Appendix H Receptor K15aa baseline re-analysis

Post-construction Noise Assessment – Stage 2

Lal Lal Wind Farm

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SLR Project No.: 640.11872

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SLR

H.1 Introduction

Receptor K15aa is a reference receptor located to the south of Elaine Wind Farm.

Baseline noise monitoring was first conducted at K15aa in two surveys during 2017 by Marshall Day Acoustics (MDA). The two surveys at this location were partially invalidated by interference of localised extraneous noise (identified as a heat pump).

In 2019 SLR was engaged to re-capture baseline noise conditions for K15aa. Monitoring was completed in two survey periods.

1. Between 31 July 2019 and 26 August 2019, but suitable wind data was unavailable during this period due to a technical problem with the met mast Scada capture system.
2. Between 22 October 2019 and 14 November 2019.

During this period the construction of Elaine Wind Farm was nearing completion.

The baseline noise monitoring data was screened and analysed in accordance with the NCTP procedures and the resulting baseline regression equations used to determine the 'background +5dBA' component of the noise limit.

H.2 Early Commissioning

Unrelated investigations in mid-2024 discovered that during the second survey period of 2019, some aspects of early commissioning of Elaine Wind Farm had already commenced, with the Project receiving a 5 MW exemption from AEMO, which permitted the site to advance to the next stage of commissioning.

The commissioning of some electrical substation components required a limited energisation and hence some WTGs were operated. Scada records indicate that during the monitoring period up to 15 individual WTGs were at some point generating power, with generally only a single WTG operational at any one time.

SLR was engaged to determine the potential impact, if any, that this very limited operation of WTGs might have had on baseline background noise levels and subsequent noise limits and assessment conclusions.

H.3 Prediction methodology

The objective was to determine and remove any influence that operational WTGs may have had on B.G. noise levels.

This was achieved by:

- Using a 3D SoundPLAN noise model (incorporating IOA GPG input assumptions), with predicted levels validated against the *Lal Lal Wind Farm Pre-construction Noise Assessment* report (ref: Sonus S5464C11).
- Predicting worst case individual WTG contributed noise levels to K15aa (which accounts for downwind assumption).
- Correcting the predicted level for the wind speed during each interval, by applying a suitable offset according to the sound power level of the WTG model for that wind speed.

- Making a correction for the WTG sound directivity and propagation effects based on wind direction. This step is necessary as the above steps in the calculation would generally overestimate WTG contribution when the receptor is upwind of a WTG. The adjustment for directivity was applied as an interpolation of data consistent with that presented in Figure 6 the IOA GPG, based on work undertaken by NASA (ref: Shepherd, K. P.; Hubbard, H. H. *Wind Turbine Acoustics*, NASA Technical Paper (TP) 3057, Dec 1990)
- Using the above predictive methodology the contributed WTG noise level was calculated for each 10 minute interval, with consideration of which WTG was operational, the average wind speed and wind direction in that interval. The contributed WTG noise level was then able to be compared to the measured background data for each interval.

H.4 Analysis

Once the contributed WTG noise level was determined for each interval the analysis of WTG influence on background noise was investigated using two primary approaches.

1 To reject any data from the valid background data set that may have been influenced by WTG noise. For example if WTG contributed noise level was within 15 dB of background noise (theoretically contributing >0.1 dB to the measured level), then that 10 minute measurement data point was deemed invalid and rejected from the valid data set. However, this approach introduces a rejection bias, as typically only the quiet background data is rejected from the valid data set. The net result of this approach is the revised regression curve increases and in effect raises the noise limit. This approach was deemed unfair and consequently discarded.

2 To correct the measured background data by subtracting the influence of WTG contributed noise. This was achieved by logarithmically subtracting the contributed WTG noise from the measured background data, such that the greater the potential influence of WTG noise on the measurement, the larger the downward adjustment of background data.

The re-analysis of K15aa background data is presented in **Figure 38** for All-time and **Figure 39** for the Night-time period. The original data set being presented as yellow markers and a black regression line with the corrected data is presented as green markers and green regression line.

It is evident that the effect of the operational WTGs was only occasionally discernible, shown where yellow markers are uncovered by the downward adjustment of the corresponding green marker. Furthermore, the resulting change in the regression curve is negligible, where the highest reduction in the all-time curve being 0.12 dB and the night-time curve being 0.17 dB.

