am to 12:00pm	62.4
L <sub>A90,8hr</sub>	10:00pm to 6:00am	38.1
L <sub>A90,18hr</sub>	6:00am to 12:00pm	41.3
L <sub>A10,12hr</sub>	6.00am to 10.00pm	67.9
Average Maximum L <sub>Aeq,1hr</sub> (Night time)	10:00pm to 6:00am	62.8
Average Maximum L <sub>Aeq,1hr</sub> (Day time)	6:00am to 10:00pm	68.4

#### Table 5 Results of Background Monitoring

The background SPL  $L_{A10,18hr}$  for the development is presented as free field measurement. A 2.5 dB(A) adjustment to the background noise source is required to enable comparison with the acoustic quality objectives, which are façade adjusted taking into account building reflection. The adjusted SPL  $L_{A10,18hr}$  for the SHMR is 64.9 dB(A).

Noise monitoring in 2004 was previously undertaken and reported by Connell Wagner (2004) in the original EIS for the proposed site. The noise monitoring results in the year 2007 are significantly higher than noise levels measured in August 2004 as a result of increased traffic and island development.

The noise monitoring results indicate that road traffic noise is the most significant source of noise with relatively consistent noise levels across the week and weekend, and short term peaks during the day, especially on week days. On the weekend, road traffic noise is caused by recreational boaters and tourists accessing Shute Harbour facilities, including the public boat ramp and the Shute Harbour Transit Facility, the latter which offers



sightseeing tours. Shute Harbour has become the leading gateway to the Whitsunday Islands.

An assessment of road traffic has been undertaken by CEO (the final report attached as Appendix K1 of the EIS) and of boat movements by Thompson Clark Shipping Pty Ltd (refer to Appendix K2 of the EIS).

As road traffic noise was identified as the major contributor to noise levels hand-held noise monitoring was undertaken to determine the SPL for each vehicle type at the development site (in the absence of other noise sources) on 2 August 2007. The results of monitoring noise levels from particular vehicles was undertaken which are presented in Table 6.

# Table 6Sound Pressure Levels for Vehicle Types Travelling Proserpine-Shute<br/>Harbour Road

Vahiala	Sound Pressure Level in dB(A)			
venicie	L <sub>Aeq</sub>	L <sub>Amax</sub>	L <sub>A10</sub>	L <sub>A90</sub>
Heavy Vehicle (truck) similar to that proposed for construction purposes	77	87	82	60
Bus (public transport)	78	89	83	56
Moped (tourist motorbike)	65	75	70	52
Car (family transport)	62	70	68	53
Van	65	72	70	55
Car and boat trailer	66	73	72	58
Toyota Land cruiser	68	78	73	48
Fire-engine	71	82	75	60
Jeep 4WD	63	70	69	54

Heavy vehicles similar to that constituting early morning week-day traffic had high noise emissions, with buses which operate numerously on weekends to convey tourists to Shute Harbour Transit Facility, having the highest noise emissions.



### 6. MODELLING RESULTS

### 6.1 Validation Modelling

Modelling of predicted future traffic noise at the site was undertaken using PEN3d2000. This model was calibrated before use by running the model with current traffic data and the measured SPL's at the site.

It was determined that the model accurately predicted the actual SPL at the monitoring location with validation modelling resulting in a 65.3 dB(A) SPL  $L_{A10,18hour}$  which is less than the allowable 2 dB(A) deviation, specified in the Code of practice, from the measured 64.9 dB(A) SPL  $L_{A10,18hour}$  (façade adjusted). Existing contours and road design and alignment were used to validate the model.

Modelling was then carried out with the traffic count data adopted for the year 2022 (development plus background traffic volumes) to determine the SPLs over the site for the ground and first floors of future dwellings on the 117 individual lots and all five floors of the proposed hotel. Design contours with the proposed changes to Proserpine-Shute Harbour Road alignment and surface level were used to predict noise levels.

Taking into account an assumed slab depth of 0.3 metres, receiver heights have been assumed to be 1.8 metres above finished ground contour levels representing the ground floor and 4.6 metres above the finished ground contour levels representing the first floor of future dwellings.

