



VIPAC ENGINEERS & SCIENTISTS

Vipac Engineers & Scientists Limited A.C.N. 005 453 627

5/324 Great Eastern Highway, Ascot, W.A., 6104, AUSTRALIA

Telephone (+61 8) 9277 3335, Facsimile (+61 8) 9277 3325, www.vipac.com.au

Technical Report

Attention: Neil Marston	Reference 60W-05-1649-TRP-185124-0-draft -
Company: Grange Resources	Date: 21 April 2006
Facsimile: +61 8 9321 1523	Pages: 1 of 14
Email: neil@grnl.com.au	Project No.: 60W-05-1649-TRP-185124-0-draft -
From: Phil Lucas	Reviewed Hugh Richardson

This Facsimile is Commercial-in-Confidence. If this Facsimile does not reach the intended recipient, please telephone the number above (reverse charges). Thank you

Dear Neil,

Re: Noise Assessment of the proposed Albany Port Development.

Attached is our report summarising our noise assessment of the proposed Albany Port Development.

Moderate exceedences are predicted at nearby noise sensitive premises due mainly to the pile driving activity and to the use of a dozer.

If you required further details or clarification please don't hesitate to contact the undersigned,

Yours sincerely

VIPAC ENGINEERS & SCIENTISTS LTD

Phil Lucas

Senior Project Engineer

Email: phill@vipac.com.au

INTRODUCTION

Vipac Scientists & Engineers was commissioned by Grange Resources Limited to assess the noise impact of the proposed Port development at Albany, and in particular whether it can comply with Environmental Protection (Noise) Regulations 1997.

The development is in two areas one being approximately 3km to the south east of the main township near to the existing port, and one being immediately south and close to the main township. The approximate positions of the noise sources from these two developments are shown in Figure 1 as S2 and S1 respectively. The corresponding nearest noise sensitive premises (commercial) are shown as R2 and R3 respectively whilst the nearest noise sensitive premises (residential) are shown as R1 and R4 respectively

Figure 1 - Plan of the Proposed Developments and nearest residences.



Figure 2 shows an aerial view of Source 2 together with the assumed position of the major noise sources. For the purpose of this analysis the noise sources are assumed to act along the lines indicated (construction crane along line A-A', dozer along C-C' etc) with the haul trucks acting along A-A'.

Figure 2 Aerial view of source 2 and nearest Noise sensitive premises (R2)

