



Thurrock Flexible Generation Plant

**Environmental Statement Volume 6
Appendix 11.1: Baseline Sound Monitoring Report**

Date: September 2019

Environmental Impact Assessment
Preliminary Environmental Information Report

Volume 6
Appendix 11.1

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It has been checked and authorised by Simon Stephenson, a Technical Director within the Acoustics Team and full member of the Institute of Acoustics, who has 20 years' experience of environmental noise impact assessment.

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Summary

This Appendix provides details of the baseline noise monitoring undertaken as part of the noise assessment, and in accordance with BS 4142:2014+A1:2019.

Qualifications

This document has been prepared by Josh Wilson, an Acoustic Consultant and full Member of the Institute of Acoustics, who has over four years' experience of environmental noise impact assessment.

1. Introduction

- 1.1.1 RPS has been commissioned by Thurrock Power Ltd to undertake baseline noise monitoring to inform the noise impact assessment for a proposed flexible generation plant comprising gas engines and battery storage near Tilbury (the proposed development).
- 1.1.2 This report provides the results of baseline sound measurements undertaken to characterise the sound environment in the vicinity of the nearest Noise Sensitive Receptors (NSRs) to the proposed development including its potential road access and supply gas pipeline routes. These baseline levels will be used in the assessment of effects for the operational and construction noise and vibration assessments to be reported in the Preliminary Environmental Impact Report (PEIR).
- 1.1.3 Access to all survey locations was agreed with the landowners. The surveys were undertaken between Thursday 1st and Wednesday 21st February 2018.
- 1.1.4 This report provides a summary of the survey data for each survey location. As stated above, these levels will be relied upon within the assessment carried out for the PEIR. Survey sheets indicating details and locations of noise monitoring equipment are provided in Annex A.

2. Baseline Survey Methodology

2.1 Consultation with Local Planning Authority

2.1.1 The proposed approach to the baseline surveys was described in the Baseline Noise Monitoring Plan issued on 18 January 2018. The survey methodology was subject to consultation and was agreed to be appropriate by Mark Gentry, Environmental Health Officer for Thurrock Council.

2.2 Survey locations

2.2.1 Survey locations were chosen to characterise baseline conditions in the vicinity of the nearest noise sensitive receptors to the proposed development and based on their proximity to the site. The proposed monitoring were as follows:

- LT1 – Byron Gardens: This location is approximately 750 m west of the proposed development and is representative of the residential properties west of Fort Road. It is proposed to undertake long-term noise monitoring at this location supplemented by attended short-term measurements.
- LT2 – Buckland: This location is approximately 1 km east-north-east of the proposed development and is representative of the residential properties in this area. It is proposed to undertake long-term noise monitoring at this location supplemented by attended short-term measurements.
- LT3 – Walnut Tree Farm: This location is approximately 840 m north-north-east of the proposed development and is representative of the residential properties in this area. It is proposed to undertake long-term noise monitoring at this location supplemented by attended short-term measurements.
- LT4 – St James Church: This location is approximately 1 km north of the proposed development and is representative of the church and town hall as well as the wider settlement of West Tilbury. It is proposed to undertake long-term noise monitoring at this location supplemented by attended short-term measurements.
- ST5 – Tilbury Fort: This location is approximately 1.2 km south-west of the proposed development and is representative of the Fort which is controlled by English Heritage and operated as a tourist attraction. It is proposed to undertake short-term noise monitoring at this location during the daytime.
- ST6 – Sandhurst Road: This location is approximately 850 m west of the proposed development and is representative of the residential properties west of Fort Road but nearer to the railway line and existing industrial areas than those properties at Byron Gardens. It is proposed to undertake short-term noise monitoring at this location.

- LT7 – Goshem’s Farm: This location is approximately 1.6 km north east of the proposed development and close to the potential gas connection compound and is representative of the residential properties in the area. It is proposed to undertake long-term noise monitoring at this location supplemented by attended short-term measurements.

2.2.2 Table 2.1 provides a summary of the baseline survey locations and grid co-ordinates of where the survey equipment was positioned. All survey locations are identified in Figure 2.1 overleaf.

Table 2.1: Survey locations.

Ref.	Long Term (LT)/ Short- Term (ST)	Representative Address	Coordinates	
			<i>Easting</i>	<i>Northing</i>
LT1	LT	143 Byron Gardens	565355	176550
LT2	LT	Buckland	567531	177202
LT3	LT	Walnut Tree Farm	566753	177610
LT4	LT	St James Church	566129	177695
ST5	ST	Tilbury Fort	564870	175222
ST6	ST	Sandhurst Road	565283	176332
LT7	LT	Goshem's Farm	567819	177511

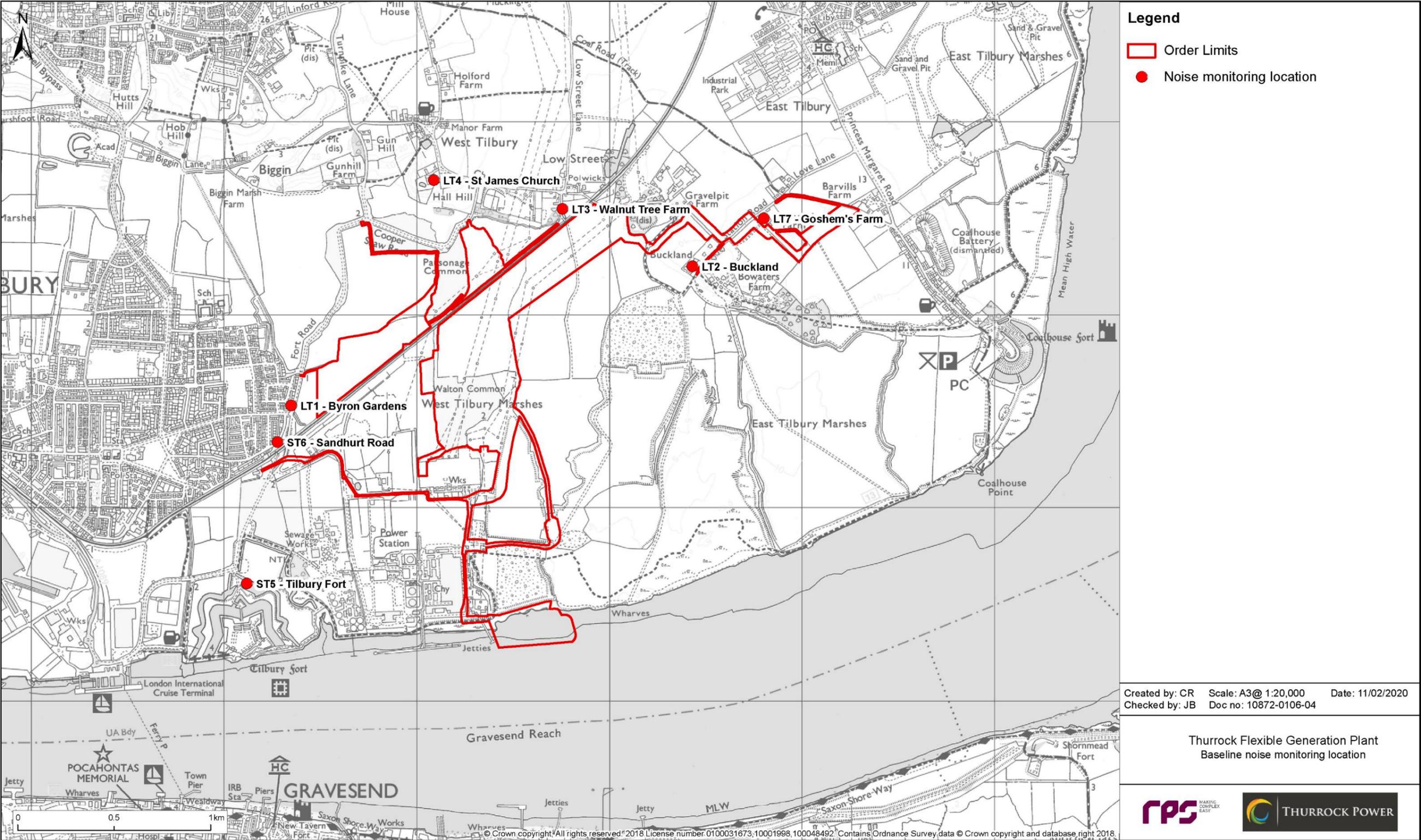


Figure 2.1: Baseline survey locations.

2.3 Baseline survey procedure

- 2.3.1 Long term unattended baseline sound level monitoring was undertaken between Thursday 1st and Wednesday 21st February 2018 at five locations in closest proximity to the proposed development. At each long term survey location, concurrent, short-term, attended surveys were carried out during the day (07:00 – 19:00 hours), evening (19:00 – 23:00 hours) and night-time (23:00 – 07:00 hours) periods. Attended short term surveys were also undertaken at two additional locations.
- 2.3.2 All sound level monitoring was carried out using one of the following 'Class 1' sound level meters (SLM): Rion NL-52, Rion NA-28 or Rion NL-31. Each SLM was checked for calibration prior to and immediately following the survey with no significant deviation found. At the long term monitoring locations, continuous data were logged of the fast time weighted, A-weighted, broadband sound pressure levels in 100 ms periods. Short-term attended survey data were logged of the fast time weighted, A-weighted, broadband sound pressure levels in 15 minute periods.
- 2.3.3 The long term surveys were established during the day and observations made of sources and other conditions in accordance with the requirements of British Standard (BS) 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' (British Standards Institution (BSI), 2019). As a minimum, the following noise parameters were recorded; L_{Aeq} , L_{Amax} , L_{A10} and L_{A90} . Third octave band measurements were carried out at all locations, with the exception of ST6, to determine the frequency content of the baseline sound. It is considered that spectral data acquired at LT1 is representative of ST6.
- 2.3.4 In addition to each long term survey location, concurrent attended surveys were carried out during the day (07:00-1900), evening (19:00-23:00) and night-time (23:00-07:00) periods. Short-term attended surveys consisted of the following: three 15 minute discontinuous periods during the daytime; one 15 minute period during the evening; and three 15 minute periods during the night-time.
- 2.3.5 Long term surveys were undertaken following guidance contained in BS 7445 2:1991 'Description and measurement of environmental noise, Part 2: Guide to the acquisition of data pertinent to land use' (BSI, 1991).
- 2.3.6 Meteorological conditions were monitored during the long-term surveys with an unattended weather station installed at LT2. Average wind speeds did not exceed 5 m/s during the survey period. There were no significant periods of precipitation. Some limited light precipitation was recorded on 2nd February 2018 however this did not have a significant influence on the measured sound levels. Therefore no data have been excluded from the dataset due to adverse weather conditions.

- 2.3.7 Meteorological conditions were also measured during each short-term attended measurement using a hand held anemometer.

3. Baseline Survey Details and Results

- 3.1.1 Survey record sheets for each survey location detailing the position of the noise monitors are presented in Annex A. Time histories of the measured sound levels and meteorological conditions during the survey period are presented in Annex B. Results of the short term attended monitoring are presented in Annex C.

4. Discussion of Results

4.1 Determining representative baseline levels

- 4.1.1 To ascertain the typical sound levels at the measurement locations, time history plots have been produced and presented for each long term monitoring position. These are presented with the summary results tables in Annex B. The summaries of results in Annex B are based on analysis of the measured sound levels processed into 15 minute samples.
- 4.1.2 Representative baseline sound levels will be determined, where possible, from long-term monitoring survey locations. For receptor locations where long-term monitoring was not undertaken, the baseline sound levels will be determined from short-term survey data. The data obtained will be analysed and compared against other datasets in order to obtain a representative baseline sound level.

4.2 Operational noise assessment

- 4.2.1 BS 4142:2014+A1:2019 requires that the background sound levels adopted for the assessment be representative for the period being assessed. The Standard recommends that the background sound level should be derived from continuous measurements of normally not less than 15-minute intervals, which can be contiguous or disaggregated. However, the standard states that there is no 'single' background sound level that can be derived from such measurements. It is particularly difficult to determine what is 'representative' of the night-time period because it can be subject to a wide variation in background sound levels between the shoulder night periods. The accompanying note to paragraph 8.1.4 states that:

"a representative level ought to account for the range of background sounds levels and ought not automatically to be assumed to be either the minimum or modal value".

- 4.2.2 In determining representative baseline noise levels for receptors identified within the Environmental Statement, it will be necessary to analyse each location individually to ensure the most representative level is considered. BS 4142:2014+A1:2019 states that:

"In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods."

4.3 Construction noise assessment

- 4.3.1 To determine the most representative ambient sound levels, the equivalent continuous A-weighted sound pressure level, L_{Aeq} , will be calculated based on standard construction hours and presented as a logarithmic average of the 15 minute period data over the relevant time periods.

5. References

British Standards Institution. British Standard 4142:2014+A1:2019. Methods for rating and assessing industrial and commercial sound.

