Rochdale Holdings Pty Ltd A.B.N. 85 009 049 067 trading as:
HERRING STORER ACOUSTICS
Suite 34, 11 Preston Street, Como, W.A. 6152
P.O. Box 219, Como, W.A. 6952
Telephone: (08) 9367 6200
Facsimile: (08) 9474 2579
Email: hsa@hsacoustics.com.au

LANDCORP

KEMERTON INDUSTRIAL PARK

ENVIRONMENTAL NOISE ASSESSMENT

AUGUST 2014

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ENVIRONMENTAL NOISE ASSESSMENT REPORT
KEMERTON INDUSTRIAL PARK

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FOR

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APPENDICIES

1. INTRODUCTION

LandCorp commissioned Herring Storer Acoustics to update the acoustic model for the Kemerton Industrial Park to reflect the change in lot layouts associated with a revised Structure Plan. The Kemerton Industrial Park Structure Plan indicating proposed lots is attached in Appendix A.

As for the previous studies, the objective of this study was to predict noise emissions from a typical mix of industries and determine the maximum noise level applicable to each lot that will comply with the requirements of the *Environmental Protection (Noise) Regulations 1997*.

The representative industry sound power emissions are based on typical industry spectrum and are considered to be a conservative indication of the expected noise emissions. Generally, new industrial plants are designed to control noise emissions and minimise internal noise levels for occupational health reasons.

2. ACOUSTIC CRITERIA

The criteria used are in accordance with the *Environmental Protection (Noise) Regulations 1997*. These regulations stipulate maximum allowable external noise levels determined by the calculation of an influencing factor, which is then added to the base levels shown below. The influencing factor is calculated for the usage of land within the two circles, having a radii of 100m and 450m from the premises of concern. The baseline assigned noise levels for the different types of receivers and during the different periods of the day are listed in Table 2.1.

TABLE 2.1 - BASELINE ASSIGNED OUTDOOR NOISE LEVEL

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Within 15m of a noise sensitive premises building	0700 - 1900 hours Monday to Saturday	45	55	65
	0900 - 1900 hours Sunday and Public Holidays	40	50	65
	1900 - 2200 hours all days	40	50	55
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	35	45	55
Further than 15m from a noise sensitive premises building	All hours	60	75	80
Commercial premises	All hours	60	75	80
Industrial and utility premises	All hours	65	80	90

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

Under the Regulations, different conditions apply to noise emissions from the Kemerton Industrial Park. From Section 2, subclause (5) of Schedule 3 the Regulations state:

> *"Where a noise emission from any premises located within the boundaries of the area known as the Kemerton Industrial Park Policy Area, as specified in the Shire of Harvey District Planning Scheme No. 1, is assessed, an adjustment of 5 dB(A) is to be added to the influencing factor determined under subclause (1) at the point of reception of the noise emission in respect of any period between –*
>
> *(a) 0900 hours and 1900 hours on Sunday or public holiday;*
> *(b) 1900 hours and 2200 hours on any day;*
> *(c) 2200 hours and 0700 hours on Monday to Saturday inclusive; and*
> *(d) 2200 and 0900 hours on a Sunday or public holiday."*

For locations outside the industrial park the influencing factor ranges from 0 – 2. For residences within 100m of the Old Coast Road the influencing factor is 2, due to the traffic factor relating to Old Coast Road. For those residences located at more than 100 metres from Old Coast Road, the influencing factor is 0. The range of assigned noise levels is listed in Table 2.2.

TABLE 2.2 - ASSIGNED OUTDOOR NOISE LEVEL

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Within 15m of a noise sensitive premises building	0700 - 1900 hours Monday to Saturday	50 - 52	60 -62	70 - 72
	0900 - 1900 hours Sunday and Public Holidays	45 – 47	55 – 57	70 – 72
	1900 - 2200 hours all days	45 – 47	55 – 57	60 – 62
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	40 – 42	50 – 52	60 – 62

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

Under the Regulations it is also a requirement that noise from the site be free of annoying characteristics (tonality, modulation and impulsiveness) at other premises, 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 15dB 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 3dB $L_{A\ Fast}$ 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 3 dB 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 above characteristics are present and cannot be practicably removed, the adjustments as listed in Table 2.3 are made to the measured or predicted level at other premises.

