

TECHNICAL APPENDIX 11.1**Noise Monitor In-Situ**

NML 1 – H7



NML 2 – H37



NML 3A



NML 5 – H103



NML 7 – Quarry



NML 8 – H108



NML 9 – H19



NML 831 – H14



Noise Monitoring Locations and the Proposed Development



TECHNICAL APPENDIX 11.2

Wind Speed Calculations for Hub Height

A GOOD PRACTICE GUIDE TO THE APPLICATION OF ETSU-R-97 FOR THE
ASSESSMENT AND RATING OF WIND TURBINE NOISE



4.5 Wind Shear Corrections

- 4.5.1 Basing the predictions on sound power data tested in accordance with the IEC 61400-11 standard (or equivalent) should mean that the wind reference used corresponds to hub height wind speeds, standardised to 10 m height using a fixed correction (see **Annex A**). These predictions can then be compared to background levels and/or associated noise limits derived using an equivalent wind speed reference, which will have wind shear taken into account directly.
- 4.5.2 When this is not the case, for example when considering background data measured against direct wind speed measurements at 10 m height, it is necessary to apply corrections to account for this. Any such corrections should be clearly outlined and detailed in any noise assessment so that they can be reviewed by any assessor. The assessment should be made using the most detailed information available.
- 4.5.3 Examples of methods which can be used to correct predictions to account for wind shear effects, when only using a 10 m mast, are included in **Supplementary Guidance Note 4** (wind shear). This note presents methods to calculate corrections on the basis of long-term data measured at different heights, but as such data may not be available for a specific site, typical shear values are also presented. Alternatively, similarly derived corrections representing typical (average) shear values can be applied to the wind speed reference used for the derived typical background noise levels.
- 4.5.4 The following simplified method is proposed for ease of use: applying a fixed correction by subtracting the following factors from the wind speed reference used in the turbine predictions: 1 m/s for turbine hub heights of up to 30 m, 2 m/s for hub heights of up to 60 m and 3 m/s for hub heights of more than 60 m. Such a generic approach would be suitable in the context of a study made using a 10 m mast to limit costs, in the absence of site-specific data.
- 4.5.5 If it can be demonstrated that the predicted levels are below the applicable lower fixed limits regardless of wind speed, it can be seen that wind shear would not have an effect on the assessment and this may form the basis of a suitable planning condition.

TECHNICAL APPENDIX 11.3

Background Noise Levels, background plus 5 trendline with the predicted noise levels against a noise limit of 45 dB(A) at each receptor

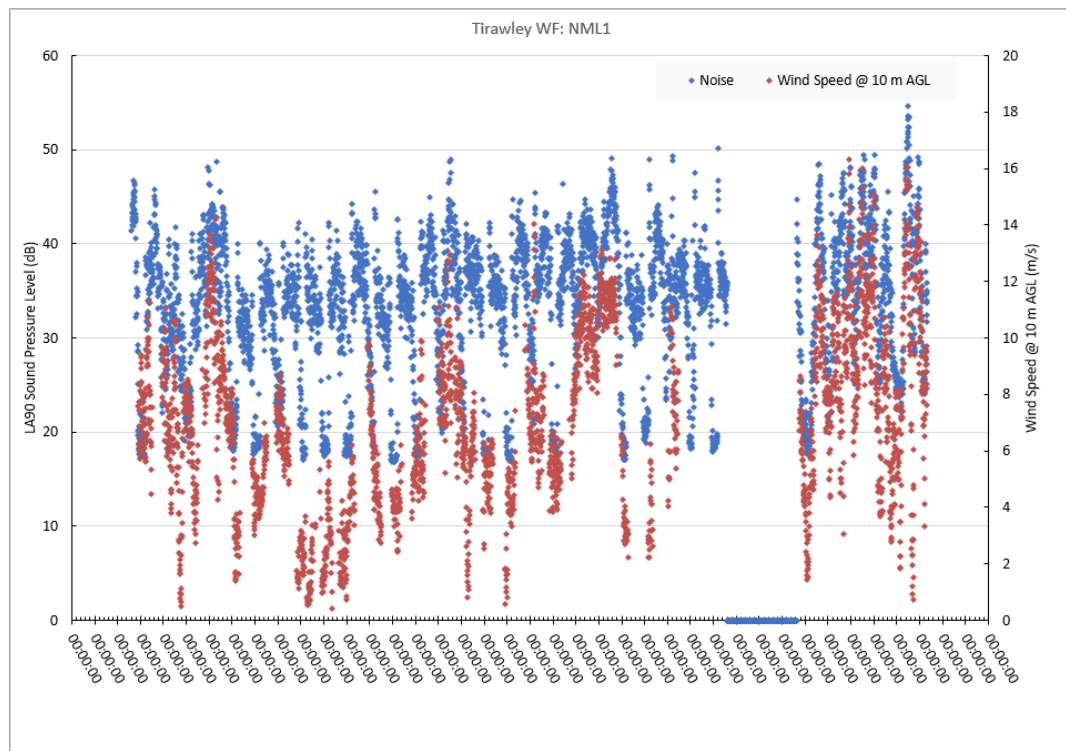


Chart 11.1: NML 1 – H7, comparing the background noise level and wind speed over the measurement period

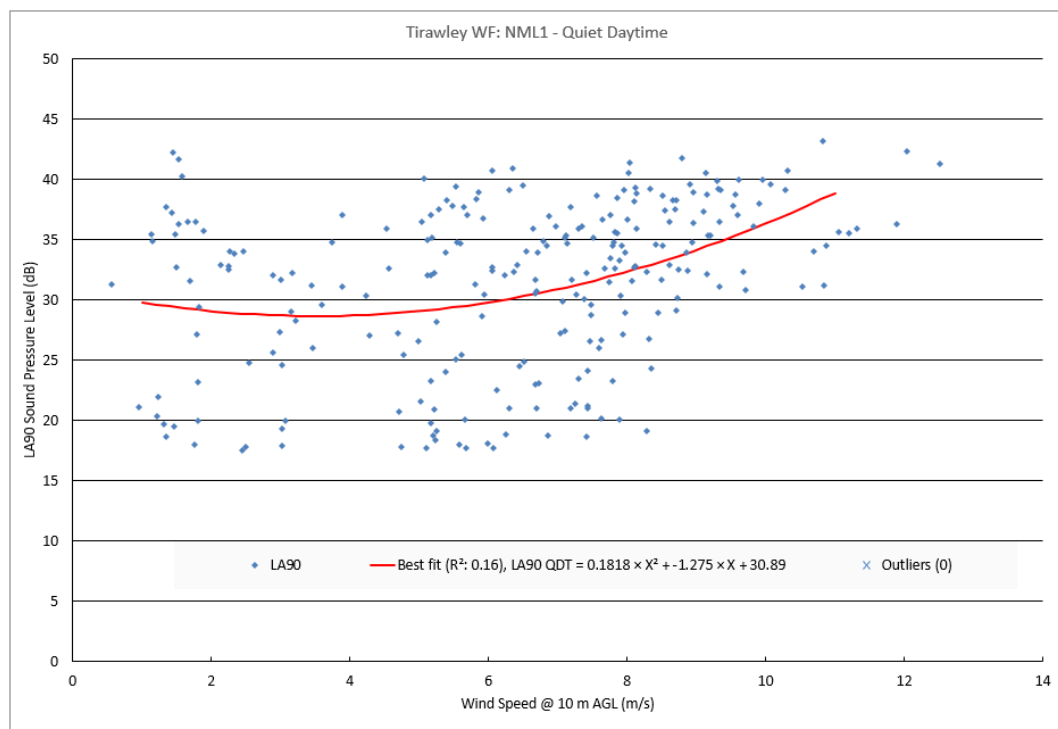


Chart 11.2: NML 1 – H7 for quiet daytime, background noise level, predicted level and assessment limit

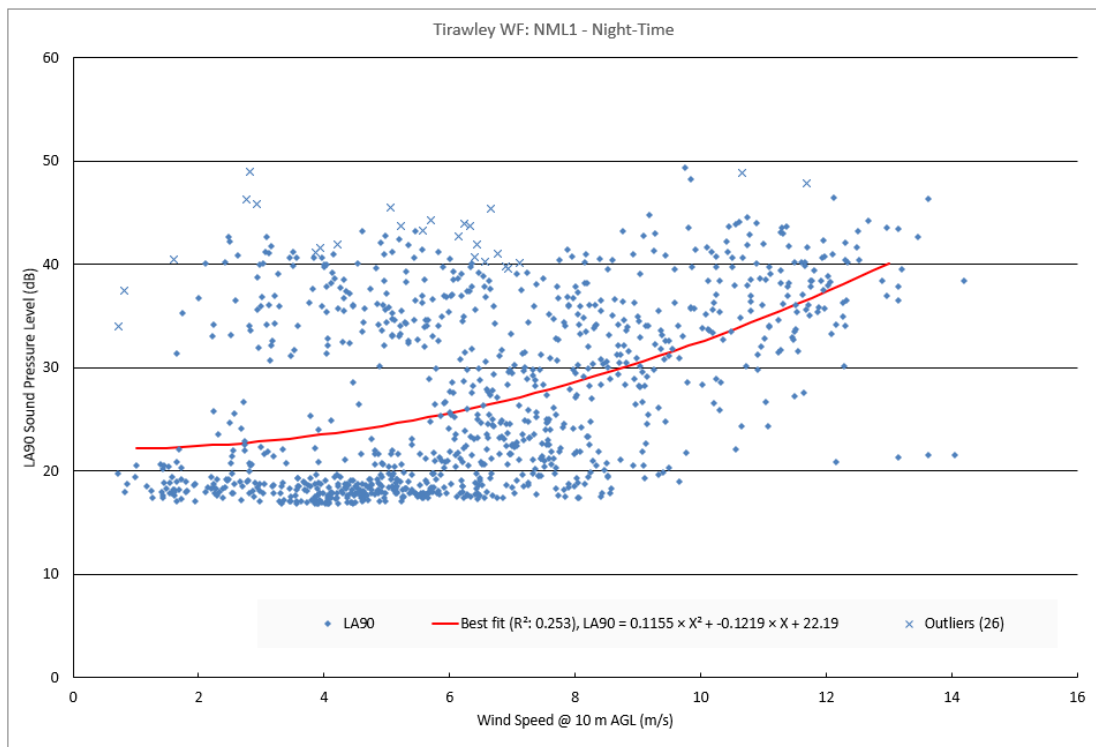


Chart 11.3: NML 1 – H7 for night-time, background noise level, predicted level and assessment limit

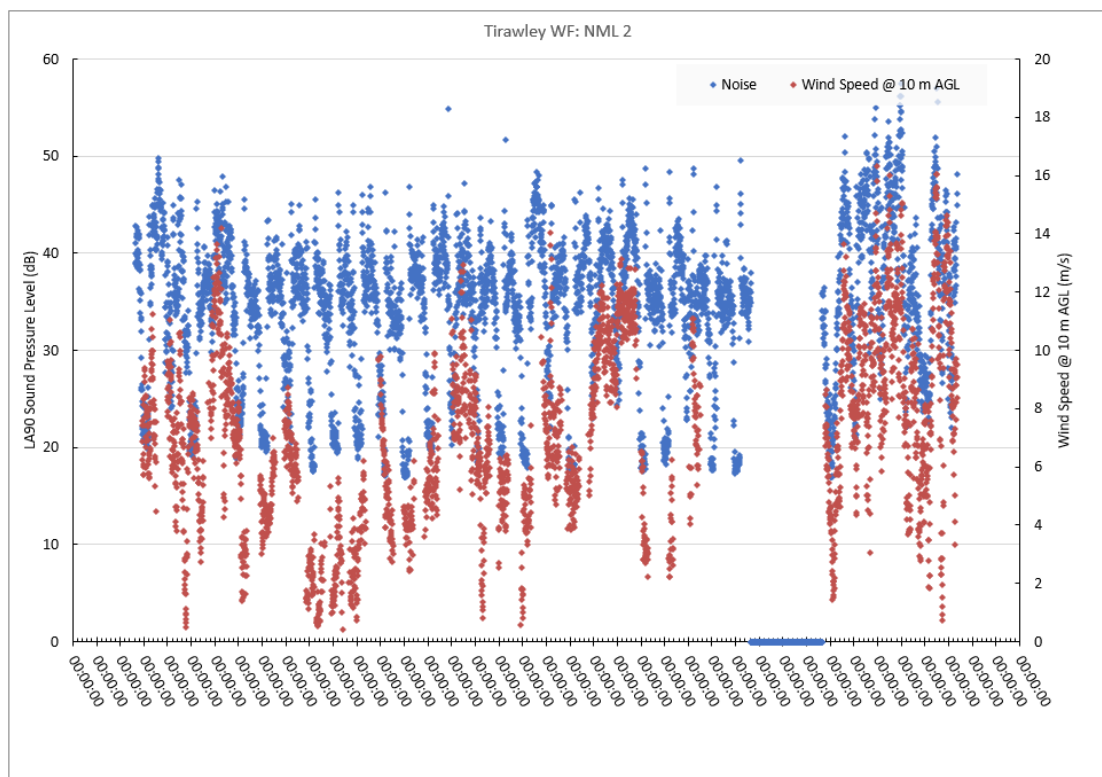


Chart 11.4: NML 2 - H37 comparing the background noise level and wind speed over the measurement period

