

# WOLLONGONG COAL WONGAWILLI

## QUARTERLY AIR QUALITY AND NOISE MONITORING REPORT

### OCTOBER TO DECEMBER 2016

## 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 fourth quarter, October to December 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 <sub>10</sub> 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

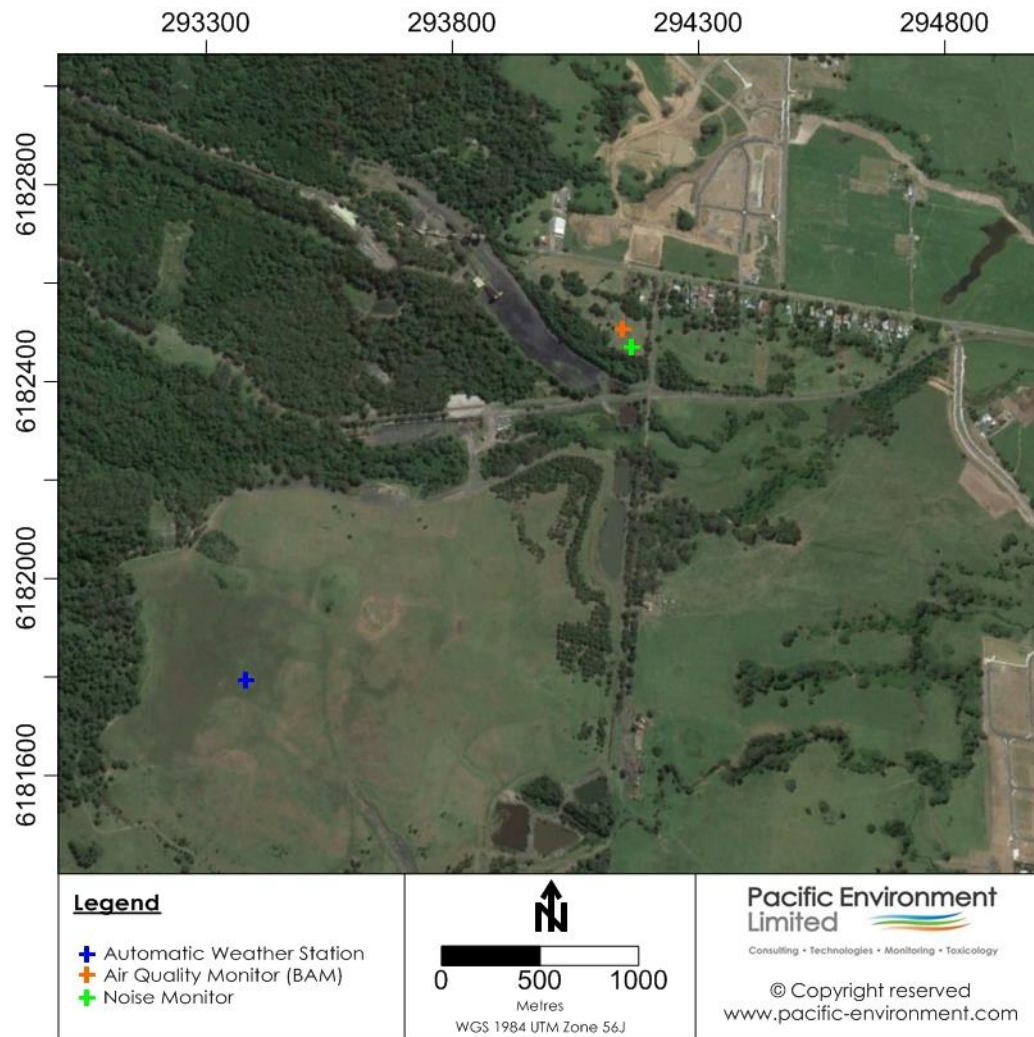


Figure 1-1: Monitoring Locations

## 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 <sub>10</sub> )	µg/m <sup>3</sup>	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 <sub>Aeq,15min</sub> dB(A)	15 min
	1 minute L <sub>A1</sub> noise level	L <sub>A1,1min</sub> dB(A)	1 min
	Period ambient continuous equivalent energy average noise level	L <sub>Aeq, period</sub> 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 <sup>a</sup>
Particulate Matter < 10 µm (PM <sub>10</sub> )	Annual	30 µg/m <sup>3</sup> <sup>(b)</sup>
Particulate Matter < 10 µm (PM <sub>10</sub> )	24 hour	50µg/m <sup>3</sup> <sup>(b)</sup>

- 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 <sub>Aeq</sub> (15mins)	L <sub>Aeq</sub> (15mins)	L <sub>Aeq</sub> (15mins)	L <sub>A1</sub> (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 <sub>Aeq</sub> (11hr)	L <sub>Aeq</sub> (4hr)	L <sub>Aeq</sub> (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 100% for all parameters (refer **Table 3-1**).

**Table 3-1: Valid data recovery rates - AWS**

Parameter	Valid Data Recovery Rate %
Wind Speed	100%
Wind Direction	100%
Temperature – 2 m	100%
Temperature – 10 m	100%
Pressure	100%

A summary of statistics for the data collected during July to September 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		19.6
Temperature (°C) – 2m		18.8
Barometric pressure (hPa)		1003.3
Wind Speed (m/s)	Median	2.5
Temperature (°C) – 10m		19.1
Temperature (°C) – 2m		18.3
Barometric pressure (hPa)		1003.8
Wind Speed (m/s)	Standard Deviation	2.1
Temperature (°C) – 10m		4.7
Temperature (°C) – 2m		5.2
Barometric pressure (hPa)		6.0
Rainfall (mm)	Quarterly Total	102
Calms	%	3.8

#### 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 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 3.8%.

#### 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 18.8°C. The lowest temperature was 11.5°C degrees recorded on 13 October and a maximum of 28.2°C was recorded 13 December.

#### 3.1.3 Rainfall

A plot of the daily rainfall over the three months period is shown in **Figure 3-3**. The station recorded 102.4 mm of rain in the quarter. The nearest Bureau of Meteorology site at Wollongong - Albion Park recorded 90.6 mm during the quarter. The highest rainfall recorded on site was on 15 December where 21 mm of rain was reported.