TABLE 2.3 - 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

With respect to residential receivers, the noise emissions may be tonal in characteristic, particularly under conditions where received noise levels are predicted to be above 35 dB(A). Under strong wind conditions, the generation of local noise from trees and the like will generally mask plant noise emissions and will most likely not have a measurable 'tonal' characteristic. The most significant acoustic parameter is the L_{A10} noise level.

For the case of an industrial estate such as Kemerton, it is expected that more than one individual industry will contribute to noise levels at noise sensitive premises surrounding the estate. Should the cumulative noise emission approach the 'assigned level' under the regulations, then the requirements of regulation 7 (2) apply. This sub-regulation is:

> *7. (2) For the purposes of subregulation (1) (a), a noise emission is taken to "**significantly contribute to**" a level of noise if the noise emission as determined under subregulation (3) exceeds a value which is 5 dB below the assigned level at the point of reception.*

Thus, under the requirements of the *Environmental Protection (Noise) Regulations 1997* there are 2 criteria that can be used to achieve compliance with the Regulations. The first is the overall noise level received from all industries. In this case, if the overall noise level received at premises complies with the applicable assigned noise level (40-42 dB(A) for Kemerton), then noise emissions from all industries would be deemed to comply with the requirements of the Regulations. However, if the overall noise level received at premises exceeds the applicable noise level, compliance will still be achieve, if the noise received at a premises from an individual industry is at least 5 dB(A) below the applicable assigned noise level.

As Kemerton has several established industries, we believe two different cases need to be considered with regards to compliance with the Regulations:

2.1 CASE 1 – AREAS OF THE PARK WHERE EXISTING INDUSTRIES ARE CONSIDERED TO BE SIGNIFICANTLY CONTRIBUTING

This case applies to the southern end of the Industrial Park where there are already established industries. Whilst noise emissions from these industries currently comply with Regulatory requirements, if new high noise industries commence operations in their vicinity, the overall noise received at certain locations beyond the buffer could exceed the assigned noise levels. It is therefore recommended that a conservative approach be adopted to any new industry seeking to locate in this southern end of the Park, by restricting their noise emissions to a level that results in noise from that industry not exceeding 32 dB(A) within 100 metres of Old Coast Road and 30 dB(A) at all other locations outside the buffer. This will ensure noise received from all industries at noise sensitive premises beyond the buffer does not exceed the Regulatory L_{A10} night time noise level of 40 dB(A).

2.2 CASE 2 – AREAS OF THE PARK WHERE EXISTING INDUSTRIES ARE NOT CONSIDERED TO BE SIGNIFICANTLY CONTRIBUTING

For areas of the Park, other than its southern end, where industries do not presently exist or, if they exist , are not significantly contributing to noise levels at the buffer boundary, any new industry will be restricted to a noise level that either results in noise from that industry not exceeding 37 dB(A) within 100 metres of Old Coast Road and 35 dB(A) at all other locations outside the buffer, or the total noise from all industries will have to comply with an assigned noise level of 42 dB(A) within 100 metres of Old Coast Road and 40 dB(A) at all other locations outside the buffer.

3. METHODOLOGY

Predictions of noise level propagation to surrounding areas were achieved utilising the computer program SoundPlan. This program incorporates various parameters including source sound power levels, ground topography and atmospheric conditions in determining propagation of noise from the site. Using recognised algorithms (Concawe) the program calculates the sound levels at distances from the source resulting in noise levels at receiver locations.

Weather conditions for the modelling were generally in accordance with the Environmental Protection Authority's *"Draft Guidance for Assessment of Environmental Factors No.8 - Environmental Noise"* for the night period and as listed in Table 3.1.

TABLE 3.1 - WEATHER CONDITIONS

Condition	Night Period
Temperature	15 ^{o}C
Relative humidity	50%
Pasquil Stability Class	F
Wind speed	3 m/s

Noise emissions were modelled for the following combination of industries:

- 3 large sized industries having an overall sound power level for the plant of 122 dB(A), with a 100metre high stack having a sound power level of 115 dB(A).
- 3 medium large sized industries having an overall sound power level for the plant of 118 dB(A), with a 65 metre high stack having a sound power level of 110 dB(A).
- 4 medium sized industries having an overall sound power level for the plant of 114 dB(A), with a 40 metre high stack having a sound power level of 107 dB(A).
- 6 small sized industries having an overall plant sound power level of 110 dB(A). There were no stacks modelled with these industries.

The sound power data used as the basis for the acoustic modelling is provided in Appendix B of this report. Figure B1 shows the location of industries and related sound power noise levels used in the acoustic model.

