

Crookwell 3 Wind Farm Noise

Purpose

SLR Consulting Australia Pty Ltd was engaged to prepare a noise impact assessment of the proposed Crookwell 3 Wind Farm. This report was updated in June 2012 in response to the *Draft NSW Wind Farm Planning Guidelines*.

The purpose of the noise impact assessment was to:

- Analyse the background noise measurements.
- Assess the predicted noise level to the relevant criteria (SA EPA or WHO).
- Predict the noise levels at all potentially impacted receivers from the operation of the proposed wind farm, including for the separate daytime and night-time periods.
- Predict the levels of swish, modulation, discrete tones and low frequency noise (known as 'Special Audible Characteristics').
- Assess the acoustic impact of the wind farm during the construction phase.

The noise limits considered in the noise impact assessment were based upon the South Australian Environmental Protection Authority Environment Noise Guidelines for Wind Farms (2003) (SA EPA Guideline), which states that the wind farm noise should not exceed the greater of:

- an amenity limit of 35 dBA; or
- the pre-existing background noise by more than 5 dBA (for any given wind speed).

Noise predictions were made for receptors within a 6 km radius of the indicative location of each wind turbine proposed for the Crookwell 3 Wind Farm.

There are 116 identified residential receivers surrounding the site. Of the 116 identified receivers, 10 houses were predicted to receive noise levels above the limit prescribed by the SA EPA Guidelines. The results are presented in Table 1.

All non-host properties are predicted to be within the nominated World Health Organisation Guideline noise limits.

Table 1: Summary of receptors predicted to exceed limits based on Crookwell 1, Crookwell 2 and Crookwell 3 Wind Farms

Residential Receiver	Turbine Model			
	GE 2.5xl Exceedance	V90 Exceedance	V100 Exceedance	MM92 Exceedance
House 8	2.6 dBA@8.2 m/s	1.3 dBA@8.2 m/s	1.5 dBA@8.2 m/s	3.6 dBA@8.2 m/s
House 17	0.6 dBA@8.2 m/s	-	-	1.5 dBA@8.2 m/s
House 19	2.5 dBA@8.2 m/s	1.1 dBA@8.2 m/s	1.2 dBA@8.2 m/s	3.5 dBA@8.2 m/s
House 20	2.9 dBA@8.2 m/s	2.4 dBA@8.2 m/s	2.2 dBA@8.2 m/s	3.2 dBA@8.2 m/s
House 58	-	-	-	0.2 dBA@8.2 m/s
House 59	-	-	-	0.9 dBA@8.2 m/s
House 61	0.1 dBA@8.2 m/s	-	-	1.4 dBA@8.2 m/s
House 62	-	-	-	1.4 dBA@8.2 m/s
House 64	0.9 dBA@8.2 m/s	-	-	1.9 dBA@8.2 m/s
House 65	0.8 dBA@8.2 m/s	-	-	1.8 dBA@8.2 m/s
House 66	6.3 dBA@9.6 m/s	3.0 dBA@9.6 m/s	3.3 dBA@9.6 m/s	6.3 dBA@9.6 m/s
House 67	3.9 dBA@9.6 m/s	0.9 dBA@9.6 m/s	0.7 dBA@9.6 m/s	3.9 dBA@9.6 m/s
House 68	1.0 dBA@8.2 m/s	-	-	1.8 dBA@8.2 m/s
House 69	2.7 dBA@8.2 m/s	1.4 dBA@8.2 m/s	1.4 dBA@8.2 m/s	3.7 dBA@8.2 m/s
House 70	2.2 dBA@8.2 m/s	1.7 dBA@8.2 m/s	1.5 dBA@8.2 m/s	2.7 dBA@8.2 m/s
Exceedance	12	7	7	15

Noise impact mitigation scenarios may be considered such as operating selected turbines from both the Crookwell 2 and Crookwell 3 Wind Farms in a 'low noise' mode. In this case, noise level exceedances were found at only one receptor (House 70) with an exceedance of 0.3 dBA at 8.2 m/s, which is considered a marginal exceedance.

