Valley of the Winds

# APPENDIX E
# BACKGROUND NOISE ASSESSMENT

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# VALLEY OF THE WINDS WIND FARM BACKGROUND NOISE ASSESSMENT

Rp 002 20191254 | 23 February 2022

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Project: **Valley of the Winds wind farm**

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Report No.: **Rp 002 20191254**



## Document Control

| Status: | Rev: | Comments | Date: | Author: | Reviewer: |
|---|---|---|---|---|---|
| Complete | - | Issued to client | 23 Feb. 2022 | A. Ahmadi<br>C. Guzik | C. Delaire |

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## 1.0 INTRODUCTION

This report presents the results of background noise monitoring undertaken for the proposed Valley of the Winds wind farm (the wind farm).

The background noise monitoring was commissioned by UPC\AC Renewables Australia (the proponent), as an element of the noise studies associated with the wind farm's development application. The background noise monitoring was undertaken to obtain a representation of typical baseline conditions at receivers in the vicinity of the wind farm and determine applicable noise limits.

This report documents the survey method, the results of the monitoring, and the derived noise limits that apply to the wind farm.

Acoustic terminology used throughout this report is presented in Appendix A.

Turbine coordinates and a site layout are provided detailed in Appendix B and Appendix C respectively.

Throughout this report, the term receiver is used to identify any dwelling identified by the proponent in the vicinity of the proposed wind energy facility. Receivers are grouped as *associated receivers* - where a noise agreement is proposed between the landowners and the proponent, or *non-associated receivers* which comprises the remaining receivers without an agreement with the proponent.

## 2.0 BACKGROUND NOISE SURVEY & ANALYSIS METHOD

The background noise survey and analysis has been conducted in accordance with the NSW Environment Protection Authority *NSW Wind Energy: Noise Assessment Bulletin*, dated December 2016 (NSW Noise Assessment Bulletin).

The NSW Noise Assessment Bulletin in turn references the South Australia Environmental Protection Authority *Wind Farms Environmental Noise Guidelines*, dated July 2009 (SA Guideline), the requirements of which have also been considered.

This section of the report presents:

- Details of the selected noise monitoring locations;
- An overview of the survey method; and
- A summary of the data analysis procedures.

### 2.1 Noise monitoring locations

Noise monitoring locations were selected based on the results of the Preliminary Noise Assessment detailed in MDA report Rp 001 20191254 *Valley of the Winds - Preliminary noise assessment*, dated 7 April 2020.

Consent to undertake background noise monitoring was not granted at all preferred receivers, however, based on the proximity to turbines and predicted noise contours and representation of receiver clusters, background noise monitoring was conducted at the thirteen (13) receivers listed in Table 1and presented in Figure 1 of Appendix C.

**Table 1: Background noise monitoring locations**

| Receiver | Nearest turbine | Distance from nearest turbine, m | Direction to nearest turbine, ° |
|---|---|---|---|
| 5 | GR40 | 2,026 | 291 |
| 25 | MH29 | 2,103 | 283 |
| 77 | MH63 | 2,511 | 221 |
| 87 | MH12 | 2,746 | 298 |
| 151 | LV20 | 2,216 | 100 |
| 187 | LV4 | 2,470 | 360 |
| 189 | LV3 | 2,381 | 282 |
| 240 | MH76 | 2,913 | 70 |
| 256 | GR35 | 1,299 | 358 |
| 278 | GR52 | 2,095 | 199 |
| 282 | MH3 | 2,221 | 314 |
| 314 | MH14 | 2,228 | 18 |
| 497 | GR2 | 2,115 | 55 |

## 2.2 Survey description

The background noise survey comprised unattended monitoring over a number of weeks to measure sound levels for a range of environmental conditions. Site wind speeds and local weather conditions were simultaneously recorded during the survey, along with periodic audio samples, to enable the relationship between background noise levels and site winds to be assessed.

The key elements of the background noise survey are summarised in Table 2 below.

**Table 2: Summary of key elements of background noise survey**

| Item | Description |
|---|---|
| Monitoring locations | Thirteen (13) receivers as described in Section 2.1. |
| Monitoring Period | 1 June to 2 September 2021 equating to approximately 13 weeks at receivers 5, 25, 151, 187, 240, 278, 282, 314 and 497.<br>17 June to 2 September 2021 equating to approximately 11 weeks at receivers 77, 57, 189 and 256. This was due to staff becoming unwell during the first round of deployments.<br>The duration of the monitoring period was chosen to satisfy the SA Guideline which requires *the collection of 2,000 data points including a minimum of 500 from the worst case wind direction*.<br>The worst-case direction is defined in Section 4.1 of the SA Guideline as *a wind direction spread of 45° on either side of the direct line between the nearest WTG and the relevant receiver*.<br>The NSW Noise Assessment Bulletin recognises that *in NSW, the worst case wind direction rarely occurs. Therefore, if it appears impractical to collect 500 valid data points under the worst-case conditions, data collection should continue for up to six weeks*. |
| Sound level meters | Class 1 automated sound loggers (most accurate class rating for field usage).<br>Microphones mounted at approximately 1.5 m above ground level and fitted with enhanced wind shielding systems based on the design recommendations detailed in the UK Institute of Acoustics guidance[1].<br>See equipment specifications and calibration records in Appendix D |
| Noise measurement data | A-weighted and C-weighted average and statistical sound pressure levels in 100 ms intervals.<br>One-third octave band frequency noise levels and two-minute audio samples every ten (10) minutes to aid the identification of extraneous noise influences. |
| Local wind speed and rainfall data | Weather stations were installed beside noise monitoring equipment at receivers 77 and 151 to concurrently record rainfall and wind speeds at microphone height.<br>This data was recorded to identify periods when local weather conditions may have resulted in excessive extraneous noise at the microphone (i.e. rainfall).<br>Local weather data was also taken from publicly available Australian Government Bureau of Meteorology (BOM) information for the corresponding survey period using data from weather stations located at Armidale Airport and Glen Innes Airport. |
| Site wind speed data | Hub height wind speeds for correlating background noise levels with site wind speeds sourced from two meteorological masts (the 'met mast').<br>Further details with respect to the met mast and wind data analysis are provided in Appendix E. |

[1] UK Institute of Acoustics *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise*, dated May 2013

## 2.3 Data analysis

The analysis of the survey data has been conducted in accordance with the NSW Noise Assessment Bulletin, and consequently the SA Guideline.

This broadly involves:

- Collating the measured noise levels, site wind speeds and local weather data into a single dataset;
- Filtering the data set to remove measurement results affected by extraneous or atypical noise;
- Filtering the data where necessary to account for site wind directions; and
- Plotting a chart of noise levels versus wind speeds and conducting a best fit regression analysis of the filtered data.

A summary of the key steps in the analysis of the data is presented in Table 3.

**Table 3: Background noise data analysis**

| Process | Description |
|---|---|
| Data collation | Time stamps for each source of measurement data are reviewed to clarify start or end times and measurement time zone.<br>Measured noise levels, site wind speeds and local weather conditions are then collated for each 10-minute measurement interval. |
| Local weather data filtering | 10-minute intervals are identified and filtered from the analysis if rainfall was identified for any 10-minute measurement interval. Data filtering is carried out where rainfall was detected at either weather local stations (located at receiver 77 and 151).<br>The BOM data is considered for the period between 1-17 June 2021 to supplement data collected at the weather station installed at receiver 151. |
| Extraneous noise filtering | The measured sound frequencies (one-third octave bands) in each 10-minute interval are used to identify periods that are significantly affected by bird or insect sounds.<br>10-minute intervals have been identified, and filtered from the analysis, when the following conditions[2] are satisfied:<br>• the highest A-weighted one-third octave band noise level is within 5 dB of the broadband A-weighted background noise level for that interval; and<br>• the identified one-third octave band A-weighted noise level is greater than a level of 20 dB $L_{A90}$.<br>At locations where insect noise was found to be prevalent, an additional method was applied, comprising the objective method detailed in Annex K of ISO 1996-2:2017[3]. Specifically, if this method identified the presence of a tone, the corresponding 10-minute was considered to have been significantly affected by bird or insect sounds and filtered from the analysis. |
| Site wind speed data filtering | 10-minute intervals in which site wind speeds are below the operating range of the wind turbines (i.e. below cut-in wind speed of 3 m/s) are filtered from the analysis. |

[2] Griffin, D., Delaire, C., & Pischedda, P. (2013). Methods of identifying extraneous noise during unattended noise measurements. *20th International Congress of Sound & Vibration*.

[3] ISO 1996-2:2017 *Acoustics - Description, measurement and assessment of environmental noise -, Part 2: Determination of sound pressure levels*

| Process | Description |
|---|---|
| Regression analysis | Two datasets are plotted on a chart of noise levels versus wind speeds:<br>• All data points that have been removed from the analysis using the above processes<br>• The filtered dataset comprising all retained measurement data.<br>The chart of filtered noise levels versus wind speed is reviewed to determine if there are any distinctive trends or gaps in the data which could warrant separation of the measurement results into subgroups (e.g. subgroups for time of day or wind direction).<br>A line of best fit is determined for the filtered data and, where applicable, any subgroups of the filtered data. The line of best fit is determined using a regression analysis of the range of noise levels and wind speeds or, where necessary, analysis of noise levels at individual wind speeds. |
| Noise limits | Noise limits are defined at each wind speed in accordance with the NSW Noise Assessment Bulletin by a value of 35 dB or the background plus 5 dB, whichever is higher. The value of the background noise level at each integer wind speed is defined by the line of best fit to the measurement results. |

## 3.0 SURVEY & ANALYSIS RESULTS

This section presents a summary of the background noise measurement results, analysed in accordance with the method described in Section 2.3.

The analysis results include the noise limits determined in accordance with the NSW Noise Assessment Bulletin.

### 3.1 Background noise levels

The tabulated data presented in Table 4 summarises the derived background noise levels for the surveyed wind speeds.

A summary of the background noise level regression coefficients is provided in Appendix F.

The results are illustrated in the graphical data provided for each receiver location in Appendix G to Appendix S. The background noise levels exhibit variations which are consistent with rural areas and are characterised by lower background noise levels during the night period (particularly during periods of increased wind shear which result in lower wind speeds near ground level, and consequently lower background noise levels from wind disturbance of vegetation). Consistent with the procedures detailed in the NSW Noise Assessment Bulletin, the derived background noise levels are based on analysis of the aggregated data for the day and night periods.

The background noise levels measured at Receiver 256 (associated receiver) indicate that the noise floor of the monitoring equipment at this location was higher than other similar units deployed in the vicinity of the Project. Audio recordings from this location were therefore reviewed and verified the presence of an instrument fault which caused audible electrical noise during periods of low background noise. The instrumentation checks carried out at the start and end of the survey confirmed correct calibration, and the measurement data is generally considered representative for the location. However, as a result of the elevated noise floor, the measured levels for this location are provided for reference purposes only. Accordingly, the results for Receiver 256 were not used to derive noise limits.

### 3.2 Noise limits

Noise limits derived considering the background noise levels detailed in Section 3.1 are provided in Table 5 for the key wind speeds relevant to the assessment of wind farm noise for non-associated receivers.

As discussed in Section 3.1, background noise levels measured at Receiver 256 (associated receiver) were not used to derive noise limits.

The derived noise limits for all surveyed wind speeds are illustrated in the graphical data provided for each non-associated receiver in Appendix G to Appendix N and Appendix P to Appendix S.

**Table 4: Background noise levels, dB $L_{A90}$**

| Receiver | Hub height wind speed, m/s | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** |
| 5 [1] | 22.6 | 22.8 | 23.4 | 24.2 | 25.3 | 26.5 | 28.0 | 29.6 | 31.3 | 33.1 | 34.9 | 36.8 | 38.6 | 40.5 | 42.2 | 43.8 | 45.3 | 46.6 |
| 25 [2] | - | 28.6 | 28.6 | 28.6 | 28.8 | 29.0 | 29.4 | 29.9 | 30.4 | 31.1 | 31.9 | 32.9 | 33.9 | 35.1 | 36.4 | 37.9 | 39.5 | 41.2 |
| 77 [2] | 22.1 | 22.4 | 22.8 | 23.3 | 23.8 | 24.3 | 24.9 | 25.5 | 26.1 | 26.8 | 27.5 | 28.1 | 28.8 | 29.5 | 30.3 | 31.0 | 31.7 | 32.4 |
| 87 [2] | - | - | - | 30.4 | 30.4 | 30.5 | 30.9 | 31.4 | 32.2 | 33.1 | 34.3 | 35.6 | 37.1 | 38.8 | 40.7 | 42.8 | 45.1 | 47.5 |
| 151 [1] | 24.8 | 25.8 | 26.7 | 27.5 | 28.3 | 29.2 | 30.0 | 30.9 | 31.9 | 33.1 | 34.4 | 35.9 | 37.6 | 39.6 | 41.8 | 44.4 | 47.3 | 50.6 |
| 187 [1] | - | 24.0 | 24.0 | 24.1 | 24.5 | 25.2 | 26.0 | 27.0 | 28.2 | 29.6 | 31.1 | 32.8 | 34.6 | 36.6 | 38.6 | 40.7 | 42.9 | 45.2 |
| 189 [1] | - | 22.8 | 22.9 | 23.2 | 23.6 | 24.2 | 25.1 | 26.1 | 27.2 | 28.6 | 30.1 | 31.9 | 33.8 | 35.9 | 38.1 | 40.6 | 43.3 | 46.1 |
| 240 [2] | 24.4 | 24.6 | 25.0 | 25.6 | 26.4 | 27.3 | 28.4 | 29.7 | 31.1 | 32.5 | 34.0 | 35.6 | 37.2 | 38.8 | 40.4 | 41.9 | 43.4 | 44.8 |
| 256* [1] | - | *27.1* | *27.2* | *27.6* | *28.3* | *29.1* | *30.2* | *31.5* | *32.9* | *34.6* | *36.3* | *38.2* | *40.3* | *42.4* | *44.6* | *46.9* | *49.3* | *51.7* |
| 278 [1] | - | 21.5 | 21.5 | 22.1 | 23 | 24.3 | 25.8 | 27.6 | 29.5 | 31.5 | 33.6 | 35.6 | 37.6 | 39.4 | 41.0 | 42.3 | 43.3 | 43.9 |
| 282 [2] | - | - | - | 27.7 | 27.7 | 28.2 | 29.1 | 30.4 | 31.9 | 33.7 | 35.7 | 37.9 | 40.1 | 42.4 | 44.7 | 47.0 | 49.1 | 51.1 |
| 314 [2] | - | 23.6 | 23.6 | 23.9 | 24.5 | 25.4 | 26.5 | 27.9 | 29.5 | 31.3 | 33.1 | 35.2 | 37.2 | 39.4 | 41.5 | 43.7 | 45.8 | 47.8 |
| 497 [1] | - | 23.1 | 23.4 | 24.2 | 25.4 | 27.0 | 28.9 | 31.0 | 33.3 | 35.7 | 38.1 | 40.5 | 42.8 | 45.0 | 46.9 | 48.5 | 49.7 | 50.5 |

Notes: 1 GR_M1 met mast at 757,267 E / 6,460,616 N (GDA 2020 Zone 55)
2 MH_M1 met mast at 751,564 E / 6,470,185 N (GDA 2020 Zone 55)
* Background noise levels measured at this associated receiver at provided for information only

**Table 5: Operational wind farm noise limits, dB $L_{A90}$**

| Receiver | Hub height wind speed, m/s | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 5 [1] | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 36.3 | 38.1 | 39.9 | 41.8 | 43.6 | 45.5 | 47.2 | 48.8 | 50.3 | 51.6 |
| 25 [2] | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.4 | 36.1 | 36.9 | 37.9 | 38.9 | 40.1 | 41.4 | 42.9 | 44.5 | 46.2 |
| 77 [2] | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.3 | 36.0 | 36.7 | 37.4 |
| 87 [2] | 35.4 | 35.4 | 35.4 | 35.4 | 35.4 | 35.5 | 35.9 | 36.4 | 37.2 | 38.1 | 39.3 | 40.6 | 42.1 | 43.8 | 45.7 | 47.8 | 50.1 | 52.5 |
| 151 [1] | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.9 | 36.9 | 38.1 | 39.4 | 40.9 | 42.6 | 44.6 | 46.8 | 49.4 | 52.3 | 55.6 |
| 187 [1] | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 36.1 | 37.8 | 39.6 | 41.6 | 43.6 | 45.7 | 47.9 | 50.2 |
| 189 [1] | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.1 | 36.9 | 38.8 | 40.9 | 43.1 | 45.6 | 48.3 | 51.1 |
| 240 [2] | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 36.1 | 37.5 | 39.0 | 40.6 | 42.2 | 43.8 | 45.4 | 46.9 | 48.4 | 49.8 |
| 278 [1] | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 36.5 | 38.6 | 40.6 | 42.6 | 44.4 | 46.0 | 47.3 | 48.3 | 48.9 |
| 282 [2] | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.4 | 36.9 | 38.7 | 40.7 | 42.9 | 45.1 | 47.4 | 49.7 | 52.0 | 54.1 | 56.1 |
| 314 [2] | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 36.3 | 38.1 | 40.2 | 42.2 | 44.4 | 46.5 | 48.7 | 50.8 | 52.8 |
| 497 [1] | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 36.0 | 38.3 | 40.7 | 43.1 | 45.5 | 47.8 | 50.0 | 51.9 | 53.5 | 54.7 | 55.5 |

Notes: 1 GR_M1 met mast at 757,267 E / 6,460,616 N (GDA 2020 Zone 55)
2 MH_M1 met mast at 751,564 E / 6,470,185 N (GDA 2020 Zone 55)

### 3.3 C-Weighted background noise levels

The NSW Noise Assessment Bulletin does not provide a specific direction to measure C-weighted background noise levels as part of pre-construction noise monitoring, noting:

> *Analysis of wind turbine spectra shows that low frequency noise is typically not a significant feature of modern wind turbine noise when it complies with the A-weighted criteria applied by this Bulletin.*

Notwithstanding the above, the NSW Noise Assessment Bulletin does however indicate that C weighted low frequency noise should be evaluated for compliance purposes.

In order to provide clarity to the proponent and any stakeholders, with respect to any future post-construction compliance assessment, C-weighted background noise levels have been recorded during the monitoring period for comparison to future operational C-weighted noise levels (if required). The C-weighted background noise levels are not presented in this report but are available upon request.

## 4.0 SUMMARY

Background noise monitoring has been conducted at thirteen (13) receivers across the proposed Valley of the Winds Wind Farm.

The survey and analysis have been carried out on the basis of the NSW Noise Assessment Bulletin, which in turn references the SA Guideline.

The results have been analysed to derive noise limits for surrounding receivers at integer hub height wind speeds as the greater of a 35 dB $L_{A90}$ base level and the background level ($L_{A90}$) plus 5 dB.

The background noise levels and derived noise limits have been documented for the purposes of the environmental noise assessment accompanying the development application for the project.

## APPENDIX A GLOSSARY

The basic quantities used within this document to describe noise adopt the conventions outlined in ISO 1996-1:2016 *Acoustics - Description measurement and assessment of environmental noise – Basic quantities and assessment procedures*. Accordingly, all frequency weighted sound pressure levels are expressed as decibels (dB) in this report.

For example, sound pressure levels measured using an "A" frequency weighting are expressed as dB $L_A$.

Alternative ways of expressing A-weighted decibels such as dBA or dB(A) are therefore not used within this report.

| Term | Definition | Abbreviation |
|---|---|---|
| A-weighting | A method of adjusting sound levels to reflect the human ear's varied sensitivity to different frequencies of sound. | -- |
| A-weighted 90$^{th}$ centile | The A-weighted pressure level that is exceeded for 90 % of a defined measurement period. It is used to describe the underlying background sound level in the absence of a source of sound that is being investigated, as well as the sound level of steady, or semi steady, sound sources. | $L_{A90}$ |
| C-weighting | The C-weighted pressure level that is exceeded for 90 % of a defined measurement period. It is used to describe the underlying background sound level in the absence of a source of sound that is being investigated, as well as the sound level of steady, or semi steady, sound sources. | $L_{C90}$ |
| Decibel | The unit of sound level. | dB |
| Hertz | The unit for describing the frequency of a sound in terms of the number of cycles per second. | Hz |
| Octave Band | A range of frequencies. Octave bands are referred to by their logarithmic centre frequencies, these being 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, and 16 kHz for the audible range of sound. | - |
| Sound pressure level | A measure of the level of sound expressed in decibels. | $L_p$ |

## APPENDIX B TURBINE COORDINATES

Table 6 sets out the coordinates of the proposed turbine layout.

(Layout dated 5 November 2021 as supplied by the proponent).

