RYE PARK WIND FARM

Noise Management Plan

Development Consent State Significant Development: 6693

April 2023

sonus.

renewables

Rye Park Wind Farm

Document Title: Noise Management Plan (External)

Revision: Rev C

Date: 24 April 2023

Document History and Status

Revision	Date	Description	Prepared by	Reviewed by	Approved
Rev A	November 2022	Draft for regulatory review	C. Turnbull (Sonus)	J. Turner (Sonus) J. Beckett (Tilt Renewables)	J. Shuker (Tilt Renewables)
Rev B	March 2023	Response to regulatory review	C. Turnbull (Sonus)	J. Beckett (Tilt Renewables)	J. Shuker (Tilt Renewables)
Rev C	April 2023	Response to regulatory review	C. Turnbull (Sonus)	J. Beckett (Tilt Renewables)	J. Shuker (Tilt Renewables)

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Department of Planning and Environment

Our ref: SSD-6693-PA-77

Jack Shuker
Project Director
Rye Park Renewable Energy Pty Ltd
By email

26/04/2023

Subject: Rye Park Wind Farm Noise Management Plan

Dear Mr Shuker

I refer to the Noise Management Plan submitted in accordance with condition 13, Schedule 3 of the consent for the Rye Park Wind Farm project (SSD-6693). I also acknowledge your response to the Department's review comments and request for additional information.

The Department has carefully reviewed the document and is satisfied that it provides sufficient detail to meet the requirements of condition 13 of Schedule 3.

Accordingly, as nominee of the Planning Secretary, I approve the Noise Management Plan (rev C, dated 24 April 2023).

You are reminded that if there are any inconsistencies between the Noise Management Plan and the conditions of approval, the conditions prevail.

Please ensure you make the document publicly available on the project website at the earliest convenience.

If you wish to discuss the matter further, please contact Anthony Ko on 8217 2022 or at anthony.ko@planning.nsw.gov.au.

Yours sincerely

Nicole Brewer
Director
Energy Assessments

As nominee of the Planning Secretary

Contents

Acronyms, Abbreviations and Definitions

A weighting	Frequency adjustment representing the response of the human ear
Associated Residences	Residences included in a commercial agreement with the wind farm
Background Noise	Noise in the absence of the wind turbines determined by monitoring conducted prior to the operation of the wind turbines
C weighting	Frequency adjustment which places emphasis on the low frequency range
Critical Non-associated Residences	Residences used to demonstrate compliance with the NSW Bulletin. The residences are selected based on having the highest predicted noise level in a range of directions around the wind farm. Compliance at these residences demonstrates compliance at all Non-associated Residences.
dB(A)	A weighted noise level measured in decibels
dB(C)	C weighted noise level measured in decibels
The Department	Department of Planning and Environment (NSW)
The Developer	Rye Park Renewable Energy Pty Ltd (ABN 34 601 541 931 23)
The Development	the Rye Park Wind Farm
Development Consent	Development Consent SSD 6693 granted for the Development under the *Environmental Planning and Assessment Act 1979* for up to 77 wind turbines with a 200 m tip height
EPA	NSW Environment Protection Authority
EPBC Approval	EPBC 2020/8837 granted for the Action under the EPBC Act
IEC61400-11 Ed3.1	IEC Standard 61400:2012/AMD1:2018/COR1:2019 Wind Turbines Part 11: Acoustic Noise Measurement Techniques
Intermediate Graph	The graph based on correlation of the Intermediate Position noise level minus the Propagation Loss against the hub height wind speed
Intermediate Position	A sound level meter location between the wind turbines and a Residential Logging Location. The Intermediate Position will be selected to minimise noise from sources other than the wind turbines (such as wind in trees and road traffic). The Intermediate Position will be located within 30° of the line between the Residential Logging Location and the closest wind turbine
kV	kilovolt
L_{A90}	The A weighted sound pressure level that is exceeded for 90 per cent of the time over which a given sound is measured
L_{Aeq}	The A weighted equivalent continuous noise level – the energy-average of noise levels occurring over a measurement period
L_{C90}	The C weighted sound pressure level that is exceeded for 90 per cent of the time over which a given sound is measured
Near Field Position	A sound level meter location near a representative turbine for the purpose of determining the character of the noise from the turbines and enabling noise from other sources to be excluded from the measured noise at Residential Logging Locations

NMP	Noise Management Plan (this document), which provides the procedure for determination of compliance with the Development Consent and the NSW Bulletin
Non-associated Residences	Residences not included in a commercial agreement with the wind farm
NSW Bulletin	*Wind Energy: Noise Assessment Bulletin – For State significant wind energy development* December 2016
MW	megawatt
Post-Construction Noise Monitoring	Noise monitoring conducted during the operation of the wind turbines, which is used to determine the total noise from the wind turbines and other noise sources
Propagation Loss	The reduction in the noise level associated with the wind turbines from the Intermediate Position to the Residential Logging Location
Re-Correlation Graph	The graph based on re-correlation of the noise data at the residential logging location with wind speed after filtering using the Propagation Loss and the Intermediate Position data
Residential Logging Location	A location where noise loggers are placed to represent the noise at Critical Non-associated Residences
SCADA	Supervisory control and data acquisition
Website	Means a set of related web pages located under a single domain name attributed to the Development and available to the public (www.ryeparkwf.com.au)

1 Introduction

The Rye Park Wind Farm (the Development) is located to the west of Rye Park, to the north-west of Yass and south-east of Boorowa, in New South Wales (NSW) (refer Figure 1) and is owned by Rye Park Renewable Energy Pty Ltd (the Developer).

Development Consent (SSD 6693) (the Development Consent) was granted by the NSW Planning Assessment Commission (PAC, now known as the Independent Planning Commission) under the *Environmental Planning & Assessment Act 1979* on 22 May 2017, and modification (MOD 1) approved 15 April 2021, subject to conditions.

The Development has also been granted approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC 2020/8837) on 1 June 2021, subject to conditions (EPBC Approval). The EPBC Approval was subsequently varied, with the variation application being approved on 30 June 2022.

This Noise Management Plan (NMP) has been prepared for the Development in accordance with Schedule 3, Condition 13 of the Development Consent, which requires the Developer to manage noise emissions from the operation of the Development to the satisfaction of the Planning Secretary.

The Development will be carried out generally in accordance with the Environmental Impact Statement and the Development Consent as per Schedule 2, Condition 2 of the Development Consent. All conditions listed within Development Consent will be adhered to and implemented throughout the life of the Development.

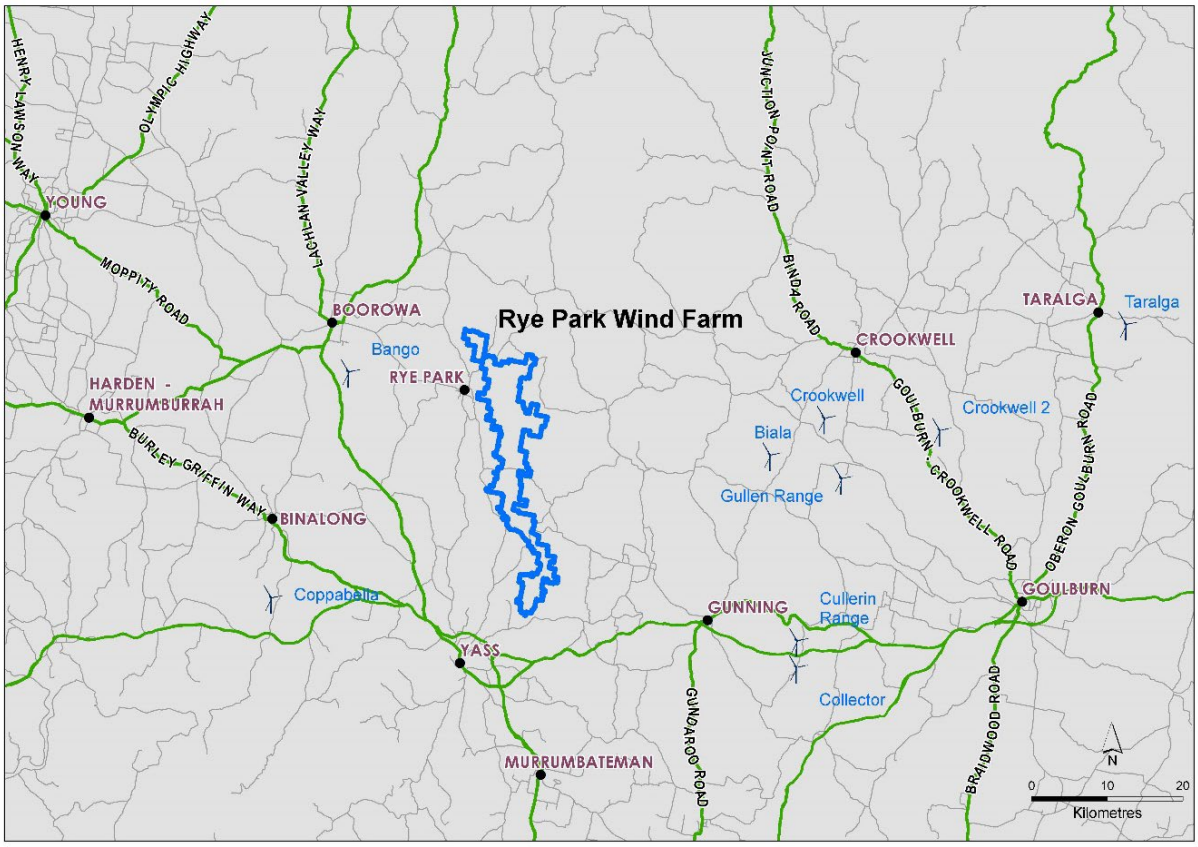

Figure 1: Development Location

1.1 Overview of the Development

The main components of the Development are as follows:

- 66 wind turbines, each with:
    - a capacity to generate up to approximately 6 MW
    - three blades mounted on a tubular steel tower, with a combined height of blade and tower limited to a maximum tip height of 200 metres
    - crane hardstand area, and related turbine lay down area.
- A new 33 kV wind farm collection substation in the northern section of the Project site.
- A new 330 kV wind farm connection substation located adjacent to the existing TransGrid 330 kV transmission line in the southern section of the Project site.
- A temporary construction compound at the northern section of the Project site.
- A temporary construction compound to facilitate the upgrades on the TransGrid owned existing 330kV Transmission Line at the southern section of the Project site.
- A new overhead powerline approximately 30km in length, rated at up to 330 kV (nominal) capacity, running north-south along the length of the wind farm between the two substations. The powerline will be mounted on a single pole type structure and will either be single-circuit or double-circuit as required.
- Underground and overhead 33 kV electrical cabling linking the wind turbines to the on-site collection substations and connection substation.
- Operation and maintenance facility incorporating a control room and equipment storage at the northern section of the Project site.
- Temporary concrete batching plants and construction facilities.
- Access tracks required for each wind turbine and the related ancillary facilities above.
- Minor upgrades to local roads, as required for the delivery of the wind turbines.
- Three temporary meteorological masts and two permanent monitoring masts for wind speed verification, weather and general monitoring purposes. The permanent monitoring masts may be either static guyed or un-guyed structures and will be to a minimum height of the wind turbine hubs (119m).

The general location of the development is shown on Figure 1.

The Development will include three key phases, including construction, operations and decommissioning. The Development will be constructed in a single stage[1] and is expected to have an operational life of 25-30 years.

1.2 Final layout

The pre-construction final layout is shown on the Final Layout Plans prepared in accordance with Schedule 2, Condition 10 of the Development Consent and Condition 12 of EPBC 2020/8837.

[1] The Development will be constructed in its entirety including pre-construction and construction activities with the commencement of wind farm construction activities sequenced in stages, triggered by the completion of relevant road upgrades. Details of the construction sequencing are contained within the Rye Park Wind Farm Staging Report.

The final layout has been submitted to the relevant departments, and will be available on the Development's website (www.ryeparkwf.com.au), including:

- details on the micro-siting of any wind turbines and/or ancillary infrastructure; and
- the GPS coordinates of the wind turbines.

The developed layout will continue to be refined through the detailed design / construction stages. Whilst significant changes are not expected, it is noted that micro-siting of the wind turbines is permitted under Schedule 2, Condition 8 of the Development Consent and the conditions of the EPBC Approval. The construction and commissioning of the wind turbines will be undertaken as a single phase of development without staging of the Development.

The micro-siting undertaken through construction must consider a range of requirements, including that it will not result in any non-compliance with the conditions of consent/approval (e.g., that it does not exceed the limits on biodiversity impacts), further detail on this process is contained in the Biodiversity Management Plan.

Prior to the commencement of operations (or following any upgrades of any wind turbines or ancillary infrastructure), work as executed plans / completed showing the comparison to the pre-construction final layout will be prepared in accordance with Schedule 5, Condition 6 of the Development Consent and Condition 5 of the EPBC Approval, will be submitted to the relevant departments, and will be available on the Development's website.

1.3 Purpose

The NMP provides the proposed procedure for determination of compliance with the operational noise criteria for the Development, in accordance with the relevant Conditions of the Development Consent. A checklist of where each requirement of the Development Consent has been addressed within this document is presented in Table 1.

Table 1: Relevant Development Consent Conditions

Condition	Requirement	Where addressed in the NMP
Schedule 3, Condition 11 (Operational Noise Criteria – Wind Turbines)	The Applicant must ensure that the noise generated by the operation of wind turbines does not exceed the higher of 35 dB(A) or the existing background noise level ($L_{A90\ (10\ minute)}$) plus 5 dB(A) for each integer wind speed, measured at hub height, from cut-in to rated turbine generator power, at any non-associated residence. Noise generated by the operation of the wind turbines is to be measured in accordance with the relevant requirements of the Department's Wind Energy: Noise Assessment Bulletin (2016) (or its latest version). The noise generated by the operation of the wind turbines must also be adjusted for tonality and low frequency noise in accordance with the Department's Wind Energy: Noise Assessment Bulletin (2016) (or its latest version). However, these criteria do not apply if the Applicant has an agreement with the relevant owner/s of these residences to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.	Criteria specified in Section 4 and Appendix A

Condition	Requirement	Where addressed in the NMP
Schedule 3, Condition 12 (Operational Noise Criteria – Ancillary Infrastructure)	The Applicant must ensure that the noise generated by the operation of ancillary infrastructure does not exceed 35 dB(A) $L_{Aeq(15\ minute)}$ at any non-associated residence. Noise generated by the development is to be measured in accordance with the relevant requirements of the Noise Policy for Industry (2017) (or its equivalent).	Section 6.7
Schedule 3, Condition 13 (Noise Management Plan)	Prior to commissioning of the turbines, the Proponent must prepare a Noise Management Plan to manage noise emissions from the operation of the development, to the satisfaction of the Planning Secretary. The Plan must include:	This NMP
	a) compliance monitoring within 3 months of operations, or the commencement of operation of a cluster of turbines if the development is to be staged, unless the Planning Secretary agrees otherwise, in accordance with the Department's Wind Energy: Noise Assessment Bulletin (2016) (or its latest version) to determine whether the development is complying with the relevant conditions of this consent;	Section 7
	b) description of the parameters and meteorological conditions which trigger the use of noise management mode and sector management;	Section 2
	c) an auditable process that compliance can be independently confirmed for the use of noise management mode and sector management;	Section 2
	d) procedures and corrective actions to be undertaken if non-compliance is detected;	Section 8
	e) provision of a copy of the compliance monitoring results to the Secretary and the EPA.	Section 7
Schedule 3, Condition 14 (Noise Management Plan)	Following the Planning Secretary's approval, the Applicant must implement the measures described in the Noise Management Plan.	N/A

These criteria outlined in the Development Consent (refer to Table 1) are based on the *New South Wales Wind Energy: Noise Assessment Bulletin for State significant wind energy development December 2016* (the NSW Bulletin), which relates to noise at Non-associated Residences.

The NMP has been designed to overcome the inherent difficulty of measuring noise from the wind turbines in the presence of noise (often higher in level) from other sources, such as wind in trees, insects, and the nearby Bango Wind Farm. This will be achieved by measuring the noise in the near field and at intermediate distances and using the measured level and character to assist in isolating the noise contribution of the Development.

2 Predicted noise levels and noise management modes

An Environmental Noise Assessment was conducted by Sonus in June 2021 (Sonus, 2021a). This assessment included predictions (the Predictions) of the noise from the pre-construction final layout as shown on the Final Layout Plans. Figure 2 and Figure 3 illustrate the proposed layout, residences in the vicinity and the predicted noise level contours for the wind speeds resulting in the highest noise levels, without any curtailment.

The noise predictions indicate that a curtailment strategy may be required to achieve the project criteria. A curtailment strategy involves operating particular turbines in a reduced noise mode under specific meteorological conditions. These reduced noise modes are designed to reduce noise but also result in reduced power output. The turbines required to operate in reduced noise mode and the mode required for specific meteorological conditions are summarised in Table 2 and Table 3.

Table 2: Curtailment Strategy

Turbine	Start Mitigation Wind Direction	End Mitigation Wind Direction	Turbine Operation Mode for hub height wind speed		
			8 m/s	9 m/s	10 m/s
A02	105	275	PO6000	SO3	SO2
A03	105	275	SO3	SO4	SO3
A04	105	275	PO6000	SO4	SO3
A05	105	275	PO6000	SO2	PO6000
B05	105	275	PO6000	SO3	SO2
B13	105	275	PO6000	SO2	PO6000
B14	105	275	PO6000	SO3	SO2
B15	105	275	PO6000	SO3	SO2

Table 3: Vestas V162 6.0MW Sound Power Levels: Noise Reduced Modes

SWL (dB(A)) for each Noise Reduced Mode	Hub Height Wind Speed (m/s)									
	3	4	5	6	7	8	9	10	11	12
PO6000 (Normal Mode)	93.9	94.1	94.3	96.2	99.2	102	104.1	104.3	104.3	104.3
SO2	93.5	93.7	94.3	97.3	100.2	102	102	102	102	102
SO3	93.5	93.7	94.3	97.3	100.2	101	101	101	101	101
SO4	93.5	93.7	94.3	97.3	99.7	100	100	100	100	100

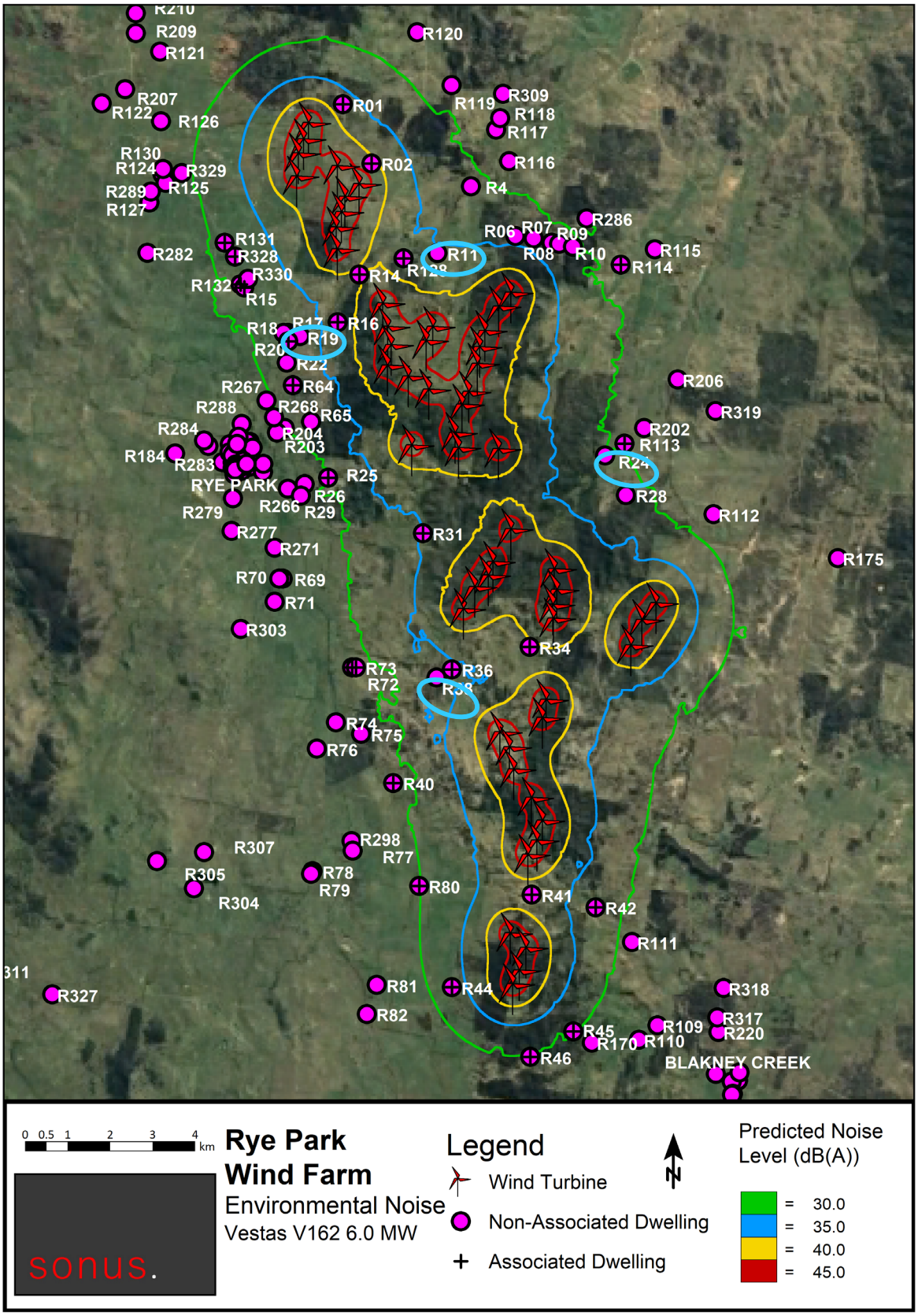

Figure 2: Predicted noise levels and Critical Non-associated Residences (North)

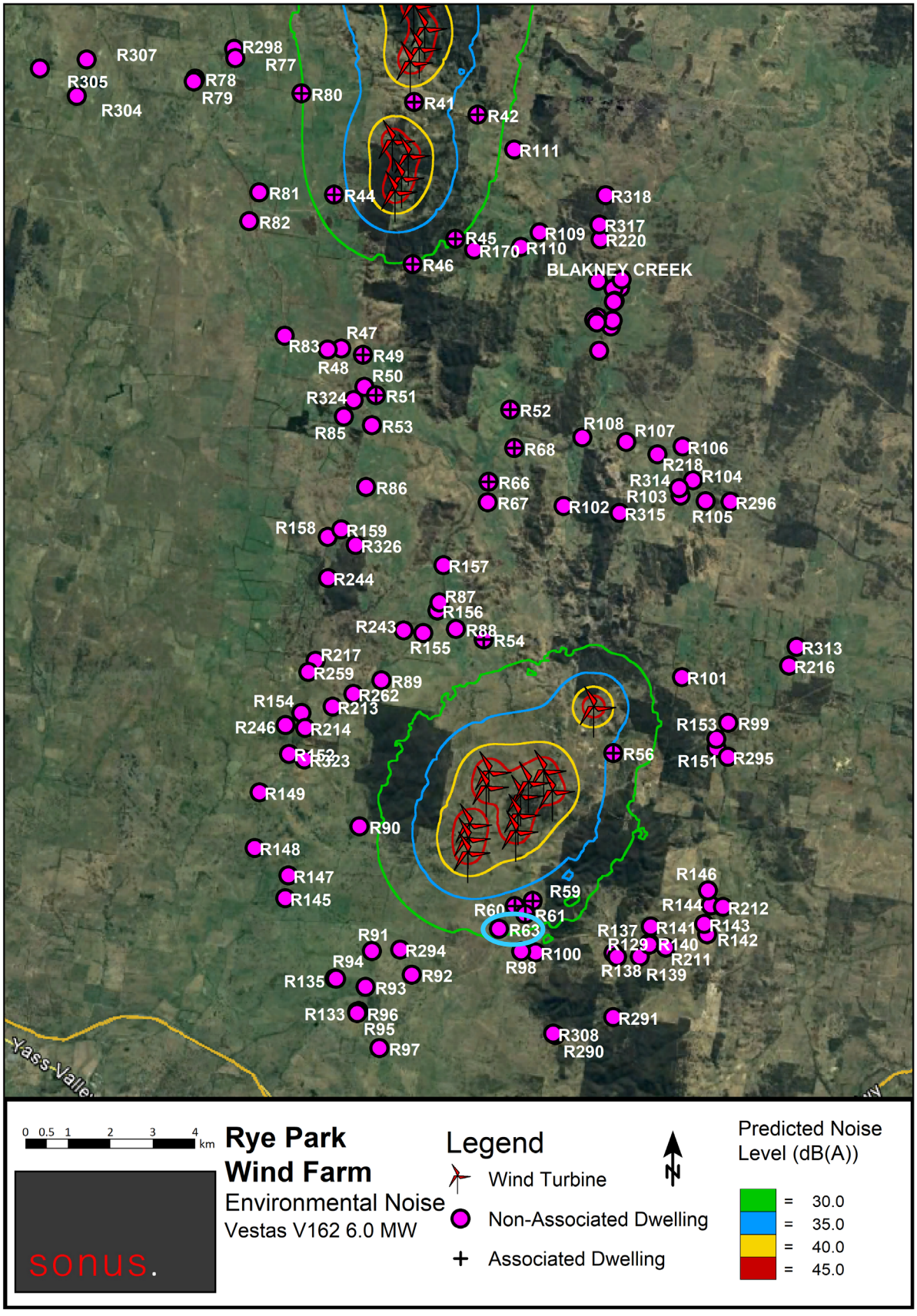

Figure 3: Predicted noise levels and Critical Non-associated Residences (South)

As the curtailment strategy described above will result in reduced power output, it will be important that the continuing operation of the curtailment strategy can be confirmed following the compliance monitoring. It is proposed that the verification of the modes of operation be conducted as follows:

A summary of control settings for each turbine, including details of noise reduced modes of operation, is available when each turbine is commissioned. This summary will be made available to the Planning Secretary and the NSW Environment Protection Authority (EPA) on request following commissioning of the wind turbines of during the operation of the wind farm. The summary will include details of the relevant ambient conditions under which noise reduced modes of operation are applied to each turbine including wind speed and direction.