Floor levels for the proposed hotel have been assessed at 1.8m, 4.6m, 7.4m, 10.2m and 12.8m. The building height of the hotel is approximately 15m tall.

It is relevant to note that noise levels have been predicted with the 3 story car park (representing 9 metres) built into the model as an impervious barrier.

### 6.2 External Acoustic Quality Objective

### 6.2.1 Future Residential Dwellings

The results of the point receiver modelling of the individual residential lots are presented in Appendix E with receptor locations as shown in Figure 2. Table 7 below highlights the potential dwellings locations which exceed the external acoustic quality objective at various future floor levels.

The façade corrected  $L_{A10,18hour}$  SPL contours are shown on Figure 3. The 60 dB(A) façade corrected  $L_{A10(18hour)}$  SPL contour represents the minimum required external acoustic quality objective of any habitable floors of dwellings over the site.

Receptors where excessive noise levels are predicted in the year 2022 are located on individual allotments in close proximity to the Proserpine-Shute Harbour Road. The hotel accommodation on the fifth floor also recorded noise levels exceeding the relevant criterion with the other floors of the hotel precinct being adequately protected from road traffic noise by an impervious three storey car park.

The predicted sound contours for the first, second and fifth floor levels have been presented graphically in Figure 3 from the 50 dB(A)sound contour upwards.



## Table 7 Predicted SPL L<sub>A10(18hour</sub>) for 2022 for New Residential Development where the External Acoustic Quality Objective is Exceeded

Receptor	Receptor Heights above Finished Ground Levels				
Description	1.8m	4.6m	7.4m	10.2m	12.8m
R74		60.5			
R75	60.1	61.4			
R76	60.9	62.4			
R77	61.5	62.8			
R78	60.1	61.3			
R79		60.3			
R81		60.8			
R82	60.9	62.1			
R83	62.3	63.6			
R84	61.5	62.8			
R85		60.8			
R91	60.2	61.5			
R92	61.6	63.0			
R93	60.2	61.8			
R94		61.0			
R95		60.2			
R103		60.3			
R104		61.5			
R105	60.2	62.1			
R106		60.8			
H4				60.1	60.8

Given the locality of the development proposal and the requirement to maintain visual amenity on Proserpine-Shute Harbour Road across the development site and Whitsunday Islands, no noise barrier is recommended. Where external acoustic quality exceeds the relevant objective, the internal acoustic quality objective has been adopted.

With regard to balconies and formal open space (including recreational areas associated with hotel operations, for example pool facilities), no predictions exceed the acoustic quality objective of SPL  $L_{A10(18hour)}$  of 63 dB(A) façade adjusted. In addition, these areas will likely be located on the dwelling façade facing seaward, the opposite facade from the noise source.

### 6.2.2 Recreational Areas

Formal outdoor recreational area associated with the development includes public parkland on the western isthmus and marina boardwalk. Predicted noise levels have been propagated by PEN3d2000 as shown in Table 8.

To enable comparison with the relevant criterion, a 5.5 dB(A) correction factor must be applied to SPL  $L_{A10(18 \text{ hour})}$ . This adjustment is the difference between the averaged SPL  $L_{A10(18 \text{ hour})}$  and averaged SPL  $L_{A10(12 \text{ hour})}$  recorded in background ambient noise monitoring. This factor is applicable given the validation monitoring.

Even with a correction of 5.5 dB(A), the marina boardwalk and open space parkland complies with the acoustic quality objective of 63 dB(A)  $L_{A10(12 \text{ hour}).}$ 



Receptor Descriptions	SPL L <sub>A10(18hour)</sub> dB(A)
B1	44.8
B2	45.8
B3	47.2
B4	49.0
B5	52.8
B6	54.2
B7	53.1
B8	51.9
B9	50.6
B10	51.2
H1	54.3
H3	56.2
P1	45.4
P2	47.1
P3	49.5
P4	51.7
P5	55.3

#### Table 8 Predicted SPL L<sub>A10(18hour)</sub> for 2022 for Formal Outdoor Recreational Areas

### 6.3 Internal Acoustic Quality Objective

As discussed in Section 4 of this report the internal acoustic quality objective for habitable areas of new residential developments is 40 dB(A)  $L_{Aeq,T}$ .