Daytime and Night-time Background Noise

The background noise data was assessed to define background noise curves for the daytime period (7:00 am to 10:00 pm) and night-time period (10:00 pm to 7:00 am), as a requirement of the *Draft NSW Wind Farm Planning Guidelines*.

Table 2 summarises the noise exceedances for each turbine model at non-host properties compared to the exceedances found from the original assessment that was based on the 24 hour all-data set.

Overall, the assessment found the noise exceedances are minor and acceptable against the relevant guidelines and standards.

Table 2: Noise exceedances at non-associated households (daytime vs. night-time)

Draft guidelines criteria	GE 2.5xl Exceedance	V90 Exceedance	V100 Exceedance	MM92 Exceedance
Daytime exceedances	7 (5 less than previous assessment)	5 (2 less than previous assessment)	4 (4 less than previous assessment)	11 (4 less than previous assessment)
Night-time exceedances	13 (1 more than previous assessment)	9 (2 more than previous assessment)	8 (1 more than previous assessment)*	16 (1 more than previous assessment)

Special Audible Characteristics

SLR Consulting assessed the predicted levels of swish, modulation, discrete tones and low frequency noise, otherwise known as 'Special Audible Characteristics', for the proposed wind farm. It was found that:

- The wind turbine noise would not exceed the limit of 60 dBC for any receiver location.
- The tonality tests showed no presence of tonality in the predicted results.
- Should excessive amplitude modulation be found to be a problem, adaptive management techniques would adequately minimise the impact.

Construction Noise

Potential construction noise impacts were assessed, and the 'worst case' scenarios modelled were found to be generally acceptable. The 'worst case' maximum construction traffic noise modelled would increase traffic noise levels along local roads by up to 3-7 dBA.

Due to the typically large setback of dwellings from the road network in the area, the predicted construction traffic noise is considered acceptable.

* This is a correction from the Noise Report, Section 12.1, Table 22, that previously stated "8 exceedances (same as previous)"

