

WOLLONGONG COAL WONGAWILLI

QUARTERLY AIR QUALITY AND NOISE MONITORING REPORT

APRIL TO JUNE 2017

1 INTRODUCTION

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

This report provides a summary of the data collected during the first quarter, April to June 2017. 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	south of coal handling and rail loading area	293358	6181778
Continuous Noise Monitor	NMT 3	Jersey Farm Road	294137	6182448

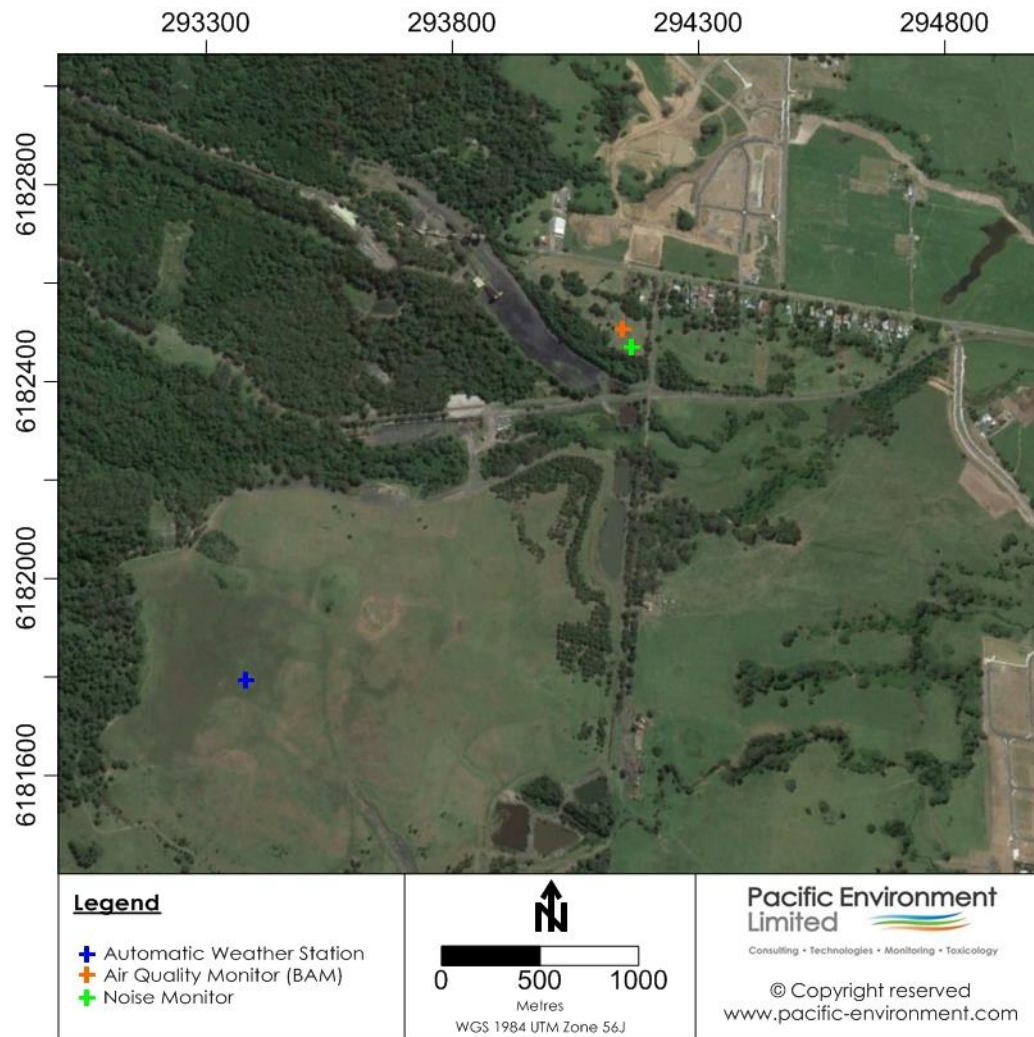


Figure 1-1: Monitoring Locations

2 PROJECT ENVIRONMENTAL CONDITIONS

2.1 Monitoring Requirements

In accordance with Project Approval (09_0161), 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 85% for all parameters (refer **Table 3-1**).

Table 3-1: Valid data recovery rates - AWS

Parameter	Valid Data Recovery Rate %
Wind Speed	85%
Wind Direction	85%
Temperature – 2 m	85%
Temperature – 10 m	85%
Pressure	85%

A summary of statistics for the data collected during April to June 2017 are shown in **Table 3-2**.

Table 3-2: Meteorology Summary Statistics

Parameter (units)	Statistical measure	Value
Wind Speed (m/s)	Mean	2.2
Temperature (°C) – 10m		15.9
Temperature (°C) – 2m		14.4
Barometric pressure (hPa)		1013.0
Wind Speed (m/s)	Median	1.6
Temperature (°C) – 10m		15.8
Temperature (°C) – 2m		14.2
Barometric pressure (hPa)		1013.4
Wind Speed (m/s)	Standard Deviation	1.9
Temperature (°C) – 10m		2.9
Temperature (°C) – 2m		3.6
Barometric pressure (hPa)		5.4
Rainfall (mm)	Quarterly Total	95
Calms	%	27.5

3.1.1 Wind data

A windrose for the quarter is presented in

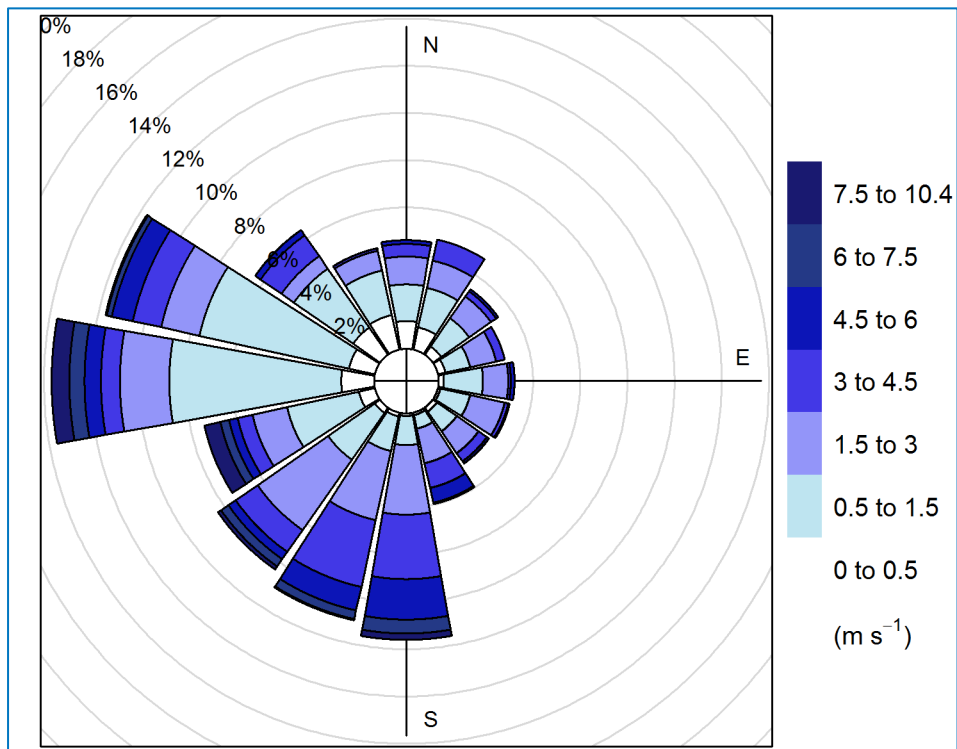


Figure 3-1. The windrose indicates that for the period of monitoring winds from the west to north west were dominant.

The average wind speed for the period was 2.2 m/s and the percentage occurrence of calm wind conditions (less than or equal to 0.5 m/s) was approximately 27.5%.