British Standards Institution. British Standard 7445-2:1991 Description and measurement of environmental noise - Part 2: Guide to the acquisition of data pertinent to land use.

Annex A Survey Record Sheets

Location		LT1: 143 Byron Gardens				
Purpose of Monitoring		Baseline				
Relevant Guidance / Standard		BS 7445-1:2003 / BS 7445-2:1991 / BS 4142:2014				
Sound Measurement System						
RPS ID	Manufacturer / Model	Serial Number	Last Lab Verification	Filename	Memory Card ID	
115	Rion NL-52	943366	16/08/2018	Auto_0001		
Microphone Height	Measurement Interval	Dynamic Range	Time Weighting	Frequency Weighting	Façade / Freefield	Photo?
1.5 m	100 ms	25 - 138	Fast	A	Freefield	x
START			END			
Personnel		PB		PB		
Date / time		01/02/2018 14:45		21/02/2018 12:15		
Calibrator	RPS ID		15		15	
	Manufacturer / Model		RION NC-74		RION NC-74	
	Serial Number		110090		110090	
	Date last verification		17/11/2017		17/11/2017	
	Reference level		94		94	
	Meter reading		94		93.8	
Weather	Cloud cover (100%= 8 oktas)		5		4	
	Temperature (degrees Celsius)		9		7	
	Subjective description / additional details		Sunny cold, still, damp ground		6°C	
Photographs of Measurement Location						
						
Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))						
Long term in the corner of a garden, adjacent to road, grass between SLM and road						
Description of sound environment at start of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)						
Road traffic on the main road dominant. Some typical residential sound in wider area but survey location mainly affected by traffic movements. Some wind rattle and aircraft						
Description of sound environment at end of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)						
Road traffic on the main road dominant. Some typical residential sound in wider area but survey location mainly affected by traffic movements. Some wind rattle and aircraft						

Figure 1: LT1 survey record sheet.

Location		LT2: Buckland				
Purpose of Monitoring		Baseline				
Relevant Guidance / Standard		BS 7445-1:2003 / BS 7445-2:1991 / BS 4142:2014				
Sound Measurement System						
RPS ID	Manufacturer / Model	Serial Number	Last Lab Verification	Filename	Memory Card ID	
116	Rion NL-52	943367	27/01/2017	Auto_0002		
Microphone Height	Measurement Interval	Dynamic Range	Time Weighting	Frequency Weighting	Façade / Freefield	Photo?
1.5 m	100 ms	25 - 138	Fast	A	Freefield	x
START			END			
Personnel		PB		PB		
Date / time		01/02/2018 13:30		21/02/2018 12:00		
Calibrator	RPS ID		15		15	
	Manufacturer / Model		RION NC-74		RION NC-74	
	Serial Number		110090		110090	
	Date last verification		17/11/2017		17/11/2017	
	Reference level		94		94	
	Meter reading		94		94	
Weather	Cloud cover (100%= 8 oktas)		5		4	
	Temperature (degrees Celsius)		9		7	
	Subjective description / additional details		Sunny cold, still, damp ground		6°C	
Photographs of Measurement Location						
						
Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))						
Scrub adjacent to dirt road, in farm yard, near to barns						
Description of sound environment at start of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)						
Wind rustle, metal recycling (continuous), birds, 1 gun shot, occasional aircraft. Industrial noise fairly audible, both from the docks area and nearby metal recycling, otherwise fairly normal rural						
Description of sound environment at end of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)						
Wind rustle, metal recycling (continuous), birds, occasional aircraft. Industrial noise fairly audible, both from the docks area and nearby metal recycling, otherwise fairly normal rural						

Figure 2: LT2 survey record sheet.

Location		LT3: Walnut Tree Farm				
Purpose of Monitoring		Baseline				
Relevant Guidance / Standard		BS 7445-1:2003 / BS 7445-2:1991 / BS 4142:2014				
Sound Measurement System						
RPS ID	Manufacturer / Model		Serial Number	Last Lab Verification	Filename	Memory Card ID
126	Rion NL-52		164423	13/04/2017	Auto_0003	
Microphone Height	Measurement Interval	Dynamic Range	Time Weighting	Frequency Weighting	Façade / Freefield	Photo?
1.5 m	100 ms	25 - 138	Fast	A	Freefield	x
			START	END		
Personnel			PB		PB	
Date / time			01/02/2018 14:20		21/02/2018 11:45	
Calibrator	RPS ID		15		15	
	Manufacturer / Model		RION NC-74		RION NC-74	
	Serial Number		110090		110090	
	Date last verification		17/11/2017		17/11/2017	
	Reference level		94		94	
	Meter reading		94		93.8	
Weather	Cloud cover (100%= 8 oktas)		5		4	
	Temperature (degrees Celsius)		9		7	
	Subjective description / additional details		Sunny cold, still, damp ground		6°C	
Photographs of Measurement Location						
						
Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))						
Garden adjacent to access road						
Description of sound environment at start of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)						
Soundscape similar to LT2 but a much higher percentage of HGV traffic dominating. Trains are also audible, and metal recycling facility. Regular HGVs to industrial units						
Description of sound environment at end of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)						
Local roads, continuous from metal recycling, birds						

Figure 3: LT3 survey record sheet.

Location		LT4: St James Church				
Purpose of Monitoring		Baseline				
Relevant Guidance / Standard		BS 7445-1:2003 / BS 7445-2:1991 / BS 4142:2014				
Sound Measurement System						
RPS ID	Manufacturer / Model		Serial Number	Last Lab Verification	Filename	Memory Card ID
113	Rion NL-52		943364	27/01/2017	Auto_0004	
Microphone Height	Measurement Interval	Dynamic Range	Time Weighting	Frequency Weighting	Façade / Freefield	Photo?
1.2 m	100 ms	25 - 138	Fast	A	Freefield	x
			START	END		
Personnel			PB		PB	
Date / time			01/02/2018 15:25		21/02/2018 11:30	
Calibrator	RPS ID		15		15	
	Manufacturer / Model		RION NC-74		RION NC-74	
	Serial Number		110090		110090	
	Date last verification		17/11/2017		17/11/2017	
	Reference level		94		94	
	Meter reading		94		93.8	
Weather	Cloud cover (100%= 8 oktas)		5		4	
	Temperature (degrees Celsius)		9		7	
	Subjective description / additional details		Sunny cold, still, damp ground		6°C	
Photographs of Measurement Location						
						
Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))						
Rear garden area of church. Soft ground in general area and towards site. Church on top of hill and elevated above general area.						
Description of sound environment at start of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)						
Relatively quiet, distant traffic and industry, some local traffic						
Description of sound environment at end of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)						
Birds, distant traffic, metal recycling, local traffic						

Figure 4: LT4 survey record sheet.

Location		ST5: Tilbury Fort										
Purpose of Monitoring		Baseline										
Relevant Guidance / Standard		BS 7445-1:2003 / BS 7445-2:1991 / BS 4142:2014										
Sound Measurement System												
RPS ID	Manufacturer / Model		Serial Number	Last Lab Verification	Filename	Memory Card ID						
24	RION NL-31		352030	20/11/2017	AUT_0101-0401	-						
Microphone Height	Measurement Interval	Dynamic Range (dB)	Time Weighting	Frequency Weighting	Façade / Freefield	Photo?						
1.5 m	15 min	20 - 110	F	A	Freefield	✓						
START			END									
Personnel			CB		PB							
Date / time			01/02/2018 16:25		02/02/2018 10:11							
Calibrator	RPS ID		15		14							
	Manufacturer / Model		RION NC-74		RION NC-74							
	Serial Number		110090		110118							
	Date last verification		17/11/2017		03/10/2017							
	Reference level		94		94							
	Meter reading		94.0		94.0							
Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))												
ST5	Path leading to Tilbury fort, grass, docklands to south and west, fort to east and open fields to the north											
1, 2 Day, 3 Evening, 4 Day												
Observations Log												
Measurement + start time	Description of sound environment			Weather								
	(principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)			Wind Speed (m/s)	Wind Direction	Cloud cover (oktas)	Temp. (degrees C)	Relative Humidity (%)	Likely temp. inversion?	Precipitation	Fog	Ground cover (Wet/ Frozen/ Snow)
1 16:25	Lorry movements and engine noise, distant traffic and aircraft, distant voices from docklands. Docklands - vehicles movements, reversing alarms, horns			2.5	W	8	6°C	-	•	•	•	Dry
2 17:21	Distant traffic, wind, water moving, distant aircraft, barges, distant reverse alarm			2.5	W	8	4°C	-	•	Light	•	Dry
3 21:23	Industry, distant traffic, distant horns			3.0	W	8	4°C	-	•	•	•	Dry
4 09:56	Distant traffic, port sounds, engines, clanging, alarms etc, distant aircraft			2.0	W	6	2°C	-	•	•	•	Dry

Figure 5: ST5 survey record sheet.

Location		ST6: Sandhurst Road										
Purpose of Monitoring		Baseline										
Relevant Guidance / Standard		BS 7445-1:2003 / BS 7445-2:1991 / BS 4142:2014										
Sound Measurement System												
RPS ID	Manufacturer / Model		Serial Number	Last Lab Verification	Filename	Memory Card ID						
100	RION NA-28		1291243	13/10/2016	MAN_0001	-						
Microphone Height	Measurement Interval	Dynamic Range (dB)	Time Weighting	Frequency Weighting	Façade / Freefield	Photo?						
1.5 m	15 min	20 - 110	F	A	Freefield	✓						
START			END									
Personnel			CB		CB							
Date / time			01/02/2018 15:12		02/02/2018 11:50							
Calibrator	RPS ID		14		14							
	Manufacturer / Model		RION NC-74		RION NC-74							
	Serial Number		110118		110118							
	Date last verification		03/10/2017		03/10/2017							
	Reference level		94		94							
	Meter reading		94.0		94.0							
Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))												
ST6	Layby off residential street, adjacent to railway and small industrial yard (likely HGV storage), broken concrete/asphalt ground bordered in scrubland.											
1 Day, 2 Evening, 3 4 5 Night, 6 7 Day												
Observations Log												
Measurement + start time	Description of sound environment			Weather								
	(principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)			Wind Speed (m/s)	Wind Direction	Cloud cover (oktas)	Temp. (degrees C)	Relative Humidity (%)	Likely temp. inversion?	Precipitation	Fog	Ground cover (Wet/ Frozen/ Snow)
1 17:12	Main road dominant, distant road apparent, distant planes. Train @ +7mins			2.5	W	8	6°C	-	•	Light	•	
2 21:45	Distant motorways, very occasional local traffic, railway powerlines hum, Trains @ +2min, +8mins			2.5	W	8	4°C	-	•	•	•	Dry
3 23:00	Distant motorways, very occasional local traffic, railway powerlines hum			3.0	W	8	4°C	-	•	•	•	Dry
4 00:08	Distant motorways, very occasional local traffic, railway powerlines hum			2.0	W	8	2°C	-	•	•	•	Dry
5 01:25	Distant motorways, very occasional local traffic, railway powerlines hum			2.0	W	8	2°C	-	•	•	•	Dry
6 09:30	Distant road and aircraft, car idling nearby. Scraping (shovels on road surface). Car alarm and train together @+12mins			3.0	W	6	6°C	-	•	•	•	Dry
7 11:35	Distant roads, occasional local traffic			2.5	W	6	6°C	-	•	•	•	Dry

Figure 6: ST6 survey record sheet.

Location		LT7: Goshem's Farm				
Purpose of Monitoring		Baseline				
Relevant Guidance / Standard		BS 7445-1:2003 / BS 7445-2:1991 / BS 4142:2014				
Sound Measurement System						
RPS ID	Manufacturer / Model		Serial Number	Last Lab Verification	Filename	Memory Card ID
-	Rion NL-52		510148	-	Auto_0007	
Microphone Height	Measurement Interval	Dynamic Range	Time Weighting	Frequency Weighting	Façade / Freefield	Photo?
1.2 m	100 ms	25 - 138	Fast	A	Freefield	x
START			END			
Personnel			PB		PB	
Date / time			01/02/2018 13:30		21/02/2018 12:00	
Calibrator	RPS ID		15		15	
	Manufacturer / Model		RION NC-74		RION NC-74	
	Serial Number		110090		110090	
	Date last verification		17/11/2017		17/11/2017	
	Reference level		94		94	
	Meter reading		94		94.2	
Weather	Cloud cover (100%= 8 oktas)		5		4	
	Temperature (degrees Celsius)		9		7	
	Subjective description / additional details		Sunny cold, still, damp ground		6°C	
Photographs of Measurement Location						
						
Description of site (location of equipment, general surroundings, nature of ground between NSR and sound source(s) (hard/ soft ground, topography, intervening features, reflecting surfaces))						
Tied to fence, scrubland behind farmhouse						
Description of sound environment at start of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)						
Wind rustle, metal recycling (continuous), birds, occasional aircraft. Industrial noise fairly audible, and local road traffic more noticeable here. Car repair garage nearby is audible during the daytime						
Description of sound environment at end of survey (principal environmental and natural sound sources, which sources are dominant, character of the sound environment cf. to the character of the new source)						
Wind rustle, metal recycling (continuous), birds, occasional aircraft. Industrial noise fairly audible, and local road traffic more noticeable here. Car repair garage nearby is audible.						