To determine internal noise levels at night (at the time of sleeping), modelling output as SPL  $L_{A10(18hr)}$  must be converted to  $L_{Aeq(T)}$  to allow for comparison with the equivalent continuous noise level over time. The actual relationship between SPL  $L_{A10(18hr)}$  and  $L_{Aeq(T)}$  has been determined as  $L_{A10(18hr)} + 0.4$ . The suggested rule of thumb is  $L_{A10(18hr)} - 3$  as noted in Section 2.2.2 of AS 3671. The relationship between each noise parameter is significantly influenced by heavy vehicle traffic in the early hours of the morning before 6.00am.

The traffic noise reduction (TNR)  $L_{Aeq,T}$  required for dwelling levels where the external acoustic quality objective is exceeded to achieve an acceptable internal noise level is presented in Table 9.

Receptor	Traffic Noise Reduction in dB(A)		
Description	1.8m	4.6m	
R74	0	20.9	
R75	20.5	21.8	
R76	21.3	22.8	
R77	21.9	23.2	
R78	20.5	21.6	
R79	0	20.7	
R81	0	21.2	

#### Table 9 Traffic Noise Reduction Required at New Multi-storey Dwellings



Receptor	Traffic Noise dB	Reduction in (A)
Description	1.8m	4.6m
R82	21.3	22.5
R83	22.7	24.0
R84	21.9	23.2
R85	0	21.2
R90	0	20.6
R91	20.6	21.9
R92	22.0	23.4
R93	20.6	22.2
R94	0	20.4
R95	0	20.6
R103	0	20.7
R104	0	21.9
R105	20.6	22.5
R106	0	21.2

The TNR can be achieved using noise attenuation measures in the dwelling design and construction.

According to AS 3671, construction category 2 should be applied to external walls of lots directly adjacent and facing Proserpine-Shute Harbour Road to ensure suitable building materials are utilised to mitigate noise intrusion to meet the internal acoustic quality objectives where the TNR is not expected to exceed 25 dB(A).

Construction category 2 is defined as "standard construction, except for lightweight elements such as fibrous cement or metal cladding or all glass facades. Windows doors and other openings must be closed. A TNR of approximately 25 dB(A) is expected".

Construction category 2 requires that areas of dwellings having an external wall directly facing Shute Harbour Road must be installed with alternative ventilation measures, commonly air conditioning. In addition the number and size of windows on the most exposed façade of the dwelling to the noise source should be minimised as far as practicable.

The buildings located beyond front line residential development to Proserpine-Shute Harbour Road shall be protected from excessive noise emissions through building reflection. The predicted noise levels are green field measurements. The approximate reduction afforded by a built-up subdivision, due to housing and fencing is 6 dB(A) which would ensure the external acoustic quality objective is achieved on lots 74-75, 78-79, 81-82, 85, 90-91, 94-95, 103 and 106.

Figure 6 illustrates the lots within the residential precinct where construction categories apply according to AS 3671.

The assurance of specific construction categories used on buildings facades located on lots 76-77, 83-84, 92-93, 104-105 can be achieved with a registrable covenant. It is proposed that the following covenant is imposed on lots highlighted on Figure 6 stating the following.

"The predicted long term traffic noise levels are expected to cause environmental nuisance. To minimise intrusion of traffic noise into dwellings, areas having an external facade directly exposed to traffic noise on Proserpine-Shute Harbour



Road should be designed to Category 2 construction standards as defined in Australian Standard 3671-1989".

Note: all proposed covenanted lots are Residential Type A defined as a dwelling with single or multiple floors that is acoustically attenuated through architectural design.



### 7. HAULAGE ROUTES

The SHMR will involve trucks transporting construction material from various points within the Whitsunday Region along Proserpine-Shute Harbour Road to the development site. This road passes through the township of Airlie Beach where existing sensitive places occur (including both residential and commercial development).