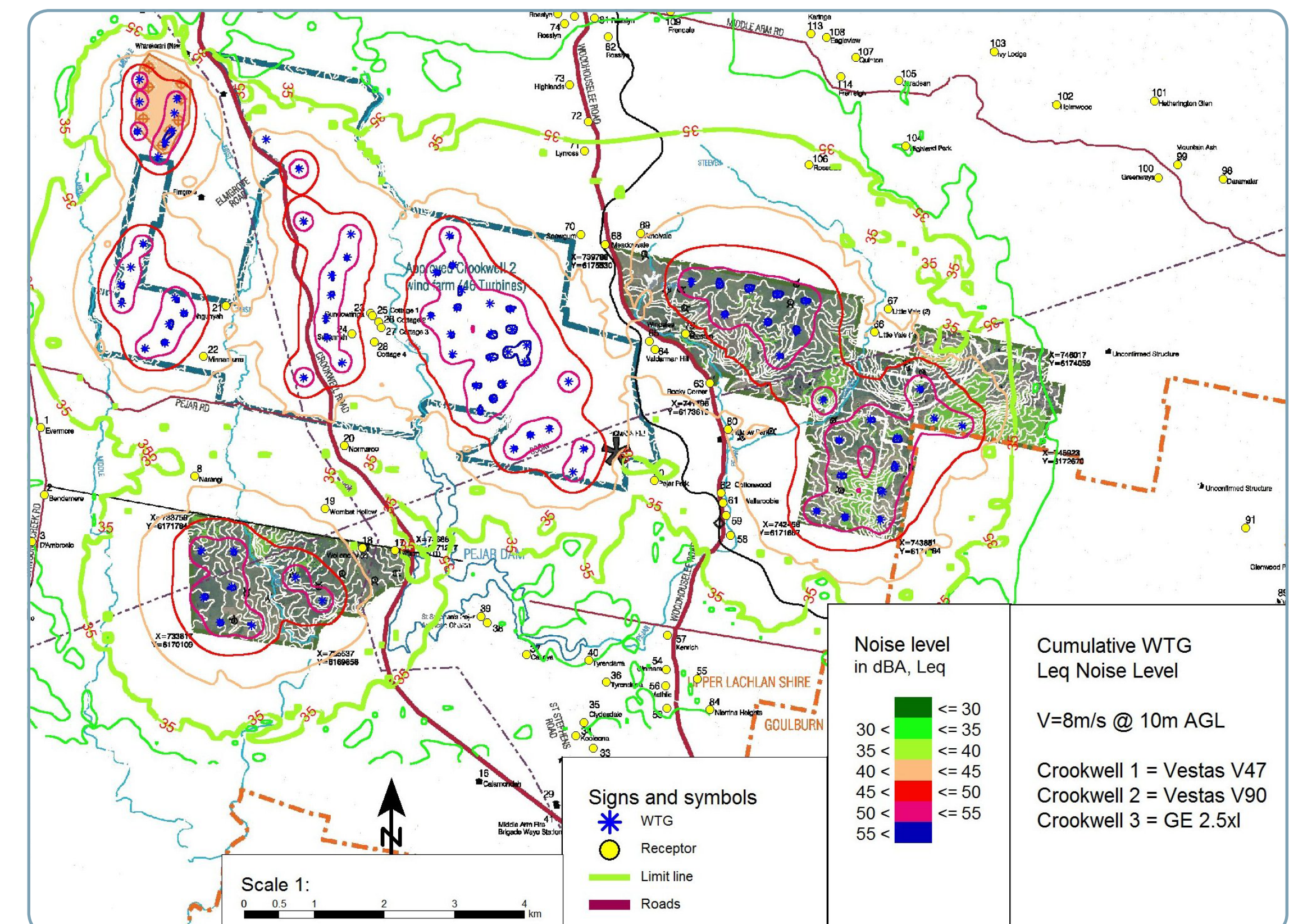


Figure 1: GE 2.5xl 2.5MW LAeq Noise Contour Map for Crookwell 1 Crookwell 2 and Crookwell 3 Wind Farms

