Client	SSE Generation Ltd
Project	Hadyard Hill Wind Farm
Document	Noise Compliance Monitoring
Date	April 2016
Reference	10548-004

Document Control

CONFIDENTIALITY (Confidential or not Confidential): Not Confidential	
Client:	SSE Generation Ltd
Project Name:	Hadyard Hill Wind Farm
Document Name:	Noise Compliance Monitoring

UNIT APPROVAL	NAME	DATE
Principal Authors:	[redacted]	02-03-2016
Issued By:	TNEI Services Ltd	27-04-2016
Approved By:	[redacted]	27-04-2016
Approvers Signature:	[redacted]	27-04-2016

REVISION	CREATION /UPDATE SUMMARY	DATE
R0	First Draft - Internal Review	02-03-2016
R1	First Issue	27-04-2016

Quality Assurance

TNEI Services Ltd has operates an Integrated Management System covering Quality (ISO 9001) Environmental (ISO 14001) and Health and Safety (OHSAS 18001). TNEI was audited in 2015 and holds certification to all three standards.

Bainbridge House 86-90 London Road Manchester M1 2PW (Registered office) Tel:+44 (0)161 233 4800 Fax:+44 (0)161 233 4801	Milburn House Dean Street Newcastle upon Tyne NE1 1LE Tel:+44 (0)191 211 1400 Fax:+44 (0)191 211 1432	Queens House 19 St. Vincent Place Glasgow G1 2DT Tel:+44 (0)141 428 3180 Fax:+44 (0)191 211 1432

Disclaimer

1. Any information provided by third parties that is included in this report has not been independently verified by us and as such we accept no responsibility for its accuracy and completeness. You should take appropriate steps to verify this information before placing any reliance on it.
2. This document is issued for the sole use of the party that commissioned it and for the specific purpose for which it was produced. All other use of this document is strictly prohibited and no other person or entity is permitted to use this report unless it has otherwise been agreed in writing by TNEI. Statements made in the document may be based on assumptions or the best information available at the time of producing the document and these may be subject to material change with either actual amounts differing substantially from those used in this document or other assumptions changing significantly. TNEI hereby expressly disclaims any and all liability for the consequences of any such changes. TNEI also accept no liability or responsibility for the consequences of this document being relied upon or being used for anything other than the specific purpose for which it is intended, or containing any error or omission which is due to an error or omission in data used in the document that has been provided by a third party.

EXECUTIVE SUMMARY

Noise complaints arising from the operation of Hadyard Hill Wind Farm were submitted by a local resident to South Ayrshire Council (SAC) in summer 2015. In June 2015, SAC asked SSE Generation Ltd (SSE) to investigate and in August 2015 SSE appointed TNEI Services Ltd (TNEI) as the Independent Noise Consultant to undertake noise monitoring at the complainant's property. The scope of the appointment (and this report) is to test, by measurement, whether the operational noise attributable to the wind farm is in compliance with the agreed noise limits.

The guidance within ETSU-R-97 and current good practice as contained within the Institute of Acoustics document '*A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise'* (IOA GPG) has been used where applicable for this assessment.

Prior to the start of the on-site noise survey only basic complaint logs were available. Despite this, the noise survey commenced as early as possible without firm agreement on either the critical periods or methodology for data analysis, with the aim to review more detailed logs to be supplied during the survey. The survey was undertaken between October 2015 and February 2016. Subsequently, a compliant log analysis and "Noise Complaint Investigation Protocol" (the Protocol) were prepared for consideration by SAC. As detailed within ETSU-R-97 and good practice in regards to wind farm noise planning condition (IOA GPG May 2013 Annex B), the analysis of the logs was undertaken to help inform the critical periods (ETSU-R-97 page 87), also referred as meteorological conditions in which the complaints occurred (ETSU-R-97 page 102). These critical conditions and the Protocol were agreed between SAC, SSE and TNEI in April 2016. The Protocol is specific to this investigation and was followed strictly for the data analysis and production of this report.

The measured noise data was correlated with concurrent wind speed, wind direction, rain and operational data from the wind turbines. The noise levels measured during periods when all wind turbines were shut-down were used to establish background levels and accordingly the ETSU-R-97 noise limit. The noise levels measured during periods of normal operation (Total Noise which includes wind turbine noise and other noise) were corrected for background noise which resulted in specific wind turbine noise rating levels. These rating levels were then compared to the ETSU-R-97 noise limit.

The noise rating level results are based on measured data filtered for the critical conditions and averaged via a line of best fit. The process of the assessment has been as transparent as possible and all measured data used and presented in this assessment are available to SAC and the local residents upon request. Please note that the resident's logs were used solely to determine the critical wind conditions.

The results show that the Hadyard Hill wind farm noise levels at the investigated property exceed the ETSU-R-97 noise limits under specific wind speed and wind directions therefore mitigation is required to reduce wind turbine noise levels to within the agreed noise limits.

CONTENTS

EXECUTIVE SUMMARY

TABLES

ANNEXES

1 INTRODUCTION

1.1 Brief

1.1.1 To undertake noise compliance monitoring at one property located proximate to the operational Hadyard Hill Wind Farm and assess compliance with the agreed noise limits.

1.2 Background

1.2.1 Hadyard Hill Wind Farm is an operational wind farm composed of 52 Bonus 2.3MW wind turbines; of the 52 operational turbines, 43 turbines have a hub height of 58.5m and 9 turbines have a hub height of 68.5m. Each turbine has a rotor diameter of 82.4m.

1.2.2 Noise complaints arising from the operation of Hadyard Hill Wind Farm were submitted by a local resident to South Ayrshire Council (SAC) in summer 2015. In June 2015, SAC asked SSE Generation Ltd (SSE) to investigate and in August 2015 SSE appointed TNEI Services Ltd (TNEI) as the Independent Noise Consultant to undertake noise monitoring at the complainant's property. For clarity, the scope of this appointment (and this report) is to test, by measurement, if the operational noise attributable to the wind farm is in compliance with the agreed noise limits which are detailed in the agreed Protocol (see 1.2.5 and 1.2.6 below).

1.2.3 In October 2015, TNEI undertook a review of the planning conditions and the available resident logs with the aim of setting out an appropriate methodology for the compliance monitoring assessment. Due to the lack of robust planning conditions and agreed background noise levels at the complainant's property, TNEI recommended that the most robust approach would be to measure noise levels at the property during periods of wind turbine shut-down to establish background noise levels which, in turn, would be used to set appropriate ETSU-R-97 limits. Noise data collected when the turbines were ON (corrected for background noise) would then be used to establish noise rating levels which would be compared to these limits.

1.2.4 Following a review of the complaints logs available, TNEI considered that there was insufficient detail to enable the establishment of the critical periods which should be considered during the analysis of measured data (ETSU-R-97 page 87). The noise survey started as early as possible, despite the fact that there was no firm agreement with SAC in relation to the critical periods or methodology for data analysis. TNEI requested that additional logs be recorded so that they could be reviewed during the survey to establish the critical conditions.

1.2.5 Resident logs were provided by SAC on behalf of the resident during the survey on two occasions, first on 01/12/2015 (1.5 months from the survey start) and then on 04/02/2016 (at the end of the survey). The correlation of resident logs with wind conditions was undertaken in February 2016 by TNEI and resulted in a letter dated 01/03/2015 sent to SAC with the aim of agreeing the critical conditions and the methodology. Following a period of consultation, on 14/04/2016 SAC, SSE and TNEI agreed the specific wind conditions to be investigated and a 'Noise Complaint Investigation Protocol', hereinafter referred to as the Protocol. A copy of this Protocol as signed by all parties on 25/04/2016 is included in Annex 4.

1.2.6 The Protocol describes the methodology used for the assessment and is based on current good practice for wind farm noise compliance assessment and a sensible approach to the interpretation of the applicable noise limits. The Protocol details all parameters specific to this investigation and was strictly followed for the data analysis and production of this report. The relevant guidance followed is:

- ETSU-R-97 'The Assessment and Rating of Noise from Wind Farms'
- Institute of Acoustics 'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise' (IOA GPG) May 2013.
- Institute of Acoustics 'Supplementary Guidance Note 5: post completion measurements" (SGN5) July 2014.

1.2.7 The Environmental Health Officer at SAC was kept informed at various stages of the assessment by SSE and attended the installation of the noise equipment.

1.2.8 This report presents the results of the noise survey and subsequent data analysis in accordance with the agreed Protocol.

1.3 Nomenclature

1.3.1 The key terminology used throughout this report is described in Table 1.1.

Table 1.1 Key Terminology

Term	Description
Total Noise	All noise as measured by the noise meter during the survey including wind turbine noise as well as all other noise in the environment. The noise index is LA_{90}(dB).
Background Noise	All noise as measured by the noise meter during the survey in the absence of wind turbine noise (during periods of shut-down). The noise index is LA_{90}(dB).
Specific Wind Turbine Noise	The results of a logarithmic subtraction of the background noise from the Total Noise. The noise index is LA_{90}(dB).
Rating Levels	Same as the Specific Wind Turbine Noise unless tonal penalty applies (not considered in the scope of this report).
WT ON	Wind Turbines ON, all nearby turbines operating normally
WT OFF	Wind Turbines OFF, all 52 wind turbines are shut-down

2 NOISE SURVEY

2.1 Noise Monitoring Location

2.1.1 One Noise Monitoring Location (NML), at the complainant's property, was agreed with SAC at the start of the survey and noise equipment was installed within the amenity area of the property. Figure A1.1 (Annex 1) show the NML and wind turbine locations. The coordinates of the NML are listed in Table 2.1.

Table 2.1 Noise Monitoring Location

Noise Monitoring Location	Easting (m)	Northing (m)	Elevation (m AOD)	Distance to nearest turbine (m)	Comment:
NML01-Tralodden Cottage	222790	596260	148	679 (T8)	Property agreed with SAC and location within property agreed with the residents and SAC.

2.1.2 A detailed description of the monitoring location is given in Annex 2 which includes Field Data Sheets, photographs, details of the sound level meters used and the parameters recorded.

2.1.3 The period of monitoring was from the 14th of October 2015 to the 4th of February 2016. The survey lasted nearly four months due to the requirement to acquire data during periods of shut-down but also due to some wind turbines being off near the property under investigation (see section 2.2.9 below).

2.2 Equipment used during the noise survey

2.2.1 Extensive environmental, acoustic and turbine operational data was gathered during the survey period.

2.2.2 All equipment was set to record continuously over the measurement period with an average provided for every 10 minute period. As part of the analysis, the data was separated into two time periods to enable assessment against a day time and night time noise limits. Night time data were filtered to consider the period 23:00 - 07:00 as defined in ETSU-R-97, whilst the day time data was filtered to consider the 'quiet day time periods' only, defined in ETSU-R-97 as 19:00 – 23:00 Monday to Friday, 13:00 – 23:00 on Saturdays and 07:00 to 23:00 on Sundays. The timestamps during the survey were initially in BST and then switched to GMT on 25th October 2015 so adjustments were applied accordingly to all equipment to compensate.

Wind Speed and Wind Direction:

2.2.3 Wind speed standardised from 58.5m (hub height of nearest wind turbines) to 10m height was required. The wind speed and wind direction used in the analysis were sourced from measurements made with a Triton SODAR unit located at the wind farm site near the closest wind turbines to the property being investigated. Since the SODAR unit records wind speeds at set heights, the 60m height measurements were used and these were standardised to 10m height by TNEI. This is as agreed in the Protocol.

2.2.4 The wind speed and wind direction logging timestamps correspond to the end of the 10 minute averaging period and therefore all timestamps from the SODAR were adjusted by minus 10 minutes to match the start of the 10 minute averaging period of the sound level meters. The data up to 25th October were adjusted by +50 minutes (+60min-10min) due to all timestamps being in GMT on this logger.

Rain:

2.2.5 Rain data were recorded from three sources, two tipping rain gauges installed by TNEI on the ground (one at the complainant location and one at another nearby property) and one local weather station located at Maybole. All three data sets were combined and when a rain event occurred within a 10 minute period at any of the three sources, the 10minute period and preceding 10 minute period were discarded.

2.2.6 The timestamps from the rain gauge correspond to the end of the 10 minute averaging period, therefore, these were adjusted by minus 10 minutes to match the start of the averaging period of the sound level meters. The data up to 25th October was adjusted by +50 minutes (+60min-10min) due to all timestamps being in GMT on this logger.

Acoustic Data (Sound Level Meters):

2.2.7 Two Sound Level Meters (SLM) were deployed next to each other, in order to have a back-up in case of failure of either noise meter. One meter was a RION NL-52 (the primary SLM) and one was a RION NL-32 (the back-up SLM). Both meters were fitted with RION WS-03 wind shields and set to log at least the $L_{A90\ 10min}$ and $L_{Aeq\ 10min}$ noise levels continuously over the deployment period. Uncompressed .wav audio files for the first 2 minutes of every 10 minutes and 1/3 octave data were also recorded on the primary SLM. The timestamps on the sound level meters correspond to the start of the 10 minute averaging periods. When data from the primary SLM was not available (due to battery failure during two periods) the data set from the secondary SLM was used. The data sets from both SLM correlated very well for all periods where concurrent data was available.

2.2.8 Annex 3 contains the calibration certificates for the equipment used in the noise survey.

Wind Turbine Operational Data:

2.2.9 The operational data recorded included the generated power (in kWh) for each of the 52 wind turbines for each 10 minute period. Any given 10 minute period when all 52 wind turbines produced less than 1kWh each was identified as a shut down period (T1-T52 All OFF) and this data was used for Stage 1 of the Protocol (establish background levels and ETSU-R-97 limits). For Stage 2, valid data is defined as "T1-T23 ON with exceptions". Annex 6 presents details of noise predictions and a 0.5dB rule which were used to find exceptions (ie. data considered valid even when one, two or three turbines were OFF).

3 NOISE ASSESSMENT RESULTS

3.1.1 The complaint log analysis and assessment results as described in the Protocol are discussed below.

3.2 RESIDENT LOG ANALYSIS

3.2.1 The environmental and operational data from the wind farm was correlated with the resident logs to determine the critical periods (ETSU-R-97 page 87), also referred as meteorological conditions in which the complaints occurred (ETSU-R-97 page 102).

3.2.2 A resident at Tralodden Cottage provided complaint logs to SAC and these were forwarded to SSE and then to TNEI. The correlation to the logs to identify the critical conditions is only based on some of the more detailed logs supplied during the survey.

3.2.3 A copy of the detailed log analysis is provided in Annex 5, it shows the wind conditions correlated to the logs during the survey period. This detailed analysis and the data used for the analysis (excel file) were sent to SAC along with a letter dated 01/03/2016 as part of the consultation to agree the Protocol. Based on this detailed analysis and subsequent consultation, the critical periods initially suggested by TNEI were :

- Critical time periods: Both Quiet day time and Night Time
- Critical range of wind speeds: 6-11m/s (standardised from 60m to 10m)
- Critical range of wind directions: 140°-270°

3.2.4 Following a further consultation process, the critical periods as set in the agreed Protocol and used for the analysis and reporting are :

- Critical time periods: Both Quiet day time and Night Time
- Critical range of wind speeds: 3-11m/s (standardised from 60m to 10m)
- Critical range of wind directions: 75°-270°

3.3 Stage 1 – Background Level and ETSU-R-97 noise limits:

3.3.1 Figure A1.2 (of Annex 1) shows the "valid data points" (black circles) and the “best fit” curve (continuous black line) during periods of shut-down (T1-T52 all OFF). The corresponding ETSU-R-97 noise limit (red dashed curve) is also shown.

3.3.2 Data was collected and analysed in accordance with ETSU-R-97 and the IOA GPG. Sufficient data was collected to meet the requirements of the IOA GPG as per paragraph 2.9.5 of that document.

3.3.3 The resident informed TNEI of a period of snowfall the week before the site visit on 19/01/2016. During this period, only a small period of quiet day time data on 13/01/2016 and night time data on 16/01/2016 is used as part of the valid data set to establish background noise. It is not possible to confirm for certain whether snow fall or snow cover was present on these specific days. Following analysis it was found that removing this data decreased the quiet day time trendline by 0.1dB at wind speeds below 5m/s and it increased the Night time period trendline by 0.1dB at wind speed below 5m/s. This is not considered significant and therefore no data has been removed due to snow. For periods when the turbines are all on (Stages 2 and 3 below) only 7 data points are valid between 13/01/2016 and 19/01/2016 and these have been included in the analysis.

3.4 Stage 2 and 3 – Total Noise Rating Level and Specific Wind Turbine Noise Rating Level:

3.4.1 Figure A1.3 (of Annex 1) shows the "valid data points" (blue circles) and the "best fit" curve (continuous blue line) during periods "T1-T23 ON with exceptions". The data for this period is referred to as Total Noise. The background levels (continuous black line) and noise limits (red dashed curve) from Stage 1 are reproduced on this figure. And finally, the Specific Wind Turbine Noise Rating Level (green continuous curve) is also shown.

3.4.2 Figure A1.4 (of Annex 1) shows the Time Series.

3.5 Noise Assessment Results

3.5.1 The assessment results are summarised in Table 3.1 and Table 3.2. A negative value indicates compliance with the noise limit.

Table 3.1 Compliance with noise limits applicable for quiet day time

Location		Wind Speed (ms^{-1}) as measured at 60m and standardised to 10m height								
		3	4	5	6	7	8	9	10	11
NML1	Specific Wind Turbine Noise (dBA L90)	38	39	40.2	41.7	43.6	45.7	48.2	50.9	54
	Noise Limits (dbA L90)	41.4	42	42.9	43.9	45.1	46.6	48.2	50	52
	Exceedance Level	-3.4	-3	-2.7	-2.2	-1.5	-0.9	0	**0.9**	**2**

Table 3.2 Compliance with noise limits applicable for night time

Location		Wind Speed (ms^{-1}) as measured at 60m and standardised to 10m height								
		3	4	5	6	7	8	9	10	11
NML1	Specific Wind Turbine Noise (dBA L90)	39.6	39.8	40.5	41.7	43.2	45.4	48	51	54.4
	Noise Limits (dbA L90)	43	43	43	43	43.9	45.8	48.1	50.6	53.5
	Exceedance Level	-3.4	-3.2	-2.5	-1.3	-0.7	-0.4	-0.1	**0.4**	**0.9**

3.5.2 It can be seen that the Specific Wind Turbine Noise exceeds the noise limits for:

- Quiet Day Time : 10 and 11m/s in wind directions 75°-270°; and
- Night Time : 10 and 11m/s in wind directions 75°-270°.

3.5.3 There are several individual 10 minute periods for which the L_{A90} measured Total Noise levels are above the noise limits and several which are below. However, in accordance with ETSU-R-97, current good practice and the Protocol averaging via a regression analysis and line of best fit is performed which gives weight to the frequency of occurrence. This averaging is consistent for all parts of the process as it is used to establish background noise level, noise limits, Total Noise and Specific Wind Turbine noise. Also, each individual 10 minute data point in this report for periods when the wind turbines are ON presents the Total Noise as measured which includes noise from other sources in the environment.