3.1.2 Temperature

A plot of the hourly average temperature, recorded at 2 m and 10 m, is shown in

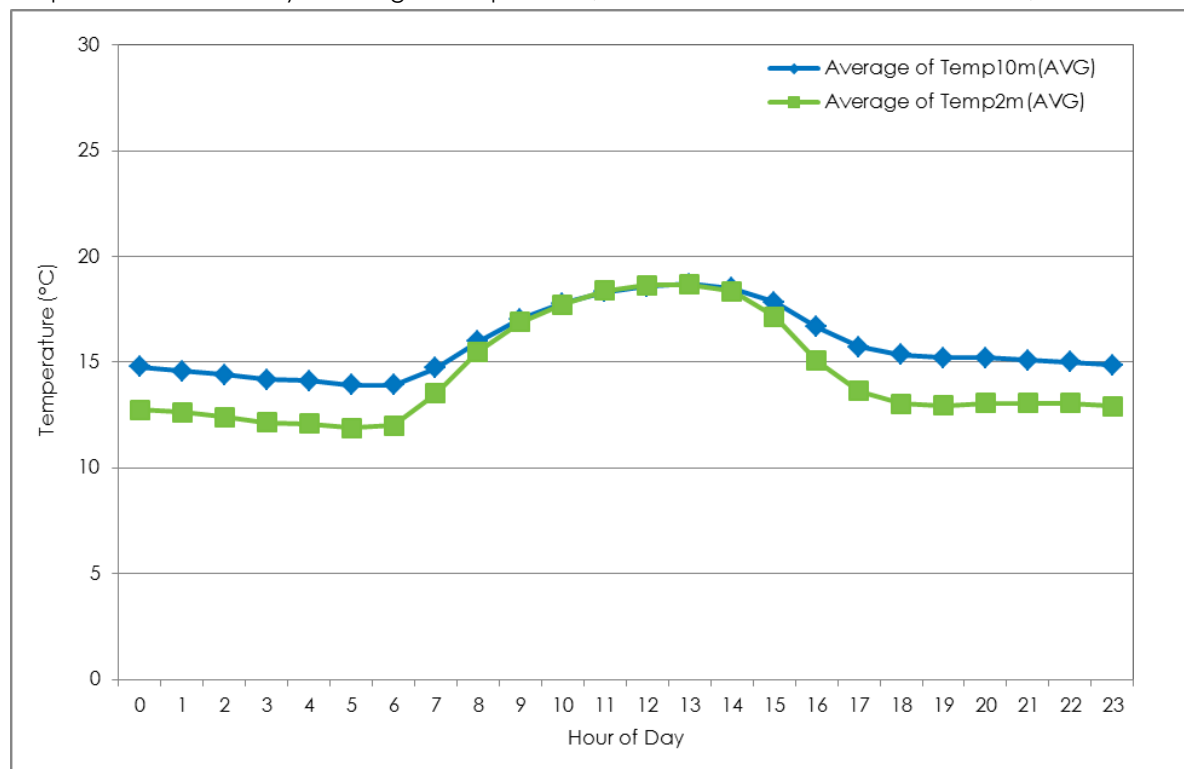


Figure 3-2. The daily average temperature at 2 m was 15.9°C. The lowest temperature was 11.4°C degrees recorded on 30 June and a maximum of 20.1°C was recorded 25 April.

3.1.3 Rainfall

A plot of the daily rainfall over the three months period is shown in **Figure 3-3**. The station recorded 95 mm of rain in the quarter. The nearest Bureau of Meteorology site at Wollongong - Albion Park recorded 110.4 mm during the quarter. The highest rainfall recorded on site was on 3 April where 13.8 mm of rain was reported.

