

WOLLONGONG COAL WONGAWILLI

QUARTERLY AIR QUALITY AND NOISE MONITORING REPORT

APRIL TO JUNE 2016

1 INTRODUCTION

Pacific Environment provides air quality and noise monitoring at the Wollongong Coal (WCL) Wongawilli Colliery, Wongawilli, NSW using the Envirosuite system.

The following report provides a summary of the data collected during the second quarter, April to May 2016. The monitoring network comprises one continuous ambient air quality particulate monitor, one continuous ambient noise monitor and one continuous automatic weather station.

The monitoring network is summarised in **Table 1-1** and presented in **Figure 1-1**.

Table 1-1: Monitoring Network

Description	Site	Address / Location	MGA 56 Easting (m)	MGA 56 Northing (m)
Continuous PM ₁₀ Monitor	BAM	Jersey Farm Road	294129	6182474
Meteorological Station	AWS	Near water tanks on ridge line	293358	6181778
Continuous Noise Monitor	NMT 3	Jersey Farm Road	294137	6182448

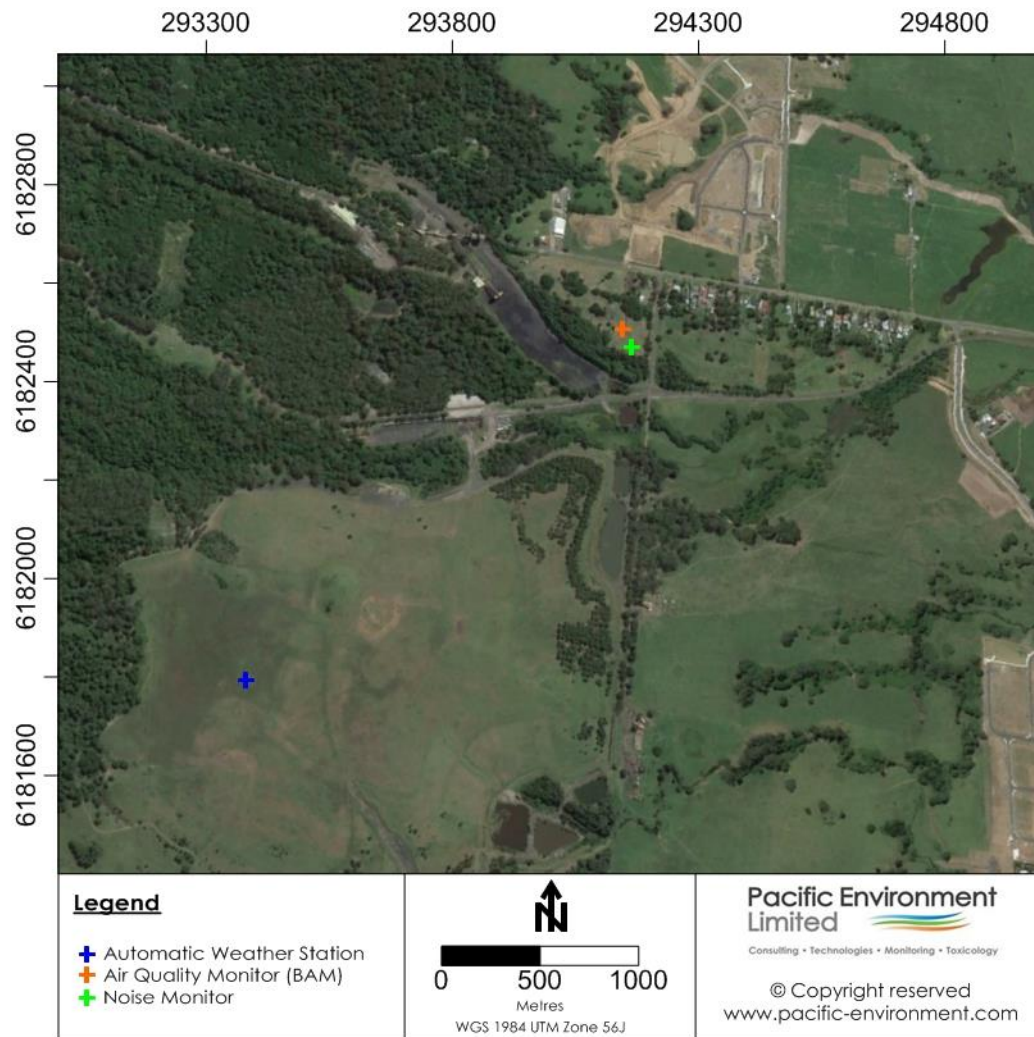


Figure 1-1: Monitoring Locations

2 PROJECT ENVIRONMENTAL CONDITIONS

2.1 Monitoring Requirements

In accordance with Project Approval (09_0161), the following air quality, meteorology and noise parameters are monitored as summarised in **Table 2-1**.

Table 2-1: Monitoring Summary

Item	Quantity Measured	Unit	Monitoring Frequency
Air Quality	Particulate Matter < 10 µm (PM ₁₀)	µg/m ³	24 h
Meteorology	Temperature at 10m	°C	Real Time
	Temperature at 2m	°C	
	Wind Speed at 10m	m/s	
	Wind Direction	°	
	Standard Deviation of Wind Speed (sigma theta)	-	
	Barometric Pressure	hPa	
	Rainfall	mm	
Noise	15 minute ambient continuous equivalent energy average noise level	L _{Aeq,15min} dB(A)	15 min
	1 minute L _{A1} noise level	L _{A1,1min} dB(A)	1 min
	Period ambient continuous equivalent energy average noise level	L _{Aeq,period} dB(A)	Day, evening, night

2.2 Air Quality

The project is subject to environmental conditions as part of the Approval. For air quality these are summarised in **Table 2-2**.

Table 2-2: Project Air Quality Criteria

Pollutant	Averaging Period	Criterion ^a
Particulate Matter < 10 µm (PM ₁₀)	Annual	30 µg/m ³ ^(b)
Particulate Matter < 10 µm (PM ₁₀)	24 hour	50µg/m ³ ^(b)

- a) Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, illegal activities or any other activity agreed by the Director-General in consultation with OEH.
- b) Total impact (i.e. incremental increase in concentrations due to the project plus background concentrations due to all other sources)

2.3 Noise

The Project Approval states both an amenity and intrusive noise criteria. The intrusive criteria are assessed over a 15 minute period and the amenity criteria are assessed over the relevant period (day, evening and night).

The intrusive criteria are both lower and assessed over a shorter time period, they represent the most onerous criteria and are therefore the limiting criteria.

These criteria are reproduced in **Table 2-3** and **Table 2-4**.

Table 2-3: Noise Criteria dB(A) – Medium term intrusive noise limits as defined in Table 4.3 of the Noise Management Plan

Location		Day	Evening	Night	
Area	Receiver Number	L _{Aeq} (15mins)	L _{Aeq} (15mins)	L _{Aeq} (15mins)	L _{A1} (15mins)
Lot 2410 Smiths Lane	RA1	43	43	43	59
120/130 Smiths Lane					
18 Wongawilli Road	RA2	44	43	43	60
1 Wongawilli Road					
Jersey Farm road	RA3	40	40	38	48
Horsley (closest receiver)					
All other privately owned land		40	40	38	48

Note: Day is defined as 7.00am to 6.00pm, evening as 6.00pm to 10.00pm and night as 10.00pm to 7.00am

Table 2-4: Noise Criteria dB(A) – Amenity Noise Limits as Defined in Table 4 of the Project Approval

Receiver Area	Day	Evening	Night
	L _{Aeq} (11hr)	L _{Aeq} (4hr)	L _{Aeq} (9hr)
All privately-owned land	60	50	45

3 METEOROLOGICAL MONITORING RESULTS

A summary of the data collected during the quarter is provided in the following sections. The valid data recovery rate was 89% for all parameters (refer **Table 3-1**).

Table 3-1: Valid data recovery rates - AWS

Parameter	Valid Data Recovery Rate %
Wind Speed	89%
Wind Direction	89%
Temperature – 2 m	89%
Temperature – 10 m	89%
Pressure	89%

A summary of statistics for the data collected during April to June 2016 are shown in **Table 3-2**.

Table 3-2: Meteorology Summary Statistics

Parameter (units)	Statistical measure	Value
Wind Speed (m/s)	Mean	2.9
Temperature (°C) – 10m		16.5
Temperature (°C) – 2m		15.3
Barometric pressure (hPa)		1007.6
Wind Speed (m/s)	Median	2.1
Temperature (°C) – 10m		16.5
Temperature (°C) – 2m		15.2
Barometric pressure (hPa)		1008.1
Wind Speed (m/s)	Standard Deviation	2.6
Temperature (°C) – 10m		3.8
Temperature (°C) – 2m		4.4
Barometric pressure (hPa)		8.7
Rainfall (mm)	Quarterly Total	433.6
Calms	%	12.4

3.1.1 Wind data

A windrose for the quarter is presented in **Figure 3-1**. The windrose indicates that for the period of monitoring winds from the west and west north-west were dominant.