3.5.4 Some outliers can be observed, especially for the quiet day time periods where L_{A90} Total Noise data points are above 50dB and wind speed is less than 8m/s. The data has been kept as it is important to keep noise levels which are high in case it is wind turbine noise, however it has not been possible at this stage to determine the specific cause of these noise levels being higher than most other data points.

3.5.5 The results indicate that mitigation is required to reduce wind turbine noise levels to within the agreed noise limits at Tralodden Cottage.

4 CONCLUSIONS

4.1.1 TNEI Services Ltd has undertaken noise monitoring within the amenity area at a property near the operational Hadyard Hill Wind Farm. The scope of the work was to test, by measurement, if the operational noise is in compliance with the agreed noise limits.

4.1.2 Noise monitoring was undertaken at the agreed Noise Monitoring Location (NML) between October 2015 and February 2016.

4.1.3 A Protocol based upon current good practice was prepared by TNEI and agreed by SAC following consultation when the survey was completed and detailed resident logs were available. Complaint logs supplied during the survey were analysed to determine the critical periods to be investigated and the agreed critical periods in the Protocol were as suggested by SAC following consultation.

4.1.4 The recorded noise data was correlated with concurrent wind speed, wind direction, rain and wind turbine operational data, all in accordance with the agreed Protocol.

4.1.5 The results show that the Hadyard Hill wind farm noise levels at the investigated property exceed the ETSU-R-97 noise limits in specific wind speed and wind directions; therefore mitigation is required to reduce wind turbine noise levels to within the agreed noise limits.

4.1.6 The assessment results are based on measured data filtered for the critical conditions and averaged via a line of best fit. The process of the assessment has been as transparent as possible and all measured data used and presented in this assessment is available to SAC and the local residents upon request. Please note that the resident logs were used solely to determine the critical wind conditions as per the scope of this work.

5 GLOSSARY OF TERMS

Broadband Noise: noise with components over a wide range of frequencies.

Decibel (dB): the ratio between the quietest audible sound and the loudest tolerable sound is a million to one in terms of the change in sound pressure. A logarithmic scale is used in noise level measurements because of this wide range. The scale used is the decibel (dB) scale which extends from 0 to 140 decibels (dB) corresponding to the intensity of the sound pressure level.

dB(A): the ear has the ability to recognise a particular sound depending on the pitch or frequencies found at the source. Microphones cannot differentiate noise in the same way as the ear, and to counter this weakness the noise measuring instrument applies a correction to correspond more closely to the frequency response of the human ear. The correction factor is called 'A Weighting' and the resulting measurements are written as dB(A). The dB(A) is internationally accepted and has been found to correspond well with people's subjective reaction to noise. Some typical subjective changes in noise levels are:

- a change of 3dB(A) is just perceptible;
- a change of 5dB(A) is clearly perceptible;
- a change of 10dB(A) is twice (or half) as loud.

Frequency: the pitch of a sound in Hz or kHz. See Hertz.

Hertz (Hz): sound frequency refers to how quickly the air vibrates, or how close the sound waves are to each other (in cycles per second, or Hertz (Hz)).

$\mathbf{L_w}$: is the sound power level. It is a measure of the total noise energy radiated by a source of noise, and is used to calculate noise levels at a distant location. The L_{WA} is the A-weighted sound power level.

$\mathbf{L_{eq}}$: is the equivalent continuous sound level, and is the sound level of a steady sound with the same energy as a fluctuating sound over the same period. It is possible to consider this level as the ambient noise encompassing all noise at a given time. The $LA_{eq,T}$ is the A-weighted equivalent continuous sound level over a given time period (T).

$\mathbf{L_{90}}$: index represents the noise level exceeded for 90 percent of the measurement period and is used to indicate quieter times during the measurement period. It is often used to measure the background noise level. The $L_{A90,10min}$ is the A-weighted background noise level over a ten minute measurement sample.

Noise emission: the noise energy emitted by a source (e.g. a wind turbine).

Noise immission: the sound pressure level detected at a given location (e.g. the nearest dwelling).

Total Noise: All noise as measured by the noise meter during the survey including wind turbine noise as well as all other noise in the environment. The noise index is LA90(dB).

Background Noise: All noise as measured by the noise meter during the survey in the absence of wind turbine noise (during periods of shut-down). The noise index is LA90(dB).

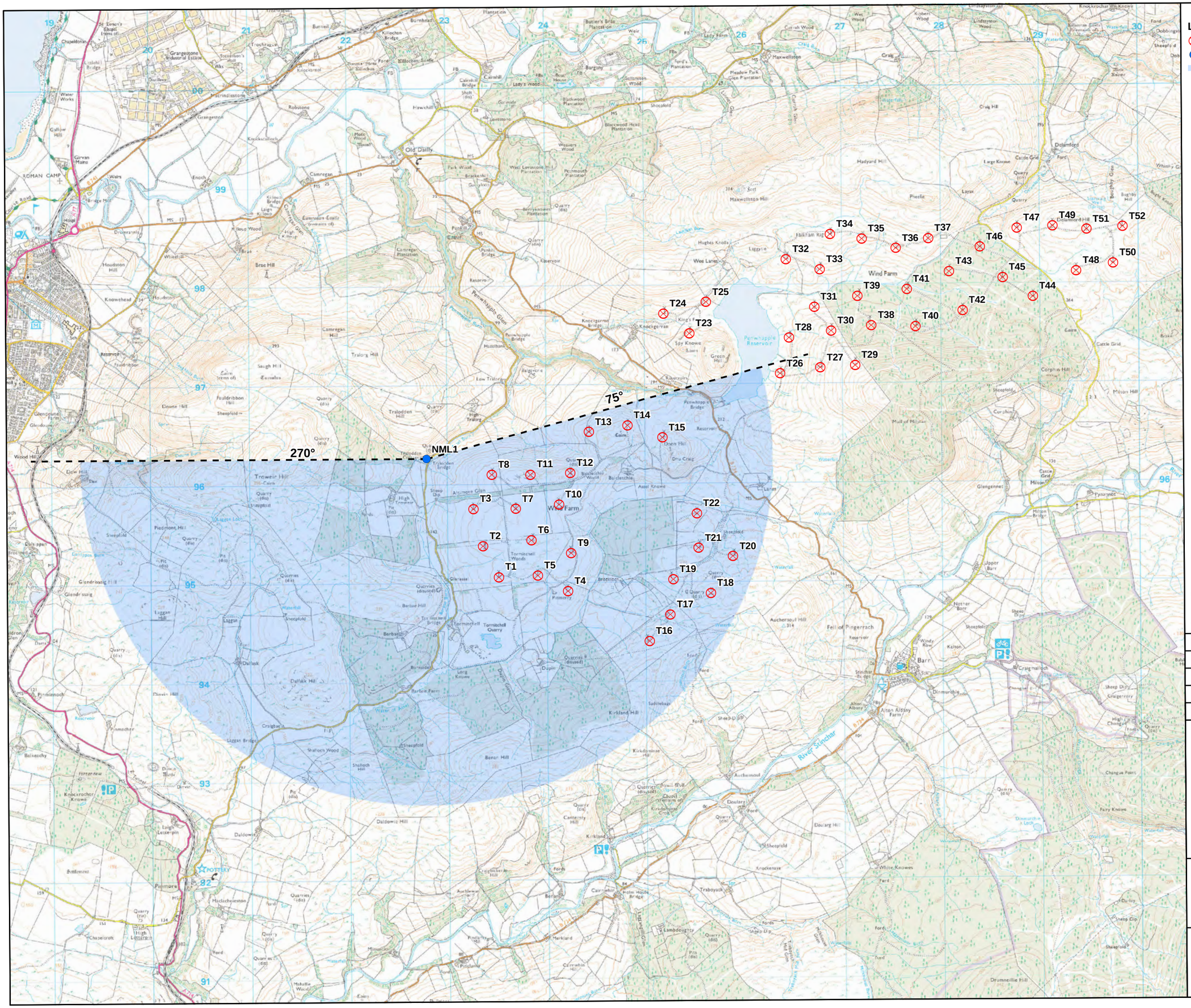
Specific Wind Turbine Noise: The results of a logarithmic subtraction of the background noise from the Total Noise. The noise index is LA90(dB).

Rating Levels: Same as the Specific Wind Turbine Noise unless tonal penalty applies (not considered in the scope of this report).

WT ON: Wind Turbines ON, all nearby turbines operating normally

WT OFF: Wind Turbines OFF, all 52 wind turbines are shut-down

ANNEX 1 - FIGURES



Legend

- Operational Hadyard Hill Turbines
- NML1 - Tralodden Cottage
- Critical Range of Wind Direction as agreed in Protocol

0 500 1,000 Metres

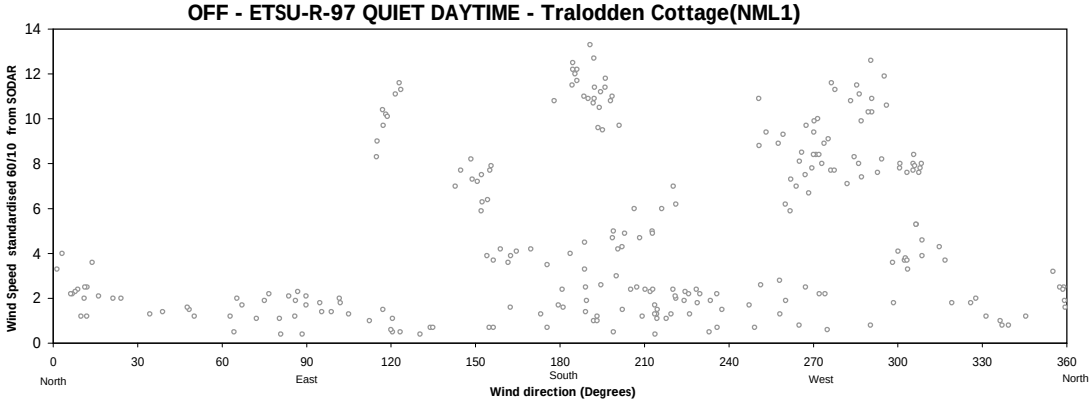
N

REV.	DETAILS	DRAWN	CHK'D	APP'D	DATE
R2	SECOND ISSUE	MT	MC	MC	22/04/2016
R1	FIRST ISSUE	MT	MC	MC	06/04/2016

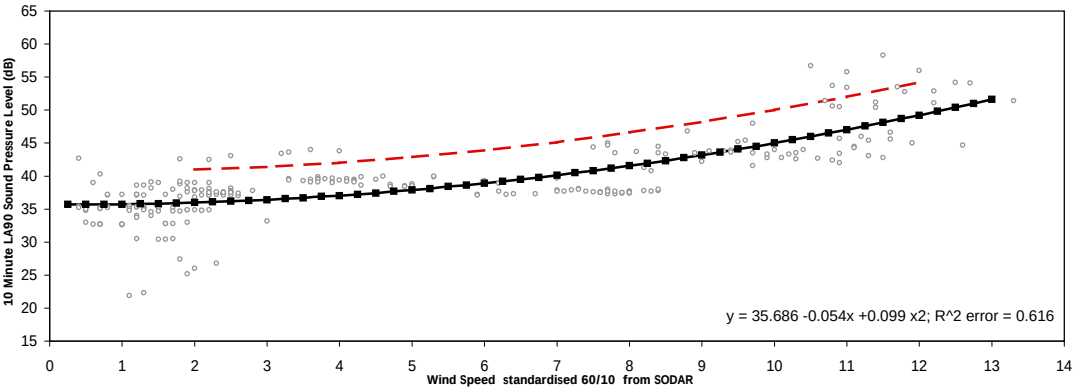
Project	Hadyard Hill Wind Farm
Client	SSE Generation Ltd
Title	Noise Monitoring Location
Figure No.	A1.1
Scale	1:35,000 @A3
Doc. Ref.	10548-005

OFF - ETSU-R-97 QUIET DAYTIME - Tralodden Cottage(NML1)

Wind Conditions Quiet Daytime (OFF)



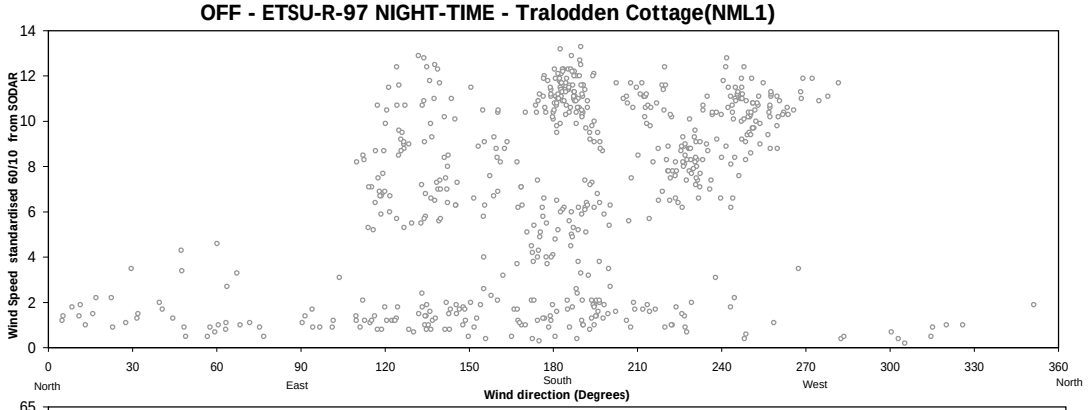
Regression Analysis Quiet Daytime (OFF)



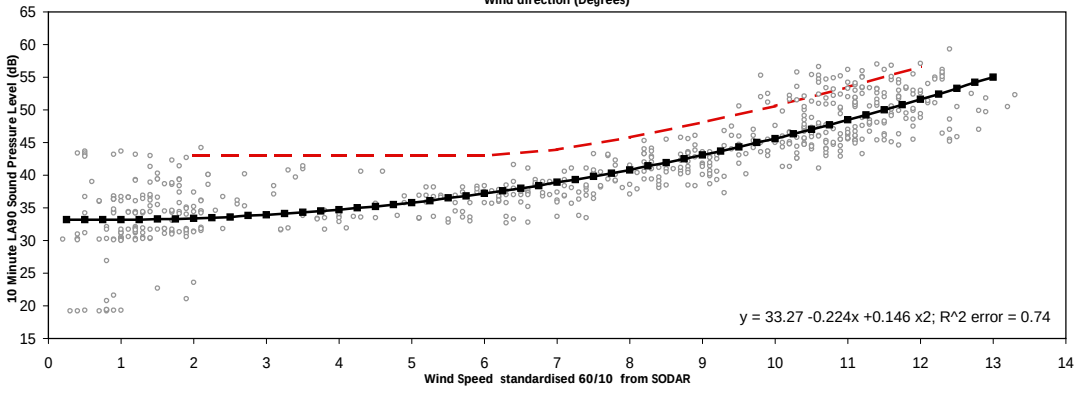
Wind Speed (m/s)	2	3	4	5	6	7	8	9	10	11	12	Total
Number of data points	58	15	21	10	8	9	29	9	13	19	10	201
Background Noise Levels(OFF)	36	36.4	37	37.9	38.9	40.1	41.6	43.2	45	47	49.2	
Noise Limits	41	41.4	42	42.9	43.9	45.1	46.6	48.2	50	52	54.2	

OFF - ETSU-R-97 NIGHT-TIME - Tralodden Cottage(NML1)

Wind Conditions Quiet Daytime (OFF)



Regression Analysis Quiet Daytime (OFF)



Wind Speed (m/s)	2	3	4	5	6	7	8	9	10	11	12	Total
Number of data points	63	11	16	18	40	43	41	52	61	107	61	513
Background Noise Levels(OFF)	33.4	33.9	34.7	35.8	37.2	38.9	40.8	43.1	45.6	48.5	51.6	
Noise Limits	43	43	43	43	43.9	45.8	48.1	50.6	53.5	56.6		

Legend:

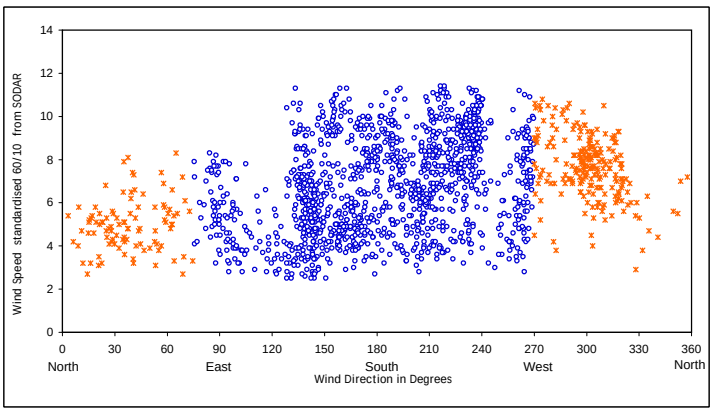
- LA90 10 Minute Measurement Point (OFF)
- Line of best fit raw (OFF)
- Line of best fit adjusted if required:Background Noise Levels(OFF)
- ETSU-R-97 Noise Limits

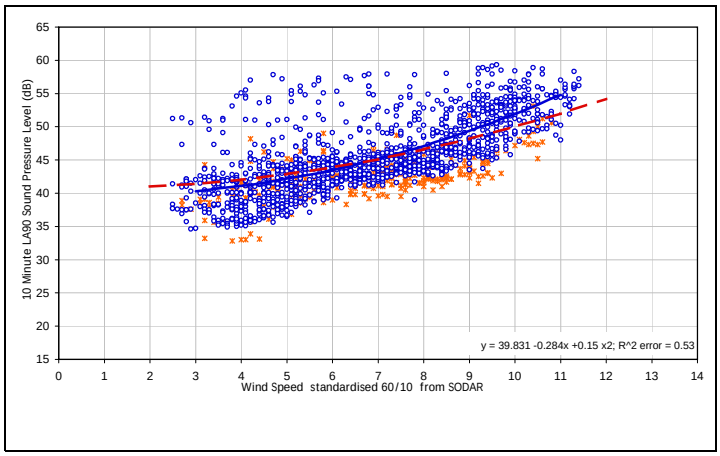
Project	Hadyard Hill
Client	SSE Generation Ltd
Title	Noise Assessment Stage1-Background and Limits Tralodden Cottage(NML1)
Figure Number	A1.2
Scale	NTS
Drawn	MC
Checked	JM
Date	22/04/2016
Document Reference	10548

