



Wollongong Coal Wongawilli Colliery

Quarterly Air Quality and Noise Monitoring Report (July to September 2017)

19 February 2019

Project No.: 0478793

Document details	The details entered below are automatically shown on the cover and the main page footer. PLEASE NOTE: This table must NOT be removed from this document.
Document title	Wollongong Coal Wongawilli Colliery
Document subtitle	Quarterly Air Quality and Noise Monitoring Report (July to September 2017)
Project No.	0478793
Date	19 February 2019
Version	1.0
Author	Tajwar Dar, Russ Francis
Client Name	Wollongong Coal Ltd

Document history

Version	Revision	Author	Reviewed by	ERM approval to issue		Comments
				Name	Date	
Draft	01	Tajwar Dar	Russ Francis Aaron McKenzie	Damon Roddie	19.12.2018	First draft
Report	01	Tajwar Dar	Aaron McKenzie	Damon Roddie	05.02.2019	
Report	02		Aaron McKenzie		19.02.2019	Footnote added

Signature Page

19 February 2019

Wollongong Coal Wongawilli Colliery Colliery

Quarterly Air Quality and Noise Monitoring Report (July to September 2017)

Aaron McKenzie
Principal Consultant

Damon Roddis
Partner

ERM Australia Pacific Pty Ltd
Level 15, 309 Kent Street
Sydney NSW 2000
Australia

© Copyright 2019 by ERM Worldwide Group Ltd and / or its affiliates ("ERM").
All rights reserved. No part of this work may be reproduced or transmitted in any form,
or by any means, without the prior written permission of ERM

CONTENTS

1	INTRODUCTION	5
2	PROJECT ENVIRONMENTAL CONDITIONS.....	6
2.1	Monitoring Requirements.....	6
2.2	Air Quality	7
2.3	Noise	8
3	METEOROLOGICAL MONITORING RESULTS	9
3.1	Wind data.....	9
3.2	Temperature	10
3.3	Rainfall.....	10
4	PM₁₀ MONITORING RESULTS.....	12
4.1	Continuous Air Quality Particulate Monitoring.....	12
5	NOISE MONITORING RESULTS	13
5.1	Unattended Noise Measurements	13
5.2	Unattended Noise Monitoring Graphs.....	18
5.3	Attended Noise Measurements.....	25

List of Tables

Table 1.1: Monitoring Network	5
Table 2.1: Monitoring Summary	7
Table 2.2: Project Air Quality Criteria.....	7
Table 2.3: Noise Criteria dB(A) – Medium term intrusive noise limits as defined in Table 4.3 of the Noise Management Plan.....	8
Table 2.4: Noise Criteria dB(A) – Amenity Noise Limits as defined in Table 4 of the Project Approval.	8
Table 3.1: Valid Data Recovery Rates - AWS	9
Table 3.2: Summary Statistics	9
Table 4.1: Summary Statistics for 24 hour PM ₁₀ (µg/m ³)	12
Table 5.1: Third Quarter Noise Monitoring Summary, dB(A)	14
Table 5.2: July- September 2017 L _{A1,15minute} Noise Monitoring Summary, dB(A).....	14
Table 5.3: Wind Speed Exceedances Percentages July - September 2017	14
Table 5.4: NMT3 Daily Noise Monitoring Results – July 2017.....	15
Table 5.5: NMT3 Daily Noise Monitoring Results – August 2017	16
Table 5.6: NMT3 Daily Noise Monitoring Results – September 2017	17

List of Figures

Figure 1.1: Monitoring Locations.....	6
Figure 3.1: Windrose for Russell Vale Colliery July to September 2017	10
Figure 3.2: Hourly Average Temperature at 2m and 10m	11
Figure 3.3: Daily Rainfall.....	11
Figure 4.1: PM ₁₀ Monitoring Data.....	13
Figure 5.1: NMT3 Noise Monitoring Results – July 2017	18
Figure 5.2: NMT3 Noise Monitoring Results – August 2017.....	19
Figure 5.3: NMT3 Noise Monitoring Results – September 2017	20
Figure 5.4: L _{1,15minute} (night time only) NMT3 Noise Monitoring Results – July 2017	21
Figure 5.5: L _{1,15minute} (night time only) NMT3 Noise Monitoring Results – August 2017	22
Figure 5.6: L _{1,15minute} (night time only) NMT3 Noise Monitoring Results – September 2017.....	23
Figure 5.7: Wind Speed and Rainfall Monitoring Data.....	24

1 INTRODUCTION

Environmental Resource Management (ERM) 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 third quarter, July to September 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 PM10 Monitor	BAM	Jersey Farm Road	294129	6182474
Meteorological Station	AWS	Near water tanks on ridge line	306297	6195791
Continuous Noise Monitor	NMT 3	Jersey Farm Road	294137	6182448

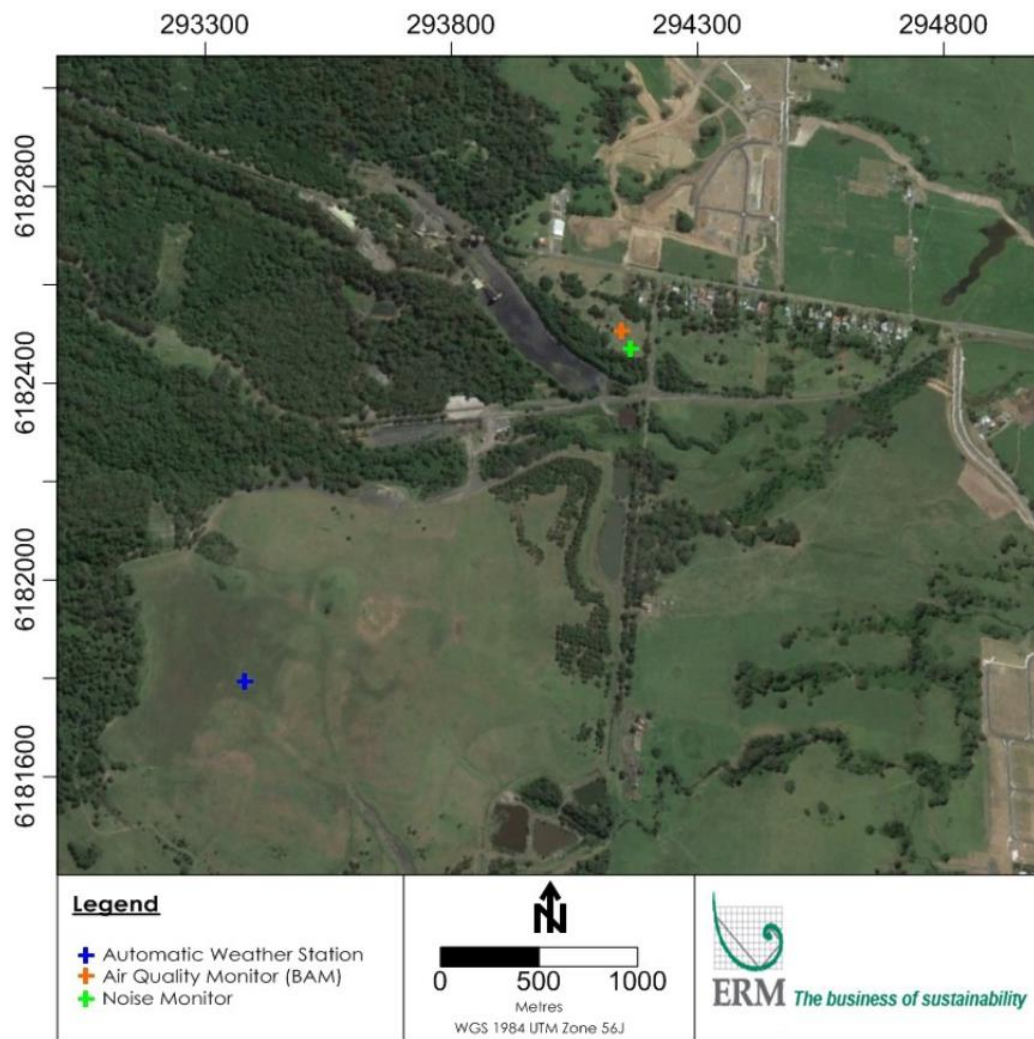


Figure 1.1: Monitoring Locations

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	LAeq,15min dB(A)	15 min
	1 minute LA1 noise level	LA1,1min dB(A)	1 min
	Period ambient continuous equivalent energy average noise level	LAeq, 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 third quarter of 2017 is provided in the following sections. The valid data recovery rate was 59% for all parameters (refer **Table 3.1**).

