Appendix G

Noise Assessment

REPORT 20-1531R1
Revision 0

Aquaculture Project, Cudgen
Noise Assessment

Aquaculture Project, Cudgen

Prepared for

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Reference	Status	Date	Prepared	Checked	Authorised
Aquaculture Project, Cudgen	Revision 0	2 September 2004	Shane Elkin	Glenn Homes	Shane Elkin

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1 INTRODUCTION

Richard Heggie Associates Pty Ltd (Heggies) has been commissioned by David McPhee & Associates to assess operational and construction noise emissions from a proposed aquaculture project at Cudgen located adjacent to the Murwillumbah exit on the Pacific Highway at the nearest residential receivers. It is understood that this assessment will form part of the Development Application.

The assessment has been conducted in general accordance with the guidelines presented in the Department of Environment and Conservation (DEC), formerly the Environmental Protection Authority (EPA), Industrial Noise Policy and Environmental Noise Control Manual.

This report presents the results of the assessment study and an indication of the degree of impact on surrounding residences.

2 SITE DESCRIPTION AND ACOUSTICAL ENVIRONMENT

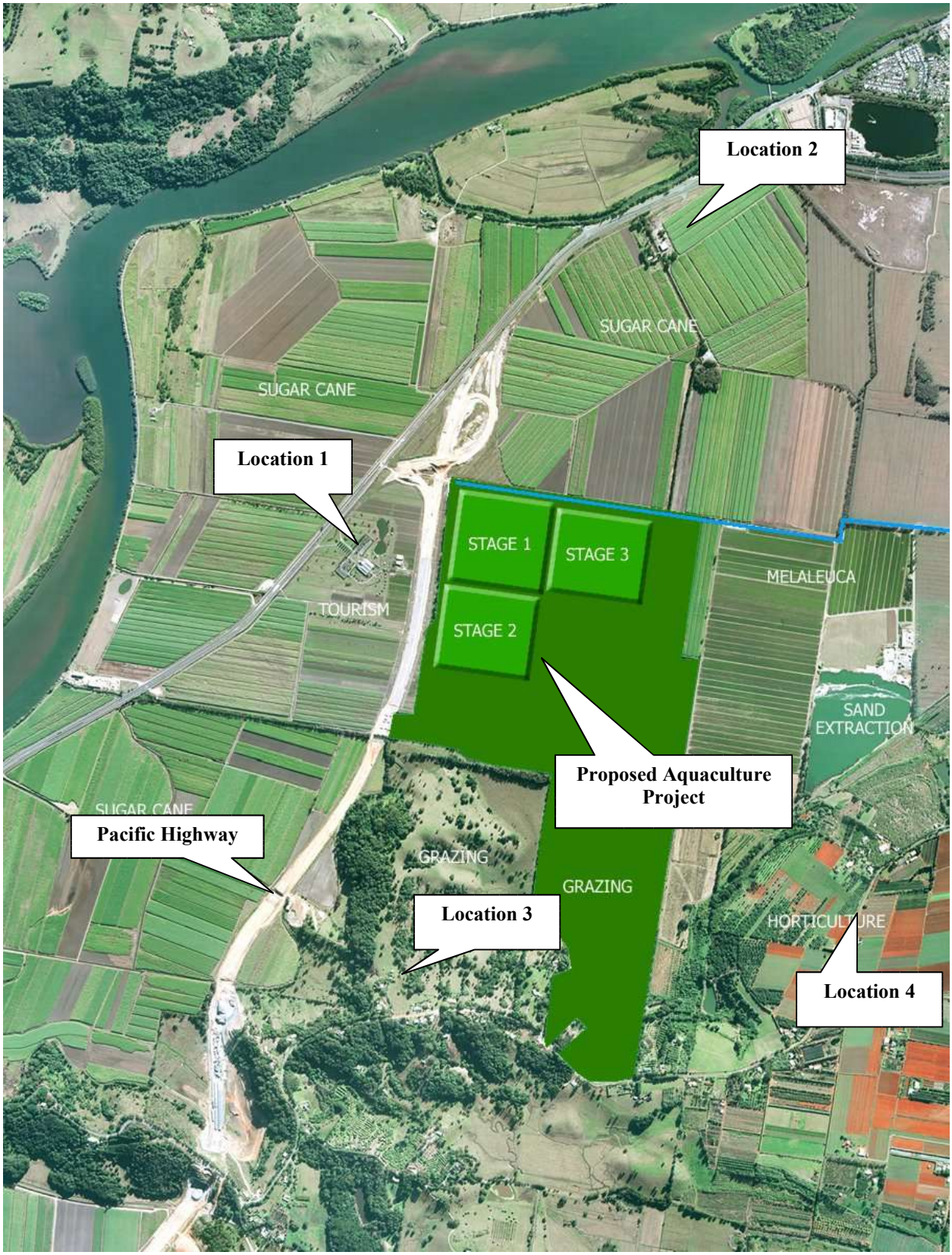
The proposed aquaculture project is located in a predominantly farming area.

