

## **Construction noise and vibration Monthly Report – March 2020**

### **London Borough of Camden**

<b>Non-technical summary</b>	<b>1</b>
<b>Abbreviations and descriptions</b>	<b>2</b>
<b>1 Introduction</b>	<b>3</b>
1.2 Measurement locations	5
<b>2 Summary of results</b>	<b>6</b>
2.1 Exceedances of SOAEL	6
2.2 Summary of measured noise and vibration levels	9
2.3 Exceedances of trigger level	14
2.4 Complaints	15
<b>Appendix A Site Locations</b>	<b>18</b>
<b>Appendix B Monitoring Locations</b>	<b>23</b>
<b>Appendix C Data</b>	<b>30</b>

## List of tables

Table 1: Table of abbreviations	2
Table 2: Monitoring locations	5
Table 3: Summary of exceedances of SOAEL	7
Table 4: Summary of total exceedances of SOAEL	9
Table 4: Summary of measured dB $L_{Aeq}$ data over the monitoring period	10
Table 5: Summary of measured PPV data over the monitoring period	14
Table 6: Summary of exceedances of trigger levels	15
Table 7: Summary of complaints	15

# Non-technical summary

This Noise and Vibration Monitoring Report fulfils HS2 Limited's commitment detailed in the Environmental Minimum Requirements (EMRs), Annex 1, Code of Construction Practice, to present the results of noise and vibration monitoring carried out within the London Borough of Camden (LBC) during the month of March 2020.

A number of worksites were active during the reporting month in the LBC area. Works at worksites D, E and F included site set up, initial site preparation and enabling works. Works at worksites G and H included cabling works, wall repair works, high level surveys, ramp demolition works and maintenance works. Site setup, scaffolding, site clearance, surveys, materials processing and ancillary activities were undertaken at the DB Cargo and former Addison Lee worksite (ref. S001-WS01). Materials storage and laydown were underway at the 132 and 140 Hampstead road and Petrol Station worksite (ref. S001-WS02). Demolition and scaffolding were undertaken at the Regent's Park Estate worksite (ref. S001-WS07) and at the One Euston Square, 40 Melton Street, Grant Thornton House, 22 Melton Street worksite (ref. S003-WS09). Demolition and propping were underway at the Wolfson House, Walkden House, 67-75 & 77-79 Euston Road worksite (ref. S003-WS03). Processing of arisings was underway at the Ibis Hotel, 3 Cardington Street worksite (ref. S003-WS05). Deliveries were made to the Former National Temperance Hospital, 110 Hampstead Road worksite (ref. S003-WS06). Propping and backfilling were underway at the 93-103 Drummond Street, 11-15 Melton Street, 54-64 Euston Street and 69 Cobourg Street worksite (ref. S003-WS07). Surveying, site clearance and installation of hoarding were undertaken at the Regent's Park Vehicle Holding Area. Utility works were also undertaken along Stephenson Way, Gower Street, North Gower Street, Euston Street, Albany Street, Cumberland Market, Park Village East, Robert Street, Hampstead Road, Stanhope Street, Varndell Street, Harrington Street and Mackworth Street.

Noise monitoring was undertaken adjacent to all active worksites.

Vibration monitoring was undertaken in the vicinity of Regent's Park Estate (worksite ref. S001-WS07), the Walkden House, 67-75 & 77-79 Euston Road worksite (ref. S003-WS03), the Ibis Hotel, 3 Cardington Street & 1-3 Cobourg Street worksite (ref. S003-WS05), the Ibis Hotel, Euston Square Gardens (west) worksite (ref. S003-WS08) and Cubitt Court on Park Village East (V043) (worksite ref. S001-WS07).

Guideline criteria for significant adverse effects were exceeded on 2 occasions due to HS2 works in the LBC area during March 2020. These were due to the demolition of a ramp at Euston Station. Thirteen complaints were received during the monitoring period. Description of complaints, results of investigations and any actions taken are detailed in Table 8 of this report.

# Abbreviations and descriptions

The abbreviations, descriptions and project terminology used within this report can be found in the Project Dictionary (HS2-HS2-PM-GDE-000-000002).

Table 1: Table of abbreviations

Acronym/Term	Definition
$L_{Aeq,T}$	See equivalent continuous sound pressure level
Ambient sound	A description of the all-encompassing sound at a given location and time which will include sound from many sources near and far. Ambient sound can be quantified in terms of the equivalent continuous sound pressure level, $L_{pAeq,T}$
Decibel(s), or dB	Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure (measured in Pascal (Pa)). Because of this wide range, a level scale called the decibel (dB) scale, based on a logarithmic ratio, is used in sound measurement. Audibility of sound covers a range of approximately 0-140dB.
Decibel(s) A-weighted, or dB(A)	The human ear system does not respond uniformly to sound across the detectable frequency range and consequently instrumentation used to measure sound is weighted to represent the performance of the ear. This is known as the 'A weighting' and is written as 'dB(A)'.
Equivalent continuous sound pressure level, or $L_{Aeq,T}$	An index used internationally for the assessment of environmental sound impacts. It is defined as the notional unchanging level that would, over a given period of time (T), deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating sound levels can be described in terms of an equivalent single figure value, typically expressed as a decibel level.
Exclusion of data	Measurement of noise levels can be affected by weather conditions such as prolonged periods of rain, winds speeds higher than 5m/s and snow/ice ground cover. Noise levels measured during these periods are considered not representative of normal noise conditions at the site and, for the purposes of this report, are excluded from the assessment of exceedances and calculation of typical noise levels and are also greyed out in charts. Identifiable incongruous noise and vibration events not attributable to HS2 construction noise are also excluded.
Façade	A facade noise level is the noise level 1m in front of a large reflecting surface. The effect of reflection, is to produce a slightly higher (typically +2.5 to +3 dB) sound level than it would be if the reflecting surface was not there.
Free-field	A free-field noise level is the noise level measured at a location where no reflective surfaces, other than the ground, lies within 3.5 metres of the microphone position.
Peak particle velocity, or PPV	Instantaneous maximum velocity reached by a vibrating element as it oscillates about its rest position. The PPV is a simple indicator of perceptibility and risk of damage to structures due to vibration. It is usually measured in mm/s.
Sound pressure level	The parameter by which sound levels are measured in air. It is measured in decibels. The threshold of hearing has been set at 0dB, while the threshold of pain is approximately 120dB. Normal speech is approximately 60dB at a distance of 1 metre and a change of 3dB in a time varying sound signal is commonly regarded as being just detectable. A change of 10dB is subjectively twice, or half, as loud.
Vibration dose value, or VDV	An index used to evaluate human exposure to vibration in buildings. While the PPV provides information regarding the magnitude of single vibration events, the VDV provides a measure of the total vibration experienced over a specified period of time (typically 16h daytime and 8h night-time). It takes into account the magnitude, the number and the duration of vibration events and can be used to quantify exposure to continuous, impulsive, occasional and intermittent vibration. The vibration dose value is measured in $m/s^{1.75}$ .

# 1 Introduction

1.1.1 The nominated undertaker is required to undertake noise (and vibration) monitoring as necessary to comply with the requirements of the High Speed Rail (London-West Midlands) Environmental Minimum Requirements, including specifically Annex 1: Code of Construction Practice, in addition to any monitoring requirements arising from conditions imposed through consents under section 61 of the Control of Pollution Act, 1974 or through Undertakings & Assurances given to third parties. Such monitoring may be undertaken for the following purposes:

- monitoring the impact of construction works;
- to investigate complaints, incidents and exceedance of trigger levels; or
- monitoring the effectiveness of noise and vibration control measures.

Monitoring data and interpretive reports are to be provided to each relevant local authority on a monthly basis and shall include a summary of the construction activities occurring, the data recorded over the monitoring period, any complaints received, any periods in exceedance of agreed trigger levels, the results of any investigations and any actions taken or mitigation measures implemented. This report provides noise data, and interpretation thereof, for monitoring carried out by HS2 within the London Borough of Camden (LBC) for the period 1<sup>st</sup> to 31<sup>st</sup> March 2020.

1.1.2 Active construction sites in the local authority area during this period include:

- On-network HS2 preparatory works: worksite ref. C (see plan 2 in Appendix A)
  - Works included vegetation removal to enable structural assessment of the PVE parapet wall; and general surveying including the use of a scissor lift.
- On-network HS2 preparatory works: worksites ref. D, E and F (see plans 2 and 3 in Appendix A)
  - Works included installation of site temporary services, installation of working platforms, installation of scaffolding, surveying and monitoring of assets and surrounding structures; site clearance including vegetation clearance and scrub; installation of hoarding, adaption and removal of hoarding; construction of drilling fluid slabs; and preparation for test piling.
- On-network HS2 preparatory works: worksites ref. G and H (see plan 3 in Appendix A)
  - Works included high level cabling, lighting installation works, cable management system installation works for high level cabling, high level trunking, wall repair works, high level surveys, cutline installation demolition works and ramp demolition works. Additional on-network maintenance works were also undertaken within proximity to these worksites, which included points installation, kango packing, weld inspections, signalling and telecoms

works, grinding points, arc welding, ultrasonic rail flaw detector operator, Network Rail Telecoms scoping works, defect scoping, direct current lines repair, plate oiling, identification and maintenance of equipment, track maintenance, point maintenance and signal maintenance.

- DB Cargo shed and adjacent land on Granby Terrace, worksite ref. S001-WS01 (see plan 2 in Appendix A)
  - Works included materials processing and ancillary activities.
- 132 and 140 Hampstead Road and Petrol Station, worksite ref. S001-WS02 (see plan 2 in Appendix A)
  - Works included material storage and laydown.
- Regent's Park Estate, worksite ref. S001-WS07 (see plan 2 and 3 in Appendix A)
  - Works activities included scaffolding and demolition.
- Wolfson House, Walkden House, 67-75 & 77-79 Euston Rd, worksite ref. S003-WS03 (see plan 3 in Appendix A)
  - Works activities included demolition and propping.
- Ibis Hotel, 3 Cardington Street, worksite ref. S003-WS05 (see plan 3 in Appendix A)
  - Work activities included processing of arisings.
- Former National Temperance Hospital, 110 Hampstead Road, worksite ref. S003-WS06 (see plan 3 in Appendix A)
  - Site activities included deliveries.
- 93-103 Drummond Street, 11-15 Melton Street, 54-64 Euston Street, 69 Cobourg Street, worksite ref. S003-WS07 (see plan 3 in Appendix A)
  - Works activities included propping and backfilling.
- One Euston Square, 40 Melton Street, Grant Thornton House, 22 Melton Street, worksite ref. S003-WS09 (see plan 3 in Appendix A)
  - Works activities included scaffolding and demolition.
- Vehicle Holding Area, worksite ref. VLH (see plan 1 in Appendix A)
  - Works activities included surveying and monitoring of assets and surrounding structures; site clearance including vegetation clearance and scrub; installation of hoarding, adaption and removal of hoarding.

Further works were also undertaken to divert utilities along Stephenson Way, Gower Street, North Gower Street and Euston Street. Manhole construction was undertaken at Albany Street; commissioning of new 1000mm pipe was undertaken at Cumberland Market; preparation of commissioning/decommissioning of new 1000mm, pipe chlorination and dichlorination were underway at Park Village East; excavation works and air valve commissioning/decommissioning were underway at Robert Street. Additional works undertaken at Hampstead Road, Stanhope Street, Varndell Street, Harrington Street, and Mackworth Street included jointing, installation of ducts and cable pulling.

- 1.1.3 The applicable standards, guidance, and monitoring methodology is outlined in the construction noise and vibration monitoring methodology report which can be found at the following location <https://www.gov.uk/government/collections/monitoring-the-environmental-effects-of-hs2>. Noise and vibration monitoring reports for previous months can also be found at this location. Noise and vibration reports prior to 2018 can be found at the following location [www.gov.uk/government/publications/monitoring-noise-and-vibration-on-the-hs2-phase-one-route](http://www.gov.uk/government/publications/monitoring-noise-and-vibration-on-the-hs2-phase-one-route).

## 1.2 Measurement locations

- 1.2.1 Table 2 summarises the position of noise and vibration monitoring installations within the LBC area in March 2020.
- 1.2.2 Maps showing the position of noise and vibration monitoring installations are presented in Appendix B.

Table 2: Monitoring locations

Worksite Reference	Measurement Reference	Address
B	JC	Juniper Crescent
C	N046	Lamppost opposite to 49 Mornington Terrace
	N022	External to 34 Mornington Terrace
	N024	External to Park Village Studios, Park Village East
	N047	Park Village East/Mornington Street bridge, lamppost #13
D	N004	Mornington Terrace, lamppost #7 (junction of Mornington Terrace, Mornington Place and Clarkson Row)
E	N005	5A Granby Terrace
F	BS	Roof of Stockbeck House, Barnby Street
	N023	Lamppost #21 on Hampstead Road
G	HH	Euston Station Parcel Deck, Barnby Street
S001-WS01	N001	Park Village East, lamppost #1 (external to Cubitt Court, 100 Park Village East)
	N002	Park Village East, lamppost #2 (external to Richmond Court)
	N003	Park Village East, lamppost #9 (external to Silsoe House)
S001-WS02	N018	Outside replacement housing, Hampstead Road
	N019	Outside Cartmel, Hampstead Road
S001-WS07	N020	Mackworth Street, lamppost #1
	N021	Stanhope Street, lamppost #2
	N044	Regents Park Estate west, near Langdale
	N045	Regents Park Estate south, external to Coniston

Worksite Reference	Measurement Reference	Address
	V039	Coniston, Regents Park Estate
	V043	Cubitt Court, Park Village East
S003-WS01	N016	Margaret Centre roof
S003-WS03	N006	Royal College of General Practitioners roof level
	N008	Stephenson's Way lamppost (external to RCGP)
	N010	Wesley Hotel
	N011	Euston Street, lamppost #4 (external to 82 Euston Street)
	V002	Royal College of General Practitioners basement boiler room by Stephenson Way
	V037	Magic Circle, basement
	V038	Wesley Hotel, basement lightwell, Euston Street
S003-WS05	N014	Starcross Street lamppost (external to Exmouth Arms)
	V021	42-44 Cobourg Street
S003-WS06	N017	Hampstead Road, lamppost #48
S003-WS07	N012	Drummond Street, lamppost #14 (opposite to 92-94 Drummond Street)
S003-WS08	N007	Royal College of General Practitioners, Melton Street
	V003	Royal College of General Practitioners basement vaults under Melton St
Vehicle Holding Area (VHA)	N025	External to 3 Prince Albert Road
	N026	Thames Water Compound

## 2 Summary of results

### 2.1 Exceedances of SOAEL

2.1.1 The significant observed adverse effect levels (SOAEL) is defined in the Planning Practice Guidance – Noise as the level above which "noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area."

2.1.2 Where construction noise levels exceed the SOAEL, relevant periods will be identified and summary statistics provided in order to evaluate ongoing qualification for noise insulation and temporary rehousing.



2.1.3 Table 3 presents a summary of recorded exceedances of the SOAEL due to HS2 related construction noise at each measurement location over the reporting period, including the number of exceedances during each time period.

Table 3: Summary of exceedances of SOAEL

Worksite Reference	Measurement Reference	Monitor Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of SOAEL
B	JC	Juniper Crescent	All days	All periods	No exceedance
C	MT2	Lamppost opposite to 49 Mornington Terrace	All days	All periods	No exceedance
	N046	Lamppost opposite to 49 Mornington Terrace	All days	All periods	No exceedance
	N022	External to 34 Mornington Terrace	All days	All periods	No exceedance
	N024	External to Park Village Studios, Park Village East	All days	All periods	No exceedance
	N047	Park Village East/Mornington Street bridge, lamppost #13	All days	All periods	No exceedance
D	N004	Mornington Terrace, lamppost #7	All days	All periods	No exceedance
E	N005	5A Granby Terrace	All days	All periods	No exceedance
F	BS	Barnby Street	Night	22:00-07:00	7
	N023	Amphill Estate, lamppost #21, Hampstead Road	All days	All periods	No exceedance
G	HH	Euston Station Parcel Deck, Barnby Street	All days	All periods	No exceedance
S001-WS01	N001	DB Cargo shed and adjacent land on Granby Terrace	All days	All periods	No exceedance
	N002	DB Cargo shed and adjacent land on Granby Terrace	All days	All periods	No exceedance
	N003	DB Cargo shed and adjacent land on Granby Terrace	All days	All periods	No exceedance
S001-WS02	N018	132 and 140 Hampstead Road and Petrol Station	All days	All periods	No exceedance
	N019	132 and 140 Hampstead Road and Petrol Station	All days	All periods	No exceedance
S001-WS07	N020	Mackworth Street, lamppost #1	All days	All periods	No exceedance
	N021	Stanhope Street, lamppost #2	All days	All periods	No exceedance

Worksite Reference	Measurement Reference	Monitor Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of SOAEL
	N044	Regents Park Estate west, near Langdale	All days	All periods	No exceedance
	N045	Regents Park Estate south, external to Coniston	All days	All periods	No exceedance
	N046	Mornington Terrace near The Edinboro Castle pub, lamppost #18	All days	All periods	No exceedance
	N047	Park Village East/Mornington Street bridge, lamppost #13	All days	All periods	No exceedance
S003-WS01	N016	Margarete Centre roof	All days	All periods	No exceedance
S003-WS03	N006	Royal College of General Practitioners Roof level	All days	All periods	No exceedance
	N008	Walkden House, 67-75 & 77-79 Euston Rd	All days	All periods	No exceedance
	N010	Wesley Hotel	All days	All periods	No exceedance
	N011	Walkden House, 67-75 & 77-79 Euston Rd	All days	All periods	No exceedance
S003-WS05	N014	Ibis Hotel, 3 Cardington Street & 1-3 Cobourg Street	All days	All periods	No exceedance
S003-WS06	N017	Hampstead Road, lamppost #48	All days	All periods	No exceedance
S003-WS07	N012	93-103 Drummond Street, 11-15 Melton Street, 54-64 Euston Street, 69 Cobourg Street	All days	All periods	No exceedance
S003-WS08	N007	Euston Square Gardens (west)	All days	All periods	No exceedance
VHA	N025	External to 3 Prince Albert Road	All days	All periods	No exceedance
	N026	Thames Water Compound	All days	All periods	No exceedance

2.1.4 SOAEL exceedances identified at measurement ref. BS were caused by the demolition of a ramp at Euston Station during night-time hours. Complaints were received resulting in the works being stopped in order for the methodology and mitigation measures to be reviewed.

2.1.5 For the purpose of assessing eligibility for noise insulation or temporary rehousing, multiple exceedances of the SOAEL in a 24-hour period would be counted as a single exceedance during that day. Over the reporting period, the overall number of SOAEL

exceedances at each measurement location is shown in Table 4 and may be lower than the total sum of individual exceedances reported in Table 3 for each location.

Table 4: Summary of total exceedances of SOAEL

Worksite Reference	Measurement Reference	Monitor Address	Total of SOAEL exceedances in the month
F	BS	Roof of Stockbeck House, Barnby Street	2

- 2.1.6 Construction and demolition works taking place at worksites D, E, F, G, H, S001-WS01, S001-WS07, S003-WS03, S003-WS07, and S003-WS09, along with utility diversion works for Granby Terrace, were ongoing for the majority of the period and are likely to have given rise to noise which would have been audible beyond the site boundary and, at times, in excess of the LOAEL at sensitive receptors.
- 2.1.7 Activities taking place at other worksites were either intermittent or not considered to give rise to substantial levels of HS2 related construction noise during this period, with the measured noise levels largely dominated by the underlying ambient noise, acknowledging that intermittent HS2 works may on occasion be taking place within the area.
- 2.1.8 Monitoring of vibration peak particle velocity (PPV) was undertaken with the purpose of ensuring that construction generated vibration are not of such a magnitude to damage adjacent buildings, in accordance with Annex 1: Code of Construction Practice of the High Speed Rail (London-West Midlands) Environmental Minimum Requirements. No exceedances of the Code of Construction Practice criteria due to vibration caused by HS2 vibration were measured. There are no LOAEL and SOAEL criteria based on PPV applicable to HS2 construction vibration.

## 2.2 Summary of measured noise and vibration levels

- 2.2.1 Table 5 presents a summary of the measured noise levels at each monitoring location over the reporting period. The  $L_{Aeq,T}$  is presented for each of the relevant time periods averaged over the calendar month, along with the highest single period  $L_{Aeq,T}$  that was found to occur within the month.
- 2.2.2 Noise monitoring in the vicinity of worksites D, E, F, G, H, S001-WS07, S003-WS03, S003-WS05, S003-WS07 and S003-WS09 is considered representative of HS2 works in LBC during periods of construction works. Other worksites were not considered to be giving rise to substantial levels of HS2 related construction noise, with the measured noise levels largely dominated by the underlying ambient noise, acknowledging that intermittent HS2 works may on occasion be taking place within the area.

Table 5: Summary of measured dB L<sub>Aeq</sub> data over the monitoring period

Worksite Reference	Measurement Reference	Monitor Address	Free-field or Façade measurement	Weekday Average L <sub>Aeq,T</sub> (highest day L <sub>Aeq,T</sub> )				Saturday Average L <sub>Aeq,T</sub> (highest day L <sub>Aeq,T</sub> )				Sunday / Public Holiday Average L <sub>Aeq,T</sub> (highest day L <sub>Aeq,T</sub> )			
				0700 - 0800	0800 - 1800	1800 - 1900	1900 - 2200	2200 - 0700	0700 - 0800	0800 - 1300	1300 - 1400	1400 - 2200	2200 - 0700	0700 - 2200	2200 - 0700
B	JC	Juniper Crescent	Free-field	59.7 (63.5)	59.8 (63.8)	59.9 (64.4)	59.6 (63.6)	56.9 (62.3)	58.4 (60.4)	59.4 (62.1)	58.4 (60.1)	59.9 (63.3)	56.4 (61.6)	58.7 (63.0)	55.7 (60.7)
C	N046	Mornington Terrace near The Edinboro Castle pub, lamppost #18	Free field	62.8 (64.4)	62.6 (64.5)	62.6 (65.2)	62.1 (66.7)	58.3 (63.5)	62.1 (64.8)	62.2 (64.0)	61.2 (62.3)	63.2 (75.3)	56.4 (63.3)	60.7 (63.8)	57.3 (62.3)
	N022	52A Mornington Terrace	Free-field	59.5 (61.7)	60.1 (62.9)	59.5 (63.6)	58.9 (62.6)	54.9 (60.3)	59.1 (62.0)	59.0 (61.3)	58.1 (59.5)	58.7 (61.6)	54.2 (61.2)	57.8 (61.3)	53.3 (59.3)
	N024	External to Park Village Studios, Park Village East	Free-field	57.1 (64.2)	63.0 (75.3)	55.7 (65.1)	54.4 (65.2)	51.3 (62.4)	55.5 (58.5)	55.6 (56.7)	55.1 (56.5)	54.6 (59.7)	51.6 (64.1)	54.9 (64.5)	50.7 (56.4)
	N047	Park Village East/Mornington Street bridge, lamppost #13	Free field	57.8 (59.5)	59.7 (62.5)	58.5 (62.7)	57.2 (60.9)	53.4 (61.5)	57.1 (58.2)	58.7 (60.5)	58.1 (59.6)	58.2 (62.6)	52.2 (57.6)	58.3 (66.4)	52.8 (58.7)
D	N004	Mornington Terrace, lamppost #7	Free-field	64.4 (66.8)	66.5 (76.1)	64.5 (68.6)	63.6 (66.6)	60.5 (69.0)	63.1 (65.1)	64.1 (66.1)	62.7 (63.7)	64.2 (71.2)	59.7 (69.2)	63.6 (69.6)	59.3 (66.5)
E	N005	5A Granby Terrace	Free-field	66.0 (69.2)	68.2 (75.9)	66.8 (74.3)	66.2 (71.8)	64.3 (74.0)	65.4 (67.7)	66.4 (69.3)	66.5 (70.2)	66.9 (73.9)	67.5 (76.5)	68.1 (77.0)	63.3 (67.3)

Worksite Reference	Measurement Reference	Monitor Address	Free-field or Façade measurement	Weekday Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$ )				Saturday Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$ )				Sunday / Public Holiday Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$ )			
				0700 - 0800	0800 - 1800	1800 - 1900	1900 - 2200	2200 - 0700	0700 - 0800	0800 - 1300	1300 - 1400	1400 - 2200	2200 - 0700	0700 - 2200	2200 - 0700
F	BS	Roof of Stockbeck House, Barnby Street	Free-field	61.2 (70.0)	62.0 (66.6)	61.1 (63.5)	60.2 (62.6)	57.5 (68.3)	60.0 (61.5)	60.0 (62.2)	59.0 (60.8)	60.2 (63.3)	56.4 (61.8)	59.7 (64.0)	56.4 (61.2)
	N023	Ampthill Estate, Hampstead Road	Free-field	70.8 (71.9)	70.4 (72.3)	69.5 (72.6)	68.8 (74.2)	66.6 (71.9)	69.0 (71.4)	69.0 (70.7)	69.8 (71.0)	69.5 (72.7)	66.7 (72.1)	68.9 (72.6)	66.5 (72.6)
G	HH	Euston Station Parcel Deck, Barnby Street	Free-field	63.1 (66.2)	65.2 (74.9)	62.8 (67.2)	62.1 (68.2)	59.6 (65.4)	61.7 (65.2)	63.4 (66.9)	61.2 (64.8)	62.5 (66.9)	59.9 (68.4)	62.0 (68.3)	59.6 (64.7)
S001-WS01	N001	External to Cubitt Court, 100 Park Village East	Façade	58.2 (67.3)	64.5 (72.4)	59.0 (63.5)	58.6 (68.2)	53.5 (71.2)	56.9 (57.4)	61.7 (65.3)	58.8 (59.6)	58.6 (62.9)	52.6 (57.5)	57.4 (63.0)	52.1 (57.0)
	N002	Richmond Court, Park Village East	Free-field	58.3 (61.7)	62.6 (66.5)	60.1 (62.7)	58.6 (62.3)	53.5 (62.6)	57.7 (58.0)	60.8 (62.8)	60.1 (60.7)	60.5 (68.0)	53.2 (57.6)	58.5 (63.1)	53.0 (57.2)
	N003	Silsoe House, Park Village East	Free-field	58.6 (60.8)	61.0 (64.6)	59.8 (62.1)	58.7 (63.8)	53.5 (62.8)	57.9 (58.4)	59.5 (60.6)	59.4 (60.5)	59.5 (65.7)	53.1 (58.0)	58.2 (63.6)	53.0 (57.7)
S001-WS02	N018	Outside replacement housing, Hampstead Road	Free-field	72.0 (73.3)	72.5 (73.8)	72.4 (77.3)	72.1 (76.6)	69.6 (75.2)	70.4 (71.7)	71.4 (73.0)	71.6 (72.8)	72.1 (76.7)	69.4 (74.1)	71.5 (78.7)	69.4 (74.2)
	N019	Outside Cartmel, Hampstead Road	Free-field	70.8 (72.0)	71.1 (73.2)	70.9 (75.7)	70.3 (75.0)	68.3 (75.8)	69.1 (70.7)	69.9 (71.6)	70.0 (71.0)	70.6 (74.5)	67.9 (73.0)	70.0 (76.3)	68.1 (73.5)

Worksite Reference	Measurement Reference	Monitor Address	Free-field or Façade measurement	Weekday Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$ )				Saturday Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$ )				Sunday / Public Holiday Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$ )			
				0700 - 0800	0800 - 1800	1800 - 1900	1900 - 2200	2200 - 0700	0700 - 0800	0800 - 1300	1300 - 1400	1400 - 2200	2200 - 0700	0700 - 2200	2200 - 0700
S001-WS07	N020	Mackworth Street	Free-field	54.3 (66.5)	59.8 (66.9)	53.4 (55.7)	52.8 (59.8)	50.6 (54.6)	52.2 (52.7)	56.5 (60.1)	54.5 (56.1)	53.7 (57.2)	50.8 (54.1)	53.2 (58.1)	49.9 (53.7)
	N021	Stanhope Street, lamppost #2	Free-field	57.4 (64.0)	63.8 (71.0)	56.9 (59.9)	56.2 (63.2)	52.4 (62.4)	54.8 (55.2)	60.1 (64.6)	56.5 (57.8)	56.7 (60.9)	53.5 (64.6)	56.0 (64.2)	51.5 (58.4)
	N044	Regents Park Estate west	Free field	53.2 (59.1)	61.8 (68.2)	53.4 (56.1)	52.8 (56.2)	50.1 (56.8)	53.3 (54.5)	58.3 (62.8)	55.3 (58.4)	54.4 (58.8)	51.5 (58.1)	53.8 (57.9)	49.5 (55.0)
	N045	Regents Park Estate south, external to Coniston	Free field	57.7 (61.7)	67.0 (75.3)	57.9 (63.5)	57.1 (61.5)	55.1 (59.4)	57.0 (58.0)	61.5 (65.7)	58.5 (60.1)	58.2 (62.0)	55.5 (57.9)	58.1 (65.5)	55.0 (58.5)
S003-WS03	N006	RCGP Roof level	Free-field	56.3 (60.3)	66.7 (75.6)	55.2 (58.5)	54.9 (57.9)	54.0 (60.6)	55.3 (55.8)	62.1 (68.1)	55.3 (56.4)	55.6 (58.2)	54.5 (58.4)	56.2 (63.5)	53.4 (55.2)
	N008	RCGP Stephenson Way	Façade	57.5 (61.4)	67.4 (75.5)	55.2 (57.1)	54.8 (56.9)	54.7 (58.1)	55.8 (56.3)	61.4 (67.7)	55.5 (56.1)	56.9 (64.8)	54.8 (56.5)	55.5 (58.5)	54.9 (57.5)
	N010	Wesley Hotel	Façade	67.8 (69.7)	70.3 (74.9)	62.1 (69.0)	63.4 (69.2)	60.0 (72.9)	67.6 (69.7)	71.4 (74.3)	68.5 (69.2)	68.2 (69.7)	62.4 (69.8)	66.2 (69.6)	62.5 (69.8)
	N011	Outside 82 Euston Street	Free-field	57.7 (67.4)	64.7 (70.5)	55.3 (59.2)	54.6 (64.4)	53.1 (65.0)	55.2 (57.0)	64.2 (71.3)	57.0 (59.1)	55.0 (59.4)	52.4 (59.9)	56.8 (69.9)	54.1 (60.3)
S003-WS05	N014	Starcross Street	Free-field	58.1 (62.2)	59.9 (65.2)	56.7 (64.0)	56.2 (65.2)	53.5 (62.7)	54.6 (57.0)	57.2 (58.8)	55.3 (56.0)	56.9 (63.2)	51.6 (56.6)	55.4 (61.0)	54.5 (60.0)
S003-WS01	N016	Margaret Centre roof	Free-field	55.7 (56.9)	59.0 (65.4)	55.8 (58.3)	55.1 (60.7)	55.1 (67.5)	54.5 (55.4)	57.9 (60.9)	57.6 (60.0)	56.5 (61.5)	55.0 (64.8)	56.2 (58.9)	55.4 (69.8)
S003-WS06	N017	Hampstead Road, lamppost #48	Free-field	71.0 (72.5)	71.7 (73.4)	71.9 (80.5)	71.0 (76.5)	68.6 (74.0)	69.4 (70.4)	70.3 (72.2)	70.1 (71.3)	71.1 (76.2)	68.5 (73.5)	70.5 (77.4)	68.4 (73.6)

Worksite Reference	Measurement Reference	Monitor Address	Free-field or Façade measurement	Weekday Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$ )				Saturday Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$ )				Sunday / Public Holiday Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$ )			
				0700 - 0800	0800 - 1800	1800 - 1900	1900 - 2200	2200 - 0700	0700 - 0800	0800 - 1300	1300 - 1400	1400 - 2200	2200 - 0700	0700 - 2200	2200 - 0700
S003-WS07	N012	Opposite 92-94 Drummond Street	Free-field	58.0 (60.6)	61.2 (65.7)	58.1 (60.2)	58.5 (66.1)	56.1 (61.2)	56.2 (58.0)	58.3 (60.4)	57.3 (58.4)	58.0 (61.0)	55.3 (60.1)	58.0 (63.2)	56.3 (60.7)
S003-WS08	N007	RCGP, Melton Street	Free-field	65.4 (80.4)	67.0 (70.9)	63.5 (65.7)	63.9 (67.5)	63.0 (81.8)	63.3 (64.8)	66.6 (73.2)	64.1 (64.9)	63.9 (67.3)	61.3 (64.6)	63.5 (66.8)	67.1 (93.3)
VHA	N025	External to 3 Prince Albert Road	Free-field	68.6 (74.8)	68.3 (70.6)	66.8 (68.7)	66.0 (72.9)	64.2 (71.7)	66.4 (67.4)	66.0 (68.3)	66.9 (68.3)	66.5 (71.6)	64.2 (69.6)	65.8 (71.6)	64.7 (69.8)
	N026	Thames Water Compound	Free-field	58.2 (61.3)	59.6 (64.8)	56.8 (59.3)	55.9 (59.8)	52.8 (63.0)	55.1 (56.0)	56.2 (57.4)	57.8 (59.6)	56.9 (61.2)	53.2 (62.0)	56.2 (58.4)	52.5 (56.7)

2.2.3 Table 6 presents a summary of the measured vibration levels at monitoring locations over the reporting period. During the monitoring high values of PPV were measured at V043 which were due to local disturbance of the vibration monitors and are not representative of HS2 construction works. These have been greyed out in the charts alongside other periods of local disturbance of the monitor as shown in Appendix B, and have been excluded to calculate values in Table 6. The highest PPV measured during the monitoring along any axis is presented in the table.

Table 6: Summary of measured PPV data over the monitoring period

Worksite Reference	Measurement Reference	Monitor Address	Highest PPV measured in any axis, mm/s
S001-WS07	V039	Coniston, Regents Park Estate	1.98 (Y-axis)
	V043	Cubitt Court, Park Village East	1.96 (Y-axis)
S003-WS03	V002	RCGP. basement boiler room. 305 Euston Road	1.70 (Z-axis)
	V037	Magic Circle, basement	3.89 (Z-axis)
	V038	Wesley Hotel, basement lightwell, Euston Street	1.39 (X-axis)
S003-WS05	V021	42-44 Cobourg Street (floor)	0.59 (Z-axis)
S003-WS09	V003	RCGP. basement vaults, 305 Euston Road	0.75 (Z-axis)

2.2.4 Construction vibration during the month was mainly due to demolition activities and may on occasion be perceptible at receptors nearby but was well below levels that may cause structural damage to surrounding buildings.

2.2.5 Appendix C presents graphs of noise and vibration monitoring data over the month for each of the measurement locations. Noise data presented consists of the hourly  $L_{Aeq}$  values and, where relevant, the  $L_{Aeq,T}$  values (where the time period T has been taken to be the averaging period as specified in Table 1 of HS2 Information Paper E23). Vibration data presented consist of hourly PPV values. The full data set for the monitoring equipment can be found at the following location: <https://data.gov.uk/dataset/24542ae7-dd44-444f-b259-871c4cc43b5e/environmental-monitoring-data>.

## 2.3 Exceedances of trigger level

2.3.1 Table 7 provides a summary of exceedances of the S61 trigger noise levels determined to be due to HS2 related construction measured during the reporting period, along with the findings of any investigation.



Table 7: Summary of exceedances of trigger levels

Complaint reference number (if applicable)	Worksite reference	Date and time period	Identified Source	Results of investigation (including noise monitoring results)	Actions taken
-	-	-	-	-	-

2.3.2 There were no exceedances of trigger levels as defined in section 61 consents during the reporting period at any monitoring position.

## 2.4 Complaints

2.4.1 Table 8 provides a summary of complaint information related to noise and vibration received during the reporting period, along with the findings of any investigation.

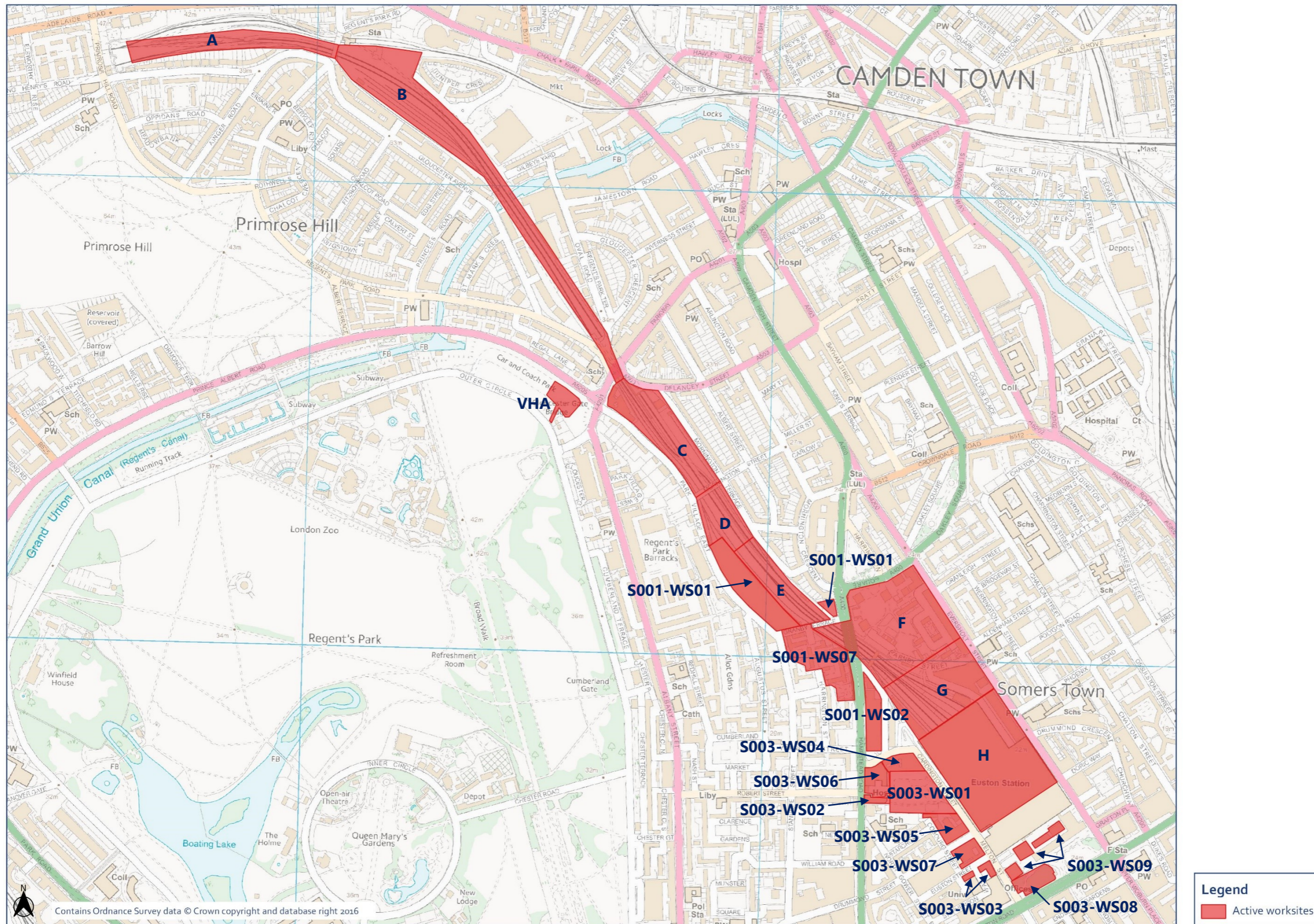
Table 8: Summary of complaints

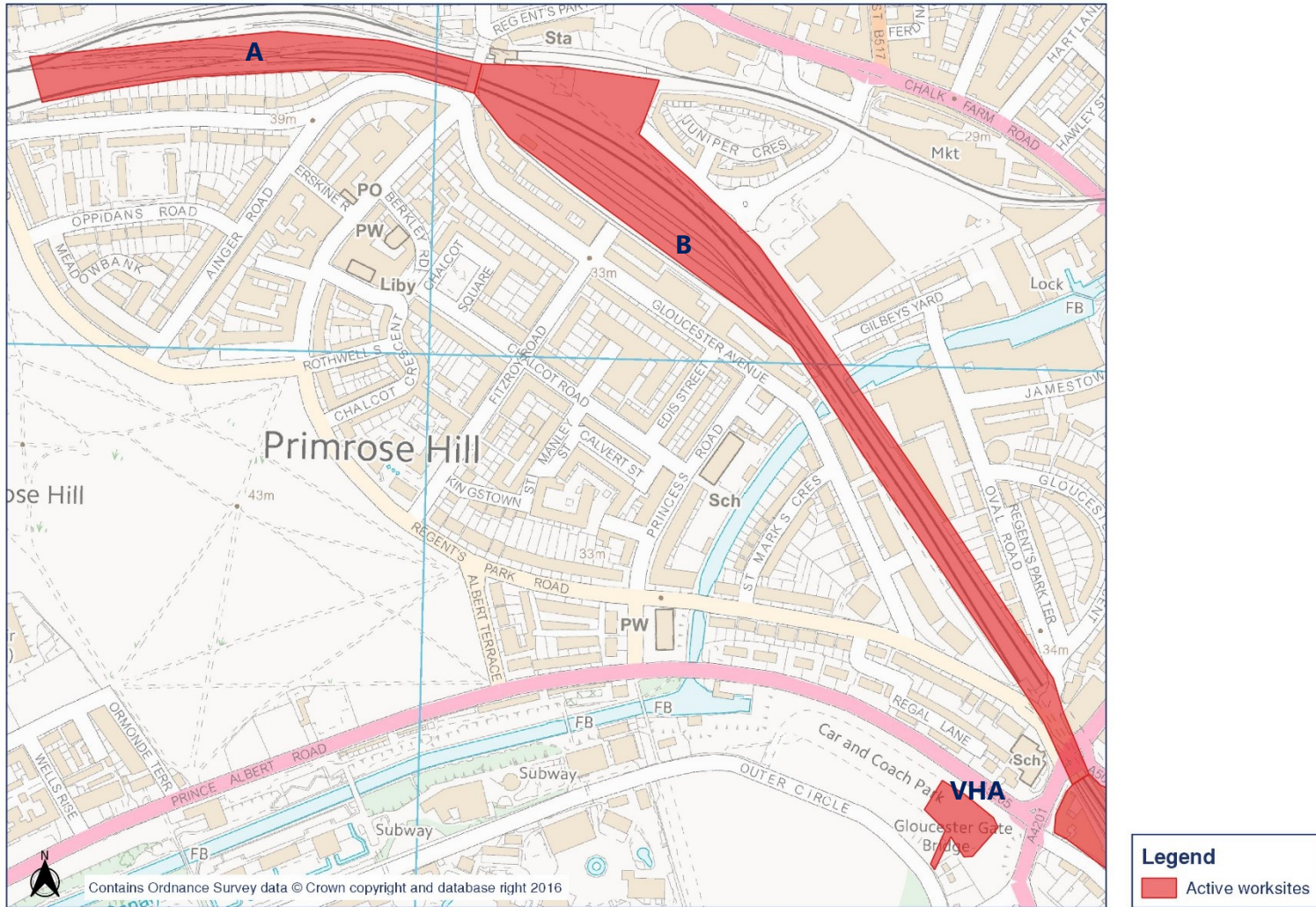
Complaint reference number	Worksite reference	Description of complaint	Results of investigation	Actions taken
HS2-20-17461-C	Worksite adjacent Euston Station	Complaint from a resident due to audible piling noise during the night-time.	Works could only be safely undertaken outside of typical construction hours when the railway is not operational.	The complainant was contacted and an explanation provided.
HS2-20-17559-C	Worksite adjacent Euston Station	Complaint from a resident due to audible drilling noise during the night-time.	Works could only be safely undertaken outside of typical construction hours when the railway is not operational.	The complainant was contacted and an explanation provided.
HS2-20-17560-C HS2-20-17564-C	S003-WS06	Complaint from a resident due to audible drilling noise during the late evening.	Works could only be safely undertaken outside of typical construction hours when the railway is not operational.	The complainant was contacted and an explanation provided.
HS2-20-17567-C	S003-WS06	Complaint from a resident due to audible drilling noise during the late evening and night-time.	Works could only be safely undertaken outside of typical construction hours when the railway is not operational.	The complainant was contacted and an explanation provided.

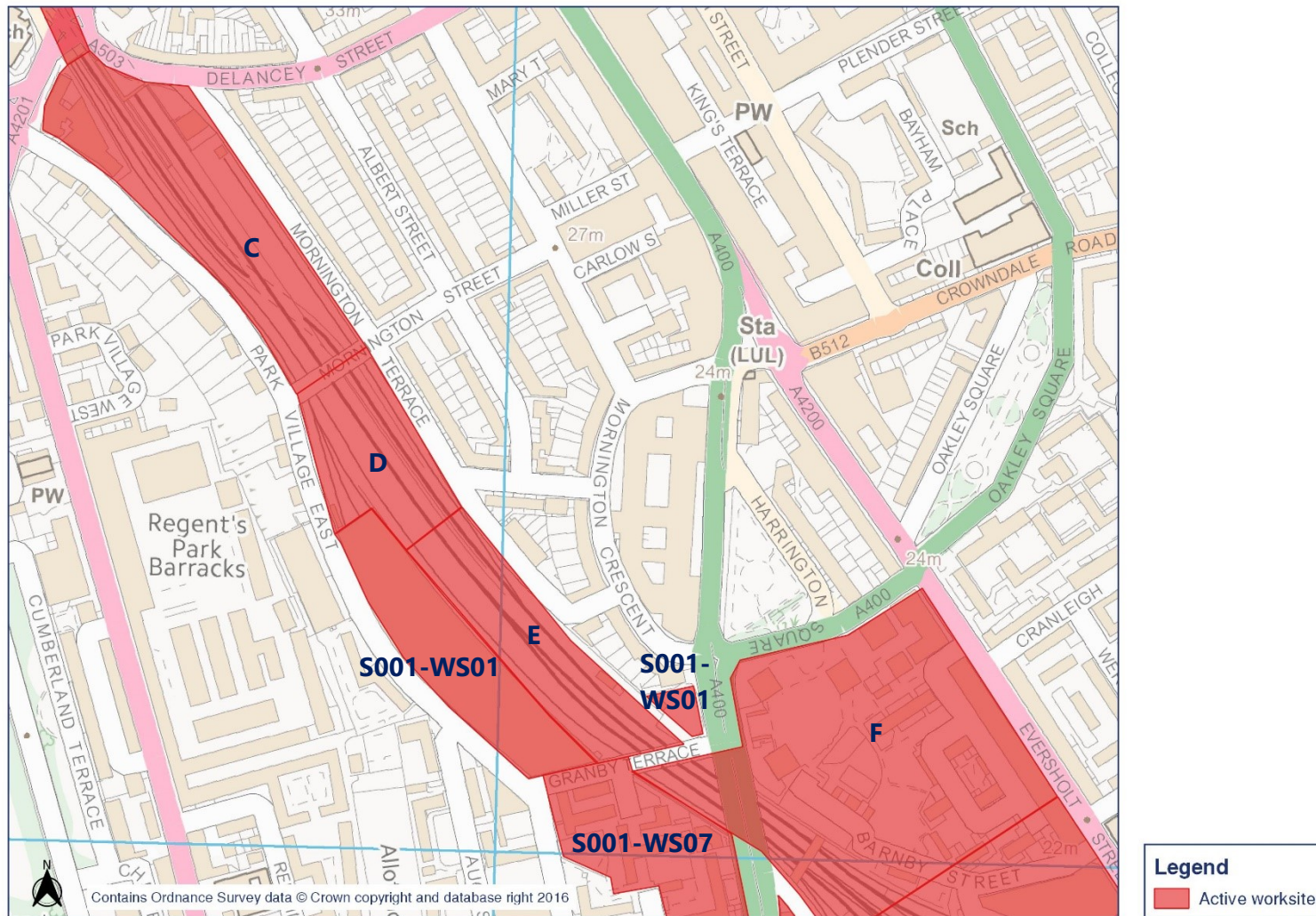
Complaint reference number	Worksite reference	Description of complaint	Results of investigation	Actions taken
HS2-20-17892-C	Worksite adjacent Euston Station	Complaint from a resident due to audible construction noise during the night-time.	Works could only be safely undertaken outside of typical construction hours when the railway is not operational.	The complainant was contacted and an explanation provided.
HS2-20-17679-C	Worksite adjacent Euston Station	Complaint from a resident due to audible construction noise during the night-time.	Works could only be safely undertaken outside of typical construction hours when the railway is not operational.	The complainant was contacted and an explanation provided.
HS2-20-18014-C	D, S003-WS08	Complaint from a non-residential property due to audible drilling noise during the daytime.	Investigation of the complaint is ongoing.	Investigation of the complaint is ongoing.
HS2-20-18013-C	S001-WS04	Complaint from Regent's Park Estate regarding perceptible vibration within the property.	Long reach demolition of Silverdale core underway. Vibration monitoring at receptor indicates maximum transient vibration levels of PPV 0.4-0.8mm/s, which may be perceptible within residential environments, although not at levels considered to be significant.	Works compliant with Section 61 and no further mitigation practicable.
HS2-20-18609-C	S001-WS07	Complaint from a resident due to perceptible vibration events within dwelling.	Vibration due to the breaking out of foundations of nearby buildings.	Works compliant with Section 61 and no further mitigation practicable.
HS2-20-18014-C	S003-WS03	Complaint from non-residential property regarding noise from demolition works at Walkden House.	Demolition of ground floor slab immediately adjacent to party wall. No significant levels of vibration measured and noise levels demonstrate compliance with TAP and Section 61. Activity in vicinity of party wall completed the same day.	No additional mitigation practicable.

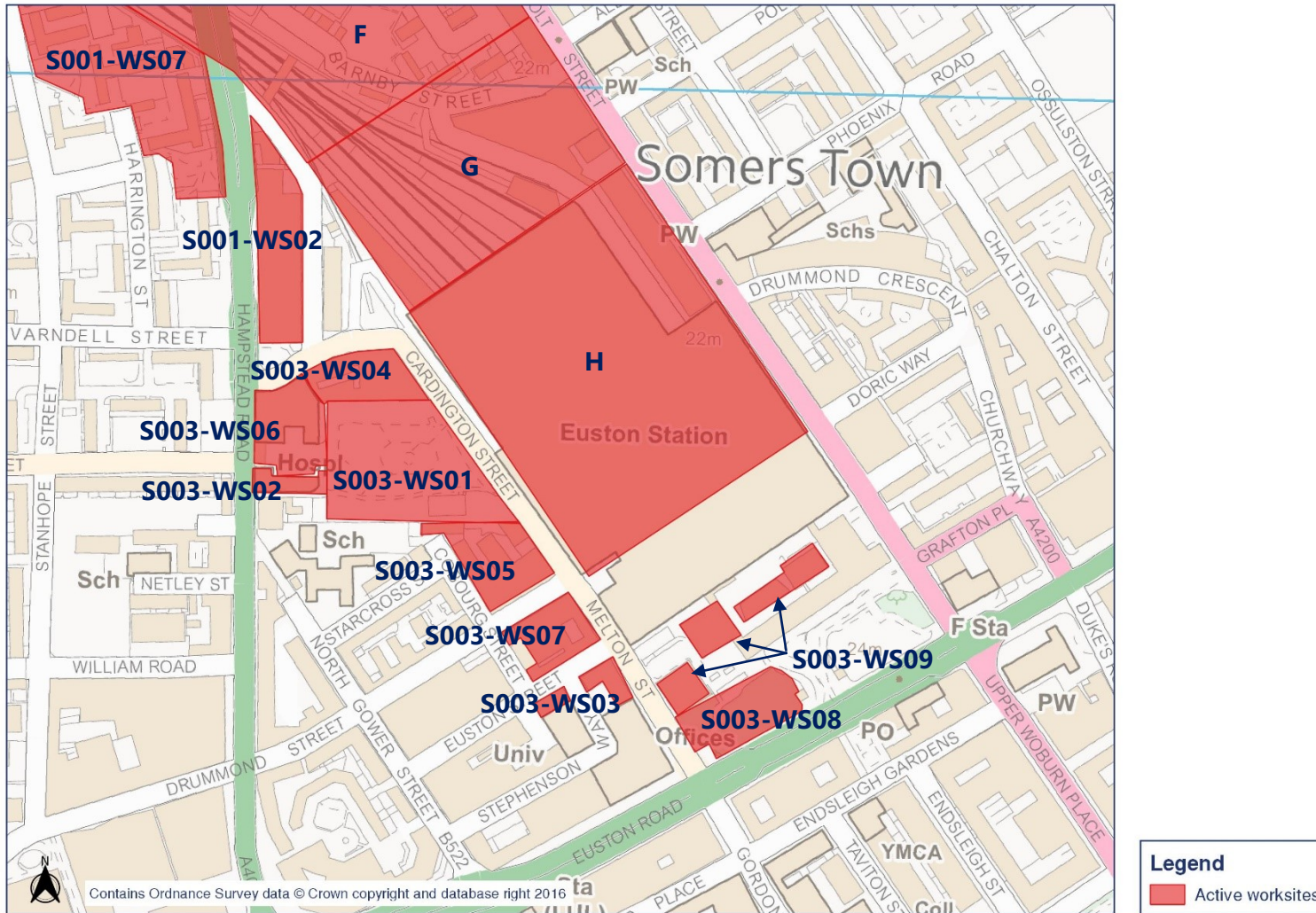
Complaint reference number	Worksite reference	Description of complaint	Results of investigation	Actions taken
HS2-20-17461-C HS2-20-17559-C HS2-20-17560-C HS2-20-17564-C	G/H	Complaints from four residential properties regarding demolition noise.	Breakout activities at Euston Station west ramp, during possession periods.	Works were stopped to review methodology and mitigation.