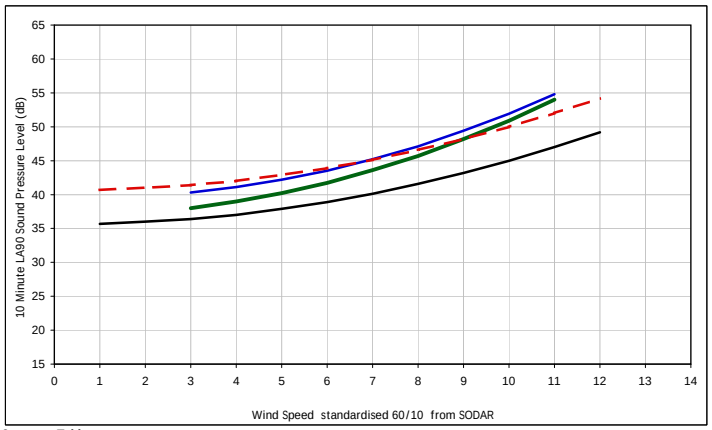
TNEI Services Limited
Newcastle upon Tyne
Telephone 01912111400
Website www.tnei.co.uk

Noise Assessment Stage 2&3 - Specific Wind Turbine Noise

ETSU-R-97 QUIET DAYTIME





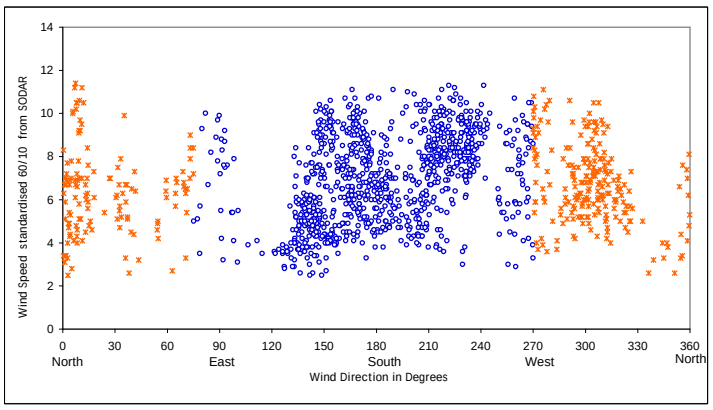


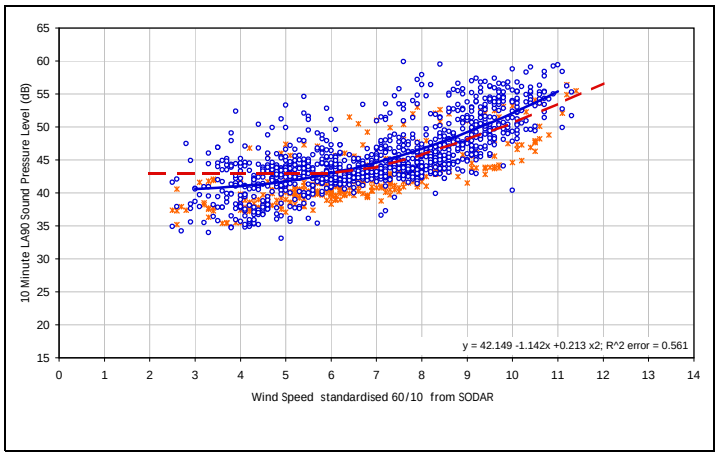
Summary Table:

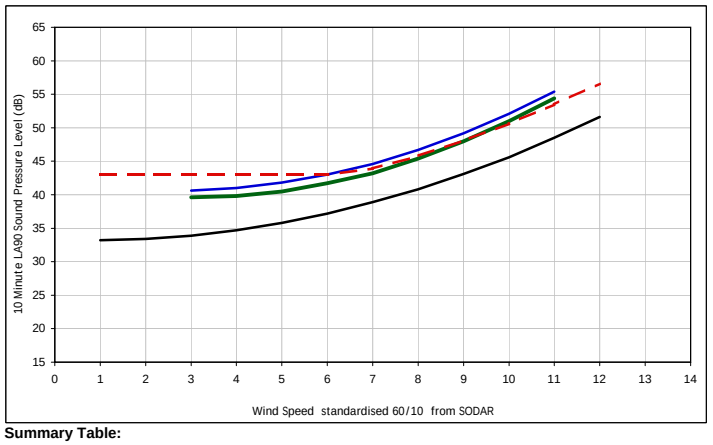
1355 total data points as follows: 0 67 163 213 185 175 186 173 136 57 0

Wind Speed (m/s)	2	3	4	5	6	7	8	9	10	11	12
Total Noise(ON)	-	40.3	41.1	42.2	43.5	45.2	47.1	49.4	51.9	54.8	-
Background Noise Levels(OFF)	36	36.4	37	37.9	38.9	40.1	41.6	43.2	45	47	49.2
Specific Wind Turbine Noise(ON minus OFF)	-	38	39	40.2	41.7	43.6	45.7	48.2	50.9	54	-
ETSU-R-97 Noise Limits	41	41.4	42	42.9	43.9	45.1	46.6	48.2	50	52	54.2
Exceedances	-	-3.4	-3	-2.7	-2.2	-1.5	-0.9	0	0.9	2	-

ETSU-R-97 NIGHT TIME







Summary Table:

1021 total data points as follows: 0 24 111 153 137 140 173 152 105 26 0

Wind Speed (m/s)	2	3	4	5	6	7	8	9	10	11	12
Total Noise(ON)	-	40.6	41	41.8	43	44.6	46.7	49.2	52.1	55.4	-
Background Noise Levels(OFF)	33.4	33.9	34.7	35.8	37.2	38.9	40.8	43.1	45.6	48.5	51.6
Specific Wind Turbine Noise(ON minus OFF)	-	39.6	39.8	40.5	41.7	43.2	45.4	48	51	54.4	-
ETSU-R-97 Noise Limits	43	43	43	43	43	43.9	45.8	48.1	50.6	53.5	56.6
Exceedances	-	-3.4	-3.2	-2.5	-1.3	-0.7	-0.4	-0.1	0.4	0.9	-

Legend:

- L_{A90} 10 Minute Measurement Point Total Noise (ON)
- Total Noise(ON)
- Background Noise Levels(OFF)
- Specific Wind Turbine Noise(ON minus OFF)
- ETSU-R-97 Noise Limits

Wind Speed Filter: 3-11m/s

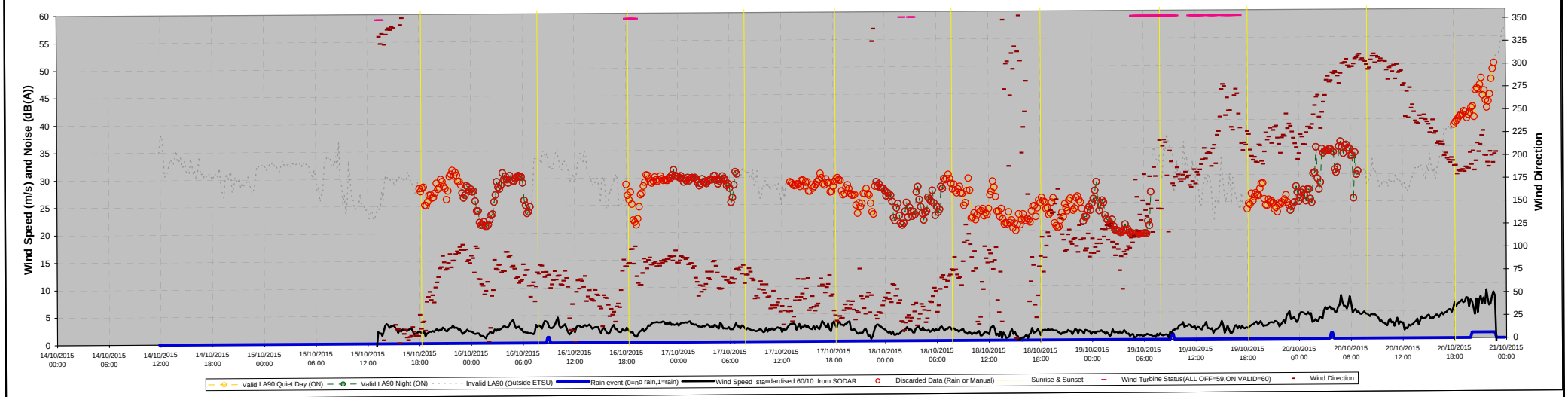
Wind Direction Filter: 75-270°

Project	Hadyard Hill
Client	SSE Generation Ltd
Title	Noise Assessment Stage 2&3 - Specific Wind Turbine Noise Tralodden Cottage(NML1)
Figure Number	A1.3
Scale	NTS
Drawn	MC
Checked	JM
Date	22/04/2016
Document Reference	10548

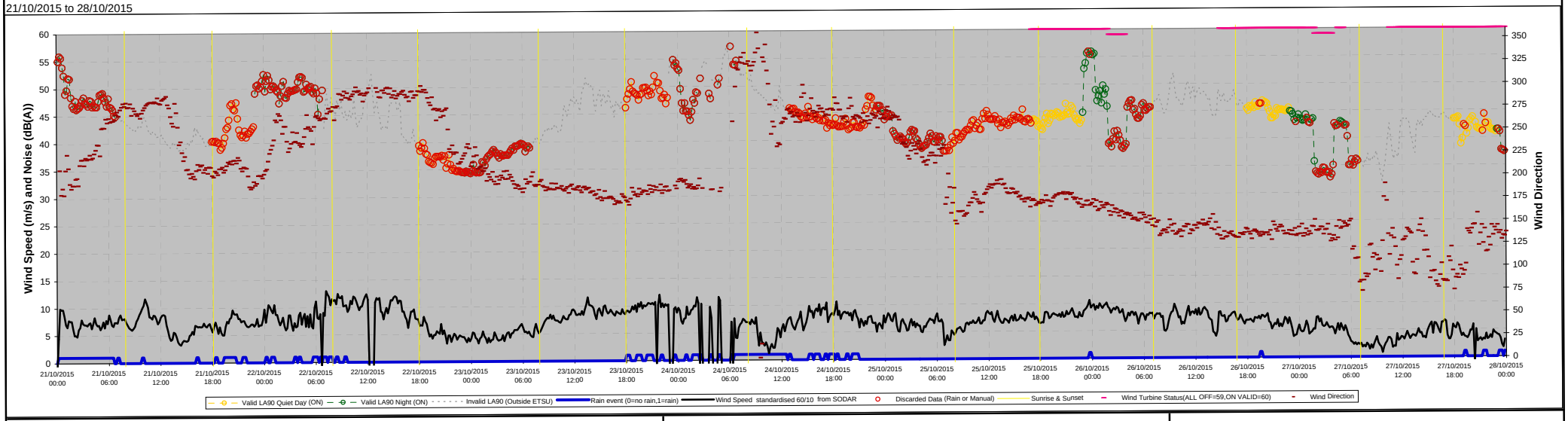
tnei enterprise with energy

TNEI Services Limited Telephone 01912111400
Newcastle upon Tyne Website www.tnei.co.uk

14/10/2015 to 21/10/2015



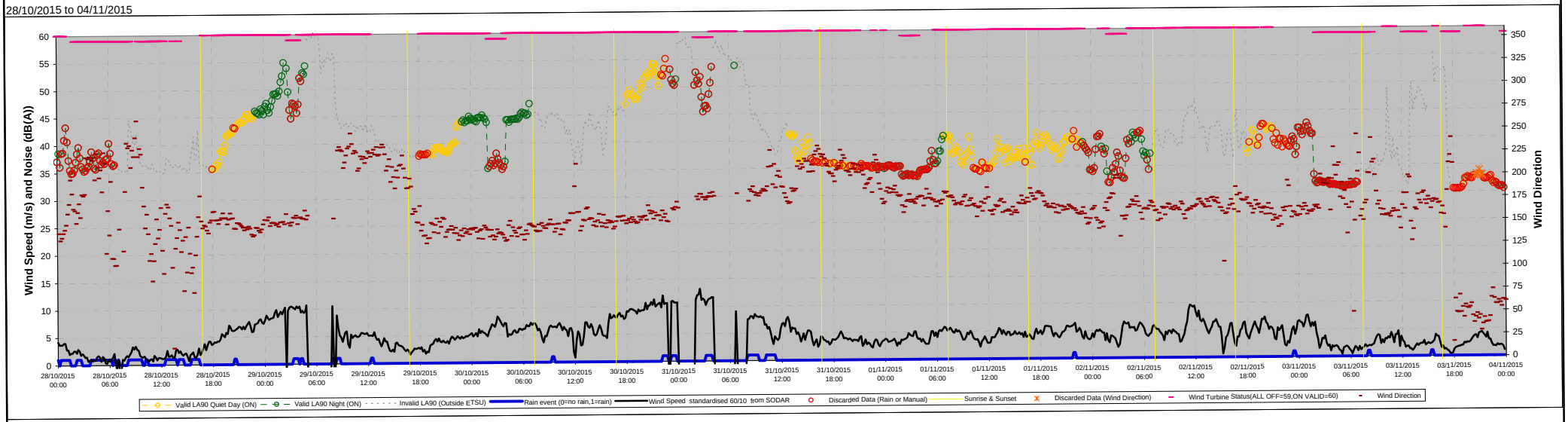
21/10/2015 to 28/10/2015



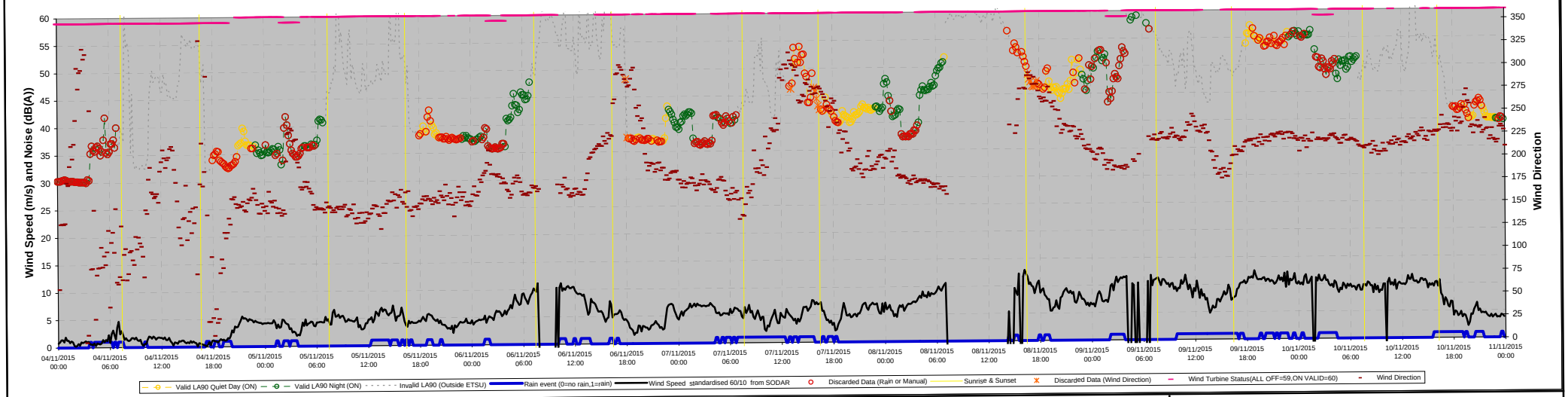
Project	Hadyard Hill
Client	SSE Generation Ltd
Title	Figure A1.4 :Time Serie for Tralodden Cottage(ON) Page 1 of 9
Date	22/04/2016

tnei
enterprise with energy
TNEI Services Limited
Newcastle upon Tyne
Telephone 01912111400
Website www.tnei.co.uk

28/10/2015 to 04/11/2015



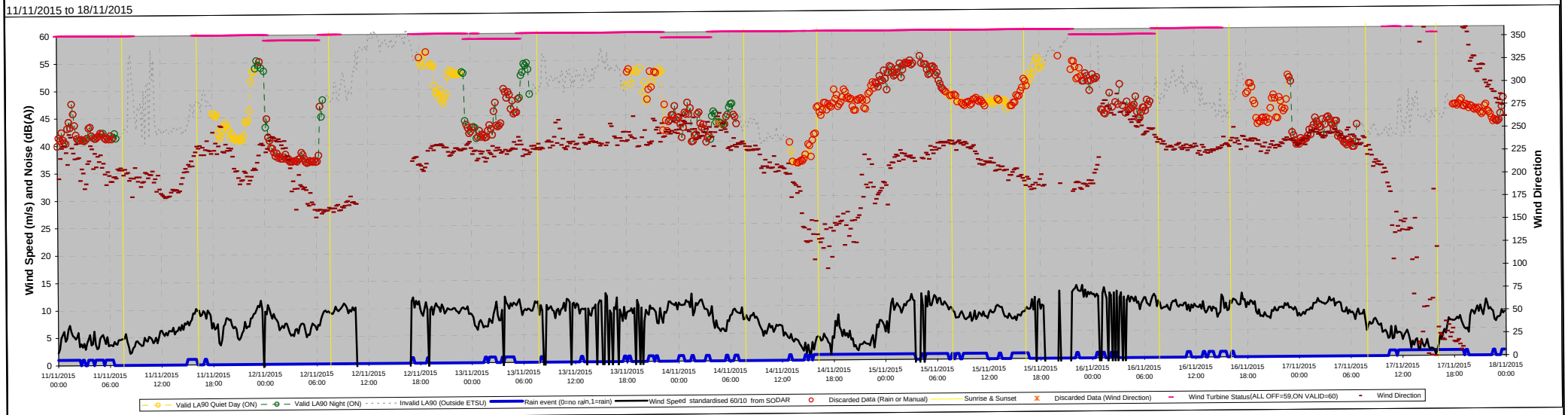
04/11/2015 to 11/11/2015



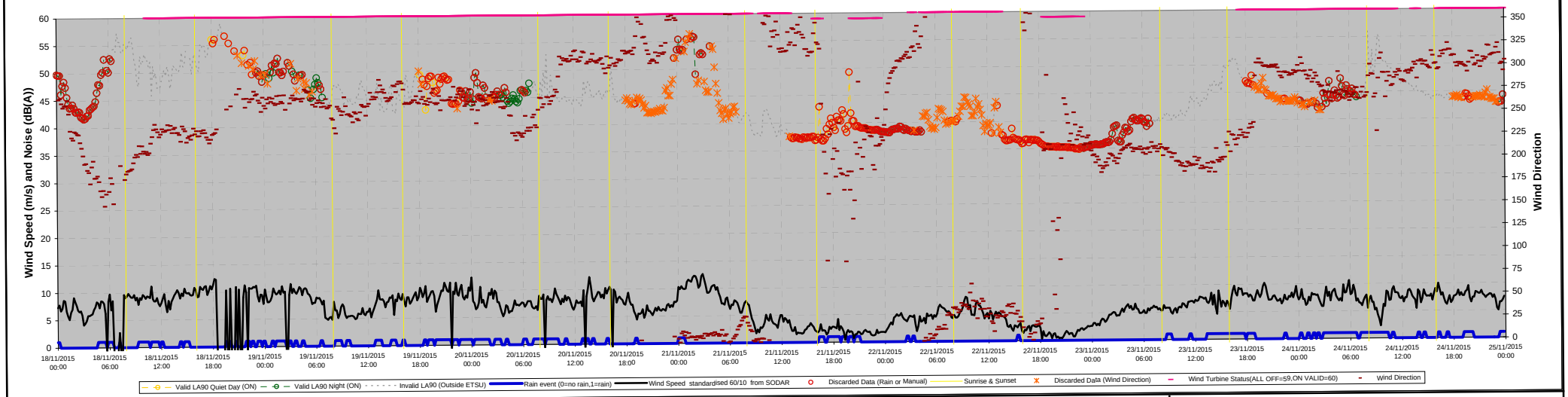
Project	Hadyard Hill
Client	SSE Generation Ltd
Title	Figure A1.4 :Time Serie for Tralodden Cottage(ON) Page 2 of 9
Date	22/04/2016

tnei
enterprise with energy
TNEI Services Limited
Newcastle upon Tyne
Telephone 01912111400
Website www.tnei.co.uk