**Table 6: Proposed wind turbine coordinates – GDA 2020 Zone 55**

| Turbine | Easting, m | Northing, m | Terrain elevation, m |
|---|---|---|---|
| GR2 | 759,945 | 6,458,232 | 719 |
| GR3 | 760,267 | 6,458,557 | 729 |
| GR4 | 760,587 | 6,458,894 | 729 |
| GR5 | 760,345 | 6,459,441 | 718 |
| GR6 | 760,398 | 6,460,059 | 729 |
| GR7 | 760,674 | 6,460,478 | 739 |
| GR8 | 760,633 | 6,461,526 | 729 |
| GR9 | 760,499 | 6,462,088 | 737 |
| GR10 | 760,559 | 6,462,572 | 740 |
| GR11 | 760,663 | 6,463,035 | 749 |
| GR12 | 760,733 | 6,463,509 | 749 |
| GR13 | 758,438 | 6,459,581 | 739 |
| GR14 | 758,775 | 6,460,045 | 739 |
| GR15 | 758,711 | 6,460,550 | 749 |
| GR16 | 758,513 | 6,461,087 | 744 |
| GR17 | 758,101 | 6,461,652 | 779 |
| GR18 | 758,392 | 6,462,051 | 799 |
| GR19 | 758,581 | 6,462,466 | 809 |
| GR20 | 758,622 | 6,462,951 | 814 |
| GR21 | 759,036 | 6,463,236 | 790 |
| GR22 | 758,870 | 6,463,773 | 763 |
| GR23 | 757,524 | 6,459,697 | 750 |
| GR24 | 757,475 | 6,460,158 | 759 |
| GR25 | 757,356 | 6,460,645 | 785 |
| GR26 | 757,170 | 6,461,574 | 799 |
| GR27 | 757,371 | 6,461,984 | 791 |
| GR28 | 756,639 | 6,458,842 | 735 |
| GR29 | 756,257 | 6,459,395 | 748 |
| GR30 | 756,756 | 6,459,623 | 764 |

| Turbine | Easting, m | Northing, m | Terrain elevation, m |
|---|---|---|---|
| GR31 | 756,561 | 6,460,198 | 759 |
| GR32 | 756,394 | 6,461,194 | 749 |
| GR33 | 756,157 | 6,462,109 | 729 |
| GR34 | 756,642 | 6,462,426 | 739 |
| GR35 | 755,094 | 6,459,083 | 729 |
| GR36 | 755,296 | 6,459,452 | 738 |
| GR37 | 755,282 | 6,460,073 | 759 |
| GR38 | 755,578 | 6,460,433 | 759 |
| GR40 | 753,535 | 6,457,743 | 741 |
| GR41 | 753,568 | 6,458,121 | 739 |
| GR42 | 753,648 | 6,458,775 | 739 |
| GR43 | 754,027 | 6,459,161 | 739 |
| GR44 | 754,338 | 6,459,538 | 739 |
| GR45 | 754,591 | 6,459,956 | 754 |
| GR46 | 754,528 | 6,460,559 | 729 |
| GR47 | 754,418 | 6,461,745 | 719 |
| GR48 | 754,829 | 6,462,101 | 719 |
| GR49 | 755,071 | 6,462,557 | 729 |
| GR50 | 755,294 | 6,462,994 | 719 |
| GR51 | 756,547 | 6,462,873 | 712 |
| GR52 | 756,616 | 6,463,255 | 709 |
| GR53 | 760,537 | 6,461,040 | 719 |
| LV3 | 750,413 | 6,451,624 | 699 |
| LV4 | 749,149 | 6,450,441 | 679 |
| LV5 | 748,725 | 6,450,997 | 689 |
| LV6 | 749,248 | 6,451,227 | 709 |
| LV7 | 749,743 | 6,451,476 | 719 |
| LV8 | 749,804 | 6,452,596 | 717 |
| LV9 | 743,857 | 6,450,601 | 678 |
| LV10 | 744,180 | 6,451,055 | 707 |
| LV11 | 744,639 | 6,451,296 | 703 |
| LV12 | 745,108 | 6,451,518 | 718 |
| LV13 | 745,623 | 6,451,741 | 712 |

| Turbine | Easting, m | Northing, m | Terrain elevation, m |
|---|---|---|---|
| LV14 | 746,242 | 6,452,428 | 709 |
| LV15 | 746,104 | 6,453,165 | 725 |
| LV16 | 746,353 | 6,453,549 | 709 |
| LV17 | 746,047 | 6,454,131 | 687 |
| LV18 | 745,568 | 6,452,958 | 729 |
| LV19 | 745,296 | 6,453,566 | 729 |
| LV20 | 744,079 | 6,453,843 | 724 |
| LV21 | 744,651 | 6,454,155 | 739 |
| LV22 | 745,062 | 6,454,505 | 694 |
| LV23 | 746,111 | 6,451,980 | 696 |
| MH3 | 749,310 | 6,466,082 | 763 |
| MH4 | 750,188 | 6,467,172 | 811 |
| MH5 | 749,563 | 6,466,461 | 784 |
| MH6 | 749,886 | 6,466,815 | 799 |
| MH7 | 750,476 | 6,467,537 | 828 |
| MH8 | 750,973 | 6,467,766 | 809 |
| MH9 | 751,254 | 6,468,130 | 809 |
| MH10 | 751,504 | 6,468,529 | 835 |
| MH11 | 751,806 | 6,468,890 | 858 |
| MH12 | 752,151 | 6,469,642 | 857 |
| MH13 | 752,361 | 6,470,113 | 879 |
| MH14 | 747,817 | 6,466,698 | 776 |
| MH15 | 747,065 | 6,467,378 | 799 |
| MH16 | 747,931 | 6,467,309 | 802 |
| MH17 | 748,267 | 6,467,739 | 809 |
| MH18 | 748,696 | 6,468,097 | 789 |
| MH19 | 748,878 | 6,468,598 | 781 |
| MH20 | 749,287 | 6,468,979 | 772 |
| MH21 | 747,908 | 6,469,081 | 768 |
| MH22 | 749,924 | 6,469,164 | 799 |
| MH23 | 750,527 | 6,469,695 | 834 |
| MH24 | 751,233 | 6,469,728 | 872 |
| MH25 | 751,472 | 6,470,237 | 889 |

| Turbine | Easting, m | Northing, m | Terrain elevation, m |
|---|---|---|---|
| MH26 | 750,576 | 6,470,263 | 849 |
| MH27 | 751,772 | 6,470,723 | 852 |
| MH28 | 751,977 | 6,471,225 | 828 |
| MH29 | 752,311 | 6,471,722 | 792 |
| MH30 | 751,131 | 6,472,105 | 838 |
| MH31 | 751,344 | 6,472,531 | 839 |
| MH32 | 751,417 | 6,472,993 | 849 |
| MH33 | 751,276 | 6,473,502 | 852 |
| MH34 | 751,106 | 6,474,247 | 860 |
| MH35 | 751,406 | 6,474,747 | 843 |
| MH36 | 751,671 | 6,475,203 | 871 |
| MH37 | 751,352 | 6,475,975 | 849 |
| MH38 | 750,845 | 6,475,562 | 839 |
| MH39 | 750,101 | 6,475,563 | 839 |
| MH41 | 749,651 | 6,471,622 | 769 |
| MH42 | 749,585 | 6,472,140 | 811 |
| MH43 | 749,773 | 6,472,587 | 839 |
| MH44 | 750,116 | 6,472,965 | 840 |
| MH45 | 750,306 | 6,473,747 | 858 |
| MH46 | 747,638 | 6,471,923 | 801 |
| MH47 | 747,721 | 6,472,511 | 829 |
| MH48 | 748,002 | 6,472,993 | 862 |
| MH49 | 748,343 | 6,473,899 | 826 |
| MH50 | 745,939 | 6,471,612 | 834 |
| MH51 | 746,166 | 6,472,195 | 839 |
| MH52 | 746,507 | 6,472,634 | 844 |
| MH53 | 747,056 | 6,473,147 | 833 |
| MH54 | 747,268 | 6,474,011 | 839 |
| MH55 | 744,419 | 6,471,709 | 817 |
| MH56 | 744,718 | 6,472,071 | 839 |
| MH57 | 744,783 | 6,472,678 | 849 |
| MH58 | 744,861 | 6,473,223 | 849 |
| MH59 | 745,929 | 6,473,660 | 839 |

| Turbine | Easting, m | Northing, m | Terrain elevation, m |
|---|---|---|---|
| MH60 | 745,097 | 6,473,851 | 842 |
| MH61 | 745,041 | 6,474,392 | 838 |
| MH62 | 745,051 | 6,475,077 | 817 |
| MH63 | 745,247 | 6,475,482 | 799 |
| MH64 | 742,133 | 6,469,995 | 849 |
| MH65 | 742,319 | 6,470,443 | 838 |
| MH66 | 742,474 | 6,470,870 | 782 |
| MH67 | 742,564 | 6,471,442 | 829 |
| MH68 | 742,903 | 6,471,899 | 839 |
| MH69 | 743,646 | 6,472,241 | 819 |
| MH70 | 743,673 | 6,473,041 | 842 |
| MH71 | 744,029 | 6,473,892 | 836 |
| MH72 | 744,138 | 6,474,344 | 834 |
| MH73 | 743,784 | 6,474,856 | 839 |
| MH74 | 742,160 | 6,472,561 | 795 |
| MH75 | 742,831 | 6,472,640 | 849 |
| MH76 | 741,505 | 6,473,174 | 811 |
| MH77 | 742,548 | 6,473,402 | 809 |
| MH78 | 743,053 | 6,474,077 | 826 |
| MH79 | 742,833 | 6,474,787 | 817 |

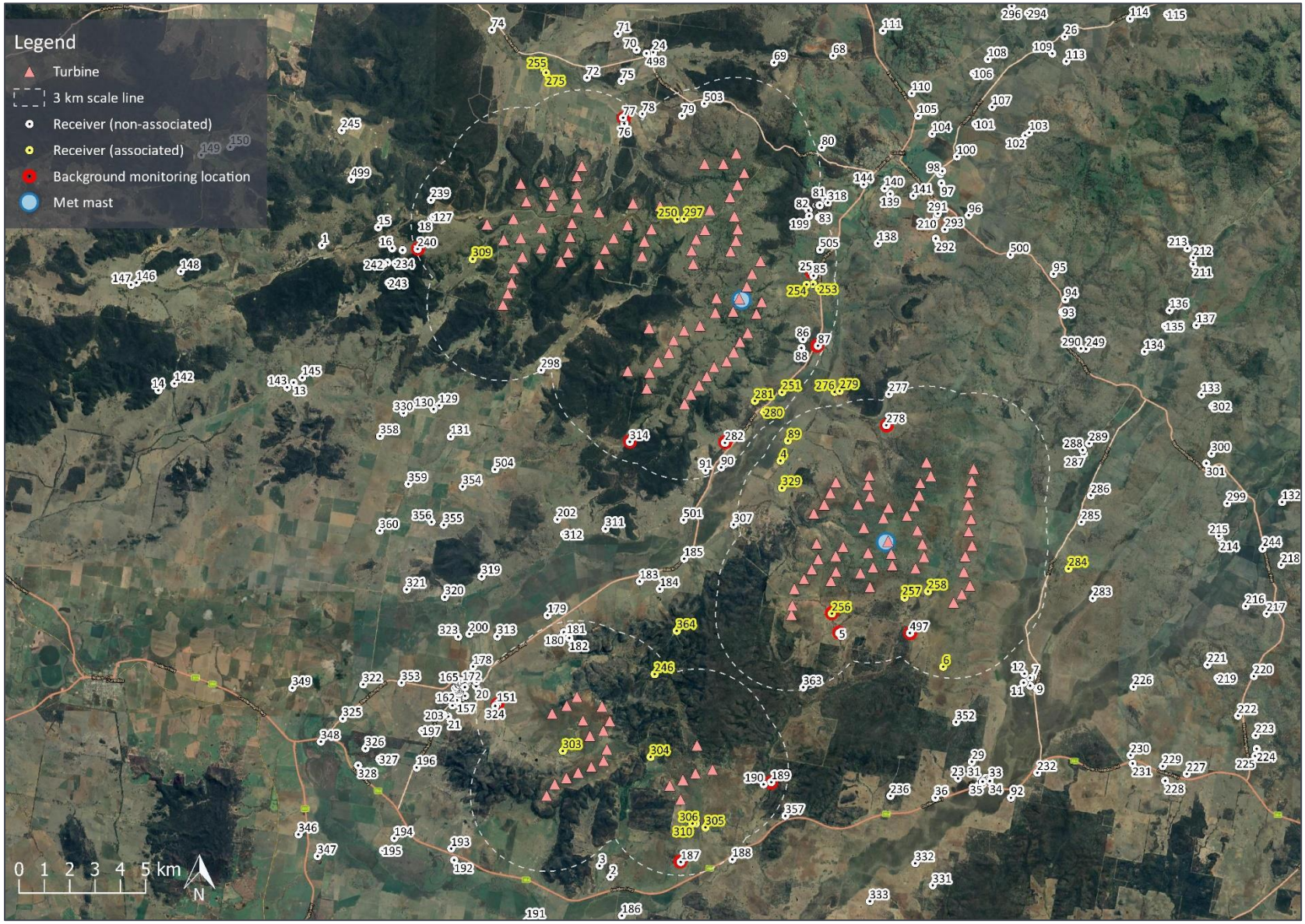
## APPENDIX C NOISE MONITORING LOCATIONS

The background noise monitoring locations were proposed based on proximity to turbines, the location of receivers and the predicted noise contours detailed in MDA report Rp 001 20191254 *Valley of the Winds - Preliminary noise assessment*, dated 7 April 2020.

The background noise monitoring locations in relation to the updated proposed turbine layout and associated predicted noise contours detailed in the MDA report Rp 003 20191254 *Valley of the Winds – EIS noise assessment*, dated 23 February 2022, is illustrated in Figure 1.

As noted in Section 2.1, consent to undertake background noise monitoring was not granted at all preferred receivers. Prior to construction of the wind farm, background noise monitoring may be undertaken at additional receivers, should consent be provided.

**Figure 1: Background noise monitoring locations relative to the proposed EIS layout**



## APPENDIX D SURVEY INSTRUMENTATION

**Table 7: Sound level measurement instrumentation summary**

| Item | Description |
|---|---|
| Equipment type | Automated/unattended integrating sound levels |
| Make & model | 01dB CUBE and 01dB DUO |
| Instrumentation class | Certified to Type 1 / Class 1 (precision grade) standards in accordance with AS/IEC 61672.1:2019[4] |
| Instrumentation noise floor | Less than 20 dB |
| Time synchronisation | Internal GPS clocks |
| Wind shielding | Enhanced wind shielding system based on the design recommendations detailed in the UK Institute of Acoustics guidance. The system comprises an inner solid primary wind shield and an outer secondary large diameter hollow wind shield |

**Table 8: Equipment details**

| Receiver | Make & model | Serial number | Microphone serial number | Independent calibration date [1] | Calibration drift [2,3] |
|---|---|---|---|---|---|
| *Noise monitoring equipment* | | | | | |
| 5 | 01dB DUO | 10497 | 144850 | 17/08/2020 | -0.04 |
| 25 | 01dB CUBE | 10520 | 224328 | 4/02/2021 | -0.14 |
| 77 | 01dB DUO | 10496 | 141230 | 31/07/2020 | -0.24 |
| 87 | 01dB DUO | 12633 | 331552 | 26/11/2020 | -0.18 |
| 151 | 01dB CUBE | 10512 | 255851 | 24/02/2021 | 0.03 |
| 187 | 01dB DUO | 10498 | 207226 | 17/08/2020 | 0.00 |
| 189 | 01dB DUO | 10344 | 144885 | 13/07/2020 | -0.33 |
| 240 | 01dB DUO | 10770 | 162058 | 17/09/2019 | -0.23 |
| 256 | 01dB CUBE | 10521 | 207208 | 29/05/2021 | -0.10 |
| 278 | 01dB DUO | 10193 | 288097 | 29/05/2021 | -0.06 |
| 282 | 01dB DUO | 12691 | 331937 | 5/09/2019 | -0.19 |
| 314 | 01dB DUO | 10339 | 144938 | 13/07/2020 | -0.08 |
| 497 | 01dB CUBE | 10518 | 207205 | 24/05/2021 | -0.34 |

Notes: [1] Independent (laboratory) calibration date to be within 2 years of measurement period as per AS 1055:2018[5]
[2] Difference between reference level checks during deployment and collection of instruments
[3] Calibration drift should not be greater than 1 dB as specified in AS 1055:2018

[4] AS/IEC 61672.1-2019 *Electroacoustics - Sound level meters – Specifications* which is identical to IEC 61672.1:2.0 *Electroacoustics - Sound Level Meters - Part 1: Specifications* published in 2013

[5] AS 1055:2018 *Acoustics – Description and measurement of environmental noise*

**Table 9: Calibrator details**

| | Make & model | Serial number | Independent calibration date [1] |
|---|---|---|---|
| During installation | Brüel & Kjær 4230 | 752491 | 30/07/2019 |
| During collection | Brüel & Kjær 4231 | 3027268 | 28/07/2021 |

Note: [1] Independent (laboratory) calibration date to be within 2 years of measurement period as per AS 1055:2018[6]

**Table 10: Local weather data measurement instrumentation**

| Receiver | Make & model | Serial number |
|---|---|---|
| 77[2] | Vaisala WXT520 | K3630005 |
| 151[1] | Vaisala WXT520 | H5020012 |

Note: [1] Between 1 June and 2 September 2021
[2] Between 17 June and 2 September 2021

[6] AS 1055:2018 *Acoustics – Description and measurement of environmental noise*

# APPENDIX E SITE WIND SPEED DATA

## E1 Wind monitoring location

Wind monitoring was carried out by the proponent at two (2) met masts during the noise monitoring survey. The wind monitoring locations are detailed in Table 11 and Appendix C.

**Table 11: Wind monitoring locations**

| Receiver | Wind monitoring reference | Location within the wind farm | Distance to monitoring location, m |
|---|---|---|---|
| 5 | GR_M1 | Girragulang Rd cluster | 4,029 |
| 25 | MH_M1 | Mount Hope cluster | 2,990 |
| 77 | MH_M1 | Mount Hope cluster | 8,555 |
| 87 | MH_M1 | Mount Hope cluster | 3,503 |
| 151 | GR_M1 | Girragulang Rd cluster | 16,640 |
| 187 | GR_M1 | Girragulang Rd cluster | 15,012 |
| 189 | GR_M1 | Girragulang Rd cluster | 10,534 |
| 240 | MH_M1 | Mount Hope cluster | 12,941 |
| 256 | GR_M1 | Girragulang Rd cluster | 3,529 |
| 278 | GR_M1 | Girragulang Rd cluster | 4,604 |
| 282 | MH_M1 | Mount Hope cluster | 5,662 |
| 314 | MH_M1 | Mount Hope cluster | 7,125 |
| 497 | GR_M1 | Girragulang Rd cluster | 3,728 |

Coordinates for the wind monitoring locations are detailed in Table 12.

**Table 12: Wind monitoring location coordinates – GDA 2020 Zone 55**

| Reference | Easting, m | Northing, m |
|---|---|---|
| GR_M1 | 757,267 | 6,460,616 |
| MH_M1 | 751,564 | 6,470,185 |

## E2 Wind speed data derivation

Hub height wind speed and direction data (119 m above ground level) for the duration of the background noise monitoring periods has been provided by the proponent.

The process for generating the wind data set for this project was provided to MDA by the proponent in an email dated 13 December 2021. The relevant extract is reproduced below.

> *The wind data set provided by UPC/AC was created from the raw data files from the meteorological masts at Girragulang Road and Mt Hope for the required period. These files were then processed using the program Windographer and data affected by tower shading was removed. The data was checked, including for consistency between all anemometers and wind vanes. The wind speed data for each measurement height was combined through averaging using the two anemometers at each measurement height. This data was then vertically extrapolated to the considered 119m hub height using the power law for wind shear in each 10 minute period.*

## APPENDIX F SUMMARY OF BACKGROUND NOISE LEVEL REGRESSION COEFFICIENTS

**Table 13: Regression equation coefficients**

| Location | Regression equation coefficients for background noise equation of best fit $L_{A90} = ax^3+bx^2+cx+d$, where x = windspeed in m/s | | | | | |
|---|---|---|---|---|---|---|
| | a | b | c | d | $R^2$ | Valid wind speed range |
| 5 | -0.005240 | 0.2143 | -1.057 | 23.97 | 0.5271 | 3 to 20 m/s |
| 25 | 0.0006500 | 0.03565 | -0.3885 | 29.54 | 0.1502 | 4 to 20 m/s |
| 77 | -0.0006700 | 0.03380 | 0.1426 | 21.36 | 0.0701 | 3 to 20 m/s |
| 87 | -0.0001200 | 0.1011 | -1.341 | 34.87 | 0.1731 | 6 to 20 m/s |
| 151 | - | 0.05082 | 0.1095 | 24.81 | 0.2656 | 3 to 20 m/s |
| 187 | -0.002160 | 0.1563 | -1.355 | 27.10 | 0.1938 | 4 to 20 m/s |
| 189 | 0.0001500 | 0.08631 | -0.6866 | 24.14 | 0.2515 | 4 to 20 m/s |
| 240 | -0.003410 | 0.1569 | -0.8083 | 25.50 | 0.3521 | 3 to 20 m/s |
| 256 | -0.002410 | 0.1623 | -1.159 | 29.26 | 0.4399 | 4 to 20 m/s |
| 278 | -0.01003 | 0.3788 | -2.713 | 26.90 | 0.3386 | 4 to 20 m/s |
| 282 | -0.008520 | 0.4066 | -4.161 | 39.83 | 0.1966 | 6 to 20 m/s |
| 314 | -0.004950 | 0.2482 | -1.989 | 27.93 | 0.3924 | 4 to 20 m/s |
| 497 | -0.01114 | 0.4186 | -2.810 | 28.40 | 0.4735 | 4 to 20 m/s |

# APPENDIX G RECEIVER 5 DATA

## G1 Receiver 5 location data

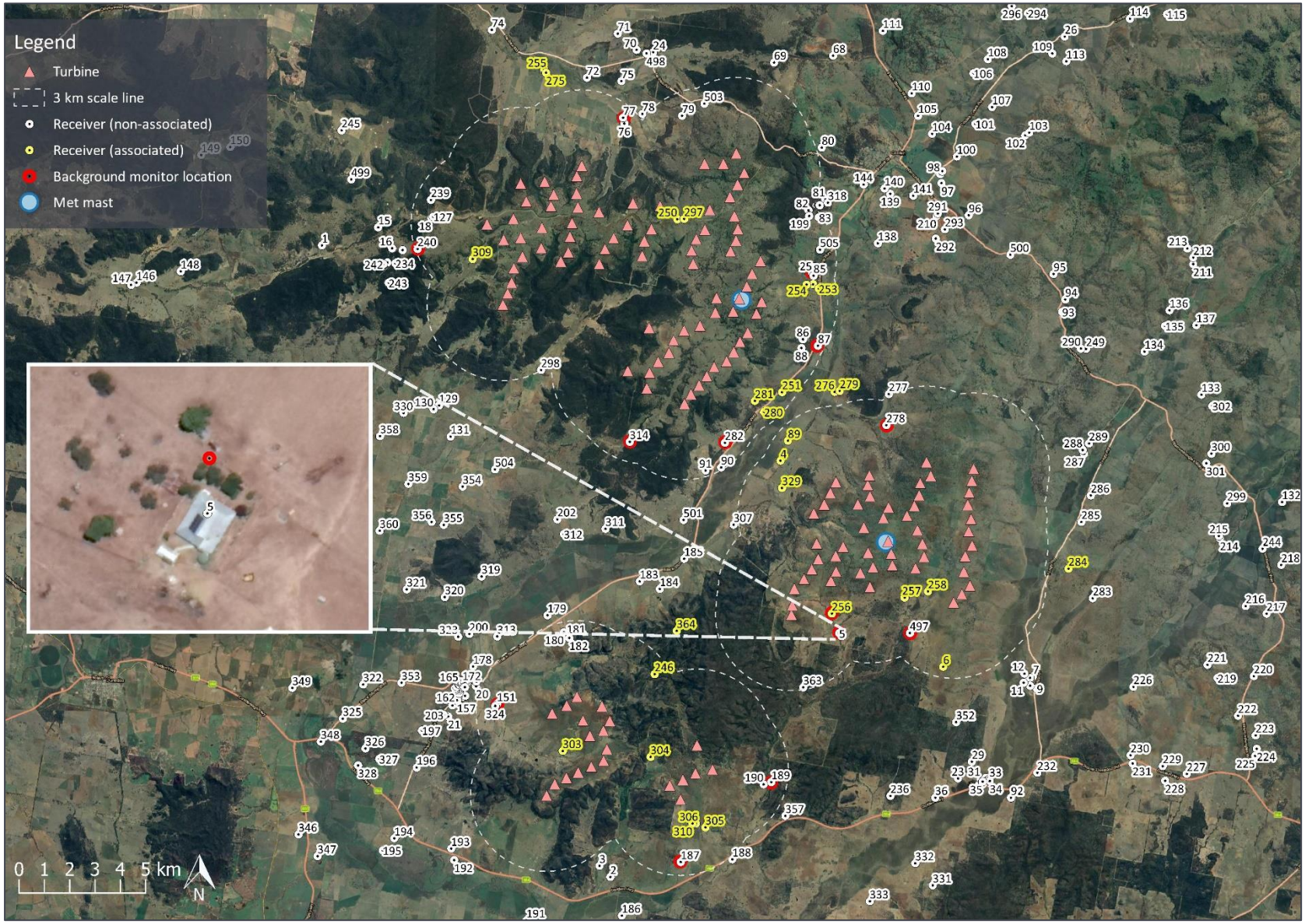
**Table 14: Receiver 5 dwelling and noise monitor coordinates – GDA 2020 Zone 55**

| Location | Easting, m | Northing, m |
|---|---|---|
| Dwelling location | 755,422 | 6,457,014 |
| Background noise monitoring location | 755,418 | 6,457,032 |

**Table 15: Receiver 5 monitor installation photos**

| Looking North | Looking East |
|---|---|
|  |  |
| Looking South | Looking West |
|  |  |

**Table 16: Receiver 5 aerial view - dwelling and noise monitor location**



## G2 Receiver 5 measurement data summary

**Table 17: Receiver 5 background noise level analysis summary**

| Item | Data point count |
|---|---|
| Number of data points collected | 12,937 |
| Number of data points removed | 4,966 |
| Number of data points for analysis (worst case wind direction) | 7,971 (3,411) |