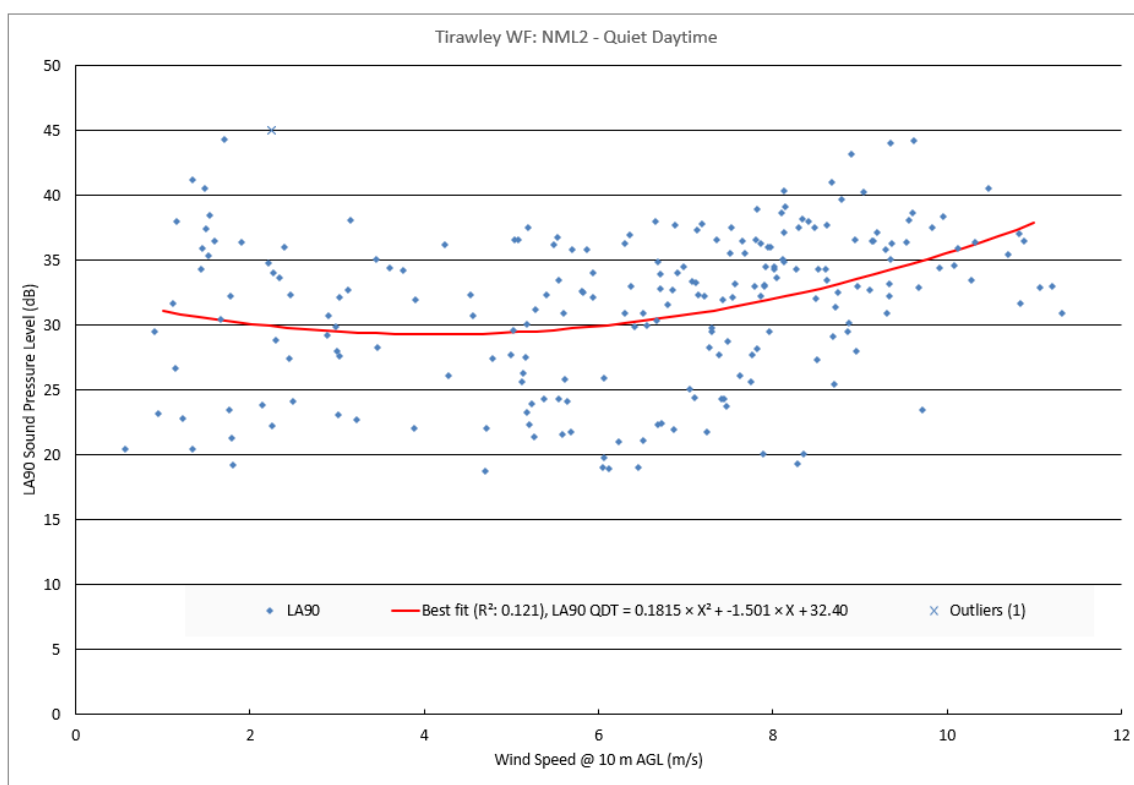


Chart 11.5: NML 2 - H37 for quiet daytime, background noise level, predicted level and assessment limit

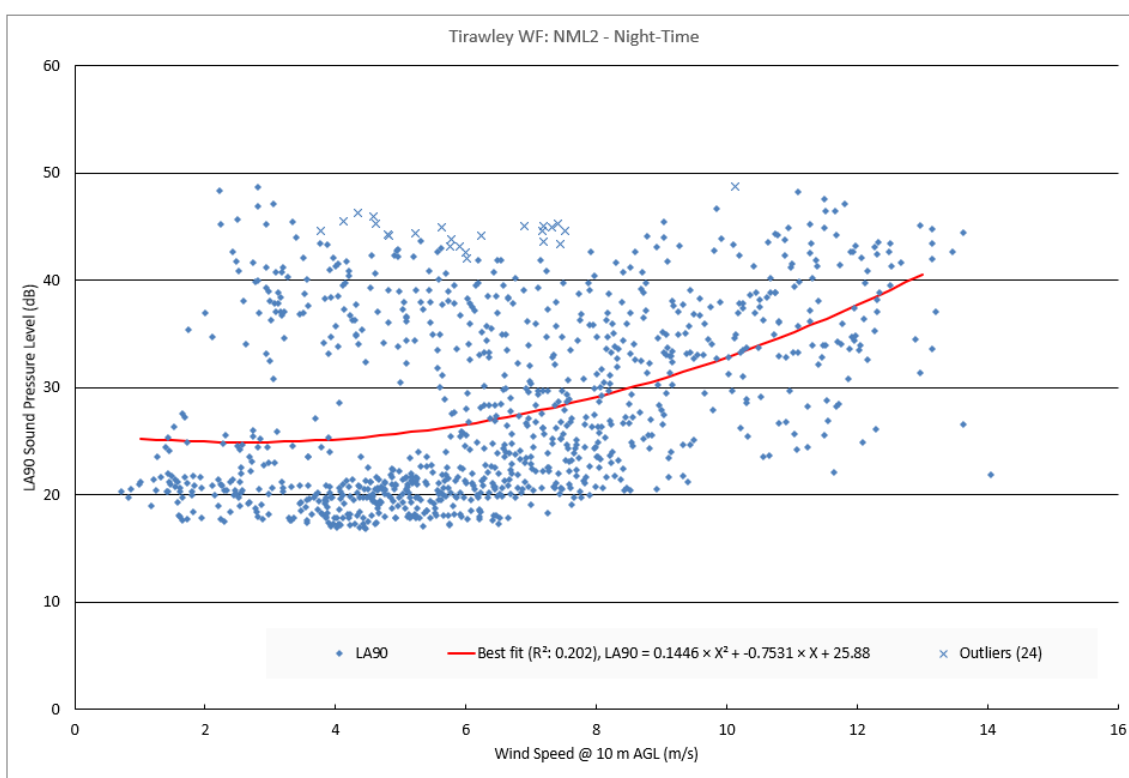


Chart 11.6: NML 2 - H37 for night-time, background noise level, predicted level and assessment limit

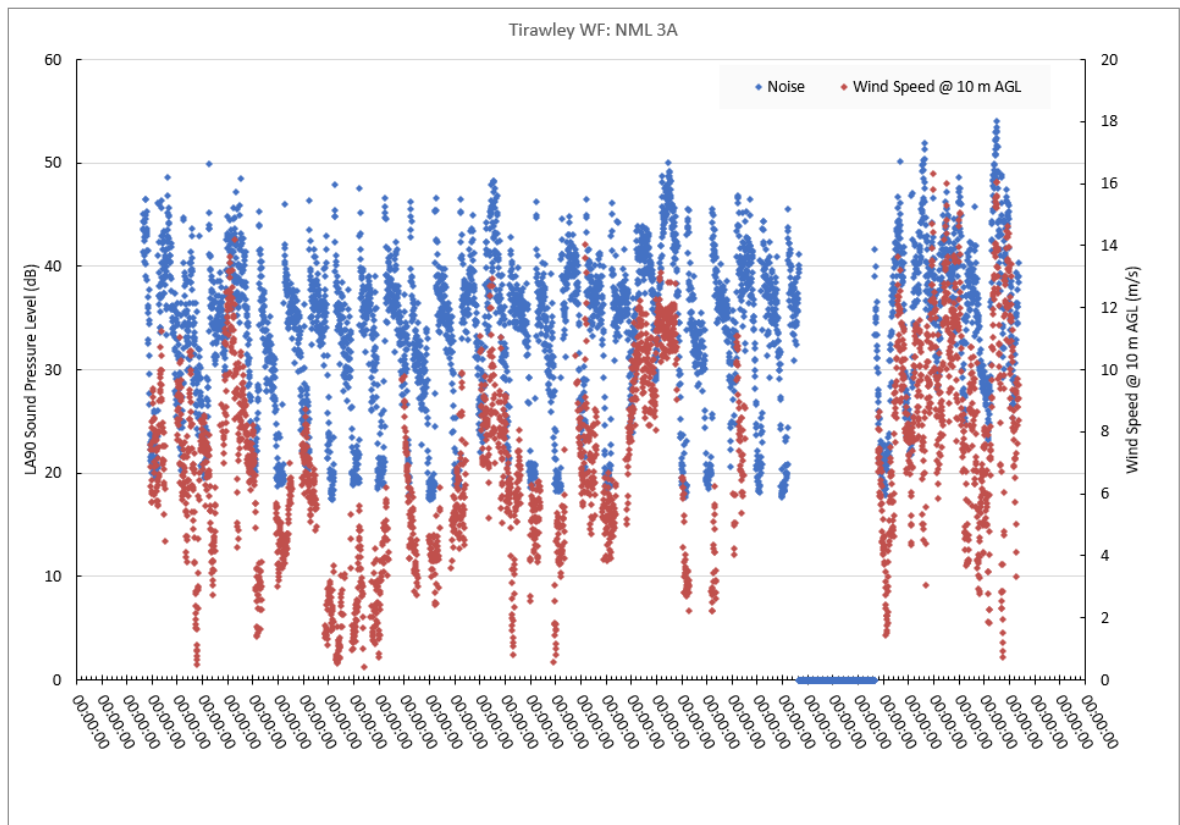


Chart 11.7: NML 3A comparing the background noise level and wind speed over the measurement period

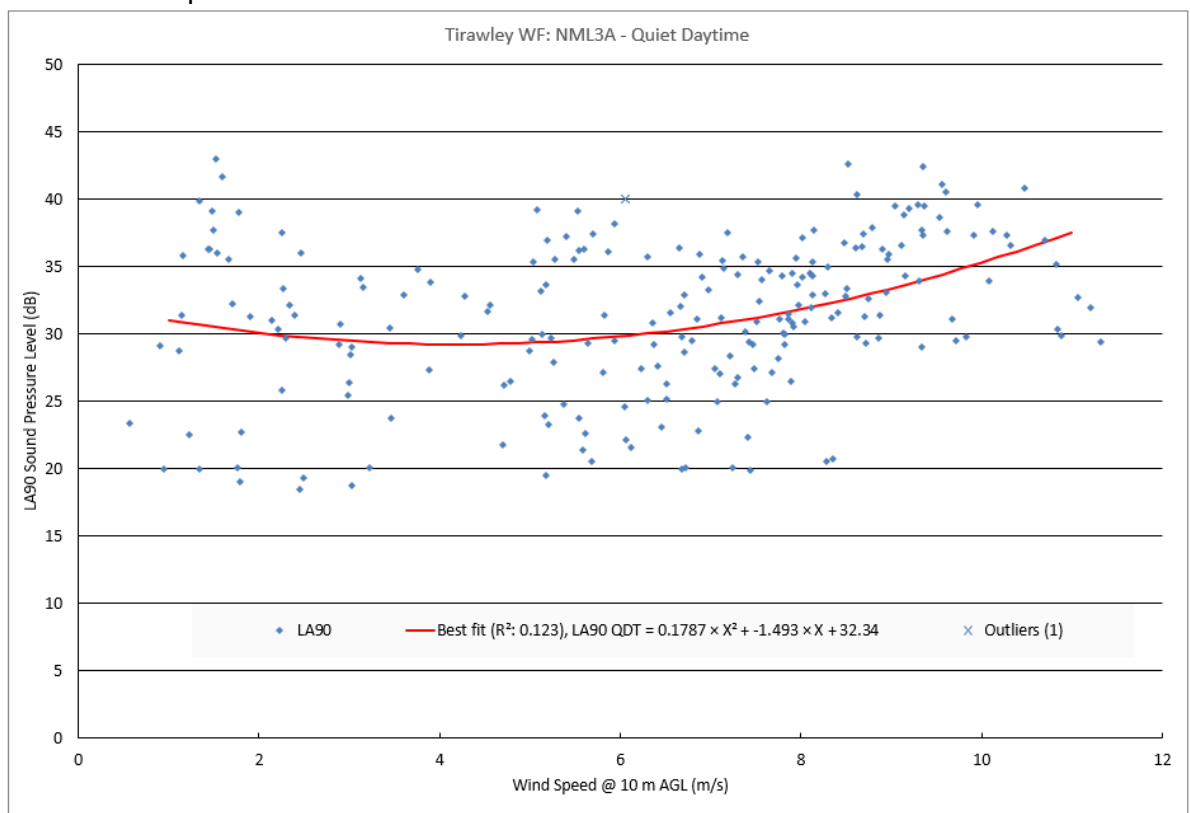


Chart 11.8: NML 3A for quiet daytime, background noise level, predicted level and assessment limit