Figure 7: LT7 survey record sheet.

Annex B Baseline Survey Results: Summary Tables and Time Histories

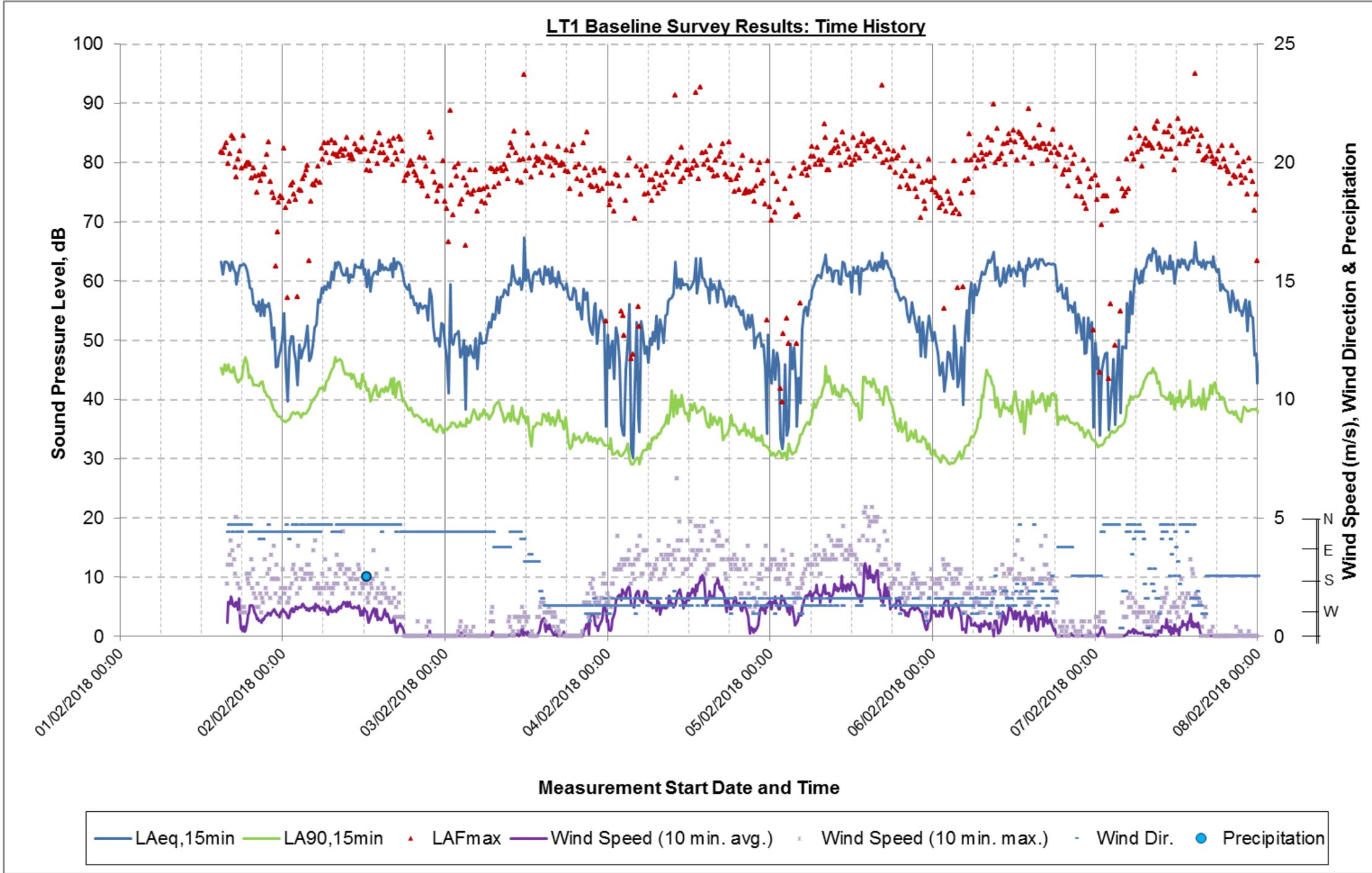


Figure 1: LT1 baseline survey results – time history graph 1

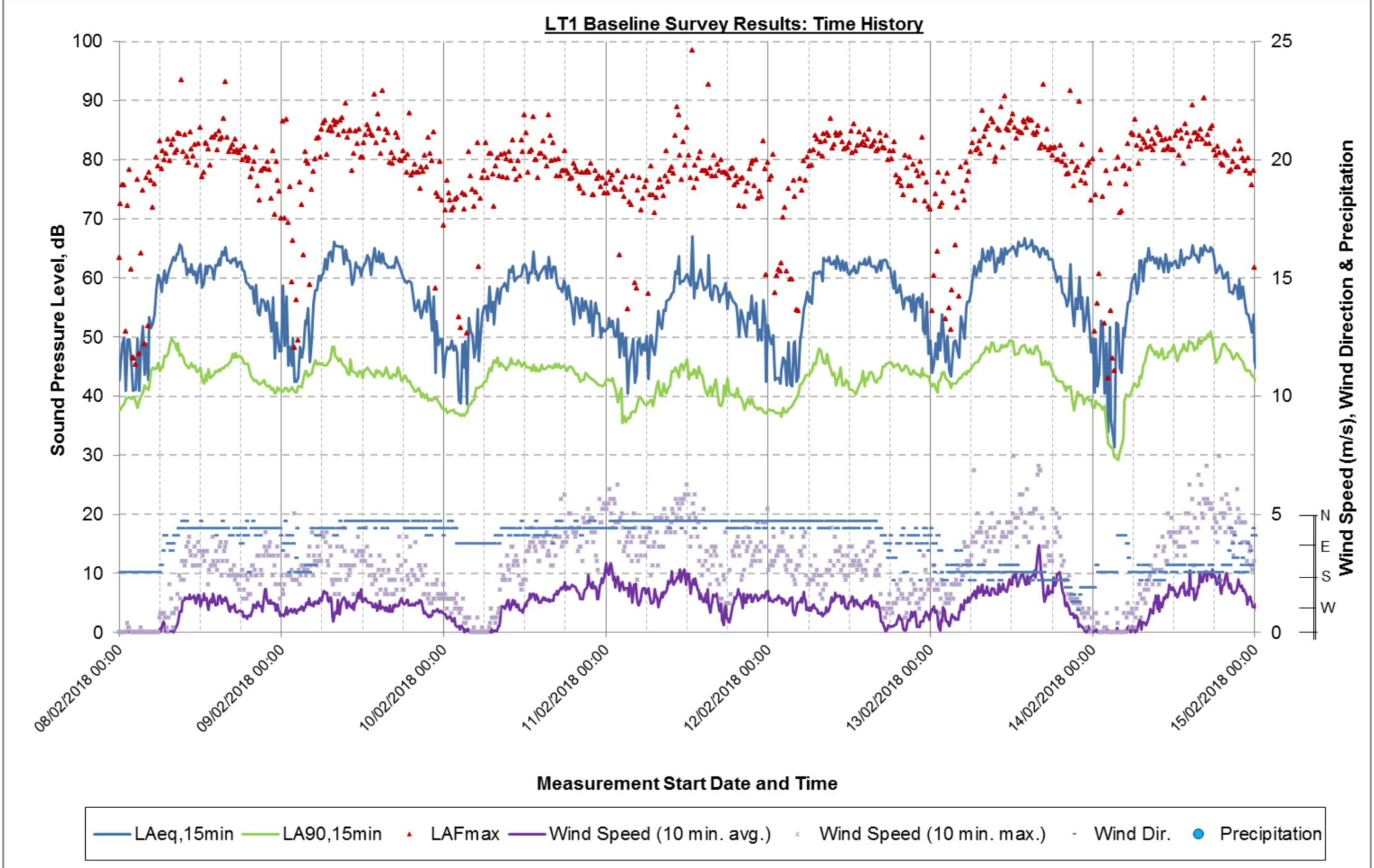


Figure 2: LT1 baseline survey results – time history graph 2

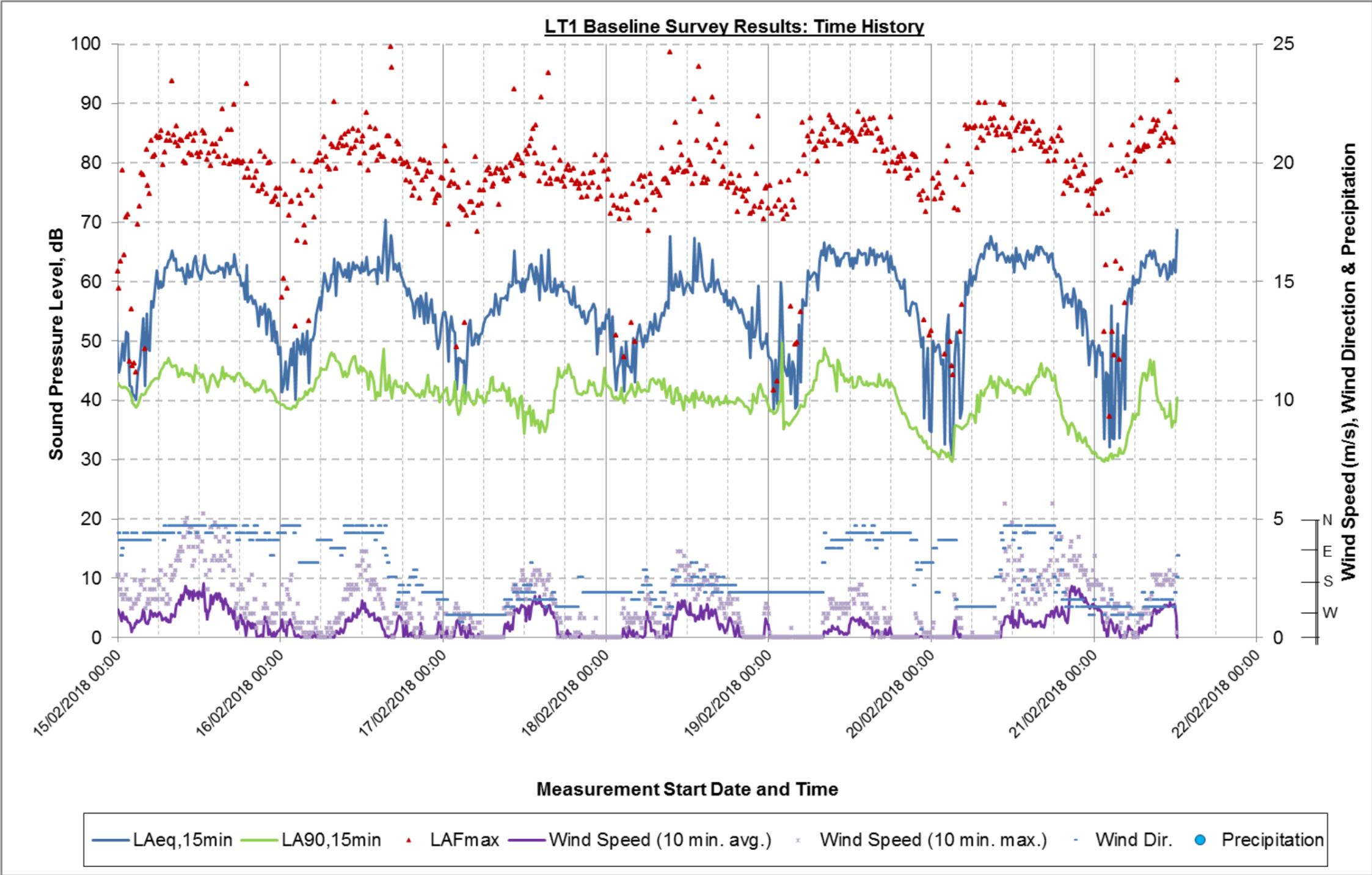


Figure 3: LT1 baseline survey results – time history graph 3

Table 1: LT1 baseline survey results summary.