The impact of increased heavy vehicles on existing sensitive places along Shute Harbour Road has been assessed qualitatively in a site inspection on 2 August 2007. Impacts on sensitive places are expected within 30 metres from the road centreline as discussed in personal communication with DMR representative Peter April dated 16 July 2007, an outcome from responding to complaints related to the Port of Airlie development.

The impact of road traffic during the construction and operation of the development on existing sensitive places is extremely difficult to quantify considering existing traffic associated with the Port of Airlie development and general location and development traffic.

The SHMR will involve a significant number of traffic movements for the delivery of sheet piles, steel piles and sand imports and the total delivery numbers are estimated in Table 10. Movement of materials will be spread across the construction period with limited numbers in peak hours and it is not expected that deliveries will impact the external road network. Further details are provided in Appendix K1 to the EIS.

Туре	Quantity	Number of truck loads	Timeframe	Daily Vehicle Numbers
Sheet piles				
- Wall 6 – Ch 0 to Ch 700		85	6 months (Month 3 – 8)	1 truck
- Wall 6 – Ch 700 to end		100	6 months (Month 9 – 14)	1 truck
Blockwork Revetment Wall				
- Wall 1 – Ch 0 to Ch 600		65	6 months (Month 3 – 8)	1 truck
- Wall 1 – Ch 600 to end		70	6 months (Month 9 – 14)	1 truck
Imported Fill Material				
- Temporary Bund	100,000 m <sup>3</sup>	6,800	6 months (Month 3 – 8)	44 trucks
- Temporary Bund – Rock Facing	9,500 m <sup>3</sup>	790	6 months (Month 3 – 8)	5 trucks
- Wall 6 – Ch 0 to 700	50,000 m <sup>3</sup>	3,400	6 months (Month 3 – 8)	22 trucks
- Wall 6 – Ch 700 to end	50,000 m <sup>3</sup>	3,400	6 months	22 trucks

#### Table 10 Maximum Heavy Vehicle Total Deliveries, Timeframe and Frequency



Туре	Quantity	Number of truck loads	Timeframe	Daily Vehicle Numbers
			(Month 9 – 14)	
- Wall 3 – Rock Faced Bund - Fill	100,000 m <sup>3</sup>	6,800	6 months (Month 9 – 14)	44 trucks
- Wall 3 – Rock Faced Bund - <b>Rock</b>	5,500 m <sup>3</sup>	450	6 months (Month 9 – 14)	3 trucks
Breakwater			12 months (Month 12 – 23)	
Concrete Panel Structure				
- Steel piles		175	7 months	1 truck
- Concrete units		590	6 months	4 trucks
Concrete Box Option				
- Steel piles		145	6 months	1 truck
- Materials for Concrete boxes	12,000 m <sup>3</sup>	810	12 months	3 trucks
- Reinforcement for Concrete boxes	1,320 t	45	12 months	1 truck / week
- Gravel fill for Concrete boxes	17,500 m <sup>3</sup>	1,200	12 months	4 trucks

To ensure excessive emissions do not result from increased heavy vehicle movement associated with the construction of the SHMR, strategies for noise mitigation have been considered. Practical measures include haulage route selection and operating times. These strategies are consistent with verbal advice received from DMR.

By selecting particular routes of travel (where possible) for heavy vehicles through the Airlie townships, engine noise from excessive breaking and gear changing can be prevented. The proposed haulage route for construction vehicles is shown on Figure 6. This route avoids entering the town centre of Airlie Beach where sensitive places, including commercial holdings, are directly adjacent to the road and passes existing residential dwellings with sufficient setback distances. It is understood this route is an approved throughfare for heavy vehicles associated with the construction of the Port of Airlie development and therefore the SHMR will not be introducing new noise emissions.