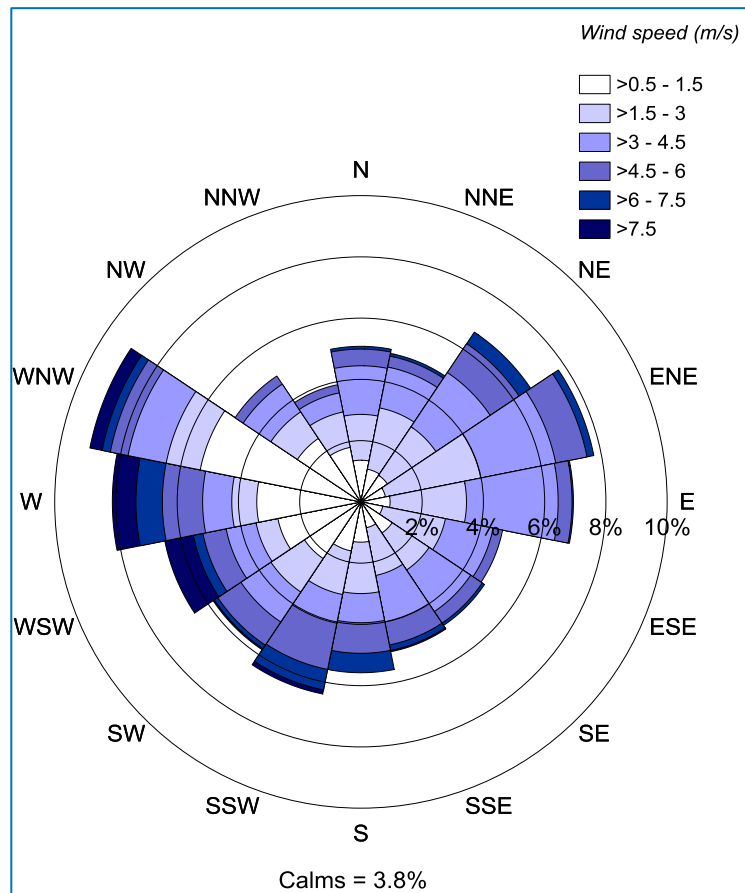


Figure 3-1: Windrose for Wongawilli Colliery – October to December 2016

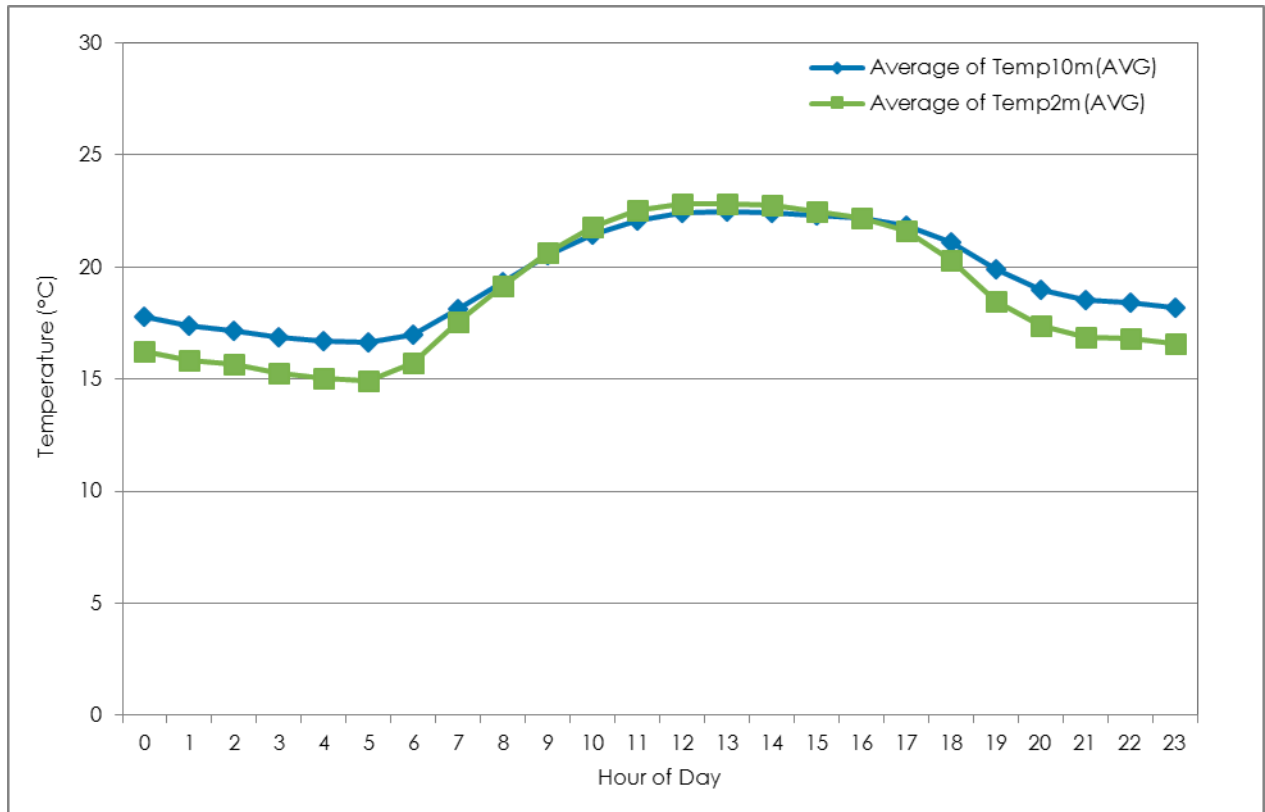


Figure 3-2: Hourly Average Temperature – October to December 2016

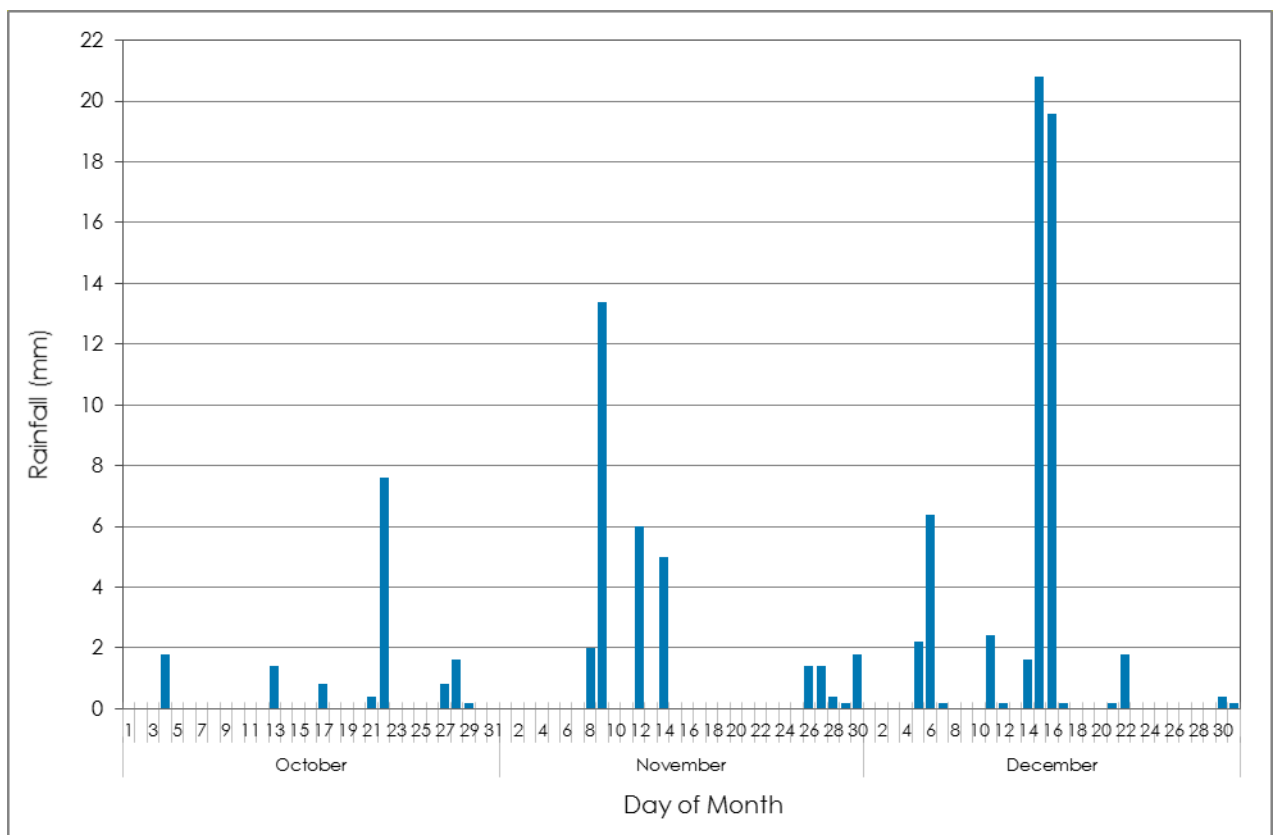


Figure 3-3: Daily Rainfall (October to December 2016)

## 4 PM<sub>10</sub> MONITORING RESULTS

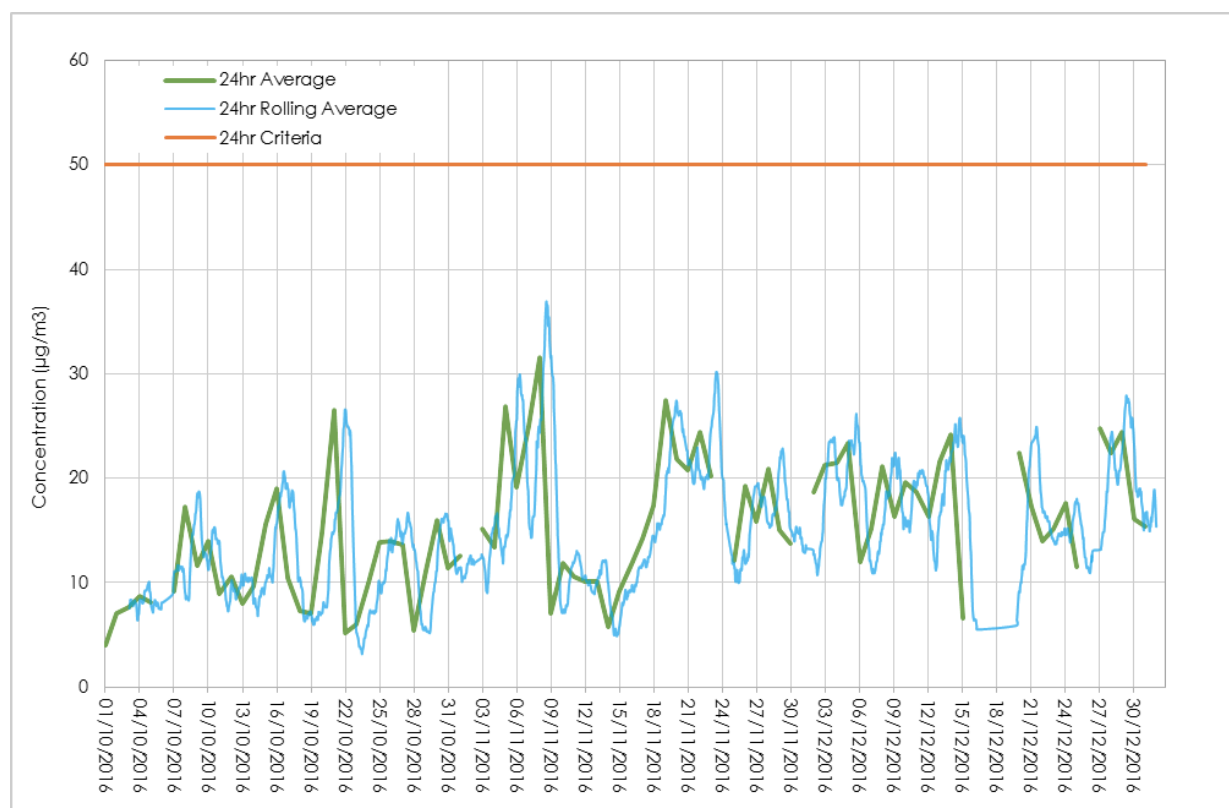
Continuous air quality particulate monitoring is carried out at the BAM monitoring station located near the site boundary (**Figure 1-1**). The monitor continuously measure airborne particulate matter from all sources.

The particle size ranges relevant to this report are described as PM<sub>10</sub> 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 October to December is provided in **Table 4-1**. The data recovery rate was 98%. There were no days over the criteria in the quarter.

**Table 4-1: Summary Statistics for 24 hour average PM<sub>10</sub> (µg/m<sup>3</sup>)**

Statistical measure	October 2016	November 2016	December 2016	Quarter 4 2016
Mean	11.5	16.1	16.4	14.5
Standard Deviation	5.2	6.5	5.3	6.1
Median	10.0	14.7	17.2	14.8
Minimum	4.1	5.7	2.9	2.9
Maximum	26.6	31.5	24.1	31.5
Days over the criteria	0	0	0	0



**Figure 3-1: PM<sub>10</sub> 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 carried out by Pacific Environment during this quarter, details of attended compliance monitoring and rail noise monitoring are included in a separate November noise compliance report.