Figure 1 contains an aerial photograph of the proposed site and surrounding noise sensitive locations. Based on this aerial photograph, the nearest noise sensitive locations are:

- Location 1 – Melaleuca Station (owner's residence) ~500 m
- Location 2 – Farmhouse ~1,260 m
- Location 3 – Residences (Cudgen Road) ~1,706 m
- Location 4 – Residences (Cudgen Road) ~1,780 m

The noise environment is typically rural with traffic noise from the Pacific Highway dominant at Locations 1 (particularly), 2 and 3 and audible at Location 4. During a night time visit, insects were also audible.

Figure 1 Aerial Photograph of the Proposed Site and Surrounding Noise Sensitive Locations



3 NOISE ASSESSMENT PROCEDURES

DEC's *Industrial Noise Policy* represents the New South Wales Government's guidelines and criteria in addressing the noise impacts of industry. It aims to balance the need for industrial activity with the desire for quiet within the community. The criteria selected are designed to protect at least 90 per cent of the population living in the vicinity of the industrial noise sources for at least 90 per cent of the time.

The *Industrial Noise Policy*'s objectives are:

a. to establish noise criteria that would protect the community from excessive noise;
b. to preserve the amenity for specific land uses;
c. to use the criteria for deriving project specific land uses;
d. to promote uniform methods to estimate and measure noise impacts, including a procedure for evaluating meteorological effects.

Implementation is achieved by ensuring:

a. that noise from any single source does not intrude greatly above the prevailing background noise level. This is known as the intrusive noise criteria;
b. the background noise level does not exceed the level appropriate for the particular locality and land use. This is known as the amenity criteria.

In order to satisfy the above two requirements, an Amenity and an Intrusive noise criterion is recommended of which the lower of the two applies.

3.1 Operational Intrusive Noise Criteria

The intrusive noise criterion sets a limit of 5 decibels (dB) for the equivalent continuous (energy – average) noise level or $L_{Aeq(15minute)}$ of the source (within any 15 minute period) above the background level. That is the $L_{Aeq(15minute)}$ from industrial sources should not exceed the L_{A90} background noise level by more than 5 dB.

Where the L_{A90} background noise level is less than 30 dBA, the INP recommends that it be taken as 30 dBA for assessment purposes.

3.2 Operational Amenity Goal

The amenity assessment is based upon the noise criteria specific to land use and associated activities, and is expressed as an L_{Aeq} over the specified time periods day, evening and night.

The amenity criteria are set out in full in Table 2.1 of the *NSW Industrial Noise Policy*. The relevant rural category criteria are reproduced in Table 1.

The limiting amenity noise criterion is that which occurs during the limiting night-time period and is 40 dBA.

