CONSTRUCTION, OPERATION AND ROAD TRANSPORT NOISE IMPACT ASSESSMENT

APPENDIX A

NEWCASTLE COAL INFRASTRUCTURE GROUP
COAL EXPORT TERMINAL

HEGGIES
AUSTRALIA

REPORT 10-4515-R1

Revision 1

Newcastle Coal Export Terminal
Construction, Operation and Road Transport
Noise Impact Assessment

PREPARED FOR

Newcastle Coal Infrastructure Group
Level 2, 116 Military Road
NEUTRAL BAY NSW 2089

27 JULY 2006

Newcastle Coal Export Terminal
Construction, Operation and Road Transport
Noise Impact Assessment

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1 INTRODUCTION

1.1 Assessment Requirements

The Newcastle Coal Infrastructure Group (NCIG) proposes to construct and operate a 66 million tonnes per annum (Mtpa) capacity Coal Export Terminal (CET) on Kooragang Island in Newcastle, New South Wales (NSW). An initial 33 months construction phase is expected for the CET capacity to reach 33 Mtpa. The timing of development of the CET to its ultimate capacity of 66 Mtpa would depend on actual market demand.

Heggies Australia Pty Ltd (Heggies) has been engaged by NCIG to evaluate and assess the potential noise impacts associated with the proposed CET. The assessment has been guided by NSW Department of Planning (DoP) Environmental Assessment (EA) noise impact requirements dated 26 April 2006 as follows:

> ***"Noise Impacts*** *- the Environmental Assessment must include a noise impact assessment for the project site, conducted in accordance with NSW Industrial Noise Policy (EPA, 2000), with particular focus on the operation of coal trains on the rail loop, coal stockyard stacker/reclaimer equipment and the ship loading conveyor system. The noise assessment must consider impacts on the residential areas of Warabrook, Mayfield, Carrington and Stockton and must consider the impact from the project in isolation and in a cumulative context with relevant existing and approved development (ie the subject of a development consent, whether or not the development has partially or fully commenced). As part of the noise assessment, noise emissions associated with coal trains operating on the rail loop must be assessed as a stationary noise source. The Environmental Assessment must also include an assessment of the construction noise impacts of the project, against the criteria provided in Chapter 171 of the Environmental Noise Control Manual (EPA, 2004) and an assessment of road traffic noise in accordance with methodology and criteria detailed in NSW Environmental Criteria for Road Traffic Noise (EPA, 1999). The Environmental Assessment must clearly outline the noise mitigation, monitoring and management measures the Proponent intends to apply to the project."*

In accordance with the CET's EA noise impact requirements the major sources of noise and vibration emissions may be grouped as follows:

On-Site Construction Noise and Vibration

Initial Construction Noise: The anticipated daytime construction scenarios arising from **mid-year 1 and mid-year 2** activities in accordance with the proposed construction schedule to achieve a capacity of 33 Mtpa.

Future Construction Noise: The anticipated daytime construction scenarios arising from the simultaneous 33 Mtpa operation and construction activities to increase the capacity of the CET up to maximum 66 Mtpa.

The assessment of impact from on-site construction works remains according to the Environment Protection Authority's (EPA's) Environmental Noise Control Manual (ENCM) 1994 Chapter 171 Noise Control Guideline - Construction Site Noise.

Construction Vibration: The anticipated maximum daytime vibratory construction activities in accordance with the proposed construction schedule.

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 NSW Department of Environment and Conservation (DEC) has recently released an interim guideline "*Assessing Vibration: A Technical Guideline"* dated February 2006 provides guideline building vibration levels associated with a low probability of annoyance from occupants.

On-Site Operating Noise

66 Mtpa Operating Noise (East): The daytime, evening and night-time operation with the locations of mobile equipment (ie. coal trains, stackers/reclaimers and shiploaders) balanced to the **east**.

66 Mtpa Operating Noise (West): The daytime, evening and night-time operation with the locations of mobile equipment (ie. coal trains, stackers/reclaimers and shiploaders) balanced to the **west**.

The NSW Industrial Noise Policy (INP 2000) provides non-mandatory procedures for setting acceptable $L_{Aeq(15minute)}$ intrusive (and $L_{Aeq(period)}$) amenity noise levels for various receiver areas and guidelines for assessing noise impacts from on-site stationary noise sources.

Off-Site Transport Noise

Road Traffic: Employee and materials vehicle movements along public roads in the vicinity of the site during construction and operation.

The NSW Environmental Criteria for Road Traffic Noise (ECRTN 1999) provides non-mandatory procedures for setting acceptable L_{Aeq} noise levels on arterial, collector and local roads and guidelines for assessing noise impacts from off-site road traffic.

Rail Traffic: The Australian Rail Track Corporation Ltd (ARTC) operates the Hunter Valley Coal Rail Network in NSW. Noise emissions from the railway are regulated via ARTC's Environmental Protection Licence (EPL No 3142, review date 1 July 2005).

An assessment of potential off-site rail traffic noise impacts is not required by the EA noise requirements however a review of the ARTC's EPL is provided.

Cumulative Industrial Noise

Cumulative Industrial Emissions: Review of existing and approved industrial developments and associated noise emissions in the vicinity of the CET site.

The INP also provides non-mandatory cumulative noise assessment guidelines that address existing and successive industrial development by setting acceptable (and maximum) cumulative $L_{Aeq(period)}$ amenity levels for all industrial (ie. non-transport related) noise in a receiver area. Note, the INP does not set acceptable cumulative $L_{Aeq(15minute)}$ intrusive criteria for all industrial noise sources in a receiver area, but rather seeks to control cumulative noise via its amenity criteria.

1.2 Hours of Operation

The proposed hours of construction and operation are presented in **Table 1**.

Table 1 Hours of Operation and Construction

Phase	Activity	Duration	Period
Construction	On-site Construction[1,2] works including Rail Spur and Loop	33 months	0700 hrs to 1800 hrs 7 days per week
	Off-site Road Transport including men and materials[3]	33 months	0700 hrs to 1800 hrs 7 days per week
Operation	On-site Operation including Rail Spur and Loop	N/A	24 hrs 7 days per week
	Off-site Road Transport including employees and materials	N/A	24 hrs 7 days per week

Note 1 Construction activities with the potential to be audible at surrounding residential areas.

Note 2: Dredging operations and the associated deposition of dredged material on the Project site would be undertaken up to 24 hours per day.

Note 3: The movement of oversize vehicles to and from the Project site may be undertaken outside of daytime hours to minimise potential impacts on existing traffic flows.

1.3 Receiver Areas

The Project Location and Monitoring Sites attached as **Appendix A1** identifies the nearest potentially affected residential, commercial and industrial receiver areas beyond the proposed site boundary. Selected representative assessment locations for each receiver area are presented in **Table 2**.

Table 2 Nearest Potentially Affected Receiver Areas and Assessment Locations

Receiver Area	ID/Location		INP Noise Amenity Zone	LEP Zone	ENM Receiver Coordinates[1]		
					East (m)	North (m)	Elevation (m)
Fern Bay West	FW1	1 Fullerton Lane	Urban	Residential	14273	5795	6
	FW2	Stockton Hospital	Hospital	Special Uses	14317	5031	7
Fern Bay East	FE1	21 Braid Road	Urban	Residential	14438	5789	5
	FE2	Fern Bay Primary	School		14248	6240	5
Stockton West	SW1	284 Fullerton Street	Urban	Residential	13592	3298	3
	SW2	Cnr Pembroke and Fullerton Streets			13069	2487	2
Stockton East	SE1	40 Eames Avenue	Urban	Residential	13719	3321	4
	SE2	Stockton Primary	School		12942	1837	4
Warabrook/ Mayfield West	W1	47 Stevenson Avenue	Urban	Residential	7279	4786	23
	W2	4 Groongal Street			8296	4479	20
	W3	Mayfield West Primary	School		9021	4222	15
Mayfield	M1	68 Bull Street	Urban	Residential	8415	4232	46
	M2	45 Simpson Crescent			8629	4335	25
	M3	1 Arthur Street			9611	3885	4
	M4	52 Arthur Street			9630	3636	18
	M5	21 Crebert Street			10188	3455	8
	M6	Hunter Christian School	School		8236	4352	30
	M7	Mayfield East Primary			9812	3562	14
Carrington	C1	Cnr Hargrave and Young Streets	Urban	City Centre	11408	2051	2
Sandgate	SG1	4 Mangrove Road	Commercial	Urban Services	6629	6135	8

Receiver Area	ID/Location		INP Noise Amenity Zone	LEP Zone	ENM Receiver Coordinates[1]		
					East (m)	North (m)	Elevation (m)
Mayfield West	MW1	Steel River	Commercial	Steel River	7939	5518	8
Kooragang Island	KI1	Blue Circle Southern	Industrial	Port and Industry	11145	5083	5
	KI2	Origin Energy			11378	5296	5
	KI3	Boral Country Concrete			11488	5403	4
	KI4	Port Waratah Coal Services			12142	5280	4
	KI5	Cargill Australia			11853	5183	3
	KI6	ERS Australia			11730	5290	3
	KI7	Cleanaway			11506	5252	3
	KI8	Port Hunter Commodities			11436	5123	4
	KI9	BOC Gas			11357	5001	4
	KI10	Sims Metal			11568	4754	3
Mayfield North	MN1	OneSteel	Industrial	Port and Industry	10174	4857	4

Note 1: To convert to ISG coordinates add 360,000 m E and add 1,355,000 m N.

Selection of Urban Noise Amenity Zone

Section 2.2.1 of the INP, *Notes to Support the Noise Level Tables*, states:

> *"**Urban** - an area with an acoustical environment that:*
>
> *- is dominated by 'urban hum' or industrial source noise*
> *- has through traffic with characteristically heavy and continuous traffic flows during peak periods*
> *- is near commercial districts or industrial districts*
> *- has any combination of the above,*
>
> *where 'urban hum' means the aggregate sound of many unidentifiable, mostly traffic-related sound sources.*
>
> *This area may be located in either a **rural, rural-residential or residential** zone as defined on an LEP or other planning instrument, and also includes mixed land-use zones such as mixed commercial and residential uses."*

Section 2.2.2 of the INP, *Determining the Receiver Type*, provides further guidance on the selection of receiver type and states:

> *"In deciding whether a receiver area should be allocated to the suburban or urban categories, it may be necessary to examine the predominant manner of development in the area and the prevailing noise climate. The definitions of suburban and urban provide guidance on this. For example, small communities such as villages or towns are likely to be closer in noise climate to a suburban category. Urban receivers are usually those located in densely populated areas where multi-dwelling developments such as townhouses, units, flats and apartments are the norm. Areas near noise generators (for example, roads, railways and industry) would normally be considered to be urban-receiver type for the purpose of the amenity criteria. The rural category is more representative of more isolated single dwellings on large lots (for example, 2 hectares). The population density for an area may provide a guide as to which of the residential receiver categories apply."*

In view of the foregoing and based on the existing noise environment findings presented in **Section 3.2** of this report, the adjacent residential receivers areas clearly fall within the "urban" noise zone due to:

- *Existing Industrial Noise* - arising from Kooragang Island and North Mayfield industrial areas throughout the day (see **Section 3.2** for discussion).
- *Existing Traffic Flows* - arising from the arterial road network comprising Nelson Bay and Cormorant Roads and Industrial Drive throughout the day (see **Section 9.1** for discussion).
- *Adjacent Land Uses* - Warabrook, Mayfield West, Mayfield and Carrington all adjoin mainland industrial areas. Similarly, both Fern Bay and Stockton are located adjacent to Kooragang Island and Mayfield North industrial areas. All adjoining and adjacent residential areas are visually exposed to existing industry and transport networks. It is likely that the historical association between the community and the industrial nature of these localities remains.

2 PROJECT OVERVIEW

2.1 Project Operation

The General Arrangement Plan is shown as **Appendix A2** and a Site Aerial Plan as **Appendix A3**. The general arrangement is based on the planned maximum 66 Mtpa coal production/transport for export markets. The main activities associated with the development include:

- foundation preparation/capping of a rail corridor traversing the existing Kooragang Island Waste Emplacement Facility (KIWEF) for the development of the rail spurs, rail sidings and rail loops;
- construction of rail spurs, rail sidings and rail loops, rail overpass, train unloading stations and connecting conveyors;
- re-use of dredged materials from the south arm of the Hunter River as preload and engineering fill for construction of the coal storage area, rail corridor and wharf facilities;
- construction of a coal storage area including coal stockpiles, conveyors, transfer points and combined stacker/reclaimers;
- construction of wharf facilities, shiploaders, conveyors and buffer bins;
- development of water management infrastructure including site drainage works, stormwater settlement ponds, primary and secondary settling ponds, site water pond, water tanks and stockpile spray system;
- installation of electricity, reticulation and control systems;
- development of access roads and internal roads;
- construction of administration and workshop buildings;
- other associated minor infrastructure, plant, equipment and activities; and
- operation of the CET up to a capacity of 66 Mtpa, including the unloading of coal trains, the stockpiling of coal, and the loading of coal to ships via the wharf facilities and shiploaders.

The major items of plant and equipment for the CET operation are shown in **Table 3**.

Table 3 Major Items of Operating Plant and Equipment

Fixed Plant(Rating/Model)	Capacities/Specifications	Total (66 Mtpa)
Rail Loops	Five sidings and two loops	2
Unloading Stations	8,500 tonnes per hour (tph)	2
Unloading Station to Coal Storage Area Stacking Reclaim Coal Storage Area to Buffer Bins Buffer Bins to wharf Wharf	Total conveyors approx. 13 kilometres (km) length	2 4 4 2 2 2
Coal Stockpiles (Single)	25 m high (including 4.5 metres (m) berm) Capacity 600,000 tonnes (t)	2
Coal Stockpiles (Wide)	25 m high (including 4.5 m berm) Capacity 1,800,000 t	3
Combined Stacker/Reclaimers	Boom length - 62.5 m Stacking - 8,500 tph Reclaim - 10,500 tph	4
Transfer Stations	Various	10
Buffer Bins	2,500 t each	2
Sampling stations	2 inbound and 2 outbound - enclosed. Cut taken of belt tripper.	4
Shiploaders	Nominal 10,500 tph Peak 12,500 tph	2
Berths	3 off at 315m long each	3

Source: NCIG and Connell Hatch (2006)

2.2 Project Construction

The construction phase would involve the installation and commissioning of rail infrastructure, coal storage area and wharf facilities and shiploaders to allow the commencement of operations at the CET. An initial 33 month construction phase is expected for the CET capacity to reach 33 Mtpa. The timing of development of the CET to its ultimate capacity of 66 Mtpa would depend on actual market demand.

Appendix B1 shows the Proposed Construction Schedule and the major items of construction plant and equipment are presented in **Table 4**.

Table 4 Major Items of Construction Plant and Equipment

Mobile Plant (model/capacity)	Timing	Rail Infrastructure	Coal Storage Area and Stacker Reclaimers	Wharf Facilities and Shiploaders
Mobile Cranes (600 t)	2008/2009	0	1	2
Mobile Cranes (150 t)	2008/2009	1	5	3
Mobile Cranes (50 t)	2008/2009	1	3	2
Mobile Cranes (25 t)	2008/2009	4	4	4
Cherry Pickers	2008/2009	3	8	8
Water Trucks	2007/2008/2009	2	6	2
Dump Trucks	2007/2008	4	6	4
Dozers	2007/2008	6	10	2
Excavators	2007/2008	6	8	4
Scrapers	2007	3	6	0
Rollers	2007/2008	4	4	2

Mobile Plant (model/capacity)	Timing	Rail Infrastructure	Coal Storage Area and Stacker Reclaimers	Wharf Facilities and Shiploaders
Graders	2007/2008	3	4	2
Compactor	2007/2008	2	6	2
Track Laying Machine	2008	1	2	0
Drill Rigs	2006/2007	0	2	1
Piling Rigs	2008	1	4	4
Loaders	2007/2008	3	12	4
Utilities (utes)	2007/2008/2009	10	30	10
Water Treatment Plant	2007/2008/2009	0	1	0
Heavy Lift float	2008/2009	0	2	1

Source: NCIG / Connell Hatch (2006)

2.3 Rail Infrastructure

Rail Spurs and Rail Loops

The CET would include the construction of two parallel rail spurs from the Kooragang Island mainline, five rail sidings and two rail loops. The total length of the rail spurs and rail loops would be designed to accommodate up to five coal trains for a 66 Mtpa capacity CET. Construction of the initial rail spur, sidings and rail loop would take approximately 18 months.

Train Unloading Stations

The train unloading stations would be located on the northern side of the rail loop. Each train unloading station would be designed to operate at up to approximately 8,500 tph. Construction and commissioning of the first train unloading station would take approximately 15 months.

Rail Overpass

A rail overpass would be constructed over the Delta access road (**Appendix A2**) to enable safe, uninterrupted access for both road and rail vehicles.

2.4 Coal Storage Area

Preloading of Coal Stockpile Pads and Berms

The pads would be between approximately 1,100 m and 1,300 m long and up to 120 m wide. The berms would be constructed approximately 4.5 m above the finished level of the pads and would be approximately 25 m wide.

Coal Stockpiles and Combined Stacker/Reclaimers

The coal stockpiles would be served by up to four rail-mounted combined stacker/reclaimers and associated stacking and reclaiming conveyors. The arrangement of combined stacker/reclaimers would enable coal to be stacked onto the coal stockpiles at approximately 8,500 tph peak capacity and reclaimed (via bucket-wheel) at up to 10,500 tph.

Conveyors and Transfer Points

A network of belt conveyors and transfer points would allow transport of coal from the train unloading stations to the coal storage area and to the wharf facilities and shiploaders.

Conveyor belts would be up to 3.5 m wide. Conveyors would be roofed or partially enclosed except for the stacking/reclaiming conveyors in the coal storage area and the shiploading conveyor at the wharf facilities. Transfer points would allow transfer of coal from one conveyor to another.

2.5 Wharf Facilities and Shiploaders

Berths and Wharf Structure

Three berths would be constructed for the CET. The first two berths (K8 and K9) would be installed initially and the third (K10) installed as the throughput capacity of the CET increased up to 66 Mtpa.

Shiploaders

The three berths would ultimately be served by two rail-mounted shiploaders. Only one shiploader would be required during the initial 33 Mtpa operation to serve berths K8 and K9. Each shiploader would consist of a large travelling structural steel portal, shuttle and boom and would be fed by a dedicated shiploading conveyor from the wharf. Each shiploader would operate at approximately 10,500 tph nominal capacity, peaking at up to 12,500 tph.

Two buffer bins would be installed adjacent the wharf facilities to allow coal conveyed from the coal storage area to be temporarily stored during hatch changes during the loading of ships.

2.6 Coal Transport

Coal trains from the Hunter Valley region would enter the site from the west, loop around in a clockwise direction to empty their wagons into a hopper in the train unloading stations. A Coal Throughput Flowsheet is shown as **Appendix B2** and the anticipated coal train movements are summarised in **Table 5**.

Table 5 Anticipated Coal Train Movements

Nominal Train Capacity:	7,000 t[1]
Locomotive Model:	Pacific National Class 81,82,90, Queensland Rail 5000 class
Average Daily Project-Related Train Movements:	26 Events (Arrival and Departure = 1) per day
Peak Daily Project-Related Train Movements:	40 Events (Arrival and Departure = 1) per day
Annual Average Train Movements:	26 *340=8,840 Events

Source: NCIG (2006)

Note 1: Actual train capacity may be up to 8,500 t.

Four coal sampling stations (two inbound and two outbound) would be required to measure and record inbound and outbound coal grade and quality (moisture, chemical assay and ash content). Each sampling station would be housed within its own enclosed building.

2.7 Workforce

Construction

It is anticipated that up to 500 people would be employed during construction. Nominal shift times for construction would be between 7.00 am to 6.00 pm up to seven days per week.

Operation

The CET would operate 24 hours a day, seven days per week and would employ up to 100 people at maximum throughput capacity (ie. 66 Mtpa) including a mixture of direct NCIG employees and contractors. The nominal shift start and finish times are summarised in **Table 6**.

Table 6 Shift-Workforce Details (66 Mtpa)

	Nominal Shift Start	Nominal Shift Finish
Construction Personnel	0700 hours	1800 hours
Administration Personnel (weekdays)	0700 hours	1800 hours
CET Operations (Day)	0700 hours	1900 hours
CET Operations (Night)	1900 hours	0700 hours

Source: NCIG (2006)

3 EXISTING NOISE AND METEOROLOGICAL ENVIRONMENT

3.1 Meteorological Environment

Kooragang Island Meteorological Conditions

Section 5.3 of the INP, Wind Effects, states:

> *"Wind effects need to be assessed where wind is a feature of the area. Wind is considered to be a feature where source to receiver wind speeds (at 10 m height) of 3 m/s or below occur for 30 percent of the time or more in any assessment period in any season."*

An assessment of prevailing wind conditions was derived from the meteorological data recorded adjacent to the Port Waratah Coal Services (PWCS) Kooragang Coal Loader off Curlew Street, Kooragang Island. The dominant seasonal wind speeds and directions for the 2-year period May 2004 to April 2006 are presented as **Appendix C1** for daytime (0700 hours to 1800 hours), evening (1800 hours to 2200 hours) and night-time (2200 hours to 0700 hours).