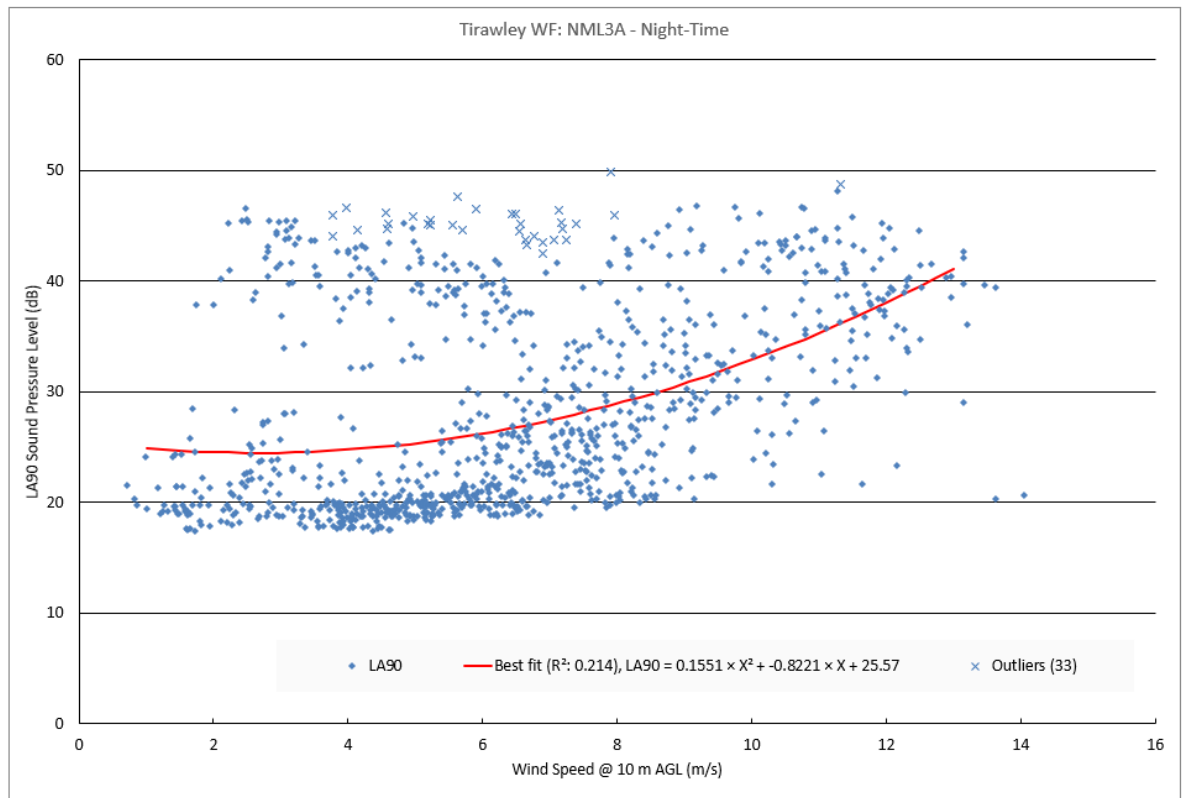


Chart 11.9: NML 3A for night-time, background noise level, predicted level and assessment limit

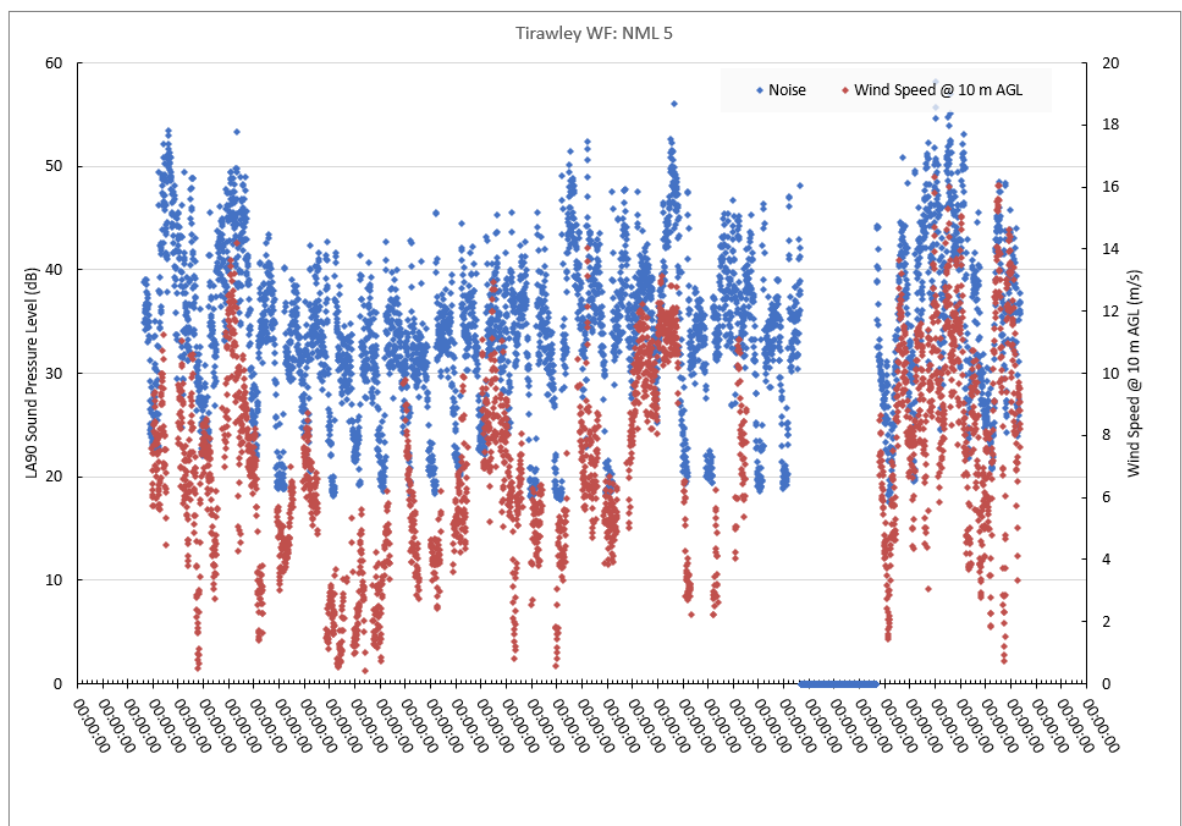


Chart 11.10: NML 5 – H103 comparing the background noise level and wind speed over the measurement period

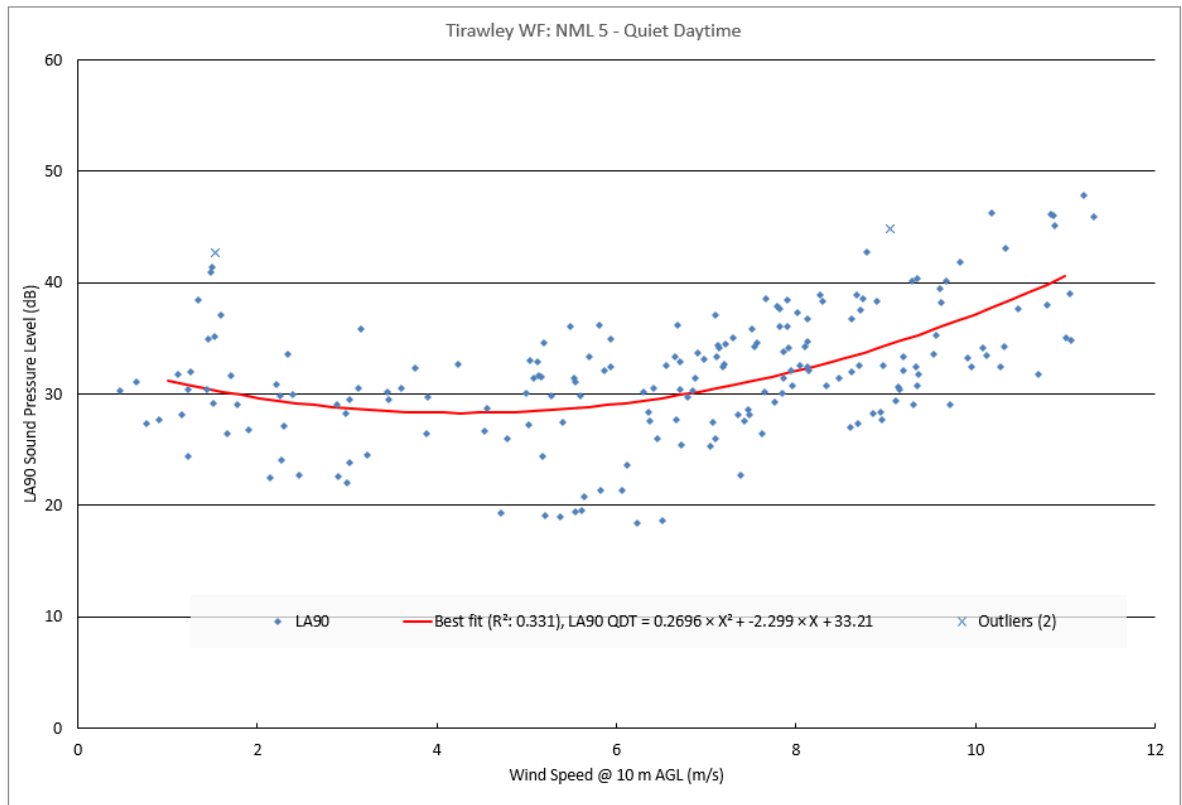


Chart 11.11: NML 5 – H103 for quiet daytime, background noise level, predicted level and assessment limit

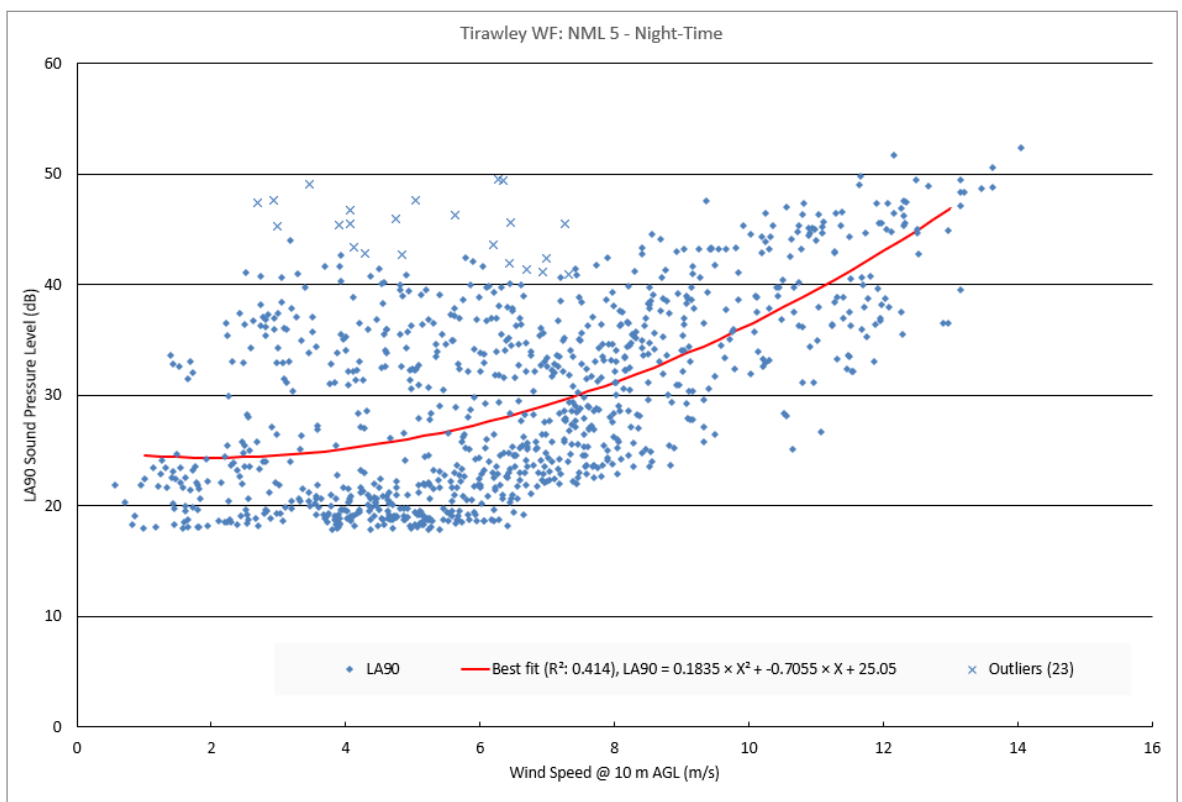


Chart 11.12: NML 5 – H103 for night-time, background noise level, predicted level and assessment limit