	Residual sound, dB L _{Aeq,T}			Background sound, dB L _{A90,T}			Maximum sound, dB L _{AFmax,T}		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
Range	47 - 70	44 - 63	30 - 63	32 - 51	33 - 49	29 - 50	71 - 101	58 - 93	37 - 89
25th percentile	60	54	46	40	36	35	80	76	71
Median	62	56	50	43	40	39	82	78	75
75th percentile	63	57	53	45	42	42	84	80	79
Arithmetic Average	61	55	49	43	39	38	82	78	72
Standard deviation	3	3	6	4	4	4	4	3	10

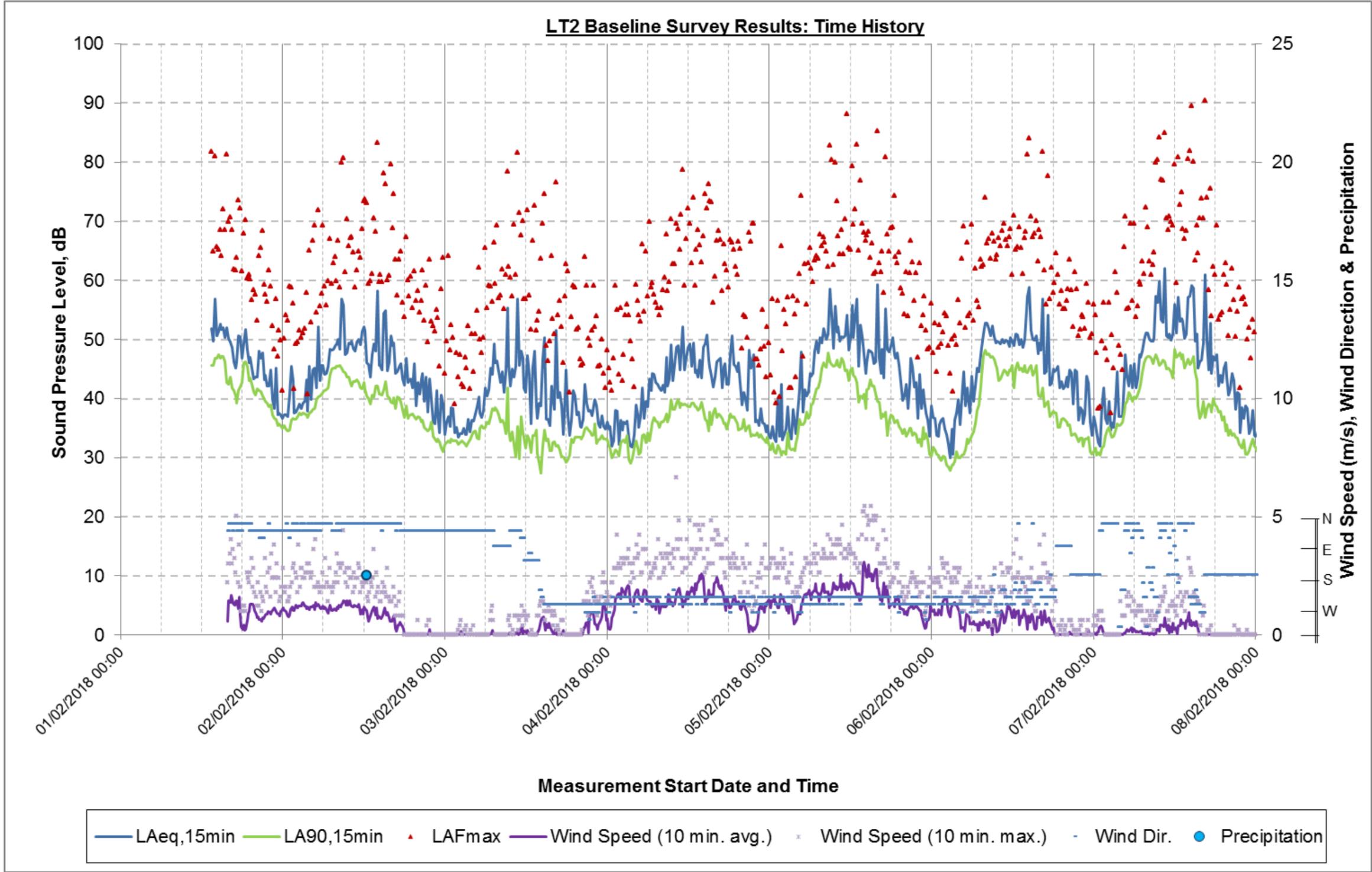


Figure 4: LT2 baseline survey results – time history graph 1

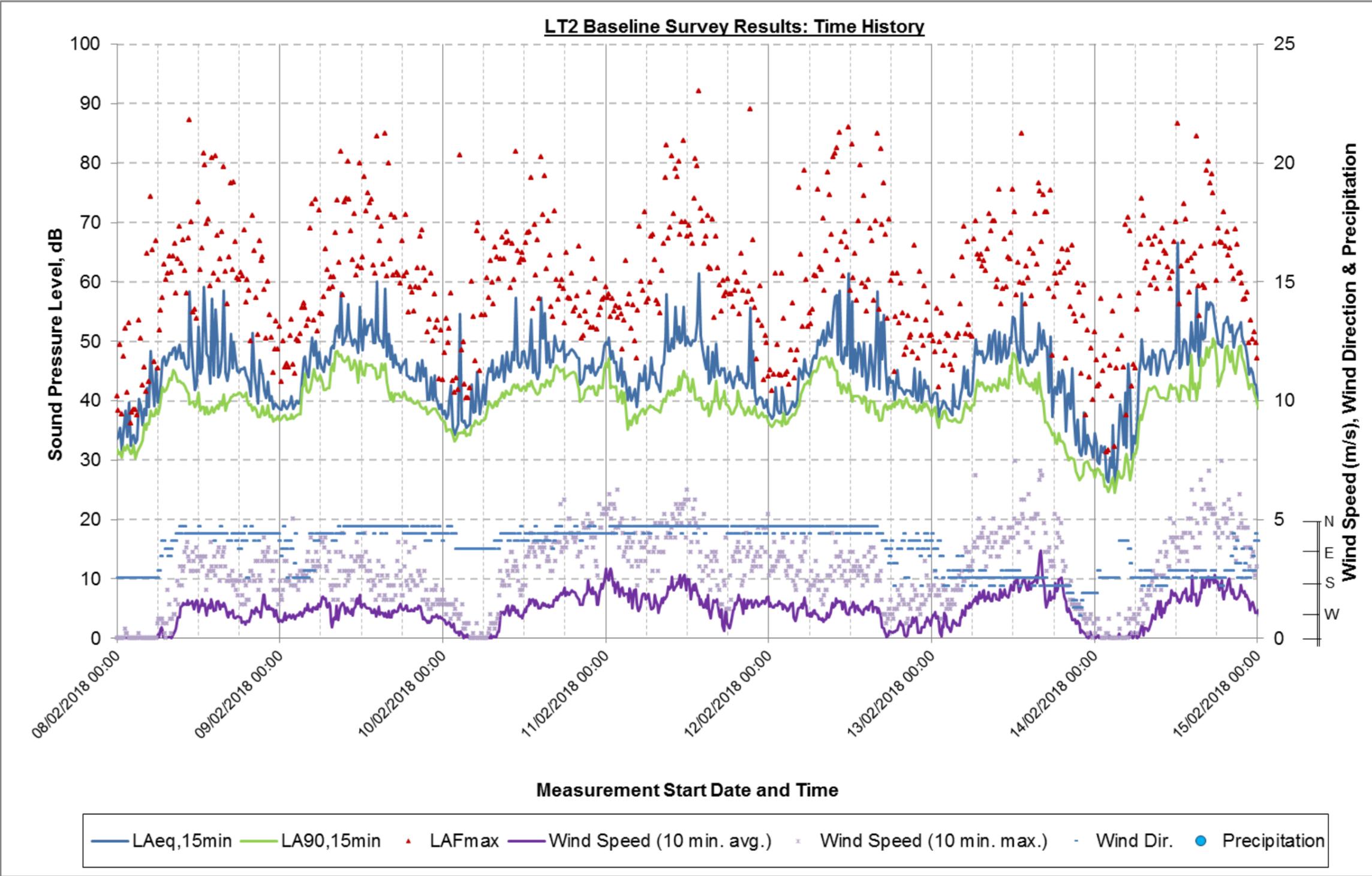


Figure 5: LT2 baseline survey results – time history graph 2

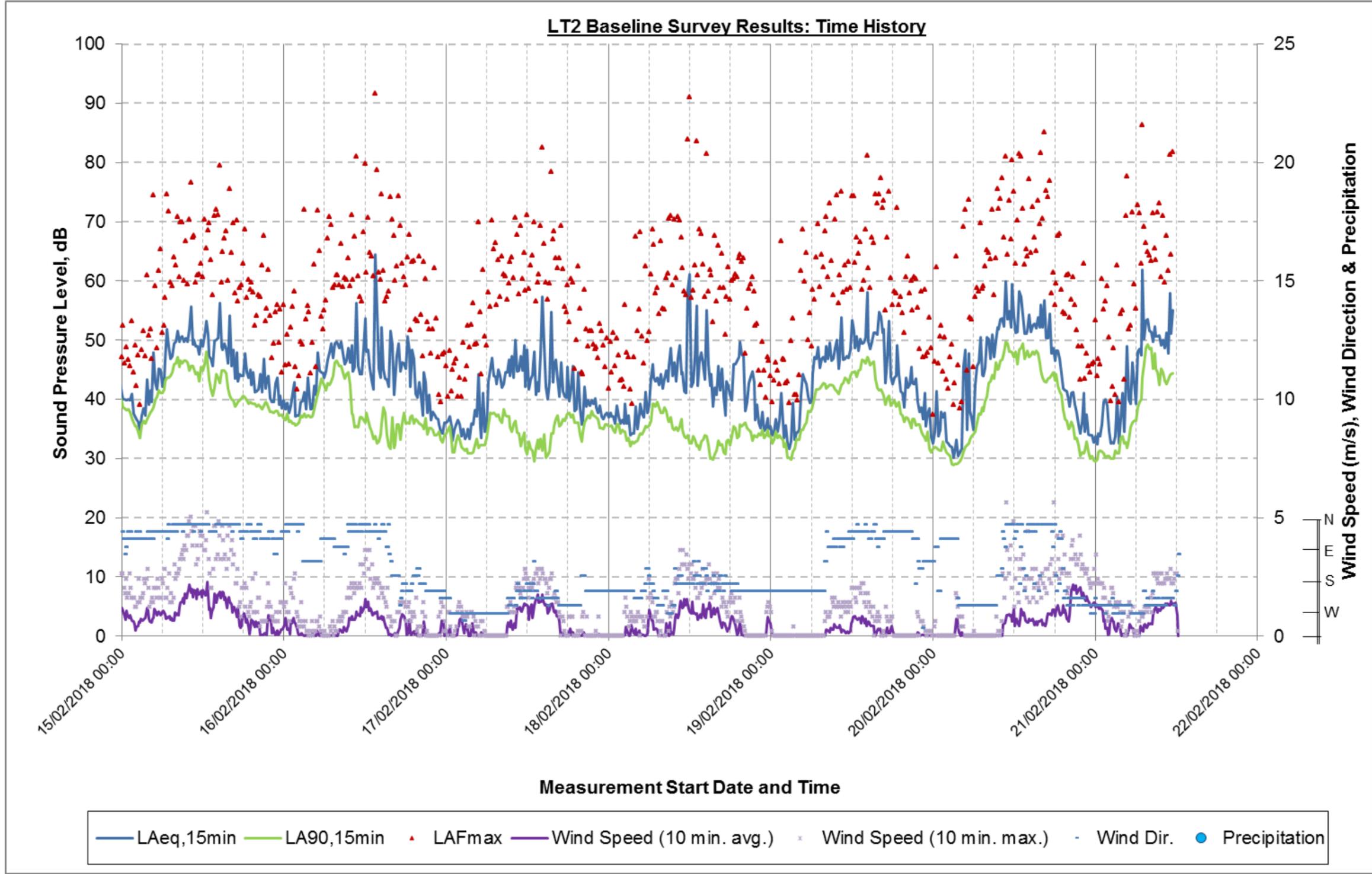


Figure 6: LT2 baseline survey results – time history graph 3

Table 2: LT2 baseline survey results summary.