The prevailing winds less than (or equal to) 3 metres per second (m/s) with a frequency of occurrence greater than (or equal to) 30% and considered to be relevant to the site in accordance with the INP are presented in **Table 7**. The dominant conditions incorporated into noise modelling are underlined.

Table 7 Prevailing Wind Conditions in accordance with the INP

Season	Winds ± 45° ≤3 m/s with Frequency of Occurrence ≥30%		
	Daytime	**Evening[1]**	**Night-time[1]**
Summer	Nil	NE 35%, <u>ENE 37%</u>, E 36%, ESE 32%	Nil
Autumn	Nil	Nil	Nil
Winter	Nil	Nil	W 32%, <u>WNW 38%</u>, NW 37%
Spring	Nil	NE 33%, ENE 30%	Nil

Note 1: The dominant seasonal wind speeds are underlined.

Section 5.2 of the INP, Temperature Inversions, states:

> *"Assessment of impacts is confined to the night noise assessment period (10.00 pm to 7.00 am), as this is the time likely to have the greatest impact - that is, when temperature inversions usually occur and disturbance to sleep is possible."*
>
> *"Where inversion conditions are predicted for at least 30% (or approximately two nights per week) of total night-time in winter, then inversion effects are considered to be significant and should be taken into account in the noise assessment".*

An assessment of atmospheric stability conditions has also been prepared from the meteorological data set described above. The winter evening and night-time frequency of occurrence of atmospheric stability classes are presented in **Table 8**, together with estimated Environmental Lapse Rates (ELR).

Table 8 Atmospheric Stability Frequency of Occurrence - Winter Evening/Night-time

Stability Class	Occurrence Percentage	Estimated ELR[1] °C/100 m	Qualitative Description
A	0%	<-1.9	Lapse
B	0%	-1.9 to-1.7	Lapse
C	0%	-1.7 to-1.5	Lapse
D	25%	-1.5 to-0.5	Neutral
E	17%	-0.5 to 1.5	Weak Inversion
F	57%	1.5 to 4.0	Moderate Inversion
G	1%	>4.0	Strong Inversion

Note 1: ELR (Environmental Lapse Rate).

In accordance with the INP the frequency of occurrence of moderate to strong (ie. 1.5 to >4.0°C/100 m) winter temperature inversions is greater than 30% during the combined evening and night-time period and therefore requires assessment.

Steel River Meteorological Conditions

For comparison, an assessment of prevailing wind conditions was also derived from meteorological data recorded at Steel River Industrial Estate. The dominant seasonal wind speeds and directions for the 3-year period ending March 2006 are presented as **Appendix C2** together with the estimated frequency of occurrence of atmospheric stability.

The Steel River data confirm that light westerly winds prevail during autumn and winter. Light easterly breezes prevail during spring and summer with slightly less frequency by comparison with the Kooragang Island data. The data also confirm that temperature inversions are likely to be a feature of the area.

Environmental Noise Model (ENM) Meteorological Parameters

The ENM noise modelling meteorological parameters presented in **Table 9** are based on the default inversion and wind speeds presented in Section 5 of the INP Meteorological Conditions and the analysis of the Kooragang Island meteorological data set.

Table 9 Calm and INP Noise Enhancing Meteorological Modelling Parameters

Period	Meteorological Parameter	Air Temp	Relative Humidity	Wind Velocity[1]	Temperature Gradient[1]
Daytime	Calm	20°C	70%	0 m/s	0°C/100 m
Evening	Wind only[1]	15°C	80%	ENE 3 m/s	0°C/100 m
Night-time	Wind only[1]	10°C	90%	WNW 3 m/s	0°C/100 m
	Inversion only[1]	10°C	90%	0 m/s	3°C/100 m
	Inversion and Drainage[2]	10°C	90%	WNW 2 m/s	3°C/100 m

Note 1: INP default wind speed 3 m/s and default temperature inversion 3°C/100 m.

Note 2: INP default inversion 3°C/100 m plus 2 m/s drainage flow to receiver areas east of the CET only (ie. Fern Bay and Stockton).

3.2 Noise Environment

CET Background Noise 2006

A noise monitoring programme was conducted in April 2006 to quantify background noise levels (ie. all noise sources) and to estimate industrial noise only (ie. in the absence of transport, natural and domestic noise sources). Ten unattended noise loggers were positioned at representative residential, commercial and industrial receiver areas in the vicinity of the CET site commencing Monday 3 April 2006 for a period of 14 days.

In order to supplement the unattended logger measurements and to assist in identifying the character and duration of the noise sources, operator-attended daytime, evening, and night-time surveys were also conducted at all ten logging locations. The measurement methodology and analysis procedures are described in **Appendix D**. The operator-attended measurement results are summarised in **Table 10**.

Table 10 Operator-Attended Noise Survey Results 2006 (dBA re 20 µPa)

Receiver Area/ Receiver Type	ID (Ref)	Background $L_{A90(15minute)}$ All Noise Sources			Estimated $L_{Aeq(15minute)}$ Industrial Noise Only		
		Day	Evening	Night	Day	Evening	Night
Fern Bay West Residential	FW1 (N1)	59, 57, 52	44, 50, 49	49, 39, 40	49, n/d, n/d	40, n/d, n/d	49, n/d, <35
Fern Bay East Residential	FE1 (N2)	45, 39, 38	42, 41, 41	47, 35, 35	40, n/d, n/d	<36, n/d, <35	43, 35, 35
Stockton West Residential	SW1 (N3)	52, 44, 45	48, 47, 47	50, 50, 51	51, n/d, n/d	48, <45, <45	49, 49, 50
Stockton East Residential	SE1 (N4)	51, 48, 48	48, 49, 49	50, 48, 48	n/d, n/d, n/d	<43, n/d, <43	<43, 42, 42
Warabrook/ Mayfield West Residential	W1 (N5)	55, 48, 49	49, 48, 48	42, 46, 45	n/d, n/d, n/d	49, 46, 46	n/d, <45, <45
	W2 (N6)	55, 54, 54	53, 53, 53	47, 49, 49	n/d, n/d, n/d	50, 51, 52	45, 49, 48
Mayfield Residential	M1 (N7)	54, 58, 53	55, 53, 53	49, 51, 51	n/d, 51, 50	55, 52, 52	47, 50, 50
Sandgate Commercial	SG1 (N13)	46, 53, 52	45, 45, 46	52, 52, 52	45, 52, 51	n/d, n/d, n/d	n/d, n/d, n/d
Kooragang Island Industrial	KI1 (N14)	56, 57, 56	53, 56, 54	55, 51, 51	57, 57, 56	54, 54, 54	55, 50, 52
Mayfield North Industrial	MN1 (N15)	62, 59, 59	62, 59, 59	55, 60, 61	63, 63, 62	63, 60, 60	59, 61, 62

Note 1: n/d - Industrial noise not discernible.

The unattended background noise logger data from each monitoring location and the on-site weather conditions were analysed on a daily basis. The background noise data were then processed in accordance with the requirements of the INP to derive the Monday to Sunday background noise levels presented in **Table 11**.

Supplementary CET Background Noise 2003

Noise monitoring to establish background levels and industrial noise at four representative residential locations in Mayfield was carried out in relation to the Port of Newcastle Extension (EIS GHD 2003). The measurement methodology is described in the Heggies Report 10-2718-R1 dated 6 August 2003 "*Noise and Blasting Assessment Proposed Extension of Shipping Channels Port of Newcastle*".

Similarly, background levels and industrial noise in Carrington have been derived from Heggies Report 30-1157-R2 dated 30 May 2003 "*Noise Impact Assessment - Proposed Concrete Plant Carrington*". In each case the background noise data were processed in accordance with the requirements of the INP to determine the background noise levels as shown in **Table 11**.

Table 11 Unattended Noise Logger Results 2006 and 2003 (dBA re 20 µPa)

Receiver Area	ID (Ref)	Measured RBL[4] All Noise Sources			Measured LAeq(period)[3] All Noise Sources			Estimated LAeq(period)[3] Industrial Noise Only		
		Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
Fern Bay West Residential	FW1 (N1)	50	42	44	60	55	54	<54	46	48
Fern Bay East Residential	FE1 (N2)	40	44	42	48	46	46	<54	42	43
Stockton West Residential	SW1 (N3)	42	44	44	63	57	59	<54	47	48
Stockton East Residential	SE1 (N4)	41	43	43	55	50	49	<54	43	44
Warabrook/ Mayfield West Residential	W1 (N5)	44	45	40	59	54	52	<54	45	42
	W2 (N6)	51	49	47	63	57	56	<54	45	43
Mayfield Residential	M1 (N7)	47	49	47	58	53	52	<54	49	48
	M2[1] (N8)	46	49	46	53	52	51	42	42	42
	M3[1] (N9)	46	46	43	58	62	51	42	42	42
	M4[1] (N10)	51	50	43	58	56	54	41	41	41
	M5[1] (N11)	57	53	48	69	63	61	45	45	45
Carrington Residential	C1[2] (N12)	42	41	37	62	67	57	46	45	42
Sandgate Commercial	SG1 (N13)	48	45	40	57	54	55	<59	46	43
Kooragang Island Industrial	KI1 (N14)	51	51	47	61	56	55	<64	53	51
Mayfield North Industrial	MN1 (N15)	56	57	57	60	59	59	<64	57	57

Note 1: Supplementary background and industrial noise Port of Newcastle Extension.

Note 2: Supplementary background and industrial noise Proposed Concrete Plant Carrington.

Note 3: Daytime 0700 hours to 1800 hours, Evening 1800 hours to 2200 hours and Night-time 2200 hours to 0700 hours.

Note 4: Rating Background Level.

CET Background Noise for Assessment Purposes

For the purposes of establishing INP-based intrusive and amenity project specific noise levels, the 2006 and 2003 noise data have been distilled for each receiver area into single representative noise levels as presented in **Table 12**.

Table 12 Background and Industrial Noise for Assessment (dBA re 20 μPa)

Receiver Area	ID	Measured RBL All Noise Sources			Measured $L_{Aeq(period)}$[2] All Noise Sources			Estimated $L_{Aeq(period)}$[2] Industrial Noise Only		
		Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
Fern Bay West Residential	FW1	50	42	44	60	55	54	<54	46	48
Fern Bay East Residential	FE1	40	44	42	48	46	46	<54	42	43
Stockton West Residential	SW1	42	44	44	63	57	59	<54	47	48
Stockton East Residential	SE1	41	43	43	55	50	49	<54	43	44
Warabrook/ Mayfield West Residential	W1-W2	45	46	41	61	56	55	<54	45	43
Mayfield Residential	M1-M5	46	47	43	63	59	56	<54	45	44
Carrington Residential	C1	42	41	37	62	67	57	46	45	42
Sandgate Commercial	SG1	48	45	40	57	54	55	<59	46	43
Steel River[1] Commercial	MW1	-	-	-	-	-	-	<59	<59	<59
Kooragang Is Industrial	KI1	51	51	47	61	56	55	<64	53	51
Mayfield North Industrial	MN1	56	57	57	60	59	59	<64	57	57

Note 1: Assumed industrial noise levels.

Note 2: Daytime 0700 hours to 1800 hours, Evening 1800 hours to 2200 hours and Night-time 2200 hours to 0700 hours.

Industrial noise is a feature of the residential night-time noise environment at all receiver areas. Sometimes it is not discernible - but at other times it is distinguishable - particularly during lulls in transport, domestic and natural noise sources (ie. ocean noise).

Fern Bay (West)/Stockton (West): Existing night-time industrial noise generally emanates from Kooragang Island and was estimated as 48 dBA at both receiver areas. Light westerly wind generally prevailed throughout the monitoring period enhancing industrial noise from the island to the nearest residential receivers. The surveys indicated that industrial noise is at least 5 dBA less in the absence of westerly winds and/or temperature inversions.

Fern Bay (East)/Stockton (East): Existing night-time industrial noise from Kooragang Island was estimated as 43 dBA to 44 dBA during noise enhancing conditions. Industrial noise therefore attenuates by approximately 5 dBA from west to east at Fern Bay and Stockton. Similarly, industrial noise is at least 5 dBA less in the absence of westerly winds and/or temperature inversions. Ocean noise is also a feature of the area particularly during north-easterly breezes.

Warabrook/Mayfield West/Mayfield/Carrington: Existing night-time industrial noise generally emanates from the industrial areas located to the immediate north of the receiver areas (eg Mayfield North) and was estimated as 42 dBA to 44 dBA. Due to the relatively close proximity of the industry to the residential receiver areas, noise enhancement due to weather effects is less by comparison for Fern Bay and Stockton and the industrial noise contribution relatively more constant.

4 NOISE ASSESSMENT METHODOLOGY

4.1 Construction Assessment Criteria

The assessment of impact from on-site construction works remains according to the EPA's ENCM (1994) Chapter 171 Noise Control Guideline - Construction Site Noise (**Appendix E**). The ENCM provides noise limits for construction periods of up to 26 weeks. As the duration of the construction works is greater than 26 weeks, the DEC suggests that the construction noise emission should generally not exceed the background level by more than 5 dBA.

4.2 Operating Assessment Criteria

Sleep Disturbance

The DEC's "*Sleep Disturbance Noise Criteria Guideline*" dated 22 June 2004 recognises that the current $L_{A1(60sec)}$ sleep disturbance criteria of 15 dBA above the prevailing $L_{A90(15min)}$ level is not ideal. The assessment of potential sleep disturbance is complex and poorly understood and the DEC believes that there is insufficient information to determine a suitable alternative criterion.

In the interim, the DEC suggest that the $L_{A1(60sec)}$ level 15 dBA above the Rating Background Level (RBL) is a suitable screening criteria for sleep disturbance for the night-time period. In practice, sleep disturbance is assessed as the emergence of the $L_{A1(60sec)}$ level above the $L_{A90(15min)}$ prevailing at the time.

A review of noise events from similar coal loading operations including train movements shows that the maximum or $L_{A1(60sec)}$ levels are typically no greater than 10 dBA above the $L_{Aeq(15minute)}$ intrusive level when measured at a distant receiver. Therefore, it is considered that the INP-based criteria would be the controlling factor in determining compliance, as opposed to the sleep disturbance criteria. This relationship enables the noise assessment process to focus on the setting of the appropriate INP-based criteria which aim to minimise annoyance at any noise sensitive receiver location.

Operation

The NSW DEC has regulatory responsibility for the control of noise from "scheduled premises" under the Protection of the Environment Operations Act 1997. In implementing the Industrial Noise Policy the DEC has two broad objectives:

- Controlling intrusive noise impacts in the short term.
- Maintaining noise level amenity for particular landuses over the medium to long term.

The INP prescribes detailed calculation routines for establishing "project specific" $L_{Aeq(15minute)}$ intrusive criteria and $L_{Aeq(period)}$ amenity (ie. non-transport related) criteria for a development at potentially affected receivers.

Ideally, the intrusive noise emission should generally not exceed the background level by more than 5 dBA. Similarly, the amenity level should generally not exceed the specified INP "acceptable" or "maximum" noise level appropriate for the particular locality and land use as shown in **Table 13**.

Table 13 INP Acceptable and Maximum Noise Amenity Levels (dBA re 20 µPa)

Receiver Area	Land Use	Amenity LAeq(period)[2] Acceptable			Amenity LAeq(period)[2] Maximum		
		Day	Evening	Night	Day	Evening	Night
Fern Bay Stockton (west and east)	Urban Residential	60	50	45	65	55	50
Warabrook Mayfield West Mayfield Carrington	Urban Residential	60	50	45	65	55	50
Sandgate Steel River	Commercial	65	65	65	70	70	70
Kooragang Island Mayfield North	Industrial	70	70	70	75	75	75
Any	School[1]	External 45 when in use [3]			External 50 when in use [3]		
Any	Hospital	External 50 when in use [3]			External 55 when in use [3]		

Note 1: External criteria equivalent to internal criteria plus 10 dBA.
Note 2: Daytime 0700 hours to 1800 hours, Evening 1800 hours to 2200 hours, Night-time 2200 hours to 0700 hours.
Note 3: Noisiest 1 hour period.

In accordance with the INP's Chapter 2 Industrial Noise Criteria, the "project specific" intrusive and amenity assessment criteria for the residential, commercial and industrial receiver areas are presented in **Table 14**. These criteria are nominated for the purposes of assessing potential noise impacts from the CET.

Table 14 Project Specific Noise Assessment Criteria (dBA re 20 µPa)

Receiver Area	ID Location	Intrusive LAeq(15minute)			Amenity LAeq(period)[1]		
		Day	Evening	Night	Day	Evening	Night
Fern Bay West	All Residential	55	47	49	60	48	38
Fern Bay East	All Residential	45	49	47	60	50	41
Stockton West	All Residential	47	49	49	60	47	38
Stockton East	All Residential	46	48	48	60	50	39
Warabrook/ Mayfield West	All Residential	50	51	46	60	48	41
Mayfield	All Residential	51	52	48	60	48	39
Carrington	All Residential	47	46	42	60	48	43
Sandgate	All Commercial	Intrusive noise not applicable			65	65	65
Mayfield West	All Steel River	Intrusive noise not applicable			65	65	65
Kooragang Island	All Industrial	Intrusive noise not applicable			70	70	70
Mayfield North	All Industrial	Intrusive noise not applicable			70	70	70
Any	School	Intrusive noise not applicable			External 45 when in use		
Any	Hospital	Intrusive noise not applicable			External 50 when in use		

Note 1: Daytime 0700 hours to 1800 hours, Evening 1800 hours to 2200 hours, Night-time 2200 hours to 0700 hours.

The INP states that these criteria have been selected to preserve the amenity of at least 90% of the population living in the vicinity of industrial noise sources from the adverse effects of noise for at least 90% of the time. Provided the criteria in the INP are achieved, it is unlikely that most people would consider the resultant noise levels excessive.

In those cases where the INP project specific assessment criteria are not achieved, it does not automatically follow that all people exposed to the noise would find the noise unacceptable. In subjective terms, exceedances of the INP project specific assessment criteria can be generally described as follows:

- Negligible noise level increase <1 dBA
  (Not noticeable by all people).
- Marginal noise level increase 1 dBA to 2 dBA
  (Not noticeable by most people).
- Moderate noise level increase 3 dBA to 5 dBA
  (Not noticeable by some people but may be noticeable by others).
- Appreciable noise level increase >5 dBA
  (Noticeable by most people).

4.3 Noise Modelling Procedure

The CET computer model was developed to incorporate the significant noise sources associated with the proposed development. Additional surrounding terrain, aspects of the built environment and nearby receiver areas were also included in the model.

The CET computer model was prepared using RTA Software's Environmental Noise Model (ENM for Windows, Version 3.06), a commercial software system developed in conjunction with the NSW EPA. The acoustical algorithms utilised by this software have been endorsed by the Australian and New Zealand Environment and Conservation Council (ANZECC) and all State Environmental Authorities throughout Australia as representing one of the most appropriate predictive methodologies currently available.

The following scenarios were assessed:

Initial Construction Noise: The anticipated daytime construction scenarios arising from **mid-year 1 and mid-year 2** activities in accordance with the proposed construction schedule to achieve a capacity of 33 Mtpa.

Future Construction Noise: The anticipated daytime construction scenarios arising from the simultaneous 33 Mtpa operation and construction activities to complete the project.

- The ***construction modelling*** includes all significant items of plant and equipment (**Table 4**) working concurrently to simulate and predict the intrusive $L_{A10(15minute)}$ construction noise emission.

66 Mtpa Operating Noise (East): The daytime, evening and night-time operation with the locations of mobile equipment (ie. coal trains, stackers/reclaimers and shiploaders) balanced to the **east**, and

66 Mtpa Operating Noise (West): The daytime, evening and night-time operation with the locations of mobile equipment (ie. coal trains, stackers/reclaimers and shiploaders) balanced to the **west.**

- The ***operations modelling*** includes all significant items of plant and equipment (**Table 3**) working concurrently to simulate and predict the intrusive $L_{Aeq(15minute)}$ and amenity $L_{Aeq(period)}$ levels.

4.4 Noise Mitigation Measures

As construction activities will generally be confined to daytime hours in accordance with **Table 6,** the predictive modelling described above involved the investigation of all feasible and reasonable noise mitigation measures, particularly for the CET night-time operation. A discussion of the noise mitigation and management controls adopted in the project design is provided below.

Source Noise Controls

For the purposes of noise impact assessment, the design maximum L_{Aeq} sound power levels (SWLs) are presented in **Table 15** for all acoustically-relevant items of plant and equipment.

The SWLs for plant are based on current "achievable" low noise emission standards. Further reductions may be possible in the future. Initial cost estimates to install, maintain and service the "achievable" noise controls have been undertaken and included in the CET's design budgets.

Subsequent detailed design studies may be required to refine individual SWLs and to prepare procurement specifications to ensure that the approved off-site environmental noise limits are achieved.

CET's noise control requirements will be delivered through the implementation of its design, procurement, commissioning and operating noise management plans and will include:

- Develop noise limits and acoustical specifications for all significant plant contributing to total noise emission from the site during the design phase.
- Perform design review and validation testing of significant plant during procurement.
- Conduct at-site acceptance testing on all significant plant during the commissioning phase.
- Perform detailed computer-based acoustical modelling to re-evaluate noise emissions to the residential and commercial/industrial areas at the commencement of operation.
- Conduct regular noise monitoring both on-site and at the residential, commercial and industrial receiver areas in accordance with an approved noise management and control programme.