The average wind speed for the period was 2.9 m/s and the percentage occurrence of calm wind conditions (less than or equal to 0.5 m/s) was approximately 12.4 %.

3.1.2 Temperature

A plot of the hourly average temperature, recorded at 2 m and 10 m, is shown in **Figure 3-2**. The daily average temperature at 2 m was 15°C. The lowest temperature was 9°C degrees recorded on 25 June and a maximum of 24°C was recorded 6 April.

3.1.3 Rainfall

A plot of the daily rainfall over the three months period is shown in **Figure 3-3**. The station recorded 433.6 mm of rain in the quarter. The nearest Bureau of Meteorology site at Wollongong - Albion Park recorded 389.2 mm during the quarter. The highest rainfall recorded on site was on 5 June where 287.8 mm of rain was reported.

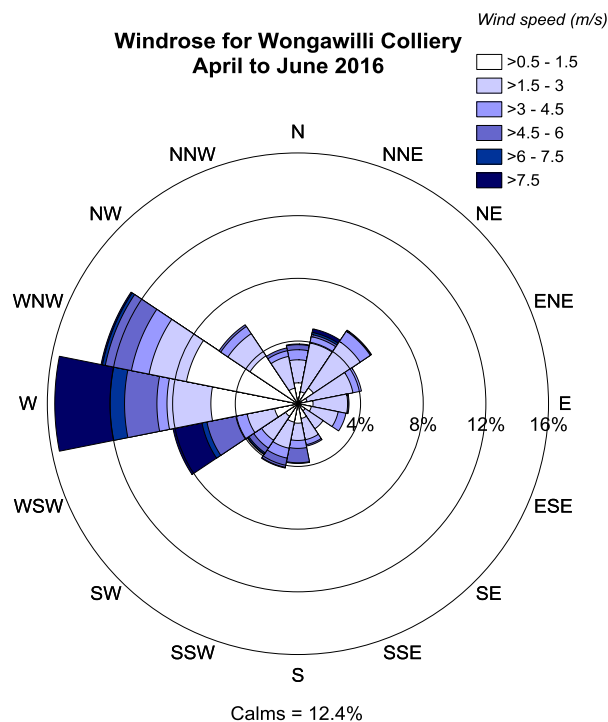


Figure 3-1: Windrose - April to June 2016

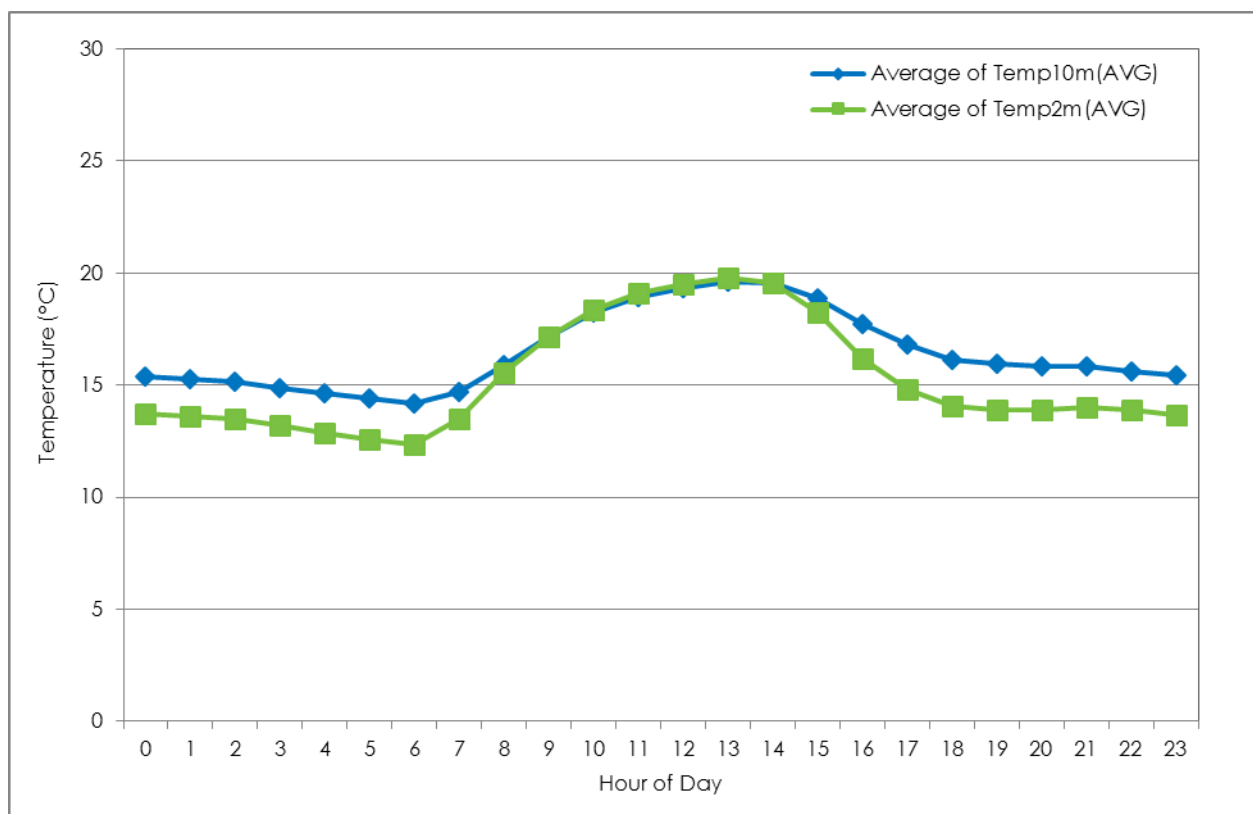


Figure 3-2: Hourly Average Temperature – April to June 2016

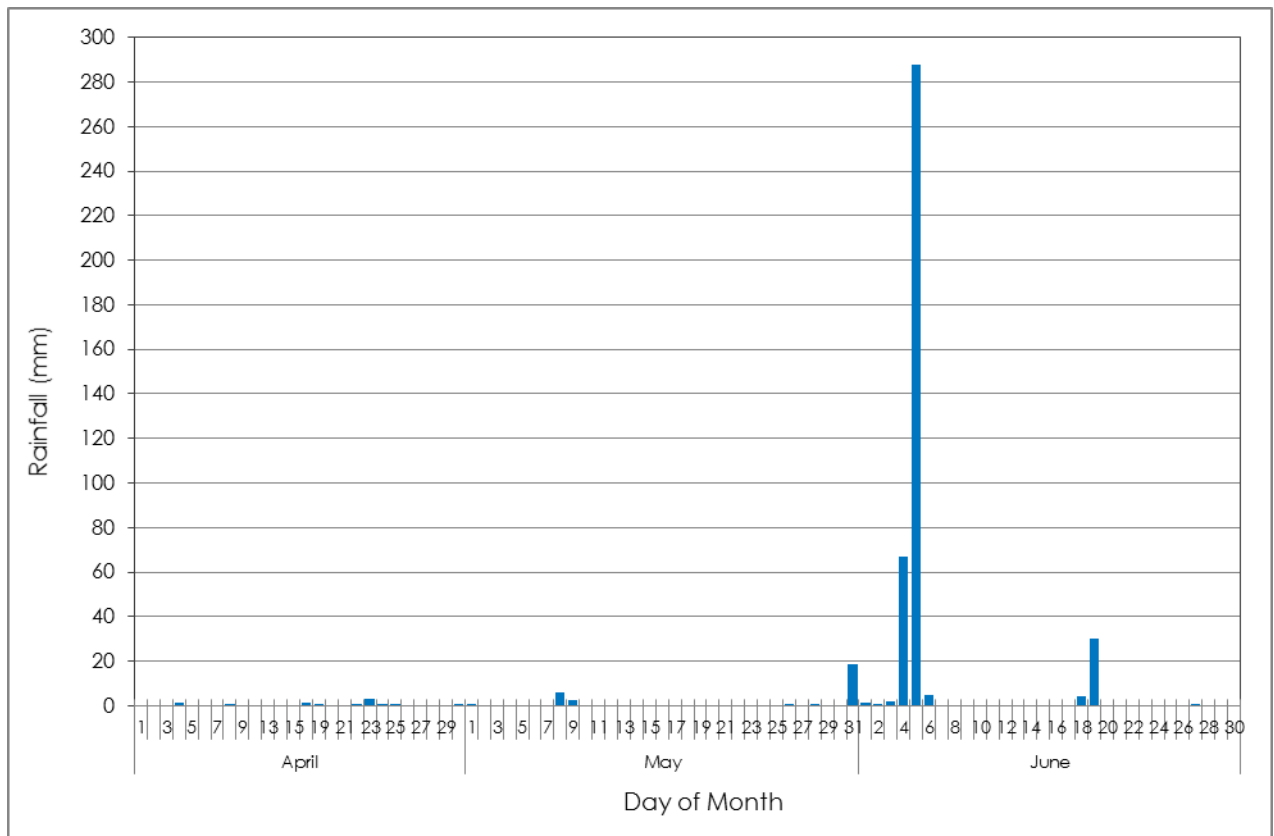


Figure 3-3: Daily Rainfall (January to March)

4 PM₁₀ MONITORING RESULTS

Continuous air quality particulate monitoring is carried out at BAM monitoring station located on or near the site boundary (**Figure 1-1**). The monitor continuously measure airborne particulate matter from all sources.