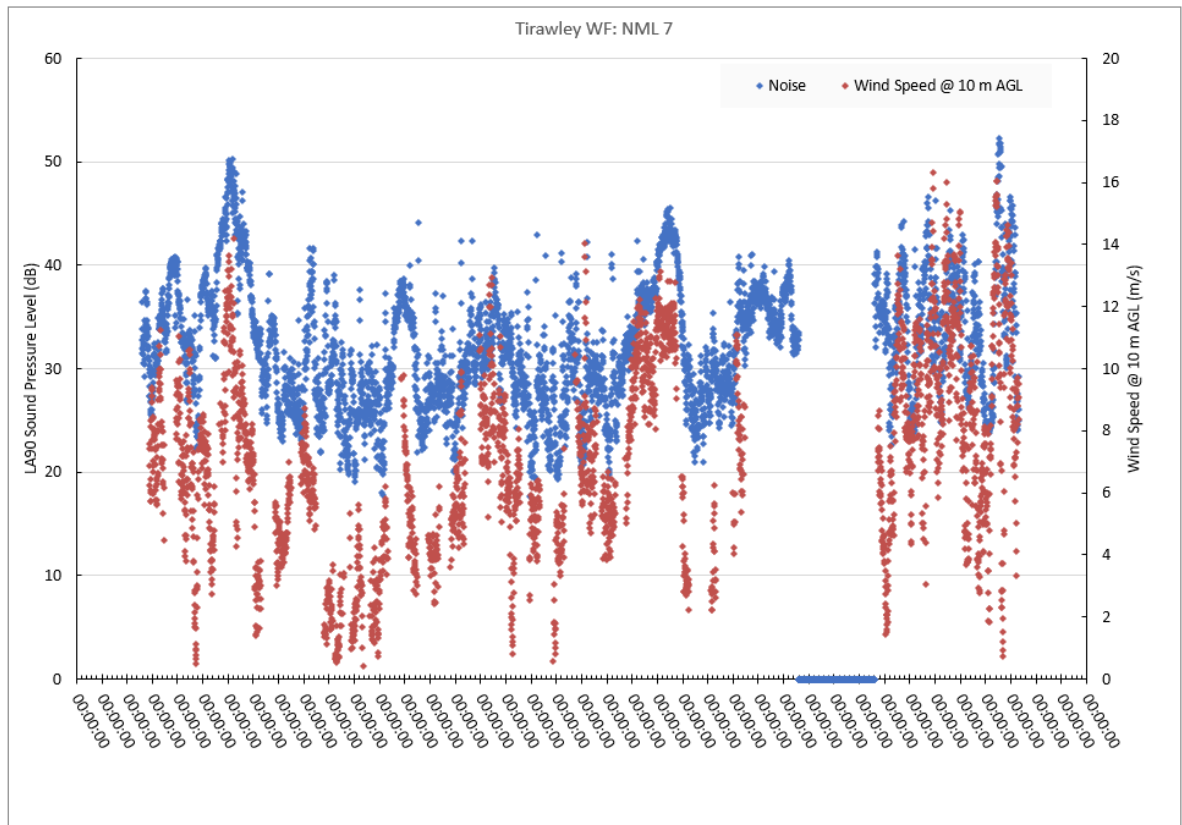


Chart 11.13: NML 7 - Quarry comparing the background noise level and wind speed over the measurement period

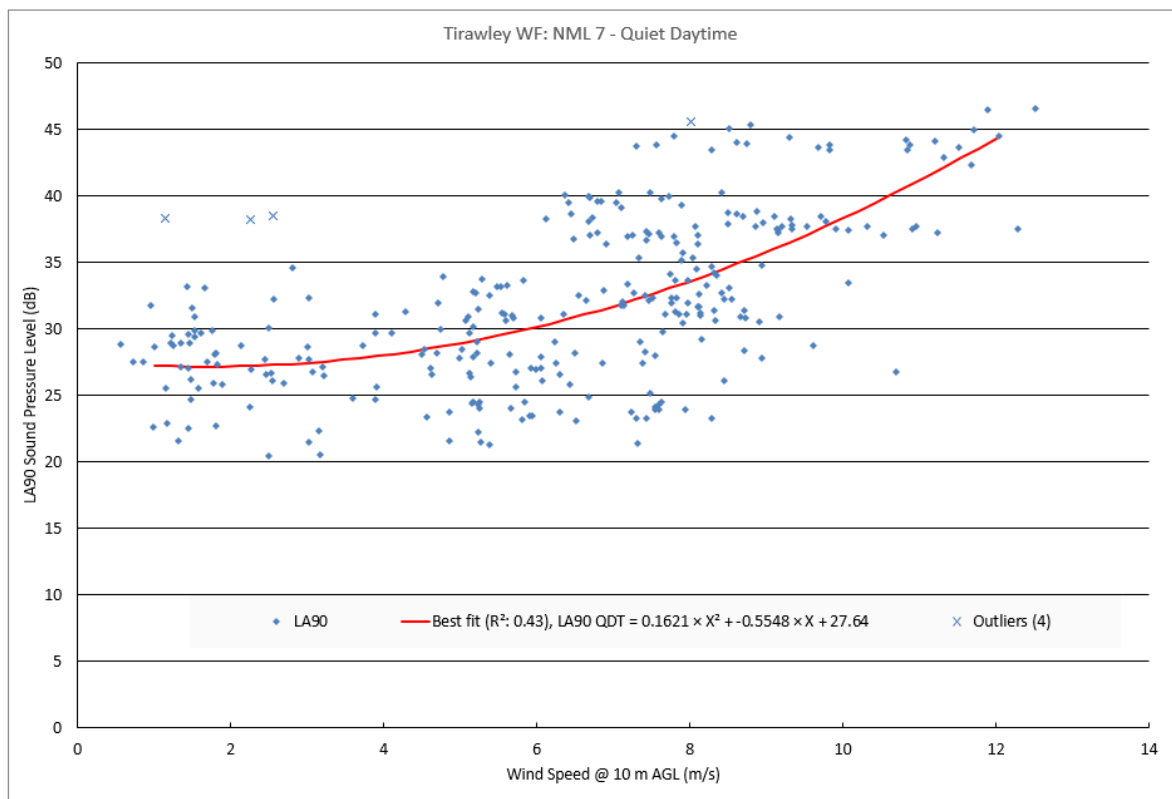


Chart 11.14: NML 7 - Quarry for quiet daytime, background noise level, predicted level and assessment limit

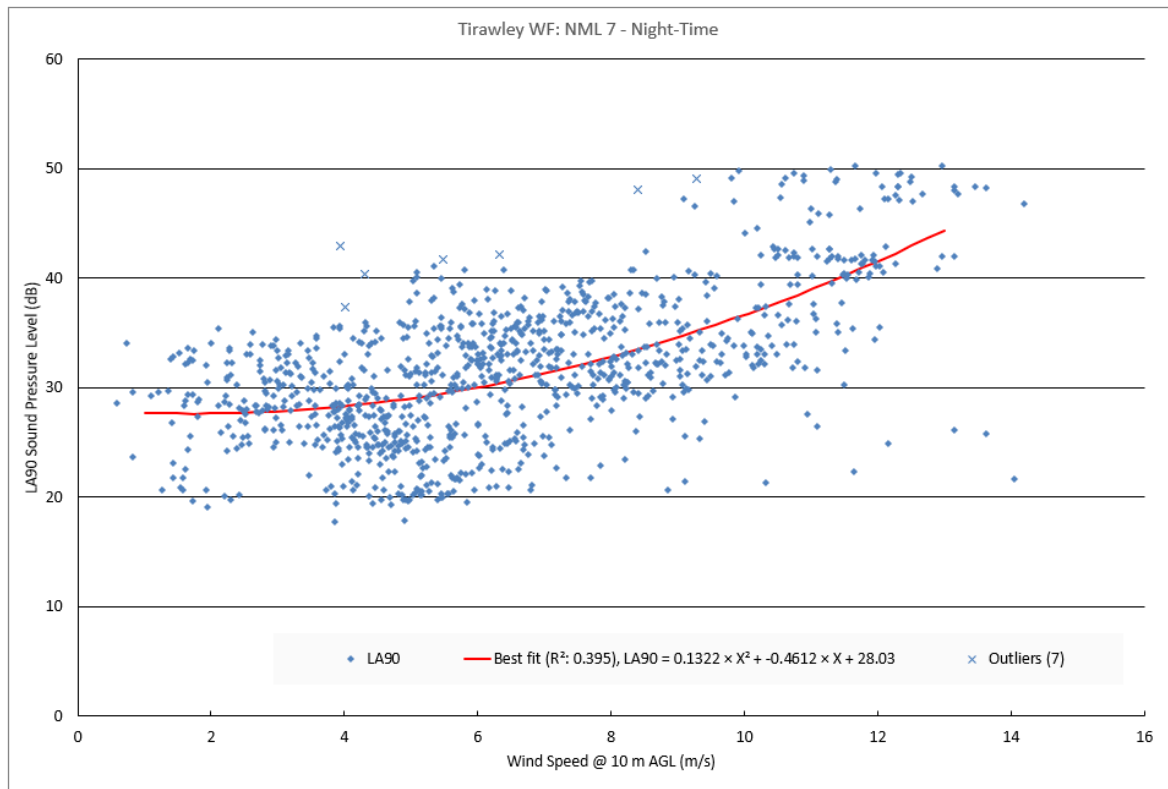


Chart 11.15: NML 7 - Quarry for night-time, background noise level, predicted level and assessment limit

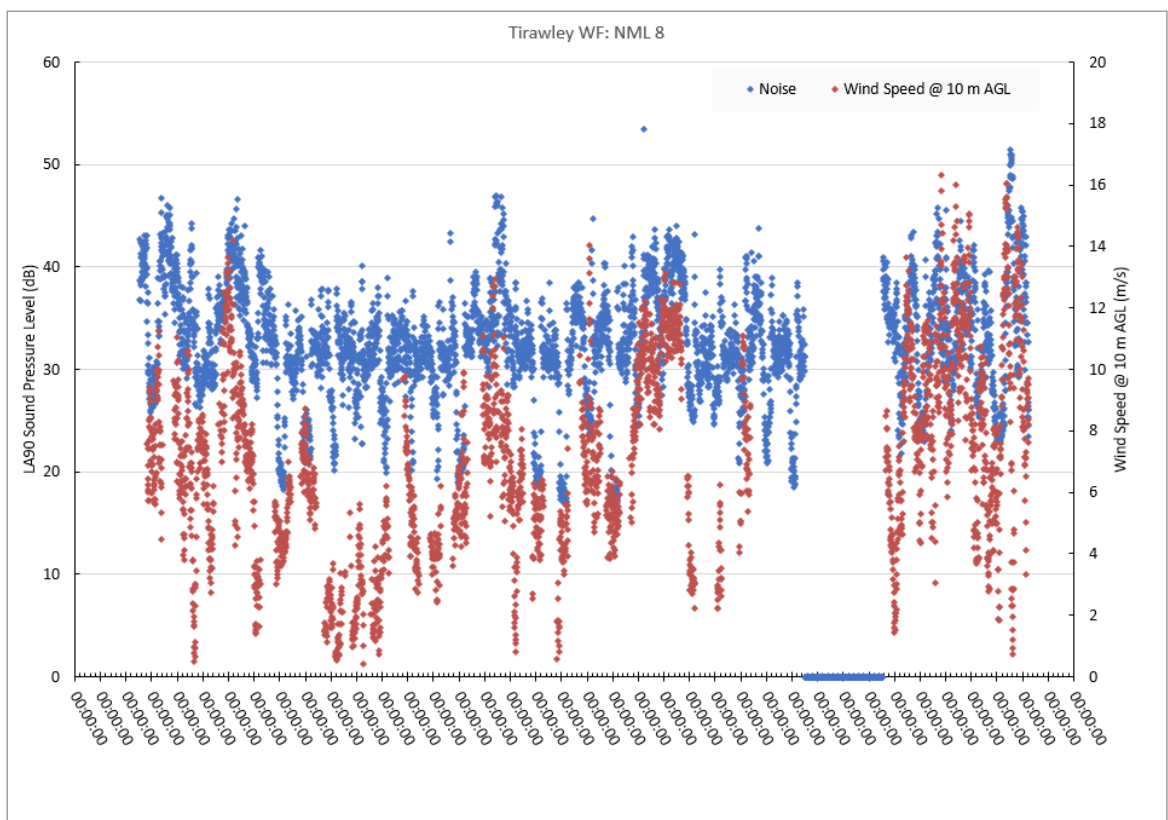


Chart 11.16: NML 8 - H108 comparing the background noise level and wind speed over the measurement period