We understand that the above industry mix is conservative in the context that it represents as noisy an assembly of industries as might eventuate in the fully developed Kemerton Industrial Park. Noise emissions from each of the 3 “Large” sized industries results in noise levels just beyond the northern and western boundaries of the Buffer slightly above 35 dB(A), which means these 3 industries will be regarded as “Significantly Contributing”. Consequently, noise emissions from other industries in their vicinity have been reduced to compensate for the proportion of the noise shed taken up by the “Large” industries, thereby seeking compliance with the nighttime assigned noise level (i.e. a Case 1 scenario).

For the noise modelling exercise, noise emissions used are typical of the following types of plants:

1 Power Station
2 Alumina Refinery
3 Synthetic Rutile Plant
4 Briquette Plant
5 Grain Handling Facility
6 Lime Cement Plant
7 Ship Building Industry
8 Lime Plant
9 Compact Steel Plant
10 Pigment Plant
11 Vanadium Plant
12 Zinc Copper Plant

The above are considered a typical mix for an industrial park but must not be taken to imply that any one – or all – of these plants will be located within Kemerton.

4. PREDICTED NOISE EMISSIONS

Noise emissions have been calculated for the proposed Kemerton Industrial Park under nighttime conditions of 3 m/s wind speed and Pasquil Stability class F as per the Department of Environment 'Draft 8' guidelines.

The predicted maximum combined noise contour for the individual industries is shown on Figure C1 in Appendix C.

Figure C2 attached in Appendix C shows the calculated cumulative noise emissions from all modelled industries within the Kemerton Industrial Park.

5. ASSESSMENT OF PREDICTED NOISE LEVELS

The predicted maximum noise contours for each individual industry are shown on Figure C1 in Appendix C. This contour plot indicates that noise emissions from each industry, with the exception of a small area along the northern boundary, should comply with the 35 or 37 dB(A) criterion. Therefore, each industry would be considered as NOT "significantly contributing" to the noise received the closest residence located outside the buffer. For the section of the northern boundary, we note that due to the orientation of the Industrial Park, the overall noise level (see Figure C2) would comply with the 40 dB(A) overall noise level, therefore, noise received along the northern boundary would also be deemed to comply with the Regulatory requirements.

The combined cumulative noise contours for all industries contours are shown on Figure C2 in Appendix C. The results of this modelling indicate that, with the estate filled with industries as per Figure B1, the total noise from the Industrial Park would, with the exception of a marginal exceedance along the eastern boundary, comply with the assigned L_{A10} night time noise level at the boundary of the buffer. For the section along the eastern boundary, we note that noise received at the boundary from each individual industry (see Figure C1) would comply with the 35 dB(A) criteria for individual industries, therefore, noise received along the eastern boundary would also comply with the Regulatory requirements.

We note that under the Regulations the assigned noise levels used as the acoustic criteria are only applicable within 15 metres from a building considered to be noise sensitive. Thus, unless a residence or other noise sensitive premise is constructed within the locations where the marginal exceedances are outlined above (i.e. sections along the northern and eastern boundary), noise emissions from the Kemerton Industrial Park would be deemed to comply with the Regulatory requirements.

6. DISCUSSION OF POTENTIAL NOISE IMPACT

To allow the existing industries at the southern end of the Park to operate as they are currently, it is recommended that new industries in this locality be restricted to sound power levels such that the resultant noise level they generate at the buffer boundary does not exceed 30 dB(A). This should limit overall noise received at the nearest residential premises to 40 dB(A), thus complying with the assigned nighttime L_{A10} noise level.

It is understood that noise received at the boundary of the Industrial Park from the Kemerton Power Station in the northeast of the Park would be considered as NOT "significantly contributing", so this industry does not affect allowable noise emissions from any new industry in the north. Thus for the eastern side of the Park, each new industry should simply comply with the 35 dB(A) criterion at the buffer boundary. We note that the noise modelling would also be considered conservative, as the model does not take into account any noise reduction that would be afforded by barrier effect that would be provided in any normal plant design (ie one item of plant or building providing a barrier to other sections of plant).