Noise Propagation Controls

In order to enhance the acoustic and visual amenity of the coal stockyard, an earth bund wall approximately 1500 m in length will be constructed on the northern side of Cormorant Road. The bund will be essentially be an extension of the existing KIWEF bund and will be of a similar scale to the existing bund.

In addition, following initial noise modelling and the Project Environmental Risk Analysis, one further noise propagation control was identified:

- A purpose built acoustic barrier approximately 600 m in length, 5 m above rail level and with an offset distance no greater than 3 m from the outer rail. The barrier will commence at the eastern tangent of the rail loop and continue in a clockwise direction and be constructed from a material with surface density not less an 18kg per square metre (ie. CSR Hebel Sound Barrier or equivalent materials). It should be noted that the implementation of the acoustic barrier would be dependant on the actual progress of the proposed staged development of the CET (ie. the barrier need only be installed as the capacity of the CET approaches 66 Mtpa in order to facilitate compliance with the relevant Project noise criteria).

Table 15 Equipment Design Maximum LAeq Sound Power Levels (dBA re 10 pW)

Equipment	Capacity/ Specifications	Mitigation (or equivalent)	Overall LAeq SWL
Rail Receival and Stacking			
Conveyor Assembly	8500 tph	Aluminium Idlers Random spacing	100 dBA/100 m
Conveyor Drive	630 kW	Low-noise Specification	100 dBA
Dump Station	8500 tph	Cladded enclosure	102 dBA
Inbound Sample Station	850 tph	Cladded enclosure	97 dBA
Transfer Tower	2 x 8500 tph	Cladded enclosure	99 dBA
Stockyard and Reclaiming			
Conveyor Assembly	10500 tph	Aluminium Idlers Random spacing	101 dBA/100 m
Conveyor Drive	800 kW	Low-noise Specification	100 dBA
Transfer Point per Chute	10500 tph	Soft Flow Chute	100 dBA
Stacker/Reclaimer	10500 tph	Low-Noise Specification	107 dBA
Buffer Bin	2500 t	Belt Feeder	103 dBA
Outbound Sample Station	850 tph	Cladded enclosure	99 dBA
Dozer	D11	Daytime use only	118 dBA
Shiploading			
Conveyor Assembly	10500 tph	Aluminium Idlers Random spacing	101 dBA/100 m
Conveyor Drive	800 kW	Low-noise Specification	100 dBA
Shiploader	10500 tph (peak 12500 tph)	Low-Noise Specification	106 dBA
Sedimentation			
Water Pump	3-4 MW	Cladded enclosure	100 dBA
Rail Loop and Spur			
Locomotive Low Idle	90 class	Partial barrier on rail loop	105 dBA
Locomotive High Idle	90 class		107 dBA
Locomotive on Arriving	90 class		106 dBA
Locomotive on Moving Off	90 class		109 dBA
Wagon - Creak	100 t	Partial barrier on rail loop	116 dBA
Wagon - Wheel Squeal	100 t		113 dBA
Wagon - Coupling Take Up	100 t		106 dBA

The LAeq sound power levels presented in **Table 15** do not include noise emissions which emanate from alarms. Alarms will be subject to procurement specifications detailing the tone frequency, noise emission levels, directionality and coverage. They will be installed to optimise safety and to minimise off-site noise leakage. In the unlikely event that alarm noise remains a source of disturbance, then further on-site optimisation and fine adjustments will be examined to achieve further noise reductions without compromising safety standards.

Exceedances of Criteria

In the event of an exceedance of Project-specific criteria during construction and operations, and depending on the degree of exceedance, additional noise mitigation and management measures would include:

- Additional targetted noise monitoring on-site and within the community.
- Prompt response to any community issues of concern.
- Refinement of on-site noise operating procedures where practicable.
- Consideration of additional acoustical mitigation controls on noise sources.

5 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

5.1 Initial Daytime Construction up to 33 Mtpa Capacity

The predicted $L_{A10(15minute)}$ intrusive noise from mid-year 1 and mid-year 2 daytime activities to nearest receiver areas are presented in **Table 16**.

Table 16 Initial Construction $L_{A10(15minute)}$ Intrusive Noise (dBA re 20 µPa)

Receiver Area	ID/Location		Mid-Year 1 Calm[3]	Mid-Year 2 Calm[3]	Intrusive Criteria
Fern Bay West	FW1	1 Fullerton Lane	32	33	55
	FW2	Stockton Hospital	31	32	50[1]
Fern Bay East	FE1	21 Braid Road	29	29	45
	FE2	Fern Bay Primary	30	31	45[2]
Stockton West	SW1	284 Fullerton Street	31	32	47
	SW2	Cnr Pembroke and Fullerton Sts	32	32	
Stockton East	SE1	40 Eames Avenue	30	32	46
	SE2	Stockton Primary	27	28	45[2]
Warabrook/ Mayfield West	W1	47 Stevenson Avenue	40	40	50
	W2	4 Groongal Street	41	43	
	W3	Mayfield West Primary	39	40	45[2]
Mayfield	M1	68 Bull Street	43	45	51
	M2	45 Simpson Crescent	43	44	
	M3	1 Arthur Street	38	39	
	M4	52 Arthur Street	41	43	
	M5	21 Crebert Street	43	42	
	M6	Hunter Christian School	43	44	45[2]
	M7	Mayfield East Primary	36	39	
Carrington	C1	Cnr Hargrave and Young Sts	34	34	47
Sandgate	SG1	4 Mangrove Road	44	36	65
Mayfield West	MW1	Steel River	53	49	
Kooragang Island	KI1	Blue Circle Southern	63	66	70
	KI2	Origin Energy	60	65	
	KI3	Boral Country Concrete	58	67	
	KI4	Port Waratah Coal Services	46	48	
	KI5	Cargill Australia	49	51	
	KI6	ERS Australia	53	55	
	KI7	Cleanaway	55	62	
	KI8	Port Hunter Commodities	55	59	
	KI9	BOC Gas	57	58	
	KI10	Sims Metal	51	53	
Mayfield North	MN1	OneSteel	60	62	70

Note 1: External amenity criteria 50 dBA used in the absence of intrusive criteria.
Note 2: Equivalent external amenity criteria 45 dBA used in the absence of intrusive criteria.
Note 3: Daytime calm meteorological parameters as described in **Table 9**.

All predicted intrusive noise levels are below the relevant assessment criteria and any small noise impacts are considered acceptable.

5.2 Future Daytime Construction up to 66 Mtpa Capacity

The predicted $L_{A10(15minute)}$ intrusive noise from simultaneous 33 Mtpa operations (east and west) and future daytime construction activities to the nearest receiver areas are presented in **Table 17**.

Table 17 Future $L_{A10(15minute)}$ Construction Intrusive Noise (dBA re 20 µPa)

Receiver Area	ID/Location		East Operation Plus Future Construction Calm[3]	West Operation Plus Future Construction Calm[3]	Intrusive Criteria
Fern Bay West	FW1	1 Fullerton Lane	33	33	55
	FW2	Stockton Hospital	32	32	50[1]
Fern Bay East	FE1	21 Braid Road	30	30	45
	FE2	Fern Bay Primary	31	30	45[2]
Stockton West	SW1	284 Fullerton Street	32	32	47
	SW2	Cnr Pembroke and Fullerton Sts	32	32	
Stockton East	SE1	40 Eames Avenue	30	30	46
	SE2	Stockton Primary	28	28	45[2]
Warabrook/ Mayfield West	W1	47 Stevenson Avenue	40	40	50
	W2	4 Groongal Street	42	42	
	W3	Mayfield West Primary	39	39	45[2]
Mayfield	M1	68 Bull Street	44	44	51
	M2	45 Simpson Crescent	44	44	
	M3	1 Arthur Street	38	38	
	M4	52 Arthur Street	41	41	
	M5	21 Crebert Street	43	43	
	M6	Hunter Christian School	43	44	45[2]
	M7	Mayfield East Primary	36	36	
Carrington	C1	Cnr Hargrave and Young Sts	34	34	47
Sandgate	SG1	4 Mangrove Road	45	45	65
Mayfield West	MW1	Steel River	54	54	
Kooragang Island	KI1	Blue Circle Southern	63	63	70
	KI2	Origin Energy	61	61	
	KI3	Boral Country Concrete	59	59	
	KI4	Port Waratah Coal Services	46	46	
	KI5	Cargill Australia	50	50	
	KI6	ERS Australia	53	53	
	KI7	Cleanaway	56	56	
	KI8	Port Hunter Commodities	56	55	
	KI9	BOC Gas	57	57	
	KI10	Sims Metal	52	52	
Mayfield North	MN1	OneSteel	60	60	70

Note 1: External amenity criteria 50 dBA used in the absence of intrusive criteria.
Note 2: Equivalent external amenity criteria 45 dBA used in the absence of intrusive criteria.
Note 3: Daytime calm meteorological parameters as described in **Table 9**.

All predicted intrusive levels are below the relevant assessment criteria and any small noise impacts are considered acceptable.

5.3 Construction Vibration

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 NSW Department of Environment and Conservation (DEC) has recently 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 **Appendix F** and summarised in **Table 18**.

Table 18 Vibration Velocity Damage and Annoyance Risk Criteria (mm/s)

Receiver Area	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.

Buffer Distance from Impact Piling

As shown in **Table 4**, up to four impact piling rigs are anticipated for use during the rail, coal storage and wharf construction activities. The buffer distances predicted to achieve compliance with the range of damage and annoyance risk criteria are presented in **Table 19**. The safe distances are based on the operation of a single hydraulic hammer rated at 5 tonne-metres (t-m) driving 450 mm concrete piles at both 50% and 100% piling capacity. As the vertical criterion is equal or lower than the horizontal criterion in all cases, buffer distances are provided in **Table 4** with respect to the vertical criterion only.

Table 19 Predicted Buffer Distance from Impact Piling (m)

Receiver Area	Damage Risk (m)		Annoyance Risk (m)	
	Vertical 50%	Vertical 100%	Vertical 50%	Vertical 100%
Residential/Dwellings	80	100	150	180
Commercial/Offices	9	12	130	150
Industrial/Workshops	9	12	100	120
Mechanical (On/Off)	9/80	12/100	-	-
Electronic/Computers	9	12	-	-
Subsurface/Pipework	2	3	-	-

Impact Assessment

Based on the predicted buffer distances from single hydraulic hammering, it is 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 also considered minimal as the nearest buildings and mechanical plant (assumed operating) are well beyond 12 m.

The risk of annoyance to the occupants of offices and workshops is also minimal at all but the very nearest adjacent industrial neighbours to the east of the site, where vibration monitoring and short term piling energy management may be required during piling activities to achieve compliance with the relevant criteria.

6 OPERATING INTRUSIVE NOISE ASSESSMENT

6.1 Daytime 66 Mtpa Operation

The predicted $L_{Aeq(15minute)}$ intrusive noise from the daytime 66 Mtpa operation to the nearest receiver areas are presented in **Table 20**.

Table 20 Daytime 66 Mtpa Operation Intrusive Noise (dBA re 20 μPa)

Receiver Area	ID/Location		East Operation Calm[3]	West Operation Calm[3]	Daytime Criteria
Fern Bay West	FW1	1 Fullerton Lane	27	26	55
	FW2	Stockton Hospital	27	25	50[1]
Fern Bay East	FE1	21 Braid Road	25	25	45
	FE2	Fern Bay Primary	27	25	45[2]
Stockton West	SW1	284 Fullerton Street	25	24	47
	SW2	Cnr Pembroke and Fullerton Sts	25	25	
Stockton East	SE1	40 Eames Avenue	24	24	46
	SE2	Stockton Primary	24	23	45[2]
Warabrook/ Mayfield West	W1	47 Stevenson Avenue	34	33	50
	W2	4 Groongal Street	36	35	
	W3	Mayfield West Primary	33	32	45[2]
Mayfield	M1	68 Bull Street	37	36	51
	M2	45 Simpson Crescent	37	36	
	M3	1 Arthur Street	31	32	
	M4	52 Arthur Street	33	33	
	M5	21 Crebert Street	33	32	
	M6	Hunter Christian School	37	36	
	M7	Mayfield East Primary	30	30	
Carrington	C1	Cnr Hargrave and Young Sts	26	26	47
Sandgate	SG1	4 Mangrove Road	32	43	65
Mayfield West	MW1	Steel River	41	42	
Kooragang Island	KI1	Blue Circle Southern	56	56	70
	KI2	Origin Energy	53	52	
	KI3	Boral Country Concrete	51	51	
	KI4	Port Waratah Coal Services	41	39	
	KI5	Cargill Australia	43	42	
	KI6	ERS Australia	45	44	
	KI7	Cleanaway	49	48	
	KI8	Port Hunter Commodities	48	47	
	KI9	BOC Gas	48	47	
	KI10	Sims Metal	44	43	
Mayfield North	MN1	OneSteel	42	46	70

Note 1: External amenity criteria 50 dBA used in the absence of intrusive criteria.
Note 2: Equivalent external amenity criteria 45 dBA used in the absence of intrusive criteria.
Note 3: Daytime calm meteorological parameters as described in **Table 9**.

All predicted intrusive noise levels are below the relevant assessment criteria and any noise impacts are considered acceptable.

6.2 Evening 66 Mtpa Operation

The predicted $L_{Aeq(15minute)}$ intrusive noise emissions from the evening 66 Mtpa operation to the nearest receiver areas are presented in **Table 21**.

Table 21 Evening 66 Mtpa Operation Intrusive Noise (dBA re 20 μPa)

Receiver Area	ID/Location		East Operation Wind[3]	West Operation Wind[3]	Evening Criteria
Fern Bay West	FW1	1 Fullerton Lane	22	22	47
	FW2	Stockton Hospital	22	21	50[1]
Fern Bay East	FE1	21 Braid Road	20	20	49
	FE2	Fern Bay Primary	21	20	45[2]
Stockton West	SW1	284 Fullerton Street	22	21	49
	SW2	Cnr Pembroke and Fullerton Sts	23	22	
Stockton East	SE1	40 Eames Avenue	21	21	48
	SE2	Stockton Primary	22	21	45[2]
Warabrook/ Mayfield West	W1	47 Stevenson Avenue	43	43	51
	W2	4 Groongal Street	45	43	
	W3	Mayfield West Primary	42	42	45[2]
Mayfield	M1	68 Bull Street	44	43	52
	M2	45 Simpson Crescent	44	43	
	M3	1 Arthur Street	40	40	
	M4	52 Arthur Street	40	40	
	M5	21 Crebert Street	40	40	
	M6	Hunter Christian School	44	42	45[2]
	M7	Mayfield East Primary	38	38	
Carrington	C1	Cnr Hargrave and Young Sts	30	29	46
Sandgate	SG1	4 Mangrove Road	43	50	65
Mayfield West	MW1	Steel River	52	50	
Kooragang Island	KI1	Blue Circle Southern	55	55	70
	KI2	Origin Energy	51	50	
	KI3	Boral Country Concrete	48	48	
	KI4	Port Waratah Coal Services	36	35	
	KI5	Cargill Australia	40	39	
	KI6	ERS Australia	41	40	
	KI7	Cleanaway	46	45	
	KI8	Port Hunter Commodities	46	45	
	KI9	BOC Gas	46	45	
	KI10	Sims Metal	42	40	
Mayfield North	MN1	OneSteel	50	49	70

Note 1: External amenity criteria 50 dBA used in the absence of intrusive criteria.
Note 2: Equivalent external amenity criteria 45 dBA used in the absence of intrusive criteria.
Note 3: Evening wind meteorological parameters as described in **Table 9**.

All predicted intrusive levels are below the relevant assessment criteria and any noise impacts are considered acceptable.

6.3 Night-time 66 Mtpa Operation

The predicted $L_{Aeq(15minute)}$ intrusive noise emissions from night-time 66 Mtpa operation to the nearest receiver areas are presented in **Table 22**.

Table 22 Night-time 66 Mtpa Operation Intrusive Noise (dBA re 20 μPa)

Receiver Area	ID/Location		East Operation		West Operation		Night-time Criteria
			Wind[3]	Inversion[4]	Wind[3]	Inversion[4]	
Fern Bay West	FW1	1 Fullerton Lane	39	39	38	38	49
	FW2	Stockton Hospital	39	39	38	39	50[1]
Fern Bay East	FE1	21 Braid Road	38	39	37	38	47
	FE2	Fern Bay Primary	38	38	37	37	45[2]
Stockton West	SW1	284 Fullerton Street	38	38	37	38	49
	SW2	Cnr Pembroke and Fullerton Sts	36	37	36	37	
Stockton East	SE1	40 Eames Avenue	37	38	37	38	48
	SE2	Stockton Primary	34	35	34	35	45[2]
Warabrook/ Mayfield West	W1	47 Stevenson Avenue	32	40	37	41	46
	W2	4 Groongal Street	39	43	39	42	
	W3	Mayfield West Primary	38	41	39	41	45[2]
Mayfield	M1	68 Bull Street	38	42	38	41	48
	M2	45 Simpson Crescent	40	42	40	42	
	M3	1 Arthur Street	38	40	37	39	
	M4	52 Arthur Street	38	39	38	39	
	M5	21 Crebert Street	36	39	38	39	
	M6	Hunter Christian School	38	42	38	41	45[2]
	M7	Mayfield East Primary	38	38	38	38	
Carrington	C1	Cnr Hargrave and Young Sts	34	33	34	32	42
Sandgate	SG1	4 Mangrove Road	29	40	42	47	65
Mayfield West	MW1	Steel River	42	49	48	49	
Kooragang Island	KI1	Blue Circle Southern	59	57	59	57	70
	KI2	Origin Energy	58	55	57	54	
	KI3	Boral Country Concrete	56	54	56	53	
	KI4	Port Waratah Coal Services	49	45	49	44	
	KI5	Cargill Australia	52	47	51	46	
	KI6	ERS Australia	53	49	52	48	
	KI7	Cleanaway	55	52	54	51	
	KI8	Port Hunter Commodities	54	50	53	50	
	KI9	BOC Gas	55	51	54	50	
	KI10	Sims Metal	52	48	51	47	
Mayfield North	MN1	OneSteel	47	48	47	48	70

Note 1: External amenity criteria 50 dBA used in the absence of intrusive criteria.
Note 2: Equivalent external amenity criteria 45 dBA used in the absence of intrusive criteria.
Note 3: Night-time wind meteorological parameters as described in **Table 9**.
Note 4: Night-time temperature inversion (and drainage flow) meteorological parameters as described in **Table 9**.

All predicted intrusive levels are below the relevant assessment criteria and any noise impacts are considered acceptable.

The outer envelope (ie. east and west) night-time $L_{Aeq(15minute)}$ intrusive noise contours under inversion and drainage airflow conditions (where applicable) are presented as **Appendix G1**. The calculation of the noise contours involves numerical interpolation of a noise level array with a graphical accuracy of up to approximately ±2.5 dBA. This means that in some cases the contour locations presented in **Appendix G1** will differ from the values in **Table 23**, particularly where topographic effects are prominent. The tabulated data have highest accuracy.

7 OPERATING NOISE AMENITY ASSESSMENT

7.1 Daytime 66 Mtpa Operation

The predicted $L_{Aeq(9hour)}$ amenity noise from the daytime 66 Mtpa operation to the nearest receiver areas are presented in **Table 23**.

Table 23 Daytime 66 Mtpa Operation Amenity Noise (dBA re 20 μPa)

Receiver Area	ID/Location		East Operation Calm[1]	West Operation Calm[1]	Daytime Criteria
Fern Bay West	FW1	1 Fullerton Lane	24	23	60
	FW2	Stockton Hospital	24	22	50
Fern Bay East	FE1	21 Braid Road	22	22	55
	FE2	Fern Bay Primary	24	22	45
Stockton West	SW1	284 Fullerton Street	22	21	60
	SW2	Cnr Pembroke and Fullerton Sts	22	22	
Stockton East	SE1	40 Eames Avenue	21	21	55
	SE2	Stockton Primary	21	20	45
Warabrook/ Mayfield West	W1	47 Stevenson Avenue	31	30	60
	W2	4 Groongal Street	33	32	
	W3	Mayfield West Primary	30	29	45
Mayfield	M1	68 Bull Street	34	33	60
	M2	45 Simpson Crescent	34	33	
	M3	1 Arthur Street	28	29	
	M4	52 Arthur Street	30	30	
	M5	21 Crebert Street	30	29	
	M6	Hunter Christian School	34	33	45
	M7	Mayfield East Primary	27	27	
Carrington	C1	Cnr Hargrave and Young Sts	23	23	60
Sandgate	SG1	4 Mangrove Road	29	40	65
Mayfield West	MW1	Steel River	38	39	
Kooragang Island	KI1	Blue Circle Southern	53	53	70
	KI2	Origin Energy	50	49	
	KI3	Boral Country Concrete	48	48	
	KI4	Port Waratah Coal Services	38	36	
	KI5	Cargill Australia	40	39	
	KI6	ERS Australia	42	41	
	KI7	Cleanaway	46	45	
	KI8	Port Hunter Commodities	45	44	
	KI9	BOC Gas	45	44	
	KI10	Sims Metal	41	40	
Mayfield North	MN1	OneSteel	39	43	70

Note 1: Daytime calm meteorological parameters as described in **Table 9**.

All predicted noise amenity levels are below the relevant assessment criteria and any noise impacts are considered acceptable.