11/11/2015 to 18/11/2015



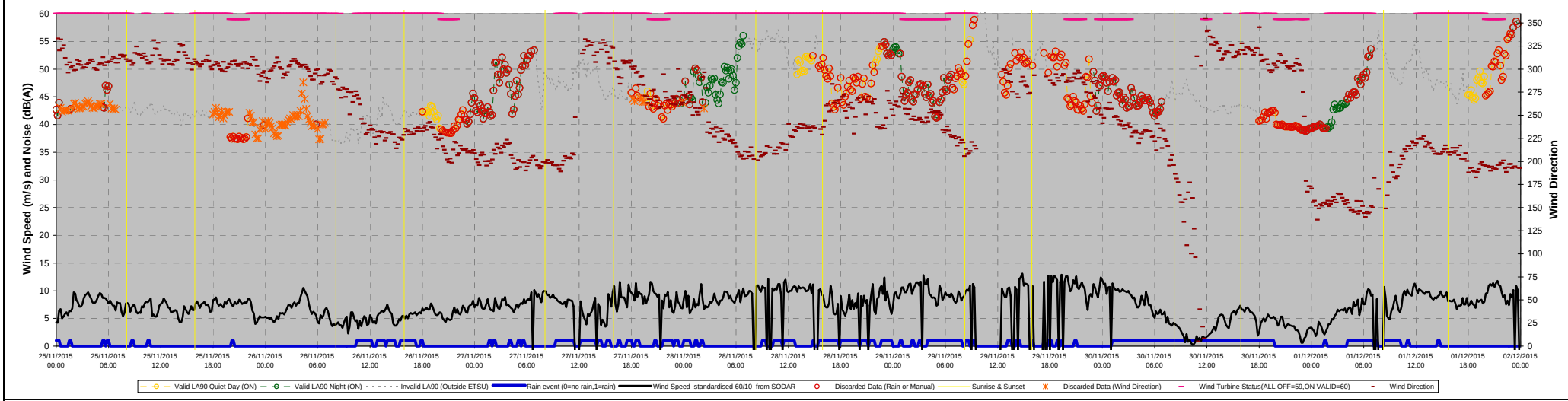
18/11/2015 to 25/11/2015



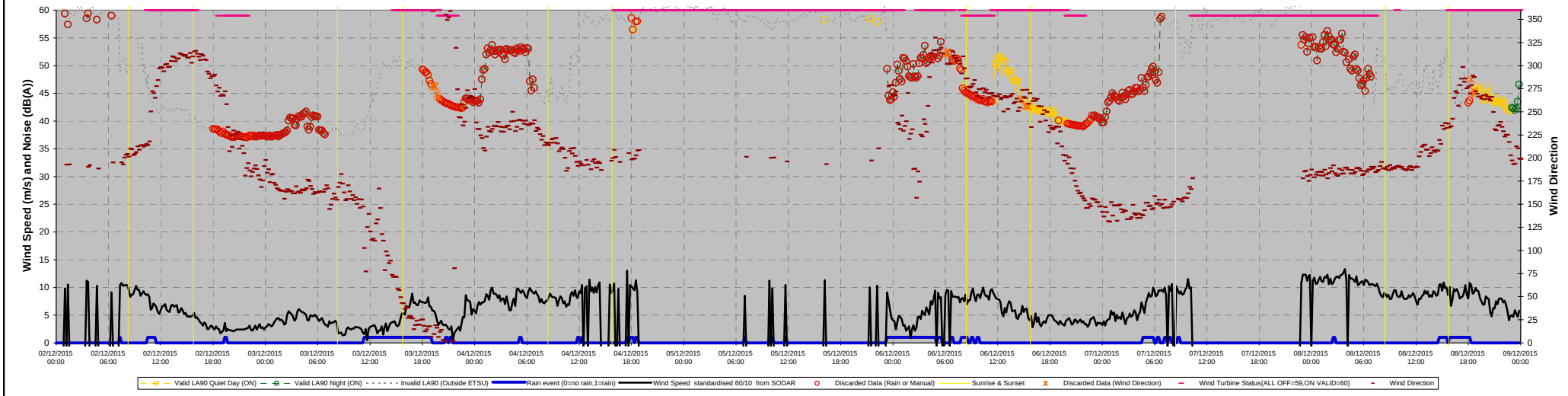
Project	Hadyard Hill
Client	SSE Generation Ltd
Title	Figure A1.4 :Time Serie for Tralodden Cottage(ON) Page 3 of 9
Date	22/04/2016

tnei
enterprise with energy
TNEI Services Limited
Newcastle upon Tyne
Telephone 01912111400
Website www.tnei.co.uk

25/11/2015 to 02/12/2015



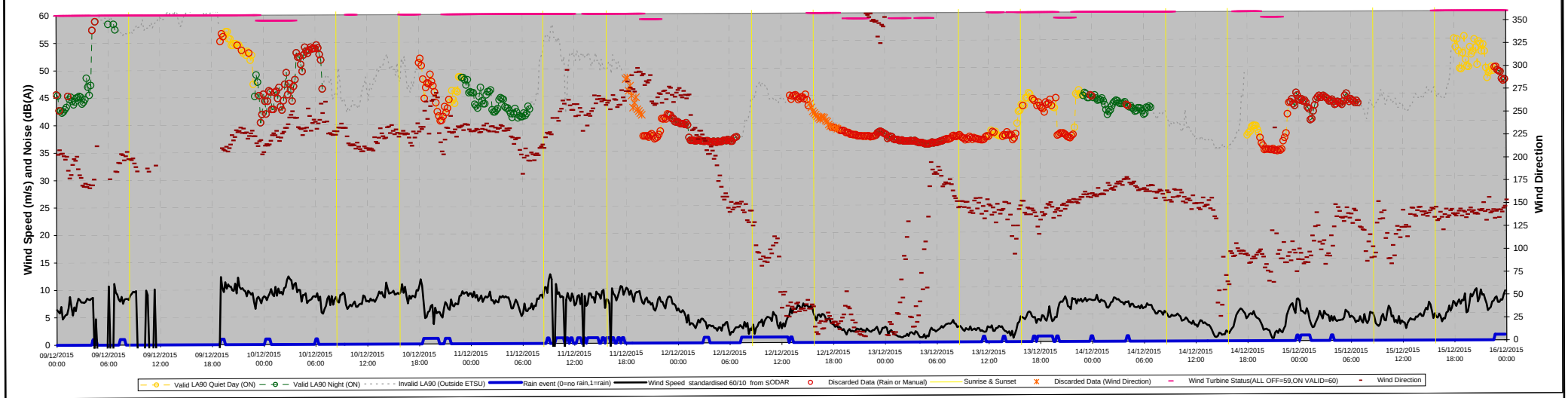
02/12/2015 to 09/12/2015



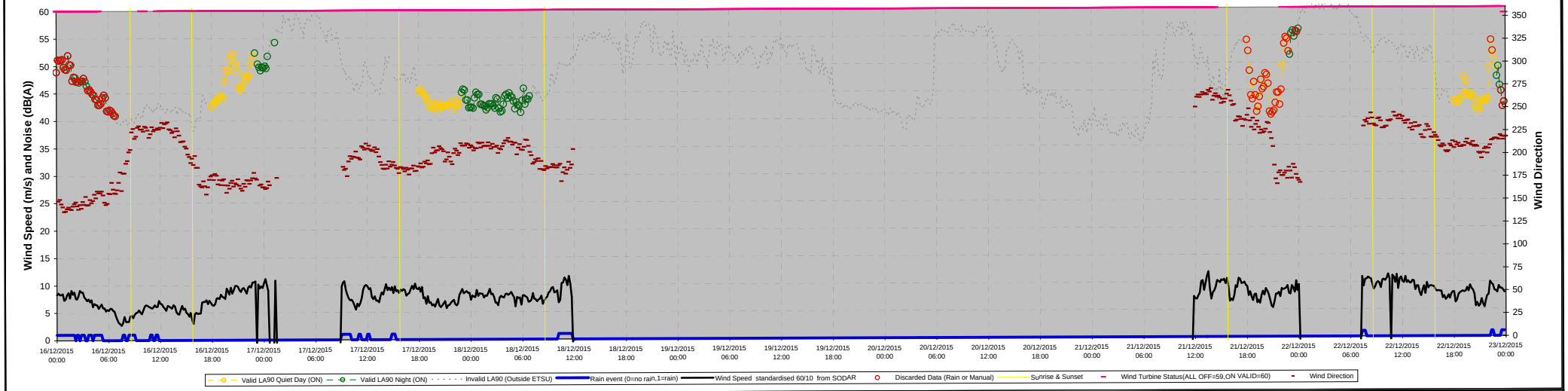
Project	Hadyard Hill
Client	SSE Generation Ltd
Title	Figure A1.4 :Time Serie for Tralodden Cottage(ON) Page 4 of 9
Date	22/04/2016

tnei
enterprise with energy
TNEI Services Limited
Newcastle upon Tyne
Telephone 01912111400
Website www.tnei.co.uk

09/12/2015 to 16/12/2015



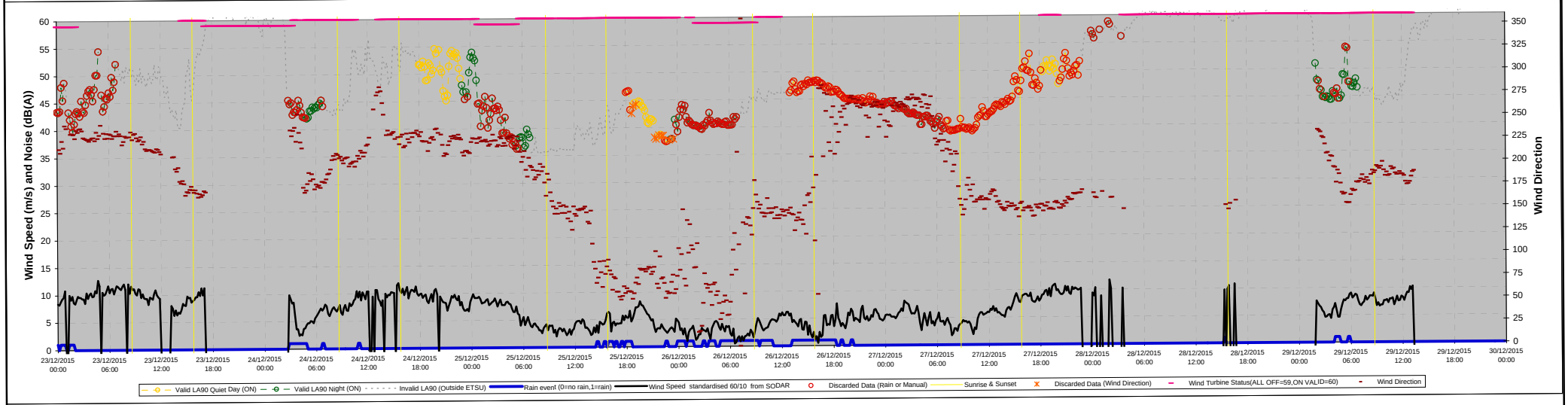
16/12/2015 to 23/12/2015



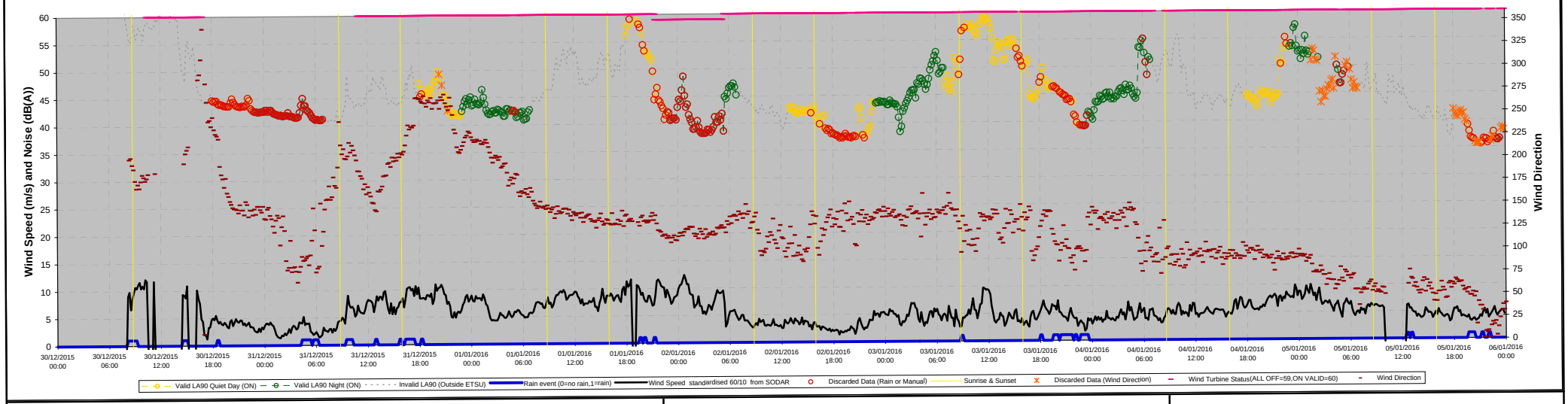
Project	Hadyard Hill
Client	SSE Generation Ltd
Title	Figure A1.4 :Time Serie for Tralodden Cottage(ON) Page 5 of 9
Date	22/04/2016

tnei
enterprise with energy
TNEI Services Limited
Newcastle upon Tyne
Telephone 01912111400
Website www.tnei.co.uk

23/12/2015 to 30/12/2015



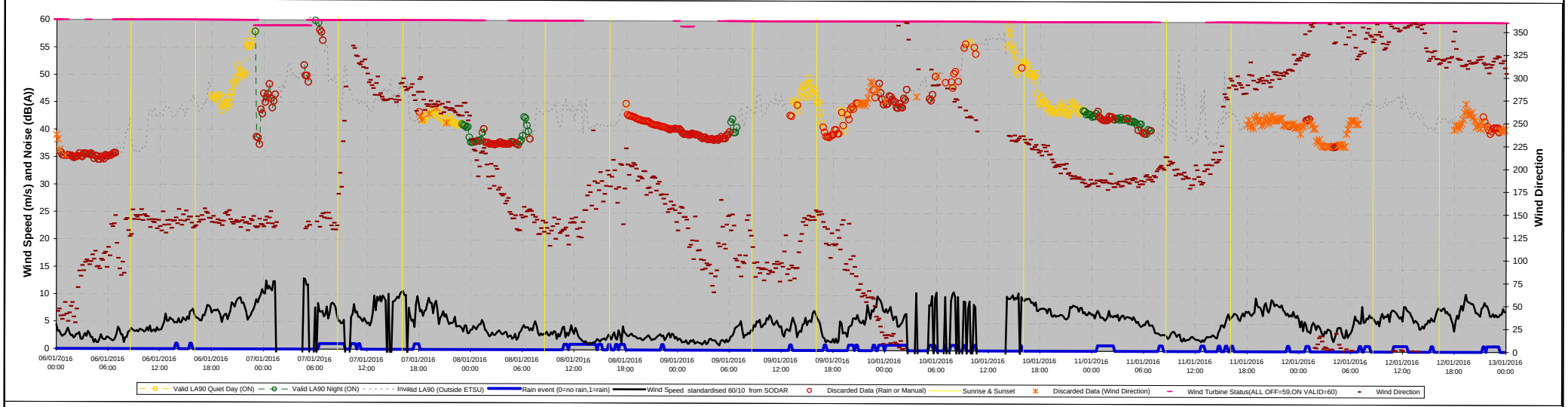
30/12/2015 to 06/01/2016



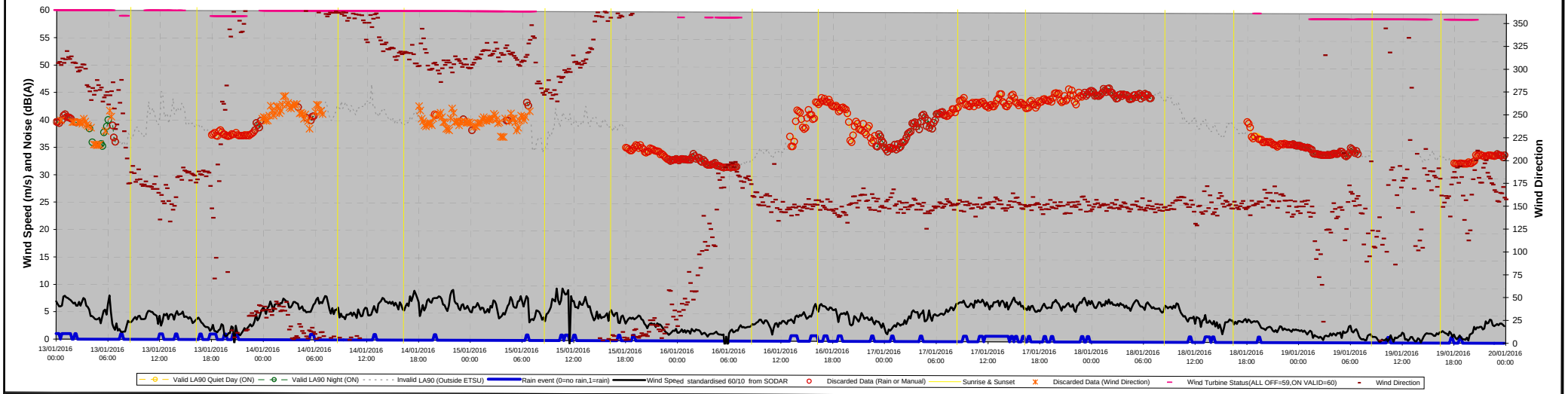
Project	Hadyard Hill
Client	SSE Generation Ltd
Title	Figure A1.4 :Time Serie for Tralodden Cottage(ON) Page 6 of 9
Date	22/04/2016

tnei
enterprise with energy
TNEI Services Limited
Newcastle upon Tyne
Telephone 01912111400
Website www.tnei.co.uk