7. KEMERTON INDUSTRIAL PARK FUTURE REQUIREMENTS

The requirements of the *Environmental Protection (Noise) Regulations 1997* will apply to each industry that locates within the Kemerton Industrial Park. While there is no obligation to impose a special noise requirement on such industry, to minimise the risk of breaching the *Environmental Protection (Noise) Regulations 1997* it would be prudent to require developments with significant noise emissions to provide an acoustic assessment by a 'competent' acoustic consultant prior to development approval. This assessment and any associated noise modelling should be provided to Landcorp, allowing a comprehensive cumulative noise model to be developed and updated as new industries move into the industrial park. When each new industry commences operation, verification measurements should be taken of sound power emissions and/or of received noise at the buffer boundary.

8. CONCLUSION

Landcorp commissioned Herring Storer Acoustics to develop an acoustic model to predict noise emissions from the proposed Kemerton Industrial Park.

Typical industries with a range of medium and high noise emissions have been modelled to represent a fully developed Kemerton Industrial Park. The modelling demonstrates that the existing industries plus a generous mix of additional noisy industries can be accommodated in the park with total noise contained to the 40 dB(A) night time noise criterion at the buffer boundary or, where this may be slightly exceeded, the contribution of individual industries meeting the 35 dB(A) criterion.

This assessment shows allowable maximum sound power levels applicable to each lot if the Park is filled to capacity with a range of medium to high noise industries.

APPENDIX A

Kemerton Industrial Park – Structure Plan

Sand Quarry

Kemerton Terminal

Kemerton Power Station

KEMERTON ROAD

TREASURE ROAD

OLD COAST ROAD

ROSAMEL RD

WELLINGTON ROAD

WELLESLEY ROAD

DEVLIN ROAD

BUNBURY HIGHWAY

MARRIOTT ROAD

30m RESERVE

35m RESERVE

95m WIDE SERVICE CORRIDOR

50m RESERVE

35m RESERVE + 10m PIPELINE

20m RESERVE

SU

W.W.T.P

SU

SU

Rail to connect with Southwest main line and Bunbury Port

LEGEND

- Kemerton Strategic Industrial Area Structure Plan Boundary
- Existing lot cadastre
- Conceptual local road and lot layout
- Indicative railway
- EPP 1992 SCP Wetlands
- Conservation/Resource Enhancement Wetlands
- Wetland buffer
- Substation
- Primary Regional Road
- Regional Open Space
- Public Purpose
- Kemerton Strategic Industry Zone
- Kemerton Ancillary Industry Zone
- Kemerton Industry Buffer (Special Control Area No. 2)

Plan 1

Structure Plan

Kemerton Industrial Park

Date: 11 November 2014

Scale: 1:35,000 @ A3

Project Manager: MR

Checked: MR

Drawn: LC

Drawing No. 710-065 ST1A 2014-11-11.dgn

0 1500m

tpg
TOWN PLANNING
URBAN DESIGN AND HERITAGE

APPENDIX B

Source Sound Power Levels

Sand Quarry

Kemerton Terminal

Kemerton Power Station

KEMERTON ROAD

ROAD

Large Ind. No 3

Large Ind. No 2

Large Ind. No 1

S

S

M

S

S

S

ML

M

ML

M

S

ML

M

SU

W.W.T.P

SU

30m RESERVE

35m RESERVE

30m RESERVE

95m WIDE SERVICE CORRIDOR

KEMERTON ROAD

TREASURE ROAD

30m RESERVE

WELLINGTON ROAD

30m RESERVE

Rail to connect with Southwest main line and Bunbury Port

WELLESLEY ROAD

35m RESERVE ± 10m PIPELINE

20m RESERVE

MARRIOTT ROAD

50m RESERVE

30m RESERVE

DEVLIN ROAD

OLD COAST ROAD

ROSAMEL RD

BUNBURY HIGHWAY

SU

KEY
S - Small with Plant SWL of 110 dB(A)
M - Medium with Plant SWL of 114 dB(A) and Stack SWL of 107 dB(A)
ML - Medium Large with Plant SWL of 118 dB(A) and Stack SWL of 110 dB(A)
L - Large with Plant SWL of 123 dB(A) and Stack SWL of 115 dB(A)

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Job No : 14150
Date : 03 December 2014

KEMERTON INDUSTRIAL PARK
LOT SOUND POWER LEVELS

Figure B1
Appendix B

LEGEND

- Kemerton Strategic Industrial Area Structure Plan Boundary
- Existing lot cadastre
- Conceptual local road and lot layout
- Indicative railway
- EPP 1992 SCP Wetlands
- Conservation/Resource Enhancement Wetlands
- Wetland buffer
- Substation
- Primary Regional Road
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Plan 1