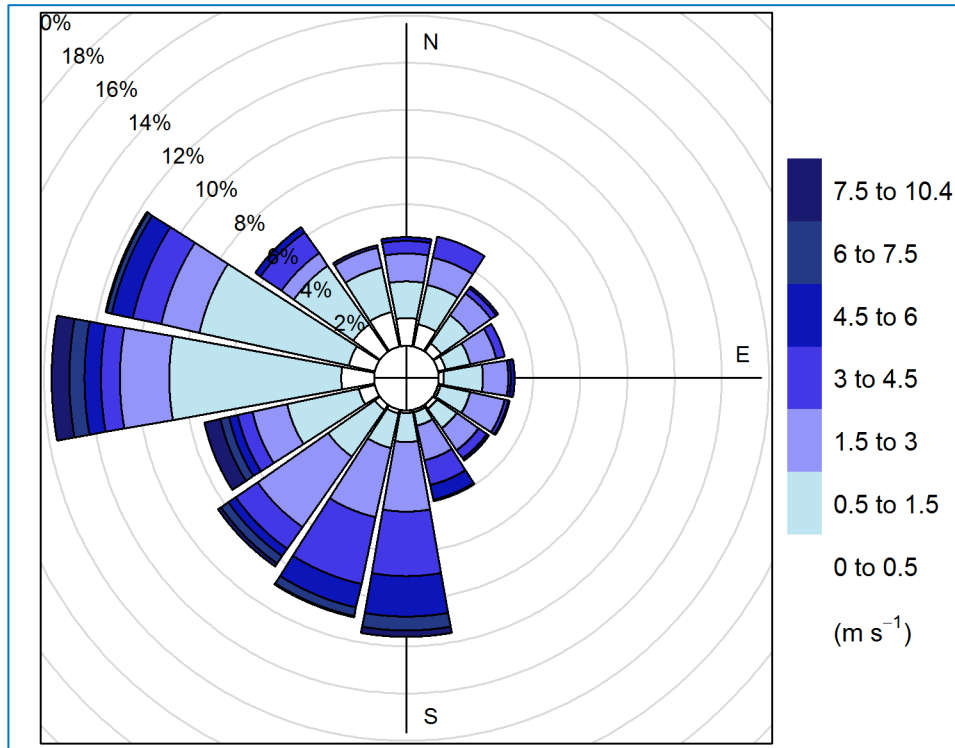


Figure 3-1: Windrose for Wongawilli Colliery – April to June 2017

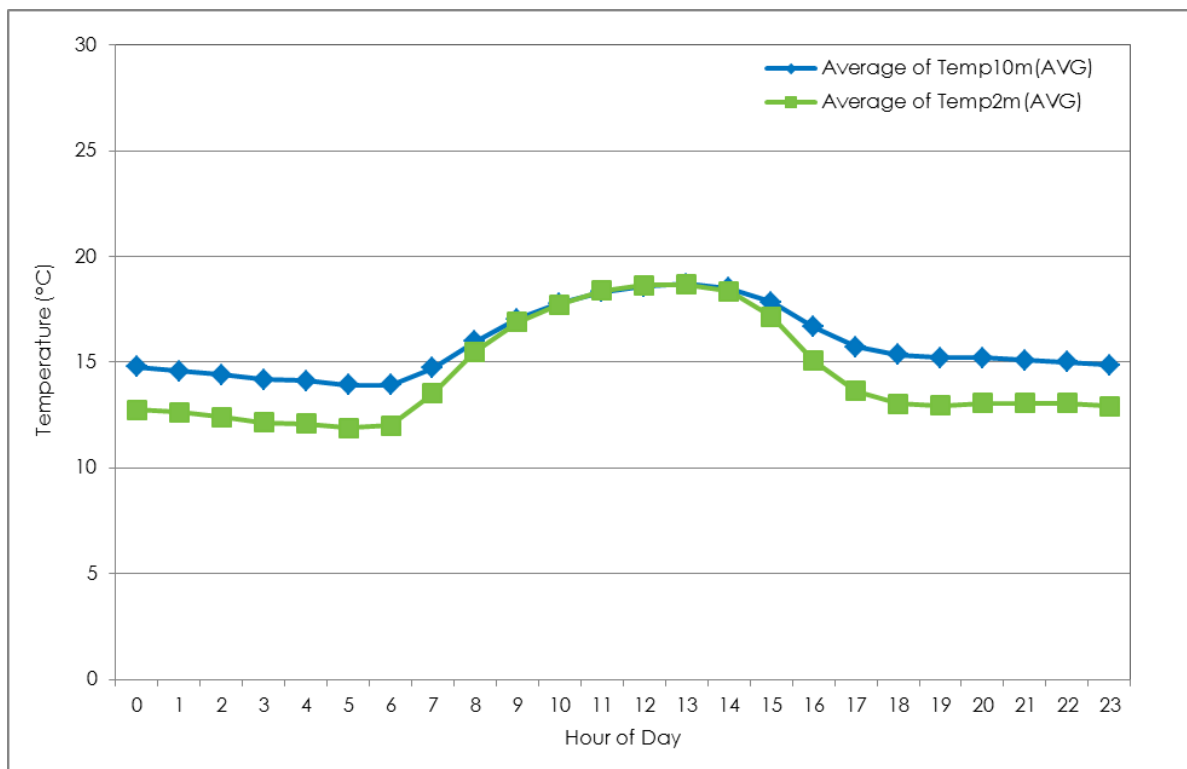


Figure 3-2: Hourly Average Temperature – April to June 2017

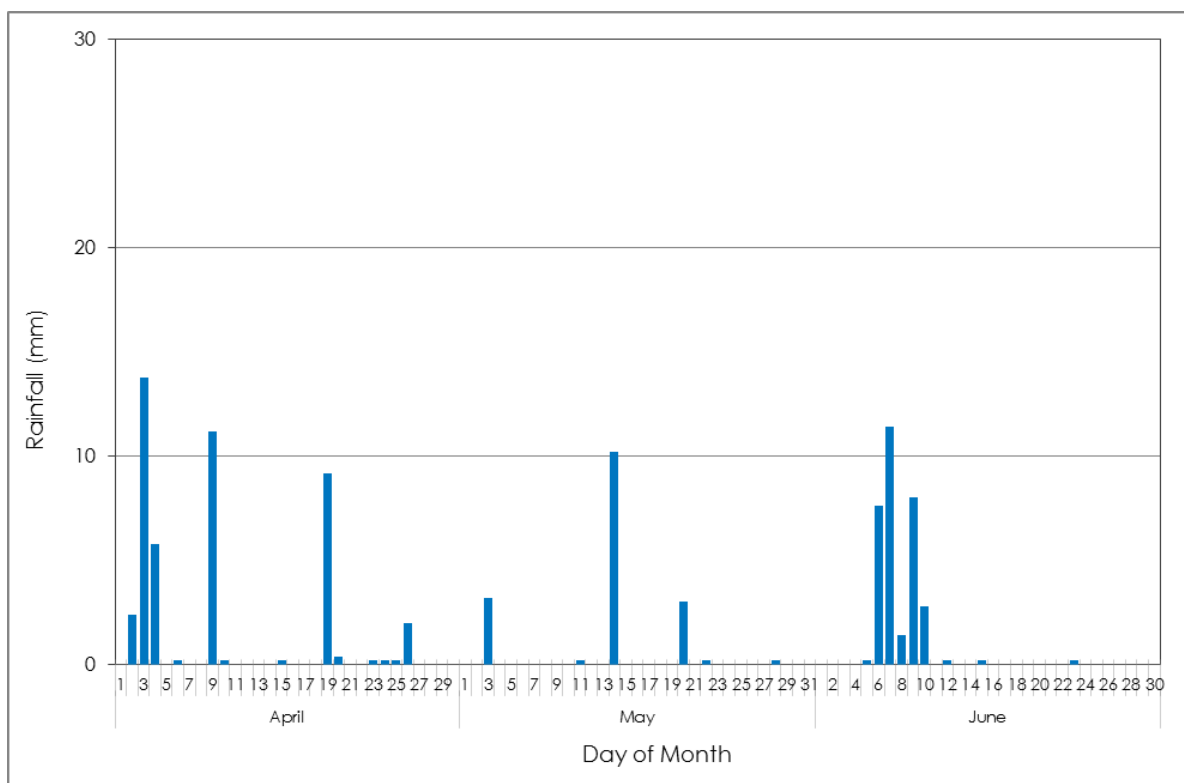


Figure 3-3: Daily Rainfall – April to June 2017

4 PM₁₀ MONITORING RESULTS

Continuous air quality particulate monitoring is carried out at the BAM monitoring station located 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 51%. 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 2017	May 2017	June 2017	Quarter 2 2017
Mean	10.2	10.6	8.4	10.0
Standard Deviation	3.4	2.7	6.2	4.0
Median	9.6	0	0	9.6
Minimum	5.8	3.2	0.3	0.3
Maximum	17.2	14.9	22.0	22.0
Days over the criteria	0	0	0	0

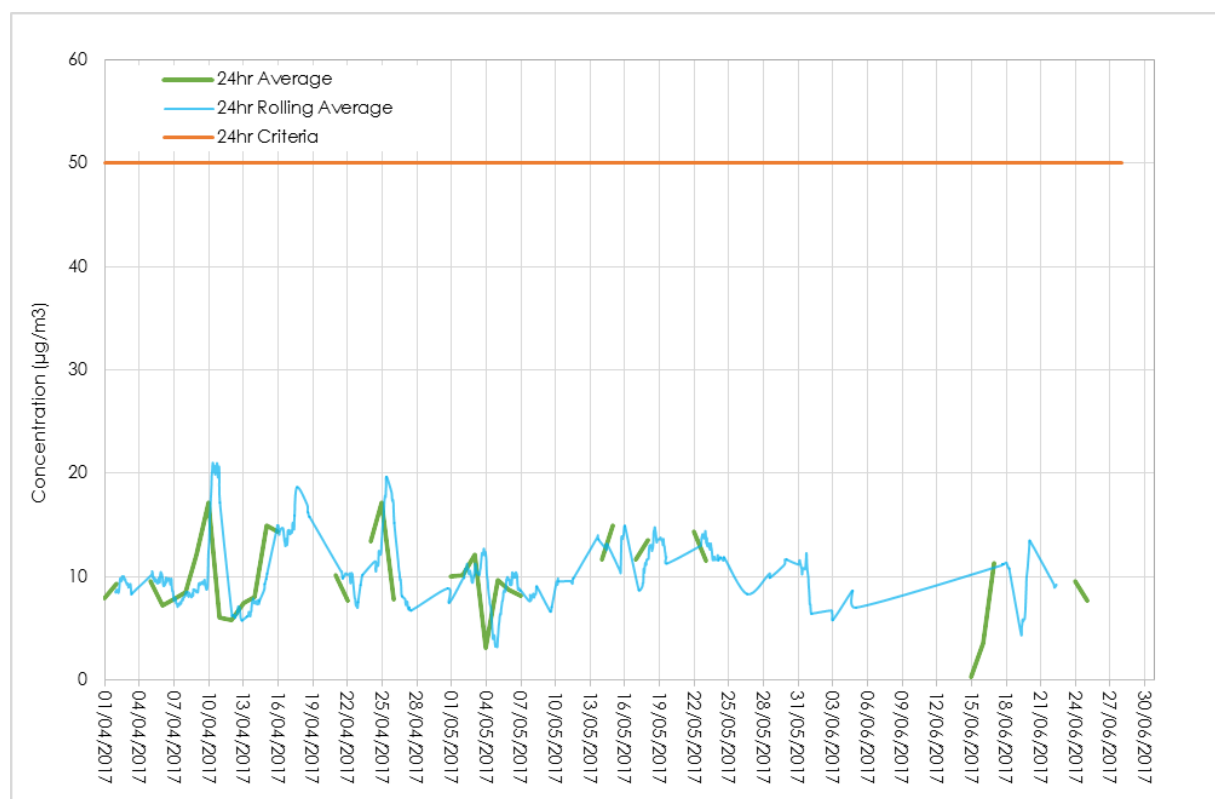


Figure 3-1: PM₁₀ Monitoring Data

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 monitor continuously monitors noise levels from all sources at the location shown in **Figure 1-1** near the site boundary.

Table 5-1 presents NMT3 recovery data percentages for this quarterly period.

Table 5-1: NMT3 LA1,15 min Recovery Data Percentages April to June 2017

NMT3	Recovery Data (%)
April	22.6
May	83.1
June	99.9

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

- c) $L_{eq AP}$ - 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) $L_{eq LP}$ - The low-pass equivalent continuous energy average noise level. This is the same as the $L_{eq AP}$ 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 L_{90} measurement for each period (day, evening and night) for the duration of the monitoring. The L_{90} 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: April – June 2017 Noise Monitoring Average Summary, dB(A)

NMT1	Day			Evening			Night		
	$L_{eq LP}^1$	$L_{eq AP}^2$	RBL ³	$L_{eq LP}$	$L_{eq AP}$	RBL	$L_{eq LP}$	$L_{eq AP}$	RBL
April	45	50	43	45	50	45	45	48	44
May	48	51	43	48	49	46	48	50	43
June	56	73	38	38	41	33	39	43	34

Note: 1. $L_{eq LP}$ is the L_{eq} with a low pass filter applied at the 800Hz third octave band.
 2. $L_{eq AP}$ is L_{eq} 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 3 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 $L_{eq,15min}$ during each period and the ABL.

The unattended noise monitors also record $L_{A1,1min}$ levels continuously at both locations. The $L_{A1,1min}$ represents short term peak noise events and is the noise level exceeded for 1% of the time. A summary of the $L_{A1,1min}$ levels is presented in **Table 5-3**.