The particle size ranges relevant to this report are described as PM₁₀ which refers to all particles with equivalent aerodynamic diameters of less than 10 µm, that is, all particles that behave aerodynamically in the same way as spherical particles.

A statistical summary of the 24- hour average monitoring data collected during April to June is provided in **Table 4-1**. The data recovery rate was 84%. There were no days over the criteria in the quarter

Table 4-1: Summary Statistics for 24 hour average PM₁₀ (µg/m³)

Statistical measure	April 2016	May 2016	June 2016	Quarter 2 2016
Mean	12.9	13.1	4.9	10.5
Standard Deviation	4.4	8.4	2.0	7.0
Median	11.7	11.9	4.4	8.9
Minimum	7.4	3.0	1.5	1.5
Maximum	24.0	39.5	10.4	39.5
Days over the criteria	0	0	0	0

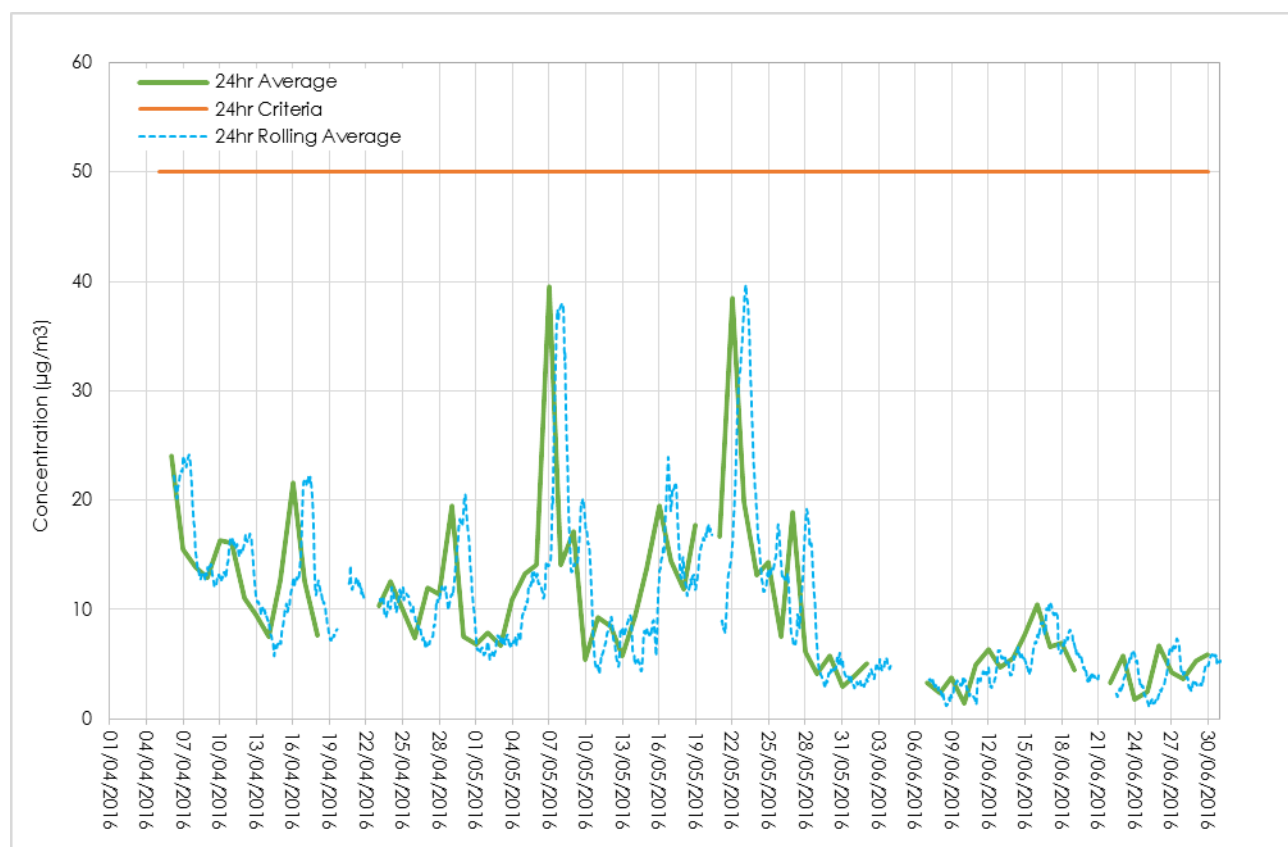


Figure 3-1: PM₁₀ Monitoring Data

5 NOISE MONITORING RESULTS

Noise is monitored using continuous unattended ambient noise monitoring and attended compliance noise monitoring.

Noise monitoring for compliance was not carried out by Pacific Environment during this quarter.

5.1 Unattended Noise Measurements

One permanent ambient noise monitors continuously monitor noise levels from all sources at the location (**Figure 1-1**) near the site boundary.

Table 5-1 presents NMT1 LA_{1,15 min} recovery data percentages for during this quarterly period.

Table 5-1: NMT1 LA_{1,15 min} Recovery Data Percentages April - June 16

NMT1	Recovery Data (%)
April	100
May	90 ¹
June	46 ¹

Notes: 1. Equipment failures occur during this period

A summary of the unattended noise monitoring is presented in **Table 5-2**. Noise monitoring is expressed in three descriptors as follows:

- c) Leq AP - The all-pass equivalent continuous energy average noise level. This descriptor represents the same energy as the actual fluctuating noise level over the measurement period.
- d) Leq LP - The low-pass equivalent continuous energy average noise level. This is the same as the Leq AP except that a frequency filter has been applied and excludes noise above the 800Hz third octave frequency band.
- e) RBL - The rating background level (RBL) as defined within the Industrial Noise Policy. The RBL is defined as the median of each assessment background level (ABL). The ABL is the lowest tenth percentile L₉₀ measurement for each period (day, evening and night) for the duration of the monitoring. The L₉₀ is the noise level exceeded for 90% of the measurement period.

The results in are presented in the following time periods:

- Day - 7.00am to 6.00pm;
- Evening - 6.00pm to 10.00pm; and
- Night - 10.00pm to 7.00am.

Table 5-2: January – March 2016 Noise Monitoring Average Summary, dB(A)

NMT1	Day			Evening			Night		
	Leq LP ¹	Leq AP ²	RBL ³	Leq LP	Leq AP	RBL	Leq LP	Leq AP	RBL
April	43	48	33	35	47	36	31	45	31
May	45	49	34	48	53	44	45	49	37
June	43	48	33	41	45	33	44	47	34

Note: 1. Leq LP is the Leq with a low pass filter applied at the 800Hz third octave band.
2. Leq AP is Leq All Pass with no frequency filter applied.
3. RBL is the rating background level according to the Industrial Noise Policy.

The daily noise monitoring results for NMT 1 are presented in **Table 5-5**, **Table 5-6** and **Table 5-7**. The daily noise monitoring results are expressed as a logarithmic average of each measured Leq,15min during each period and the ABL.

The unattended noise monitors also record LA_{1,15min} levels continuously at both locations. The LA_{1,15min} represents short noise events and is the noise level exceeded for 1% of 15 minutes A summary of the LA_{1,15min} levels is presented in **Table 5-3**.

Table 5-3: January – March 2016 $L_{A1,15\text{minute}}$ Noise Monitoring Summary, dB(A)

NMT1	$L_{A1,15\text{min}}$ Maximum dB(A)	$L_{A1,15\text{min}}$ Average dB(A)	$L_{A1,15\text{min}} > 52$ dB(A) night time (%)
April	76.3	49.1	46
May	96.4	52.7	51
June	71.8	47.8	17

The noise limits at the site apply for wind speeds less than 3 m/s. **Table 5-4** presents monthly percentages that wind speeds more than 3 m/s occurred from WTX monitoring data during this quarterly period.