Structure Plan

Kemerton Industrial Park

Date: 11 November 2014
Scale: 1:35,000 @ A3
Project Manager: MR
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Drawn: LC
Drawing No. 710-065 ST1A 2014-11-11.dgn

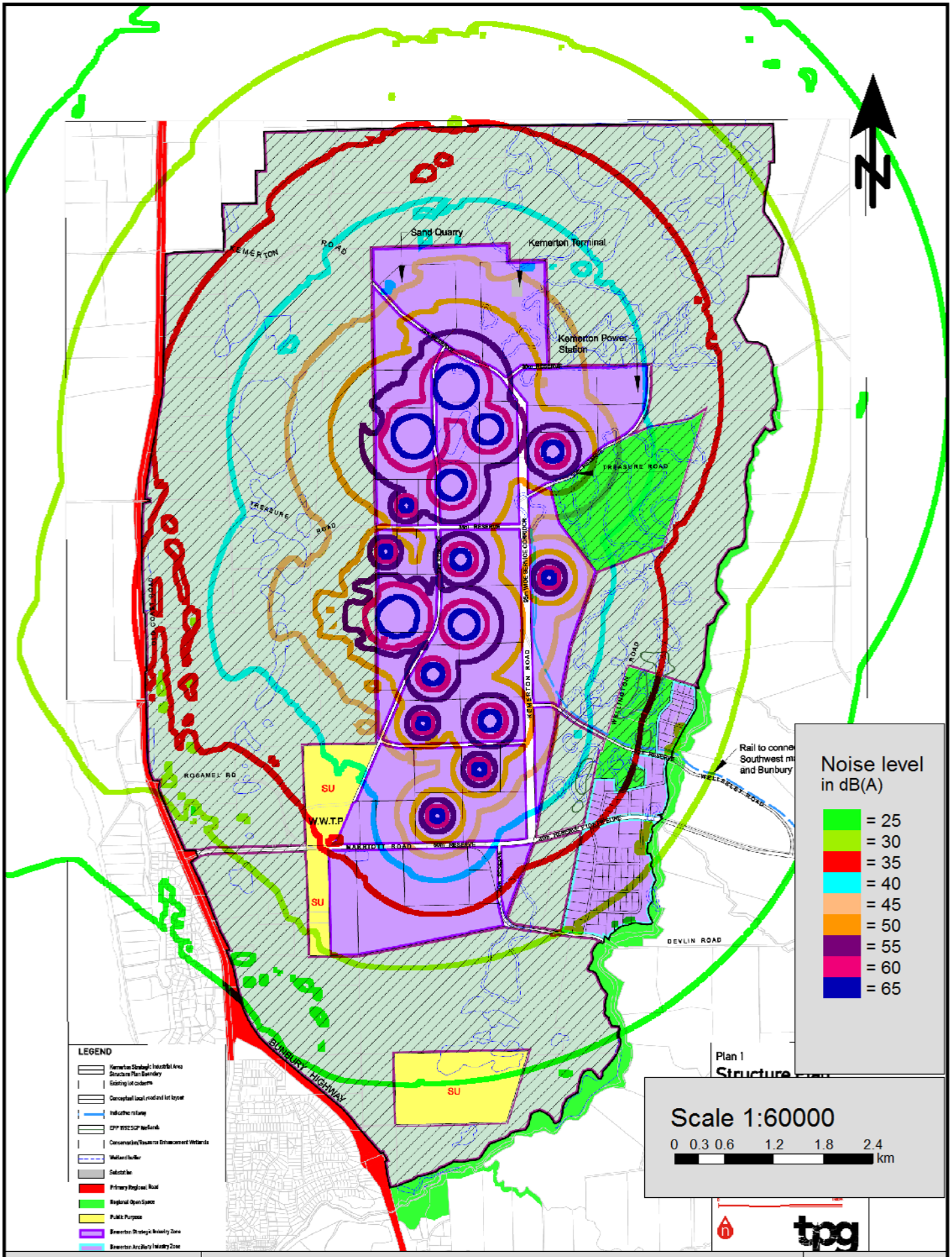
0 1500m

TOWN PLANNING
URBAN DESIGN AND HERITAGE

APPENDIX C

Noise Contours

Figure C1 – Combined Maximum Noise Contours of Each Industry
Figure C2 – Combined Cumulative Noise Contours