**Figure 2: Receiver 5 background noise level and wind speed time history**

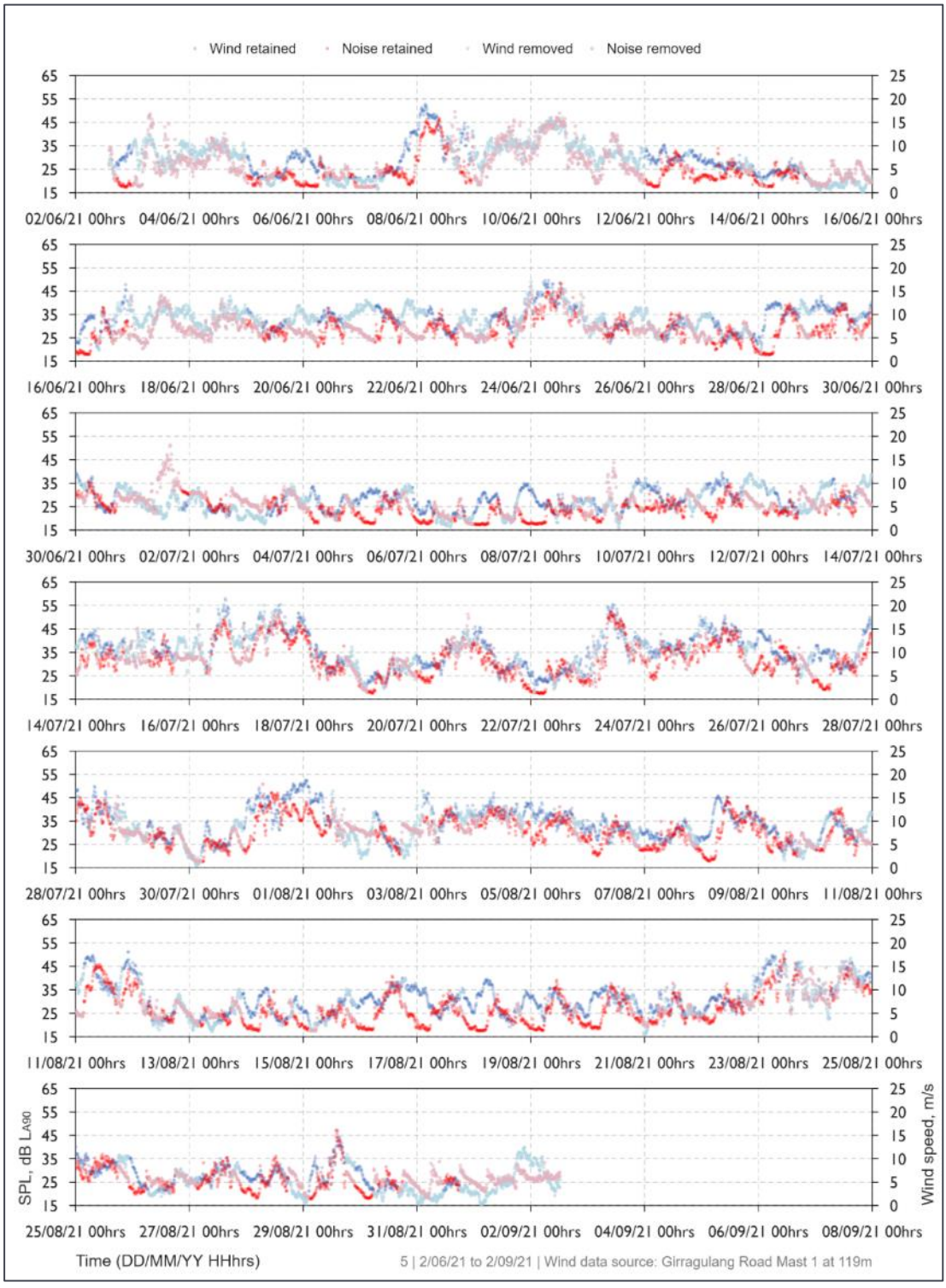
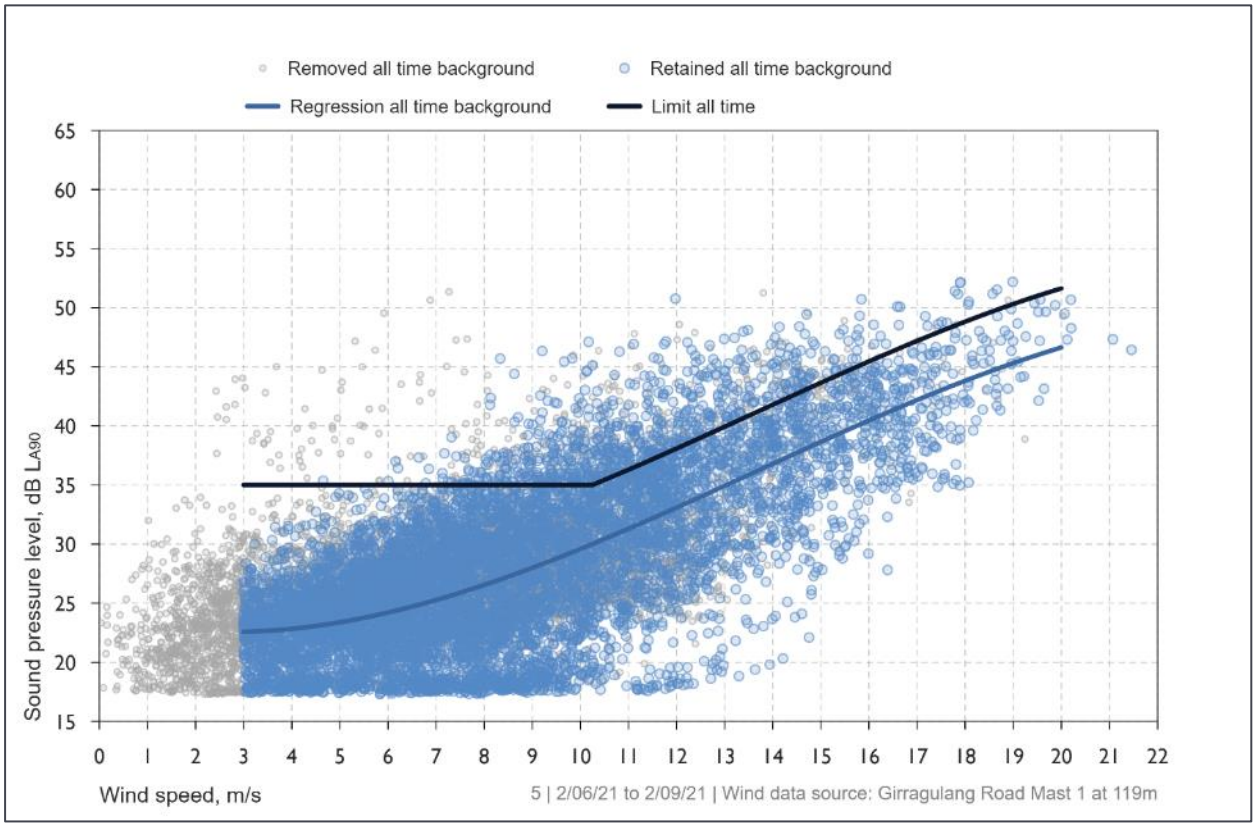


**Figure 3: Receiver 5 – derived background noise levels and noise limits**



# APPENDIX H RECEIVER 25 DATA

## H1 Receiver 25 location data

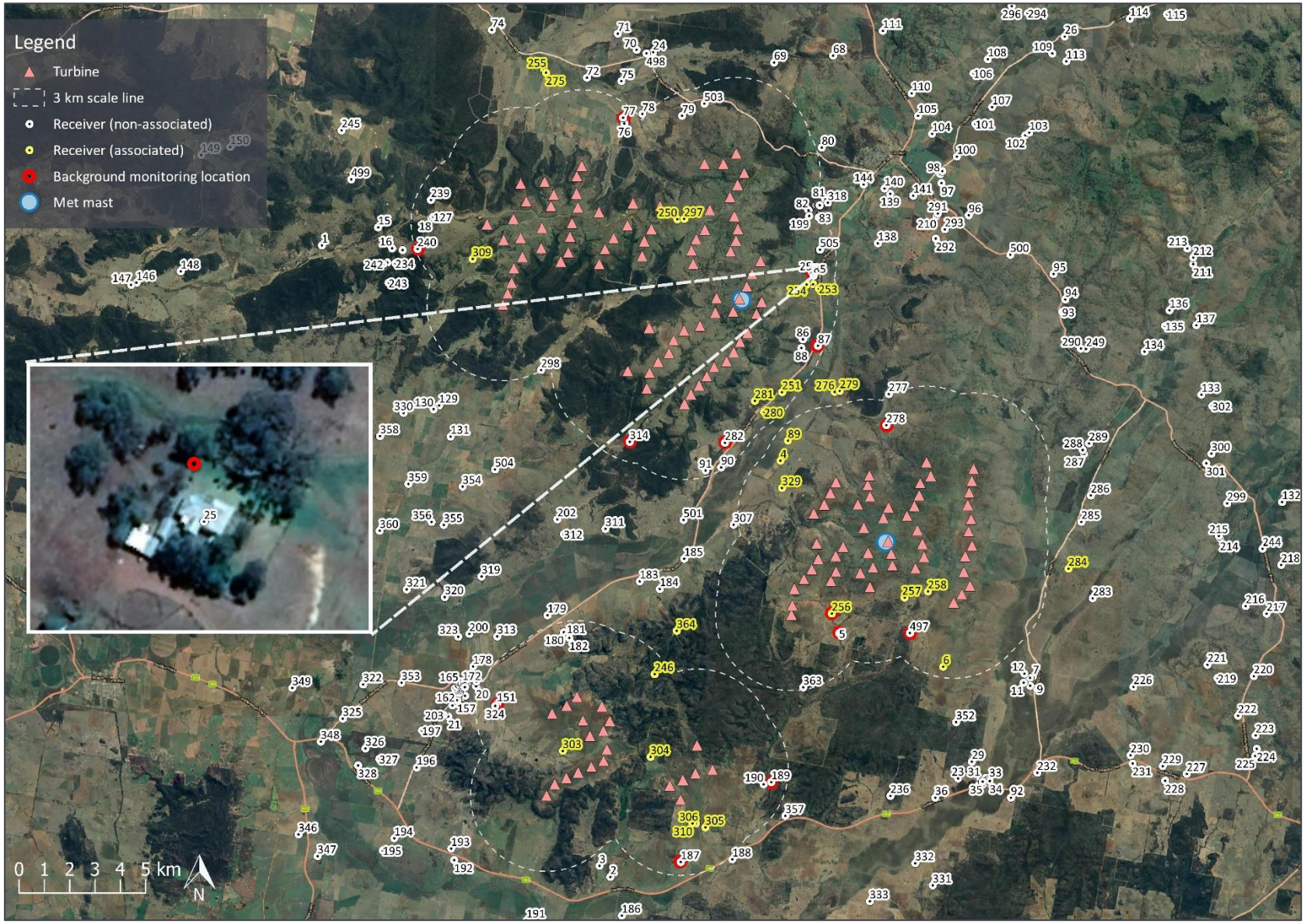
**Table 18: Receiver 25 dwelling and noise monitor coordinates – GDA 2020 Zone 55**

| Location | Easting, m | Northing, m |
|---|---|---|
| Dwelling location | 7,543,56 | 6,471,246 |
| Background noise monitoring location | 7,54,352 | 6,471,266 |

**Table 19: Receiver 25 monitor installation photos**

| Looking North | Looking East |
|---|---|
|  |  |
| Looking South | Looking West |
|  |  |

**Table 20: Receiver 25 aerial view - dwelling and noise monitor location**



## H2 Receiver 25 measurement data summary

**Table 21: Receiver 25 background noise level analysis summary**

| Item | Data point count |
|---|---|
| Number of data points collected | 12,876 |
| Number of data points removed | 2,798 |
| Number of data points for analysis (worst case wind direction) | 10,078 (3,969) |

**Figure 4: Receiver 25 background noise level and wind speed time history**

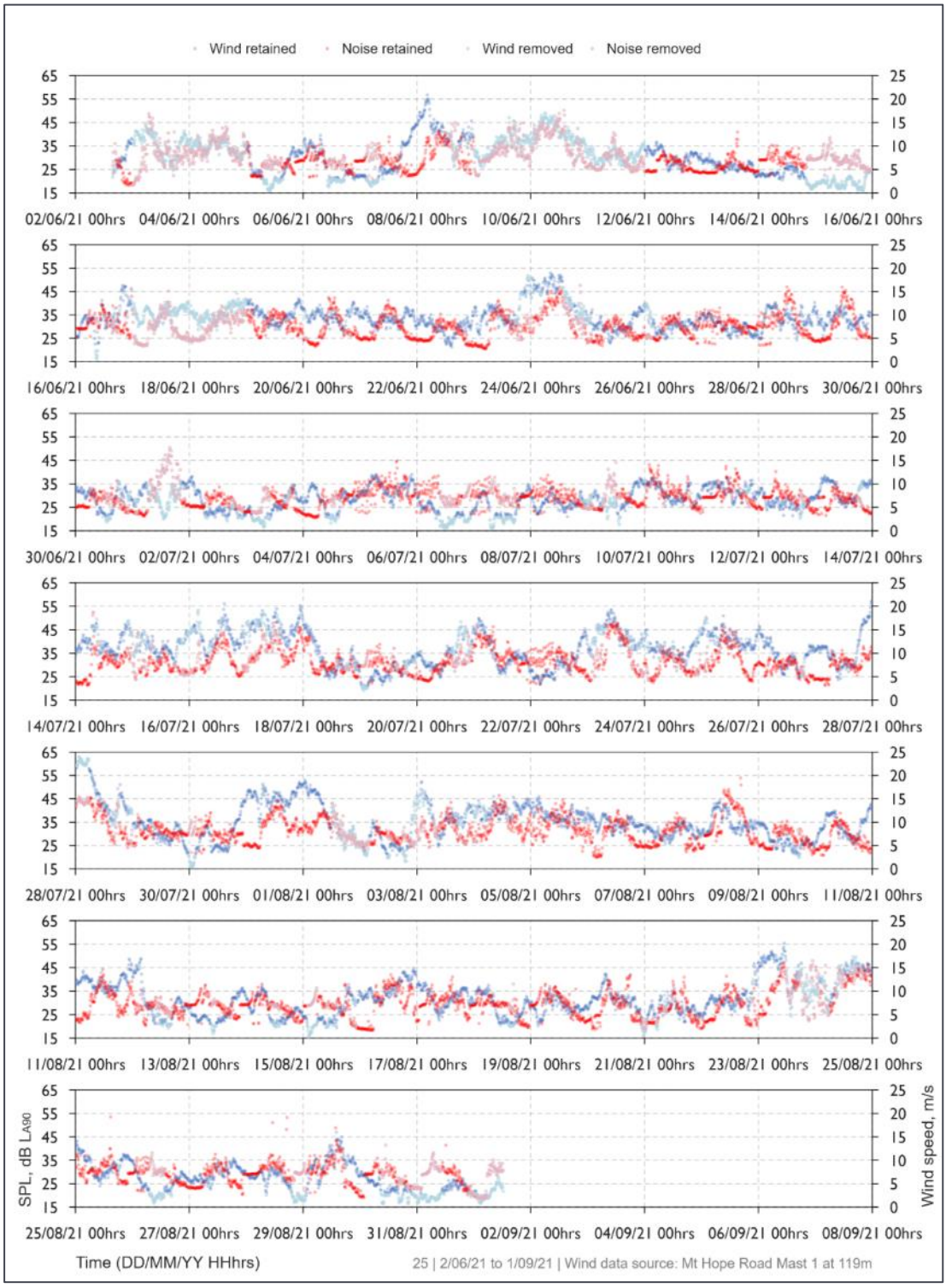
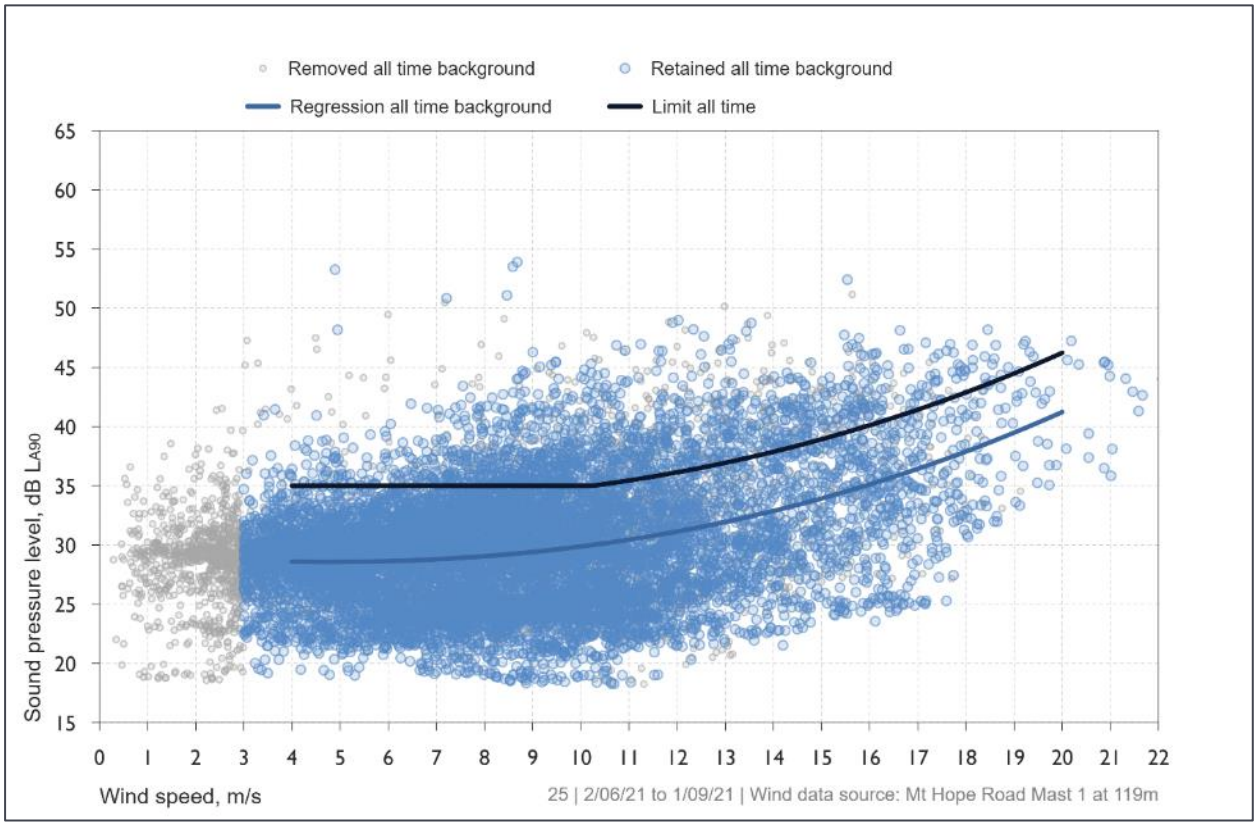


**Figure 5: Receiver 25 – derived background noise levels and noise limits**



# APPENDIX I RECEIVER 77 DATA

## I1 Receiver 77 location data

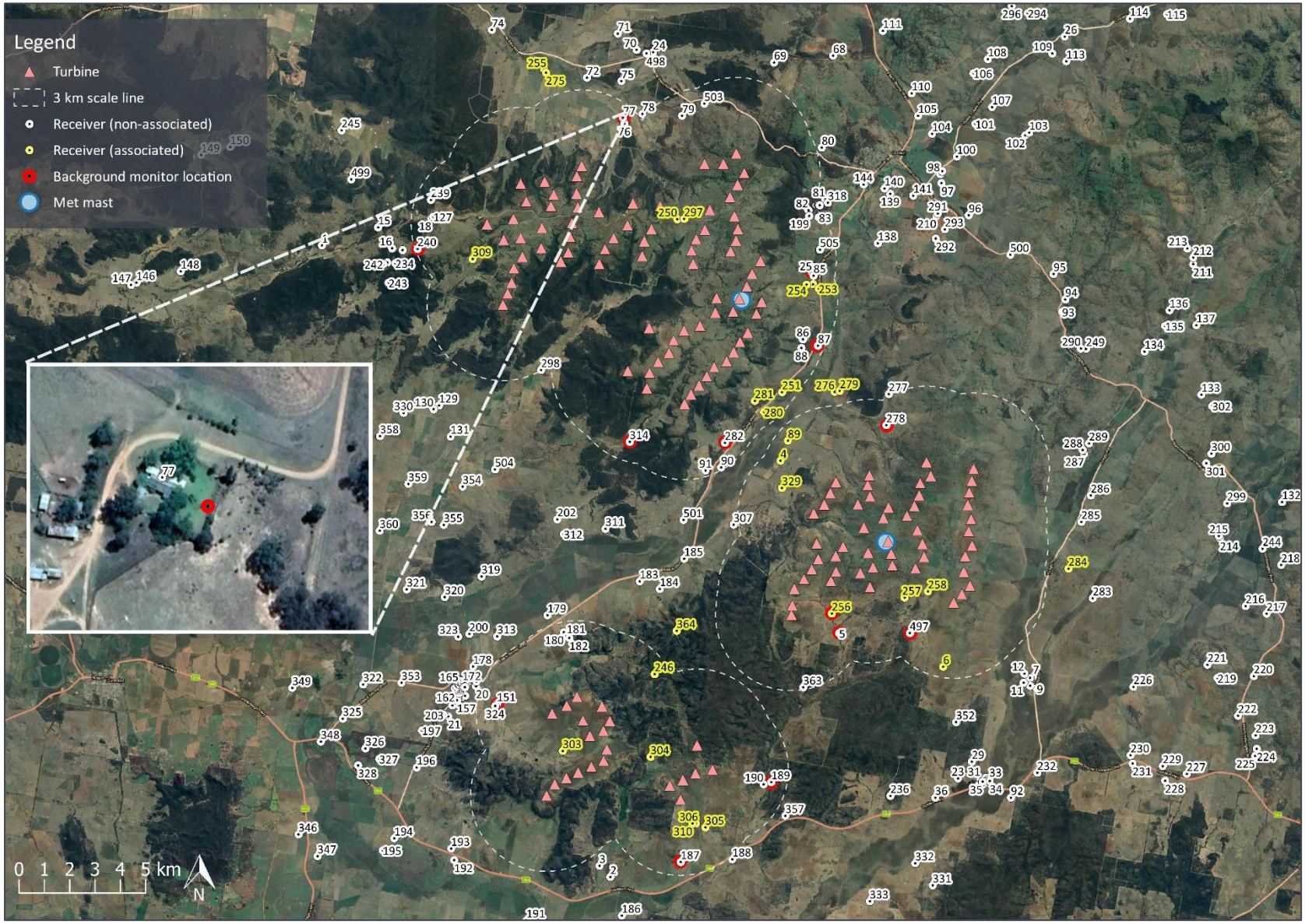
**Table 22: Receiver 77 dwelling and noise monitor coordinates – GDA 2020 Zone 55**

| Location | Easting, m | Northing, m |
|---|---|---|
| Dwelling location | 746,882 | 6,477,385 |
| Background noise monitoring location | 746,913 | 6,477,365 |

**Table 23: Receiver 77 monitor installation photos**

| | |
|---|---|
| Looking North | Looking East |
|  |  |
| Looking South | Looking West |
|  |  |

**Table 24: Receiver 77 aerial view - dwelling and noise monitor location**



## I2 Receiver 77 measurement data summary

**Table 25: Receiver 77 background noise level analysis summary**

| Item | Data point count |
|---|---|
| Number of data points collected | 10,668 |
| Number of data points removed | 1,417 |
| Number of data points for analysis (worst case wind direction) | 9,251 (2,453) |

