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**PORT SPENCER  
STAGE 1**

**ENVIRONMENTAL NOISE ASSESSMENT**

**FOR GOLDER ASSOCIATES PTY LTD  
199 FRANKLIN STREET  
ADELAIDE SA 5000**

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**S3143C7**



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## EXECUTIVE SUMMARY

An environmental noise assessment has been carried out for Stage 1 of Port Spencer (the Project). The assessment has considered the noise from operational activity at the port, and vehicle movements to and from the site along Swaffers Road and Lipson Cove Road.

The assessment has determined that for operational activity at the port:

- the relevant criteria for noise at the surrounding noise-sensitive locations are set by the “goal noise levels” of the *Environment Protection (Noise) Policy 2007*. Specifically, daytime noise levels of no greater than 47 dB(A)  $L_{eq}$  and night-time noise levels no greater than 40 dB(A)  $L_{eq}$ .
- the Project already incorporates a number of measures that assist in controlling noise to the noise-sensitive locations, including:
  - providing significant distances between the majority of the noise sources and the noise-sensitive locations;
  - locating all unloading activities within fully enclosed buildings;
  - ensuring that the conveyor belts are fully enclosed
- given the measures that have already been incorporated, it will be practicable to achieve the noise criteria at the noise-sensitive locations provided that environmental noise is a consideration in the design, procurement, and placement of the power generation equipment at the site. It may be necessary to consider a combination of:
  - installation of proprietary acoustic enclosures and/or attenuators to the generators
  - locating the generators within acoustically-treated buildings
  - locating the generators at the maximum practicable distance from the surrounding noise-sensitive locations

Whilst the assessment of noise from port operations has included truck movements around the site, it is important to also consider the noise from vehicle movements along the public roads of Swaffers Road and Lipson Cove Road. The assessment of vehicle movements to and from the port along these roads has determined that:

- the most relevant criteria for noise at residences along the roads are provided by the *Department for Transport, Energy, and Infrastructure (DTEI) Road Traffic Noise Guidelines 2007* (the Guidelines).
- the most stringent interpretation of the Guidelines provide target criteria of 55 dB(A)  $L_{eq}$  during the day and 50 dB(A)  $L_{eq}$  during the night at the facade of the residences along the roads. Where these criteria are not met, the Guidelines require specific acoustic treatment to be applied to the residences.
- acoustic treatment measures will be required along Swaffers Road to ensure that the intent of the Guidelines are achieved. The measures may include a combination of treatment options such as:
  - the selection of “low noise” open-graded or stone mastic asphalt road surfaces;
  - the construction of earth mounds and/or barriers along the Swaffers Road corridor;
  - the upgrading of windows and doors, and provision of seals and alternate ventilation, to minimise noise levels inside the residence



The assessment has also recommended that a Construction Noise and Vibration Management Plan (CNVMP) be prepared for the project, to ensure that noise and vibration from construction activities are appropriately addressed and minimised as far as is practicable once the detailed construction methods have been determined.

Given the stringency of the criteria that apply to the port operations and the vehicle movements, noise and vibration from the port operations and vehicle movements are likely to be of a similar order to that which local fauna would already be exposed to from existing sources such as vehicle movements and agricultural activity. Notwithstanding, it is recommended that the predicted noise levels as presented in this report be reviewed by a fauna expert as the design progresses.



## GLOSSARY

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A weighting	Frequency adjustment representing the response of the human ear
dB(A)	A weighted noise level measured in decibels
Equivalent noise level	Energy averaged noise level
Ambient noise level	Noise level inclusive of all noise sources in the vicinity of the measurement period, including intermittent noise sources, in the absence of the noise source under investigation
Background noise level	Noise level in the absence of intermittent noise sources
$L_{Aeq}$	A weighted equivalent noise level measured in decibels
Sound power level	A measure of the sound energy emitted from a source of noise.

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## 1 INTRODUCTION

Centrex Metals Ltd (Centrex) has applied for Development Approval for Stage 1 of a deep water marine port to be known as Port Spencer (the Project) on the east coast of the Eyre Peninsula, South Australia. Note that the Project was formerly referred to as Sheep Hill Port, therefore some documents and drawings referenced in this report may show this name for the Project.

The infrastructure and operations associated with the Project are described in detail in the "Development Application and Request for Guidelines" document prepared by Golder Associates Pty Ltd (Golder). The activity associated with the site will generally be as follows:

- Grain and hematite delivered to site by road trains, along an access corridor generally following the alignment of Swaffers Road.
- The road trains unloaded at the site within fully enclosed, ventilated buildings.
- The grain and hematite transferred from fully enclosed, ventilated storage sheds to the end of the jetty via enclosed conveyor belts. Whilst two conveyor belts will be installed (one for grain and one for hematite), only one conveyor will operate at any one time.
- Ships loaded at the end of the jetty using a ship loader. Whilst two ship loaders will be installed (one for grain and one for hematite), only one loader will operate at any one time.
- Passenger vehicle movements to and from the site along the existing Lipson Cove Road.

The Development Assessment Commission (DAC) has determined that the Project will be subject to a Public Environmental Report (PER). The DAC has provided guidelines for the preparation of the PER, which include the following noise-related requirements:

- 5.3.38 *Outline the effect of noise emissions, vibration, and light pollution on fauna, especially nocturnal species. (DAC 2011, p.16)*
- 5.3.55 *Detail the expected levels of environmental noise associated with the operation of the development, identifying all potential noise sources, and describe the impact upon the wider locality, including native fauna. (DAC 2011, p.18)*
- 5.3.56 *Detail the extent to which noise emissions can be reduced and contained (such as via building design/materials, noise barriers and buffers) to minimise impacts upon the wider locality, including the effects from increased transport. (DAC 2011, p.18)*
- 5.10.8 *Identify the measures for the control of dust, vibration, noise, stormwater and other emissions during construction and operation. (DAC 2011, p.23)*

This report summarises an assessment of the environmental noise and vibration from the proposal, to address the above.