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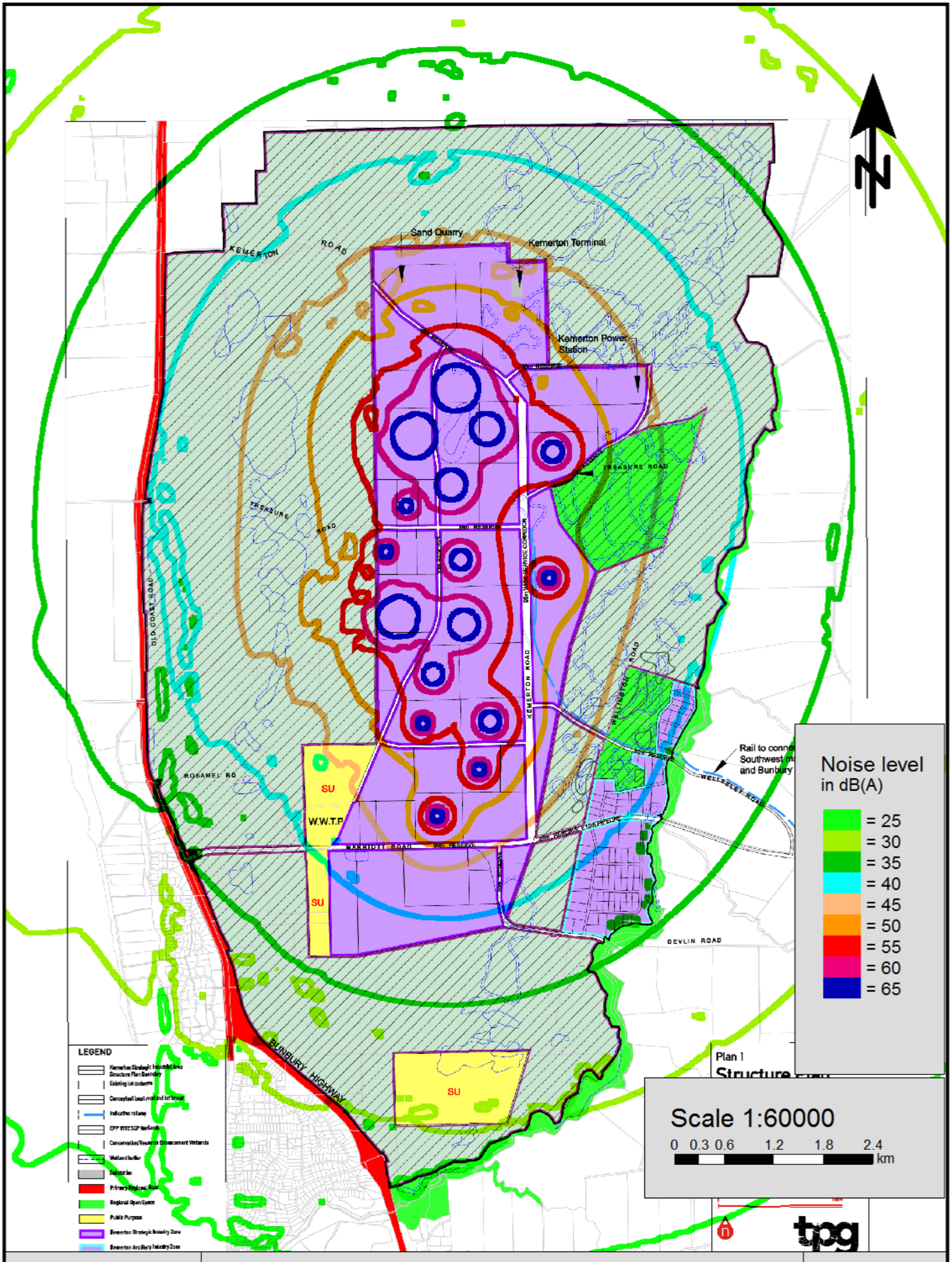
03 December 2014

KEMERTON INDUSTRIAL PARK
COMBINED INDIVIDUAL MAXIMUM NOISE CONTOUR PLOT
FOR COMBINATION OF INDUSTRIES

Figure C1



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03 December 2014

KEMERTON INDUSTRIAL PARK
TOTAL COMBINED NOISE CONTOUR PLOT
FOR COMBINATION OF INDUSTRIES

Figure C2