Table 5-4: Wind Speed Exceedances Percentages January - March 16

WTX	Exceedances (%)
April	24
May	40
June	39

Table 5-5: NMT1 January Daily Noise Monitoring Results

Date	Day			Evening			Night		
	L _{eq,11hr} LP ¹	L _{eq,11hr} AP	ABL ²	L _{eq,4hr} LP	L _{eq,4hr} AP	ABL	L _{eq,9hr} LP	L _{eq,9hr} AP	ABL
01/04/2016	44	48	36	33	48	39	31	53	36
02/04/2016	43	46	29	35	54	42	27	53	33
03/04/2016	33	44	31	32	44	35	30	42	33
04/04/2016	35	45	33	32	48	41	34	54	36
05/04/2016	41	45	34	34	46	37	33	40	37
06/04/2016	45	48	35	35	44	37	32	40	35
07/04/2016	39	44	35	33	48	33	28	41	28
08/04/2016	43	47	34	34	39	34	29	34	27
09/04/2016	42	47	32	33	41	36	30	35	29
10/04/2016	32	39	29	35	44	38	35	41	30
11/04/2016	42	46	34	36	44	34	30	38	32
12/04/2016	42	46	34	36	42	33	32	36	27
13/04/2016	44	49	33	35	41	34	30	33	28
14/04/2016	45	49	35	34	43	35	35	41	33
15/04/2016	44	48	33	33	46	36	31	43	31
16/04/2016	37	42	31	33	43	36	30	40	32
17/04/2016	35	45	31	34	48	34	30	34	27
18/04/2016	42	47	34	37	41	32	30	34	28
19/04/2016	37	44	31	36	47	37	31	38	29
20/04/2016	44	48	34	34	42	33	30	36	29
21/04/2016	43	48	32	34	47	36	30	45	28
22/04/2016	43	48	35	34	45	31	33	39	31
23/04/2016	37	45	35	36	42	31	32	35	27
24/04/2016	34	45	31	33	46	32	29	34	25
25/04/2016	36	43	30	35	46	29	29	34	26
26/04/2016	36	44	32	36	46	33	32	40	31
27/04/2016	47	50	34	36	43	33	31	37	29
28/04/2016	46	50	34	35	49	34	30	37	27
29/04/2016	45	49	32	36	45	35	35	39	27
30/04/2016	52	55	28	37	52	32	32	37	26
Log Avg	43	48	33	35	47	36	31	45	31
Median	42	47	33	35	45	34	30	38	29
Max	52	55	36	37	54	42	35	54	37
Min	32	39	28	32	39	29	27	33	25

Note: 1. LP=Low Pass, AP= All Pass

2. ABL is the Assessment Background Level and represents the lowest tenth percentile L₉₀ measured during the period.

Table 5-6: NMT1 May Daily Noise Monitoring Results

Date	Day			Evening			Night		
	L _{eq,11hr} LP ¹	L _{eq,11hr} AP	ABL ²	L _{eq,4hr} LP	L _{eq,4hr} AP	ABL	L _{eq,9hr} LP	L _{eq,9hr} AP	ABL
01/05/2016	53	55	31	36	52	31	31	35	23
02/05/2016	45	50	30	34	42	29	31	36	27
03/05/2016	45	49	35	34	44	29	30	33	28
04/05/2016	43	47	34	35	45	32	31	35	29
05/05/2016	44	48	33	36	48	32	30	35	27
06/05/2016	46	49	31	37	47	32	31	33	28
07/05/2016	44	48	32	34	43	31	30	45	28
08/05/2016	32	41	28	32	41	30	33	42	30
09/05/2016	36	42	33	37	42	32	30	34	28
10/05/2016	45	50	34	37	46	35	37	42	27
11/05/2016	43	47	34	49	54	39	51	56	31
12/05/2016	51	56	35	61	65	59	54	58	29
13/05/2016	45	50	36	36	45	30	31	34	30
14/05/2016	43	47	31	36	45	36	32	36	28
15/05/2016	35	42	29	42	50	33	34	40	27
16/05/2016	44	48	33	37	45	30	34	41	28
17/05/2016	43	47	33	47	52	32	46	51	26
18/05/2016	42	46	32	41	44	32	45	49	29
19/05/2016	43	48	34	42	47	30	39	44	25
20/05/2016	44	48	33	36	42	31	30	33	27
21/05/2016	35	48	32	32	37	31	32	36	29
22/05/2016	35	44	31	36	39	29	34	38	27
23/05/2016	39	44	32	46	50	42	43	47	34
24/05/2016	42	47	34	50	54	44	47	52	35
25/05/2016	43	48	33	38	41	32	30	35	27
26/05/2016	43	48	35	34	38	29	46	50	28
27/05/2016	53	57	42	54	58	47	53	57	49
28/05/2016	42	47	31	46	51	41	48	53	48
29/05/2016	-	-	-	-	-	-	-	-	-
30/05/2016	-	-	-	-	-	-	-	-	-
31/05/2016	-	-	-	-	-	-	-	-	-
Log Avg	45	49	34	48	53	44	45	49	37
Median	43	48	33	37	45	32	33	40	28
Max	53	57	42	61	65	59	54	58	49
Min	32	41	28	32	37	29	30	33	23

Note: 1. LP=Low Pass, AP= All Pass

2. ABL is the Assessment Background Level and represents the lowest tenth percentile L₉₀ measured during the period.

3. - Monitor offline due to instrument problems.

Table 5-7: NMT1 June Daily Noise Monitoring Results

Date	Day			Evening			Night		
	L _{eq,11hr} LP ¹	L _{eq,11hr} AP	ABL ²	L _{eq,4hr} LP	L _{eq,4hr} AP	ABL	L _{eq,9hr} LP	L _{eq,9hr} AP	ABL
01/06/2016	-	-	-	-	-	-	-	-	-
02/06/2016	-	-	-	-	-	-	-	-	-
03/06/2016	-	-	-	-	-	-	-	-	-
04/06/2016	-	-	-	-	-	-	-	-	-
05/06/2016	-	-	-	-	-	-	-	-	-
06/06/2016	-	-	-	-	-	-	-	-	-
07/06/2016	-	-	-	-	-	-	-	-	-
08/06/2016	-	-	-	-	-	-	-	-	-
09/06/2016	-	-	-	-	-	-	-	-	-
10/06/2016	-	-	-	-	-	-	-	-	-
11/06/2016	-	-	-	-	-	-	-	-	-
12/06/2016	-	-	-	-	-	-	-	-	-
13/06/2016	-	-	-	-	-	-	-	-	-
14/06/2016	-	-	-	-	-	-	-	-	-
15/06/2016	-	-	-	-	-	-	-	-	-
16/06/2016	-	-	-	-	-	-	-	-	-
17/06/2016	41	47	34	36	40	34	34	39	31
18/06/2016	36	46	32	34	37	33	33	36	29
19/06/2016	37	48	37	37	43	37	36	41	32
20/06/2016	39	49	34	50	54	38	43	46	35
21/06/2016	43	49	36	38	40	34	36	39	31
22/06/2016	54	58	40	53	56	44	54	58	31
23/06/2016	44	49	38	38	40	33	36	39	30
24/06/2016	48	52	37	46	50	37	55	59	48
25/06/2016	45	49	33	39	42	34	34	38	28
26/06/2016	41	47	33	36	38	31	37	40	30
27/06/2016	45	50	36	40	43	34	37	41	33
28/06/2016	43	49	38	38	42	36	37	40	32
29/06/2016	45	50	38	38	40	34	36	45	32
30/06/2016	44	52	34	40	44	32	45	49	-
Log Avg	43	48	33	41	45	33	44	47	34
Median	43	49	36	38	42	34	37	40	31
Max	54	58	40	53	56	44	55	59	48
Min	36	46	32	34	37	31	33	36	28

Note: 1. LP=Low Pass, AP= All Pass

2. ABL is the Assessment Background Level and represents the lowest tenth percentile L₉₀ measured during the period.

3. - Monitor offline due to instrument problems.