06/01/2016 to 13/01/2016



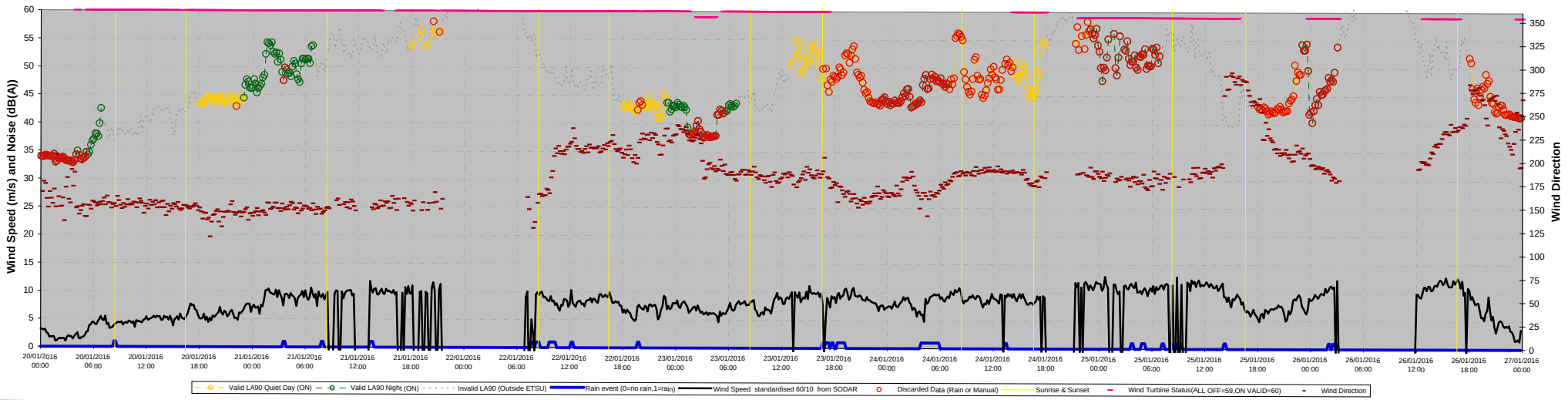
13/01/2016 to 20/01/2016



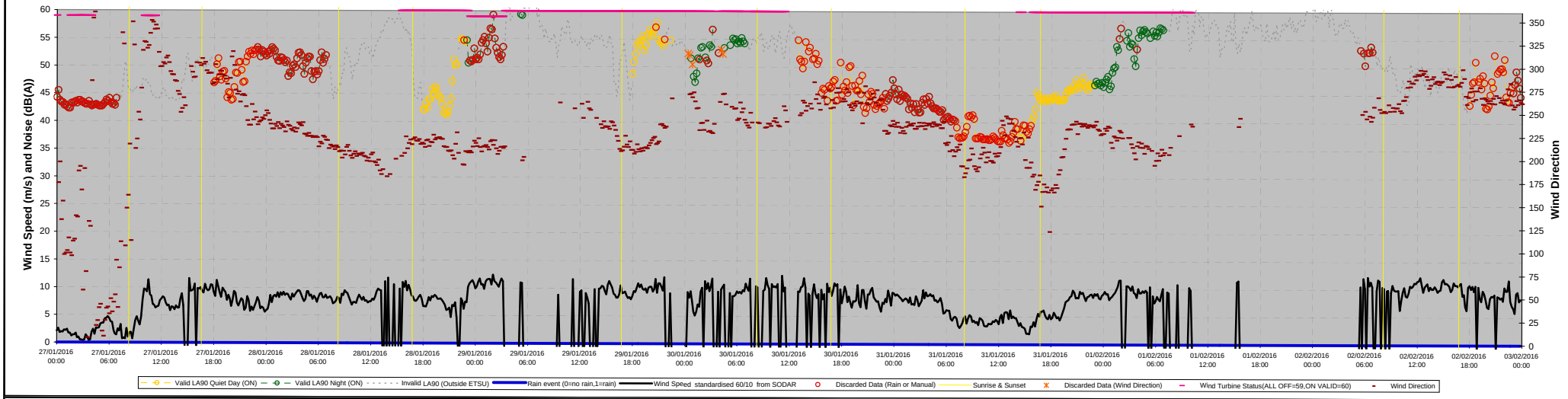
Project	Hadyard Hill
Client	SSE Generation Ltd
Title	Figure A1.4 :Time Serie for Tralodden Cottage(ON) Page 7 of 9
Date	22/04/2016

tnei
enterprise with energy
TNEI Services Limited
Newcastle upon Tyne
Telephone 01912111400
Website www.tnei.co.uk

20/01/2016 to 27/01/2016



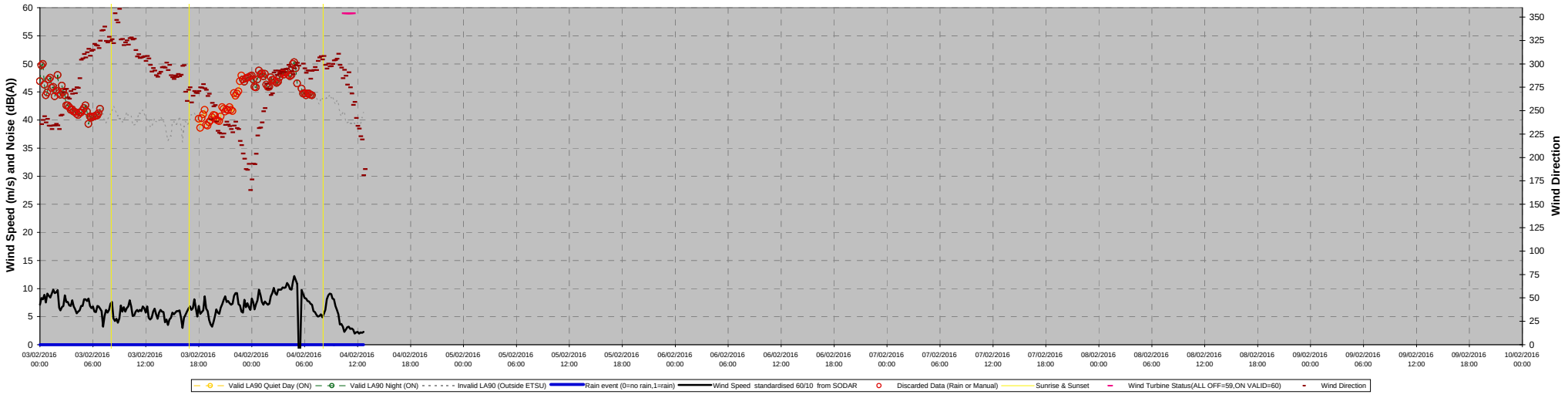
27/01/2016 to 03/02/2016



Project	Hadyard Hill
Client	SSE Generation Ltd
Title	Figure A1.4 :Time Serie for Tralodden Cottage(ON) Page 8 of 9
Date	22/04/2016

tnei
enterprise with energy
TNEI Services Limited
Newcastle upon Tyne
Telephone 01912111400
Website www.tnei.co.uk

03/02/2016 to 10/02/2016



Project	Hadyard Hill
Client	SSE Generation Ltd
Title	Figure A1.4 :Time Serie for Tralodden Cottage(ON) Page 9 of 9
Date	22/04/2016

tnei
enterprise with energy
TNEI Services Limited
Newcastle upon Tyne
Telephone 01912111400
Website www.tnei.co.uk

ANNEX 2 - FIELD DATA SHEETS

Noise Monitoring Field Data Sheet

Project Title	Hadyard Hill	Project Number	10548
Client	SSE	Surveyor	JS/MC/MT/JB/JM/SA/MCL

MONITORING LOCATION

Location Name	NML1 – Tralodden Cottage (Primary SLM)
Description	The SLM was installed in the amenity area, between the turbines and the complainant's dwelling. This location was agreed on-site with an Environmental Health Officer from South Ayrshire Council and the resident. The precise location was selected in order to be away from a nearby stream. This SLM is a Primary SLM immediately adjacent to an other SLM (a back-up SLM). A rain gauge was also installed on the ground.
Approximate Grid Reference	222789,596263
Noise sources noted during installation, weekly inspection and removal	Wind induced noise in vegetation, birds, occasional cars, road work, occasional aircraft, stream & wind turbines.

NOISE MONITORING EQUIPMENT DETAILS

		TNEI Kit Number	Model	Serial Number	Last Calibrated/ Conformance Checked
14/10 to 03/11	Sound Level Meter	30	NL-52	00643022	12/08/15
	Pre Amplifier	30	NH-25	43050	12/08/15
	Microphone	30	UC-59	06802	12/08/15
03/11 to 04/02	Sound Level Meter	29	NL-52	00932360	20/12/15
	Pre Amplifier	29	NH-25	05586	20/12/15
	Microphone	29	UC-59	32388	20/12/15
	Calibrator	02	NC-74	34973250	10/02/15, 15/01/16

NOISE MONITORING EQUIPMENT SETTINGS

	Frequency Weighting (A,B,Z)	Index and Time	Time Weighting (Slow,Fast)	Range (dB)	Audio
Parameters Recorded	A	LA90 10min, LAeq 10min, LAeq 100ms…	Fast	20-130	12KHz/16bit 2minute every 10minute

DATA

File Name	Start Time	End Time	Cal. at Start	Cal. at End	Drift	Observations
0101	14/10/15 12:00 (BST)	21/10/15 00:20 (BST)	94.0	94.0	0.0	On 14/10: Sounds audible include quarry noise, wind in trees, stream, traffic. Turbines not audible.
0102	03/11/15 15:20 (GMT)	18/11/15 15:11 (GMT)	94.0	94.0	0.0	On 03/11: Kit batteries ran out on 21/10 and data available up to that date. Lots of activity – road works outside of property. Also revving of engines at property – van with trailer + car being repaired. High noise levels; turbines not audible. Changed SLM to Kit 29.
0103	18/11/15 15:20 (GMT)	04/12/15 12:08 (GMT)	94.0	94.0	0.0	On 18/11: Turbines clearly audible. Conditions windy; wind in trees audible.
0104	04/12/15 12:30 (GMT)	17/12/15 14:42 (GMT)	94.0	94.1	+0.1	On 04/12: Turbines clearly audible. Conditions windy; wind in trees audible.
0105	17/12/15 15:10 (GMT)	06/01/16 15:10 (GMT)	94.0	93.9	-0.1	On 17/12: Wind in trees. Turbines just audible. Significant road traffic noise.
0106	06/01/16 15:30 (GMT)	12/01/16 19:40 (GMT)	94.0	93.9	-0.1	On 06/01: Turbines audible.

0107	19/01/16 14:00 (GMT)	04/02/16 12:42 (GMT)	94.0	93.9	-0.1	On 19/01/16: Kit batteries ran out on 12/01/16 and data available up to that date. No wind, no snow on ground but resident reported snow the week before. No wind turbine noise. Stream ~33dB. Occasional traffic. No logs provided. On 04/02/16: Stream audible, ~40dB. Steady rain. Ground conditions very wet. Low hum audible. No logs provided. Kit removed.

NML1 and NML1B PHOTOGRAPHS - OCTOBER 2015

NML1 - NE

NML1 - NW

NML1 - SE

NML1 - SW

NML1 and NML1B PHOTOGRAPHS – FEBRUARY 2016

NML1 - NE

NML1 - NW

NML1 - SE

NML1 - SW

Noise Monitoring Field Data Sheet

Project Title	Hadyard Hill	Project Number	10548
Client	SSE	Surveyor	JS/MC/MT/JB/JM/SA/MCL

MONITORING LOCATION

Location Name	NML1B – Tralodden Cottage (back-up SLM)
Description	The SLM was installed in the amenity area, between the turbines and the complainant's dwelling. This location was agreed on-site with an Environmental Health Officer from South Ayrshire Council and the resident. The precise location was selected in order to be away from a nearby stream. This SLM is a back-up SLM immediately adjacent to an other SLM (a Primary SLM). A rain gauge was also installed on the ground.
Approximate Grid Reference	222789,596263
Noise sources noted during installation, weekly inspection and removal	Wind induced noise in vegetation, birds, occasional cars, road work, occasional aircraft, stream & wind turbines.

NOISE MONITORING EQUIPMENT DETAILS

		TNEI Kit Number	Model	Serial Number	Last Calibrated/ Conformance Checked
14/10 to 04/02	Sound Level Meter	02	NL-32	00661768	18/02/15
	Pre Amplifier	02	NH-21	19772	18/02/15
	Microphone	02	UC-53A	310459	18/02/15
	Calibrator	02	NC-74	34973250	10/02/15, 15/01/16

NOISE MONITORING EQUIPMENT SETTINGS

	Frequency Weighting (A,B,Z)	Index and Time	Time Weighting (Slow,Fast)	Range (dB)	Audio
Parameters Recorded	A	LA90 10min, LAeq 10min…	Fast	20-110	N/A

DATA

File Name	Start Time	End Time	Cal. at Start	Cal. at End	Drift	Observations
9901	14/10/15 11:50 (BST)	03/11/15 15:03 (GMT)	94.0	94.0	0.0	On 14/10: Sounds audible include quarry noise, wind in trees, stream, traffic. Turbines not audible.
9902	03/11/15 15:20 (GMT)	18/11/15 15:11 (GMT)	94.0	94.0	0.0	On 03/11: Lots of activity – road works outside of property. Also revving of engines at property – van with trailer + car being repaired. High noise levels; turbines not audible.
9903	18/11/15 15:10 (GMT)	04/12/15 12:07 (GMT)	94.0	93.9	-0.1	On 18/11: Turbines clearly audible. Conditions windy; wind in trees audible.
9904	04/12/15 12:30 (GMT)	17/12/15 14:40 (GMT)	94.0	94.1	+0.1	On 04/12: Turbines clearly audible. Conditions windy; wind in trees audible.
9905	17/12/15 15:10 (GMT)	06/01/16 15:16 (GMT)	94.0	94.0	0.0	On 17/12: Wind in trees. Turbines just audible. Significant road traffic noise.
9906	06/01/16 15:30 (GMT)	19/01/16 08:20 (GMT)	94.0	93.8	-0.2	On 06/01: Turbines audible.

9907	19/01/16 14:00 (GMT)	04/02/16 12:40 (GMT)	94.0	94.0	0.0	On 19/01/16: Kit battery ran out on the morning of 19/01/16, a few hours before the site visit and data available up to that date. No wind, no snow on ground but resident reported snow the week before. No wind turbine noise. Stream ~33dB. Occasional traffic. No logs provided. On 04/02/16: Stream audible, ~40dB. Steady rain. Ground conditions very wet. Low hum audible. No logs provided. Kit removed.

NML1 and NML1B PHOTOGRAPHS - OCTOBER 2015

NML1 - NE

NML1 - NW

NML1 - SE

NML1 - SW

NML1 and NML1B PHOTOGRAPHS – FEBRUARY 2016

NML1 - NE

NML1 - NW

NML1 - SE

NML1 - SW

ANNEX 3 – NOISE KIT CALIBRATION CERTIFICATES

CERTIFICATE OF CALIBRATION

Date of Issue: 20 December 2014 **Certificate Number: TCRT14/1357**

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Approved Signatory [redacted]

Customer	TNEI Services Ltd Milburn House Dean Street Newcastle Upon Tyne NE1 1LE
Order No.	5001
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification

Manufacturer	*Instrument*	*Type*	*Serial No. / Version*
Rion	Sound Level Meter	NL-52	00932360
Rion	Firmware		1.5
Rion	Pre Amplifier	NH-25	32388
Rion	Microphone	UC-59	05586
Rion	Calibrator	NC-74	34536109
	Calibrator adaptor type if applicable		NC-74-002

Performance Class 1

Test Procedure TP 2.SLM 61672-3 TPS-49

Procedures from IEC 61672-3:2006 were used to perform the periodic tests.

Type Approved to IEC 61672-1:2002 YES Approval Number 21.21 / 13.02

If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003

Date Received 18 December 2014 ANV Job No. TRAC14/12199

Date Calibrated 20 December 2014

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	Initial Calibration		

CERTIFICATE OF CALIBRATION

Certificate Number
TCRT14/1357

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	Sound Level Meter	NL-42 / NL-52	
SLM instruction manual ref / issue		11-03	
SLM instruction manual source		Manufacturer	
Internet download date if applicable		N/A	
Case corrections available		Yes	
Uncertainties of case corrections		Yes	
Source of case data		Manufacturer	
Wind screen corrections available		Yes	
Uncertainties of wind screen corrections		Yes	
Source of wind screen data		Manufacturer	
Mic pressure to free field corrections		Yes	
Uncertainties of Mic to F.F. corrections		Yes	
Source of Mic to F.F. corrections		Manufacturer	
Total expanded uncertainties within the requirements of IEC 61672-1:2002		Yes	
Specified or equivalent Calibrator		Specified	
Customer or Lab Calibrator		Lab Calibrator	
Calibrator adaptor type if applicable		NC-74-002	
Calibrator cal. date		04 December 2014	
Calibrator cert. number		UCRT14/1256	
Calibrator cal cert issued by		ANV Measurement Systems	
Calibrator SPL @ STP		94.00 dB	Calibration reference sound pressure level
Calibrator frequency		1001.90 Hz	Calibration check frequency
Reference level range		25 - 130 dB	

Accessories used or corrected for during calibration - Wind Shield WS-10
Note - if a pre-amp extension cable is listed then it was used between the SLM and the pre-amp.

Environmental conditions during tests	Start	End	
Temperature	21.45	21.28	± 0.20 °C
Humidity	31.6	32.8	± 3.00 %RH
Ambient Pressure	101.41	101.46	± 0.03 kPa

Response to associated Calibrator at the environmental conditions above.

Initial indicated level	93.8	dB	Adjusted indicated level	94.0	dB
The uncertainty of the associated calibrator supplied with the sound level meter ±				0.10	dB

Self Generated Noise	This test is currently not performed by this Lab.		
Microphone installed (if requested by customer) = Less Than		N/A dB	A Weighting
Uncertainty of the microphone installed self generated noise ±		N/A dB	

Microphone replaced with electrical input device - UR = Under Range indicated

Weighting	A			C			Z		
	11.8	dB	UR	16.8	dB	UR	22.6	dB	UR
Uncertainty of the electrical self generated noise ±						0.12	dB		

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

For the test of the frequency weightings as per paragraph 12. of IEC 61672-3:2006 the Actual microphone free field response was used.

The acoustical frequency tests of a frequency weighting as per paragraph 11 of IEC 61672-3:2006 were carried out using an electrostatic actuator.

..... END .....