In addition general annoyance from vehicular noise can be reduced by restricting passage time to between 6.30am to 6.30pm Monday to Saturday. When works are required to be undertaken over 24 hours 7 days a week, for example capital dredging works and land reclamation, the number of trucks accessing the site shall be restricted. In this sense where clean sand resources are required from existing quarries in the region, deliveries shall be prioritised for arrival during approved construction times as nominated above.

In addition there is a Vehicle Standard (Australian Design Rule 83/00 - External Noise) 2005 (ADR 83/00) under the *Motor Vehicle Standards Act 1989*, with noise limits specified for vehicle type. In Queensland, the *Environmental Protection (Noise) Policy 1997* for main roads plans for noise emissions to an acceptable upper limit of 68 dB(A) L<sub>A10</sub> over 18 hours and a single event maximum SPL of 80dB(A).



Impacts from heavy vehicles during marina operation have been assessed for new residential dwellings associated with the SHMR with predicted results based on no change to the existing percentage of heavy vehicles on Proserpine-Shute Harbour Road (i.e. 10%).



### 8. CONCLUSIONS AND RECOMMENDATIONS

The Proponent proposes to develop mixed use precincts, including residential housing and managed resort accommodation, on a site where road traffic noise impacts from Proserpine-Shute Harbour Road, a state-controlled road, are possible.

The results of this road traffic noise assessment indicate that the external acoustic quality objective will be met at the façade of the majority of floors of dwellings associated with the development proposal, however is exceeded on the ground and first floors of lots directly facing Proserpine-Shute Harbour Road. Traffic noise attenuation is required to achieve internal acoustic quality objectives for both the ground floor and first floors of lots 76-77, 83-84, 92-93 and 105, and the first floor of lot 104.

No exceedences of noise criterion for recreational areas and formal open space (balconies) are predicted in the year 2022.

The traffic noise reduction required to meet the internal acoustic quality objective can be met with a covenant for those lots directly backing onto Proserpine-Shute Harbour Road.

Impacts from increased construction traffic have also been considered with haulage routes and operating times proposed to minimise and/or avoid environmental nuisance from construction traffic noise, in addition to commonwealth legislation for vehicle standards.



## FIGURES

- Figure 1 Monitoring Location
- Figure 2 Development Layout and Receptor Locations

Figure 3 SPL L<sub>A10(18hours)</sub> Sound Contours for Ground and First Floors of Residential Development and Public Open Space

- Figure 4 SPL L<sub>A10(18hours)</sub> Sound Contours for the 5th Floor of Future Residential (Hotel)
- Figure 5 Covenant Plan
- Figure 6 Haulage Route



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Rev: Orig. Date: 17 July 2008

Sute Harbour Marina Development Pty Ltd (AD FILE: I-V1800-41VA(AD)Road Traffic Noise Assessment/Figure 1 - Monitoring Location.dwg XREF's: Master Plan 11-21-07; X-EX CONTS COMBINDED with detention basin conts

### Scale 1:3500 (A3) FIGURE 1 **MONITORING LOCATION**

Project No.: 7800/41 PRINT DATE: 17 July, 2008 - 4:15pm



Sute Harbour Marina Development Pty Ltd (AD FILE: 1/7800-4114CAD/Road Traffic Noise Assessment/Figure 2 -Development layout and Receptor locations\_v3.dwg XREF's: Master Plan July 2008



PRINT DATE: 17 July, 2008 - 4:16pm





SPL LAIGITATION SOUND CONTOURS FOR GROUND AND FIRST FLOORS OF RESIDENTIAL DEVELOPMENT, AND PUBLIC OPEN SPACE

Sute Harbour Marina Development Pty Ltd (AD FILE: I\7800-41\ACAD\Road Traffic Noise Assessment\Figure 3 - Sound contours GF and FF\_v3.dwg XREF's: Master Plan July 2008

Project No: 7800/41 PRINT DATE: 17 July, 2008 - 4:18pm

FIGURE 3





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#### Rev: v.2 Date: 17 July 2008

Shute Harbour Marina Development Pty Ltd CAD FILE: 1\7800-41\ACADRoad Traffic Noise Assessment\Figure 4 - Sound contours 5th floor\_v3.dwg XREF's: Master Plan July 2008