# Appendix A Site Locations



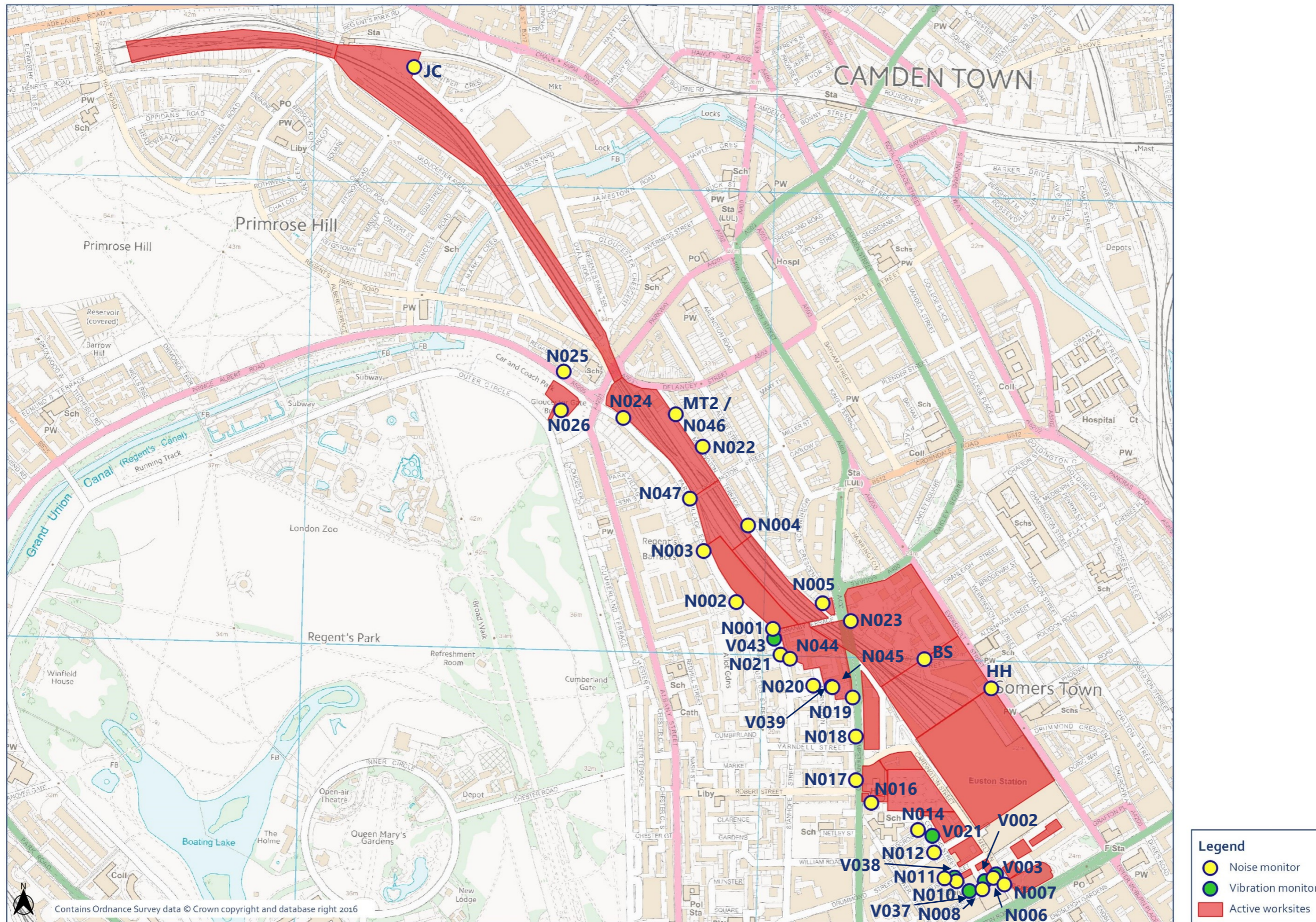


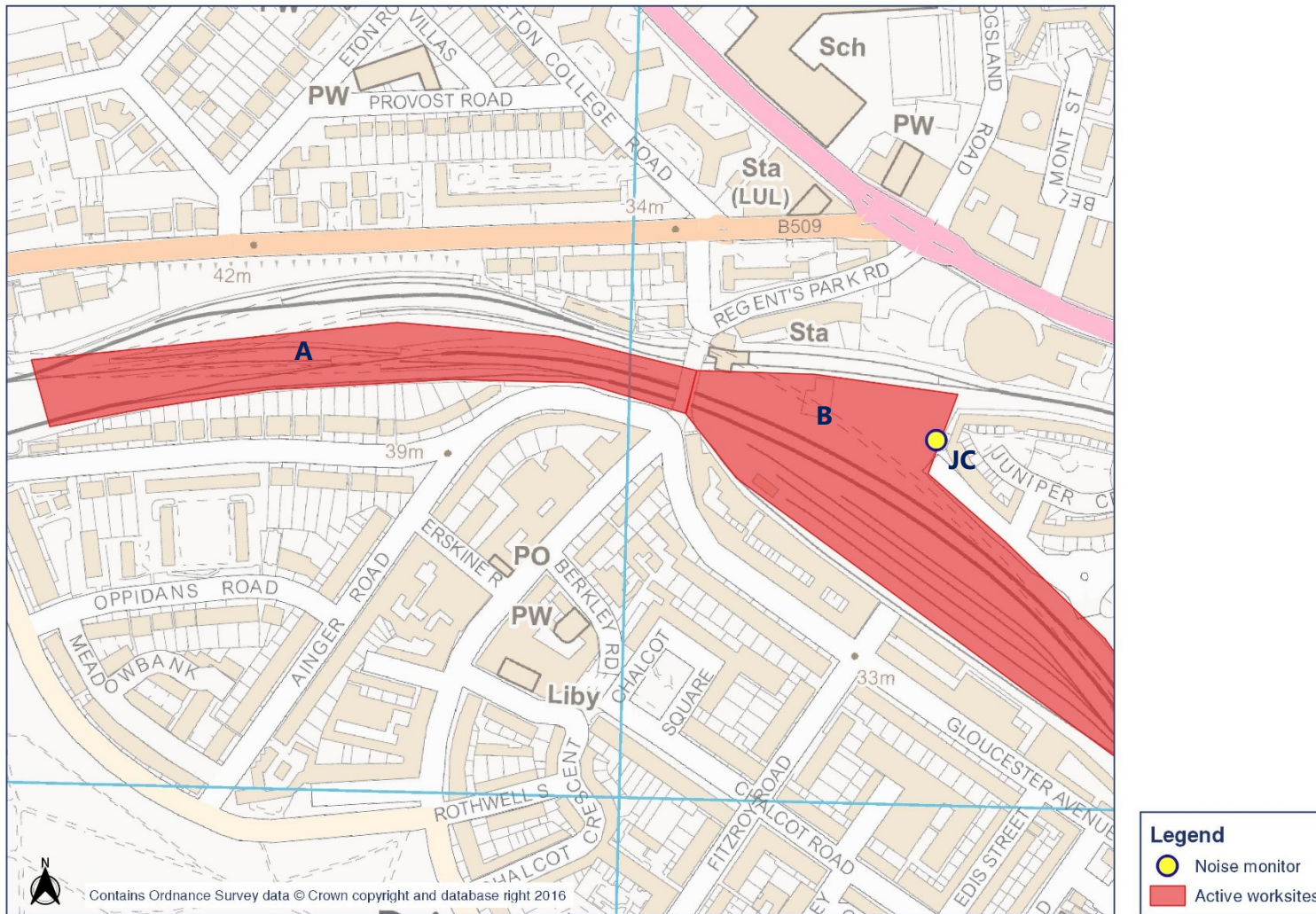


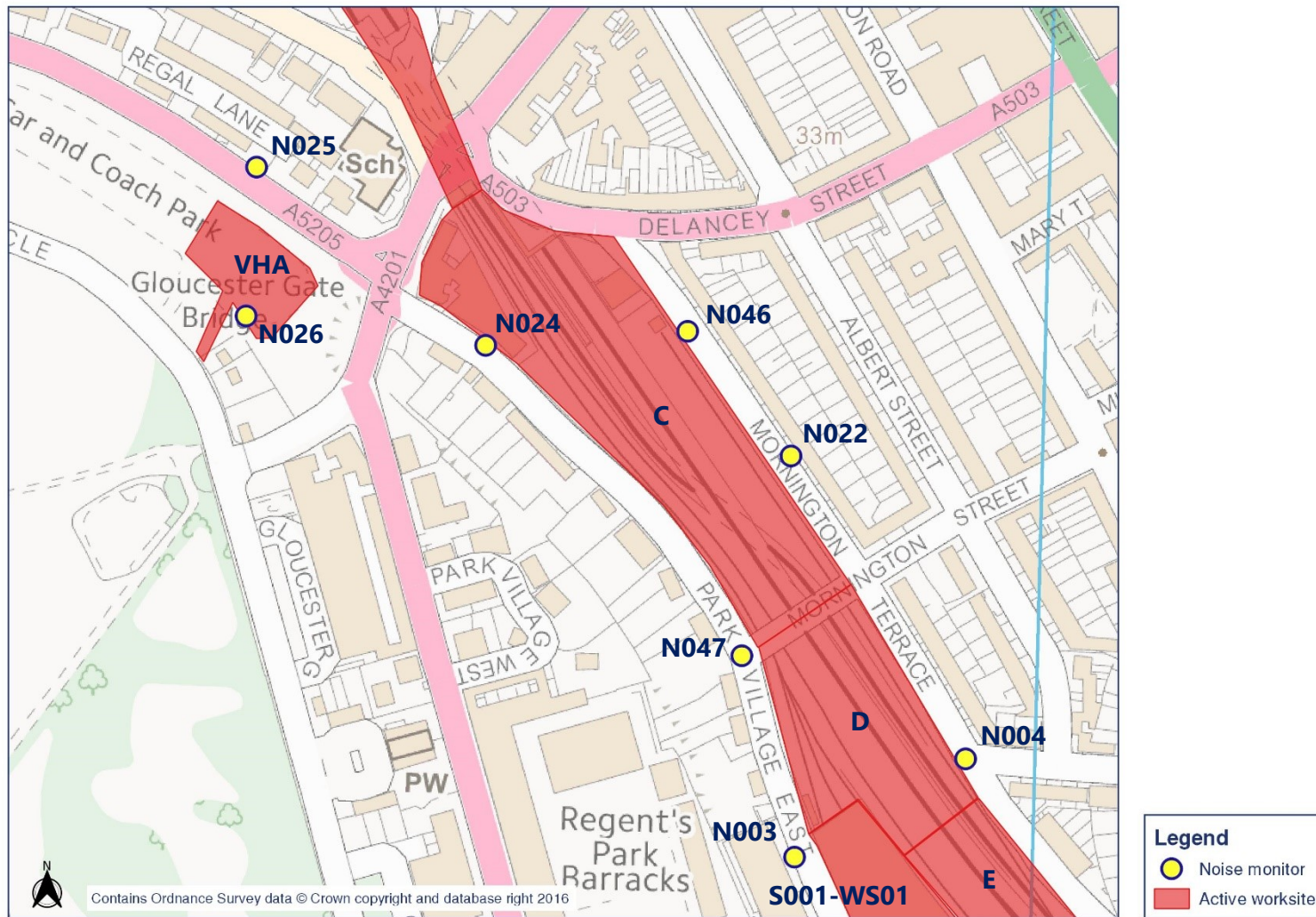


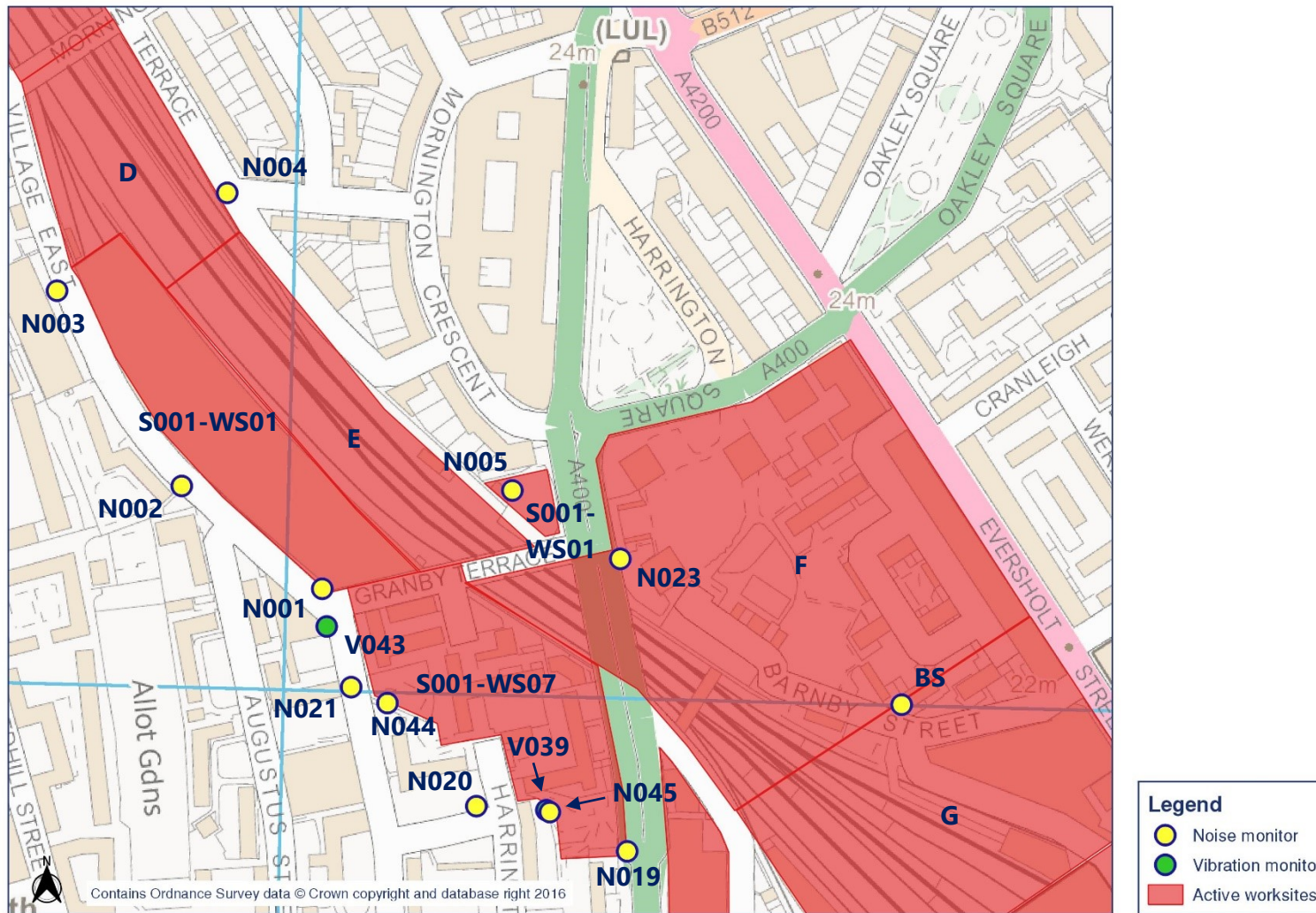


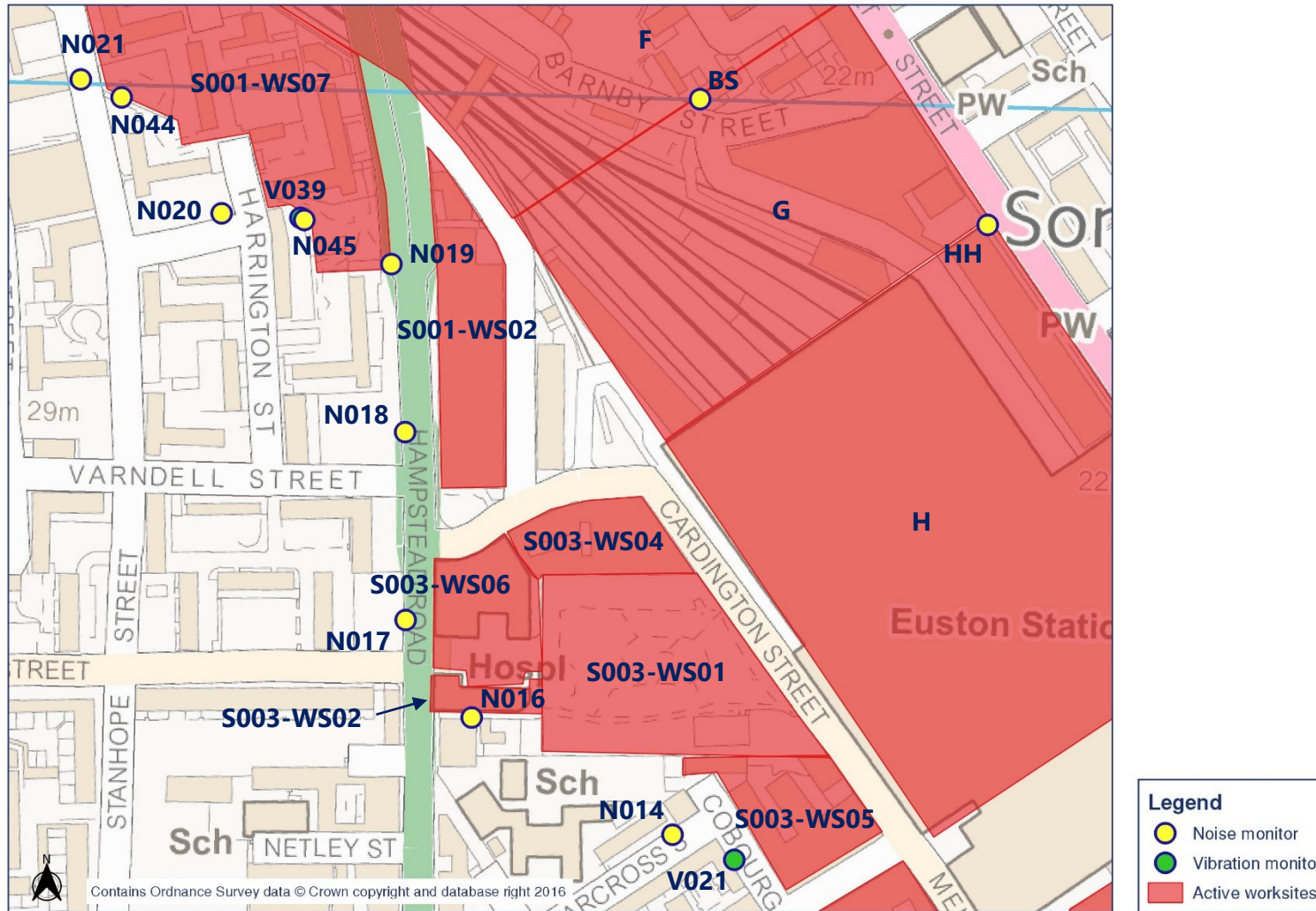
# Appendix B Monitoring Locations

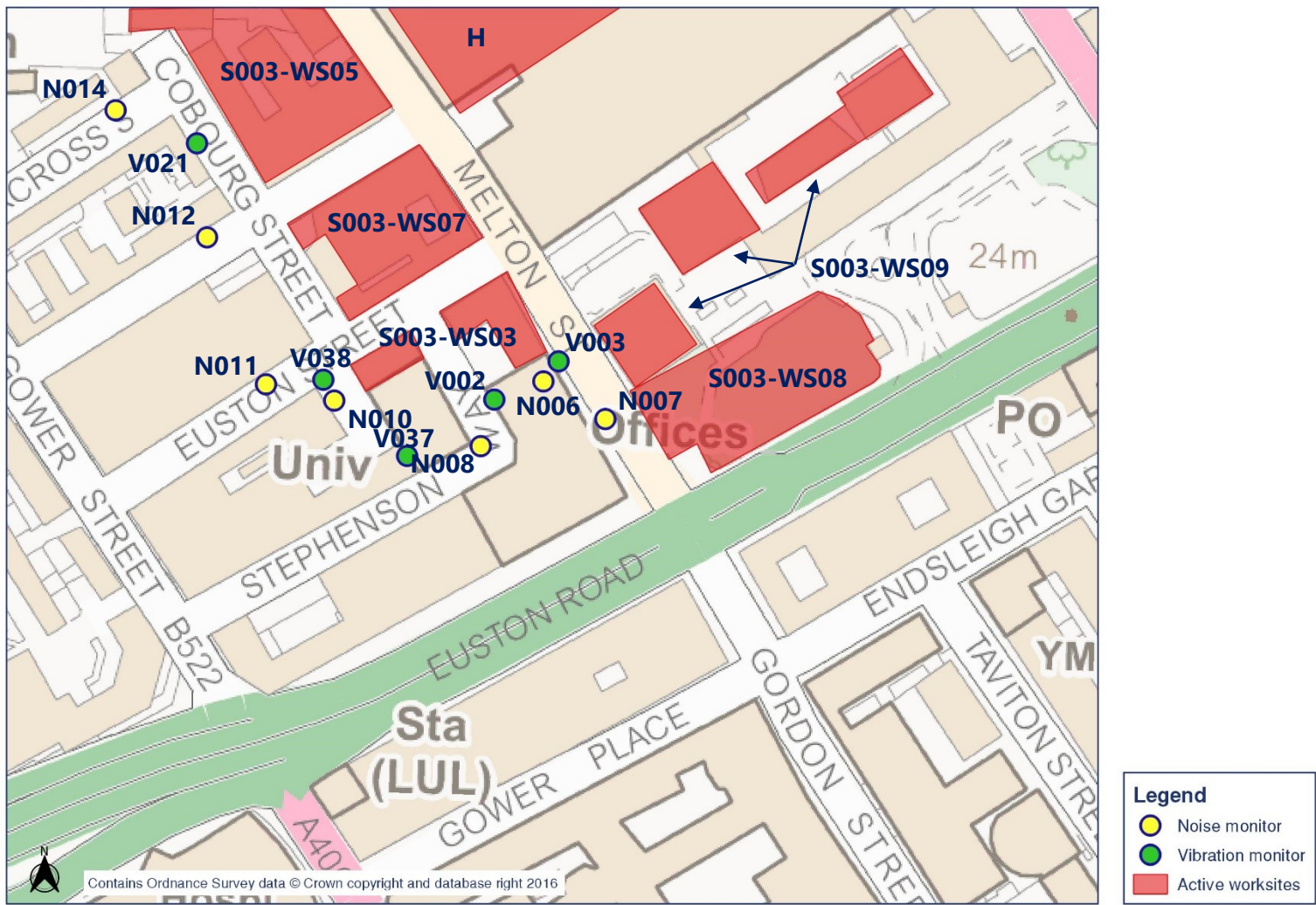










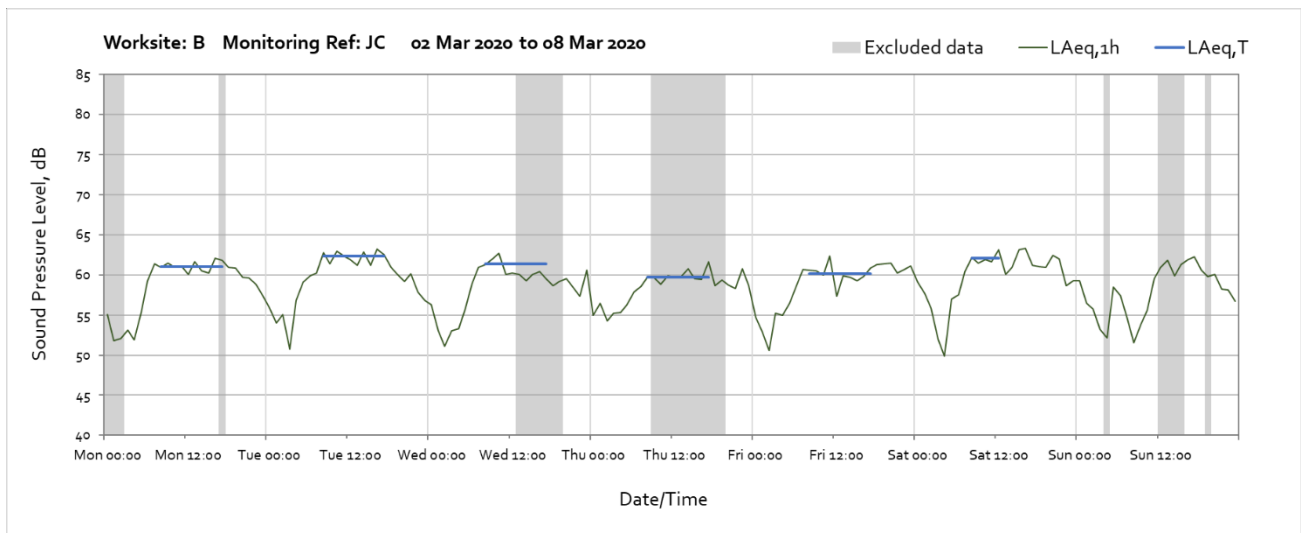
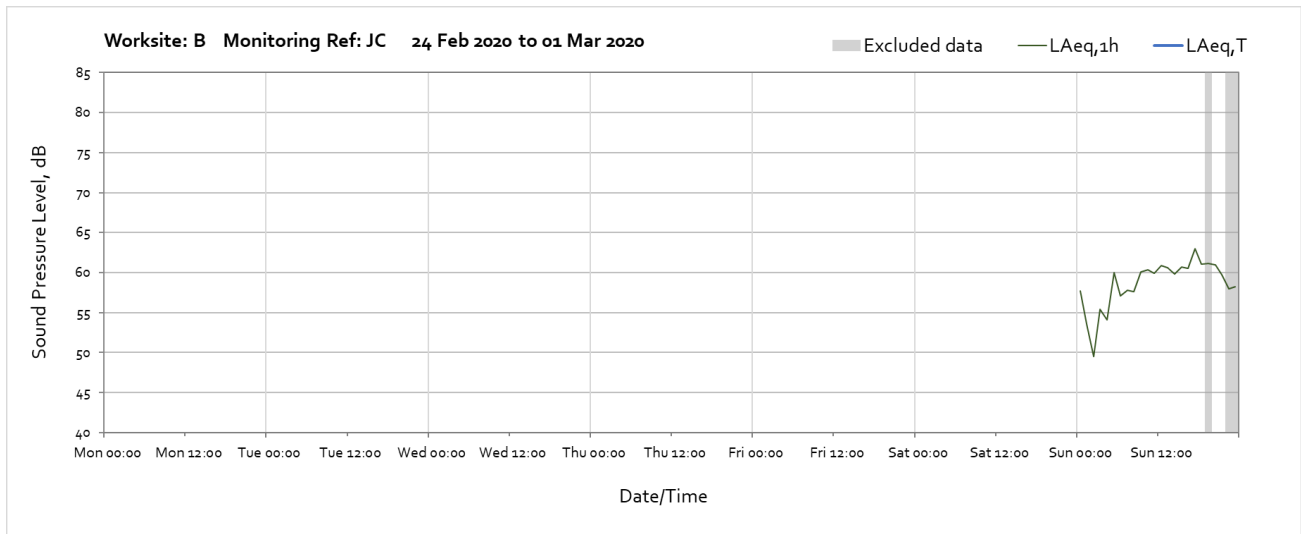


# Appendix C Data

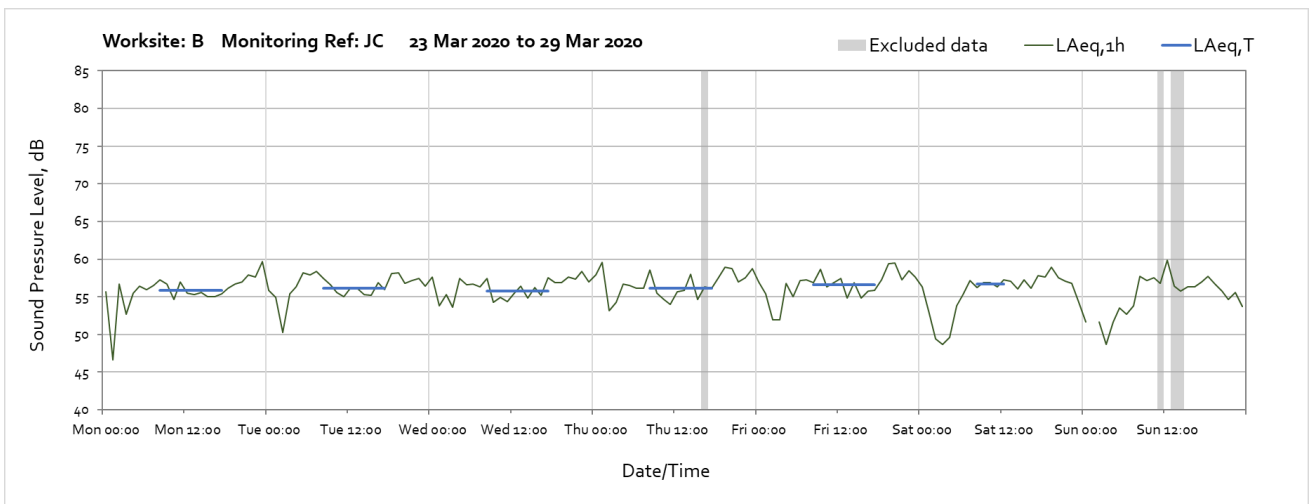
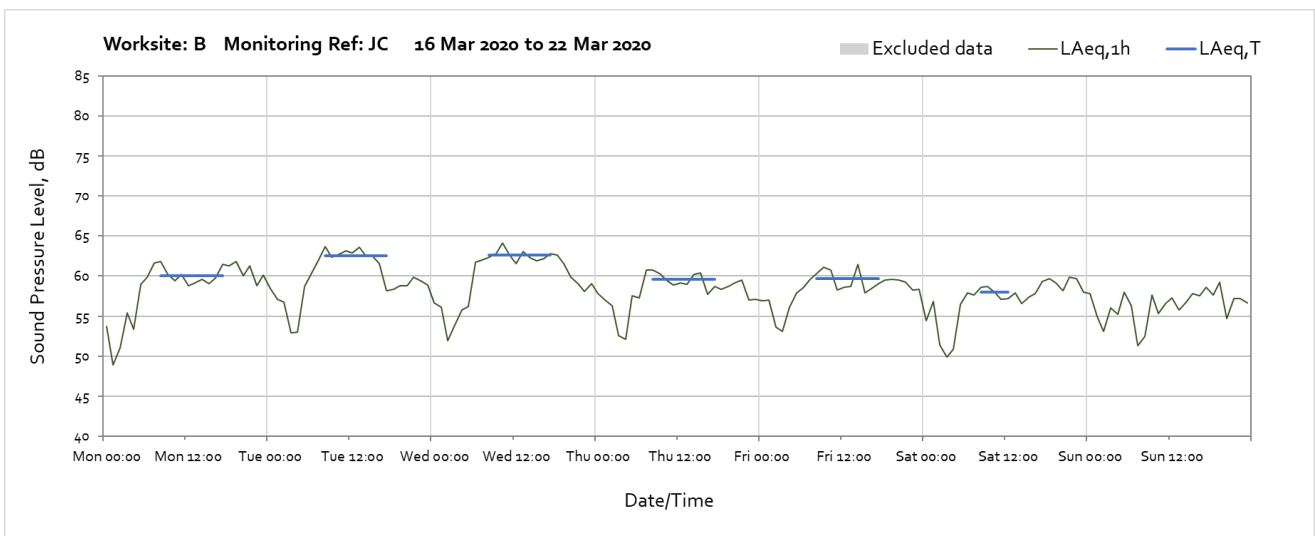
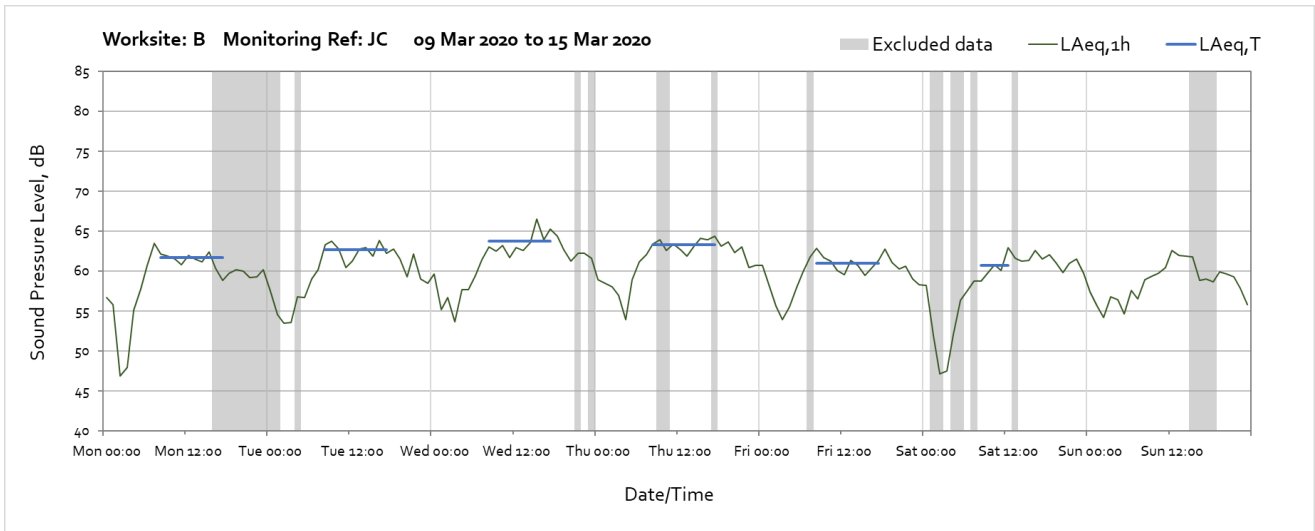
## Noise

The following graphs show the hourly measured ambient noise level  $L_{Aeq,1h}$  and, where relevant, the averaged noise level  $L_{Aeq,T}$  values, where the time period T is as specified in Table 1 of HS2 Information Paper E23. Periods with adversely weather affected noise levels are greyed out and have been excluded from the calculation of the  $L_{Aeq,T}$  values in Table 5.

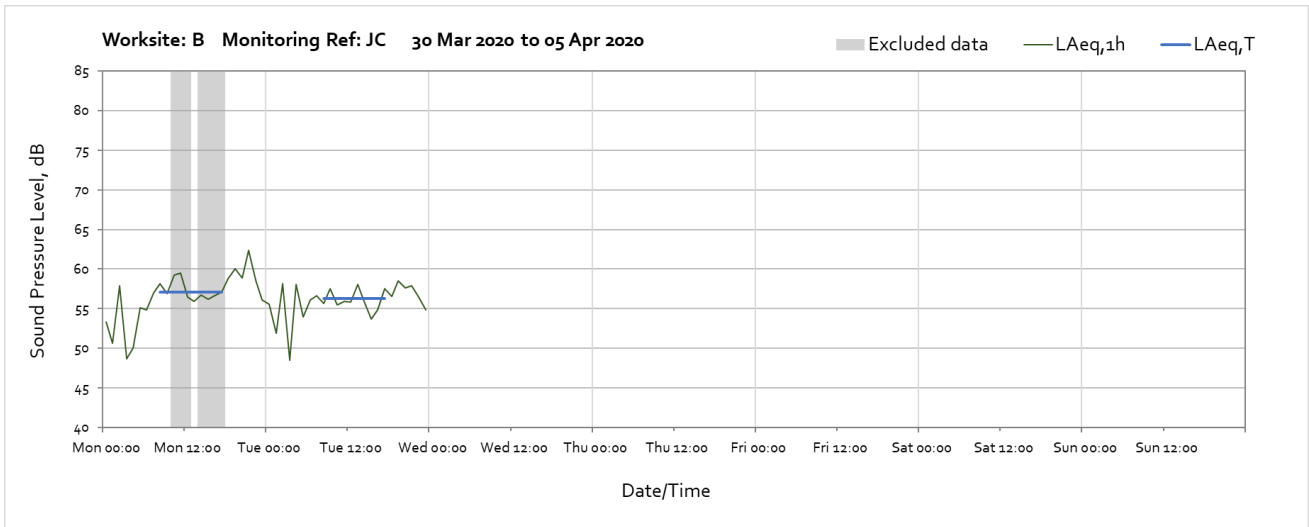
### Worksite: B – Monitoring Ref: JC



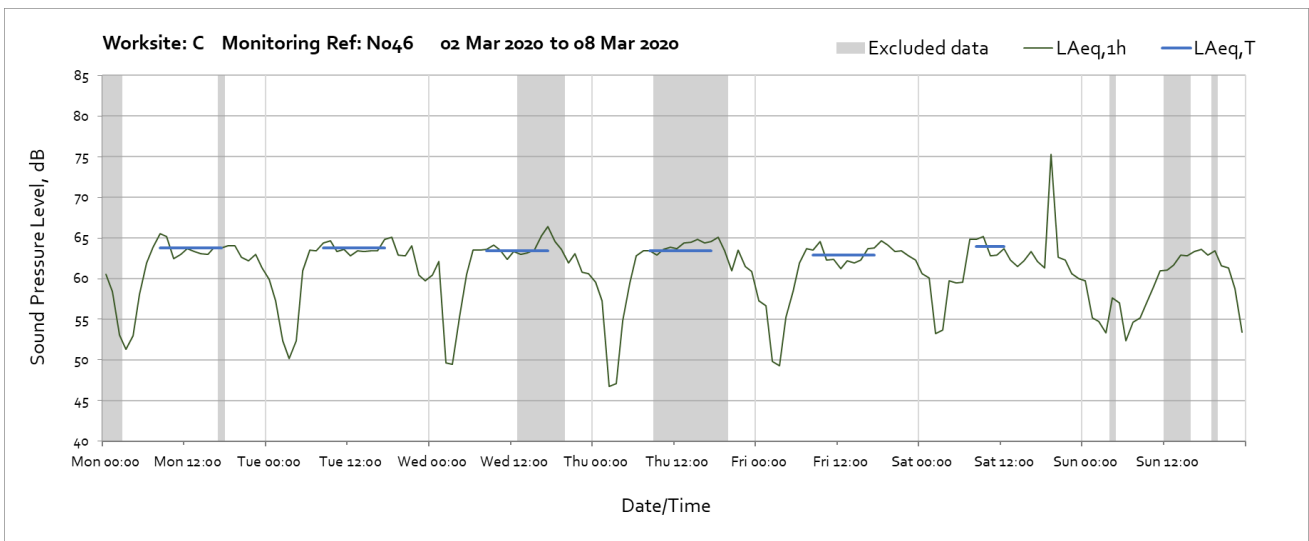
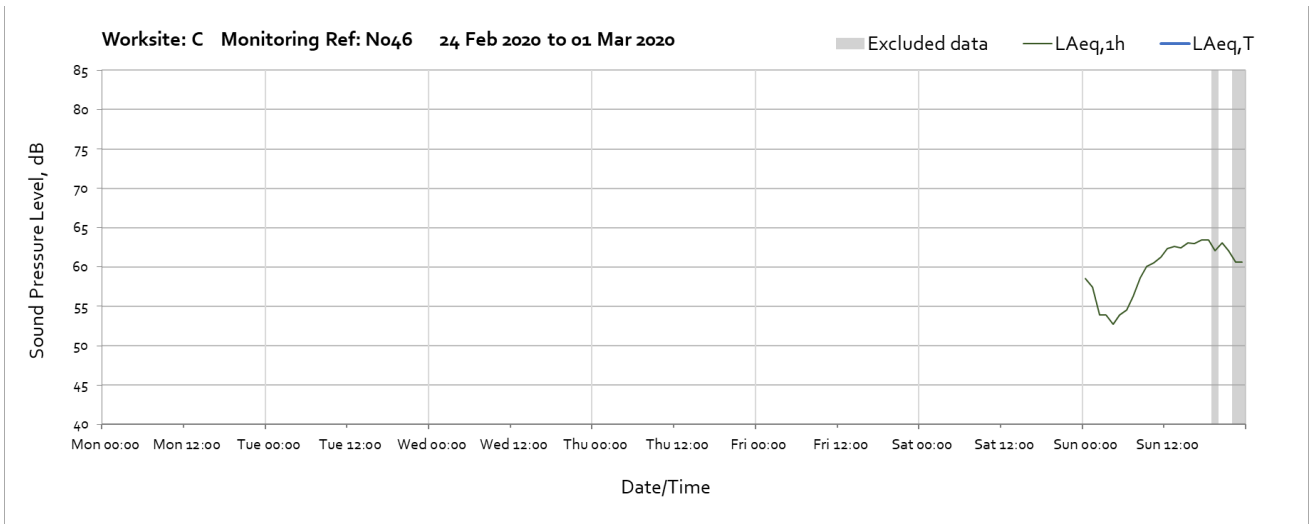


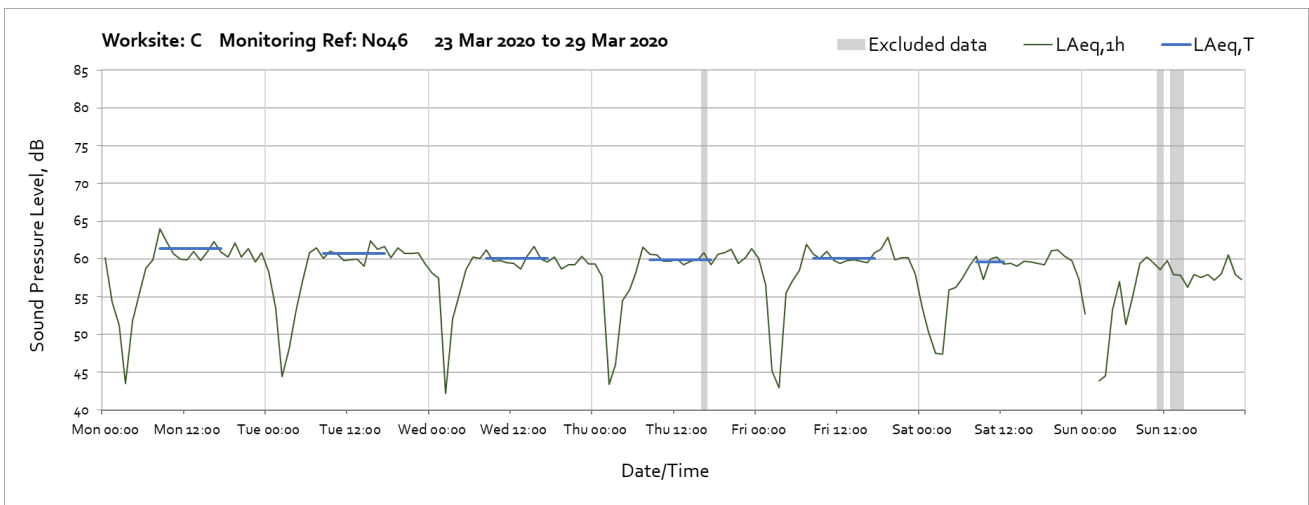
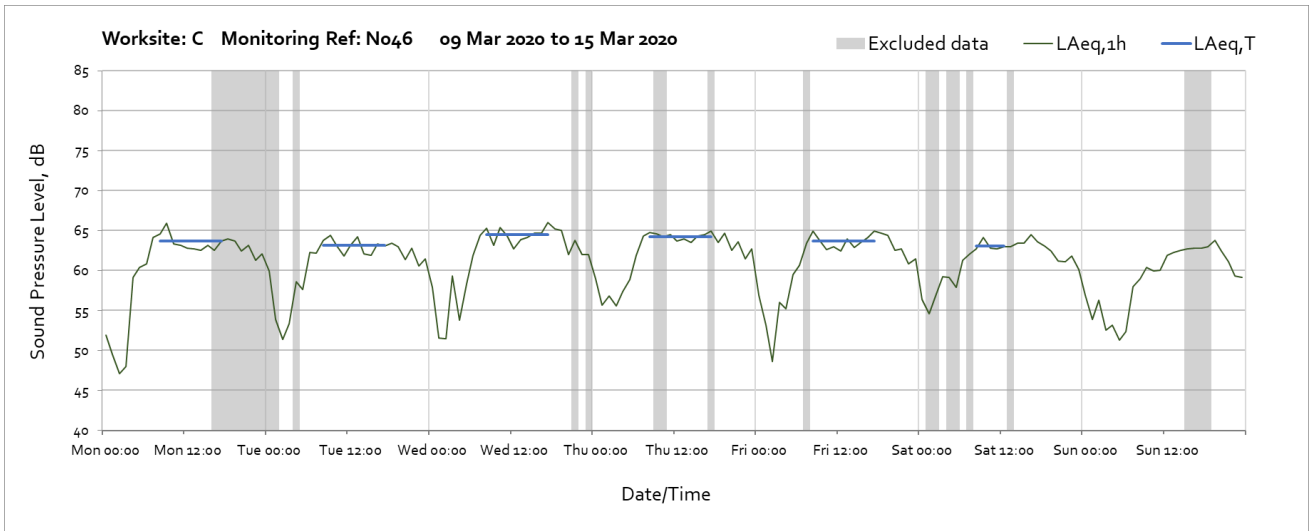


Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.