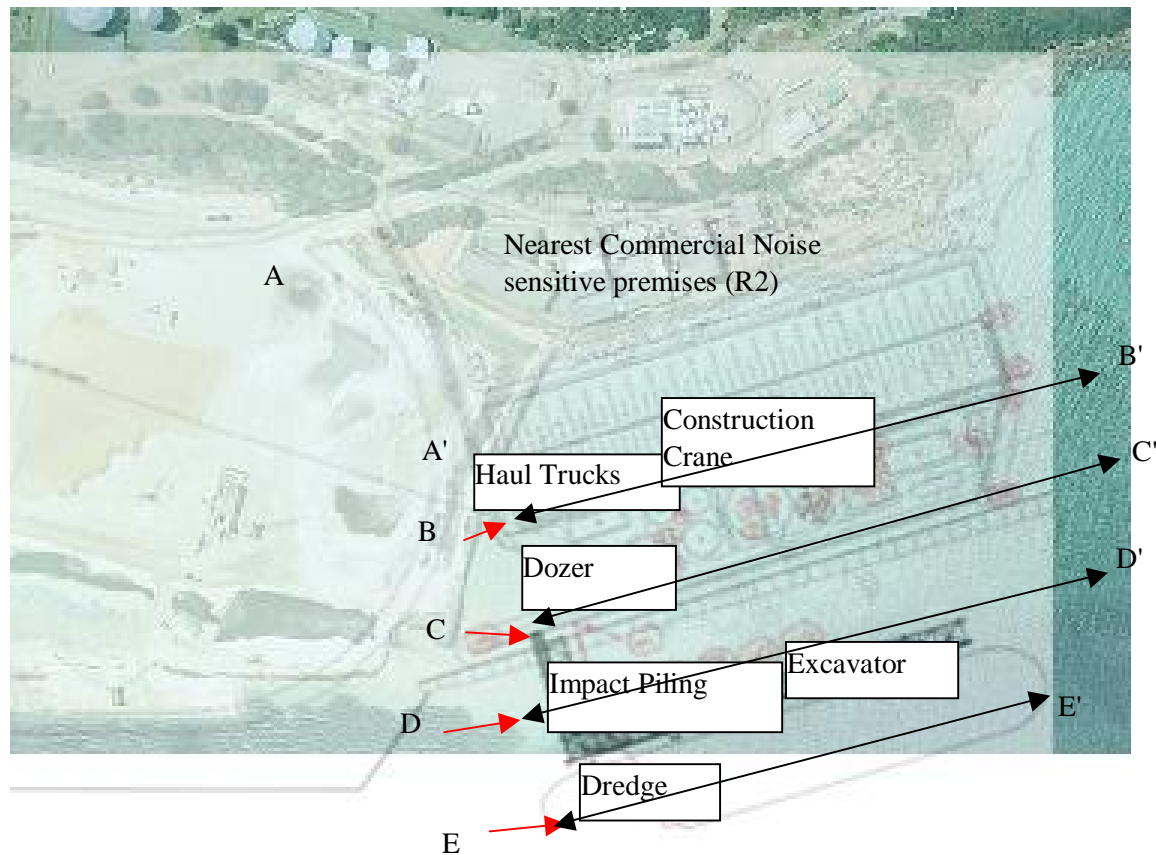


Figure 3 shows the location nearest residential noise sensitive premises to S2. The surrounding circles represent 100m and 450m distances and are required in order to calculate the value of the Influencing Factor (IF)

Figure 3 Location of R1 - nearest residential noise sensitive to S2



For the noise source S1, Figure 4 shows the location of the nearest commercial noise sensitive premises (R3) and residential noise sensitive premises (R4)

Figure 4 – Location of the nearest noise sensitive premises to S1





CRITERIA

The noise criteria as defined by Environmental Protection (Noise) Regulations 1997 is summarised in Table 1 below.

Table 1 EPA Assigned Noise Levels

Type of premises receiving noise	Time of day	Assigned level (dB)		
		L _{A10}	L _{A1}	L _{Amax}
Noise sensitive premises at locations within 15 metres of a building directly associated with a noise sensitive use	0700 to 1900 hours Monday to Saturday	45 + IF	55 + IF	65 + IF
	0900 to 1900 hours Sunday and public holidays	40 + IF	50 + IF	65 + IF
	1900 to 2200 hours all days	40 + IF	50 + IF	55 + IF
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35 + IF	45 + IF	55 + IF
Noise sensitive premises at locations further than 15 metres from a building		60	75	80
Commercial premises		60	75	80
Industrial and utility premises		65	80	90

'IF' represents an influencing factor which increases along with the number of busy roads, and commercial and industrial areas that surround the noise sensitive premises.

Commercial noise sensitive premises (R2 and R3) will therefore have an L_{A10} criterion of 60dB(A) for all hours.

For the residential noise sensitive premises (R1 and R4) the criterion will depend on time of day and on the value of IF. We estimate the value of IF from the Albany Town Planning Scheme (Appendix B) as follows:

R4

IF=5 (40% commercial premises within 100m and within 450m, 10% industrial within 450 m)
ie L_{A10} Criterion = 40dB (night), 45dB(evening) and 50dB(day)

R1

IF = 12 (60% industrial within 100 m, 60% industrial within 450m)
ie L_{A10} Criterion = 47dB (night), 42dB(evening) and 57dB(day)

Penalties apply for noise that has characteristics of impulsive, tonal or modulation.

