

APPENDIX 2

Construction Noise and Vibration Management Plan

PWCS Construction Noise and Vibration Management Plan

1.0 Background

Condition 7.3(b) of the 120 Mtpa Project Approval requires the preparation and implementation of a Construction Noise and Vibration Management Plan (CNVMP).

The CNVMP has been prepared to address the requirements of this condition and was approved by the Director-General from the Department of Planning (DoP) in March 2008. The CNVMP has been implemented on site since 2008. In March 2010 the Construction Environmental Management Plan (CEMP) was revised to incorporate the construction requirements associated with the Stage 3 Development Consent and the issue specific management sub plans for surface water, noise and traffic.

In the event of further project approval and / or licence requirements associated with the Kooragang Coal Terminal (KCT), the CNVMP will be reviewed and amended as appropriate.

The CNVMP has been prepared for PWCS by Umwelt (Australia) Pty Limited (Umwelt), with input from Heggies Pty Ltd on the specific noise monitoring requirements for construction activities associated with KCT.

1.1 Management Sub Plan Context

The CNVMP has been developed as a supplementary management plan to the KCT CEMP. The context of this CNVMP in relation to KCT environmental management policy and systems is outlined in the CEMP.

1.2 Purpose and Scope

This CNVMP has been prepared in accordance with Condition 7.2(b) of the 120 Mtpa Project Approval and Condition 13 of the Stage 3 Development Consent to detail how construction noise and vibration would be minimised and managed during construction activities.

1.3 Objective

The primary objective of the CNVMP is to outline procedures to minimise and control the noise and vibration impacts of construction activities on the environment.

2.0 Construction Noise and Vibration Management

2.1 Potential Construction Noise and Vibration Impacts

The major sources of noise during construction are potentially from outdoor construction equipment as part of the installation of plant and equipment, earthworks and from truck deliveries during each phase of construction, as outlined in Section 2.1 of the CEMP. The construction activities may vary from relatively low intensity to medium intensity during times of peak activity.

The distance from construction activities to any residential areas is such that there would be a minimal noise impact on the receivers. The noise impact assessments undertaken as part of the Stage 3 EIS, 120 Mtpa EA and Stage 4 Modification demonstrate that the noise levels resulting from construction are likely to be indiscernible at nearest residential receivers.

Despite the low potential for construction noise being discernable in receiver areas, should construction activities be considered to have affected receiver areas, residents will be notified through the existing community consultation processes and invited to make contact through the community enquiry line if the effects were considered unacceptable.

PWCS has approval under its Stage 3 Development Consent to undertaken pile driving and blasting activities. Blasting activities will not be required to complete the scope of works. Pile driving will take place for the wharf construction and specific noise monitoring will be undertaken at the commencement of this activity. Appropriate actions will be implemented dependant on the outcomes of the monitoring.

The construction activities of pile driving and the use of vibration compactors will generate ground vibration. The Stage 4 Modification EA concluded that the damage and annoyance risk to all residential receivers is negligible - as the nearest dwellings are well beyond 180 m. Similarly, the damage risk to the nearest commercial and industrial receivers are considered minimal as the nearest buildings and mechanical plant (assumed operating) are beyond 12 metres.

The risk of annoyance to the occupants of offices and workshops is also considered minimal based on distance at all but the very nearest adjacent industrial neighbours (i.e. the KBF Administrative Building), where vibration monitoring and short term piling energy management may be required during piling activities to achieve compliance with the relevant criteria.

2.2 Construction Hours

Construction activities which are audible at any residential premises will be limited between 7.00 am and 6.00 pm seven days a week. This requirement does not apply in the event of a direction from police or other relevant authority for safety or emergency reasons.

Construction activities which are inaudible at residential receivers may be undertaken 24 hours per day 7 days per week (refer to Condition 2.7 of the 120 Mtpa Project Approval).