Table 3.1: Valid Data Recovery Rates - AWS

Parameter	Valid Data Recovery Rate %
Wind Speed	59%
Wind Direction	59%
Temperature – 2 m	59%
Temperature – 10 m	59%
Relative Humidity	No data available
Pressure	
Solar Radiation	

A summary of statistics for the data collected during the reporting period are shown in **Table 3.2**.

Table 3.2: Summary Statistics

Parameter (units)	Statistical measure	Value
Wind Speed (m/s)	Mean	3.7
Temperature (°C) – 10m		15.5
Temperature (°C) – 2m		14.7
Barometric pressure (hPa)		-
Wind Speed (m/s)	Median	3.3
Temperature (°C) – 10m		14.6
Temperature (°C) – 2m		14.1
Barometric pressure (hPa)		-
Wind Speed (m/s)	Standard Deviation	2.4
Temperature (°C) – 10m		4.7
Temperature (°C) – 2m		5.4
Barometric pressure (hPa)		-
Rainfall (mm)	Quarterly Total	23.4
Calms	%	2.3

3.1 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 North East were dominant.

The average wind speed for the period was 3.7 m/s and the percentage occurrence of calm wind conditions (less than or equal to 0.5 m/s) was approximately 2.3%.

3.2 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 11.9°C, and a maximum daily average of 30.9°C was recorded on 23 September 2017.

3.3 Rainfall

A plot of the daily average rainfall is shown in **Figure 3.3**. The station recorded 23.4 mm of rain for the quarter.

