ROTTNEST BARGE FACILITY
ROTTNEST ISLAND

ACOUSTIC ASSESSMENT

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EXECUTIVE SUMMARY

Herring Storer Acoustics have been commissioned to carry out an acoustical assessment of noise emissions associated with the existing Rottnest Barge Facility.

The purpose of this assessment is to undertake noise modelling to ascertain the noise impact that operations at the facility have on surrounding commercial and residential premises.

It is understood that the facility employs forklifts and trucks to load and unload containers and packages onto boats which arrive at the dock.

The criteria considered in this assessment are the *Environmental Protection (Noise) Regulations 1997* requirements. It has been found that noise emissions from the current operation comply with the criteria for all applicable time periods.

1. INTRODUCTION

Herring Storer Acoustics have been commissioned to carry out an acoustical assessment of noise emissions associated with the existing development, Rottnest Barge Facility, located at Thomsons Bay, Rottnest Island.

The objectives of the study were to:

- Perform measurements and noise modelling to predict noise levels at the nearest noise sensitive premises.
- Compare the predicted noise levels received at the closest noise sensitive premises, with relevant acoustic criteria.

2. EXISTING DEVELOPMENT

The existing development of Rottnest Barge Facility is located at Thomsons Bay, Rottnest Island.

It is understood that the venue currently operates from 8am to 2pm, however, compliance with night-time criteria at residential receivers was sought, to be conservative.

3. CRITERIA

The criteria that has been considered in our assessment is the *Environmental Protection (Noise) Regulations 1997*.

The criteria are detailed below:

Environmental Protection (Noise) Regulations 1997

The acoustic criteria are as required in the *Environmental Protection (Noise) Regulations 1997*. These regulations stipulate maximum allowable external noise levels at various types of premises. The allowable assigned noise level at a residential premise is determined by the calculation of an influencing factor, which is then added to the base levels shown in Table 3.1. The influencing factor is calculated for the usage of land within the two circles, having radii of 100m and 450m from the premises of concern. For commercial and industrial premises, the assigned noise levels are fixed. Table 3.1 lists the baseline outdoor noise levels for noise sensitive premises and the allowable noise level for commercial premises.

TABLE 3.1 - BASELINE ASSIGNED OUTDOOR NOISE LEVEL

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises	0700 - 1900 hours Monday to Saturday (Day)	45 + IF	55 + IF	65 + IF
	0900 - 1900 hours Sunday and Public Holidays (Sunday / Public Holiday Day)	40 + IF	50 + IF	65 + IF
	1900 - 2200 hours all days (Evening)	40 + IF	50 + IF	55 + IF
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays (Night)	35 + IF	45 + IF	55 + IF
Commercial Premises	All Hours	60	75	80

Note: L_{A10} is the noise level exceeded for 10% of the time.
L_{A1} is the noise level exceeded for 1% of the time.
L_{Amax} is the maximum noise level.
IF is the influencing factor.

It is a requirement that received noise be free of annoying characteristics (tonality, modulation and impulsiveness), defined below as per Regulation 9.

"impulsiveness" means a variation in the emission of a noise where the difference between L_{Apeak} and $L_{Amax\ Slow}$ is more than 15 dB when determined for a single representative event;

"modulation" means a variation in the emission of noise that –

(a) is more than 3dB $L_{A\ Fast}$ or is more than 3 dB $L_{A\ Fast}$ in any one-third octave band;
(b) is present for more at least 10% of the representative assessment period; and
(c) is regular, cyclic and audible;

"tonality" means the presence in the noise emission of tonal characteristics where the difference between –

(a) the A-weighted sound pressure level in any one-third octave band; and

(b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,

is greater than 3dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A\ Slow}$ levels.

Where the noise emission is not music, if the above characteristics exist and cannot be practicably removed, then any measured level is adjusted according to Table 3.2 below.

TABLE 3.2 - ADJUSTMENTS TO MEASURED LEVELS

Where **tonality** is present	Where **modulation** is present	Where **impulsiveness** is present
+5 dB(A)	+5 dB(A)	+10 dB(A)

Note: These adjustments are cumulative to a maximum of 15 dB.

Where the noise emission is music, then any measured level is adjusted to Table 3.3 below.

TABLE 3.3 - ADJUSTMENTS TO MEASURED MUSIC NOISE LEVELS

Where **impulsiveness** is not present	Where **impulsiveness** is present
+10 dB(A)	+15 dB(A)

The area considered in our assessment is shown in Figure 3.1 below.

FIGURE 3.1 – EXISTING DEVELOPMENT AND SURROUNDING AREA

The influencing factor at the residential receivers R1 and R2 has been taken as **+0 dB** in order to be conservative.

Thus, the assumed Assigned Noise Level for the surrounding area is as listed in Table 3.4.

TABLE 3.4 - ASSIGNED OUTDOOR NOISE LEVEL

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		$L_{A\ 10}$	$L_{A\ 1}$	$L_{A\ max}$
Neighbouring Residences R1 and R2	Day	45	55	65
	Sunday / Public Holiday Day Period	40	50	65
	Evening	40	50	65
	Night	35	45	55
Commercial Premise C1	All Hours	60	75	80

Note: L_{A10} is the noise level exceeded for 10% of the time.
L_{A1} is the noise level exceeded for 1% of the time.
L_{Amax} is the maximum noise level.

4. NOISE CALCULATIONS

The barge facility was attended by Herring Storer Acoustics and acoustic measurements of operations at the facility were taken. The main sources of noise were emissions resulting from forklift and truck movements, as well as noise from setting containers down during the loading and unloading phases.

Noise modelling was then performed to predict the noise impact to the surroundings from the existing development. Resultant noise levels were then compared to criteria to determine compliance.