Table 1 INP Recommended Amenity Criteria

Type of Receiver	Indicative Noise Amenity Area	Time of Day	ANL (L_{Aeq})
Residence	Suburban	Day	50
		Evening	45
		Night	40

3.3 Construction Noise Guidelines

When dealing with noise emanating from construction works, the NSW DEC (formerly EPA) recognises that higher levels of noise are likely to be tolerated by people in view of the relatively short duration of the works. As a result, the DEC's current guidelines for construction noise assessment are contained in its *"Environmental Noise Control Manual"* (ENCM).

Chapter 171-1 of the ENCM recommends the following approaches to mitigating adverse noise impacts from construction sites:

Noise Emission Objectives

The ENCM recommends that the $L_{A10(15minute)}$ noise levels arising from a construction site and measured within the curtilage of an occupied noise-sensitive premises (ie at boundary or within 30 m of dwelling, whichever is the lesser) should not exceed the levels indicated in Table 2. These noise goals are consistent with community reaction to construction noise.

Table 2 Recommended DEC Noise Goals for Construction Works

Period of Noise Exposure	$L_{A10(15minute)}$ Construction Noise Goal
Cumulative noise exposure period not exceeding 4 weeks	$L_{A90(15minute)}$ plus 20 dBA
Cumulative noise exposure period of between 4 weeks and 26 weeks	$L_{A90(15minute)}$ plus 10 dBA
Cumulative noise exposure period longer than 26 weeks	$L_{A90(15minute)}$ plus 5 dBA

Preferred Hours of Construction

The guidelines recommend confining permissible work times as outlined in Table 3.

Table 3 Preferred DEC Daytime Construction Hours

Day	Preferred Construction Hours
Monday to Friday	7.00 am to 6.00 pm
Saturdays	7.00 am to 1.00 pm (if inaudible at residences) Otherwise, 8.00 am to 1.00 pm.
Sundays or Public Holidays	No construction

Works Undertaken Outside of Preferred Construction Hours

Where it is necessary for construction works to be undertaken outside the preferred daytime construction hours, the condition normally applied is that:

- $L_{A10(15minute)}$ noise levels emitted by the works should not exceed the L_{A90} level during the relevant evening or night-time period by a margin of more than 5 dBA, *independent* of the duration of the construction activity.

Silencing

All practical measures should be used to silence construction equipment, particularly in instances where extended hours of operation are required.

3.4 Modifying Factors

A penalty of 5 dB is to be applied to the source level if the characteristic of the noise source is likely to increase annoyance. This includes noise of tonal, impulsive, intermittent or low frequency character.

3.4.1 Tonal Noise

Tonal noise is defined by the INP as containing a prominent frequency and characterised by a definite pitch. It is assessed in one-third octave bands or narrow band analysis.

Table 4 Modifying Factors - Tonal Noise

Level of one-third octave band exceeds the level of the adjacent bands on both sides by:	Centre Frequency	Penalty
5 dB	Above 400 Hz	5 dB
8 dB	160 to 400 Hz Inclusive	5 dB
15 dB	Below 160 Hz	5 dB

Taken from INP Table 4.1.

3.4.2 Low-frequency Noise

Low-frequency noise is defined as containing major components within the low frequency range (20 Hz to 250 Hz) of the frequency spectrum. C-weighted and A-weighted levels are measured over the same time period and modifying factor of 5 dB is to be applied if the difference between the two levels is 15 dB or more.

The INP states that only one 5 dB correction should be applied if the tone is in the low-frequency range, where a source emits tonal and low-frequency noise.

No impulsive, tonal or low-frequency noise is anticipated during operation of the aquaculture project therefore no modifying factors have been applied in this assessment.

3.5 Project Specific Noise Limits

No background noise measurements have been undertaken for this study. Therefore, the following background noise assumptions have been made:

- **Daytime (7am to 6pm) – 40 dBA L_{A90}**
  based on Noise Area Category "R1" – Areas with negligible transport – from Australian Standards 1055.3-1977 *Acoustics – Description and measurement of environmental noise.*
- **Night-time (6pm to 7am) – 30 dBA L_{A90}**
  based on the fact that 30 dBA is recommended as the minimum background noise level in the DEC's INP.