### 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  $L_{A1,15 \text{ min}}$  Recovery Data Percentages July - September 16**

NMT3	Recovery Data (%)
October	100
November	78 <sup>1</sup>
December	0 <sup>1</sup>

Notes: 1. Equipment failure on November and December

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

- c)  $L_{eq \text{ AP}}$  - 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)  $L_{eq \text{ LP}}$  - The low-pass equivalent continuous energy average noise level. This is the same as the  $L_{eq \text{ AP}}$  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: October - December 2016 Noise Monitoring Average Summary, dB(A)**

NMT1	Day			Evening			Night		
	$L_{eq \text{ LP}}^1$	$L_{eq \text{ AP}}^2$	RBL <sup>3</sup>	$L_{eq \text{ LP}}$	$L_{eq \text{ AP}}$	RBL	$L_{eq \text{ LP}}$	$L_{eq \text{ AP}}$	RBL
October	58	61	36	51	55	35	51	55	34
November	46	50	36	41	47	34	43	46	33
December	-	-	-	-	-	-	-	-	-

Note: 1.  $L_{eq \text{ LP}}$  is the  $L_{eq}$  with a low pass filter applied at the 800Hz third octave band.  
 2.  $L_{eq \text{ AP}}$  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 **Error! Reference source not found..** 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  $L_{A1,15min}$  levels continuously at both locations. The  $L_{A1,15min}$  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: October – December 2016  $L_{A1,15minute}$  Noise Monitoring Summary, dB(A)**

NMT1	$L_{A1,15min}$ Maximum dB(A)	$L_{A1,15min}$ Average dB(A)	$L_{A1,15min} > 52$ dB(A) night time (%)
October	112.7	62.0	64%
November	94.7	59.8	70%
December	-	-	-

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 October - December 2016**

WTX	Exceedances (%)
October	54
November	36
December	34

Table 5-5: NMT3 October Daily Noise Monitoring Results

Date	Day			Evening			Night		
	Leq,11hr LP <sup>1</sup>	Leq,11hr AP	ABL <sup>2</sup>	Leq,4hr LP	Leq,4hr AP	ABL	Leq,9hr LP	Leq,9hr AP	ABL
1/10/2016	49	53	37	38	40	31			
2/10/2016	36	42	30	34	40	34	38	42	27
3/10/2016	42	46	35	54	58	38	35	41	28
4/10/2016	71	73	38	56	62	38	50	56	32
5/10/2016	53	56	40	59	62	35	59	63	40
6/10/2016	67	72	40	63	66	55	60	64	32
7/10/2016	52	55	43	48	50	41	62	65	54
8/10/2016	46	48	35	36	38	32	41	44	35
9/10/2016	48	51	35	41	43	34	41	46	36
10/10/2016	59	62	41	50	53	44	52	55	44
11/10/2016	51	55	41	48	51	41	45	49	36
12/10/2016	46	49	35	51	55	43	46	49	36
13/10/2016	46	49	39	42	44	41	41	45	31
14/10/2016	43	45	35	41	44	34	45	47	41
15/10/2016	43	46	35	39	42	32	41	45	36
16/10/2016	42	47	34	38	41	31	38	43	34
17/10/2016	48	51	41	40	43	36	44	48	28
18/10/2016	59	64	36	38	41	32	46	50	34
19/10/2016	44	47	38	38	40	35	40	44	32
20/10/2016	46	50	37	37	40	35	41	45	36
21/10/2016	46	51	32	37	39	32	39	43	28
22/10/2016	43	47	33	42	46	33	43	45	31
23/10/2016	41	45	35	33	38	28	41	46	33
24/10/2016	45	49	38	40	42	37	39	43	27
25/10/2016	46	50	36	41	44	37	39	44	35
26/10/2016	45	49	35	40	42	37	42	44	36
27/10/2016	47	51	36	35	38	33	41	47	33
28/10/2016	46	49	35	36	38	34	37	41	32
29/10/2016	44	49	36	37	41	35	37	41	34
30/10/2016	39	44	35	36	40	35	36	40	33
31/10/2016	44	47	36	36	38	31	39	43	
Log Avg	58	61	38	51	55	41	51	55	41
Median	46	49	36	40	42	35	41	45	34
Max	71	73	43	63	66	55	62	65	54
Min	36	42	30	33	38	28	35	40	27

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

2. ABL is the Assessment Background Level and represents the lowest tenth percentile L<sub>90</sub> measured during the period.

Table 5-6: NMT3 November Daily Noise Monitoring Results

Date	Day			Evening			Night		
	Leq,11hr LP <sup>1</sup>	Leq,11hr AP	ABL <sup>2</sup>	Leq,4hr LP	Leq,4hr AP	ABL	Leq,9hr LP	Leq,9hr AP	ABL
1/11/2016	44	48	36	39	41	34	40	44	36
2/11/2016	45	50	37	36	40	32	40	43	37
3/11/2016	45	48	37	42	46	35	40	44	30
4/11/2016	46	49	37	39	42	35	39	44	37
5/11/2016	48	52	38	48	52	37	39	43	36
6/11/2016	40	44	36	37	39	34	44	48	32
7/11/2016	48	52	35	35	43	31	38	42	34
8/11/2016	46	50	38	38	42	33	40	44	33
9/11/2016	45	49	37	36	43	30	45	47	33
10/11/2016	45	50	35	32	43	30	34	40	27
11/11/2016	51	53	34	34	43	32	39	44	26
12/11/2016	38	43	34	42	47	34	34	44	29
13/11/2016	44	47	33	40	43	32	41	44	32
14/11/2016	46	53	36	48	50	38	46	48	43
15/11/2016	46	50	35	39	41	31	50	51	43
16/11/2016	46	50	36	34	40	34	39	43	30
17/11/2016	45	50	37	37	47	35	41	45	35
18/11/2016	45	49	34	37	48	35	41	44	36
19/11/2016	45	49	34	37	40	33	38	43	33
20/11/2016	38	43	33	34	52	31	33	40	31
21/11/2016	47	51	36	40	50	37	38	43	29
22/11/2016	44	48	35	40	52	35	38	43	35
23/11/2016	45	49	41	40	43	39	48	49	36
24/11/2016	50	53					48	49	33
25/11/2016									
26/11/2016									
27/11/2016									
28/11/2016									
29/11/2016									
30/11/2016									
Log Avg	46	50	36	41	47	34	43	46	36
Median	45	49	36	38	43	34	40	44	33
Max	51	53	41	48	52	39	50	51	43
Min	38	43	33	32	39	30	33	40	26

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

2. ABL is the Assessment Background Level and represents the lowest tenth percentile L<sub>90</sub> measured during the period.

3. - Monitor offline due to instrument problems.