In addition, an alternative monitoring location (Easting 677726, Northing 6183358) on public land has been identified to allow a short-term measurement to be made in the vicinity of the curtailed turbines. The location is along Grassy Creek Road near Perks Road, at a site access point to the wind farm (Site Access 2) and is shown in Figure 4. The predicted noise level at this location is 5 dB(A) higher than at R11, the most marginally compliant residence. Therefore, where the contribution of noise from the wind farm at this location is no greater than the levels detailed in Table 4 (5 dB(A) higher than the R11 criteria), the noise modelling indicates that the wind farm will comply with the criteria at Residence R11.

Table 4: Alternative Measurement Location Criteria

Hub height wind speed (m/s)	4	5	6	7	8	9	10
Criteria	40 dB(A)	40 dB(A)	40 dB(A)	40 dB(A)	40 dB(A)	40 dB(A)	41 dB(A)

Figure 4: Alternative Measurement Location

3 Residential noise logging locations

An Environmental Noise Assessment was conducted by Sonus in June 2021 (Sonus, 2021a). This assessment included predictions (the Predictions) of the noise from the pre-construction final layout as shown on the Final Layout Plans. From the Predictions, it is considered that the Critical Non-associated Residences are:

- R11;
- R19;
- R24;
- R38; and
- R63.

Compliance at these residences will demonstrate overall compliance of the wind turbines with the relevant noise criteria.

Figure 2 and Figure 3 illustrate the proposed layout, residences in the vicinity and the predicted noise level contours for the wind speeds resulting in the highest noise levels, without any curtailment. The Critical Non-associated Residences have been circled in blue for reference in Figure 2 and Figure 3.

The selected Critical Non-Associated Residences may be modified for a range of reasons. These include:

- Permission to conduct noise logging not being granted by the landowners at these locations; or
- Changes to the status of residences (e.g. Non-associated Residences becoming an Associated Residence).

It is understood that access to R24 is unlikely to be available, based on experience with previous noise logging attempts. Therefore, it is proposed that R113 be used, with the noise logger positioned on the R113 property at a proxy position for the R24 dwelling as shown in Figure 5.

Figure 5: R24 Proxy Position on R113 Property

4 Criteria for Critical Non-associated Residences

In accordance with the NSW Bulletin and Condition 11 of the Development Consent, the noise from the wind turbines, when adjusted for tonality and low frequency noise, must not exceed 35 dB(A) or the background noise ($L_{A90(10\ minute)}$) by more than 5 dB(A), whichever is the greater, at all relevant receivers for integer wind speeds from cut-in to rated power.

The background noise levels and associated criteria are detailed in the Rye Park Wind Farm Background Noise Monitoring Report (Sonus, 2021), which is attached as Appendix A and summarised below in Table 5.

Table 5: Noise criteria summary

Residence locations	Hub height wind speed (m/s)									
	3	4	5	6	7	8	9	10	11	12
R01, R02, R114, R14, R16, R20, R64, R25, R31, R34, R36, R72, R73, R41, R42, R44, R45, R46, R49, R51, R52, R66, R68, R54, R56, R60, R59, R61, R40, R80, R128, R15, R131, R132, R328, R113	45	45	45	45	45	45	45	45	45	45
R117, R118, R119, R120, R309	35	35	35	35	35	35	36	38	40	42
R04, R06, R07, R08, R09, R10, R115, R116, R286, R67, R102, R103, R104, R105, R106, R107, R108, R218, R296, R314, R315, Blakney Creek Township	35	35	35	35	35	35	35	35	36	37
R11	35	35	35	35	35	35	35	36	40	44
R17, R18	35	35	35	35	35	36	38	39	41	42
R19, R22, R267, R268, R288	36	36	36	36	36	37	37	38	39	40
R26, R29, R65, R69, R70, R71, R184, R192, R203, R204, R266, R271, R277, R279, R283, R284, R303, Rye Park Township, R24, R28, R112, R175, R202, R206, R319	35	35	35	35	35	35	35	35	35	35
R38, R74, R75, R76	35	35	35	35	35	35	38	41	45	49
R111	35	35	35	35	35	35	35	35	35	36
R81, R82	35	35	35	35	35	35	35	35	35	37
R109, R110, R170, R220, R317, R318	35	35	35	35	35	35	35	35	36	41
R47, R48, R83, R50, R53, R85, R86, R158, R159, R324, R326	35	35	35	35	35	35	35	36	37	39
R87, R88, R89, R149, R152, R154, R155, R156, R157, R213, R214, R217, R243, R244, R246, R259, R262, R323	35	36	37	38	38	39	40	41	43	45
R99, R101, R144, R146, R151, R153, R212, R216, R295, R313	35	35	35	35	35	35	35	36	38	40
R63, R90, R91, R92, R93, R94, R95, R96, R97, R98, R100, R129, R133, R135, R137, R138, R139, R140, R141, R142, R143, R145, R147, R148, R211, R290, R291, R294, R308	35	35	35	35	35	35	36	39	41	45
R77, R78, R79, R298, R304, R305, R307, R311, R327	35	35	35	35	35	37	38	40	41	43
R121, R122, R124, R125, R126, R127, R130, R207, R209, R210, R282, R289, R329, R330	37	37	38	38	39	40	41	42	43	45

5 Near field and intermediate testing

Near field and intermediate testing is proposed for the purpose of determining the character of the noise from the turbines and enabling noise from other sources to be excluded from the measured noise at Residential Logging Locations.

5.1 Near field

The NSW Bulletin includes requirements for tonality. The tonality calculation will be conducted in accordance with the NSW Bulletin for representative time periods at each integer wind speed. The tonality assessment will be used to assist in determining the wind speeds and frequencies of potential tones at Residential Logging Locations.

In addition, the measured sound pressure levels will be used to determine the wind speed at which the highest noise level is emitted from the turbines. If the noise at Residential Logging Locations continues to increase at wind speeds above the wind speed of highest noise emission, this will indicate that the noise is from sources other than the turbines (most commonly wind in trees for high wind speed conditions).

Near field measurements will be conducted in a similar way to IEC61400-11 Edition 3.1 at a representative turbine. The purpose of IEC61400-11 Ed3.1 is to determine the sound power level of each turbine and therefore the noise of other turbines needs to be excluded by turning off other turbines in the vicinity.

The NMP utilises IEC61400-11 Ed3.1 as the framework for the near field measurements but with the purpose to determine the presence of tonality and the wind speed of highest emitted noise level (rather than the sound power level). In such a circumstance, the method of IEC61400-11 Ed3.1 may be modified (if desired) to have all turbines continuing to operate during the near field measurements.

5.2 Intermediate

Loggers will be placed at Intermediate Positions between the turbines and Residential Logging Locations (refer to Section 3). These loggers will operate at the same time as the residential loggers and will assist in determining the contribution of noise from the wind turbines as well as providing a calibration point to validate noise modelling.

The Intermediate Positions will be located within 30 degrees of the line between the Residential Logging Location and the closest wind turbine.

6 Residential logging

The near field and intermediate test data will be used to support the following regime.

6.1 Locations

Compliance testing will be conducted at the Residential Logging Locations outlined in Section 3. The equipment will be placed at a location which is consistent with the position used for the Background Noise Levels, subject to any changes to the local conditions. Any changes which might result in modified results, such as the construction of structures, change in vegetation or the installation of pumps or air conditioning units, will be documented and the rationale provided for any alternative location.

6.2 Equipment

Sound level meters with a noise floor no greater than 20 dB(A) will be used. The equipment will be either Class 1 or Class 2 sound level meters in accordance with the Australian Standard *AS 1259-1990 Acoustics – Sound Level Meters and IEC 61672.1-2004 Electroacoustics – Sound Level Meters* as relevant.

A double layer wind shield (such as the Rion WS-15) will be used to minimise noise on the microphone. A calibrated reference sound source will be used before and after the compliance testing regime.

6.3 Data

The compliance testing will collect L_{A90} data continuously over 10-minute intervals.

Data filtering will remove time periods:

(i) Affected by rain, hail or wind based on a weather logger placed at a representative location to one of the noise loggers. Data is adversely affected where precipitation occurs in a ten-minute period or where a wind speed at microphone height greater than 5 m/s is exceeded for 90 percent of a 10-minute period;

(ii) When the wind farm is not operating or is not operating in the noise reduced modes described above;

(iii) Considered abnormal, such as during local construction or related to local extraneous noise sources; and

(iv) Where the wind direction is not within 45° either side of the direct line between the nearest wind turbine and the Residential Logging Location (if sufficient data points can be collected using this method).

Further data filtering may remove time periods or frequency content where:

- Noise data collected at a Near Field or Intermediate Position confirms that the source of the noise at a receptor is not from the wind turbines. For example, noise data collected in a particular 10-minute interval at a receptor may be removed if the noise measured in the same period at the Intermediate Position (closer to the turbines) is not sufficiently higher in noise level to represent the Propagation Loss with distance;
- The frequency content of the noise at the receptor is not consistent with the frequency content at the Near Field or Intermediate Position; or
- The noise at a receptor continues to increase as the wind speed increases above the wind speed of highest noise emission (determined from near field testing).

Following data filtering and application of applicable penalties for special audible characteristics (refer to Section 6.5 and 6.6), the remaining noise data for the full monitoring period will be correlated with the corresponding wind speed for each Residential Logging Location. The wind speed will be consistent with the wind speed measurement location used for the Background Noise Logging.

If the Intermediate position has not been used to remove data points, the wind turbine noise contribution at the dwellings (where Background Noise levels were measured) will be derived by logarithmically subtracting the Background Noise curve (from the Pre-Construction Noise Monitoring) from the curve generated by the Post-Construction Noise Monitoring correlation. This procedure is the primary test method.

An example of a wind farm noise contribution line derived from the primary test method is shown in Figure 5.

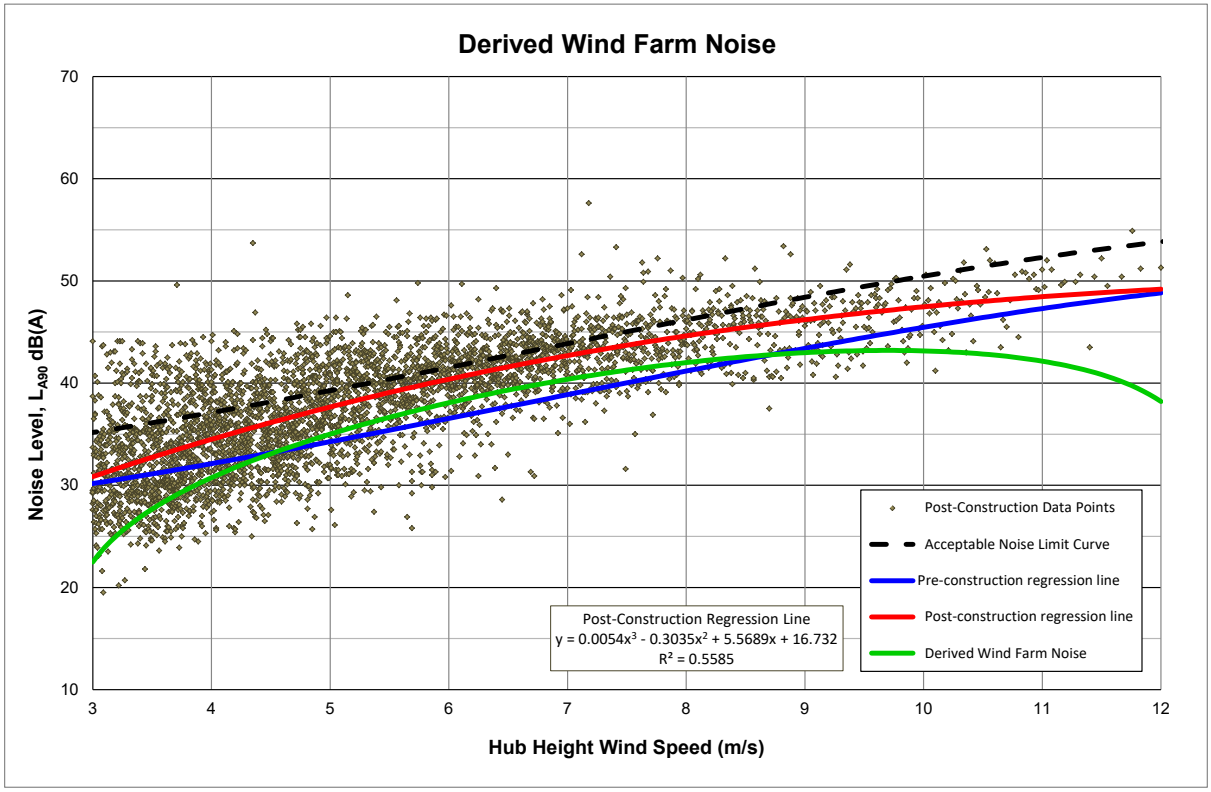

Figure 6: Wind Farm Noise Contribution – Example

Where the regression demonstrates that the criteria are achieved at all wind speeds at all Critical Non associated Residences, the noise from the wind turbines will be deemed to be in compliance with the relevant criteria.

6.4 Supplementary assessments

The primary test method cannot be used in all circumstances to demonstrate compliance. This is primarily related to changes in local conditions or extraneous noise sources when compared to the conditions and noise sources that existed at the time of the pre-construction background noise logging.

Where the regression analysis does not demonstrate compliance, further investigations will be conducted to determine if the recorded noise is from the wind turbines or from another source. The investigation will include the consideration of:

- Noise at Intermediate Positions and/or at locations not affected by other noise sources (such as birds, insects and wind in trees). The consideration will assess whether it is possible that the noise at the Residential Logging Location is from the wind turbines, given the level of noise at the alternative locations. This will include a comparison of the measured noise at the Intermediate Position against the noise model to determine if the noise model can be verified, as well as an assessment of the Propagation Loss between the Intermediate Position and the Residential Logging Location. Where the analysis determines that the excessive noise is from a source other than the wind turbines, the data will be modified according to the extent of interference.

- The shape of the regression curve. Where the noise is dominated by the noise from the wind turbines, the shape of the curve at the residence will be similar to the shape of the curve at the intermediate point or near field location. A different regression curve shape indicates that the noise is from another source. An indication that the noise is not from the wind turbines might occur, for example, where the noise at low wind speeds does not reduce in the same way as the noise from the turbine reduces at low wind speeds. In this circumstance, the noise recorded at residences at low wind speeds will be modified according to the shape of the intermediate or near field curve.

Where the above methods cannot be used to demonstrate compliance, an alternate analysis incorporating *on/off* testing and the intermediate noise logging data will be conducted.

Where conducted, the following methodology will be followed:

- At dwellings (and associated intermediate locations) where the primary test method cannot be used to demonstrate compliance;
- For integer wind speeds where the primary test method cannot be used to demonstrate compliance;
- With the noise monitoring equipment at the same position where the primary test had been conducted, or if that position is considered to be a factor in the inability of the primary test to demonstrate compliance, at an equivalent position with respect to turbine noise at the dwelling, but which has a higher turbine to background noise level ratio (noting that the on/off testing will assist in determining if the primary test position can ultimately be used);
- Conducted under a downwind condition. A downwind condition is defined as the wind direction at the relevant wind mast being within 45 degrees of the direct line from the closest turbine to the dwelling;
- Over a minimum interval of 10 minutes with the wind farm operational and a measurement over the same interval with the wind farm shut off to obtain the background noise level;
- Monitoring the wind speed and direction over the measurement intervals to identify the comparable *on* and *off* measurements;
- Where there is a sufficient difference between the *on* and *off* noise measurements, the contribution of noise from the turbines at the Residential Logging Location and Intermediate Position will be determined by logarithmically subtracting the off measurement from the on measurement;
- The difference between the contribution of noise from the turbines at the Residential Logging Location and Intermediate Position will be deemed the Propagation Loss for the specific wind speed;
- The Propagation Loss will be used for further filtering of the collected noise logger data prior to re-correlation of the noise data with the wind speed (the Re-Correlation Graph). That is, noise data will be removed where the noise level at the dwelling is higher than the corresponding noise at the Intermediate Position less the Propagation Loss. The assessment of compliance for the dwelling will then be made based on the Re-Correlation Graph.
- If the further data filtering (refer to Section 6.3) results in insufficient data for a correlation to be performed, this will demonstrate that the noise at the dwelling is dominated by noise other than the wind turbines. In these circumstances, the noise at the dwelling will be determined as the noise at the Intermediate Position less the Propagation Loss. That is, a correlation will be performed of the noise at the Intermediate Position minus the Propagation Loss with the hub height wind speed (the Intermediate Graph). The assessment of compliance for the dwelling will then be made based on the Intermediate Graph.

The supplementary *on/off* test method cannot be used in all circumstances to determine the Propagation Loss. This would occur where it is not practicable to consistently achieve comparable wind conditions between the *on* and *off* conditions or when there is not a sufficient difference in noise level between the *on* and *off* conditions. In these circumstances, the Propagation Loss will be determined from *on/off* testing at a

lower wind speed, or by measurement at a closer location than the Residential Logging Location and by reference to a noise model. The model shall be consistent with that utilised for the Environmental Noise Assessment conducted by Sonus in June 2021 (Sonus, 2021a)., calibrated against the *on/off* testing as relevant.

6.5 Special audio characteristics – Tonality

Tonality testing at Residential Logging Locations will be conducted if tonality is found in a near field test at any wind speed. The testing will be conducted at all Residential Logging Locations:

- In accordance with the NSW Bulletin;
- For the specific tonal frequencies identified in the near field tests; and
- For each 10-minute period at the wind speeds where tonality was identified in the near field tests.

Where tonality is found in accordance with the above methodology for more than 10 percent for a particular wind speed and there is no evidence that the tone is from a source other than the wind turbines, 5 dB(A) will be added for each wind speed where tonality is identified after correlation with wind speed.

6.6 Special audio characteristics – Low frequency noise

The primary test for low frequency noise will be conducted:

- At R11;
- At the integer wind speed where the predicted noise level is highest;
- Conducted under a downwind condition at night;
- Over a 10-minute interval with the wind farm operational;
- Collecting at least 5 measurement intervals where the wind turbines are audible;
- Comparing the C-weighted L_{90} noise level with the criterion of 60 dB(C);

Where the level is consistently less than 60 dB(C), no adjustment shall be made for low frequency noise and no further low frequency testing shall be made.

A secondary analysis will be conducted if the contribution of the wind turbines to the L_{90} is greater than 60 dB(C) during the primary test and a detailed internal low frequency noise assessment has not been conducted, which demonstrates compliance with the proposed criteria for the assessment of low frequency noise disturbance (DEFRA, 2005) for a steady state noise source.

The secondary test will be conducted at R11 or its Intermediate Position by analysing the measured (or extrapolated by using the Propagation Loss) C-weighted level over the full logging period. Where the occurrence of excessive low frequency noise from the wind turbines is greater than 10 percent for a particular wind speed or period (day or night) (and there is no evidence that the low frequency is from a source other than the wind turbines), 5 dB(A) will be added for each wind speed where low frequency is identified after correlation with wind speed. This increase will be applied to other Non-associated residences (at the same wind speeds), unless there is evidence that the excessive low frequency content is not present at the other residences.

6.7 Auxiliary infrastructure

The noise from the substation will be measured at an intermediate distance between the substation and the closest residence during normal operation. This measured noise level will be extrapolated to the closest Non associated Residence under the meteorological conditions specified in the Noise Policy for Industry (EPA, 2017).

Where the predicted noise level is no greater than 35 dB(A) $L_{Aeq(15\ minute)}$ at any Non-associated Residence (after any adjustment in accordance with the Noise Policy for Industry), the noise from the substation will be deemed to be compliant.

Where the predicted adjusted level is greater than 35 dB(A), further measurements will be conducted and any necessary treatment measures will be applied to achieve a level of 35 dB(A) at the closest Non-associated Residence under the meteorological conditions specified in the Noise Policy for Industry.

7 Testing schedule

Compliance testing of the operational wind turbines and the ancillary infrastructure will commence within 3 months following the commencement of operation of the Development, which does not include commissioning trials or use of temporary facilities[2].