7.2 Evening 66 Mtpa Operation

The predicted $L_{Aeq(4hour)}$ amenity noise emissions from the evening 66 Mtpa operation to the nearest receiver areas are presented in **Table 24**.

Table 24 Evening 66 Mtpa Operation Amenity Noise (dBA re 20 μPa)

Receiver Area	ID/Location		East Operation Wind[1]	West Operation Wind[1]	Evening Criteria
Fern Bay West	FW1	1 Fullerton Lane	19	19	48
	FW2	Stockton Hospital	19	18	50
Fern Bay East	FE1	21 Braid Road	17	17	
	FE2	Fern Bay Primary	18	17	45
Stockton West	SW1	284 Fullerton Street	19	18	47
	SW2	Cnr Pembroke and Fullerton Sts	20	19	
Stockton East	SE1	40 Eames Avenue	18	18	50
	SE2	Stockton Primary	19	18	45
Warabrook/ Mayfield West	W1	47 Stevenson Avenue	40	40	48
	W2	4 Groongal Street	42	40	
	W3	Mayfield West Primary	39	39	45
Mayfield	M1	68 Bull Street	41	40	48
	M2	45 Simpson Crescent	41	40	
	M3	1 Arthur Street	37	37	
	M4	52 Arthur Street	37	37	
	M5	21 Crebert Street	37	37	
	M6	Hunter Christian School	41	39	45
	M7	Mayfield East Primary	35	35	
Carrington	C1	Cnr Hargrave and Young Sts	27	26	48
Sandgate	SG1	4 Mangrove Road	40	47	65
Mayfield West	MW1	Steel River	49	47	
Kooragang Island	KI1	Blue Circle Southern	52	52	70
	KI2	Origin Energy	48	47	
	KI3	Boral Country Concrete	45	45	
	KI4	Port Waratah Coal Services	33	32	
	KI5	Cargill Australia	37	36	
	KI6	ERS Australia	38	37	
	KI7	Cleanaway	43	42	
	KI8	Port Hunter Commodities	43	42	
	KI9	BOC Gas	43	42	
	KI10	Sims Metal	39	37	
Mayfield North	MN1	OneSteel	47	46	70

Note1: Evening wind meteorological parameters as described in **Table 9**.

All predicted noise amenity levels are below the relevant assessment criteria and any noise impacts are considered acceptable.

7.3 Night-time 66 Mtpa Operation

The predicted $L_{Aeq(9hour)}$ amenity noise emissions from night-time 66 Mtpa operation to the nearest receiver areas are presented in **Table 25**.

Table 25 Night-time 66 Mtpa Operation Amenity Noise (dBA re 20 μPa)

Receiver Area	ID/Location		East Operation		West Operation		Night-time Criteria
			Wind[1]	Inversion[2]	Wind[1]	Inversion[2]	
Fern Bay West	FW1	1 Fullerton Lane	36	36	35	35	38
	FW2	Stockton Hospital	36	36	35	36	50
Fern Bay East	FE1	21 Braid Road	35	36	34	35	41
	FE2	Fern Bay Primary	35	35	34	34	45
Stockton West	SW1	284 Fullerton Street	35	35	34	35	38
	SW2	Cnr Pembroke and Fullerton Sts	33	34	33	34	
Stockton East	SE1	40 Eames Avenue	34	35	34	35	39
	SE2	Stockton Primary	31	32	31	32	45
Warabrook/ Mayfield West	W1	47 Stevenson Avenue	29	37	34	38	41
	W2	4 Groongal Street	36	40	36	39	
	W3	Mayfield West Primary	35	38	36	38	45
Mayfield	M1	68 Bull Street	35	39	35	38	39
	M2	45 Simpson Crescent	37	39	37	39	
	M3	1 Arthur Street	35	37	34	36	
	M4	52 Arthur Street	35	36	35	36	
	M5	21 Crebert Street	33	36	35	36	
	M6	Hunter Christian School	35	39	35	38	45
	M7	Mayfield East Primary	35	35	35	35	
Carrington	C1	Cnr Hargrave and Young Sts	31	30	31	29	43
Sandgate	SG1	4 Mangrove Road	26	37	39	44	65
Mayfield West	MW1	Steel River	39	46	45	46	
Kooragang Island	KI1	Blue Circle Southern	56	54	56	54	70
	KI2	Origin Energy	55	52	54	51	
	KI3	Boral Country Concrete	53	51	53	50	
	KI4	Port Waratah Coal Services	46	42	46	41	
	KI5	Cargill Australia	49	44	48	43	
	KI6	ERS Australia	50	46	49	45	
	KI7	Cleanaway	52	49	51	48	
	KI8	Port Hunter Commodities	51	47	50	47	
	KI9	BOC Gas	52	48	51	47	
	KI10	Sims Metal	49	45	48	44	
Mayfield North	MN1	OneSteel	44	45	44	45	70

Note 1: Night-time wind meteorological parameters as described in **Table 9**.

Note 2: Night-time temperature inversion (and drainage flow) meteorological parameters as described in **Table 9**.

All predicted noise amenity levels are below the relevant assessment criteria and any noise impacts are considered acceptable. The outer envelope (ie. east and west) night-time $L_{Aeq(9hour)}$ noise amenity contours under inversion and drainage (where applicable) are presented as **Appendix G2**. The calculation of the noise contours involves numerical interpolation of a noise level array with a graphical accuracy of up to approximately ±2.5 dBA. This means that in some cases the contour locations presented in **Appendix G2** will differ from the values in **Table 26**, particularly where topographic effects are prominent. The tabulated data have highest accuracy.

8 CUMULATIVE INDUSTRIAL NOISE AMENITY ASSESSMENT

Noise Amenity Criteria $L_{Aeq(period)}$

In order to assess any cumulative noise impacts, it is important to appreciate and distinguish between the INP's first and second environmental noise control objectives.

The INP's first objective - that the intrusive noise emission from any single source does not exceed the background level by more than 5 dBA - relates to individual industrial sites where the intrusive noise limit is generally specified in the Development Consent and/or Environmental Protection Licence.

There is no established procedure (or regulatory requirement) to derive intrusive $L_{Aeq(15minute)}$ noise criteria for the cumulative operation of existing and/or approved industrial developments in a locality.

The INP's second objective - that the $L_{Aeq(period)}$ amenity level (ie. non-transport related) does not exceed the specified "acceptable" or "maximum" noise level appropriate for the particular locality and land use - is aimed at restricting the potential cumulative increase in amenity noise levels otherwise known as "background creep". The INP based acceptable and maximum noise amenity levels for residential, commercial and industrial areas are presented in **Table 13**.

Approved Industrial Developments on Kooragang Island and Immediate Surrounds

A review of approved industrial developments on Kooragang Island and in the vicinity of the proposed CET site is presented in **Table 26**.

Table 26 Approved Industrial Development on Kooragang Island and Surrounds

Site	Operator	Approval Date	Development	Status	Source of Noise Data
Kooragang Coal Terminal	Port Waratah Coal Services Ltd	25/11/1996	Stages 1, 2 and 3A Stage 3 Steps (1-4) Project 3D Stage 3 Remainder	Operating Operating In Progress Planned Development	ERM (1996)
Cargill Oilseed Processing Facility	Cargill Australia Ltd	04/04/2006	Stage 1 Stage 2 Expansion	Operating Planned Development	HLA Envirosciences (2005)
Extension of Shipping Channels	NSW Waterways Authority	09/08/2005	Approved	Temporary Planned Development	NSW Waterways Authority (2004)
Cold Mill Facility	Protech Steel Pty Ltd	2002	Approved	Unlikely[1]	GHD (2001)
Multi-purpose Facility	BHP Company Ltd	06/04/2001	Approved	Not yet commenced	URS (2000)

Note 1: Cold Mill Facility not assessed cumulatively as this project would be effectively sterilised by the CET.

The likelihood of all existing, approved and proposed developments in **Table 26** emitting maximum noise emission at any one time appears remote.

Night-time Cumulative Noise Amenity Assessment

Existing amenity levels (from industrial noise) at the adjacent commercial and industrial receiver areas are below the INP's acceptable levels during daytime, evening and night-time. Similarly, the existing amenity levels (from industrial noise) at residential areas presented in **Table 12** are below the INP's acceptable level during the daytime and evening (but not *night-time*).

Existing amenity levels at *night-time* in residential areas are in some cases just above the INP's acceptable criteria (but below the maximum). It is therefore reasonable to confine the cumulative assessment of noise from existing, approved and proposed developments to residential areas to the *night-time* period only.

In accordance with the INP's Chapter 2 Industrial Noise Criteria, the night-time cumulative sum of existing and approved developments - and the proposed CET noise amenity levels - are presented in **Table 27,** together with the acceptable and maximum amenity criteria for the residential receiver areas.

Table 27 Night-time Cumulative Existing, Approved and CET Amenity (dBA re 20 µPa)

Receiver Area	Existing Industry Measured	PWCS Remainder (Adverse)[2]	Cargill Stage 2 (Adverse)	Channel Extension (Adverse)	Multi Purpose (Limits)	CET (Adverse)[1]	Cumulative Sum (Adverse)	INP Amenity Criteria	
								Acceptable	Maximum
Fern Bay West Residential	48	34	33	30	30	36	49	45	50
Fern Bay East Residential	43	29	28	25	30	36	44		
Stockton West Residential	48	35	33	35	30	35	49		
Stockton East Residential	44	31	28	30	30	35	45		
Warabrook/ Mayfield West Residential	43	32	25	33	30	39	45	45	50
Mayfield Residential	44	31	28	39	36	38	47		
Carrington Residential	42	24	25	30	34	31	43		

Source: refer to Table 26 for the sources of non-NCIG noise emissions.

Note 1: Average adverse weather noise predictions for each locality.

Note 2: PWCS noise contribution based on likely emissions from Stage 3 Remainder assuming an appropriate level of noise suppression for new plant.

As discussed in **Section 3.2,** existing industrial noise is a feature of the residential night-time noise environment at all receiver areas. Sometimes it is not discernible - but at other times it is distinguishable - particularly during lulls in transport, domestic and natural noise sources (ie. ocean noise).

Fern Bay (West)/Stockton (West): Existing night-time industrial noise generally emanates from Kooragang Island and was estimated as 48 dBA at both receiver areas during noise-enhancing weather conditions. Cumulative noise amenity levels are anticipated to increase by approximately 1 dBA and remain marginally under the maximum noise amenity level of 50 dBA. Industrial noise is at least 5 dBA less in the absence of westerly winds and/or temperature inversions and therefore is just below the acceptable noise amenity level of 45 dBA.

Fern Bay (East)/Stockton (East): Existing night-time industrial noise from Kooragang Island was estimated as 43 dBA to 44 dBA during noise-enhancing weather conditions. Cumulative noise amenity levels are anticipated to increase by approximately 1 dBA and remain under the acceptable noise amenity level of 45 dBA. Similarly, industrial noise is at least 5 dBA less in the absence of westerly winds and/or temperature inversions. Ocean noise is also a feature of the area particularly during north-easterly breezes.

Warabrook/Mayfield West/Carrington: Existing night-time industrial noise generally emanates from the industrial areas located to the immediate north of the receiver areas (eg Mayfield North) and was estimated as 42 dBA to 43 dBA. Cumulative noise amenity levels are anticipated to increase by approximately 1 dBA to 2 dBA and remain within the acceptable noise amenity level of 45 dBA. Due to the relatively close proximity of the industry to the residential receiver areas, noise enhancement due to weather effects is less than for Fern Bay and Stockton and the industrial noise contribution is relatively more constant.

Mayfield: Similarly, existing night-time industrial noise generally emanates from the industrial areas located to the immediate north of the receiver areas and was estimated as 44 dBA. Cumulative noise amenity levels are anticipated to increase by approximately 3 dBA and remain under the maximum noise amenity level of 50 dBA.

It should be noted that for each of the cases discussed above, the likelihood of all existing, approved and proposed developments emitting maximum noise emission at any one time appears remote. It is therefore considered that this assessment includes a degree of conservatism.

9 OFF-SITE TRANSPORT

9.1 Road Transport

Traffic Noise Criteria

Based on the EPA's "*Environmental Criteria for Road Traffic Noise*" policy (ECRTN) dated May 1999, Nelson Bay Road, Cormorant Road and Industrial Drive are classified as "arterial roads". The applicable noise criteria are presented in **Table 28**.

Table 28 NSW Environmental Criteria for Road Traffic Noise

Receiver Area	Road	Policy	Descriptor	Traffic Noise Goal
Fern Bay Kooragang Island Warabrook/Mayfield	Nelson Bay Road Cormorant Road Industrial Drive	Land use developments with the potential to create additional traffic on existing freeways/arterials	Daytime LAeq(15hour)	60 dBA
			Night-time LAeq(9hour)	55 dBA

Note that in all cases where the nominated criteria are already exceeded, traffic associated with the development should not be permitted to lead to an increase in the existing noise traffic levels of more than 2 dBA.

Traffic Movements

Section 2.7 presents the construction and operation workforce details. A breakdown of the anticipated CET traffic movements is presented in **Table 29**.

Table 29 CET Daily Total Two-way Traffic Movements

Vehicle Type	Construction	Operations
Employee	800	60
Visitors/representatives	200	20
Fuel deliveries	6	2 per month
Machine parts/container trucks	9	1 per week
Other deliveries	100	10
Delivery truck (20t)	34	-
Concrete trucks	9	-

Source: after: Mason Wilson Twiney (2006)

For the purposes of noise impact assessment, the existing and anticipated construction and operating traffic flows are presented in **Table 30** for the daytime (0700 hours to 2200 hours) and night-time (2200 hours to 0700 hours). The percentage increase arising from the CET-contributed traffic is shown in brackets.

Table 30 Existing and Anticipated Traffic Flows

Location	Time Period	2007	Construction Phase CET	Total	2017	Operation Phase CET	Total
Nelson Bay Road	Daytime 0700 hrs to 2200 hrs	16,744	109 (1%)	16,853	18,370	5 (<1%)	18,375
Cormorant Road		21,803	586 (3%)	22,389	23,864	53 (<1%)	23,917
Industrial Drive		27,687	293 (1%)	27,980	30,320	26 (<1%)	30,346
Nelson Bay Road	Night-time 2200 hrs to 0700 hrs	2,791	65 (2%)	2,856	3,062	2 (<1%)	3,064
Cormorant Road		3,540	398 (12%)	3,938	3,884	30 (1%)	3,914
Industrial Drive		4,521	199 (4%)	4,720	4,960	15 (<1%)	4,975

Source: after Mason Wilson Twiney (2006)

Traffic Noise Impact

The maximum increase in daytime CET-related traffic flow occurs along Cormorant Road during the construction period. The anticipated 3% increase in vehicle movements corresponds to a very small 0.1 dB increase in the existing daytime $L_{Aeq(15hour)}$ noise level and is negligible.

Similarly, the maximum increase in night-time CET-related traffic flow also occurs along Cormorant Road during the construction period. The anticipated 12% increase in vehicle movements corresponds to only a small 0.5 dB increase in the existing night-time $L_{Aeq(9hour)}$ noise level - and is also considered negligible.

9.2 Rail Transport

The Australian Rail Track Corporation Ltd (ARTC) operates the Hunter Valley Coal Rail Network in NSW. Noise emissions from the railway are regulated via ARTC's Environmental Protection Licence (EPL No 3142, Review Date 1 July 2005). An assessment of potential off-site rail traffic impacts is not a CET EA requirement however a description of the ARTC's regulation of noise via the EPL is provided below.

The intent of the relevant EPL conditions is to control airborne noise by two principal means:

- Noise Limits.
- Management of noise via Pollution Reduction Programs (PRPs).

EPL Section L6 - Noise Limits (**Appendix H1**)

Maximum locomotive source noise levels and tonality criteria for stationary and in-service test conditions are specified in EPL Condition L6 *Noise Limits*. EPL Section L6 does not nominate airborne noise limits at receiver locations but notes that:

> *"It is an objective of this licence to progressively reduce noise levels of railway operations to appropriate goals through the implementation of Pollution Reduction Programs (PRPs)."*

EPL Section U1 Noise Management for Existing Activities and Infrastructure (**Appendix H2**)

EPL Condition U1 *Noise Management for Existing Activities and Infrastructure* requires the preparation of Pollution Reduction Programmes (PRPs) in accordance with Conditions U1.2, U1.3 and U1.4.

Condition U1.1 sets out noise objectives of PRPs as stated below. The noise goals are specified in terms of daytime $L_{Aeq(15hour)}$ and night-time $L_{Aeq(9hour)}$ equivalent continuous noise levels (log-averaging rail noise energy over the respective time periods) as well as a maximum passby noise level (L_{Amax}).

> *"U1.1 Objectives of PRPs*
>
> *In developing the PRPs, the licensee must work towards the goals of 65 dB(A)L_{eq}, (daytime - 7.00 am-10.00 pm), 60 dB(A)L_{eq}, (night-time – 10.00 pm-7.00 am) and 85 dB(A) (24hr) max passby noise, at one metre from the facade of affected residential properties. If it is not possible for these goals to be reached by feasible and reasonable mitigation measures, the PRP must aim, through feasible and reasonable measures to:*
>
> - *reduce operational rail noise emissions and the associated noise impact on the community where traffic levels are anticipated to remain constant; or*
> - *stabilise operational rail noise emissions and the associated noise impact on the community where traffic levels are anticipated to increase."*

The goals do not represent unobtrusive noise levels. Rather, the objectives recognise that rail operations are inherently noisy and represent a compromise between what may be desirable from a community point of view (ie. maintaining amenity) and what is necessary to enable trains to operate.

It should be noted that the Main Northern Railway (which includes the Muswellbrook to Newcastle line) does not currently have a PRP, however the stated objectives of the PRP provide guidance for noise regulation for the Hunter Valley rail network.

The Main Northern Railway

In addition to the above, the following points can be made in relation to the Main Northern Railway:

- The ARTC released "2006-2011 Hunter Valley Coal Network Capacity Improvement Strategy" in April 2006.
- This document makes the following points of relevance to the Project:
  - ARTC has outlined a series of rail upgrade projects necessary to keep track capacity ahead of the projected growth in coal exportation.
  - ARTC's planning accounts for the capacity of the CET.
  - ARTC has already engaged in the process of planning and statutory approvals for rail capacity upgrade projects. Noise impacts resulting from rail capacity upgrades will be assessed by ARTC as part of the assessment and approval of these projects.
- The upgrades referred to in the ARTC publication would each be subject to a public environmental assessment process under the *Environmental Planning and Assessment Act 1979* and ultimately regulation by the DEC via an EPL.
- The environmental assessment for each phase of physical upgrade in the rail network would provide the ARTC with the opportunity to develop noise mitigation works.

10 SUMMARY OF FINDINGS

10.1 Construction Noise and Vibration Assessment

Construction Noise

The construction phase would involve the installation and commissioning of rail infrastructure, coal storage area, wharf facilities and shiploaders to allow the commencement of operations at the CET. An initial 33 month construction phase is expected for the CET capacity to reach 33 Mtpa. The timing of further development of the CET for a capacity up to 66 Mtpa would depend on market demand. Construction hours would be between 7.00 am to 6.00 pm up to seven days per week.

In the absence of guidance under the Industrial Noise Policy, the assessment of impact from on-site construction works remains according to the EPA's ENCM (1994) Chapter 171 Noise Control Guideline - Construction Site Noise (**Appendix E**). The ENCM provides noise limits for construction periods of up to 26 weeks. As the duration of the construction works is greater than 26 weeks, the DEC suggests that the construction noise emission should generally not exceed the background level by more than 5 dBA.

The anticipated daytime 33 Mtpa construction scenarios arising from **mid-year 1 and mid-year 2** activities have been assessed as well as a future daytime construction scenario arising from the simultaneous 33 Mtpa operation and construction activities to complete the project. All predicted intrusive levels are below the relevant assessment criteria and any noise impacts are considered acceptable.

Construction Vibration

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 NSW Department of Environment and Conservation (DEC) has recently released an interim guideline "*Assessing Vibration: A Technical Guideline"* dated February 2006 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 **Appendix F**.

Based on the predicted buffer distances from single hydraulic hammering it is concluded that the damage and annoyance risk to all residential receivers is negligible as the nearest dwellings are well beyond the predicted buffer distance of 180 m. Similarly, the damage risks to the nearest commercial and industrial receivers are also considered minimal as the nearest buildings and mechanical plant (assumed operating) are well beyond the predicted "buffer distance" of 12 m.

The risk of disturbance to the occupants of offices and workshops is also minimal at all but the very nearest adjacent industrial neighbours to the east of the site, where vibration monitoring and piling energy management during piling activities may be required to achieve compliance with the relevant criteria.

10.2 Operating Noise Assessment

Operating Noise Criteria

The INP prescribes detailed calculation routines for establishing "project specific" $L_{Aeq(15minute)}$ intrusive criteria and $L_{Aeq(period)}$ amenity (ie. non-transport related) criteria at potentially affected receivers. Ideally, the intrusive noise emission levels should generally not exceed the background level by more than 5 dBA. Similarly, the amenity level should generally not exceed the specified "acceptable" or "maximum" noise level appropriate for the particular locality and land use as shown in **Table 31**.