**Figure 6: Receiver 77 background noise level and wind speed time history**

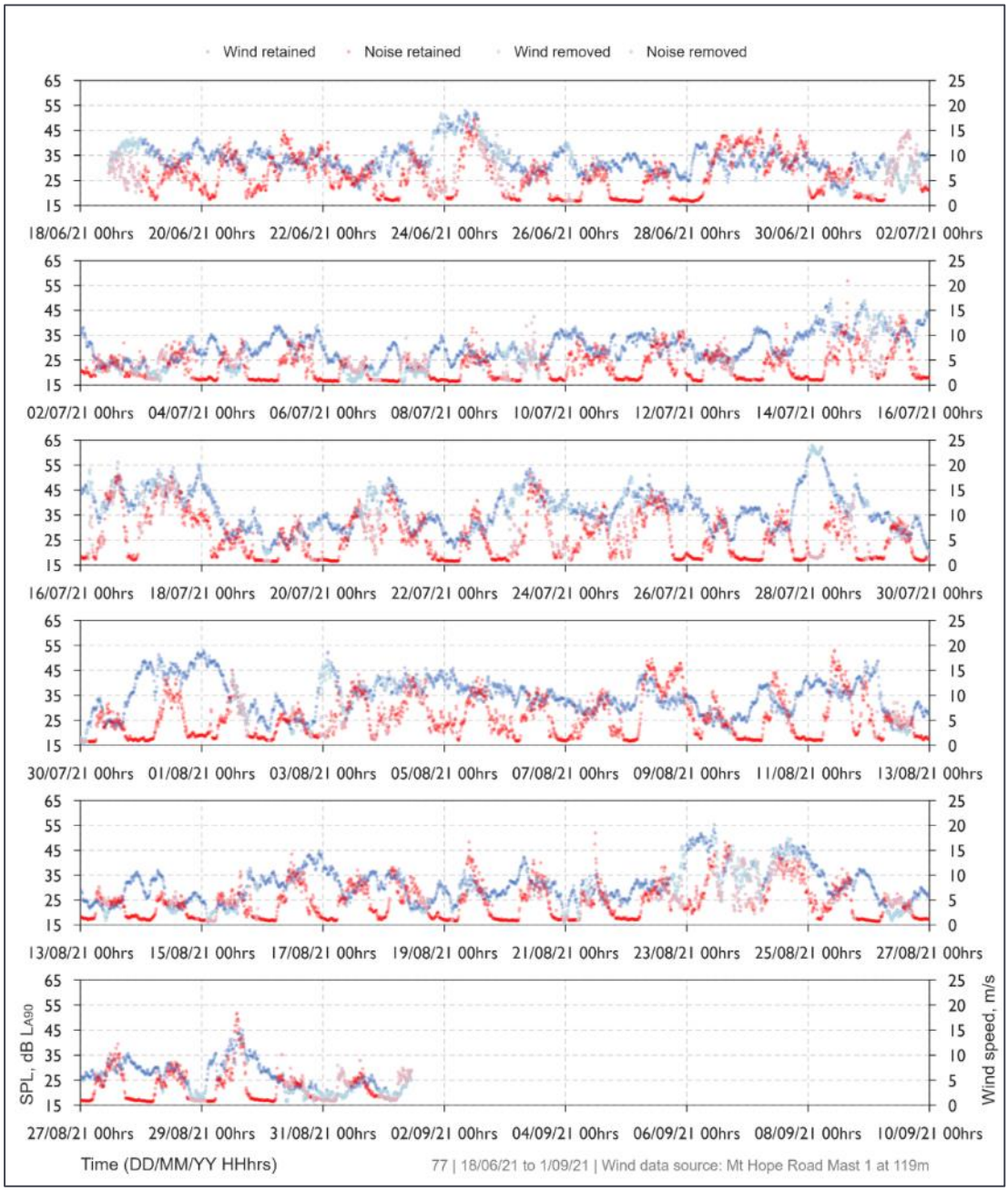
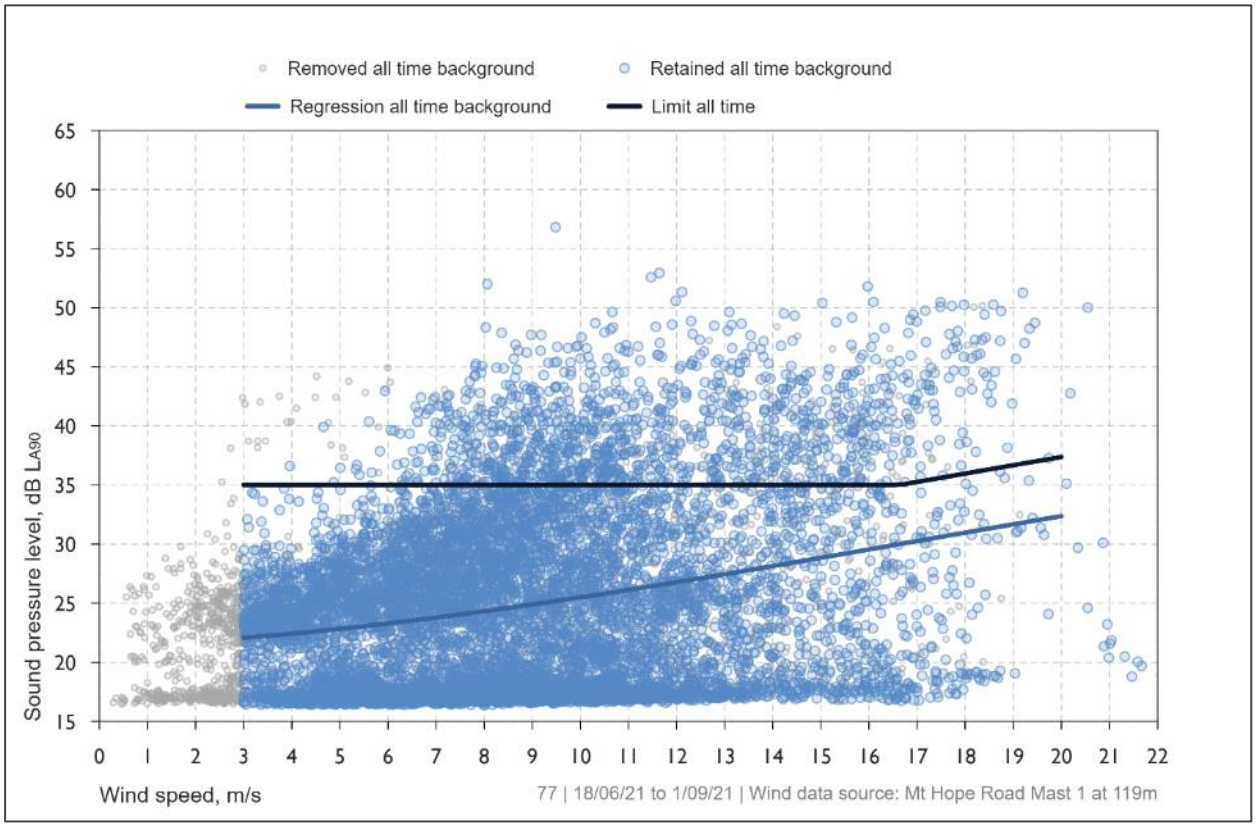


**Figure 7: Receiver 77 – derived background noise levels and noise limits**



# APPENDIX J RECEIVER 87 DATA

## J1 Receiver 87 location data

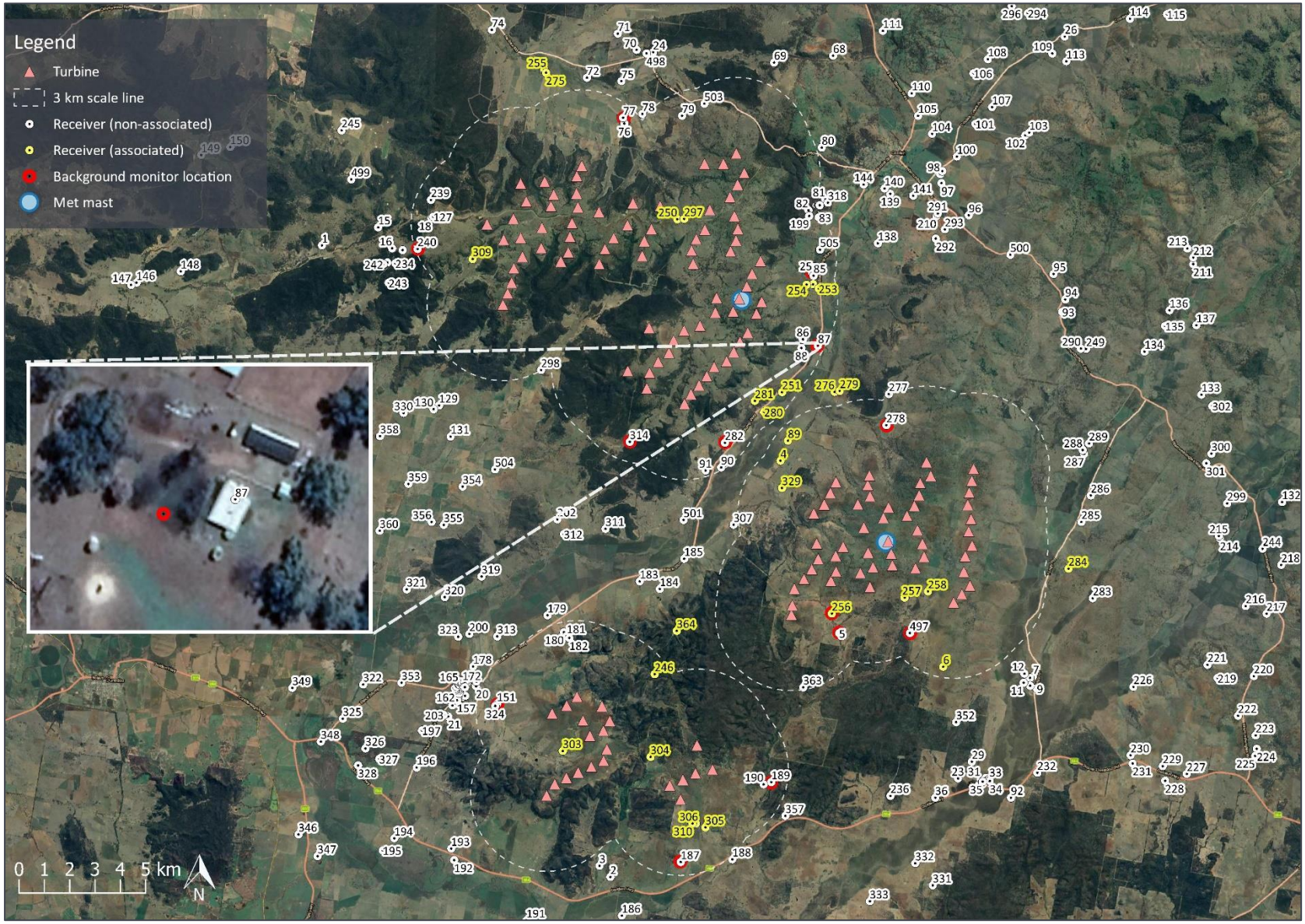
**Table 26: Receiver 87 dwelling and noise monitor coordinates – GDA 2020 Zone 55**

| Location | Easting, m | Northing, m |
|---|---|---|
| Dwelling location | 754,583 | 6,468,372 |
| Background noise monitoring location | 754,558 | 6,468,367 |

**Table 27: Receiver 87 monitor installation photos**

| | |
|---|---|
| Looking North | Looking East |
|  |  |
| Looking South | Looking West |
|  |  |

**Table 28: Receiver 87 aerial view - dwelling and noise monitor location**



## J2 Receiver 87 measurement data summary

**Table 29: Receiver 87 background noise level analysis summary**

| Item | Data point count |
|---|---|
| Number of data points collected | 10,682 |
| Number of data points removed | 1,640 |
| Number of data points for analysis (worst case wind direction) | 9,042 (3,029) |

**Figure 8: Receiver 87 background noise level and wind speed time history**

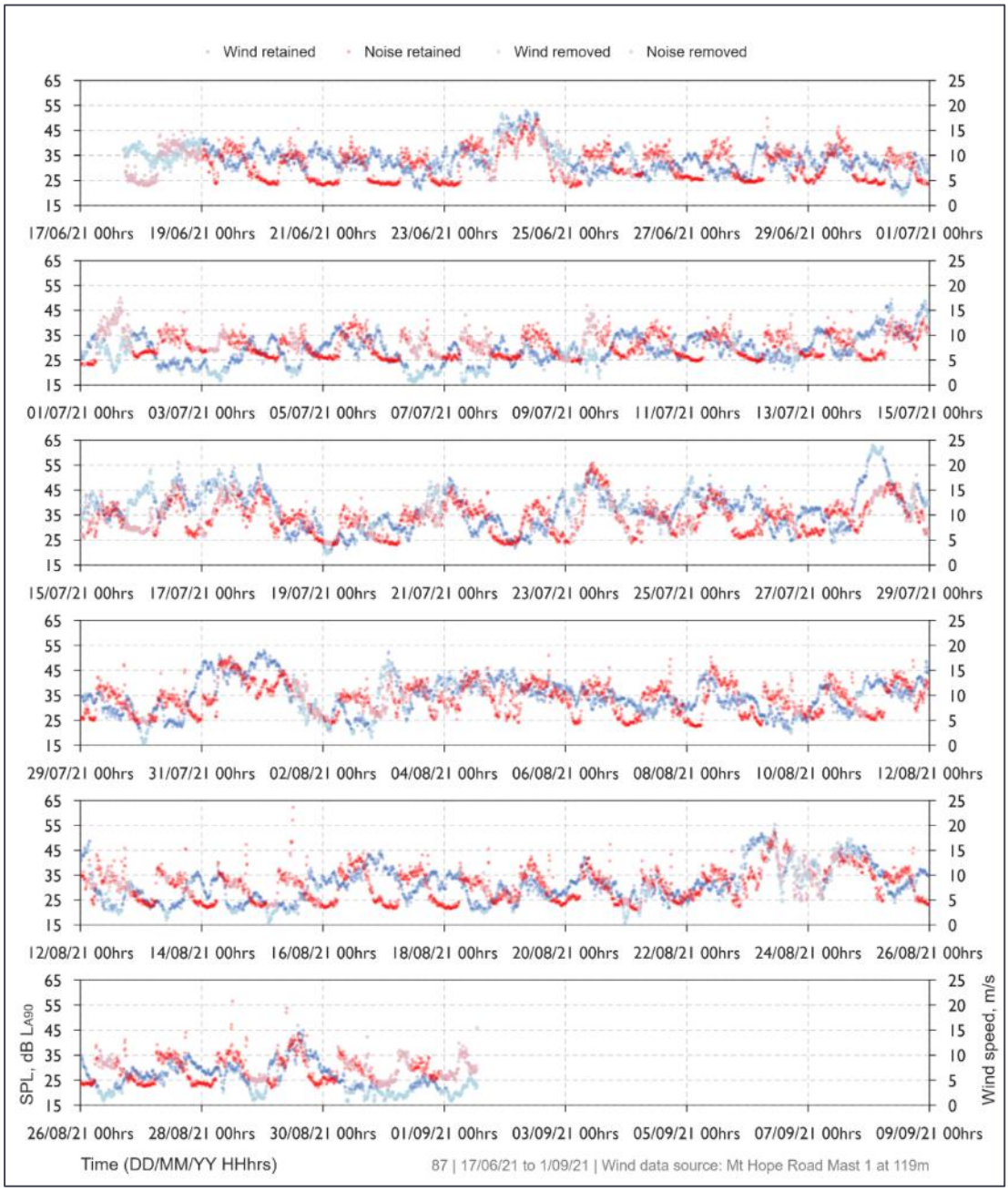
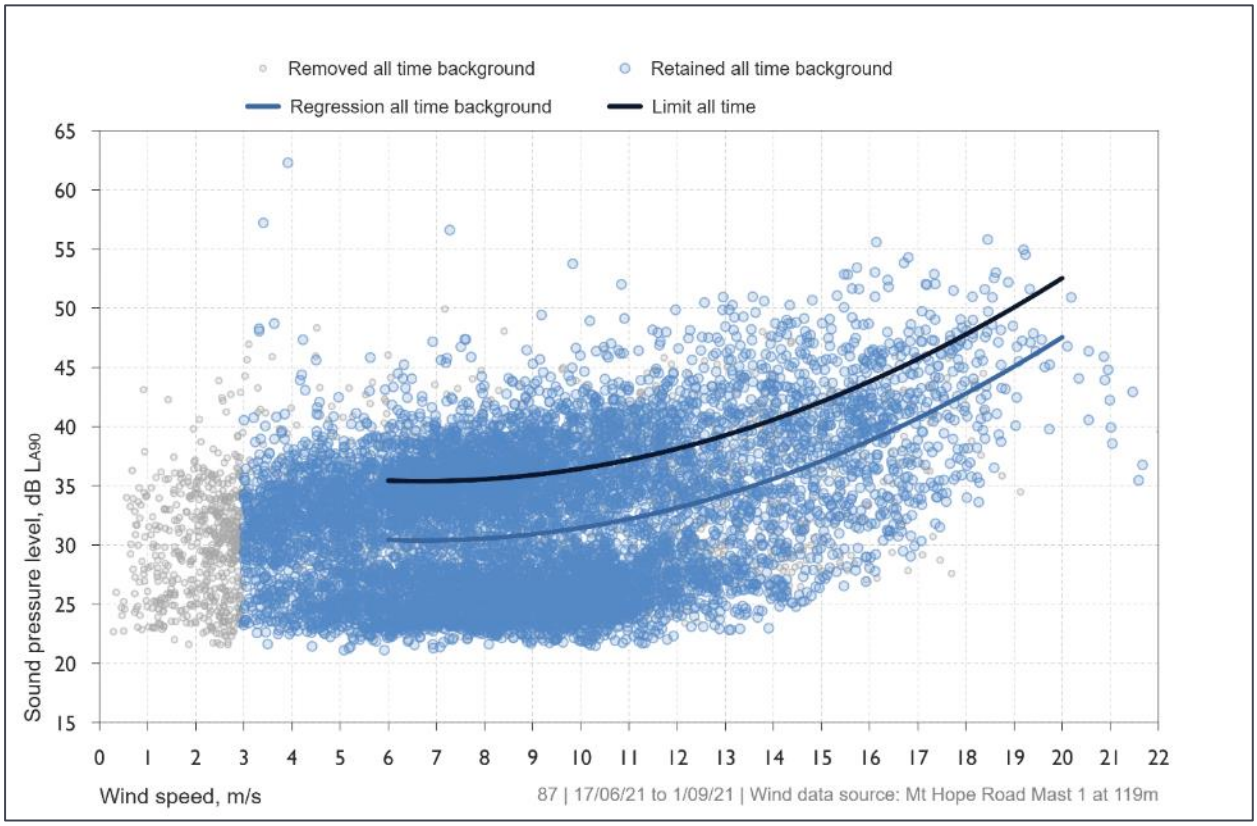


**Figure 9: Receiver 87 – derived background noise levels and noise limits**



# APPENDIX K RECEIVER 151 DATA

## K1 Receiver 151 location data

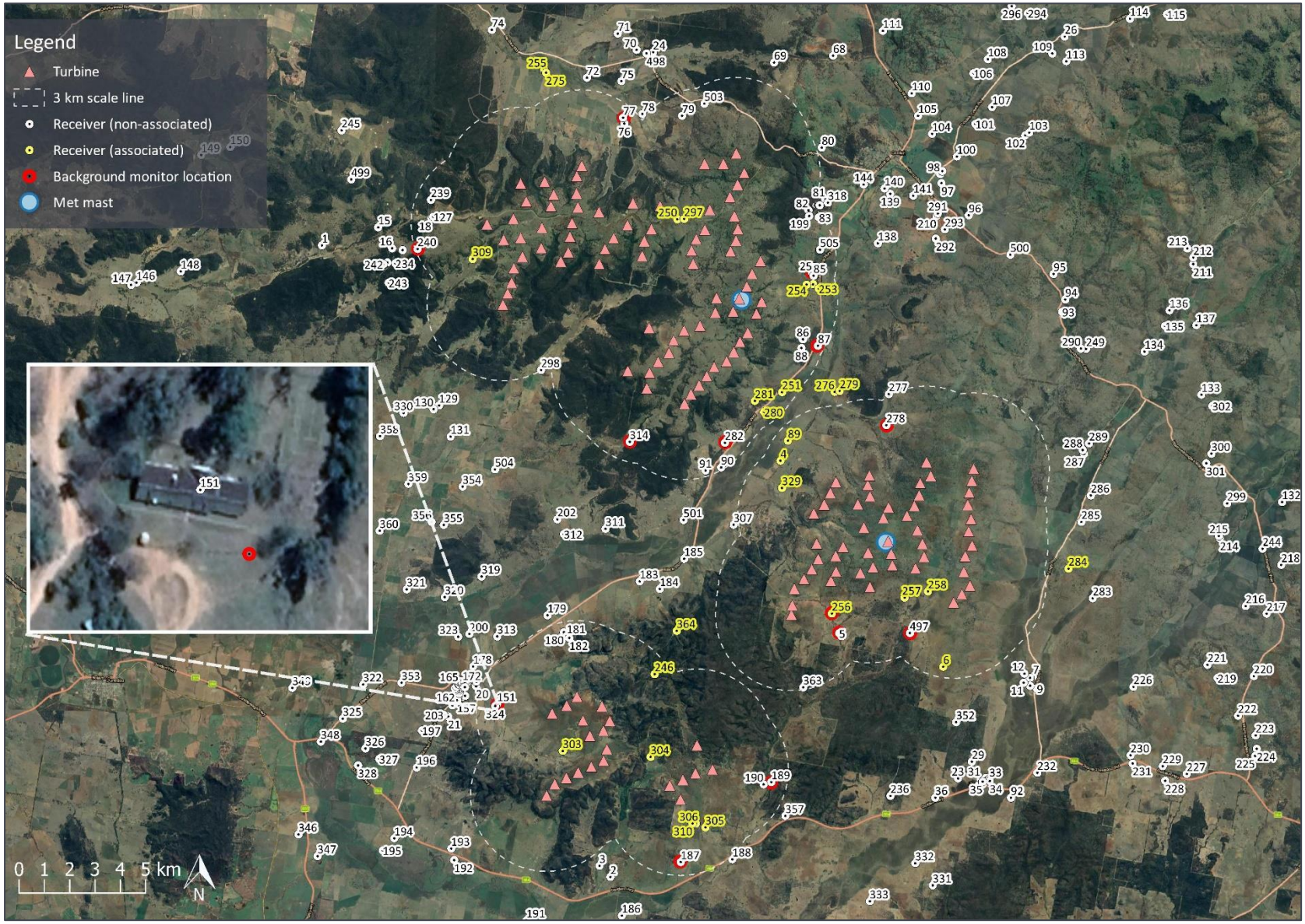
**Table 30: Receiver 151 dwelling and noise monitor coordinates – GDA 2020 Zone 55**

| Location | Easting, m | Northing, m |
|---|---|---|
| Dwelling location | 741,898 | 6,454,218 |
| Background noise monitoring location | 741,915 | 6,454,196 |

**Table 31: Receiver 151 monitor installation photos**

| Looking North | Looking East |
|---|---|
|  |  |
| Looking South | Looking West |
|  |  |

**Table 32: Receiver 151 aerial view - dwelling and noise monitor location**



## K2 Receiver 151 measurement data summary

**Table 33: Receiver 151 background noise level analysis summary**

| Item | Data point count |
|---|---|
| Number of data points collected | 12,703 |
| Number of data points removed | 2,608 |
| Number of data points for analysis (worst case wind direction) | 10,09 (1,780) |