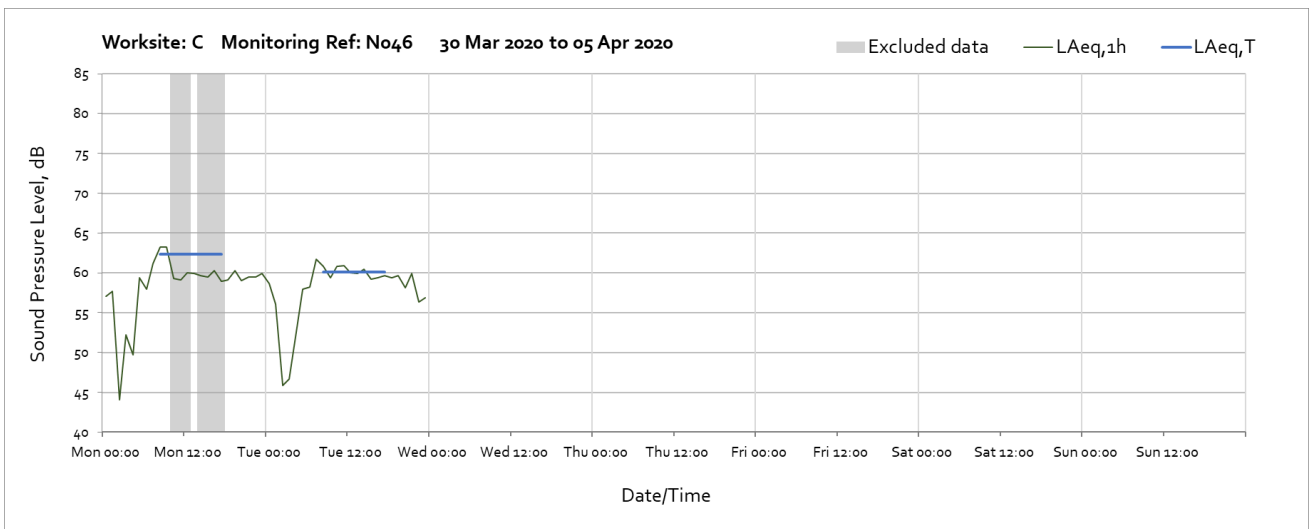


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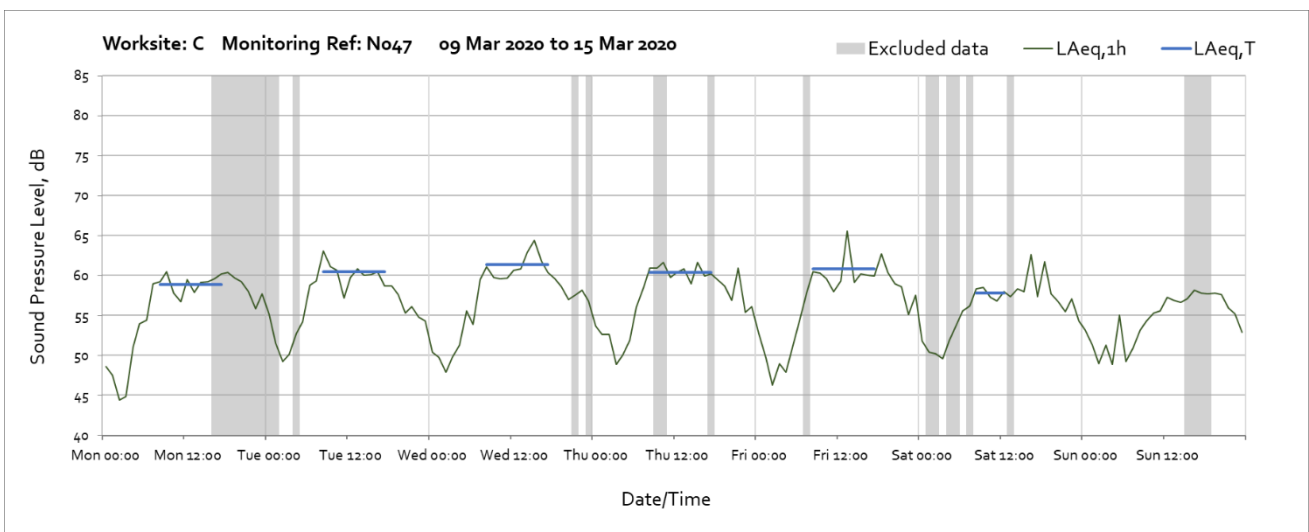
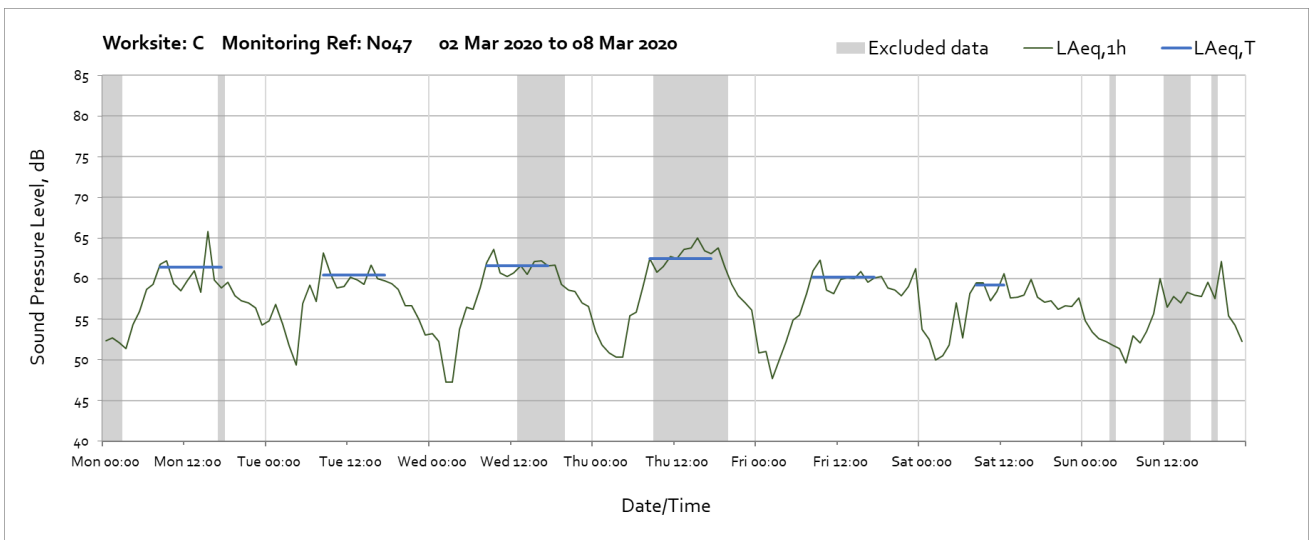
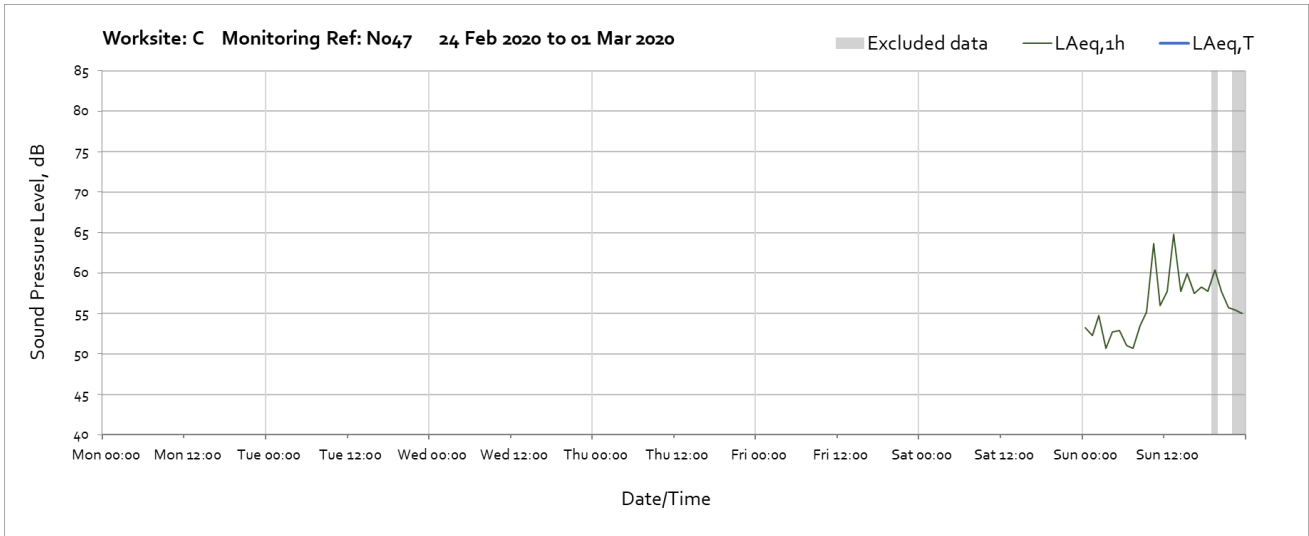


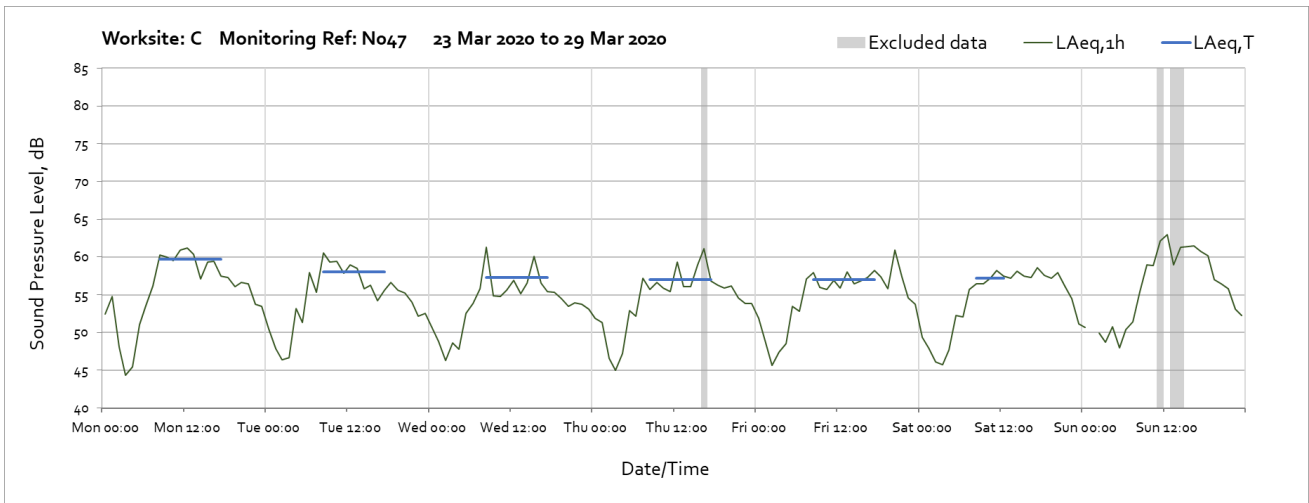
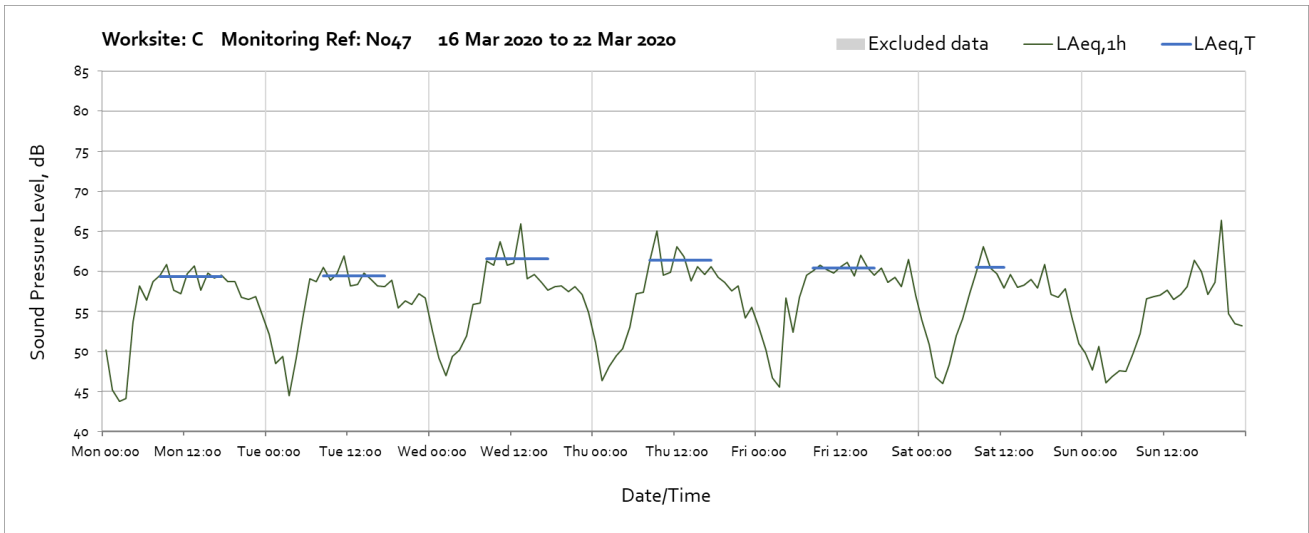


Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.

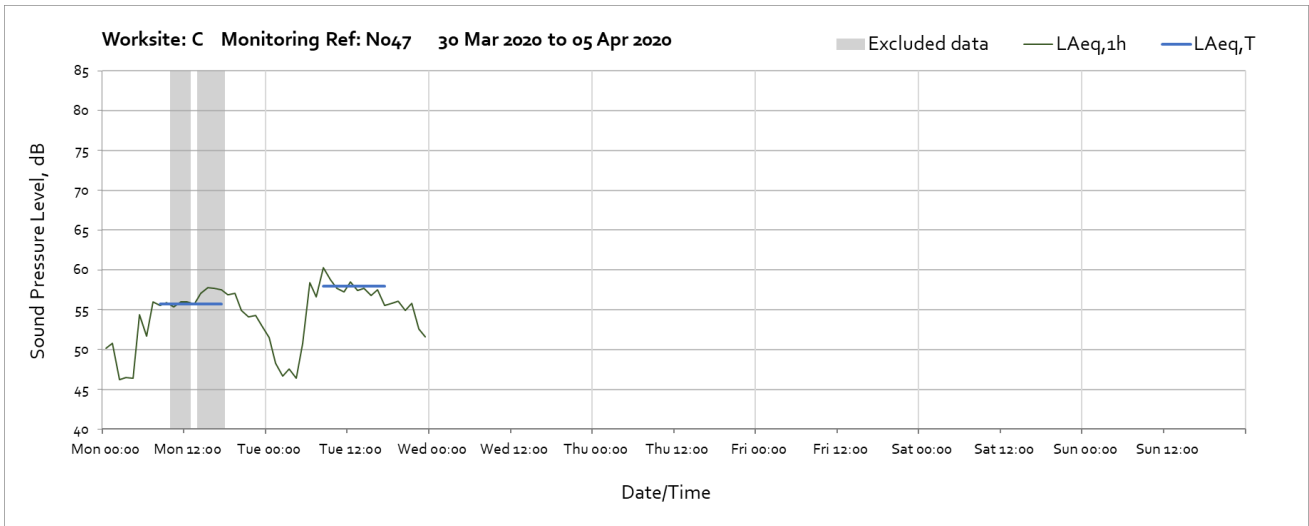


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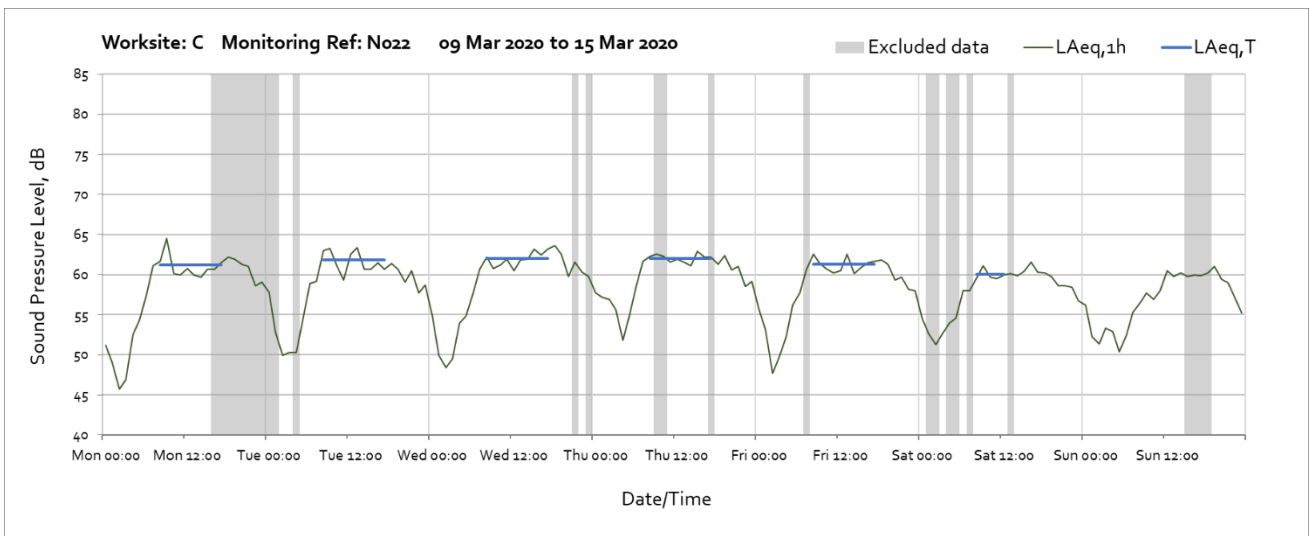
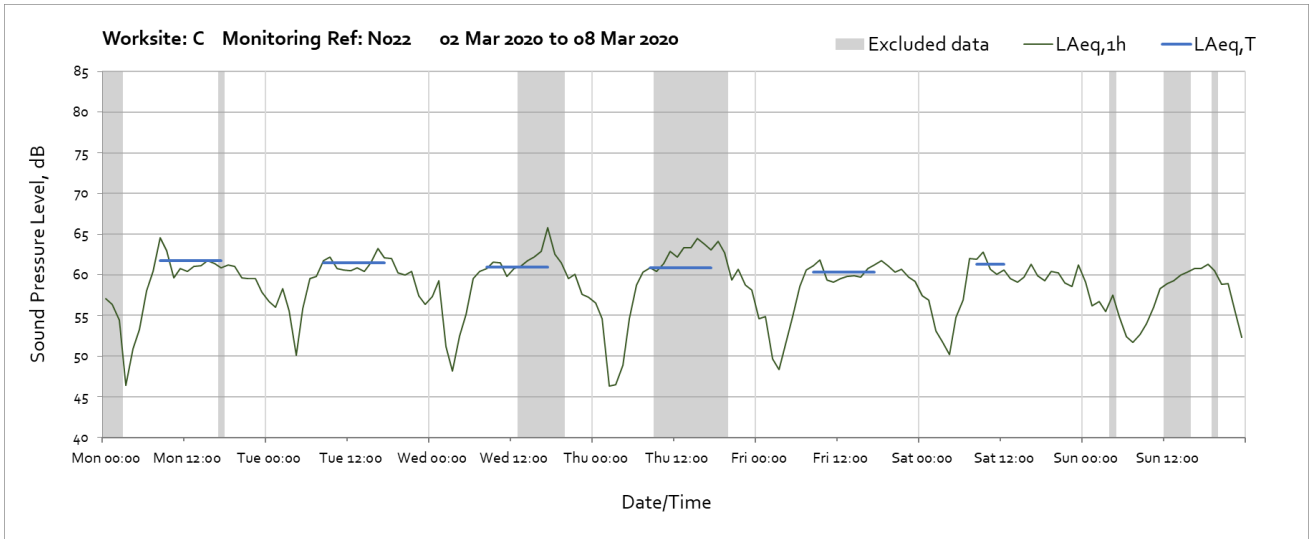
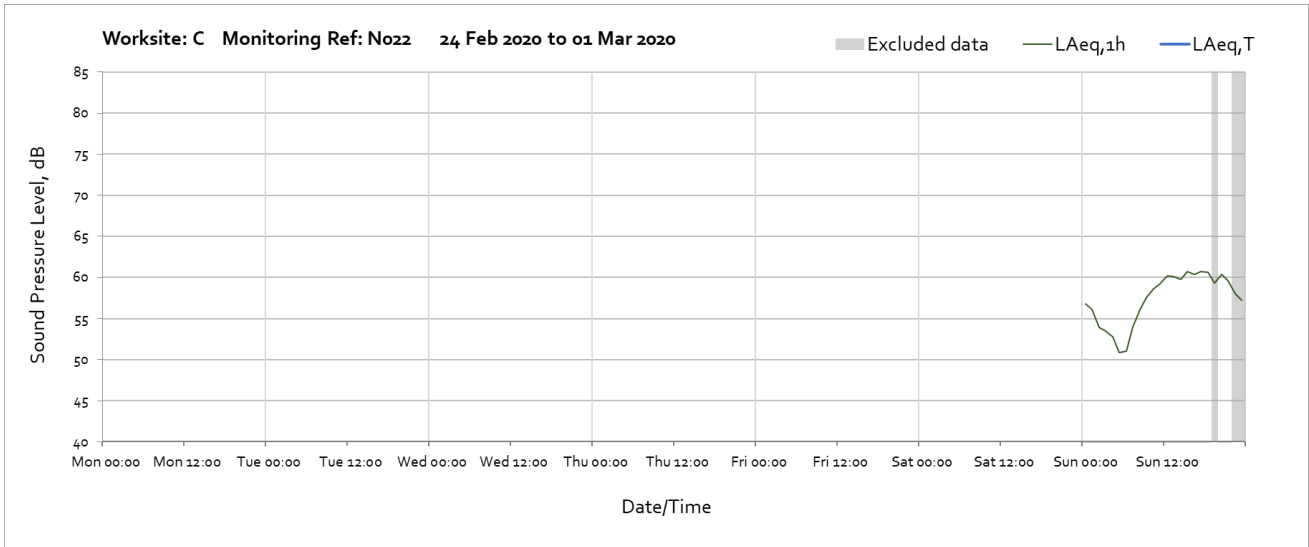


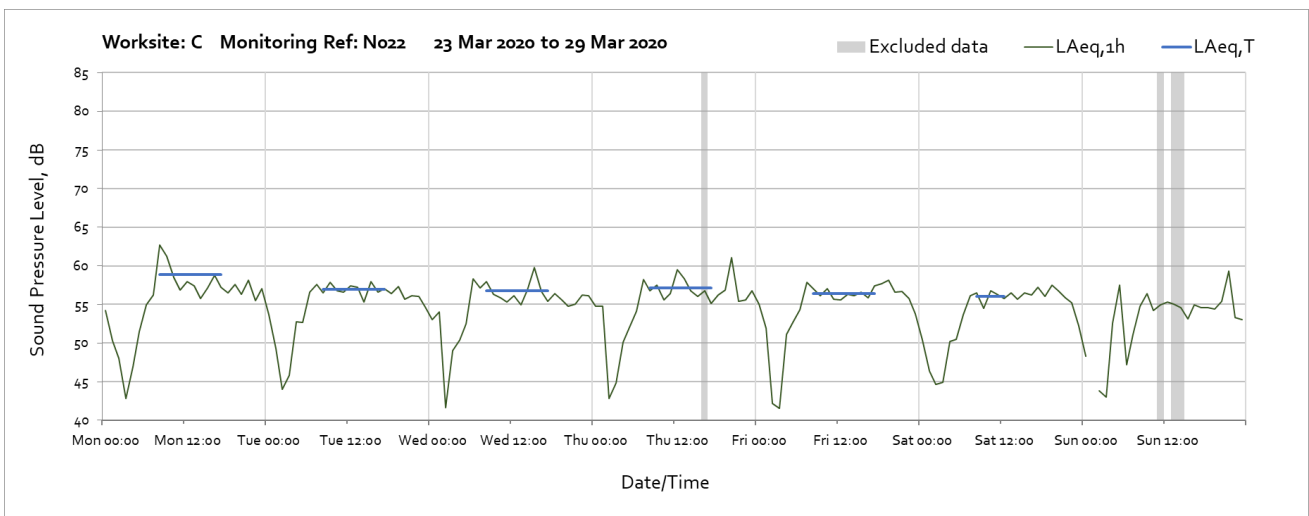
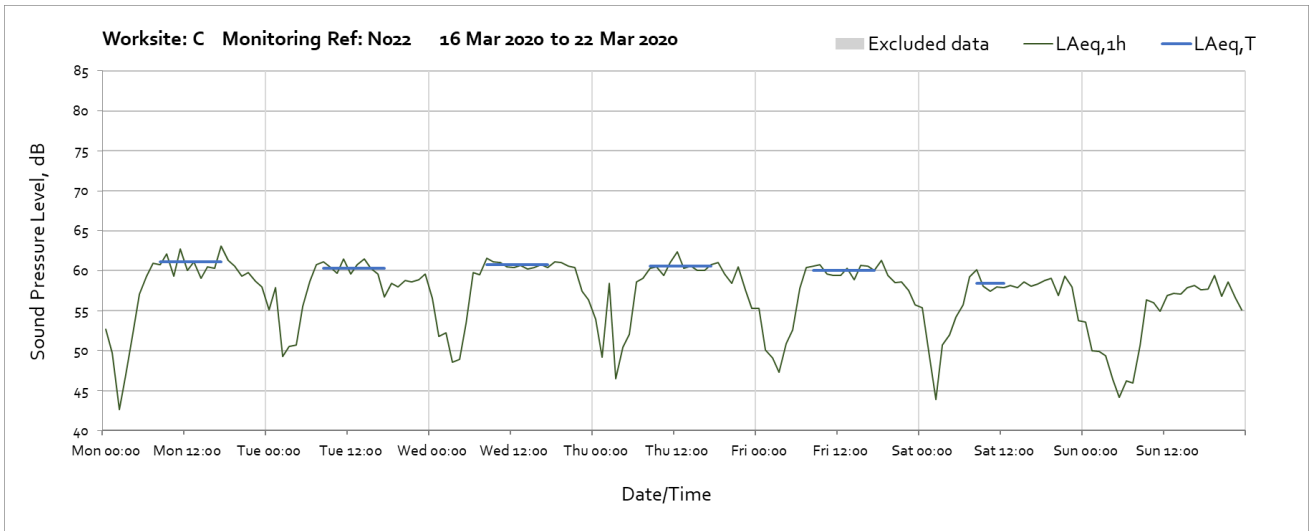


Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.



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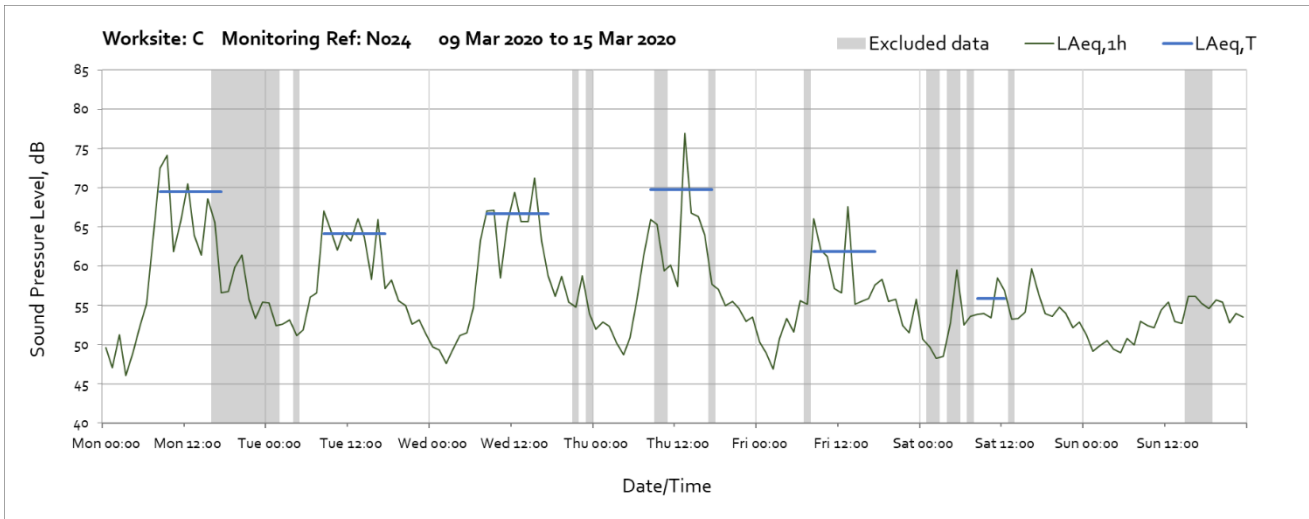
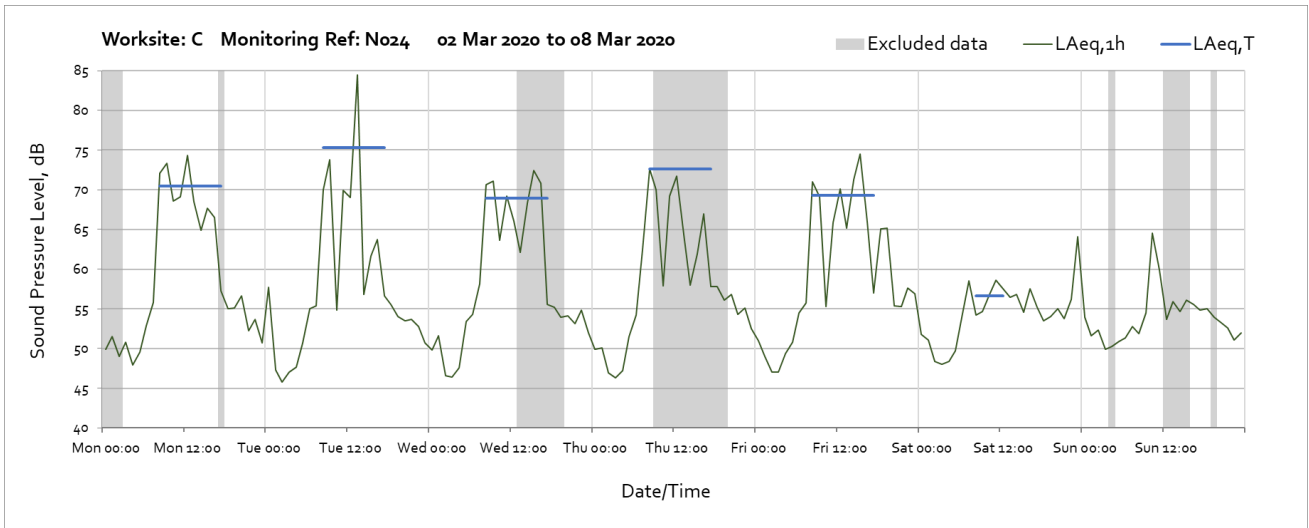
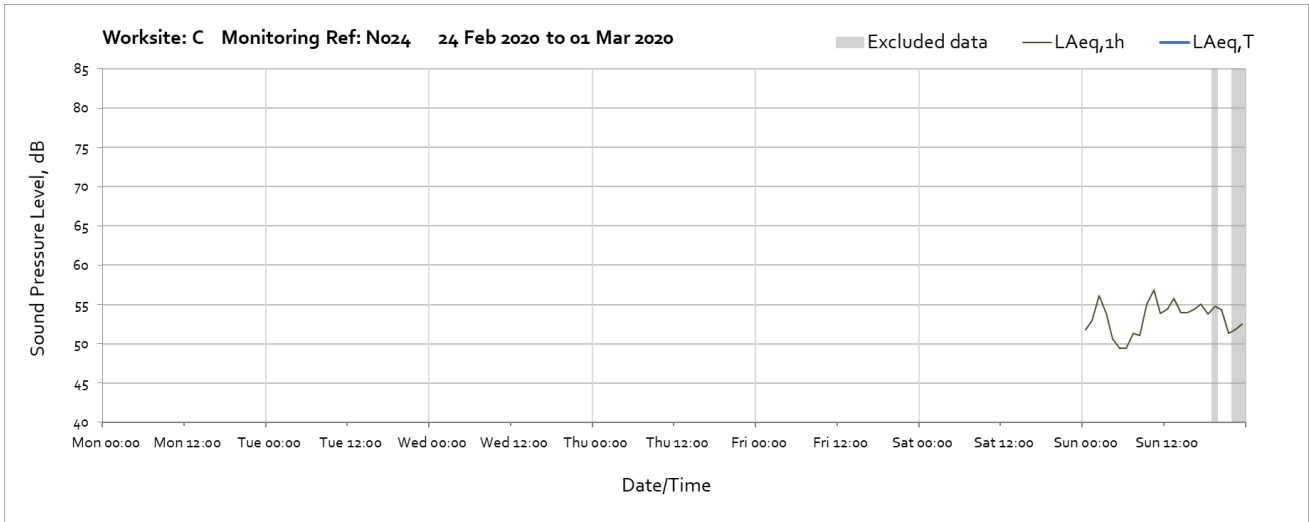




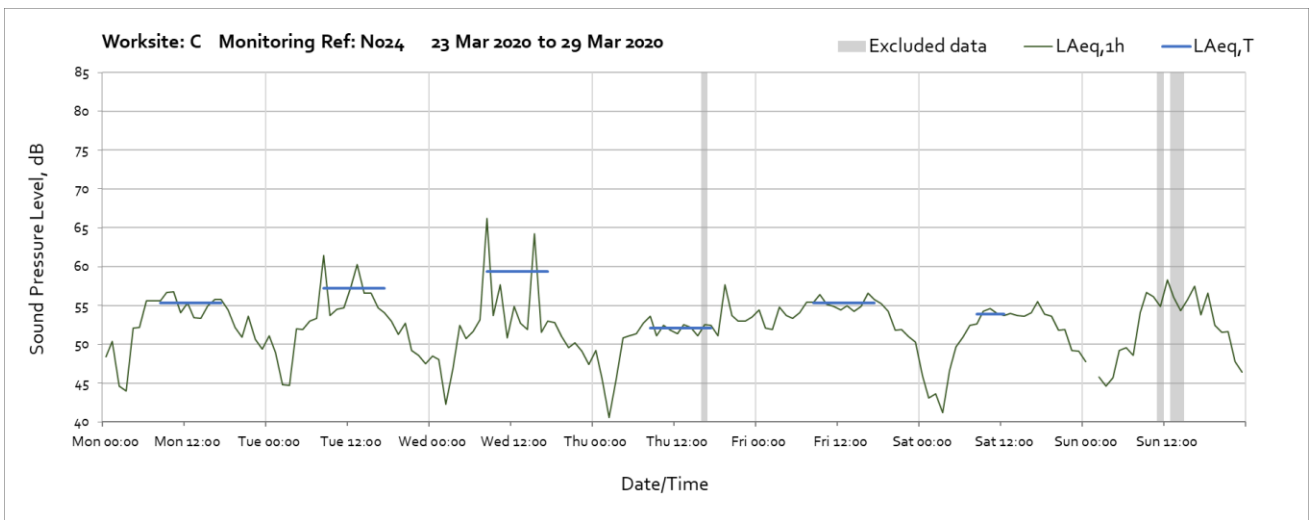
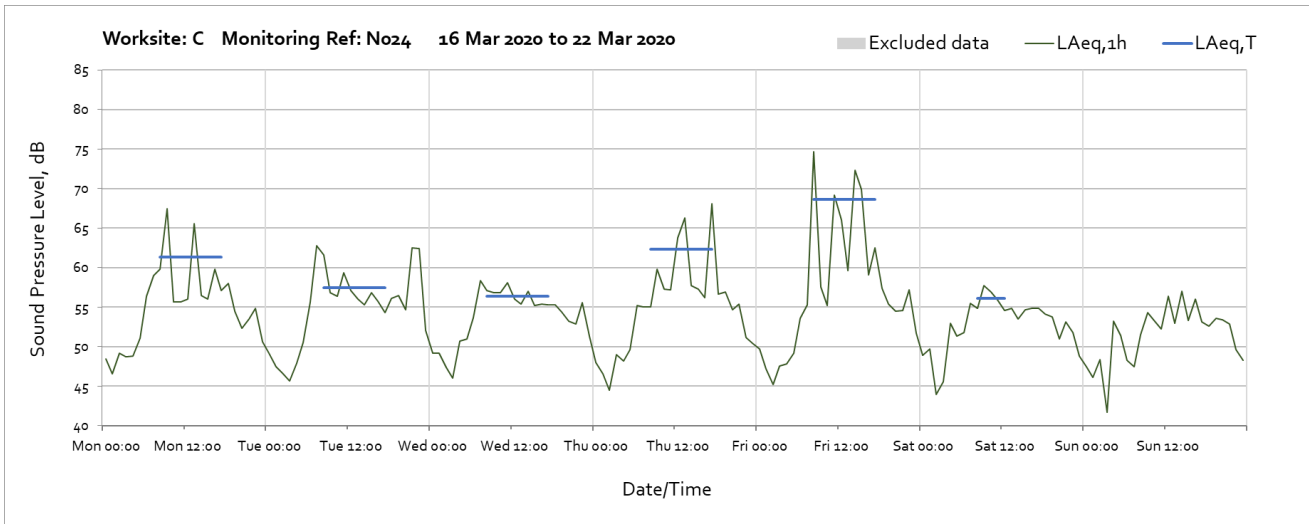
Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.



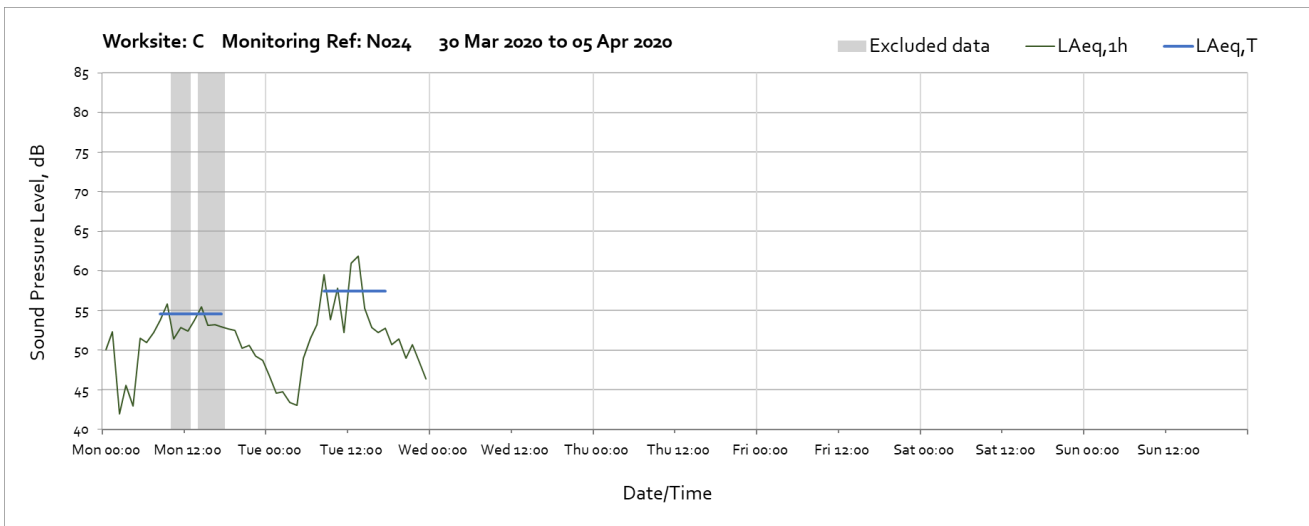
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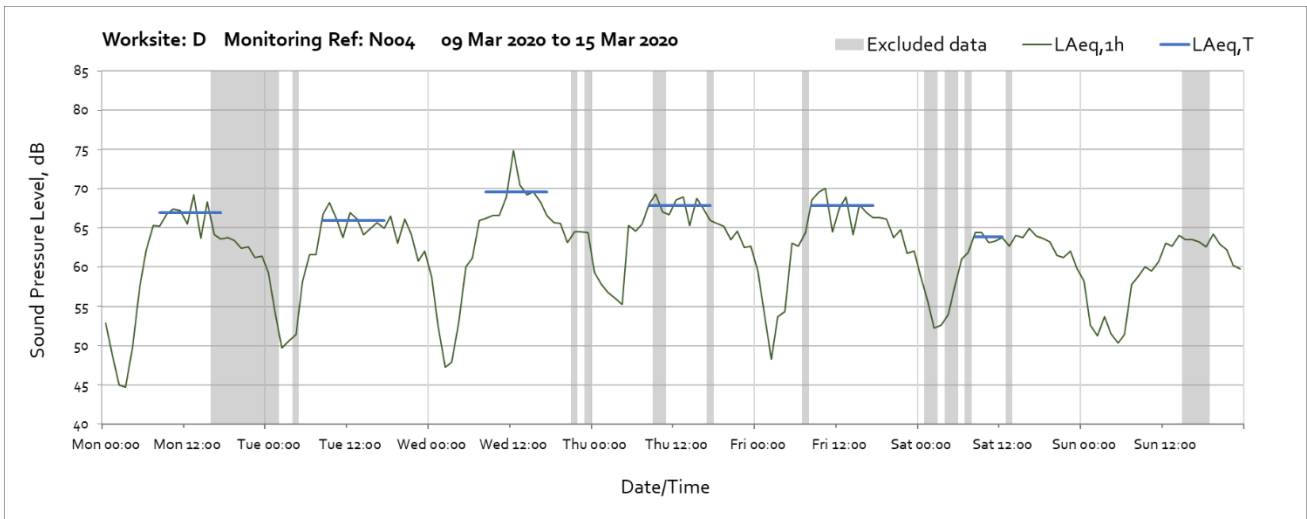
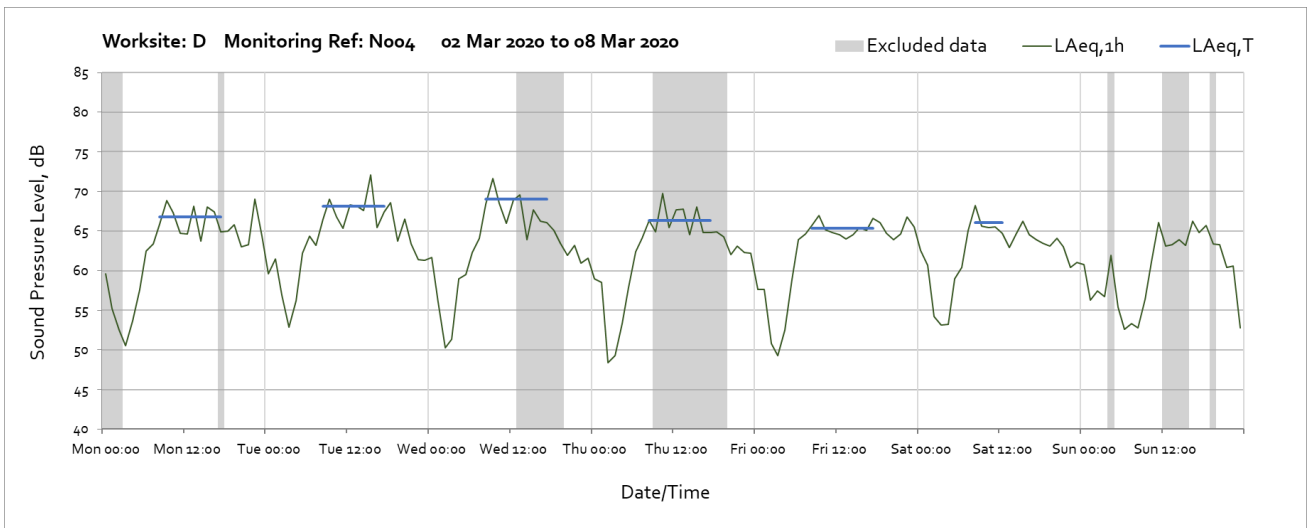
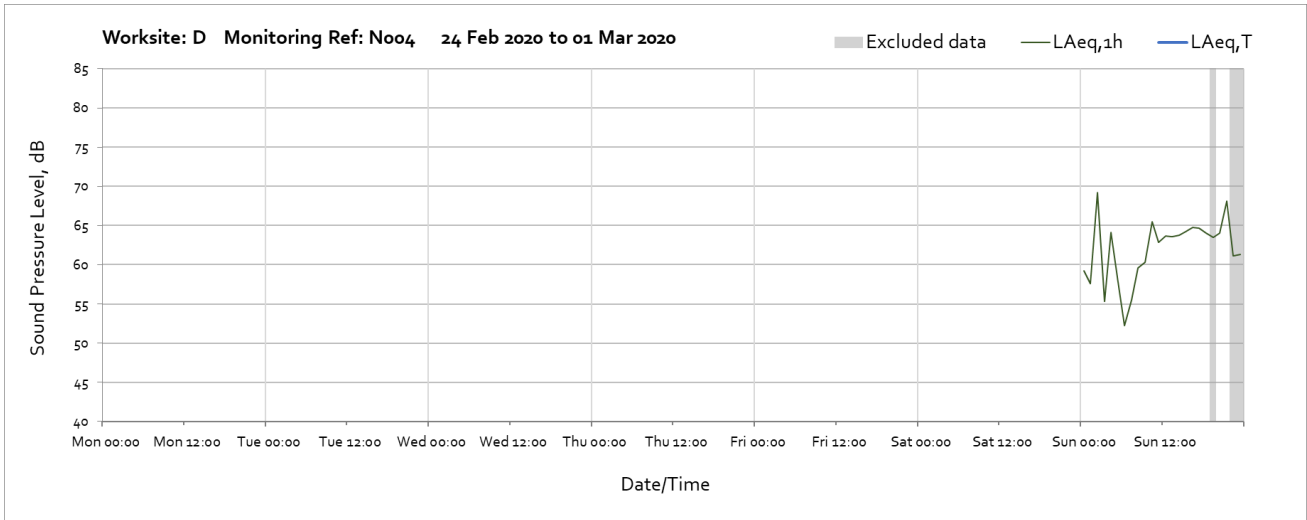


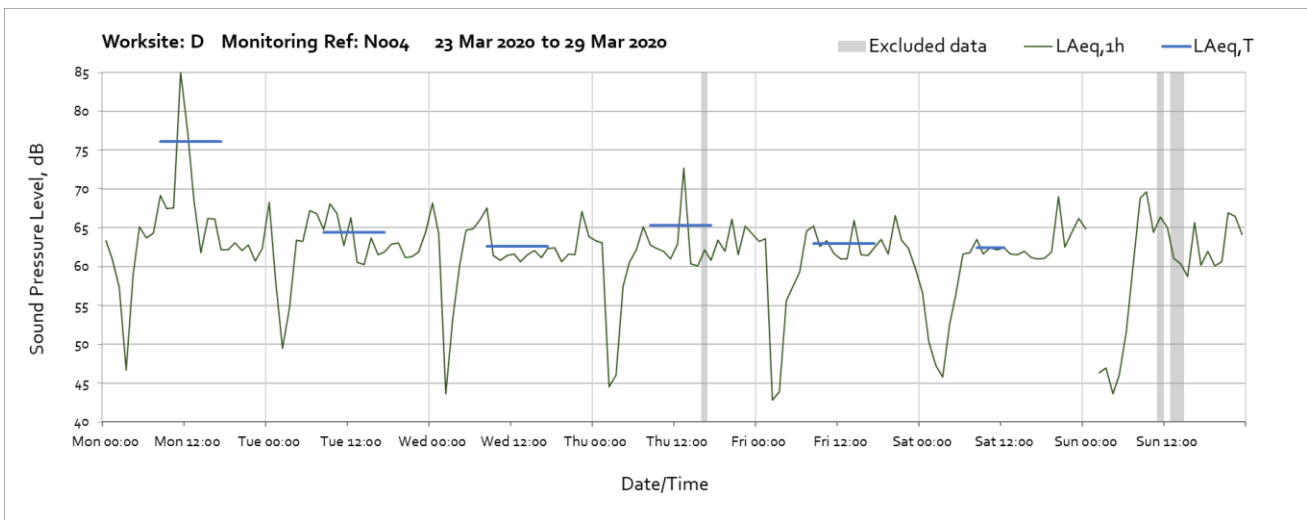
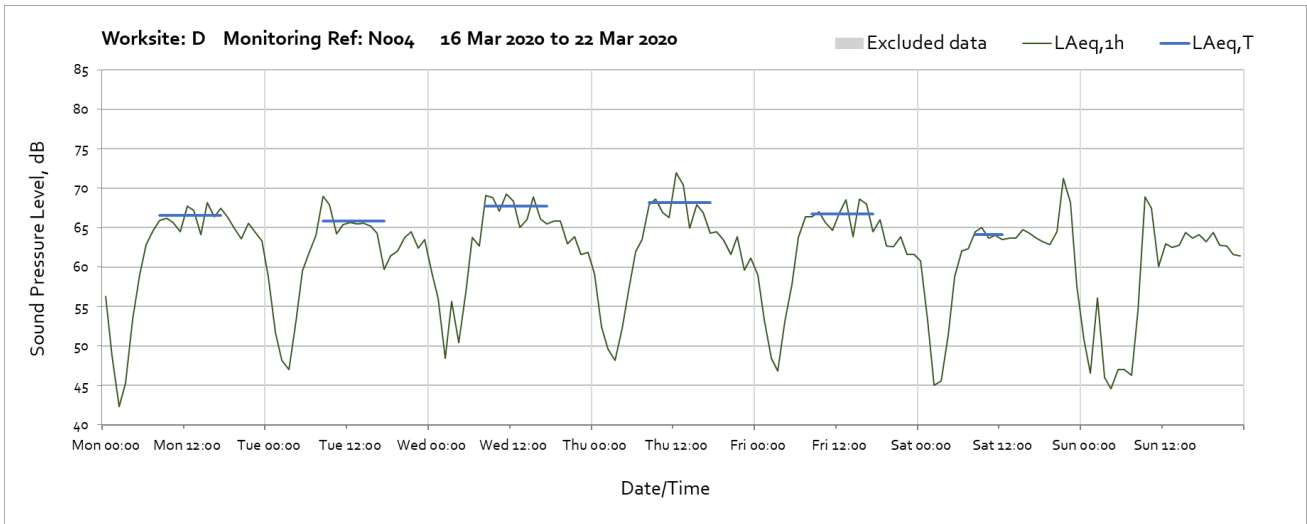


Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.

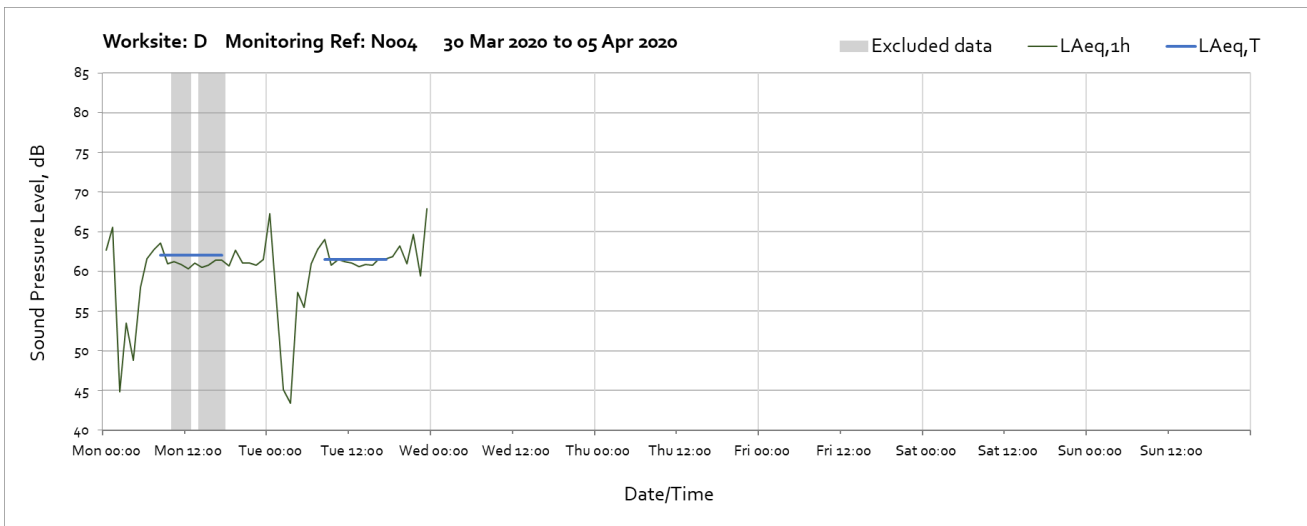


# Worksite: D – Monitoring Ref: N004

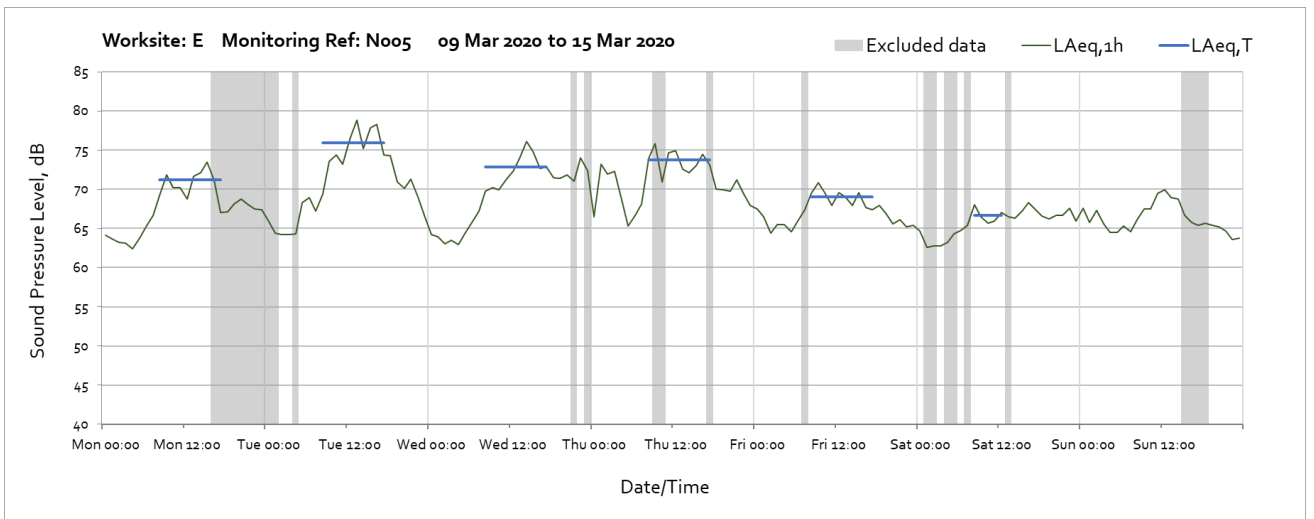
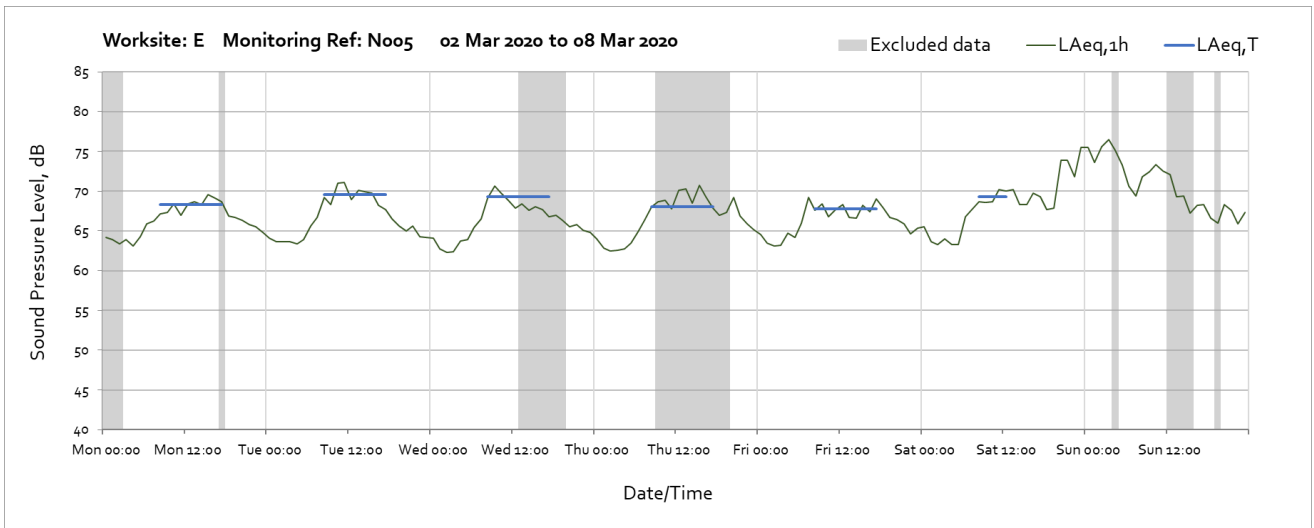
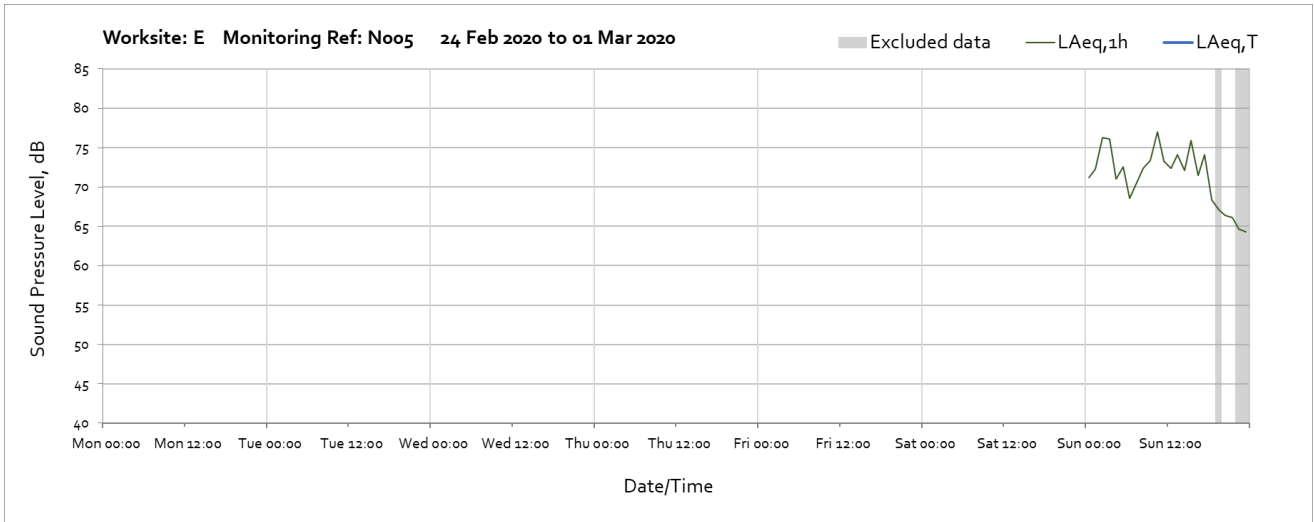


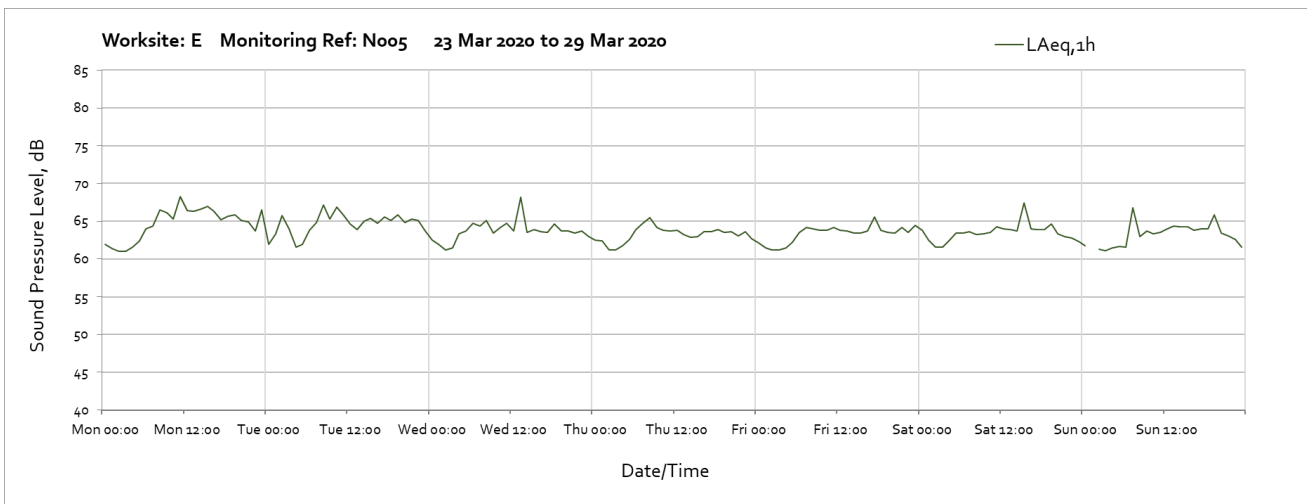
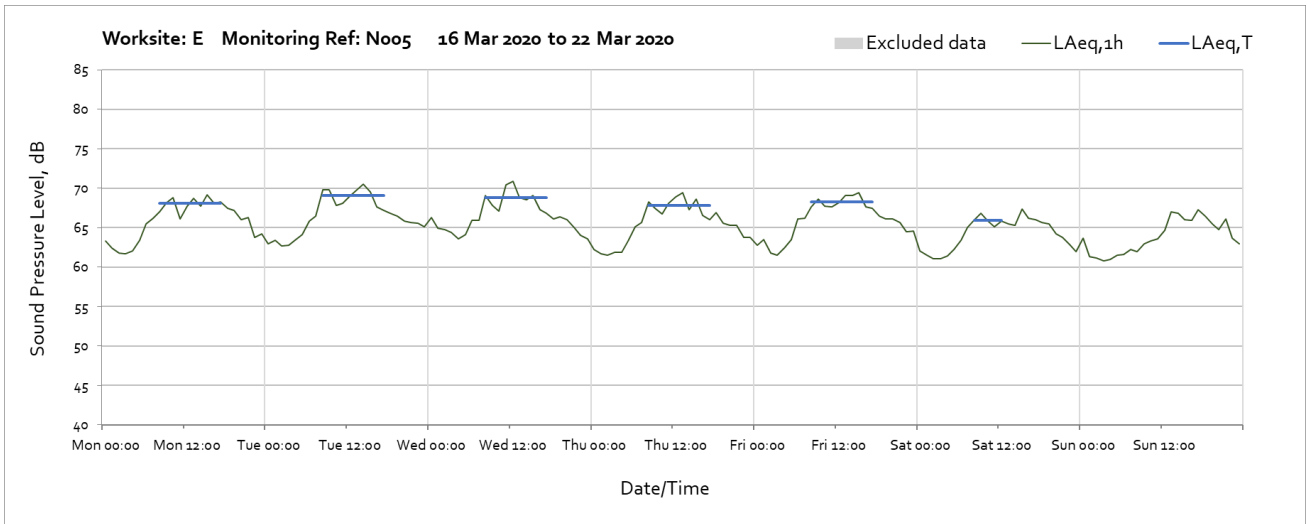


Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.