	Residual sound, dB L _{Aeq,T}			Background sound, dB L _{A90,T}			Maximum sound, dB L _{AFmax,T}		
	<i>Day</i>	<i>Eve</i>	<i>Night</i>	<i>Day</i>	<i>Eve</i>	<i>Night</i>	<i>Day</i>	<i>Eve</i>	<i>Night</i>
Range	34 - 68	31 - 56	26 - 55	27 - 51	27 - 49	25 - 47	41 - 99	38 - 89	31 - 81
25th percentile	45	39	35	38	34	32	61	52	46
Median	48	42	39	42	36	35	65	57	51
75th percentile	51	45	42	45	39	38	70	61	57
Arithmetic Average	48	42	39	41	37	35	66	57	52
Standard deviation	5	4	5	5	4	4	8	6	9

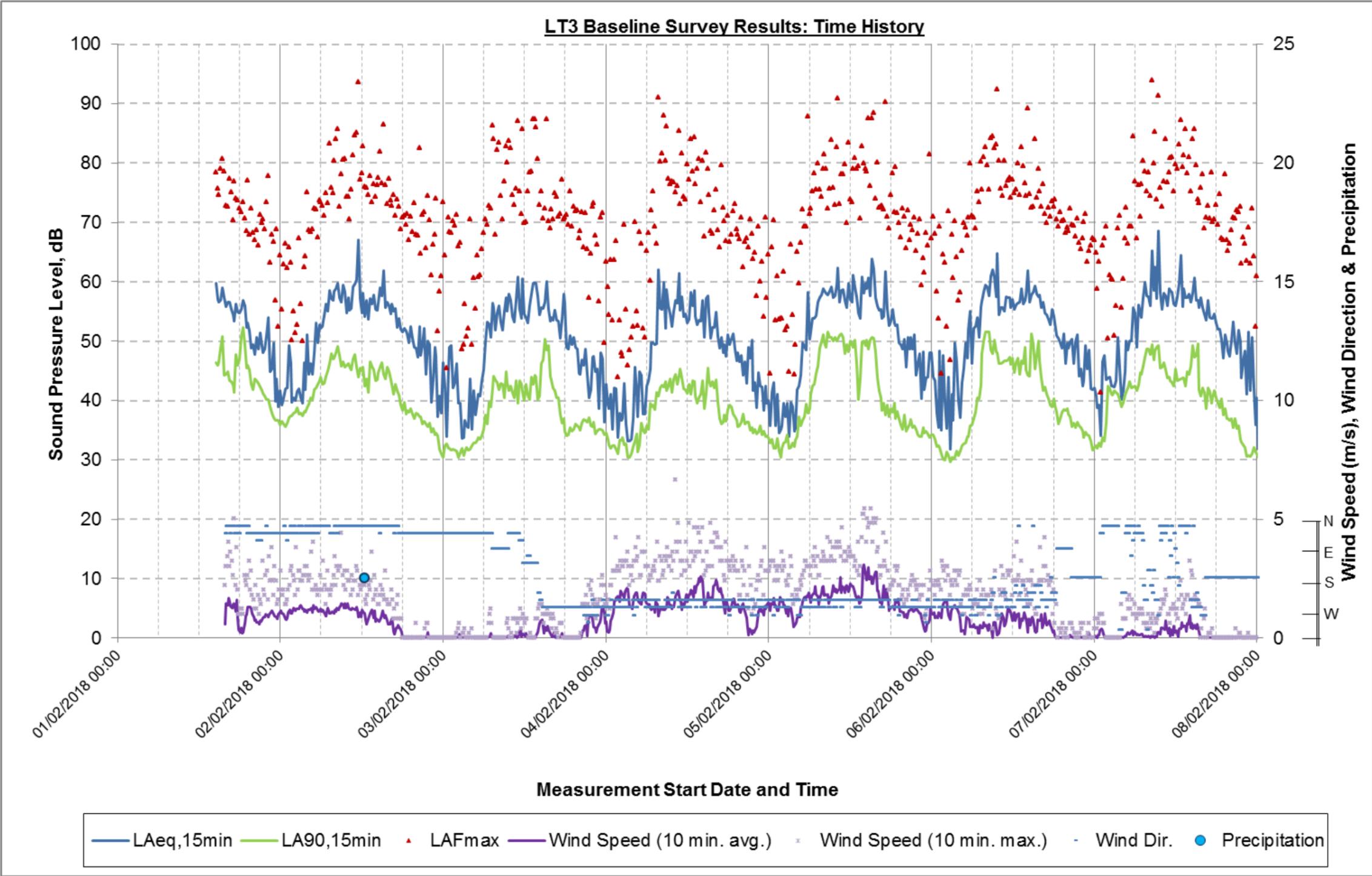


Figure 7: LT3 baseline survey results – time history graph 1

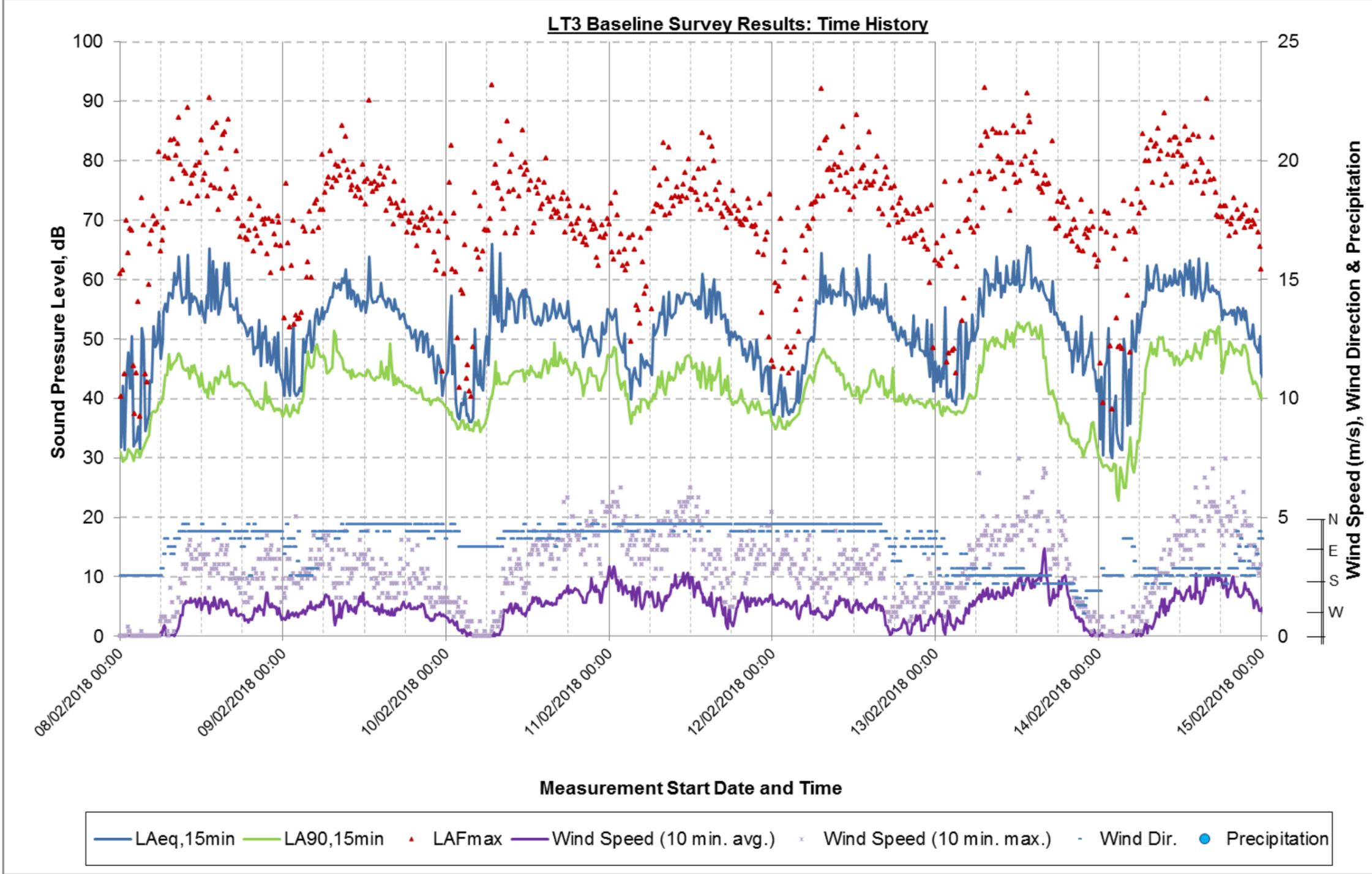


Figure 8: LT3 baseline survey results – time history graph 2

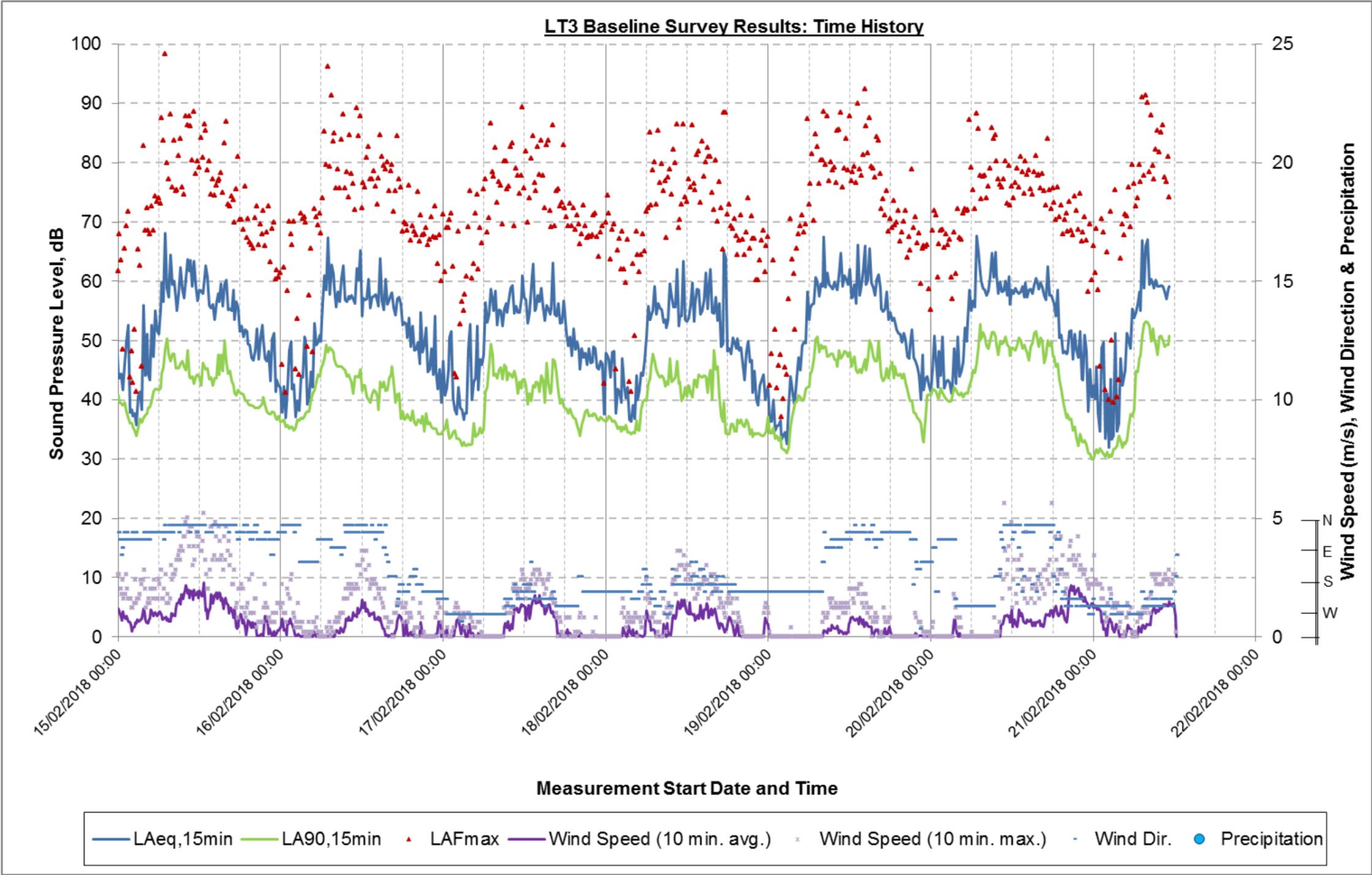


Figure 9: LT3 baseline survey results – time history graph 3

Table 3: LT3 baseline survey results summary.