Figure 38 K15aa background re-analysis – All time

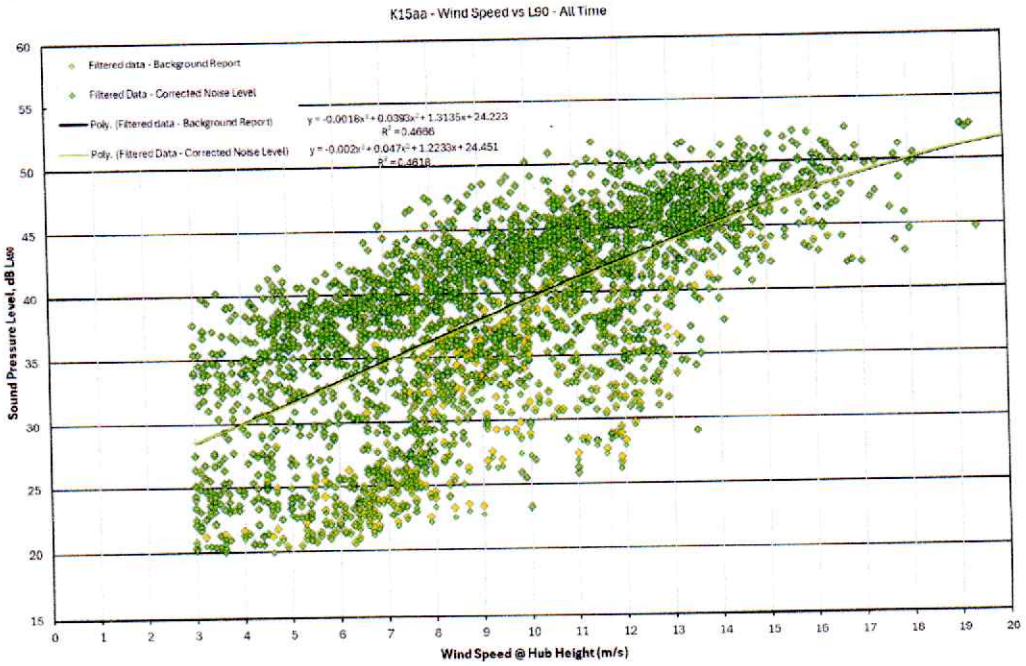
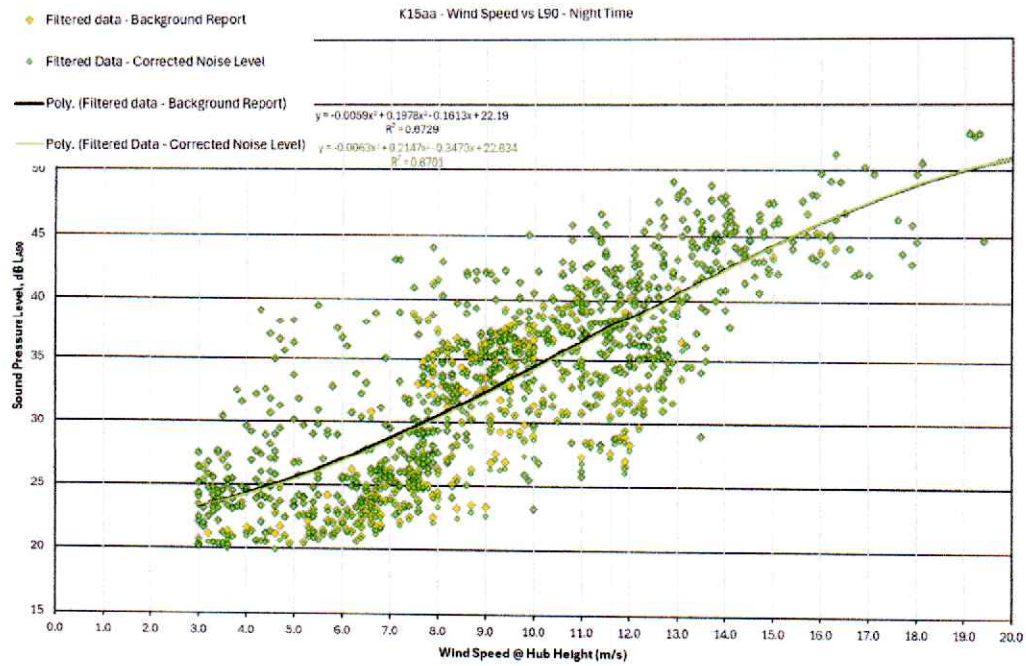


Figure 39 K15aa background re-analysis – Night time



H.5 Assessment

It is important to note that the background noise regression curve is used in the post construction noise assessment for two purposes.

