APPENDIX F
NOISE ASSESSMENT

1.1 Acoustic Environment

The noise environment in the urban residential area to the north and north-west of the port was assessed using unattended noise-monitoring for a nominal two week period. The monitoring was undertaken at 10 Swan Street and 392 Kiera Street Wollongong, between Thursday 6 May and Friday 21 May 2004 (inclusive). The noise-monitoring locations were selected as being representative of the wider residential area most likely to be influenced by the proposed dredging activities.

Observations when setting up the logger at each of the residential locations indicated that the area would be influenced from distant traffic as well as general industry noise from the Wollongong industrial area to the south. This is consistent with the relatively low differential between the daytime and night-time noise levels recorded by the noise logger at each location.

Analysis of the data from the noise loggers indicated that the measured background $L_{A90,15minute}$ noise levels at the two residential monitoring locations were very similar even though they are separated by a substantial distance. This is indicative of the influence from a distant source such as broader industrial noise.

To categorise the range in the ambient day to day noise levels, the Department of Environment and Conservation (DEC) recommends that for large projects, a minimum of one week of ambient noise monitoring be undertaken. The DEC categorises a 24 hour period into the following three assessment periods:

- Day 7:00 am to 6:00 pm
- Evening – 6:00 pm to 10:00 pm; and
- Night – 10:00 pm to 7:00 am

A summary of the measured levels is presented in **Table 5-22 and Table 5-23**.

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- Table 1 Summary of Background ($L_{A90\ 10th\ percentile}$) Noise Levels – 392 Klera Street

Monitoring Time	Daytime	Evening	Night-time
Thursday 6 May 2004	48 7	41 8	40 3
Friday 7 May 2004	49 5	42 3	44 5
Saturday 8 May 2004	47 5	42 3	47.0
Sunday 9 May 2004	48 0	48.0	46 0
Monday 10 May 2004	52 0	49.0	46.8
Tuesday 11 May 2004	48 0	48 0	47 3
Wednesday 12 May 2004	53 5	49.8	46 8
Thursday 13 May 2004	49.5	50 5	46.8
Friday 14 May 2004	49 7	49 8	48 0
Saturday 15 May 2004	45 0	45.5	40 8
Sunday 16 May 2004	41 5	44 3	45 5
Monday 17 May 2004	47 5	45 0	33 3
Tuesday 18 May 2004	46 5	39.0	42 5
Wednesday 19 May 2004	49 5	43 8	41.0
Thursday 20 May 2004	45 7	46 5	43.0
Median	**48 dB(A)**	**45 dB(A)**	**45 dB(A)**

- Table 2 Summary of Background ($L_{A90\ 10th\ percentile}$) Noise Levels – 10 Swan Street

Monitoring Time	Daytime	Evening	Night-time
Thursday 6 May 2004	43 5	42 0	42 5
Friday 7 May 2004	43 5	40 3	44 5
Saturday 8 May 2004	46.7	43 5	47 0
Sunday 9 May 2004	49.0	49 0	47 5
Monday 10 May 2004	51 5	49 3	46 3
Tuesday 11 May 2004	48 0	48 8	48 5
Wednesday 12 May 2004	53.5	50.5	47 5
Thursday 13 May 2004	48 0	50.5	47 3
Friday 14 May 2004	48 7	50 3	48 3
Saturday 15 May 2004	41 0	47 8	44 0
Sunday 16 May 2004	40 0	46.0	46.3
Monday 17 May 2004	41 0	45 3	37.0
Tuesday 18 May 2004	44 0	40 3	43.5
Wednesday 19 May 2004	41 0	45 3	44 8
Thursday 20 May 2004	46 5	47 3	46 0
Median	**45 dB(A)**	**47 dB(A)**	**46 dB(A)**

The L_{Aeq} levels for each site was also determined for the day, evening and night periods and are presented in **Table 3** below.

- **Table 3 Summary of L_{Aeq} noise monitoring all sites**

Assessment Period	10 Swan Street	392 Kiera Street
Day	53 8 dB(A)	57.8 dB(A)
Evening	52.5 dB(A)	54 2 dB(A)
Night	50 9 dB(A)	51 3 dB(A)

Attended noise surveys were also conducted at six locations on Wednesday 9 June 2004 between the hours of 12:15am and 3:05am to validate the noise logger results and subjectively determine the noise sources in the area. The measurement locations encompassed both Port and residential areas including 10 Swan Street and 392 Kiera Street, Wollongong. The night-time measured background $L_{A90,\ 15minute}$ noise levels at the two residential locations i.e. 45.2 dB(A) and 44.6 dB(A) respectively, were very similar to levels previously recorded during the unattended survey. Furthermore, the night-time background levels were controlled from distant industrial noise from the general direction of the Port.