**Figure 10: Receiver 151 background noise level and wind speed time history**

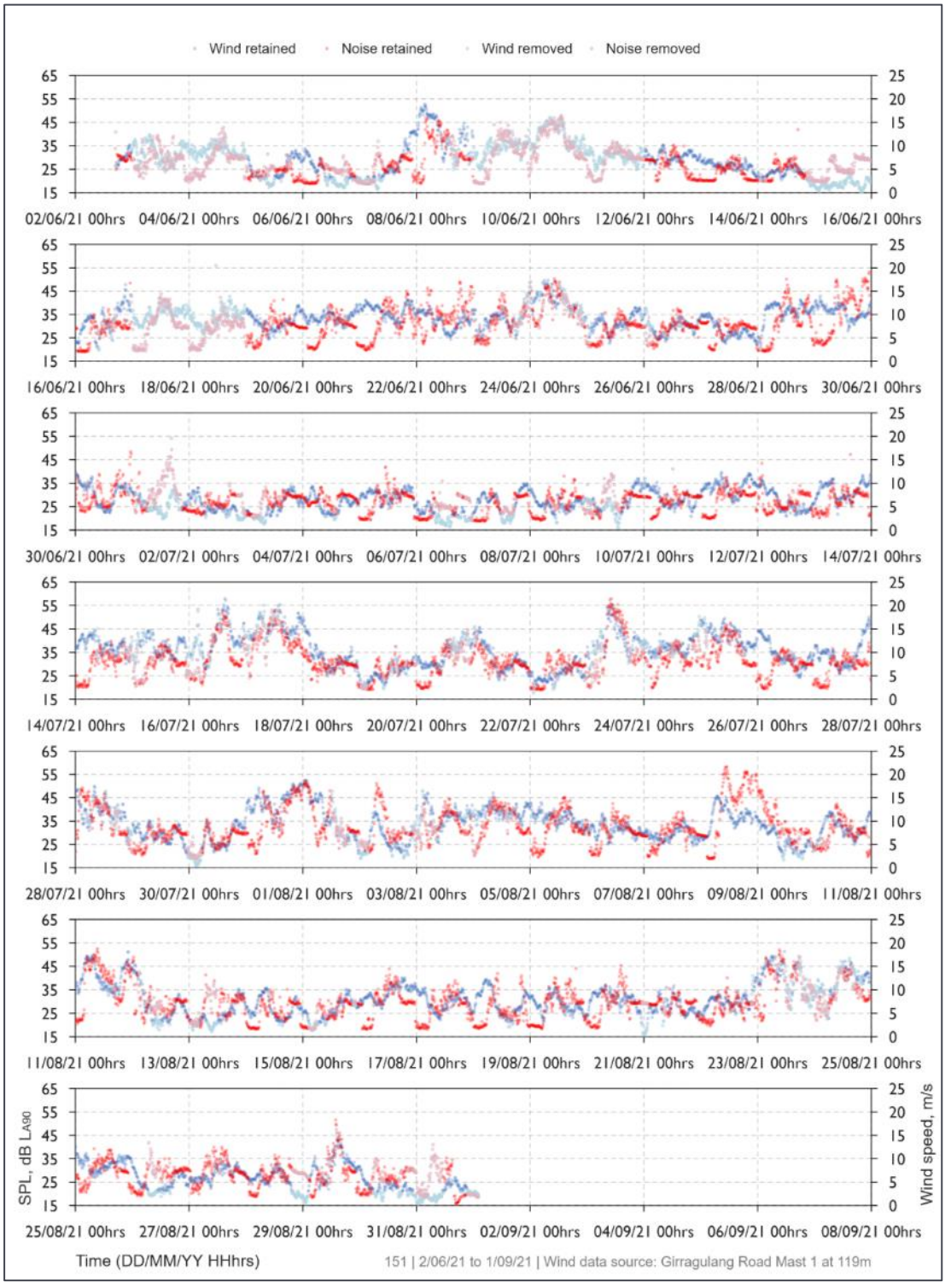
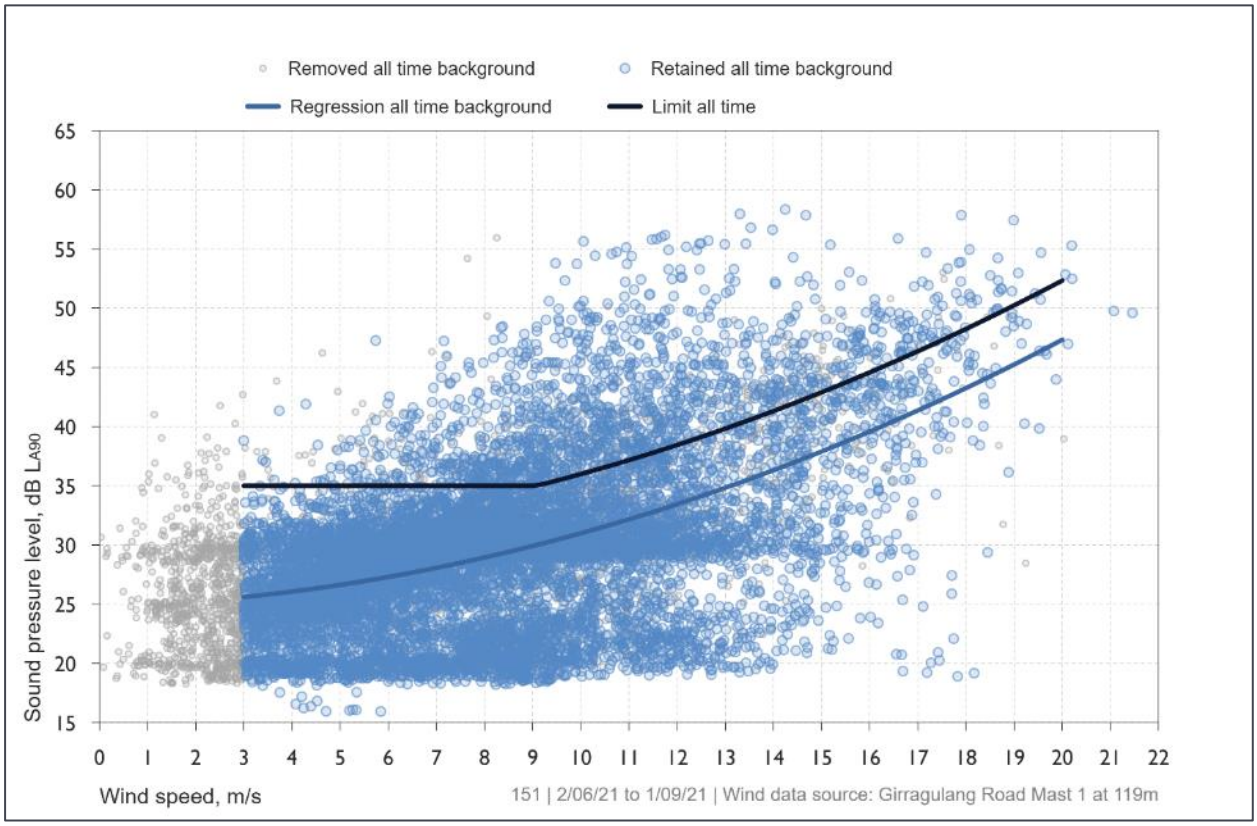


**Figure 11: Receiver 151 – derived background noise levels and noise limits**



# APPENDIX L RECEIVER 187 DATA

## L1 Receiver 187 location data

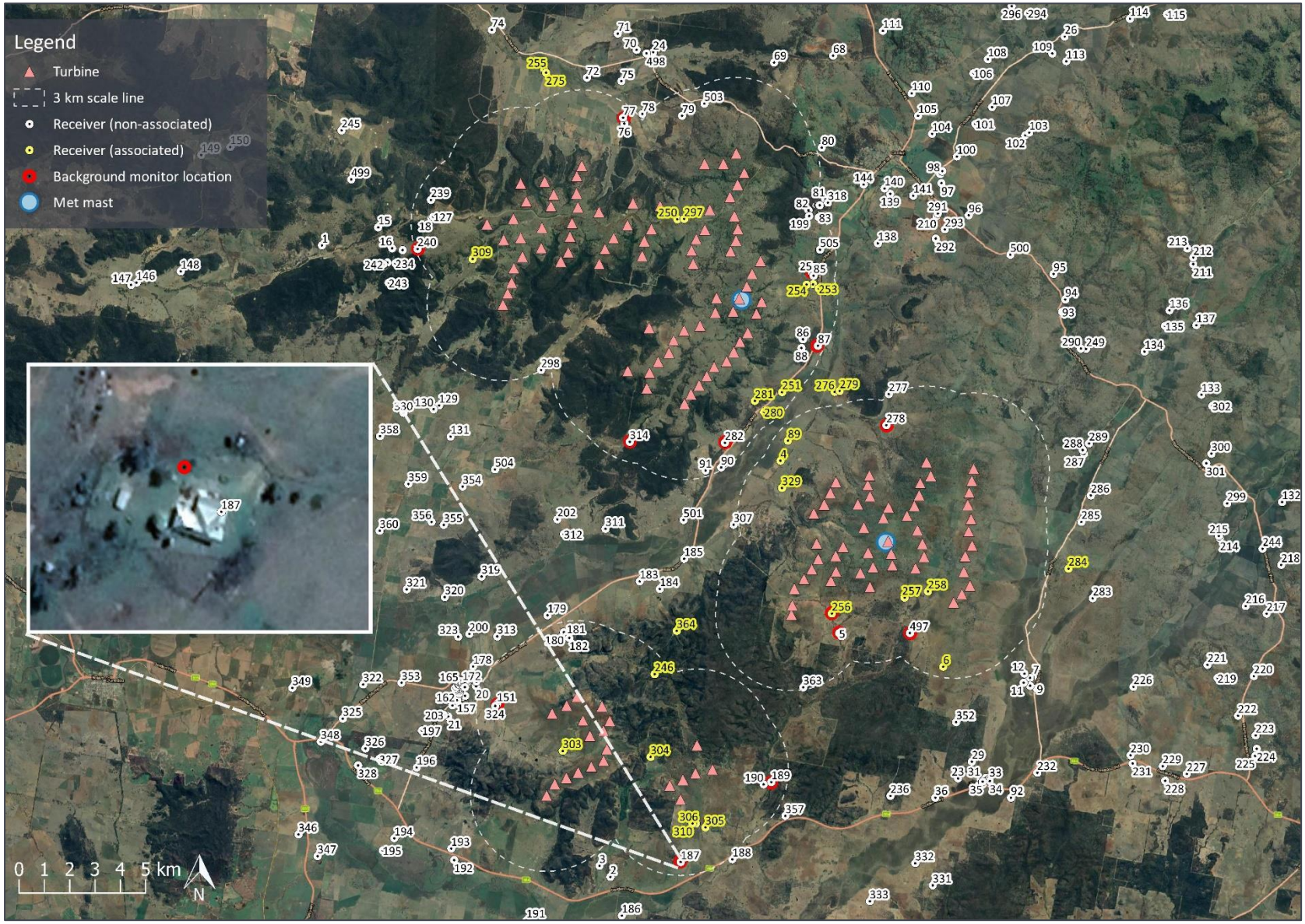
**Table 34: Receiver 187 dwelling and noise monitor coordinates – GDA 2020 Zone 55**

| Location | Easting, m | Northing, m |
|---|---|---|
| Dwelling location | 749,161 | 6,447,974 |
| Background noise monitoring location | 749,148 | 6,447,989 |

**Table 35: Receiver 187 monitor installation photos**

| Looking North | Looking East |
|---|---|
|  |  |
| Looking South | Looking West |
|  |  |

**Table 36: Receiver 187 aerial view - dwelling and noise monitor location**



## L2 Receiver 187 measurement data summary

**Table 37: Receiver 187 background noise level analysis summary**

| Item | Data point count |
|---|---|
| Number of data points collected | 12,787 |
| Number of data points removed | 2,674 |
| Number of data points for analysis (worst case wind direction) | 10,113 (3,728) |

**Figure 12: Receiver 187 background noise level and wind speed time history**

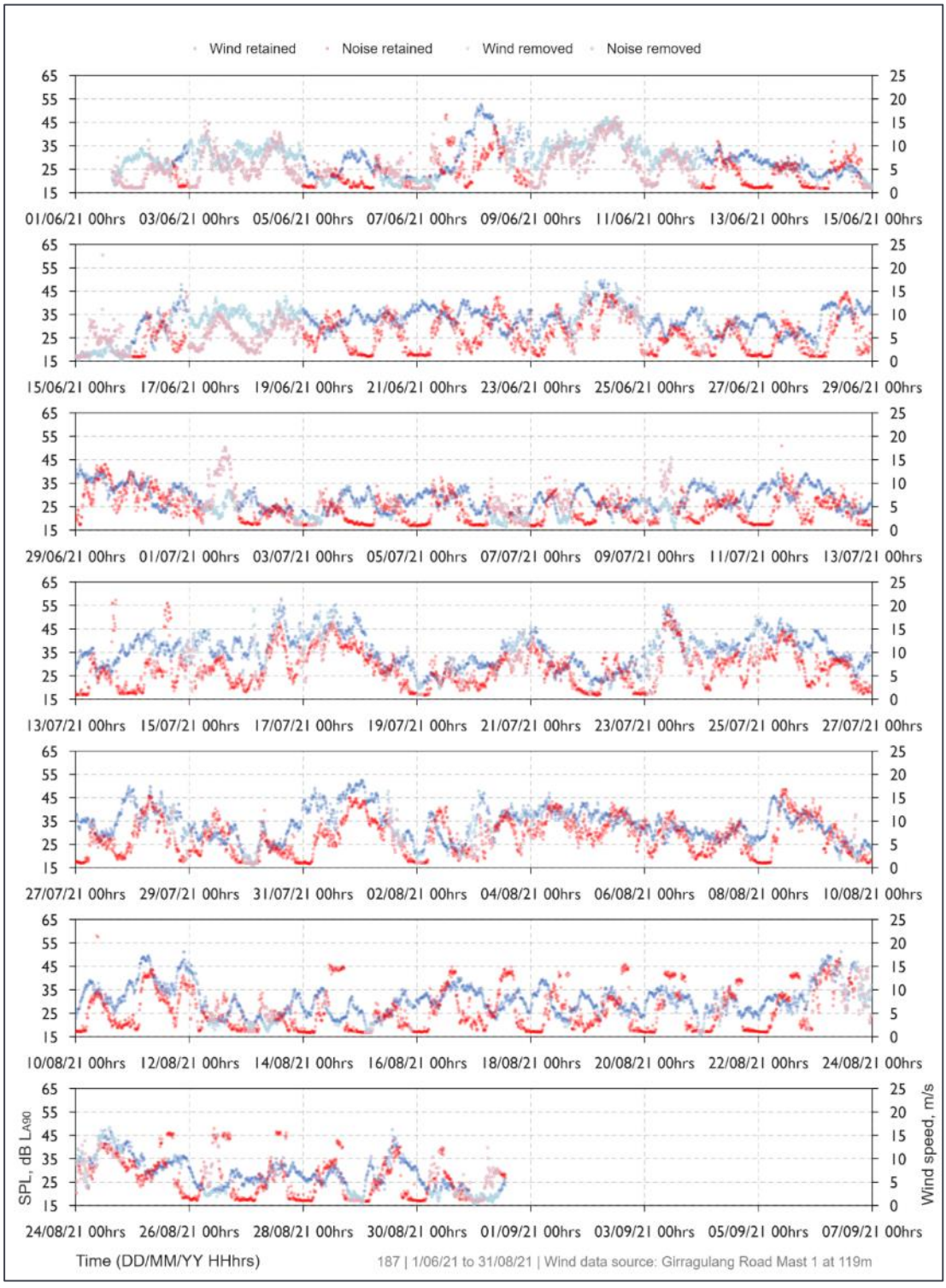
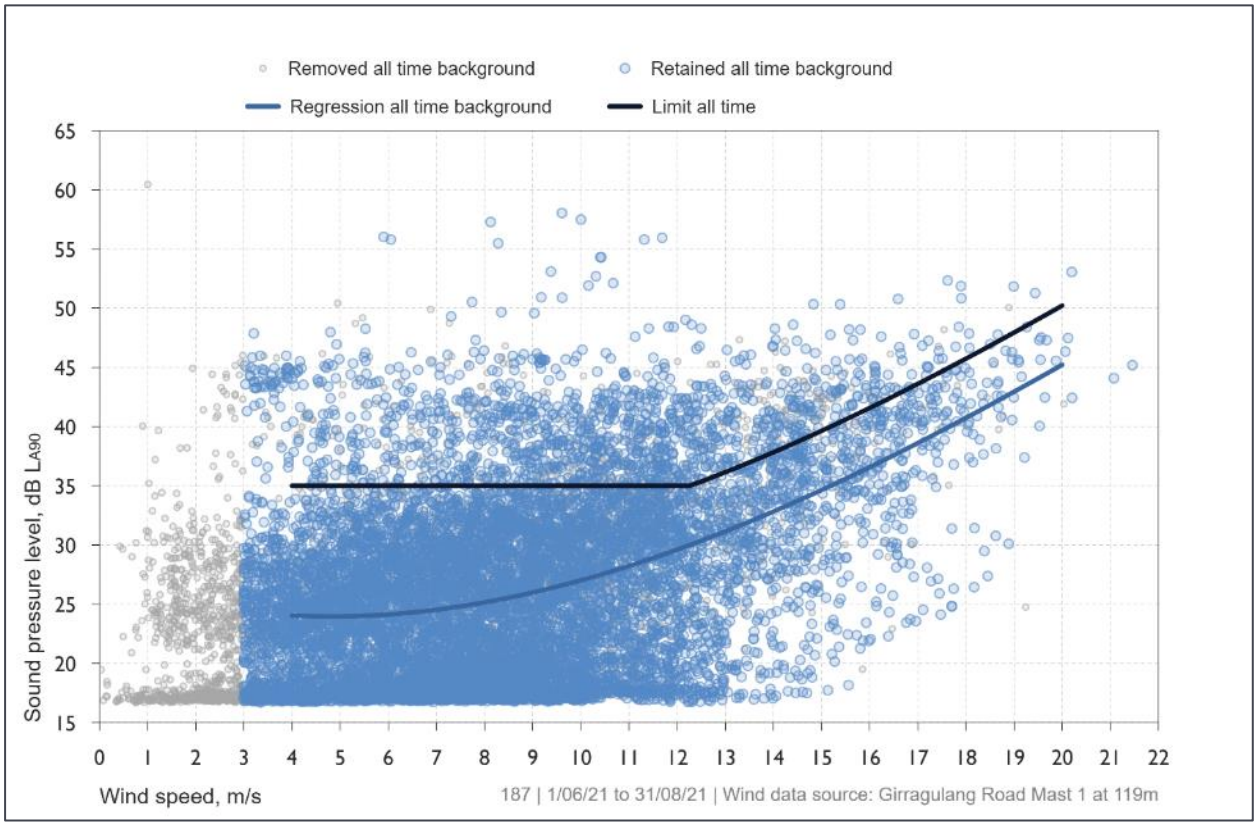


**Figure 13: Receiver 187 – derived background noise levels and noise limits**



# APPENDIX M RECEIVER 189 DATA

## M1 Receiver 189 location data

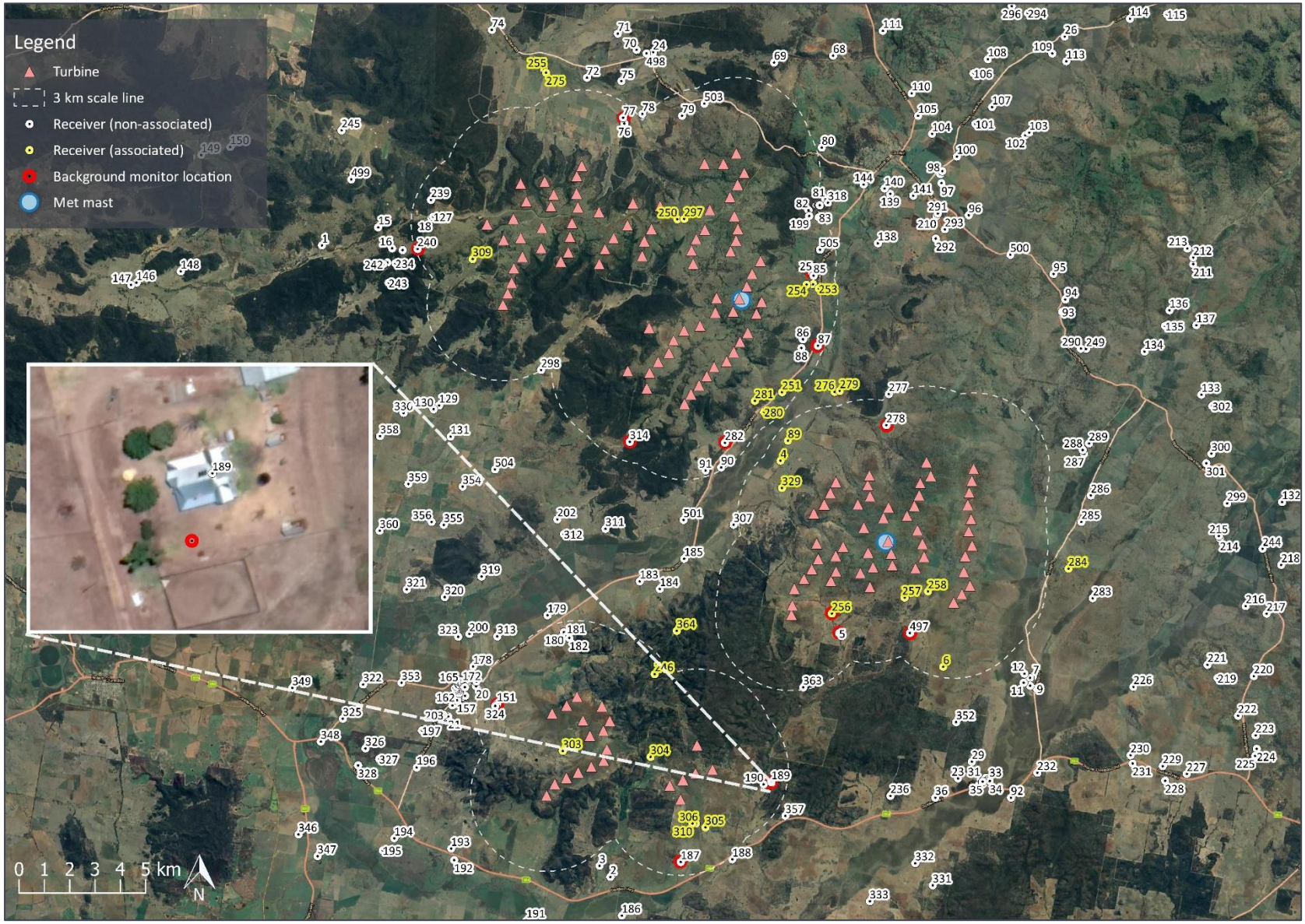
**Table 38: Receiver 189 dwelling and noise monitor coordinates – GDA 2020 Zone 55**

| Location | Easting, m | Northing, m |
|---|---|---|
| Dwelling location | 752,739 | 6,451,131 |
| Background noise monitoring location | 752,732 | 6,451,107 |

**Table 39: Receiver 189 monitor installation photos**

| Looking North | Looking East |
|---|---|
|  |  |
| Looking South | Looking West |
|  |  |

**Table 40: Receiver 189 aerial view - dwelling and noise monitor location**



## M2 Receiver 189 measurement data summary

**Table 41: Receiver 189 background noise level analysis summary**

| Item | Data point count |
|---|---|
| Number of data points collected | 10,915 |
| Number of data points removed | 1,696 |
| Number of data points for analysis (worst case wind direction) | 9,219 (3,970) |