2.3 Receiver Areas

2.3.1 Residential Receivers

The potentially most affected residential receivers and key noise monitoring locations are listed in **Table 2.1**. Construction activities will be undertaken across the whole site, as such, the potential noise impacts, whilst assessed as minimal, may affect receiver areas differently dependent on the nature of the particular construction activity and location within KCT site.

Table 2.1 - Residential Receivers

Receiver Area	ID and Key Noise Monitoring Locations
Fern Bay North	FN1 Nelson Bay Road
Fern Bay West	FW1 1 Fullerton Lane
Stockton West	SW1 284 Fullerton Street
Mayfield West/Warrabrook	W1 47 Stevenson Avenue
	W2 4 Groongal Street
Mayfield	M2 45 Simpson Crescent
	M4 52 Arthur Street
Carrington/Maryville	C1 Cnr Hargrave and Young Streets

2.3.2 Industrial Receivers

The potentially most affected industrial receivers are listed in **Table 2.2**. Where a noise contribution can't be measured at an industrial receiver, measurements may be conducted at a representative location at a similar distance or at a closer proximity to the construction site so that the contributed noise level can be calculated.

Table 2.2 - Industrial Receivers

Receiver Area	ID and Key Noise Monitoring Locations
Kooragang Island	IB2 Mountain Industries
	IB3 Kooragang Bulk Facilities
	IB6 Cargill Australia Raven St
Mayfield North	MN1 OneSteel

2.4 Construction Noise Criteria

2.4.1 Residential Receivers

The relevant criteria for construction noise are based on the duration of the construction activities as outlined in the Interim Construction Noise Guideline (ICNG) (DECCW 2009). The interim guideline for major projects recommends a construction noise management level (CNML) equivalent to the RBL plus 10 dBA within standard hours (i.e. daytime) and RBL plus 5 dBA outside standard hours (i.e. evening and night-time). The approved construction noise condition and the ICNG construction noise management levels are presented in **Table 2.3**.

Table 2.3 - Residential DECCW Construction Noise Criteria, LAeq(15minute) dB(A)

Residential Receiver Area	Project Approval Construction Noise Condition 2.7 ¹	Daytime ¹ LAeq(15minute) CNML RBL plus 10 dBA	Evening LAeq(15minute) CNML RBL plus 5 dBA	Night-time LAeq(15minute) CNML RBL plus 5 dBA
Fern Bay North	The Proponent shall only undertake construction activities associated with the project that would generate an audible noise at any residential premises between 7:00 am and 6:00 pm, seven days a week. Audible noise is defined as "noise that can be heard at the receiver".	54	50	45
Fem Bay West		57	47	45
Fern Bay East		50	48	46
Stockton West		52	48	47
Stockton East		51	47	47
Mayfield West		55	51	46
Mayfield		56	52	48
Carrington		52	46	42

Note 1: 7 days per week - 0700 hours to 1800 hours.

A review of noise measurements during the previous Stage 3 and the current project construction phase confirms that noise emissions arising from construction activities are not discernible at the nearest residential receiver areas of Fern Bay and Stockton and any construction noise impacts are therefore minimal. It is reasonable to anticipate intrusive construction noise emissions will remain indiscernible at the nearest residential receiver areas and below the approved construction noise limits.

2.4.2 Industrial Receivers

The DECCW's ICNG also recommends a CNML for industrial and commercial receivers as presented in **Table 2.4**.

Table 2.4 - Industrial and Commercial DECCW Construction Noise Criteria, dB(A)

Receiver Type	Construction Noise Criteria External LAeq(15minute)
Industrial	75 dB(A)
Commercial	70 dB(A)

2.5 Construction Vibration Criteria

2.5.1 Residential, Industrial and Structural Assessment Criteria

German Standard DIN 4150-3 1999 "Structural Vibration Part 3: Effects of Vibration on Structures" provides guideline criteria for evaluating the short and long-term effects of vibration on structures. In addition, the DECCW has released an interim guideline "Assessing Vibration: A Technical Guideline" dated February 2006 which provides guideline building vibration levels associated with a low probability of annoyance from occupants. The range of applicable damage and annoyance risk vibration velocity criteria are discussed in the Stage 4 EA and summarised in **Table 2.5**.