1.2 Construction Noise

Noise from the proposed construction activity is assessed under the guidelines detailed in Chapter 171 of the 1994 Environmental Noise Control Manual. In summary these are:

Hours of Construction

The Department of Environment and Conservation guidelines recommend confining the permissible work times to:

- 7.00 am to 6.00 pm, Monday to Friday
- 7.00 am to 1.00 pm on Saturdays if inaudible at residences otherwise 8.00 am to 1.00 pm.
- No construction is permitted on Sundays or Public Holidays. Works outside these hours is usually permissible if it can be demonstrated that the construction activities will be inaudible within all nearby residential dwellings.

Use of Silenced Equipment

All possible steps should be taken to use residential class mufflers or other silencing methods appropriate for construction equipment. This is of particular relevance for works where evening or night-time activities are involved.

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1.3 Construction Noise Emission Objectives

Daytime noise levels of around 45 dB(A) to 48 dB(A) are currently experienced at the residential properties surrounding the site. Taking 45 dB(A) as the lower typical daytime level, the Department of Environment and Conservation recommends that the $L_{A10(15\ minute)}$ noise levels arising from a construction site and measured in the general vicinity of any noise sensitive premises should not exceed:

- Background plus 20 dB(A) - For a cumulative period of noise exposure not exceeding 4 weeks, the construction noise should not exceed 65 dB(A).
- Background plus 10 dBA - For a cumulative period of noise exposure between 4 weeks and 26 weeks, the construction noise should not exceed 55 dB(A).
- Background plus 5 dBA - For a cumulative period of exposure greater than 26 weeks, the construction works should not exceed 50 dB(A).

Where night time construction activities are proposed, inaudibility would be approximately equal to background minus 10 dB(A). At the nearest residences the night time background noise level ($L_{A90\ 10^{th}\ percentile}$) is approximately 45 dB(A). Therefore the night time criteria for dredging activities would be approximately 35 dB(A).

Sleep Disturbance Criteria

Noise emissions that may cause sleep disturbance are assessed under Chapter 19-3 of the 1994 Environmental Noise Control Manual, *Noise Quality Objectives. Special Considerations. Sleep Arousal Level.*

Many short duration, high level noise impacts which occur at night, may comply with the project specific construction criteria, and yet may be undesirable because of sleep disturbance effects. Such noise should be given special consideration, and whatever action possible should be taken to abate noise that is likely to interfere with a person's sleep, particularly between the hours of 10 pm and 7 am.

Noise control should be applied with the general intent to protect people from sleep disturbance. In summary, the main requirements for residential receiving areas are:

- Night-time – from 10 pm to 7 am the L_{A1} noise level of any specific noise source should not exceed the L_{A90} background noise level by more than 15 dB(A) when measured outside the bedroom window.

Based on the L_{A90} noise levels measured at the nearby residential locations, the L_{A1} sleep arousal criterion is 60 dB(A).

1.4 Modelling Procedure

The acoustic modelling predictions were conducted using the CONCAWE algorithms as implemented within the SoundPLAN suite of noise prediction programs. No acoustic information was available for the proposed dredging equipment, therefore sound power levels for the plant was estimated based on similar equipment types. This information does not necessarily reflect the ultimate choice of dredging equipment but will serve as a close approximation of expected noise emissions from the proposed works.

Predictions made on the data result in the determination of the L_{A10} index at the nearest receiver, and assume that all plant is fully operational, under typical load conditions. The L_{A10} level, often referred to as the average maximum noise level, will serve as an appropriate indicator of inaudibility below existing night time noise levels.

1.5 Results of Noise Predictions

Dredging

The dredger used for harbour deepening works is expected to be a grab dredger. This type of dredger has an estimated sound power level (for a typical unit) of 118 dB(A). Noise from dredging activities would be constant in nature and are not likely to exhibit impulsive or sporadically noisy emission levels. Table 4 estimates noise levels at the nearest residences due to emissions from dredging operations alone.

Table 4: Calculated Noise Levels During Dredging

Location of Receiver	Approx. Distance from Proposed Works (m)	L_{A10} Noise Level
Kiera and Swann Street	Approx 1700m	30 dB(A)

Based on these predicted values, construction noise impacts from the dredging works would not exceed the DEC noise criteria at the nearest residences and are likely to be inaudible at these locations.

Sleep Disturbance Predictions

The L_{AMAX} and L_{A10} calculated noise levels are not expected to vary by more than 10 dB(A) as the result of operations

Based on the predicted L_{A10} level of 30 dB(A) for operations at the nearest residences the maximum predicted level arising from dredging operations is 40 dB(A) which is 20 dB(A) below the recommended sleep disturbance criteria. Because the L_{Amax} was used instead of the traditional L_{A1} the predicted level sleep disturbance impacts would be slightly conservative.

1.6 Conclusions

The results of the noise impact assessment indicates that there are no adverse noise impacts anticipated as the result of the proposed dredging activities within the Inner Harbour and Eastern Basins of Port Kembla.