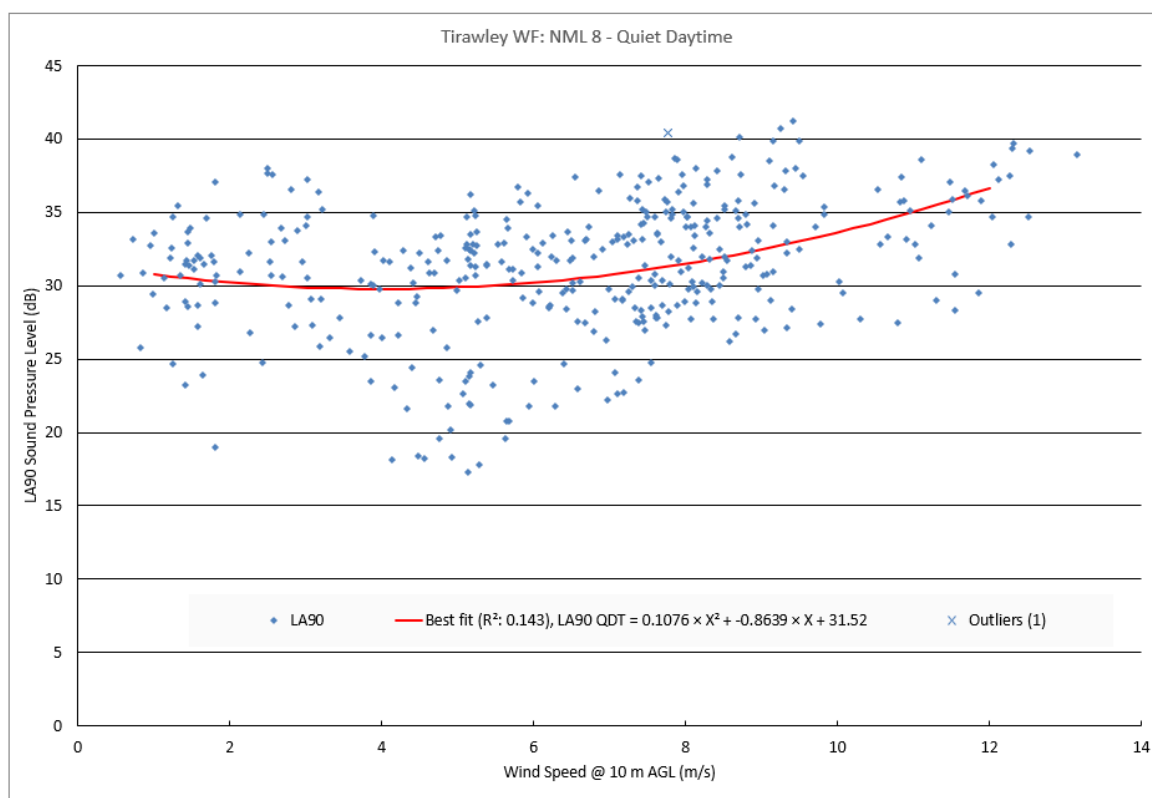


Chart 11.17: NML 8 - H108 for quiet daytime, background noise level, predicted level and assessment limit

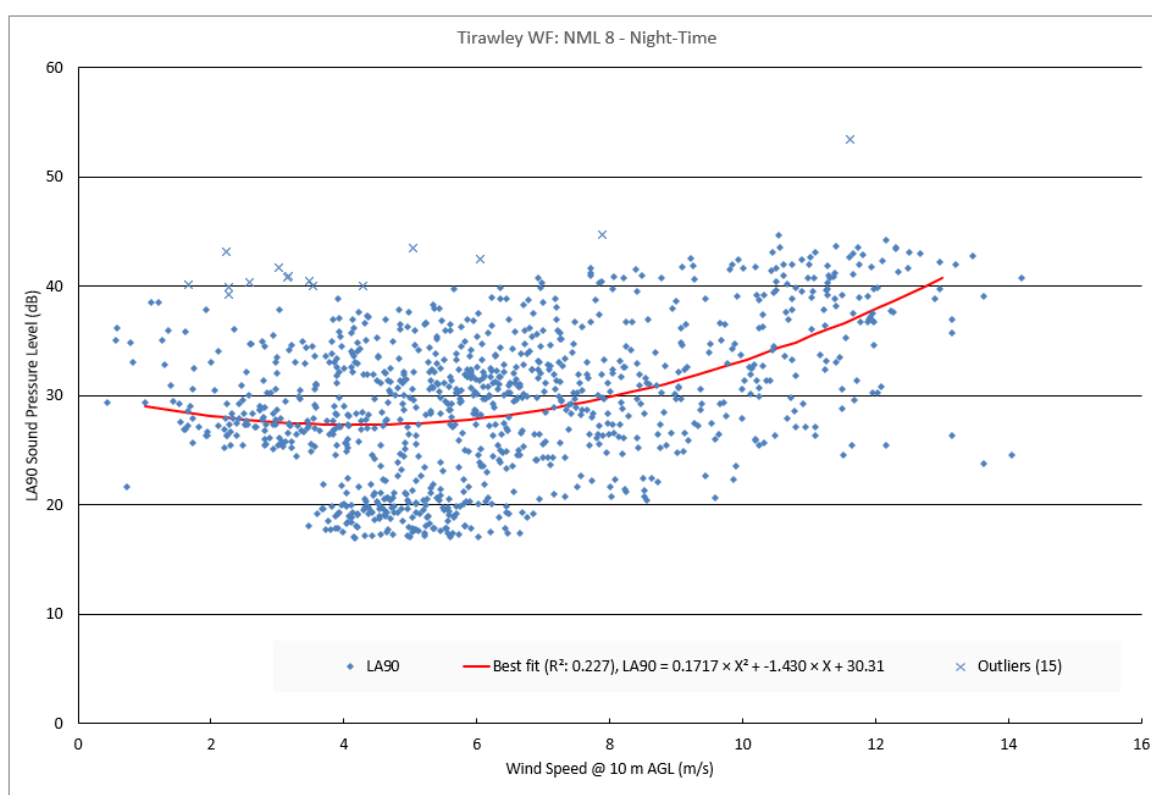


Chart 11.18: NML 8 - H108 for night-time, background noise level, predicted level and assessment limit

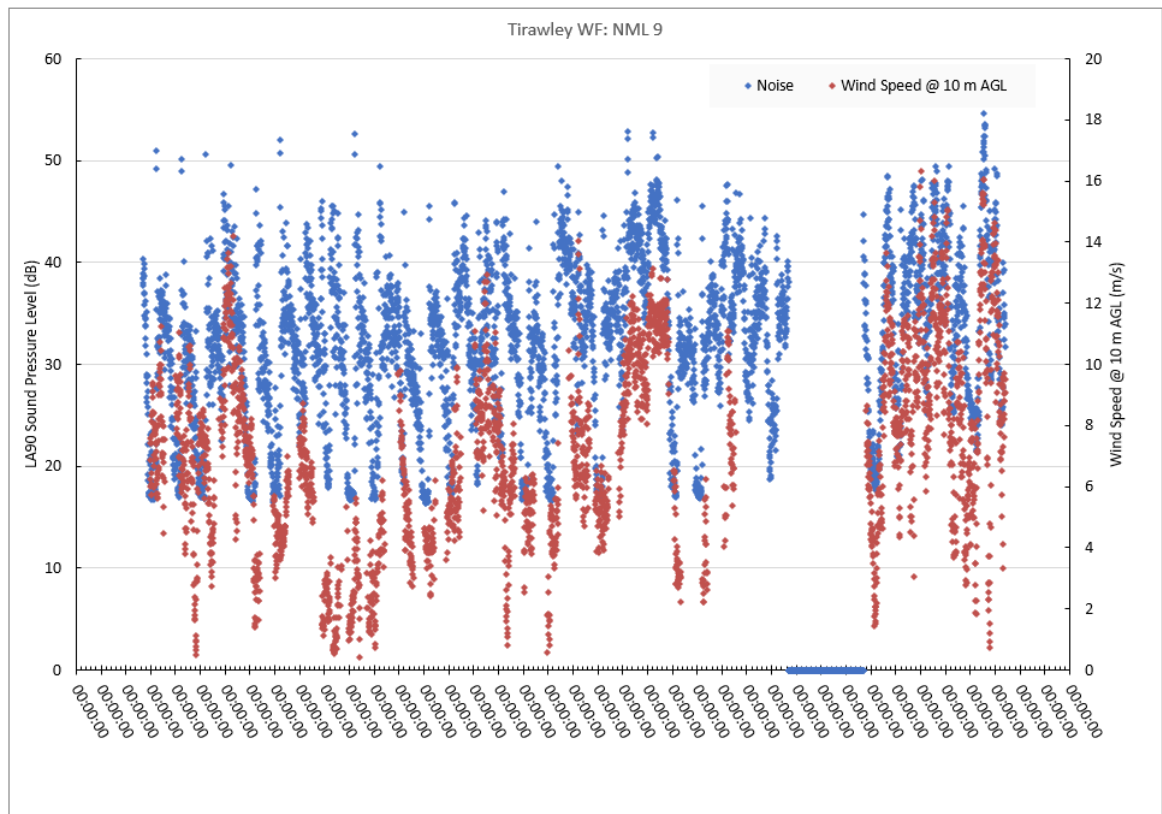


Chart 11.19: NML 9 - H19 comparing the background noise level and wind speed over the measurement period

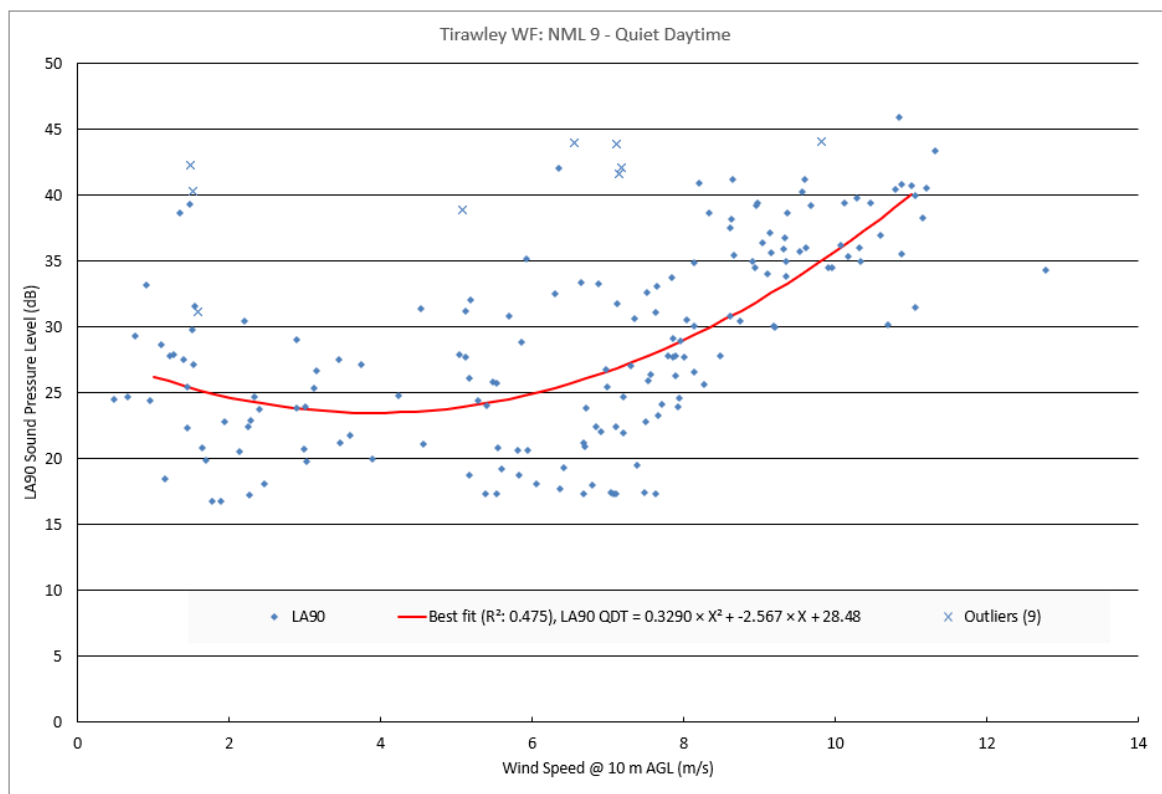


Chart 11.20: NML 9 - H19 for quiet daytime, background noise level, predicted level and assessment limit