Particularly for Location 1, and to a lesser degree Locations 2 and 3, the above assumptions are considered conservative given the dominance of Pacific Highway traffic noise observed during the site visit.

Therefore, the project specific noise limits are:

Operational - **35 dBA L_{Aeq}** (based on night-time intrusive criterion of background +5 dBA)

Construction (daytime only)

- **60 dBA L_{A10}** – Earthworks (activities up to 4 weeks duration)

- **50 dBA L_{A10}** – Construction (activities up to 26 weeks duration)

4 NOISE SOURCES

4.1 Operational

Table 5 outlines the proposed plant for each stage (1, 2 & 3) of the aquaculture project as supplied by David McPhee and Associates. Table 5 also lists the sound pressure levels (again supplied by David McPhee and Associates) that have been used to assess operational noise levels in this study.

Table 5 Operation Equipment List

Item	Number	Sound Pressure Level @ 1 m (of each item)
Pumps	24	64 dBA
	24	55 dBA
Fans	60	62 dBA
Fans	20	65 dBA
Refrigeration Plant	1	70 dBA①

① *Assumes Refrigeration Plant is housed within the processing building constructed of tilt up concrete walls and metal roof*

An emergency diesel generator will also likely be located on-site. No acoustic data was supplied for this item of plant so a Sound Power Level (SWL) of 107 dBA was assumed based on Heggies in-house database. It should be noted that the emergency generator would only be operational during loss of electricity to the site which is hardly every anticipated.

4.2 Construction

Table 6 outlines the likely plant required during construction of each stage (1, 2 & 3) of the aquaculture project (as supplied by David McPhee and Associates). Table 6 also lists the sound power levels associated with such plant. These sound power levels are based on Heggies database and are considered typical for such equipment.

Table 6 Likely Construction Equipment

Plant Item	L_{Amax} Sound Power Level
Earthworks	
Dozer	110 dBA
Vibratory Roller	110 dBA
30t Excavator	110 dBA
Bobcat	100 dBA
Grader	110 dBA
Construction	
Forklift	98 dBA
Crane	105 dBA
Concrete Truck	111 dBA

Note: Under normal operation, LA10 noise levels are typically 5 dBA less than maximum noise levels for mobile construction equipment.

Heggies has been advised that 'earthworks' for each stage are likely to occur for 3 to 4 weeks with 'construction' to take up to six months (26 weeks) for each stage. Furthermore, earthworks/construction activities are only proposed during the day (7am to 6pm) period.

5 NOISE MODELLING METHODOLOGY

In order to calculate noise emission levels at the various noise sensitive receiver locations, a SoundPLAN (Version 6) environmental computer model was used. SoundPLAN is a software package which enables compilation of a sophisticated computer model comprising a digitised ground map (containing ground contours), the location and acoustic sound power levels of potentially critical noise sources on site and the location of receivers for assessment purposes.

The computer model can generate noise emission levels taking into account factors such as source sound power levels and locations, distance attenuation, ground absorption, air absorption, and shielding attenuation, as well as meteorological conditions, including wind effects.

The CONCAWE prediction methodology was utilised within SoundPLAN. The statistical accuracy of environmental noise predictions using CONCAWE was investigated by Marsh (Applied Acoustics 15 - 1982). Marsh concluded that CONCAWE was accurate to ±2 dB in any one octave band between 63 Hz and 4 kHz and ± 1 dBA overall.

The sound power levels documented in Table 5 (operational) and **Table 6** (construction) were utilised for these predictions. The predictions were undertaken by summing the sound power associated with all items of plant for each stage and locating them in the centre of the appropriate (Stage 1, 2 or 3) area shown in **Figure 1**. For conservatism, no shielding has been modelled for the light-weight buildings covering the aquaculture facility.