**Figure 14: Receiver 189 background noise level and wind speed time history**

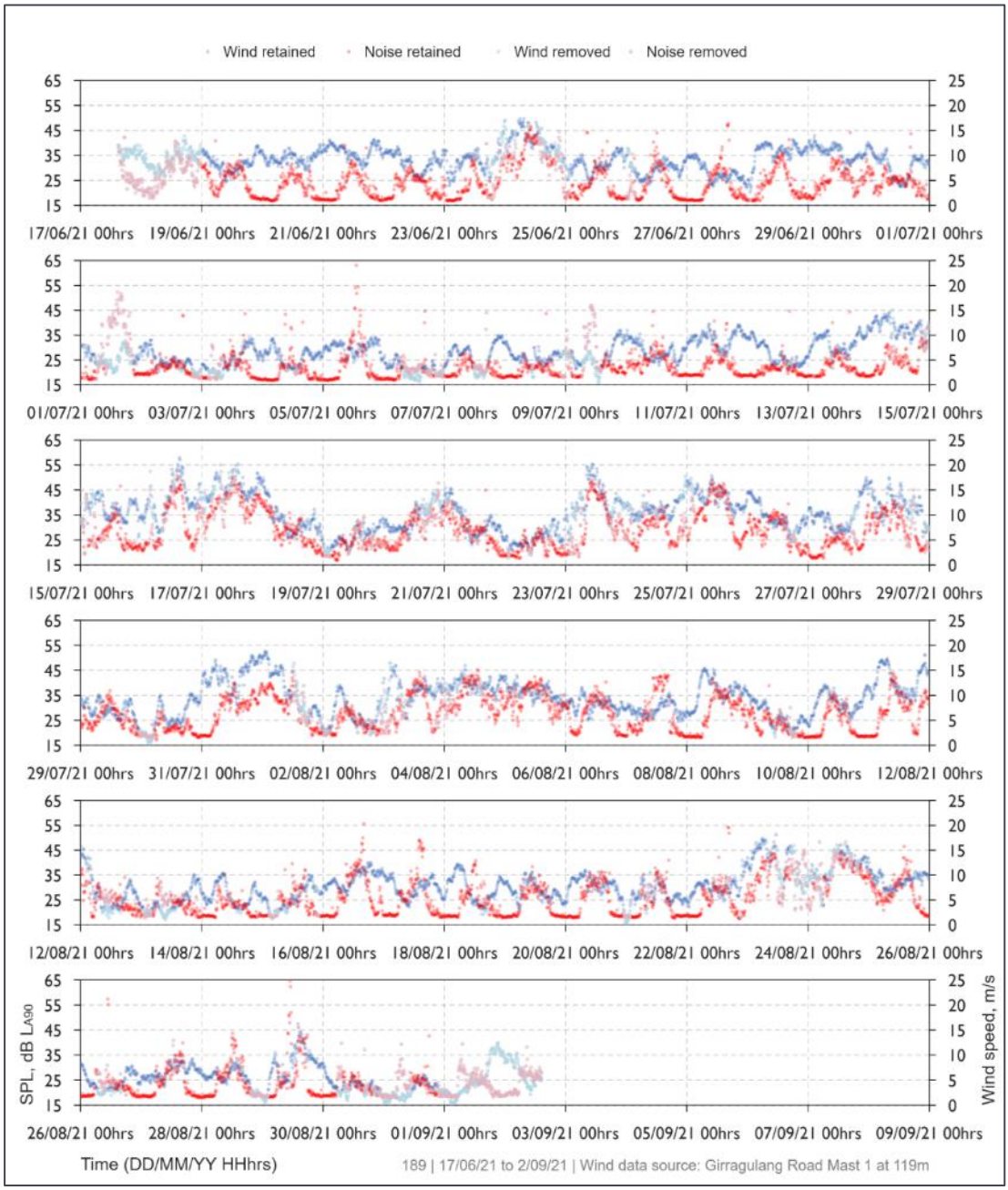
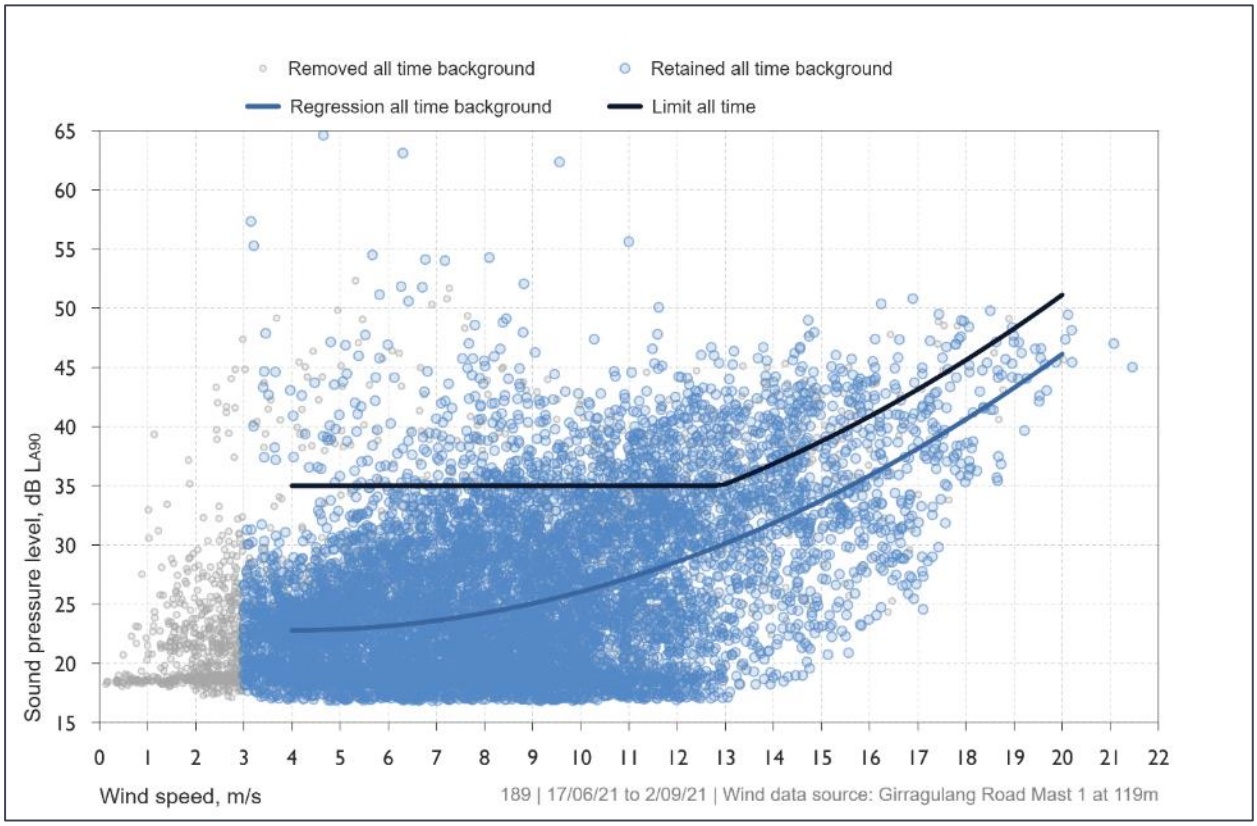


**Figure 15: Receiver 189 – derived background noise levels and noise limits**



# APPENDIX N RECEIVER 240 DATA

## N1 Receiver 240 location data

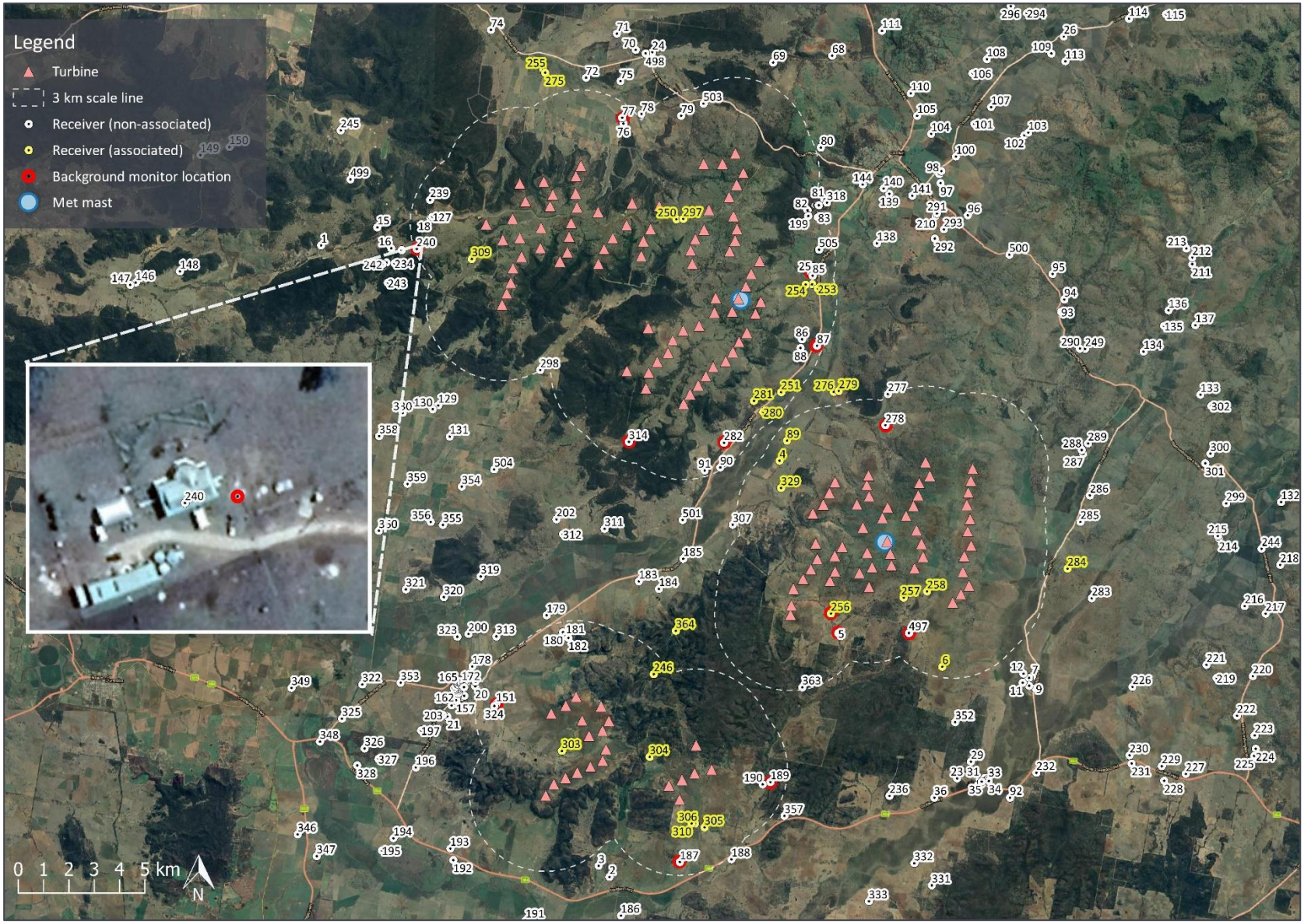
**Table 42: Receiver 240 dwelling and noise monitor coordinates – GDA 2020 Zone 55**

| Location | Easting, m | Northing, m |
|---|---|---|
| Dwelling location | 738,763 | 6,472,198 |
| Background noise monitoring location | 738,771 | 6,472,199 |

**Table 43: Receiver 240 monitor installation photos**

| Looking North | Looking East |
|---|---|
|  |  |
| **Looking South** | **Looking West** |
|  |  |

**Table 44: Receiver 240 aerial view - dwelling and noise monitor location**



## N2 Receiver 240 measurement data summary

**Table 45: Receiver 240 background noise level analysis summary**

| Item | Data point count |
|---|---|
| Number of data points collected | 12,708 |
| Number of data points removed | 2,529 |
| Number of data points for analysis (worst case wind direction) | 10,179 (982) |

**Figure 16: Receiver 240 background noise level and wind speed time history**

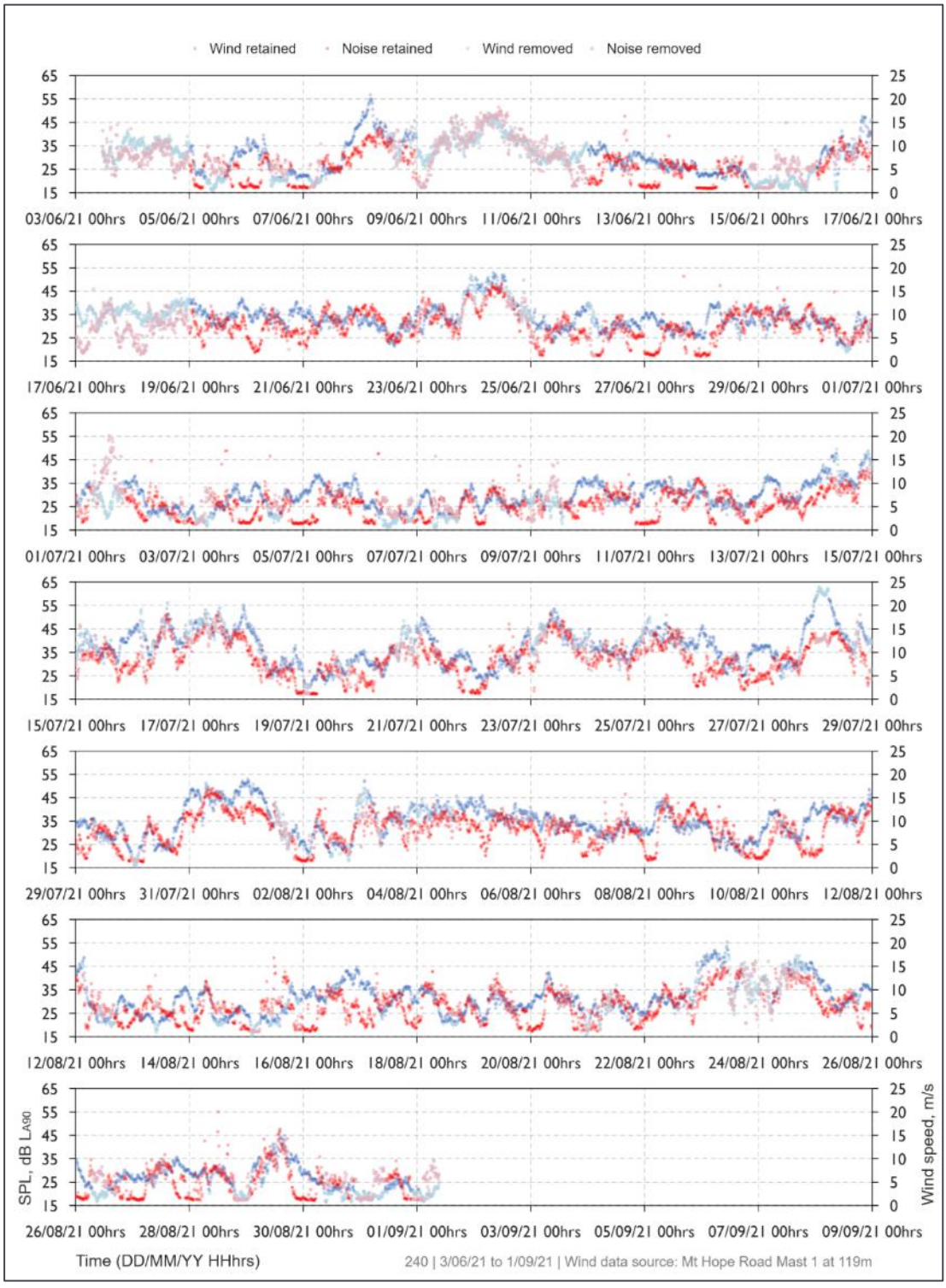
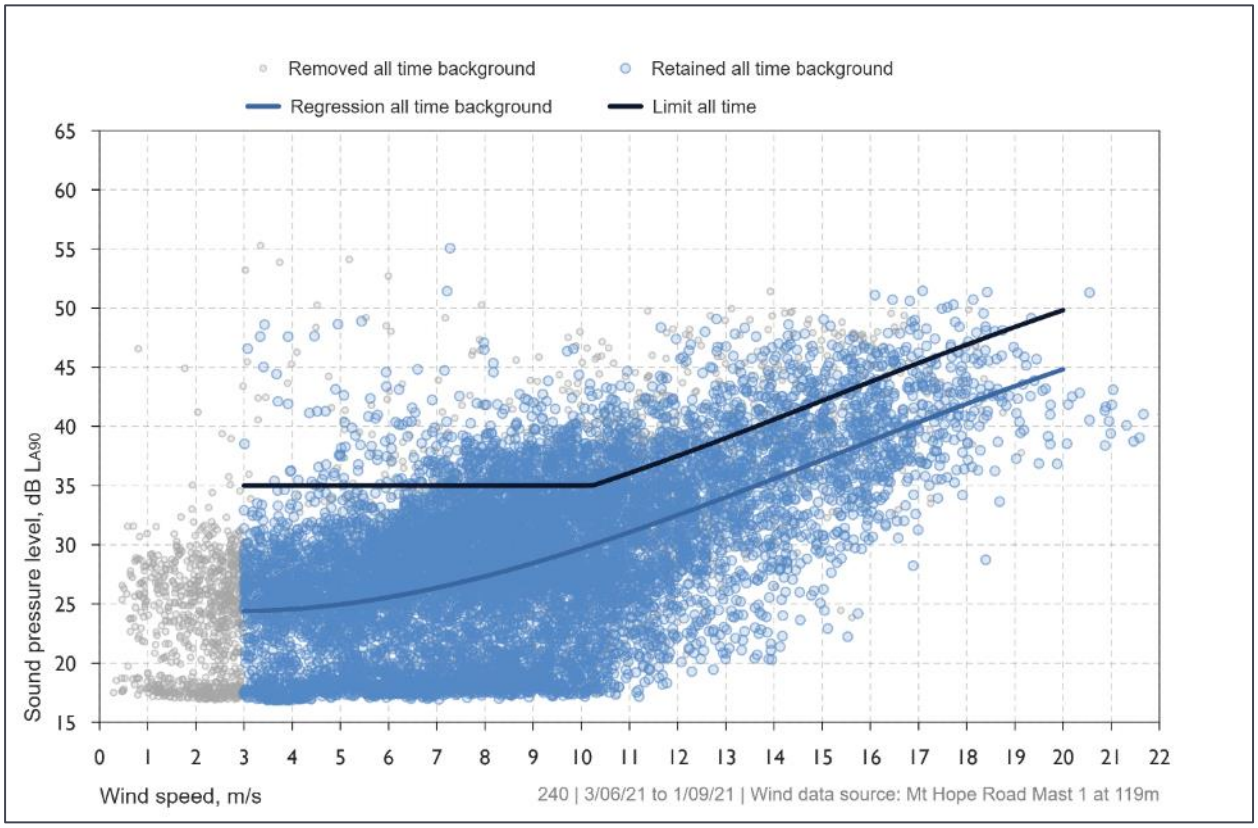


**Figure 17: Receiver 240 – derived background noise levels and noise limits**



# APPENDIX O RECEIVER 256 DATA

## O1 Receiver 256 location data

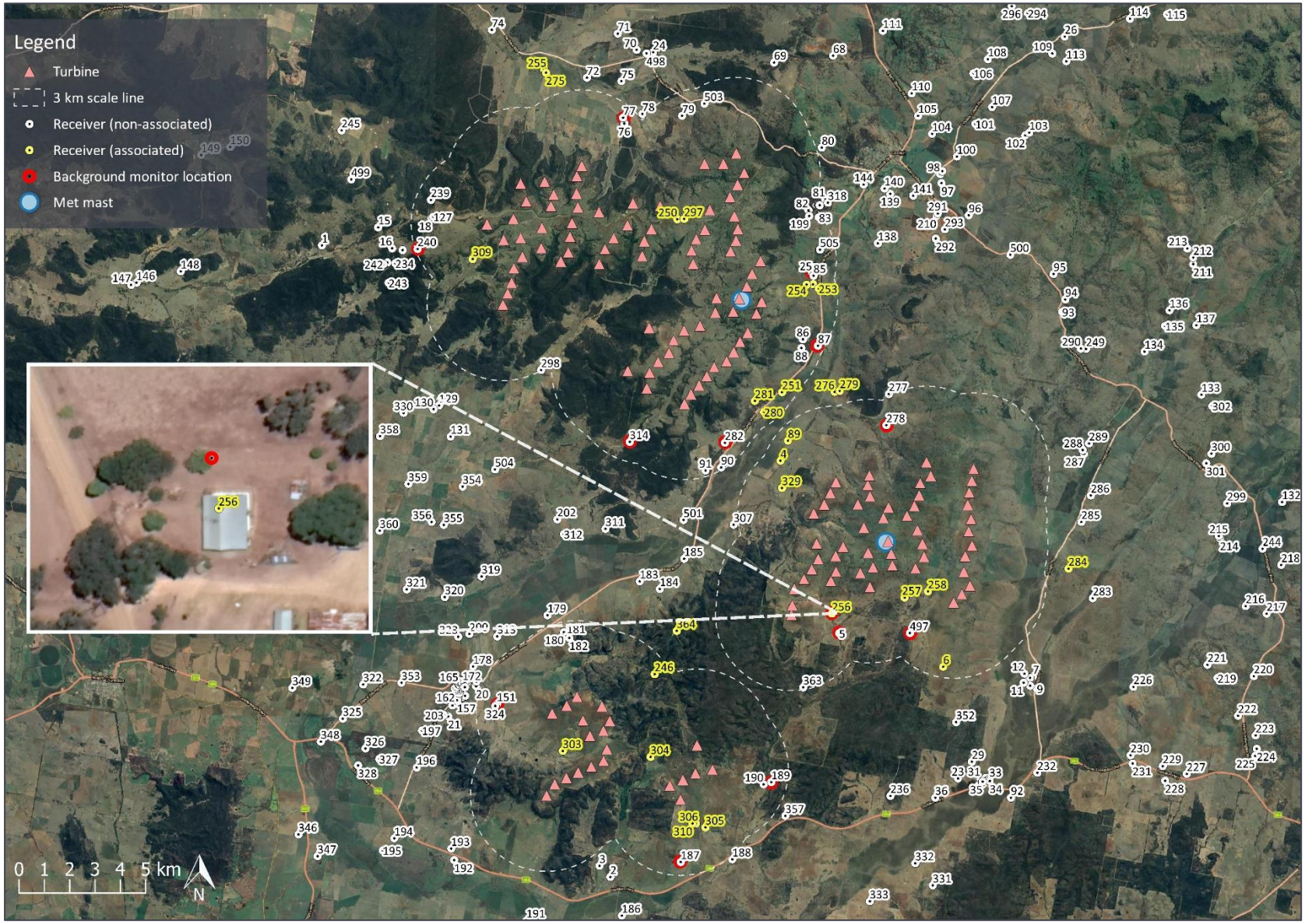
**Table 46: Receiver 256 dwelling and noise monitor coordinates – GDA 2020 Zone 55**

| Location | Easting, m | Northing, m |
|---|---|---|
| Dwelling location | 755,133 | 64,57,790 |
| Background noise monitoring location | 755,131 | 6,457,807 |

**Table 47: Receiver 256 monitor installation photos**

| Looking North | Looking East |
|---|---|
|  |  |
| Looking South | Looking West |
|  |  |

**Table 48: Receiver 256 aerial view - dwelling and noise monitor location**



## O2 Receiver 256 measurement data summary

**Table 49: Receiver 256 background noise level analysis summary**

| Item | Data point count |
|---|---|
| Number of data points collected | 10,563 |
| Number of data points removed | 1,399 |
| Number of data points for analysis (worst case wind direction) | 9,164 (3,253) |