The assessment has considered operational activity at the Project, and vehicle movements to and from the site along Swaffers Road and Lipson Cove Road. The assessment also provides guidance on the preparation of a Construction Noise and Vibration Management Plan (CNVMP) for the project, to ensure that construction noise and vibration is appropriately addressed.

The assessment has been based on the site layout presented as Appendix A of this report, and the information contained in the following documents:

- Golder Associates “Development Application and Request for Guidelines – Sheep Hill Marine Port, Eyre Peninsula, South Australia”, dated 18 February 2011
- DAC “Guidelines for the preparation of a Public Environmental Report. Sheep Hill Deep Water Port Facility (Stage 1) on Eyre Peninsula”, dated April 2011
- Tumby Bay Council Development Plan consolidated 13 January 2011
- Murray F Young & Associates “Sheep Hill Port – Centrex Metals Eyre Peninsula. Traffic Impact Assessment”, dated June 2011

The closest noise-sensitive locations to the port site and the roads are marked in Appendix B of this report. Locations ‘A’ through ‘F’ are residences, whilst location ‘G’ is a public campsite at Lipson Cove. Whilst a building is also located at the position marked by a blue square in Appendix B, it is understood that this location is owned by Centrex and will not be used as a permanent residence.



## 2 NOISE FROM OPERATIONAL ACTIVITY

### 2.1 Criteria

In determining the applicable criteria for noise from operational activity at the Project to the surrounding noise-sensitive locations, consideration has been given to the South Australian *Environment Protection Act 1993*, and the South Australian *Environment Protection (Noise) Policy 2007*.

#### 2.1.1 Environment Protection Act 1993

Reference has been made to the *Environment Protection Act 1993* (the Act), and in particular the “General Environmental Duty” of the Act. Section 25 of the Act describes the “General Environmental Duty”, as follows:

*“(1) A person must not undertake an activity that pollutes, or might pollute, the environment unless the person takes all practicable and reasonable measures to prevent or minimise any resulting environmental harm.*

*(2) In determining what measures are required to be taken under subsection (1), regard is to be had, amongst other things, to –*

- (a) the nature of the pollution or potential pollution and the sensitivity of the receiving environment; and*
- (b) the financial implications of the various measures that might be taken as those implications relate to the class of persons undertaking activities of the same or similar kind; and*
- (c) the current state of technical knowledge and likelihood of successful application of the various measures that might be taken.*

The “General Environmental Duty” is the ultimate test of the acceptability of noise levels under the Act.

#### 2.1.2 Environment Protection (Noise) Policy 2007

Under the Act, Environment Protection Policies provide further guidance to the interpretation of the General Environmental Duty. The most relevant policy to noise from an industrial source is the *Environment Protection (Noise) Policy 2007* (the Policy). According to the Policy, achievement of the relevant noise goals will satisfy the General Environmental Duty of the Act (Government of South Australia 2007, p.12).

The Policy provides two tests for a noise source. If either test is met, the noise source secures compliance with both the Policy and the Act (Government of South Australia 2007, p.12). The tests are generally as follows:

- comparison of the noise from the source with existing background ( $L_{A90}$ ) noise levels
- comparison of the noise from the source with “goal noise levels” determined from the Development Plan zones in which the noise source (the Project area) and the noise-sensitive locations (the residences) are located.





### 2.1.2.1 Comparison with Background Noise Levels

The test against existing background noise levels is designed primarily for existing high noise environments, such as industrial areas or inner-city locations, where the existing ambient noise levels are sufficiently and continuously high enough to effectively “mask” the noise from a noise source.

Given the significant distance between the locality and the closest source of continuous and significant noise (the Lincoln Highway, approximately 4km from the site), background noise levels in the area will be low, and it is therefore the stringent goal noise levels of the Policy that are most relevant for this assessment.

### 2.1.2.2 Comparison with Goal Noise Levels

Under the Policy, goal noise levels are determined based on the Development Plan zoning in which the noise source (the Project) and the noise-sensitive locations (the residences and the campsite) are located, and the land uses that are principally promoted by those zones.

The Project and the noise-sensitive locations are all located within either a “General Farming” zone or a “Coastal” zone of the District Council of Tumby Bay Development Plan (Government of South Australia 2011)

Based on this zoning, and the “new development” nature of the Project, the Policy sets the following goal noise levels for noise from the Project to achieve at the noise-sensitive locations, across any continuous 15-minute period:

- 52 dB(A) during the daytime (7am to 10pm);
- 45 dB(A) during the night-time (10pm to 7am).

When measuring or predicting levels for comparison with the goal noise levels of the Policy, penalties may be applied if the noise exhibits any of the “annoying” characteristics of tone, impulse, low frequency and modulation. A 5 dB(A) penalty is applied if the noise exhibits one characteristic, 8 dB(A) for two characteristics, and 10 dB(A) for three or four characteristics. Based upon the nature of activities that are envisaged for the Project, it is expected that the noise from the Project will modulate due to truck movements, and therefore it is appropriate to apply a 5 dB(A) penalty to the assessment. The application of this penalty effectively reduces each of the goal noise levels by 5 dB(A).