	Residual sound, dB L _{Aeq,T}			Background sound, dB L _{A90,T}			Maximum sound, dB L _{AFmax,T}		
	<i>Day</i>	<i>Eve</i>	<i>Night</i>	<i>Day</i>	<i>Eve</i>	<i>Night</i>	<i>Day</i>	<i>Eve</i>	<i>Night</i>
Range	48 - 80	39 - 55	30 - 68	34 - 53	30 - 50	23 - 49	65 - 104	55 - 83	37 - 93
25th percentile	55	47	40	42	36	33	74	67	57
Median	57	49	44	45	38	37	77	69	66
75th percentile	59	51	50	48	40	40	81	71	70
Arithmetic Average	57	49	45	45	38	37	78	69	64
Standard deviation	3	3	6	4	4	5	5	3	10

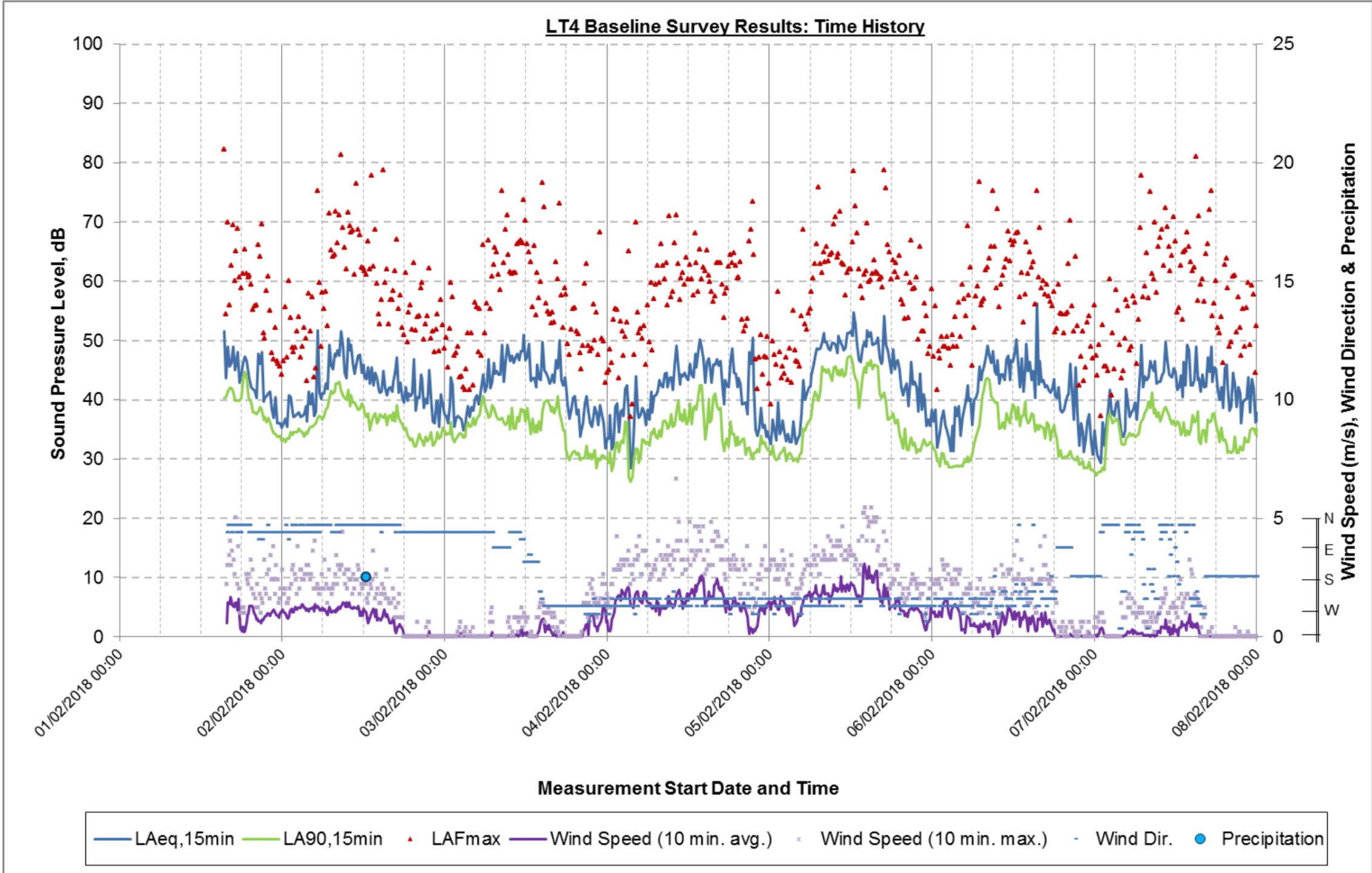


Figure 10: LT4 baseline survey results – time history graph 1

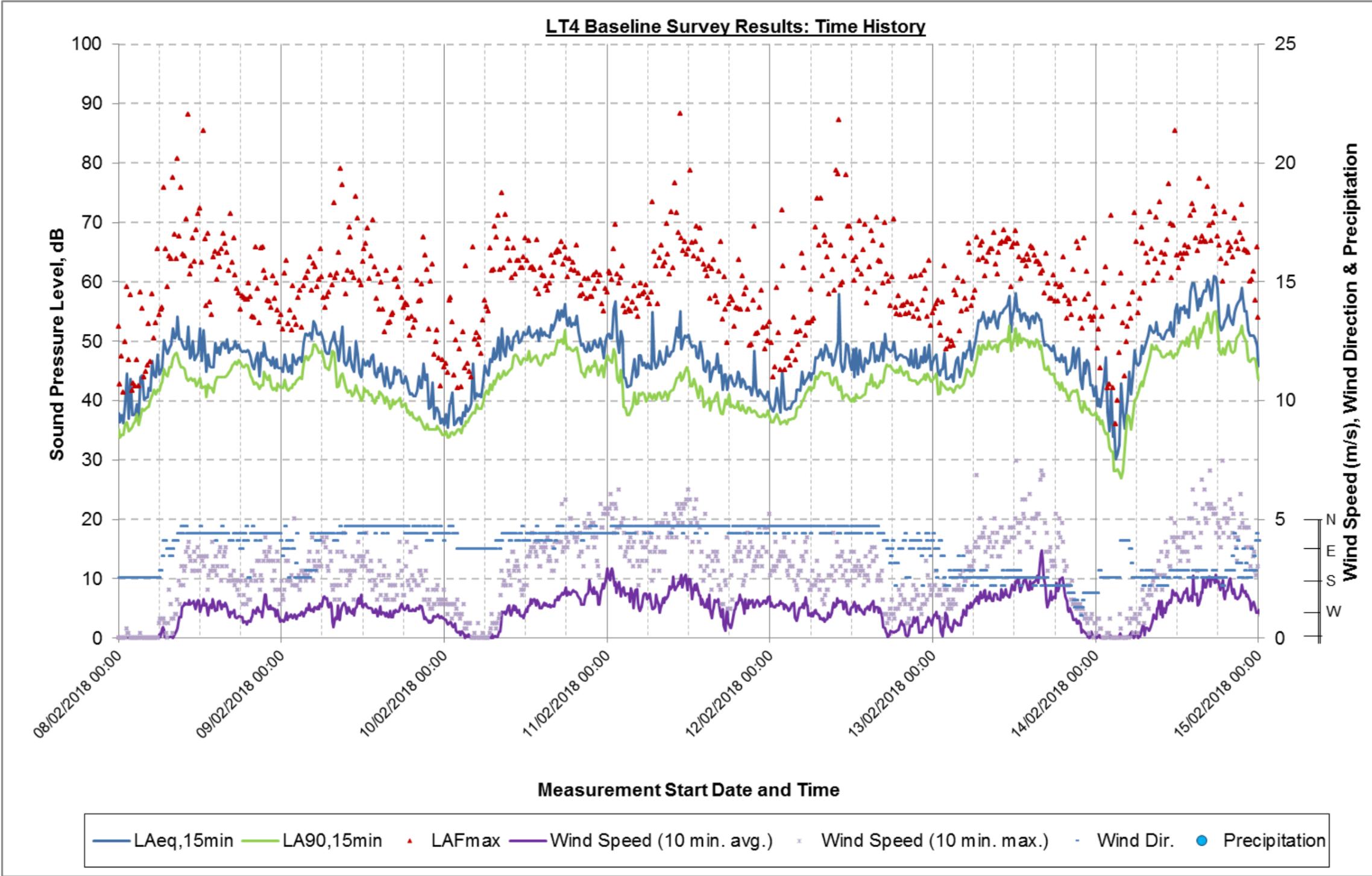


Figure 11: LT4 baseline survey results – time history graph 2

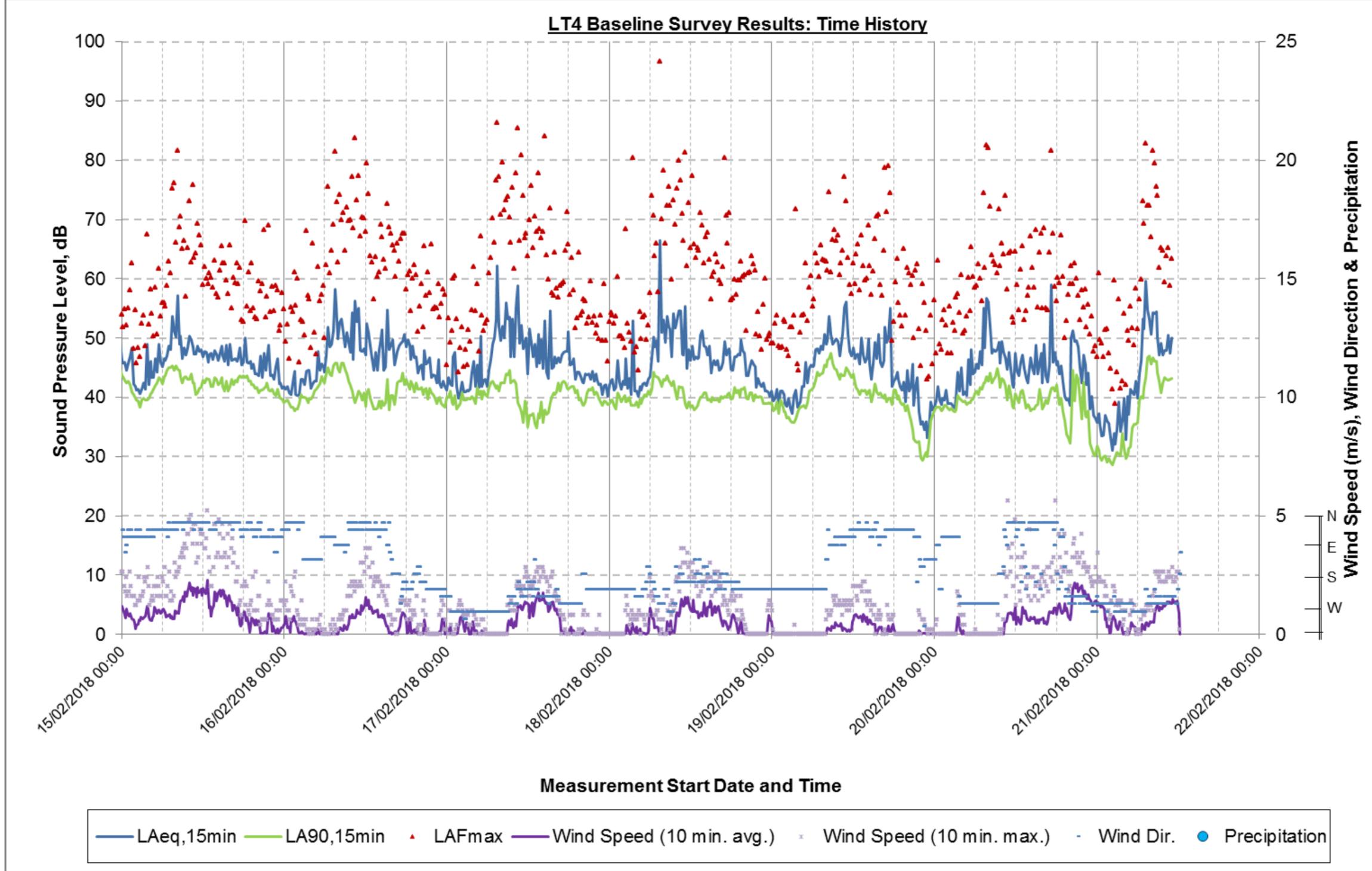


Figure 12: LT4 baseline survey results – time history graph 3

Table 4: LT4 baseline survey results summary.

	Residual sound, dB L _{Aeq,T}			Background sound, dB L _{A90,T}			Maximum sound, dB L _{AFmax,T}		
	<i>Day</i>	<i>Eve</i>	<i>Night</i>	<i>Day</i>	<i>Eve</i>	<i>Night</i>	<i>Day</i>	<i>Eve</i>	<i>Night</i>
Range	37 - 66	31 - 59	29 - 57	30 - 55	28 - 53	26 - 50	48 - 97	42 - 73	36 - 80
25th percentile	45	41	38	39	33	34	60	53	48
Median	48	44	41	41	39	38	64	57	53
75th percentile	50	47	45	44	42	41	68	61	58
Arithmetic Average	48	44	41	42	38	37	64	57	53
Standard deviation	4	5	5	4	6	5	7	6	7