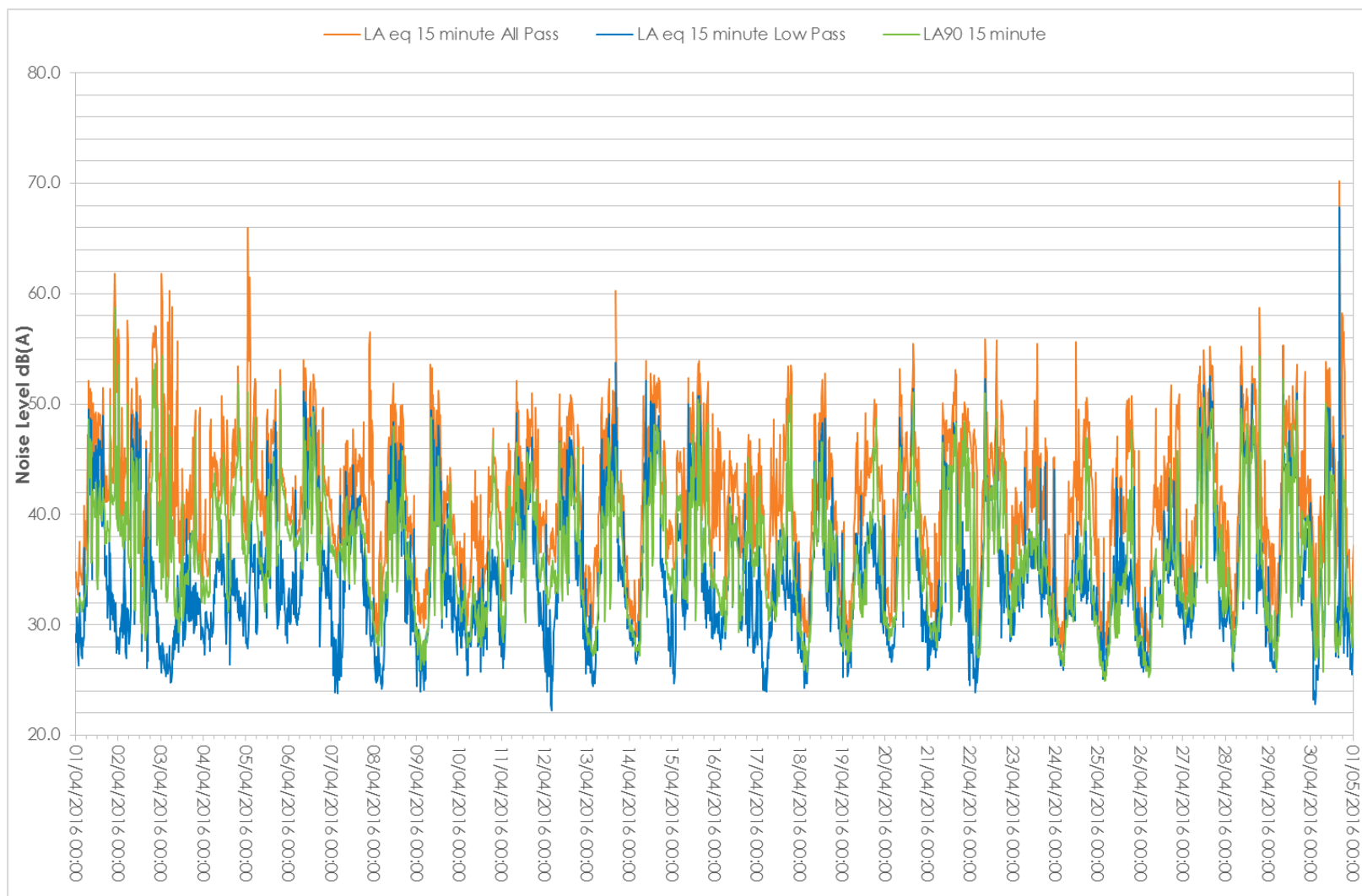


Figure 5-1: NMT3 Noise Monitoring Results – April 2016

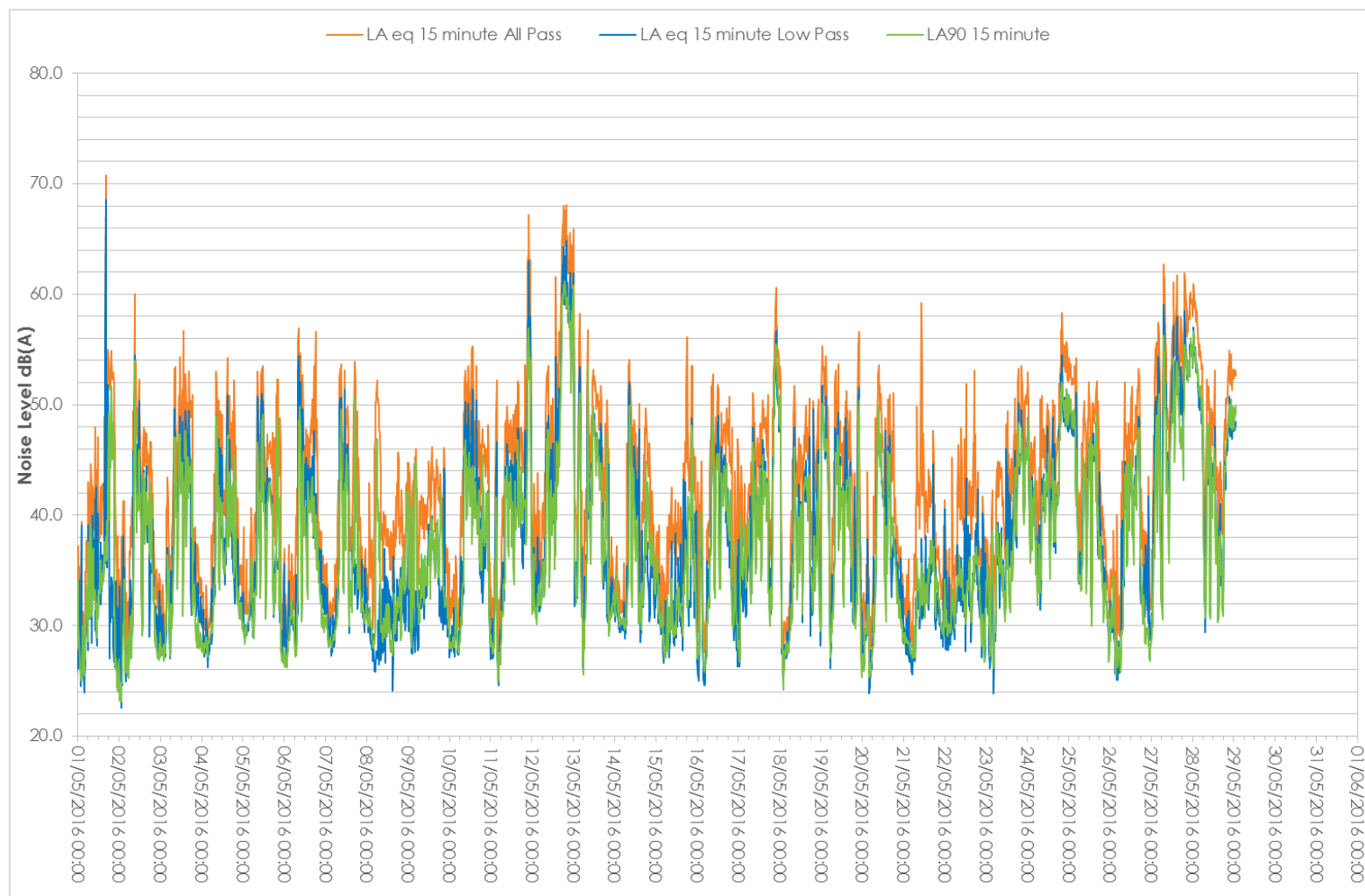


Figure 5-2: NMT3 Noise Monitoring Results – May 2016