A report will be submitted to the Planning Secretary and the EPA within 2 months of the completion of the testing. This report will provide an assessment of compliance with the operational noise criteria. The assessment will include analysis of the data collected for at least 6 weeks at each Residential Logging Location.

In the circumstance where a supplementary assessment is required, the testing will occur in accordance with the NMP. Following completion of all testing outlined in the NMP, a report will be submitted to the Planning Secretary and the EPA, which provides a detailed assessment of the noise compliance testing and compliance with the operational noise criteria. The need for and extent of any such supplementary testing will be unknown until the initial assessment has been made and timing shall be discussed with the Department of Planning and Environment (the Department) at the lodgement of the initial assessment.

[2] Operation will have commenced when all of the following have occurred:

- All turbines are commissioned and tested (including testing dependent on wind conditions);
- All turbines have been handed over from the Contractor to Tilt Renewables; and
- AEMO testing is complete (grid compliance testing).

8 Review and revision

8.1 Modification of noise management modes

Following the testing in the NMP, an assessment of noise compliance will be made to determine if any modification to the noise management modes (or other modifications) should be made. Any modifications will be designed to ensure that the operational noise criteria are achieved (refer to Section 4).

If non-compliance is identified outside of the initial compliance testing period, the relevant notification procedures will be made in accordance with the requirements of the Development Consent (refer to Section 8.4). Non-compliance with the operational noise criteria may result in refinement of the noise management modes identified in Section 2 and require review of the NMP (refer to Section 8.5).

Should any review of the NMP result in further refinement of the noise management modes, the relevant components of the compliance testing, including reporting, will be repeated.

8.2 Continuous improvement

Continuous improvement of the NMP will be achieved when opportunities for improvement are identified. Any proposed improvement and/or changes to the NMP are required to be approved by the Planning Secretary prior to implementation.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance;
- Determine the cause or causes of non-conformances and deficiencies;
- Develop and implement a plan of corrective and preventative action to address any nonconformances and deficiencies;
- Verify the effectiveness of the corrective and preventative actions;
- Document any changes in procedures resulting from process improvement; and
- Make comparisons with objectives and targets.

8.3 Complaint handling procedure

The Development is committed to managing complaints in a transparent and professional manner. Complaints not handled correctly can incur significant cost through damage to reputation or fines by the regulatory authorities. Complaints also provide an opportunity to improve the way that the Development conducts its business.

The Development has a specific Complaints Handling Procedure within the broader Complaints Management Plan, which outlines how it will receive and handle complaints and disputes. All reporting, monitoring and evaluation associated with complaints management for the Development must be in accordance with this procedure.

The Complaints Management Plan is prepared to specifically address all phases of the Development, in accordance with Australian / New Zealand Standard *AS / NZS 10002:2014 – Guidelines for complaint management in organizations* and to address the requirements of the Development Consent.

A copy of the Complaints Management Plan will be available on the Development's website. Any enquiries, complaints and/or compliments, including those related to operational noise will be directed to the Development information line, via email or telephone.

8.4 Non-compliance and corrective actions

In accordance with Schedule 5, Condition 8 of the Development Consent, the Developer will notify the Planning Secretary in writing via the Major Projects website within seven (7) days of becoming aware of any non-compliance with the conditions of the Development Consent. The notification is to:

- Identify the development and the application number; and
- Set out the condition of the Development Consent that the development is in non-compliance with, the way in which it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance.

Any identification of non-compliance with the conditions of the Development Consent outside of the initial compliance testing period will result in the instigation an incident investigation, which shall be commenced as soon as reasonably practicable following identification of the non-compliance. The status of any incident investigation will be notified to the Department with the initial non-compliance notification.

The Developer will assess the assess the source of the non-compliance as part of the incident investigation and notify the Department and EPA of any proposed corrective measures that are to be developed and implemented to ensure ongoing operational noise compliance prior to their implementation. Measures that would be considered to ensure continued compliance with the operational noise criteria include:

- Modification of noise management modes (refer to Section 8.1);
- Wind sector management of wind turbine(s) causing the non-compliance;
- Engineering solutions (e.g. replacement, improvement or modification of turbine components to reduce noise levels); or
- Implementation of an agreement with a neighbour, which may include noise mitigation at the affected residence (e.g. dwelling sound insultation).

In developing corrective measures for the identification of an ongoing non-compliance, the Developer would seek to agree with the Department a timeframe for implementation of the proposed corrective measures and undertaking additional noise testing to demonstrate compliance with the conditions of the Development Consent following implementation of the corrective measures.

8.5 Update and amendment to Plan

The processes outlined in Section 8 of the NMP may result in the need to update or revise the NMP. In line with Schedule 5, Condition 2 of the Development Consent, the NMP will also be reviewed in response to:

- An incident;
- Submission of an audit report; or
- Modification to the conditions of Development Consent.

Any revision of the NMP is to ensure it incorporates any recommended measures to improve the environmental performance of the Development. Where the review results in the revision to the NMP, within four (4) weeks of the review, the revised document/s will be submitted to the Planning Secretary for approval.

Once approved, a copy of the revised document/s will be uploaded to the Development's website.

References

DEFRA, 2005, Proposed criteria for the assessment of low frequency noise disturbance, Moorhouse, AT, Waddington, DC and Adams, MD, published by the United Kingdom Department for Environment, Food and Rural Affairs, University of Salford Manchester, Revision 1 (NANR45, December 2011), Available at: http://usir.salford.ac.uk/id/eprint/491/

DPE, 2016, *New South Wales Wind Energy: Noise Assessment Bulletin for State significant wind energy development*, The State of NSW and the NSW Department of Planning and Environment, December 2016.

EPA, 2017, *Noise Policy for Industry*, The State of NSW and the NSW Environment Protection Authority, October 2017 (ISBN 978 1 76039 481 3), Available at: https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/noise/17p0524-noise-policy-for-industry.pdf

Sonus, 2021, *Rye Park Wind Farm Background Noise Monitoring Report* (S3200.2C4, Revision: Final), April 2021, prepared by Sonus Pty Ltd for Rye Park Renewable Energy Pty Ltd.

Sonus, 2021a, *Rye Park Wind Farm Environmental Noise Assessment Report* (S3200C26, Revision: Final), June 2021, prepared by Sonus Pty Ltd for Rye Park Renewable Energy Pty Ltd.

Appendix A: Rye Park Wind Farm Background Noise Monitoring Report

Rye Park Wind Farm

Background Noise Monitoring

S3200.2C4

April 2021

sonus.

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Document Title	:	Rye Park Wind Farm Background Noise Monitoring
Document Reference	:	S3200.2C4
Date	:	April 2021
Prepared By	:	Chris Turnbull, MAAS
Reviewed By	:	Jason Turner, MAAS

INTRODUCTION

Background noise monitoring has previously been conducted in the vicinity of the Rye Park Wind Farm by Epuron. This monitoring was conducted during the period between June and 22 August 2012, and was conducted at 20 locations across the wind farm site.

Sonus has been engaged by Tilt Renewables (Tilt) to conduct additional background monitoring prior to construction. The additional monitoring was conducted between January and March 2020 and between February and April 2021.

The noise data measured at each monitoring location has been correlated with wind speed referenced to a hub height of 119m. As the hub height has changed since the time of the original background noise assessment, the correlations for the original 20 locations have been updated to account for the change in hub height.

This report provides the methodology for the monitoring, as well as the results of each of the background monitoring regimes. From the measured background noise levels, criteria are assigned for all residences in the vicinity.

ORIGINAL NOISE MONITORING

Location

The original noise monitoring regime was conducted at 20 locations across the wind farm site. These locations have been provided in Table 1, and circled in Figures 1 and 2 below. A full list of the residences and coordinates are shown in Appendix D.

Table 1: *Original Monitoring Locations Coordinates.*

Coordinates (UTM WGS84 55 H)			Coordinates (UTM WGS84 55 H)		
Location	**Easting**	**Northing**	**Location**	**Easting**	**Northing**
R02	678095	6185733	R36	679988	6173811
R06	681484	6184020	R41	681802	6168516
R14	677807	6183115	R44	679986	6166322
R16	677297	6181991	R46	681835	6164679
R20	676130	6181544	R49	680667	6162540
R128	678848	6183498	R51	680970	6161588
R25	677075	6178323	R52	684135	6161246
R30	682495	6177218	R54	683514	6155819
R32	680416	6176683	R56	686567	6153140
R34	681817	6174338	R60	684244	6149529

Wind Speed Data

During the monitoring period, wind data were collected at four separate wind masts in different locations on the site. The coordinates of these wind masts, as well as the closest residences are shown in Table 2.

Table 2: *Wind Mast Locations and Nearest Monitoring Locations.*

Wind Mast	Coordinates (UTM WGS84 55 H)		Highest Measurement Point	Nearest Background Locations
	Easting	**Northing**		
RYP_2	676503	6186530	49m	R02, R06, R14, R16, R20, R128
RYP_3	682046	6170278	70m	R25, R30, R32, R34, R36, R41, R44
RYP_4	682325	6162517	70m	R46, R49, R51, R52
YJ	684969	6152742	60m	R54, R56, R60

The wind data were measured at various heights above ground on each mast, with the highest point for each mast shown in Table 2 above. The data have been sheared up to a height of 119m above ground.

Figure 1: *Original Monitoring Locations Aerial Photo (Northern Section).*

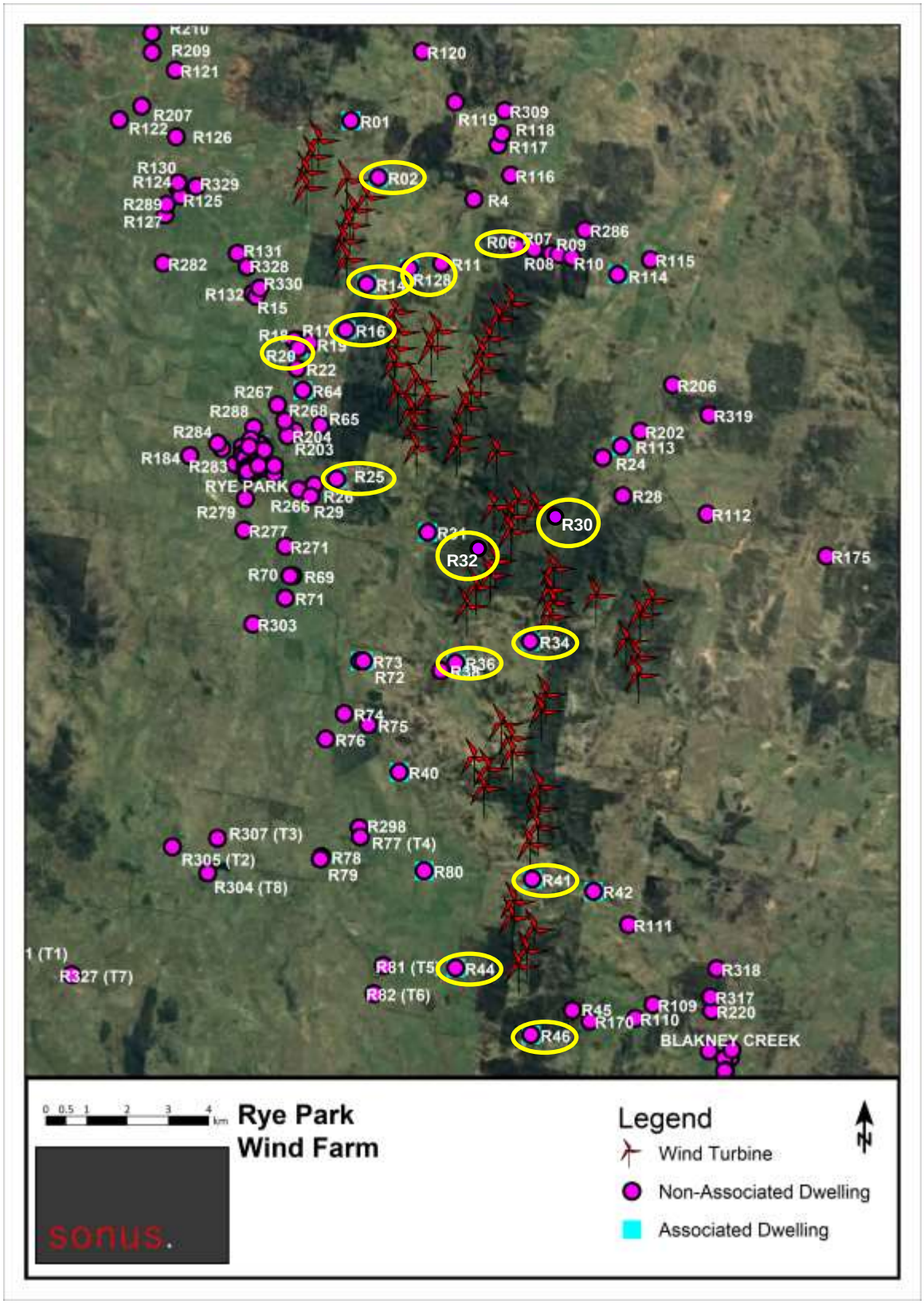
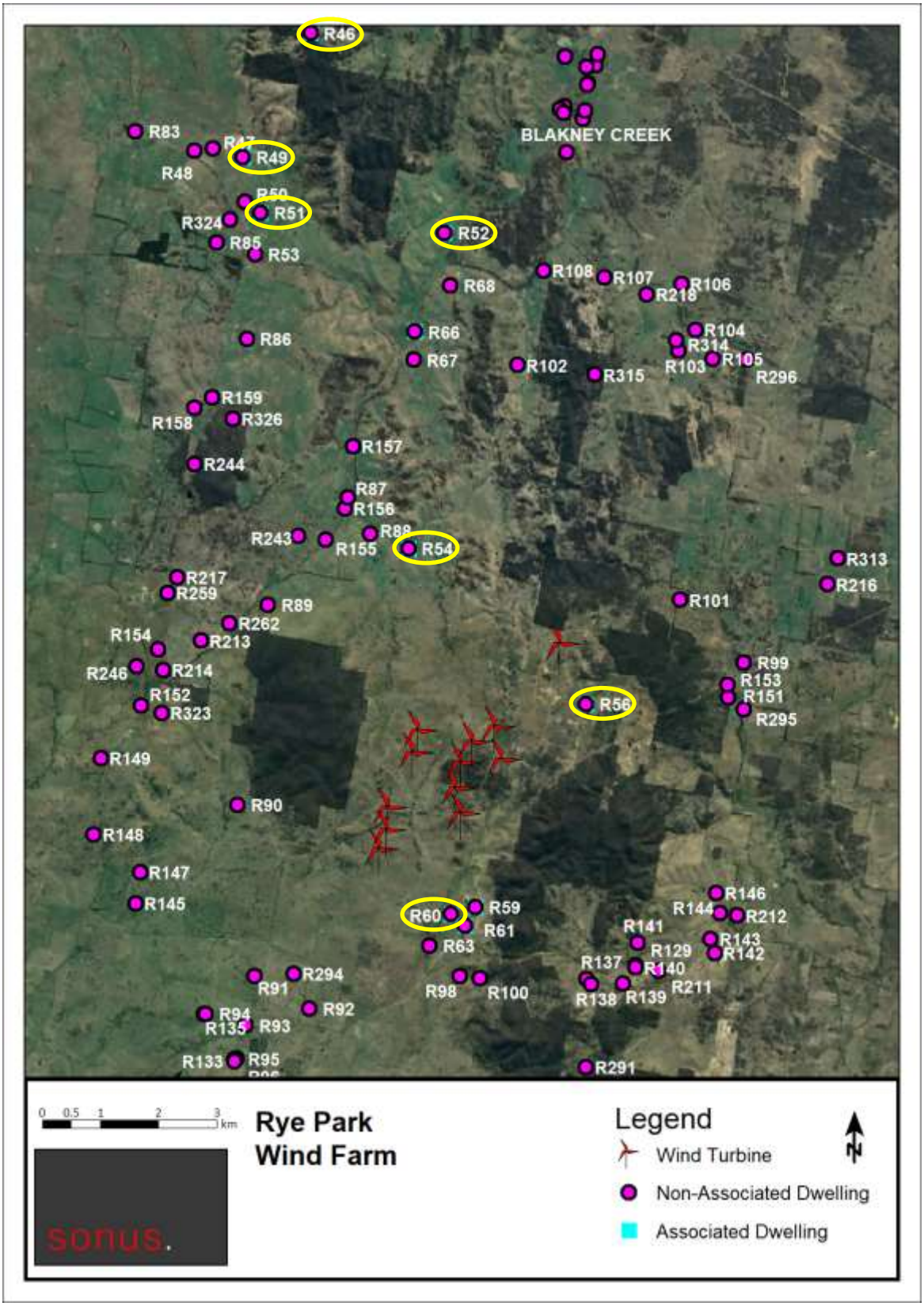


Figure 2: *Original Monitoring Locations Aerial Photo (Southern Section).*



Data Analysis

Rain data were also recorded throughout the monitoring period at a central location on the site. The measured rain data have been taken to be indicative of conditions across the whole site during the monitoring period. Any periods where rain was detected have been excluded from the analysis.

Data below the cut in wind speed (3m/s) were also removed. After the data removal process, the following number of points remained for each monitoring location.

Table 3: *Data Points Remaining at each Monitoring Location.*

Location	Data Points	Location	Data Points
R02	2365	R36	2188
R06	2382	R41	3372
R14	3501	R44	2445
R16	3243	R46	2553
R20	2434	R49	2742
R128	3053	R51	3398
R25	2721	R52	2859
R30	2402	R54	2647
R32	2473	R56	2795
R34	2238	R60	2547

Background Noise Correlation

The background noise data collected at each monitoring location were correlated with the sheared wind speed at the nearest wind mast for a hub height of 119m for each 10 minute period.

A least squares regression analysis of the data was undertaken to determine the line of best fit for the correlations. The data and the regression curves are shown in Appendix B[1].

Based on the line of best fit in Appendix B, the background noise level ($L_{A90,10min}$) can be determined for each integer wind speed. Table 4 summarises the background noise level for each integer wind speed at a hub height of 119m, between 3 and 12 m/s:

[1] While noise monitoring was conducted at R14, R16 and R34, these locations are associated residences and are not used as a proxy for other locations. As such, the correlation graphs have no bearing on the criteria and so have been omitted from this report.

Table 4: *Background Noise Levels ($L_{A90,10min}$) at Original Monitoring Locations (dB(A)).*

	Wind Speed (m/s) at 119m									
Location	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
R02	32	29	28	28	28	29	31	33	35	37
R06	26	26	27	27	28	29	29	30	31	32
R20	32	31	31	31	31	32	32	33	34	35
R128	28	28	29	29	30	30	31	32	34	35
R25	24	24	24	24	24	25	25	26	26	27
R30	25	27	28	29	29	30	31	32	32	33
R32	30	29	29	30	30	31	31	32	33	34
R36	24	23	23	22	23	23	24	24	25	26
R41	21	20	20	21	22	23	25	27	29	31
R44	26	25	25	25	26	26	27	29	30	32
R46	26	26	26	27	27	28	29	30	32	34
R49	26	26	26	26	27	28	29	31	32	34
R51	29	27	26	26	27	28	29	31	32	34
R52	29	28	28	28	28	28	29	30	31	32
R54	29	31	32	33	33	34	35	36	38	40
R56	26	26	26	26	27	28	30	31	33	35
R60	32	31	31	31	32	33	34	36	38	40

Operational Noise Criteria

Based on the background noise levels measured, the criteria at the different residences can be determined. The criteria for non-associated residences are defined as the higher of 35 dB(A) or the background noise level plus 5 dB(A) for each integer wind speed. Where a residence is associated with the wind farm, the criteria become 45 dB(A) across all wind speeds. The criteria for each measurement location and other representative residences are shown in Table 5 below.

It is noted that where the background noise level increased at lower wind speeds, the criteria in the above table have been limited. That is, if the background noise level at 3 m/s was higher than the noise level at 4 m/s, the value at 4 m/s has been used for both wind speeds. Values in the above table that have been limited in this way have been shown in **red**.

Residences close to the townships of Rye Park and Blakney Creek have been grouped together for ease of readability in the above table. The full list of locations that have been included within each township are shown in Table 6 below.

Table 6: *Locations Included in Township Areas*

Township	Included Locations
Rye Park Township	R276, R188, R189, R310, R190, R191, R230, R186, R185, R193, R194, R195, R196, R234, R232, R197, R187, R200, R180, R274, R272, R278, R226, R199, R198, R179, R325, R177, R183, R270, R269, R280, R281, R181, R292, R223, R182
Blakney Creek Township	R160, R161, R162, R163, R164, R165, R166, R167, R168, R169, R219, R316

2020 NOISE MONITORING

Additional background noise monitoring was conducted at five locations over the course of two separate periods, as described in Table 7.

Table 7: *Additional Noise Monitoring Periods.*

Location	Monitoring Period(s)
R16	27/02/2020 to 27/03/2020
R18	16/01/2020 to 26/02/2020
R80	16/01/2020 to 26/02/2020
R113	27/02/2020 to 28/03/2020
R330	16/01/2020 to 27/02/2020

Location

A noise logger was positioned on the wind farm side of each dwelling, at an equivalent distance to major trees as the dwellings. Noise monitoring locations are provided in Table 8 and circled in Figure 3 below. A photograph of the noise monitoring equipment at each location for the 2020 monitoring is provided in Appendix A.

Table 8: *Additional Monitoring Locations Coordinates.*

Coordinates (UTM WGS84 55 H)		
Location	**Easting**	**Northing**
R16	677319	6181986
R18	676034	6181759
R80	679214	6168723
R113	683691	6179223
R330	675206	6183020

It is noted that the logger at R113 was positioned at a position to be a proxy for R24 and R28 as access to these properties was not available.

Equipment

The background noise was measured in 10 minute intervals with a Rion Type 1 sound level meter with a noise floor of less than 20 dB(A), calibrated at the beginning and end of the measurement period with a Rion Calibrator. The microphones were positioned approximately 1.5 m above ground level and fitted with a wind shield with a diameter of at least 150mm. An example of a typical on-site setup is shown in Figure 4 below.