Calibrated by: [redacted]

Additional Comments
None

CERTIFICATE OF CALIBRATION

Date of Issue: 12 August 2015

Certificate Number: TCRT15/1227

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Approved Signatory

[redacted]

Customer	TNEI Services Ltd Milburn House Dean Street Newcastle Upon Tyne NE1 1LE
Order No.	5001
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification

Manufacturer	*Instrument*	*Type*	*Serial No. / Version*
Rion	Sound Level Meter	NL-52	00643022
Rion	Firmware		1.5
Rion	Pre Amplifier	NH-25	43050
Rion	Microphone	UC-59	06802
Rion	Calibrator	NC-74	34536109
	Calibrator adaptor type if applicable		NC-74-002

Performance Class 1

Test Procedure TP 2.SLM 61672-3 TPS-49

Procedures from IEC 61672-3:2006 were used to perform the periodic tests.

Type Approved to IEC 61672-1:2002 YES Approval Number 21.21 / 13.02

If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003

Date Received 07 August 2015 ANV Job No. TRAC15/08116

Date Calibrated 12 August 2015

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	Initial Calibration		

CERTIFICATE OF CALIBRATION

Certificate Number
TCRT15/1227

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	Sound Level Meter	NL-42 / NL-52
SLM instruction manual ref / issue		11-03
SLM instruction manual source		Manufacturer
Internet download date if applicable		N/A
Case corrections available		Yes
Uncertainties of case corrections		Yes
Source of case data		Manufacturer
Wind screen corrections available		Yes
Uncertainties of wind screen corrections		Yes
Source of wind screen data		Manufacturer
Mic pressure to free field corrections		Yes
Uncertainties of Mic to F.F. corrections		Yes
Source of Mic to F.F. corrections		Manufacturer
Total expanded uncertainties within the requirements of IEC 61672-1:2002		Yes
Specified or equivalent Calibrator		Specified
Customer or Lab Calibrator		Lab Calibrator
Calibrator adaptor type if applicable		NC-74-002
Calibrator cal. date		04 August 2015
Calibrator cert. number		UCRT15/1211
Calibrator cal cert issued by		ANV Measurement Systems
Calibrator SPL @ STP	94.09 dB	Calibration reference sound pressure level
Calibrator frequency	1001.89 Hz	Calibration check frequency
Reference level range	25 - 130 dB	

Accessories used or corrected for during calibration - Wind Shield WS-10
Note - if a pre-amp extension cable is listed then it was used between the SLM and the pre-amp.

Environmental conditions during tests	Start	End	
Temperature	23.58	23.54	± 0.20 °C
Humidity	40.8	39.9	± 3.00 %RH
Ambient Pressure	101.39	101.35	± 0.03 kPa

Response to associated Calibrator at the environmental conditions above.

Initial indicated level	94.1	dB	Adjusted indicated level	94.1	dB
The uncertainty of the associated calibrator supplied with the sound level meter ±				0.10	dB

Self Generated Noise — This test is currently not performed by this Lab.

Microphone installed (if requested by customer) = Less Than	N/A	dB	A Weighting		
Uncertainty of the microphone installed self generated noise ±	N/A	dB			

Microphone replaced with electrical input device - UR = Under Range indicated

Weighting	A			C			Z		
	11.4	dB	UR	16.0	dB	UR	21.3	dB	UR
Uncertainty of the electrical self generated noise ±							0.12	dB	

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

For the test of the frequency weightings as per paragraph 12. of IEC 61672-3:2006 the actual microphone free field response was used.

The acoustical frequency tests of a frequency weighting as per paragraph 11 of IEC 61672-3:2006 were carried out using an electrostatic actuator.

..... END .....

Calibrated by: [redacted]

R 1

Additional Comments
None

CERTIFICATE OF CALIBRATION

UKAS CALIBRATION
7623

Date of Issue: 10 February 2015 **Certificate Number: UCRT15/1041**

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Approved Signatory
[redacted]

Customer	TNEI Services Ltd Milburn House Dean Street Newcastle Upon Tyne NE1 1LE
Order No.	5001
Test Procedure	Procedure TP 1 Calibration of Sound Calibrators
Description	Acoustic Calibrator

Identification	*Manufacturer*	*Instrument*	*Model*	*Serial No.*
	Rion	Calibrator	NC-74	34973250

The calibrator has been tested as specified in Annex B of IEC 60942:2003. As public evidence was available from a testing organisation (PTB) responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the reqirements for pattern evaluation decribed in Annex A of IEC 60942:2003, the sound calibrator tested is considered to conform to all the class 1 requirements of IEC 60942:2003.

ANV Job No.	UKAS15/02014	
Date Received	09 February 2015	
Date Calibrated	10 February 2015	
Previous Certificate	*Dated*	30 January 2015
	Certificate No.	UCRT14/1272SUP
	Laboratory	7623

Measurements

The sound pressure level generated by the calibrator in its WS2 configuration was measured five times by the Insert Voltage Method using a microphone as detailed below. The mean of the results obtained is shown below. It is corrected to the standard atmospheric pressure of 101.3 kPa (1013 mBar) using original manufacturers information.

Test Microphone	*Manufacturer*	*Type*
	Brüel & Kjær	4192

Results

The level of the calibrator output under the conditions outlined above was

94.01 ± 0.10 dB rel 20 µPa

Functional Tests and Observations

The frequency of the sound produced was	1002.7 Hz	±	0.13 Hz
The total distortion was	1.06 %	±	6.9 % of Reading

During the measurements environmental conditions were

Temperature	22	to	23	°C
Relative Humidity	32	to	40	%
Barometric Pressure	102.0	to	102.2	kPa

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k =2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

The uncertainties refer to the measured values only with no account being taken of the ability of the instrument to maintain its calibration.

A small correction factor may need to be applied to the sound pressure level quoted above if the device is used to calibrate a sound level meter which is fitted with a free-field response microphone. See manufacturers handbook for details.

..... END .....

Note:

Calibrator adjusted prior to calibration?	YES	
Initial Level	94.13	dB
Initial Frequency	1002.8	Hz

Additional Comments

Adjustment approved with Customer [redacted]

Calibrated by: [redacted]

ANNEX 4 – AGREED NOISE INVESTIGATION PROTOCOL

Noise Measurement and Assessment Protocol

Specific to one complainant property near the operational Hadyard Hill Wind Farm.

Complaints attributed to operational noise levels from the Hadyard Hill Wind Farm were received from a local resident at one property, hereafter referred to as the Noise Monitoring Location (NML). The NML to be investigated is NML01-[redacted]

This Noise Measurement and Assessment Protocol sets out the steps required to determine whether operational wind turbine noise levels at the complainant's property comply with appropriate noise limits established in accordance with ETSU-R-97 and the IOA GPG. It is acknowledged by all parties that the wording of conditions 7.11 and 7.12 (specific to operational noise) of the planning consent are inappropriate (see previous report PJ1954/PJ/24175 by Spectrum Acoustics). The agreed re-wording to be used for the purposes of this protocol is as follows:

'7.11 At properties occupied by persons with a financial interest in the development, for all wind speeds up to 12m/s, day and night time noise levels must not exceed an LA90(10 mins) of 45dB(A) or the prevailing background noise level plus 5dB(A), whichever is the greater value.

7.12 At residential properties with no such financial interest, for all wind speeds up to 12m/s, the LA90(10 mins) should not exceed 38dB(A) (daytime) and 43dB(A) (night time) or the prevailing background noise level plus 5dB(A), whichever is the greater value.'

Condition 7.12 is applicable as there is no financial interest at NML01. It should be noted that the 'prevailing background noise level' which is used to set the noise limits has never been defined for NML01. The prevailing background noise level is the background noise level in the absence of any turbine noise and this will therefore be established using data measured during periods of turbine shut down in the TNEI noise survey which started on 14/10/2015.

Type 1 or Class 1 sound level meters fitted with RION WS-03 wind shields were installed at the complainant's property. These will be set to record at least $L_{A90\ 10min}$ noise levels.

Each measured $L_{A90\ 10min}$ noise data point will be correlated with its corresponding 10 minute data point for rain, wind speed and operational data. These non acoustic parameters will be collected by a combination of rain gauges, local weather station, wind turbine control system and a SODAR remote sensing unit installed on site near the nearest wind turbines to NML01. The wind speed measurements for this noise complaint investigation will be based on the SODAR measured 60m height (hub height of nearest turbine is 58.5m) wind speeds which will be standardised to 10m height. Each 10 minute period where a rain event is recorded will be discarded, and so will be the preceding 10 minute period.

The operational data from the Development has been correlated with complaint logs to determine the critical periods (ETSU-R-97 page 87), also referred to as meteorological conditions in which the complaints occurred (ETSU-R-97 page 102). Following a detailed analysis of the resident logs (by TNEI and South Ayrshire Council) and the operational and meteorological 10 minute data measured at the time of the logs, the critical periods to be investigated for NML01 are defined as follows:

- Critical time : Both Quiet daytime and Night Time

- Critical range of wind speed: 3-11 m/s (standardised 60m to 10m). From analysis of the resident logs, the range was initially 6-11m/s, however following discussion with South Ayrshire Council, a lower 3m/s cut off is considered for this protocol. This represents the cut-in wind speed of the turbines.

- Critical range of wind direction: 75-270°.From analysis of the resident logs, the range was initially 140-270°, however following discussion with South Ayrshire Council, a wider range is considered for this protocol to include more downwind sectors.

At least 20 valid data points (ETSU-R-97 page 102) will need to be collected at the property during the critical period defined above.

The assessment of the "Rating Level" based on the measured data can be split into two stages, as follows:

- Stage 1 "Background Level and ETSU-R-97 noise limits": Establish the ETSU-R-97 noise limits which will apply, these will be based relative to the Background Noise Levels measured during periods when all wind turbines are switched off (T1-T52 All OFF) in all wind directions.

- Stage 2 "Total Noise Rating Level": Establish the Rating Level for periods when the nearest wind turbines are switched ON. For periods when only one or two of the nearest wind turbines are OFF, data may still be considered valid if predictions indicate less than 0.5dB difference compared to all turbines ON (see IOA GPG SGN 5 paragraph 2.1.7 and 2.4.4). A technical note from TNEI on the 8th of April provides more details on the 0.5dB rule. Filters will be applied to consider only the critical periods, critical range of wind speed and critical range of wind directions outlined above. At this stage there is no correction for background noise and the Rating Level is inclusive of all noise measured and therefore, includes background noise as well as wind turbine noise. No opinion suggesting that the noise imissions contains a tonal component (ETSU-R-97 page 103) was received during the survey therefore tonal component is not considered in this protocol. It was agreed during the consultation process that this protocol would be focusing on a test of overall noise levels. The rating level is compared to the ETSU-R-97 noise limits as a first test.

- Stage 3 "Specific Wind Turbine Noise Rating Level": If an exceedance is found in Stage 2, the Specific Wind Turbine Noise Rating Level needs to be established (referred to as 'Lw' in ETSU-R-97 page 103). In order to consider the specific Hadyard Hill wind turbine noise, a correction for background noise is applied by logarithmically subtracting the Rating Level from Stage 2 (Lc in ETSU-R-97) minus background noise from Stage 1 (Lb in ETSU-R-97). The resulting Lw rating for this stage should be compared to the above agreed ETSU-R-97 noise limits.

This Noise Measurement and Assessment Protocol has been agreed in consultation between all relevant parties, signatures are included below:

The Appointed Noise Consultant [_TNEI SERVICES LTD_]

Represented by (Name of Staff) [redacted]

Signature [redacted] **Date** 25/4/2016

The Operator [_SSE GENERATION LTD_]

Represented by (Name of Staff) [redacted]

Signature [redacted] **Date** 25/04/2016.

The Council [_SOUTH AYRSHIRE COUNCIL_]

Represented by (Name of Staff) [redacted]

Signature [redacted] **Date** 21/4/16

Please note. Our agreement to this protocol does not preclude South Ayrshire Council from taking any enforcement action it sees fit in terms of legislation which we enforce. 21/4/16

ANNEX 5 – DETAILED LOG ANALYSIS

LOG TREND ANALYSIS at Tralodden Cottage

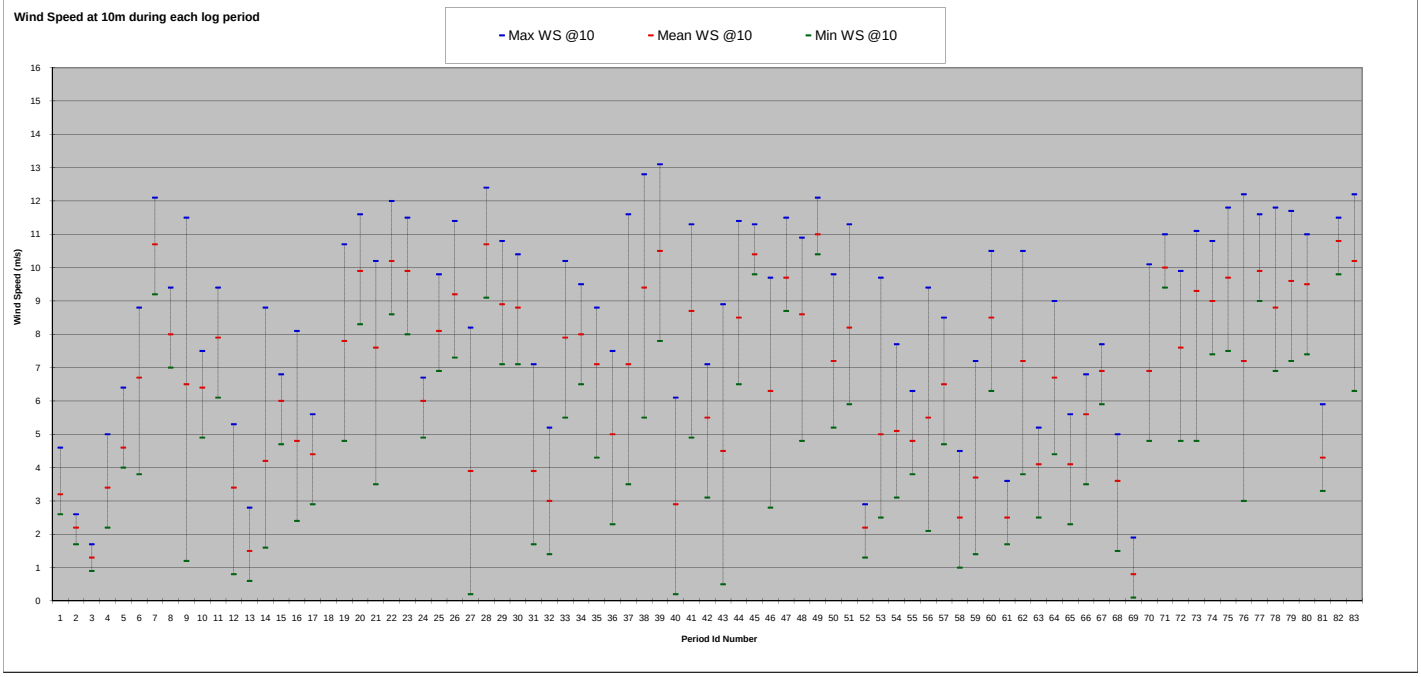
Note1: The operational data from the Development has been correlated with complaint logs to determine the critical periods (ETSU-R-97 page 87), also referred to as meteorological conditions in which the complaints occurred (ETSU-R-97 page 102).
Note2: When no start or end time was reported, a start/end period +2h/-2h of the reported time is assumed. When "All day" was reported, a 12h period is assumed from 9am to 9pm. Other time assumptions may also apply if logs are not specific/clearly legable.

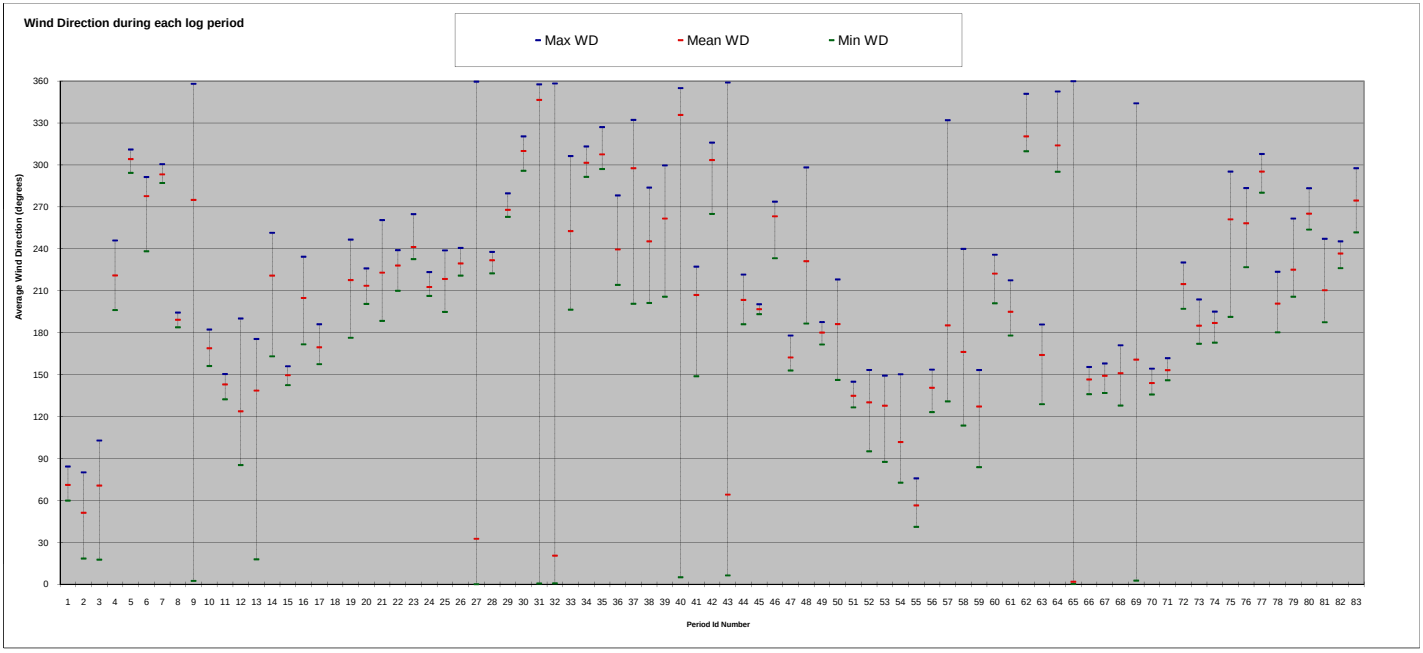
Summary of general comments from residents:
Loud, very loud, realy loud and high noise from whooshing and swishing. Disturb work, leisure, rest and sleep.
No specific logs provided before the start of the survey, one log for every day of the survey (which was 14/10/2015 to 04/02/2016). Some periods of "High noise" are reported despite the resident noting some turbines had stopped.