Therefore based on the zoning of the area, the development nature of the site, and the application of a 5 dB(A) penalty for noise character, the applicable “goal noise levels” for noise from operational activity at the Project to the surrounding noise-sensitive locations are as follows:

- 47 dB(A) during the daytime (7am to 10pm);
- 40dB(A) during the night-time (10pm to 7am).

As it is understood that operations will occur on a 24-hour basis, it is the “night-time” goal noise level of 40 dB(A) that is most relevant to this assessment.



## 2.2 Meteorological Conditions and Atmospheric Effects

When predicting or measuring noise levels over significant distances, it is necessary to describe the meteorological conditions between the noise source and the receiver using the Conservation of Clean Air and Water in Europe (CONCAWE) weather category system.

The CONCAWE system is defined in CONCAWE Report 4/81 “The propagation of noise from petroleum and petrochemical complexes to neighbouring communities” (Manning 1981), and divides the range of possible meteorological conditions into six separate “weather categories”, from CONCAWE weather category 1 to CONCAWE weather category 6. Considering wind speed, wind direction, time of day, and level of cloud cover, weather category 1 provides “best-case” (i.e. lowest noise level) weather conditions for the propagation of noise, whilst weather category 6 provides “worst-case” (ie highest noise level) conditions. Weather category 4 provides “neutral” weather conditions for noise propagation.

The CONCAWE system is directly referenced in the *Environment Protection (Noise) Policy 2007* and the *Guidelines for the use of the Environment Protection (Noise) Policy 2007*. Specifically, the *Guidelines for the use of the Environment Protection (Noise) Policy 2007* state:

*Predictions of the source noise levels for distances over 100 metres should be made using default weather conditions that are equivalent to CONCAWE meteorological category 6 at night, and CONCAWE meteorological category 5 for the day period. A different weather category to the default values can be used for comparison against the Noise Policy where it can be shown that the associated weather conditions occur for less than 10% of the year and 30% of any one season during the day or night period as relevant. (South Australian Environment Protection Authority 2009, p.46)*

That is, under the *Environment Protection (Noise) Policy 2007*, noise levels from a 24-hour activity must be predicted under CONCAWE weather category 6 conditions, unless it can be proven that this weather category does not occur in the area for more than 10% of the year.

A review of 12 months of weather data for the area indicates that CONCAWE weather category 6 conditions are likely to be present between the Project area and each of the noise-sensitive locations for more than 10% of the year. Therefore, CONCAWE weather category 6 conditions apply to all noise levels that are predicted for or measured at the noise-sensitive locations from the Project.



### 2.3 Environmental Noise Predictions

Environmental noise predictions have been made for the Project using the CONCAWE noise propagation model in the SoundPlan noise modelling software. The CONCAWE propagation model takes into account topography, ground absorption, air absorption and meteorological conditions, and has been used and accepted widely as an appropriate sound propagation model. Of particular relevance to this project is that the model includes the reflective properties of water.

The predictions have been made based on the following:

- the CONCAWE noise propagation model and CONCAWE weather category 6 conditions;
- the site layout presented in Appendix A;
- noise sources at the port comprising:
  - road train movements around the site;
  - the unloading of grain and hematite within fully enclosed buildings;
  - ventilation and dust control equipment associated with the unloading and storage areas;
  - the operation of front end loaders within the grain and hematite storage sheds;
  - operation of the enclosed conveyor belts and associated conveyor drives;
  - operation of a ship loader;
  - operation of on-site power generators.
- the following assumed level of activity on the port site in a 15-minute period (the default assessment period under the *Environment Protection (Noise) Policy 2007*):
  - 2 B-Triple trucks moving continuously around the site;
  - a ship being continuously loaded at the jetty;
  - a truck unloading at the grain in-loading shed;
  - continuous operation of:
    - a conveyor
    - a conveyor drive at the sampling station, and a conveyor drive at the end of the jetty
    - a front end loader in the grain storage shed
    - a front end loader in the hematite storage shed
    - 2 exhaust fans and associated filters on the grain storage shed
    - 2 exhaust fans and associated filters on the hematite storage shed
    - 3 x 1MW diesel generators at the “switchyard and generator” location
- the sound power levels presented in Appendix C and noise levels previously measured from road train movements at various speeds under both loaded and unloaded conditions. The sound power levels in Appendix C have been sourced from an environmental noise assessment previously carried out for Centrex for a similar development at the Port Lincoln wharf, and measurements of unloading activities at other similar sites.



### 2.3.1 Predicted Noise Levels with No Acoustic Treatment

The Project already incorporates the following measures that assist in minimising noise to the surrounding noise-sensitive locations:

- providing a significant distance (in the order of 1000 m) between the majority of the noise sources and the closest noise-sensitive locations;
- ensuring that all unloading activities occur in fully enclosed buildings; and,
- ensuring that the conveyor belts are also fully enclosed.

Based on the above, predictions have been made of the noise from the Project to the noise-sensitive locations. Noise contours detailing the predicted noise levels are presented on Figure 1.

From the predictions and the contours, the following comments are provided:

- With no specific acoustic treatment in place, the noise from operational activity of the Project will exceed the 40 dB(A) goal noise level of the Policy at location A (the residence to the immediate north of the site).
- The noise from the Project operations is dominated by the operation of the three diesel generators toward the centre of the site. For example at location A, the noise from the generators is predicted to account for 44 dB(A) of the predicted overall 45 dB(A) noise level.
- It will be practicable to achieve the 40 dB(A) goal noise level at all of the noise-sensitive locations, provided that an appropriate level of acoustic treatment is applied to the generators.