Table 31 INP Acceptable and Maximum Noise Amenity Levels (dBA re 20 µPa)

Receiver Area	Land Use	Amenity $L_{Aeq(period)}$[2] Acceptable			Amenity $L_{Aeq(period)}$[2] Maximum		
		Day	Evening	Night	Day	Evening	Night
Fern Bay Stockton	Urban Residential	60	50	45	65	55	50
Warabrook Mayfield West Mayfield Carrington	Urban Residential	60	50	45	65	55	50
Sandgate Steel River	Commercial	65	65	65	70	70	70
Kooragang Island Mayfield North	Industrial	70	70	70	75	75	75
Any	School[1]	External 45 when in use[3]			External 50 when in use[3]		
Any	Hospital	External 50 when in use[3]			External 55 when in use[3]		

Note 1: External criteria equivalent to internal criteria plus 10 dBA.
Note 2: Daytime 0700 hours to 1800 hours, Evening 1800 hours to 2200 hours, Night-time 2200 hours to 0700 hours.
Note 3: Noisiest 1 hour period.

In accordance with the INP's Chapter 2 Industrial Noise Criteria, the "project specific" intrusive and amenity assessment criteria for the residential, commercial and industrial receiver areas are presented in **Table 32**. These criteria are nominated for the purposes of assessing potential noise impacts from the CET and are also recommended noise limits for General Terms of Approval.

Table 32 Project Specific Noise Assessment Criteria (dBA re 20 µPa)

Receiver Area	ID Location	Intrusive $L_{Aeq(15minute)}$			Amenity $L_{Aeq(period)}$[1]		
		Day	Evening	Night	Day	Evening	Night
Fern Bay West	All Residential	55	47	49	60	48	38
Fern Bay East	All Residential	45	49	47	60	50	41
Stockton West	All Residential	47	49	49	60	47	38
Stockton East	All Residential	46	48	48	60	50	39
Warabrook/ Mayfield West	All Residential	50	51	46	60	48	41
Mayfield	All Residential	51	52	48	60	48	39
Carrington	All Residential	47	46	42	60	48	43
Sandgate	All Commercial	Intrusive noise not applicable			65	65	65
Mayfield West	All Steel River	Intrusive noise not applicable			65	65	65
Kooragang Island	All Industrial	Intrusive noise not applicable			70	70	70
Mayfield North	All Industrial	Intrusive noise not applicable			70	70	70
Any	School	Intrusive noise not applicable			External 45 when in use		
Any	Hospital	Intrusive noise not applicable			External 50 when in use		

Note 1: Daytime 0700 hours to 1800 hours, Evening 1800 hours to 2200 hours, Night-time 2200 hours to 0700 hours.

The INP states that these criteria have been selected to preserve the amenity of at least 90% of the population living in the vicinity of industrial noise sources from the adverse effects of noise for at least 90% of the time. Provided the criteria in the INP are achieved, it is unlikely that most people would consider the resultant noise levels excessive. In those cases where the INP project specific assessment criteria are not achieved, it does not automatically follow that all people exposed to the noise would find the noise unacceptable. Exceedances of 5 dBA or more are generally required before the "impact" becomes clearly noticeable and appreciable.

CET Noise Modelling Results and Impact Assessment

The CET computer model was developed to incorporate and predict noise emissions from the significant noise sources associated with the proposed development. Additional surrounding terrain, aspects of the built environment and nearby receiver areas were also included in the model. The operations modelling includes all significant items of plant and equipment (**Table 3**) working concurrently to simulate and predict the highest intrusive $L_{Aeq(15minute)}$ and amenity $L_{Aeq(period)}$ levels. The following scenarios were assessed:

66 Mtpa Operating Noise (East): The daytime, evening and night-time operation with the locations of mobile equipment (ie. coal trains, stackers/reclaimers and shiploaders) balanced to the **east**.

66 Mtpa Operating Noise (West): The daytime, evening and night-time operation with the locations of mobile equipment (ie. coal trains, stackers/reclaimers and shiploaders) balanced to the **west**.

In all cases, the predicted intrusive levels are below the relevant assessment criteria and any noise impacts are considered acceptable. The outer envelope (ie. east and west) night-time $L_{Aeq(15minute)}$ intrusive noise contours under temperature inversions and drainage airflow conditions (where applicable) are presented as **Appendix G1**.

Similarly, the predicted noise amenity levels are below the relevant assessment criteria and any noise impacts are considered acceptable. The outer envelope (ie. east and west) night-time $L_{Aeq(9hour)}$ noise amenity contours under temperature inversions and drainage airflow conditions (where applicable) are presented as **Appendix G2**.

The predictive modelling described above involved the investigation of all feasible and reasonable noise mitigation measures particularly for the CET night-time operation. A discussion of the noise mitigation and management controls adopted in the design of the CET is provided below.

Mitigation - Source Noise Controls

For the purposes of noise impact assessment the design maximum L_{Aeq} sound power levels (SWLs) are presented in **Table 15** for all significant items of plant and equipment. The SWLs for plant are based on currently "achievable" low noise emission standards. Further reductions may be possible in the future. Initial cost estimates to install, maintain and service the "achievable" noise controls have been undertaken and included in the CET's design budgets.

Subsequent detailed design studies may be required to refine individual SWLs and to prepare procurement specifications to ensure that the approved off-site environmental noise limits are achieved. CET's noise control requirements will be delivered through the implementation of its design, procurement, commissioning and operating noise management plans.

The L_{Aeq} sound power levels presented in **Table 15** do not include noise emissions which emanate from alarms. Alarms will be subject to procurement specifications, detailing the tone frequency, noise emission levels, directionality and coverage . They will be installed to optimise safety and minimise off-site noise leakage. In the unlikely event that alarm noise remains a source of disturbance, then further optimisation will be carried to achieve further noise reduction without compromising safety standards.

Mitigation - Noise Propagation Controls

In order to enhance the acoustic and visual amenity of the coal stockyard, an earth bund wall approximately 1500 m in length will be constructed on the northern side of Cormorant Road. The bund will be essentially be an extension of the existing KIWEF bund and will be of a similar scale to the existing bund.

Similarly, a purpose built acoustic barrier approximately 600 m in length, 5 m above rail level and with an offset distance no greater than 3 m from the outer rail will be erected. The barrier will commence at the eastern tangent of the rail loop and continue in a clockwise direction and be constructed from a material with surface density not less an 18 kg per square metre (ie CSR Hebel Sound Barrier or equivalent materials).

It should be noted that the implementation of the acoustic barrier would be dependent on the actual progress of the proposed staged development of the CET (ie. the barrier need only be installed as the capacity of the CET approaches 66 Mtpa in order to facilitate compliance with the relevant Project noise criteria).

Mitigation - Receiver Noise Controls

In the event that the project specific criteria are exceeded by 1 dBA to 5 dBA, then noise impacts could range from negligible to moderate. It is recommended that management procedures be implemented including:

- Noise monitoring on-site and within the community.
- Prompt response to any community issues of concern.
- Refinement of noise mitigation measures and operating procedures where practicable.
- Consideration of acoustical mitigation at receivers where substantiated by monitoring results.
- Consideration of negotiated agreements with land owners.

10.3 Cumulative Industrial Noise Amenity Assessment

The INP's second objective, that the $L_{Aeq(period)}$ amenity level (ie. non-transport related) does not exceed the specified "acceptable" or "maximum" noise level appropriate for the particular locality and land use, is aimed at restricting the potential cumulative increase in amenity noise levels otherwise known as "background creep". The INP-based acceptable and maximum noise amenity levels for residential, commercial and industrial areas are presented in **Table 13**.

A review of approved industrial developments on Kooragang Island and in the vicinity of the proposed CET site is presented in **Table 33**.

Table 33 Approved Industrial Development on Kooragang Island and Surrounds

Site	Operator	Approval Date	Development	Status
Kooragang Coal Terminal	Port Waratah Coal Services Ltd	25/11/1996	Stages 1, 2 and 3A Stage 3 Steps (1-4) Project 3D Stage 3 Remainder	Operating Operating In Progress Planned Development
Cargill Oilseed Processing Facility	Cargill Australia Ltd	04/04/2006	Stage 1 Stage 2 Expansion	Operating Planned Development
Extension of Shipping Channels	NSW Waterways Authority	09/08/2005	Approved	Temporary Planned Development
Cold Mill Facility	Protech Steel Pty Ltd	2002	Approved	Unlikely[1]
Multi-purpose Facility	BHP Company Ltd	06/04/2001	Approved	Not yet commenced

Note 1 Cold Mill Facility not assessed cumulatively as this project would be effectively sterilised by the CET.

It is reasonable to confine the cumulative assessment of existing, approved and proposed developments to residential areas during the night-time period as existing amenity levels are at times already just below or just above the INP's acceptable criteria (but below the maximum) - but are everywhere else below the acceptable criteria.

In accordance with the INP's Chapter 2 Industrial Noise Criteria (Section 2.2.4), an assessment of the night-time cumulative sum of existing, approved and the proposed CET noise amenity levels has been determined and assessed against the acceptable and maximum amenity criteria as follows:

Fern Bay (West)/Stockton (West): Existing night-time industrial noise generally emanates from Kooragang Island and was estimated as 48 dBA at both receiver areas under noise-enhancing weather conditions. Cumulative noise amenity levels are anticipated to increase by approximately 1 dBA and remain marginally under the maximum noise amenity level of 50 dBA. Industrial noise is at least 5 dBA less in the absence of westerly winds and/or temperature inversions and therefore just below the acceptable noise amenity level of 45 dBA.

Fern Bay (East)/Stockton (East): Existing night-time industrial noise from Kooragang Island was estimated as 43 dBA to 44 dBA during noise enhancing conditions. Cumulative noise amenity levels are anticipated to increase by approximately 1 dBA and remain under the acceptable noise amenity level of 45 dBA. Similarly, industrial noise is at least 5 dBA less in the absence of westerly winds and/or temperature inversions. Ocean noise is also a feature of the area, particularly during north-easterly breezes.

Warabrook/Mayfield West/Carrington: Existing night-time industrial noise generally emanates from the industrial areas located to the immediate north of the receiver areas (eg Mayfield North) and was estimated as 42 dBA to 43 dBA. Cumulative noise amenity levels are anticipated to increase by approximately 1 dBA to 2 dBA and remain under the acceptable noise amenity level of 45 dBA. Due to the relatively close proximity of the industry to the residential receiver areas, noise enhancement due to weather effects is less than for Fern Bay and Stockton and the industrial noise contribution is relatively more constant.

Mayfield: Similarly, existing night-time industrial noise generally emanates from the industrial areas located to the immediate north of the receiver areas and was estimated as 44 dBA. Cumulative noise amenity levels are anticipated to increase by approximately 3 dBA and remain under the maximum noise amenity level of 50 dBA.

It should be noted that for each of the cases discussed above the likelihood of all existing, approved and proposed developments emitting maximum noise emission at any one time appears remote. It is therefore considered that this assessment includes a degree of conservatism.

10.4 Road Transport

Based on the EPA's "*Environmental Criteria for Road Traffic Noise*" policy (ECRTN) dated May 1999, Nelson Bay Road, Cormorant Road and Industrial Drive are classified as "arterial roads". The applicable noise criteria are presented in **Table 34**.

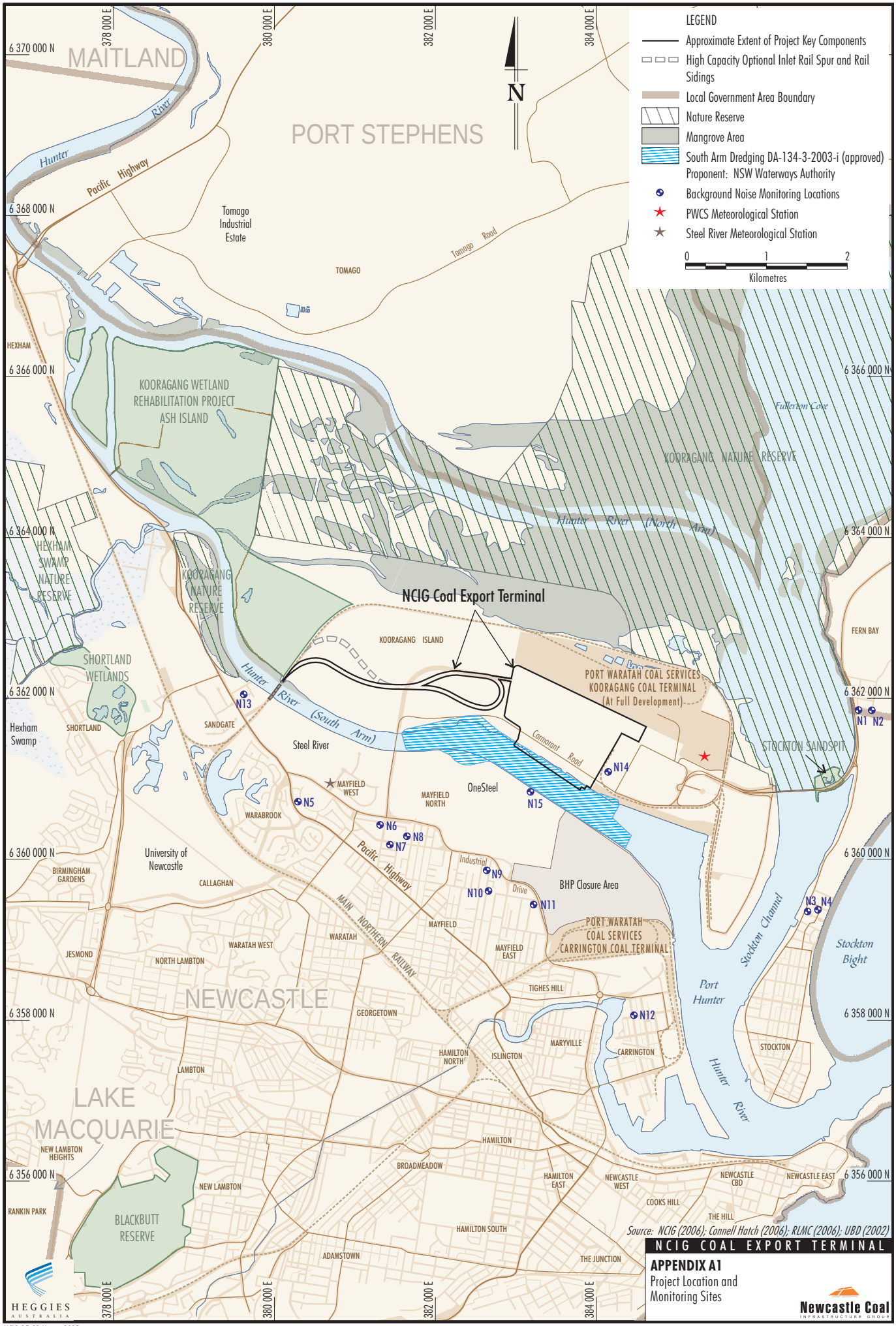
Table 34 NSW Environmental Criteria for Road Traffic Noise

Receiver Area	Road	Policy	Descriptor	Traffic Noise Goal
Fern Bay	Nelson Bay Road	Land use developments with the potential to create additional traffic existing on freeways/arterials	Daytime $L_{Aeq(15hour)}$	60 dBA
Kooragang Island	Cormorant Road		Night-time $L_{Aeq(9hour)}$	55 dBA
Warabrook/Mayfield	Industrial Drive			

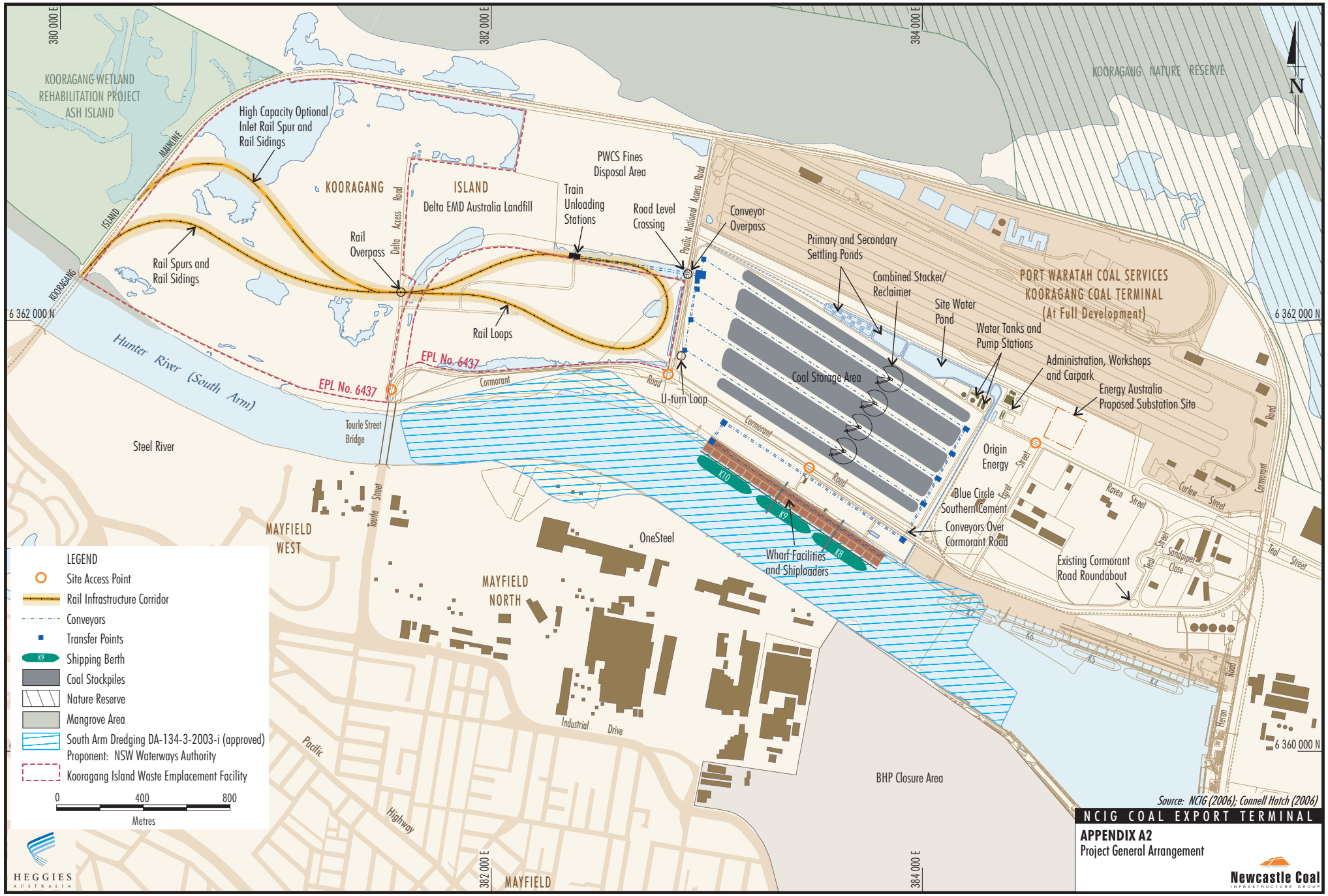
Note, in all cases (where the nominated criteria are already exceeded), traffic associated with the development should not be permitted to lead to an increase in the existing noise traffic levels of more than 2 dBA.

The maximum daytime CET-related traffic flows occurs along Cormorant Road during the construction period. The anticipated 3% increase in vehicle movements corresponds to a very small 0.1 dB increase in the existing daytime $L_{Aeq(15hour)}$ noise level and is negligible.

Similarly, the maximum night-time CET-related traffic flows also occurs along Cormorant Road during the construction period. The anticipated 12% increase in vehicle movements corresponds to a small 0.5 dB increase in the existing night-time $L_{Aeq(9hour)}$ noise level and is also considered negligible.