Table 2.5 - Vibration Velocity Damage and Annoyance Risk Criteria, (mm/s)

Receiver Type	Damage Risk (mm/s)		Annoyance Risk (mm/s)	
	Horizontal	Vertical	Horizontal	Vertical
Residential/Dwellings	15	5	1.2	0.45
Commercial/Offices	40	20	1.6	0.6
Industrial/Workshops	40	20	3.2	1.2
Mechanical (On/Off) ¹	20/5	20/5	-	-
Electronic/Computers	5	5	-	-
Subsurface/Pipework	50-100	50-100	-	-

Note 1: Use of machinery on/use of machinery off.

2.6 Construction Noise and Vibration Management and Control

In addition to the ongoing implementation of the Continuous Noise Improvement Program, noise and vibration monitoring will be carried out in accordance with the Construction Noise and Vibration Management Sub Plan. Monitoring will be carried out on the construction area perimeter and in other locations, and will assess construction and background noise and vibration to confirm compliance with prescribed limits.

Due to the nature of the construction activities, monitoring will be carried out to focus on the specific task being undertaken, and will change according to the location of construction activities. Where there is a potential for prolonged or intermittent activity to be reasonably detected at residential areas (but still be within prescribed limits) the need to liaise with affected residents will be implemented by PWCS.

PWCS is committed to the management of potential noise impacts on receiver areas as a result of construction activities at KCT. As such, all construction activities will be undertaken to comply with the relevant construction noise criteria outlined in **Section 2.3**. The specific activities and controls that will be implemented to control construction activities to within the relevant criteria include:

- all equipment used on site is maintained to achieve optimum noise attenuation performance.
- Prevent modifications that could potentially increase the noise emitted from exhaust systems of equipment utilised on site.
- Awareness of climatic conditions such as temperature inversions or unfavourable wind directions, which may enhance off site noise propagation.
- Ensure that horns and other signalling devices (reversing beepers) fitted to construction vehicles to provide a danger warning, and are not able to audible off site.
- Adjust work hours to suit the activity and the prevailing background levels and weather conditions.

3.0 Monitoring and Review

3.1 Construction Noise Monitoring

3.1.1 General Requirements

The noise measurement procedures employed throughout the monitoring program shall be guided by the requirements of AS 1055.1-1997, 'Acoustics - Description and Measurement of Environmental Noise, Part 1 General Procedures' and the DECCW's Industrial Noise Policy (INP 2000).

3.1.2 Operator-Attended Noise Surveys

Operator-attended noise measurements will be conducted to quantify the contributed level of noise emissions from construction operations as well as the overall level of ambient noise. The time and location of these surveys will be determined by the particular construction activity and its location to the relevant receivers.

The operator shall quantify and characterise the $L_{Aeq(15\text{minute})}$ intrusive noise level from construction operations over a 15 minute measurement period. In addition, the operator shall quantify and characterise the overall levels of ambient noise (i.e. L_{Amax} , L_{A1} , L_{A10} , L_{A50} , L_{A90} , and L_{Aeq}) over the 15 minute measurement interval.

In some instances, it may be difficult to measure the intrusive construction noise over a full 15 minute period in the presence of other noise sources. In such instances, the $L_{Aeq(15\text{minute})}$ noise levels may be measured at a point between the source and receiver, and calculated back to the receiver.

3.1.3 Key Monitoring Locations and Intervals

3.1.3.1 Daytime Construction (7.00 am to 6.00 pm)

Operator attended noise measurements shall be conducted during daytime construction campaigns (for each type of construction activity) at selected KCT industrial boundary locations (or other noise-sensitive locations) relevant to the construction operations at the time of monitoring, to determine if construction noise is audible.

In the event that construction noise is not audible at the selected KCT industrial boundary monitoring locations, it will be determined that construction noise from that type of activity would also be inaudible at the residential receiver areas and therefore in compliance with the construction noise criteria. It is envisaged that once compliance has been determined for a particular type of activity and location, that no subsequent monitoring of that activity would be required.