Figure 3: *2020 Additional Monitoring Locations Aerial Photo.*

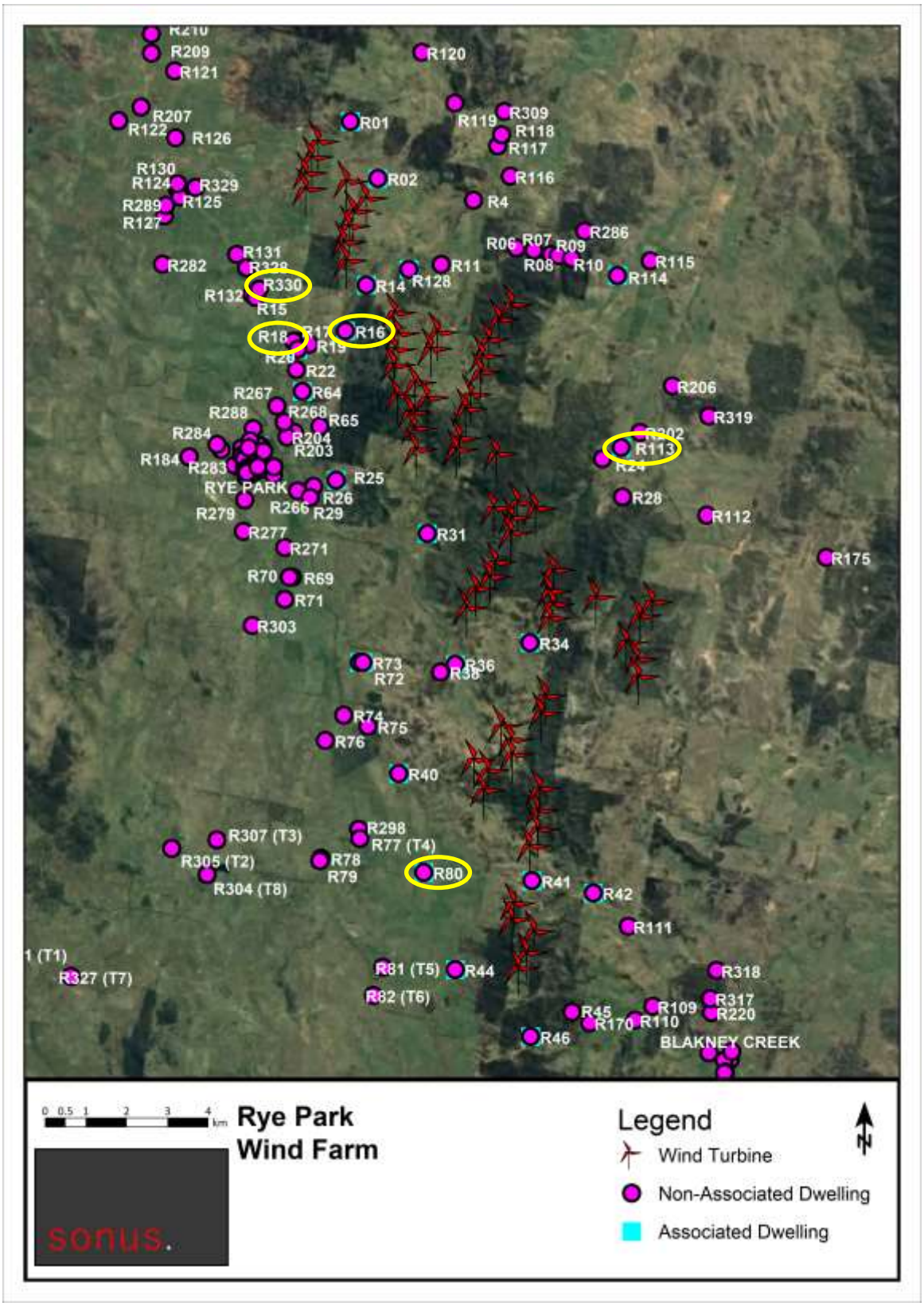


Figure 4: *Typical Monitoring Location Setup*

Hub Height Wind Speed

During the background noise monitoring, the hub height wind speeds were measured in 10 minute intervals using three wind masts. Table 9 provides the details of the closest wind mast to each monitoring location.

Table 9: *Closest Wind Mast to Additional Monitoring locations.*

Location	Closest Wind Mast
R16	RYP6
R18	RYP6
R80	RYP3
R113	RYP8
R330	RYP6

The background noise data were correlated with wind speeds at a hub height of 119m at the wind mast closest to the monitoring location. The wind data were sheared to a height of 119m from the highest measured point on the wind mast before being provided to Sonus.

Data Analysis

During the background noise monitoring period, wind speed at the microphone location (approximately 1.5m above ground level) was measured using *"Rainwise"* wind speed loggers. Wind speed at R330 was based on the measurements from R18. At R18 and R16 rainfall was also recorded. The rainfall and wind speed data were used to determine the periods when weather may have affected the background noise measurements.

Data within these periods were discarded. This includes periods where rainfall was measured and/or where the measured wind speed exceeded 5 m/s at the microphone for more than 90% of the measurement period. The rainfall loggers at R18 and R16 were taken to be indicative of rainfall at the other monitoring locations for their respective measurement periods. Any data for wind speeds below the cut in wind speed (3m/s) were also removed.

Following the data removal procedure, the following number of points remained for each of the monitoring locations;

Table 10: *Data Points Remaining at each Monitoring Location*

Location	Data Points
R16	3901
R18	5250
R80	5306
R113	3957
R330	5258

Background Noise Correlation

The background noise data collected at each monitoring location was correlated with the sheared wind speed at the nearest wind mast for an indicative hub height of 119m for each 10 minute period.

A least squares regression analysis of the data was undertaken to determine the line of best fit for the correlations. The data and the regression curves are shown in Appendix D[2]. Based on the line of best fit in Appendix D, the background noise level ($L_{A90,10min}$) can be determined for each integer hub height wind speed.

Table 11 summarises the background noise level for each integer wind speed at a hub height of 119m, between 3 and 12 m/s:

[2] While noise monitoring was conducted at R16, this location is an associated residence, and is not representative of the conditions at other locations. As such, the correlation graph has no bearing on the criteria, and so has been omitted from this report.

Table 11: *Background Noise Levels ($L_{A90,10min}$) at Additional Monitoring Locations (dB(A)).*

	Wind Speed (m/s) at 119m									
Location	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
R18	27	27	28	29	30	31	33	34	36	37
R80	27	28	28	29	30	32	33	35	36	38
R113	19	19	19	20	21	22	24	25	27	30
R330	33	32	33	33	34	35	36	37	38	40

Operational Noise Criteria

For residences not associated with the wind farm, the appropriate criteria are determined as the higher of 35 dB(A) or the background noise level plus 5 dB(A). Where a residence is associated with the wind farm, the criteria are 45 dB(A) regardless of the wind speed. Based on this, the criteria for each of the additional measurement locations are shown in Table 17. These measurement locations have also been used as representative of the background noise at other locations, where background noise has not been measured. These are also shown in Table 18. Where the noise level has been limited due to a higher value at lower wind speeds, the limited values are shown in **red**.

2021 NOISE MONITORING

Additional background noise monitoring was conducted at five locations as described in Table 12.

Table 12: *Additional Noise Monitoring Periods.*

Location	Monitoring Period(s)
R11	18/02/2021 to 07/04/2021
R38	18/02/2021 to 07/04/2021
R45	18/02/2021 to 07/04/2021
R63	18/02/2021 to 07/04/2021

Location

A noise logger was positioned on the wind farm side of each dwelling, at an equivalent distance to major trees as the dwellings. Noise monitoring locations are provided in Table 13. Dwellings R11, R38, and R45 are circled in Figure 5; Dwelling R63 is circled in Figure 6. A photograph of the noise monitoring equipment for the 2021 monitoring at each location is provided in Appendix B.

Table 13: *Additional Monitoring Locations Coordinates.*

Coordinates (UTM WGS84 55 H)		
Location	**Easting**	**Northing**
R11	679650	6183618
R38	679623	6173620
R45	682847	6165279
R63	683875	6148991

Equipment

The background noise was measured in 10 minute intervals with a Rion sound level meter with a noise floor of less than 20 dB(A), calibrated at the beginning and end of the measurement period with a Rion Calibrator. The microphones were positioned approximately 1.5 m above ground level and fitted with a wind shield with a diameter of at least 150mm.

Figure 5: *2021 Additional Monitoring Locations Aerial Photo – Northern Section.*

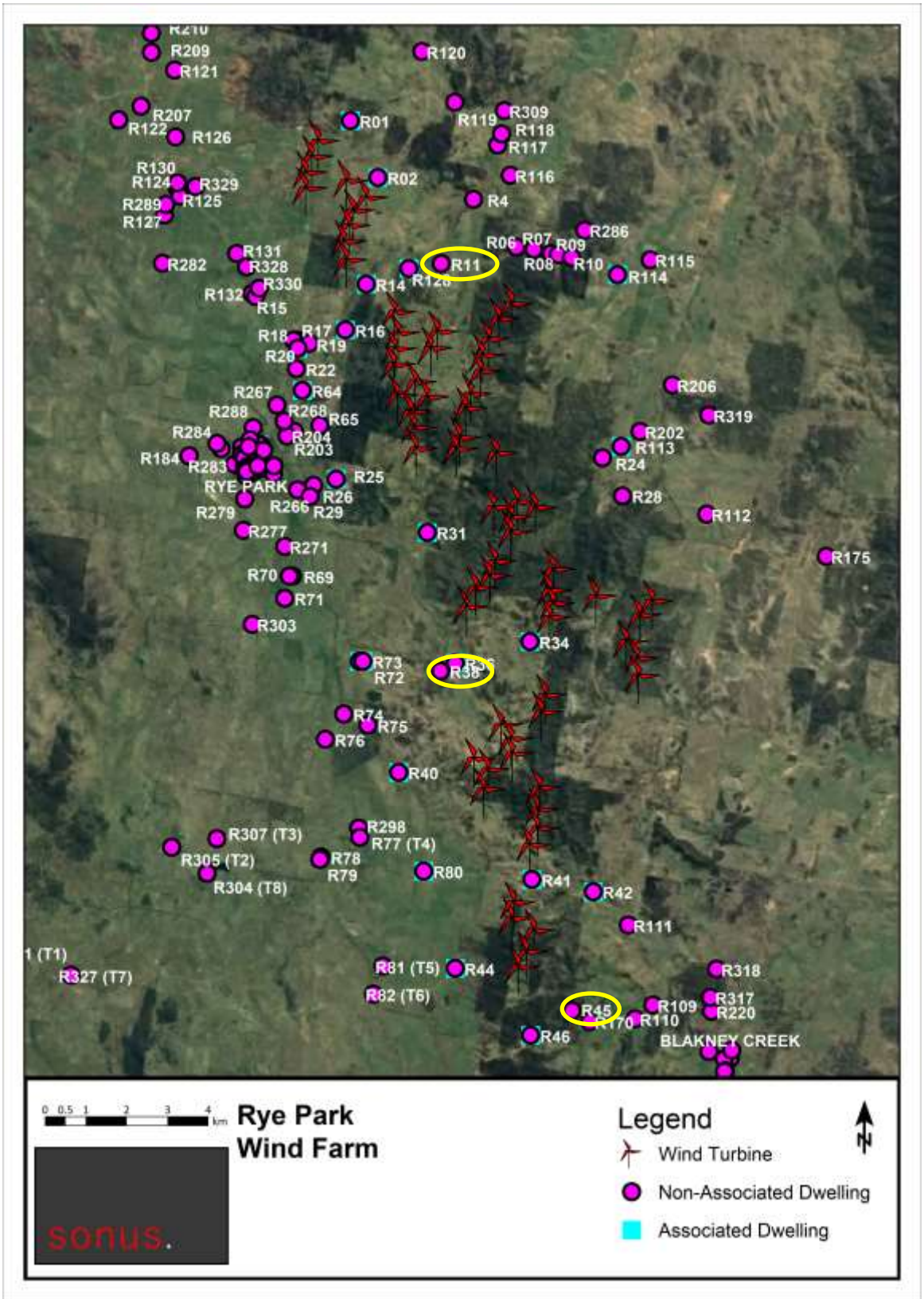
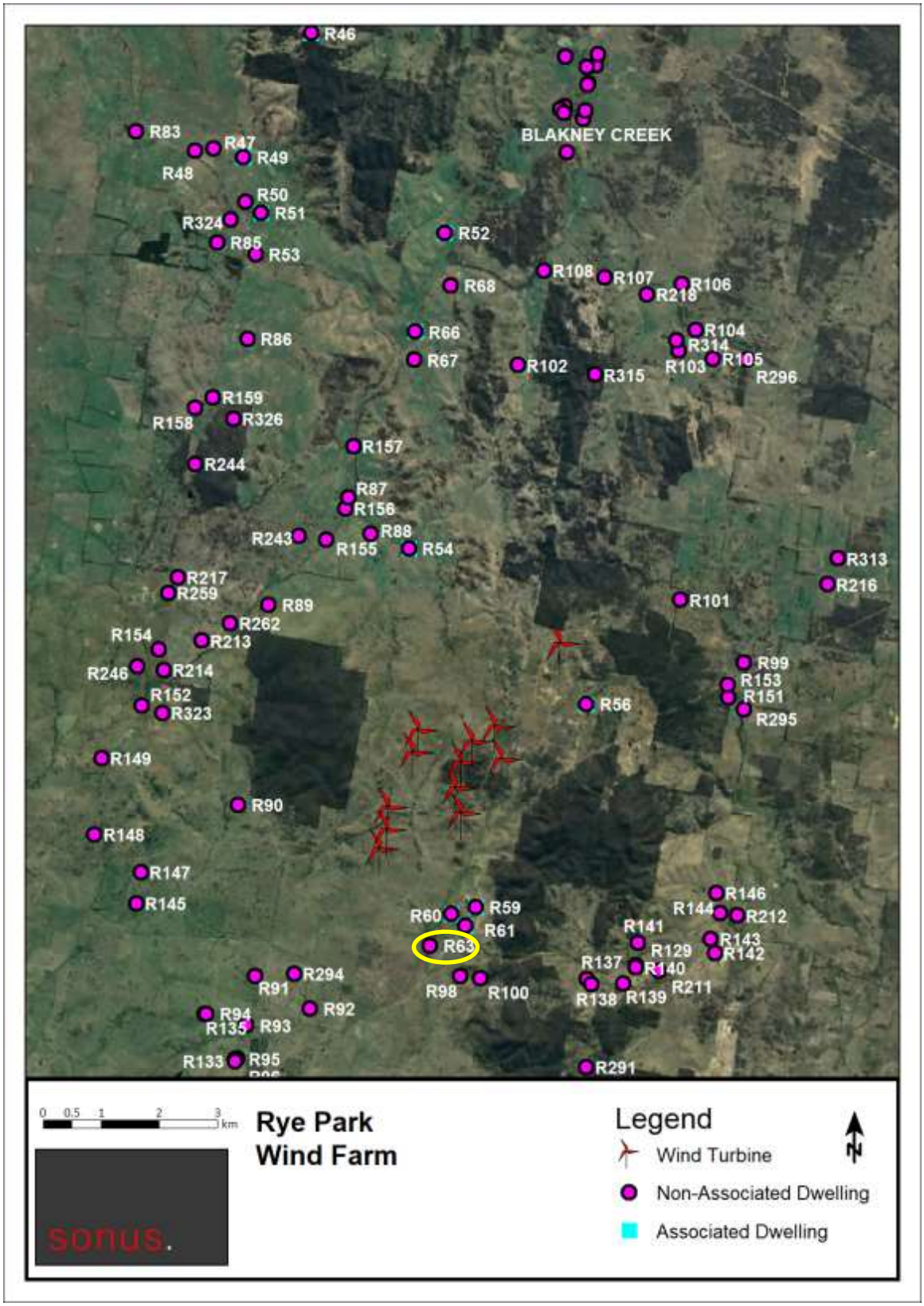


Figure 6: *2021 Additional Monitoring Locations Aerial Photo – Southern Section.*



Hub Height Wind Speed

During the background noise monitoring, the hub height wind speeds were measured in 10 minute intervals using four wind masts. Table 14 provides the details of the closest wind mast to each monitoring location.

Table 14: *Closest Wind Mast to Additional Monitoring locations.*

Location	Closest Wind Mast
R11	RYP6
R38	RYP8
R45	RYP3
R63	YASS1

The background noise data were correlated with wind speeds at a hub height of 119m at the wind mast closest to the monitoring location. The wind data were sheared to a height of 119m from the highest measured point on the wind mast before being provided to Sonus.

Data Analysis

During the background noise monitoring period, wind speed at the microphone location (approximately 1.5m above ground level) was measured using *"Rainwise"* wind speed loggers. Wind speed at R38 and R63 was based on the measurements from R45. At R45 rainfall was also recorded. The rainfall and wind speed data were used to determine the periods when weather may have affected the background noise measurements. Data within these periods were discarded. This includes periods where rainfall was measured and/or where the measured wind speed exceeded 5 m/s at the microphone for more than 90% of the measurement period. The rainfall logger at R45 was taken to be indicative of rainfall at the other monitoring locations for their respective measurement periods. Any data for wind speeds below the cut in wind speed (3m/s) as well as outlier points were also removed. Outlier points are shown in the correlation graphs without the point filled.

Following the data removal procedure, the following number of points remained for each of the monitoring locations:

Table 15: *Data Points Remaining at each Monitoring Location*

Location	Data Points
R11	5167
R38	5383
R45	5371
R63	5427

Background Noise Correlation

The background noise data collected at each monitoring location was correlated with the sheared wind speed at the nearest wind mast for an indicative hub height of 119m for each 10 minute period.

A least squares regression analysis of the data was undertaken to determine the line of best fit for the correlations. The data and the regression curves are shown in Appendix E. Based on the line of best fit in Appendix E, the background noise level ($L_{A90,10min}$) can be determined for each integer hub height wind speed.

Table 16 summarises the background noise level for each integer wind speed at an indicative hub height of 119m, between 3 and 12 m/s:

Table 16: *Background Noise Levels ($L_{A90,10min}$) at Additional Monitoring Locations (dB(A)).*

	Wind Speed (m/s) at 119m									
Location	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
R11	27	26	26	26	26	27	29	31	35	39
R38	24	24	24	26	28	30	33	36	40	44
R45	21	23	23	23	24	24	26	28	31	36
R63	28	28	28	28	29	30	31	34	36	40

Operational Noise Criteria

For residences not associated with the wind farm, the appropriate criteria are determined as the higher of 35 dB(A) or the background noise level plus 5 dB(A). Where a residence is associated with the wind farm, the criteria are 45 dB(A) regardless of the wind speed. Based on this, the criteria for each of the additional measurement locations are shown in Table 18 below. These measurement locations have also been used as representative of the background noise at other locations, where background noise has not been measured. These are also shown in Table 17. Where the noise level has been limited due to a higher value at lower wind speeds, the limited values are shown in **red**.

Table 17: *Criteria at Dwellings (dB(A)).*

Measurement Location (Year of Monitoring)	Associated/ Non-Associated	Representative Locations	Wind Speed (m/s) at 119m									
			3	4	5	6	7	8	9	10	11	12
R02 (2012)	Yes	R01, R02	45	45	45	45	45	45	45	45	45	45
	No	R117, R118, R119, R120, R309	35	35	35	35	35	35	36	38	40	42
R06 (2012)	Yes	R114	45	45	45	45	45	45	45	45	45	45
	No	R04, R06, R07, R08, R09, R10, R115, R116, R286	35	35	35	35	35	35	35	35	36	37
R11 (2021)	No	R11	35	35	35	35	35	35	35	36	40	44
R14 (2012)	Yes	R14	45	45	45	45	45	45	45	45	45	45
R16 (2020)	Yes	R16	45	45	45	45	45	45	45	45	45	45
R18 (2020)	No	R17, R18	35	35	35	35	35	36	38	39	41	42
R20 (2012)	Yes	R20, R64	45	45	45	45	45	45	45	45	45	45
	No	R19, R22, R267, R268, R288	36	36	36	36	36	37	37	38	39	40
R25 (2012)	Yes	R25	45	45	45	45	45	45	45	45	45	45
	No	R26, R29, R65, R69, R70, R71, R184, R192, R203, R204, R266, R271, R277, R279, R283, R284, R303, Rye Park Township	35	35	35	35	35	35	35	35	35	35
R32 (2012)[3]	Yes	R31	45	45	45	45	45	45	45	45	45	45
R34 (2012)	Yes	R34	45	45	45	45	45	45	45	45	45	45
R36 (2012)	Yes	R36	45	45	45	45	45	45	45	45	45	45

[3] Monitoring was previously conducted here, however it is no longer a noise sensitive receiver with regards to the wind farm.

Measurement Location (Year of Monitoring)	Associated/ Non-Associated	Representative Locations	Wind Speed (m/s) at 119m									
			3	4	5	6	7	8	9	10	11	12
R38 (2021)	Yes	R72, R73	45	45	45	45	45	45	45	45	45	45
	No	R38, R74, R75, R76	35	35	35	35	35	35	38	41	45	49
R41 (2012)	Yes	R41, R42	45	45	45	45	45	45	45	45	45	45
	No	R111	35	35	35	35	35	35	35	35	35	36
R44 (2012)	Yes	R44	45	45	45	45	45	45	45	45	45	45
	No	R81, R82	35	35	35	35	35	35	35	35	35	37
R45 (2021)	Yes	R45	45	45	45	45	45	45	45	45	45	45
	No	R109, R110, R170, R220, R317, R318	35	35	35	35	35	35	35	35	36	41
R46 (2012)	Yes	R46	45	45	45	45	45	45	45	45	45	45
R49 (2012)	Yes	R49	45	45	45	45	45	45	45	45	45	45
	No	R47, R48, R83	35	35	35	35	35	35	35	36	37	39
R51 (2012)	Yes	R51	45	45	45	45	45	45	45	45	45	45
	No	R50, R53, R85, R86, R158, R159, R324, R326	35	35	35	35	35	35	35	36	37	39
R52 (2012)	Yes	R52, R66, R68	45	45	45	45	45	45	45	45	45	45
	No	R67, R102, R103, R104, R105, R106, R107, R108, R218, R296, R314, R315, Blakney Creek Township	35	35	35	35	35	35	35	35	36	37
R54 (2012)	Yes	R54	45	45	45	45	45	45	45	45	45	45
	No	R87, R88, R89, R149, R152, R154, R155, R156, R157, R213, R214, R217, R243, R244, R246, R259, R262, R323	35	36	37	38	38	39	40	41	43	45
R56 (2012)	Yes	R56	45	45	45	45	45	45	45	45	45	45
	No	R99, R101, R144, R146, R151, R153, R212, R216, R295, R313	35	35	35	35	35	35	35	36	38	40

Measurement Location (Year of Monitoring)	Associated/ Non-Associated	Representative Locations	Wind Speed (m/s) at 119m									
			3	4	5	6	7	8	9	10	11	12
R60 (2012)	Yes	R60	45	45	45	45	45	45	45	45	45	45
R63 (2021)	Yes	R59, R61	45	45	45	45	45	45	45	45	45	45
	No	R63, R90, R91, R92, R93, R94, R95, R96, R97, R98, R100, R129, R133, R135, R137, R138, R139, R140, R141, R142, R143, R145, R147, R148, R211, R290, R291, R294, R308	35	35	35	35	35	35	36	39	41	45
R80 (2020)	Yes	R40, R80	45	45	45	45	45	45	45	45	45	45
	No	R77, R78, R79, R298, R304, R305, R307, R311, R327	35	35	35	35	35	37	38	40	41	43
R113 (2020)	Yes	R113	45	45	45	45	45	45	45	45	45	45
	No	R24, R28, R112, R175, R202, R206, R319	35	35	35	35	35	35	35	35	35	35
R128 (2012)	Yes	R128	45	45	45	45	45	45	45	45	45	45
R330 (2020)	Yes	R15, R131, R132, R328	45	45	45	45	45	45	45	45	45	45
	No	R121, R122, R124, R125, R126, R127, R130, R207, R209, R210, R282, R289, R329, R330	37	37	38	38	39	40	41	42	43	45

Appendix A: Photographs of loggers at additional monitoring locations – 2020 monitoring

Figure 7: *R16 monitoring location.*

Figure 8: *R18 monitoring location.*

Figure 9: *R80 monitoring location.*

Figure 10: *R113 monitoring location.*

Figure 11: *R330 monitoring location.*

Appendix B: Photographs of loggers at additional monitoring locations – 2021 monitoring