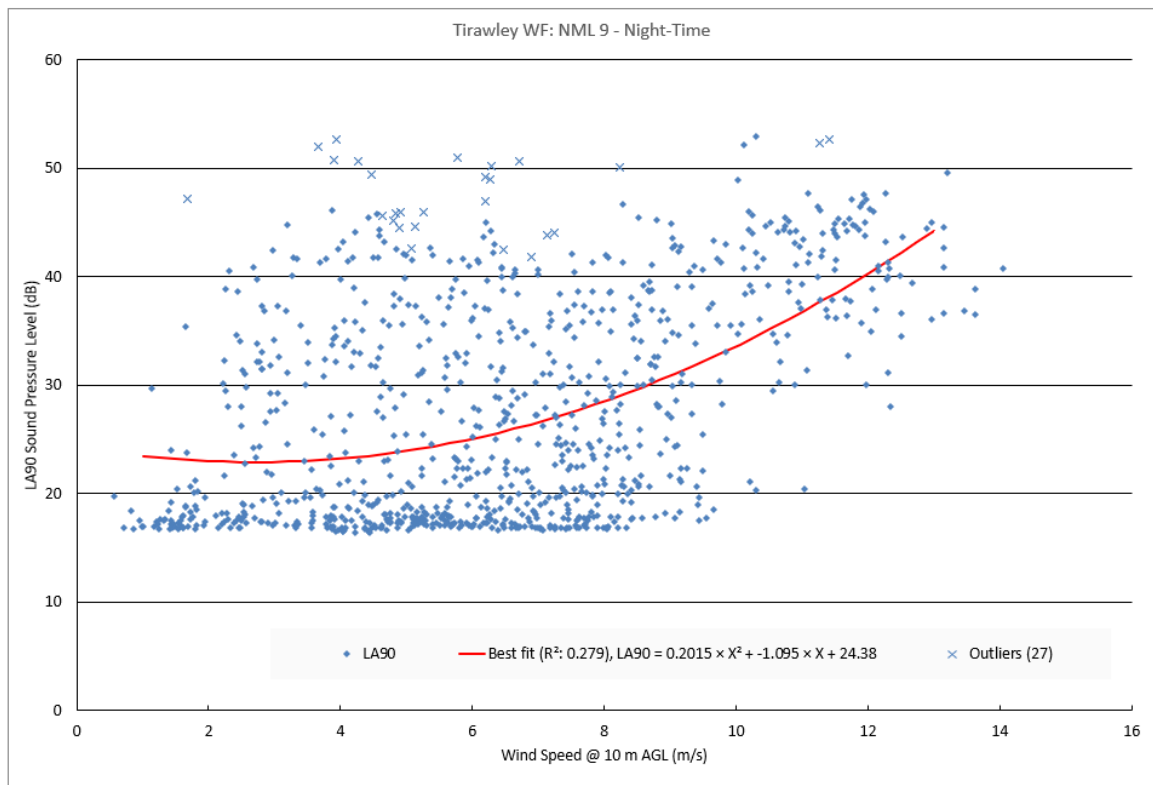


Chart 11.21: NML 9 - H19 for night-time, background noise level, predicted level and assessment limit

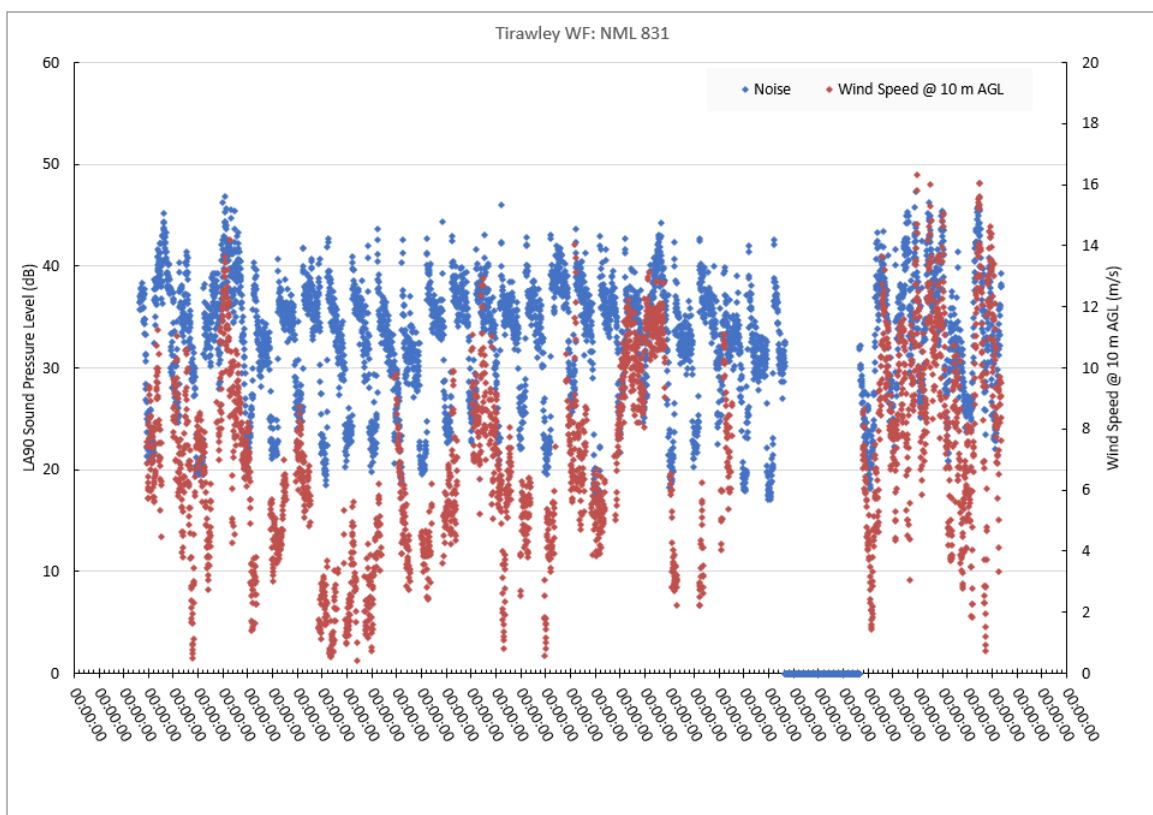


Chart 11.22: NML 831 - H14 comparing the background noise level and wind speed over the measurement period

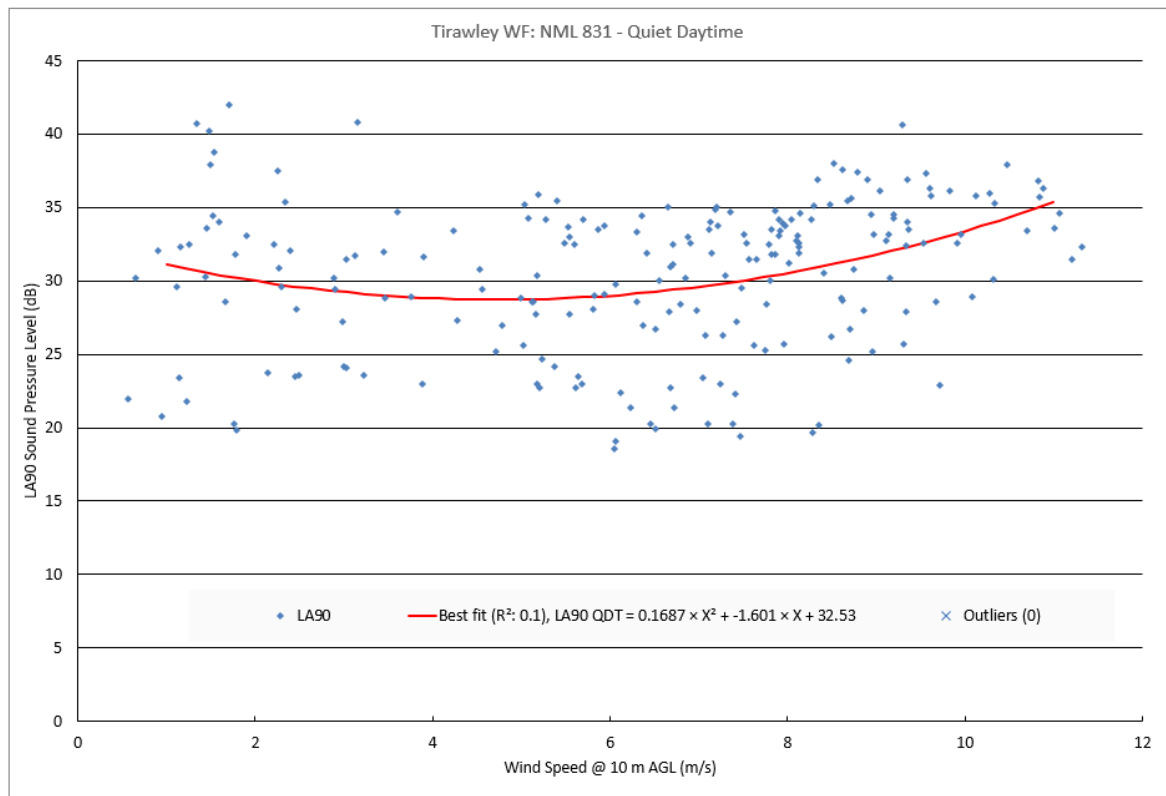


Chart 11.23: NML 831 - H14 for quiet daytime, background noise level, predicted level and assessment limit

