



5 OPERATIONAL NOISE LEVELS

5.1 Introduction

As discussed in **Section 1.2.2**, a three-dimensional computer noise model was used to predict L_{Aeq} noise levels from all WTG's at all surrounding residential dwellings.

The ISO 9613 noise model incorporates a 'hard ground' assumption and includes one-third octave band calculated effects for air absorption, ground attenuation and topographic shielding. It is noted that ISO 9613 equations predict for average downwind propagation conditions and also hold for average propagation under a well-developed moderate ground-based temperature inversion.

The estimated accuracy of the prediction model is approximately ± 3 dBA.

Further discussion with regards to ISO 9613 and the noise predictions of wind farms is included in **Appendix F**.

While $L_{A90(10 \text{ min})}$ noise levels are used for compliance monitoring, the assessment utilises predicted L_{Aeq} noise levels as prescribed by SA EPA Guidelines, inferring a degree of conservatism that assists in other uncertainties in the noise prediction and assessment process.

5.2 Wind Turbine Noise

For indicative purposes the WTG noise levels from the proposed 125 WTG and 107 WTG base layouts were calculated for the reference wind condition of 8 m/s at 10m AGL. The resulting WTG noise levels are listed in **Table 11** for the two different turbines.

The predicted noise contour plots resulting from the 107 WTG layout equipped with Seimens SWT-2.3-101 (2.3 MW) WTG's is depicted in **Figure 3** and **Figure 4** depicts the 125WTG layout equipped with Repower MM92 (2.05 MW) WTG's.

Furthermore, noise levels from the proposed wind farm were calculated for all integer wind speeds in the range of 5 to 10 m/s (at 10m AGL) at all surrounding assessment receivers within 6 km of a turbine. Whilst the rated wind speed of the WTG's is typically 13 to 14 m/s, published manufacturers sound power level test data (IEC 61400-11) has only been generated as high as 10 m/s. It should be noted that noise produced by WTG's begins to 'plateau off' at higher wind speeds and because of the higher masking background noise level at higher wind speeds, noise impacts and compliance are not critical at these speeds. The assessed wind range sufficiently covers the most noise critical operational conditions.

To compare predicted noise levels with the assessment criteria, the wind speed data, normally measured at 10m AGL, was extrapolated to 80m using the logarithmic profile law (Section 8 Data reduction procedures, page 20, International Standard IEC61400-11 ©IEC:2002+A1:2006 (E) '*Wind Turbine Generator Systems – Part 11: Acoustic noise measurement techniques*').

The predicted levels for both the 107 WTG layout equipped with Seimens SWT-2.3-101 (2.3 MW) WTG's and 125WTG layout equipped with Repower MM92 (2.05 MW) WTG's are displayed on the assessment graphs presented in **Appendix A1** and **Appendix A2** respectively.



Table 11 WTG LAeq noise level (dBA) at $V_{ref,10m} = 8$ m/s, $V_{80m} = 11.1$ m/s, $V_{100m} = 11.5$ m/s

Receiver / Property	107 WTG's Siemens SWT-2.3-101 (2.3 MW) 101m rotor diameter, 100m hub height	125 WTG's Repower MM92 (2.05 MW), 92.5m rotor diameter, 100m hub height
Avonlake* **	42.7	42
Belmore	29.5	29.1
Benbullen*	43.4	42.5
Boco *	38.2	36.9
Brooklyn*	34.7	33.9
Bungee	33.7	33
Clifton	22.4	22.1
Coombala	28.2	27.4
Coopers hill*	43	41.2
Curry Flat	22.3	21.8
Edendale	20.7	20.4
Glenfinnan*	41.3	39.8
H1	30.8	30.3
H2	18	17.6
H3	19.1	18.9
Hyland Grange	24	24.1
Kangaroo Camp Retreat	24.2	23.7
Kanoute	27	26.7
Kelton Plain* **	39	38.2
Kenilworth	28.4	27.7
Loftyvale	19	18.8
Lyndarra	21	20.4
Mia Mia	32.9	32.3
Mohawke	19.5	19.3
Monastery	22.8	22.2
Mountain View	32.4	32.1
Nestlebrae* **	42.8	42
Old Curry Flat	28	27.4
Old Springfield*	31.9	31
Peters Park	28.3	27.9
Riverside*	35.7	35.1
Rockybah*	43	42.4
Roselea*	40.2	39.1
Rosemount	28	27.2
Roslyn	26.7	26.3



Receiver / Property	107 WTG's	125 WTG's
	Siemens SWT-2.3-101 (2.3 MW) 101m rotor diameter, 100m hub height	Repower MM92 (2.05 MW), 92.5m rotor diameter, 100m hub height
Sherwood*	36.3	36
Springfield*	30.1	29.3
Telebugrm*	33.9	32.8
Tinbery Lodge	31.9	31.6
Windella*	32	31.7
Wodburn	29.8	29.4
Woodbine	36	34.9
Wyuna*	37.1	36.2
Xenmor	18.1	17.5
Yandra*	43.9	43.4