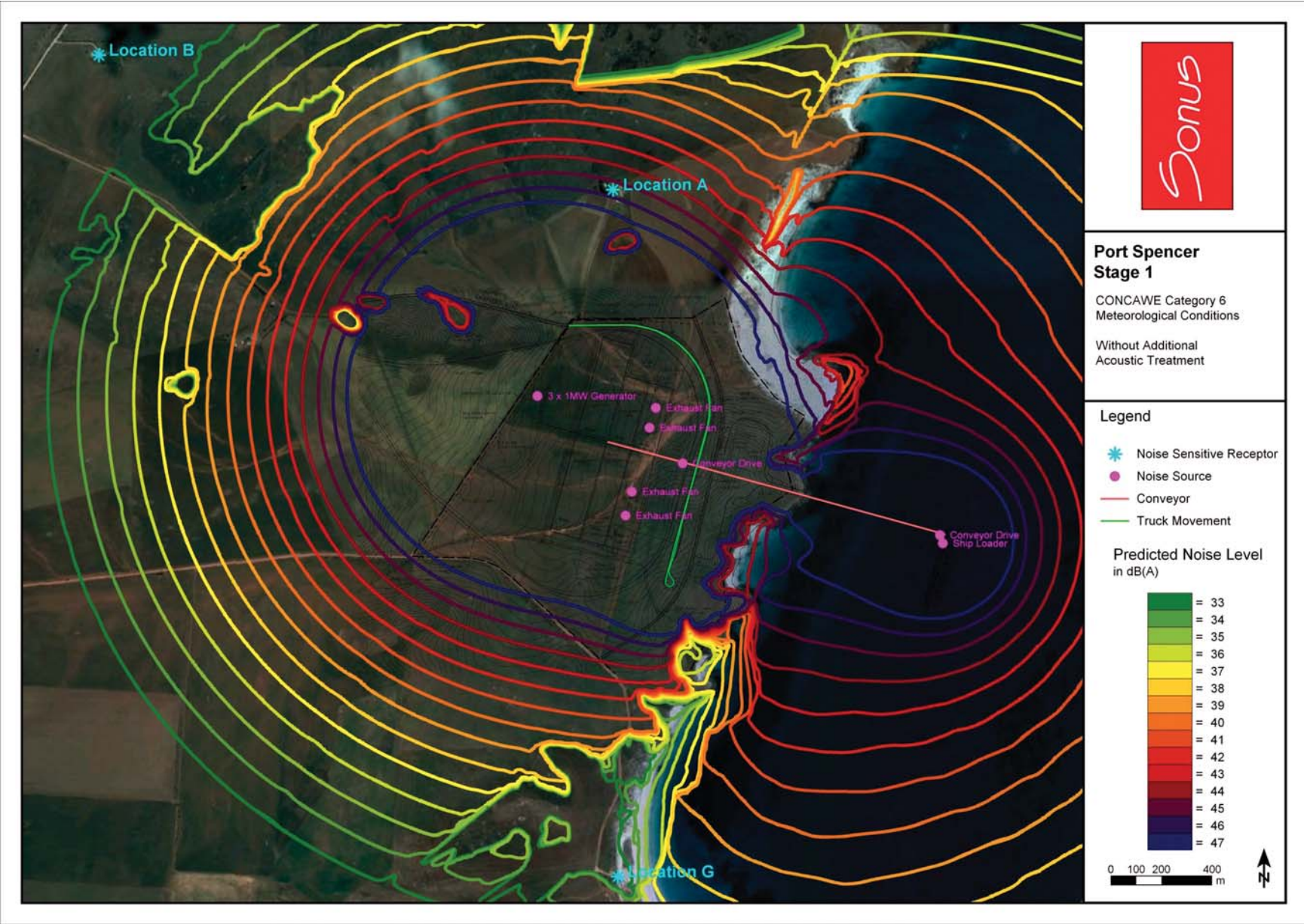


Figure 1 – Predicted Noise Levels with No Acoustic Treatment



### 2.3.2 Predicted Noise Levels With Acoustic Treatment

To ensure that the 40 dB(A) “night-time” goal noise level is achieved at all of the surrounding noise-sensitive locations, it will be necessary to apply acoustic treatment to the generators. Acoustic treatment to a generator set can be applied using a number of methods, including the following:

- careful selection during the procurement phase, to ensure that the generator selected achieves the lowest practicable noise level whilst providing its intended duty;
- the installation of proprietary acoustic treatment direct to the generator, such as acoustically-rated enclosures and/or proprietary attenuators to the air inlet and exhaust paths;
- the installation of local barriers around the generators, such that the barriers as a minimum block line of sight between the generators and the noise-sensitive locations;
- locating the generators within an acoustically-treated building

In these circumstances, it is considered appropriate to specify octave band sound power levels for the on-site power generation equipment to achieve as the detailed design and procurement phases of the project progress. This approach ensures that the equipment will achieve appropriate noise levels at the noise-sensitive locations, whilst allowing for flexibility in determining the most appropriate method of noise attenuation.

Based on the current location proposed for the power generation equipment (at the location marked “switchyard and generator” in Appendix A), the combined sound power levels from all power generation equipment at the site should not exceed the values provided in Table 1:

Octave Band	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz
Sound Power Level, dB re 1pW	119	115	109	105	103	105	109

*Table 1 – Combined Maximum Allowable Sound Power Levels for Power Generation Equipment*

In addition to this, it is also recommended that all mobile equipment that operates at the site be installed with broadband noise reversing alarms, such as the “BBS-Tek Backalarm”, in lieu of the common tonal reversing alarms. Reversing alarms are vital for safety but can cause nuisance and annoyance for residents. Broadband reversing alarms emit a unique ‘broad spectrum noise’ sound which solves this problem as well as having the potential to maintain a safe working environment subject to installation in accordance with the relevant International Standard ISO 9533:1989 “Earth-moving machinery - Machine-mounted forward and reverse audible warning alarm - Sound test method”.