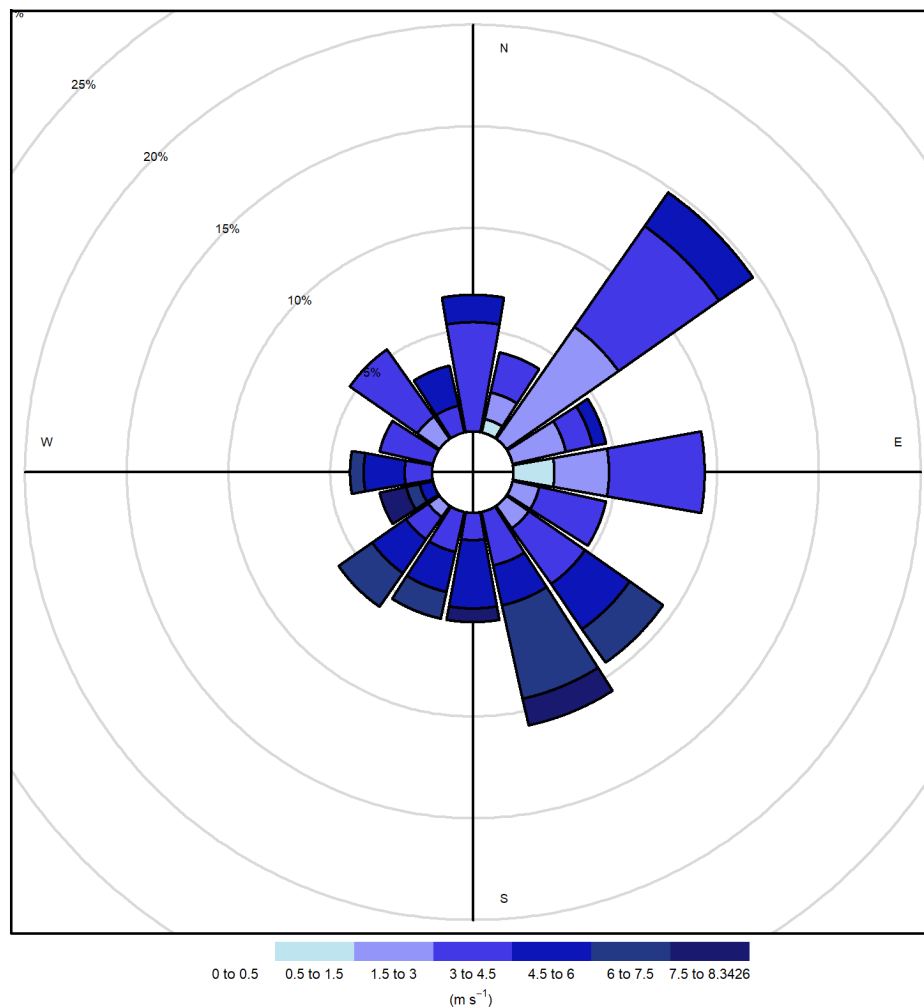


Figure 3.1: Windrose for Russell Vale Colliery July to September 2017

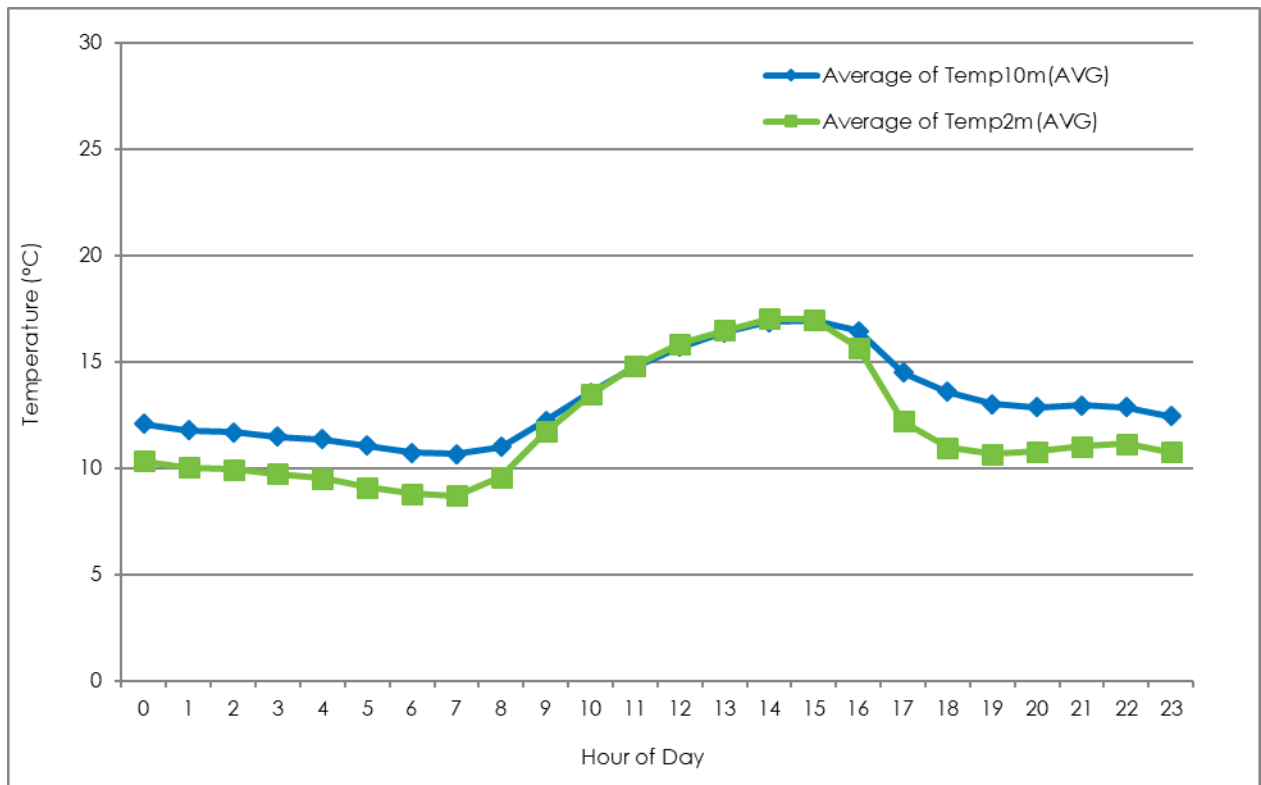


Figure 3.2: Hourly Average Temperature at 2m and 10m

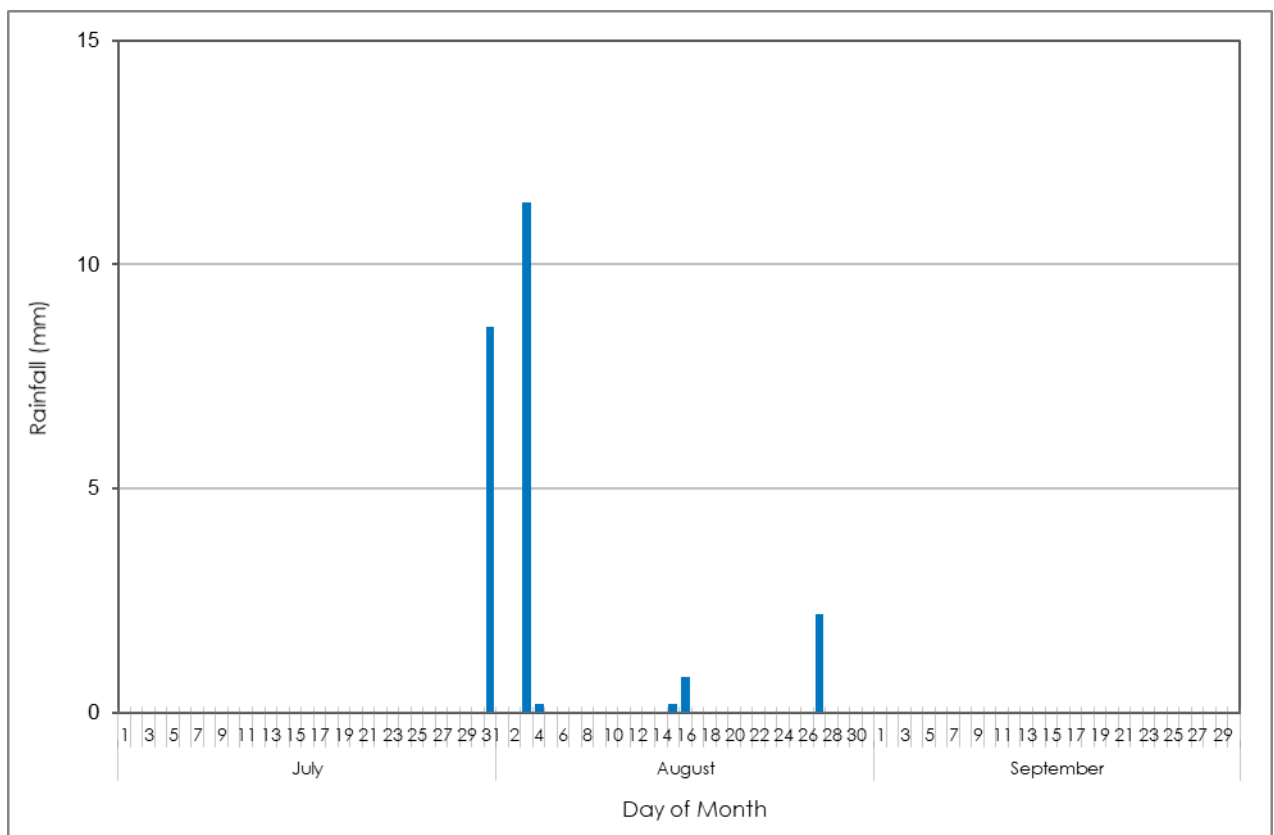


Figure 3.3: Daily Rainfall

4 PM₁₀ MONITORING RESULTS

4.1 Continuous Air Quality Particulate Monitoring

Continuous air quality particulate monitoring is carried out at a BAM monitoring stations located on or near the site boundary (**Figure 1.1**). The monitors 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 with a unit density.

A statistical summary of the monitoring data collected during the third quarter of 2017 is provided in **Table 4.1**. The data recovery rate (for 24-hour average) was 68%. The 24-hour PM₁₀ concentrations are presented in **Figure 4.1** for the BAM.

Table 4.1: Summary Statistics for 24 hour PM₁₀ (µg/m³)

Statistical measure	July	August	September	Q3
Mean	8.0	8.0	16.4	11.2
Standard Deviation	3.7	2.2	7.3	6.5
Median	6.8	7.4	14.5	8.1
Minimum	4.4	4.8	6.2	4.4
Maximum	19.1	12.8	33.3	33.3
Days over the criteria	0	0	0	0