Table 5-3: April - June 2017 $L_{A1,15minute}$ Noise Monitoring Summary, dB(A)

NMT1	$L_{A1,1min}$ Maximum dB(A)	$L_{A1,1min}$ Average dB(A)	$L_{A1,15min} > 52$ dB(A) night time (%)
April	79	50	28%
May	91	50	24%
June	115	45	9%

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 April - June 2017

WTX	Exceedances (%)
April	41
May	39
June	31

Table 5-5: NMT3 April Daily Noise Monitoring Results

Date	Day			Evening			Night		
	Leq,11hr LP ¹	Leq,11hr AP	ABL ²	Leq,4hr LP	Leq,4hr AP	ABL	Leq,9hr LP	Leq,9hr AP	ABL
1/04/2017	47	51	44	46	52	48	46	52	47
2/04/2017	45	52	44	40	53	43	36	47	38
3/04/2017	42	49	41	40	48	44	40	45	40
4/04/2017	44	51	43	46	50	45	48	50	47
5/04/2017	45	51	42	-	-	-	-	-	-
6/04/2017	-	-	-	-	-	-	-	-	-
7/04/2017	-	-	-	-	-	-	-	-	-
8/04/2017	-	-	-	-	-	-	-	-	-
9/04/2017	-	-	-	-	-	-	-	-	-
10/04/2017	-	-	-	-	-	-	-	-	-
11/04/2017	-	-	-	-	-	-	-	-	-
12/04/2017	-	-	-	-	-	-	-	-	-
13/04/2017	-	-	-	-	-	-	-	-	-
14/04/2017	-	-	-	-	-	-	-	-	-
15/04/2017	-	-	-	-	-	-	-	-	-
16/04/2017	-	-	-	-	-	-	-	-	-
17/04/2017	-	-	-	-	-	-	-	-	-
18/04/2017	-	-	-	-	-	-	-	-	-
19/04/2017	-	-	-	-	-	-	-	-	-
20/04/2017	-	-	-	-	-	-	-	-	-
21/04/2017	-	-	-	-	-	-	-	-	-
22/04/2017	-	-	-	-	-	-	-	-	-
23/04/2017	-	-	-	-	-	-	-	-	-
24/04/2017	-	-	-	-	-	-	-	-	-
25/04/2017	-	-	-	-	-	-	-	-	-
26/04/2017	-	-	-	-	-	-	-	-	-
27/04/2017	-	-	-	-	-	-	-	-	-
28/04/2017	49	52	49	50	52	47	47	48	45
29/04/2017	42	45	36	40	42	34	46	48	42
30/04/2017	39	43	32	38	41	34	32	36	34
Log Avg	45	50	43	45	50	45	45	48	44
Median	45	51	43	40	50	44	46	48	42
Max	49	52	49	50	53	48	48	52	47
Min	39	43	32	38	41	34	32	36	34

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: NMT3 May Daily Noise Monitoring Results

Date	Day			Evening			Night		
	Leq,11hr LP ¹	Leq,11hr AP	ABL ²	Leq,4hr LP	Leq,4hr AP	ABL	Leq,9hr LP	Leq,9hr AP	ABL
1/05/2017	50	52	47	48	49	45	45	46	29
2/05/2017	50	53	47	48	49	46	47	48	45
3/05/2017	47	50	45	47	49	45	40	43	31
4/05/2017	47	50	42	47	48	46	49	50	46
5/05/2017	49	52	46	46	48	44	45	46	36
6/05/2017	37	42	35	40	45	39	40	44	30
7/05/2017	39	42	32	36	42	37	41	43	31
8/05/2017	49	51	39	43	45	32	37	40	29
9/05/2017	48	51	42	51	52	49	50	51	49
10/05/2017	48	52	44	49	50	48	48	50	32
11/05/2017	47	50	38	50	51	47	50	51	32
12/05/2017	48	52	45	47	48	47	45	47	43
13/05/2017	44	48	37	46	47	45	48	50	44
14/05/2017	45	50	40	46	47	45	45	46	31
15/05/2017	46	50	41	43	45	40	37	40	30
16/05/2017	46	50	39	40	43	35	38	41	33
17/05/2017	48	52	41	40	43	34	45	46	34
18/05/2017	47	50	38	47	48	46	47	49	46
19/05/2017	47	50	45	45	47	44	45	48	43
20/05/2017	44	47	41	48	49	46	46	47	44
21/05/2017	44	47	40	48	49	47	48	49	46
22/05/2017	46	49	43	48	49	46	47	48	45
23/05/2017	50	53	48	49	50	46	58	59	45
24/05/2017	49	52	41	52	56	48	47	49	32
25/05/2017	48	51	39	51	52	46	48	49	46
26/05/2017	49	51	45	51	52	49	48	49	31
27/05/2017	42	48	36	44	45	34	51	52	49
28/05/2017	48	50	44	47	48	44	48	49	45
29/05/2017	54	57	49	53	55	52	52	54	46
30/05/2017	-	-	-	-	-	-	-	-	-
31/05/2017	45	47	37	41	43	32	36	39	33
Log Avg	48	51	43	48	49	46	48	50	43
Median	47	50	41	47	48	46	47	48	39
Max	54	57	49	53	56	52	58	59	49
Min	37	42	32	36	42	32	36	39	29

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: NMT3 June Daily Noise Monitoring Results

Date	Day			Evening			Night		
	Leq,11hr LP ¹	Leq,11hr AP	ABL ²	Leq,4hr LP	Leq,4hr AP	ABL	Leq,9hr LP	Leq,9hr AP	ABL
1/06/2017	62	71	34	38	39	31	31	35	29
2/06/2017	40	48	34	34	36	30	31	36	28
3/06/2017	39	45	32	34	37	31	30	34	28
4/06/2017	39	43	32	35	37	31	33	37	28
5/06/2017	47	51	39	36	39	32	48	52	35
6/06/2017	47	51	40	38	44	36	44	50	41
7/06/2017	46	51	40	36	42	34	35	39	32
8/06/2017	43	48	36	37	41	35	34	38	31
9/06/2017	46	50	38	38	43	35	34	41	33
10/06/2017	36	41	34	34	37	34	31	35	31
11/06/2017	36	42	33	42	44	32	32	36	31
12/06/2017	37	41	33	35	38	33	35	38	31
13/06/2017	47	52	36	36	40	33	34	38	31
14/06/2017	40	44	36	37	40	34	35	38	32
15/06/2017	44	48	37	36	39	34	35	38	32
16/06/2017	45	50	37	38	40	34	34	37	31
17/06/2017	46	50	35	35	38	33	32	36	31
18/06/2017	37	44	35	33	35	32	33	37	31
19/06/2017	46	50	39	35	39	35	35	38	32
20/06/2017	46	50	39	36	39	33	35	38	32
21/06/2017	46	51	38	36	39	34	35	38	31
22/06/2017	46	51	40	35	38	34	35	39	33
23/06/2017	47	52	40	42	45	36	44	47	31
24/06/2017	46	49	35	34	37	31	34	37	30
25/06/2017	40	46	33	34	37	31	44	49	30
26/06/2017	47	52	42	35	39	30	34	38	30
27/06/2017	46	52	38	41	45	33	35	38	30
28/06/2017	47	51	36	40	42	32	34	37	30
29/06/2017	69	87	41	44	48	37	46	50	44
30/06/2017	45	49	40	38	40	32	31	34	31
Log Avg	56	73	38	38	41	33	39	43	34
Median	46	50	37	36	39	33	34	38	31
Max	69	87	42	44	48	37	48	52	44
Min	36	41	32	33	35	30	30	34	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.