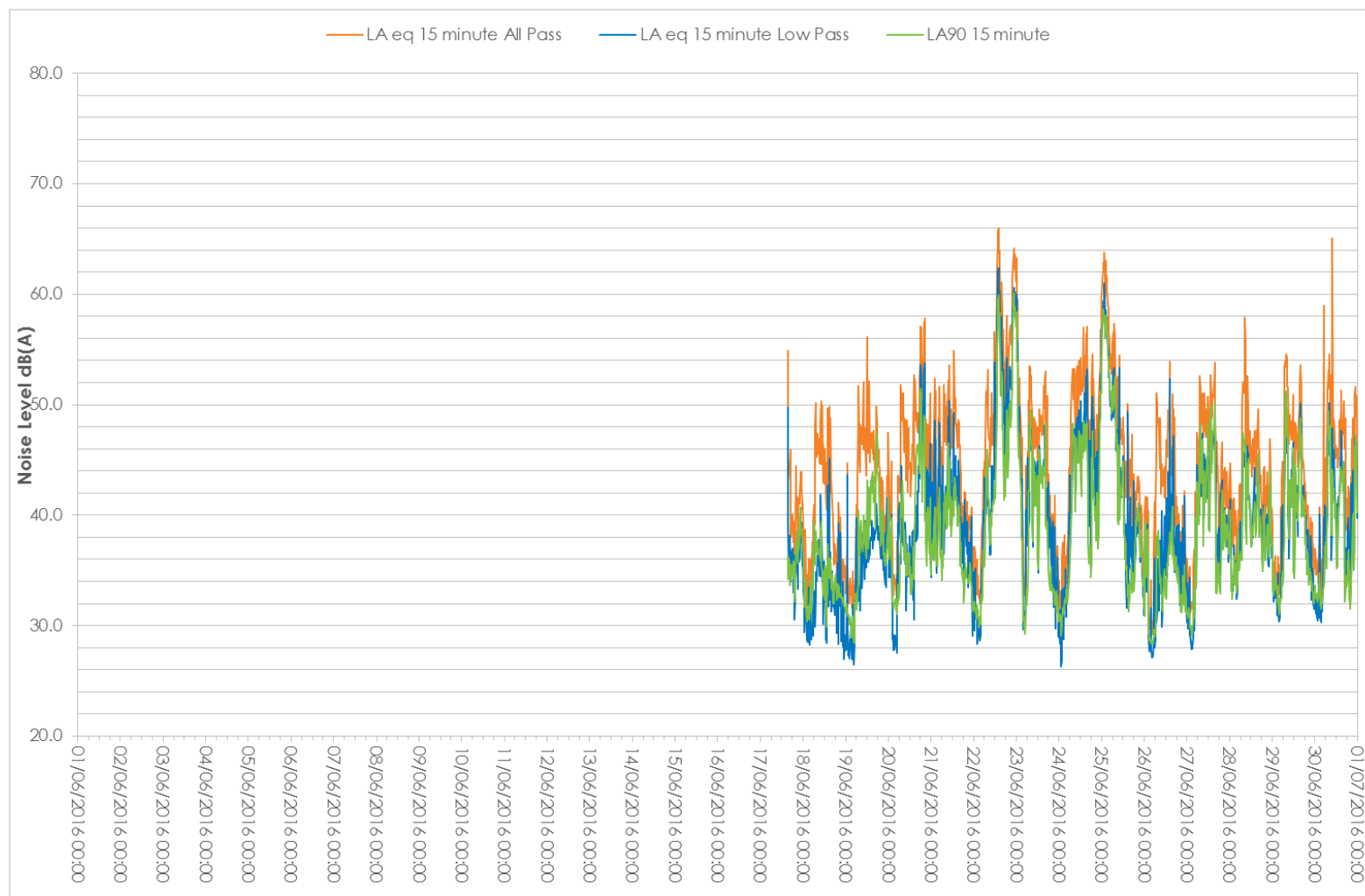


Figure 5-3: NMT3 Noise Monitoring Results – June 2016

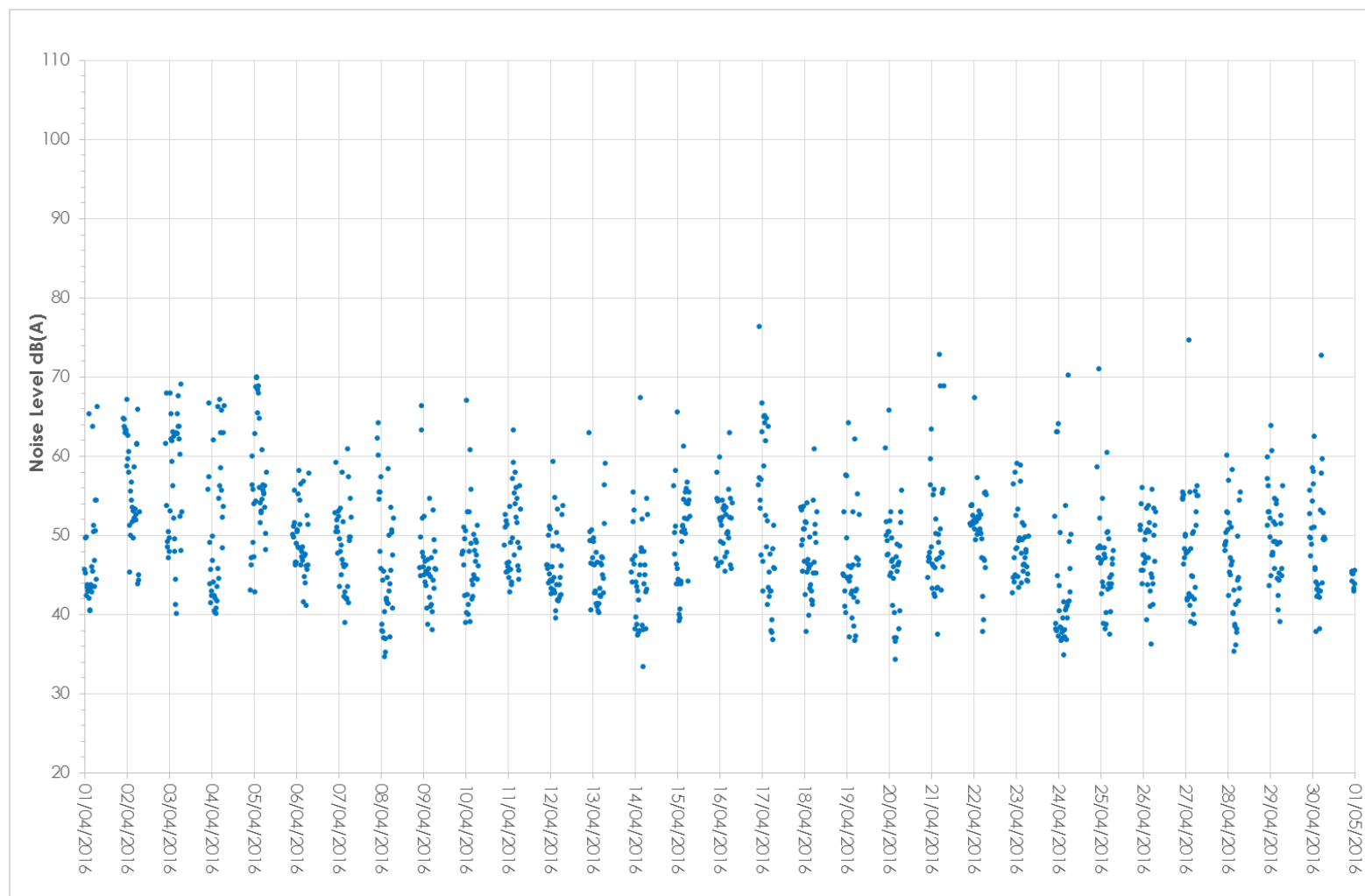


Figure 5-4: L_{1,15minute} (night time only) NMT3 Noise Monitoring Results – April 2016