Scale 1:2,500 (A4) FIGURE 4 SPL LA10(18hours) SOUND CONTOURS FOR THE 5th FLOOR OF FUTURE RESIDENTIAL (HOTEL)

 Project No.:
 7800/41

 PRINT DATE:
 17 July,
 2008 - 4:19pm



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Rev: v.2 Date: 17 July 2008

Shute Harbour Marina Development Pty Ltd (AD FILE: IN/380-411ACAD:Road Traffic Noise Assessment/Figure 5 - Covenant Plan\_v3.dwg XREF's: Master Plan July 2008

![](_page_26_Picture_9.jpeg)

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![](_page_27_Figure_1.jpeg)

Haulage Route

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Rev: Orig. Date: 17 July 2008

Shute Harbour Marina Development Pty Ltd (AD FILE: H/880-41\ACAD\Road Traffic Noise Assessment\Figure 6 - Haulage Route.dwg XREF's: Master Plan July 2008

![](_page_27_Picture_7.jpeg)

![](_page_27_Figure_8.jpeg)

PRINT DATE: 17 July, 2008 - 4:20pm

![](_page_28_Picture_1.jpeg)

## **APPENDIX A**

**DMR AADT Segment Report** 

![](_page_29_Picture_0.jpeg)

### Traffic Analysis and Reporting System AADT SEGMENTS REPORT

District 8 MACKAY DISTRICT
Road Section 851 PROSERPINE - SHUTE HARBOUR ROAD
Year 2006
TDist         26.67         33.64         Status         C
Direction All Directions
Through DistanceSite26.670 -33.64082848 West of Shute Harbour Airport
% per Vehicle Class
Gaz Light Heavy Short Truck Articulated Road % Growth Dir AADT Vehicle Vehicle Vehicle or Bus Vehicle Train 1 Yr 5 Yr 10 Yr
G 1,286 89.89 10.11 89.89 8.49 1.53 .09 -3.16 .54 1.91
A         1,385         89.89         10.11         89.89         8.45         1.59         .07         7.78         2.53         2.49
B         2,671         89.88         10.12         89.88         8.48         1.57         .07         2.22         1.55         2.20

\* These values were updated manually or derived from previous years growth figures.

![](_page_30_Picture_1.jpeg)

## **APPENDIX B**

**Cardno Eppell Olsen Predicted Development Volumes** 

#### CE005668 Shute Harbour Marina

Cardno Eppell Olsen PO Box 388 Toowong QLD 4066 Phone 07 3310 2401 Fax 07 3369 9722

![](_page_31_Picture_2.jpeg)

#### **Generation Rates**

Туре	•	Yield	Daily Gen	eration Rate	Peak Hour G	eneration Rate	Source
Single lot dwellings	61	dwellings	6 vpd	per dwelling	0.6 vph	per dwelling	TAG medium density
1 bedroom	42	units	4 vpd	per unit	0.4 vph	per unit	TAG high density
2 bedroom	88	units	4 vpd	per unit	0.4 vph	per unit	TAG high density
3 bedroom	128	units	4 vpd	per unit	0.4 vph	per unit	TAG high density
Commercial	991	sq m GFA	10 vpd	per 100 sq m GFA	3.4 vph	per 100 sq m GFA	TAG
Retail	595	sq m GFA	120 vpd	per 100 sq m GFA	12.0 vph	per 100 sq m GFA	RTA
Restaurant	396	sq m GFA	60 vpd	per 100 sq m GFA	5.0 vph	per 100 sq m GFA	TAG
Marina Berths	733	berths	1 vpd	per berth	0.1 vph	per berth	CEO previous work

#### Traffic Generation

				Peak Hour
Туре		Yield	Daily Generation	Generation
Single lot dwellings	61	dwellings	366	37
1 bedroom	42	units	168	17
2 bedroom	88	units	352	35
3 bedroom	128	units	512	51
Commercial	991	sq m GFA	99	34
Retail	595	sq m GFA	714	71
Restaurant	396	sq m GFA	238	20
Marina Berths	733	berths	733	73
TOTAL			3,182	338