To confirm the outcomes of this treatment, the noise from the Project has been remodelled based on the combined noise from all power generation equipment at the site achieving the sound power levels listed in Table 1. The results of this remodelling are presented on Figure 2, and confirm that the noise from the Project will achieve the 40 dB(A) “night-time” criterion of the *Environment Protection (Noise) Policy 2007* at all of the surrounding noise-sensitive locations as marked in Appendix B.



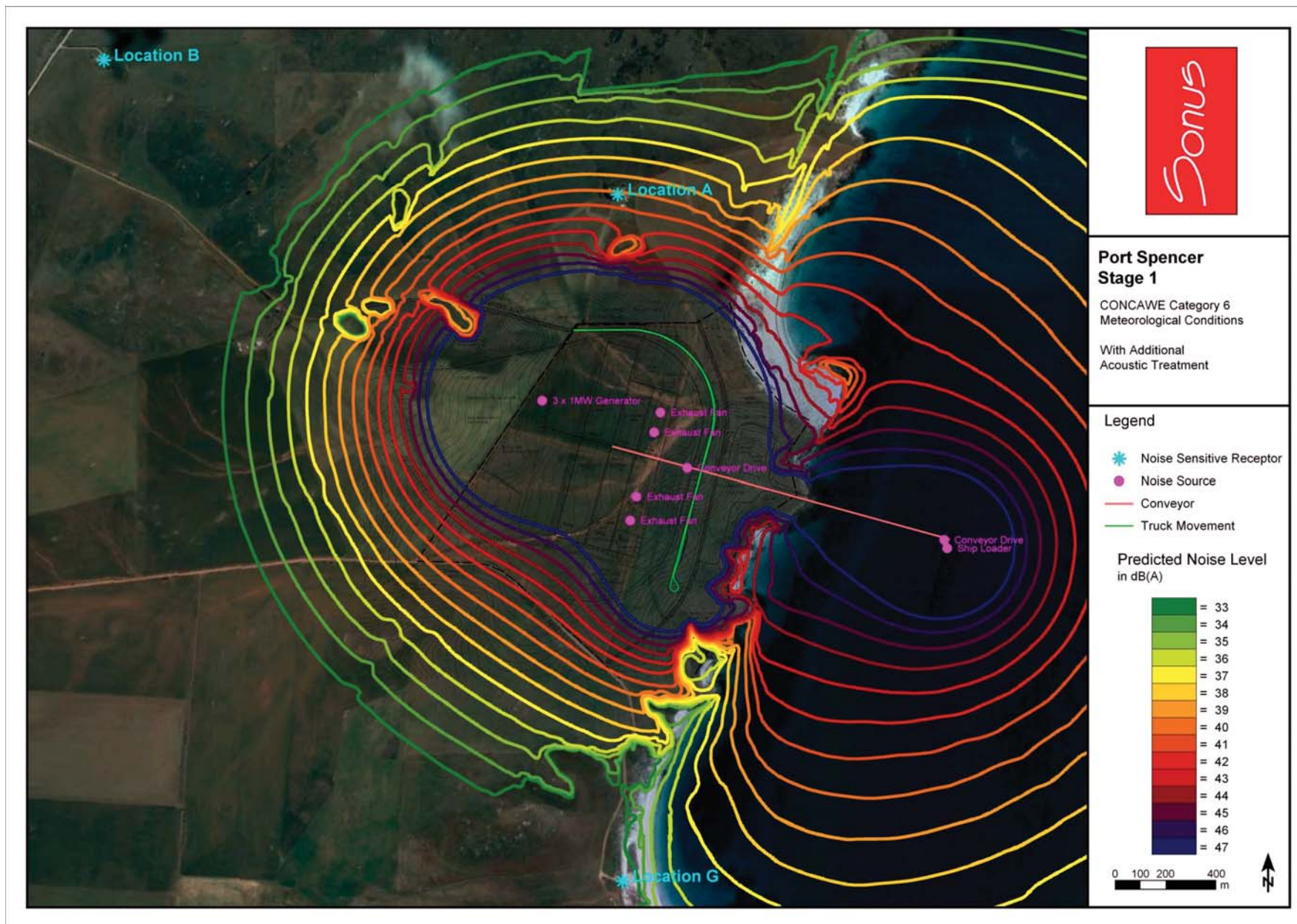


Figure 2 - Predicted Noise Levels with Acoustic Treatment

### 3 NOISE FROM VEHICLE MOVEMENTS

Whilst the assessment of noise from the Project has included truck movements around the site, it is important to also consider the noise from vehicle movements to and from the site along the public roads of Swaffers Road and Lipson Cove Road.

The assessment of noise from vehicles on Swaffers Road and Lipson Cove Road has been based on the following:

- A total of 280 road train movements (140 movements for hematite trucks and 140 movements for grain trucks) along Swaffers Road per day (Murray F Young 2011);
- An assumption that these road train movements will be equally distributed across the 24-hour period. That is, approximately 12 movements per hour along Swaffers Road, over each hour of the day;
- A total of 30 passenger vehicle movements along Lipson Cove Road per day (Murray F Young 2011);
- An assumption that one third of these passenger vehicle movements could occur in a single hour;
- A speed limit along both roads of 100 km/hr.