Overall Comment TNEI on 01/03/2016:
Logs supplied to TNEI as scaned paper document and typed by TNEI into electronic format. Only logs relevant to the specific noise complaint have been included here to help identifying trends in the wind conditions during complaint periods (ie. comments on other type of noise source such as trafic not included). Some logs which had no specific times between 09/12&29/12 have not been included. Based on the fourteen logs id 11,19,20,21,22,23,24,25,26,28,29,46,47,48 (loud, very loud, realy loud and high noise) the critical periods may be interpreted as follows: Critical time: Time given are during the day, but both Quiet day time and Night time may be assessed. Critical Wind speed: 6-11 m/s (60m height stantdardised to 10m), Critical Wind Direction: 140-270°.

Id:	Date Start	Date End	Description of Noise	Resident Comments (Wind Conditions? Location within property? Rain? Noise description?)	Activity affected	Data Summary	TNEI Comment
1	16/10/2015 08:00	16/10/2015 11:00	Light swishing noise	Some turbines stopped.	Work & lesiure	Mean WS@10=3.2; Mean WD=71.1	
2	17/10/2015 08:00	17/10/2015 12:00	Light swishing noise	Nearest turbine stopped	Work & lesiure	Mean WS@10=2.2; Mean WD=51.2	
3	18/10/2015 10:00	18/10/2015 12:00	Medium swishing noise	Nearest turbine stopped	Work & lesiure	Mean WS@10=1.3; Mean WD=70.7	
4	19/10/2015 21:00	20/10/2015 00:00	High Levels of Noise. Swishing.	Nearest turbine stopped.	Rest & sleep	Mean WS@10=3.4; Mean WD=221	Low wind speed compared to the other identified fourteen high level logs
5	20/10/2015 06:00	20/10/2015 09:00	High Levels of Noise. Swishing.	Nearest turbine stopped.	Rest & sleep	Mean WS@10=4.6; Mean WD=304.2	Low wind speed compared to the other identified fourteen high level logs
6	21/10/2015 11:00	21/10/2015 14:00	Medium swishing noise	Nearest turbine stopped.	Work & lesiure	Mean WS@10=6.7; Mean WD=277.7	
7	22/10/2015 09:00	22/10/2015 11:00	Mixed levels	Nearest turbine stopped.	Work & lesiure	Mean WS@10=10.7; Mean WD=293.3	
8	23/10/2015 09:00	23/10/2015 12:00	Whirling constant.	Turbine 8 "ST" (Started? Stopped?)	Work, lesiure, sleep	Mean WS@10=8; Mean WD=189.3	
9	24/10/2015 01:00	24/10/2015 15:00	Whirling, Whooshing	Turbine 8 "ST" (Started? Stopped?)	Work, lesiure, sleep	Mean WS@10=6.5; Mean WD=275	
10	25/10/2015 09:00	25/10/2015 11:00	Whooshing		Work, lesiure, sleep	Mean WS@10=6.4; Mean WD=168.9	No end time specified, TNEI assumed 2h after start
11	26/10/2015 10:00	26/10/2015 13:00	Whooshing. Constant aircraft sound.	Turbine 8 started.	Work, lesiure, sleep	Mean WS@10=7.9; Mean WD=143	
12	27/10/2015 09:00	27/10/2015 15:00	Constant whooshing noise		Work, lesiure, sleep	Mean WS@10=3.4; Mean WD=123.8	
13	28/10/2015 10:00	28/10/2015 14:00	Repetative whooshing noise		Work, lesiure, sleep	Mean WS@10=1.5; Mean WD=138.6	
14	29/10/2015 08:00	29/10/2015 17:00	Whooshing noise		Work, lesiure, sleep	Mean WS@10=4.2; Mean WD=220.9	
15	30/10/2015 08:30	30/10/2015 10:00	Whooshing noise		Work, lesiure, sleep	Mean WS@10=6; Mean WD=149.6	
16	31/10/2015 09:00	31/10/2015 21:00	Whooshing noise		Work, lesiure, sleep	Mean WS@10=4.8; Mean WD=204.9	Times not specified, assumed 9am-9pm
17	01/11/2015 12:00	01/11/2015 18:00	whooshing repetative		Work, lesiure, sleep	Mean WS@10=4.4; Mean WD=169.6	
18	08/11/2015 10:00	08/11/2015 14:00	Whooshing noise		Lesiure, rest, sleep	#N/A	No MET or SCADA available for this period
19	09/11/2015 11:00	09/11/2015 15:00	Loud Whooshing		Work, sleep	Mean WS@10=7.8; Mean WD=217.7	
20	10/11/2015 08:00	10/11/2015 14:00	Loud whooshing		Work, sleep	Mean WS@10=9.9; Mean WD=213.6	
21	11/11/2015 13:00	11/11/2015 19:00	Loud whooshing		Work, sleep	Mean WS@10=7.6; Mean WD=223	
22	12/11/2015 12:00	12/11/2015 21:00	Really loud whooshing		Work, sleep	Mean WS@10=10.2; Mean WD=228.1	
23	13/11/2015 09:00	13/11/2015 15:00	Really loud swooshing noise		Work, sleep	Mean WS@10=9.9; Mean WD=241.3	
24	14/11/2015 10:00	14/11/2015 12:00	Very loud whooshing		Work, sleep	Mean WS@10=6; Mean WD=212.7	
25	15/11/2015 08:00	15/11/2015 15:00	Very loud whooshing		Work, sleep	Mean WS@10=8.1; Mean WD=218.5	
26	16/11/2015 08:00	16/11/2015 16:00	Whooshing very loud	Turbines off at 1620, started again 1800	Work, sleep	Mean WS@10=9.2; Mean WD=229.6	
27	17/11/2015 12:00	17/11/2015 20:00	NA	Turbine closest stopped	Work, sleep	Mean WS@10=3.9; Mean WD=32.6	
28	18/11/2015 16:00	18/11/2015 18:30	Really noisy whooshing		Work, sleep	Mean WS@10=10.7; Mean WD=231.9	
29	19/11/2015 16:00	19/11/2015 19:00	Really loud whooshing noise	Noise audible through closed windows	Work, sleep	Mean WS@10=8.9; Mean WD=267.9	
30	20/11/2015 14:00	20/11/2015 18:00	Varied levels whooshing		Work, sleep	Mean WS@10=8.8; Mean WD=310	
31	21/11/2015 08:00	21/11/2015 13:00	Whooshing		Sleep, work	Mean WS@10=3.9; Mean WD=346.6	
32	22/11/2015 13:00	22/11/2015 17:00	Whooshing		Sleep, work	Mean WS@10=3; Mean WD=20.5	
33	23/11/2015 15:00	23/11/2015 21:30	Whooshing		Sleep, work	Mean WS@10=7.9; Mean WD=252.7	
34	24/11/2015 18:00	24/11/2015 21:00	Whooshing		Sleep, work	Mean WS@10=8; Mean WD=301.6	
35	25/11/2015 14:00	25/11/2015 20:00	Whooshing	Fog, light wind	Work, sleep	Mean WS@10=7.1; Mean WD=307.6	
36	26/11/2015 09:00	26/11/2015 16:00	Whooshing	Windy	Work, sleep	Mean WS@10=5; Mean WD=239.6	
37	27/11/2015 10:00	27/11/2015 17:00	Whooshing	Windy, rain	Work, sleep	Mean WS@10=7.1; Mean WD=297.7	
38	28/11/2015 08:00	29/11/2015 05:00	Whooshing	Windy	Work, sleep	Mean WS@10=9.4; Mean WD=245.4	
39	29/11/2015 07:00	29/11/2015 19:00	Whooshing	Mixed	Work, sleep	Mean WS@10=10.5; Mean WD=261.7	
40	30/11/2015 10:00	30/11/2015 15:00	Whooshing	Rain, windy	Work, sleep	Mean WS@10=2.9; Mean WD=335.8	
41	01/12/2015 08:00	01/12/2015 14:00	Whooshing	Rain, windy	Work, sleep	Mean WS@10=8.7; Mean WD=207	
42	02/12/2015 11:00	02/12/2015 17:00	Whooshing	Rain, windy	Work, sleep	Mean WS@10=5.5; Mean WD=303.5	
43	03/12/2015 11:00	03/12/2015 19:00	Whooshing	Rain, windy	Work, sleep	Mean WS@10=4.5; Mean WD=64.2	
44	04/12/2015 08:00	04/12/2015 14:00	Whooshing	Stormy	Work, sleep	Mean WS@10=8.5; Mean WD=203.5	
45	05/12/2015 10:00	05/12/2015 22:00	Whooshing	Stormy	Work, sleep	Mean WS@10=10.4; Mean WD=196.8	
46	06/12/2015 11:00	06/12/2015 16:00	Loud Whooshing	Sunny, light winds	Leisure, sunny day but noise too loud to go out into garden	Mean WS@10=6.3; Mean WD=263.3	
47	07/12/2015 09:00	07/12/2015 21:00	Loud Whooshing	Winds	Work, sleep	Mean WS@10=9.7; Mean WD=162.3	Used 09:00-21:00 for "various time day&night".
48	08/12/2015 09:00	08/12/2015 21:00	Loud Whooshing	Winds	Work, sleep	Mean WS@10=8.6; Mean WD=231.2	Used 09:00-21:00 for "various time day&night".
49	30/12/2015 09:00	30/12/2015 11:00	Swishing, Whooshing	Mixed	Sleep, work	Mean WS@10=11; Mean WD=180.1	
50	31/12/2015 10:00	31/12/2015 16:00	Swishing, Whooshing	Mixed	Sleep, work	Mean WS@10=7.2; Mean WD=186.2	
51	01/01/2016 13:00	01/01/2016 18:00	Swishing, Whooshing	Mixed	Sleep, work	Mean WS@10=8.2; Mean WD=134.9	
52	02/01/2016 16:00	02/01/2016 20:00	Swishing, Whooshing	Windy	Sleep, work	Mean WS@10=2.2; Mean WD=130.2	
53	03/01/2016 11:00	03/01/2016 18:00	Swishing, Whooshing	Mixed	Sleep, work	Mean WS@10=5; Mean WD=127.8	
54	04/01/2016 02:00	04/01/2016 18:00	Swishing, Whooshing	Mixed	Work, sleep	Mean WS@10=5.1; Mean WD=101.8	
55	05/01/2016 11:00	05/01/2016 16:00	Swishing, Whooshing	Mixed	Work, sleep	Mean WS@10=4.8; Mean WD=56.5	
56	06/01/2016 08:00	06/01/2016 22:00	Swishing, Whooshing	Mixed	Work, sleep	Mean WS@10=5.5; Mean WD=140.6	

57	07/01/2016 07:00	07/01/2016 11:00	Swishing, Whooshing	Mixed	Work, sleep	Mean WS@10=6.5; Mean WD=185.3	
58	08/01/2016 09:00	08/01/2016 20:00	Swishing, Whooshing	Mixed	Work, sleep	Mean WS@10=2.5; Mean WD=166.3	
59	09/01/2016 15:00	09/01/2016 20:00	Whooshing, Swishing	Rain, mixed	Work, sleep	Mean WS@10=3.7; Mean WD=127.2	
60	10/01/2016 13:00	10/01/2016 20:00	Swishing, Whooshing	Windy, mixed	Work, sleep	Mean WS@10=8.5; Mean WD=222.3	
61	11/01/2016 09:00	11/01/2016 14:00	Swishing, Whooshing	Varied	Work, sleep	Mean WS@10=2.5; Mean WD=195	
62	12/01/2016 15:00	12/01/2016 21:00	Swishing, Whooshing	Mixed	Work, sleep	Mean WS@10=7.2; Mean WD=320.5	
63	13/01/2016 09:00	13/01/2016 13:00	Whooshing, Swishing	Mixed	Work, sleep	Mean WS@10=4.1; Mean WD=164.1	
64	14/01/2016 13:00	14/01/2016 20:00	Whooshing, Swishing	Windy	Work, sleep	Mean WS@10=6.7; Mean WD=314	
65	15/01/2016 14:00	15/01/2016 21:00	Whooshing, Swishing	Mixed	Work, sleep	Mean WS@10=4.1; Mean WD=1.9	
66	16/01/2016 15:00	16/01/2016 19:00	Whooshing, Swishing	Rain	Work, sleep	Mean WS@10=5.6; Mean WD=146.6	
67	17/01/2016 09:00	17/01/2016 14:00	Whooshing, Swishing	Mixed	Work, sleep	Mean WS@10=6.9; Mean WD=149.2	
68	18/01/2016 11:00	18/01/2016 21:00	Swishing, Whooshing	Mixed	Work, sleep	Mean WS@10=3.6; Mean WD=151	
69	19/01/2016 09:00	19/01/2016 15:00	Swishing, Whooshing	Mixed	Work, sleep	Mean WS@10=0.8; Mean WD=160.8	
70	20/01/2016 22:00	21/01/2016 01:30	Whooshing, Swishing	Rain	Work, sleep	Mean WS@10=6.9; Mean WD=144	
71	21/01/2016 14:00	21/01/2016 19:00	Whooshing, Swishing	Rain	Work, sleep	Mean WS@10=10; Mean WD=153.2	
72	22/01/2016 15:00	22/01/2016 21:00	Whooshing, Swishing	Mixed	Work, sleep	Mean WS@10=7.6; Mean WD=214.8	
73	23/01/2016 13:00	23/01/2016 17:00	Whooshing, Swishing	Mixed	Work, sleep	Mean WS@10=9.3; Mean WD=185	
74	24/01/2016 08:00	24/01/2016 21:00	Swishing, Whooshing	Mixed	Work, sleep	Mean WS@10=9; Mean WD=187	
75	25/01/2016 13:00	25/01/2016 16:00	Swishing, Whooshing	Mixed	Work, sleep	Mean WS@10=9.7; Mean WD=261.1	
76	26/01/2016 17:00	26/01/2016 22:00	Swishing, Whooshing	Mixed	Work, sleep	Mean WS@10=7.2; Mean WD=258.3	
77	27/01/2016 15:00	27/01/2016 18:00	Swishing, Whooshing	Mixed	Work, sleep	Mean WS@10=9.9; Mean WD=295.3	
78	28/01/2016 09:00	28/01/2016 16:00	Swishing, Whooshing	Mixed	Work, sleep	Mean WS@10=8.8; Mean WD=200.8	
79	29/01/2016 11:00	29/01/2016 21:00	Whooshing, Swishing	Mixed	Work, sleep	Mean WS@10=9.6; Mean WD=225.1	
80	30/01/2016 14:00	30/01/2016 18:00	Whooshing, Swishing	Mixed	Work, sleep	Mean WS@10=9.5; Mean WD=265.2	
81	31/01/2016 09:00	31/01/2016 13:00	Whooshing, Swishing	Dry, light wind	Work, sleep	Mean WS@10=4.3; Mean WD=210.4	
82	01/02/2016 08:00	01/02/2016 17:00	Whooshing, Swishing	Showers, Light wind	Work, sleep	Mean WS@10=10.8; Mean WD=236.7	
83	02/02/2016 07:00	02/02/2016 14:00	Whooshing, Swishing	Dry, sunny, light wind	Work, sleep	Mean WS@10=10.2; Mean WD=274.6	





Project	Hadyard Hill
Client	SSE Gemeration Ltd
Title	Summary graph of logs trend analysis Tralodden Cottage
Figure Number	N/A
Scale	NTS
Drawn	MC
Checked	JM
Date	01/03/2016
Document Reference	10548-Log Analysis

tnei
enterprise with energy
TNEI Services Limited
Newcastle upon Tyne
Telephone 01912111400
Website

Noise Complaint Record

ess of Affected Property: [redacted] [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

	date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity is the noise interfering with. 4.	weather conditions 5.
NA	15/10/15	10-00 AM	12-00 AM.	ALL	WINDMILLS STOPPED PEACE AND QUIETS	NONE	NONE NO NOISE	SUNNY
1	16TH OCT 2015	8-00 A.M	11.00 AM.	ALL	SOME WINDMILLS STOPPED.	LIGHT SWISHING NOISE	WORK LEISURE	SUNNY
2	17TH OCT 2015	8.00 AM	12-00 MIDDAY	ALL	NEAREST WINDMILL STOPPED	LIGHT SWISHING NOISE	WORK LEISURE	SUNNY
3	18TH OCT 2015	10-00 A.M	12-00 MID	ALL	NEAREST WINDMILL STOPPED	MEDIUM NOISE SWISHING	WORK & LEISURE	SUNNY CLOUDY

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI id	date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity at the property is the noise interfering with. 4.	weather conditions 5.
4	14th Oct 2015	9.00 P.M	12.00 NOON	ALL	HIGH LEVELS OF NOISE SWISHING NEAREST WINDMILL STOP	MR & MRS CLIFTON	REST SLEEP	WINDY RAIN
5	20th OCT	6.00 AM	9.00 AM	ALL	HEIGH LEVELS NOISE SWISHING NEAR/WINDMILL STOP.	MR & MRS CLIFTON	REST SLEEP ?	WINDY RAIN
6	21st OCT	11.00 AM	2.00 P.M	ALL	MEDIUM SWISHING NOISE NEAR/WINDMILL STOP	MR & MRS CLIFTON	WORK LEISURE	CLOUDY WINDY DRY
7	22nd OCT	9.00	11.00	ALL	MINOR LEVELS NEAR/WINDMILL/STOP	MR & MRS CLIFTON	WORK LEISURE	WINDY DRY SCHOOLS

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI ref

	date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity is the noise interfering with. 4.	weather conditions 5.
8	23rd OCT 2015	9.00 am	12.00 PM	ALL	WHIRLING CONSTANT	MR KERRIE	WORK LEISURE SLEEP	WINDY SUNNY.
9	24TH OCT 2015	11.00 a.m	3.00 PM	ALL	WHIRLING WOOSHING WINDMILL & ST	MR KERRIE CLIFTON	WORK LEISURE SLEEP	RAIN WINDY SUNNY
10	25TH OCT 2015	9.00		ALL	WHOOSHING	MR KERRIE CLIFTON	WORK LEISURE SLEEP	VARIOUS SUNNY WINDY
11	26TH OCT 2015	10.00 AM	1.00 P.M	ALL	WOOSHING. CONSTANT AIRCRAFT SOUND. WINDMILL & STARTED	MR KERRIE CLIFTON	WORK LEISURE SLEEP	SUNNY WINDY
12	27TH OCT 2015	from 9.00 ~~3.00~~ PM	3.00 PM	ALL	CONSTANT WOOSHING NOISE	ALL MR CLIFTON MRS KERRIE	WORK LEISURE SLEEP	SUNNY RAIN