### CE005668 Shute Harbour Marina Cardno Eppell Olsen PO Box 388 Toowong QLD 4066 Phone 07 3310 2401 Fax 07 3369 9722

![](_page_32_Picture_1.jpeg)

#### **Residential Traffic**

![](_page_32_Figure_3.jpeg)

![](_page_32_Figure_4.jpeg)

10	AM Peak	
(10)	PM Peak	

10

(10)

AM Peak

**PM Peak** 

#### Retail & Restaurant

No Trips

![](_page_32_Figure_8.jpeg)

#### Total Development Traffic (Operation)

![](_page_32_Figure_10.jpeg)

![](_page_33_Figure_0.jpeg)

Site Access

#### **Total Construction Traffic**

![](_page_33_Figure_3.jpeg)

10	AM Peak	
(10)	PM Peak	

![](_page_33_Picture_5.jpeg)

Cardno Eppell Olsen PO Box 388 Toowong QLD 4066 Phone 07 3310 2401 Fax 07 3369 9722

![](_page_34_Picture_1.jpeg)

#### AM Peak hour (05:45 - 06:45am)

Date	Time	Eastbound	Westbound	Total
30/08/2007	5:45:00 AM	50	2	52
30/08/2007	6:00:00 AM	98	3	101
30/08/2007	6:15:00 AM	55	11	66
30/08/2007	6:30:00 AM	25	9	34
TOTAL		228	25	253

#### PM Peak hour (04:30 - 05:45pm)

Date	Time	Eastbound	Westbound	Total
30/08/2007	4:30:00 PM	24	12	36
30/08/2007	4:45:00 PM	21	56	77
30/08/2007	5:00:00 PM	26	147	173
30/08/2007	5:15:00 PM	12	86	98
TOTAL		83	301	384

### CE005668 Shute Harbour Marina Cardno Eppell Olsen PO Box 388 Toowong QLD 4066 Phone 07 3310 2401 Fax 07 3369 9722

![](_page_35_Picture_2.jpeg)

![](_page_35_Figure_3.jpeg)

![](_page_35_Figure_4.jpeg)

![](_page_35_Figure_5.jpeg)

![](_page_35_Figure_6.jpeg)

![](_page_35_Figure_7.jpeg)

#### 2012 Background Traffic

Growth Rate 3.5%

![](_page_35_Figure_10.jpeg)

#### 2022 Background Traffic

3.5%

Growth Rate

![](_page_35_Figure_13.jpeg)

10	AM Peak	
(10)	PM Peak	

10	AM Peak	
(10)	PM Peak	

10	AM Peak	
(10)	PM Peak	

10	AM Peak	
(10)	PM Peak	

![](_page_36_Picture_1.jpeg)

#### 2011 Background & Construction Traffic

![](_page_36_Figure_3.jpeg)

#### 2012 Background & Development Traffic

![](_page_36_Figure_5.jpeg)

#### 2022 Background & Development Traffic

![](_page_36_Figure_7.jpeg)

(10)	PM Peak	

AM Peak

AM Peak

PM Peak

10

(10)

10

10	AM Peak	
(10)	PM Peak	

![](_page_37_Picture_1.jpeg)

## **APPENDIX C**

**Photos of Monitoring Location** 

![](_page_38_Picture_1.jpeg)

![](_page_38_Picture_2.jpeg)

![](_page_38_Picture_3.jpeg)

![](_page_38_Picture_4.jpeg)

![](_page_39_Picture_1.jpeg)

## **APPENDIX D**

## **Graphical Representation of 2007 Ambient Noise Levels**

![](_page_40_Picture_1.jpeg)

![](_page_40_Figure_2.jpeg)

![](_page_41_Picture_1.jpeg)

## **APPENDIX E**

## Predicted SPL LA10(18 hour) for 2022 for New Dwellings

![](_page_42_Picture_1.jpeg)