1. The background noise regression curve helps define the 'background + 5 dBA' portion of the noise limit.
2. The background noise regression curve is used to determine the wind farm only contribution by logarithmic subtraction from post construction monitoring data.

To evaluate the potential for any change in the post construction noise assessments as a consequence of reanalysis of K15aa background data, the Stage 1 and Stage 2 assessment graphs have been reproduced with the re-analysed K15aa background regressions.

The Stage 1 post construction noise assessment completed with the reanalysed K15aa background data is shown in **Section H.6.1** for the All-time period and **Section H.6.2** for the Night-time period. Both assessments show that the wind farm noise complies with the noise limit, with;

- No change in the margin of compliance at the critical wind speed of 7 m/s where the margin is smallest (3.5 dB margin) for all time period.
- 0.1 dB change in the margin of compliance at the critical wind speed of 10 m/s where the margin was smallest (2.9 dB margin) for night-time period.

The Stage 2 post construction noise assessment completed with the reanalysed K15aa background data is shown in **Section H.6.3** for the All-time period and **Section H.6.4** for the Night-time period. Both assessments show that the wind farm noise complies with the noise limit, with;

- No change in the margin of compliance at the critical wind speed of 7 m/s where the margin was smallest (3.2 dB margin) for all time period.
- 0.1 dB change in the margin of compliance at the critical wind speed of 10 m/s where the margin was smallest (0.9 dB margin) for night-time period.

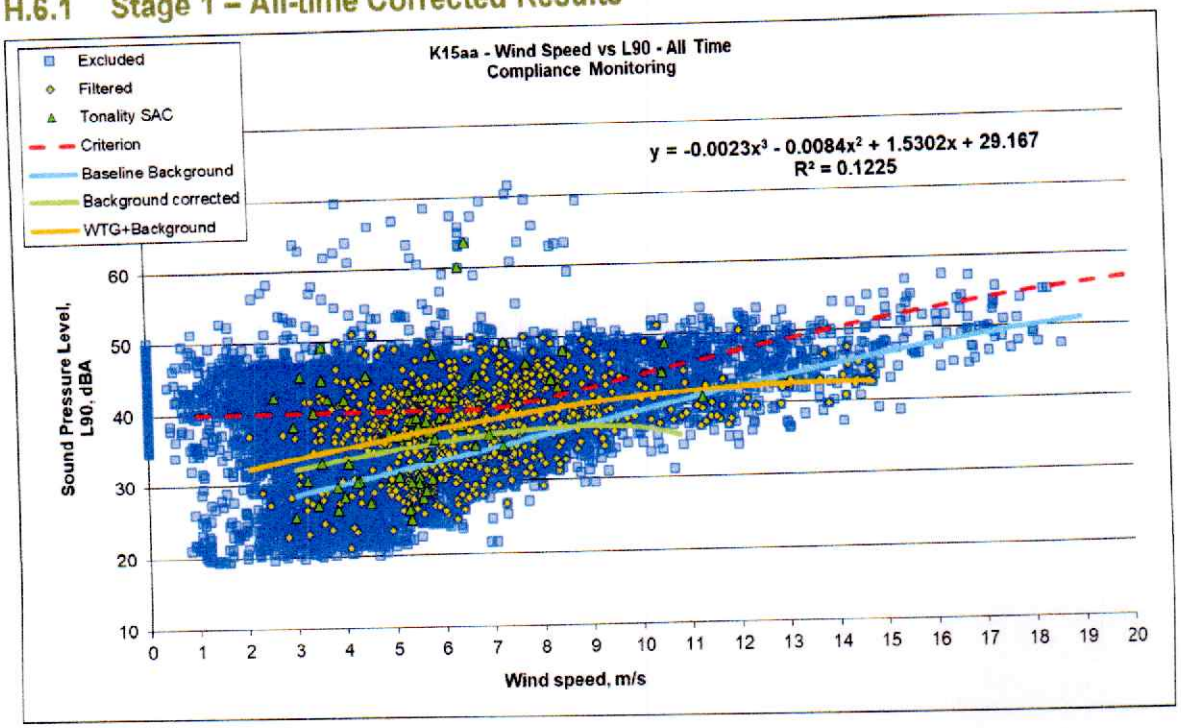
H.6 Conclusion

The potential influence on background noise levels of occasional single WTG operation during the K15aa monitoring period has been evaluated. The change in the relevant all-time and night time regression curves is minor, being less than 0.2 dB at most.