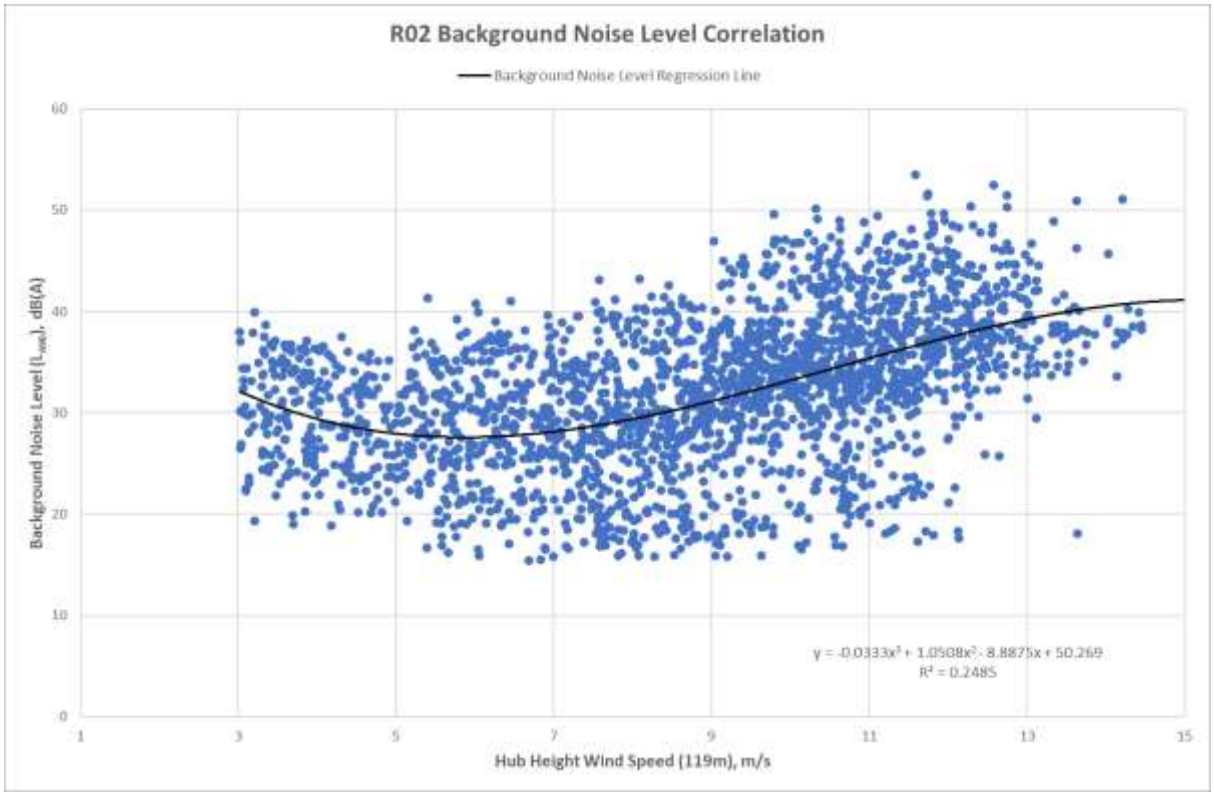
Figure 12: *R11 monitoring location.*

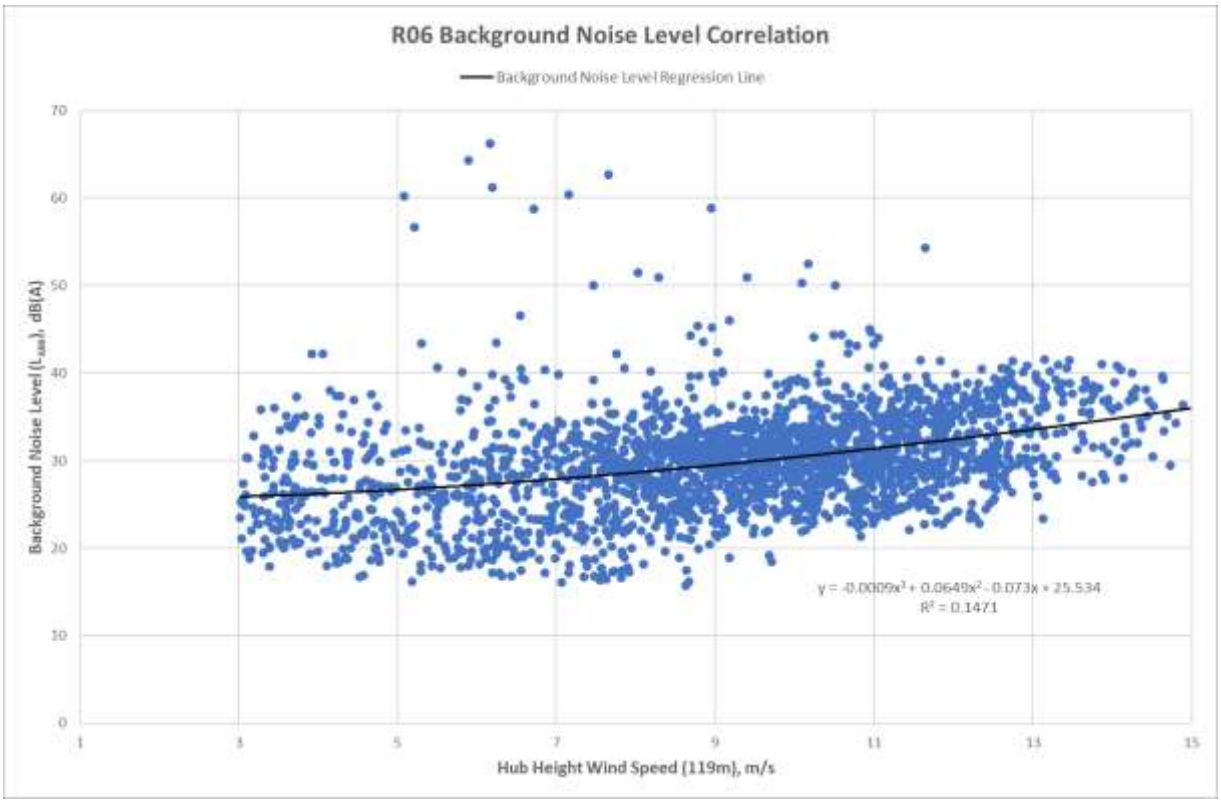
Figure 13: *R38 monitoring location.*

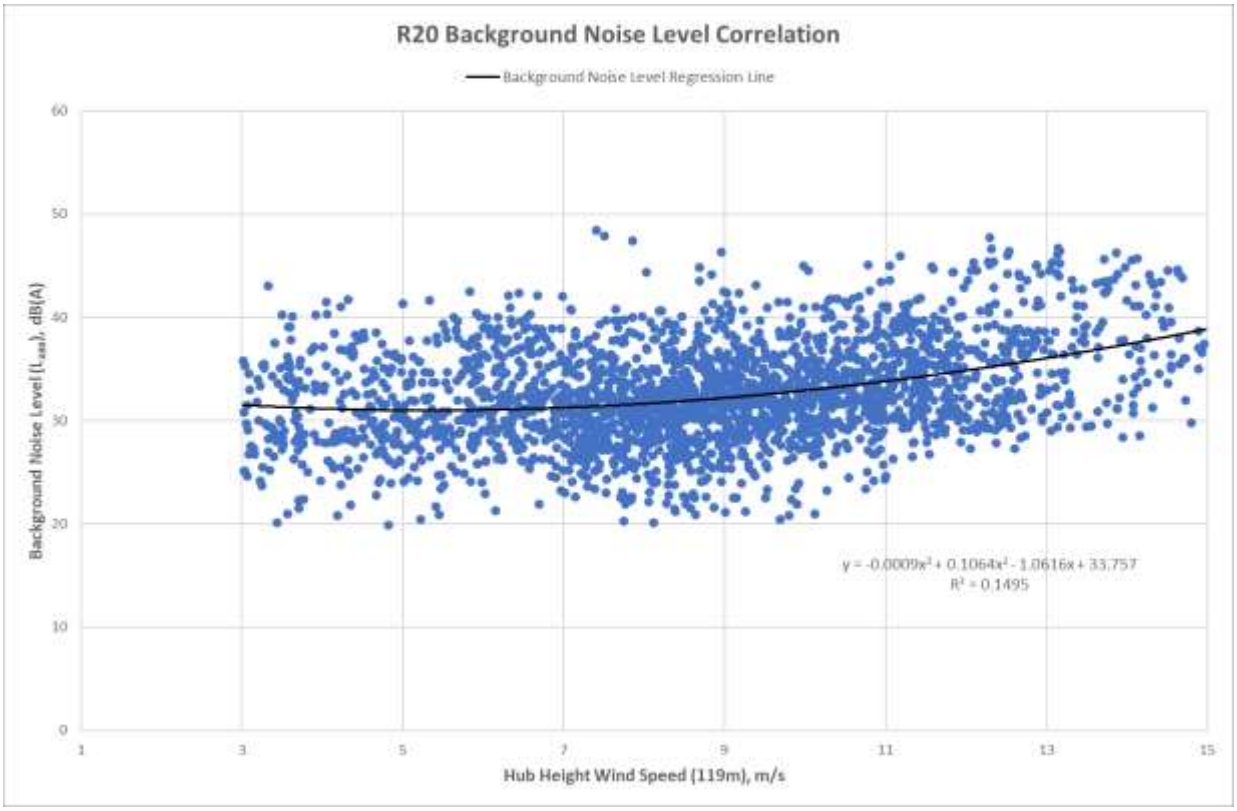
Figure 14: *R45 monitoring location.*

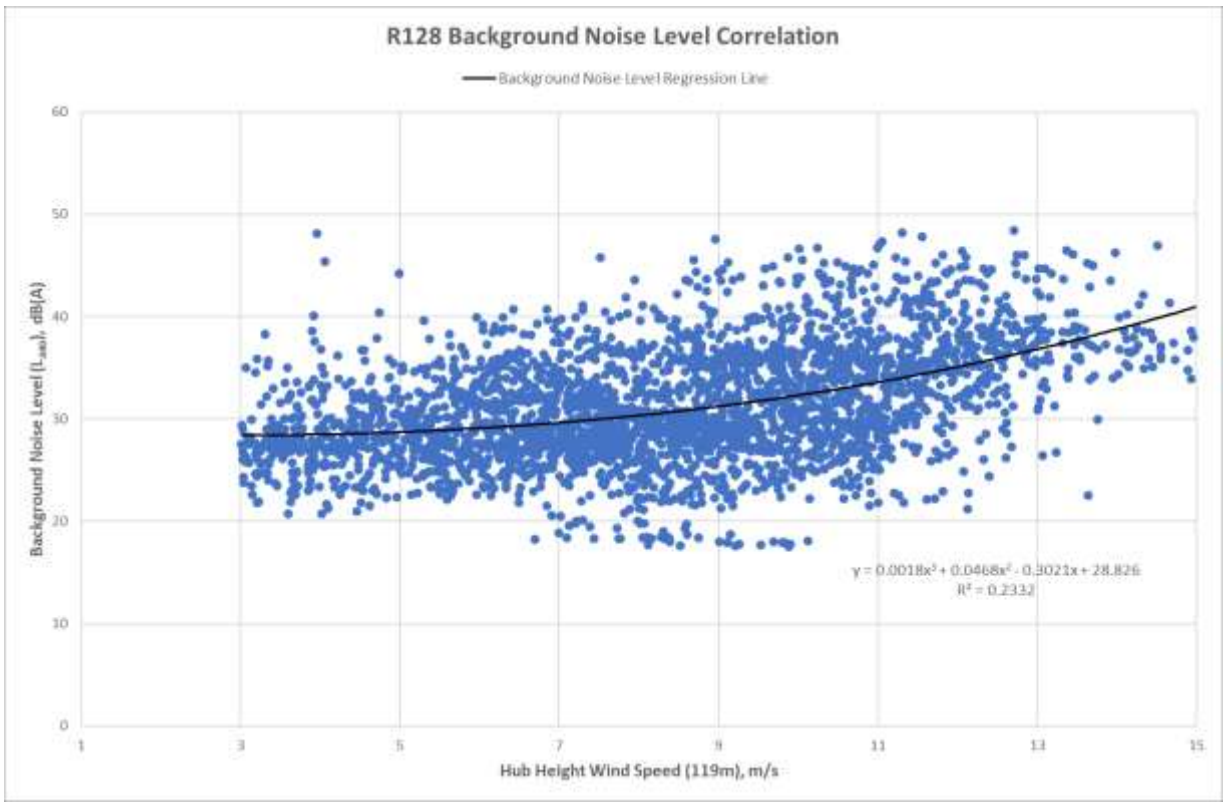
Figure 15: *R63 monitoring location.*

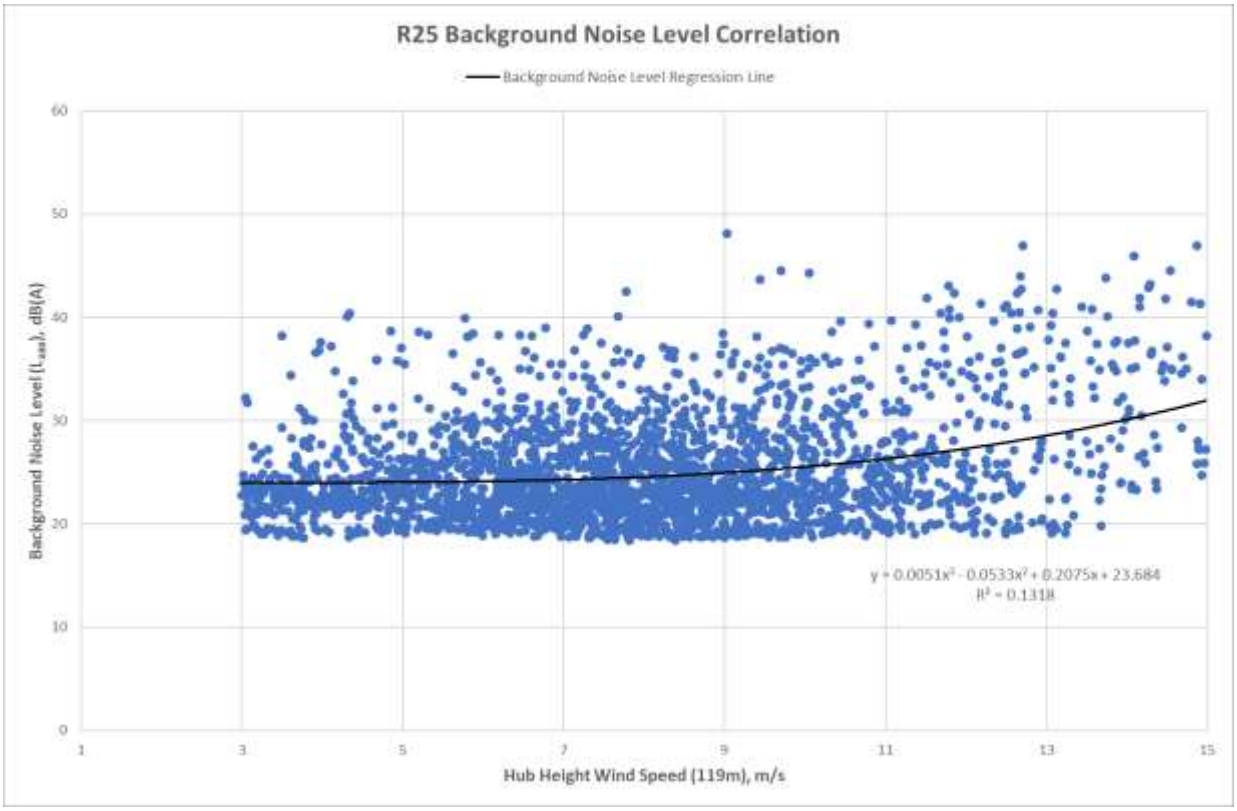
Appendix C: Background noise and wind speed correlations for original monitoring locations

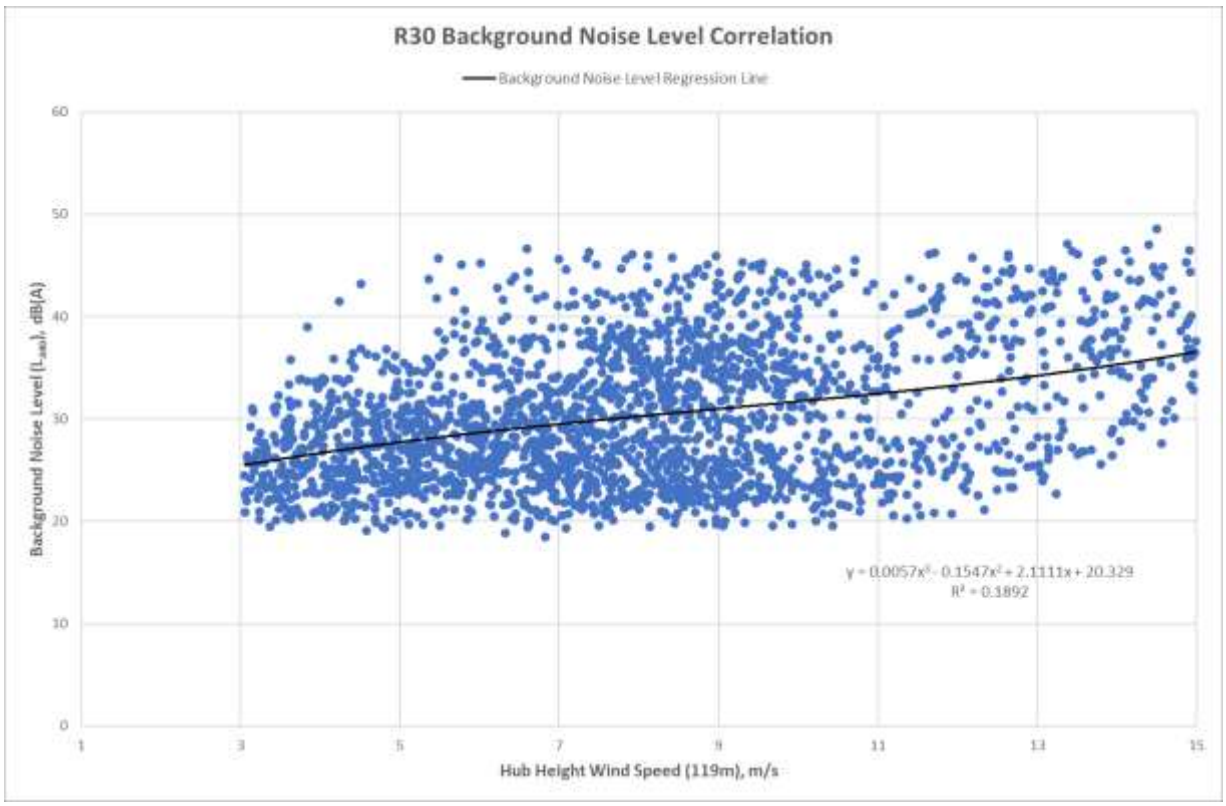


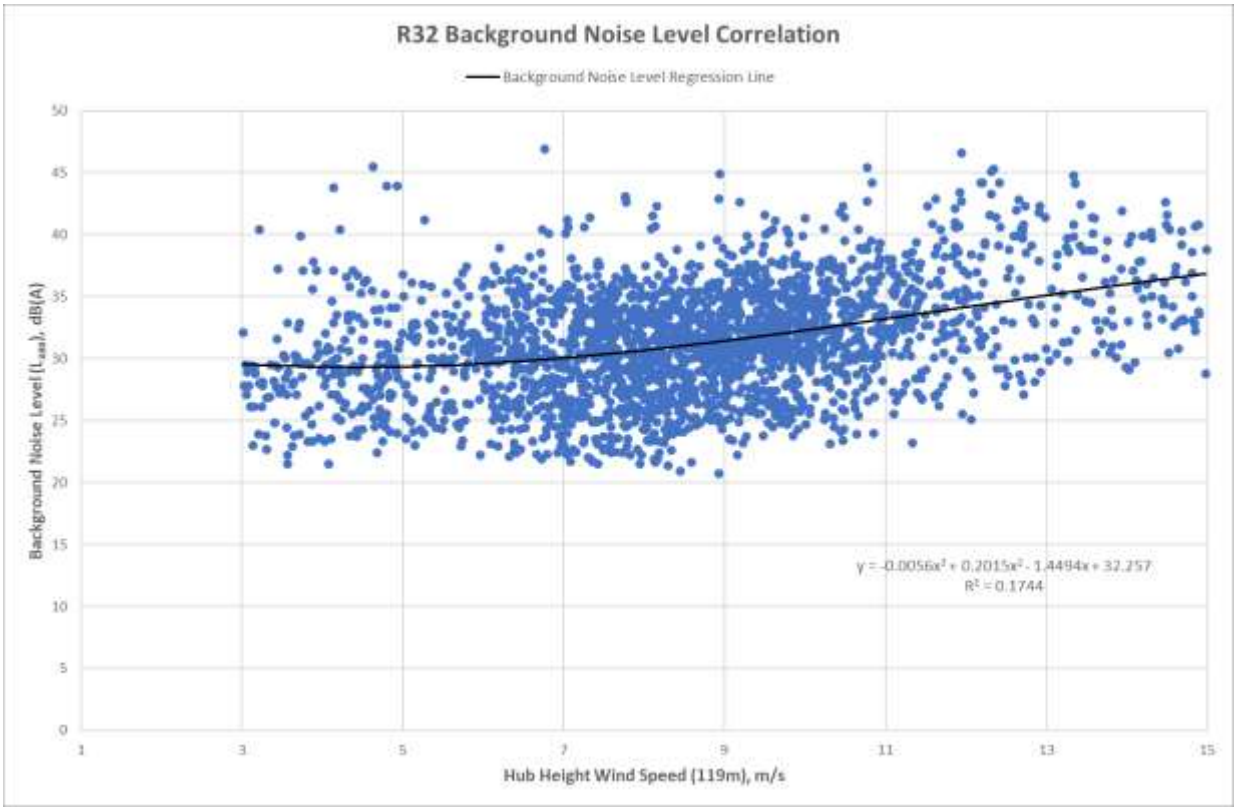


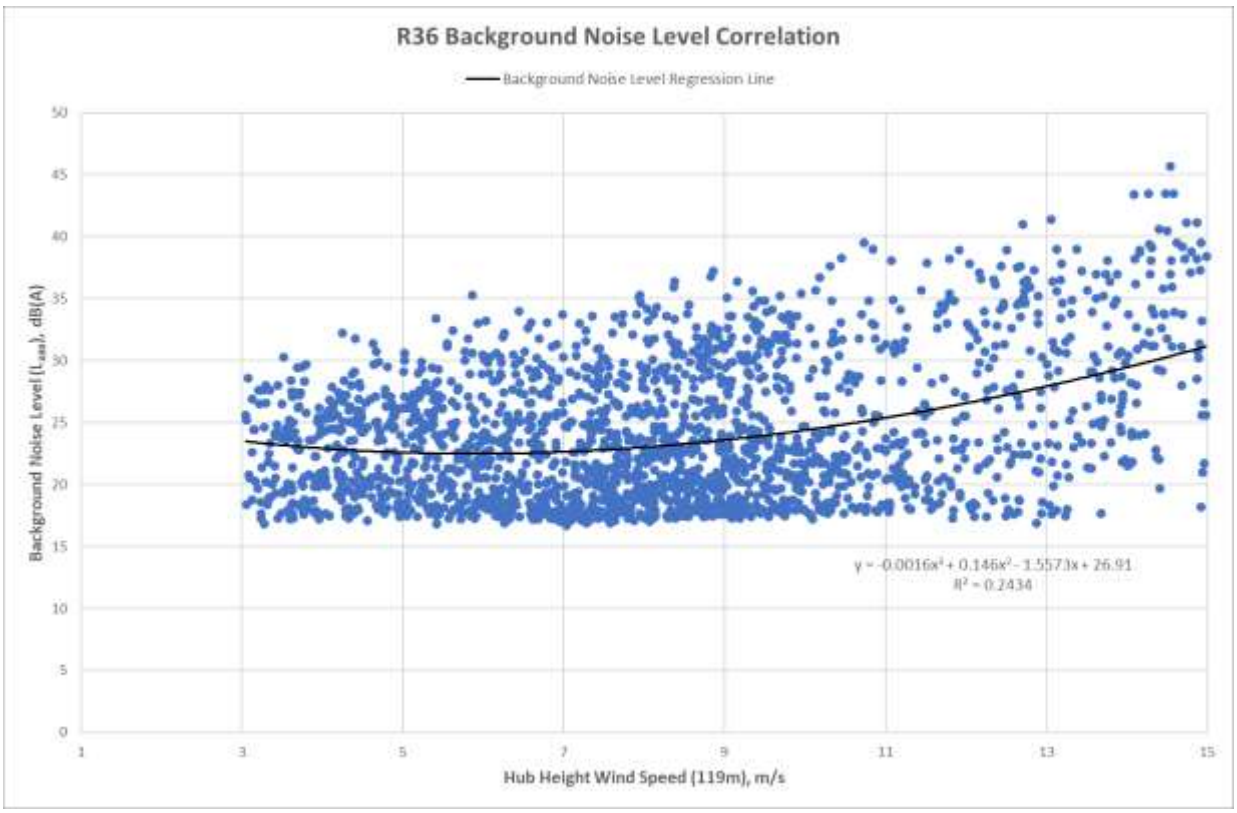

R20 Background Noise Level Correlation
Background Noise Level Regression Line
Background Noise Level (L90), dB(A)
Hub Height Wind Speed (119m), m/s
y = -0.0009x³ + 0.1064x² - 1.0616x + 33.757
R² = 0.1495