Receptor	Receptor Heights above Finished Ground Levels				
Description	1.8m	4.6m	7.4m	10.2m	12.8m
R1	45.0	45.9			
R2	45.1	46.1			
R3	45.4	46.3			
R4	45.5	46.4			
R5	45.7	46.5			
R6	45.8	46.7			
R7	46.1	46.9			
R8	46.3	47.1			
R9	46.5	47.4			
R10	46.8	47.6			
R11	47.0	47.9			
R12	47.3	48.2			
R13	47.6	48.5			
R14	47.9	48.8			
R15	48.2	49.0			
R16	48.4	49.3			
R17	48.6	49.6			
R18	48.9	49.8			
R19	49.2	50.1			
R20	49.4	50.3			
R21	49.7	50.6			
R22	50.0	50.9			
R23	50.3	51.2			
R24	50.6	51.5			
R25	51.0	51.9			
R26	51.4	52.3			
R27	51.7	52.7			
R28	52.1	53.1			
R29	52.5	53.5			
R30	52.9	53.8			
R31	53.4	54.4			
R32	53.9	54.8			
R33	54.2	55.1			
R34	54.5	55.4			
R35	54.7	55.6			
R36	55.2	56.2			
R37	55.5	56.5			
K38	55.8	56.8			
K39	55.9	56.8			
R40	55.7	56.7			
R41	55.6	56.6			
R42	55.4	56.4			
R43	55.2	56.2			
R44	55.0	56.0			
R45	54.7	55.8			

![](_page_43_Picture_1.jpeg)

R46	54.5	55.6		
R47	54.3	55.3		
R48	54.2	55.3		
R49	54.2	55.3		
R50	54.1	55.3		
R51	54.0	55.2		
R52	54.0	55.2		
R53	54.1	55.3		
R54	54.2	55.4		
R55	54.4	55.5		
R56	54.0	55.3		
R57	53.9	55.2		
R58	53.8	55.1		
R59	53.8	55.0		
R60	53.7	54.9		
R61	53.7	54.9		
R62	53.6	54.9		
R63	53.6	54.9		
R64	53.6	54.9		
R65	53.6	54.9		
R66	53.6	54.9		
R67	53.2	54.5		
R68	55.5	56.4		
R69	56.0	56.9		
R70	56.6	57.6		
R71	57.1	58.1		
R72	57.5	58.6		
R73	58.5	59.5		
R74	59.5	60.5		
R75	60.1	61.4		
R76	60.9	62.4		
R77	61.5	62.8		
R78	60.1	61.3		
R79	59.2	60.3		
R80	58.1	59.2		
R81	59.6	60.8		
R82	60.9	62.1		
R83	62.3	63.6		
	61.5	62.8		
R85	59.6	60.8		
R86	58.4	59.6		
K87	57.2	58.4		
K88	56.6	58.0		
K89	57.6	59.0		
K90	58.8	60.2		
K91	60.2	61.5		
R92	61.6	63.0		

![](_page_44_Picture_1.jpeg)

R93	60.2	61.8			
R94	59.5	61.0			
R95	58.9	60.2			
R96	58.1	59.4			
R97	56.9	58.3			
R98	55.6	57.0			
R99	56.2	57.7			
R100	56.7	58.2			
R101	57.3	58.8			
R102	58.0	59.5			
R103	58.7	60.3			
R104	59.7	61.5			
R105	60.2	62.1			
R106	59.1	60.8			
R107	58.1	59.6			
R108	57.4	59.0			
R109	56.7	58.3			
R110	55.9	57.4			
R111	55.3	56.7			
R112	55.7	57.2			
R113	56.5	58.1			
R114	57.7	59.3			
R115	58.8	60.5			
R116	60.0	61.8			
R117	61.7	63.5			
H2	54.5	55.7	56.6	57.2	57.6
H4	56.5	58.1	59.4	60.1	60.8
H5	53.7	55.2	56.8	57.9	58.5
H6	47.7	49.8	52.2	56.2	57.6
H7	48.9	50.9	52.5	53.8	55.5
H8	51.1	53.0	54.4	55.6	57.2
H9	54.7	56.5	57.5	58.3	58.9