**Figure 18: Receiver 256 background noise level and wind speed time history**

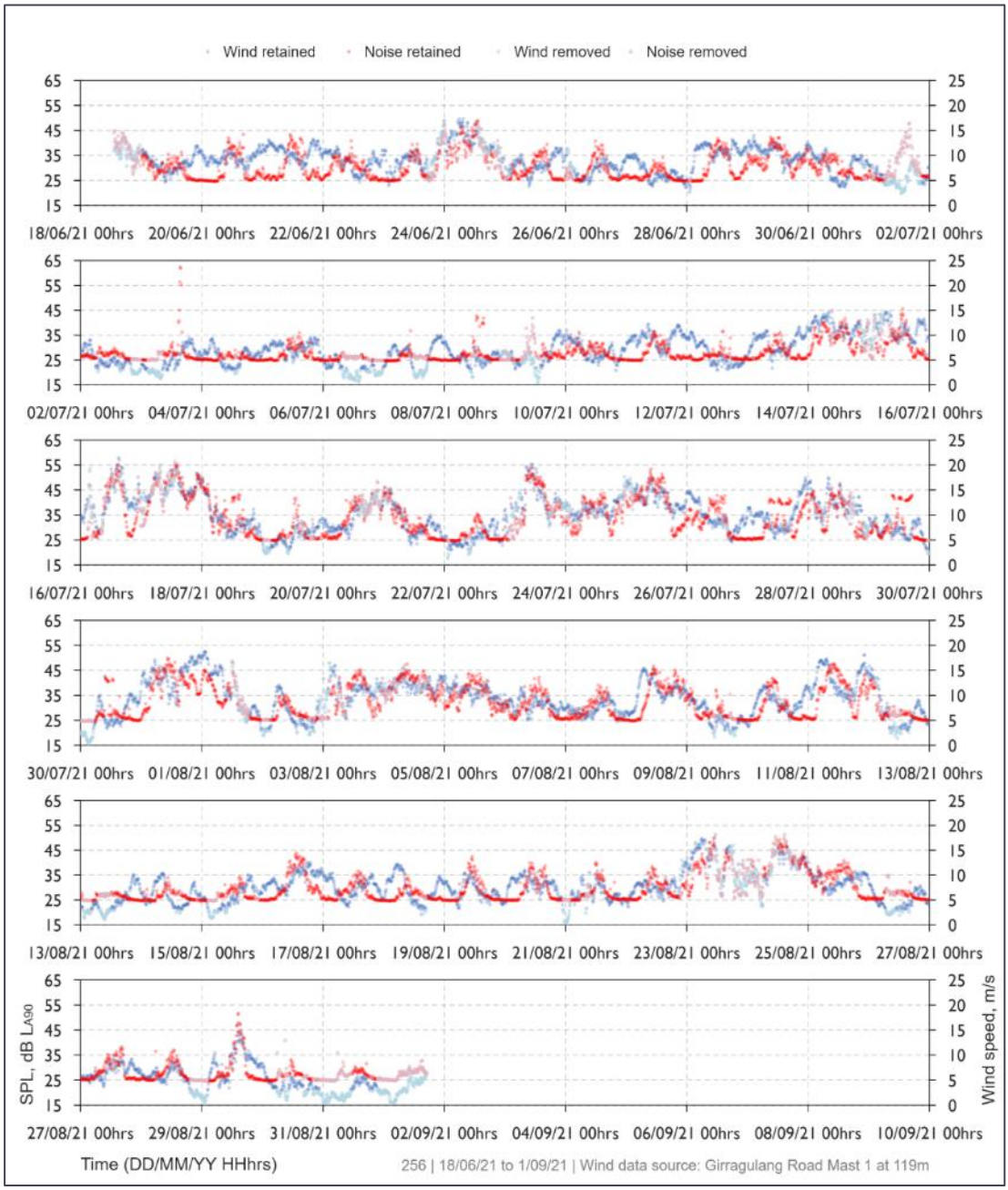
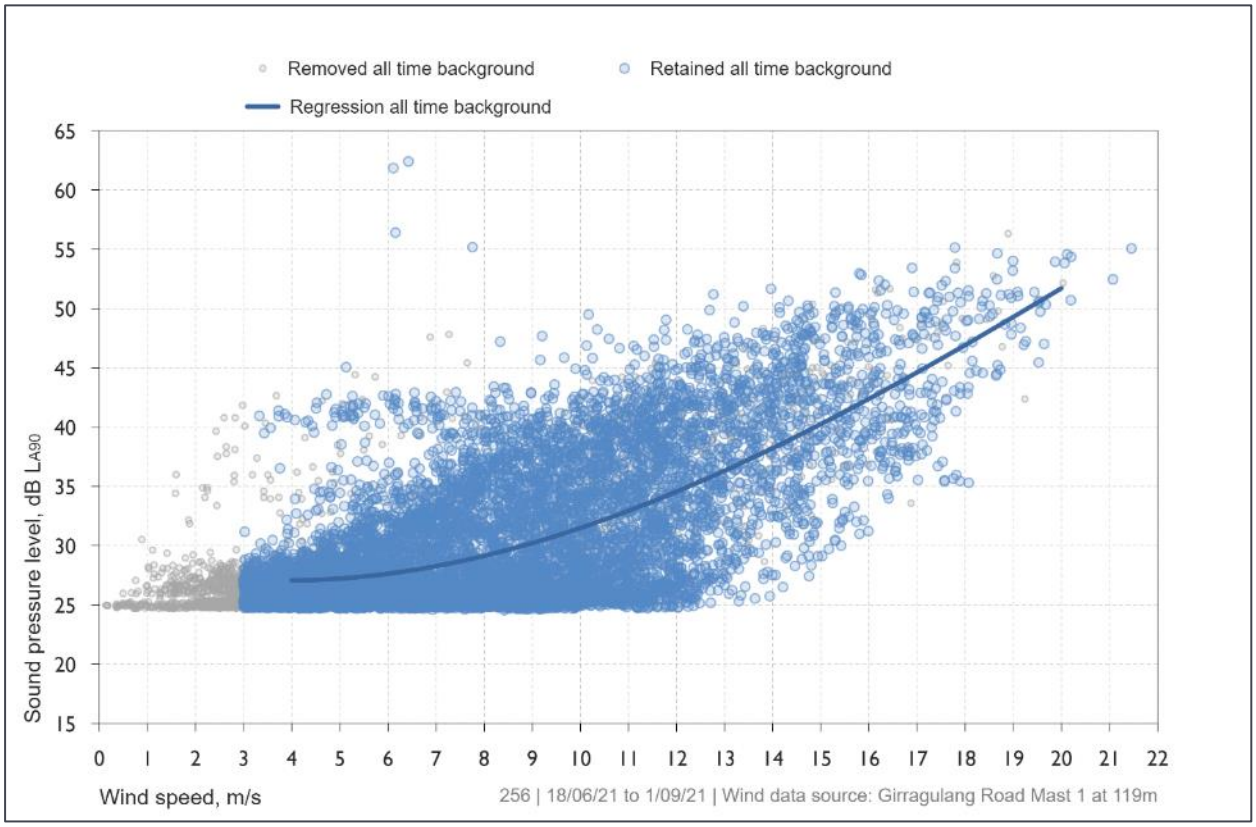


**Figure 19: Receiver 256 – derived background noise levels**



# APPENDIX P RECEIVER 278 DATA

## P1 Receiver 278 location data

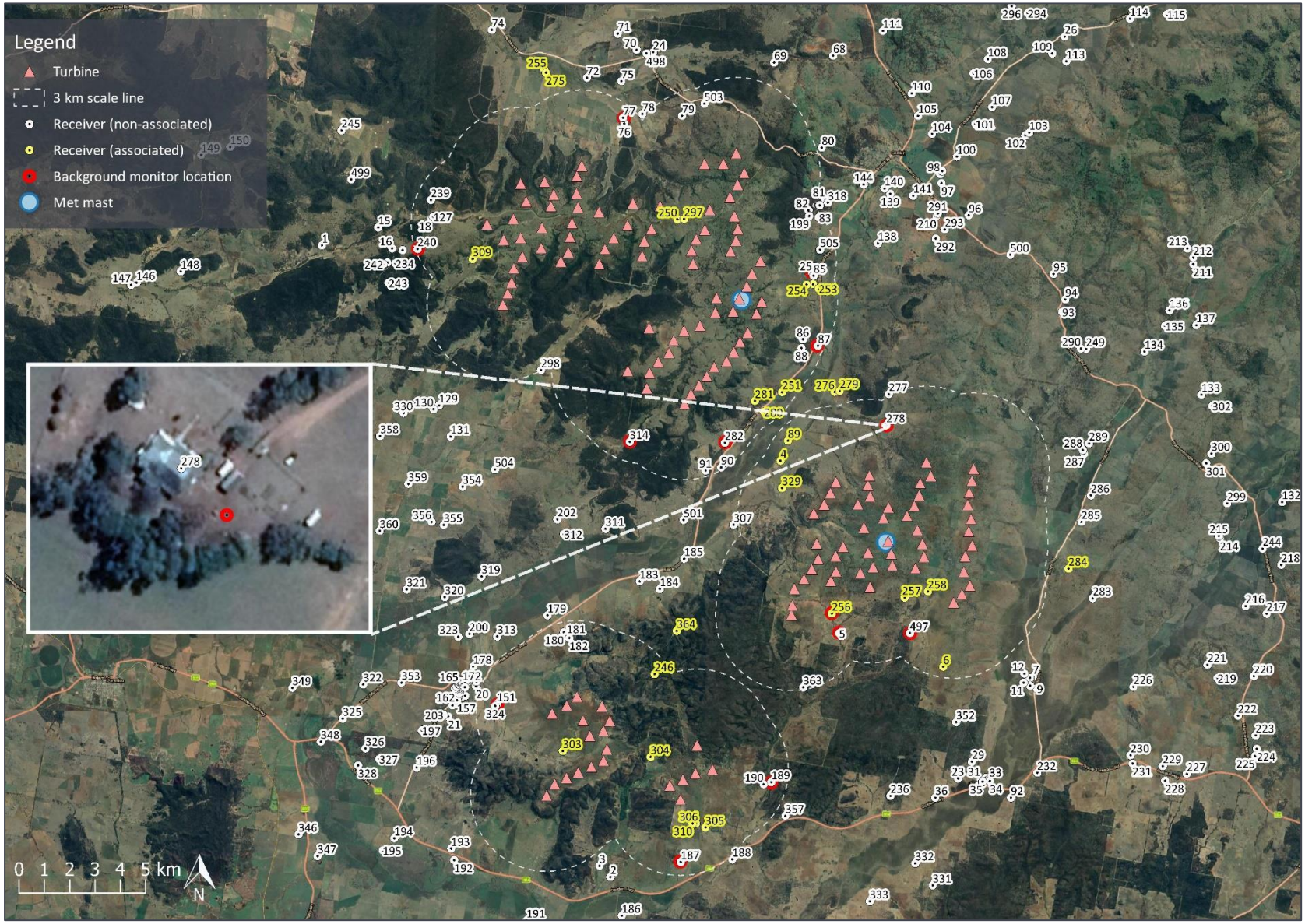
**Table 50: Receiver 278 dwelling and noise monitor coordinates – GDA 2020 Zone 55**

| Location | Easting, m | Northing, m |
|---|---|---|
| Dwelling location | 757,286 | 6,465,236 |
| Background noise monitoring location | 757,302 | 6,465,220 |

**Table 51: Receiver 278 monitor installation photos**

| Looking North | Looking East |
|---|---|
|  |  |
| Looking South | Looking West |
|  |  |

**Table 52: Receiver 278 aerial view - dwelling and noise monitor location**



## P2 Receiver 278 measurement data summary

**Table 53: Receiver 278 background noise level analysis summary**

| Item | Data point count |
|---|---|
| Number of data points collected | 12,944 |
| Number of data points removed | 2,810 |
| Number of data points for analysis (worst case wind direction) | 10,134 (662) |

**Figure 20: Receiver 278 background noise level and wind speed time history**

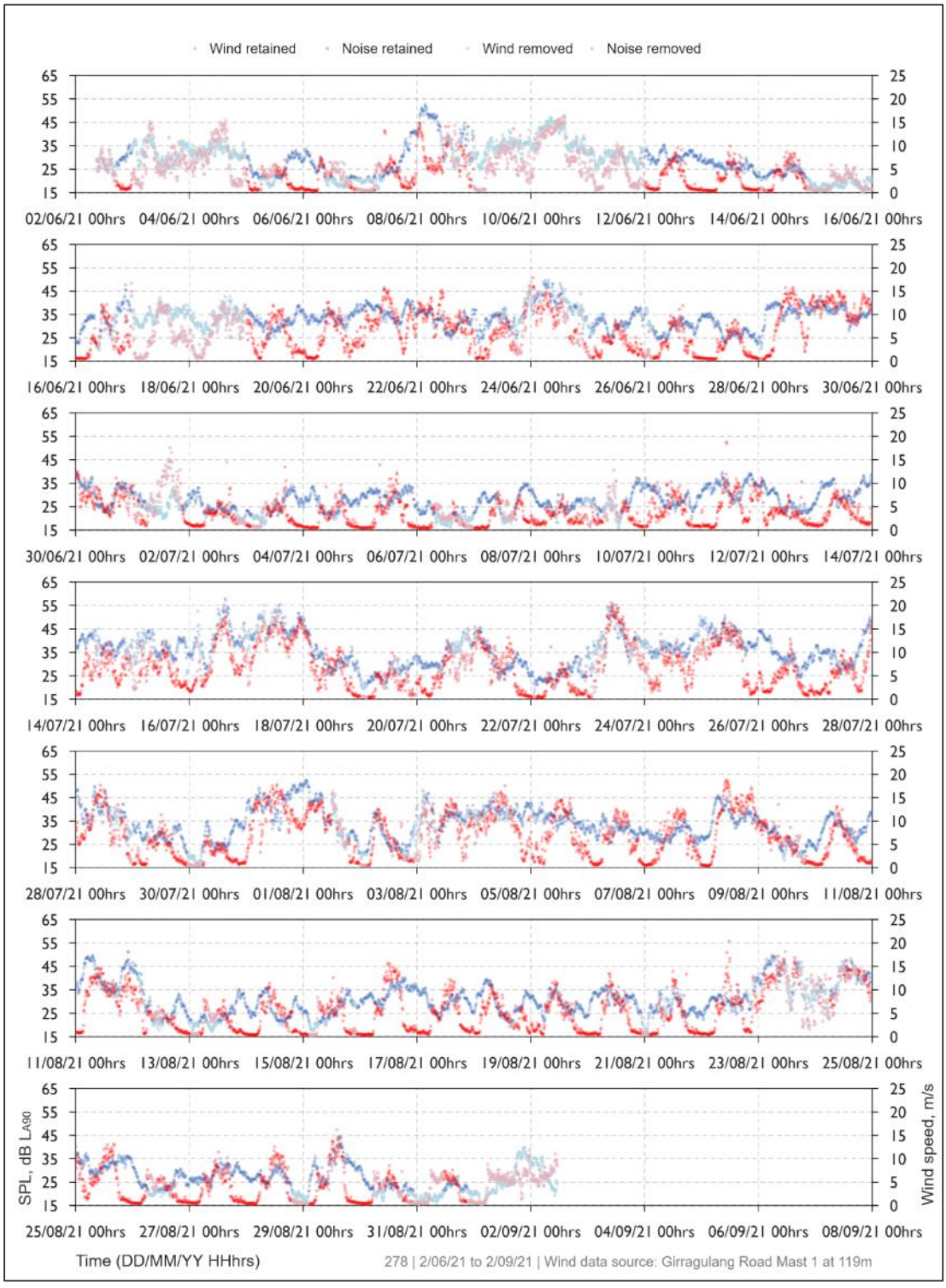
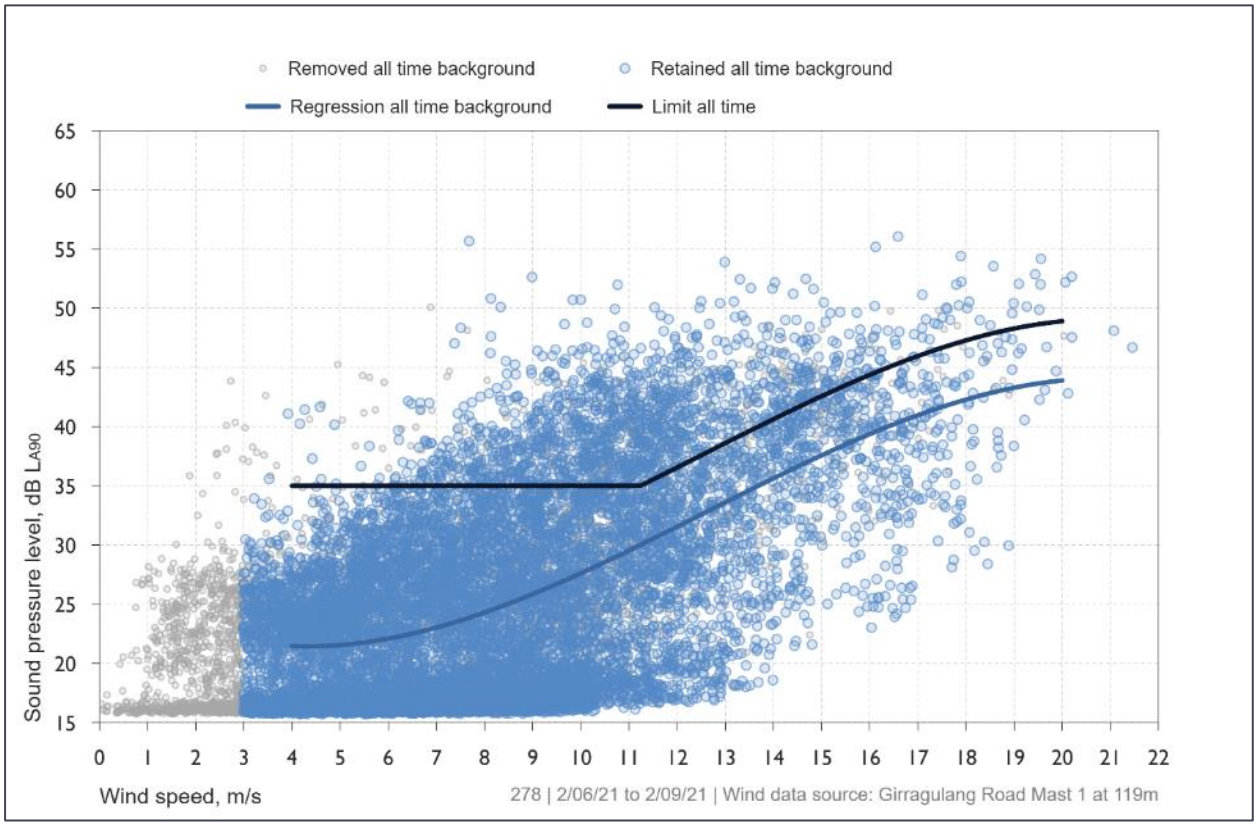


**Figure 21: Receiver 278 – derived background noise levels and noise limits**



# APPENDIX Q RECEIVER 282 DATA

## Q1 Receiver 282 location data

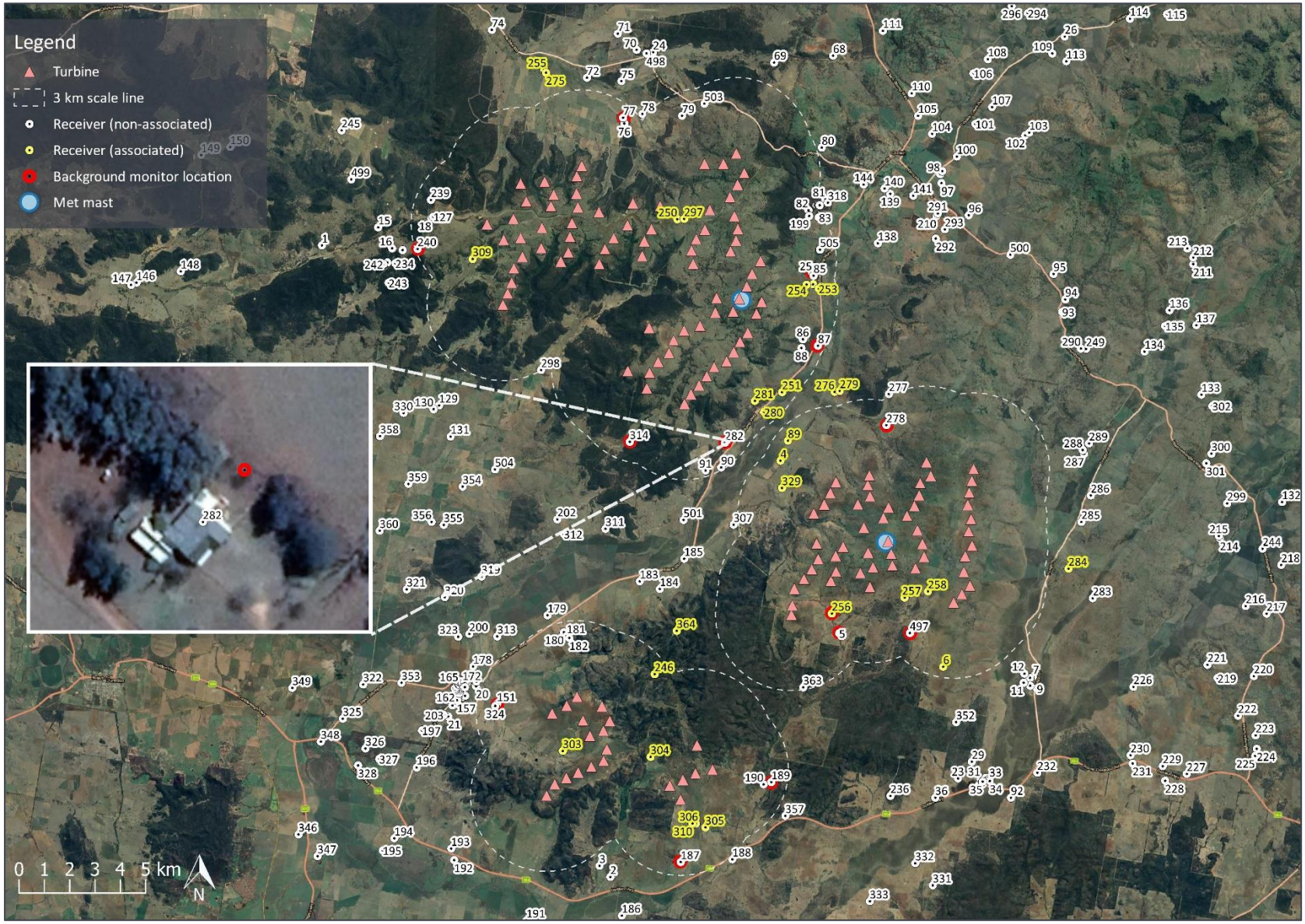
**Table 54: Receiver 282 dwelling and noise monitor coordinates – GDA 2020 Zone 55**

| Location | Easting, m | Northing, m |
|---|---|---|
| Dwelling location | 7,50,906 | 6,464,542 |
| Background noise monitoring location | 7,50,920 | 6,464,560 |

**Table 55: Receiver 282 monitor installation photos**

| Looking North | Looking East |
|---|---|
|  |  |
| Looking South | Looking West |
|  |  |

**Table 56: Receiver 282 aerial view - dwelling and noise monitor location**



## Q2 Receiver 282 measurement data summary

**Table 57: Receiver 282 background noise level analysis summary**

| Item | Data point count |
|---|---|
| Number of data points collected | 12,901 |
| Number of data points removed | 2,697 |
| Number of data points for analysis (worst case wind direction) | 10,204 (3,292) |