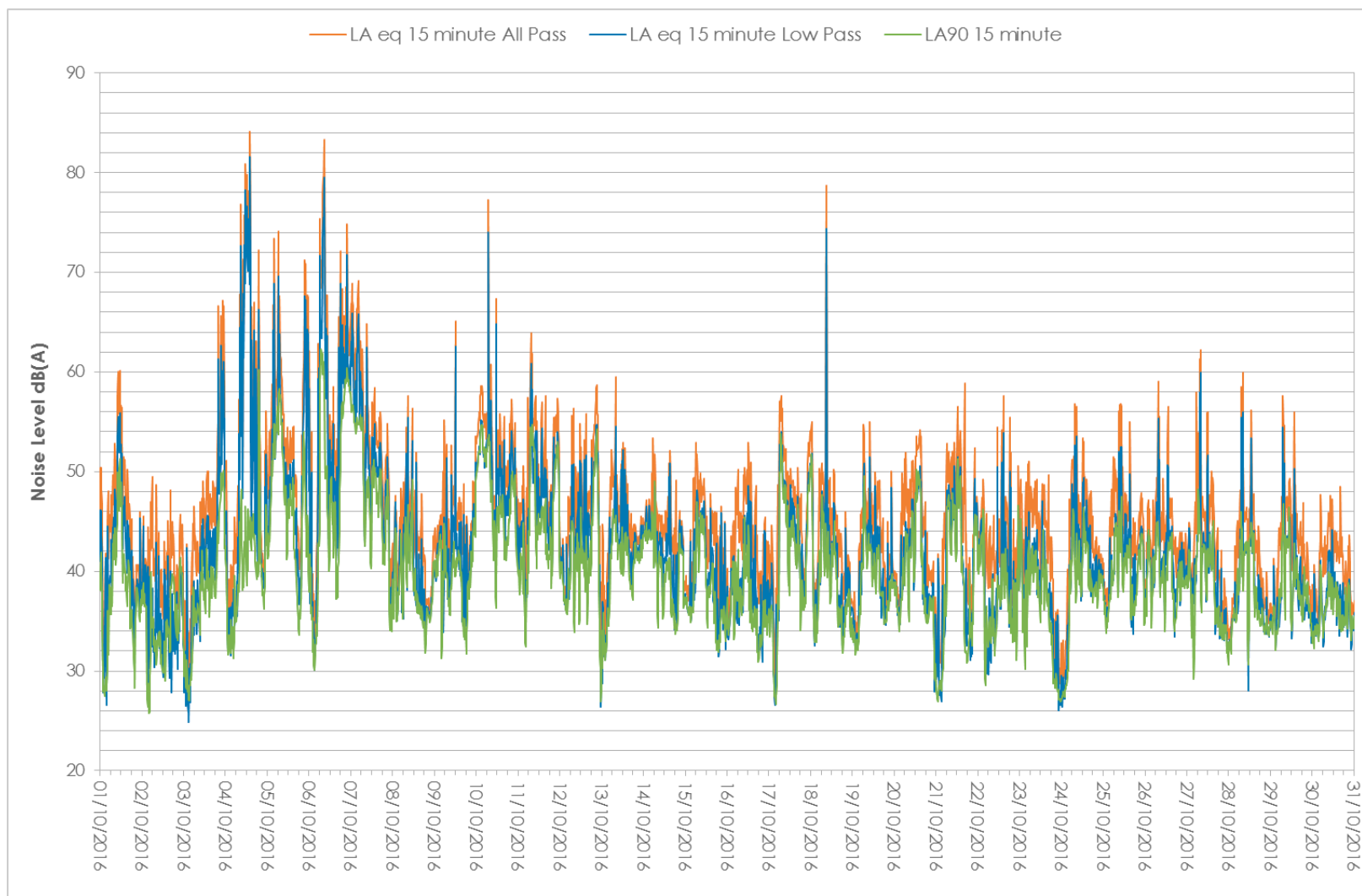


Figure 5-1: NMT3 Noise Monitoring Results – October 2016