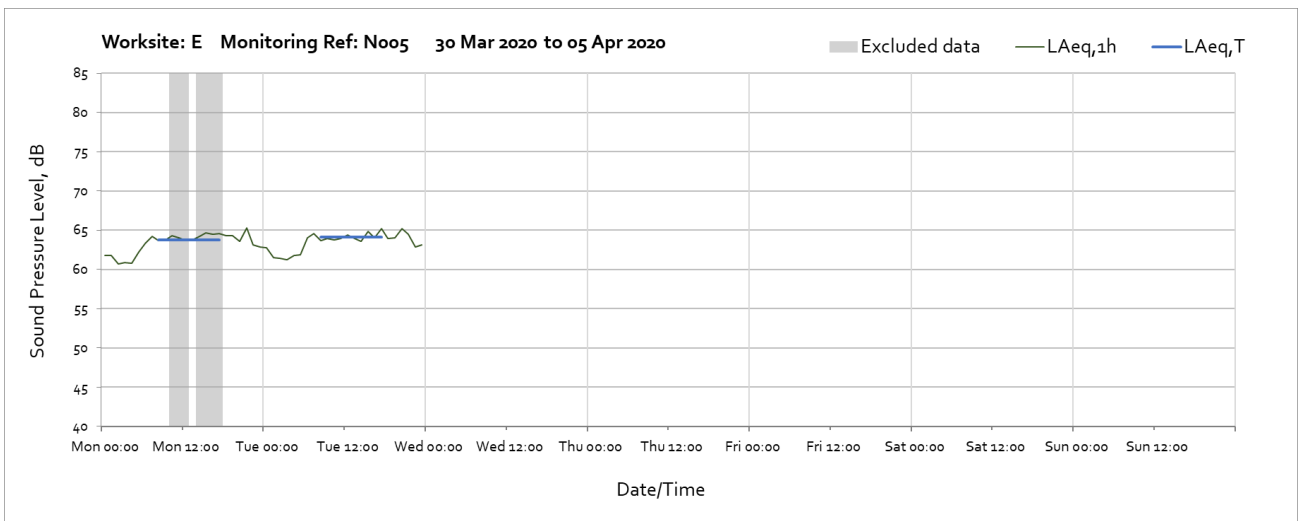


# Worksite: E – Monitoring Ref: N005

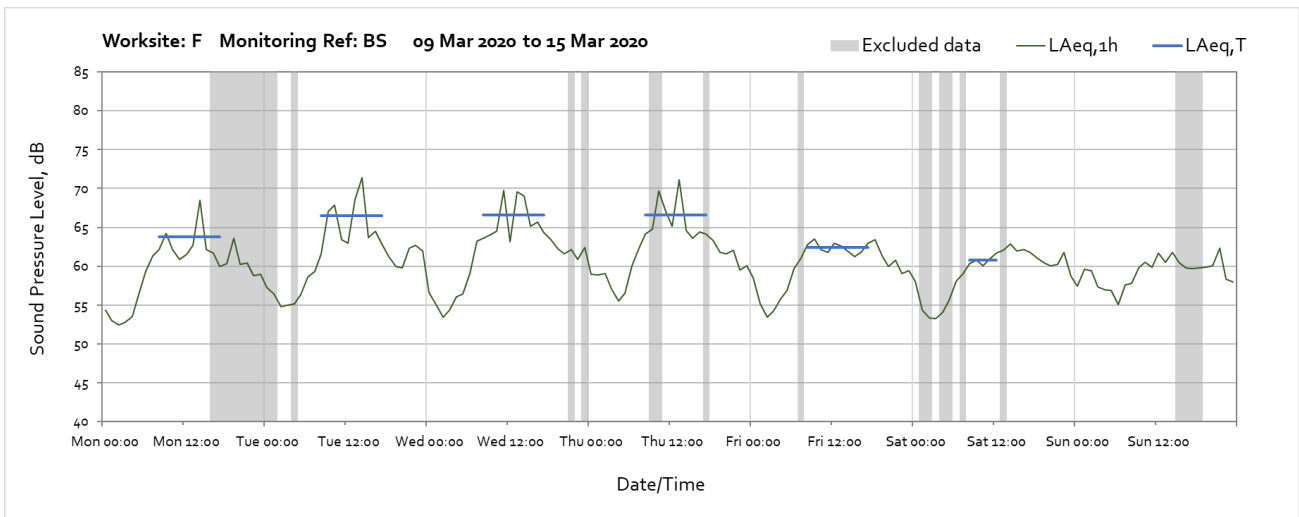
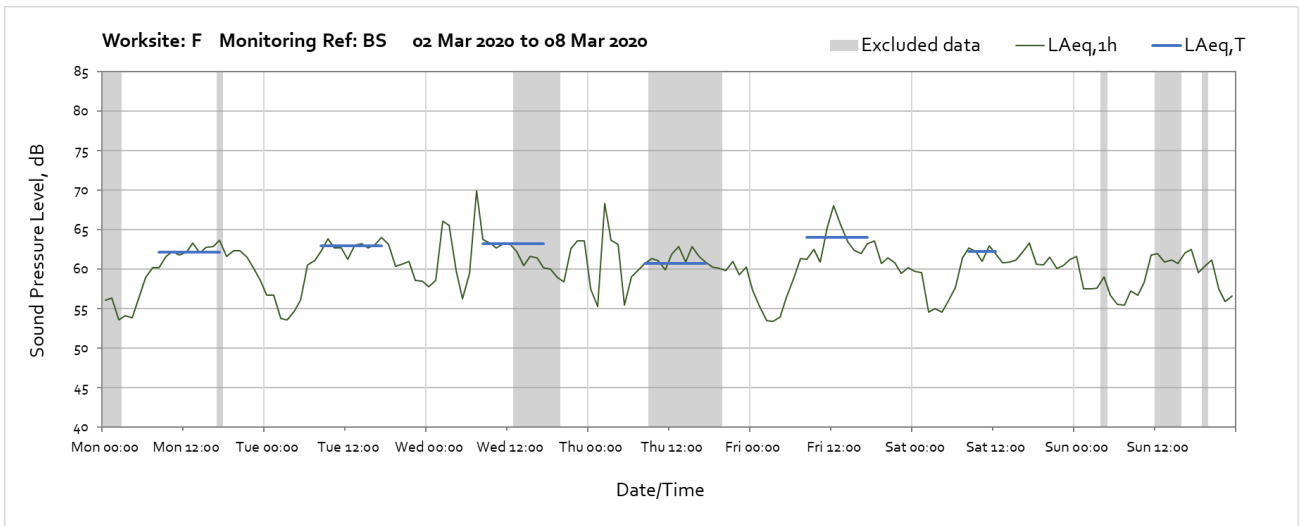
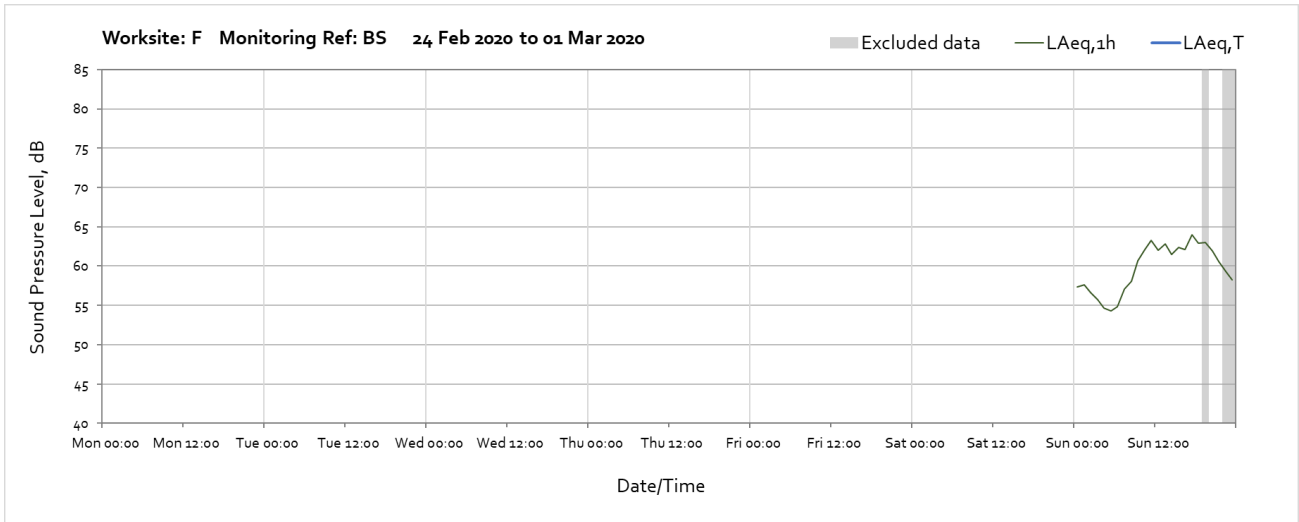


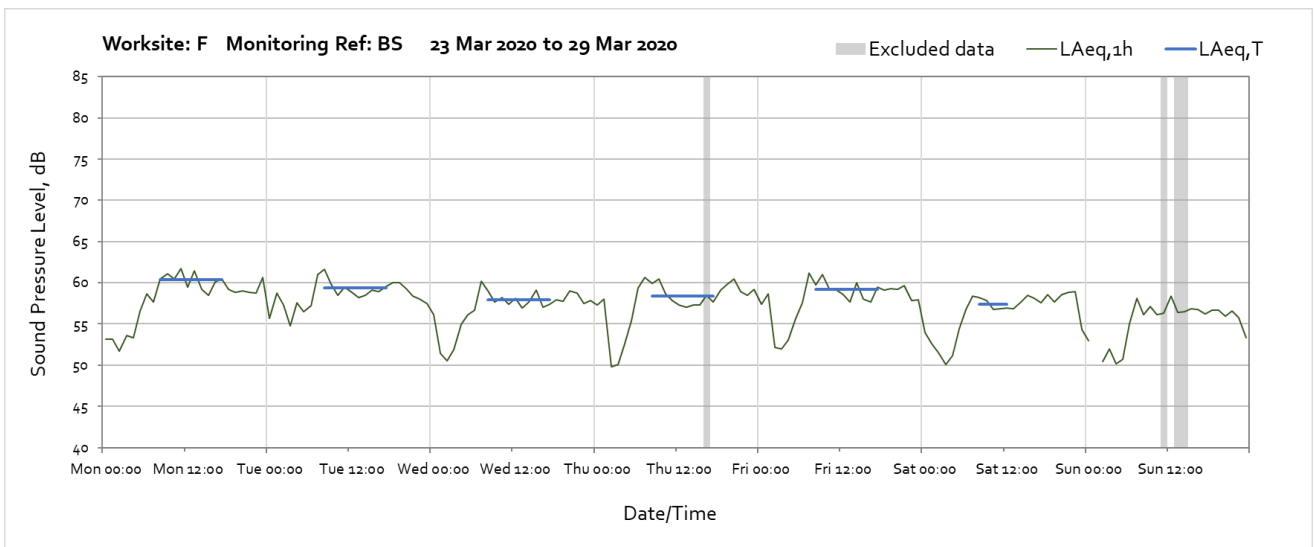
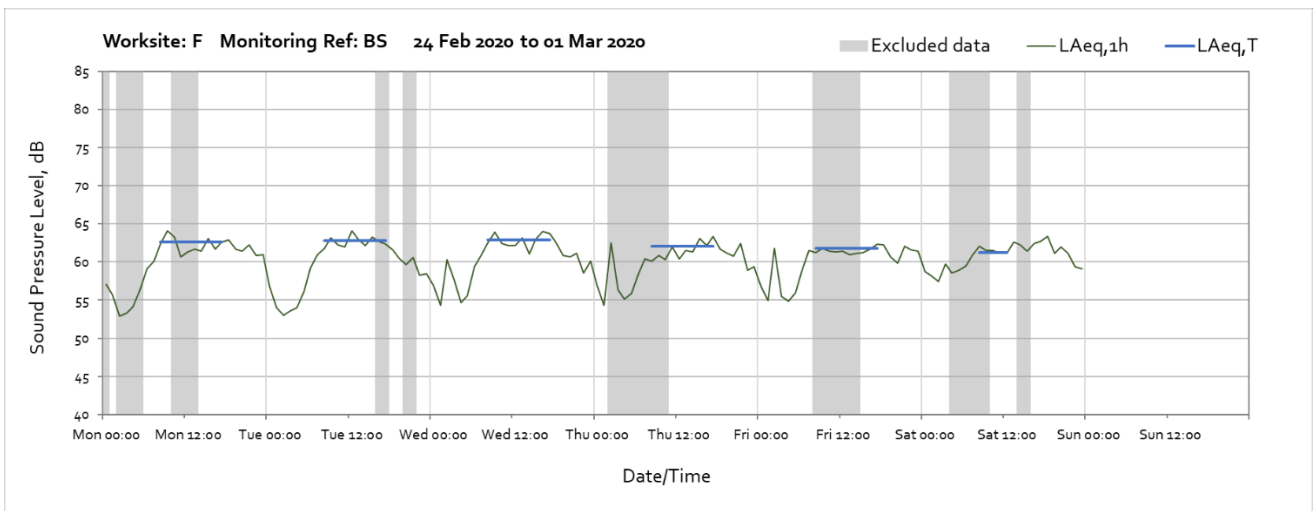
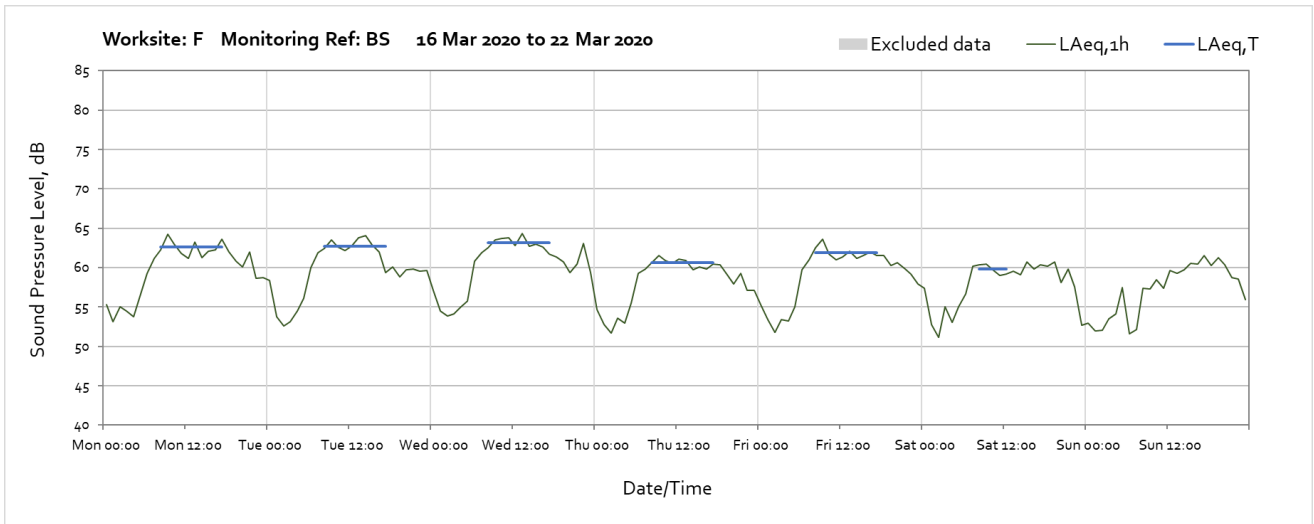


Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.

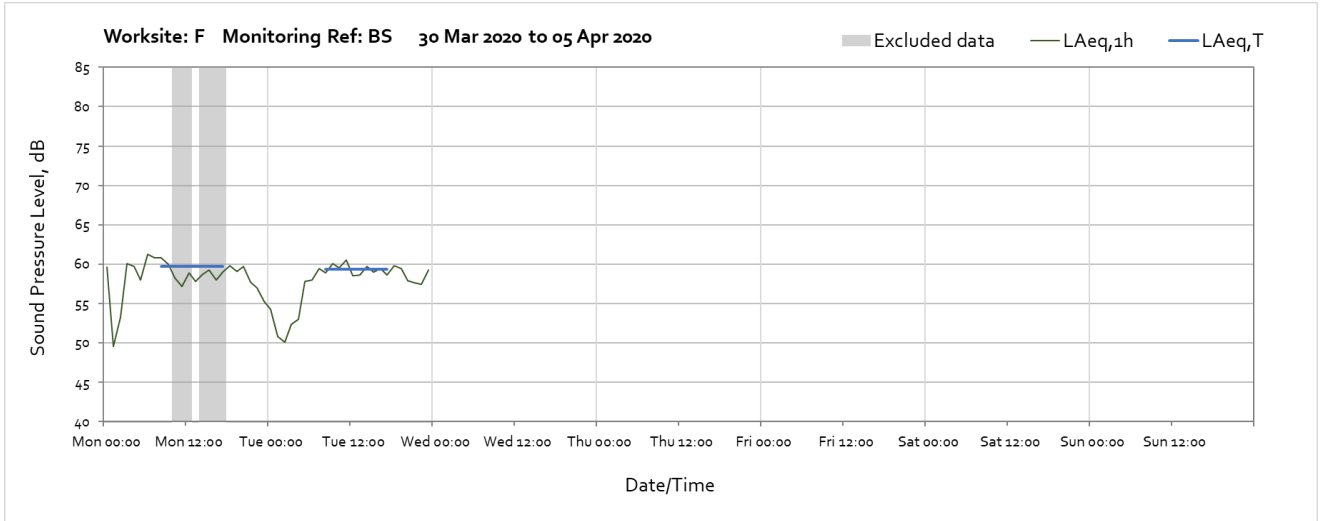


# Worksite: F – Monitoring Ref: BS

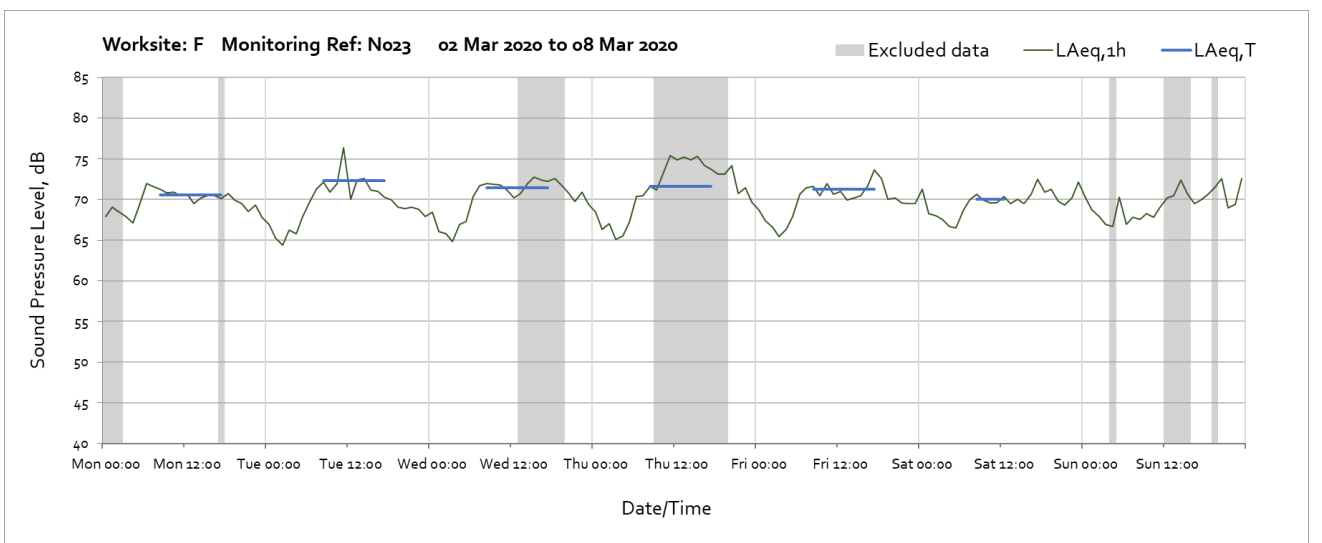
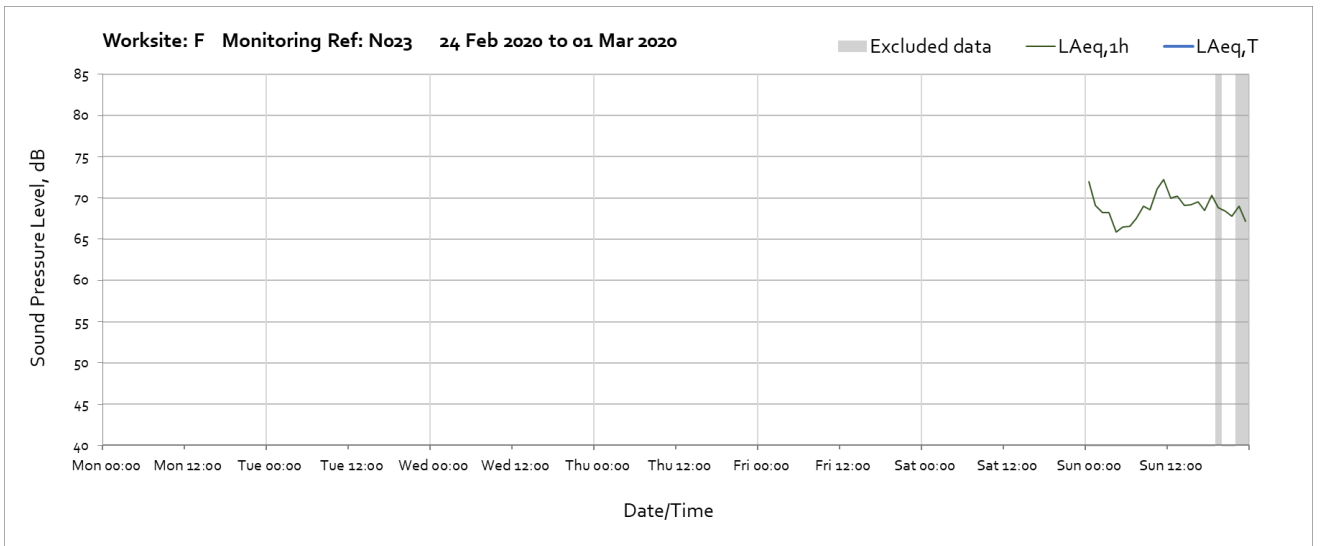




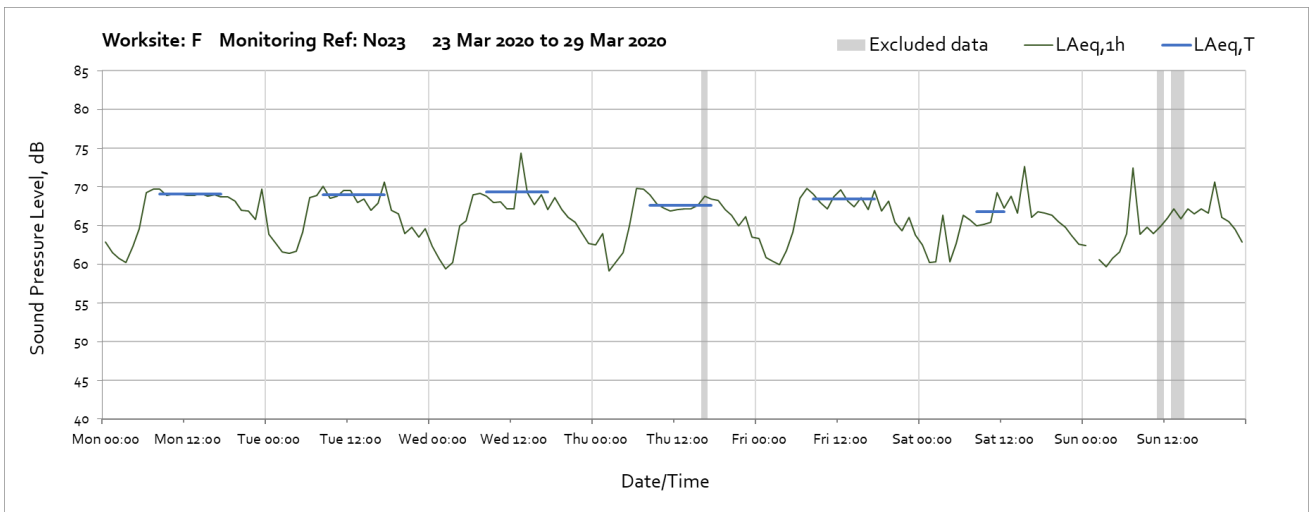
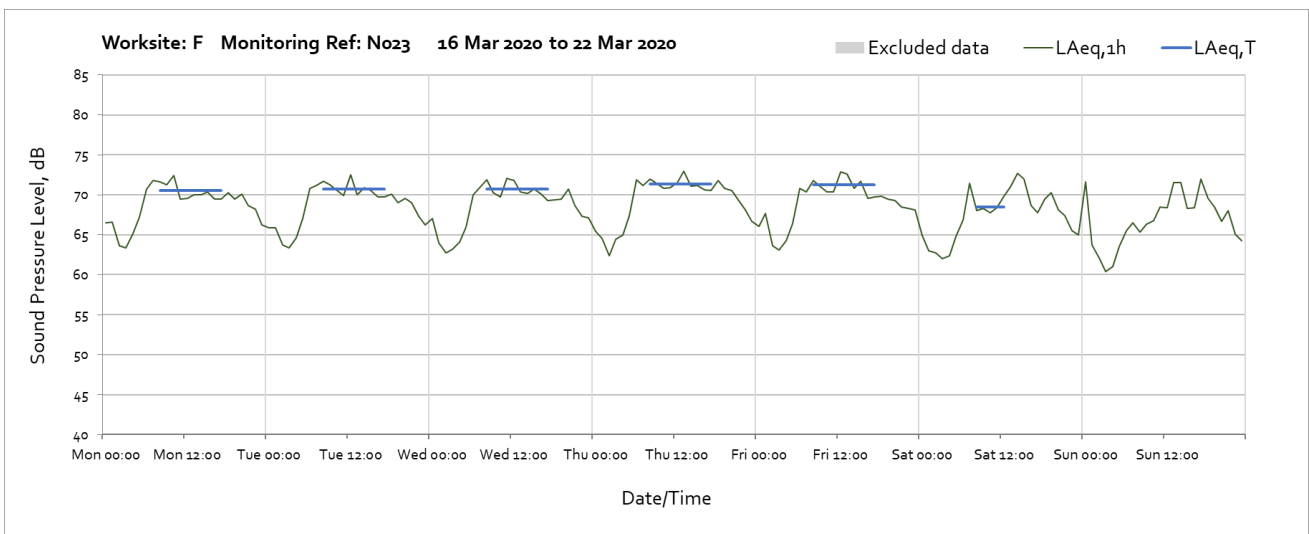
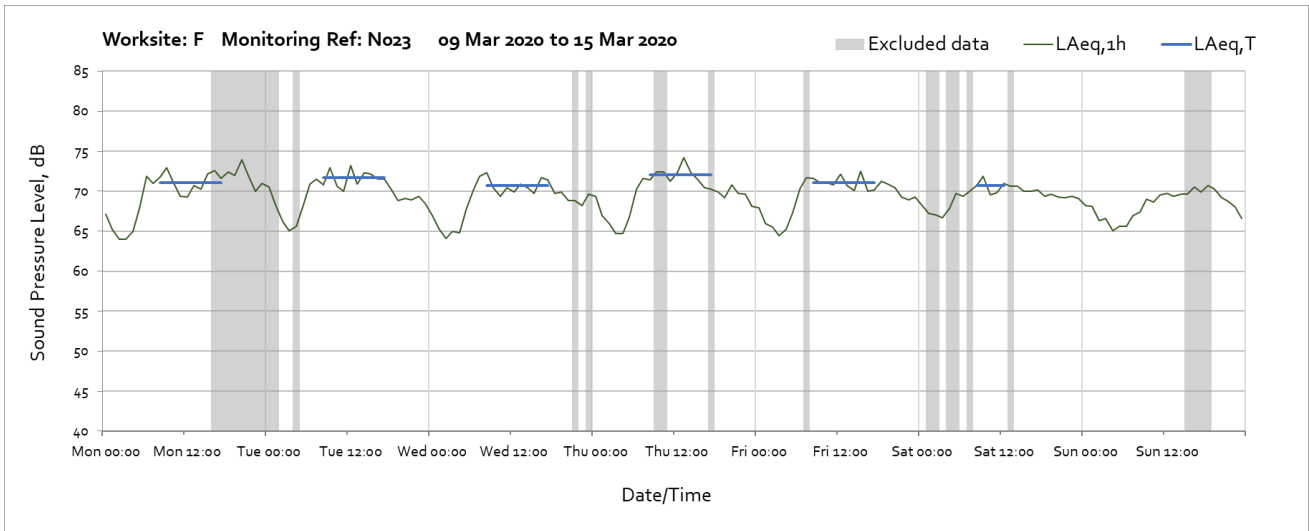
Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.



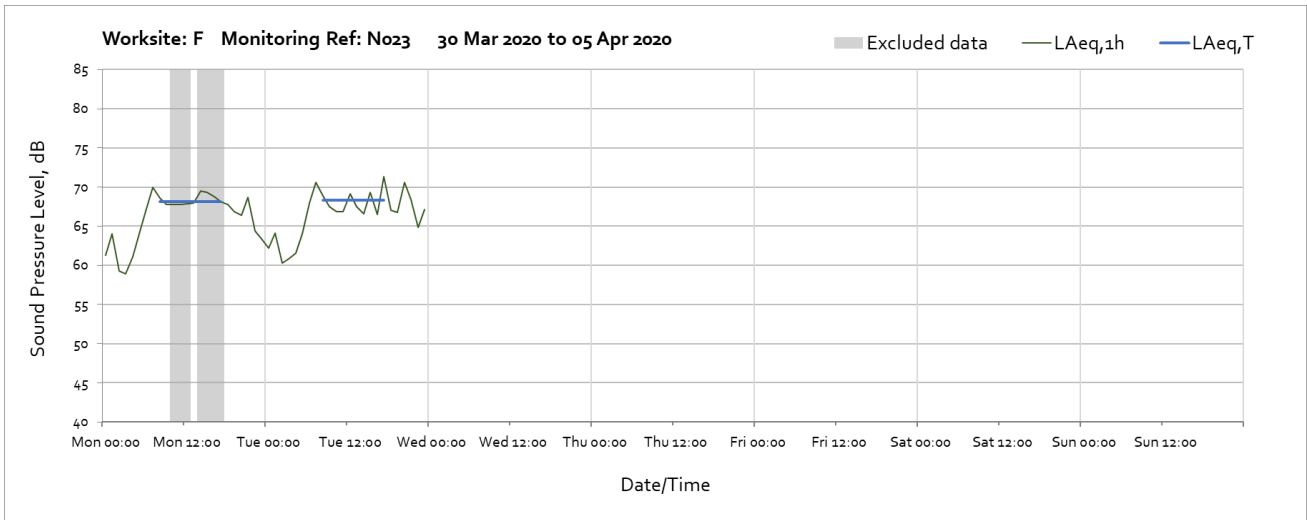
## Worksite: F – Monitoring Ref: N023



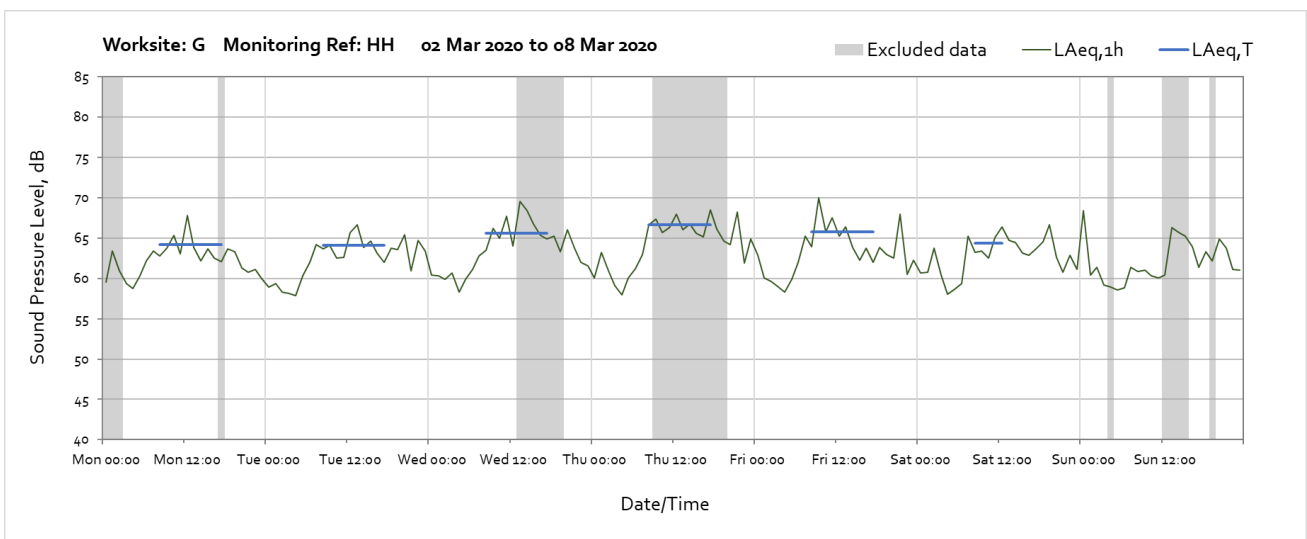
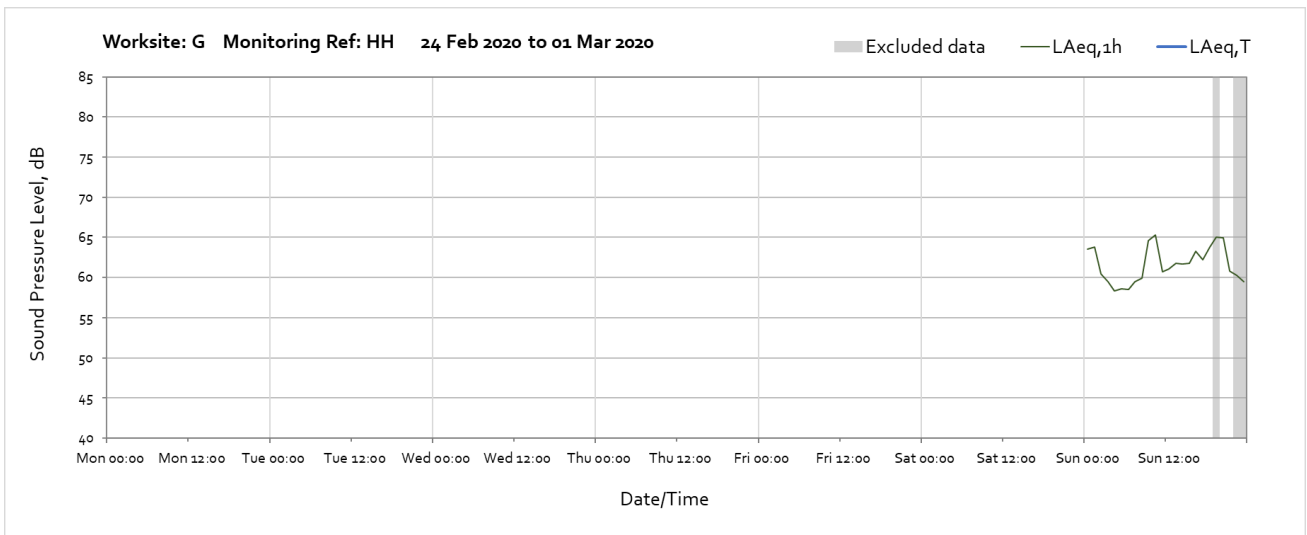


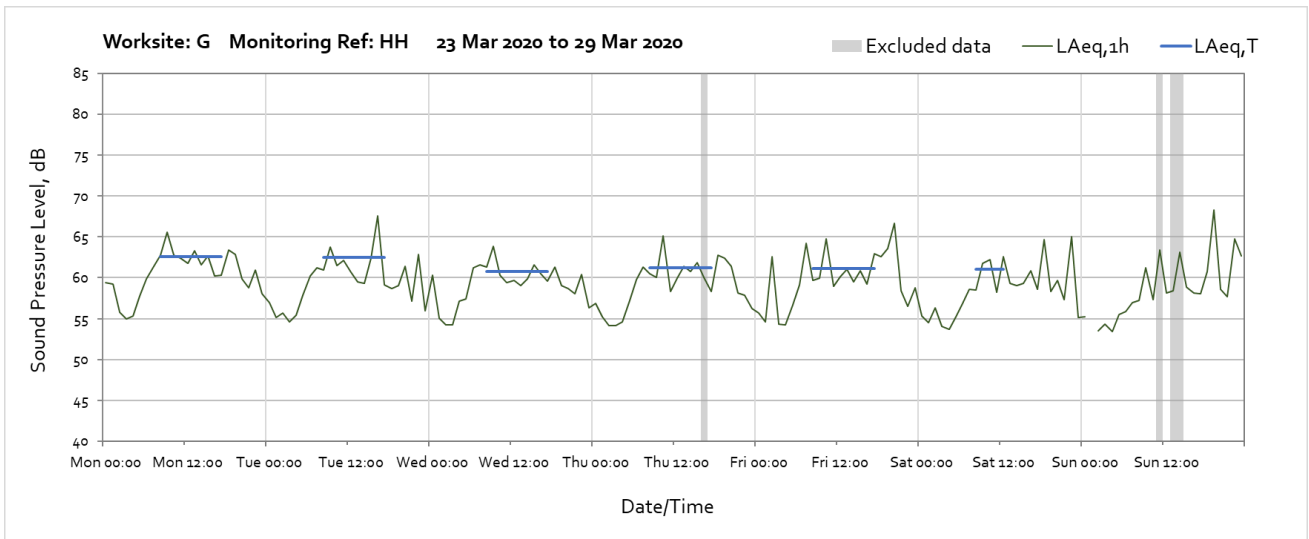
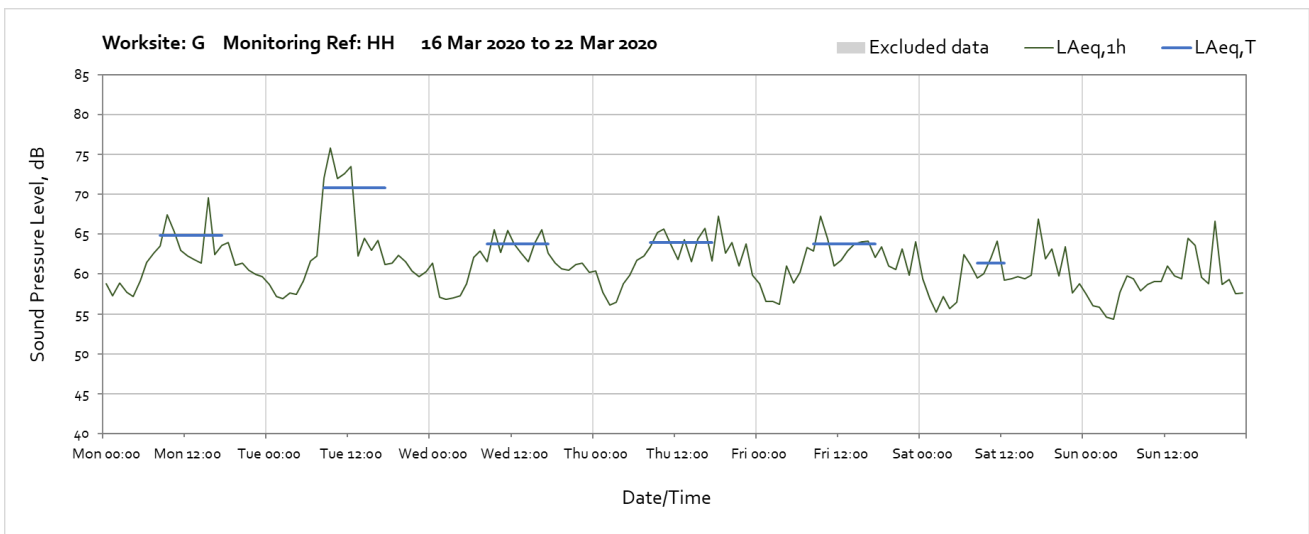
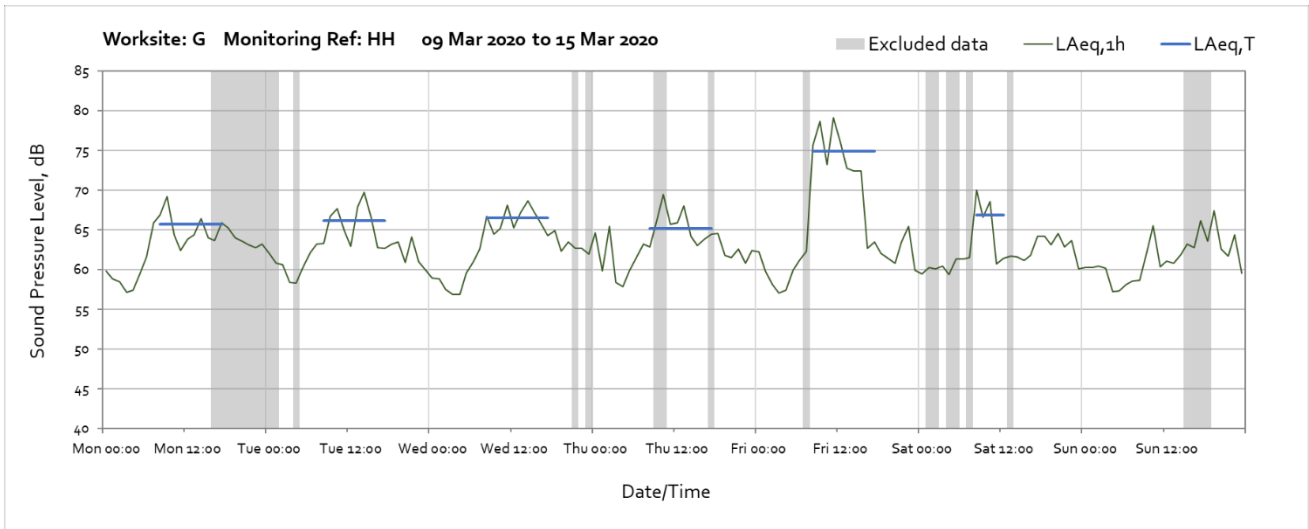


Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.