**Figure 22: Receiver 282 background noise level and wind speed time history**

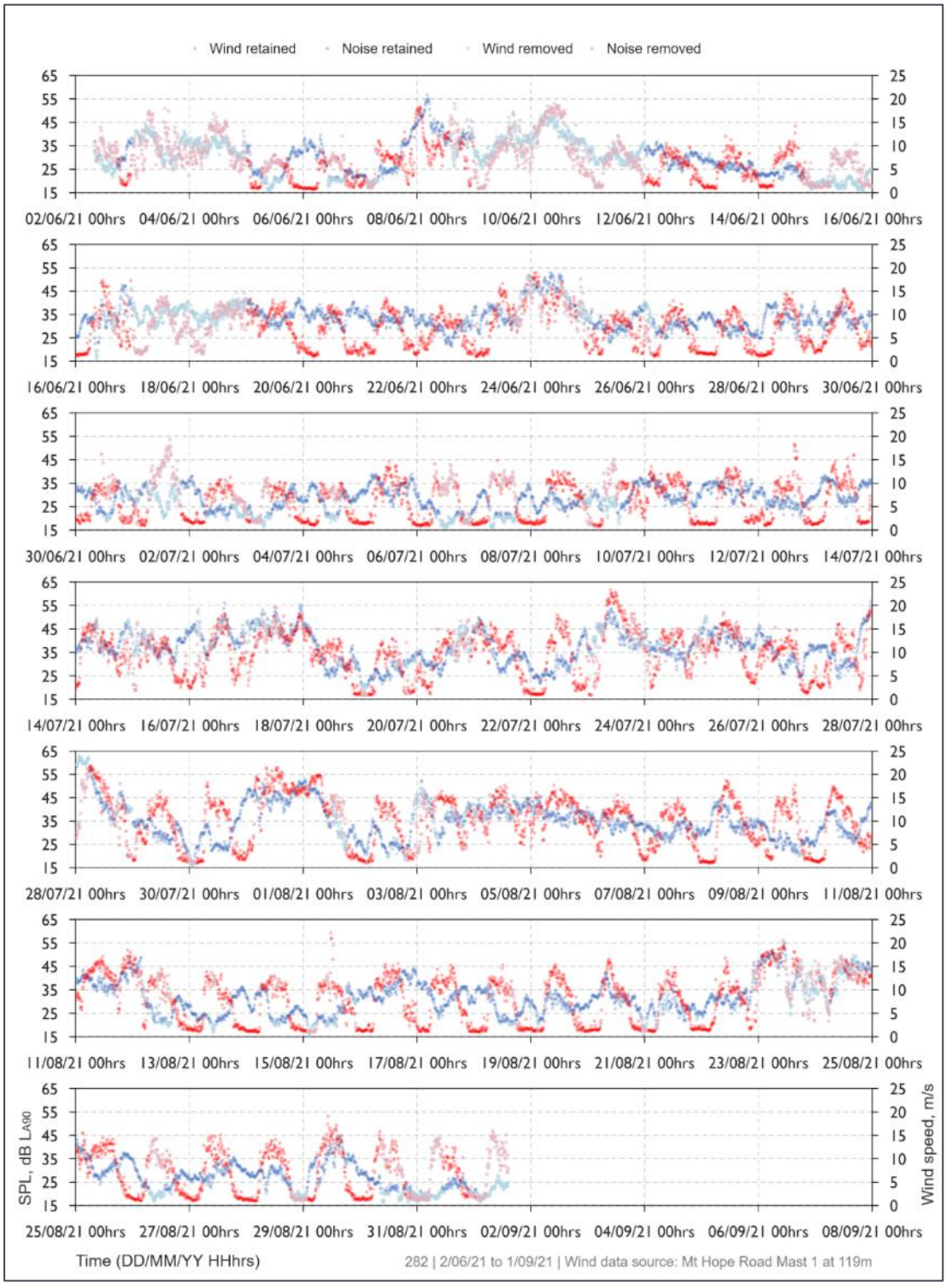
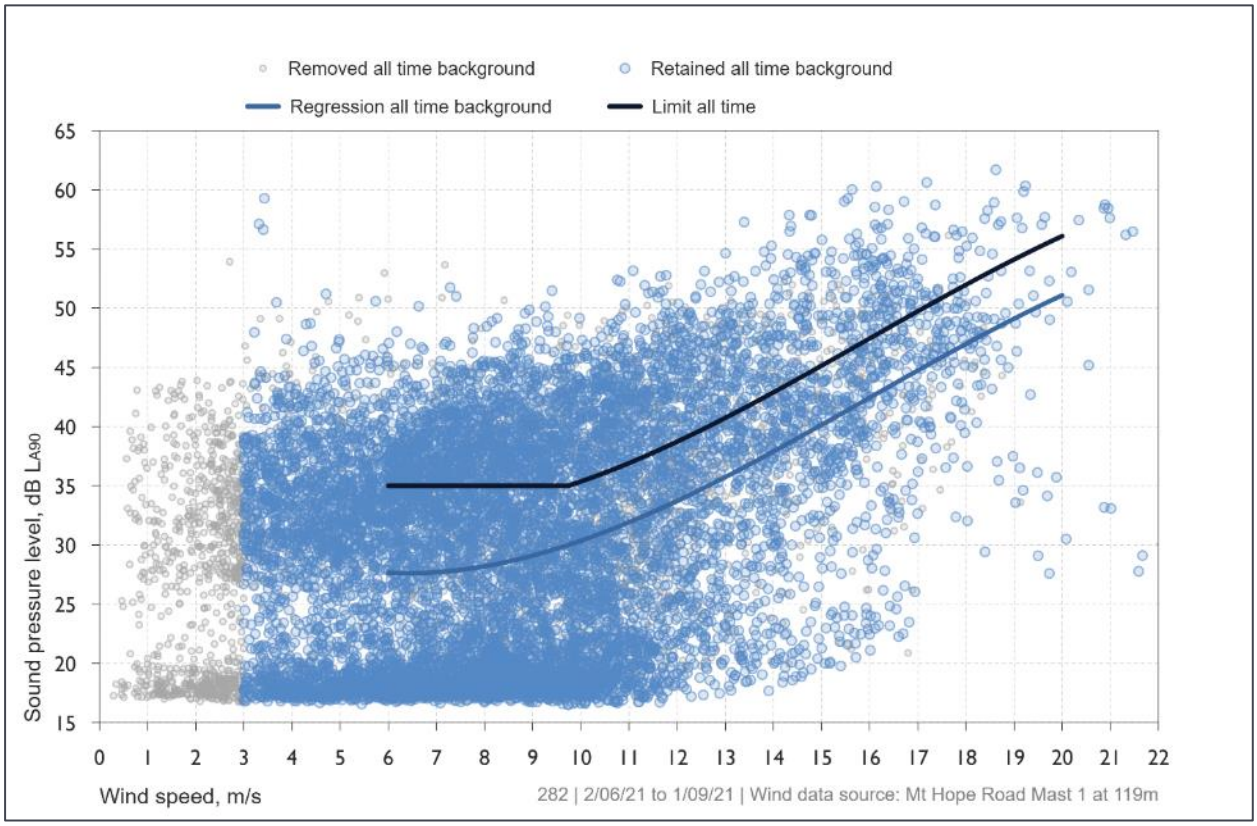


**Figure 23: Receiver 282 – derived background noise levels and noise limits**



# APPENDIX R RECEIVER 314 DATA

## R1 Receiver 314 location data

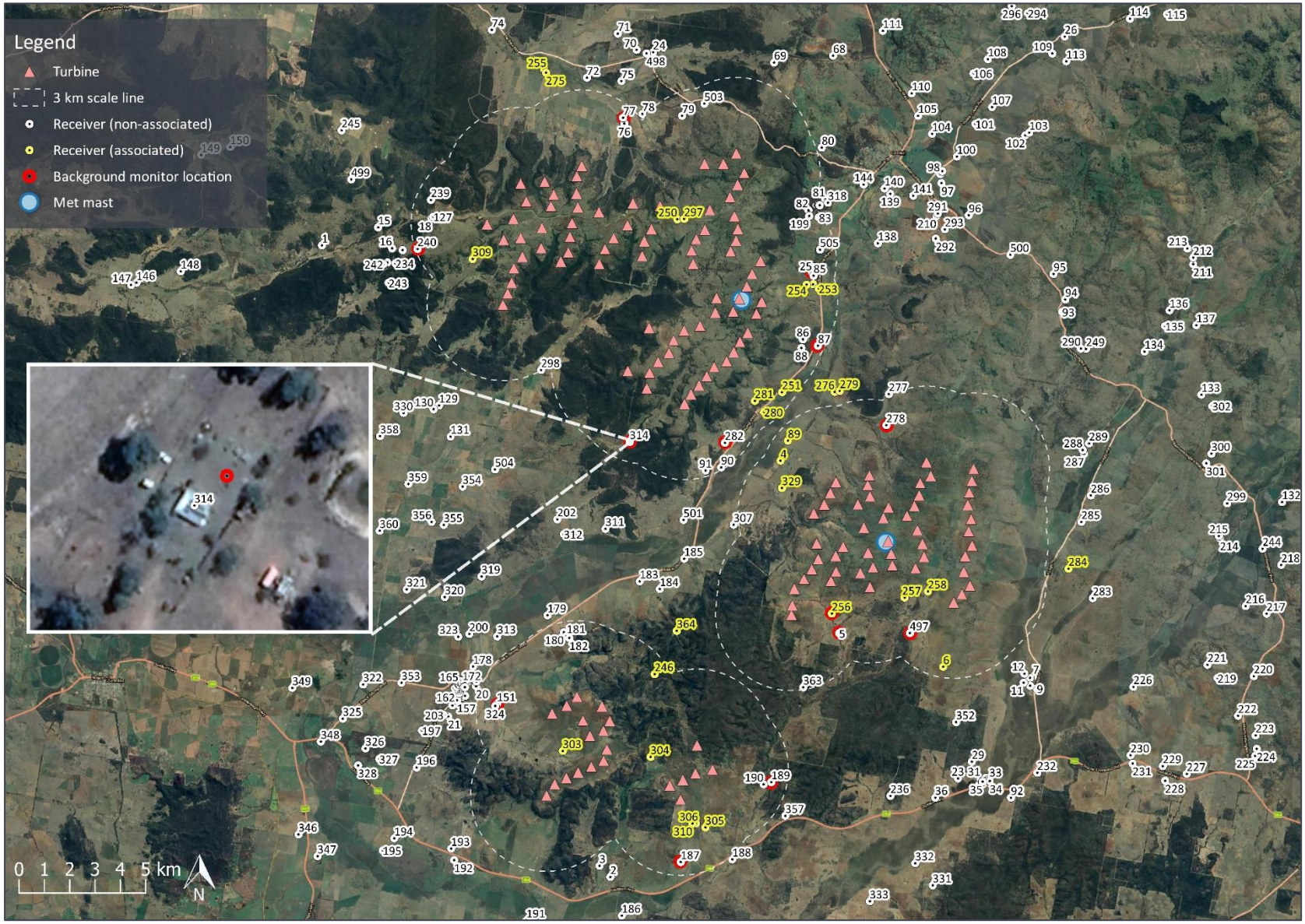
**Table 58: Receiver 314 dwelling and noise monitor coordinates – GDA 2020 Zone 55**

| Location | Easting, m | Northing, m |
|---|---|---|
| Dwelling location | 747,146 | 6,464,576 |
| Background noise monitoring location | 747,157 | 6,464,586 |

**Table 59: Receiver 314 monitor installation photos**

| | |
|---|---|
| Looking North | Looking East |
|  |  |
| Looking South | Looking West |
|  |  |

**Table 60: Receiver 314 aerial view - dwelling and noise monitor location**



## R2 Receiver 314 measurement data summary

**Table 61: Receiver 314 background noise level analysis summary**

| Item | Data point count |
|---|---|
| Number of data points collected | 12,622 |
| Number of data points removed | 2,713 |
| Number of data points for analysis (worst case wind direction) | 9,909 (3,398) |

**Figure 24: Receiver 314 background noise level and wind speed time history**

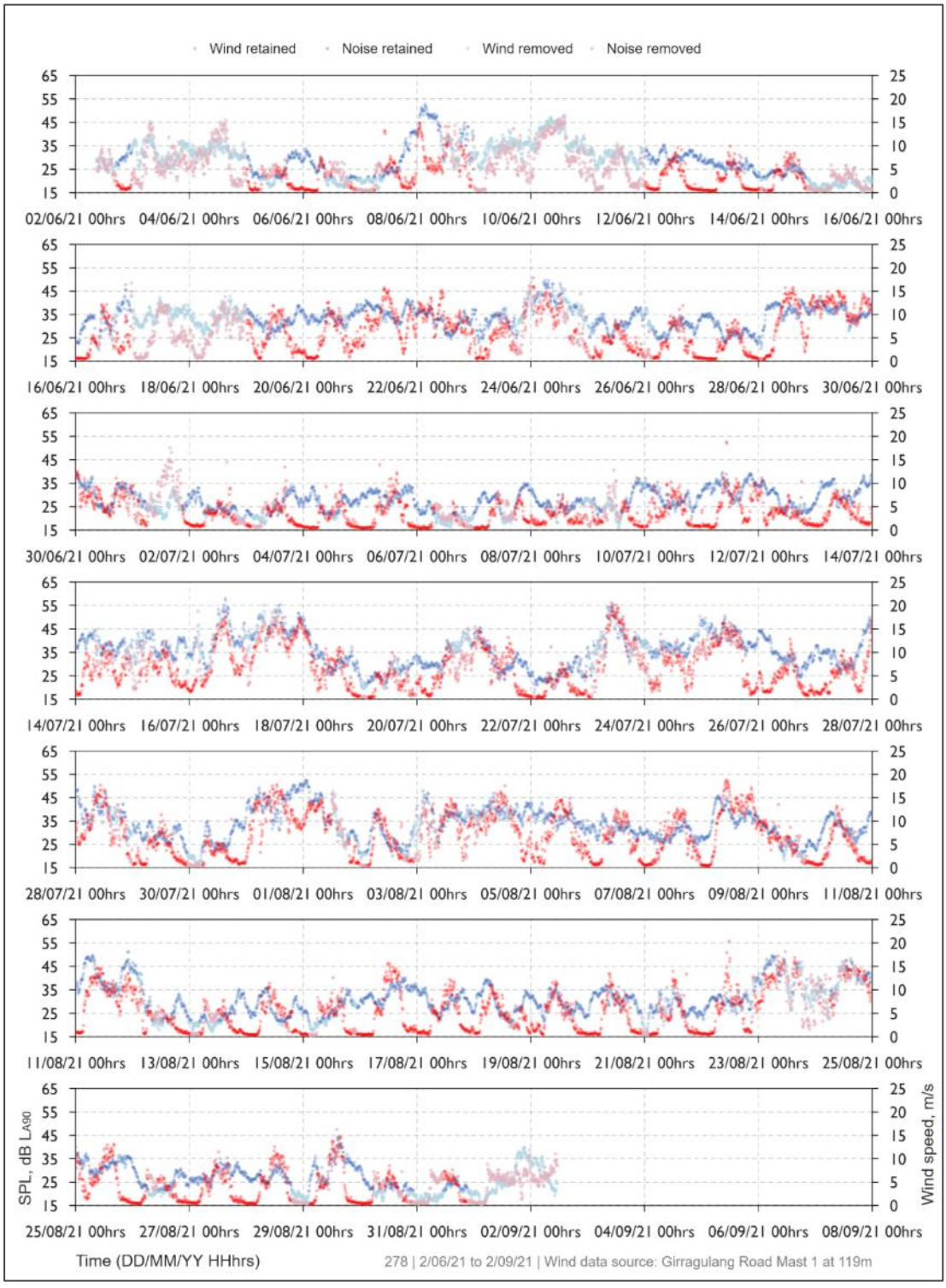
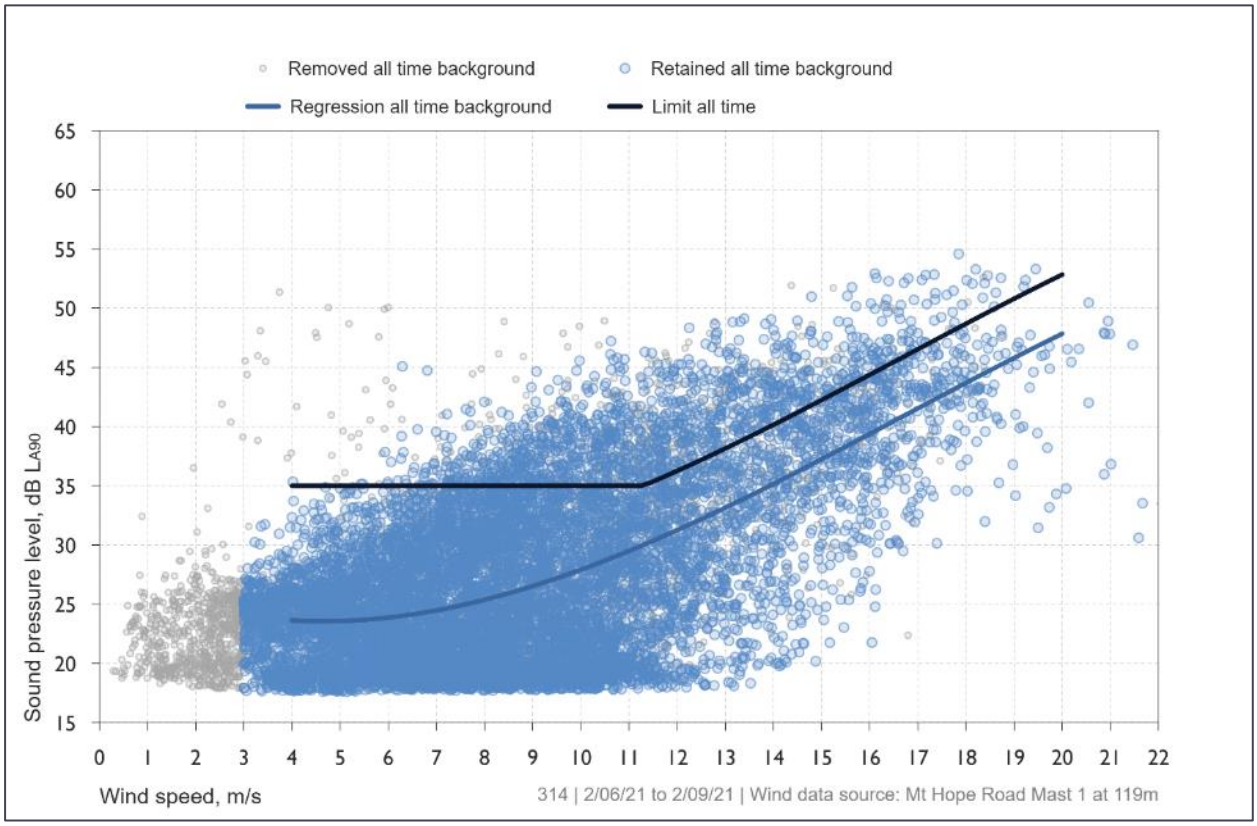


**Figure 25: Receiver 314 – derived background noise levels and noise limits**



# APPENDIX S RECEIVER 497 DATA

## S1 Receiver 497 location data

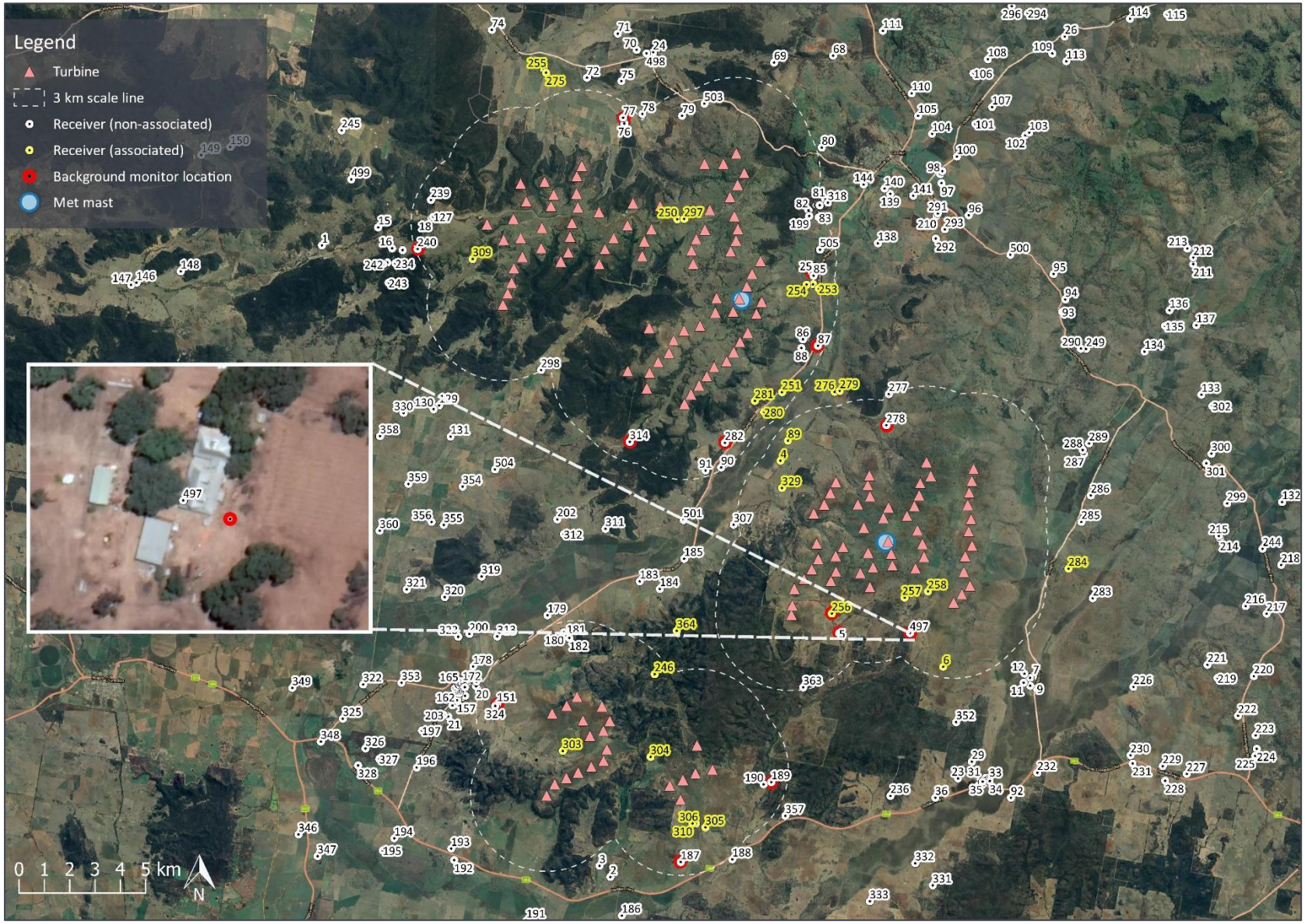
**Table 62: Receiver 497 dwelling and noise monitor coordinates – GDA 2020 Zone 55**

| Location | Easting, m | Northing, m |
|---|---|---|
| Dwelling location | 758,215 | 6,457,021 |
| Background noise monitoring location | 758,231 | 6,457,015 |

**Table 63: Receiver 497 monitor installation photos**

| Looking North | Looking East |
|---|---|
|  |  |
| **Looking South** | **Looking West** |
|  |  |

**Table 64: Receiver 497 aerial view - dwelling and noise monitor location**



## S2 Receiver 497 measurement data summary

**Table 65: Receiver 497 background noise level analysis summary**

| Item | Data point count |
|---|---|
| Number of data points collected | 12,831 |
| Number of data points removed | 2,673 |
| Number of data points for analysis (worst case wind direction) | 10,158 (1,027) |

**Figure 26: Receiver 497 background noise level and wind speed time history**

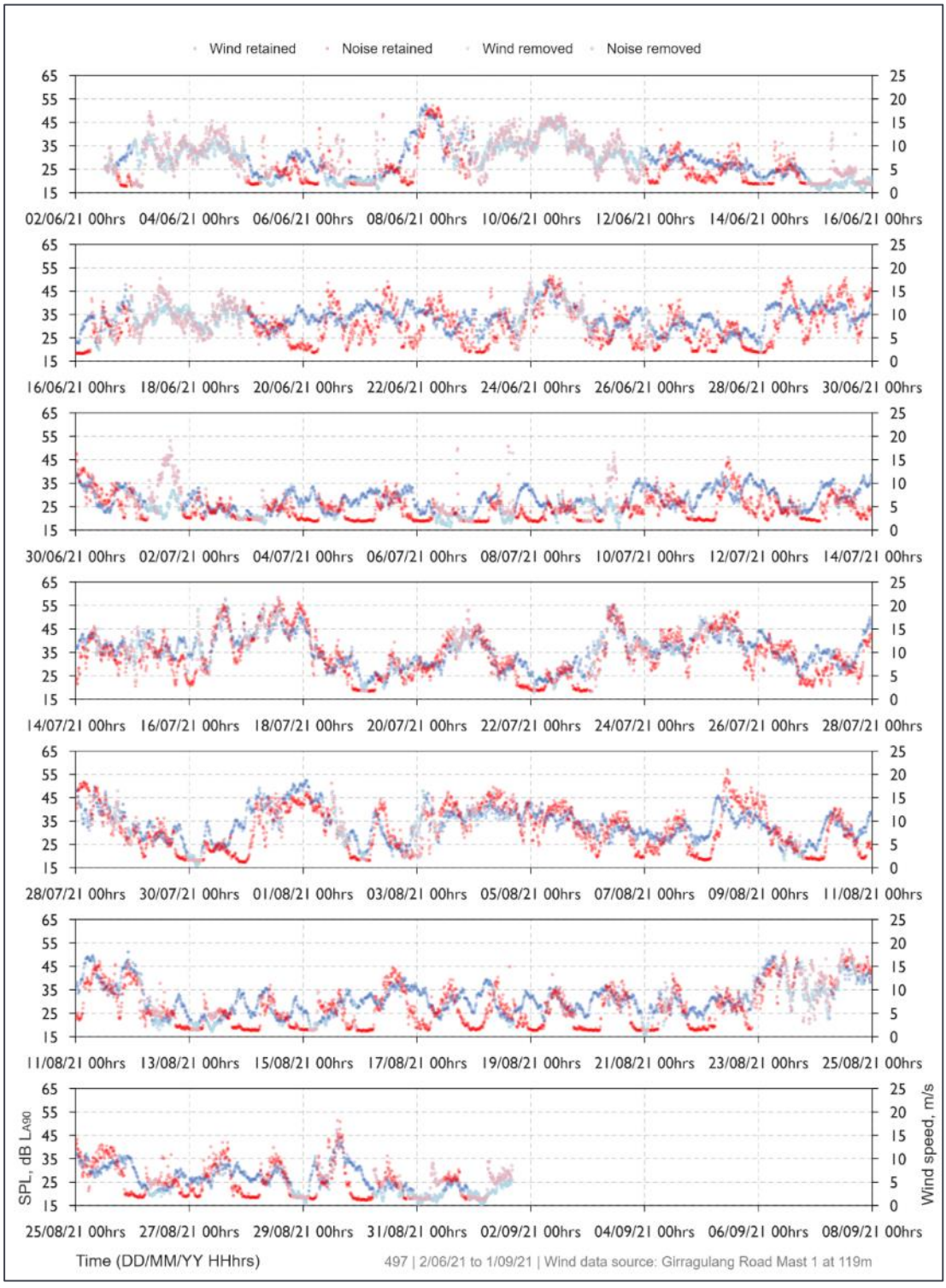


**Figure 27: Receiver 497 – derived background noise levels and noise limits**