NOISE SOURCES

Table 2 gives the assumed sound power for the various noise sources to be used on site. This is based on supplied data (see Appendix A, and on previous measurements elsewhere). In addition we have added a dozer with sound power of 118dB(A) and with the same spectrum as was assumed for the Southdown Mine analysis (Vipac Report 60w-05-1649-trp-185082)



Table 2 – Assumed Sound Power Levels and Spectrums For Various Items of Equipment

Earthmoving

	S	31.5	63	125	250	500	1000	2000	4000	8000
Crane	110	75.3	89.1	91.7	99.9	101.9	106.1	104.1	96.9	89.9
Pile Driving (Conventional)	130	87.3	96.3	105.3	114.3	120.7	123.7	124.6	122.9	121.1
Excavator	110	75.3	89.1	91.7	99.9	101.9	106.1	104.1	96.9	89.9
Haul Truck	110	64.2	73.6	81.6	88.4	96.3	103.9	105.0	105.4	95.5
Dozer	118	82.6	96.3	99.0	107.2	109.2	113.3	111.4	106.4	109.3
Air Compressor	100	31.0	49.0	51.5	62.0	73.6	86.3	92.5	96.2	95.5
Power Tools	108	42.1	50.9	61.9	81.5	86.6	95.8	101.2	104.7	102.2
Bobcat	100	55.9	67.9	82.8	87.5	94.0	95.1	94.3	88.5	80.4
Generator	100	58.7	70.4	78.2	86.2	91.0	92.5	96.4	92.6	83.4

Dredges

WD Medway	105	59.8	79.8	90.0	94.8	98.8	99.3	98.0	94.3	85.4
WD Severn	106	60.8	80.8	91.0	95.8	99.8	100.3	99.0	95.3	86.4
Orion	106	60.8	80.8	91.0	95.8	99.8	100.3	99.0	95.3	86.4

ANALYSIS

All analysis was done using worst-case meteorological conditions (CONCAWE category 6: 50% RH, 3 m/s, 20°C). No shielding due to topographical effects or between different items of equipment has been allowed for. The results are therefore likely to be conservative or ‘worst case’.

It is clear from the sound power figures in Table 2 that the noise due to pile driving will dominate all other noise sources. In addition it is likely to fall under the EPA definition of an impulsive noise and will therefore carrier a further penalty 10dB(A). On the other hand this noise source is likely to be more limited in duration. For these reasons this noise source will be considered separately to the others.

For the noise of the existing port expansion (Source 2) the following three stages have been considered

- Stage 1 ‘Lay Down Area’ Pile Driving, construction crane, haul truck, excavator, dozer, Dredger
- Stage 2 Pile Driving, Dredger, Haul Truck
- Stage 3 Construction (no piling or dredging), bob cat, power tools etc

For the noise near the Albany Township (Source 1) only one stage has been considered this being:

- Excavator, Dozer, Haul Truck

In addition since it is unlikely that not all equipment will be operating simultaneously a ‘usage factor’ has been factored in such that, for example, a usage factor of 50% implies that the equipment will is operating for an average of 50% of the applicable time period. Halving the usage factor has the effect of reducing the sound pressure level contribution from that piece of equipment by 3dB(A).

For the dredging we have assumed an average of the three dredgers named in Appendix A



RESULTS

Source 2 Pile Driving

Table 3 – Sound pressure level at Receivers 1 and 2 due to Pile Driving

	S	31.5	63	125	250	500	1000	2000	4000	8000
Sound Power (SWL)										
Pile Driving (d)	130	87.3	96.3	105.3	114.3	120.7	123.7	124.6	122.9	121.1
Sound Pressure Level (SPL) at Receiver 1										
Pile Driving (d)	60.0	18.2	29.8	39.9	50.0	56.0	55.7	51.1	30.1	-50.4
Sound Pressure Level (SPL) at Receiver 2										
Pile Driving (d)	77.8	34.5	45.0	54.0	63.3	69.6	72.3	73.9	68.1	54.1

Source 2 – Stage 1

Table 4 – Sound Pressure Levels at Receivers 1 and 2 due to Stage 1 activity less Piling