The resulting change in the post construction compliance assessment has been evaluated, with the results demonstrating compliance to all noise limits by the same margin (within 0.1 dB) of compliance at the relevant critical wind speeds.

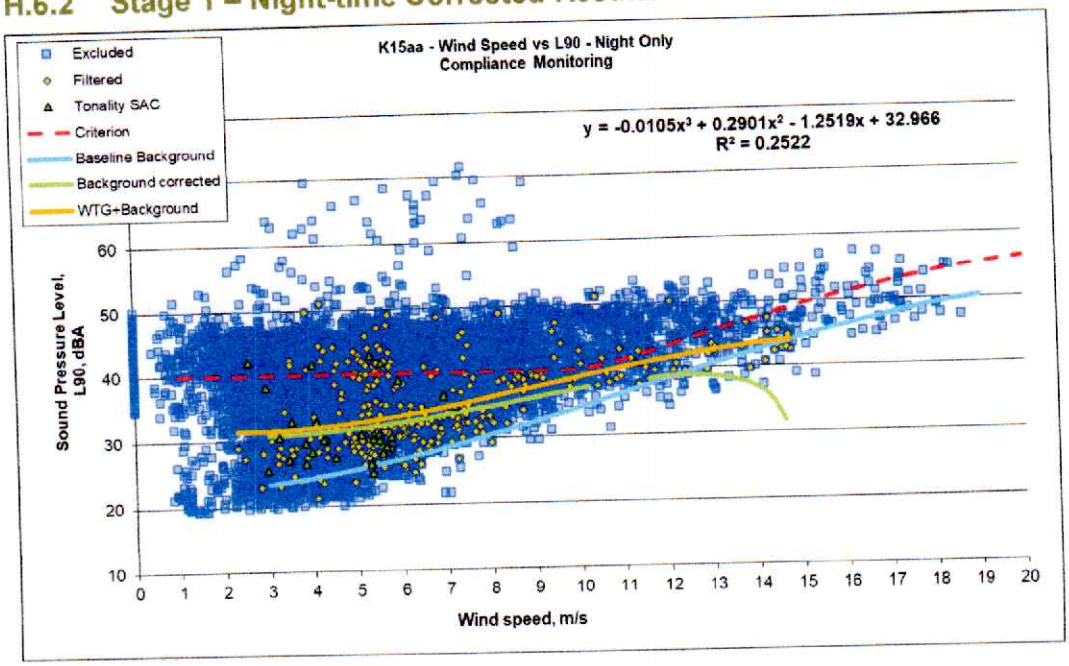
It is therefore concluded that the influence on background noise levels of occasional single WTG operation during the K15aa monitoring period had no substantive bearing on background monitoring and subsequent Stage 1 and Stage 2 post construction compliance assessments.