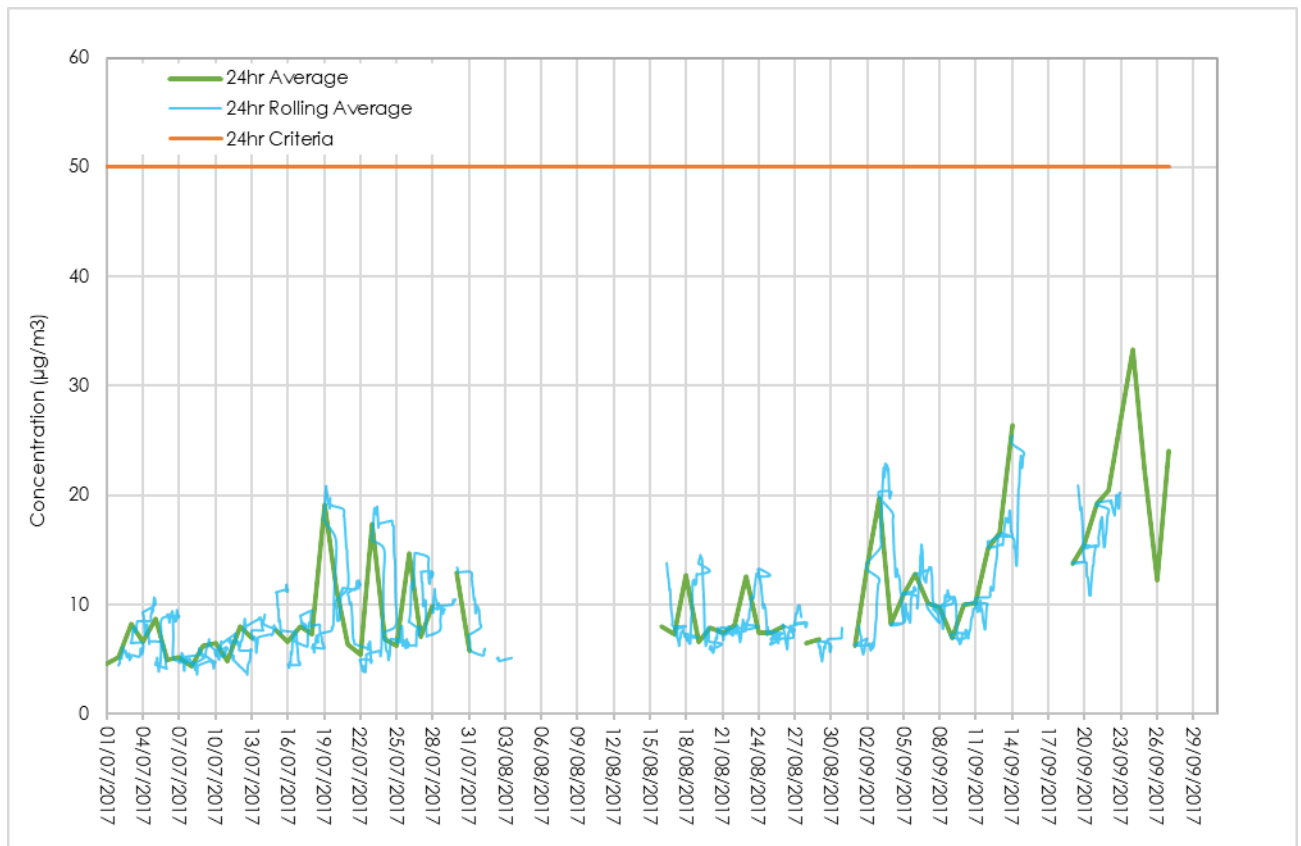


Figure 4.1: PM₁₀ Monitoring Data

5 NOISE MONITORING RESULTS

5.1 Unattended Noise Measurements

One permanent ambient noise monitor continuously monitor noise levels from all sources.

The unattended noise monitoring during the third quarter of 2017 recovered 89% of data at NMT3.

A summary of the unattended noise monitoring is presented in **Table 5.1**. Noise monitoring is expressed in three descriptors as follows:

- **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.
- **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.
- **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 5.1: Third Quarter Noise Monitoring Summary, dB(A)

	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
July	46	51	37	44	48	35	45	48	33
August	46	51	38	48	51	39	45	49	37
September	47	74	40	50	53	41	50	53	41

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 5.4** to **Table 5.6** and as graphs in **Figure 5.1** to **Figure 5.3**. 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 LA_{1,1min} levels continuously at both locations. The LA_{1,1min} represents short-term peak noise events and is the noise level exceeded for 1% of 1 minute. A summary of the LA_{1,1min} is presented in Figure 5.4 to Figure 5.6.

Table 5.2: July- September 2017 LA_{1,15minute} Noise Monitoring Summary, dB(A)

NMT1	LA _{1,1min} Maximum dB(A)	LA _{1,1min} Average dB(A)	LA _{1,15min} > 52 dB(A) night time (%)
July	86	46	15
August	81	47	20
September	87	49	32

The noise limits at the site apply for wind speeds less than 3 m/s. **Table 5.3** presents monthly percentages that wind speeds more than 3 m/s occurred from WTX monitoring data during this quarterly period.

Table 5.3: Wind Speed Exceedances Percentages July - September 2017

WTX	Exceedances (%)
July	47
August	51
September	68

Table 5.4: NMT3 Daily Noise Monitoring Results – July 2017

Date	Day			Evening			Night		
	L _{eq} .11hr	L _{eq} .11hr	ABL ²	L _{eq} .4hr LP	L _{eq} .4hr AP	ABL	L _{eq} .9hr LP	L _{eq} .9hr	ABL
1/07/2017	44	50	35	38	41	36	36	38	33
2/07/2017	40	45	35	35	38	33	36	38	33
3/07/2017	45	50	36	37	39	32	37	41	31
4/07/2017	44	51	38	37	40	34	35	39	31
5/07/2017	45	50	39	54	57	38	47	51	31
6/07/2017	46	51	40	35	37	33	36	40	32
7/07/2017	46	52	37	37	38	31	32	36	31
8/07/2017	42	47	33	43	46	33	44	48	37
9/07/2017	43	49	34	36	40	32	32	37	30
10/07/2017	44	50	37	39	43	36	32	36	29
11/07/2017	46	52	38	36	39	31	33	37	30
12/07/2017	46	52	36	39	42	31	34	37	31
13/07/2017	43	48	36	36	39	32	35	38	32
14/07/2017	43	50	34	38	42	32	45	49	31
15/07/2017	38	44	32	35	37	31	35	39	30
16/07/2017	38	45	32	37	39	33	36	40	32
17/07/2017	39	46	34	34	38	32	34	39	29
18/07/2017	41	47	36	40	44	32	52	55	32
19/07/2017	52	55	42	47	51	44	48	52	35
20/07/2017	49	53	42	49	53	40	38	42	31
21/07/2017	40	47	36	37	40	33	32	36	30
22/07/2017	40	48	33	49	52	34	56	59	39
23/07/2017	57	60	34	38	41	32	36	40	28
24/07/2017	40	46	34	50	54	33	45	49	30
25/07/2017	41	47	36	38	41	34	42	46	31
26/07/2017	48	52	41	50	54	39	36	41	31
27/07/2017	41	48	37	37	39	32	34	39	30
28/07/2017	47	51	39	44	48	33	42	46	35
29/07/2017	37	45	32	43	46	39	43	46	39
30/07/2017	42	47	35	36	41	30	31	36	27
31/07/2017	38	47	37	35	39	31	34	35	30
Loq Avg	46	51	37	44	48	35	45	48	33
Median	43	49	36	38	41	33	36	40	31
Max	57	60	42	54	57	44	56	59	39
Min	37	44	32	34	37	30	31	35	27

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 5.5: NMT3 Daily Noise Monitoring Results – August 2017

Date	Day			Evening			Night		
	L _{eq,11hr}	L _{eq,11hr}	ABL ²	L _{eq,4hr} LP	L _{eq,4hr} AP	ABL	L _{eq,9hr} LP	L _{eq,9hr}	ABL
1/08/2017	37	46	36	38	41	32	34	43	29
2/08/2017	40	47	36	35	39	32	36	41	28
3/08/2017	40	48	36	42	47	34	37	42	27
4/08/2017	50	53	38	59	61	29	34	39	29
5/08/2017	41	48	34	33	37	31	32	38	30
6/08/2017	37	47	34	38	39	31	35	41	30
7/08/2017	48	52	40	48	51	39	53	57	41
8/08/2017	45	50	37	55	59	53	52	56	50
9/08/2017	43	49	37	39	44	33	34	42	30
10/08/2017	42	47	35	34	38	32	32	38	30
11/08/2017	44	50	37	34	37	30	53	56	29
12/08/2017	53	56	34	51	54	34	39	44	28
13/08/2017	39	46	34	34	37	31	33	39	28
14/08/2017	38	46	33	40	44	32	43	46	29
15/08/2017	41	48	36	35	38	32	40	45	32
16/08/2017	46	51	40	52	55	43	39	43	32
17/08/2017	44	49	38	39	42	31	42	46	31
18/08/2017	57	60	44	54	58	41	54	58	40
19/08/2017	42	49	36	34	37	30	34	38	29
20/08/2017	36	46	35	36	38	33	40	43	31
21/08/2017	49	51	45	32	36	26	35	40	28
22/08/2017	42	48	38	36	41	31	35	41	32
23/08/2017	45	51	40	36	40	31	31	39	27
24/08/2017	39	47	38	36	39	31	35	42	29
25/08/2017	38	48	37	36	39	33	31	40	29
26/08/2017	38	48	38	35	40	33	41	45	34
27/08/2017	43	49	38	37	39	30	41	47	30
28/08/2017	41	51	38	35	38	31	33	43	30
29/08/2017	38	49	37	37	41	32	32	40	29
30/08/2017	39	49	37	34	38	30	33	42	29
31/08/2017	39	51	39	33	40	30	31	33	28
Log Avg	46	51	38	48	51	39	45	49	37
Median	41	49	37	36	40	32	35	42	29
Max	57	60	45	59	61	53	54	58	50
Min	36	46	33	32	36	26	31	33	27

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 Daily Noise Monitoring Results – September 2017