Modelling of the noise propagation from the proposed development was carried out using an environmental noise modelling computer program, "SoundPlan" using the CONCAWE algorithm. Calculations were carried out using the EPA weather conditions as stated in the Environmental Protection Authority's *"Draft Guidance for Assessment of Environmental Factors No.8 - Environmental Noise"*.

Ground absorption was considered in the model and uses values of 0.65 for grassed areas, and 0.1 for paved areas such as roads and carparks. A factor of 0 was assumed for water areas.

Google Earth ground contours were utilised to account for the topography of the area.

Noise emissions from the development, include:

- Forklift movements;
- Truck movements;
- Container set-down noise.

The calculations were based in the sound power levels listed in Table 4.1.

TABLE 4.1 – MECH EQUIPMENT SOUND POWER LEVELS

Plant Item	Sound Power Level dB(A)
Forklift Movement	92
Truck Movement	94
Container Set Down Noise	101

It was ascertained that during operations, it is likely that there will be forklifts and trucks moving in the area simultaneously.

Therefore, the modelling was conducted to simulate the maximum noise received at a noise sensitive premise from these sources operating simultaneously.

These levels were assessed against the L_{A10} criteria.

Container set down noise was assessed separately against the L_{AMax} criteria.

The above noise sources need to comply with the following assigned noise levels:

L_{A10} - Vehicle Movements

L_{AMax} - Container set down noise

Environmental Protection (Noise) Regulations 1997

The nearest noise-sensitive premises to the existing development are located to the west of the existing development. Compliance at these premises implies compliance at all other premises in the area.

5. RESULTS

Environmental Protection (Noise) Regulations 1997

Given the calculated noise levels, it is considered likely that impulsive characteristics would be present only for container set down noise, therefore a + 10 dB adjustment is applicable to these noise levels.

Calculations were undertaken to all the premises noted on Figure 3.1.

Table 5.1 and 5.2 below show the calculated noise levels at all the receivers.

TABLE 5.1 – CALCULATED NOISE LEVELS
NOISE SOURCES REQUIRING COMPLIANCE – VEHICLES AND CONTAINER SET DOWN NOISE

Item	Calculated Noise Levels (dB(A))		
	C1	R1	R2
Vehicles	55	31	31
Container Set Down Noise	58	35	37

6. ASSESSMENT

The following provided the acoustic assessment for the noise sources requiring compliance, as listed in Table 5.1.

6.1 L_{A10} NOISE EMISSIONS – VEHICLE MOVEMENTS

During operation, noise emissions from the facility from vehicle movements may occur for more than 10% of the time. Thus, noise received at the neighbouring residences needs to comply with the assigned L_{A10} noise levels.

Based on the information above, the resultant and assessable noise levels are shown in Table 6.1 below.

TABLE 6.1 – APPLICABLE ADJUSTMENTS AND ASSESSABLE L_{A10} NOISE LEVELS, dB(A)
VEHICLE MOVEMENTS – ASSESSABLE LEVELS

Location	Calculated Noise Level, dB(A)	Applicable Adjustments to Measured Noise Levels, dB(A)			Assessable Noise Level, dB(A)
		Where Noise Emission is NOT music			
		Tonality	Modulation	Impulsiveness	
C1	55	-	-	-	55
R1	31	-	-	-	31
R2	31	-	-	-	31

Table 6.2 below shows the assessable noise levels compared to the applicable levels for each receiver.

TABLE 6.2 – ASSESSMENT OF L_{A10} NOISE LEVEL EMISSIONS
VEHICLE MOVEMENTS (NIGHT PERIOD)

Location	Assessable Noise Level, dB(A)	Applicable Times of Day	Applicable Assigned L_{A10} Noise Level (dB)	Exceedance to Assigned Noise Level (dB)
C1	55	Day Period	60	Complies
R1	31	Day Period	35	Complies
R2	31	Day Period	35	Complies

6.2 L_{AMAX} NOISE EMISSIONS – CONTAINER SET DOWN NOISE

During operation, noise emissions from set down noise would occur for less than 1% of the time and are thus assessed to the assigned L_{AMAX} noise criteria.

The noise has the potential to contain impulsive characteristics, so has been assessed the penalty for impulsiveness.

Based on the information above, the resultant noise levels are shown in Table 6.3 below.

TABLE 6.3 – APPLICABLE ADJUSTMENTS AND ASSESSABLE L_{AMAX} NOISE LEVELS, dB(A)
CONTAINER SET DOWN NOISE – ASSESSABLE LEVELS

Location	Calculated Noise Level, dB(A)	Applicable Adjustments to Measured Noise Levels, dB(A)			Assessable Noise Level, dB(A)
		Where Noise Emission is NOT music			
		Tonality	Modulation	Impulsiveness	
C1	58	-	-	+10	68
R1	35	-	-	+10	45
R2	37	-	-	+10	47

The assessable noise levels are compared to the relevant criteria in Table 6.4 below.

TABLE 6.4 – ASSESSMENT OF L_{AMAX} NOISE LEVEL EMISSIONS
CONTAINER SET DOWN NOISE (NIGHT PERIOD)

Location	Assessable Noise Level, dB(A)	Applicable Times of Day	Applicable Assigned L_{AMax} Noise Level (dB)	Exceedance to Assigned Noise Level (dB)
C1	68	All Hours	80	Complies
R1	45	All Hours	55	Complies
R2	47	All Hours	55	Complies

It is noted that compliance with the night period implies compliance with all other periods.

Hence, noise emissions from the existing operations at the Rottnest Barge Facility comply with the criteria set out by the *Environmental Protection (Noise) Regulations 1997* at all times.