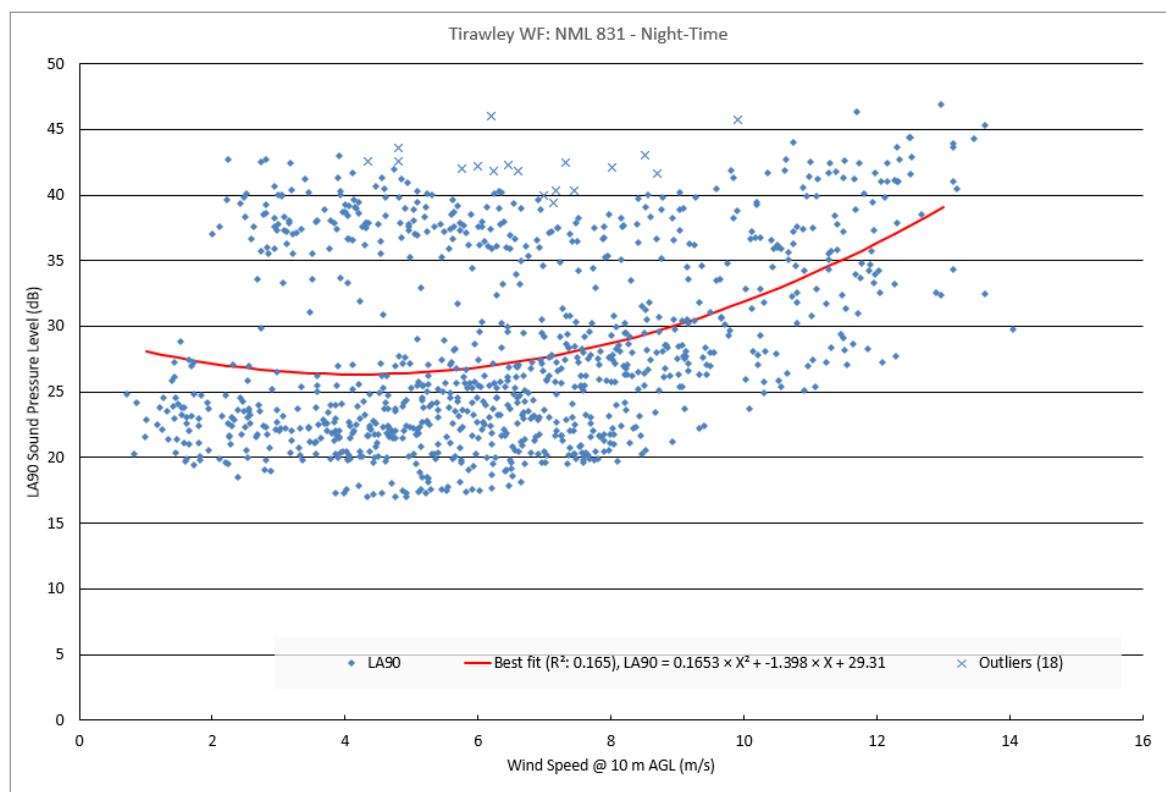
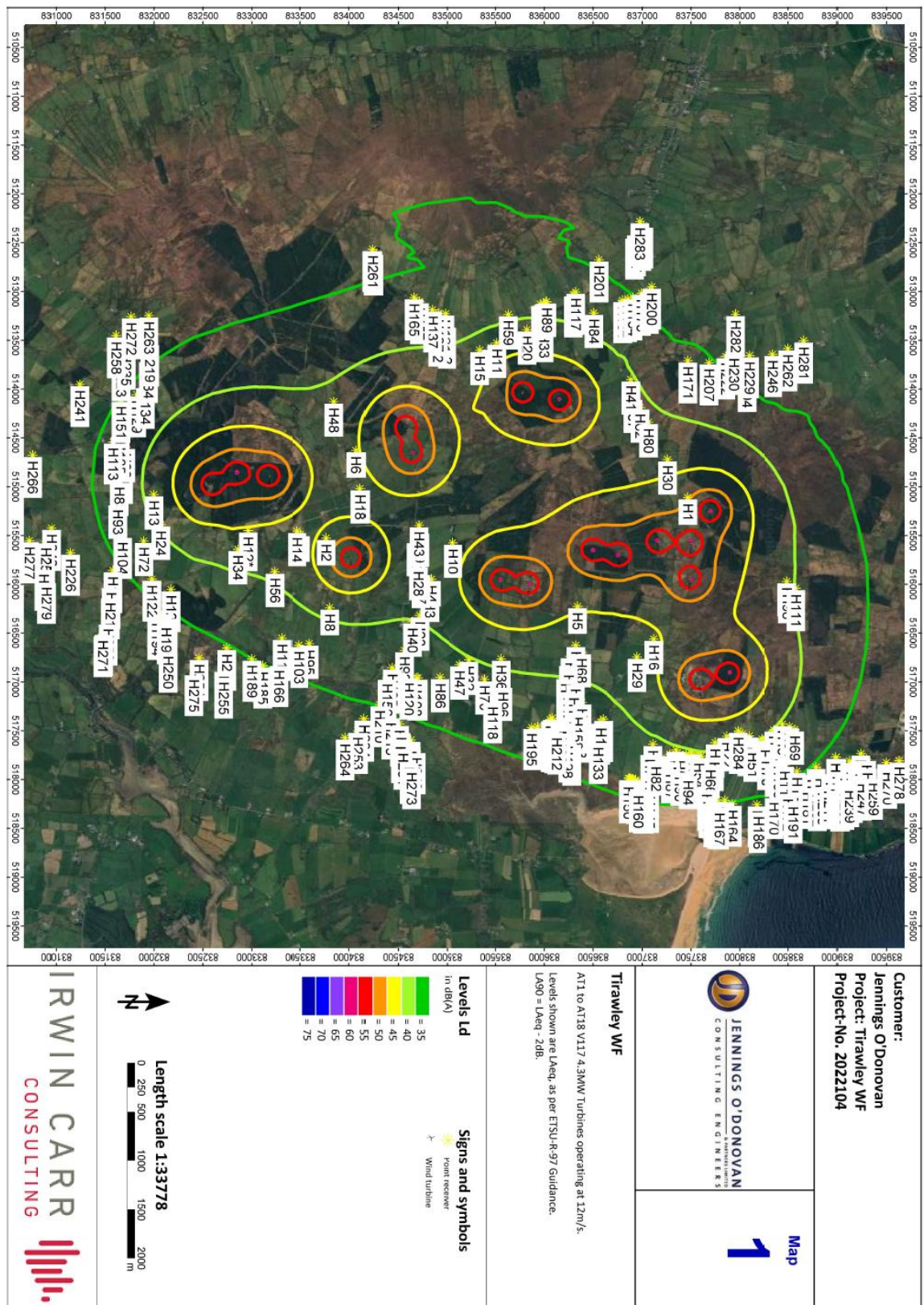
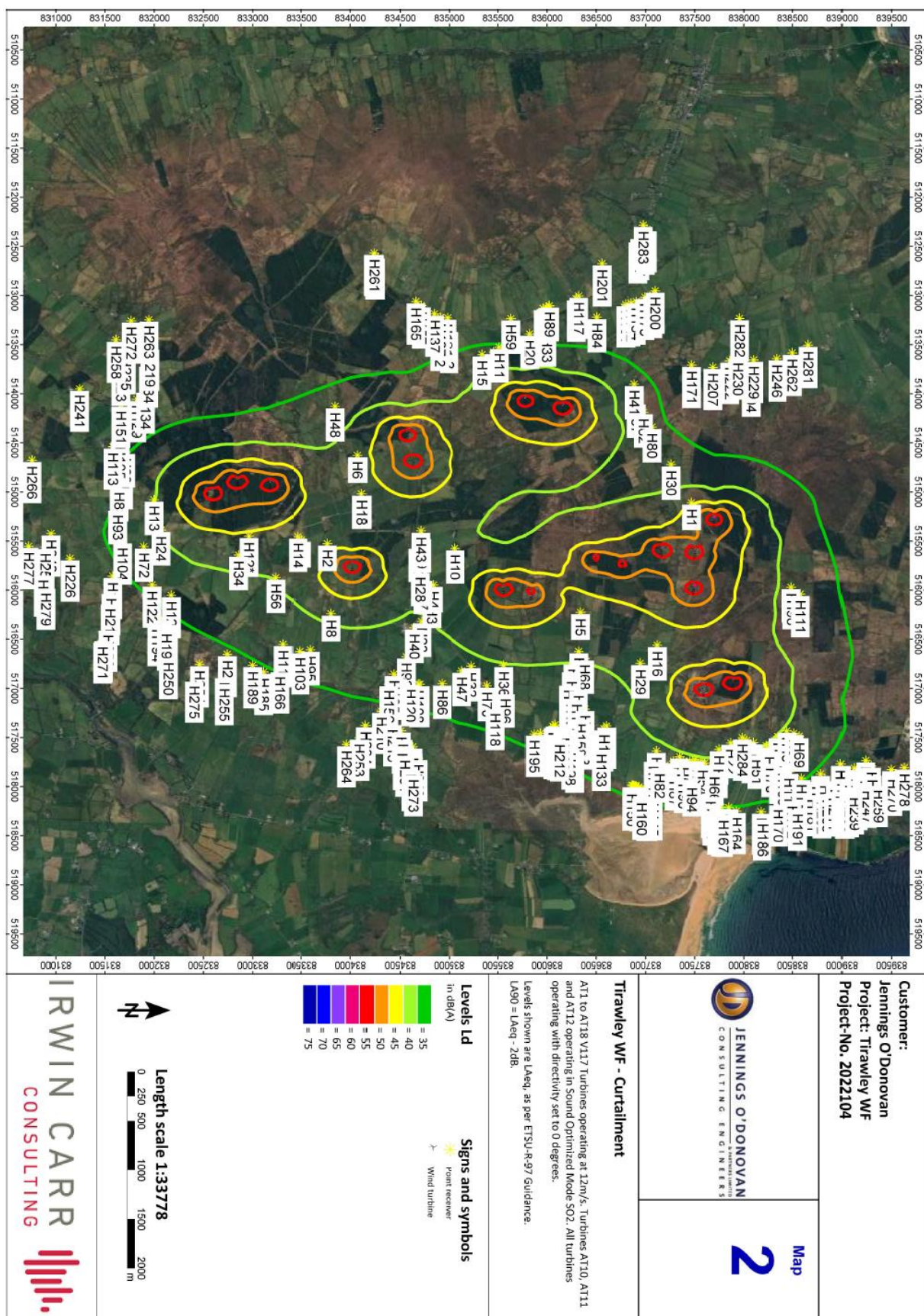


Chart 11.24: NML 831 - H14 for night-time, background noise level, predicted level and assessment limit

TECHNICAL APPENDIX 11.4

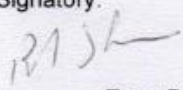
SoundPLAN Noise Outputs

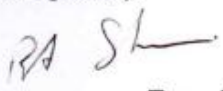


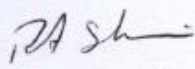


TECHNICAL APPENDIX 11.5

Calibration Certificates of Noise Instruments

	MTS Calibration Ltd, The Grange Business Centre, Belasis Avenue, Billingham TS23 1LG, England Telephone: 01642 876 410																																
		0607																															
CERTIFICATE OF CALIBRATION		Page 1 of 1																															
Issued by: MTS Calibration Ltd Performed by: Tony Sherris Date of Issue: 02 March 2023		Approved Signatory:  Tony Sherris																															
Certificate Number: 38152U																																	
Sound Calibrator																																	
Client: Environmental Measurements Unit 12, Tallaght Business Centre Whitestown Business Park Co.Dublin 24, Ireland		On behalf of: Brendan Oreilly																															
The Device calibrated was: Larson Davis Model CAL200 Serial Number 18140																																	
The measurements were performed at Elvington Close, Billingham, TS23 3YS and the measured values were as follows:																																	
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%;">Output Level 1:</td> <td style="width: 20%;">93.98 dB re 20µPa</td> <td style="width: 40%;">± 0.15 dB (k= 2)</td> </tr> <tr> <td>Fundamental Frequency 1:</td> <td>1000.07 Hz</td> <td>± 0.11 Hz (k= 2)</td> </tr> <tr> <td>Total Harmonic Distortion 1:</td> <td>0.37 %</td> <td>± 0.01 % (k= 2)</td> </tr> <tr> <td colspan="3"> </td> </tr> <tr> <td>Output Level 2:</td> <td>114.01 dB re 20µPa</td> <td>± 0.15 dB (k= 2)</td> </tr> <tr> <td>Fundamental Frequency 2:</td> <td>1000.07 Hz</td> <td>± 0.11 Hz (k= 2)</td> </tr> <tr> <td>Total Harmonic Distortion 2:</td> <td>0.51 %</td> <td>± 0.01 % (k= 2)</td> </tr> </table>				Output Level 1:	93.98 dB re 20µPa	± 0.15 dB (k= 2)	Fundamental Frequency 1:	1000.07 Hz	± 0.11 Hz (k= 2)	Total Harmonic Distortion 1:	0.37 %	± 0.01 % (k= 2)				Output Level 2:	114.01 dB re 20µPa	± 0.15 dB (k= 2)	Fundamental Frequency 2:	1000.07 Hz	± 0.11 Hz (k= 2)	Total Harmonic Distortion 2:	0.51 %	± 0.01 % (k= 2)									
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This measurement is valid only for the above device configured for calibration of a WS-2 microphone under the stated environmental conditions. For deviation of prevailing conditions, the manufacturer's literature for the calibrator should be referred to.																																	
Date of Measurements: 02 March 2023		Date of Receipt: 23 February 2023																															
Method of calibration A Reference Calibrator was used to establish the sensitivity of the measurement chain. The same measurement chain is then used to determine the output level of the Object Calibrator by the difference between its output and that of the nominated Reference Calibrator. Four independent measurements of the third-octave band sound pressure levels produced by the Reference Calibrators and the Object Calibrator are averaged to minimise uncertainties of the calibration. The measurement chain consists of a calibrated, Reference Microphone, Reference Preamplifier and Reference Analyser. As well as providing a traceable measurement of the sound pressure level in the cavity of the Object Calibrator, the Calibrator's frequency and total harmonic distortion are also measured. Frequency is determined from the average of four independent measurements using a multimeter. The total harmonic distortion is measured from the average of three independent measurements by third octave analysis, subtracting the level of the fundamental frequency from the sum of the combined harmonics in the frequency band to 20kHz. The complete procedure is detailed in the MTS Calibration Ltd work procedure WP01. The sound pressure level generated by the calibrator in its WS2 configuration was measured by reference to the reference Sound Calibrator as shown in the Test Equipment section below. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k (individually calculated as above), providing a coverage probability of approximately 95%. The uncertainty evaluation has been calculated in accordance with the current version of UKAS publication M3003. The uncertainty quoted for the Distortion Measurement is the Distortion Percentage as measured, multiplied by our Uncertainty as calculated for the individual measurement or our CMC, whichever is the larger.																																	
Measurement Conditions: <table style="width: 100%;"> <tr> <td style="width: 40%;">Temperature</td> <td style="width: 20%;">23 °C</td> <td style="width: 40%;">± 1 °C</td> </tr> <tr> <td>Atmospheric Pressure</td> <td>1027 mBar</td> <td>± 2 mBar</td> </tr> <tr> <td>Relative Humidity</td> <td>35 %</td> <td>± 5 %</td> </tr> </table>				Temperature	23 °C	± 1 °C	Atmospheric Pressure	1027 mBar	± 2 mBar	Relative Humidity	35 %	± 5 %																					
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This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.																																	
End of Certificate																																	