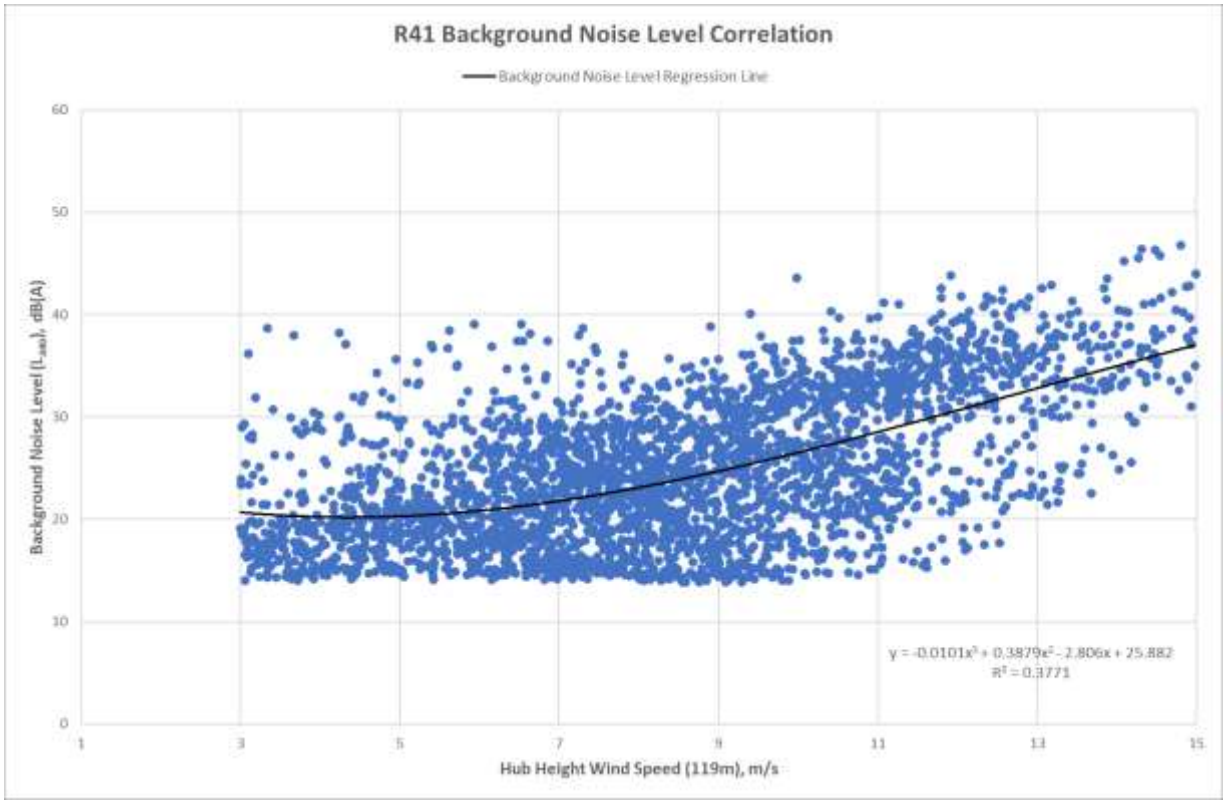

R128 Background Noise Level Correlation
Background Noise Level Regression Line
Background Noise Level (L90), dB(A)
Hub Height Wind Speed (119m), m/s
y = 0.0018x³ + 0.0468x² - 0.3021x + 28.826
R² = 0.2332

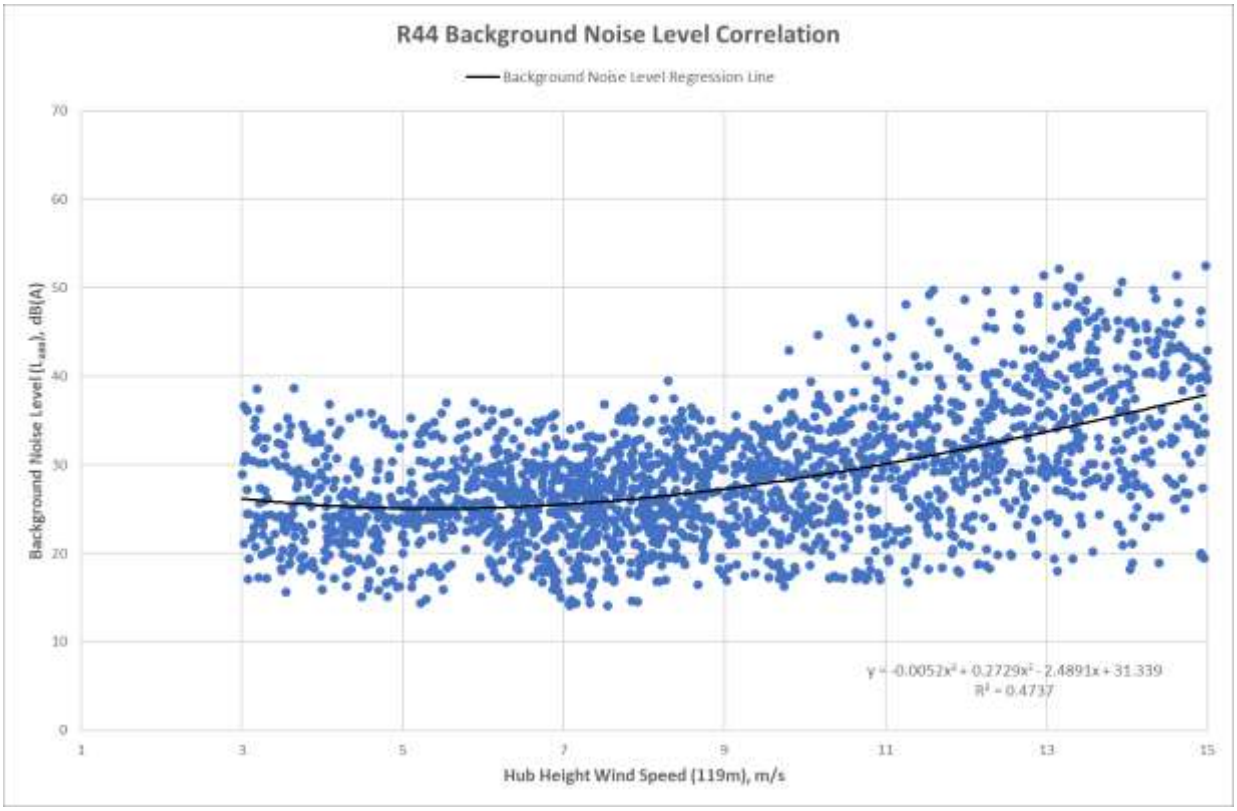

R25 Background Noise Level Correlation
Background Noise Level Regression Line
Background Noise Level (L90), dB(A)
Hub Height Wind Speed (119m), m/s
y = 0.0051x³ - 0.0533x² + 0.2075x + 23.684
R² = 0.1318

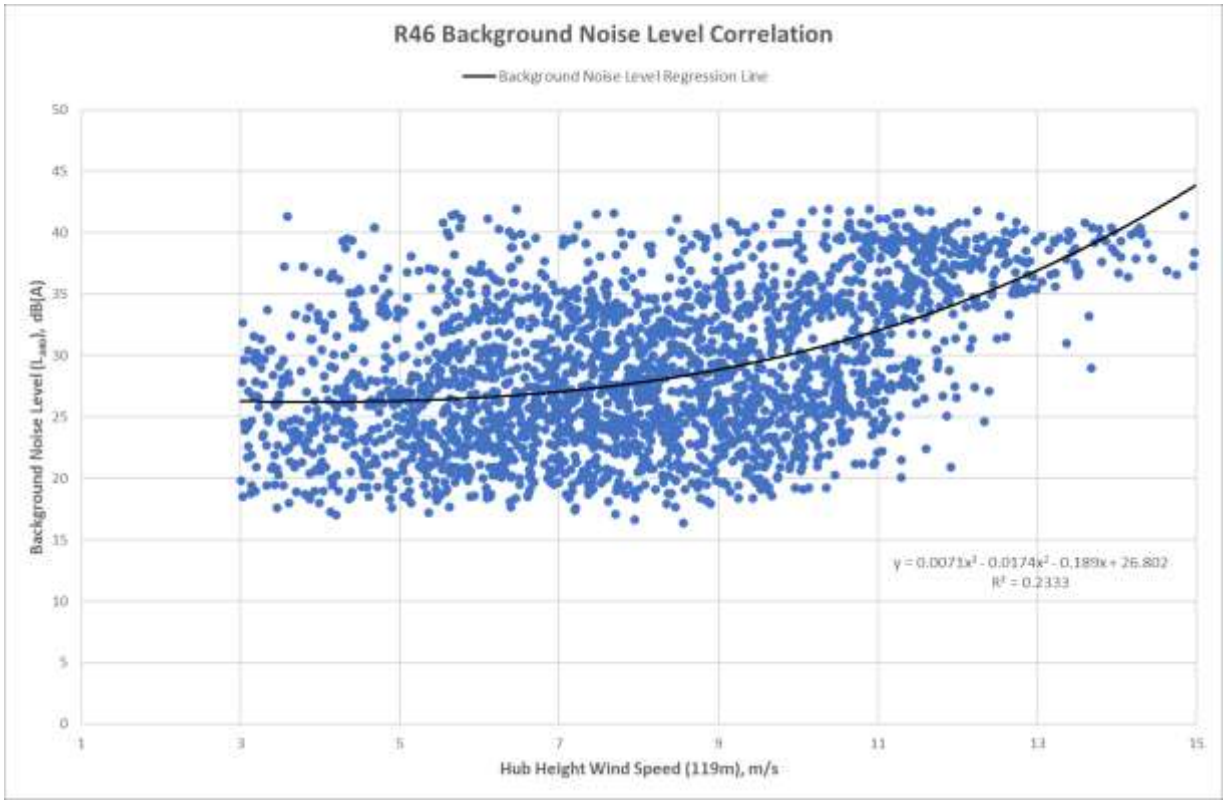

R30 Background Noise Level Correlation
Background Noise Level Regression Line
Background Noise Level (L90), dB(A)
Hub Height Wind Speed (119m), m/s
y = 0.0057x³ - 0.1547x² + 2.1111x + 20.329
R² = 0.1892

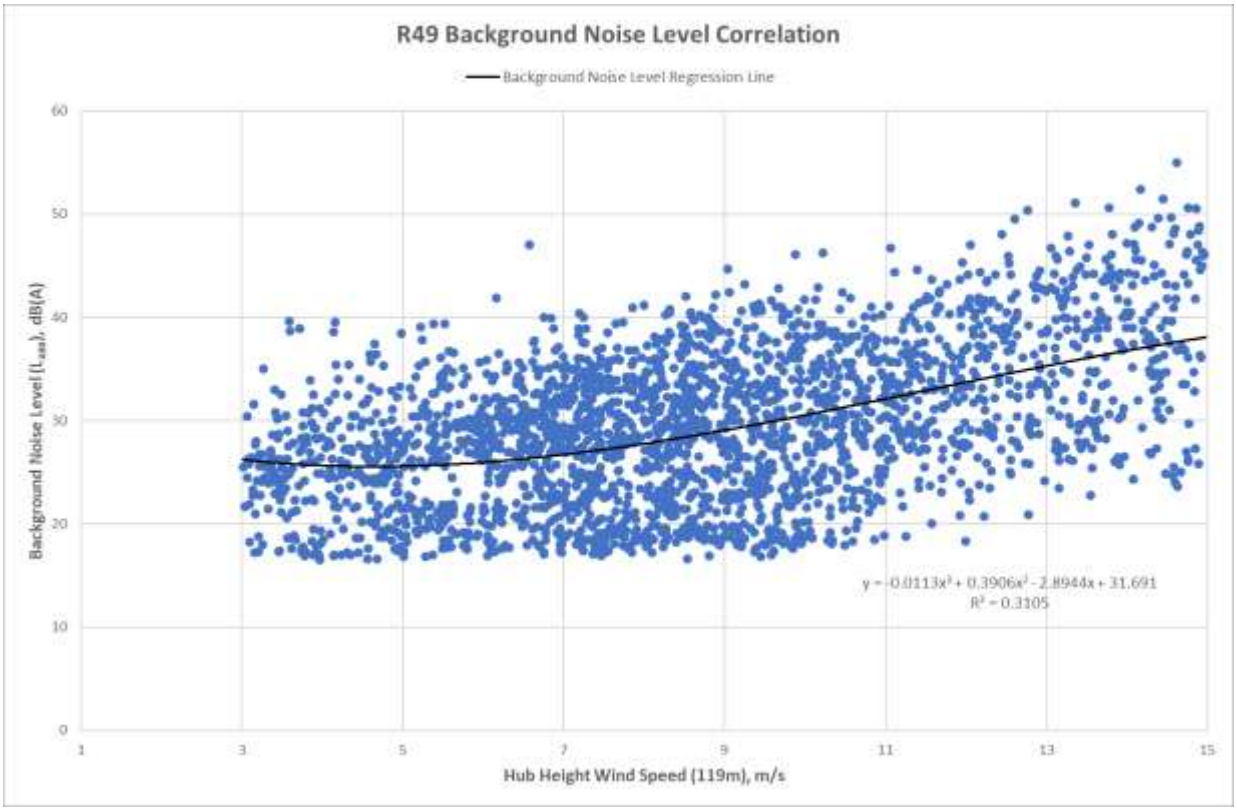

R32 Background Noise Level Correlation
Background Noise Level Regression Line
Background Noise Level (L90), dB(A)
Hub Height Wind Speed (119m), m/s
y = -0.0056x³ + 0.2015x² - 1.4494x + 32.257
R² = 0.1744

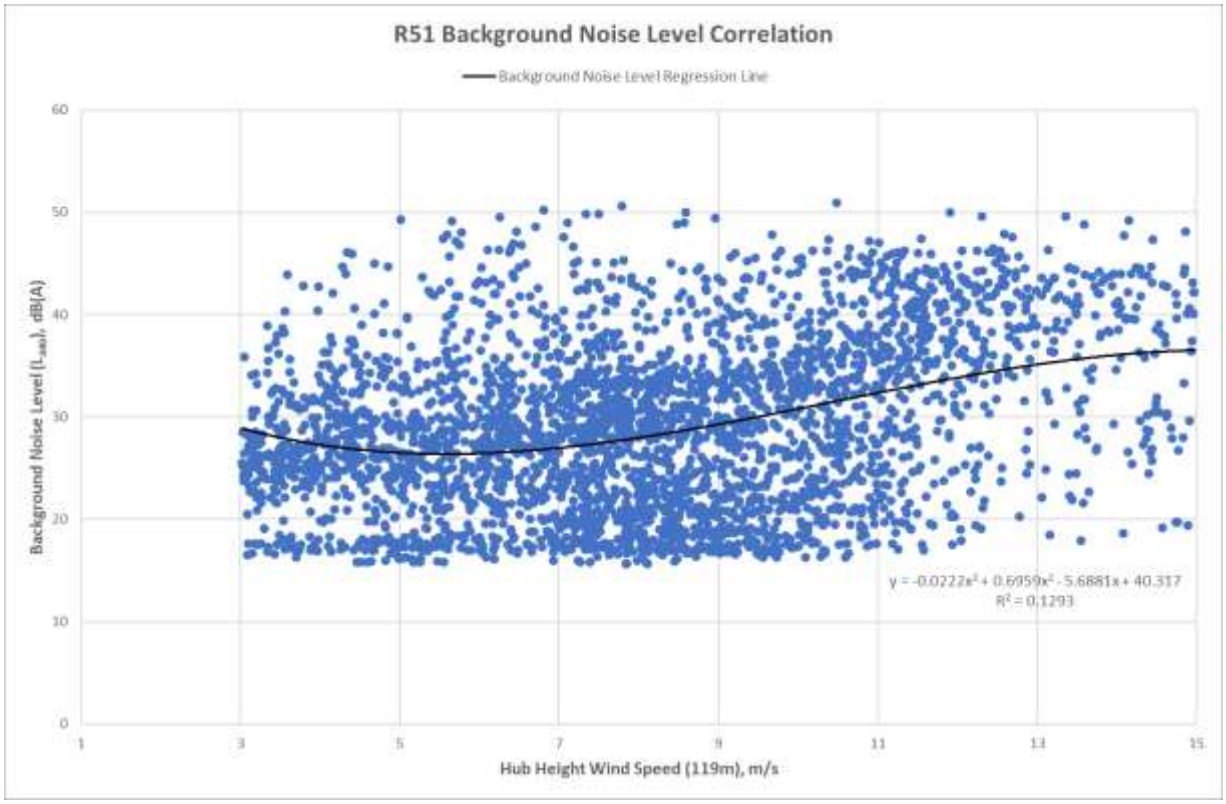

R36 Background Noise Level Correlation
Background Noise Level Regression Line
Background Noise Level (L90), dB(A)
Hub Height Wind Speed (119m), m/s
y = -0.0016x³ + 0.146x² - 1.5573x + 26.91
R² = 0.2434

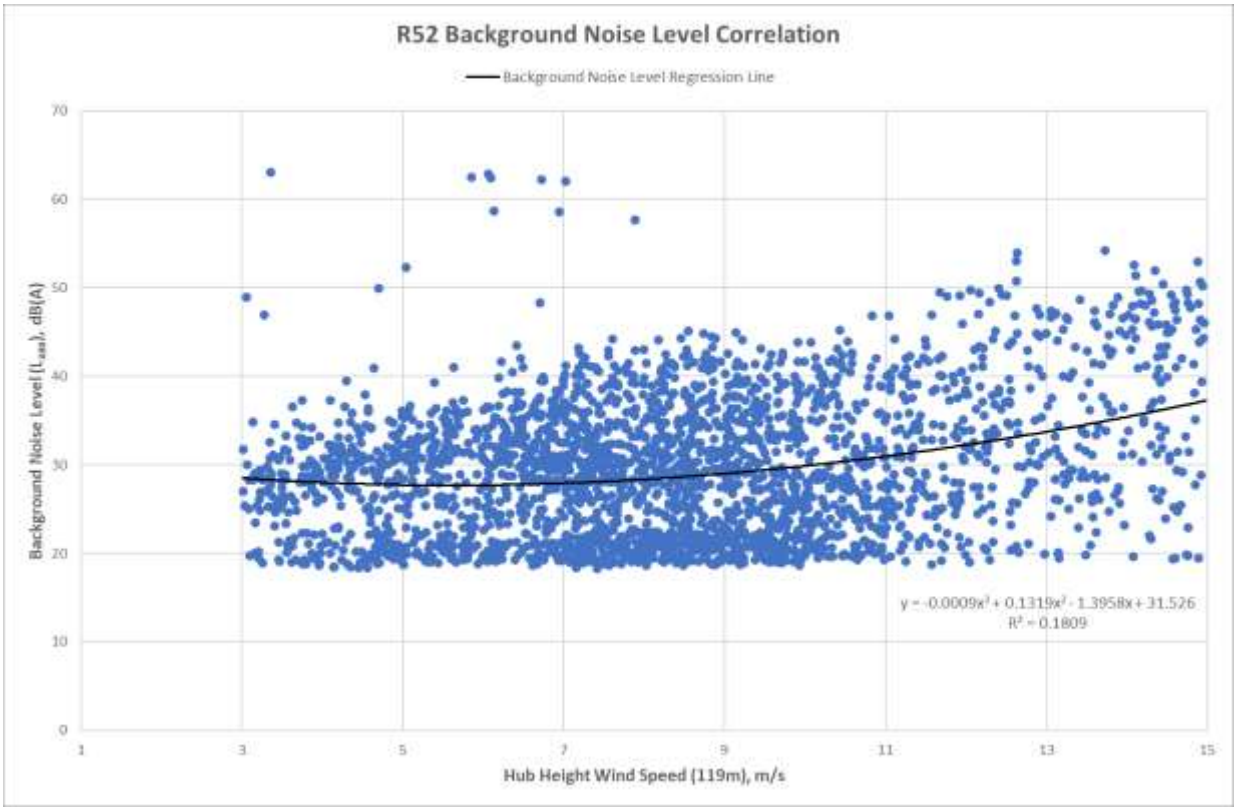

R41 Background Noise Level Correlation
Background Noise Level Regression Line
Background Noise Level (L90), dB(A)
Hub Height Wind Speed (119m), m/s
y = -0.0101x³ + 0.3879x² - 2.806x + 25.882
R² = 0.3771