Date	Day			Evening			Night		
	L _{eq,11hr}	L _{eq,11hr}	ABL ²	L _{eq,4hr} LP	L _{eq,4hr} AP	ABL	L _{eq,9hr} LP	L _{eq,9hr}	ABL
1/09/2017	39	48	38	35	39	33	32	41	28
2/09/2017	38	48	37	37	39	31	31	41	30
3/09/2017	41	48	37	43	45	32	33	43	30
4/09/2017	43	50	40	38	42	35	32	42	27
5/09/2017	48	52	39	35	39	31	42	46	33
6/09/2017	53	55	46	46	49	36	53	56	33
7/09/2017	47	51	40	52	56	37	54	57	31
8/09/2017	49	54	39	46	50	32	55	58	41
9/09/2017	39	48	36	35	39	32	48	52	43
10/09/2017	37	46	35	33	37	32	31	42	30
11/09/2017	42	48	36	37	40	30	33	41	30
12/09/2017	52	87	38	37	40	33	36	46	31
13/09/2017	47	50	40	47	48	43	43	45	36
14/09/2017	53	57	42	52	55	44	45	49	31
15/09/2017	50	53	41	62	65	52	59	62	53
16/09/2017	46	49	42	34	37	28	56	59	35
17/09/2017	37	45	34	38	40	33	31	40	28
18/09/2017	39	46	36	36	39	33	34	41	32
19/09/2017	47	50	39	47	50	38	36	44	32
20/09/2017	42	47	40	-	-	-	44	46	31
21/09/2017	-	-	-	-	-	-	-	-	-
22/09/2017	-	-	-	-	-	-	-	-	-
23/09/2017	-	-	-	-	-	-	-	-	-
24/09/2017	-	-	-	-	-	-	-	-	-
25/09/2017	-	-	-	-	-	-	-	-	-
26/09/2017	-	-	-	-	-	-	-	-	-
27/09/2017	-	-	-	-	-	-	-	-	-
28/09/2017	-	-	-	-	-	-	-	-	-
29/09/2017	-	-	-	-	-	-	-	-	-
30/09/2017	-	-	-	-	-	-	-	-	-
Log Avg	47	74	40	50	53	41	50	53	41
Median	44	49	39	38	40	33	39	46	31
Max	53	87	46	62	65	52	59	62	53
Min	37	45	34	33	37	28	31	40	27