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Test results summary, detailed results are shown on subsequent pages.																																																																																						
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Tests performed</th> <th style="text-align: left;">Section</th> <th style="text-align: left;">Results of test</th> <th style="text-align: left;">Page</th> <th style="text-align: left;">Comments</th> </tr> </thead> <tbody> <tr> <td>Calibration Certificate</td> <td>22</td> <td></td> <td>1</td> <td></td> </tr> <tr> <td>Additional information</td> <td></td> <td></td> <td>2</td> <td></td> </tr> <tr> <td>Indication with Calibrator Supplied</td> <td>10</td> <td>No Limit</td> <td>3</td> <td></td> </tr> <tr> <td>Self-Generated Noise</td> <td>11</td> <td>No Limit</td> <td>3</td> <td></td> </tr> <tr> <td>Frequency and Time-weightings at 1kHz</td> <td>14</td> <td>Complies</td> <td>3</td> <td></td> </tr> <tr> <td>Long term stability</td> <td>15</td> <td>Complies</td> <td>3</td> <td></td> </tr> <tr> <td>High stability</td> <td>21</td> <td>Complies</td> <td>3</td> <td></td> </tr> <tr> <td>Acoustic Tests</td> <td>12</td> <td>Complies</td> <td>4</td> <td></td> </tr> <tr> <td>Frequency Weighting A</td> <td>13</td> <td>Complies</td> <td>5</td> <td></td> </tr> <tr> <td>Frequency Weighting C</td> <td>13</td> <td>Complies</td> <td>6</td> <td></td> </tr> <tr> <td>Frequency Weighting Z</td> <td>13</td> <td>Complies</td> <td>7</td> <td></td> </tr> <tr> <td>Level Linearity</td> <td>16</td> <td>Complies</td> <td>8</td> <td></td> </tr> <tr> <td>Level Linearity Range Control</td> <td>17</td> <td>n/a</td> <td></td> <td>SLM only has one range</td> </tr> <tr> <td>Tone-burst Response</td> <td>18</td> <td>Complies</td> <td>9</td> <td></td> </tr> <tr> <td>Peak C sound level</td> <td>19</td> <td>Complies</td> <td>10</td> <td></td> </tr> <tr> <td>Overload indication</td> <td>20</td> <td>Complies</td> <td>11</td> <td></td> </tr> </tbody> </table>	Tests performed	Section	Results of test	Page	Comments	Calibration Certificate	22		1		Additional information			2		Indication with Calibrator Supplied	10	No Limit	3		Self-Generated Noise	11	No Limit	3		Frequency and Time-weightings at 1kHz	14	Complies	3		Long term stability	15	Complies	3		High stability	21	Complies	3		Acoustic Tests	12	Complies	4		Frequency Weighting A	13	Complies	5		Frequency Weighting C	13	Complies	6		Frequency Weighting Z	13	Complies	7		Level Linearity	16	Complies	8		Level Linearity Range Control	17	n/a		SLM only has one range	Tone-burst Response	18	Complies	9		Peak C sound level	19	Complies	10		Overload indication	20	Complies	11		
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MTS Calibration Ltd,
The Grange Business Centre,
Belasis Avenue,
Billingham TS23 1LG,
England
Telephone: 01642 876 410

CERTIFICATE OF CALIBRATION

Page 1 of 11 pages

Issued by: **MTS Calibration Ltd**

Approved Signatory:

RA SL

Date of Issue: **05 August 2022**

Certificate Number: **37266**

Tony Sherris

Sound Level Meter

Sound Level Meter Periodic Tests to EN 61672-3: 2013 Class 1

Client: Environmental Measurements
 Unit 12, Tallaght Business Centre
 Whitestown Business Park
 Co.Dublin 24, Ireland

Instrument Make: Larson Davis
Instrument Model: LxT1L
Serial Number: 0005990

4

Associated Equipment	Make	Model	Serial number
Preamplifier	Larson Davis	PRMLxT1L	055804
Microphone	PCB	377B02	316349
Calibrator	Brüel & Kjær	4231	3014620
Calibrator supplied by	MTS for this calibration		

The measurements were performed at Elvington Close, Billingham, TS23 3YS. The results only apply to the items tested.

Periodic tests were performed in accordance with procedures from IEC 61672-3:2013 Class 1

Test results summary, detailed results are shown on subsequent pages.

Tests performed	Section	Results of test	Page	Comments
Calibration Certificate	22		1	
Additional Information			2	
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Frequency Weighting A	13	Complies	5	
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The instrument was within the above specification as received - no modifications were made

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3: 2013 for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2: 2013, to demonstrate that the model of sound level meter fully conformed to the Class 1 specifications in IEC 61672-1: 2013, the sound level meter submitted for testing conforms to the Class 1 specifications of IEC 61672-1: 2013

Additional tests performed

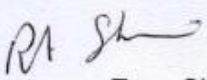
Microphone full frequency response
 Filter calibration, third octave or octave

Reference

37268
 37266F

See additional certificate
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England
Telephone: 01642 876 410

CERTIFICATE OF CALIBRATION

Page 1 of 11 pages

Issued by: **MTS Calibration Ltd**

Approved Signatory:

RA SL

Date of Issue: **05 August 2022**

Certificate Number: **37269**

Tony Sherris

Sound Level Meter

Sound Level Meter Periodic Tests to EN 61672-3: 2013 Class 1

Client: Environmental Measurements for Brendan O'Reilly
 Unit 12, Tallaght Business Centre
 Whitestown Business Park
 Co.Dublin 24, Ireland

Instrument Make: Larson Davis
Instrument Model: LxT1L
Serial Number: 0005046

7

Associated Equipment

Preamplifier

Microphone

Calibrator

Calibrator supplied by

Make

Larson Davis

PCB

Brüel & Kjær

MTS for this calibration

Model

PRMLxT1L

377B02

4231

Serial number

042734

172753

2343058

The measurements were performed at Elvington Close, Billingham, TS23 3YS. The results only apply to the items tested.

Periodic tests were performed in accordance with procedures from IEC 61672-3:2013 Class 1

Test results summary, detailed results are shown on subsequent pages.

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Additional tests performed

Microphone full frequency response
 Filter calibration, third octave or octave

Reference

37271
 37269F

See additional certificate
 See additional certificate

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Calibration Certificate

Certificate Number 2021014389

Customer:

Environmental Measurement
Unit 12 Tallaght Business Centre
Whitestown Business Park
Dublin, 24, Ireland

Model Number LxT SE
Serial Number 0006871

Test Results **Pass**

Initial Condition As Manufactured

Description Sound Expert LxT
Class 1 Sound Level Meter
Firmware Revision: 2,404

Procedure Number D0001.8378

Technician Ron Harris

Calibration Date 10 Nov 2021

Calibration Due

Temperature 23.46 °C ± 0.25 °C

Humidity 51.9 %RH ± 2.0 %RH

Static Pressure 86.64 kPa ± 0.13 kPa

Evaluation Method Tested electrically using Larson Davis PRMLxT1L S/N 070117 and a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 µPa assuming a microphone sensitivity of 23.6 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8384:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61252:2002	ANSI S1.25 (R2007)
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1
IEC 61260:2001 Class 1	ANSI S1.11 (R2009) Class 1

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017. **Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

This report may not be reproduced, except in full, unless permission for the publication of an approved abstract is obtained in writing from the organization issuing this report.

Correction data from Larson Davis LxT Manual for SoundTrack LxT & SoundExpert LxT, I770.01 Rev O Supporting Firmware Version 4.0.5, 2019-09-10

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa

LARSON DAVIS – A PCB PIEZOTRONICS DIV.
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

2021-11-10T09:02:03



Page 1 of 8

D0001.8407 Rev F

Calibration Certificate

Certificate Number 2021014391

Customer:

Environmental Measurement
Unit 12 Tallaght Business Centre
Whitestown Business Park
Dublin, 24, Ireland

Model Number LxT SE
Serial Number 0006869
Test Results **Pass**
Initial Condition As Manufactured
Description Sound Expert LxT
Class 1 Sound Level Meter
Firmware Revision: 2,404

Procedure Number D0001.8378
Technician Ron Harris
Calibration Date 10 Nov 2021
Calibration Due
Temperature 23.41 °C ± 0.25 °C
Humidity 53.2 %RH ± 2.0 %RH
Static Pressure 86.63 kPa ± 0.13 kPa

Evaluation Method Tested electrically using Larson Davis PRMLxT1L S/N 070113 and a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 µPa assuming a microphone sensitivity of 23.6 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8384:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61252:2002	ANSI S1.25 (R2007)
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1
IEC 61260:2001 Class 1	ANSI S1.11 (R2009) Class 1

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017. **Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Correction data from Larson Davis LxT Manual for SoundTrack LxT & SoundExpert Lxt, I770.01 Rev O Supporting Firmware Version 4.0.5, 2019-09-10

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa

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716-684-0001

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D0001.8407 Rev F

Calibration Certificate

Certificate Number 2021014392

Customer:

Environmental Measurement
Unit 12 Tallaght Business Centre
Whitestown Business Park
Dublin, 24, Ireland

Model Number LxT SE
Serial Number 0006870
Test Results **Pass**
Initial Condition As Manufactured
Description Sound Expert LxT
Class 1 Sound Level Meter
Firmware Revision: 2,404

Procedure Number D0001.8378
Technician Ron Harris
Calibration Date 10 Nov 2021
Calibration Due
Temperature 23,5 °C ± 0,25 °C
Humidity 53 %RH ± 2,0 %RH
Static Pressure 86.69 kPa ± 0.13 kPa

Evaluation Method Tested electrically using Larson Davis PRMLxT1L S/N 070116 and a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 µPa assuming a microphone sensitivity of 23.6 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8384:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61252:2002	ANSI S1.25 (R2007)
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1
IEC 61260:2001 Class 1	ANSI S1.11 (R2009) Class 1

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017. **Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Correction data from Larson Davis LxT Manual for SoundTrack LxT & SoundExpert Lxt, I770.01 Rev O Supporting Firmware Version 4.0.5, 2019-09-10

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa

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TECHNICAL APPENDIX 11.6

Candidate Turbine Manufacturer's Performance Specification

RESTRICTED

Document no.: 0090-2475 V02
Document owner: Platform Management
Type: T05 - General Description

Performance Specification V117-4.3 MW 50/60 Hz
Power Curves, Ct Values and Sound Curves for Power
Optimized (PO) Mode

Date: 2020-01-03
Restricted
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4.3 Sound Curves, Power Optimized Mode PO2/PO2-0S; HWO Disabled

Sound Power Level at Hub Height		
Conditions for Sound Power Level:	Measurement standard IEC 61400-11 ed. 3 Maximum turbulence at hub height: 30% Inflow angle (vertical): $0 \pm 2^\circ$ Air density: 1.225 kg/m ³	
Wind speed at hub height [m/s]	Sound Power Level at Hub Height [dBA] Mode PO2 (Blades with serrated trailing edge)	Sound Power Level at Hub Height [dBA] Mode PO2-0S (Blades without serrated trailing edge)
3	91.7	93.7
4	92.2	94.6
5	94	97.1
6	97	100.2
7	100	103.1
8	102.8	105.6
9	105.1	107.7
10	106	108.5
11	106	108.5
12	106	108.5
13	106	108.5
14	106	108.5
15	106	108.5
16	106	108.5
17	106	108.5
18	106	108.5
19	106	108.5
20	106	108.5
21	106	108.5
22	106	108.5
23	106	108.5
24	106	108.5
25	106	108.5
26	106	108.5
27	106	108.5

Table 4-3: Sound curves, Mode PO2/PO2-0S (High Wind Operation Disabled)

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Classification: Restricted

VESTAS PROPRIETARY NOTICE

Vestas

Original Instruction: T05 0090-2475 VER 02

T05 0090-2475 Ver 02 - Approved- Exported from DMS: 2024-01-29 by FIGRL

Candidate Turbine Manufacturer's Performance Specifications during Curtailment Strategy

10.3 Sound Curves, Sound Optimized Mode SO1

Sound Power Level at Hub Height	
Conditions for Sound Power Level:	Measurement standard IEC 61400-11 ed. 3 Maximum turbulence at hub height: 30% Inflow angle (vertical): $0 \pm 2^\circ$ Air density: 1.225 kg/m^3
Wind speed at hub height [m/s]	Sound Power Level at Hub Height [dBA] Sound Optimized Mode SO1 (Blades with serrated trailing edge)
3	92.2
4	92.8
5	94.0
6	97.0
7	100.0
8	102.7
9	104.2
10	105.0
11	105.0
12	105.0
13	105.0
14	105.0
15	105.0
16	105.0
17	105.0
18	105.0
19	105.0
20	105.0

Table 10-3: Sound curves, Sound Optimized Mode SO1

12.3 Sound Curves, Sound Optimized Mode SO2

Sound Power Level at Hub Height	
Conditions for Sound Power Level:	Measurement standard IEC 61400-11 ed. 3 Maximum turbulence at hub height: 30% Inflow angle (vertical): $0 \pm 2^\circ$ Air density: 1.225 kg/m ³
Wind speed at hub height [m/s]	Sound Power Level at Hub Height [dBA] Sound Optimized Mode SO2 (Blades with serrated trailing edge)
3	92.2
4	92.8
5	94.0
6	97.0
7	99.9
8	101.6
9	102.3
10	102.3
11	102.4
12	102.7
13	103.0
14	103.0
15	103.0
16	103.0
17	103.0
18	103.0
19	103.0
20	103.0

Table 12-3: Sound curves, Sound Optimized Mode SO2