#### 3.1 Criteria

##### 3.1.1 Environment Protection Act 1993

There are no specific objective noise criteria that address the introduction of additional vehicles onto a public road. Notwithstanding, the overarching requirement of Section 25 of the Act is to take all reasonable and practicable noise reduction measures where noise levels may generate an adverse impact on the amenity of the area.

In order to objectively assess the requirement to implement acoustic treatment measures in accordance with the general environmental duty of the Act, reference is made to the Department for Transport, Energy and Infrastructure (DTEI) *Road Traffic Noise Guidelines 2007*.

##### 3.1.2 Department for Transport, Energy, and Infrastructure Road Traffic Noise Guidelines 2007

The Department for Transport, Energy and Infrastructure (DTEI) *Road Traffic Noise Guidelines 2007* (the Guidelines) have been developed to provide DTEI with the process and criteria for the assessment of changes to their road network. The Guidelines are considered to be the most relevant objective criteria for the assessment of increased traffic flow along the proposed haul route for the purposes of comparison against the general environmental duty of the Act.

The Guidelines specify outdoor noise level targets, separated into the day and night time periods. The most stringent targets are provided in Table 2:



	Time	Target
Day time	7am to 10pm	55 (L <sub>Aeq(15hr)</sub> )
Night time	10pm to 7am	50 (L <sub>Aeq(9hr)</sub> )

*Table 2 – Most Stringent Outdoor Noise Level Targets of DTEI Guidelines*

The targets can be interpreted to provide an objective indication of the noise levels above which “all reasonable and practicable noise reduction measures” should be implemented in accordance with the general environmental duty provisions of the Act.

In general terms, the extent of these measures can be based on the pre-determined “house treatment packages” applicable to rural properties in the Guidelines and comprise an upgrade to door and window seals, the acoustic treatment of air vents, shielding of outdoor areas with local fences, upgrades of the door, window and ceiling constructions and the provision of alternative ventilation to enable the upgraded doors and windows to be closed.

### **3.2 Noise from Vehicles on Lipson Cove Road**

The noise from passenger vehicle movements along Lipson Cove Road has been predicted using the “Traffic Noise Model Version 2.6” traffic noise modelling software, which is accepted by DTEI to be “an appropriate traffic noise prediction software package” (Department for Transport, Energy, and Infrastructure 2007, p.28)

The closest residences to Lipson Cove Road (locations D and E as shown in Appendix B) are at distances of approximately 200m from the road, which provides significant attenuation for noise from the road to the residences.

With no specific acoustic treatment in place, the predictions indicate that noise levels at these closest from the vehicle movements will be less than 40 dB(A), which is below the 55 dB(A) “daytime” and 50 dB(A) “night-time” target levels of the DTEI Guidelines.

That is, distance alone is sufficient to ensure that vehicle movements along Lipson Cove Road achieve the target noise levels of the DTEI Guidelines, and no acoustic treatment is warranted for the residences along the road.

### **3.3 Noise from Trucks on Swaffers Road**

To accurately predict the noise from road train movements along Swaffers Road, reference has been made to noise levels previously measured from movements of “super triple” road train movements near Ceduna. The measurements included:

- trucks moving at “low speed” (approximately 40km/h) on sealed roads;
- trucks moving at “high speed” (approximately 80-90km/h) on sealed roads; and,
- trucks moving at “high speed” on unsealed roads.

For each of the above scenarios, measurements were conducted for trucks travelling at constant speed, both loaded and unloaded trucks, and at various distances from the road.

To supplement the measurements of the super triple movements operating at constant speed, manual measurements of trucks decelerating to and accelerating from an intersection have also been made. These measurements were taken in order to determine the increase in noise from truck movements in the vicinity of an intersection compared to trucks cruising at “low speed”. The measurements indicated that increased noise levels will be present 200m either side of an intersection.

Based on the above measurements, predictions have been made of the noise from truck movements along Swaffers Road to each of the residences along the road (locations B and C in Appendix B). The predictions are based on:

- an average of 12 truck movements per hour, 6 loaded trucks and 6 non-loaded trucks. As the frequency of truck movements is assumed to be constant throughout a 24-hour period, there is no difference between the daytime and night-time predicted noise levels;
- “worst case” (highest noise level) weather conditions. That is, a still night with a light breeze from the noise source to the noise sensitive receiver. The use of any other weather conditions would result in lower predicted noise levels.

The predicted noise levels at each residence are presented in Table 3:

Location	Predicted Traffic Noise Level, $L_{eq}$
B	45 dB(A)
C	52 dB(A)