In the event that construction noise is audible and can be quantified at the selected KCT industrial boundary monitoring locations, additional noise monitoring will be conducted at relevant key monitoring locations at the potentially most affected receiver locations. The selection of the key monitoring locations will be relevant to the construction operations at the time of monitoring, in order to quantify noise emissions and estimate the $L_{Aeq(15\text{minute})}$ intrusive noise level from the construction. The operator shall quantify and characterise the maximum (L_{Amax}), L_{A10} , and background (L_{A90}) noise levels from ambient noise sources and construction operations over a 15 minute measurement period.

3.1.3.2 Out of Hours Construction (6.00 pm to 7.00 am)

Evening and night time construction noise will be monitored at selected key monitoring locations in the potentially affected residential receiver locations (or other noise-sensitive locations) relevant to the construction operations at the time of monitoring, in order to quantify the audibility of construction activities.

3.1.4 Noise Monitoring Equipment

All acoustic instrumentation employed throughout the monitoring program will comply with the requirements of AS 1259.2-1990 'Sound Level Meters' and carry current NATA or manufacturer calibration certificates. The instrumentation will be operated and maintained by suitably qualified or trained personnel.

All instrumentation will be programmed to record continuously statistical noise level indices in 15 minute intervals including the L_{Amax} , L_{A1} , L_{A10} , L_{A50} , L_{A90} and L_{Aeq} .

Instrument calibration shall be conducted before and after each measurement survey, with the variation in calibrated levels not to exceed ± 0.5 dB.

All noise measurement results will be accompanied by both qualitative descriptions (including cloud cover) and quantitative measurements of the prevailing local weather conditions throughout the survey period.

3.1.5 Nearfield Noise Measurement Requirements

In addition to identifying the source(s) of excessive noise emission level, any potentially excessively noisy item(s) of plant and equipment will be measured, assessed and mitigated where appropriate.

3.2 Construction Vibration Monitoring

3.2.1 General Requirements

Continuous vibration monitoring procedures employed throughout the monitoring programme will be guided by the requirements of German Standard DIN 4150-3 1999 "Structural Vibration Part 3: Effects of Vibration on Structures" and the DECCW's interim guideline "Assessing Vibration: A Technical Guideline" dated February 2006.

3.2.2 Monitoring Locations and Intervals

At the commencement of pile driving continuous vibration monitoring measurements will be conducted at the nearest industrial/commercial building on Kooragang Island. In some instances, it may be difficult to measure continuous vibration levels in the presence of other ambient sources (i.e. traffic vibration). In such instances continuous vibration may be measured in radial alignment from source to receiver and calculated back to the receiver.

3.2.3 Continuous Vibration Monitoring Equipment

Vibration monitoring instrumentation will be employed to meet the following primary specifications presented in **Table 3.1**. The instrumentation will be installed, operated and maintained by suitably qualified or trained personnel. The instruments will carry current NATA or manufacturer calibration certificates.

Table 3.1 - Vibration Monitor Primary Specifications

Specification	Seismic
Sample Rate	Minimum 1024 samples per second per channel
Frequency Response	2 Hz to 250 Hz (3 dB points)
Resolution	0.016 mm/s
Range	0.1 mm/s to 254 mm/s
Accuracy	3% at 15 Hz
Recording Mode	Full Waveform and Histogram recording with archiving

3.3 Reporting and Corrective Action

3.3.1 Reporting Requirements

All routine monitoring results will be documented and forwarded to the Specialist Advisor Environment on a monthly basis during construction activity. In the event of an exceedance of the construction noise and vibration criteria it will be reported immediately including the location and the level of exceedance. The monitoring results shall be documented and forwarded to the Environment Representative within 7 days.

3.3.2 Corrective Action

Section 7.0 of the CEMP outlines the corrective action process to be followed in the event of a potential environmental incident.