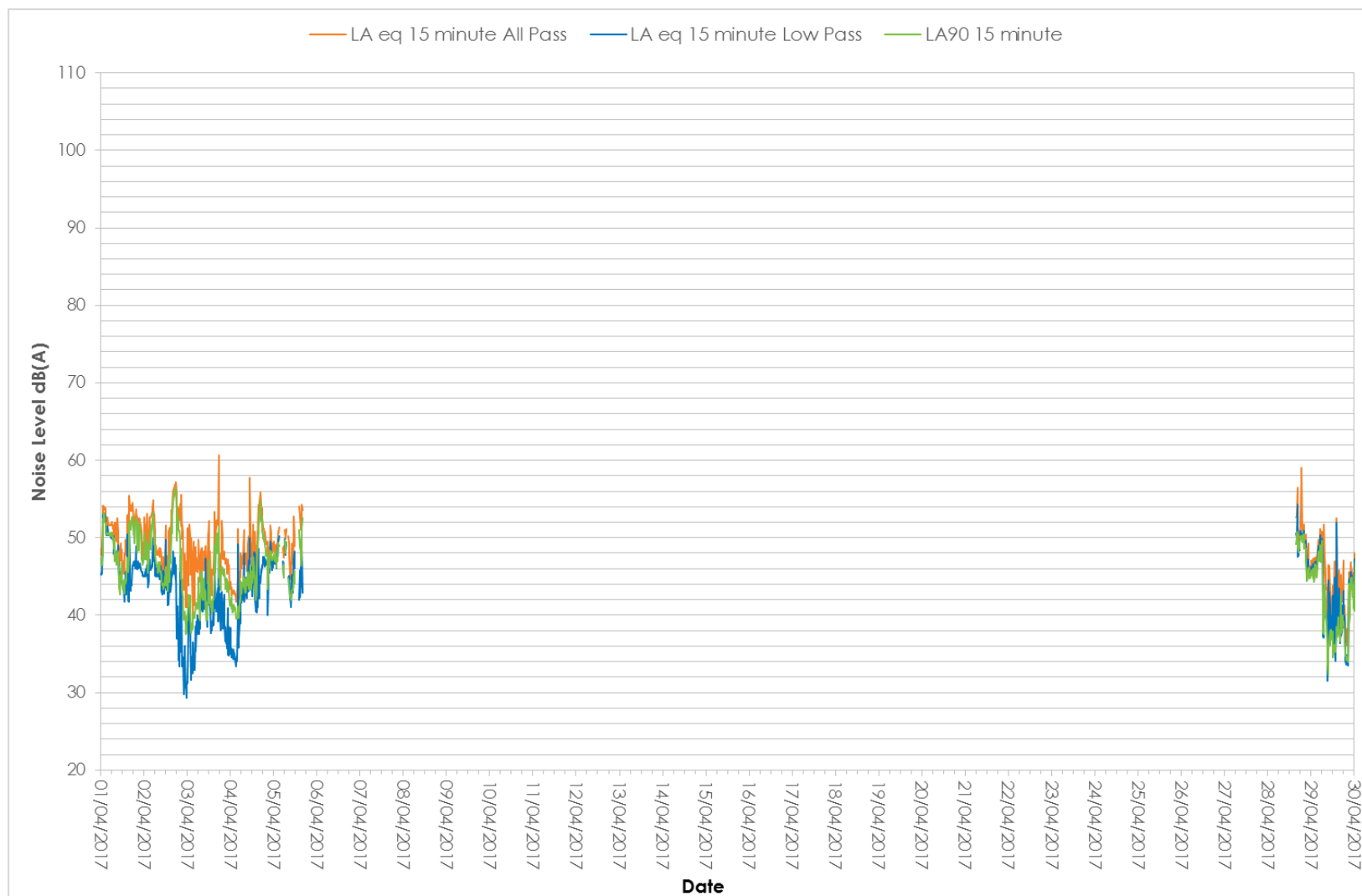


Figure 5-1: NMT3 Noise Monitoring Results – April 2017

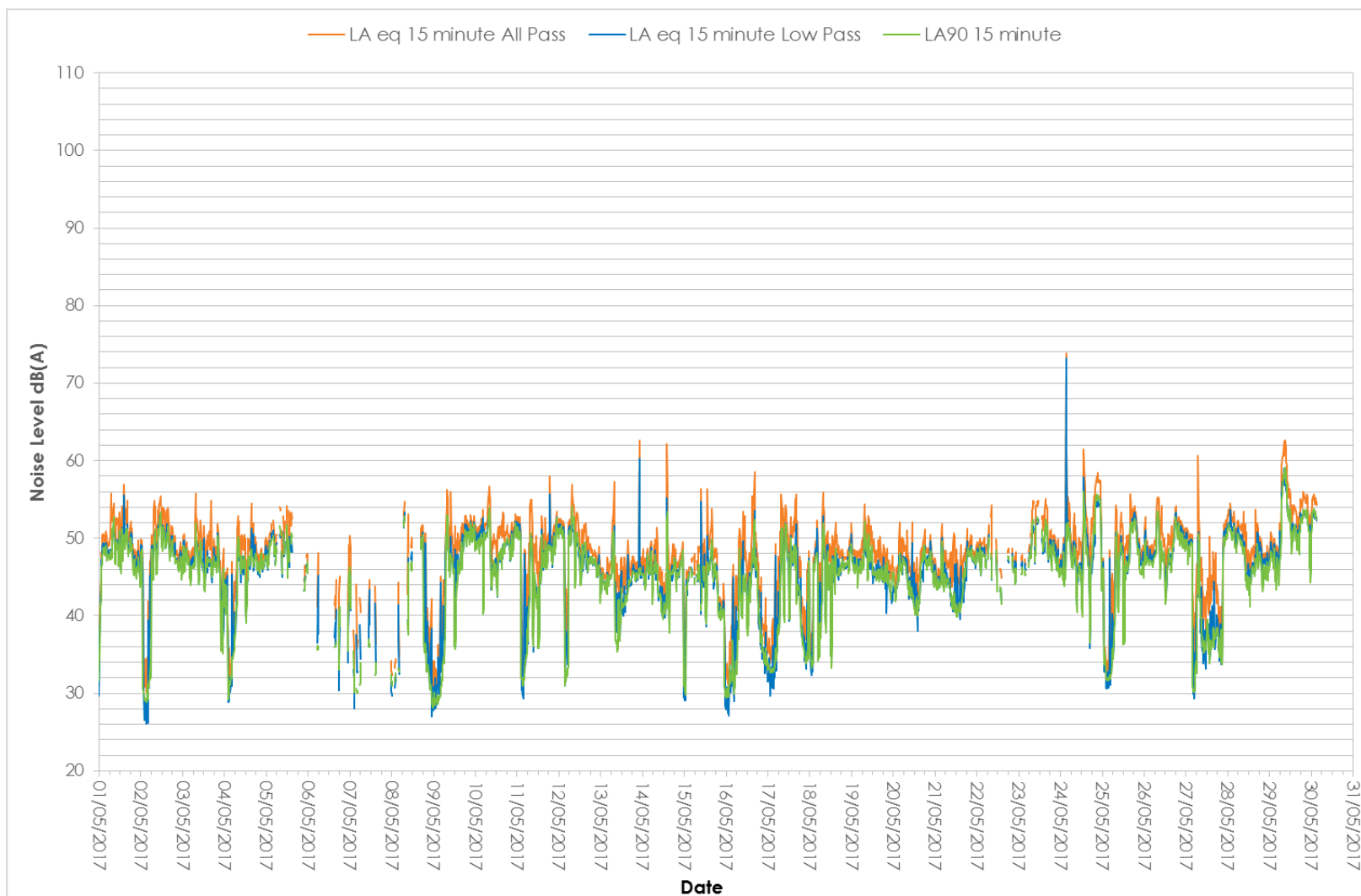


Figure 5-2: NMT3 Noise Monitoring Results – May 2017

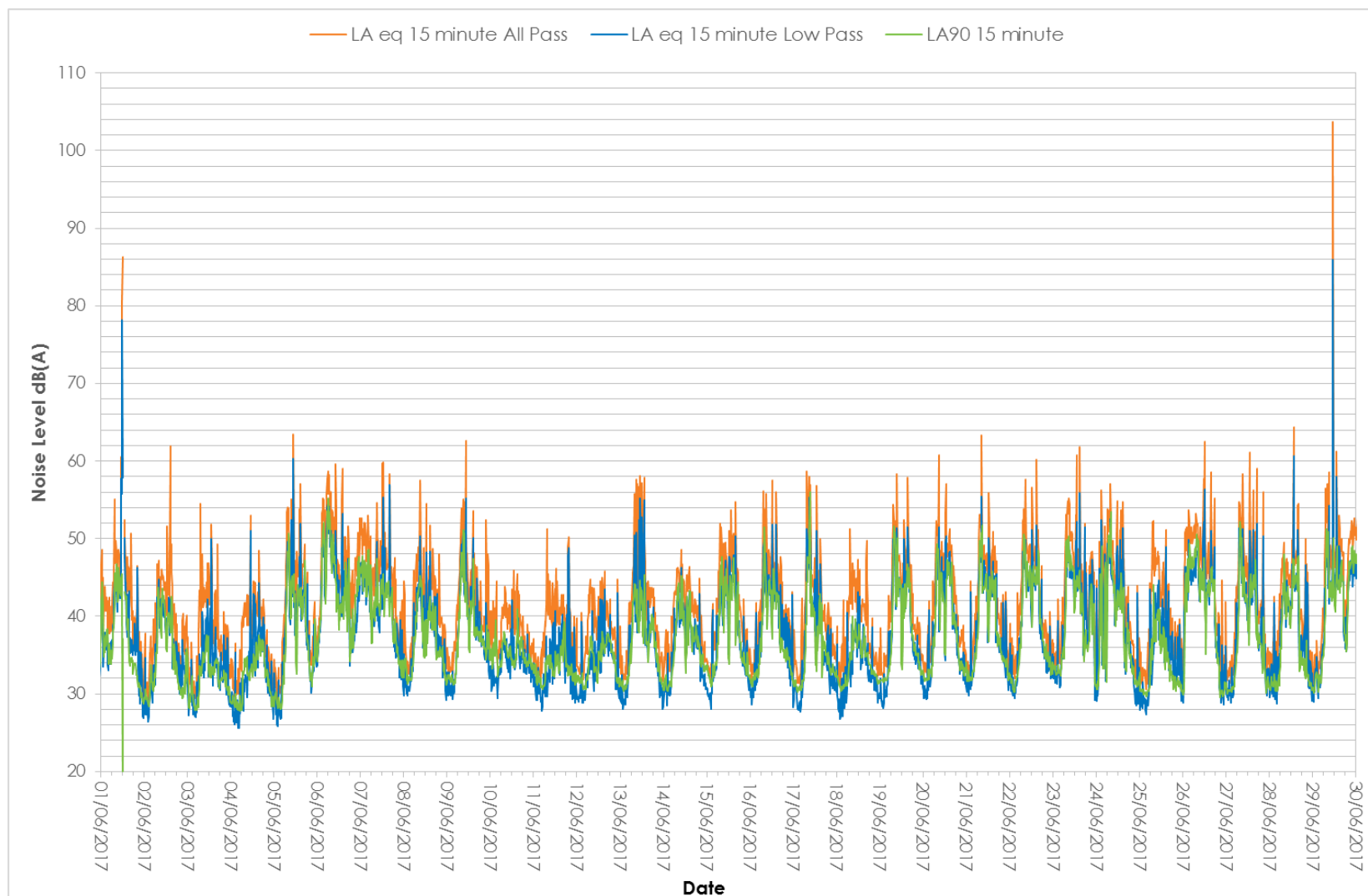


Figure 5-3: NMT3 Noise Monitoring Results – June 2017