H.6.1 Stage 1 – All-time Corrected Results



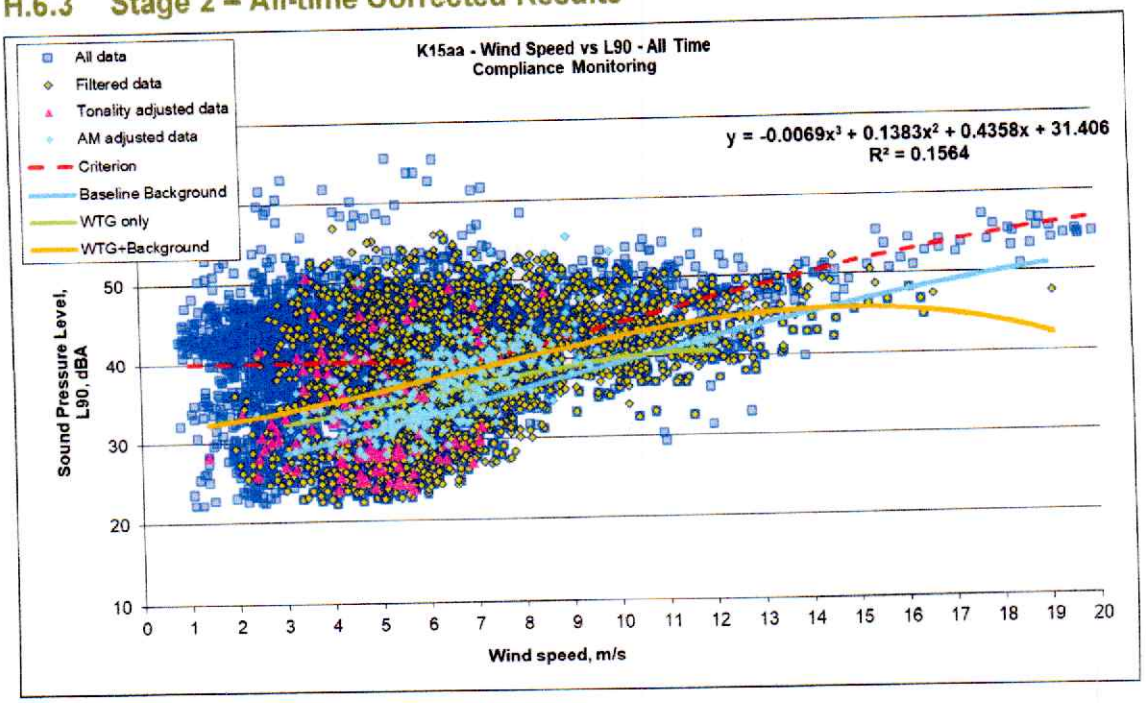
Wind speed (m/s)	4	5	6	7	8	9	10	11	12	13	14	15
Reanalysed Baseline Background, dBA	40.0	40.0	40.0	40.0	41.2	42.8	44.4	45.9	47.4	48.9	50.3	51.6
6808 limit, dBA	35.0	36.3	37.6	38.7	39.7	40.6	41.4	42.0	42.4	42.7	42.7	42.6
Background + WTG, dBA	30.0	31.5	33.1	34.6	36.2	37.8	39.4	40.9	42.4	43.9	45.3	46.6
WTG noise, dBA	33.4	34.6	35.7	36.5	37.1	37.4	37.0	35.3	-	-	-	-
Reanalysed Compliance Margin, dBA	6.6	5.4	4.3	3.5	4.1	5.4	7.4	10.6	-	-	-	-
Original Compliance Margin, dBA	6.6	5.4	4.4	3.5	4.3	5.6	7.6	11.1	-	-	-	-
Difference in compliance margin	0.0	0.0	0.1	0.0	0.2	0.2	0.2	0.5	-	-	-	-