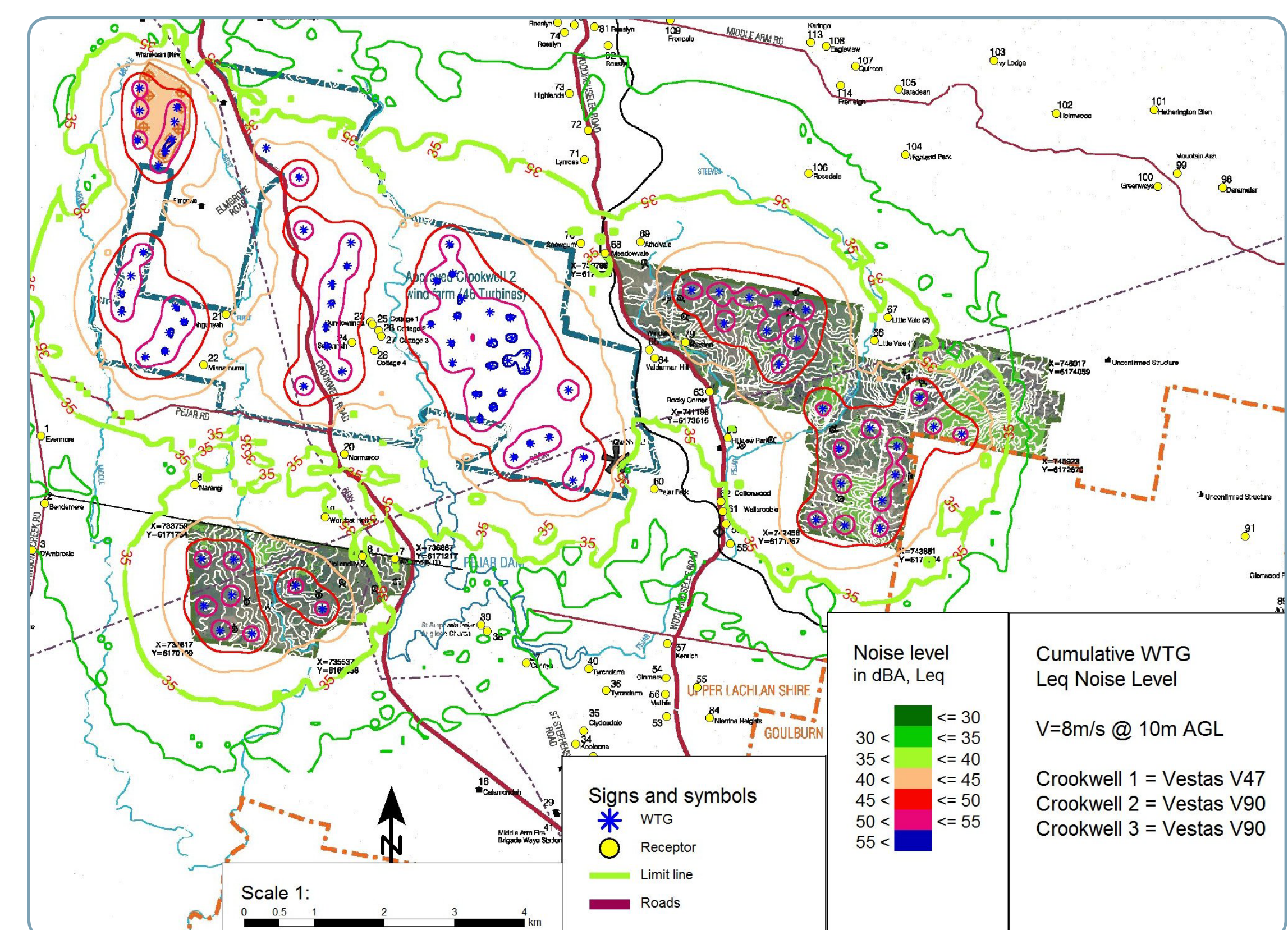


Figure 2: Vestas V90 2MW LAeq Noise Contour Map for Crookwell 1 Crookwell 2 and Crookwell 3 Wind Farms