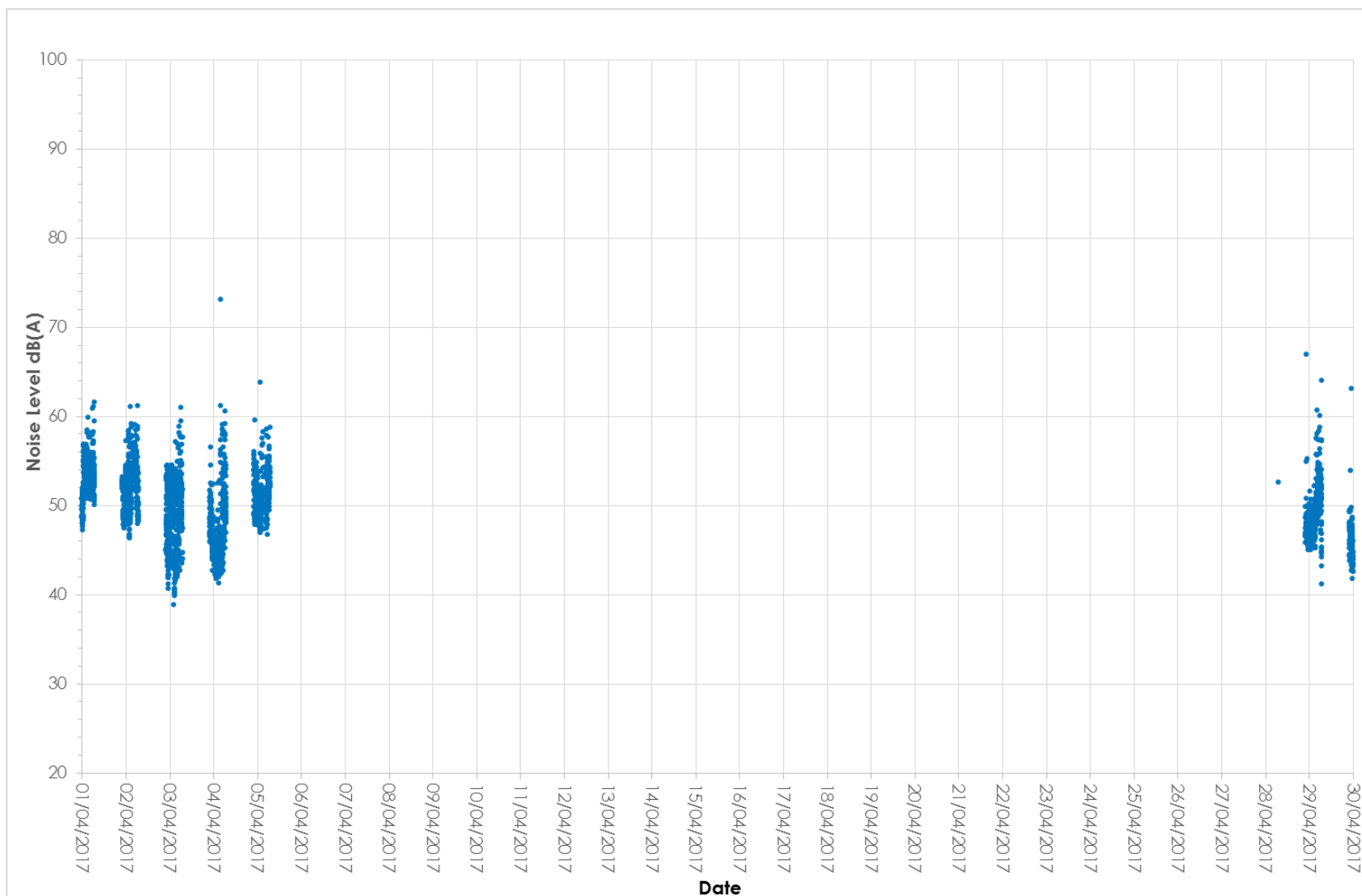


Figure 5-4: L_{1,15minute} (night time only) NMT3 Noise Monitoring Results – April 2017

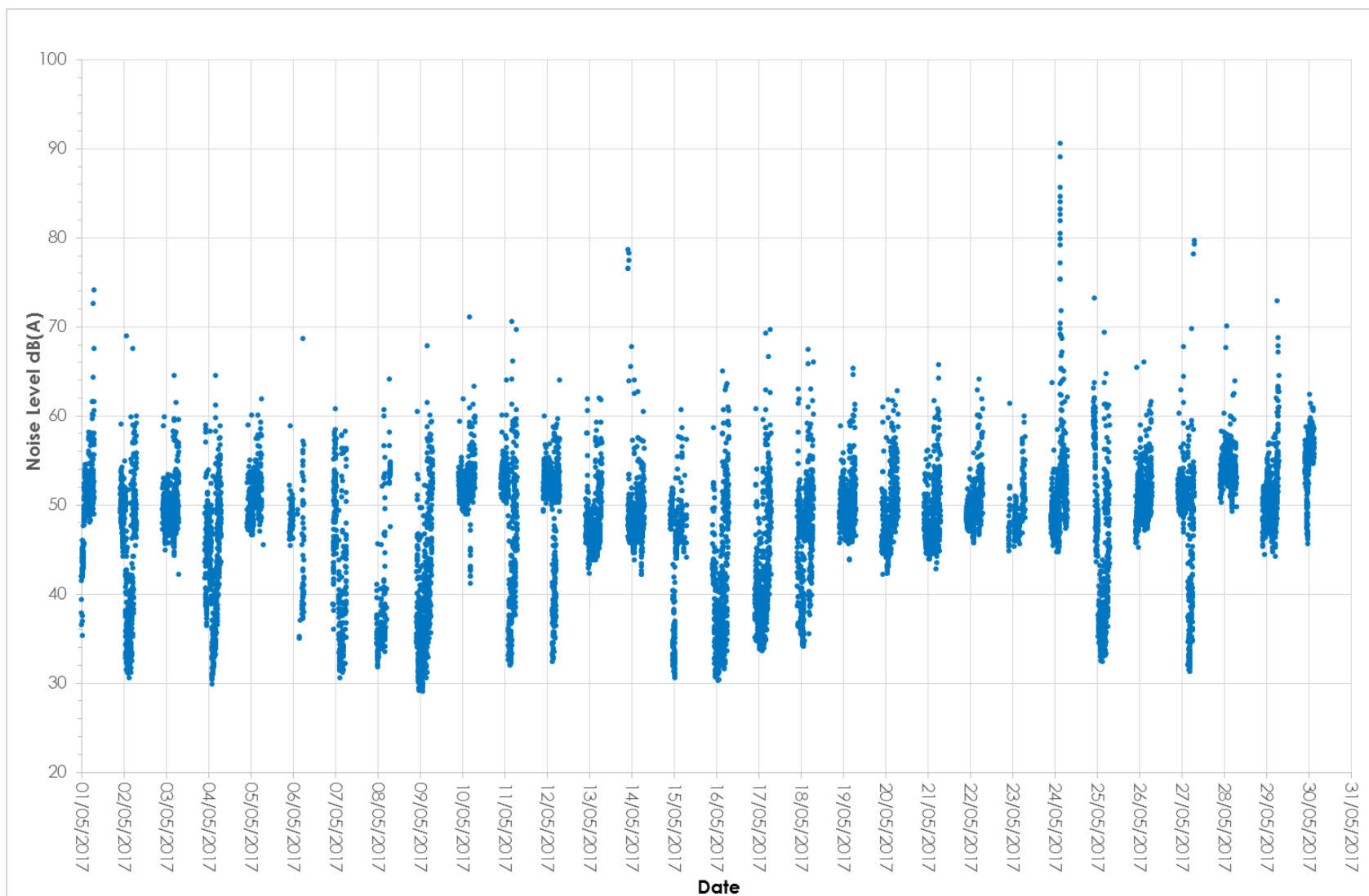


Figure 5-5: L_{1,15minute} (night time only) NMT3 Noise Monitoring Results – May 2017