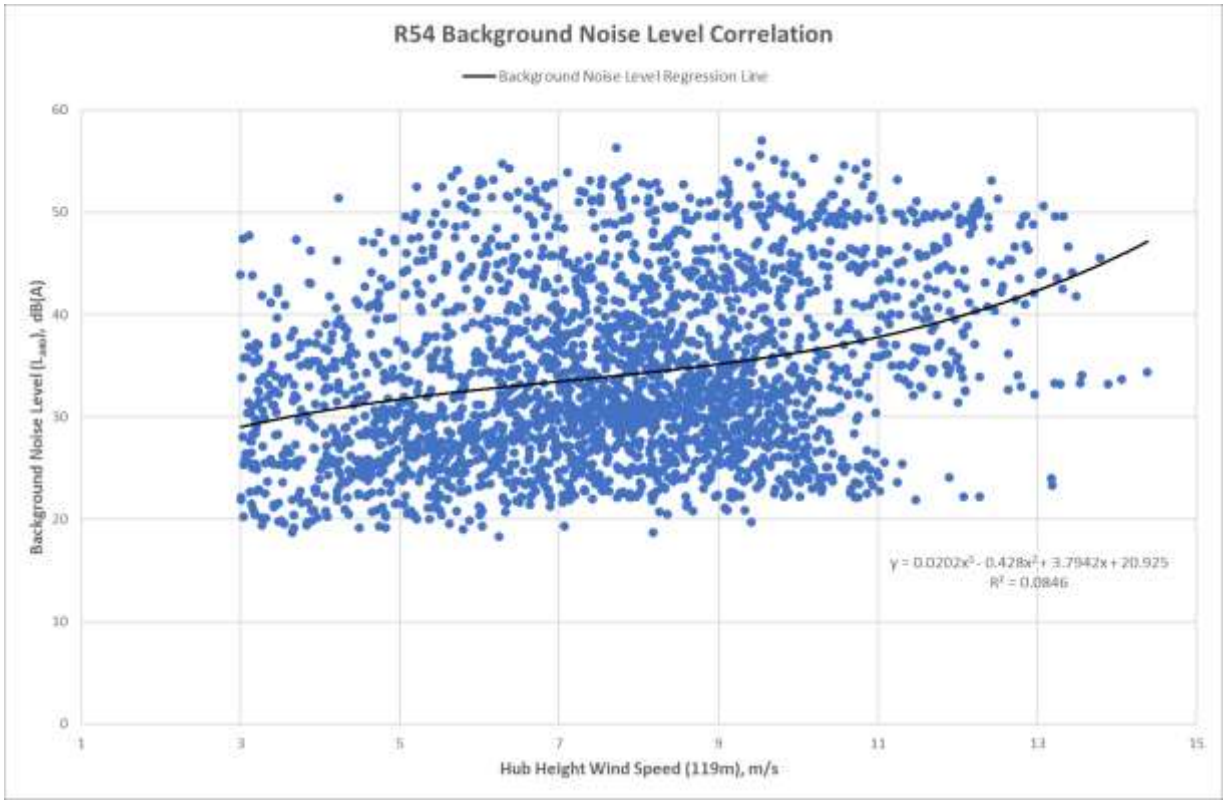

R44 Background Noise Level Correlation
Background Noise Level Regression Line
Background Noise Level (L90), dB(A)
Hub Height Wind Speed (119m), m/s
y = -0.0052x³ + 0.2729x² - 2.4891x + 31.339
R² = 0.4737

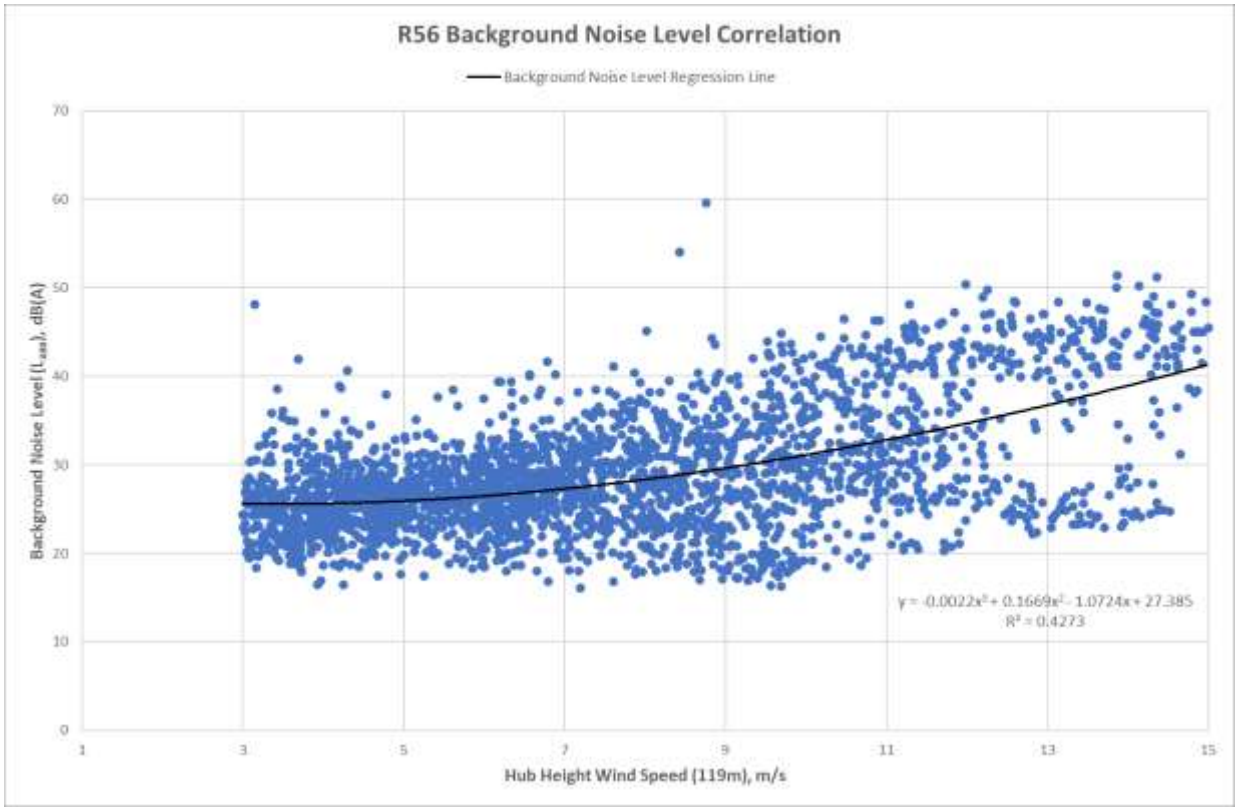

R46 Background Noise Level Correlation
Background Noise Level Regression Line
Background Noise Level (L90), dB(A)
Hub Height Wind Speed (119m), m/s
y = 0.0071x³ - 0.0174x² - 0.189x + 26.802
R² = 0.2333

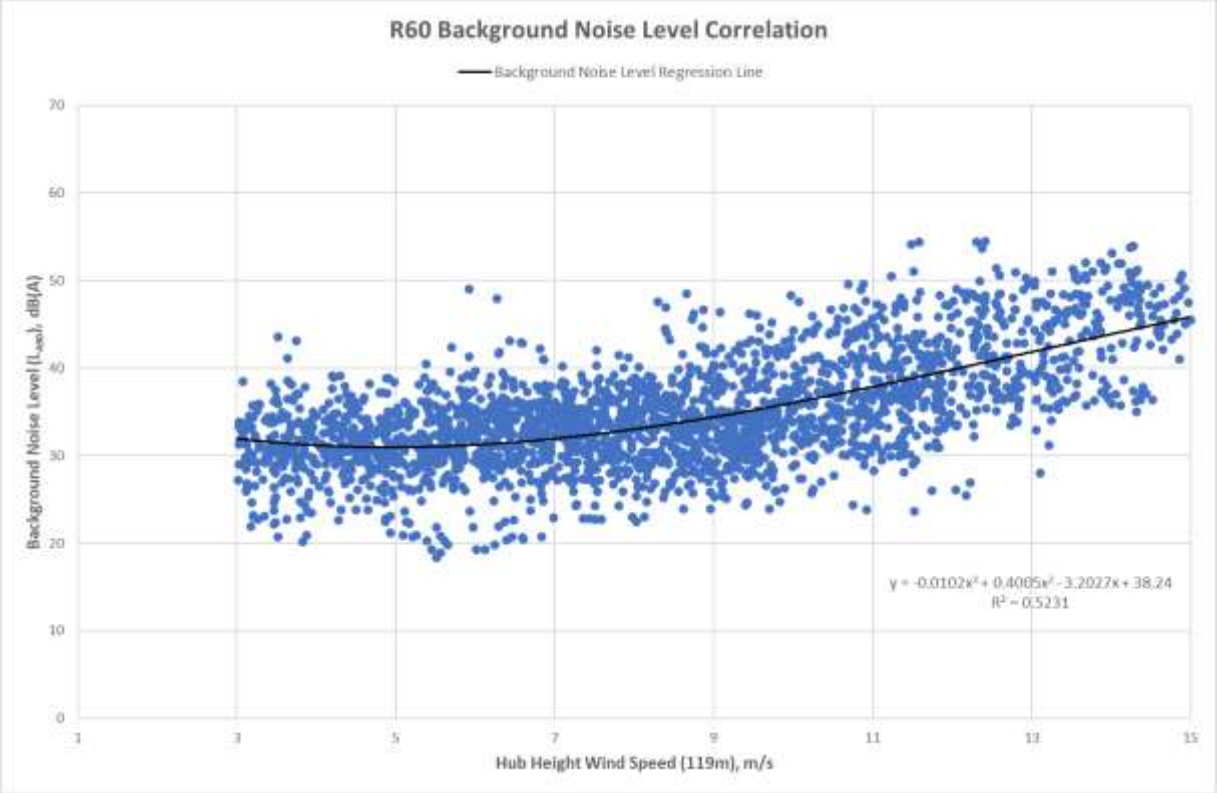

R49 Background Noise Level Correlation
Background Noise Level Regression Line
Background Noise Level (L90), dB(A)
Hub Height Wind Speed (119m), m/s
y = -0.0113x³ + 0.3906x² - 2.8944x + 31.691
R² = 0.3105


R51 Background Noise Level Correlation
Background Noise Level Regression Line
Background Noise Level (L90), dB(A)
Hub Height Wind Speed (119m), m/s
y = -0.0222x³ + 0.6959x² - 5.6881x + 40.317
R² = 0.1293

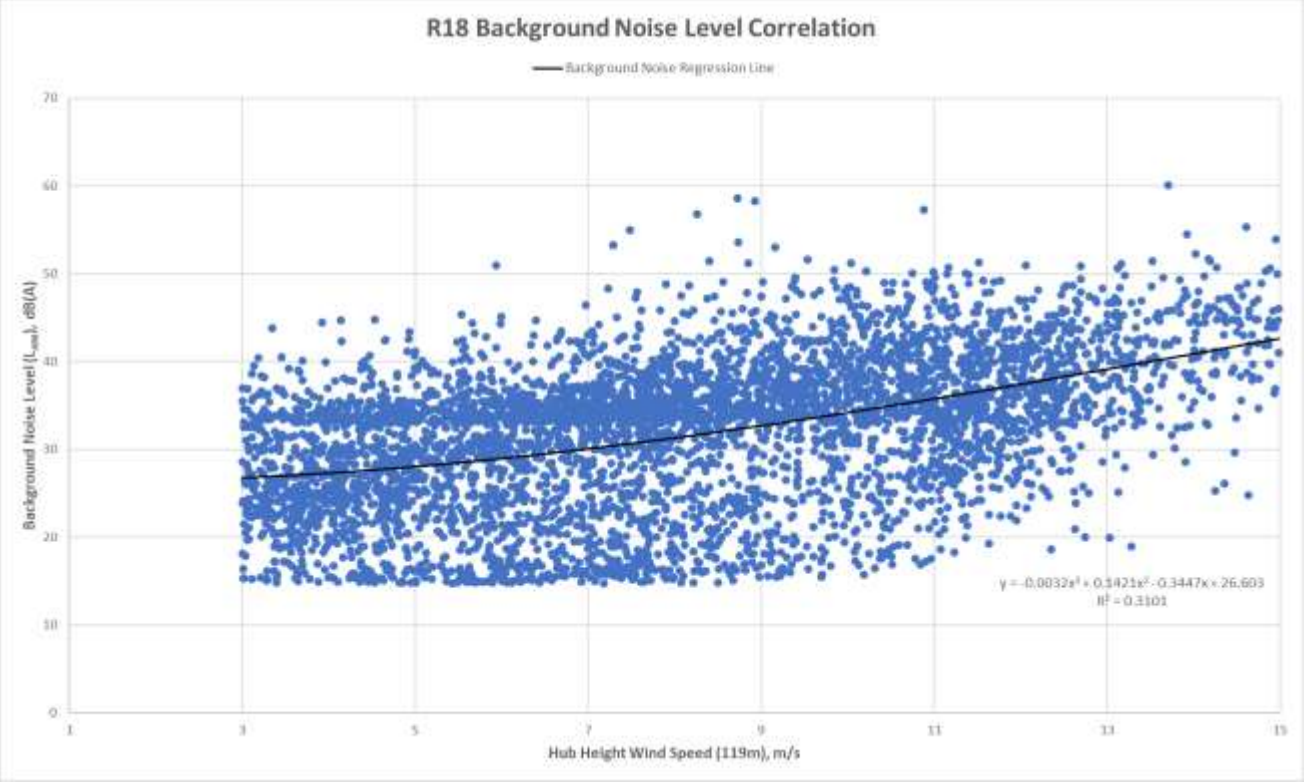

R52 Background Noise Level Correlation
Background Noise Level Regression Line
Background Noise Level (L90), dB(A)
Hub Height Wind Speed (119m), m/s
y = -0.0009x³ + 0.1319x² - 1.3958x + 31.526
R² = 0.1809

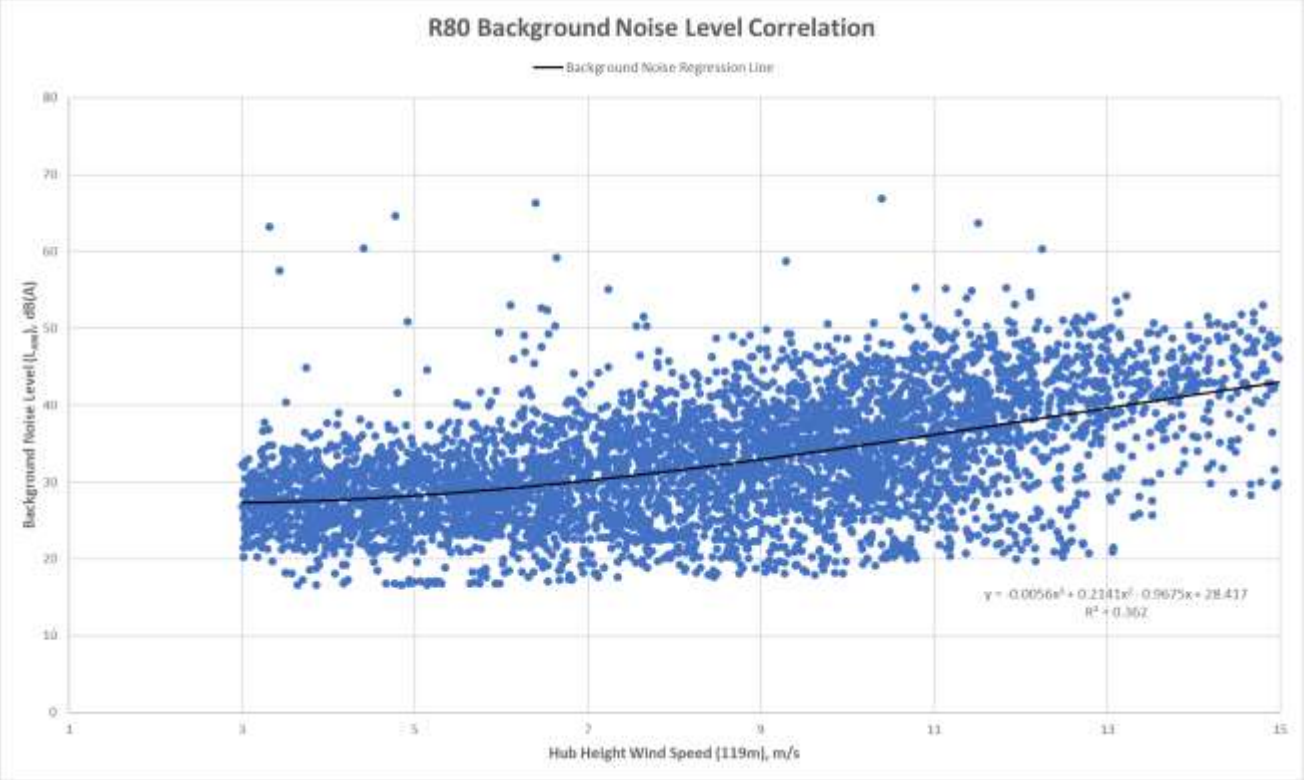

R54 Background Noise Level Correlation
Background Noise Level Regression Line
Background Noise Level (L90), dB(A)
Hub Height Wind Speed (119m), m/s
y = 0.0202x³ - 0.428x² + 3.7942x + 20.925
R² = 0.0846

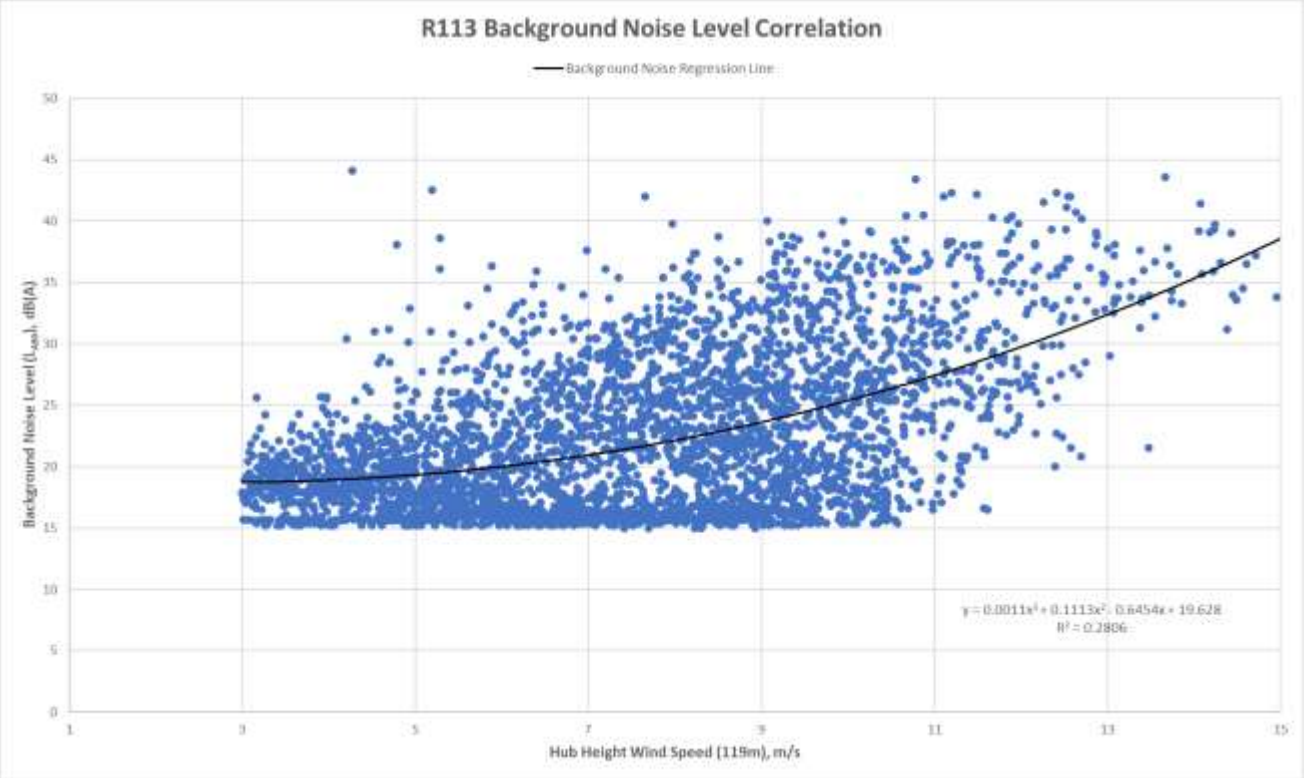

R56 Background Noise Level Correlation
Background Noise Level Regression Line
Background Noise Level (L90), dB(A)
Hub Height Wind Speed (119m), m/s
y = -0.0022x³ + 0.1669x² - 1.0724x + 27.385
R² = 0.4273

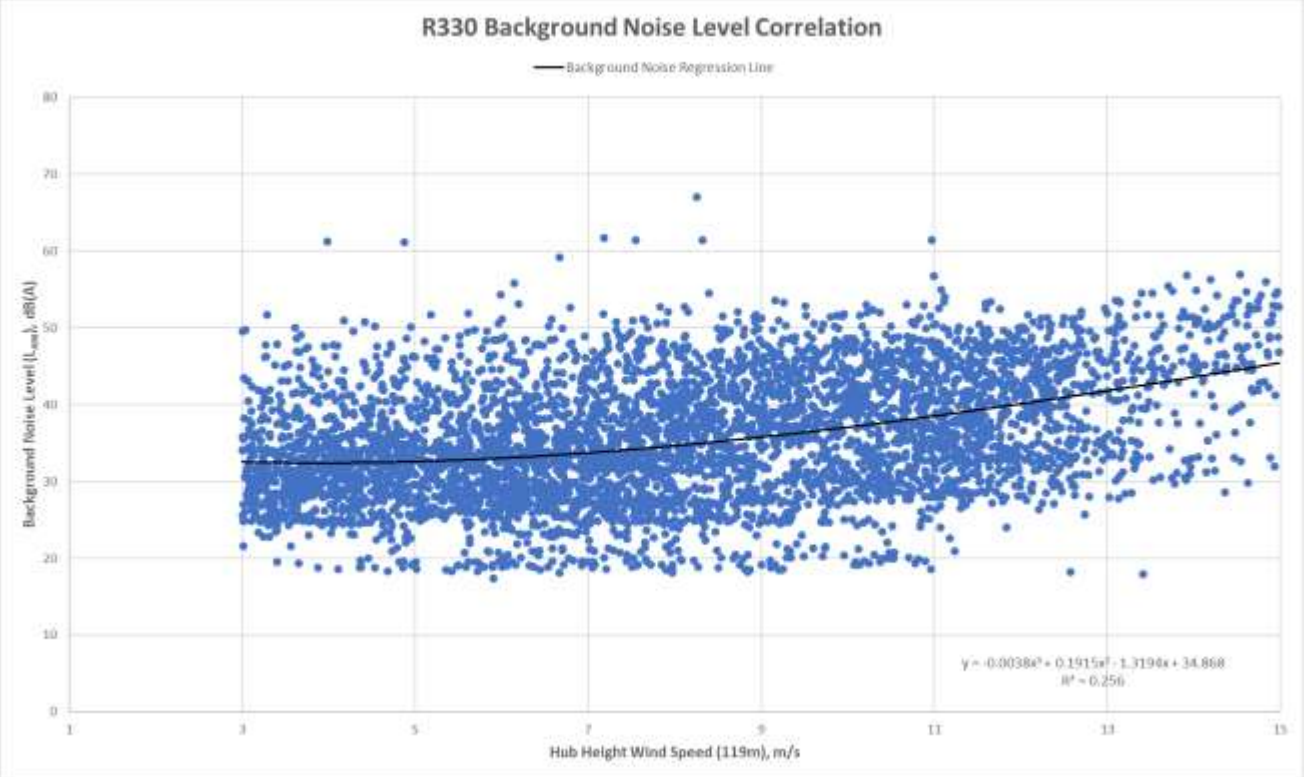

R60 Background Noise Level Correlation
Background Noise Level Regression Line
Background Noise Level (L90), dB(A)
Hub Height Wind Speed (119m), m/s
y = -0.0102x² + 0.4005x² - 3.2027x + 38.24
R² = 0.5231
0
10
20
30
40
50
60
70
1
3
5
7
9
11
13
15