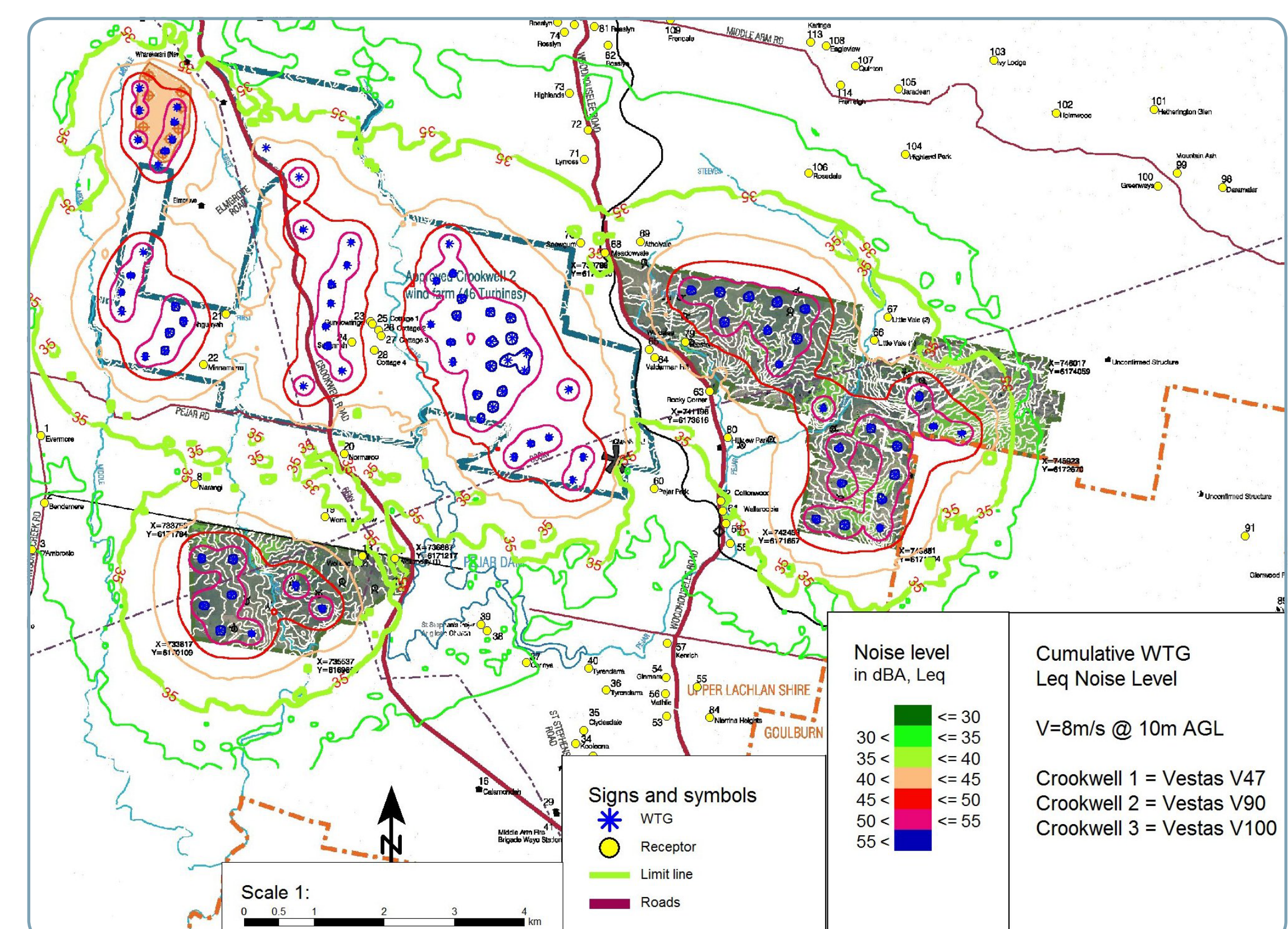


Figure 3: Vestas V100 1.8MW LAeq Noise Contour Map for Crookwell 1 Crookwell 2 and Crookwell 3 Wind Farms