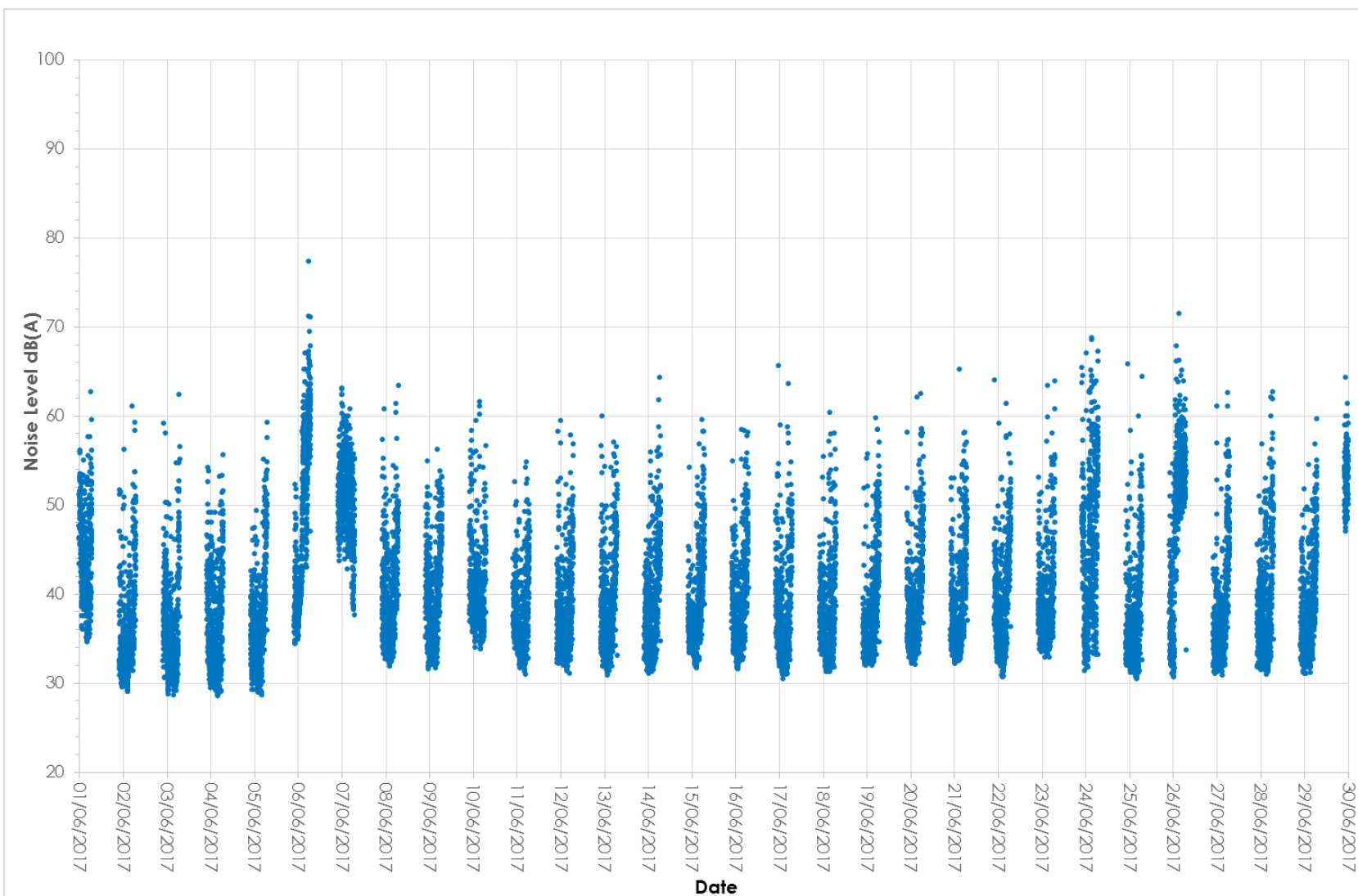


Figure 5-6: L_{1,15minute} (night time only) NMT3 Noise Monitoring Results – June 2017