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

5.2 Unattended Noise Monitoring Graphs

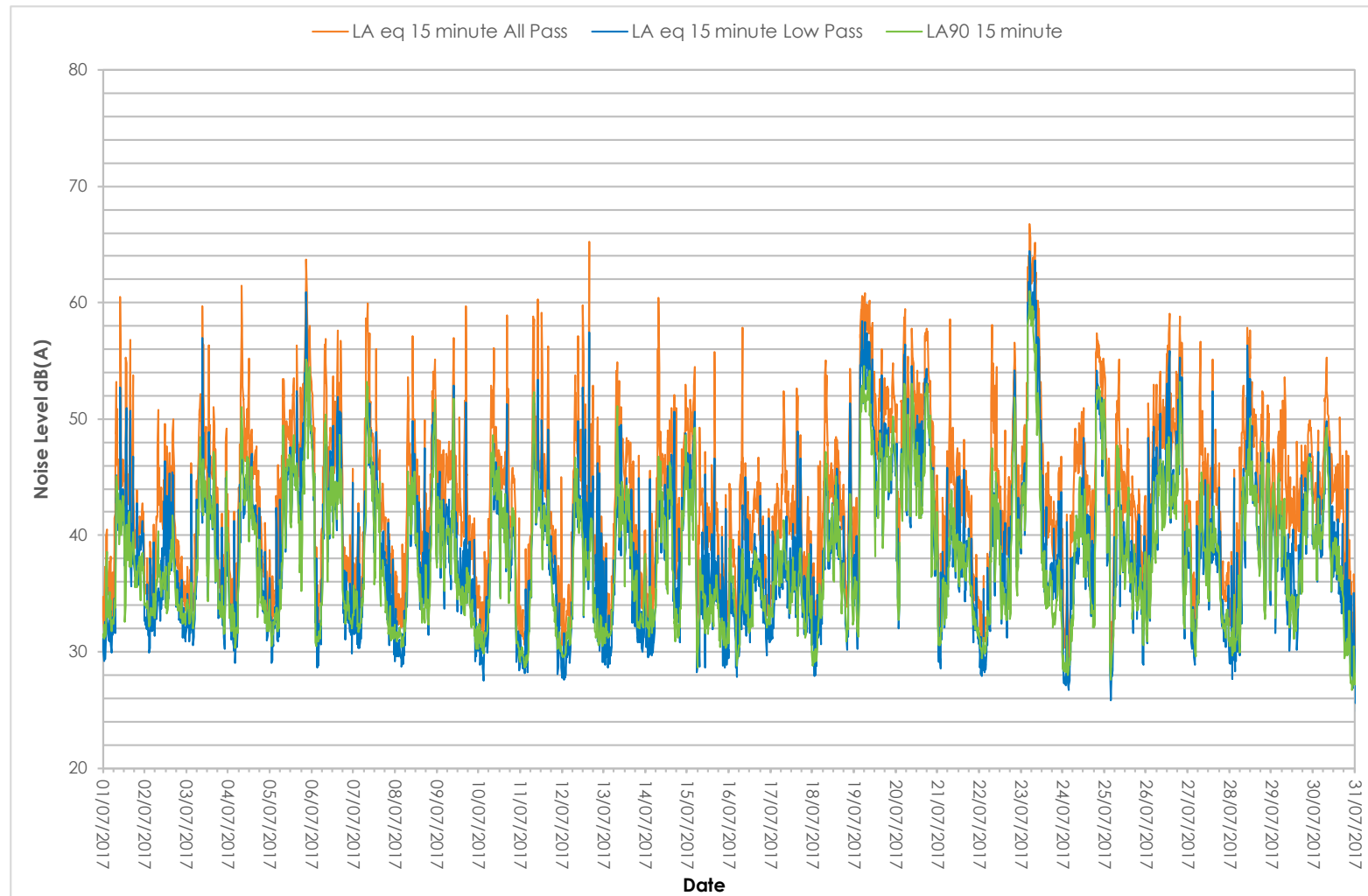


Figure 5.1: NMT3 Noise Monitoring Results – July 2017

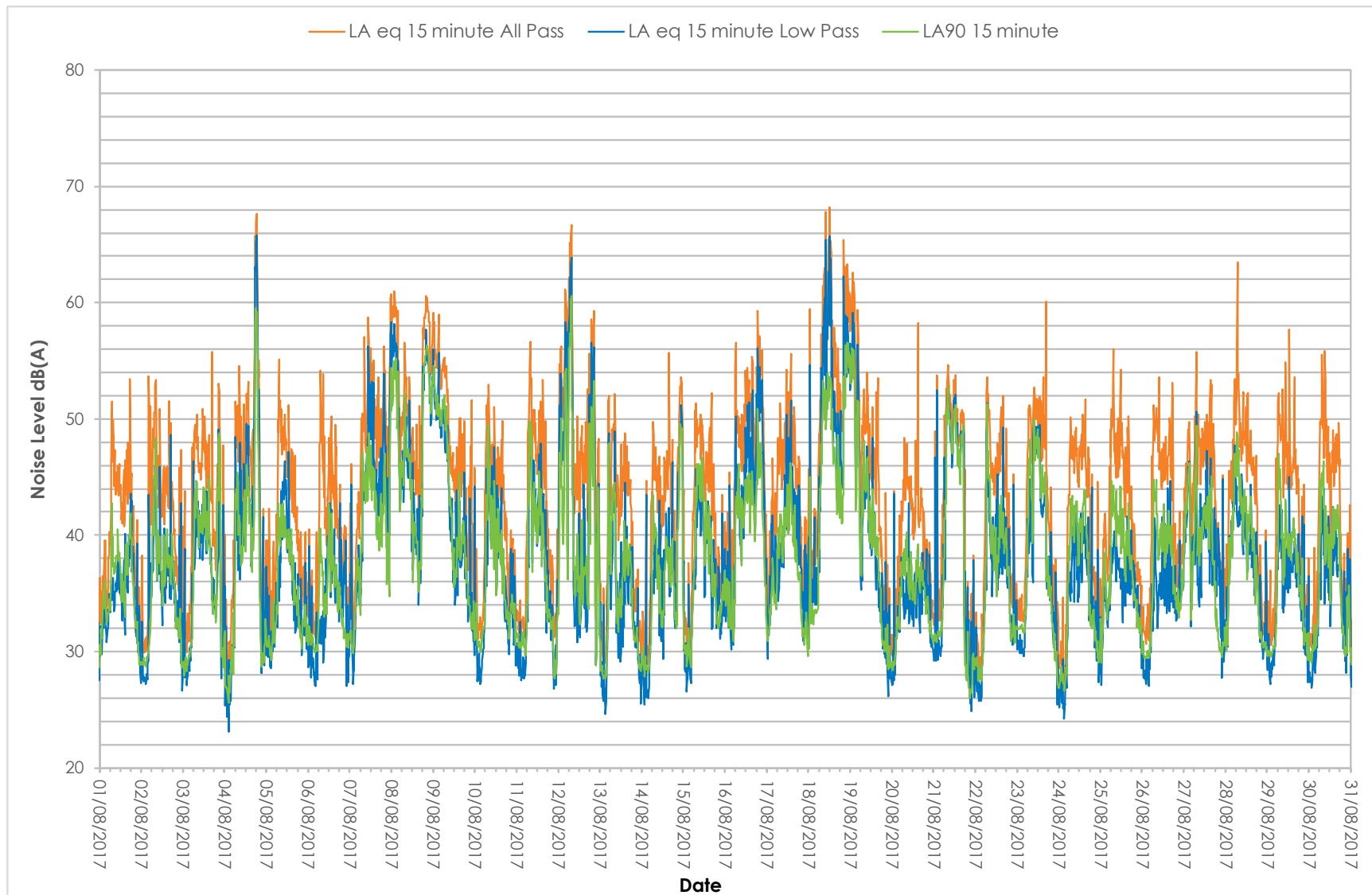
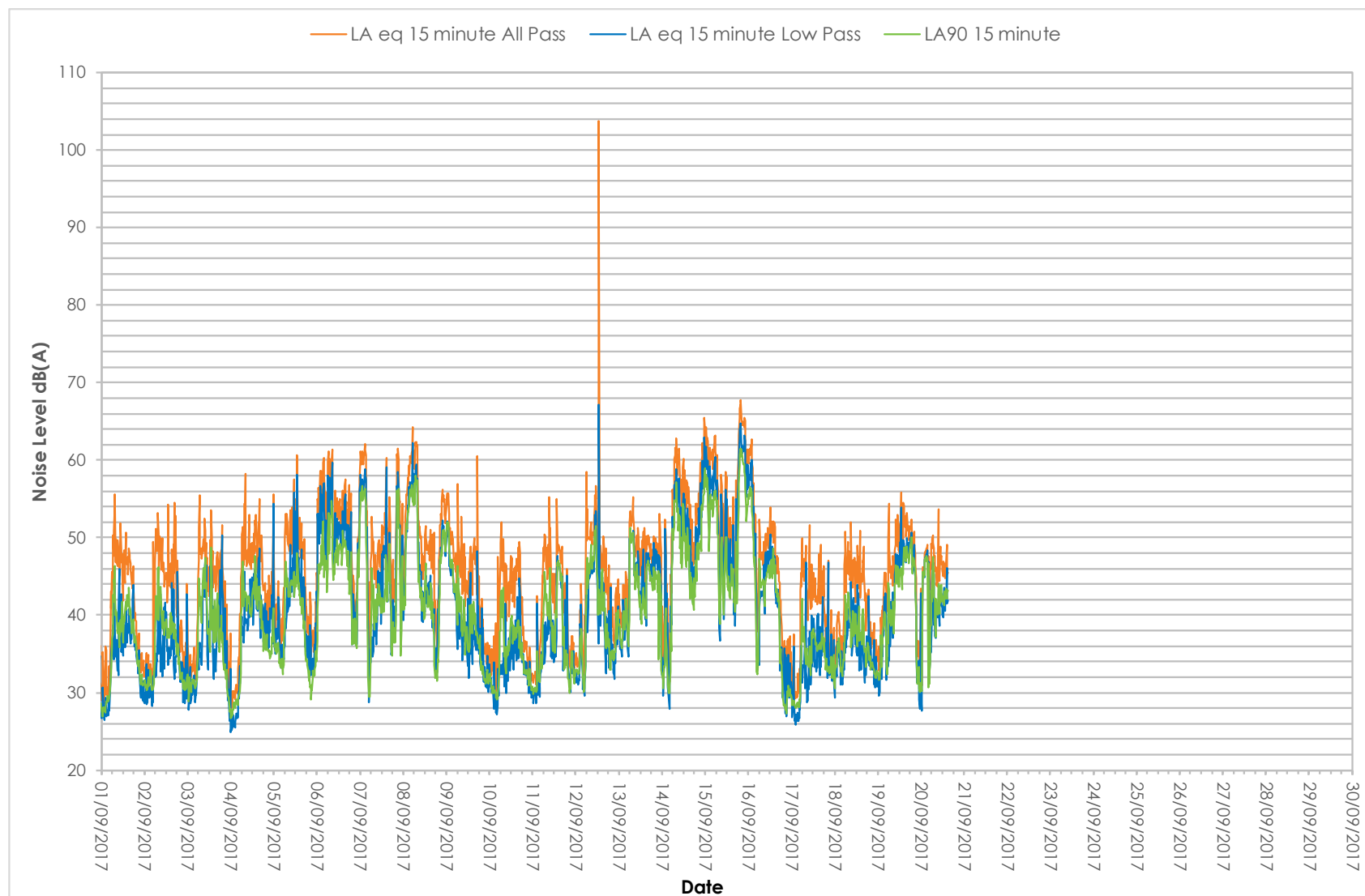