Sound Power Levels -Earthmoving

Item	S	31.5	63	125	250	500	1000	2000	4000	8000	usage factor
Crane	110	75.3	89.1	91.7	99.9	101.9	106.1	104.1	96.9	89.9	50
Excavator	110	75.3	89.1	91.7	99.9	101.9	106.1	104.1	96.9	89.9	50
Haul Truck	110	64.2	73.6	81.6	88.4	96.3	103.9	105.0	105.4	95.5	50
Dozer	118	82.6	96.3	99.0	107.2	109.2	113.3	111.4	106.4	109.3	50

Sound Power Levels -Dredges

WD Medway	104.7	59.8	79.8	90.0	94.8	98.8	99.3	98.0	94.3	85.4	30
WD Severn	105.7	60.8	80.8	91.0	95.8	99.8	100.3	99.0	95.3	86.4	30
Orion	105.7	60.8	80.8	91.0	95.8	99.8	100.3	99.0	95.3	86.4	30

Sound Pressure Level at Receiver 1

Crane	39.8	3.6	19.9	23.6	33.0	34.6	35.6	28.4	3.0	-79.1
Excavator	38.9	2.9	19.1	22.9	32.3	33.8	34.5	26.8	-0.5	-89.5
Haul Truck	38.8	-5.5	6.4	15.5	23.3	30.6	36.2	33.0	19.0	-51.3
Dozer	49.4	12.8	29.1	32.8	42.1	43.5	45.6	39.4	20.0	-37.6
WD Medway	32.7	-14.1	8.5	19.8	25.7	29.2	26.7	20.1	-1.9	-85.8
WD Severn	31.3	-15.2	7.3	18.6	24.6	28.1	24.5	16.5	-10.8	-115.2
Orion	31.3	-15.2	7.3	18.6	24.6	28.1	24.5	16.5	-10.8	-115.2
Total	50.6	13.8	30.1	34.2	43.2	44.9	46.8	40.8	22.6	-37.4

Sound Pressure Level at Receiver 2

Crane	59.0	23.6	38.4	40.5	48.8	50.7	54.7	54.3	43.4	28.4
Excavator	53.2	16.5	32.0	35.1	43.9	45.6	49.4	47.3	35.5	11.5
Haul Truck	51.9	5.4	16.6	25.0	32.4	40.0	47.3	48.2	44.0	17.1
Dozer	66.4	30.8	45.7	47.8	56.1	58.0	61.9	61.6	52.9	47.7
WD Medway	51.4	5.9	27.0	36.6	41.5	45.4	45.7	46.0	38.6	21.6
WD Severn	45.1	-2.1	19.9	30.8	36.2	39.9	40.0	37.9	28.9	-1.0
Orion	45.1	-2.1	19.9	30.8	36.2	39.9	40.0	37.9	28.9	-1.0
Total	67.6	31.7	46.7	49.1	57.3	59.3	63.1	62.8	54.1	47.7



Source 2 – Stage 2

Table 5 – Sound Pressure Levels at Receivers 1 and 2 due to Stage 2 activity less Piling

Sound Power Level -Earthmoving

Item	S	31.5	63	125	250	500	1000	2000	4000	8000	usage factor
Haul Truck	110	64.221	73.621	81.621	88.421	96.321	103.92	105.02	105.42	95.521	100
Dozer	118	82.571	96.341	98.954	107.23	109.2	113.34	111.41	106.44	109.26	100

Sound Power Level -Dredges

WD Medway	104.7	59.8	79.8	90.0	94.8	98.8	99.3	98.0	94.3	85.4	30
WD Severn	105.7	60.8	80.8	91.0	95.8	99.8	100.3	99.0	95.3	86.4	30
Orion	105.7	60.8	80.8	91.0	95.8	99.8	100.3	99.0	95.3	86.4	30