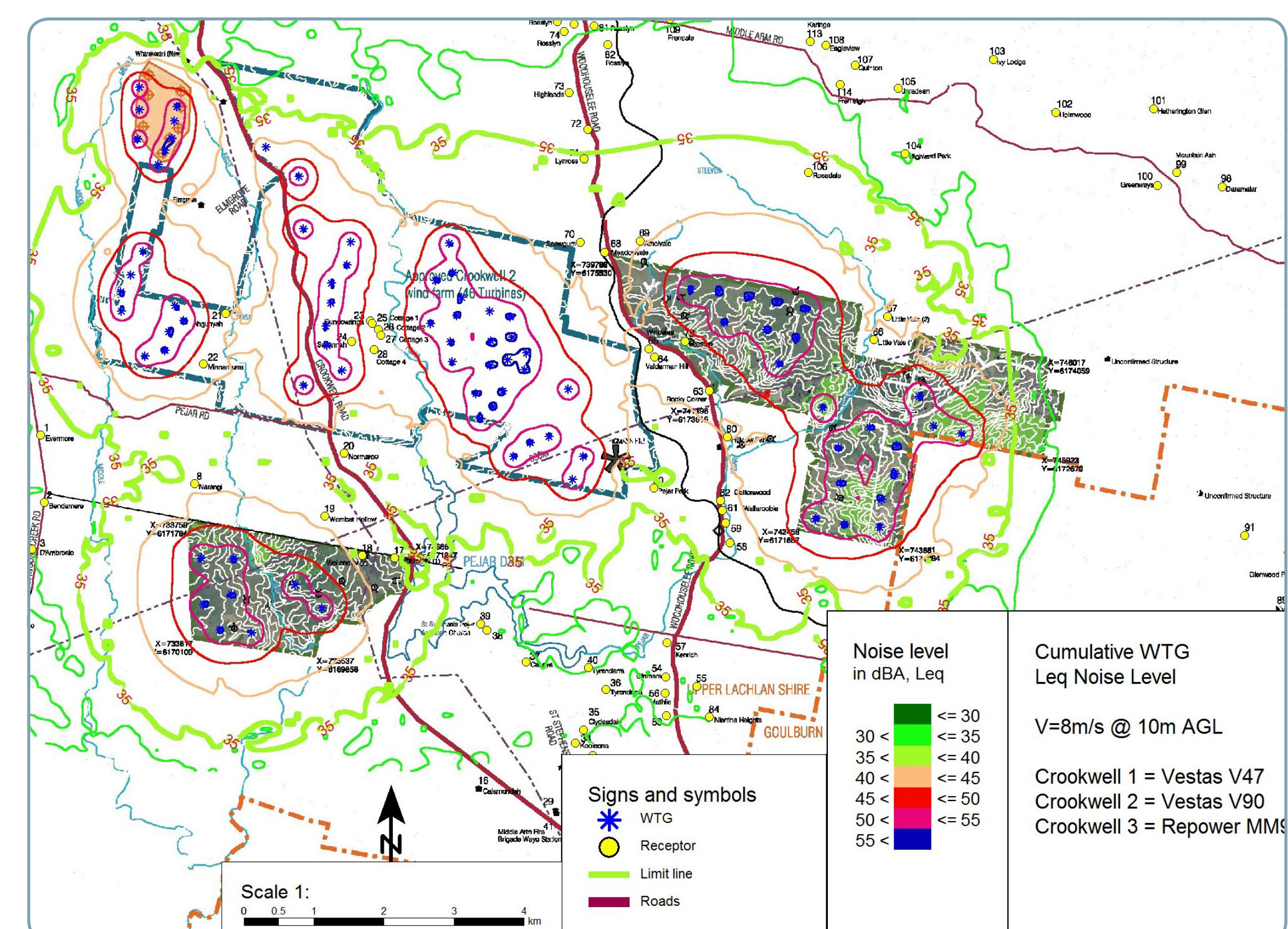


Figure 4: Repower MM92 2MW LAeq Noise Contour Map for Crookwell 1 Crookwell 2 and Crookwell 3 Wind Farms

Key Findings and Impacts

SLR Consulting assessed the potential cumulative noise generated from the existing Crookwell 1 Wind Farm, the approved Crookwell 2 Wind Farm, and the proposed Crookwell 3 Wind Farm turbines.

It is important to note that the noise modelling procedure relies on a number of conservative assumptions (the foremost being that noise propagates downwind from each source), causing potential overestimation of noise levels and noise limit exceedances.

Response to Findings

In circumstances where undue turbine noise impacts are identified during operations then an 'adaptive management' approach can be implemented, which includes:

- Identifying exactly what conditions or times lead to undue impacts.
- Operating selected turbines in a reduced 'noise optimised' mode during identified times and conditions.
- Providing acoustic upgrades (glazing, façade, masking noise, etc) to affected dwellings.
- Turning off turbines that are identified as causing the undue impact during identified times and conditions.

SLR Consulting has developed a noise impact mitigation strategy in order to address the cumulative noise impacts, which includes:

- Developing a mitigated noise operation layout (involving a number of turbines operating in 'low noise' mode),
- Entering into agreements, in accordance with Section 2.3 of the SA EPA Guideline, with selected neighbouring landowners, or
- Applying acoustic treatment to impacted dwellings to reduce the impact of turbine noise.