Appendix D: Background noise and wind speed correlations for additional monitoring locations – 2020 monitoring

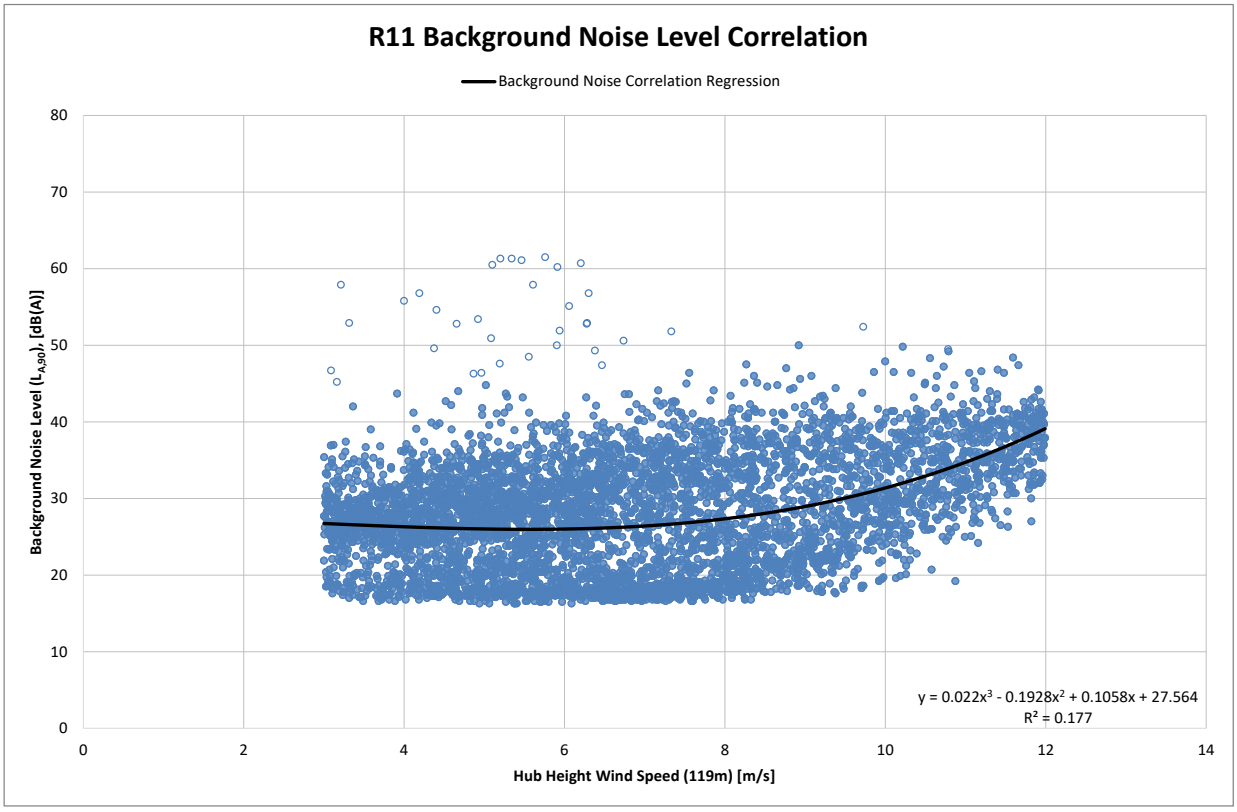


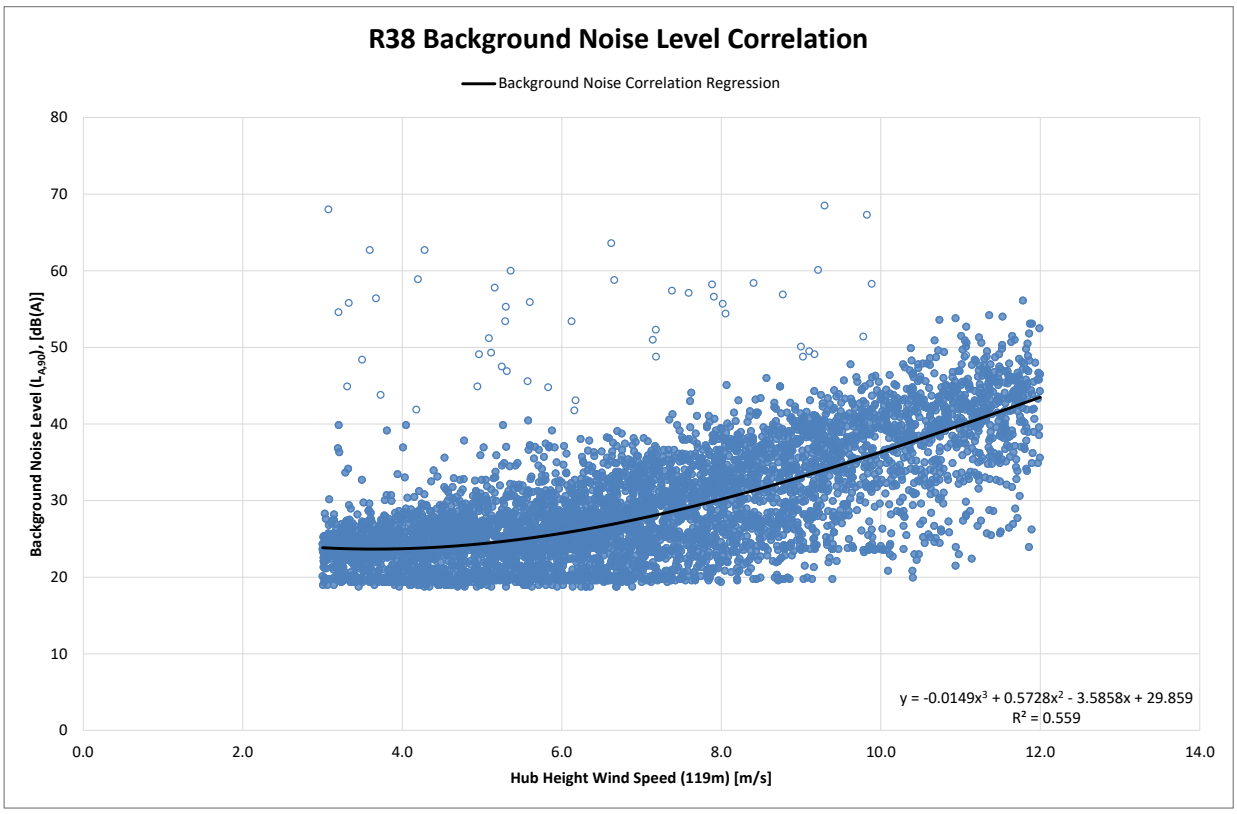


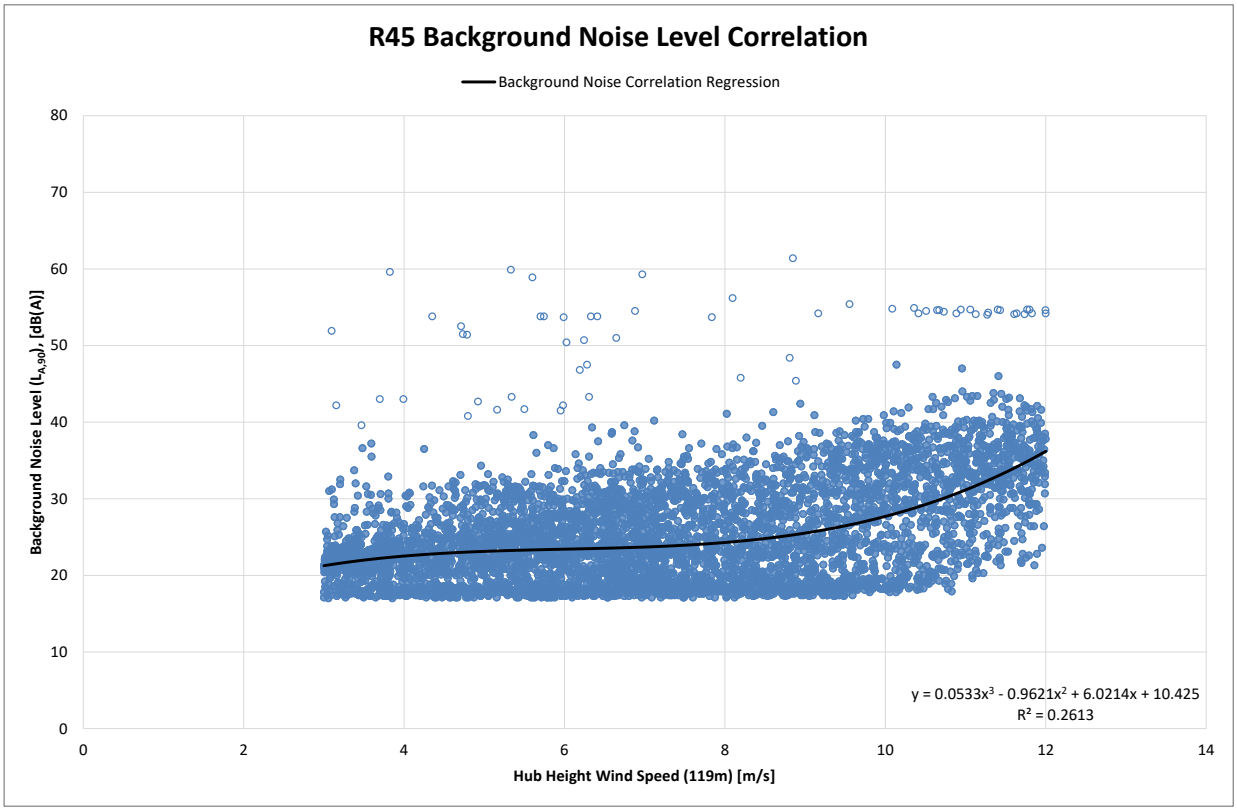

R113 Background Noise Level Correlation
Background Noise Regression Line
Background Noise Level (L95), dB(A)
Hub Height Wind Speed (119m), m/s

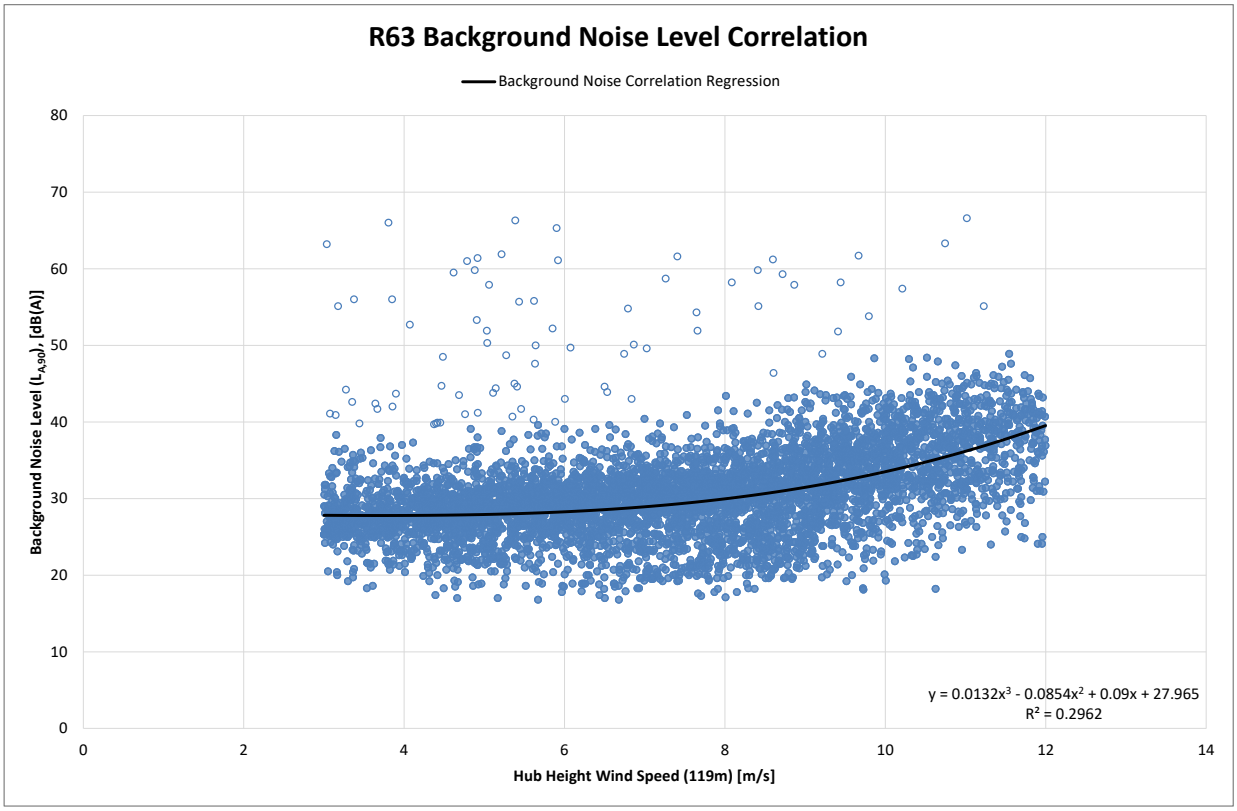

R330 Background Noise Level Correlation
Background Noise Regression Line
Background Noise Level (L95), dB(A)
Hub Height Wind Speed (119m), m/s

Appendix E: Background noise and wind speed correlations for additional monitoring locations – 2021 monitoring






R45 Background Noise Level Correlation
Background Noise Correlation Regression
Background Noise Level ($L_{A,90}$), [dB(A)]
Hub Height Wind Speed (119m) [m/s]
y = 0.0533x³ - 0.9621x² + 6.0214x + 10.425
R² = 0.2613


R63 Background Noise Level Correlation
Background Noise Correlation Regression
Background Noise Level ($L_{A,90}$), [dB(A)]
Hub Height Wind Speed (119m) [m/s]
y = 0.0132x³ - 0.0854x² + 0.09x + 27.965
R² = 0.2962

Appendix F: Residence Coordinates

ID	Coordinates (UTM WGS84 H55)	
	Easting	Northing
Associated Residences		
R01	677,418	6,187,127
R02	678,095	6,185,733
R14	677,807	6,183,115
R16	677,297	6,181,991
R20	676,130	6,181,544
R25	677,075	6,178,323
R31	679,304	6,177,019
R34	681,817	6,174,338
R36	679,988	6,173,811
R40	678,605	6,171,136
R41	681,870	6,168,503
R42	683,370	6,168,206
R44	679,986	6,166,322
R46	681,835	6,164,679
R49	680,667	6,162,540
R51	680,970	6,161,588
R52	684,135	6,161,246
R54	683,514	6,155,819
R56	686,567	6,153,140
R59	684,670	6,149,654
R60	684,244	6,149,529
R61	684,489	6,149,335
R64	676,239	6,180,502
R66	683,628	6,159,544
R72	677,635	6,173,854
R73	677,725	6,173,856
R80	679,215	6,168,709
R113	684,054	6,179,129
R114	683,962	6,183,346
R128	678,848	6,183,498
R192	675,172	6,179,170

ID	Coordinates (UTM WGS84 H55)	
	Easting	Northing
Non-Associated Residences		
R04	680,436	6,185,190
R06	681,484	6,184,020
R07	681,917	6,183,967
R08	682,339	6,183,864
R09	682,517	6,183,838
R10	682,842	6,183,767
R11	679,650	6,183,618
R15	675,095	6,182,805
R17	676,127	6,181,740
R18	676,024	6,181,739
R19	676,412	6,181,665
R22	676,095	6,181,037
R24	683,597	6,178,847
R26	676,523	6,178,178
R28	684,090	6,177,918
R29	676,434	6,177,903
R38	679,623	6,173,620
R45	682,847	6,165,279
R47	680,155	6,162,689
R48	679,834	6,162,662
R50	680,701	6,161,784
R53	680,877	6,160,875
R63	683,875	6,148,991
R65	676,668	6,179,644
R67	683,606	6,159,059
R68	684,235	6,160,336
R69	676,002	6,175,948
R70	675,919	6,175,950
R71	675,814	6,175,406
R74	677,256	6,172,562
R75	677,851	6,172,291
R76	676,803	6,171,944
R77	677,654	6,169,542
R78	676,707	6,169,056
R79	676,671	6,168,992
R81	678,216	6,166,375
R82	677,982	6,165,692
R83	678,818	6,162,988
R85	680,217	6,161,078
R86	680,739	6,159,422
R87	682,469	6,156,694
R88	682,860	6,156,066
R89	681,098	6,154,853
R90	680,583	6,151,407

ID	Coordinates (UTM WGS84 H55)	
	Easting	Northing
Non-Associated Residences		
R91	680,875	6,148,463
R92	681,812	6,147,909
R93	680,723	6,147,619
R94	680,028	6,147,815
R95	680,529	6,147,037
R96	680,529	6,146,998
R97	681,049	6,146,176
R98	684,400	6,148,461
R99	689,280	6,153,857
R100	684,738	6,148,432
R101	688,189	6,154,931
R102	685,395	6,158,972
R103	688,158	6,159,213
R104	688,448	6,159,572
R105	688,749	6,159,082
R106	688,206	6,160,370
R107	686,879	6,160,480
R108	685,842	6,160,591
R109	684,831	6,165,424
R110	684,391	6,165,083
R111	684,234	6,167,383
R112	686,151	6,177,467
R115	684,767	6,183,708
R116	681,337	6,185,781
R117	681,030	6,186,528
R118	681,128	6,186,796
R119	679,979	6,187,579
R120	679,167	6,188,823
R121	673,113	6,188,366
R122	671,741	6,187,148
R124	673,168	6,185,478
R125	673,241	6,185,272
R126	673,137	6,186,723
R127	672,865	6,184,811
R129	687,424	6,148,652
R130	673,183	6,185,598
R131	674,633	6,183,862
R132	675,005	6,182,884
R133	680,562	6,147,046
R135	679,999	6,147,821
R137	686,573	6,148,420
R138	686,660	6,148,328
R139	687,199	6,148,339
R140	687,418	6,148,615

ID	Coordinates (UTM WGS84 H55)	
	Easting	Northing
Non-Associated Residences		
R141	687,456	6,149,042
R142	688,783	6,148,859
R143	688,712	6,149,106
R144	688,869	6,149,542
R145	678,834	6,149,712
R146	688,806	6,149,898
R147	678,909	6,150,247
R148	678,110	6,150,900
R149	678,227	6,152,209
R151	689,009	6,153,254
R152	678,918	6,153,120
R153	689,004	6,153,469
R154	679,214	6,154,085
R155	682,087	6,155,970
R156	682,424	6,156,503
R157	682,567	6,157,576
R158	679,832	6,158,239
R159	680,150	6,158,414
R160	686,516	6,163,209
R161	686,558	6,163,349
R162	686,194	6,163,423
R163	686,122	6,163,365
R164	686,179	6,163,303
R165	686,730	6,164,124
R166	686,578	6,164,097
R167	686,605	6,163,812
R168	686,585	6,163,793
R169	686,768	6,164,315
R170	683,284	6,165,017
R175	689,083	6,176,435
R177	675,210	6,178,587
R179	675,135	6,178,717
R180	675,088	6,178,761
R181	674,875	6,178,540
R182	675,037	6,178,486
R183	674,578	6,178,693
R184	673,469	6,178,896
R185	674,831	6,178,963
R186	675,142	6,178,988
R187	675,113	6,178,835
R188	675,224	6,179,170
R189	674,755	6,179,114
R190	674,929	6,179,085
R191	674,993	6,179,119
R193	675,059	6,178,927
R194	675,004	6,178,932

ID	Coordinates (UTM WGS84 H55)	
	Easting	Northing
Non-Associated Residences		
R195	674,752	6,178,927
R196	674,852	6,178,901
R197	675,003	6,178,871
R198	675,154	6,178,827
R199	675,207	6,178,841
R200	675,115	6,178,809
R202	684,519	6,179,497
R203	676,049	6,179,500
R204	675,863	6,179,390
R206	685,306	6,180,642
R207	672,288	6,187,479
R209	672,542	6,188,800
R210	672,541	6,189,270
R211	687,811	6,148,549
R212	689,159	6,149,506
R213	679,947	6,154,232
R214	679,299	6,153,729
R216	690,718	6,155,201
R217	679,547	6,155,316
R218	687,614	6,160,188
R219	686,206	6,164,280
R220	686,269	6,165,266
R223	674,862	6,178,409
R226	675,069	6,178,599
R230	675,291	6,179,035
R232	674,827	6,178,687
R234	674,816	6,178,852
R243	681,627	6,156,031
R244	679,843	6,157,268
R246	678,838	6,153,796
R259	679,376	6,155,053
R262	680,441	6,154,534
R266	676,126	6,178,067
R267	675,619	6,180,141
R268	675,798	6,179,747
R269	675,542	6,178,459
R270	675,545	6,178,651
R271	675,812	6,176,676
R272	675,077	6,178,674
R274	675,072	6,178,723
R276	674,959	6,179,291
R277	674,797	6,177,072
R278	674,900	6,178,637
R279	674,830	6,177,839
R280	674,827	6,178,559
R281	674,896	6,178,572

ID	Coordinates (UTM WGS84 H55)	
	Easting	Northing
Non-Associated Residences		
R282	672,813	6,183,624
R283	674,251	6,179,077
R284	674,150	6,179,201
R286	683,162	6,184,437
R288	675,035	6,179,594
R289	672,895	6,185,072
R290	685,210	6,146,484
R291	686,571	6,146,903
R292	674,883	6,178,516
R294	681,540	6,148,503
R295	689,276	6,153,049
R296	689,334	6,159,068
R298	677,624	6,169,761
R303	675,012	6,174,765
R304	673,912	6,168,651
R305	673,040	6,169,296
R307	674,148	6,169,506
R308	685,152	6,146,518
R309	681,194	6,187,371
R310	674,929	6,179,121
R311	668,973	6,166,709
R313	690,893	6,155,645
R314	688,121	6,159,393
R315	686,718	6,158,805
R316	686,237	6,162,634
R317	686,240	6,165,612
R318	686,391	6,166,303
R319	686,200	6,179,899
R323	679,280	6,152,986
R324	680,449	6,161,468
R325	675,154	6,178,653
R326	680,497	6,158,049
R327	670,573	6,166,151
R328	674,877	6,183,534
R329	673,626	6,185,507
R330	675,185	6,183,010