Note: * Denotes the location is involved with the project

** Denotes that the property has no current dwelling or is uninhabited



Figure 3 107 WTG Layout, Siemens SWT-2.3-101 2.3 MW, LAeq Noise Contour Map

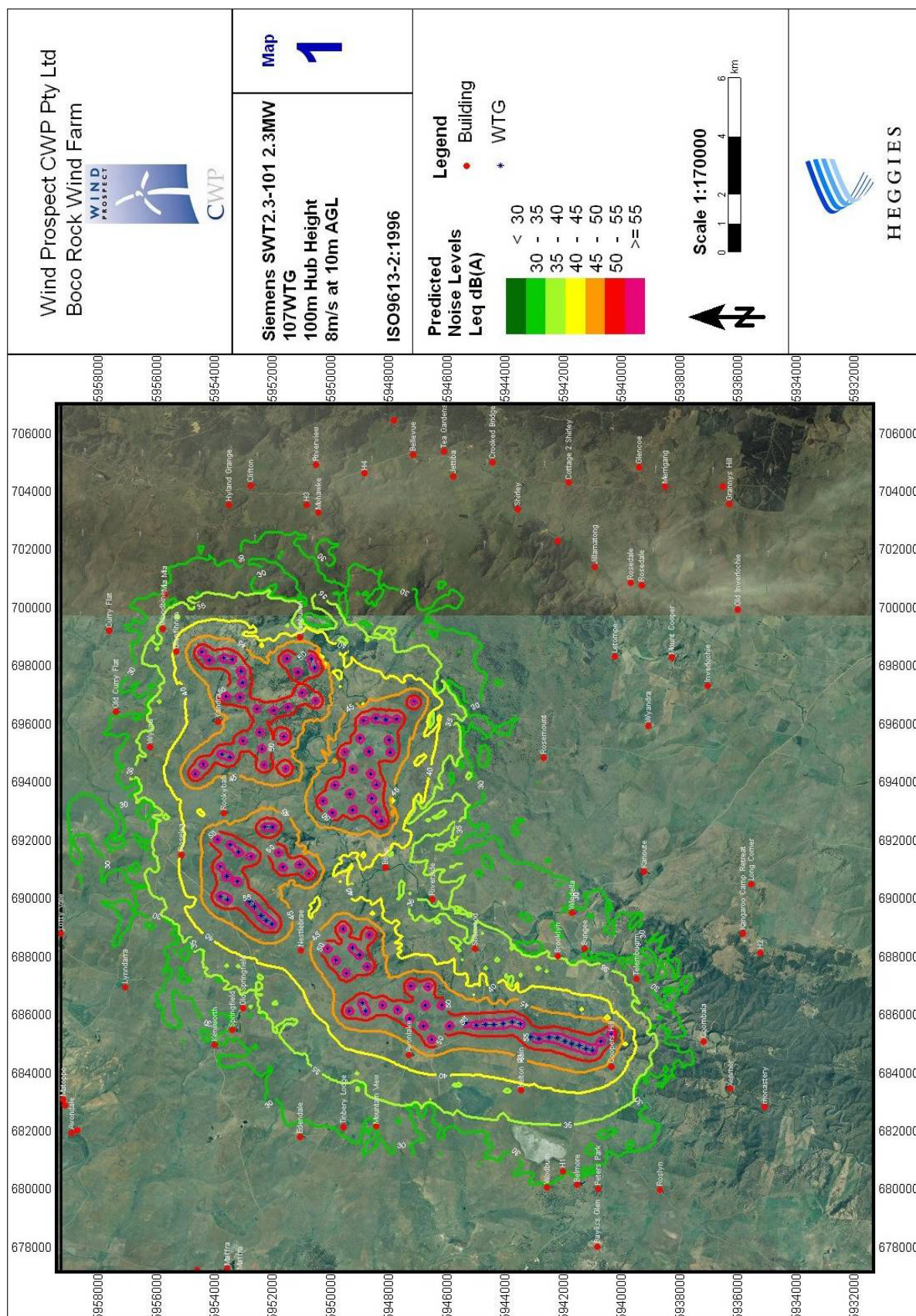
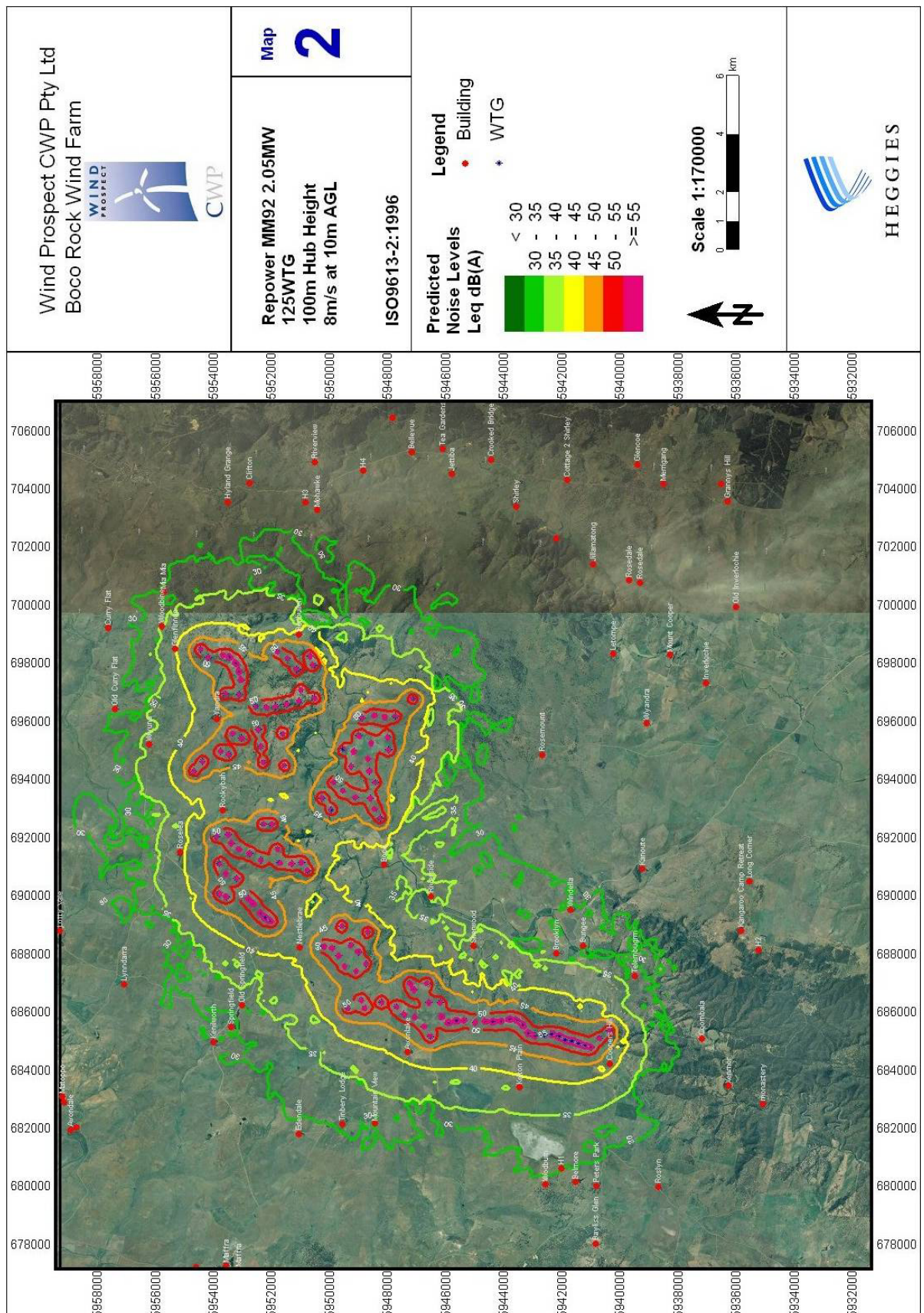