Sound Pressure Level (SPL) at Receiver 1

Haul Truck	41.8	-2.5	9.4	18.5	26.3	33.7	39.2	36.0	22.0	-48.3
Dozer	52.4	15.8	32.1	35.9	45.1	46.5	48.6	42.4	23.0	-34.6
WD Medway	32.7	-14.1	8.5	19.8	25.7	29.2	26.7	20.1	-1.9	-85.8
WD Severn	31.3	-15.2	7.3	18.6	24.6	28.1	24.5	16.5	-10.8	-115
Orion	31.3	-15.2	7.3	18.6	24.6	28.1	24.5	16.5	-10.8	-115
Total	52.9	15.9	32.2	36.2	45.3	46.9	49.1	43.3	25.5	-34.4

Sound Pressure Level (SPL)at Receiver 2

Haul Truck	54.9	8.4	19.6	28.1	35.4	43.0	50.3	51.2	47.0	20.1
Dozer	69.4	33.9	48.7	50.8	59.1	61.0	65.0	64.6	55.9	50.7
WD Medway	51.4	5.9	27.0	36.6	41.5	45.4	45.7	46.0	38.6	21.6
WD Severn	45.1	-2.1	19.9	30.8	36.2	39.9	40.0	37.9	28.9	-1.0
Orion	45.1	-2.1	19.9	30.8	36.2	39.9	40.0	37.9	28.9	-1.0
Total	69.7	33.9	48.8	51.0	59.2	61.2	65.2	64.9	56.5	50.7



Source 2 – Stage 3

Table 6 – Sound Pressure Levels at Receivers 1 and 2 due to Stage 3 activity less Piling

Sound Power Levels - Earthmoving

<i>Item</i>	<i>S</i>	<i>31.5</i>	<i>63</i>	<i>125</i>	<i>250</i>	<i>500</i>	<i>1000</i>	<i>2000</i>	<i>4000</i>	<i>8000</i>	<i>usage factor</i>
Crane	110	75.3	89.1	91.7	99.9	101.9	106.1	104.1	96.9	89.9	50
Haul Truck	130	64.2	73.6	81.6	88.4	96.3	103.9	105.0	105.4	95.5	50
Dozer	110	82.6	96.3	99.0	107.2	109.2	113.3	111.4	106.4	109.3	50
Air Compressor	110	31.0	49.0	51.5	62.0	73.6	86.3	92.5	96.2	95.5	100
Power Tools	118	42.1	50.9	61.9	81.5	86.6	95.8	101.2	104.7	102.2	100
Bobcat	100	55.9	67.9	82.8	87.5	94.0	95.1	94.3	88.5	80.4	50
Generator	108	58.7	70.4	78.2	86.2	91.0	92.5	96.4	92.6	83.4	100

Sound Pressure Level (SPL) at Receiver 1

Crane	39.8	3.6	19.9	23.6	33.0	34.6	35.6	28.4	3.0	-79.1
Haul Truck	38.8	-5.5	6.4	15.5	23.3	30.6	36.2	33.0	19.0	-51.3
Dozer	49.4	12.8	29.1	32.8	42.1	43.5	45.6	39.4	20.0	-37.6
Air Compressor	22.7	-37.6	-17.1	-13.5	-1.9	9.3	18.9	19.8	5.3	-70.5
Power Tools	32.1	-26.6	-15.3	-3.2	17.5	22.2	28.3	28.5	13.7	-63.9
Bobcat	29.9	-15.8	-1.3	14.8	20.6	26.6	24.7	18.6	-5.5	-88.6
Generator	30.9	-9.9	4.3	13.2	22.3	26.7	25.1	23.7	1.7	-82.6
Total	50.3	13.4	29.6	33.5	42.7	44.4	46.6	41.0	23.2	-37.4

Sound Pressure Level (SPL) at Receiver 2

Crane	59.0	23.6	38.4	40.5	48.8	50.7	54.7	54.3	43.4	28.4
Haul Truck	51.9	5.4	16.6	25.0	32.4	40.0	47.3	48.2	44.0	17.1
Dozer	66.4	30.8	45.7	47.8	56.1	58.0	61.9	61.6	52.9	47.7
Air Compressor	49.4	-17.7	1.4	3.3	13.9	25.4	37.9	45.8	45.7	36.9
Power Tools	57.9	-6.7	3.2	13.7	33.3	38.3	47.4	54.4	54.2	43.6
Bobcat	49.0	4.2	17.3	31.7	36.4	42.8	43.7	44.5	35.0	18.8
Generator	52.1	10.0	22.8	30.1	38.1	42.8	44.1	49.7	42.1	24.9
Total	68.0	31.6	46.5	48.7	57.0	59.0	63.1	63.5	57.5	49.4