*Table 3 – Predicted Traffic Noise Levels at Noise-Sensitive Locations*

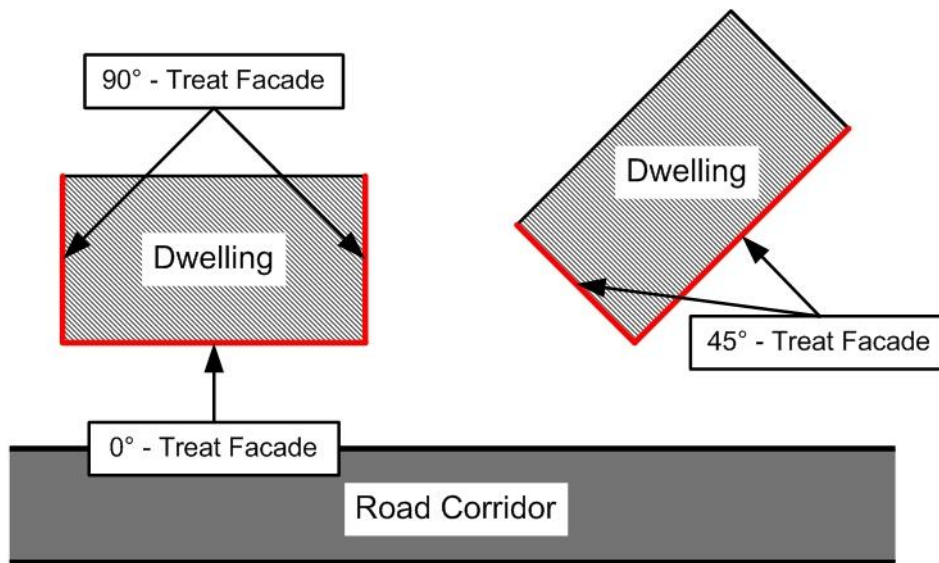
As the predicted noise level at location C exceeds the 50 dB(A) “night-time” target level, it is recommended that acoustic treatment be considered for this residence. No acoustic treatment is warranted for location B or any of the other noise-sensitive locations that are further away from the road.

In order to provide “all reasonable and practicable” measures in accordance with the Act, it is recommended that the following acoustic treatments, adapted from the Guidelines, are applied:

- Glazing should be upgraded to 10.38mm laminated glass;
- Replace any hollow core doors with 40mm thick solid core doors;
- Install acoustic seals to doors and windows, such that they are sealed as close as practicable to airtight when closed;
- Provide alternate ventilation to allow windows to be closed;
- Air vents should be acoustically treated; and,
- Provide a 1.8m high local sheet steel (Colorbond or equivalent) fence around any outdoor entertaining areas.

The treatment should be limited to habitable rooms (e.g. bedrooms, studies, living areas). Non habitable spaces such as corridors, bathrooms and laundries should not be treated.

The number of facades of a dwelling to be treated should be determined on a case by case basis, in accordance with the Guidelines as shown in Figure 3:



**Figure 3 – Acoustic Treatment to Dwelling Façades**



#### **4 EFFECT OF NOISE AND VIBRATION ON FAUNA**

Fauna in the areas around the Project, Swaffers Road, and Lipson Cove Road is exposed to noise and vibration from existing sources such as vehicle movements along the roads and the Lincoln Highway, and agricultural activity (such as the movement of tractors and harvesters) on private land.

With the Project in place, noise and vibration from the port and vehicles on the roads will be at levels that are of a similar order to these existing sources. In addition, due to the stringency of the criteria that apply both to the Project and the vehicles on the public roads, the levels of noise and vibration can be less than those that are often experienced in the existing environment.

Notwithstanding, it is recommended that the predicted noise levels as presented in this report, and the proposed activities on the site, be reviewed by a fauna expert as the design progresses.

## 5 CONSTRUCTION

### 5.1 Criteria

The construction of the port and the upgrade of Swaffers Road will comprise activities which have the potential for short term adverse noise and vibration impacts on the surrounding noise-sensitive locations.

In this regard, Centrex and its construction contractors will be bound by Section 25 and the “General Environmental Duty” of the Act to take “all reasonable and practicable measures” to minimise or prevent noise impacts associated with construction activity.

Schedule 1 of the *Environment Protection (Noise) Policy 2007* provides specific guidance on the interpretation of the “General Environmental Duty” for construction activities. In general terms, the requirements of Schedule 1 are as follows:

- For construction activity that results in a noise level no greater than 45 dB(A)  $L_{eq}$  or 60 dB(A)  $L_{max}$ , at noise-sensitive locations, the Policy allows that activity to occur at any time provided that “all reasonable and practicable measures” are taken to minimise the noise from the activity and its impact on the surrounding land uses.
- For construction activity that results in a noise level of more than 45 dB(A)  $L_{eq}$  or 60 dB(A)  $L_{max}$  at noise-sensitive locations, the Policy includes a mandatory requirement that the activity:
  - must not occur on a Sunday or other public holiday; and
  - must not occur on any other day except between 7:00am and 7:00pm

### 5.2 Construction Noise and Vibration Management Plan

Whilst the detailed construction activities and the equipment to be used is yet to be finalised, typical construction activities has the potential to generate high levels of noise and vibration when in close proximity to dwellings. This makes the provision of all reasonable and practicable noise reduction measures through a detailed construction framework a central element in both securing compliance with environmental legislation and minimising impacts on the community, whilst expediting the construction period.

In these circumstances, it is recommended that a CNVMP be developed for the project, to ensure that potential noise and vibration impacts are appropriately addressed. The CNVMP should address the following:

- Prediction modelling results for noise and vibration
- Monitoring plan (locations, timing, methodology, reporting) for noise and vibration
- Identification of sites for dilapidation surveys (such as heritage sites)
- Full consultation plan
- Noise and vibration mitigation measures
- Complaint mitigation options
- Justification for any night works

The CNVMP will outline the noise and vibration control strategies for the project and will be an important element in community engagement activities.