Figure 4 125 WTG Layout, Repower MM92 2.05 MW, LAeq Noise Contour Map





5.3 Substation Transformer Noise Levels

A switching substation is required at the point of connection to Country Energy owned transmission infrastructure to the east of the wind farm site. Assessment of noise from the substation will be assessed separately from the wind farm and will be subject to a separate approval also included in this report.

A collector substation location has been chosen to minimise access distance and electrical losses, and to reduce its visibility from surrounding public viewpoints. The substation is within the Boco Rock Wind Farm Site, located 2 km from 'Boco', the nearest inhabited dwelling, also central to the wind farm site.

The proposed location of the collector substation is at MGA94 E690200 N5950010.

The substation would 'step up' the voltage from the incoming level of 33kV to 132 kV for connection to the existing transmission line using two 150 MVA transformers.

Australian Standard AS 60076 Part 10 2009: "*Power Transformers – Determination of sound levels*" indicates that a transformer of this capacity may produce sound power levels up to 100 dBA. The dominant frequency of such a transformer is 100 Hz.

Noise predictions for transformer substations have been made using CONCAWE algorithms assuming an absolute 'worst case' meteorology enhancement condition of downwind 3 m/s and Pasquill Stability Class F temperature inversion.

Predicted noise levels from the transformer installation are expected to be less than 28 dBA under worst case propagation conditions at the most exposed receiver location, Nestlebrae, which is approximately equal with the Rating Background Level and therefore it will generally be below the existing ambient background and predicted future WTG levels and as such would not effect the compliance assessment of the proposed wind farm.

Furthermore, it should also be noted that the Nestlebrae site is currently uninhabited.