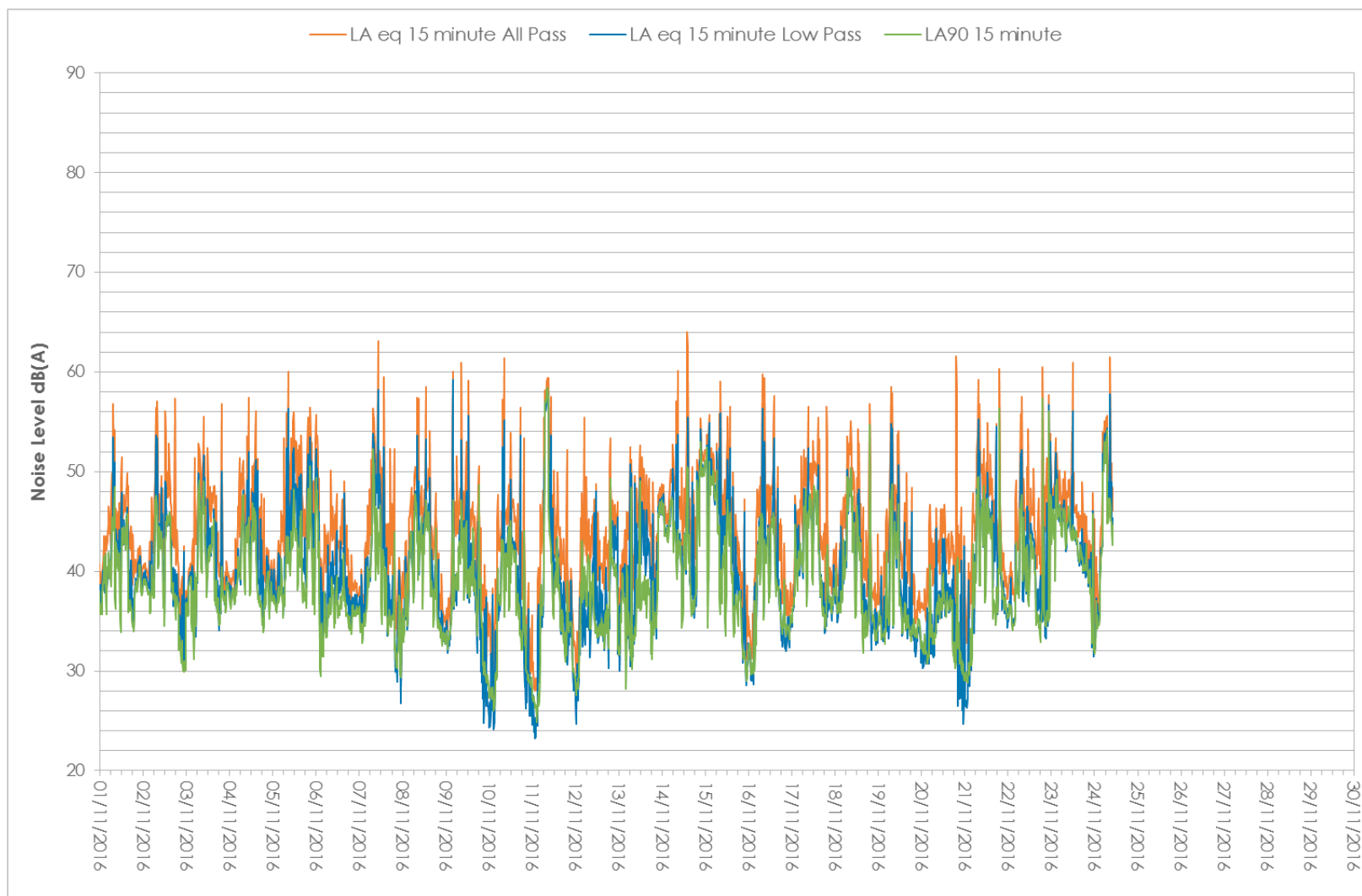
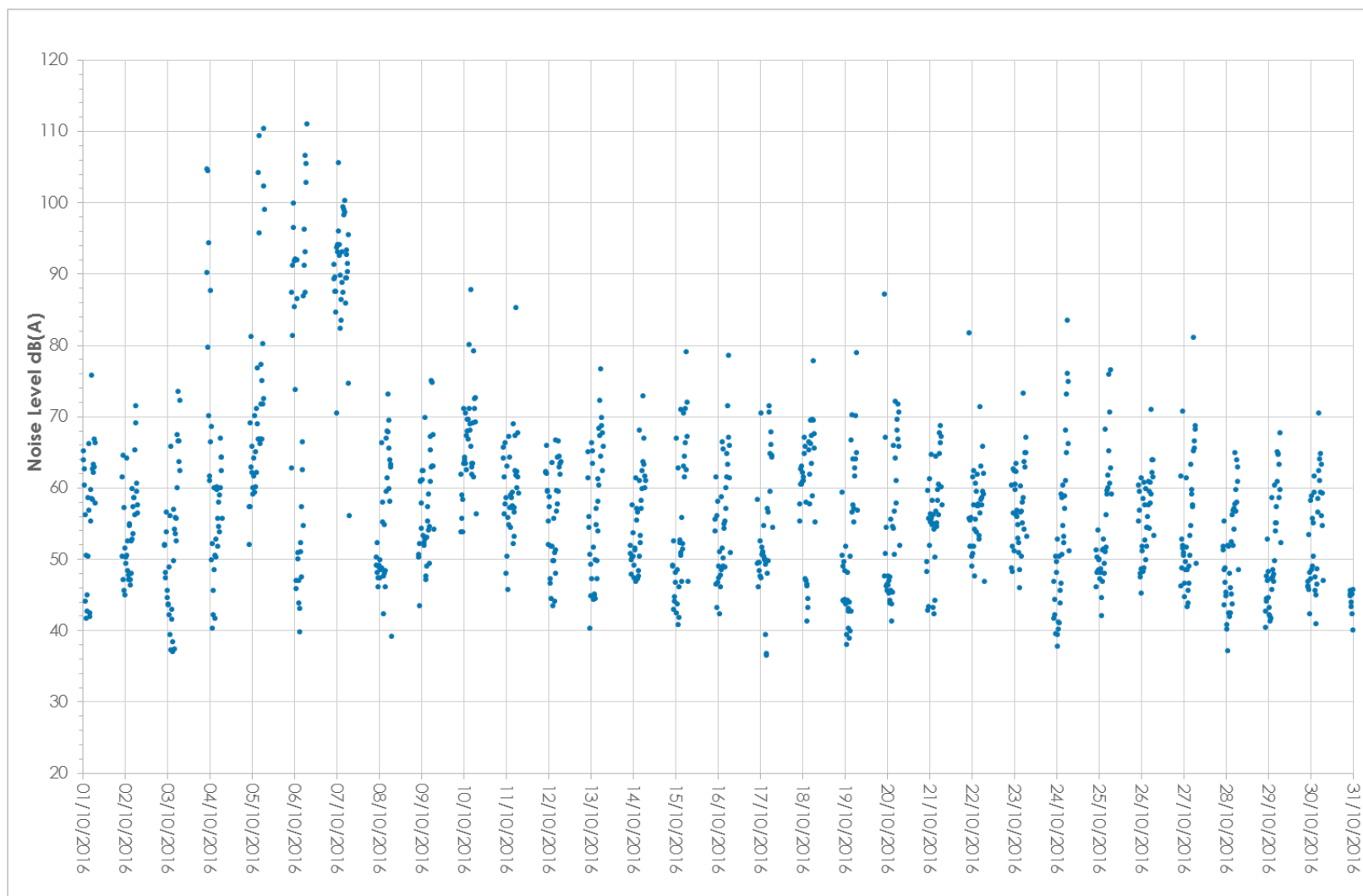
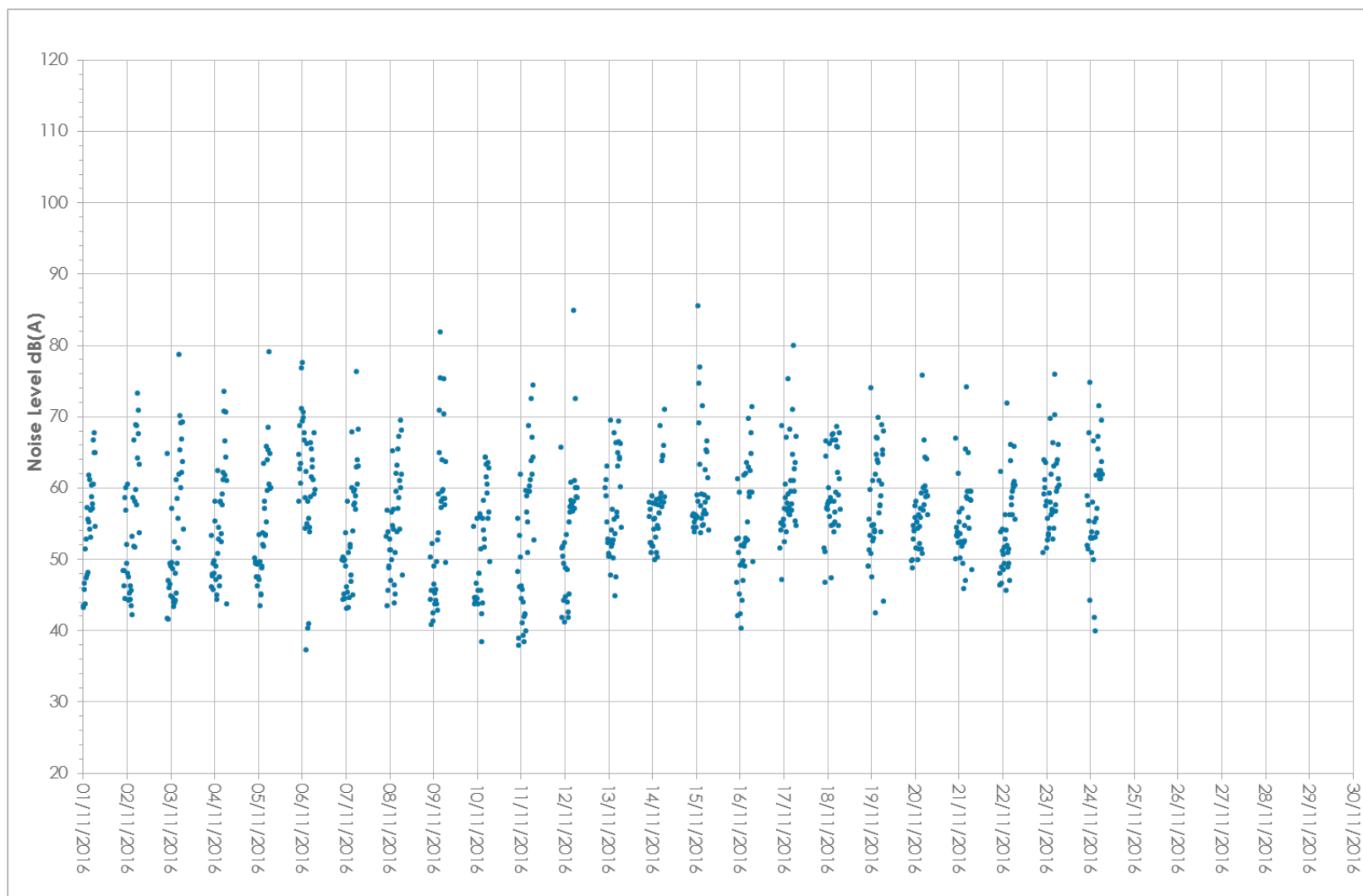