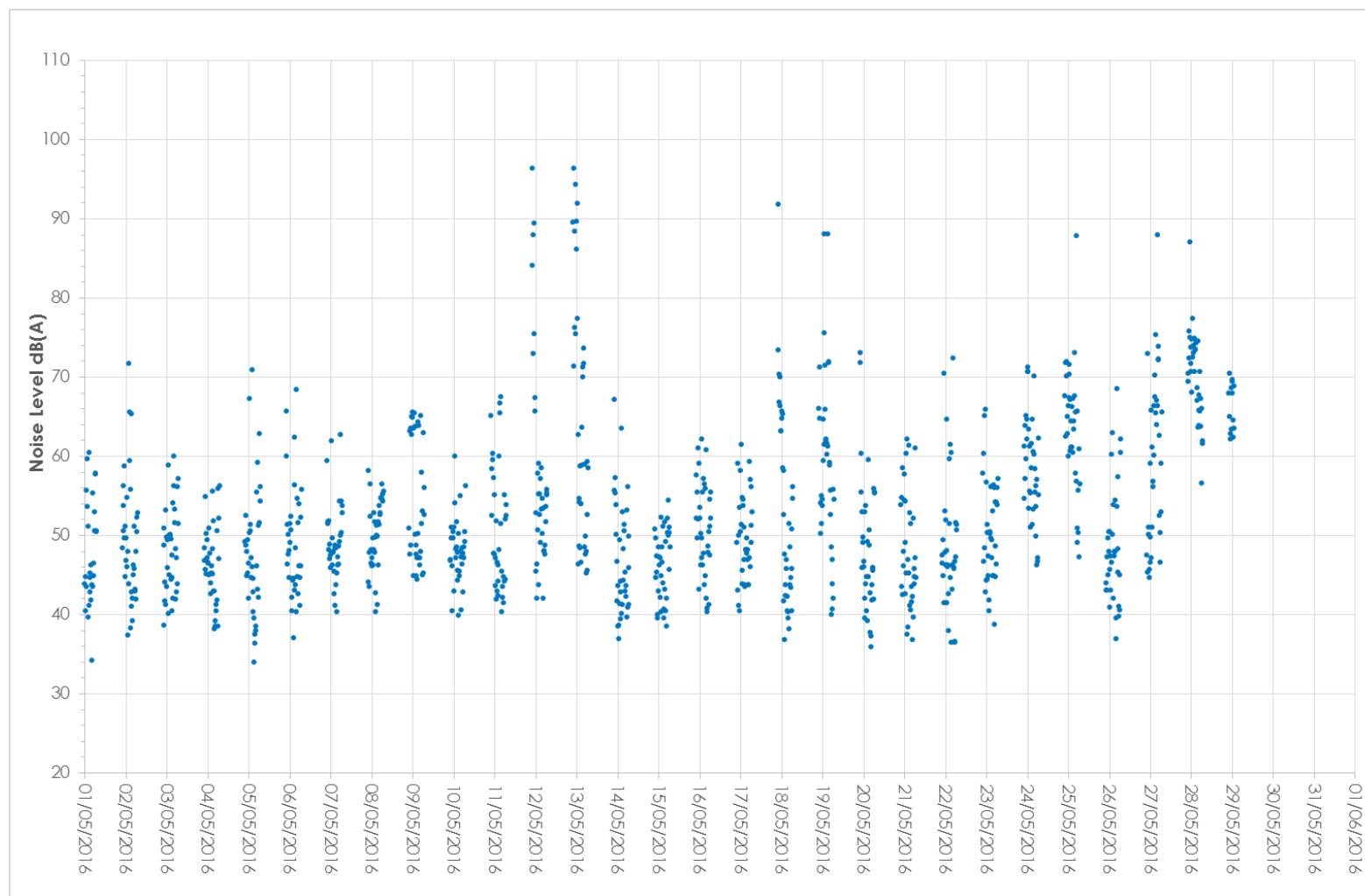


Figure 5-5: L_{1,15minute} (night time only) NMT3 Noise Monitoring Results – May 2016

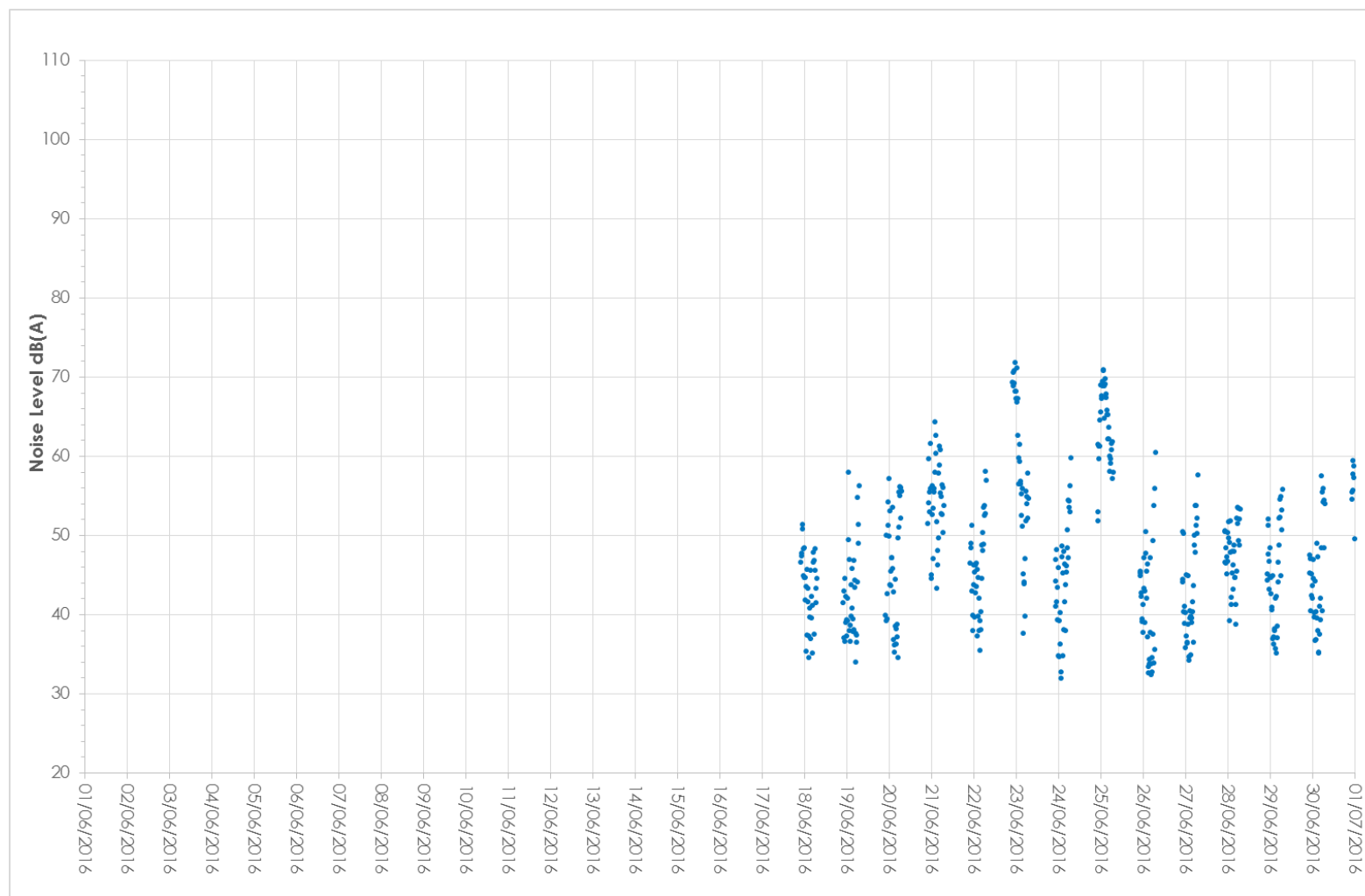


Figure 5-6: L_{1,15minute} (night time only) NMT3 Noise Monitoring Results – June 2016