H.6.2 Stage 1 – Night-time Corrected Results



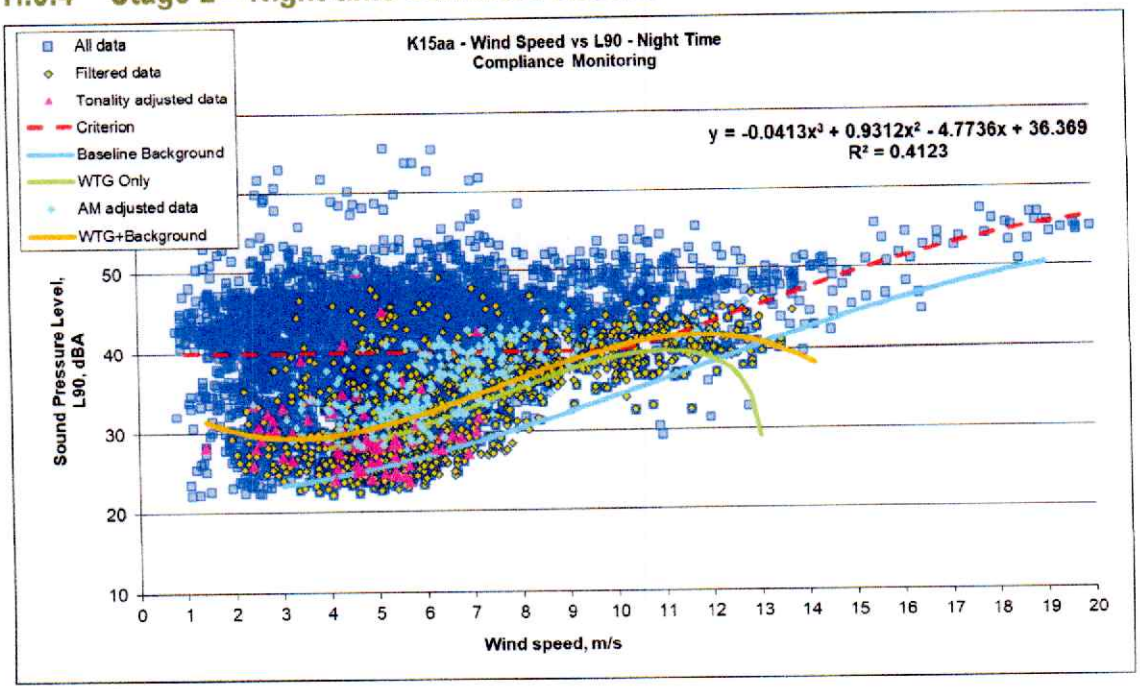
Wind speed (m/s)	4	5	6	7	8	9	10	11	12	13	14	15
Reanalysed Baseline Background, dBA	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.4	43.5	45.6	47.6	49.5
6808 limit, dBA	31.9	32.7	33.6	34.8	36.2	37.6	39.0	40.4	41.6	42.7	43.6	44.1
Background + WTG, dBA	24.3	25.5	26.9	28.6	30.4	32.3	34.3	36.4	38.5	40.6	42.6	44.5
WTG noise, dBA	31.1	31.7	32.6	33.7	34.8	36.0	37.2	38.1	38.8	38.7	36.8	-
Reanalysed Compliance Margin, dBA	8.9	8.3	7.4	6.3	5.2	4.0	2.8	3.3	4.7	6.9	10.8	-
Original Compliance Margin, dBA	8.9	8.3	7.4	6.4	5.2	4.0	2.9	3.5	4.9	6.9	10.5	-
Difference in compliance margin	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.2	0.2	0.0	-0.3	-

H.6.3 Stage 2 – All-time Corrected Results



Wind speed (m/s)	4	5	6	7	8	9	10	11	12	13	14	15
Reanalysed Baseline Background, dBA	24.3	25.5	26.9	28.6	30.4	32.3	34.3	36.4	38.5	40.6	42.6	44.5
6808 limit, dBA	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.4	43.5	45.6	47.6	49.5
Background + WTG, dBA	29.5	30.6	32.3	34.4	36.6	38.7	40.4	41.5	41.7	40.9	38.6	34.8
WTG noise, dBA	33.2	34.4	35.6	36.8	38.0	39.1	40.0	40.5	40.6	39.7	35.0	-
Reanalysed Compliance Margin, dBA	6.8	5.6	4.4	3.2	3.2	3.7	4.4	5.4	6.8	9.2	15.3	-
Original Compliance Margin, dBA	6.8	5.7	4.5	3.2	3.4	3.9	4.6	5.6	7.1	9.5	16.2	-
Difference in compliance margin	0.0	0.1	0.1	0.0	0.2	0.2	0.2	0.2	0.3	0.3	0.9	-

H.6.4 Stage 2 – Night-time Corrected Results



Wind speed (m/s)	4	5	6	7	8	9	10	11	12	13	14	15
Reanalysed Baseline Background, dBA	24.3	25.5	26.9	28.6	30.4	32.3	34.3	36.4	38.5	40.6	42.6	44.5
6808 limit, dBA	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.4	43.5	45.6	47.6	49.5
Background + WTG, dBA	29.5	30.6	32.3	34.4	36.6	38.7	40.4	41.5	41.7	40.9	38.6	34.8
WTG noise, dBA	28.0	29.0	30.8	33.1	35.4	37.6	39.2	39.9	39.0	29.0	-	-
Reanalysed Compliance Margin, dBA	12.0	11.0	9.2	6.9	4.6	2.4	0.8	1.5	4.5	16.5	-	-
Original Compliance Margin, dBA	12.0	11.0	9.2	7.0	4.6	2.5	0.9	1.6	4.6	16.5	-	-
Difference in compliance margin	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.0	-	-