NCIG-05-01 Noise_001E



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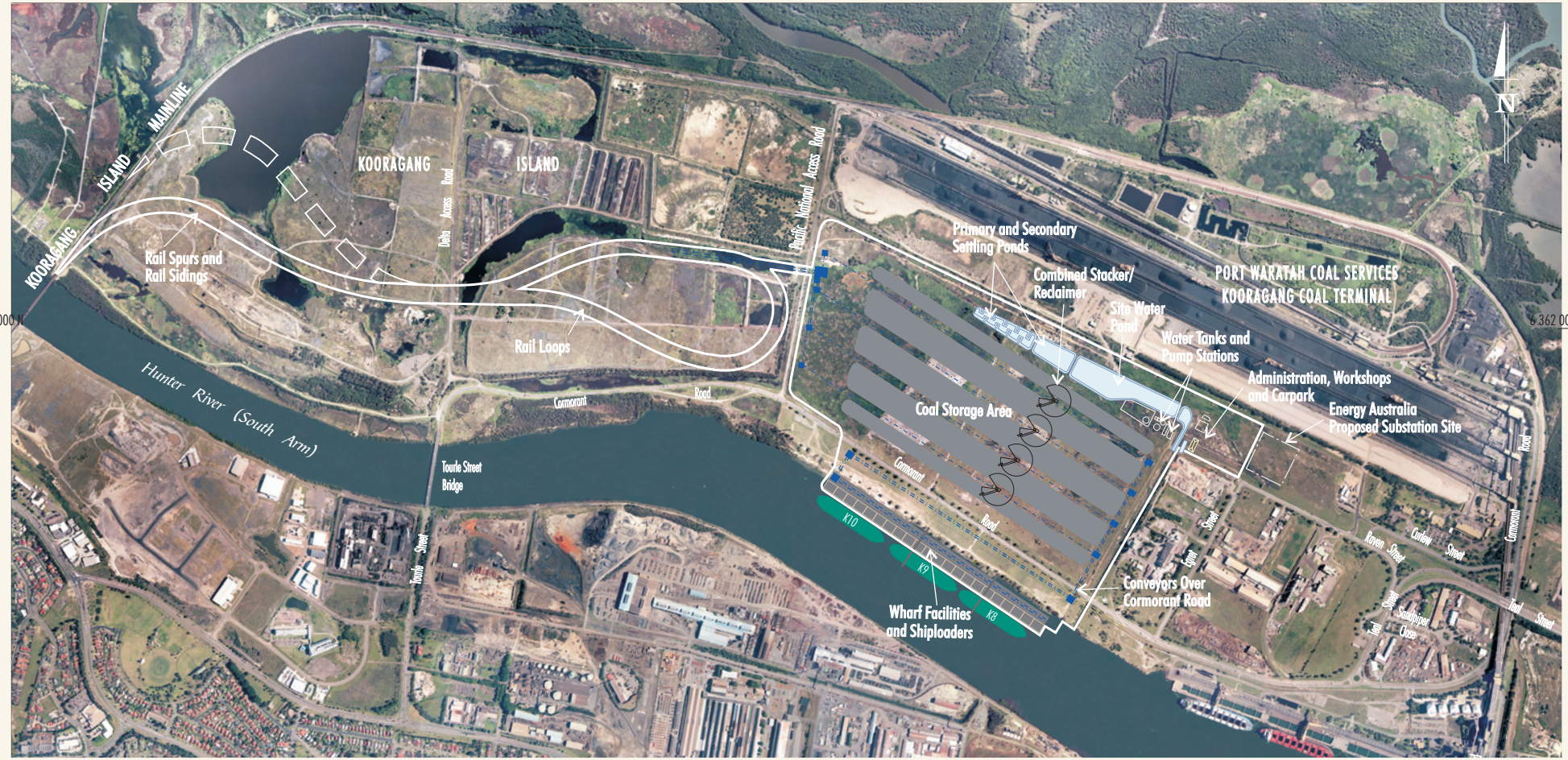

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Metres

Source: NCIG (2006); Connell Hatch (2006)

NCIG COAL EXPORT TERMINAL

APPENDIX A3
Aerial Photograph of Site Showing Project General Arrangement

HEGGIES AUSTRALIA

Newcastle Coal INFRASTRUCTURE GROUP

NCIG-05-01 Noise_003D

Proposed Construction Schedule

Project Component	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Development of Water Management Infrastructure												
Development of Access Roads and Internal Roads												
Construction of Administration and Workshop Buildings												
Foundation Preparation/Capping of the Proposed Rail Corridor												
Preloading of the Coal Storage Area using Dredged Material from the South Arm of the Hunter River												
Construction of the Rail Spur, Rail Sidings, Rail Loop and Rail Overpass												
Construction of the Rail Unloading Station and Connecting Conveyors												
Commissioning of Rail Infrastructure *												
Construction of the Coal Storage Area												
Installation of Conveyors (including Pacific National Private Access Road and Cormorant Road overpass), Transfer Points, and Combined Stacker/Reclaimers												
Progressive Commissioning of the Coal Storage Area *												
Construction of Wharf Facilities and Shiploader												
Commissioning of Wharf Facilities and Shiploader *												
Installation of Electricity Reticulation and Control Systems												
Stack First Coal on Completed Coal Stockpile Pad												

* *For up to a 33 Mtpa Capacity CET. The timing of further development of the CET for a capacity up to 66 Mtpa would depend on coal market demand.*

Source: After Connell Hatch (2005) and NCIG (2006)

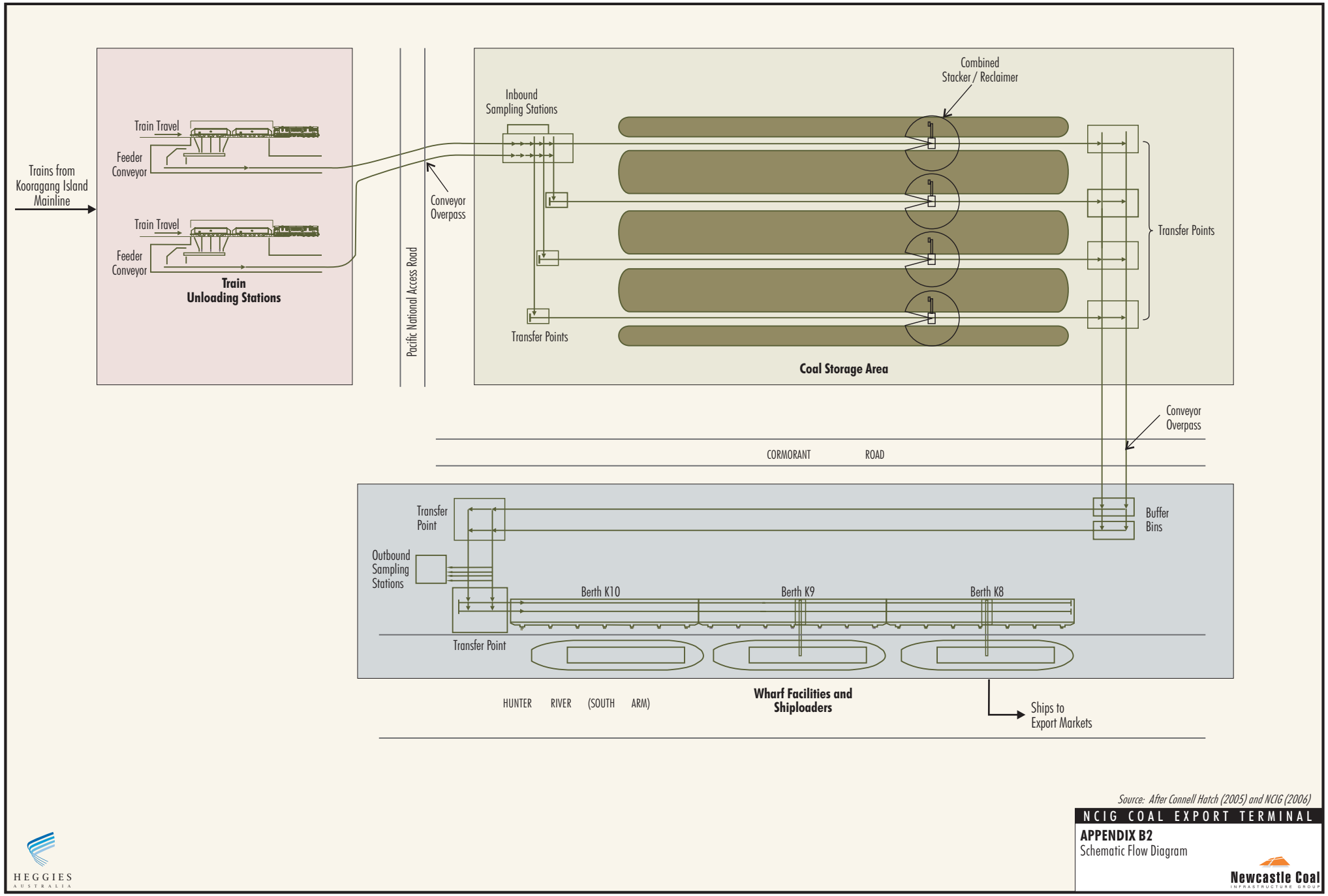
NCIG COAL EXPORT TERMINAL

APPENDIX B1
Proposed Construction Schedule

HEGGIES AUSTRALIA

Newcastle Coal INFRASTRUCTURE GROUP

NCIG-05-01 Noise_004F



Source: After Connell Hatch (2005) and NCIG (2006)

NCIG COAL EXPORT TERMINAL

APPENDIX B2
Schematic Flow Diagram

HEGGIES AUSTRALIA

Newcastle Coal INFRASTRUCTURE GROUP

NCIG-05-01 Noise_005D

KOORAGANG ISLAND METEOROLOGICAL DATA SET - MAY 2004 TO APRIL 2006

Table C1 Seasonal Frequency of Occurrence Wind Speed Intervals - Daytime

Period	Calm (<0.5 m/s)	Wind Direction ±(45°)	Wind Speed		
			0.5 to 1.5 m/s	1.5 to 3 m/s	0.5 to 3 m/s
Summer	1.7	ESE	5.5	17.2	22.7
Autumn	14.8	ESE	11.3	10.1	21.3
Winter	12.2	NW	11.6	10.9	22.5
Spring	3.2	E	5.9	15.2	21.1

Table C2 Seasonal Frequency of Occurrence Wind Speed Intervals - Evening

Period	Calm (<0.5 m/s)	Wind Direction ±(45°)	Wind Speed		
			0.5 to 1.5 m/s	1.5 to 3 m/s	0.5 to 3 m/s
Summer	9.4	ENE	18.0	18.9	36.8
Autumn	36.8	WNW	11.4	4.7	16.1
Winter	29.6	NW	16.0	9.7	25.7
Spring	19.8	NE	19.7	13.3	32.9

Table C3 Seasonal Frequency of Occurrence Wind Speed Intervals - Night-time

Period	Calm (<0.5 m/s)	Wind Direction ±(45°)	Wind Speed		
			0.5 to 1.5 m/s	1.5 to 3 m/s	0.5 to 3 m/s
Summer	25.4	SE	14.0	5.6	19.6
Autumn	33.2	WNW	15.6	8.3	23.8
Winter	29.1	WNW	24.3	15.3	39.6
Spring	29.9	NW	18.3	6.5	24.8

Season	Winds ± 45° ≤3 m/s with Frequency of Occurrence ≥30%		
	Daytime	Evening[1]	Night-time[1]
Summer	Nil	NE 34.2, ENE 36.8, E 35.4, ESE 30.9	Nil
Autumn	Nil	Nil	Nil
Winter	Nil	Nil	W31.8, WNW 39.6, NW 39.3
Spring	Nil	NE 32.9, ENE 30.1	Nil

Table C4 Frequency of Occurrence of Atmospheric Stability Classes - Evening & Night-time

Stability Class	Frequency of Occurrence				Estimated ELR °C/100 m	Qualitative Description
	Summer	Autumn	Winter	Spring		
A	0.0%	0.0%	0.0%	0.0%	<-1.9	Lapse
B	0.0%	0.0%	0.0%	0.0%	-1.9 to -1.7	Lapse
C	0.0%	0.0%	0.0%	0.0%	-1.7 to -1.5	Lapse
D	14.4%	21.6%	23.0%	16.4%	-1.5 to -0.5	Neutral
E	16.3%	19.7%	17.6%	15.9%	-0.5 to 1.5	Weak Inversion
F	68.8%	57.6%	58.1%	66.4%	1.5 to 4	Moderate Inversion
G	0.5%	1.2%	1.2%	1.4%	>4.0	Strong Inversion

Note: ELR (Environmental Lapse Rate).

STEEL RIVER METEOROLOGICAL DATA SET - JANUARY 2003 TO MARCH 2006

Table C5 Seasonal Frequency of Occurrence Wind Speed Intervals - Daytime

Period	Calm (<0.5 m/s)	Wind Direction ±(45°)	Wind Speed		
			0.5 to 1.5 m/s	1.5 to 3 m/s	0.5 to 3 m/s
Summer	0.1	N	2.0	3.5	5.5
Autumn	0.6	NW	6.5	7.3	13.7
Winter	0.7	NW	7.9	11.7	19.6
Spring	0.2	NW	3.0	4.2	7.1

Table C6 Seasonal Frequency of Occurrence Wind Speed Intervals - Evening

Period	Calm (<0.5 m/s)	Wind Direction ±(45°)	Wind Speed		
			0.5 to 1.5 m/s	1.5 to 3 m/s	0.5 to 3 m/s
Summer	0.5	E	5.8	15.0	20.9
Autumn	3.4	WSW	12.8	8.3	21.2
Winter	3.9	W	21.0	13.9	34.9
Spring	1.5	ENE	11.9	13.9	25.7

Table C7 Seasonal Frequency of Occurrence Wind Speed Intervals - Night-time

Period	Calm (<0.5 m/s)	Wind Direction ±(45°)	Wind Speed		
			0.5 to 1.5 m/s	1.5 to 3 m/s	0.5 to 3 m/s
Summer	1.9	ENE	10.6	9.9	20.6
Autumn	4.4	W	26.2	11.9	38.1
Winter	4.1	WNW	34.1	17.9	52.0
Spring	3.0	W	18.5	10.3	28.8

Season	Winds ± 45° ≤3 m/s with Frequency of Occurrence ≥30%		
	Daytime	Evening[1]	Night-time[1]
Summer	Nil	Nil	Nil
Autumn	Nil	Nil	WSW 34.7, W 38.1, WNW 35.7
Winter	Nil	WSW 30.4, W 34.9, WNW 33.3	WSW 33.7, W 47.4, WNW 52.0, NW 45.4, NNW 30.8
Spring	Nil	Nil	Nil

Table C8 Frequency of Occurrence of Atmospheric Stability Classes - Evening & Night-time

Stability Class	Frequency of Occurrence				Estimated ELR °C/100 m	Qualitative Description
	Summer	Autumn	Winter	Spring		
A	0.0	0.0	0.0	0.0	<-1.9	Lapse
B	0.0	0.0	0.0	0.0	-1.9 to -1.7	Lapse
C	0.0	0.0	0.0	0.0	-1.7 to -1.5	Lapse
D	54.1	39.5	36.0	49.0	-1.5 to -0.5	Neutral
E	18.9	17.8	21.5	18.2	-0.5 to 1.5	Weak Inversion
F	19.2	25.6	28.8	21.9	1.5 to 4	Moderate Inversion
G	7.7	17.1	13.8	10.9	>4.0	Strong Inversion

Note: ELR (Environmental Lapse Rate).

3.1 Overview of Methodology

A noise monitoring programme was conducted in April 2006 to qualify background noise levels (ie. all noise sources) and to estimate industrial noise only (ie. in the absence of transport, natural and domestic noise sources). Ten unattended noise loggers were positioned at representative residential, commercial and industrial localities adjacent to the CET site commencing Monday 3 April 2006 for a period of 14 days.

In order to supplement the unattended logger measurements and to assist in identifying the character and duration of the noise sources, operator-attended daytime, night-time surveys were also conducted at all ten logging locations.

The background noise monitoring programme was implemented in accordance with AS 1055-1997 "*Acoustics-Description and Measurement of Environmental Noise*" and the NSW Industrial Noise Policy (INP) 2000.

3.2 Instrumentation and Measurement Parameters

Unattended Monitoring and Operator-Attended Surveys

All acoustic instrumentation employed throughout the noise monitoring programme has been designed to comply with the requirements of AS 1259.2-1990, "Sound Level Meters" and carries current National Association of Testing Authorities (NATA) or manufacturer calibration certificates.

A description of instrumentation, designated type and serial numbers is shown in **Table D1**.

Table D1 Acoustic Instrumentation Schedule

Receiver Area	ID/Location		Logger Position	Instrumentation
Fern Bay West Residential	FW1 (N1)	1 Fullerton Lane	Front fence boundary	194528
Fern Bay East Residential	FE1 (N2)	21 Braid Road	Front fence boundary	194591
Stockton West Residential	SW1 (N3)	284 Fullerton Street	Front fence boundary	194801
Stockton East Residential	SE1 (N4)	40 Eames Avenue	Side fence boundary	194627
Warabrook Residential	W1 (N5)	47 Stevenson Avenue	Front fence boundary	194625
	W2 (N6)	4 Groongal Street	Front fence boundary	16004038
Mayfield	M1 (N7)	68 Bull Street	Side fence boundary	16004033
Sandgate Commercial	SG1 (N13)	4 Mangrove Road	Side fence boundary	16004034
Kooragang Island Industrial	KI1 (N14)	Blue Circle Southern	Eastern Boundary - adjacent to railway line and administration buildings	194574
Mayfield North Industrial	MN1 (N15)	OneSteel	River Frontage - adjacent to railway line and administration buildings	16203528

All instrumentation was programmed to record continuously the noise exceedance levels in 15 minute intervals including the L_{Amax}, L_{A1}, L_{A10}, L_{A50}, L_{A90}, L_{A99}, L_{Amin} and the L_{Aeq}.

Instrument calibration was conducted before and after each measurement survey, with the variation in calibrated levels not exceeding ±0.5 dBA.

Weather Monitoring Station

Meteorological data was obtained from the permanent automatic weather station located at the Port Waratah Coal Services Ltd (PWCS) Administration Building on Kooragang Island.

3.3 Unattended Background Noise Monitoring Results

The unattended background noise logger data from each monitoring location, together with the on-site weather conditions were analysed on a daily basis.

The statistical noise exceedance levels (L_{AN}) are the levels exceeded for N% of the interval period. The LA90 represents the level exceeded for 90% of the interval period and is referred to as the average minimum or background noise level. The LA10 is the level exceeded for 10% of the time and is usually referred to as the average maximum noise level. The LAeq is the equivalent continuous sound pressure level and represents the steady sound level which is equal in energy to the fluctuating level over the interval period.

Prior to further analysis, the background noise data from each location which correlated with periods of unstable weather (eg rainfall greater than 0.5 mm or wind speed greater than 5 m/s) were discarded. The acceptable background noise data was then processed in accordance with the INP "Appendix B - Applying the Background Noise Policy" to derive the Monday to Sunday background noise levels presented in **Table D2**.

Table D2 Unattended Noise Logger Results 2006 (dBA re 20 µPa)

Receiver Area	ID	Measured RBL All Noise Sources			Measured $L_{Aeq(period)}$[1] All Noise Sources			Estimated $L_{Aeq(period)}$[1] Industrial Noise Only		
		Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
Fern Bay West Residential	FW1 (N1)	50	42	44	60	55	54	<54	46	48
Fern Bay East Residential	FE1 (N2)	40	44	42	48	46	46	<54	42	43
Stockton West Residential	SW1 (N3)	42	44	44	63	57	59	<54	47	48
Stockton East Residential	SE1 (N4)	41	43	43	55	50	49	<54	43	44
Warabrook/Mayfield West Residential	W1 (N5)	44	45	40	59	54	52	<54	45	42
	W2 (N6)	51	49	47	63	57	56	<54	45	43
Mayfield Residential	M1 (N7)	47	49	47	58	53	52	<54	49	48
Sandgate Commercial	SG1 (N13)	48	45	40	57	54	55	<59	46	43
Kooragang Island Industrial	KI1 (N14)	51	51	47	61	56	55	<64	53	51
Mayfield North Industrial	MN1 (N15)	56	57	57	60	59	59	<64	57	57

Note 1: Daytime 0700 hours to 1800 hours, Evening 1800 hours to 2200 hours and Night-time 2200 hours to 0700 hours.

3.4 Operator-Attended Background Noise Survey Results

Operator-attended noise surveys of 15 minutes duration were conducted with a precision integrating sound level meter in order to qualify the results obtained with the unattended noise loggers. During the attended noise surveys, the operator identified the character and duration of acoustically significant background noise sources. Wherever applicable the operator quantified local traffic flow and made a qualitative assessment of the prevailing weather conditions.