Figure 5.2: NMT3 Noise Monitoring Results – August 2017



Note: Peak on 12th September is due to an instrument calibration check

Figure 5.3: NMT3 Noise Monitoring Results – September 2017

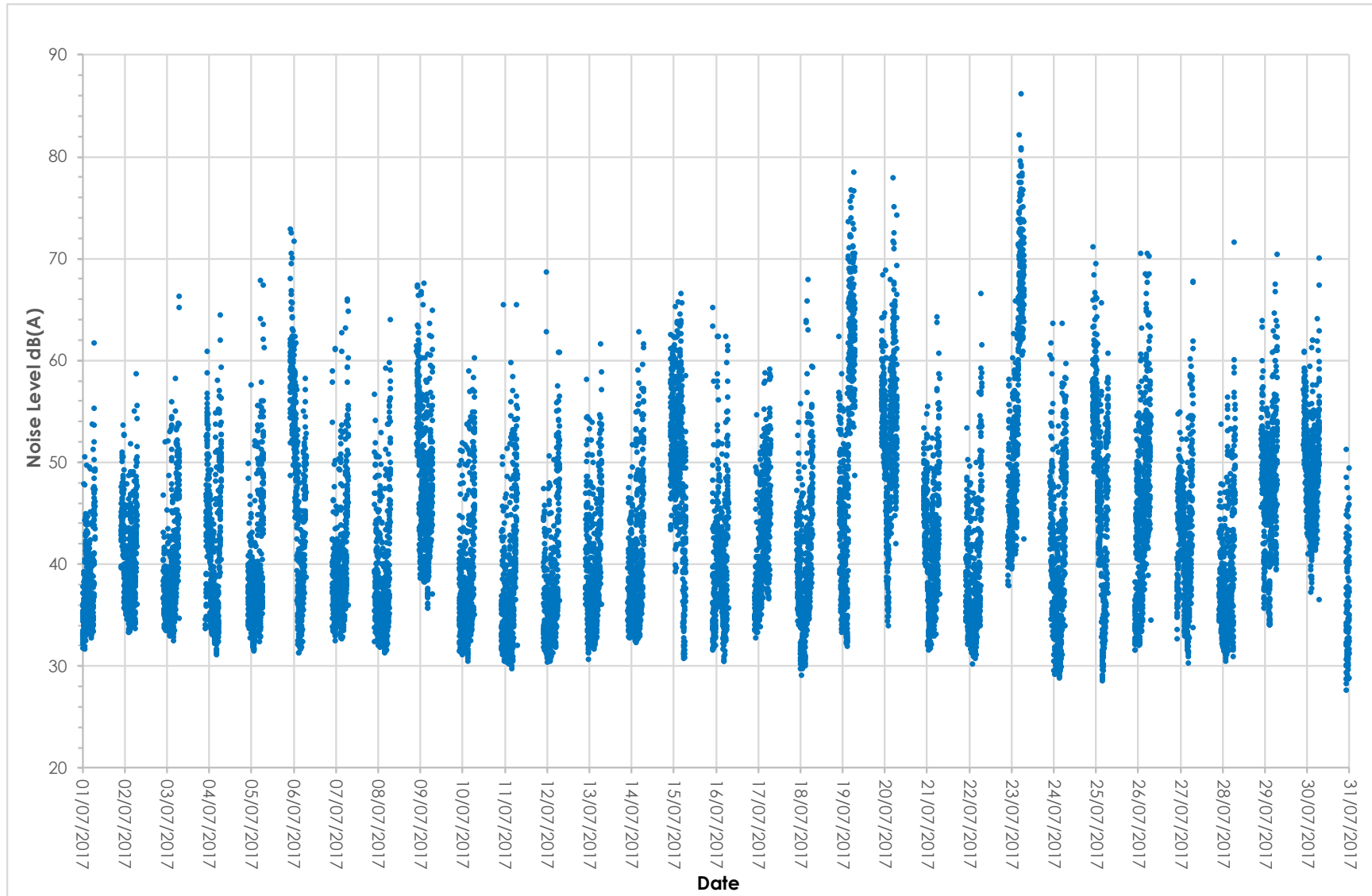


Figure 5.4: L_{1,15minute} (night time only) NMT3 Noise Monitoring Results – July 2017

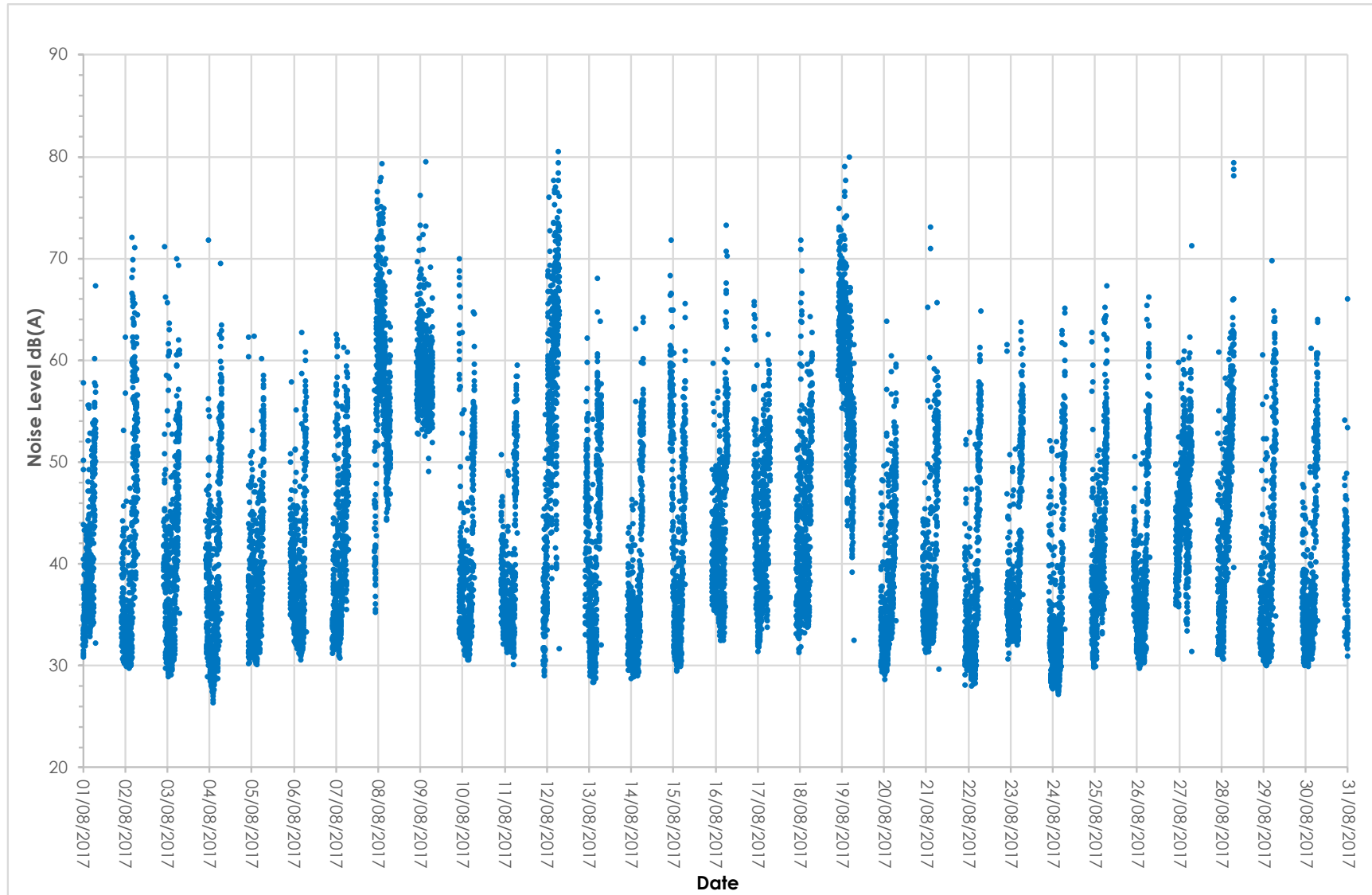


Figure 5.5: $L_{1,15\text{minute}}$ (night time only) NMT3 Noise Monitoring Results – August 2017