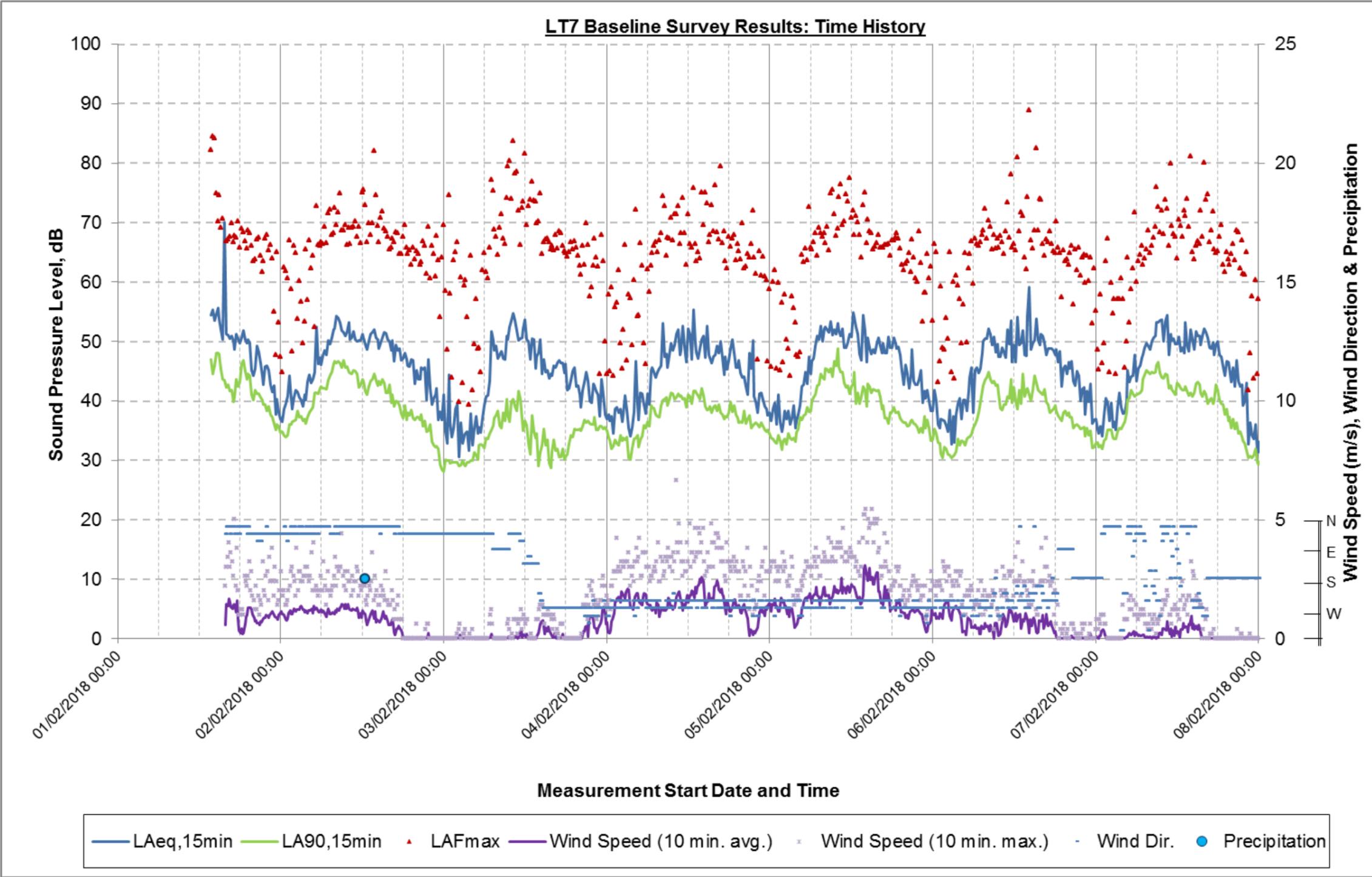


Figure 13: LT7 baseline survey results – time history graph 1

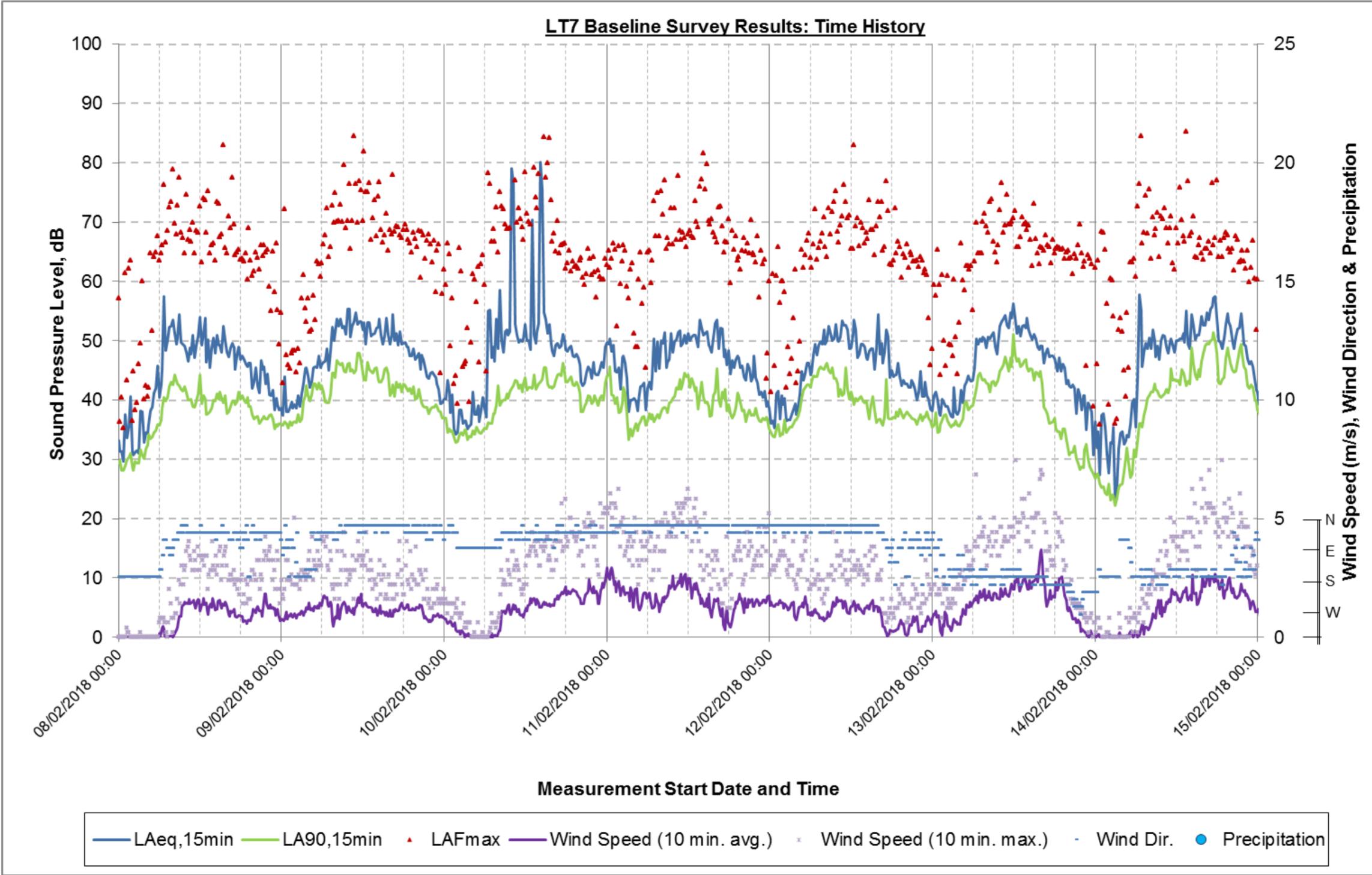


Figure 14: LT7 baseline survey results – time history graph 2

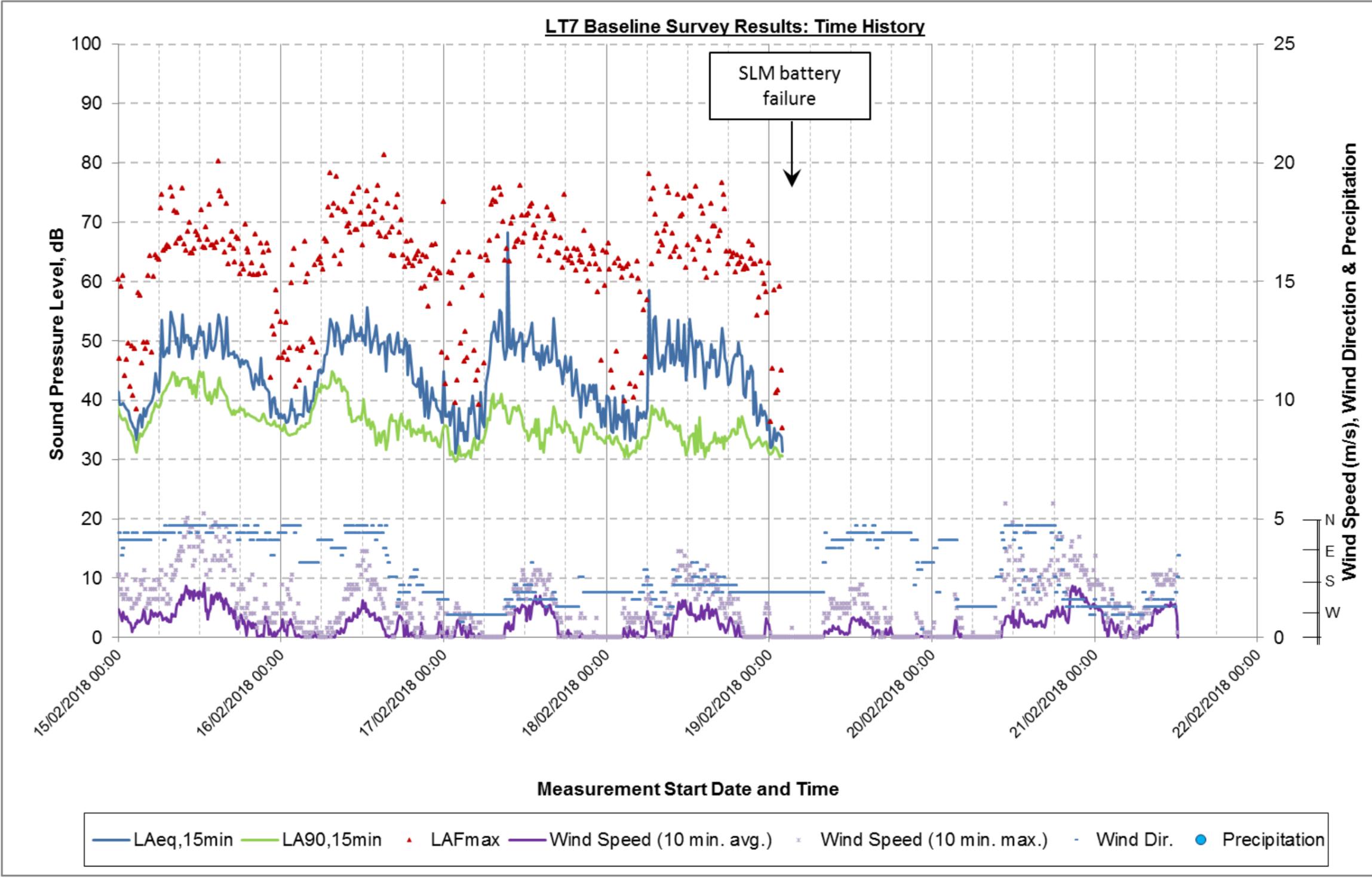


Figure 15: LT7 baseline survey results – time history graph 3

Table 5: LT7 baseline survey results summary.

	Residual sound, dB L _{Aeq,T}			Background sound, dB L _{A90,T}			Maximum sound, dB L _{AFmax,T}		
	<i>Day</i>	<i>Eve</i>	<i>Night</i>	<i>Day</i>	<i>Eve</i>	<i>Night</i>	<i>Day</i>	<i>Eve</i>	<i>Night</i>
Range	42 - 80	33 - 55	24 - 59	29 - 51	28 - 50	22 - 46	60 - 118	42 - 72	35 - 85
25th percentile	48	42	37	38	35	32	66	62	49
Median	50	44	39	41	37	35	69	64	59
75th percentile	51	46	42	43	38	37	72	66	64
Arithmetic Average	50	44	39	41	37	35	70	64	56
Standard deviation	3	3	5	4	3	4	6	4	9

Annex C Baseline Survey Results: Short Term Attended Measurements

Table 1: Short term attended measurements – LT1 Byron Gardens.

Start time	Local weather					Subjective audibility (0 – 4)*				Sound pressure level, dB					No. of pauses	Comments
	Wind Speed, ms ⁻¹	Wind Direction	Temperature, °C	Humidity, %RH	Cloud, Octants	Industry	Wind in flora	Road	Other (trains/aircraft)	L _{Aeq}	L _{Amax}	L _{A10}	L _{A50}	L _{A90}		
01/02/2018 16:47	2	W	7	60	4	1	2	4	1	67	88	71	53	45	0	Occasional but regular traffic on adjacent on Fort Road dominant and cause of L _{Amax} levels (high % HGVs). Distant traffic audible. Distant industry audible.
01/02/2018 21:23	2	W	4	60	8	1	2	4	1	57	83	51	43	41	0	Very occasional but regular traffic on adjacent on Fort Road dominant and cause of L _{Amax} levels (high % HGVs). Distant traffic, v. distant sirens and port activity, v. occasional local traffic, fence rattling. Train @ +5mins. Distant industry.
01/02/2018 23:01	3	W	5	60	6	1	2	3	3	46	69	50	40	38	0	Distant traffic, distant reverse alarm from port, distant aircraft, 2 trains, 1 passenger 1 long freight. Distant industry.
02/02/2018 00:08	3	W	5	60	3	1	2	3	3	45	73	42	38	37	0	Occasional freight train cause of L _{Amax} levels. Distant traffic, distant aircraft. Distant industry.
02/02/2018 01:14	2	W	4	60	2	1	2	3	3	49	75	50	40	38	0	Wind, distant traffic, 2 freight trains cause of L _{Amax} levels. Distant industry.
02/02/2018 10:26	3	W	6	60	6	1	2	4	1	59	80	59	48	44	0	Occasional but regular traffic on adjacent Fort Road dominant and cause of L _{Amax} levels (high % HGVs). Wind rustle, distant aircraft, trains, local traffic, distant and local HGVs. Distant industry.
02/02/2018 11:30	3	W	6	60	7	1	2	4	1	61	81	60	47	42	0	Occasional but regular traffic on adjacent Fort Road dominant and cause of L _{Amax} levels (high % HGVs). Road traffic local and distant, greater proportion of HGVs, voices, distant industry and aircraft, birds

*Subjective audibility; 0 = Inaudible; 1 = Just audible; 2 = Audible; 3 = Significant source; 4 = Dominant

C.1.1 Daytime ambient levels at LT1 were dominated by local road traffic movements on Fort Road, including a high percentage of HGVs. Night-time ambient levels were dominated by local road traffic movements and rail movements. Daytime and night-time background levels were primarily affected by distant traffic and industry. Daytime and night-time maxima affected by local road traffic and/or train movements.