The daytime, evening and night-time operator-attended noise survey results are presented below:

FW1 1 Fullerton Lane, Fern Bay West

Date/Start Time Weather		Primary Noise Descriptor (dBA re 20uPa)					Typical maximum Levels LAmax - dBA
		Leq	L1	L10	L50	L90	
Day 4/4/06 1640 hrs 5 Okta 26°C 45% Calm - 1 m/s N	Ambient	66	72	69	65	59	Traffic 65-70 Bicycle 67 Birds 66 Insects <40 Industrial 50
	Industrial	Estimated LAeq 50 dBA					
Day 10/4/06 1600 hrs 0-1 Okta 21°C 55% 2-3 m/s E	Ambient	66	74	69	63	57	Truck 74-76 Cars 61-69 Aeroplane 58-60
	Industrial	Not discernable					
Day 10/4/06 1615 hrs 0-1 Okta 21°C 55% 2-3 m/s E	Ambient	66	75	69	63	52	Truck 70-72 Motorbike 65-67 Cars 63-65 Dog 51-53 Birds 49-51
	Industrial	Not discernable					
Evening 3/4/06 2050 hrs 0 Okta 20°C 50% Calm -1 m/s S	Ambient	57	66	61	52	44	Traffic 49-63 Insects 41-42 Industrial 40
	Industrial	Estimated LAeq 40 dBA					
Evening 10/4/06 1900 hrs 0 Okta 18°C 60% Calm - 1 m/s E	Ambient	58	67	62	56	50	Traffic 55-67 Music 50-52 Insects <50
	Industrial	Not discernable					
Evening 10/4/06 1915 hrs 0 Okta 19°C 65% Calm - 1 m/s E	Ambient	58	67	62	55	49	Traffic 60-72 Music 50-52
	Industrial	Not discernable					
Night 4/4/06 2300 hrs 6-7 Okta 21°C 65% Calm	Ambient	57	67	60	53	49	Traffic 52-61 Insects 45-48 Industrial 49
	Industrial	Estimated LAeq 49 dBA					
Night 10/4/06 2310 hrs 1-2 Okta 17°C 75% Calm	Ambient	53	64	58	44	39	Traffic 51-68 Power lines 37-38 Insects 38-39
	Industrial	Not discernable					
Night 10/4/06 2325 hrs 1-2 Okta 17°C 80% Calm	Ambient	54	63	58	46	40	Traffic 58-63 Power line 39-40 Industrial <35
	Industrial	Estimated LAeq <35 dBA					

FE1 21 Braid Street, Fern Bay East

Date/Start Time Weather		Primary Noise Descriptor (dBA re 20uPa)					Typical maximum Levels LAmax - dBA
		Leq	L1	L10	L50	L90	
Day 4/4/06 1644 hrs 4 Okta 25°C 40% 1 m/s SW	Ambient	50	61	52	47	45	Local traffic 80 Distant traffic 46-51 Helicopter 56-66 Birds 51-53 Residential 46-48 Reverse alarm 47
	Industrial	Estimated LAeq 40 dBA					
Day 10/4/06 1600 hrs 0 Okta 21°C 50% 1 -2 m/s E	Ambient	48	61	49	42	39	Local traffic 45-54 Aeroplane 51-61 Bird 49 Bus 49-58 Wind 44-43
	Industrial	Not discernable					
Day 10/4/06 1615 hrs 0 Okta 21°C 48% 2-3 m/s E	Ambient	48	60	51	42	38	Local traffic 44-56 Aeroplane 67 Dirt bikes 55 Bird 42-58 Wind 39-42
	Industrial	Not discernable					
Evening 3/4/06 2045hrs 0 Okta 19°C 48% Calm - 1 m/s NE	Ambient	44	48	46	44	42	Distant traffic 40 Car 54-68, 90 Insects 42-46 Ocean 42-45 Aeroplane 42 Industrial <36
	Industrial	Estimated LAeq <36 dBA					
Evening 10/4/06 1900 hrs 0 Okta 17°C 66% Calm - 1 m/s NE	Ambient	44	50	45	43	41	Distant traffic 36 Near traffic 46-54 Insects 40-43 Ocean 36-39
	Industrial	Not discernable					
Evening 10/4/06 1915 hrs 0 Okta 17°C 70% Calm - 1 m/s NE	Ambient	43	49	44	42	41	Near traffic 46-54 Distant traffic 36 Aeroplane 46 Insects 40-43 Ocean 36-39 Industrial <35
	Industrial	Estimated LAeq <35 dBA					
Night 4/4/06 2300 hrs 6 Okta 21°C 85% Calm - 1 m/s W	Ambient	49	51	50	49	47	Residential 52 Insects 42 Industrial 40-46
	Industrial	Estimated LAeq 43 dBA					
Night 10/4/06 2245 hrs 2 Okta 17°C 80% 1-2 m/s NE	Ambient	39	47	40	37	35	Ocean 34-35 Industrial 35
	Industrial	Estimated LAeq 35 dBA					
Night (10/4/06) 2300 hrs 2 Okta 17°C 80% 1-2 m/s NE	Ambient	39	47	40	37	35	Ocean 34-35 Industrial 35
	Industrial	Estimated LAeq 35 dBA					

SW1 284 Fullerton Street, Stockton West

Date/Start Time Weather		Primary Noise Descriptor (dBA re 20uPa)					Typical maximum Levels LAmax - dBA
		Leq	L1	L10	L50	L90	
Day 4/4/06 1720 hrs 5 Okta 26°C 45% Calm - 1 m/s W	Ambient	62	76	65	57	52	Traffic 59-61 Dog 59, 65 Industrial 51
	Industrial	Estimated LAeq 51 dBA					
Day 10/4/06 1635 hrs 1 Okta 21°C 50% 2-3 m/s E	Ambient	59	70	62	51	44	Near traffic 57-58 Local traffic 51-52 Bus 67-72 Dog 65-68 Ocean 45-46
	Industrial	No contribution					
Day 10/4/06 1650 hrs 0-1 Okta 20°C 55% 2-3 m/s E	Ambient	57	66	62	51	45	Traffic 55 Bird 52 Dog 51-73 Residential 51-55 Aeroplane 51-52 Wind 45-48
	Industrial	No contribution					
Evening 3/4/06 2125 hrs 2-3 Okta 21°C 50% Calm	Ambient	56	67	59	49	48	Traffic 54-65 Horn 55 Reversing alarm 47 Insects 41-42 Industrial 48
	Industrial	Estimated LAeq 48 dBA					
Evening 10/4/06 1930 hrs 0 Okta 20°C 66% Calm	Ambient	56	66	59	49	47	Traffic 61-62 Industrial <45
	Industrial	Estimated LAeq <45 dBA					
Evening 10/4/06 1945 hrs 0 Okta 21°C 60% Calm	Ambient	58	68	62	50	47	Traffic 58-64 Aeroplane 64-67 Residential 47-48 Insects 45 Industrial <45
	Industrial	Estimated LAeq <45 dBA					
Night 4/4/06 2325 hrs 7-8 Okta 20°C 65% Calm - 1 m/s W	Ambient	53	63	53	52	50	Wind 45 Industrial 49
	Industrial	Estimated LAeq 49 dBA					
Night 10/4/06 2340 hrs 1 Okta 17°C 80% Calm	Ambient	53	62	52	51	50	Traffic 55-57 Industrial 49
	Industrial	Estimated LAeq 49 dBA					
Night 10/4/06 2355 hrs 0-1 Okta 17°C 85% Calm	Ambient	53	63	53	52	51	Traffic 55-60 Industrial 50
	Industrial	Estimated LAeq 50 dBA					

SE1 Eames Avenue, Stockton East

Date/Start Time Weather		Primary Noise Descriptor (dBA re 20uPa)					Typical maximum Levels LAmax - dBA
		Leq	L1	L10	L50	L90	
Day 4/4/06 1720 hrs 4 Okta 25°C 50% 1 m/s NW	Ambient	55	63	56	53	51	Local traffic 70-75 Distant traffic 48-55 Dog 58-75
	Industrial	Not discernable					
Day 10/4/06 1630 hrs 1 Okta 20°C 50% 6 m/s E	Ambient	56	69	54	51	48	Cars 66-68 Ocean 52-54
	Industrial	Not discernable					
Day 10/4/06 1645 hrs 1 Okta 20°C 50% 6 m/s E	Ambient	55	67	54	51	48	Cars 56-67 Ocean 51-53
	Industrial	Not discernable					
Evening 3/4/06 2120 hrs 1-2 Okta 19°C 55% Calm	Ambient	53	63	53	50	48	Car 71-73 Ocean 49-54 Insects 46 Industrial <43
	Industrial	Estimated LAeq <43 dBA					
Evening 10/4/06 1935 hrs 1-2 Okta 19°C 65% Calm to 2 m/s NE	Ambient	55	65	56	52	49	Distant traffic 46 Helicopter 63-67 Ocean 50-54
	Industrial	Not discernable					
Evening 10/4/06 1950 hrs 1-2 Okta 19°C 65% Calm to 2 m/s NE	Ambient	63	70	56	52	49	Distant traffic 46 Car 91 Helicopter 64 Ocean 50-54 Industrial <43
	Industrial	Estimated LAeq <43 dBA					
Night 4/4/06 2330 hrs 4 Okta 21°C 70% 2 m/s W	Ambient	51	55	52	51	50	Traffic 50-60 Industrial 40-45
	Industrial	Estimated LAeq 43 dBA					
Night 10/4/06 2315 hrs 1 Okta 17°C 85% Calm	Ambient	49	52	50	49	48	Ocean~48 Industrial 41-43
	Industrial	Estimated LAeq 42 dBA					
Night 10/4/06 2330 hrs 1 Okta 17°C 85% Calm	Ambient	49	51	50	49	48	Ocean~48 Industrial 41-43
	Industrial	Estimated LAeq 42 dBA					

W1 Stevenson Avenue, Warabrook

Date/Start Time Weather		Primary Noise Descriptor (dBA re 20uPa)					Typical maximum Levels LAmax - dBA
		Leq	L1	L10	L50	L90	
Day 4/4/06 1615 hrs 5-6 Okta 27°C 40% 4-5 m/s N, Gusts >5 m/s	Ambient	59	66	61	58	55	Local traffic 56-58 Residential 61-63 Main road 56-58 Wind 56-57 Dog 45-62
	Industrial	Not discernable					
Day 10/4/06 1450 hrs 1 Okta 21°C 40% 3 m/s S	Ambient	53	62	55	52	48	Bus 60-62 Cars 54-61 Trucks 51-54 Birds 47-51
	Industrial	Not discernable					
Day 10/4/06 1505 hrs 1 Okta 21°C 40% 3 m/s S	Ambient	54	62	56	52	49	Cars 58-64 Truck 55-57 Birds 51-53
	Industrial	Not discernable					
Day 10/4/06 1520 hrs 1 Okta 20°C 40% 3 m/s S	Ambient	54	63	56	52	48	Residential 66-68 Cars 58-69 Truck 54-56 Birds 52-54
	Industrial	Not discernable					
Evening 3/4/06 2015 hrs 2-3 Okta 21°C 55% Calm - 1 m/s E Gusts 1 - 2 m/s	Ambient	55	61	57	53	49	Local traffic 56-64 Crash 53 Distant traffic 51-62 Residential 52-53 Insects 35-40 Industrial 47-51
	Industrial	Estimated LAeq 49 dBA					
Evening 10/4/06 2020 hrs 1 Okta 19°C 60% Calm - 1 m/s NE	Ambient	53	61	56	51	48	Traffic 55-58 Local traffic 55-67 Insects 45-46 Reversing alarm 50 Industrial 43-49
	Industrial	Estimated LAeq 46 dBA					
Evening 10/4/06 2035 hrs 1 Okta 20°C 65% Calm	Ambient	54	61	57	52	48	Local traffic 60-70 Aeroplane 54-56 Highway 52-58 Residential 51-54 Industrial 46
	Industrial	Estimated LAeq 46 dBA					
Night 4/4/06 0025 hrs 5-6 Okta 18°C 75% Calm - 1 m/s N	Ambient	51	59	55	47	42	Traffic 49-50 Train 50-52 Insects 35-35
	Industrial	Not discernable					
Night 11/4/06 0015 hrs 3 Okta 17°C 85% Calm	Ambient	51	57	54	48	46	Highway Traffic 51-67 Railway 44-48 Industry <45
	Industrial	Estimated LAeq <45 dBA					
Night 11/4/06 0030 hrs 3 Okta 17°C 85% Calm	Ambient	51	58	55	48	45	Traffic 55-60 Industry <45
	Industrial	Estimated LAeq <45 dBA					

W2 Groongal Street, Warabrook

Date/Start Time Weather		Primary Noise Descriptor (dBA re 20uPa)					Typical maximum Levels LAmax - dBA
		Leq	L1	L10	L50	L90	
Day 4/4/06 1540 hrs 6-7 Okta 27°C 40% 2-3 m/s N	Ambient	66	71	63	59	55	Traffic 57-61 Local traffic 65-69, 96 Truck 65 Residential 61-62 Birds 54-55
	Industrial	Not discernable					
Day 10/4/06 1425 hrs 2 Okta 22°C 50% 3 m/s S	Ambient	59	67	61	58	54	Truck 59-62 Car 56-58
	Industrial	Not discernable					
Day 10/4/06 1530 hrs 2 Okta 21°C 50% 3 m/s S	Ambient	59	67	61	58	54	Motorbike 66-68 Truck 60-67 Car 56-63
	Industrial	Not discernable					
Evening 3/4/06 1945 hrs 6-7 Okta 20°C 50% Calm - 1 m/s S	Ambient	58	67	59	54	53	Local traffic 66-78 Distant traffic 55-58 Reverse alarm 53-54 Metallic drop 50-55 Industrial 50
	Industrial	Estimated LAeq 50 dBA					
Evening 10/4/06 2050 hrs 1-2 Okta 18°C 68% Calm - 1 m/s E	Ambient	55	60	57	55	53	Traffic 55-57 Crash 54 Insects 40-45 Industrial 51
	Industrial	Estimated LAeq 51 dBA					
Evening 10/4/06 2100 hrs 1-2 Okta 19°C 65% Calm	Ambient	56	62	58	55	53	Traffic 54-57 Reversing alarm 54 Industrial 52
	Industrial	Estimated LAeq 52 dBA					
Night 4/4/06 0000 hrs 7-8 Okta 19°C 70% Calm - 1 m/s N	Ambient	53	63	55	50	47	Local traffic 57-65 Distant traffic 50-67 Insects 40-46 Industrial 45
	Industrial	Estimated LAeq 45 dBA					
Night 11/4/06 0055 hrs 1 Okta 16°C 85% Calm	Ambient	53	61	54	51	49	Highway Traffic 55-57 Industrial 49
	Industrial	Estimated LAeq 49 dBA					
Night 11/4/06 0110 hrs 4 Okta 17°C 85% Calm	Ambient	52	60	54	50	49	Local Traffic 56-57 Hwy Traffic 50-51 Truck 52-60 Industrial 48
	Industrial	Estimated LAeq 48 dBA					

M1 68 Bull Street, Warabrook

Date/Start Time Weather		Primary Noise Descriptor (dBA re 20uPa)					Typical maximum Levels LAmax - dBA
		Leq	L1	L10	L50	L90	
Day 4/4/06 1540 hrs 28°C 40% 6 Okta 1-2 m/s SW	Ambient	64	76	64	56	54	Distant traffic 52-55 Cars 70-80 Residential 52-60
	Industrial	Not discernable					
Day 10/4/06 1400 hrs 1 Okta 22°C 40% 1-2 m/s S Gusts 3-4 m/s	Ambient	52	68	61	54	58	Local traffic 54-63 Reversing alarm 46-47 Birds 44-69 Industrial hwy 56-57 Industrial 54-55
	Industrial	Estimated LAeq 51 dBA					
Day 10/4/06 1430 hrs 1 Okta 22°C 40% 1-2 m/s SE Gusts 3 m/s	Ambient	59	68	63	56	53	Local traffic 65 Aeroplane 66-68 Reversing alarm 53 Residential 57 Local construction 47-48 Industrial Hwy 54-55 Industrial 50-51
	Industrial	Estimated LAeq 50 dBA					
Evening 4/4/06 1940 hrs 6 Okta 19°C 50% Calm - 1 m/s NE	Ambient	60	70	61	57	55	Near traffic 65-70 Distant traffic 53-60 Pipe ringing 58 Insects <50 Industrial 55
	Industrial	Estimated LAeq 55 dBA					
Evening 10/4/06 2050 hrs 6 Okta 19°C 70% 2 m/s NE Gusts 3 m/s	Ambient	56	64	57	55	53	Near traffic 65-70 Distant traffic 53-69 Industrial 52
	Industrial	Estimated LAeq 52 dBA					
Evening 10/4/06 2105 hrs 6 Okta 19°C 70% 2-3 m/s NE	Ambient	58	69	58	54	53	Near traffic 71 Pipe clang 55
	Industrial	Estimated LAeq 52 dBA					
Night 5/4/06 0000 hrs 3 Okta 21°C 85% 1 m/s W	Ambient	52	58	53	51	49	Insects 40-44 Distant traffic 48-53 Local traffic 65 Industrial 47
	Industrial	Estimated LAeq 47 dBA					
Night 11/4/06 0045 hrs 1-2 Okta 17°C 85% Calm - 1 m/s NE	Ambient	53	58	54	52	51	Traffic 48 Ship's horn 64 Clanging 56-60 Industrial 50
	Industrial	Estimated LAeq 50 dBA					
Night 11/4/06 0100 hrs 2 Okta 17°C 85% Calm - 1 m/s NE	Ambient	53	58	55	52	51	Traffic 48 Ship's horn 64 Clanging 56-60 Industrial 50
	Industrial	Estimated LAeq 50 dBA					

SG1 Mangrove Road, Sandgate

Date/Start Time Weather		Primary Noise Descriptor (dBA re 20uPa)					Typical maximum Levels LAmax - dBA
		Leq	L1	L10	L50	L90	
Day 4/4/06 1605 hrs 6 Okta 28°C 50% 1-2 m/s SW	Ambient	54	64	57	49	46	Local traffic 50-62 Distant traffic 46-50 Train 57-58 Commercial 45
	Industrial	Estimated LAeq 45 dBA					
Day 10/4/06 1515 hrs 1 Okta 20°C 40% 2-3 m/s E	Ambient	61	72	62	56	53	Hwy traffic 58-59 Local traffic 42-72 Helicopter 62-63 Aeroplane 51 Train 51-52 Commercial 52 Residential 46-46
	Industrial	Estimated LAeq 52 dBA					
Day 10/4/06 1530 hrs 0-1 Okta 22°C 40% Calm -1 m/s SE	Ambient	60	71	62	57	52	Local traffic 61-82 Hwy traffic 59-60 Shunting 61-62 Wheel squeal 60 Train 55-59 Commercial 51
	Industrial	Estimated LAeq 51 dBA					
Evening 3/4/06 2010 hrs 2-3 Okta 18°C 55% Calm	Ambient	56	65	56	51	45	Distant traffic 50-70 Car 82 Train 54-58 Ship horn 40
	Industrial	Not discernable					
Evening 10/4/06 2015 hrs 6 Okta 19°C 65% 1 m/s NE	Ambient	51	61	53	47	45	Distant traffic 45 Highway 48-54 Truck 63
	Industrial	Not discernable					
Evening 10/4/06 2030hrs 6 Okta 19°C 65% 1 m/s NE	Ambient	51	60	53	49	46	Train over bridge 51-53 Train bunching 51-58 Train squeal 49-51 Train 48
	Industrial	Not discernable					
Night 5/4/06 0025 hrs 3 Okta 21°C70% 1 m/s W	Ambient	53`	60	58	45	52	Traffic 42-62 Train 50-56 Insects 38
	Industrial	Not discernable					
Night 11/4/06 0015 hrs 1 Okta 16°C 85% Calm	Ambient	51	64	55	46	52	Hwy traffic 55-69 Distant traffic~42 Truck exhaust brake 71 Train 53-56 Insects 40-42
	Industrial	Not discernable					
Night 11/4/06 0030 hrs 1 Okta 16°C 85% Calm	Ambient	51	64	55	45	52	Hwy traffic 55-69 Distant traffic~42 Truck exhaust brake 71 Train 53-56 Insects 40-42
	Industrial	Not discernable					

KI1 Blue Circle Southern, Kooragang Island

Date/Start Time Weather		Primary Noise Descriptor (dBA re 20uPa)					Typical maximum Levels LAmax - dBA
		Leq	L1	L10	L50	L90	
Day 4/4/06 1745 hrs 6 Okta 24°C 50% Calm - 1 m/s N	Ambient	58	65	59	58	56	Traffic 59 Aeroplane 67-74 Plant 57
	Industrial	Estimated LAeq 57 dBA					
Day 10/4/06 1730 hrs 0-1 Okta 18°C 40% Calm - 1 m/s NE	Ambient	60	66	61	59	57	Traffic 59-67 Plant 57
	Industrial	Estimated LAeq 57 dBA					
Day 10/4/06 1745 hrs 0-1 Okta 18°C 40% Calm - 1 m/s NE	Ambient	58	63	59	57	56	Traffic 59-67 Plant 56
	Industrial	Estimated LAeq 56 dBA					
Evening 4/4/06 1815 hrs 6 Okta 24°C 60% Calm	Ambient	56	61	58	56	53	Traffic 56-57 Plant 54
	Industrial	Estimated LAeq 54 dBA					
Evening 10/4/06 1800 hrs 2 Okta 24°C 60% Calm - 1 m/s NE	Ambient	58	61	59	58	56	Traffic 59-67 Plant 54
	Industrial	Estimated LAeq 54 dBA					
Evening 10/4/06 1815 hrs 2 Okta19°C 70% Calm - 1 m/s NE	Ambient	56	63	58	55	54	Traffic 59-67 Plant 54
	Industrial	Estimated LAeq 54 dBA					
Night 3/4/06 2210 hrs 4 Okta 17°C 65% Calm	Ambient	59	66	61	57	55	Traffic 54-62 Horn 63 Pump 57 Plant 55
	Industrial	Estimated LAeq 55 dBA					
Night 10/4/06 2210 hrs 2 Okta 18°C 85% Calm - 1 m/s NE	Ambient	53	60	54	52	51	Traffic 50-52 Truck 66-68 Cars 55 Plant 50 Siren 46
	Industrial	Estimated LAeq 50 dBA					
Night 10/4/06 2225 hrs 2 Okta 18°C 85% Calm - 1 m/s NE	Ambient	55	65	55	52	51	Traffic 50-52 Exhaust brake 77 Truck 66-68 Cars 55 Plant 52 Siren 48
	Industrial	Estimated LAeq 52 dBA					

MN1 OneSteel, Mayfield North

Date/Start Time Weather		Primary Noise Descriptor (dBA re 20uPa)					Typical maximum Levels LAmax - dBA
		Leq	**L1**	**L10**	**L50**	**L90**	
Day 4/4/06 1750 hrs 6 Okta 25°C 45% 1-2 m/s W	Ambient	63	65	63	63	62	Radio 68-70 Plant 60-66
	Industrial	Estimated LAeq 63 dBA					
Day 10/4/06 1715 hrs 0-1 Okta 20°C 55% 1 m/s E	Ambient	63	74	64	60	59	Distant Traffic 59-61 Truck 77-79 Forklift 68-70 Plant 59-61
	Industrial	Estimated LAeq 63 dBA					
Day 10/4/06 1730 hrs 0-1 Okta 20°C 55% 1 m/s E	Ambient	62	71	63	60	59	Trucks 64-74 Plant 59-61
	Industrial	Estimated LAeq 62 dBA					
Day 10/4/06 1745 hrs 0-1 Okta 19°C 60% 2 m/s E	Ambient	61	63	61	61	59	Plant 60-62
	Industrial	Estimated LAeq 61 dBA					
Evening 4/4/06 1810 hrs 6 Okta 25°C 60% 1-2 m/s W	Ambient	63	67	63	63	62	Truck 75 Plant 63
	Industrial	Estimated LAeq 63 dBA					
Evening 4/4/06 1830 hrs 6 Okta 25°C 60% 1-2 m/s W	Ambient	60	64	61	59	59	Trucks 65-70 Plant 60
	Industrial	Estimated LAeq 60 dBA					
Evening 4/4/06 1845 hrs 6 Okta 25°C 60% 1-2 m/s W	Ambient	60	65	61	59	59	Trucks 65-75 Plant 60
	Industrial	Estimated LAeq 60 dBA					
Night 4/4/06 2220hrs 7-8 Okta 20°C 60% Calm	Ambient	59	66	61	58	55	Plant 60-61
	Industrial	Estimated LAeq 61 dBA					
Night 10/4/06 2215 hrs 1-2 Okta 18°C 75% Calm	Ambient	61	64	62	61	60	Plant 61
	Industrial	Estimated LAeq 61 dBA					
Night 10/4/06 2230 hrs 0 Okta 18°C 75% Calm	Ambient	62	65	63	62	61	Plant 62 Helicopter 61-62
	Industrial	Estimated LAeq 62 dBA					

CHAPTER 171
NOISE CONTROL GUIDELINE CONSTRUCTION SITE NOISE

Where there is likelihood of annoyance due to noise from construction sites, conditions such as the following may be specified in a development consent or building application.