Figure 5-2: NMT3 Noise Monitoring Results – November 2016



**Figure 5-3: L<sub>1,15minute</sub> (night time only) NMT3 Noise Monitoring Results – October 2016**



**Figure 5-4: L<sub>1,15minute</sub> (night time only) NMT3 Noise Monitoring Results – November 2016**



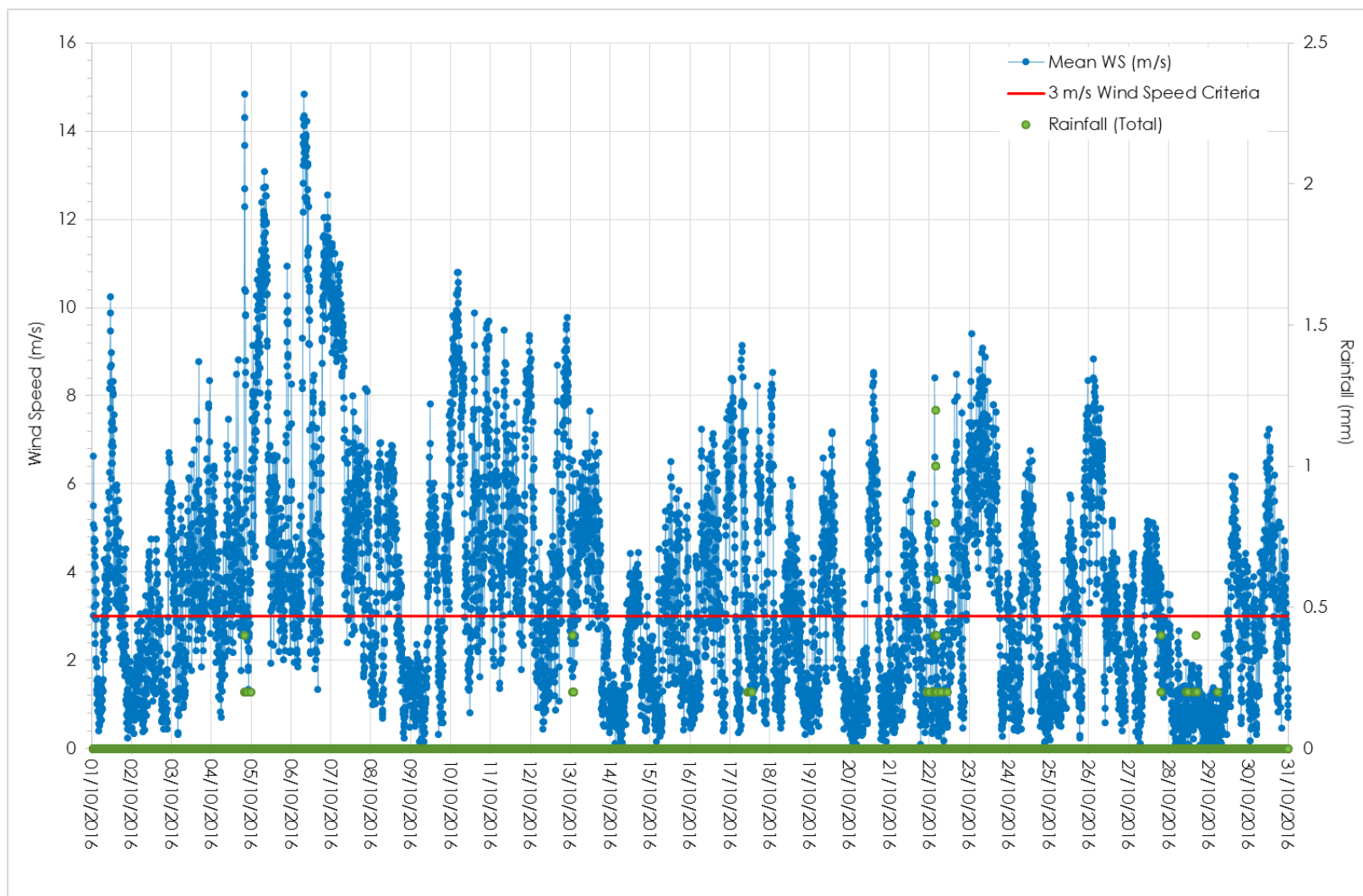


Figure 5-5: Wind Speed and Rainfall Monitoring Data – October 2016