Source 1

Table 7 – Sound Pressure Levels at Receivers 3 and 4 due to Source 1 activity

Sound Power Levels - Earthmoving

Item	S	31.5	63	125	250	500	1000	2000	4000	8000	usage factor
Excavator	110	75.3	89.1	91.7	99.9	101.9	106.1	104.1	96.9	89.9	80
Haul Truck	110	64.2	73.6	81.6	88.4	96.3	103.9	105.0	105.4	95.5	80
Dozer	118	82.6	96.3	99.0	107.2	109.2	113.3	111.4	106.4	109.3	80

Sound Pressure Levels (SPL) at Receiver 3

Excavator	58.5	22.5	37.6	40.1	48.6	50.5	54.3	53.3	42.2	24.1
Haul Truck	57.7	11.4	22.2	30.0	37.1	44.9	52.2	54.2	50.7	29.7
Dozer	65.8	29.7	44.9	47.4	55.9	57.7	61.6	60.6	51.7	43.4
Total	67.1	30.5	45.6	48.2	56.7	58.7	62.8	62.1	54.5	43.7

Sound Pressure Levels (SPL) at Receiver 4

Excavator	50.8	13.5	29.6	33.2	42.2	43.7	47.3	43.5	29.2	-8.0
Haul Truck	48.7	2.5	14.1	23.1	30.7	38.1	45.2	44.4	37.7	-2.4
Dozer	58.1	20.8	36.8	40.5	49.5	51.0	54.6	50.7	38.7	11.3
Total	59.2	21.6	37.6	41.3	50.3	51.9	55.7	52.3	41.5	11.6

Table 8 Summary of Predicted Exceedences (note that with respect to the residential noise sensitive premises (R1 & R4) the exceedence are assuming day time operation only)

Source 2

R1(residential) R2 (commercial)

	SPL	Exceedence	SPL	Exceedence
Piling Driving Only	60.0	3.0	77.8	17.8
Stage 1	50.6	-6.4	67.6	7.6
Stage 2	52.9	-4.1	69.7	9.7
Stage 3	50.3	-6.7	68.0	8.0

Source 1

R3 (commercial) R4 (residential)

	SPL	Exceedence	SPL	Exceedence
	67.1	7.1	59.23	9.2



CONCLUSIONS

1. All activities should, as far as possible, be restricted to day time operation
2. Tables 1 and 8 Show that pile driving activity will be the main cause of noise exceedences with respect to the EPA noise regulation criteria. The quoted sound power figure of 130dB(A) seems very high and we would recommend looking at other types of pile driving methods to see if this figure could be reduced. Alternatively some sort of barrier may need to be considered to shield noise emissions from noise sensitive premises. The impulsive nature of this activity will increase exceedences above those calculated in the results.
3. The next dominant noise source after the piling is the dozer. We would recommend investigating use of a similar vehicle with noise emissions less than the 118dB(A) assumed for this vehicle. We note that if piling and the dozer noise is ignored then almost all exceedences are eliminated.



Appendix A - Supplied Noise Data from Grange Resources.

Table 1 - Typical Sound Power Levels for Equipment Used On Construction Sites

Item	db(A)
Crane	110
Pile Driving (Conventional)	130
Excavator	110
Haul Truck	110
Air Compressor	100
Power Tools	108
Bobcat	100
Generator	100

Dredger Name	Type	Noise Level (dB L_{Aeq}) at stated distance		
		100m	200m	500m
WD Medway II	TSD	56	50	41
WD Severn	TSD	57	51	42
Orion	CSD	57	51	42



Appendix B – Albany Town Planning Scheme