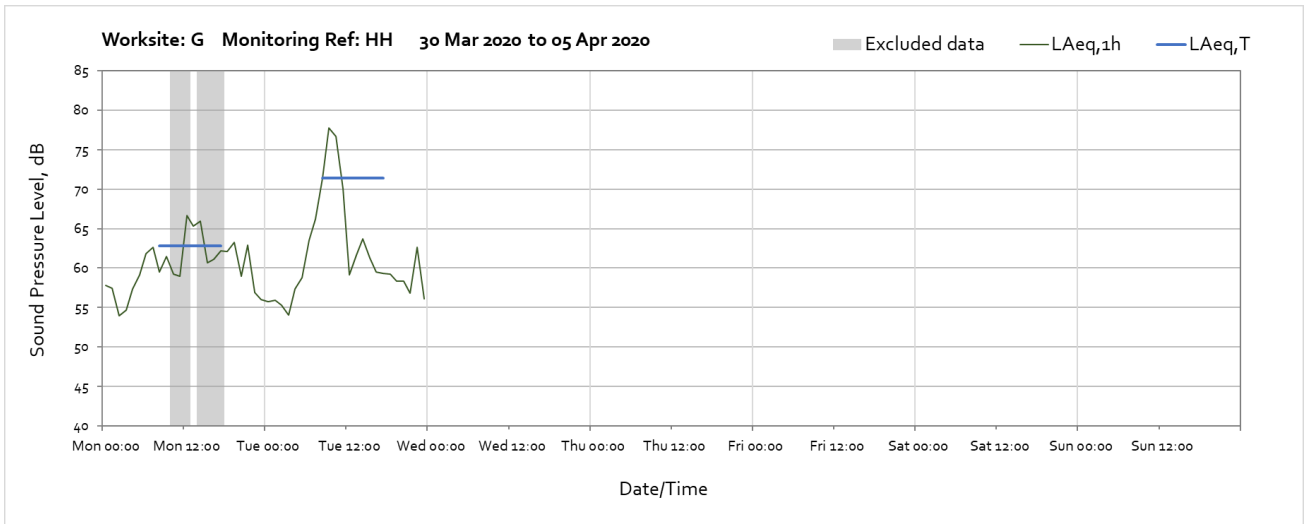


## Worksite: G – Monitoring Ref: HH

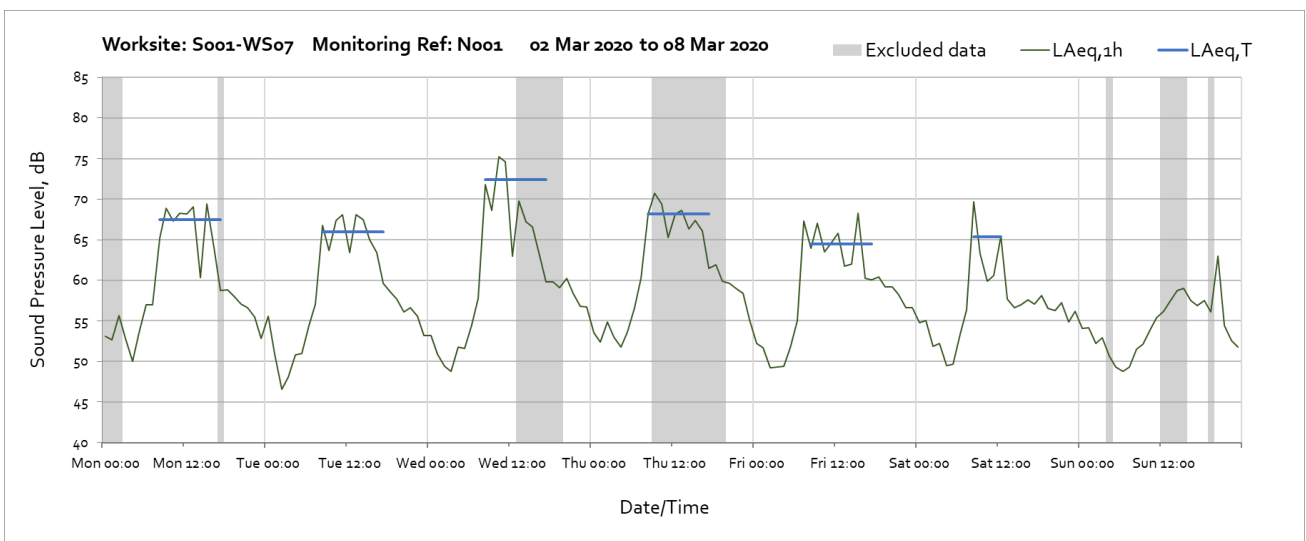
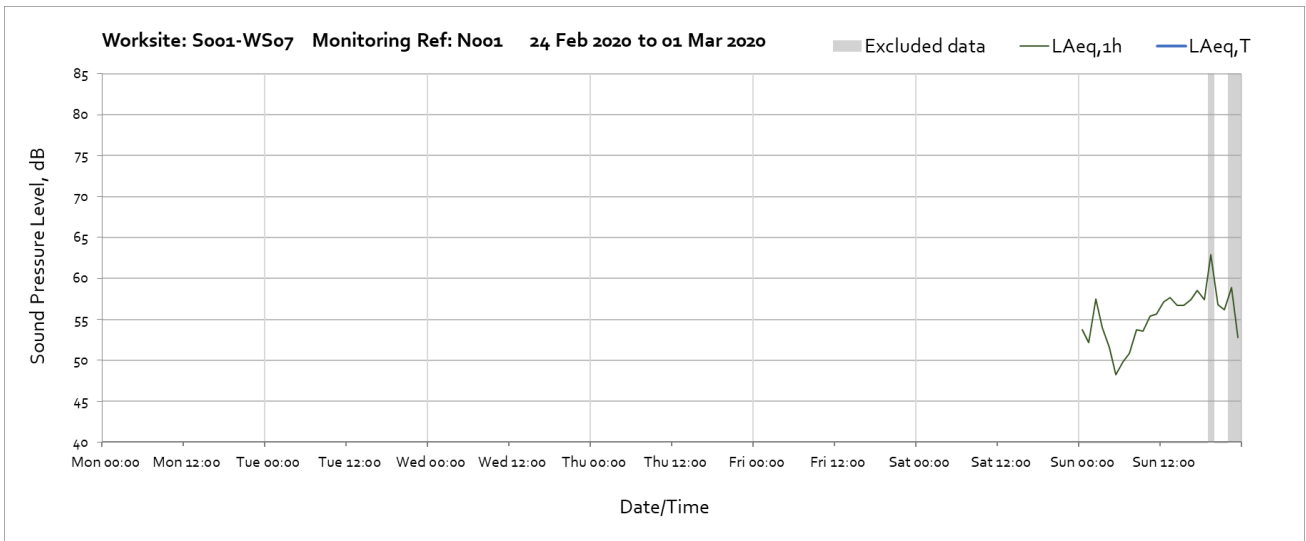


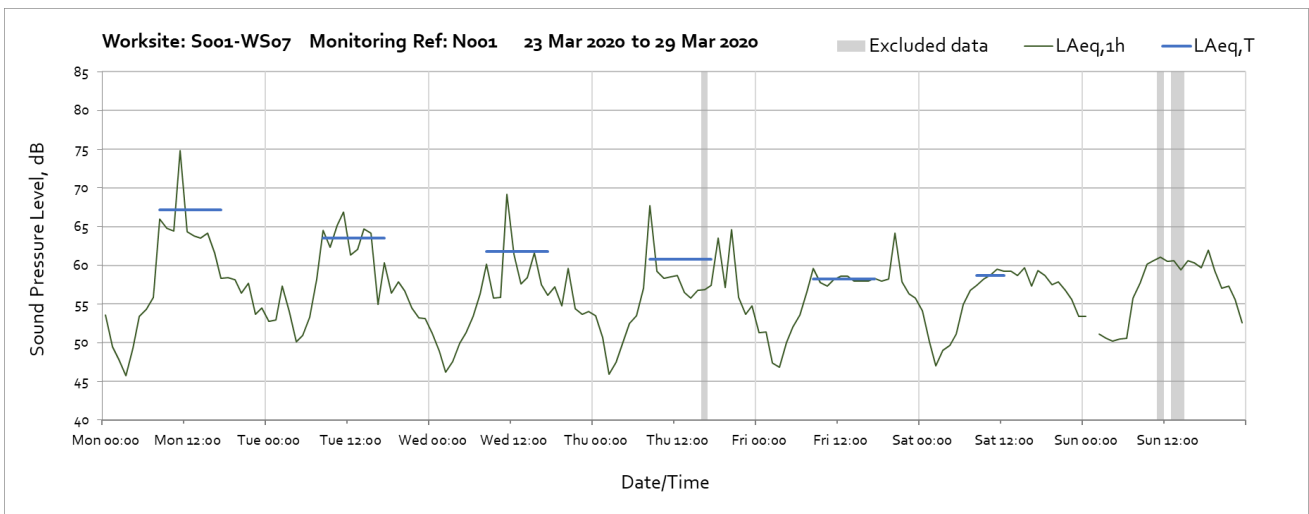
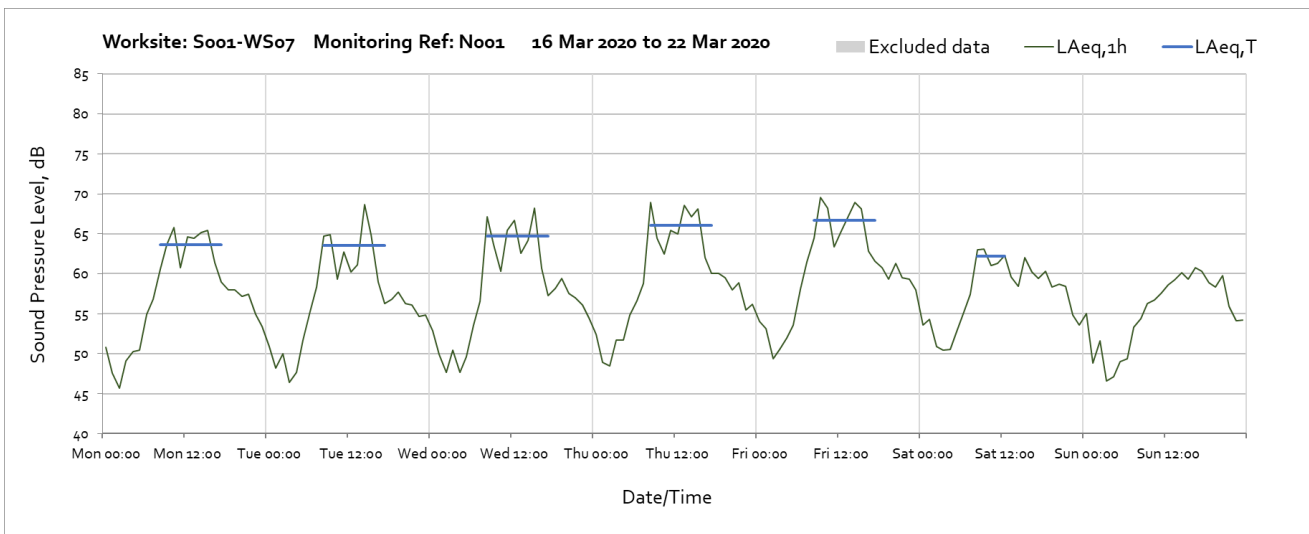
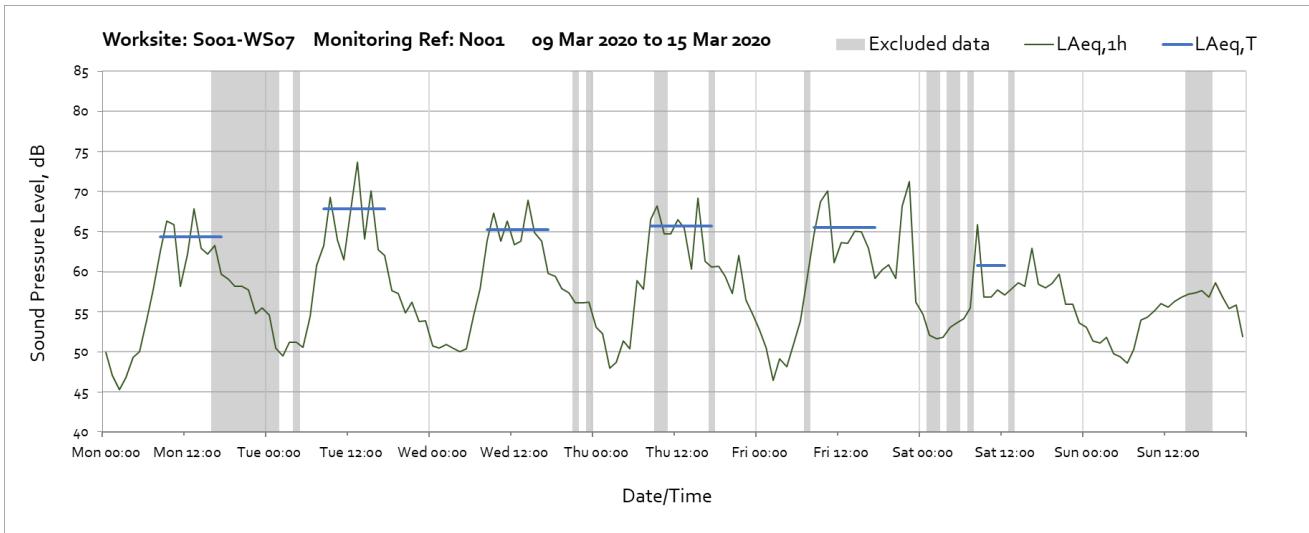


Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime

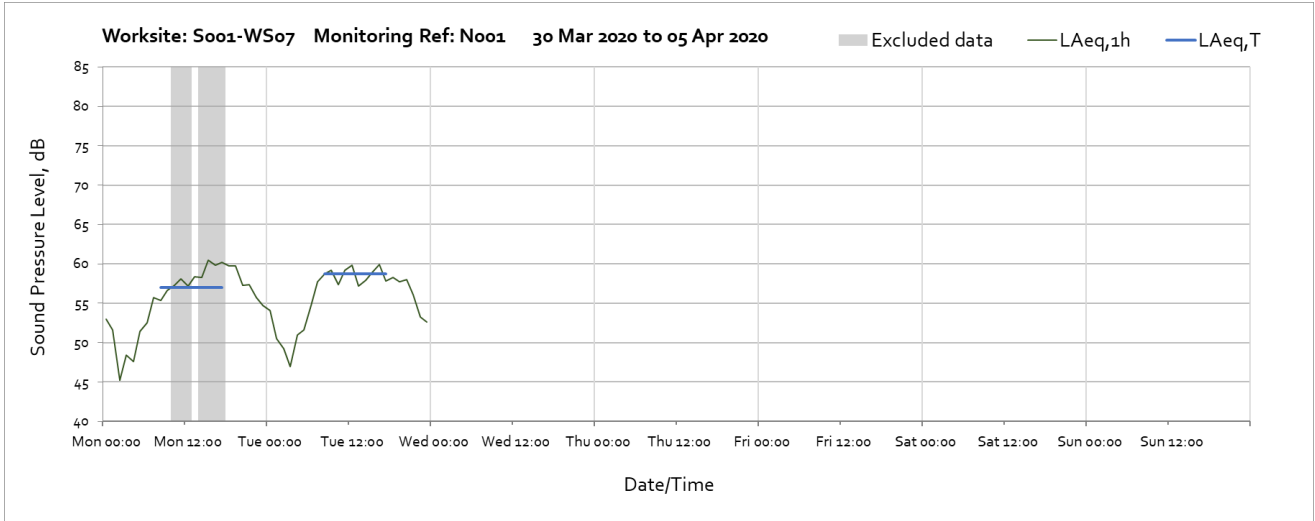


## Worksite: S001-WS01 – Monitoring Ref: N001

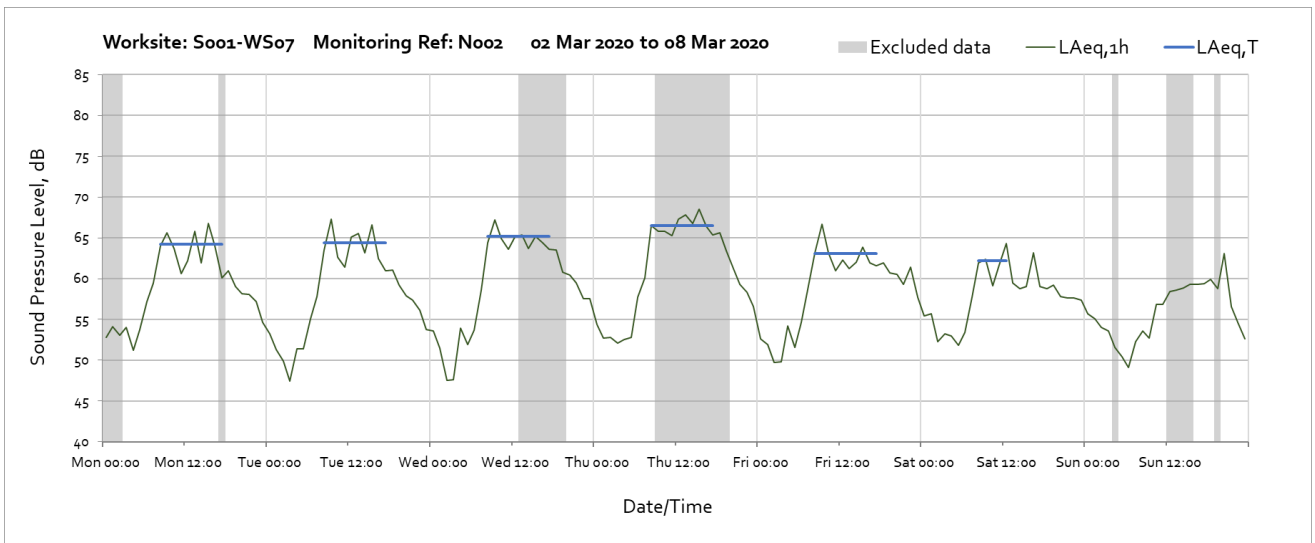
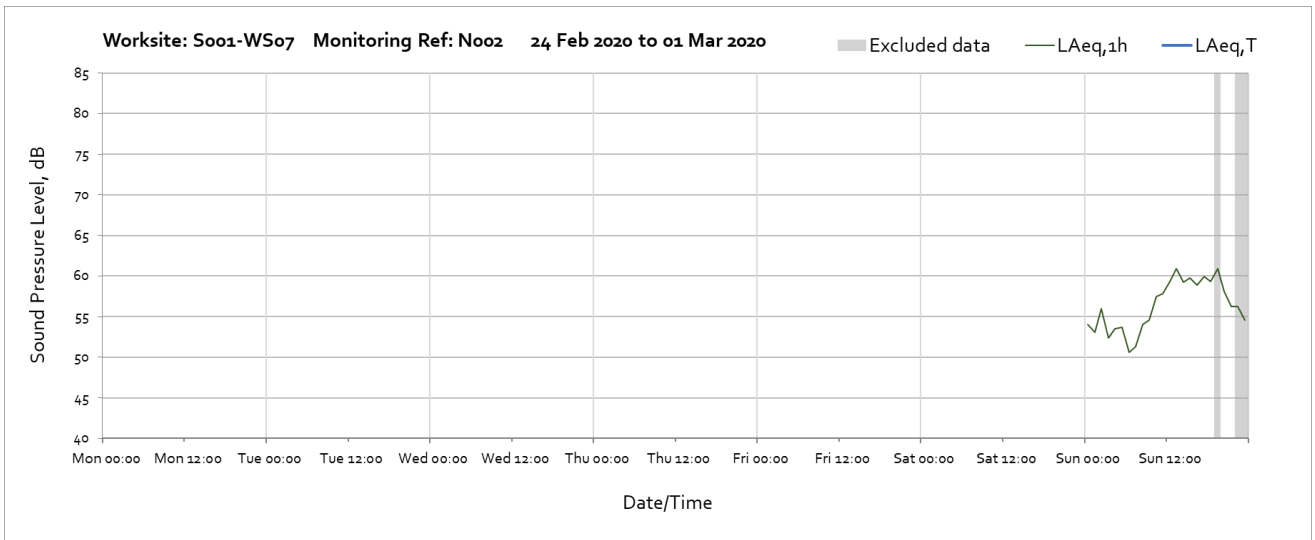


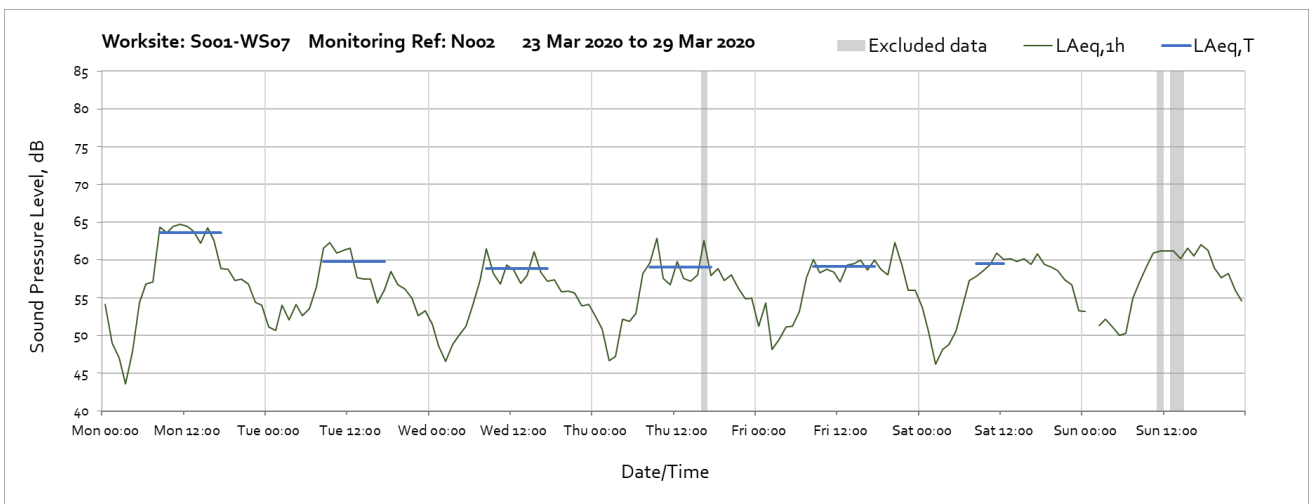
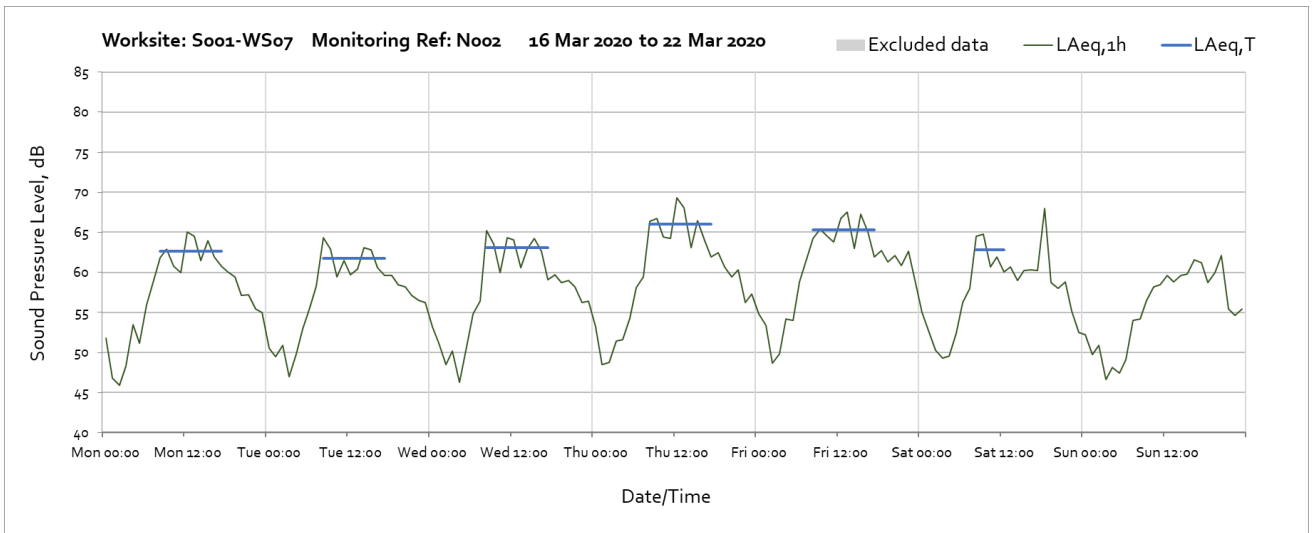
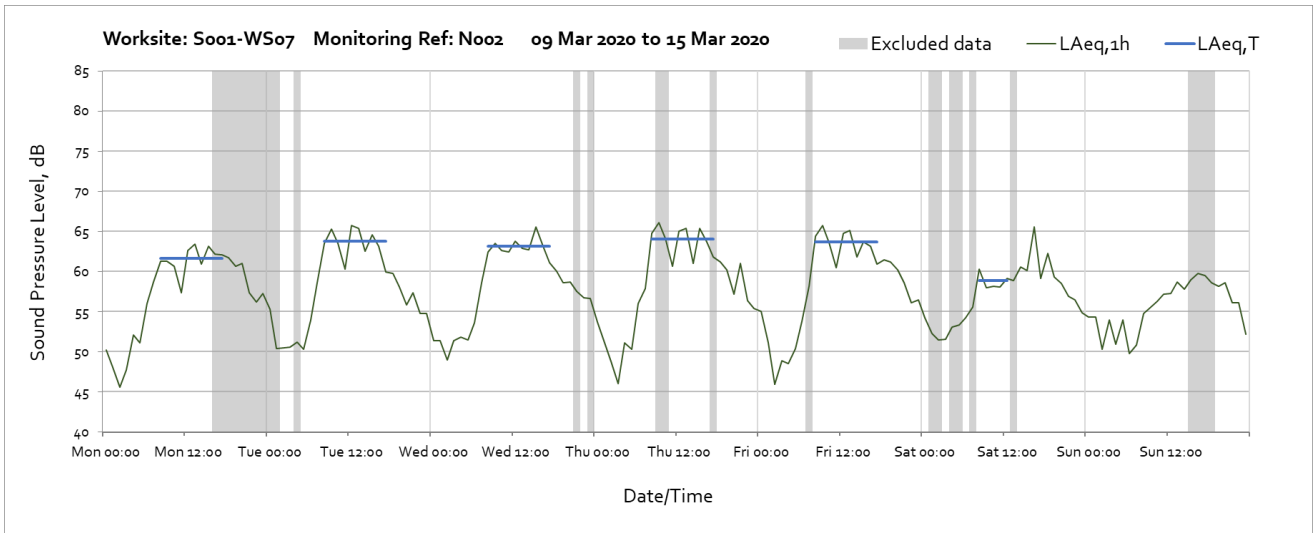


Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.

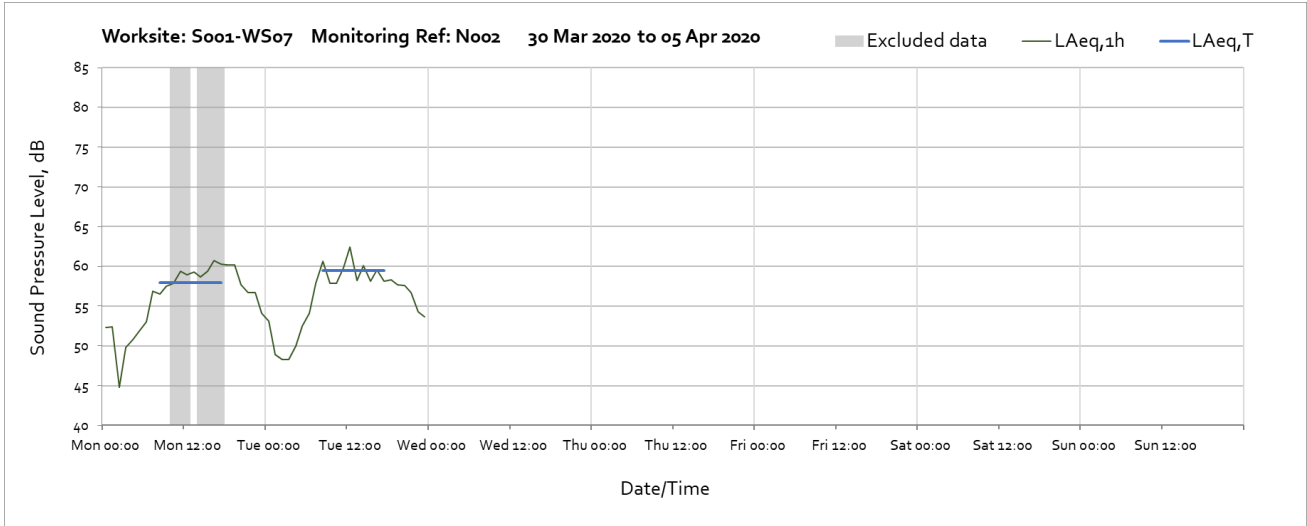


## Worksite: S001-WS01 – Monitoring Ref: N002

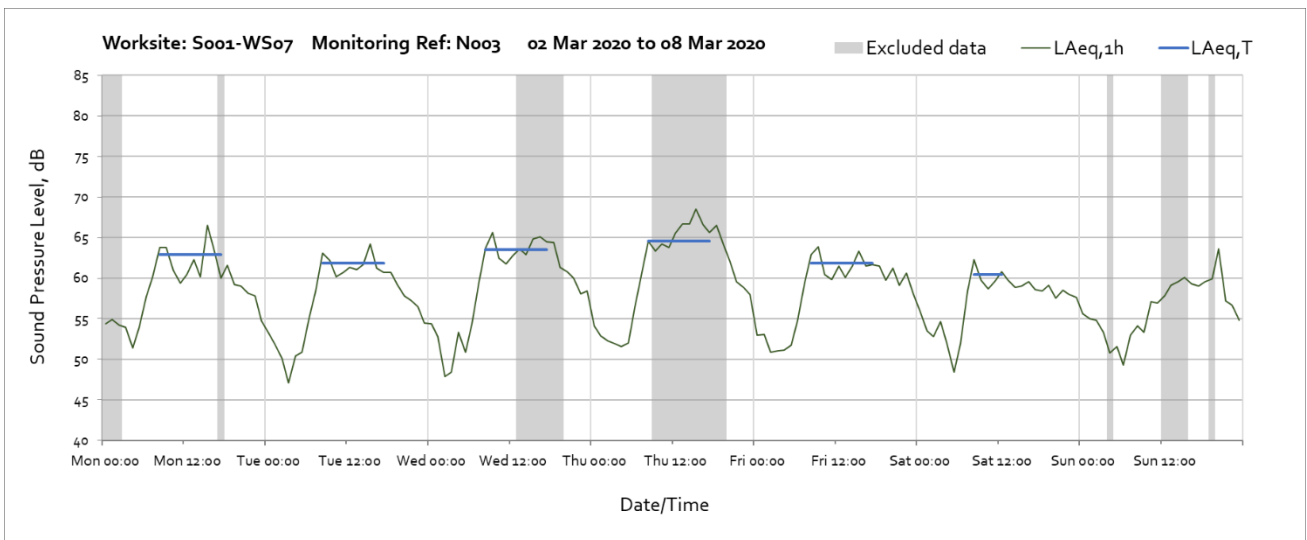
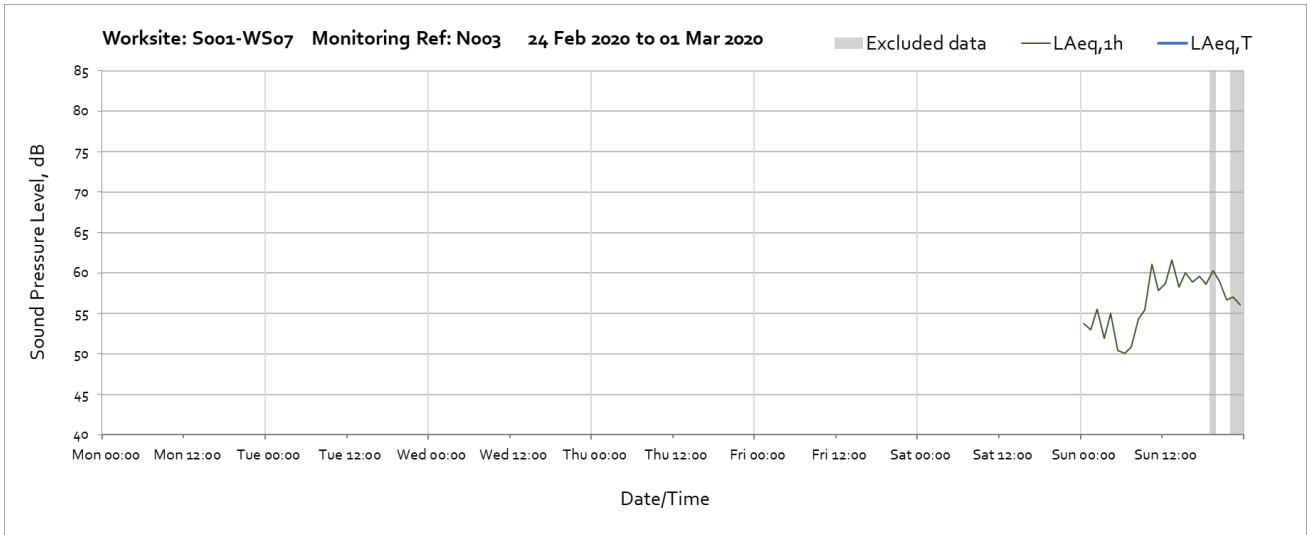




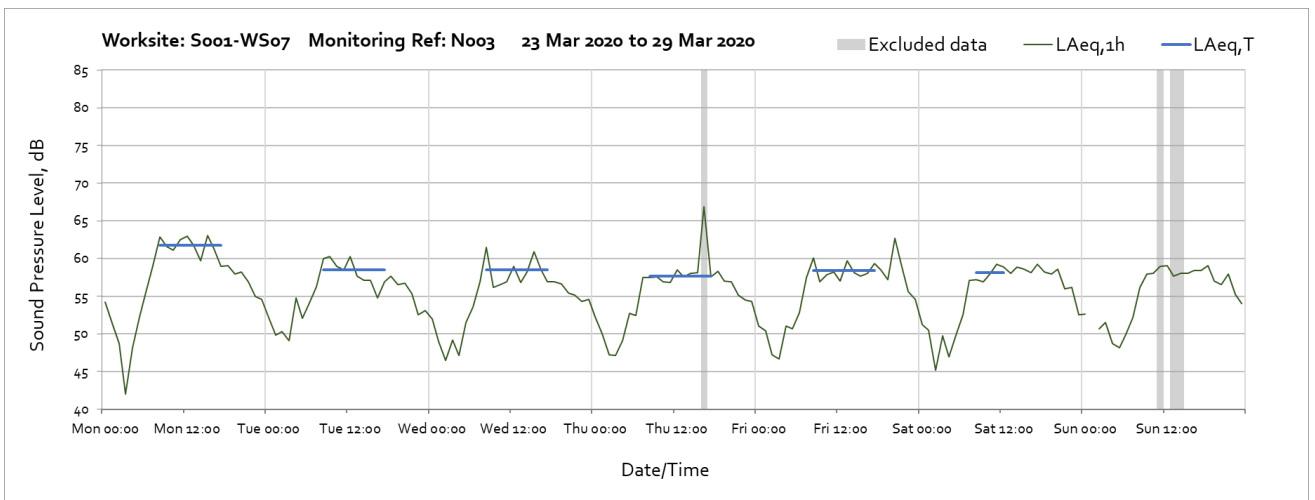
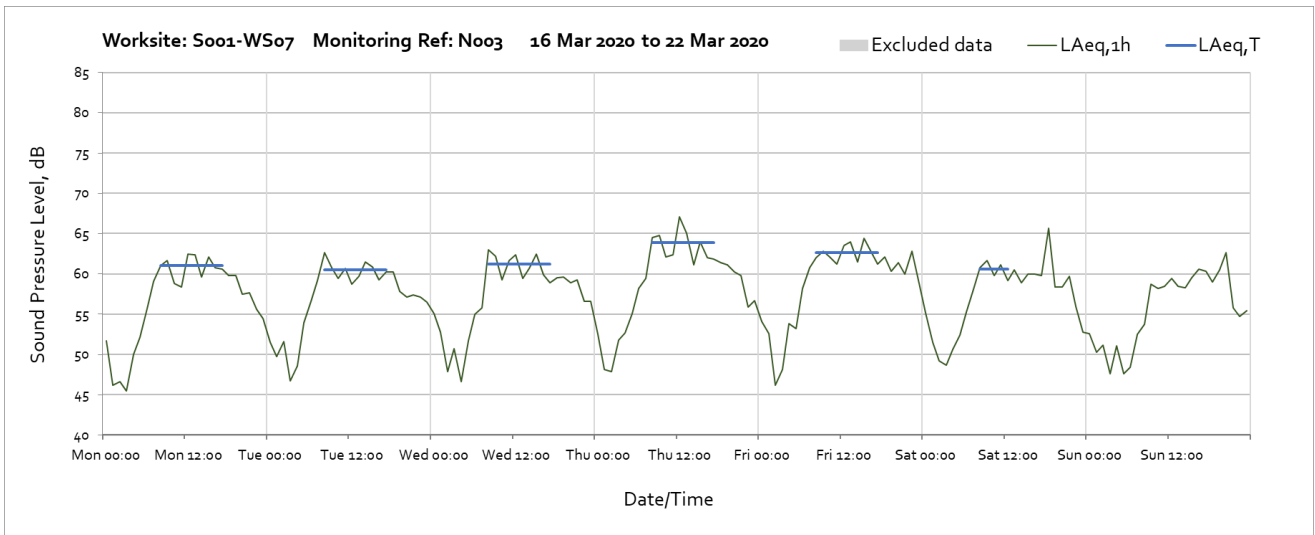
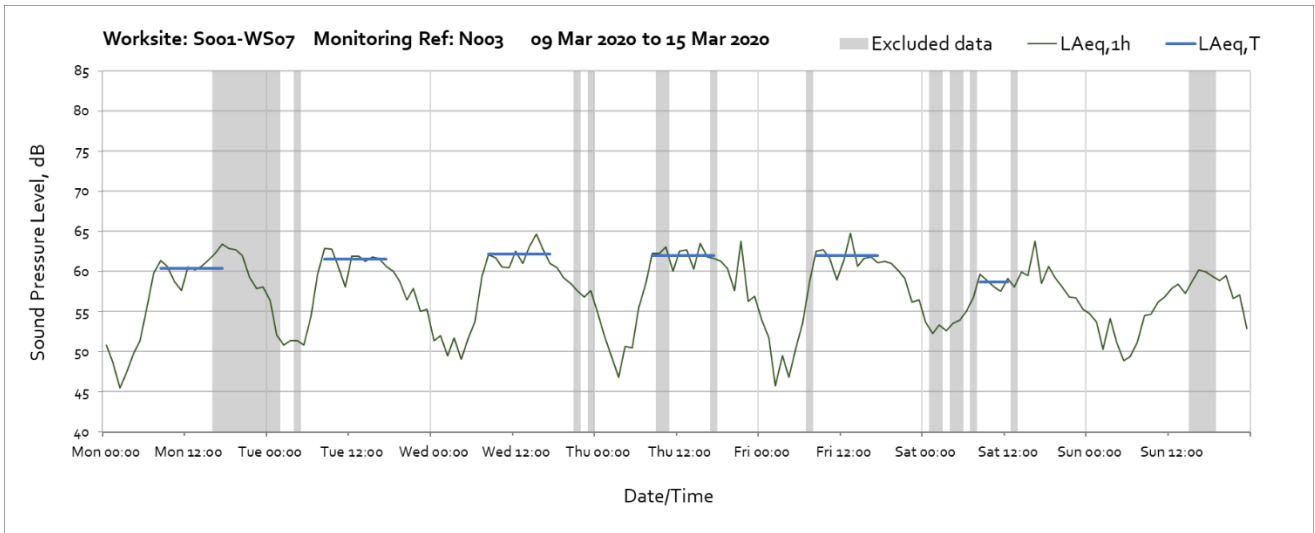
Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.



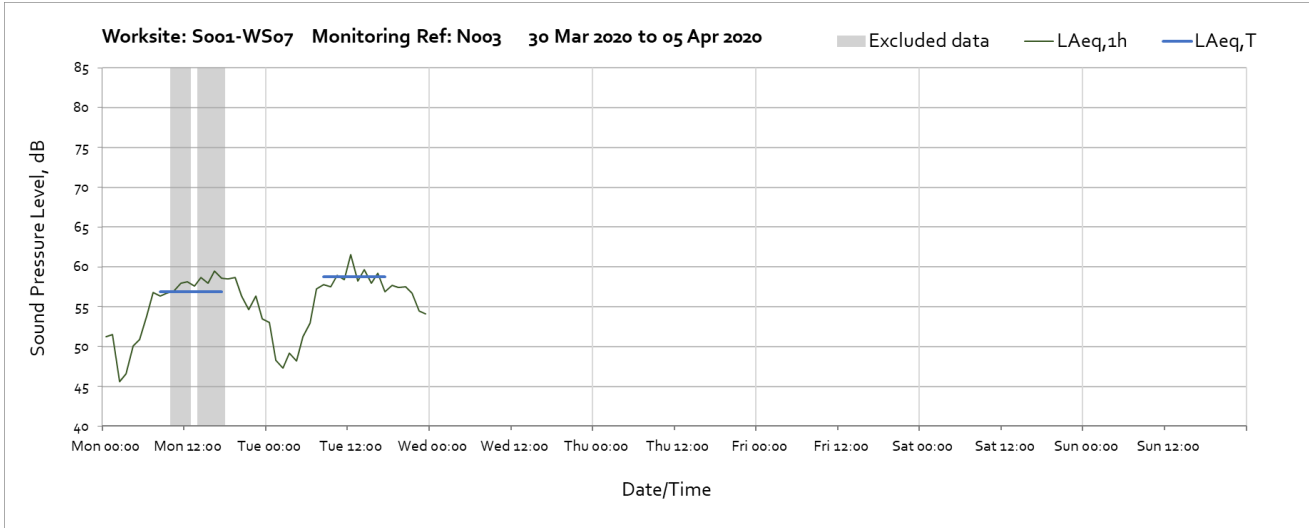
## Worksite: S001-WS01 – Monitoring Ref: N003



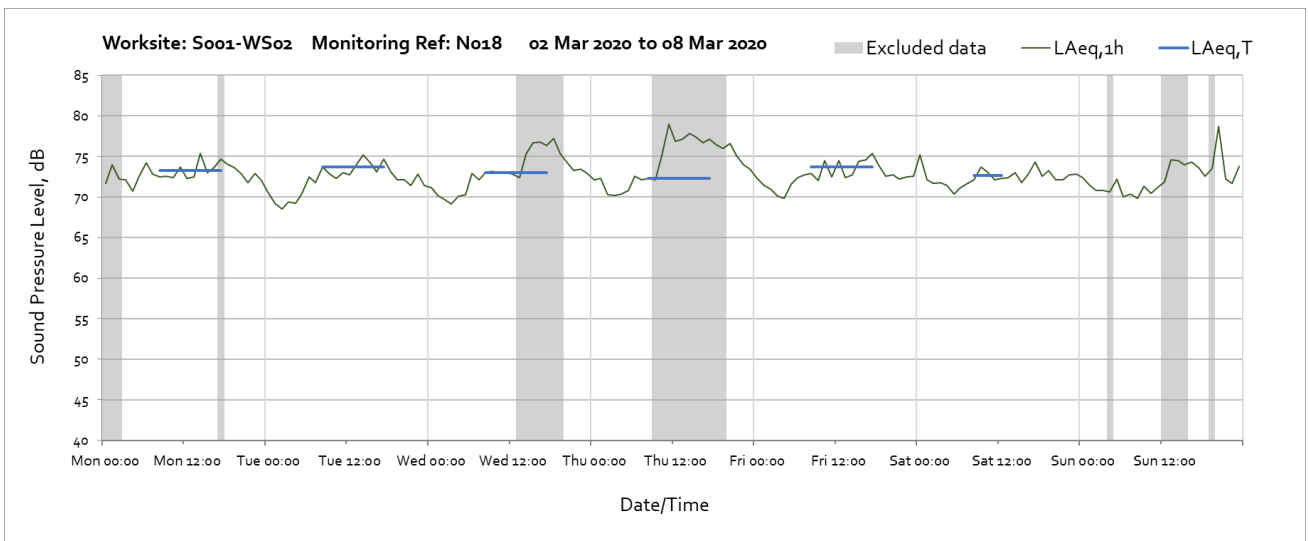
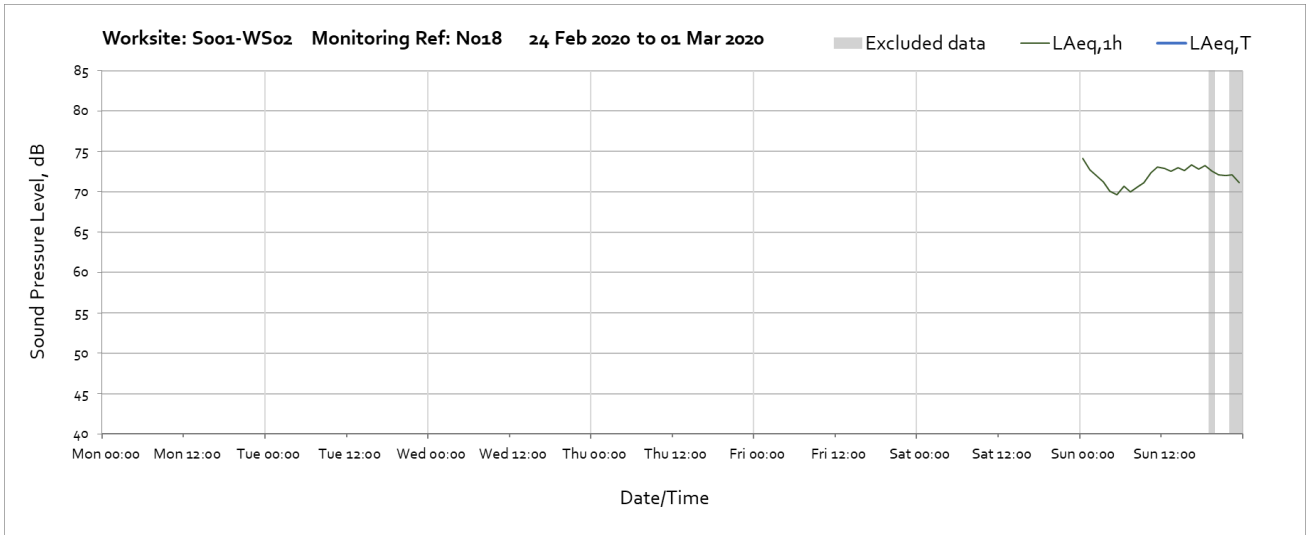


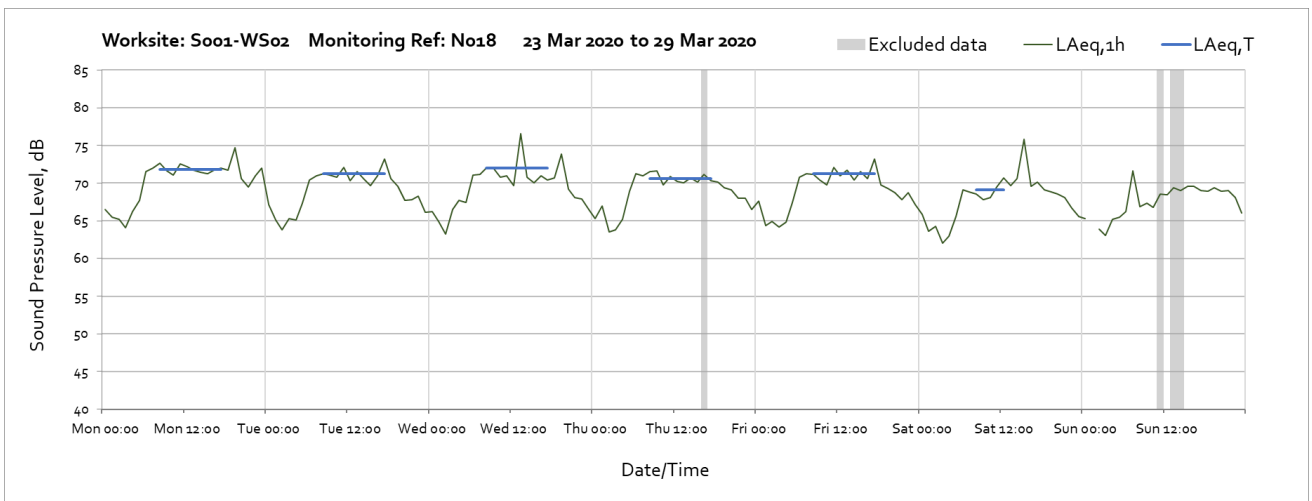
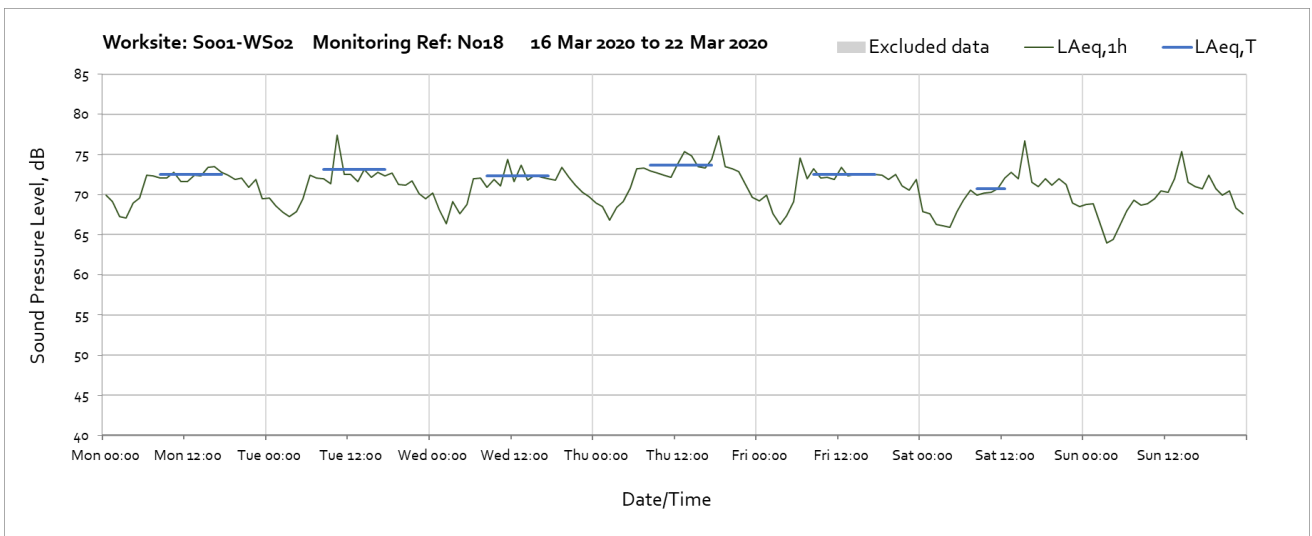
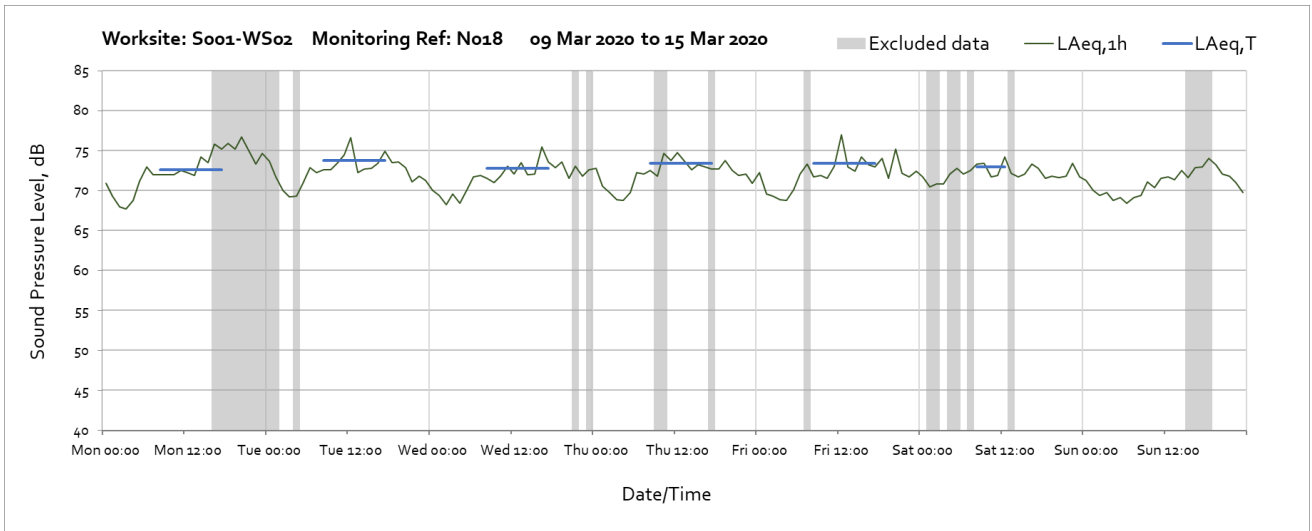


Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.