The noise and vibration control strategies in the CNVMP will vary according to the construction methods employed. However in general, they may include the following:

- Implementing a site culture through ongoing training such that operational impacts are minimised through personal actions such as:
  - Using low noise reversing beepers;
  - Ensuring machines that are used intermittently shall be shut down in the intervening periods between works or throttled down to a minimum;
  - Ensuring vehicle warning devices such as horns are not used as signalling devices;
  - Ensuring two way radios are used at the minimum effective volume;
  - Ensuring silencers and enclosures are intact, rotating plants are balanced, loose bolts are tightened, frictional noise is reduced through lubrication and cutting noise reduced by keeping equipment sharp;
  - Using only necessary power to complete the task;
  - Using traffic practice controllers to prevent vehicles and equipment queuing, idling or reversing near noise-sensitive locations.
  - Substituting noisy plant or processes for quieter, lower impact alternatives;
  - Using plant that can achieve a similar outcome with less vibration, or modification of existing equipment to reduce vibration power levels.
  - Balancing variable speed plant and operate at speeds that do not produce resonances (excessive felt vibration in the ground or in the equipment, compared to other speeds).
- Implementing staging of the construction activities such that sufficient respite is provided between periods of high impact activity, particularly for night works;
- Developing a monitoring regime for both noise and vibration to ensure the basis of the CNVMP with respect to the predicted noise and vibration impacts are maintained and met. This will be particularly important for activities such as piling;
- Considering the haulage routes to minimise impacts on the amenity of the surrounding areas;
- Conducting site inspections to identify all reasonable and practicable mitigation methods on a daily basis;
- Sourcing plant and equipment that performs at or better than industry expectations as noise level emissions and potential annoyance depend significantly on the condition of the equipment;
- Acoustically enclosing generators, lighting generators and compressors;
- Acoustically screening individual activities where reasonable and practicable. Some activities are suitable for screening such as fixed operations. Effective screening depends upon the extent to which the noise source and/or the operator can be enclosed without hampering operation of the equipment;
- Locating noisy plant as far away from noise-sensitive locations as possible;
- Selecting and locating off site access as far away from noise-sensitive locations as possible;



- Locating material stores as far away as possible from noise-sensitive locations;
- Taking care not to drop materials to cause peak noise events, including materials from a height into a truck.

## 6 CONCLUSION

From the assessment, the following conclusions are drawn:

### Noise From Port Operations

- The relevant criteria for noise from the Project are 47 dB(A) during the daytime (7am to 10pm), and 40dB(A) during the night-time (10pm to 7am).
- As activity will occur at the Project on a 24-hour basis, the night-time criteria will determine the acoustic treatment measures that are required. The night-time criteria will be required to be achieved under weather conditions most conducive to noise propagation from the site to the noise-sensitive locations.
- The proposal already incorporates measures that significantly assist in reducing noise to the noise-sensitive locations, including:
  - significant separation distances between the majority of the noise sources and the noise-sensitive locations;
  - enclosing unloading activity within buildings;
  - using enclosed conveyor belts.
- Given the measures already incorporated, it will be practicable to achieve the noise criteria at residences, provided that environmental noise is a key consideration in the detailed design of the Project, in particular for the on-site power generation equipment.

### Noise from Vehicle Movements

- For most existing dwellings, distance alone will be sufficient to ensure that the noise from vehicle movements to and from the port achieve appropriate levels.
- For one location, consideration should be given to providing acoustic treatment to the residence. The treatment generally comprises upgraded windows and external doors, acoustic seals to windows and doors, alternate ventilation, and the provision of a barrier around any outdoor entertaining areas.

### Construction

- A CNVMP should be developed to ensure that potential noise and vibration impacts from the construction activities are appropriately addressed and minimised.
- The control measures for construction noise and vibration will vary depending on the construction methods that are employed. However in general, they are likely to include engineering methods such as temporary barriers, enclosures, and silencers, and administrative measures such as training.



## REFERENCE LIST

Development Assessment Commission 2011, *Guidelines for the preparation of a Public Environmental Report Sheep Hill Deep Water Port Facility (Stage 1) on Eyre Peninsula*, Development Assessment Commission, Adelaide, South Australia.

Department for Transport, Energy, and Infrastructure 2007, *Department for Transport, Energy, and Infrastructure Road Traffic Noise Guidelines*, Department for Transport, Energy, and Infrastructure, Walkerville, South Australia.

Environment Protection Authority 2009, *Guidelines for the use of the Environment Protection (Noise) Policy 2007*, Environment Protection Authority, Adelaide, South Australia.

Government of South Australia 2007, *Environment Protection (Noise) Policy 2007*, Government of South Australia, Adelaide, South Australia.

Government of South Australia 2011, *Tumby Bay (DC) Development Plan*, Government of South Australia, Adelaide, South Australia.

Manning 1981, *The propagation of noise from petroleum and petrochemical complexes to neighbouring communities*, CONCAWE, Den Haag.

Murray F Young 2011, *Sheep Hill Port – Centrex Metals Eyre Peninsula Traffic Impact Assessment*, Murray F Young & Associates, Fullarton, South Australia.

Sinclair Knight Merz 2009, *Port Lincoln Wharf Acoustic Assessment*, Sinclair Knight Merz, Adelaide, South Australia.





APPENDIX B – NOISE-SENSITIVE LOCATIONS





## APPENDIX C – NOISE MODELLING SOUND POWER LEVELS

Sound power level data obtained from Centrex Port Lincoln Wharf Assessment (Sinclair Knight Merz 2009, p.19)

Octave Band	Sound Power Level, dB re 1 $\mu$ W						
	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz
Ship Loader	115	108	108	108	104	99	92
Conveyor Drive	73	77	75	67	66	60	56
Conveyor (per metre)	72	77	72	67	61	55	44
Exhaust fan and filter	96	96	98	94	86	80	71

Sound power level data obtained from manufacturer's data and measurements at similar facilities

Octave Band	Sound Power Level, dB re 1 $\mu$ W						
	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz
1MW diesel generator	114	110	104	105	108	110	106
Front end loader	121	101	106	99	99	98	90
Truck unloading	103	97	98	98	96	93	87