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI id	date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity at the property is the noise interfering with. 4.	weather conditions 5.
13	28th	10.00 am	2-00 pm	ALL	REPEATED WHOOSHING NOISE	ME CHARLIE	WORK LEISURE SLEEP	OVERCAST CLOUDY RAIN WINDY
14	29th	8-00 am	5-00 pm	ALL	WOOSHING NOISE	ME CHARLIE	WORK LEISURE SLEEP	CLOUDY SUNNY RAIN WINDY
15	30th	8-30 am	10-00 AM	ALL	WOOSHING NOISE	ME CHARLIE	WORK LEISURE SLEEP	WINDY RAIN DRY
16	31st				WHOOSHING NOISE	ME CHARLIE	WORK LEISURE SLEEP	DRY WINDY RAIN

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI id	date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity is the noise interfering with. 4.	weather conditions 5.
17	1st Nov	12-00	6-00	YARD	WHOOSHING REPETATIVE	MR. KIRKUP CLIFTON	WORK LEISURE SLEEP	LIGHT DRY WIND RAIN
NA	2 Nov 2015	"	"	"	" MAJOR	" ROAD	" WORKS	"
NA					"	"	"	
NA					"	"	"	

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI id	date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity at the property is the noise interfering with. 4.	weather conditions 5.
NA	5th				MAJOR ROAD WORKS			
NA	6th				MAJOR ROAD WORKS			
NA	7th				Lc	4	4	
18	8th WW	10-00 am	2-00 p.m.	AC	WORKING NOISE	NOISE HELICOPTER CLIPTON	LEISURE REST SLEEP	WINDY RAINING

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI id

date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity is the noise interfering with. 4.	weather conditions 5.
9TH	11-00 AM	PM 3.00	ALL	LOUD WOOSHING	ALL FAMILY	WORK SLEEP	RAIN WIND
10TH	8-00 AM	2-00 PM	ALL	LOUD WOOSHING	ALL FAMILY CLIFTON	WORK SLEEP	RAIN WIND
11TH	1-00 PM	7-00 PM	ALL	LOUD WOOSHING	ALL FAMILY CLIFTON	WORK SLEEP	RAIN WIND
12TH	12.00 NOON	9.00 PM	ALL	REALLY LOUD WOOSHING	ALL FAMILY	WORK SLEEP	RAIN WIND
13TH	9.0	3.00	ALL	REALLY LOUD SWOOSHING NOISE	ALL FAMILY	WORK SLEEP	RAIN WIND

20 OF WINDMILLS WERE DURING THIS PERIOD

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI id	date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity at the property is the noise interfering with. 4.	weather conditions 5.
24	14th	10.00 A.M.	12-00 MID NIGHT	ALL	VERY LOUD WOOSHING	ME CLERK CLIFTON	WORK SLEEP	RAIN WINDY
25	15th	8-00 A.M	5-00 P.M 9.00 PM	ALL	VERY LOUD WOOSHING	ME CLERK CLIFTON	WORK SLEEP	RAIN WINDY
26	16th	8-00 AM	4-20 P.M	ALL	WOOSHING VERY LOUD WIND MILLS OFF AT 4-20 PM	ME CLERK	WORK SLEEP	RAIN WINDY
	16th	"	"	"	STARTED AGAIN 6.00 PM VERY LOUD	ME CLERK	WORK. SLEEP	RAIN WINDY

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI id	date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity is the noise interfering with. 4.	weather conditions 5.
27	17th Nov 2015	12-00	2000 pm STARTED AGAIN	ALL	WIND MILL CLOSEST STOPPED	MR KERRIE CLIFTON	LOOKE STARTED.	WINDY RAIN
28	18th.	4-00 P.M	6-30 P.M.	ALL	REALLY NOISE WOOSHING	MR KERRIE CLIFTON	WORKE SLEEP.	WIND RAIN SUN
29	19T NOV 2015	4-00 P.M	7-00 P.M	ALL	REALLY NOISE WOOSHING NOISE CLIFTON HAD TO LEAVE	MR KERRIE CLIFTON LEFT	WORK SLEEP. CLIFTON LEFT WE HAD TO COOK WINDOWS AND STILL HEARD IT.	RAIN WIND SUN
30	20TH NOV	2-00 PM	6-00 PM	ALL	UNEARTH LIKE WOOSHING	MR KERRIE	WORKE SLEEP	SLOOSHES

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI id	date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity at the property is the noise interfering with. 4.	weather conditions 5.
31	21	8-00 AM	1-00 PM	ALL	WOOSHING	MR KEARNEY	SLEEP WORK	WARM
32	22	1-00 PM	5-00 P.M	ALL	WOOSHING	MR KEARNEY	SLEEP WORK	LIGHT WINDY RAIN
33	23	3-00 PM	9-30 P.M	ALL	WOOSHING	MR KEARNEY	SLEEP WORK	SUN WINDY LIGHT
34	24	6-00 PM	9.00 PM	ALL	WOOSHING	MR KEARNEY	SLEEP WORK	RAIN WINDY

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI	date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity is the noise interfering with. 4.	weather conditions 5.
35	25 NOV	2.00 P.M	7.06 P.M	ALL	WOOSHING	MR KARLIE	WORK SLEEP	FOG LIGHT WIND
36	26 NOV	9.00 A.M	3.00 P.M	ALL	WOOSHING	MR KARLIE	WORK SLEEP	WINDY
37	27	10.30 A.M	4.30 P.M	ALL	WOOSHING	MR KARLIE CLIFTON	WORK SLEEP	WINDY RAIN
38	28	8.00 A.M	5.00 A.M	ALL	WOOSHING	MR KARLIE CLIFTON	WORK SLEEP	WINDY
39	29	7.30 A.M	7.00 P.M	ALL	WOOSHING	MR KARLIE CLIFTON	WORK SLEEP	MIXED

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI id	date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity at the property is the noise interfering with. 4.	weather conditions 5.
40	30	10.00 AM	2.00 P.M	ALL	~~SOME~~ WOOSHING	MR KELLIE CLIFTON	WORK SLEEP	RAIN WINDY
41	1 DECEMBER	8-30 AM	2-00 P.M	ALL	WOOSHING	MR KELLIE CLIFTON	WORK SLEEP	RAIN WINDY
42	2 DEC	11-00 AM	4-30 P.M	ALL	WOOSHING	MR KELLIE CLIFTON	WORK SLEEP	RAIN WINDY
43	3	11-30 AM	2.00 PM	ALL	WOOSHING	MR KELLIE CLIFTON	WORK SLEEP	RAIN WINDY

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI id	date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity is the noise interfering with. 4.	weather conditions 5.
44	4	7-00 AM	2-00 P-M	ALL	WOOSHING	MR KIRK CLIFTON	WORK SCRIPT	STORMY
45	5	10-00 AM	10 00 P.M	ALL	WOOSHING	MR KIRK CLIFTON	WORK SCRIPT	STORMY
46	6TH	11.00 A-M	4-00 P-M	ALL	LOUD WOOSHING	MR KIRK CLIFTON	LIGHT SLEEP DAY BUT NOISE TO LOUD TO GO OUT IN TO GARDEN	SUNNY LIGHT WINDS
47	7TH	VARIOUS TIMES DAY AND NIGHT		ALL	LOUD WOOSHING	MR KIRK CLIFTON	WORK SCRIPT	WINDY
48	8TH	"	"	"	LOUD WOOSHING	MR KIRK CLIFTON	WORK SCRIPT	WINDY

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI id	date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity at the property is the noise interfering with. 4.	weather conditions 5.
MA	9TH	VARIOUS	ALL	WOOSHING	MR KRALIK CLIFTON		WORK SLEEP	WET WIND
MA	10th	"	"	"	"	MR KRALIK CLIFTON	WORK SLEEP	VARIOUS
MA	11TH	"	"	"	"	MR KRALIK CLIFTON	WORK SLEEP	VARIOUS WET
MA	12TH	"	"	"	"		WORK SLEEP	VARIOUS WET

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI id	date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity is the noise interfering with. 4.	weather conditions 5.
	DECEMBER							
NA	13TH	VARIOUS DAY	NIGHT	ALL	WOOSHING	MR CARLIN CLIFTON	WORK SLEEP	OVERCAST DAY NIGHT
NA	14TH	"	"	ALL	WOOSHING	MR CARLIN CLIFTON	WORK SLEEP	"
NA	15TH	"	"	ALL	WOOSHING	MR CARLIN CLIFTON	WORK SLEEP	"
NA	16TH	"	"	ALL	WOOSHING	MR CARLIN CLIFTON	WORK SLEEP	"

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI Id	date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity at the property is the noise interfering with. 4.	weather conditions 5.
	DECEMBER							
NA	17TH	VARIOUS DAY	NIGHT	ALL	WOOSHING	ALL	WORK SLEEP	WARM WIND
NA	18TH	"	"	ALL	WOOSHING	ALL	WORK SLEEP	"
NA	19TH	"	"	ALL	WOOSHING	ALL CLIFTON LEFT AT 2 AM	WORK SLEEP	"
NA	20TH	"	"	ALL	WOOSHING	ALL MR KERR	WORK SLEEP	"

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI id	date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity is the noise interfering with. 4.	weather conditions 5.
NA	21	VARIOUS MAY	NIGHT			ME FAMILY		
NA	22	"	"	ALL		ME FAMILY	WORK SLEEP	VARIED WINDY
NA	23	"	"	ALL		ME FAMILY	WORK SLEEP	"
NA	24	"	"	ALL		ME FAMILY	WORK SLEEP	"
NA	25	X MAS	AND	NO	FAMILY	CAME	TOP DINNER	

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI id	date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity at the property is the noise interfering with. 4.	weather conditions 5.
	26/27/28/29							
YA	26TH	VARIOUS DAY	VARIOUS NIGHT	ALL	WOOSHING	MR KELLIE	SLEEP	VARIED
YA	27TH	"	"	ALL	WOOSHING	MR KELLIE	WORK & SLEEP	VARIED
YA	28TH	"	"	ALL	WOOSHING	MR KELLIE	WORK SLEEP	"
YA	29TH	"	"	ALL	WOOSHING	MR KELLIE	WORK SLEEP	"

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI id	date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity at the property is the noise interfering with. 4.	weather conditions 5.
49	30th DEC 2015	9.00 AM	11.00 AM	ALL	SWISHING WOOSHING	MR & MRS KERR	SLEEP WORK	MIXED
50	31st DEC	10.30 AM	3.30 PM	ALL	SWISHING WOOSHING	MR & MRS KERR CLIFTON	SLEEP WORK	MIXED
51	2016 1st JAN	1.00 PM	6.00 P.M	ALL	SWISHING WOOSHING	MR & MRS KERR CLIFTON	SLEEP WORK	MIXED
52	2nd	4.00 P.M	8.00 P.M	ALL	SWISHING WOOSHING	MR & MRS KERR CLIFTON	SLEEP WORK	WINDY
53	3rd	11.00 A.M	6.00 P.M	ALL	SWISHING WOOSHING	MR & MRS CLIFTON KERR	SLEEP WORK	MIXED

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI id	date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity is the noise interfering with. 4.	weather conditions 5.
54	2016 4TH JAN	2-00 a.m	6-00 p.m		SWISHING WOOSHING	MR KERLIE CLIFTON	WORK SLEEP	MIXED
55	5th	11-00 a.m	4-00 p.m	ALL	SWISHING WOOSHING	MR KERLIE CLIFTON	WORK SLEEP	MIXED
56	6th	8-30 a.m	9-30 p.m	ALL	SWISHING WOOSHING	MR KERLIE CLIFTON	WORK SLEEP	MIXED
57	7th	7-00 a.m	11-00 a.m	ALL	SWISHING WOOSHING	MR KERLIE CLIFTON	WORK SLEEP	MIXED
58	8TH JAN 2016	9.30 a.m	7-30 p.m	ALL	SWISHING WOOSHING	MR KERLIE CLIFTON	WORK SLEEP	MIXED

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI id	date 2016	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity at the property is the noise interfering with. 4.	weather conditions 5.
59	9th JAN	3-00 P.M	8-00 P.M	ALL	WOOSHING SWISHING	MR KIRKER	WORK SLEEP.	RAIN MIXED
60.	10th	1.00 P.M	7-30 P.M	ALL	SWISHING WOOSHING	MR KIRKER	WORK SLEEP	WINDY MIXED
61	11th	9-00 a.m	2-00 P.M	ALL	SWISHING WOOSHING	MR KIRKER	WORK SLEEP	VARIED
62	12th	3.00 P.M	8.30 P.M	ALL	SWISHING WOOSHING	MR KIRKER CLIFTON	WORK SLEEP	MIXED
63	13th	9-00 A.M	1-00 P.M	ALL	WOOSHING SWISHING	MR KIRKER CLIFTON	WORK SLEEP	MIXED

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI id	date 2016	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity is the noise interfering with. 4.	weather conditions 5.
64	14th JAN	1:00 P.M	7-30 P.M	ALL	WOOSHING SWISHING	ME KERRIE CLIFTON	WORK SLEEP	WINDY
65	15th	2-00 P.M	9-00 P.M	ALL	WOOSHING SWISHING	ME KERRIE CLIFTON	WORK SLEEP	MIXED
66	16th	3-00 P.M	7-00 P.M	ALL	WOOSHING SWISHING	ME KERRIE CLIFTON	WORK SLEEP	RAIN
67	17th	9-30 A.M	2-00 P.M	ALL	WOOSHING SWISHING	ME KERRIE CLIFTON	WORK SLEEP	RAIN MIXED
68	18th	11-00 A.M	8-30 P.M	ALL	SWISHING WOOSHING	ME KERRIE	WORK SLEEP	MIXED

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI id	date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity at the property is the noise interfering with. 4.	weather conditions 5.
69	2016 19th JAN	9:00 p.m	3-00 a.m	ALL	SWISHING WOOSHING	MR MRS CHILD	WORK SLEEP	WINDY
70	20th	10-30 p.m	1-30 a.m.	ALL	WOOSHING SWISHING	MR MRS CHILD	WORK SLEEP	RAIN
71	21st	2-00 p.m	7-00 p.m.	ALL	WOOSHING SWISHING	MR MRS CHILD	WORK SLEEP	RAIN
72	22nd	8-00 p.m	9-00 p.m	ALL	WOOSHING SWISHING	MR MRS CHILD	WORK SLEEP	WINDY
73	23rd JAN	1-00 pm	5-00 pm	ALL	WOOSHING SWISHING	MR MRS CHILD	WORK SLEEP	WINDY

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI id	date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity is the noise interfering with. 4.	weather conditions 5.
74	2016 24TH JAN.	8.00 PM	9.00 PM	ALL	SWISHING WOOSHING	MR KRAUER	WORK SLEEP	WINDY
75	25TH	1-00 P.M	6-00 P.M	ALL	SWISHING WOOSHING	MR KRAUER CLIFTON	WORK SLEEP	WINDY
76	26TH	5-00 PM	9-30 PM	ALL	SWISHING WOOSHING	MR KRAUER CLIFTON	WORK SLEEP	WINDY
77	27TH	2-00 P.M	6-00 P.M	ALL	SWISHING WOOSHING	MR CLIFTON KRAUER	WORK SLEEP	WINDY
78	28TH	9-30 P.M	6-00 P.M	ALL	SWISHING WOOSHING	MR KRAUER CLIFTON	WORK SLEEP	WINDY

Noise Complaint Record

Address of Affected Property: [redacted] Complainant: [redacted] Type of Noise: Noise from wind turbines

TNEI id	date	Time started	Time ceased	Area of property affected 1.	Description of the noise 2.	Persons affected at the time 3.	What activity at the property is the noise interfering with. 4.	weather conditions 5.
79	2016 29TH JAN	11-00 am	8-30 pm	ALL	WOOSHING SWISHING	MR KERR CARTER	WORK SLEEP	MIXED
80	30TH	2-00 PM	6-00 PM	ALL	WOOSHING SWISHING	MR KERR CARTER	WORK SLEEP	MIXED
81	31ST	9-00 AM	1-00 PM	ALL	WOOSHING SWISHING	MR KERR CARTER	WORK SLEEP	DRY LIGHT WIND
82	2016 1ST FEB	8-30 AM	5-00 AM	ALL	WOOSHING SWISHING	MR KERR	WORK SLEEP	DRY SUNNY LIGHT WIND
83	2ND FEB	7-30 AM	2-00 PM	ALL	WOOSHING SWISHING	MR KERR	WORK SLEEP	DRY SUNNY LIGHT WIND

ANNEX 6 – NOISE PREDICTIONS TO TEST SCENARIOS WITHIN 0.5dB of SCENARIO "ALL ON"

Technical Note

Hadyard Hill Wind Farm - Tralodden Cottage noise survey October 2015 to February 2016

Detail of 0.5dB rule for shut-down periods – Revision 1

Moise Coulon

The operational data recorded included the generated power (in kWh) for each of the 52 wind turbines for each 10 minute period. Any given 10 minute period when all 52 wind turbines produced less than 1kWh each was identified as a shut down period (T1-T52 All OFF) and this data was used for Stage 1 of the protocol (establish background levels and ETSU-R-97 limits). For Stage 2, valid data are defined as "T1-T23 ON with exceptions". Noise predictions were undertaken and showed that "T1-T23 ON" was within 0.5dB of "T1-T52 ON" (criteria set in the IOA GPG SGN 5 and in the protocol) therefore as a first step the assessment only included data when T1-T23 were all ON. However, during the survey there was a large amount of time were one or two of the turbines within the group T1-T23 were off. TNEI identified seventeen combinations which occurred for long periods of time during the survey and undertook noise predictions to test if any would be within 0.5dB of predictions "T1-T52 ON". The results are shown below in Table 1, as can be seen a large number of combinations are within 0.5dB and these have therefore included. This test also shows that combinations when either T8 or T3 (the two nearest turbines) were off could not be included.

Table 1 : Analysis of combination within T1-T22 appearing frequently during the survey

Combination id	Combination Name	Predicted LA90 for the combination @12m/s in sector 5 (downwind)	Difference to 43.8dB which is the predicted LA90 for all turbines ON @12m/s in sector 5 (downwind)	Are 10miute periods during the survey valid (ie less than 0.5dB difference)?
1	T4,T8 OFF	42.3	1.5	No
2	T4,T8,T16 OFF	42.6	1.2	No
3	T4 OFF	43.7	0.1	Yes
4	T17 OFF	43.8	0	Yes
5	R17,T11 OFF	43.4	0.4	Yes
6	T10 OFF	43.6	0.2	Yes
7	T10,T18 OFF	43.6	0.2	Yes
8	T10,T14 OFF	43.5	0.3	Yes
9	T13 OFF	43.7	0.1	Yes
10	T9 OFF	43.7	0.1	Yes
11	T9,T5 OFF	43.6	0.2	Yes
12	T3,T12 OFF	42.5	1.3	No
13	T3 OFF	42.7	1.1	No
14	T12 OFF	43.6	0.2	Yes
15	T14,T17 OFF	43.7	0.1	Yes
16	T10,T13 OFF	43.5	0.3	Yes
17	T10,T13,T17 OFF	43.6	0.2	Yes