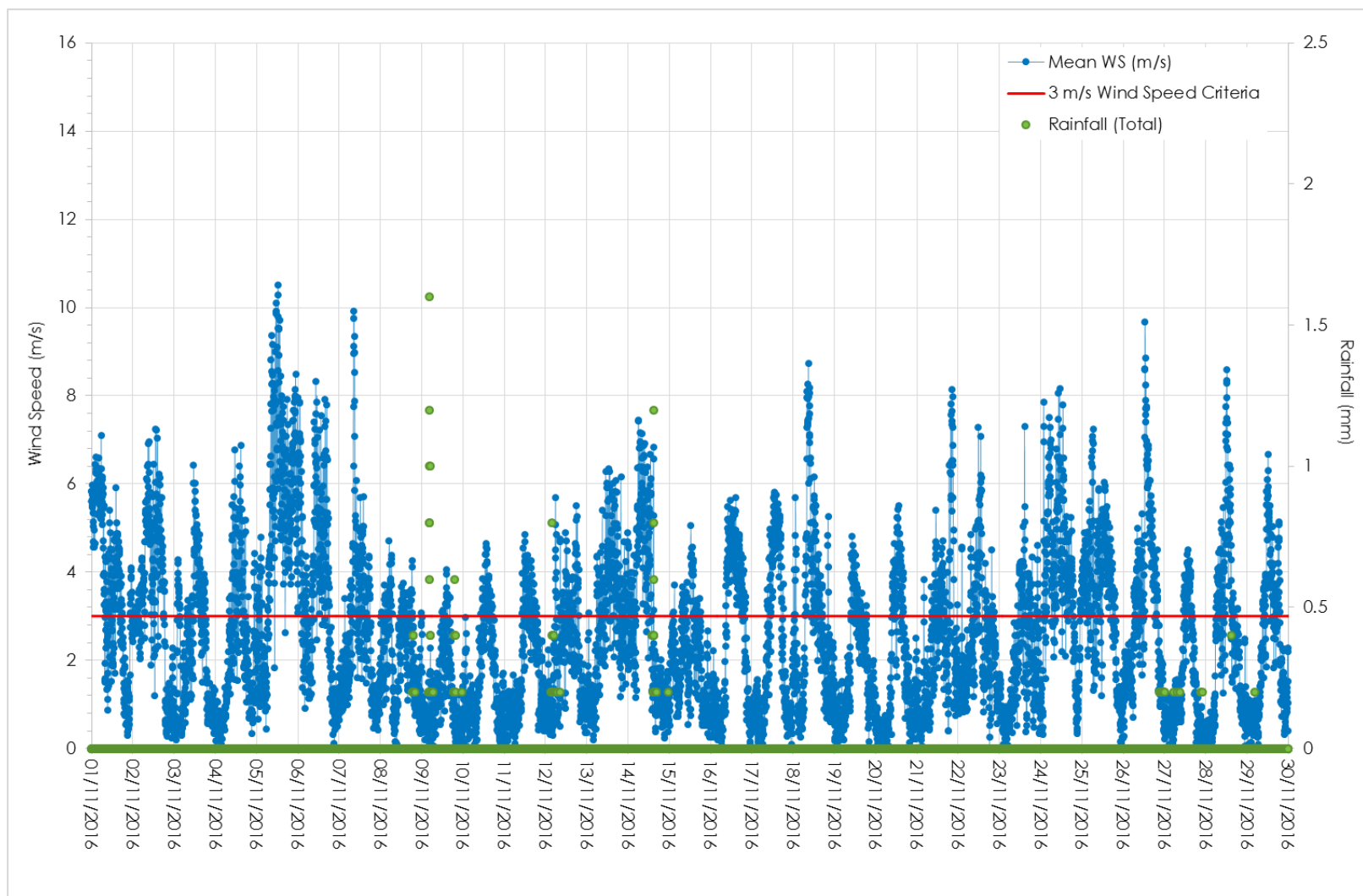


Figure 5-6: Wind Speed and Rainfall Monitoring Data – November 2016

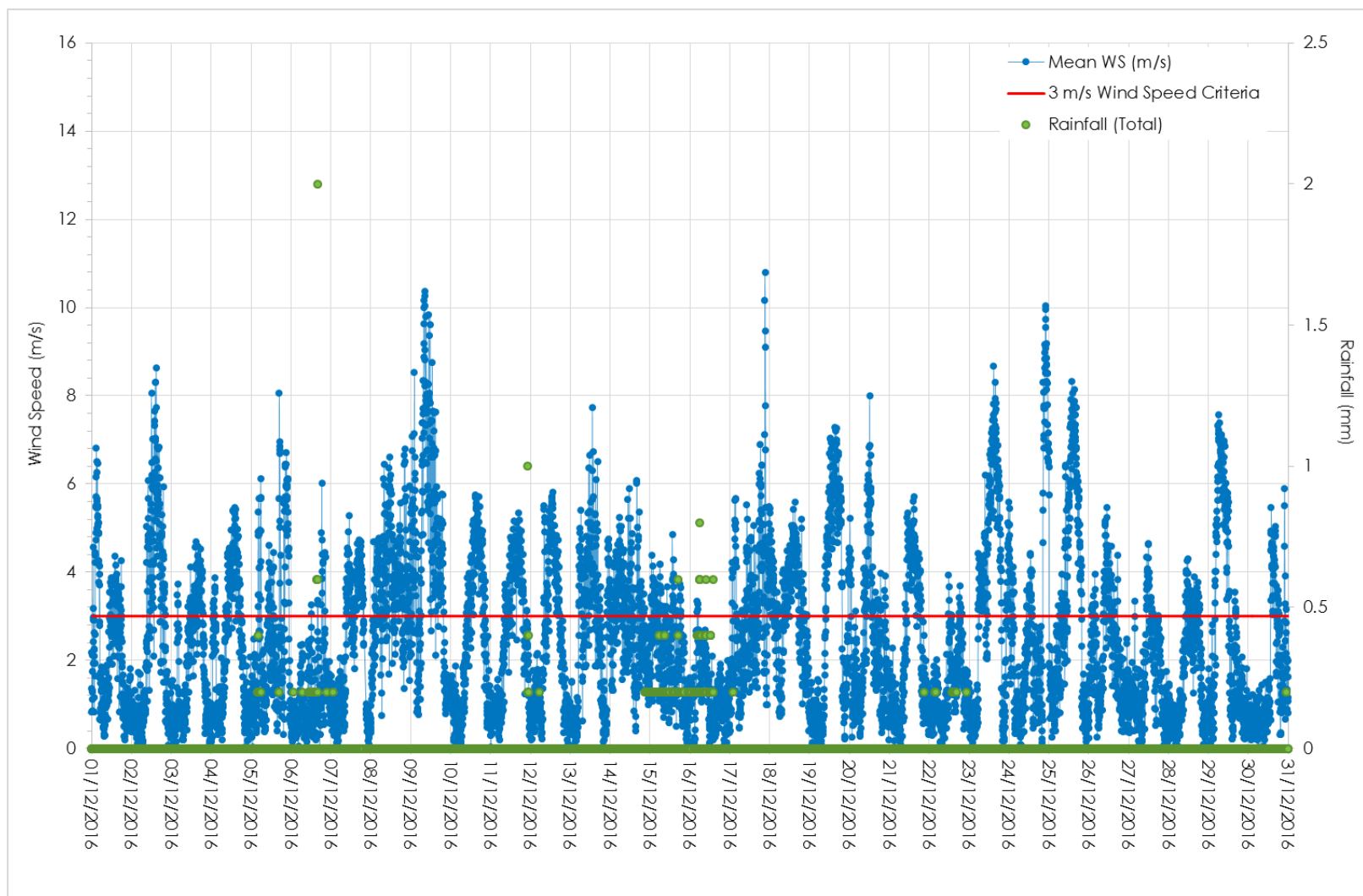


Figure 5-7: Wind Speed and Rainfall Monitoring Data – December 2016

## **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 carried out in November 2016, results of this monitoring are included in a separate noise compliance report.