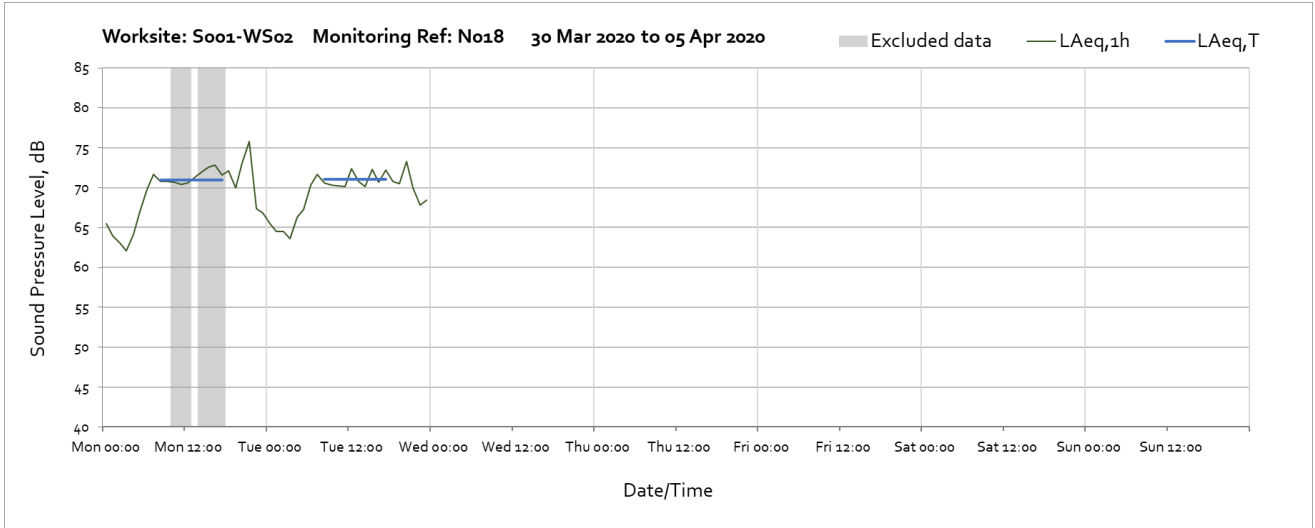


## Worksite: S001-WS02 – Monitoring Ref: N018

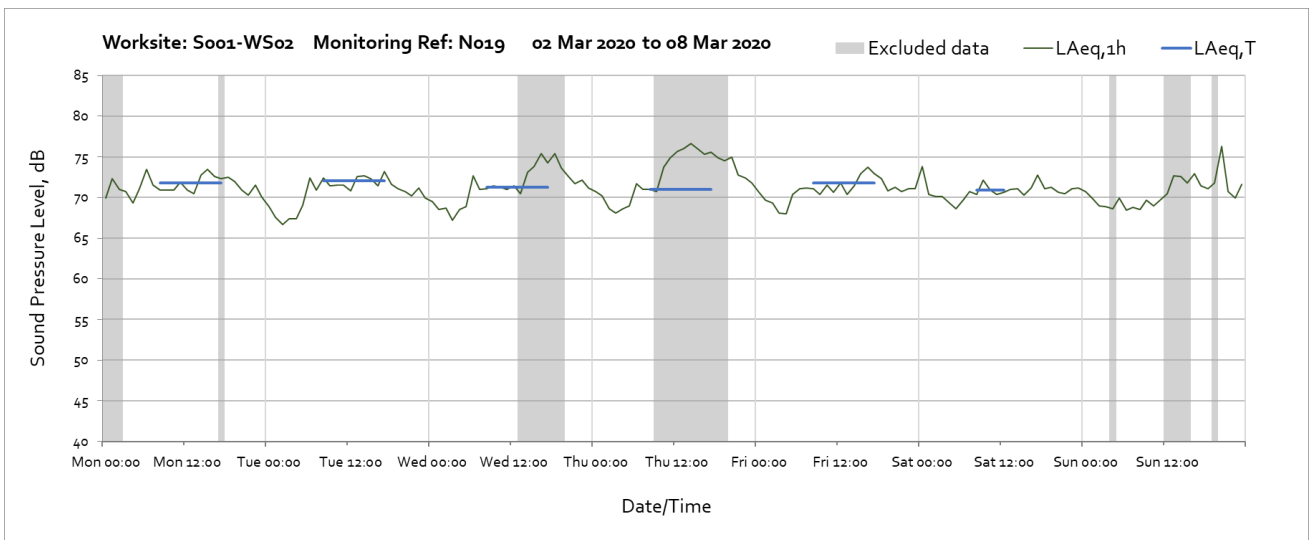
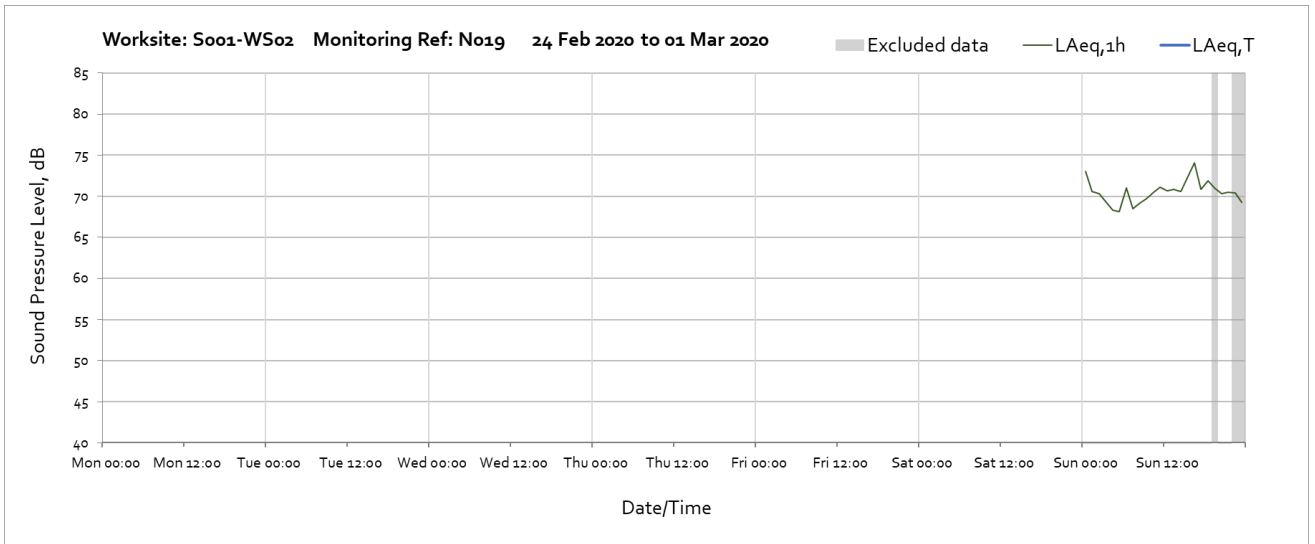


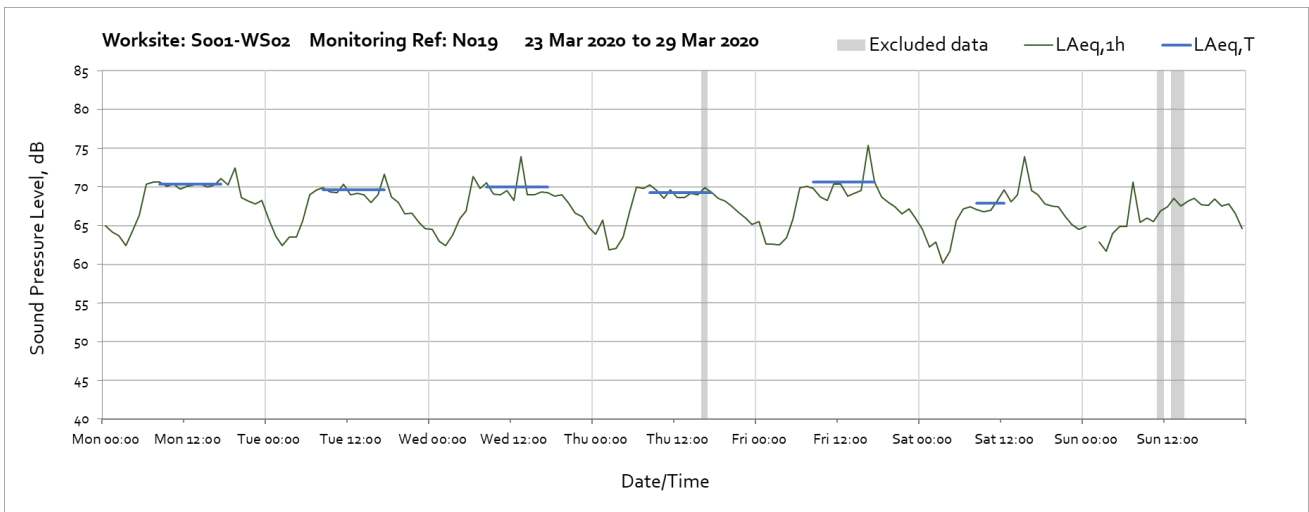
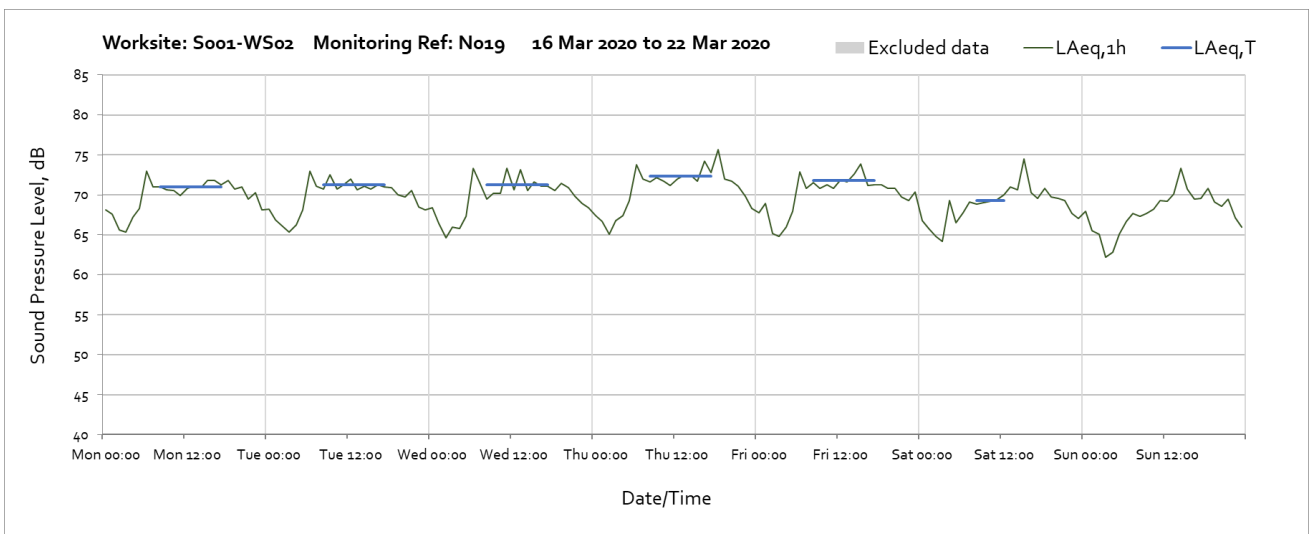
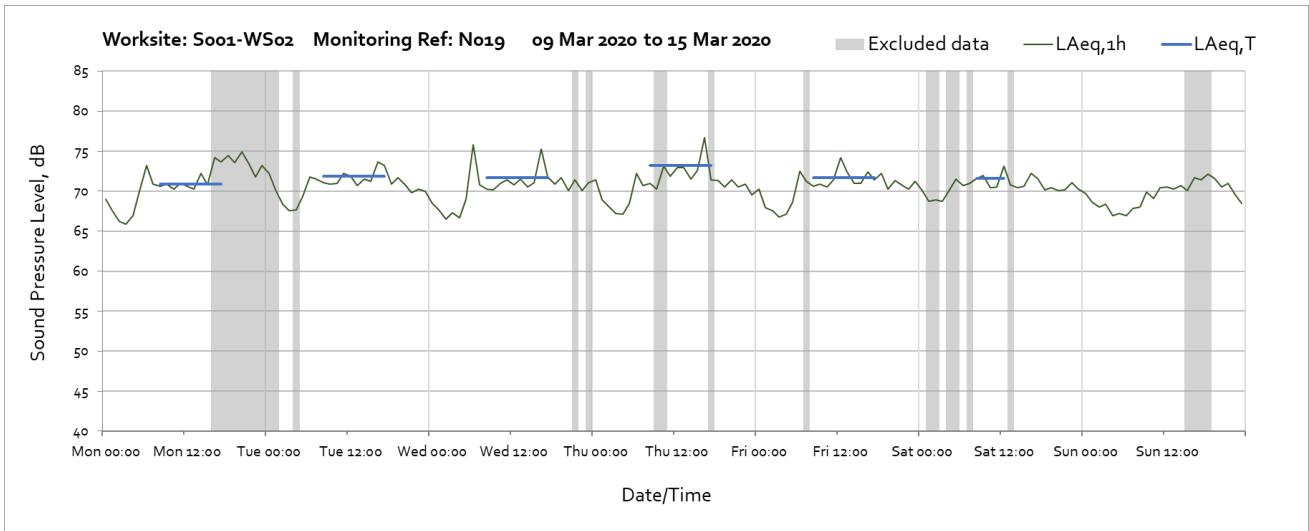


Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.

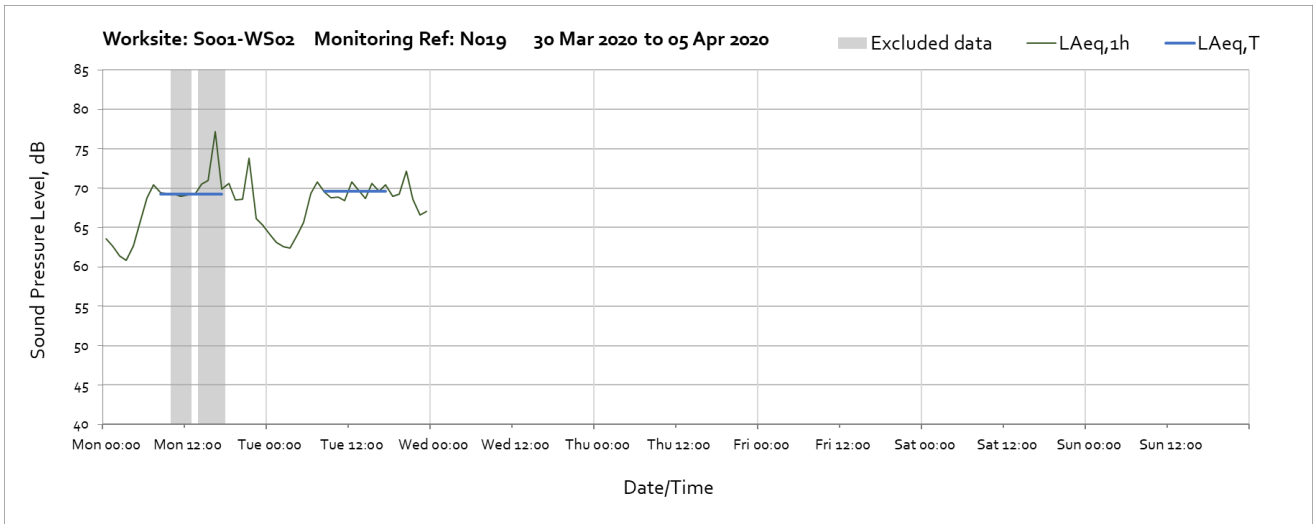


## Worksite: S001-WS02 – Monitoring Ref: N019

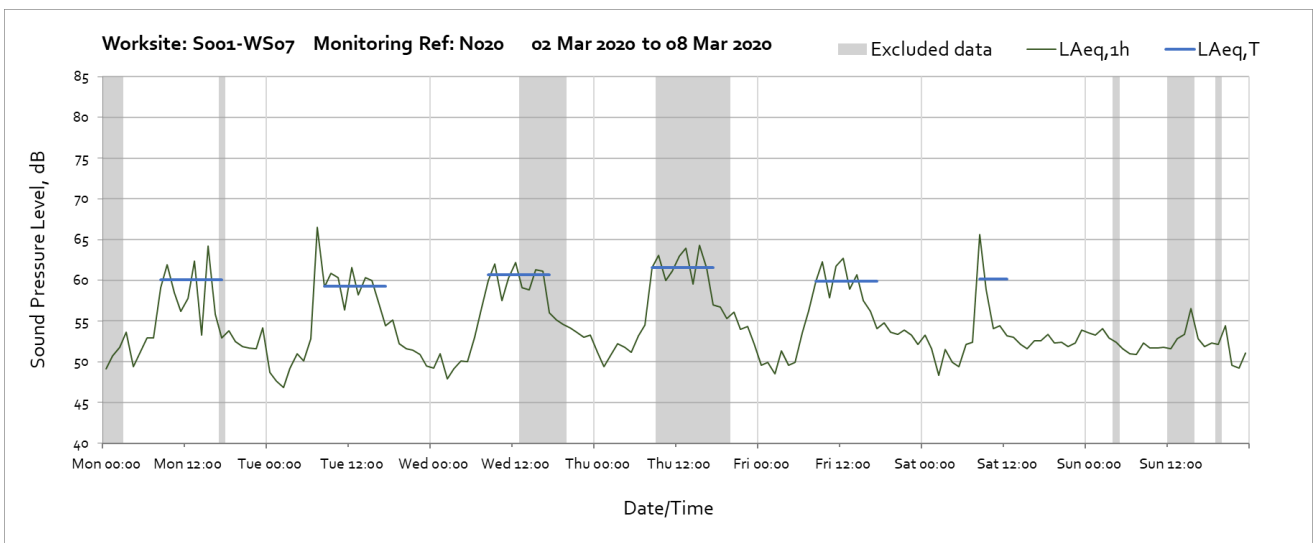
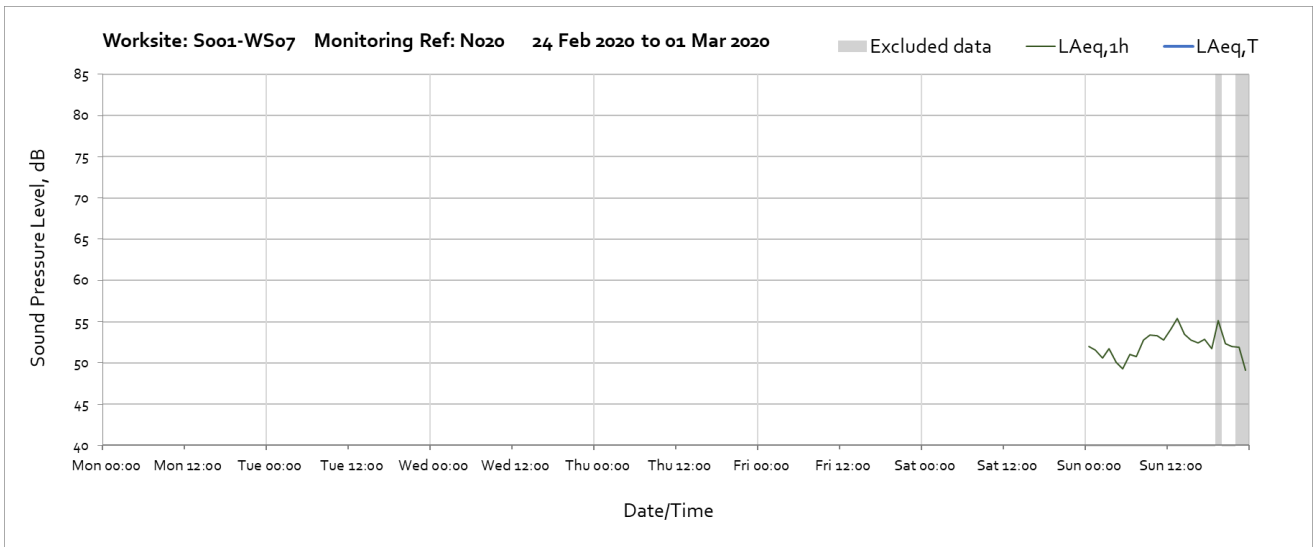


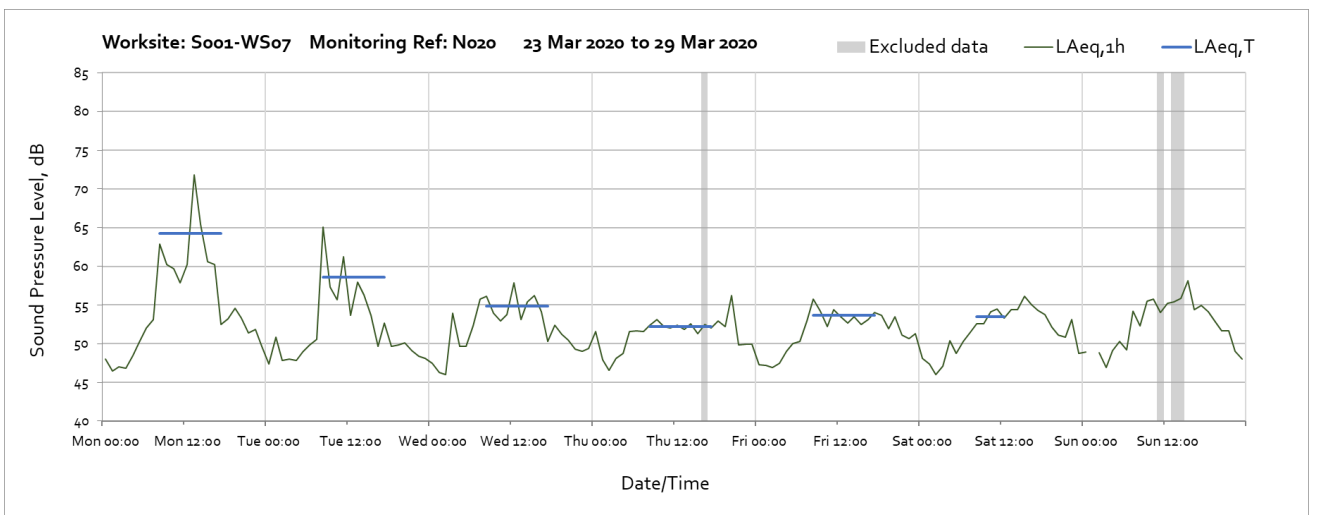
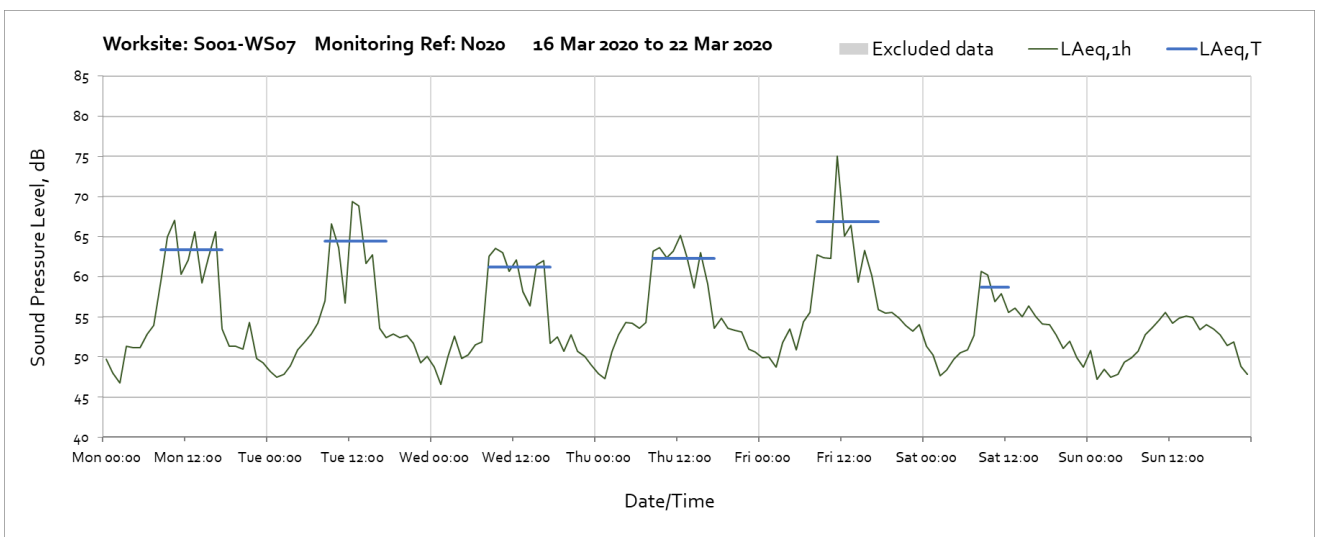
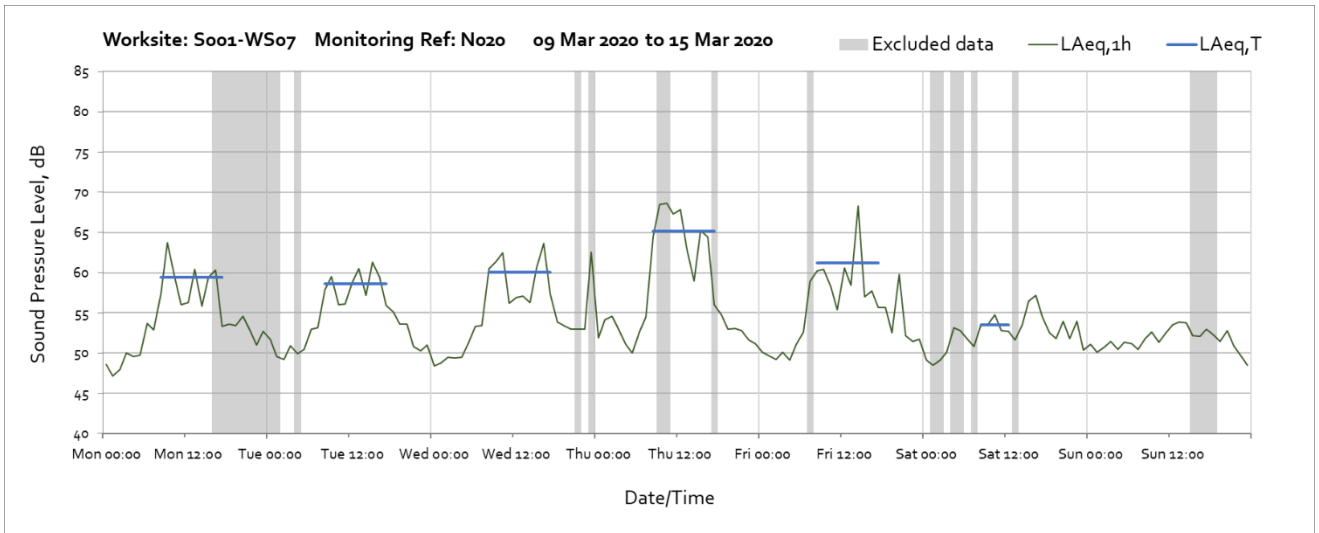


Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.

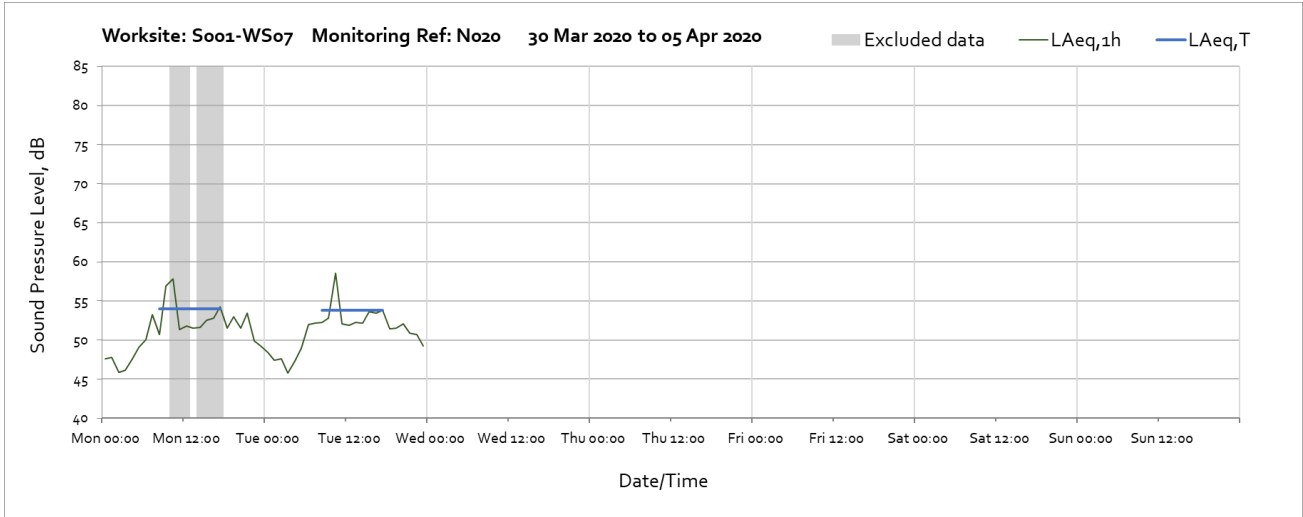


## Worksite: S001-WS07 – Monitoring Ref: N020

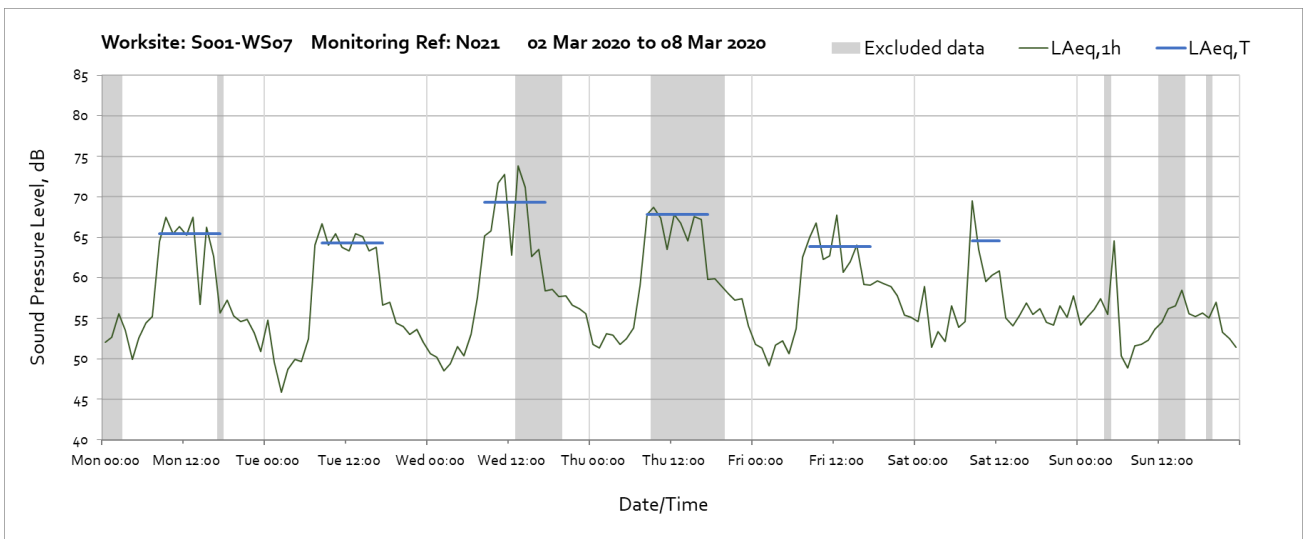
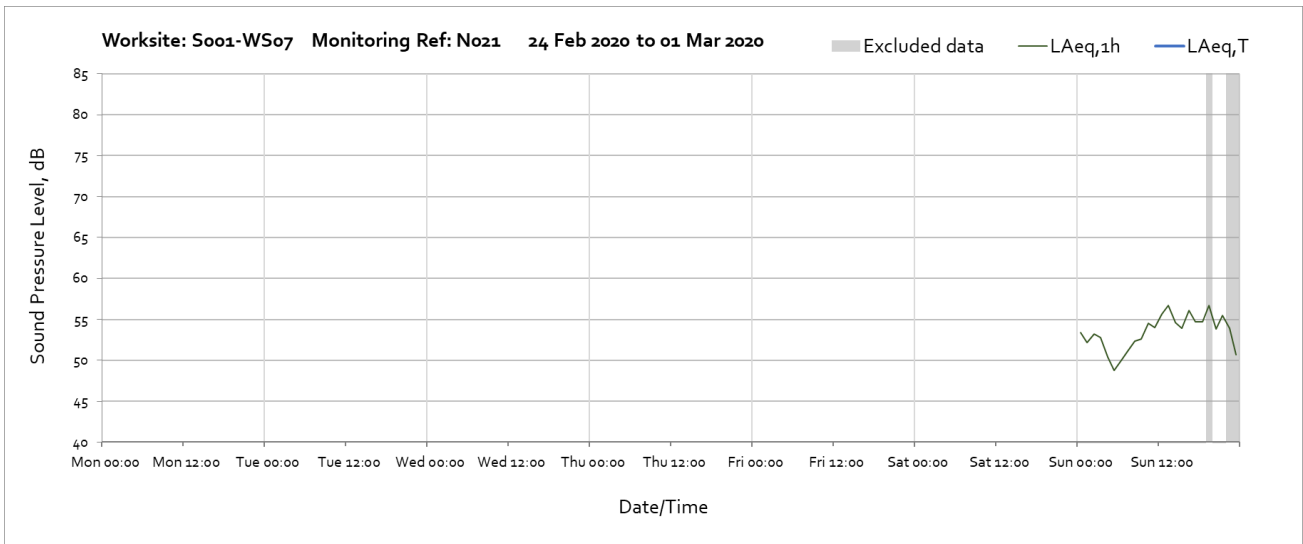




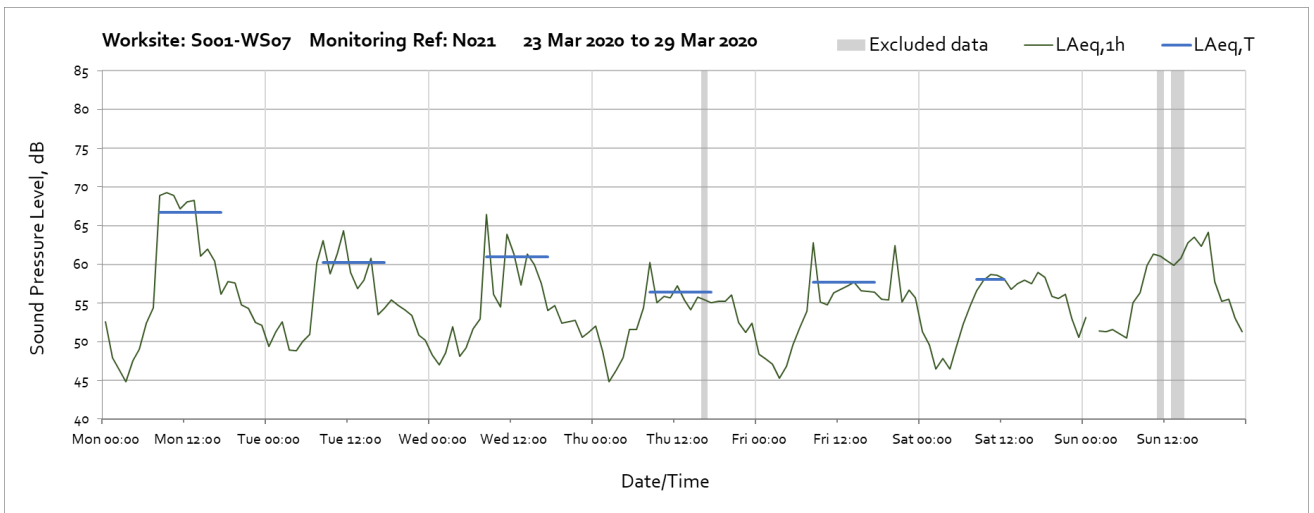
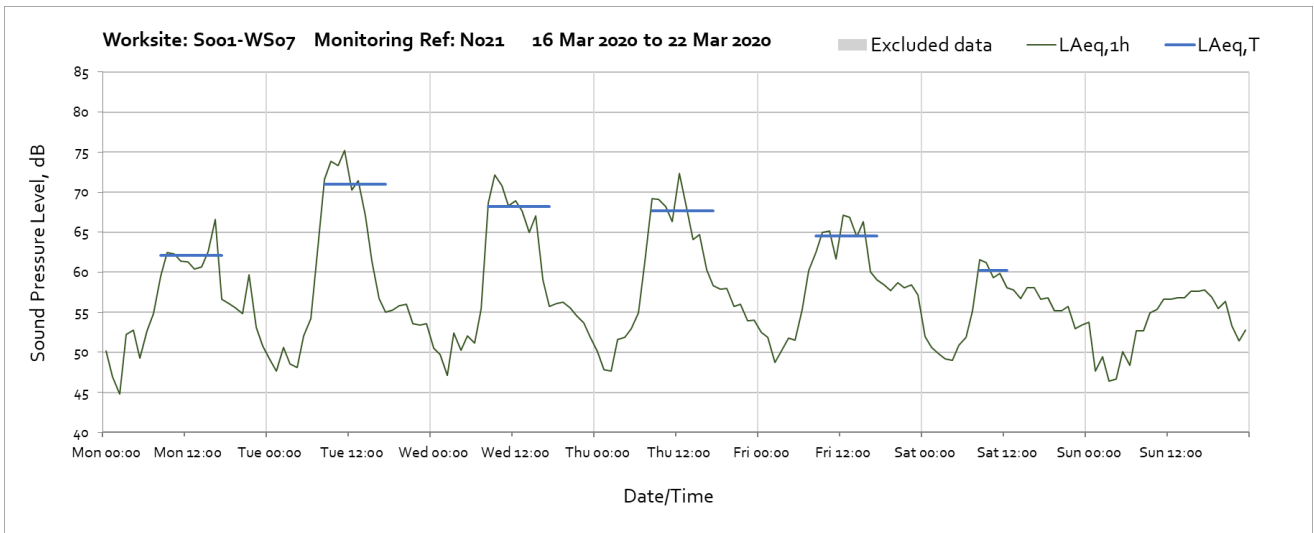
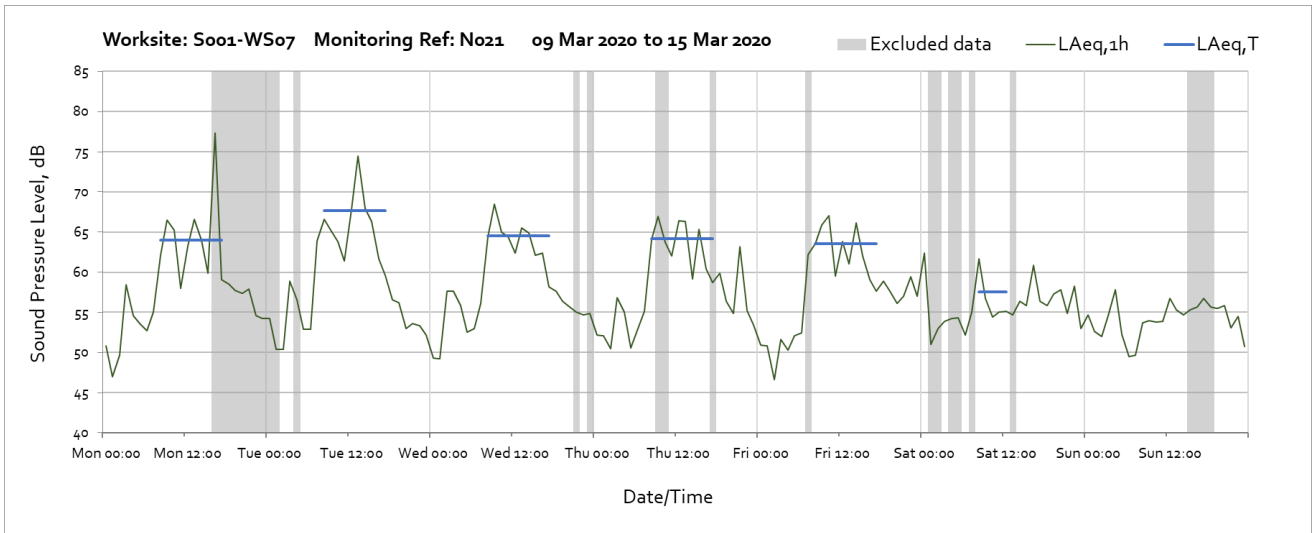
Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.



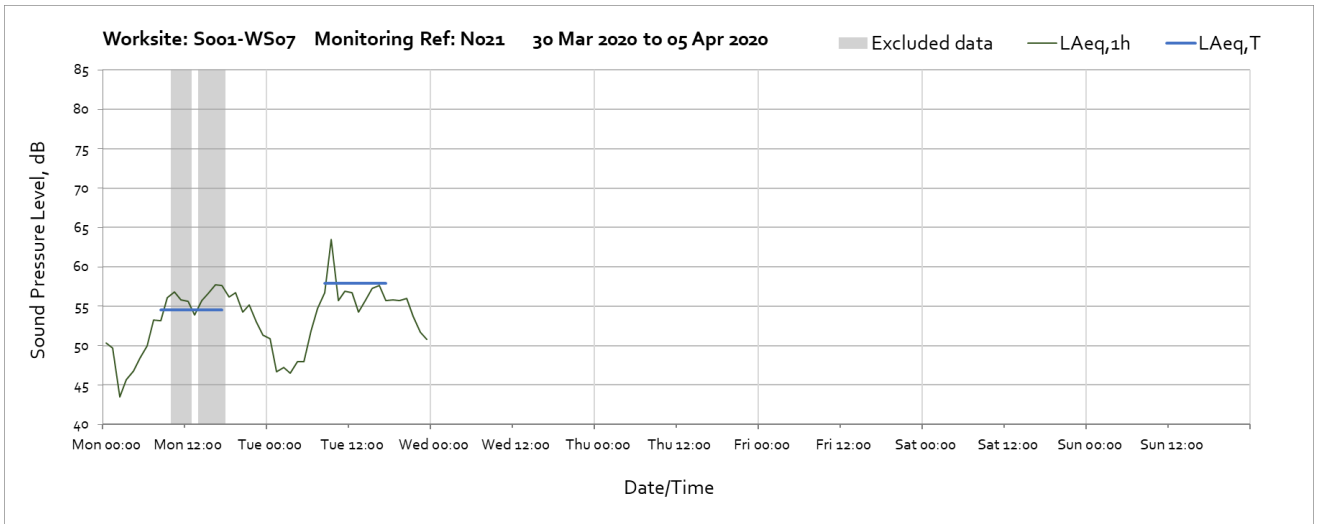
## Worksite: S001-WS07 – Monitoring Ref: N021



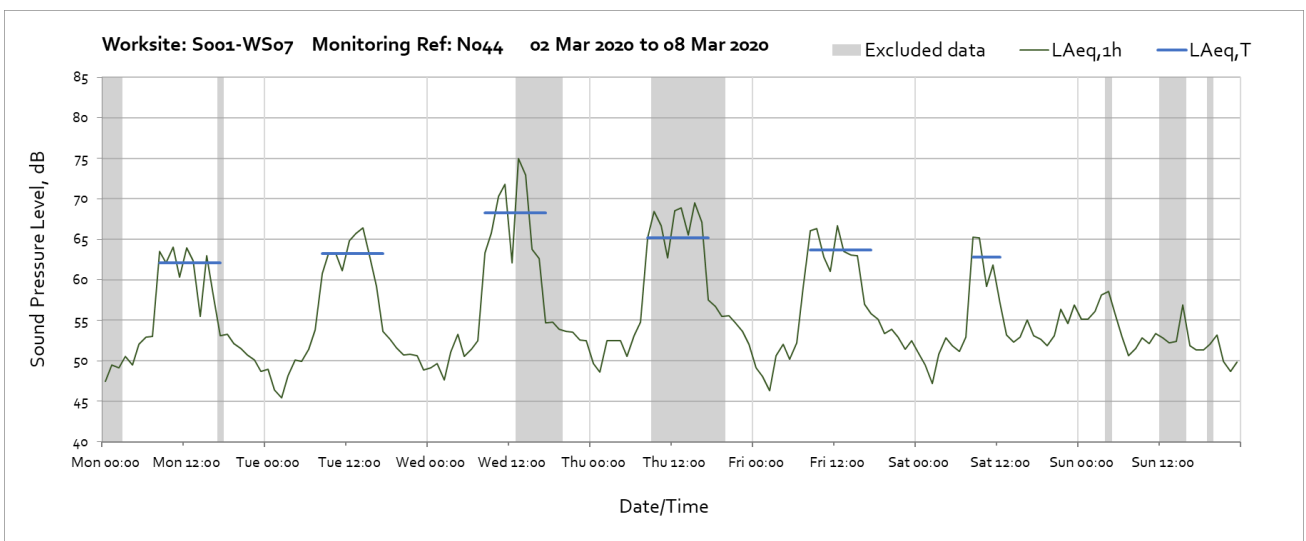
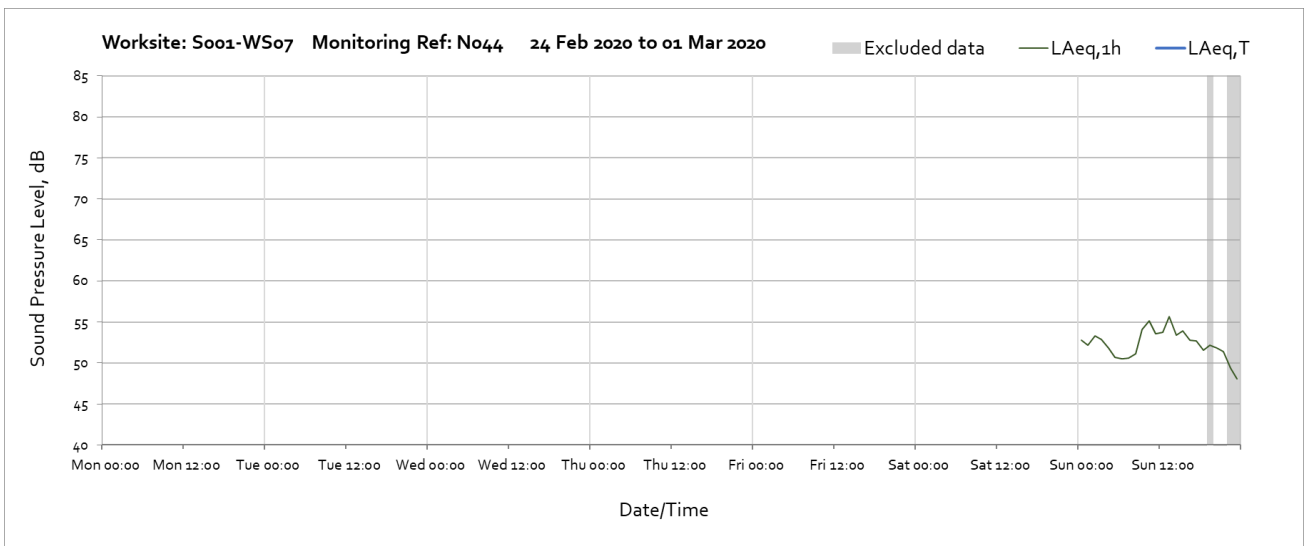


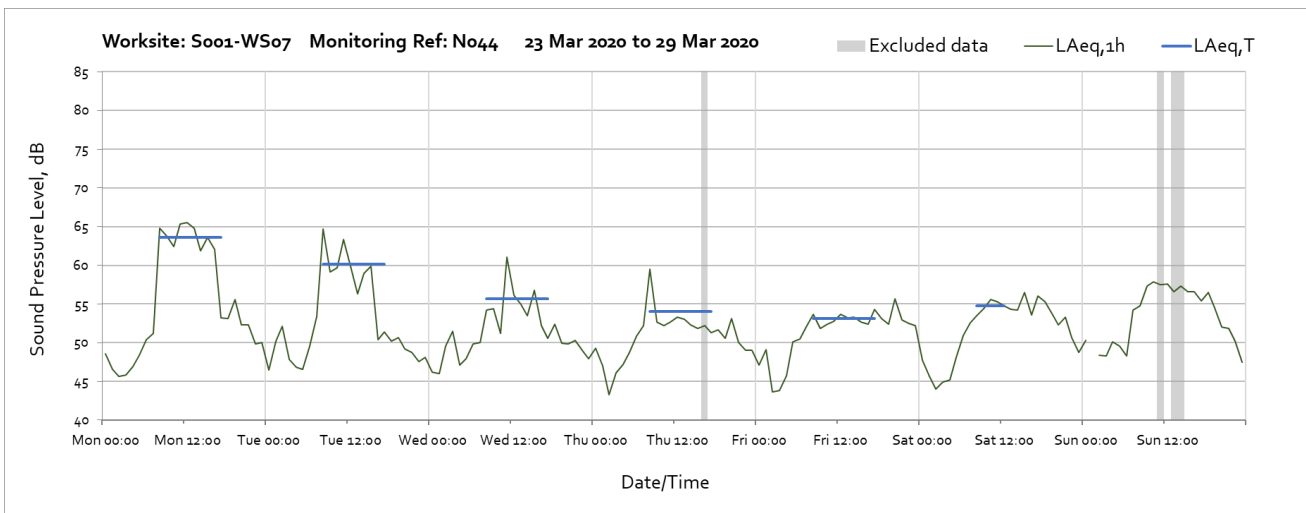
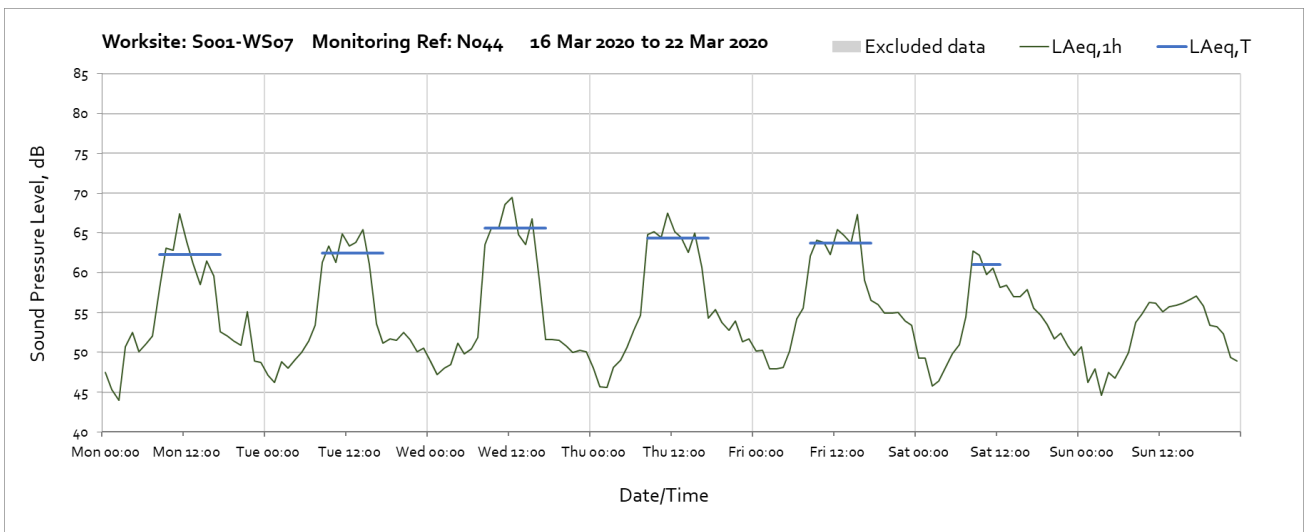
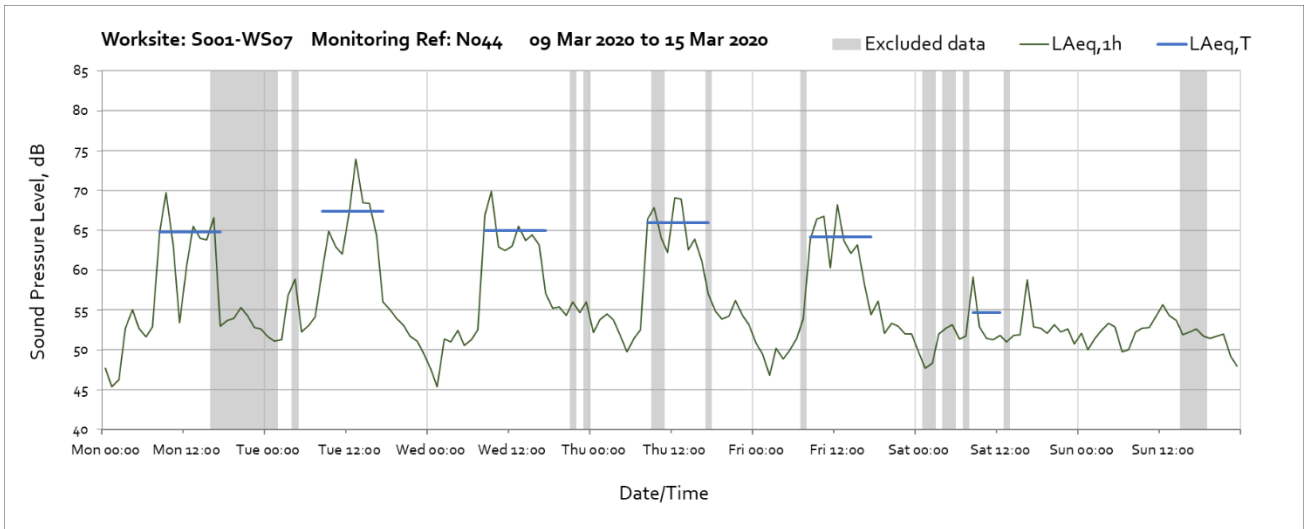


Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.