This applies particularly to non-scheduled premises such as commercial buildings where a long construction time is not likely.

The criteria may not be applicable to long-term construction such as coal mines which may take several years.

Variations should be made according to local conditions.

Level Restrictions

i Construction period of 4 weeks and under.

The L_{A10} level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background level by more than 20 dBA.

ii Construction period greater than 4 weeks and not exceeding 26 weeks.

The L_{A10} level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background level by more than 10 dBA.

Time Restrictions

Monday to Friday 7.00 am to 6.00 pm.

Saturday 7.00 am to 1.00 pm if inaudible on residential premises, otherwise 8.00 am to 1.00 pm.

No construction work to take place on Sunday or Public Holidays.

Silencing

All possible steps should be taken to silence construction site equipment. It is particularly important that silenced equipment should be used on road or rail works where 24 hour operation is necessary.

Vibration - Building Structures

The German Standard DIN 4150-3:1999 "*Structural Vibration Part 3: Effects of vibration in structures*" provides the most recently updated criteria against which the likelihood of building damage from ground vibration can be assessed. The recommended limits for short term vibration to ensure minimal risk of damage are presented numerically in **Table G1**.

Table G1 Guideline Values for Vibration - Effects of Short Term Vibration on Structures

Line	Type of Structure	Vibration at the Foundation at a Frequency of			Vibration at Horizontal Plane of Highest Floor at all Frequencies
		1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 H*	
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15
3	Structures that, because of their particular sensitivity to vibration, cannot be classified under Lines 1 and 2 and are of great intrinsic value (eg listed buildings under preservation order)	3	3 to 8	8 to 10	8

Note * At frequencies above 100 Hz, the values given in this column may be used as minimum values.

Vibration - Mechanical Plant

The criteria in **Table G2** are based on previous experience at the Kooragang Coal Terminal site.

Table G2 Guideline Values for Vibration - Effect of Short Term Vibration on Mechanical Plant

Situation	Vibration Measured on Support Structure (ppv mm/s)
Mechanical Plant (ie. conveyors, reclaimers) **In Operation**	20
Mechanical Plant (ie. conveyors, reclaimers) **Not In Operation**	5

Vibration - Buried Pipework

The German Standard DIN 4150-3:1999 "*Structural Vibration Part 3: Effects of vibration in structures*" provides guideline values for evaluating the effect of vibration on buried pipework. The values are based on the assumption that pipes have been manufactured and laid using current technology. Additional considerations may be required at junctions. The recommended limits for short term vibration to ensure minimal risk of damage are presented numerically in **Table G3**.

Table G3 Guideline Values for Vibration - Effects of Short Term Vibration on Buried Pipework

Pipe Material	Vibration Measured on the Pipe[1] (ppv mm/s)
Steel (including welded pipes)	100
Clay, concrete, reinforced concrete, pre-stressed concrete, metal (with or without flange)	80
Masonry, plastic	50

Note 1: Mounting equipment directly onto pipes may not be possible. If the vibration source is not immediately next to the pipework, measurements can be made on the ground surface to obtain an estimate. Generally, this vibration level will be greater than the level measured directly on the pipework.

Vibration - Computer Rooms

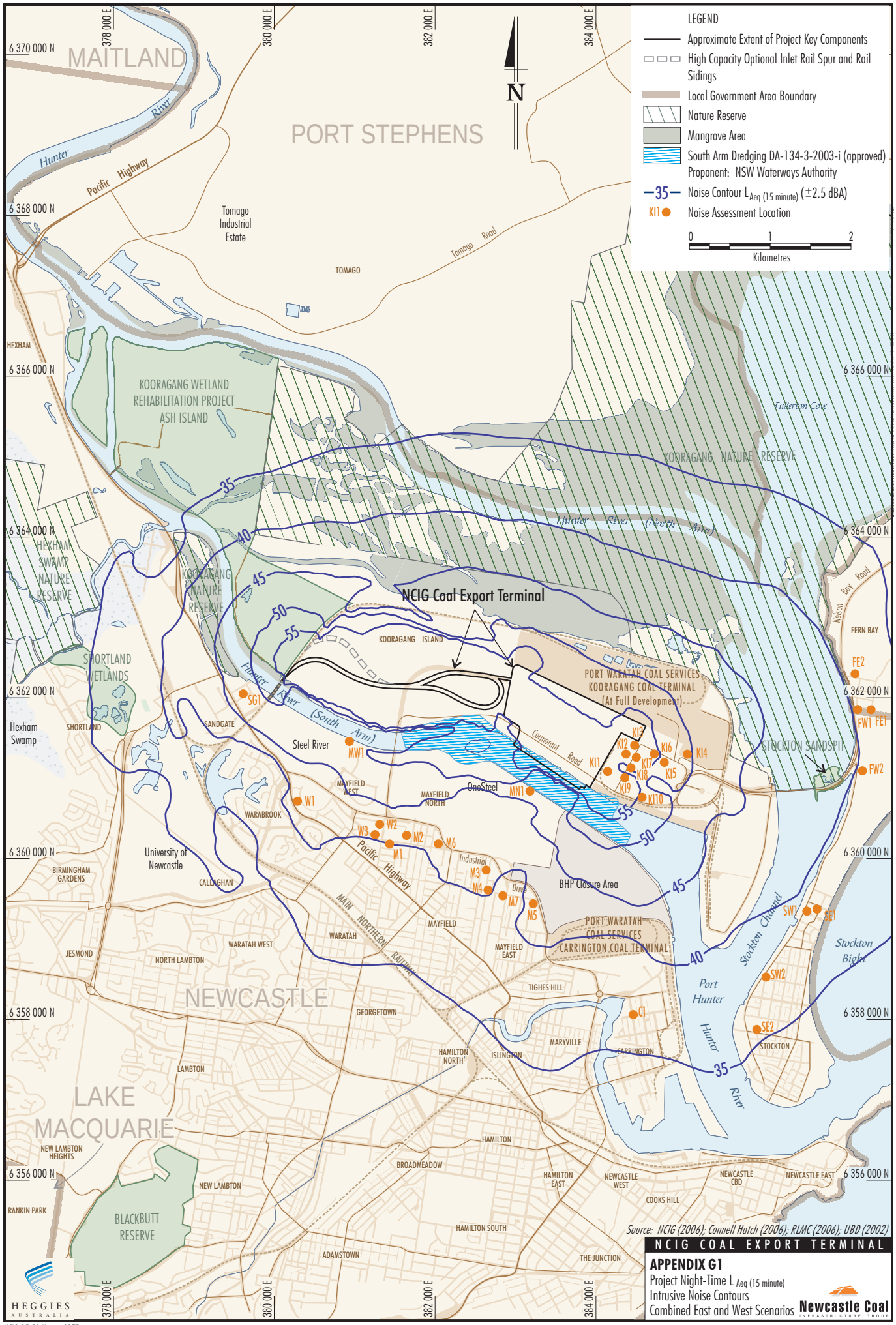
Based on previous experience, Heggies have found a peak particle velocity (ppv) criterion of 5 mm/s to be appropriate for computer room floors (based on vibration requirements for hard drives). If it is determined that more sensitive equipment is stored in these rooms, this criterion may need to be revised.

Vibration – Human Comfort

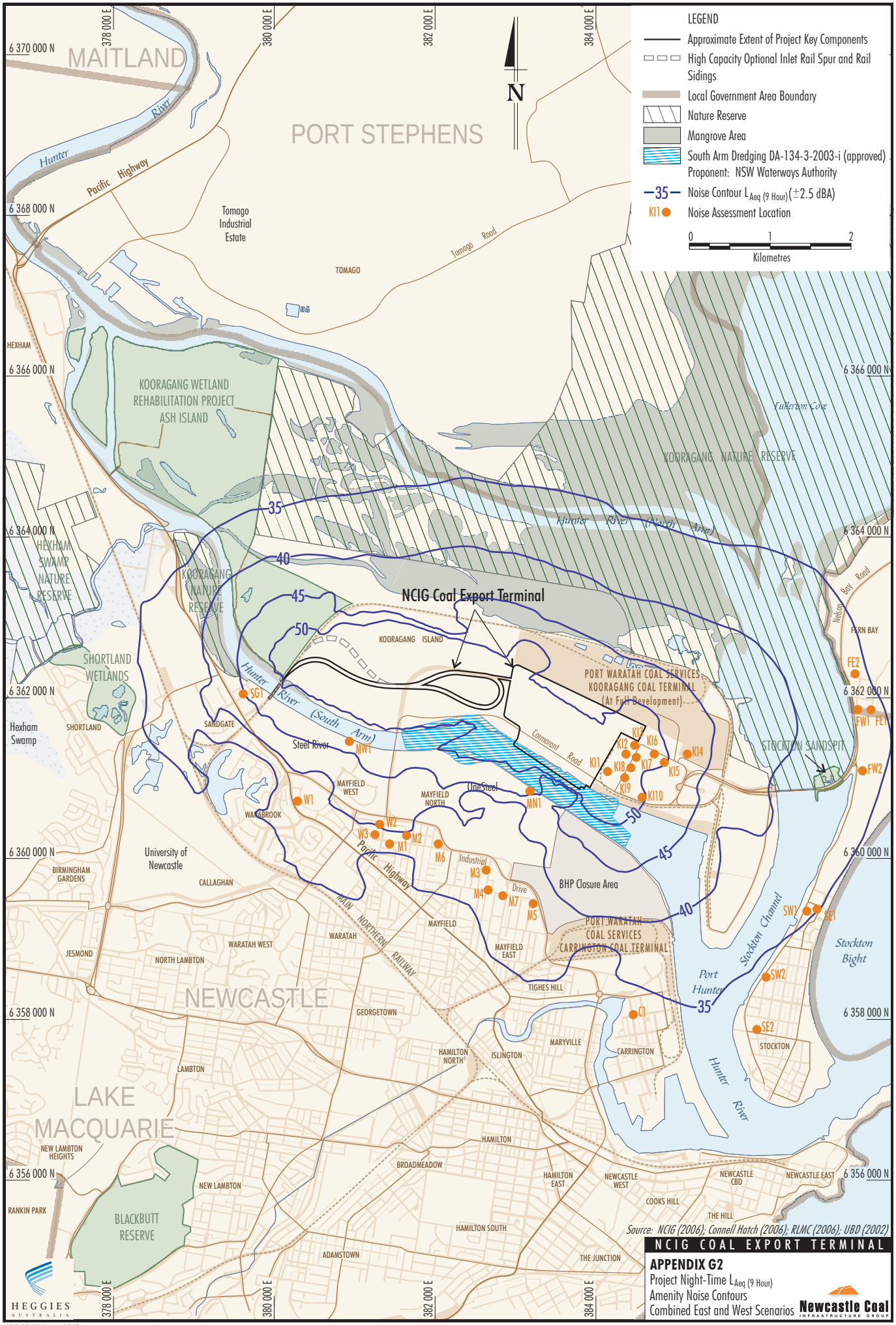
The NSW DEC has recently released an interim guideline Assessing Vibration: A Technical Guideline dated February 2006. The DEC's guideline is based on the information set out in British Standard 6472-1992 "*Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz)".* This standard defines levels of building vibration associated with a "low probability of adverse comment" from occupants. The applicable levels for continuous daytime activities are shown in **Table G4**.

Table G4 Vibration Levels with "Low Probability of Adverse Comment" (1 Hz to 80 Hz)

Building Type	Peak Floor Vibration	Peak Floor Vibration (Z Vertical)
Residential	0.8 mm/s to 1.6 mm/s	0.3 mm/s to 0.6 mm/s
Offices	1.6 mm/s	0.6 mm/s
Workshops	3.2 mm/s	1.2 mm/s



NCIG-05-01 Noise_007F



Source: NCIG (2006); Connell Hatch (2006); RLMC (2006); UBD (2002)

NCIG COAL EXPORT TERMINAL

APPENDIX G2

Project Night-Time $L_{Aeq\ (9\ Hour)}$
Amenity Noise Contours
Combined East and West Scenarios

Newcastle Coal INFRASTRUCTURE GROUP

NCIG-05-01 Noise_006F

L6 Noise Limits

Note:

It is an objective of this licence to progressively reduce noise levels of railway operations to appropriate goals through the implementation of Pollution Reduction Programs (PRPs).

L6.1 Approvals for Locomotives

The licensee must seek approval from the EPA prior to permitting operation on the "premises" of:

1. a class or type of locomotive, whether new or existing, that has not been operated on the NSW rail network; or
2. a locomotive that has been substantially modified since it was last used on the NSW rail network

EPA approval will be on the basis of compliance with the locomotive noise limits in Condition L6.2.

This condition L6 does not apply to the operation of a locomotive solely for the purposes of conducting noise or other tests that are required for the locomotive's acceptance by the EPA, the licensee or any person concerned with the design, manufacture, supply or acquisition of the locomotive, provided that multiple pass bys do not occur adjacent to residential premises in the course of the testing.

Note: EPA approval for a class or type of locomotive will require noise test results from a representative number of locomotives from that class or type.

L6.2 EPA Locomotive Noise Limits

L6.2.1 General Noise Limits

Operating Condition	Speed & Location of Measurement	Noise Limit at a microphone height of 1.5 metres above ground level
Idle with compressor radiator fans and air conditioning operating at maximum load occurring at idle	Stationary 15 metre contour	70 dB(A) $_{Max}$
All other throttle settings under self load with compressor radiator fans and air conditioning operating	Stationary 15 metre contour	87 dB(A) $_{Max}$ 95 dB Linear $_{Max}$
All service conditions	As per Australian Standard AS2377-2002 (Acoustics – Methods for the measurement of railbound vehicle noise) except as otherwise approved by the EPA	87 dB(A) $_{Max}$ 95 dB Linear $_{Max}$

L6.2.2 Limits for Tonality

All external noise must be non-tonal. For the purpose of this condition, external noise is non-tonal if the sound pressure level in each unweighted (linear) one-third octave band does not exceed the level of the adjacent bands on both sides by:

a) 5 dB if the centre frequency of the band containing the tone is above 400 Hz; and

b) 8 dB if the centre frequency of the band containing the tone is between 160 and 400 Hz, inclusively; and

c) 15 dB if the centre frequency of the band containing the tone is below 160 Hz.

L6.2.3 Limits for Low-Frequency Noise

All external noise must not exhibit an undue low-frequency component. To comply with this requirement, linear noise levels must not exceed the A-weighted noise levels by more than 15 dB.

L6.3 Locomotive Noise Emission Test Methods

Application for approval as required by L6.1 must be supported by type testing of the locomotive using procedures that are consistent with the requirements of Australian Standard AS2377-2002 (Acoustics – Methods for the measurement of railbound vehicle noise) except as otherwise approved by the EPA. The type testing must provide all necessary measurement parameters for demonstrating compliance with the locomotive noise limits in L6.2.
Information supplied to the EPA as part of the application for approval must fulfil the requirements of Section 11 of AS2377-2002 for reporting.

Note: The measurement parameters required in L6.2 differ in some cases from those identified in AS2377-2002. The test procedures, measurement equipment and environmental conditions applied in supporting the application to the EPA for approval are to yield all parameters identified in L6.2 but are otherwise to be applied in a manner that is consistent with the requirements of AS2377-2002. The 15 metre contour specified in L6.2.1 is to be represented by the 12 measurement points shown in AS2377-2002, Figure 1.

L6.4 Approval of Locomotives Not Meeting All EPA Limits

The EPA may approve locomotives that do not comply with all limits prescribed by L6.2, provided that the application for approval demonstrates that:

a) the noise emission performance of the locomotive is consistent with current best practice; and

b) all measures for minimising the extent of any non-compliance have been investigated and those that are identified as reasonable and feasible have been implemented; and

c) none of the non-compliances will result in unacceptable environmental impacts.

U1 Noise Management for Existing Activities and Infrastructure

The development of Pollution Reduction Programs (PRPs) is a mechanism by which the licensee will prioritise the management and mitigation of operational rail noise from existing activities and infrastructure so as to reduce offensive noise levels from the "premises". This will be achieved through the identification and implementation of feasible and reasonable noise mitigation strategies.

U1.1 Objectives of PRPs

In developing the PRPs, the licensee must work towards the goals of 65 dB(A)Leq, (day time - 7am-10pm), 60 dB(A)Leq, (night time - 10pm-7am) and 85 dB(A) (24hr) max pass-by noise, at one metre from the facade of affected residential properties. If it is not possible for these goals to be reached by feasible and reasonable mitigation measures, the PRP must aim, through feasible and reasonable measures to:

- reduce operational rail noise emissions and the associated noise impact on the community where traffic levels are anticipated to remain constant; or
- stabilise operational rail noise emissions and the associated noise impact on the community where traffic levels are anticipated to increase

U1.2 Infrastructure Management and Maintenance PRP

The licensee must submit an Infrastructure Management and Maintenance PRP to the EPA by 7 March 2005. The PRP is to identify and assess infrastructure management and maintenance measures that can be implemented by the licensee to reduce operational rail noise, in consideration of the objectives set out in condition U1.1. Measures to be considered in the Infrastructure Management and Maintenance PRP are to include, but not be limited to:

- rail grinding strategies;
- rolling stock condition monitoring, including wheel impact load detection;
- rail and sleeper replacement programs, including implementation of continuously welded rail;
- rail lubrication methods and procedures;
- rail maintenance scheduling, including maintenance of noise-enhancing infrastructure such as turnouts and crossovers;
- track quality evaluation procedures;
- infrastructure design standards; and
- infrastructure selection.

Where the licensee identifies management or maintenance measures that are, or are likely to be, feasible and reasonable, the licensee should determine an indicative timetable for the implementation, or further investigation, of those measures.

EPL SECTION U1 - NOISE MANAGEMENT FOR EXISTING ACTIVITIES AND INFRASTRUCTURE

U1.3 Whole of Licensee's Network PRP

The licensee must submit a Whole of Licensee's Network PRP to the EPA by 05 December 2005. The PRP is to identify and assess a range of management and maintenance measures that can be implemented by the Licensee to reduce operational rail noise, including measures that can be applied by rail operators that are using the licensee's network. The PRP is to be prepared in consideration of the objectives set out in condition U1.1 and the outcomes of the Infrastructure Management and Maintenance PRP that is the subject of condition U1.2. Measures to be considered in the Whole of Licensee's Network PRP are to include, but not be limited to:

- measures to reduce noise from key noise sources, including locomotive engine noise, wheel squeal, train braking, drawgear impacts, turnouts, crossovers and steel bridges;
- network management methods, including the location and operation of signalling equipment and methods to maximise the through running of trains;
- noise transmission controls; and
- innovative source control measures, including wheel damping, disc braking and active noise control.

Where the licensee identifies management or maintenance measures that are, or are likely to be, feasible and reasonable, the licensee should determine an indicative timetable for the implementation, or further investigation, of those measures.

The licensee is to submit a report to the EPA by 07 March 2005 detailing progress in preparing the Whole of Licensee's Network PRP and is to submit further progress reports at least every three months thereafter.

U1.4 PRP Implementation, Evaluation and Reporting

Not applicable.

Note: The outcomes of the Infrastructure Management and Maintenance and the Whole of Network PRPs will be used to develop specific licence conditions covering the implementation of feasible and reasonable mitigation measures. Conditions covering the evaluation and reporting of PRP implementation will also be included.

U2 Noise Management for New Works

U2.1 Noise goals for significant new works

In the planning of significant new works, the licensee must consider feasible and reasonable mitigation measures which could be implemented to achieve, to the extent possible, the planning goals of 60 dB(A)Leq, (day time - 7am-10pm), 55 dB(A)Leq, (night time - 10pm-7am) and 80 dB(A) (24hr) max pass-by noise, at one metre from the facade of affected residential properties.