Table 2: Short term attended measurements – LT2 Buckland.

Start time	Local weather					Subjective audibility (0 – 4)*				Sound pressure level, dB					No. of pauses	Comments
	Wind Speed, ms ⁻¹	Wind Direction	Temperature, °C	Humidity, %RH	Cloud, Octants	Industry	Wind in flora	Road	Other (trains/aircraft)	L _{Aeq}	L _{AFmax}	L _{A10}	L _{A50}	L _{A90}		
01/02/2018 15:43	2	W	7	60	4	2	2	4	2	52	74	56	50	45	0	Metal recycling continuous, birds, vegetation
01/02/2018 22:12	2	W	4	60	8	1	2	3	1	46	68	49	43	41	0	Distant traffic, vegetation movement
01/02/2018 23:41	3	W	5	60	5	1	2	3	1	42	65	43	40	38	0	Distant traffic, vegetation movement
02/02/2018 00:49	3	W	5	60	2	1	2	3	1	39	58	40	37	36	0	Vegetation movement
02/02/2018 02:05	3	W	3	60	2	1	2	3	1	43	63	45	42	40	0	Vegetation movement
02/02/2018 11:08	3.5	W	6	60	6	2	2	4	2	53	66	56	51	47	0	Metal recycling continuously audible, distant traffic, vegetation

*Subjective audibility; 0 = Inaudible; 1 = Just audible; 2 = Audible; 3 = Significant source; 4 = Dominant

C.1.2 Daytime ambient levels at LT2 were primarily affected by local farming activity, occasional aircraft overhead and to some extent distant industry (metals recycling facility located on Station Road). Night-time ambient levels were primarily affected by distant traffic and industry. Daytime and night-time background levels were primarily affected by distant traffic and industry, and wind in flora. Daytime and night-time maxima affected by local road traffic and/or train movements.

Table 3: Short term attended measurements – LT3 Walnut Tree Farm.

Start time	Local weather					Subjective audibility (0 – 4)*				Sound pressure level, dB					No. of pauses	Comments
	Wind Speed, ms ⁻¹	Wind Direction	Temperature, °C	Humidity, %RH	Cloud, Octants	Industry	Wind in flora	Road	Other (trains/aircraft)	L _{Aeq}	L _{Amax}	L _{A10}	L _{A50}	L _{A90}		
01/02/2018 16:34	2	W	7	60	4	2	1	4	1	56	76	60	46	41	0	Local road traffic on Church Road dominant with high % HGVs. Distant aircraft, birds. Quiet when traffic is low
01/02/2018 22:30	3	W	5	60	6	2	1	3	2	52	74	49	40	38	0	Occasional local road traffic movements (cars) on Church Road. Distant traffic, some local traffic, wind rustle, distant aircraft and industry
01/02/2018 23:21	3	W	5	60	6	1	1	3	2	52	78	41	38	37	0	Occasional local road traffic movements (cars) on Church Road. Distant traffic, v. occasional local traffic, vegetation movement. Train @ +2mins
02/02/2018 00:29	3	W	5	60	3	1	1	3	2	48	72	45	37	36	0	Occasional local road traffic movements (cars) on Church Road. Distant traffic, v. occasional local traffic, vegetation movement
02/02/2018 01:44	2	W	4	60	2	1	1	3	2	40	65	42	39	38	0	Occasional local road traffic movements (cars) on Church Road. Vegetation movement
02/02/2018 10:49	3	W	6	60	6	2	1	4	1	63	82	67	52	48	0	Local road traffic on Church Road dominant with high % HGVs. Road adjacent fairly busy, cars and HGVs. Traffic dominant

*Subjective audibility; 0 = Inaudible; 1 = Just audible; 2 = Audible; 3 = Significant source; 4 = Dominant

C.1.3 Daytime ambient levels at LT3 were dominated by local road traffic movements on Church Road, including a high percentage of HGVs. Night-time ambient levels were dominated by local road traffic movements on Church Road and rail movements. Daytime and night-time background levels were primarily affected by distant traffic and industrial sources. Daytime and night-time maxima affected by local road traffic on Church Road and/or train movements.

Table 4: Short term attended measurements – LT4 St James' Church.

Start time	Local weather					Subjective audibility (0 – 4)*				Sound pressure level, dB					No. of pauses	Comments
	Wind Speed, ms ⁻¹	Wind Direction	Temperature, °C	Humidity, %RH	Cloud, Octants	Industry	Wind in flora	Road	Other (trains/aircraft)	L _{Aeq}	L _{Amax}	L _{A10}	L _{A50}	L _{A90}		
01/02/2018 16:51	3	W	5	60	7	1	2	3	1	58	78	54	46	43	0	Distant traffic and aircraft, birds, occasional local traffic on Church Road
01/02/2018 21:51	2	W	4	60	8	1	2	2	1	45	61	46	44	42	0	Distant traffic, wind rustle, dog bark
01/02/2018 23:22	3	W	5	60	5	1	2	2	1	47	72	48	40	39	0	Fox, distant traffic, wind
02/02/2018 00:29	3	W	5	60	3	1	2	2	1	42	73	41	38	37	0	Distant traffic, v. distant industry
02/02/2018 01:47	2	W	4	60	2	1	2	2	1	43	74	42	40	39	0	Wind, light distant traffic
02/02/2018 10:45	3	W	6	60	6	1	2	3	1	58	78	57	47	45	0	Wind rustle, local on Church Road and distant traffic, birds, distant aircraft
02/02/2018 11:51	3	W	6	60	7	1	2	3	1	59	77	59	48	44	0	Wind rustle, local on Church Road and distant traffic, birds, distant aircraft

*Subjective audibility; 0 = Inaudible; 1 = Just audible; 2 = Audible; 3 = Significant source; 4 = Dominant

C.1.4 Daytime ambient levels at LT4 were primarily affected by local road traffic movements on Church Road and occasional aircraft. Night-time ambient levels were primarily affected by local and distant road traffic movements. Daytime and night-time background levels were primarily affected by distant traffic and industrial sources, and wind in flora. Daytime and night-time maxima affected by local road traffic and/or aircraft.

Table 5: Short term attended measurements – LT5 Tilbury Fort.

Start time	Local weather					Subjective audibility (0 – 4)*				Sound pressure level, dB					No. of pauses	Comments
	Wind Speed, ms ⁻¹	Wind Direction	Temperature, °C	Humidity, %RH	Cloud, Octants	Industry	Wind in flora	Road	Other (trains/aircraft)	L _{Aeq}	L _{Amax}	L _{A10}	L _{A50}	L _{A90}		
01/02/2018 16:23	2	W	7	60	4	2	1	2	1	52	65	54	52	50	0	Largely distant road traffic, distant aircraft, distant voices, fence rattle with wind. Train @ +13mins
01/02/2018 17:21	2	W	6	60	8	2	1	2	1	52	69	53	52	50	0	Distant traffic, distant reverse alarm, wind, water, distant aircraft, barges
02/02/2018 09:55	3	W	6	60	6	2	1	2	1	52	66	54	51	49	0	Distant traffic and aircraft, port activity: engines, clanging, alarms

*Subjective audibility; 0 = Inaudible; 1 = Just audible; 2 = Audible; 3 = Significant source; 4 = Dominant

C.1.5 Daytime ambient and background levels at ST5 were primarily affected by local activity, distant traffic and industry. Daytime maxima affected by local activity and/or aircraft.

Table 6: Short term attended measurements – LT6 Sandhurst Road.

Start time	Local weather					Subjective audibility (0 – 4)*				Sound pressure level, dB					No. of pauses	Comments
	Wind Speed, ms ⁻¹	Wind Direction	Temperature, °C	Humidity, %RH	Cloud, Octants	Industry	Wind in flora	Road	Other (trains/aircraft)	L _{Aeq}	L _{AFmax}	L _{A10}	L _{A50}	L _{A90}		
01/02/2018 17:10	3	W	5	60	7	2	1	4	1	50	66	53	47	45	0	Roads dominant, local and distant, distant aircraft, train @+7mins.
01/02/2018 21:44	2	W	4	60	8	2	1	4	1	50	73	51	44	43	0	Distant traffic, occasional local traffic on Sandhurst Road close to survey location and Fort Road, railway power lines humming. Train @ +2mins, +8mins.
01/02/2018 22:59	3	W	5	60	6	2	1	3	3	57	90	59	42	41	0	Distant traffic, occasional local traffic on Sandhurst Road close to survey location and Fort Road, railway power lines humming.
02/02/2018 00:06	3	W	5	60	4	2	1	2	3	41	68	42	40	39	0	Distant traffic, railway power lines humming.
02/02/2018 01:23	2	W	4	60	2	2	1	2	3	50	70	48	41	40	0	Railway power lines humming.
02/02/2018 10:26	3	W	6	60	6	2	1	4	1	53	71	55	47	45	0	Distant roads and aircraft, car idling nearby. Car alarm and train together @ +12mins.
02/02/2018 11:31	3	W	6	60	7	2	1	4	1	52	77	54	47	44	0	Distant roads and aircraft, occasional local traffic on Sandhurst Road close to survey location and Fort Road.

*Subjective audibility; 0 = Inaudible; 1 = Just audible; 2 = Audible; 3 = Significant source; 4 = Dominant

C.1.6 Daytime ambient levels at ST6 were dominated by local road traffic movements on Fort Road, including a high percentage of HGVs. Night-time ambient levels were dominated by local road traffic movements and rail movements. Daytime and night-time background levels were primarily affected by distant traffic and industrial sources. Daytime and night-time maxima affected by local road traffic and/or train movements.

Table 7: Short term attended measurements – LT7 Goshem's Farms.

Start time	Local weather					Subjective audibility (0 – 4)*				Sound pressure level, dB					No. of pauses	Comments
	Wind Speed, ms ⁻¹	Wind Direction	Temperature, °C	Humidity, %RH	Cloud, Octants	Industry	Wind in flora	Road	Other (trains/aircraft)	L _{Aeq}	L _{AFmax}	L _{A10}	L _{A50}	L _{A90}		
01/02/2018 16:14	2	W	7	60	4	2	2	3	2	51	68	54	47	43	0	Metal recycling audible, local traffic, distant aircraft, birds
01/02/2018 22:10	2	W	4	60	8	1	2	2	2	50	76	48	40	38	0	Distant traffic, wind, distant industry (not metal recycling)
01/02/2018 23:44	3	W	5	60	4	1	2	2	2	44	73	45	40	37	0	Distant traffic, wind, distant industry(not metal recycling)
02/02/2018 00:52	2	W	4	60	2	1	2	2	2	39	65	40	36	34	0	Distant traffic, wind, distant industry (not metal recycling), distant train
02/02/2018 02:07	3	W	3	60	2	1	2	2	2	43	69	45	40	37	0	Distant traffic and industry (not metal recycling), wind
02/02/2018 11:07	3.5	W	6	60	6	2	2	3	2	60	83	57	48	44	0	Local traffic on Station Road (cause of LAmax levels) and metal recycling: metal clanging, reverse alarm. Distant traffic and aircraft, birds, trains
02/02/2018 12:11	3	W	6	60	8	2	2	3	2	62	84	60	48	44	0	Local traffic on Station Road (cause of LAmax levels) and metal recycling: metal clanging, reverse alarm. Distant traffic and aircraft, birds, trains

*Subjective audibility; 0 = Inaudible; 1 = Just audible; 2 = Audible; 3 = Significant source; 4 = Dominant

C.1.7 Daytime ambient levels at LT7 were primarily affected by local road traffic movements on Station Road, local commercial activity (vehicle service centre), and to some extent distant industry (metals recycling facility located on Station Road). Night-time ambient levels were dominated by local road traffic movements and rail movements. Daytime and night-time background levels were primarily affected by distant traffic and industrial sources, and wind in flora. Daytime and night-time maxima affected by local road traffic movements.