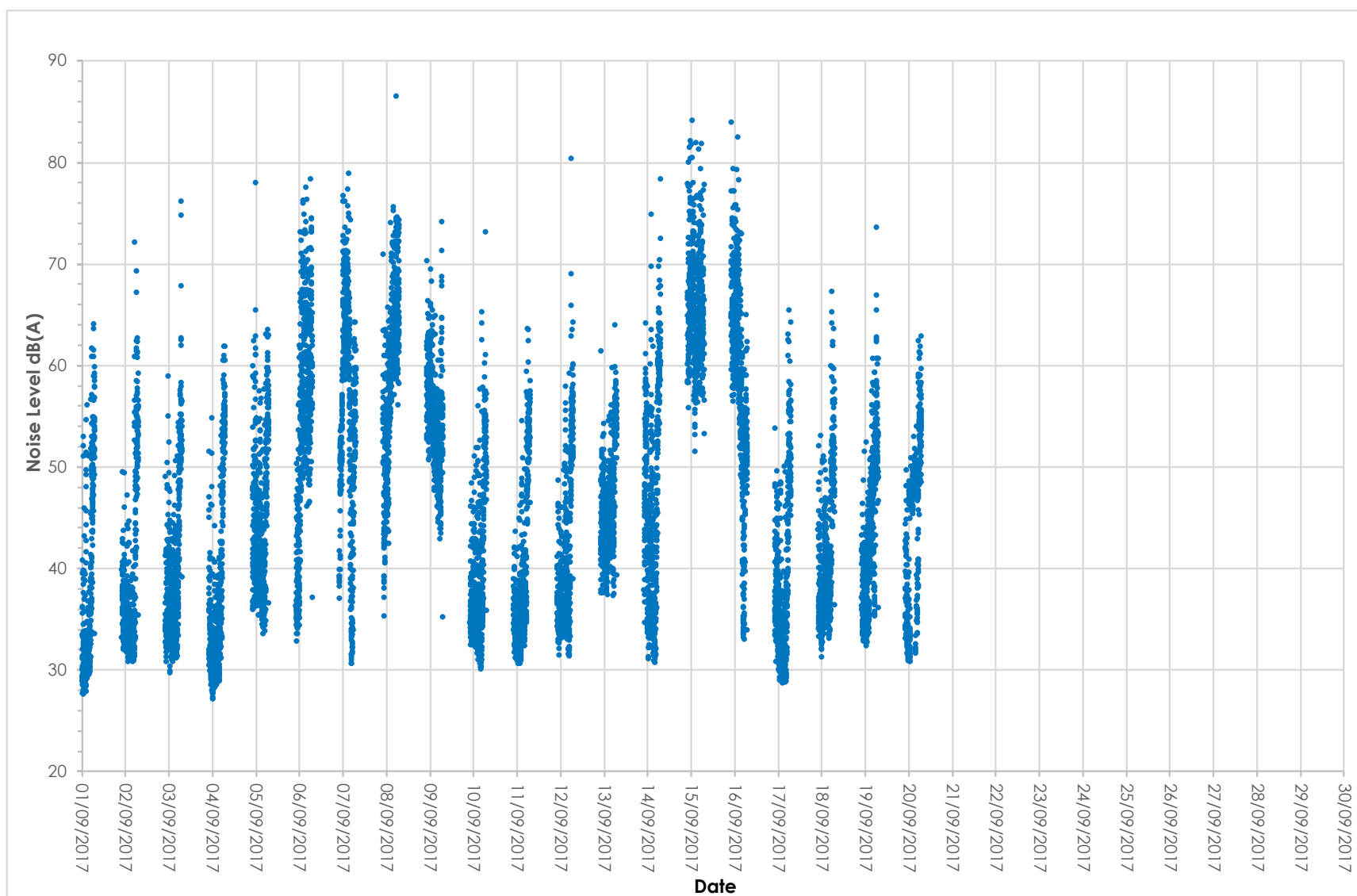


Figure 5.6: L_{1,15minute} (night time only) NMT3 Noise Monitoring Results – September 2017

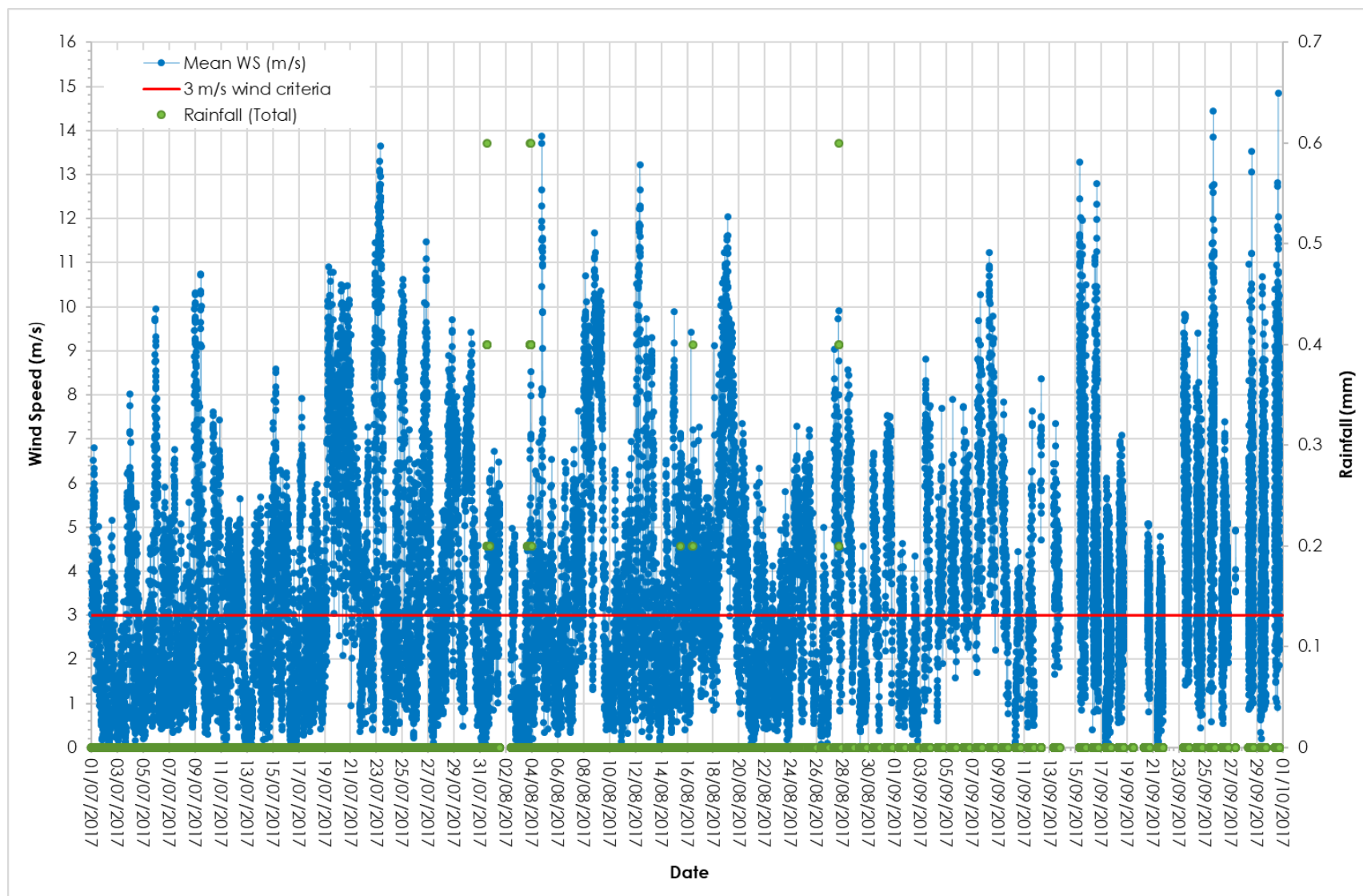


Figure 5.7: Wind Speed and Rainfall Monitoring Data

5.3 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 up to ten different compliance locations surrounding the site during the day, evening and night.

Attended noise compliance monitoring was not undertaken during the quarter.

**ERM has over 160 offices across the following
countries and territories worldwide**

Argentina	New Zealand
Australia	Panama
Belgium	Peru
Brazil	Poland
Canada	Portugal
China	Puerto Rico
Colombia	Romania
France	Russia
Germany	Singapore
Hong Kong	South Africa
Hungary	South Korea
India	Spain
Indonesia	Sweden
Ireland	Taiwan
Italy	Thailand
Japan	UAE
Kazakhstan	UK
Kenya	US
Malaysia	Vietnam
Mexico	
The Netherlands	

ERM Sydney

Level 15
309 Kent Street
Sydney 2000

T: 02 8584 8852

www.erm.com