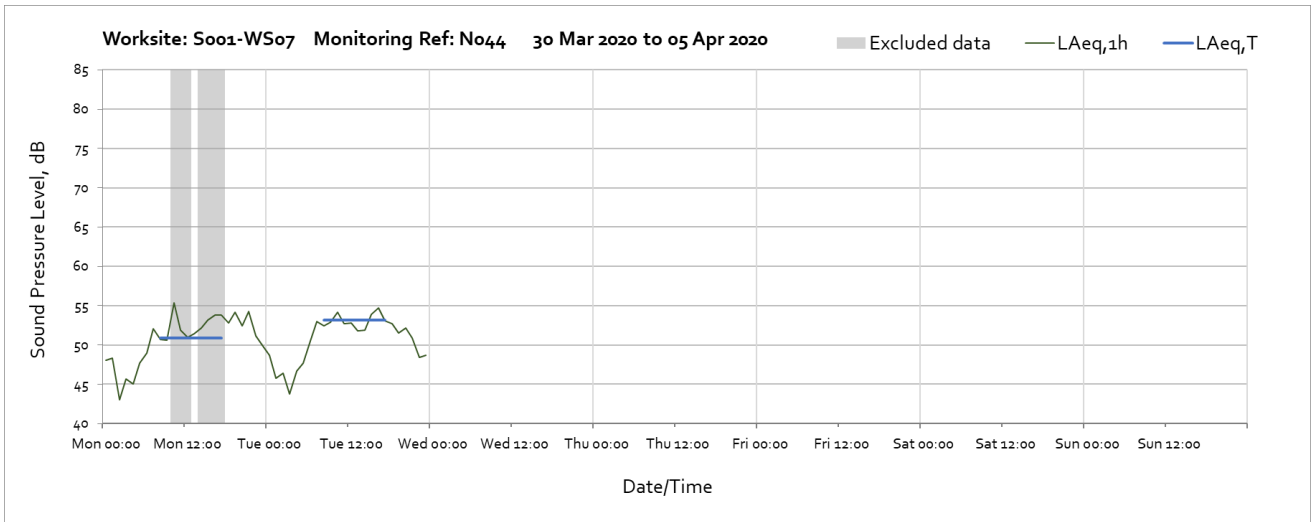


## Worksite: S001-WS07 – Monitoring Ref: N044

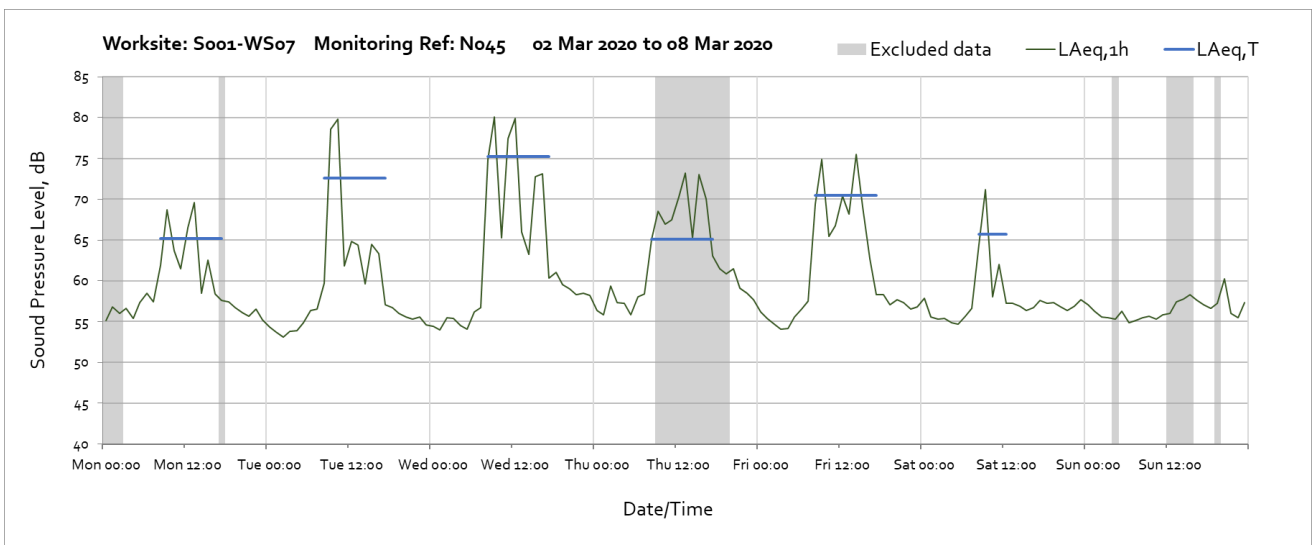
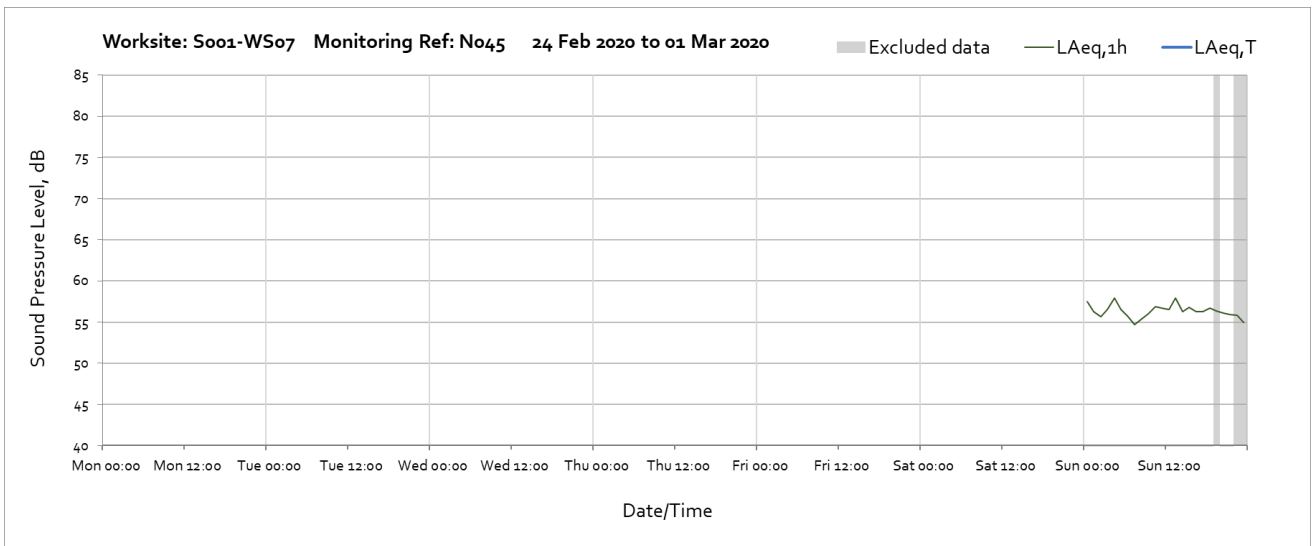


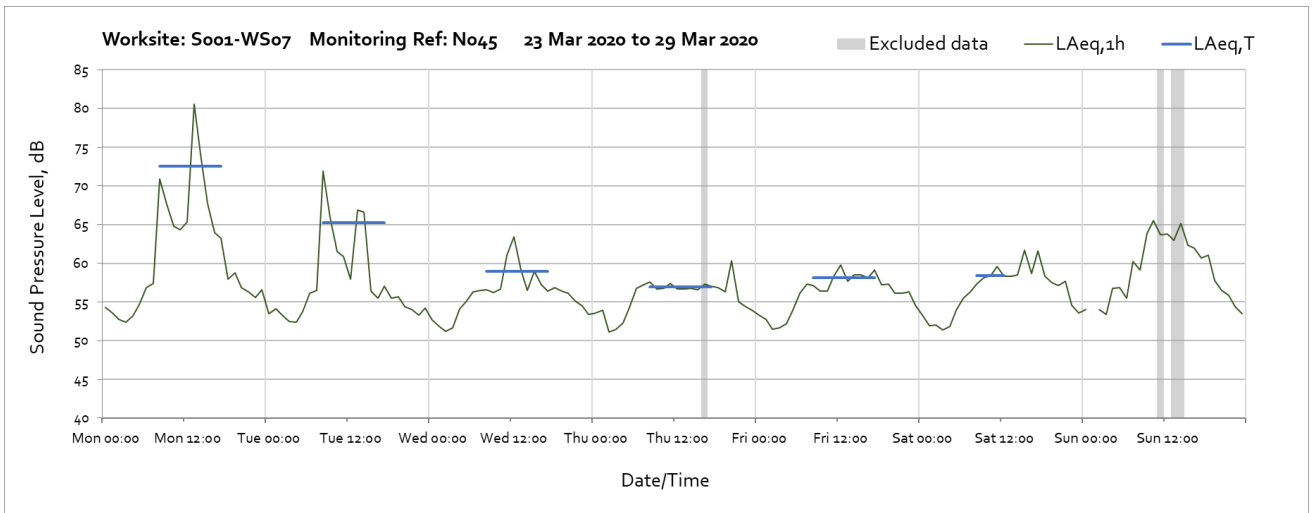
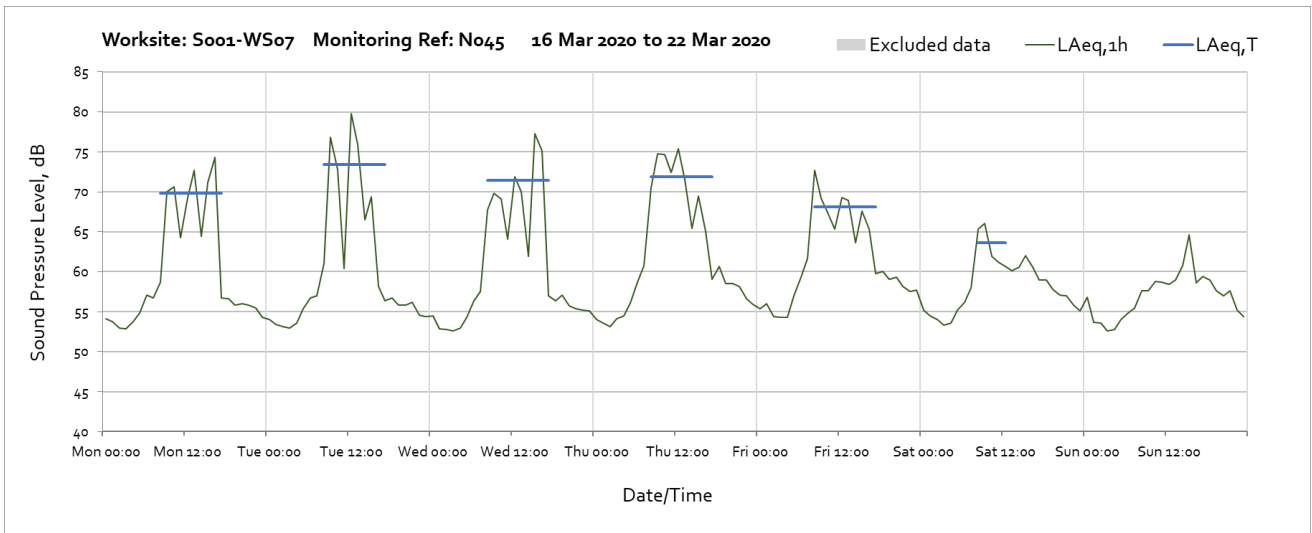
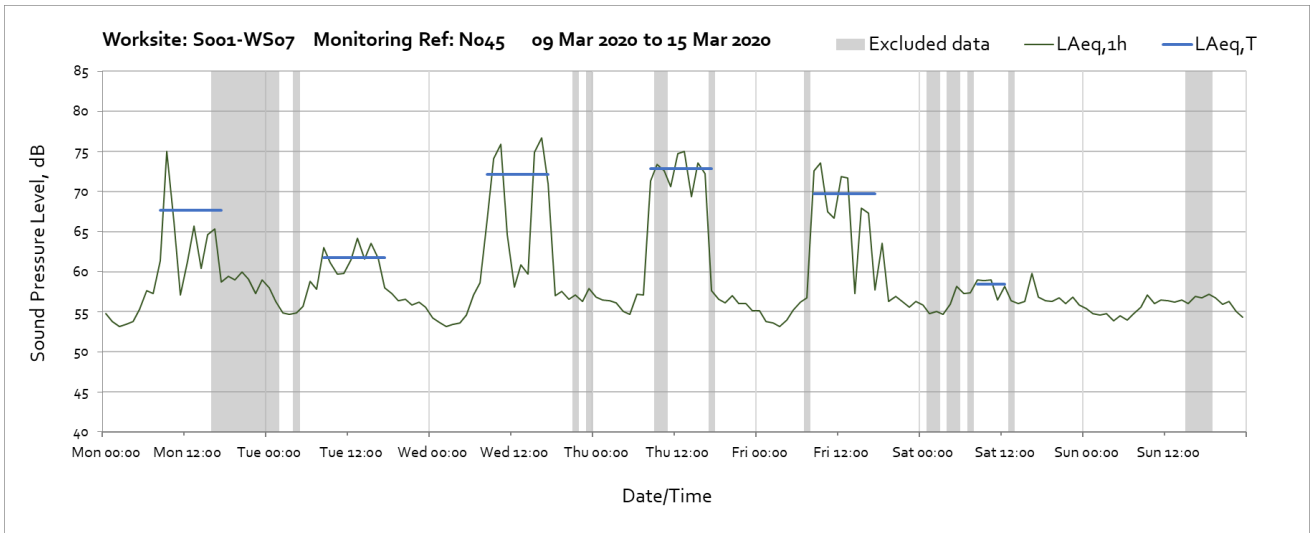


Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.

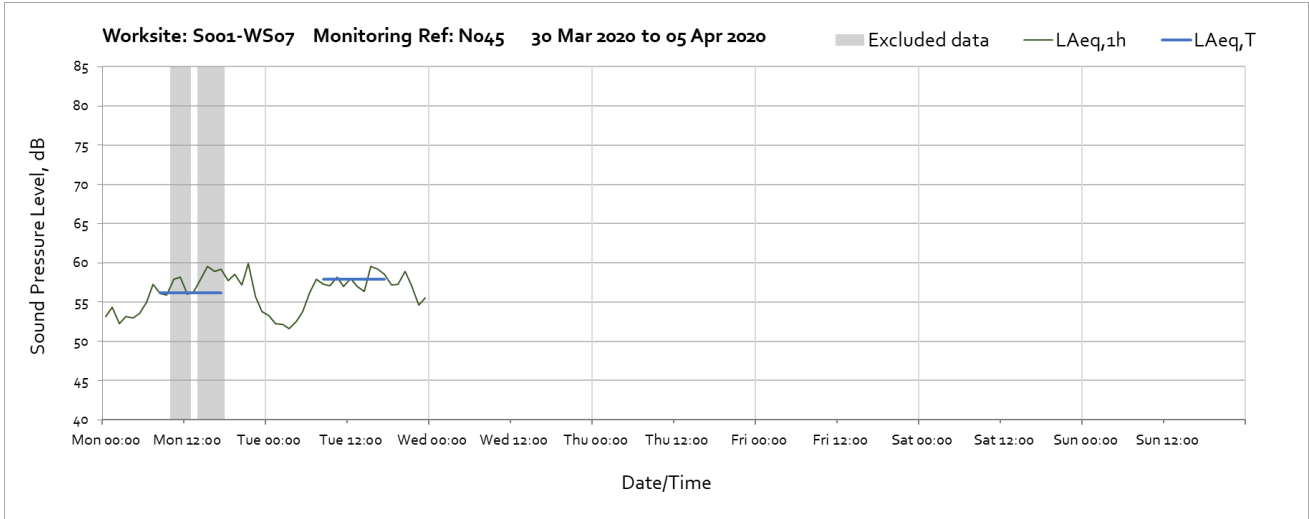


## Worksite: S001-WS07 – Monitoring Ref: N045

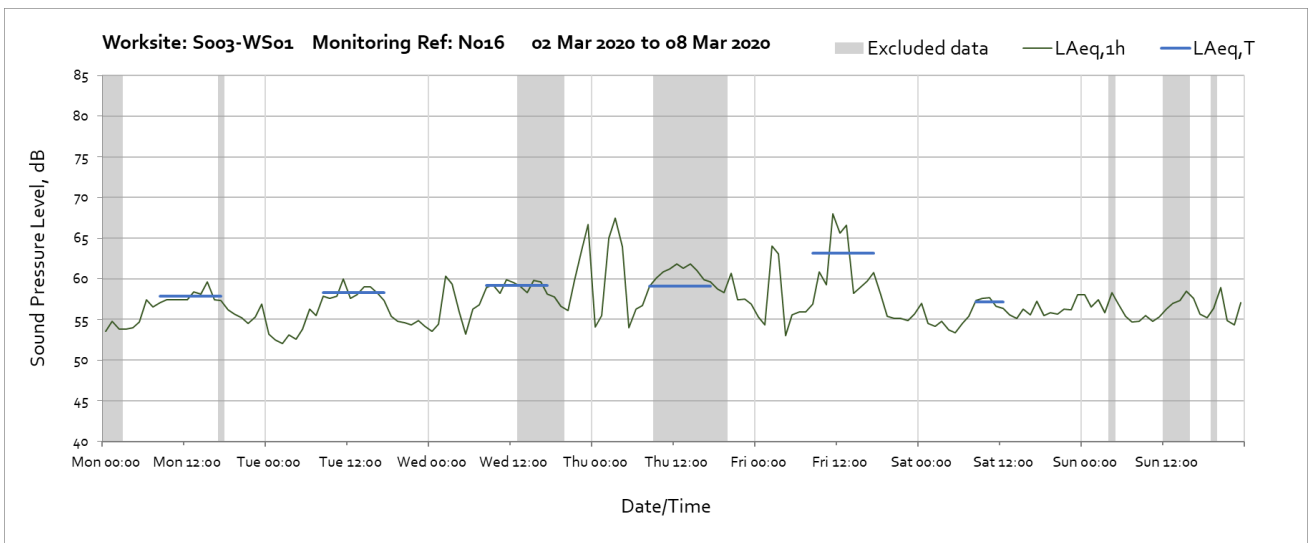
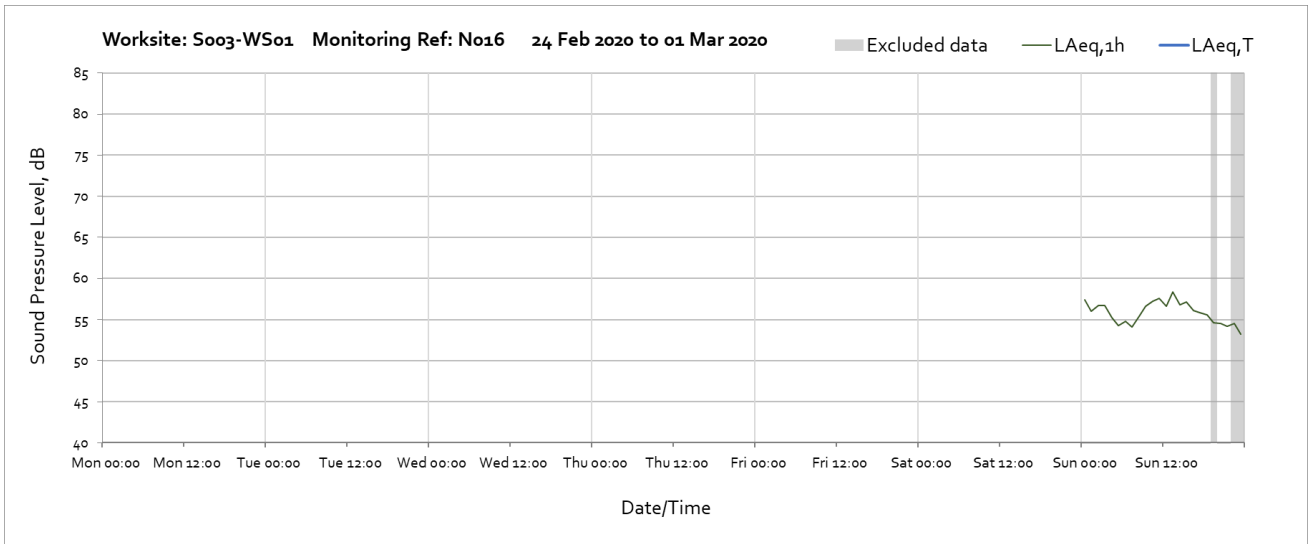


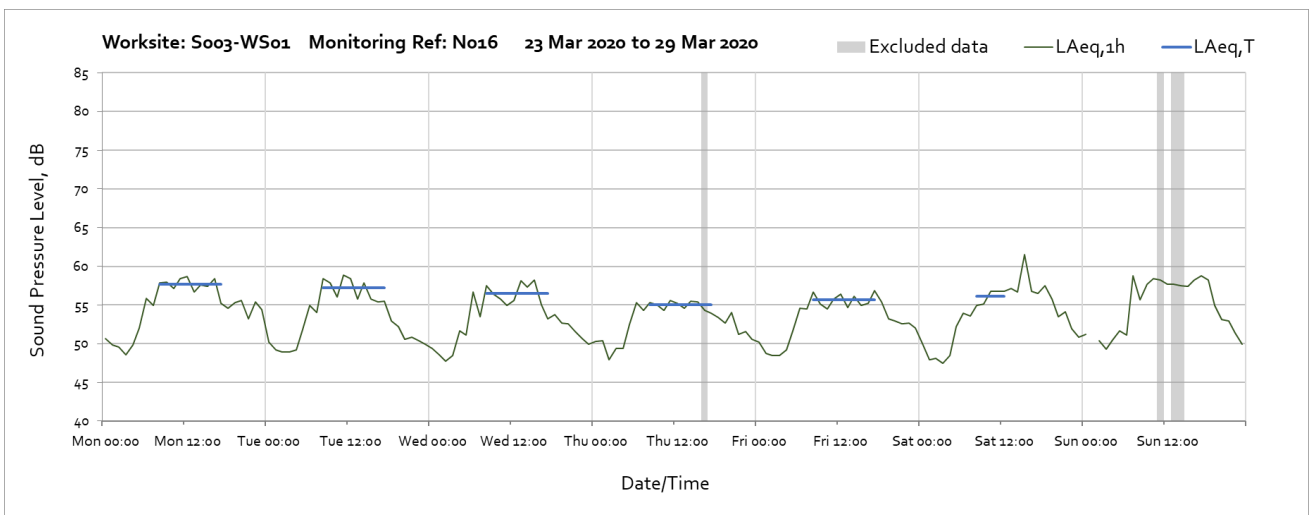
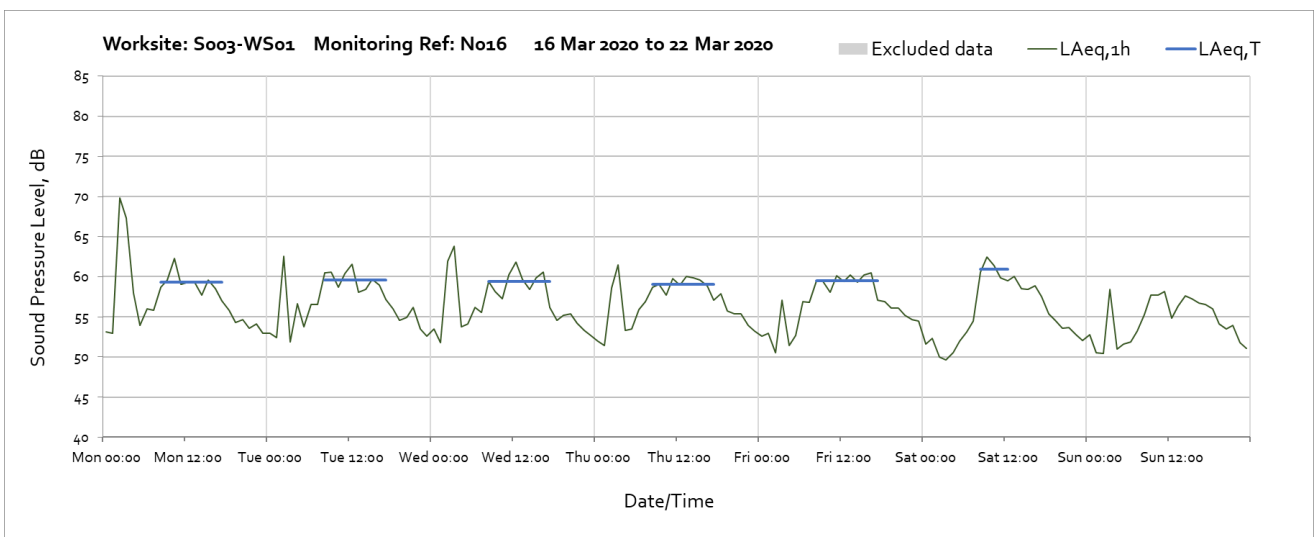
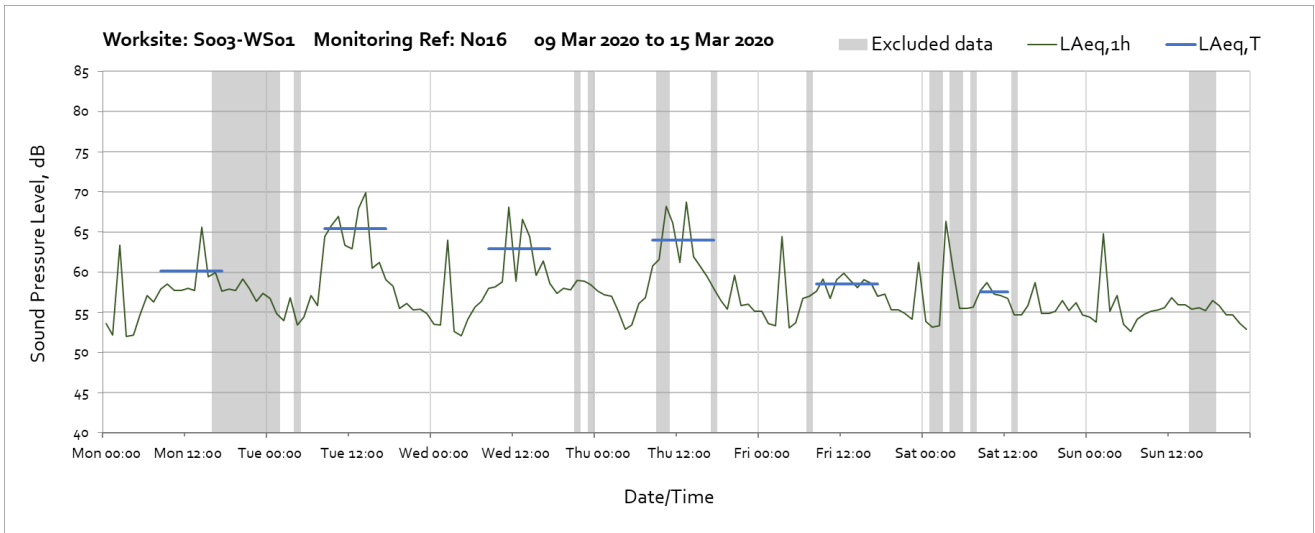


Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.



## Worksite: S003-WS01 – Monitoring Ref: N016

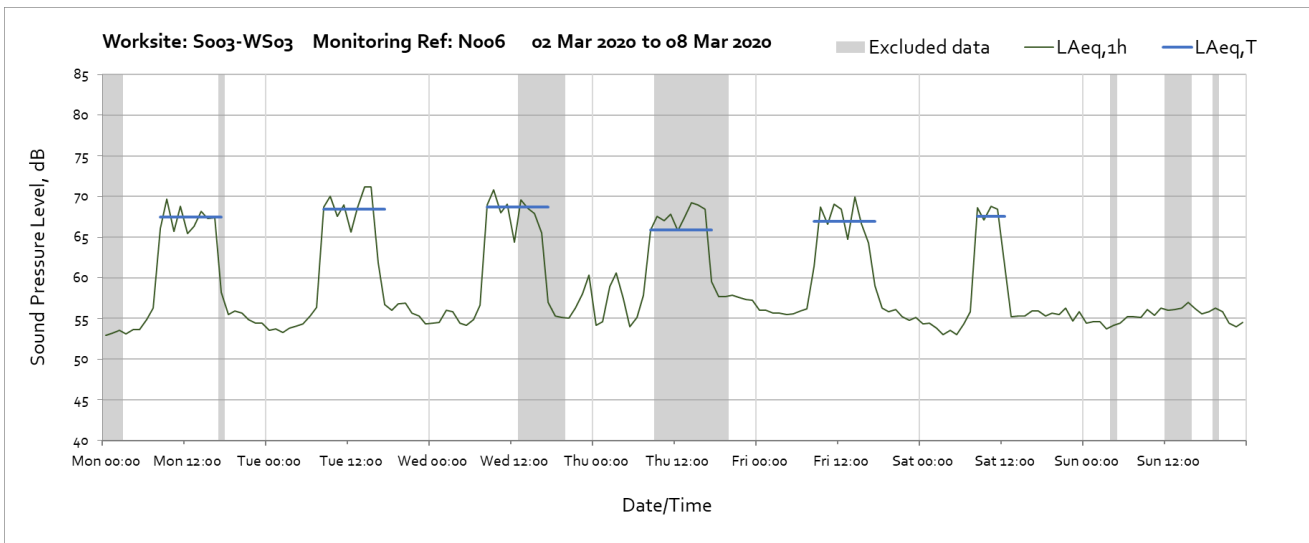
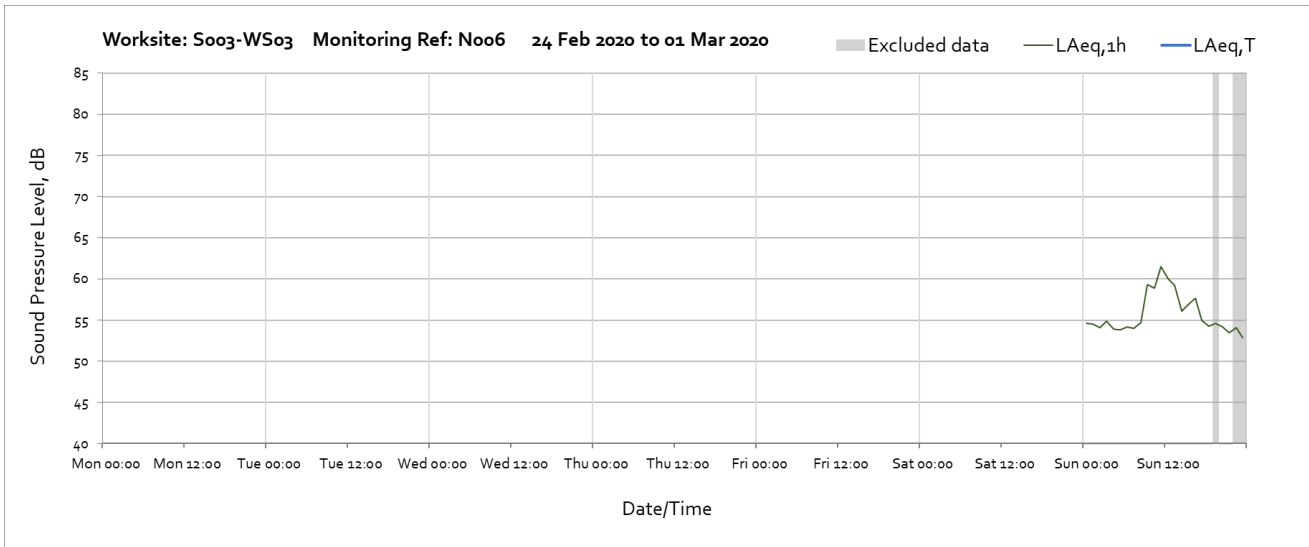




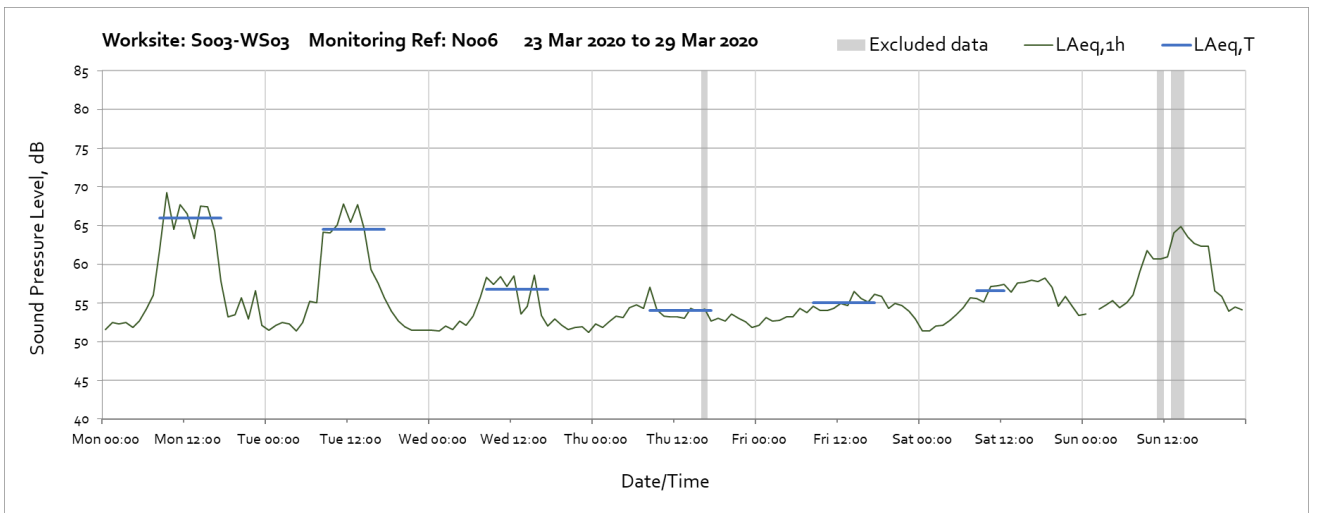
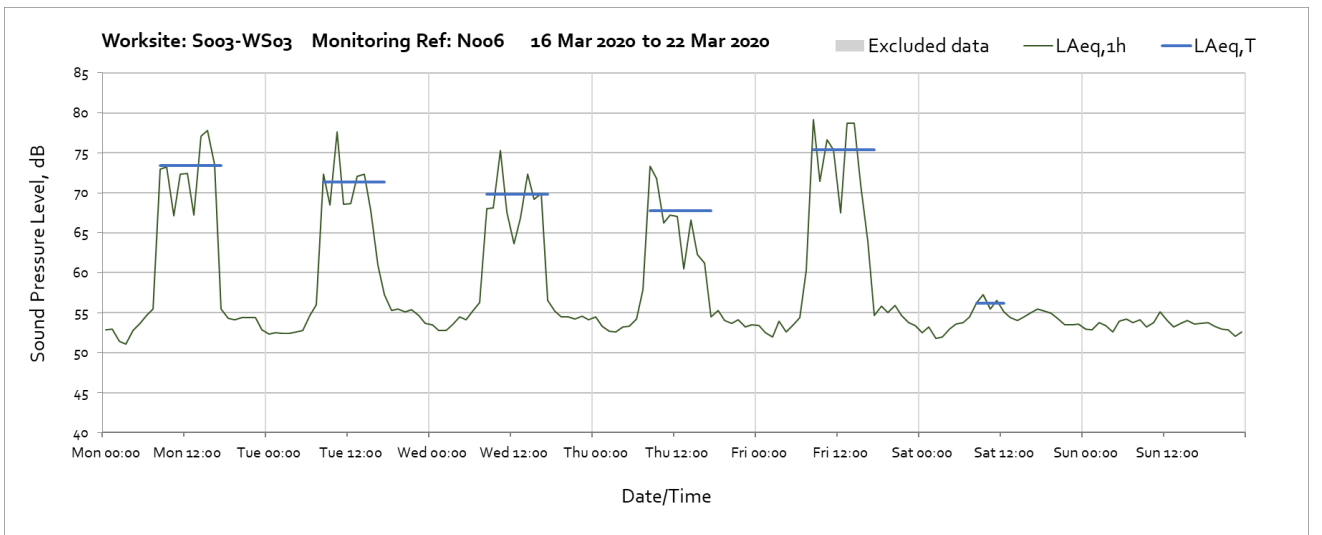
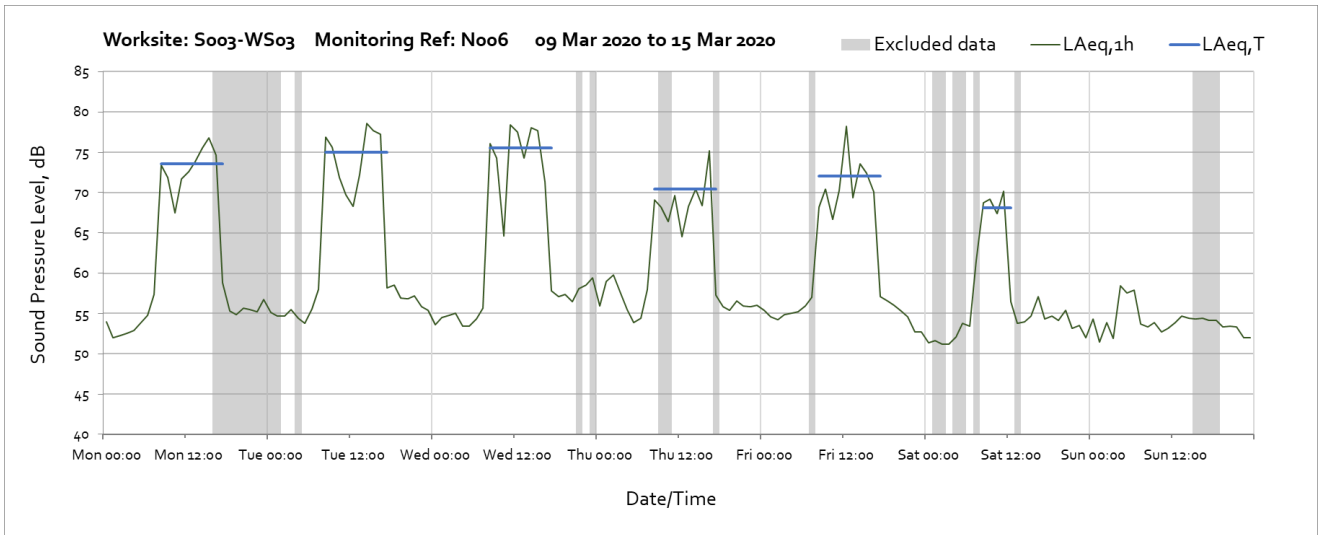
Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.



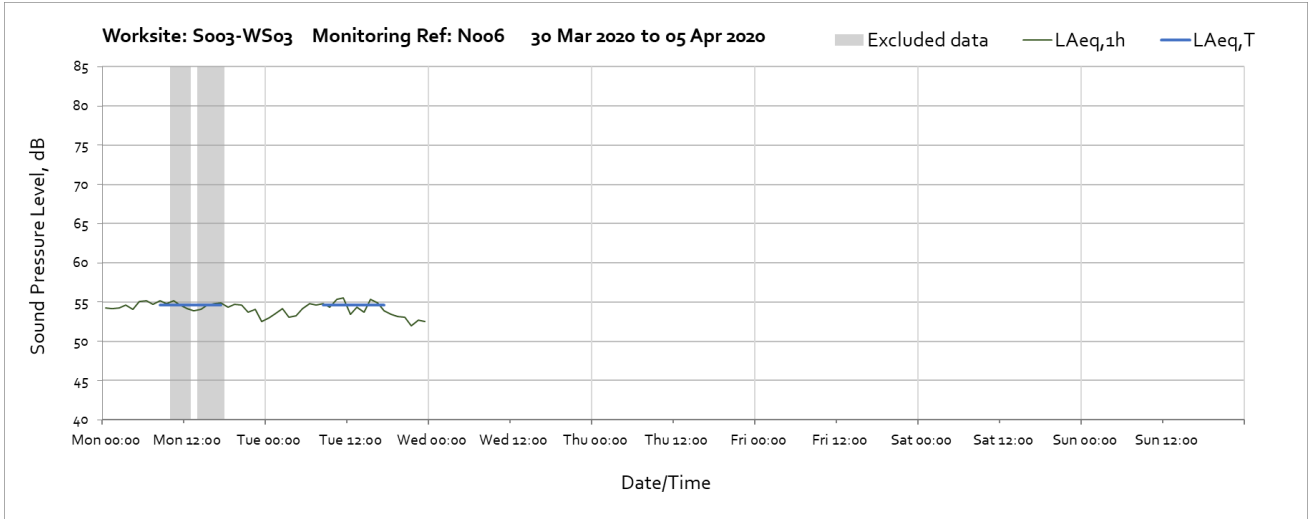
## Worksite: S003-WS03 – Monitoring Ref: N006



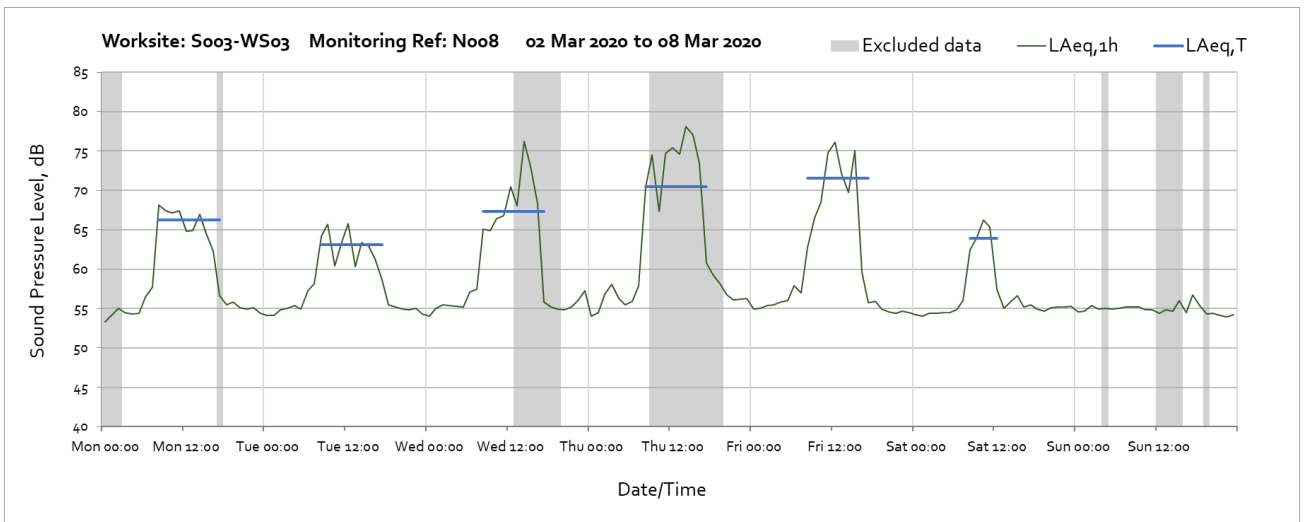
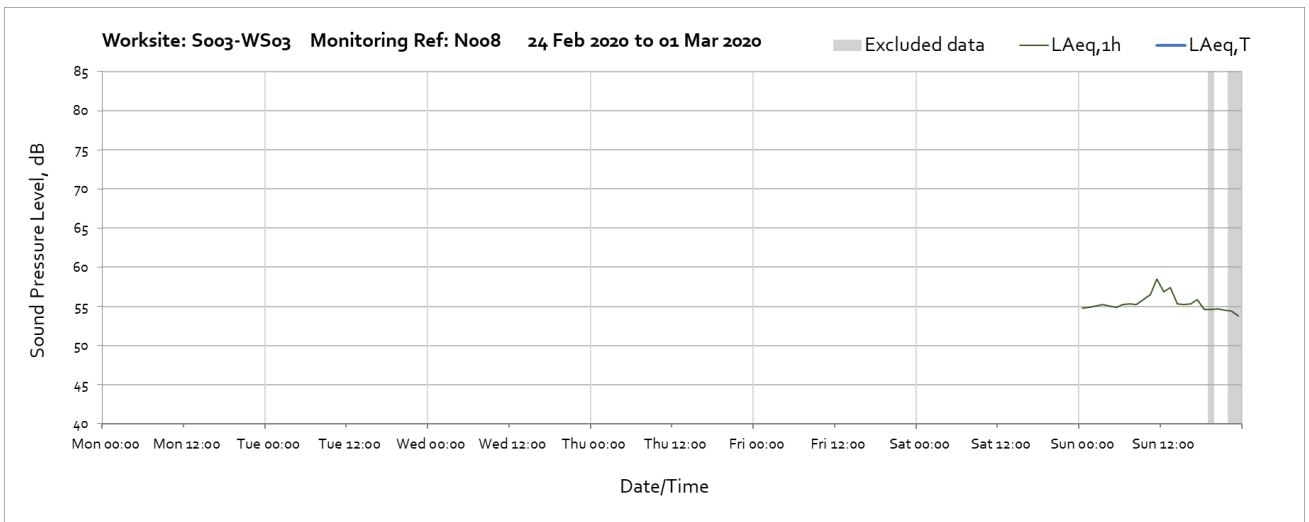


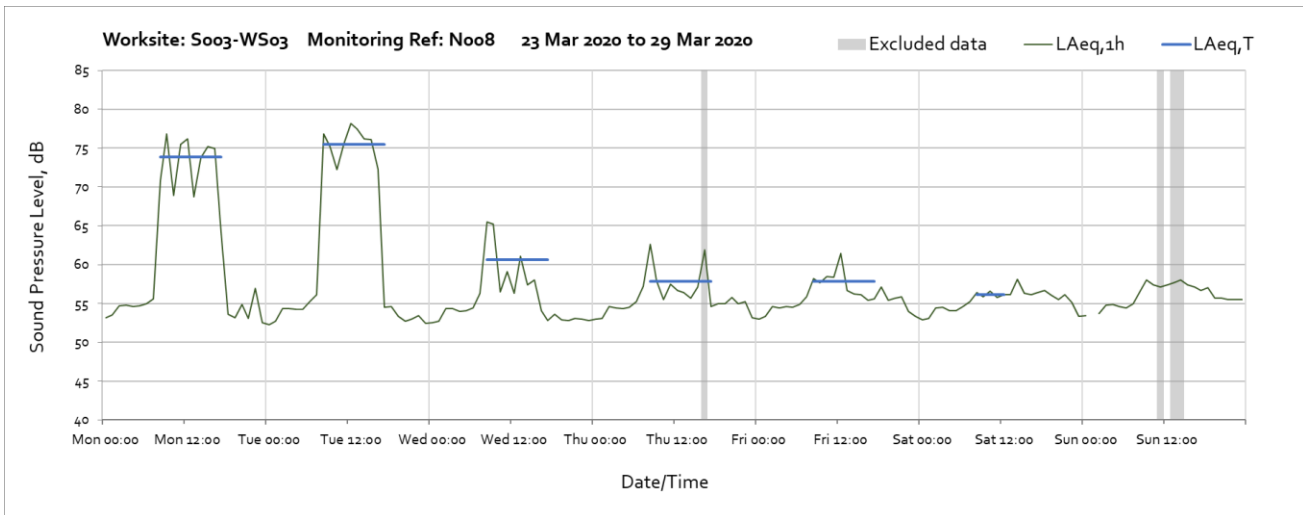
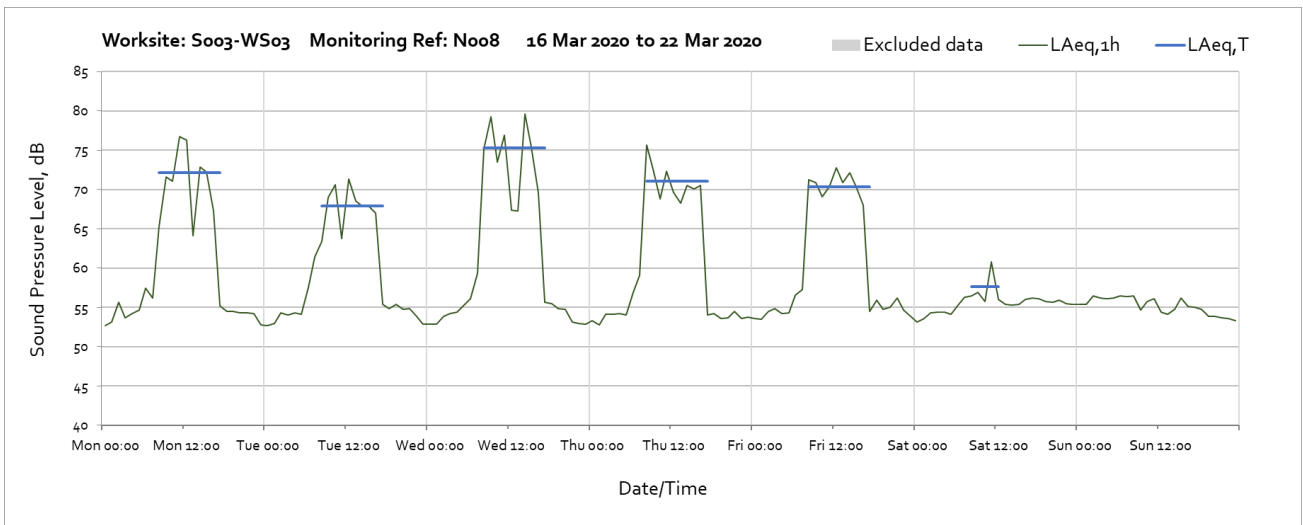
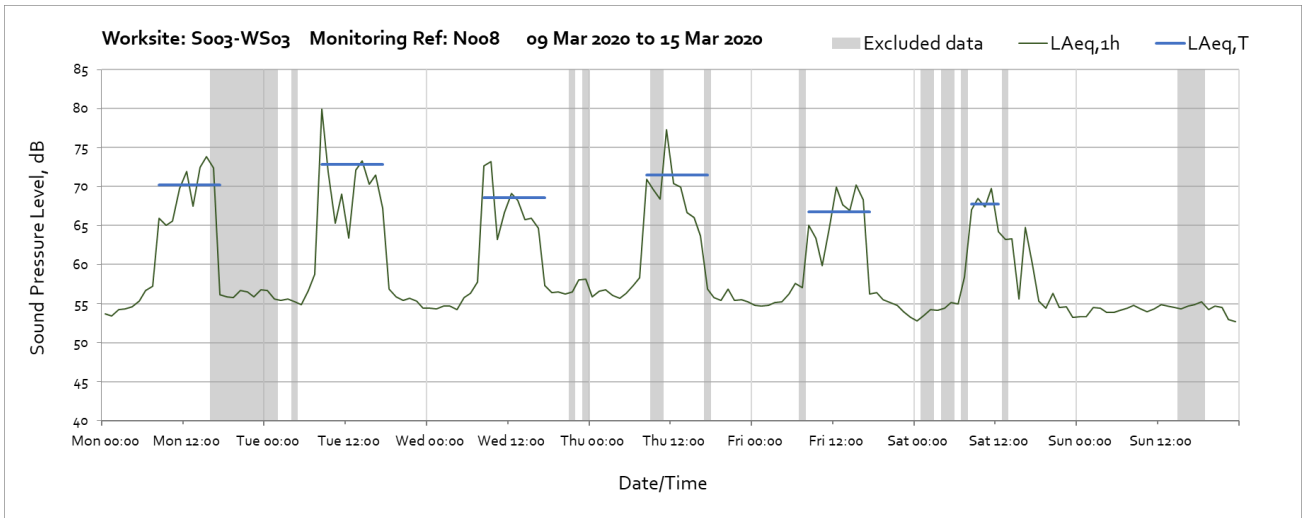


Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.