Both "neutral" and "worst case" noise predictions were conducted for both the operational and construction noise predictions. The worst case weather conditions modelled were:

- 10°C
- 90% Humidity
- Pasquill Stability Category F
- 2 m/s Wind Speed

It should also be noted that the sound power levels documented in Table 6 correspond to the maximum noise levels from the associated machinery. Experience has shown that the L_{10} noise levels with mobile construction machinery in operation are typically 5 dBA lower than the maximum levels. Therefore the SoundPLAN predictions undertaken for the construction phase of the project utilise sound power levels 5 dBA less than those shown in Table 6.

6 PREDICTIONS AND ASSESSMENT

6.1 Operational Noise

Table 7 documents the "neutral" and "worst case" noise predictions for the operational phase (Stages 1, 2 and 3) of the proposed aquaculture project. Table 7 also shows the applicable noise limits, as discussed in **Section 3** of this report and whether noise control measures will be required in order to achieve compliance with the appropriate limit.

Table 7 Operational Noise Predictions and Assessment

Location	Predicted Operational Noise Level dBA L_{Aeq}		Noise Limit	Noise Control Measures Required
	"Neutral" Weather Conditions	"Worst Case" Weather Conditions		
1	19	25	35	No
2	11	18	35	No
3	7	14	35	No
4	7	14	35	No

During operation of the emergency diesel generator, noise levels of 33 dBA (neutral weather) and 38 dBA (worst-case weather) are predited at Location 1. The predictions at the other three locations are all (neutral and worst-case) less than 30 dBA. This would result in a minor exceedance (3 dBA) of the night-time criterion at Location 1 under worst case conditions only. Given the conservative night-time background noise assumption of 30 dBA at Location 1, due to its close proximity to the Pacific Highway, and the very infrequent use of the generator, this minor exceedance is considered acceptable.

Heggies has also been advised that submersible pumps are the preferred option in the vicinity of the police station adjacent to the ocean for pumping fresh seawater to the proposed aquaculture facility. As these pumps are submersible, no noise impacts are anticipated. However, if submersible pumps are not feasible, above ground pumps in this area may need to be housed in a suitably designed building to ensure acceptable noise levels. Such a building may include besser block walls, concrete slab roof and silenced air intake/outlet vents if warranted following a more detailed assessment.

6.2 Construction Noise

Table 8 documents the "neutral" and "worst case" noise predictions for the two construction phases – earthworks and construction - of each stage of the proposed aquaculture project. As construction for the three stages are not expected to run concurrently, these predictions are valid throughout the construction phase of all three stages of the project. Table 8 also shows the applicable noise limits, as discussed in **Section 3** of this report and whether noise control measures will be required in order to achieve compliance with the appropriate limit.

Table 8 Construction Noise Predictions and Assessment

Location	Predicted Construction Noise Level dBA L_{10}		Noise Limit	Noise Control Measures Required
	"Neutral" Weather Conditions	"Worst Case" Weather Conditions		
Earthworks				
1	37	42	60	No
2	27	34	60	No
3	24	31	60	No
4	23	30	60	No
Construction				
1	33	38	50	No
2	23	30	50	No
3	20	27	50	No
4	19	26	50	No

As shown in **Tables 7** and **8**, no exceedances of the operational or construction noise limits are predicted at the neighbouring noise sensitive locations for Stage 1 of the proposed aquaculture project.

7 CONCLUSION

The level of noise emission from the proposed aquaculture project at Cudgen has been assessed based on the guidelines presented in the DEC's *NSW Industrial Noise Policy* and the *Environmental Noise Control Manual.*

Based on the investigations undertaken for this report it is concluded that:

b. No specific noise control measures are required for the operation of the aquaculture project based on the advice that the refrigeration plant will be located within the processing building.
c. No specific controls are required for the construction of Stages 1, 2 or 3 of the aquaculture project.