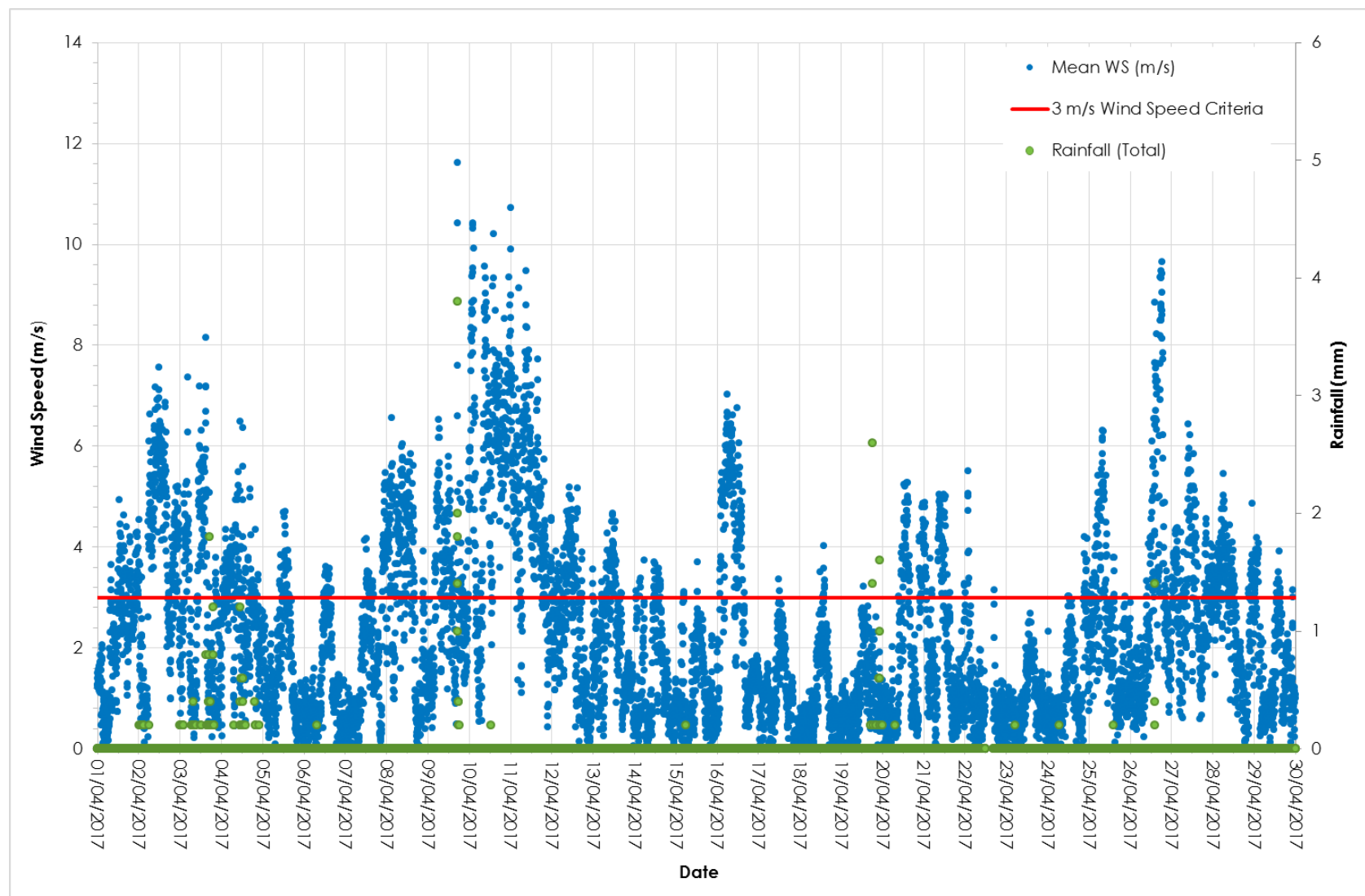


Figure 5-7: Wind Speed and Rainfall Monitoring Data – April 2017

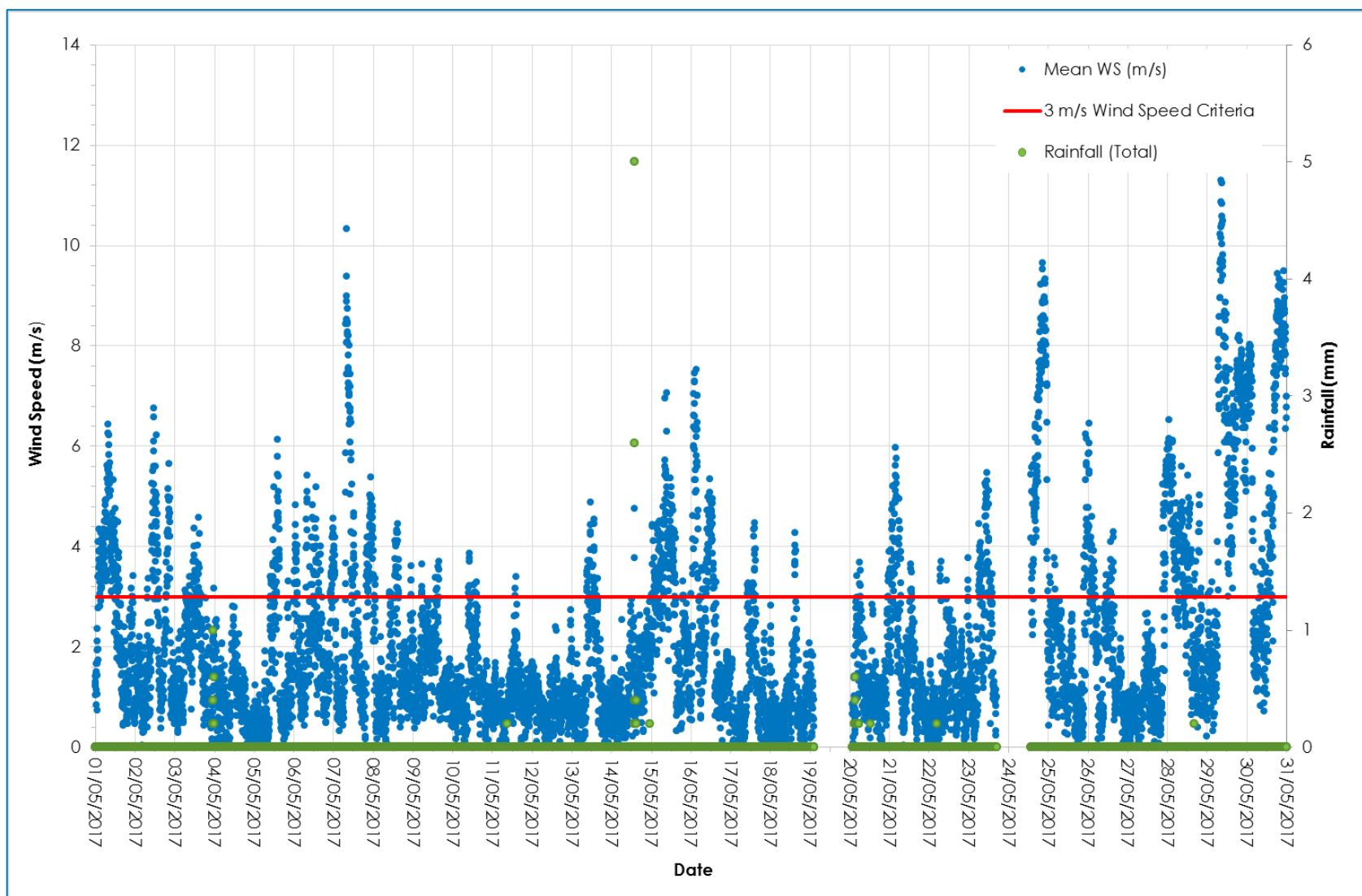


Figure 5-8: Wind Speed and Rainfall Monitoring Data – May 2017

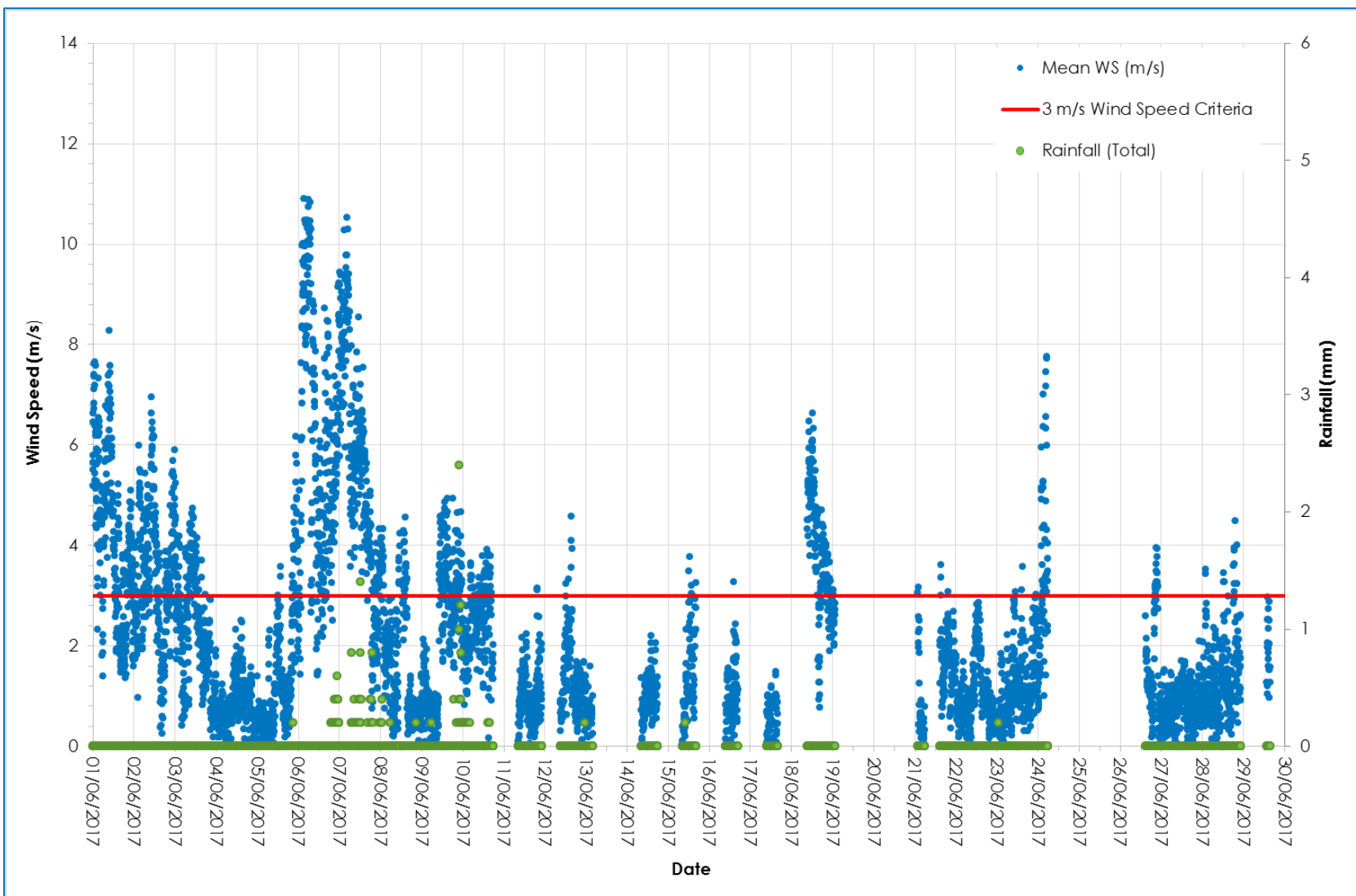


Figure 5-9: Wind Speed and Rainfall Monitoring Data – June 2017

5.2 Attended Noise Measurements and Rail Spur Noise

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 and adjacent the rail spur during the day, evening and night.

Attended noise monitoring was not carried out during this period.