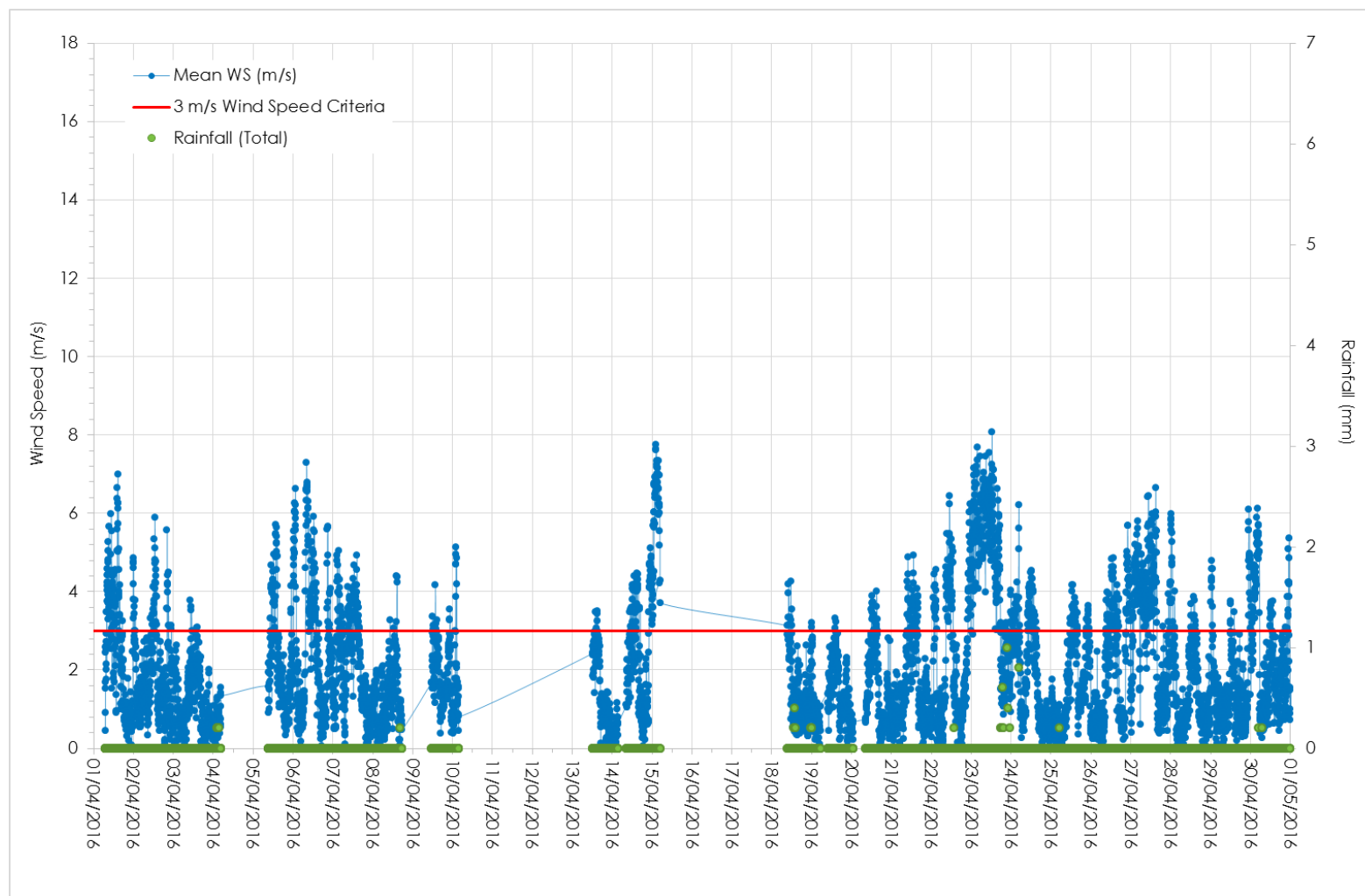


Figure 5-7: Wind Speed and Rainfall Monitoring Data – April 2016

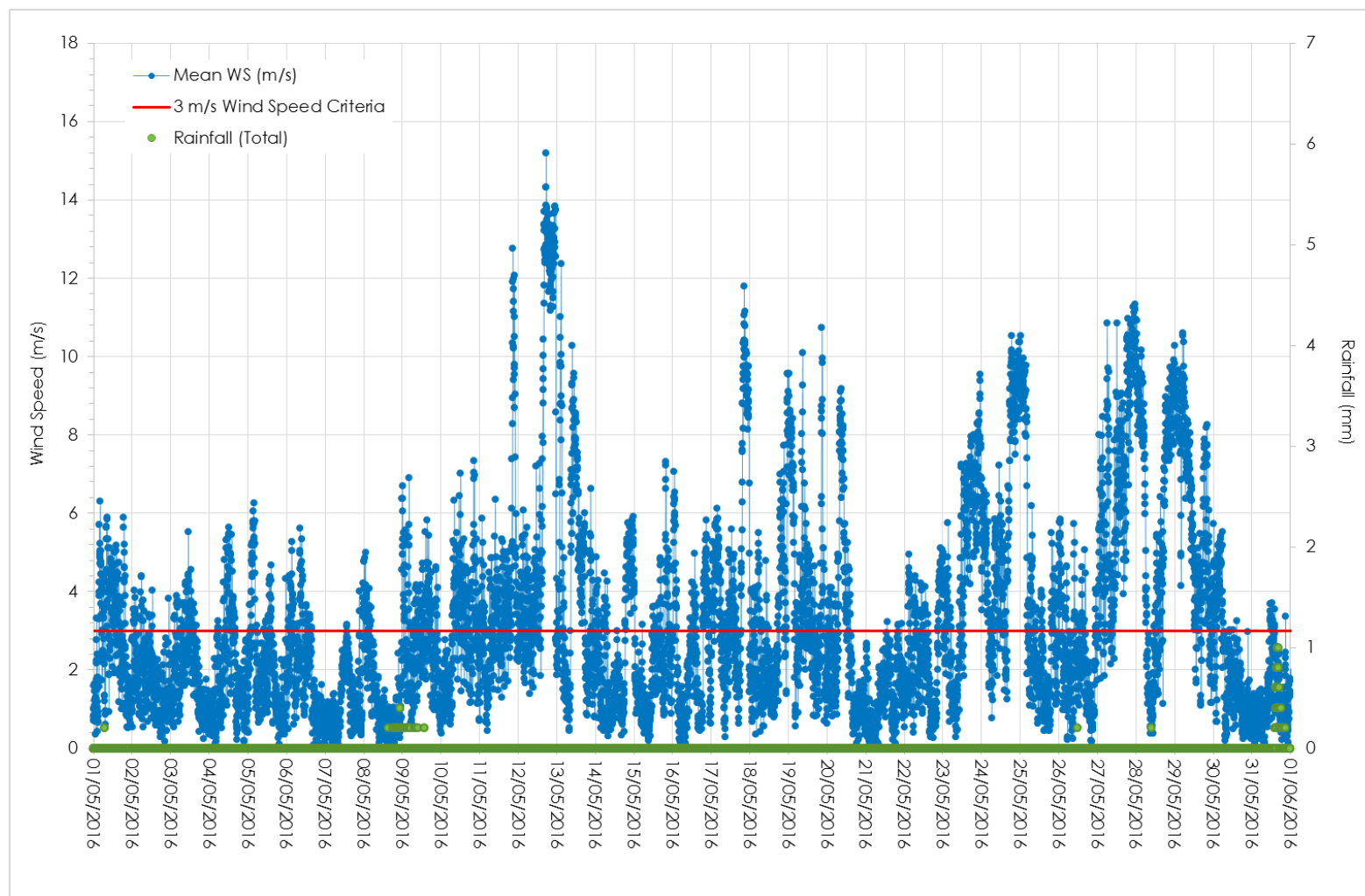


Figure 5-8: Wind Speed and Rainfall Monitoring Data – May 2016

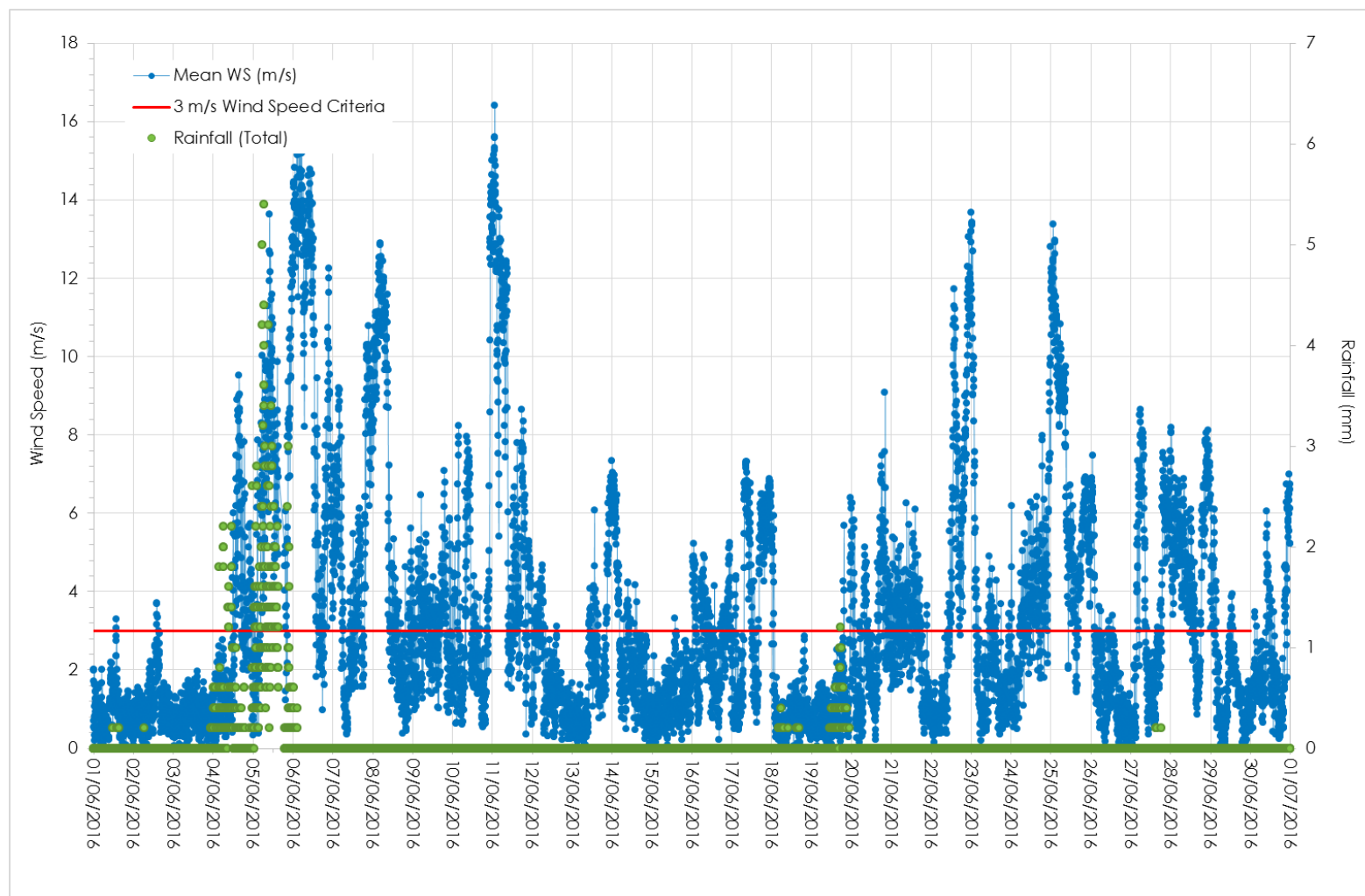


Figure 5-9: Wind Speed and Rainfall Monitoring Data – June 2016

5.2 Attended Noise Measurements

Whilst operational, attended noise measurements are carried out once every three months to establish compliance with the site's noise limits at compliance locations surrounding the site during the day, evening and night.

As the Wongawilli is not currently operating, attended noise monitoring was not carried out in April - June 2016.