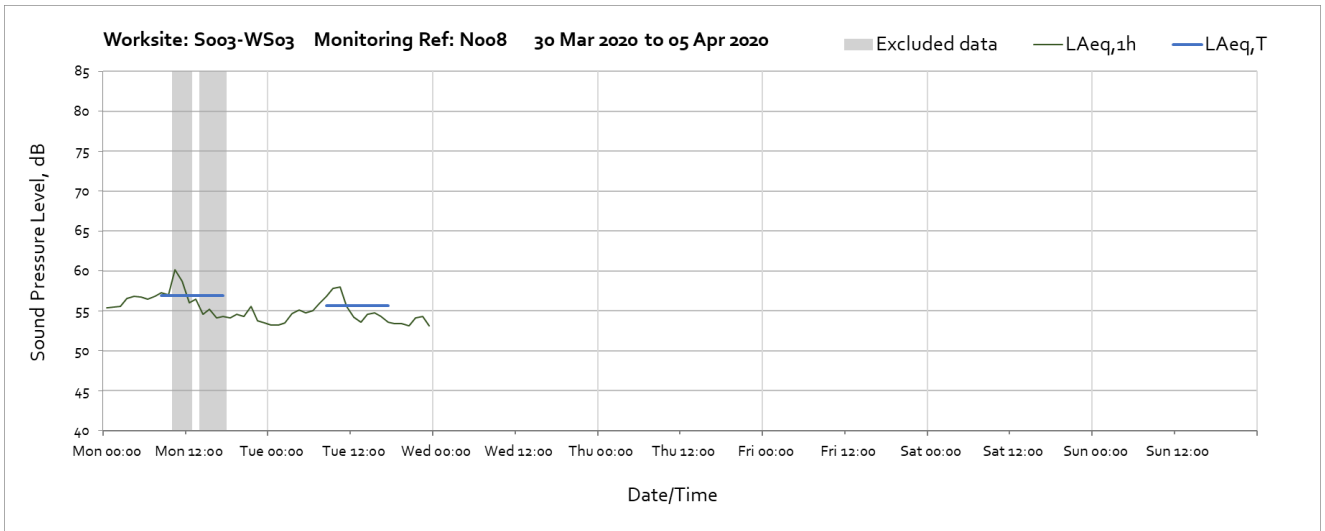


## Worksite: S003-WS03 – Monitoring Ref: N008

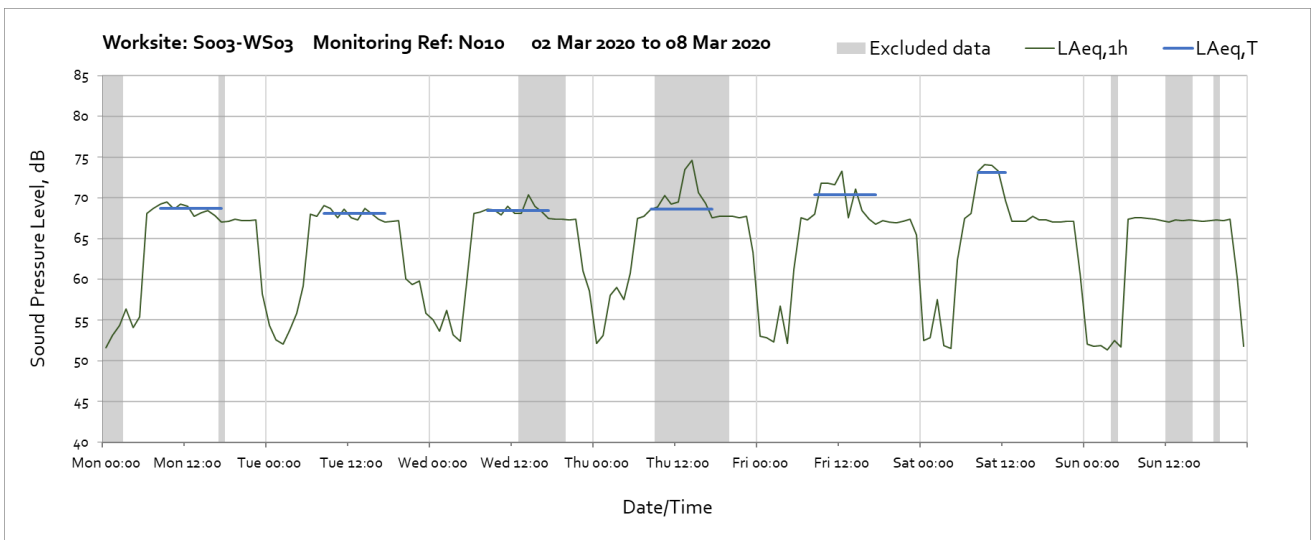
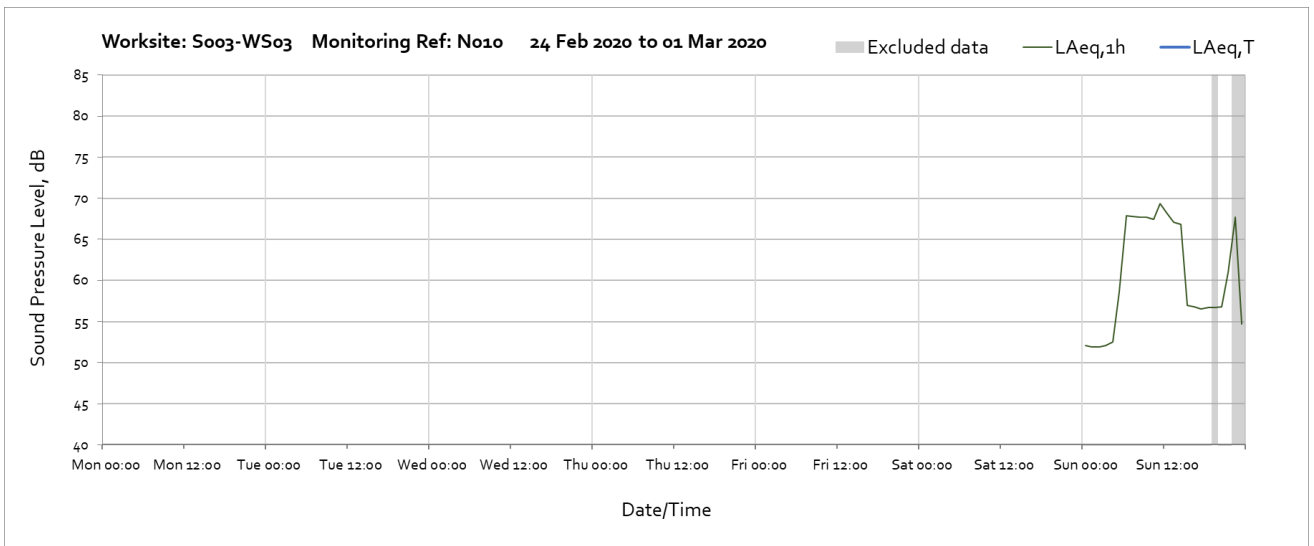


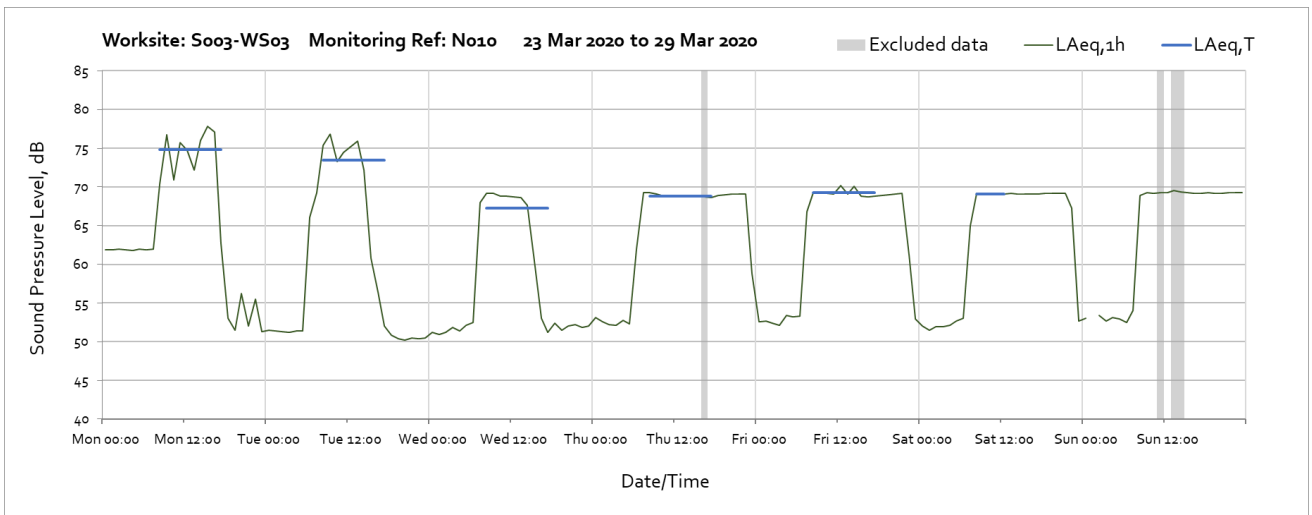
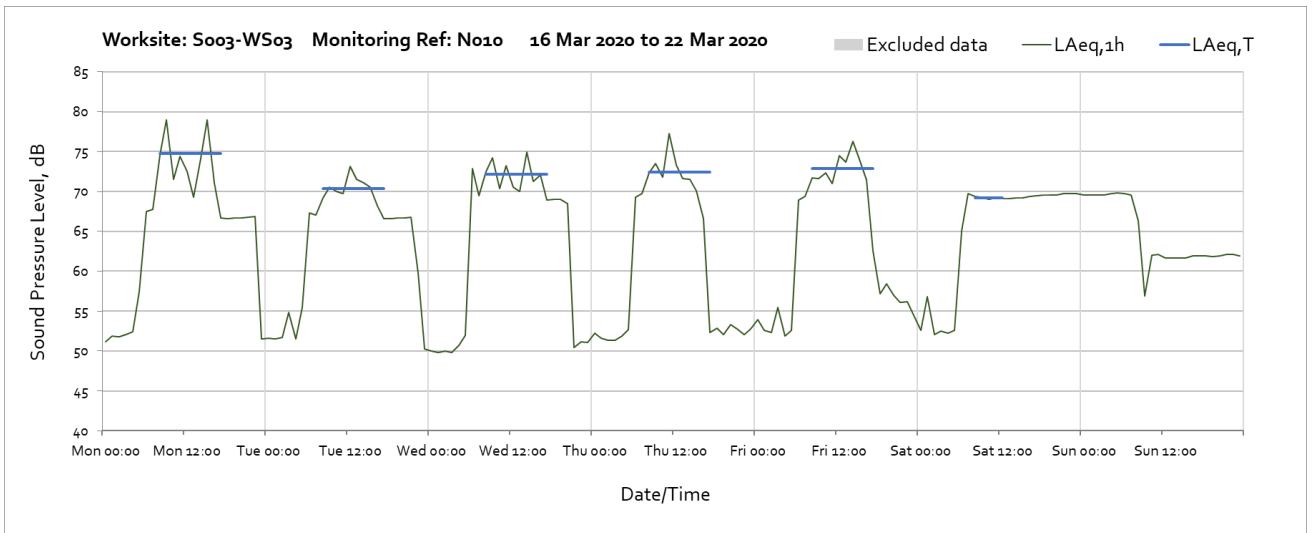
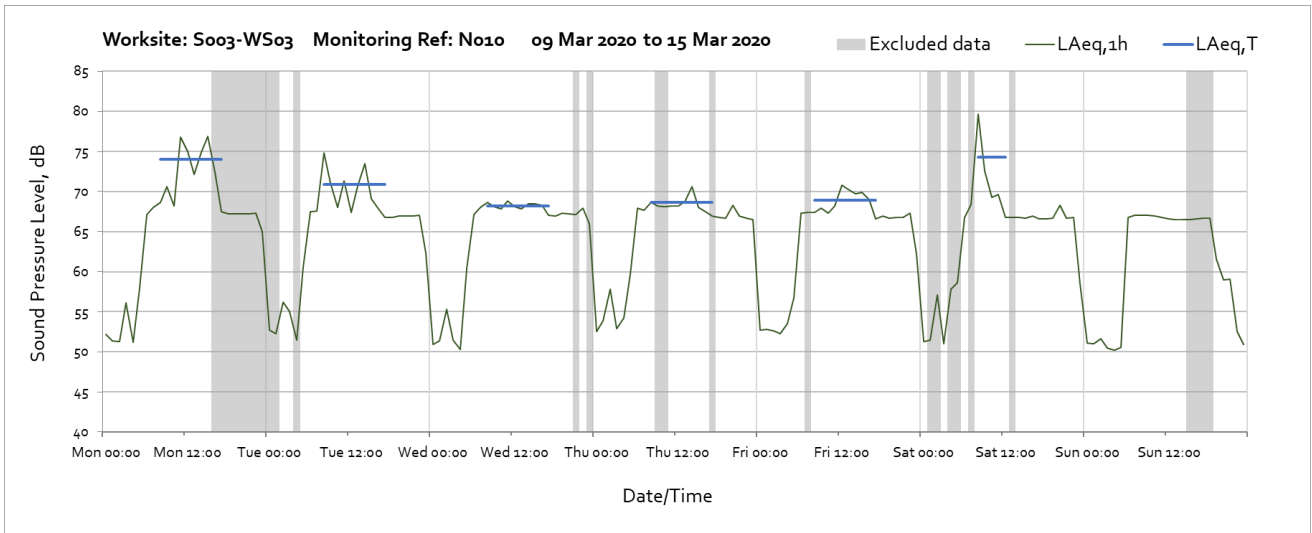


Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.

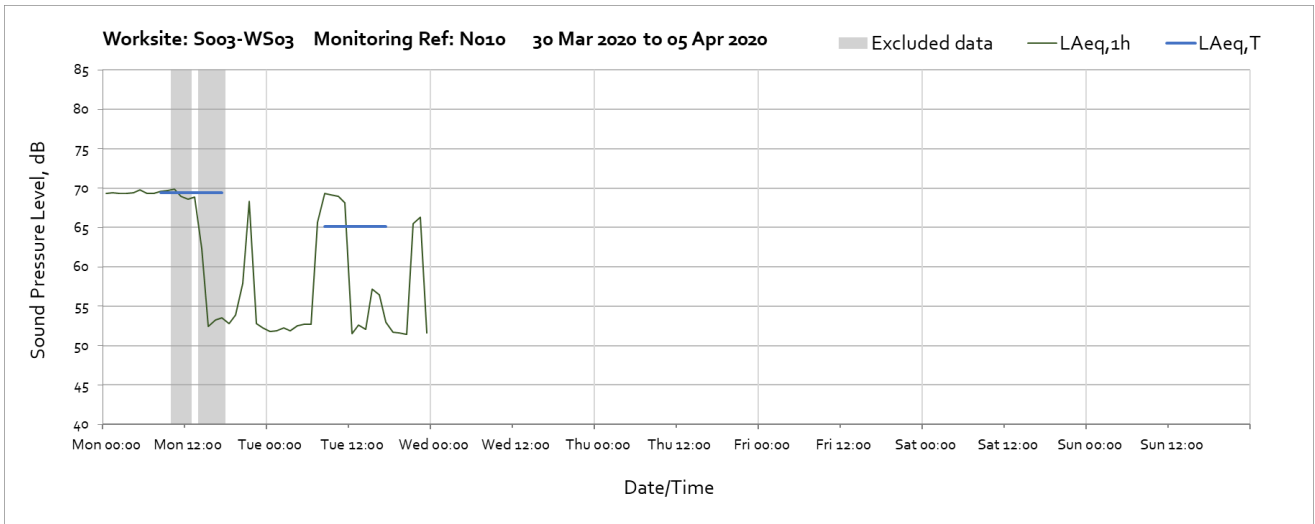


## Worksite: S003-WS03 – Monitoring Ref: N010

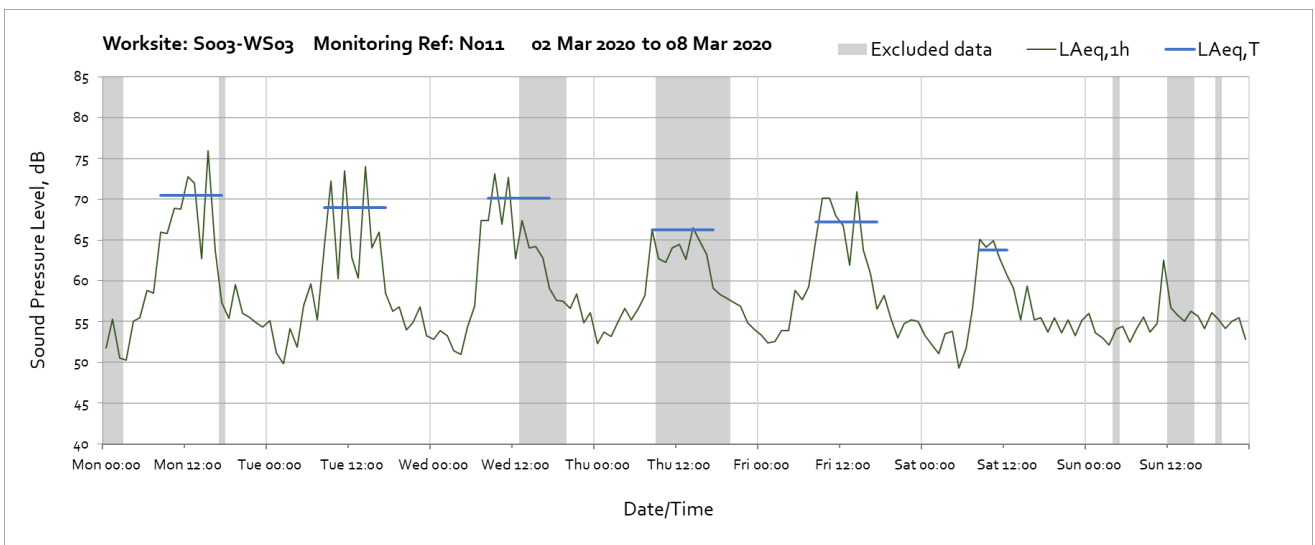
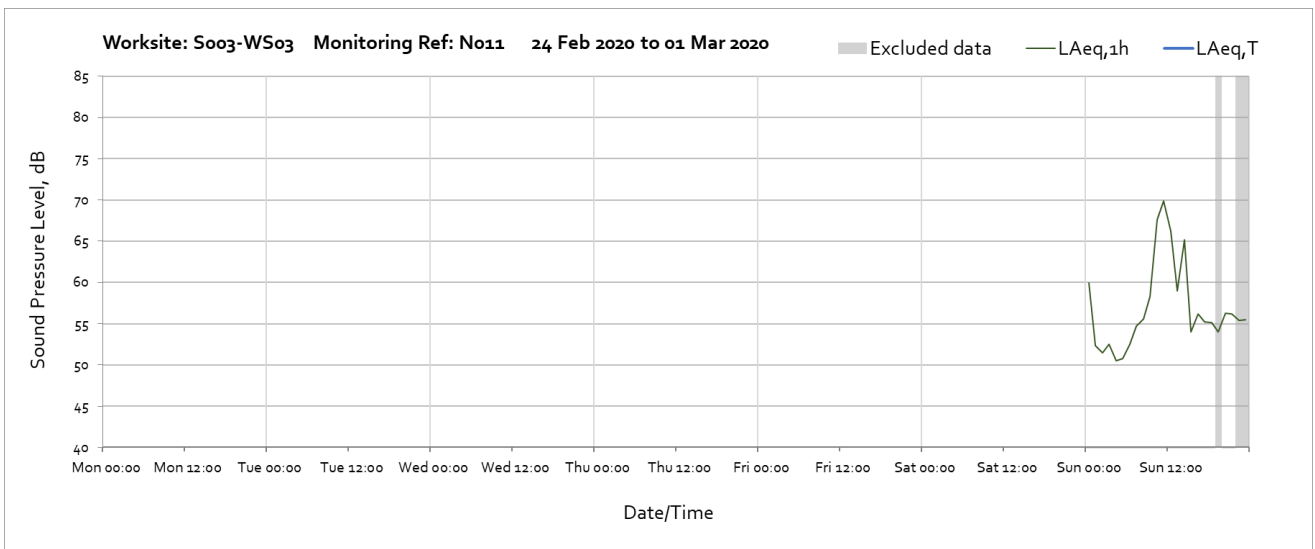


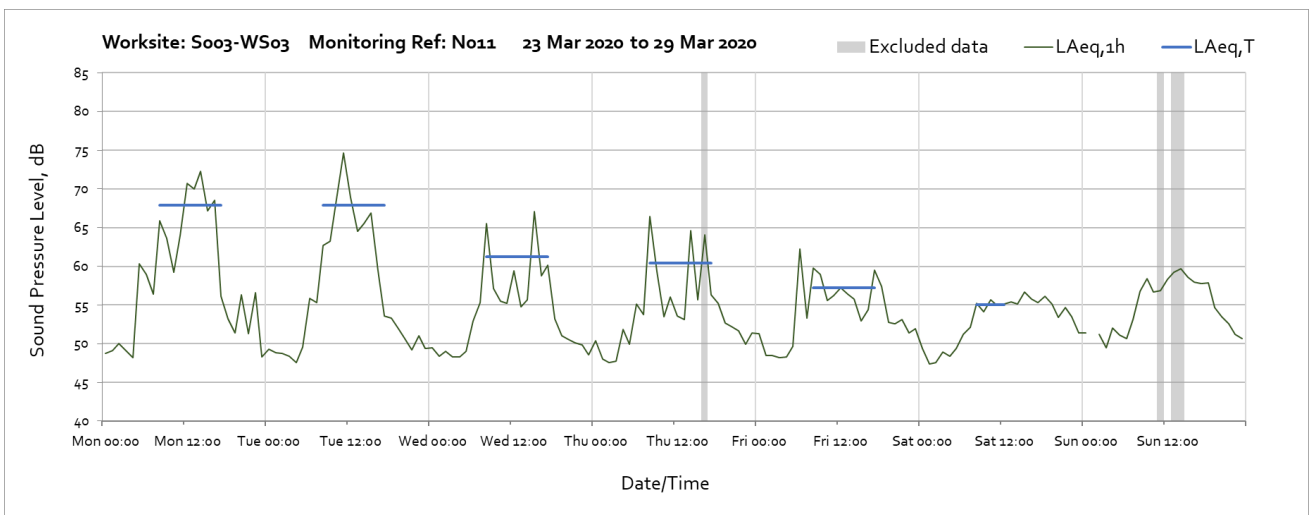
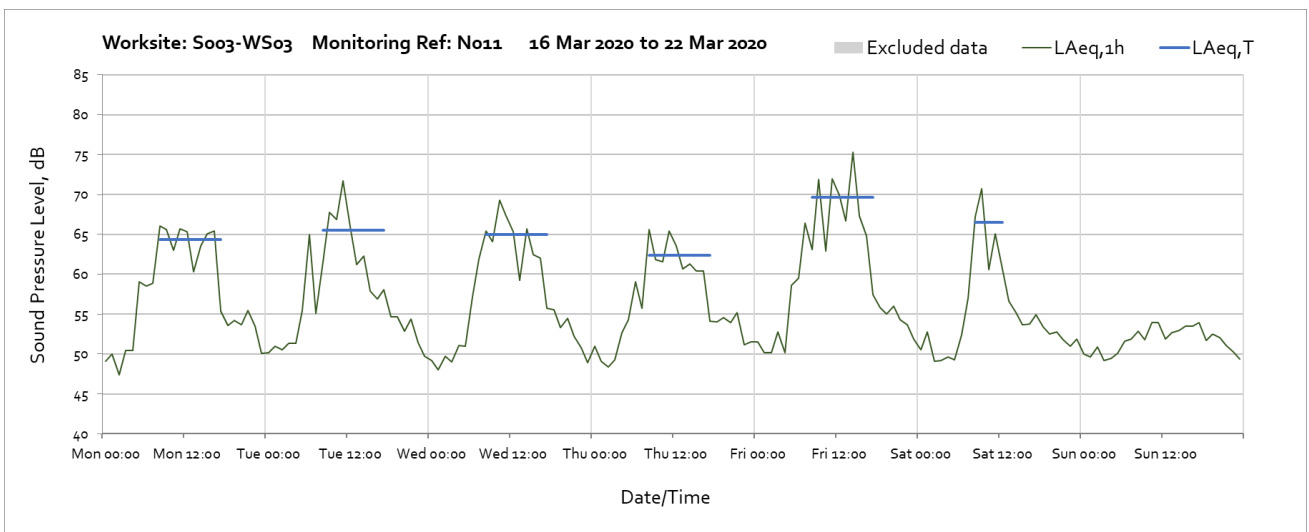
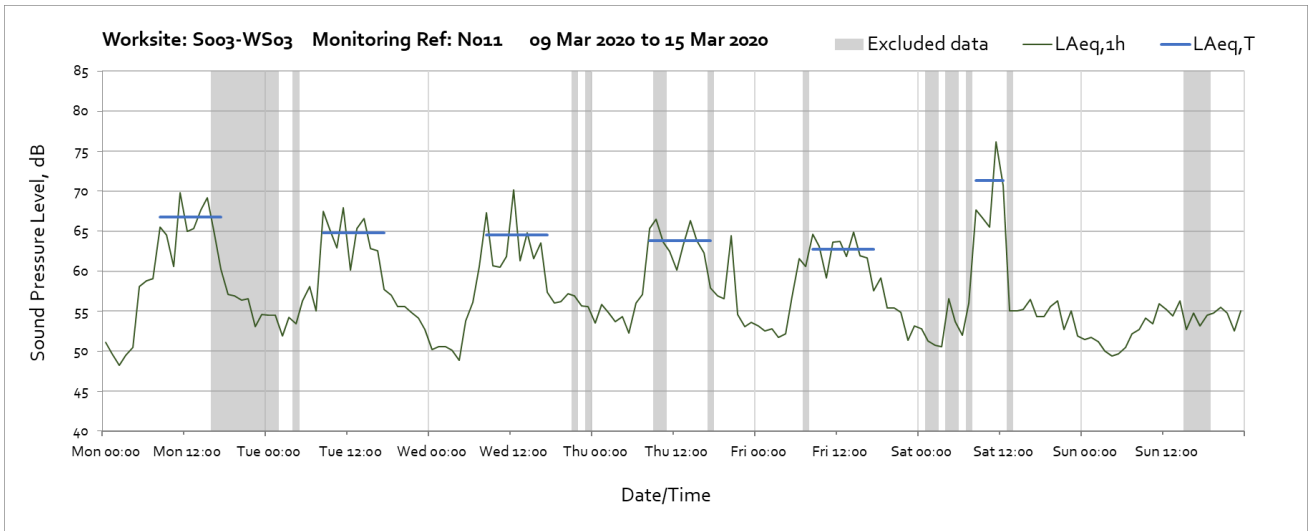


Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.

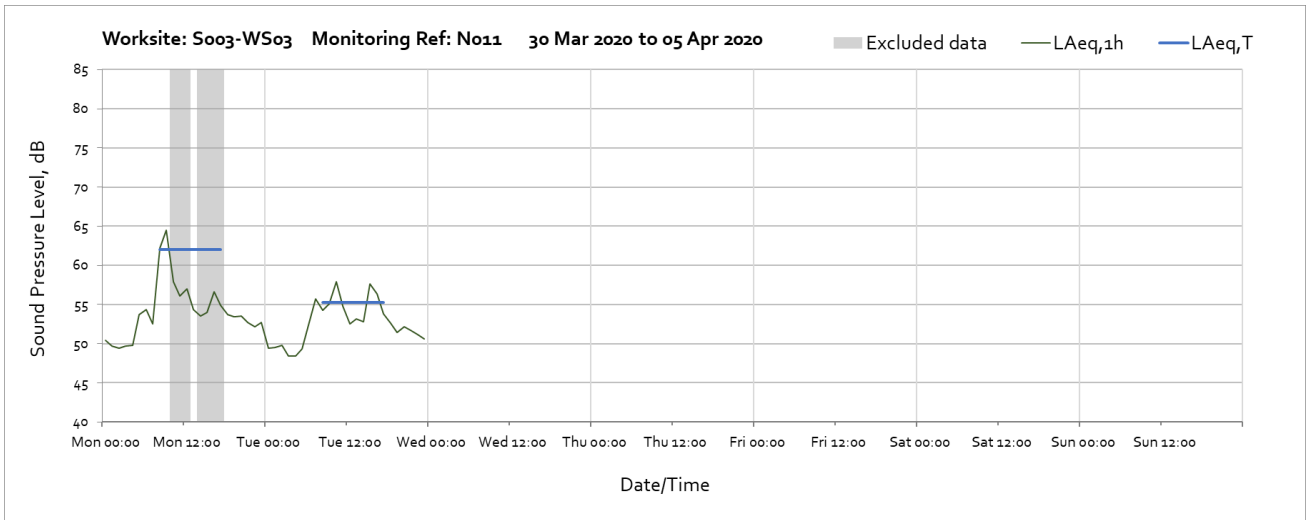


## Worksite: S003-WS03 – Monitoring Ref: N011

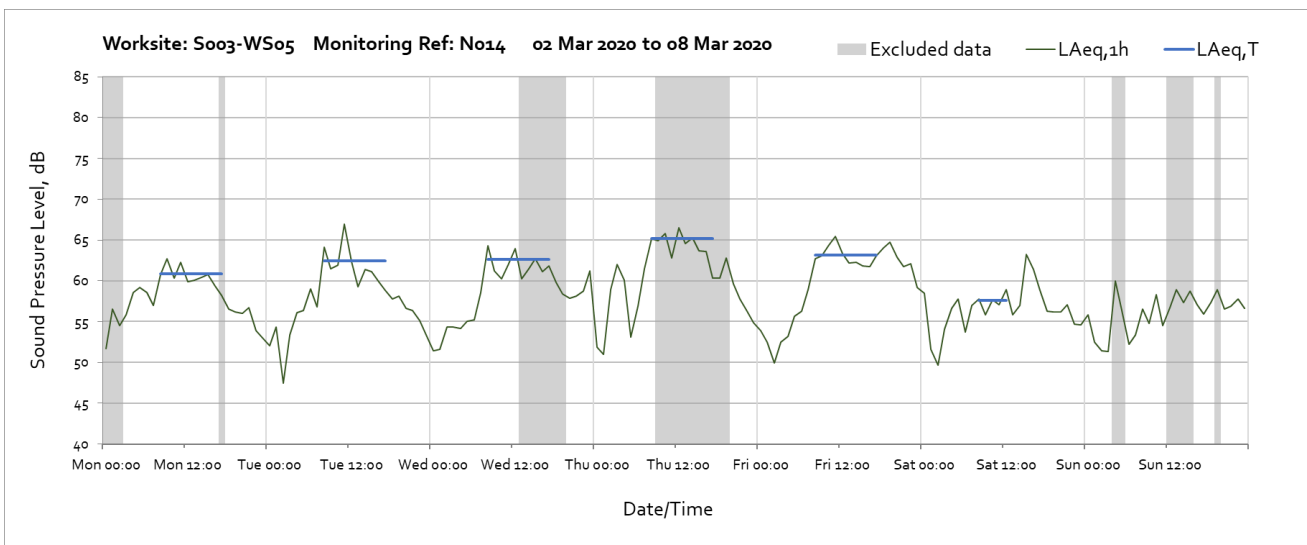
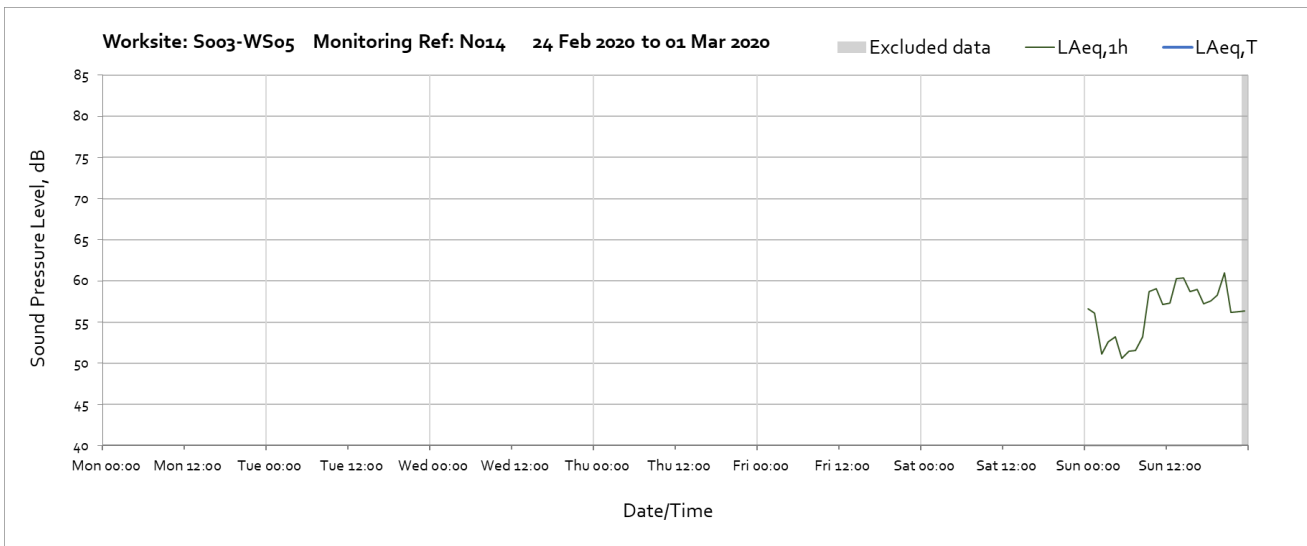




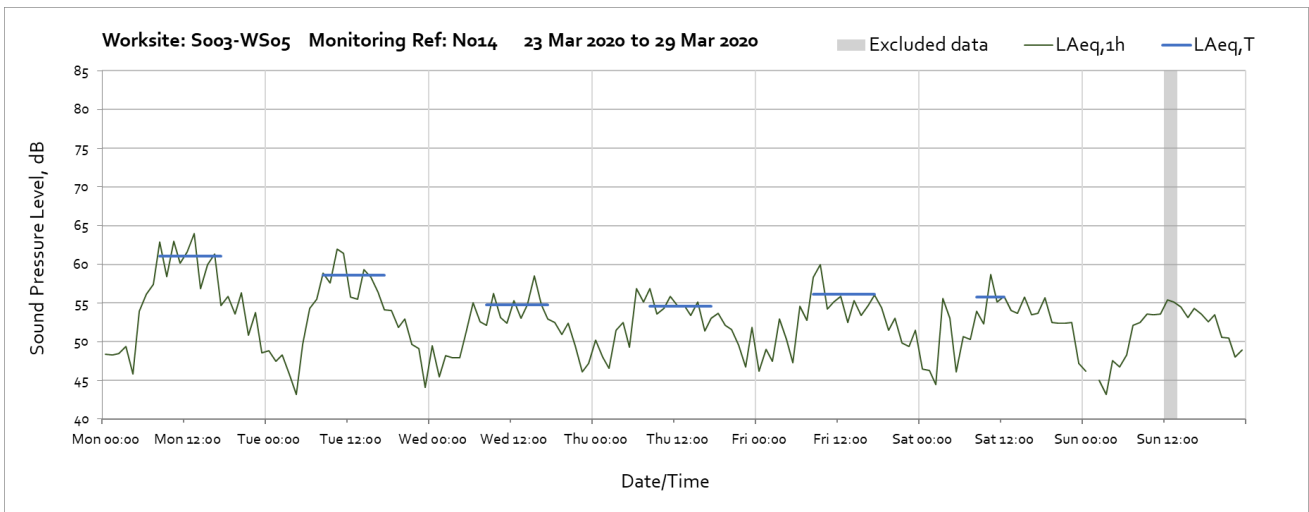
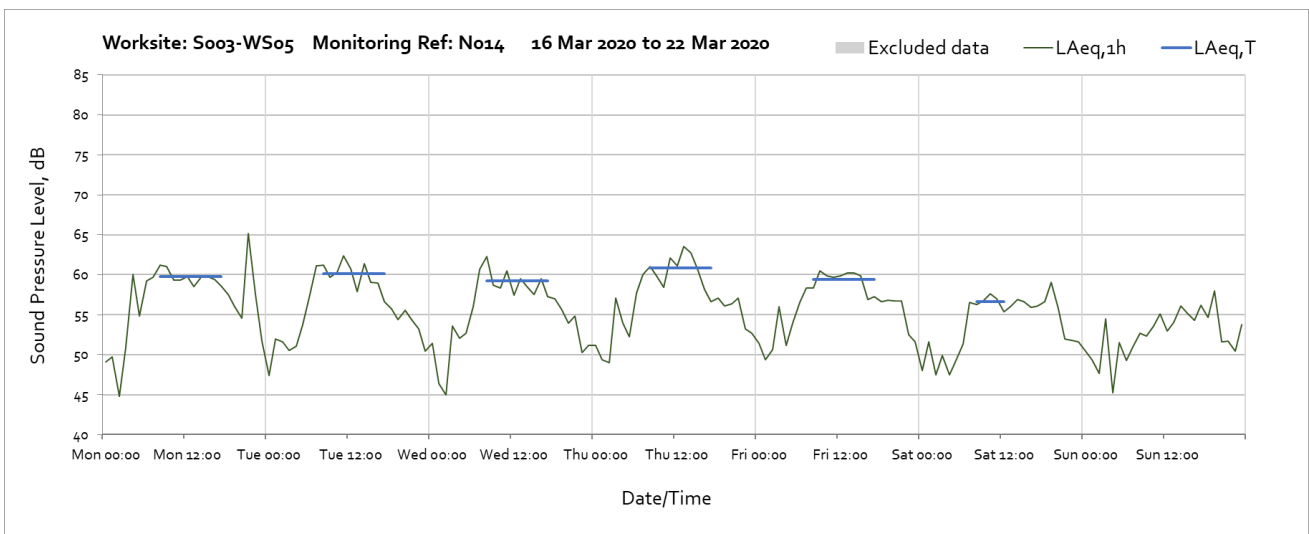
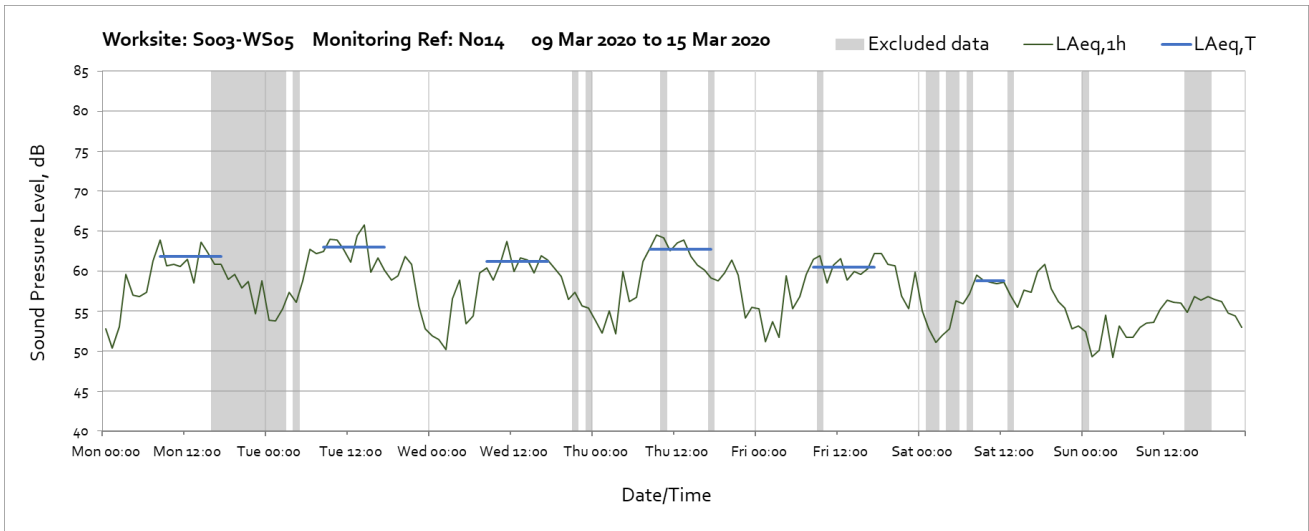
Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.



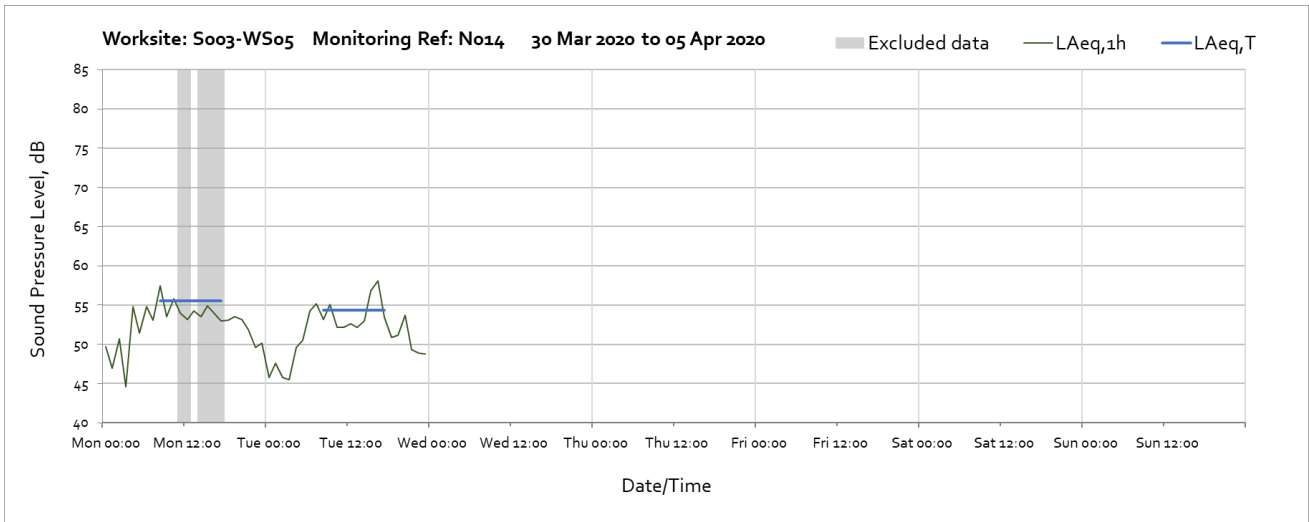
## Worksite: S003-WS05 – Monitoring Ref: N014



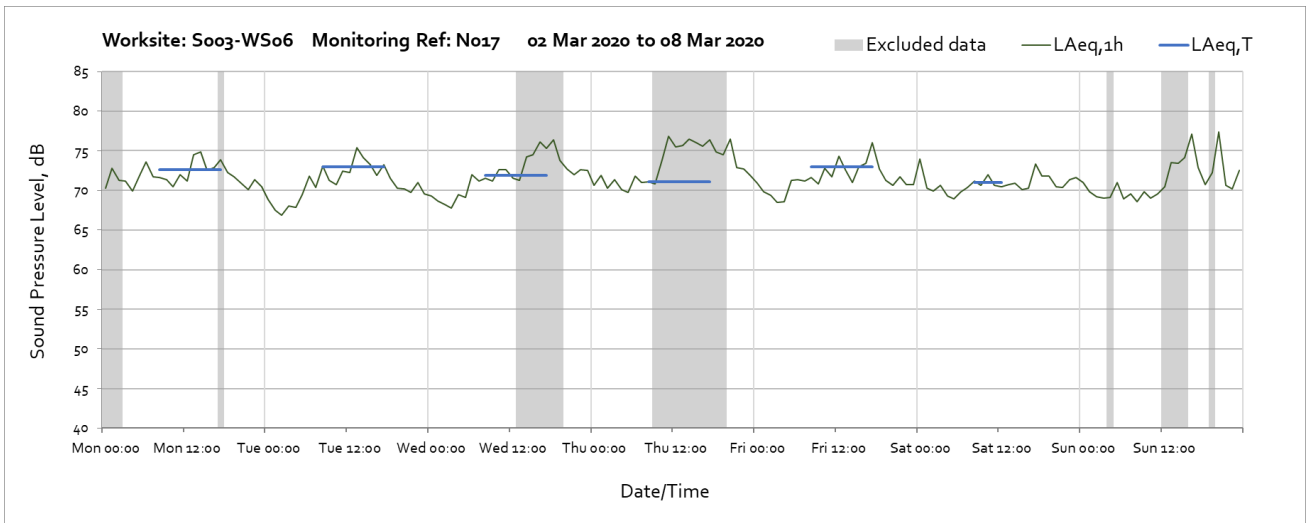
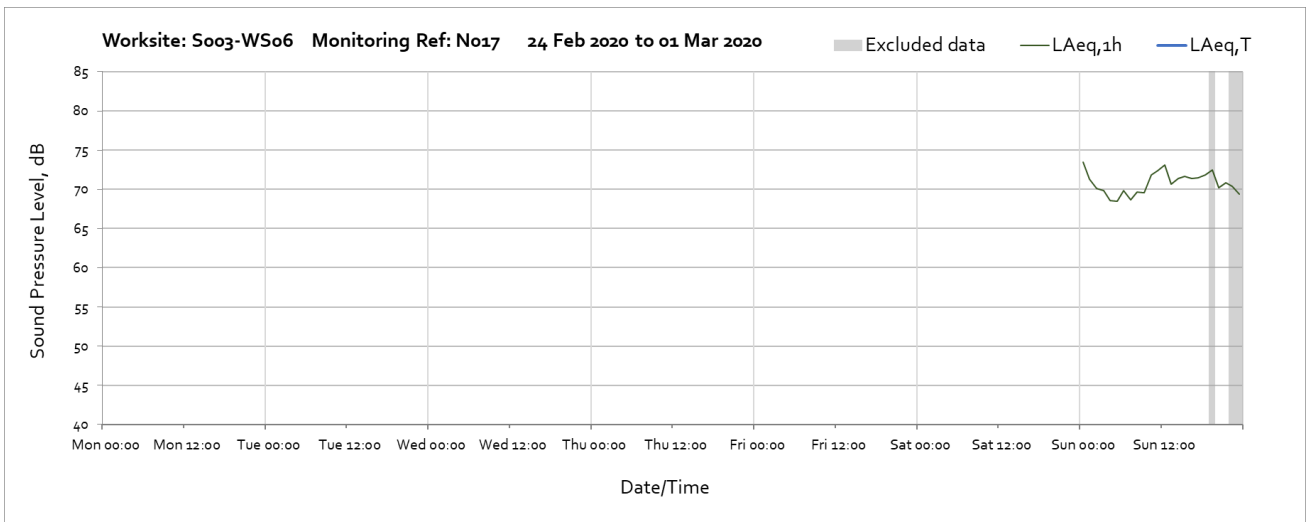


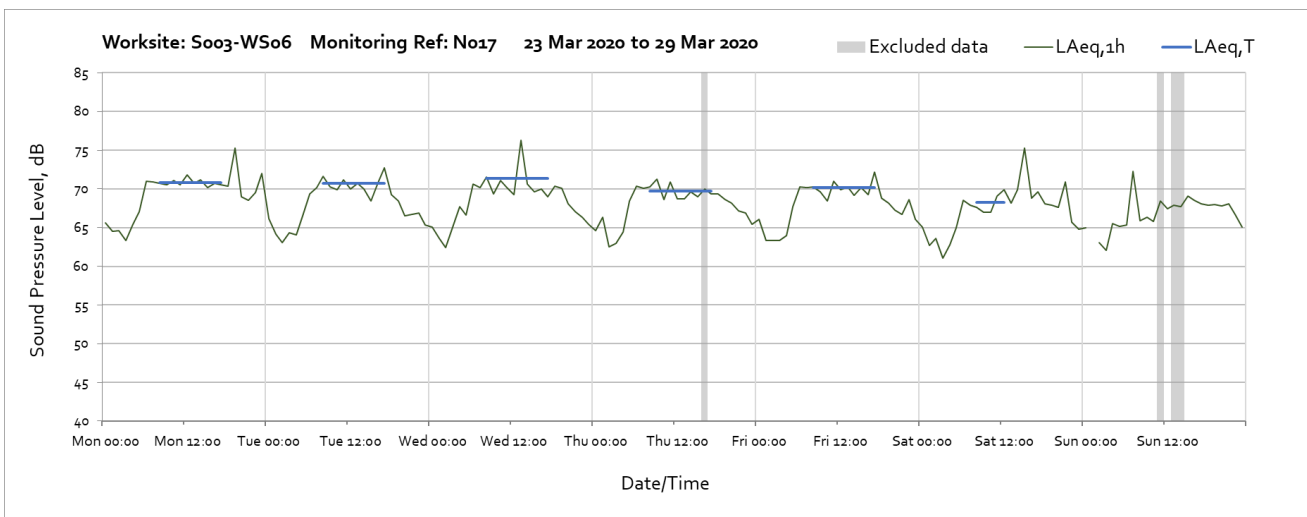
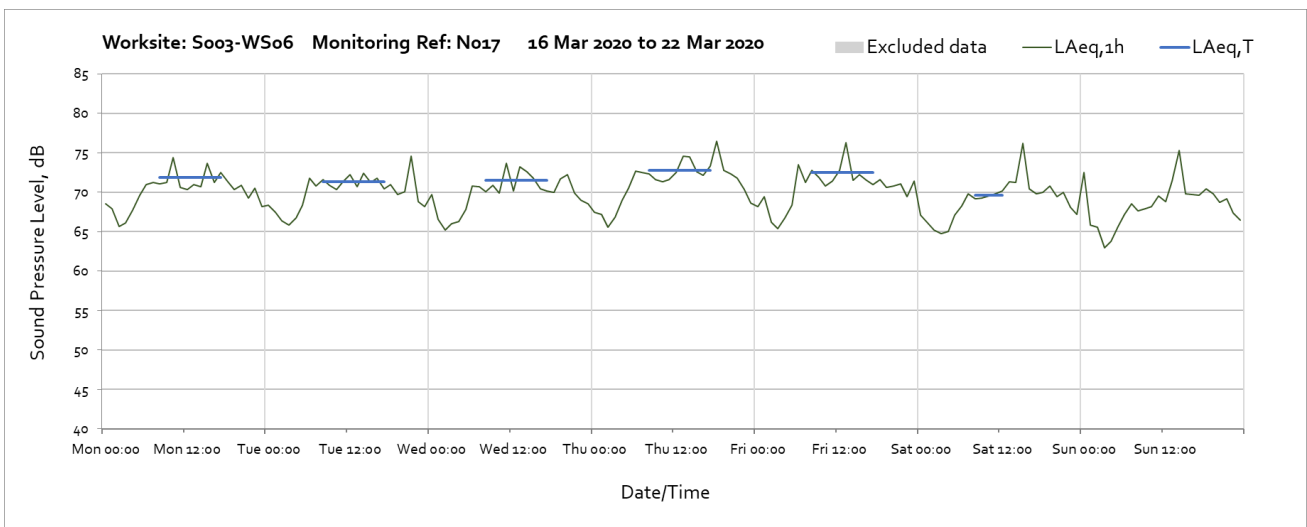
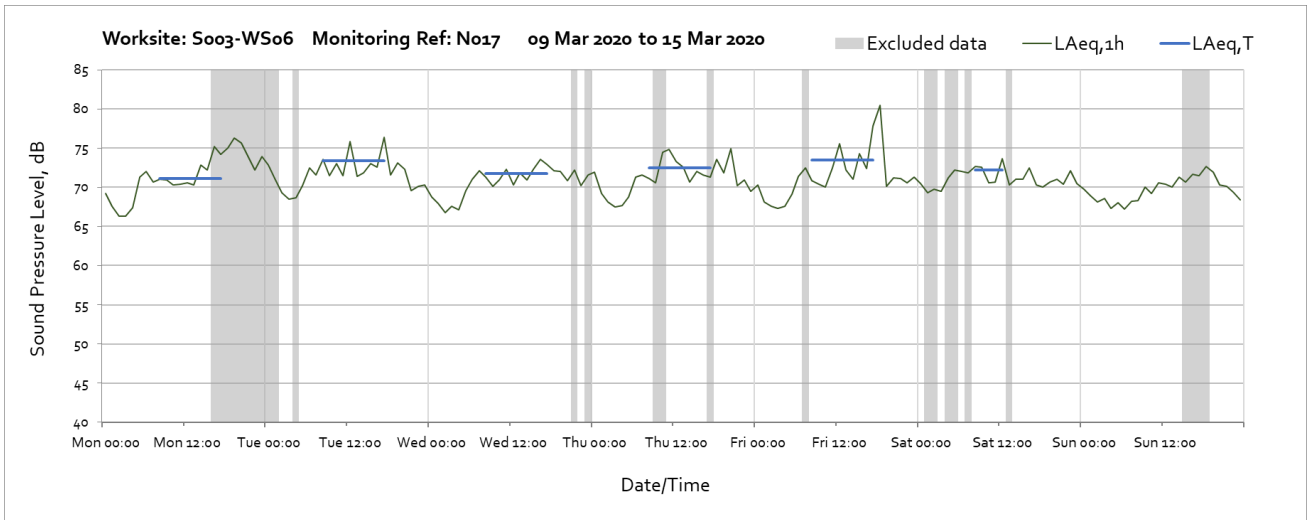


Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.

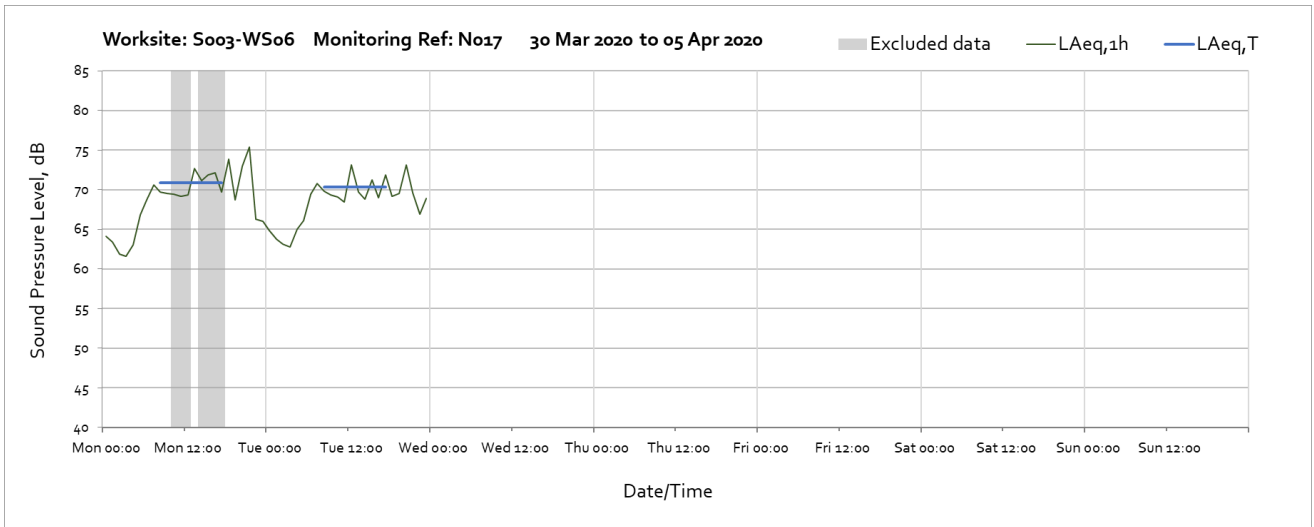


## Worksite: S003-WS06 – Monitoring Ref: N017

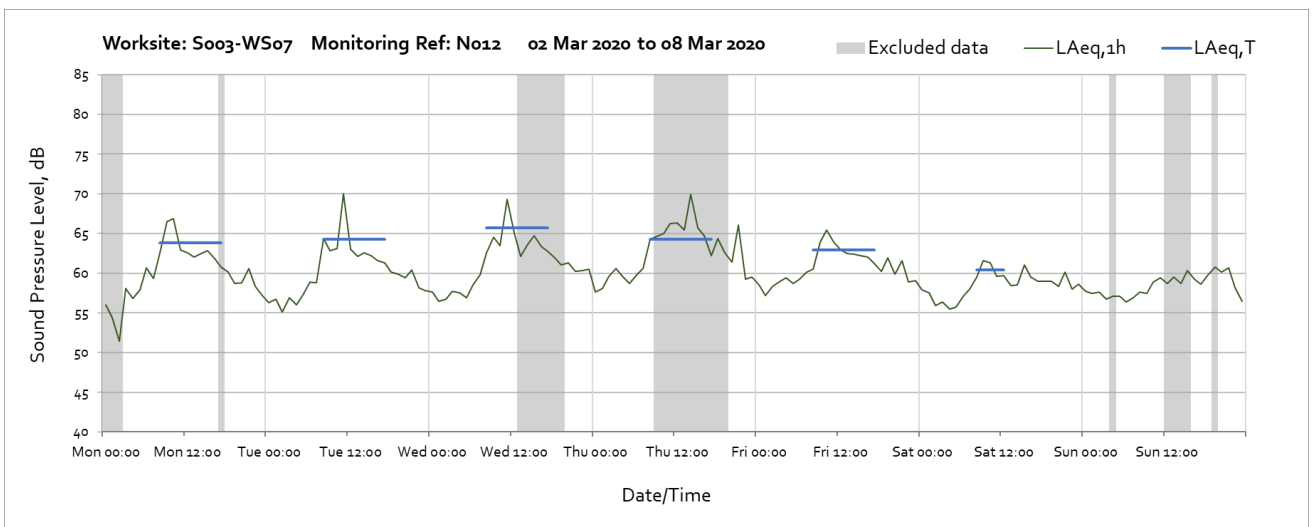
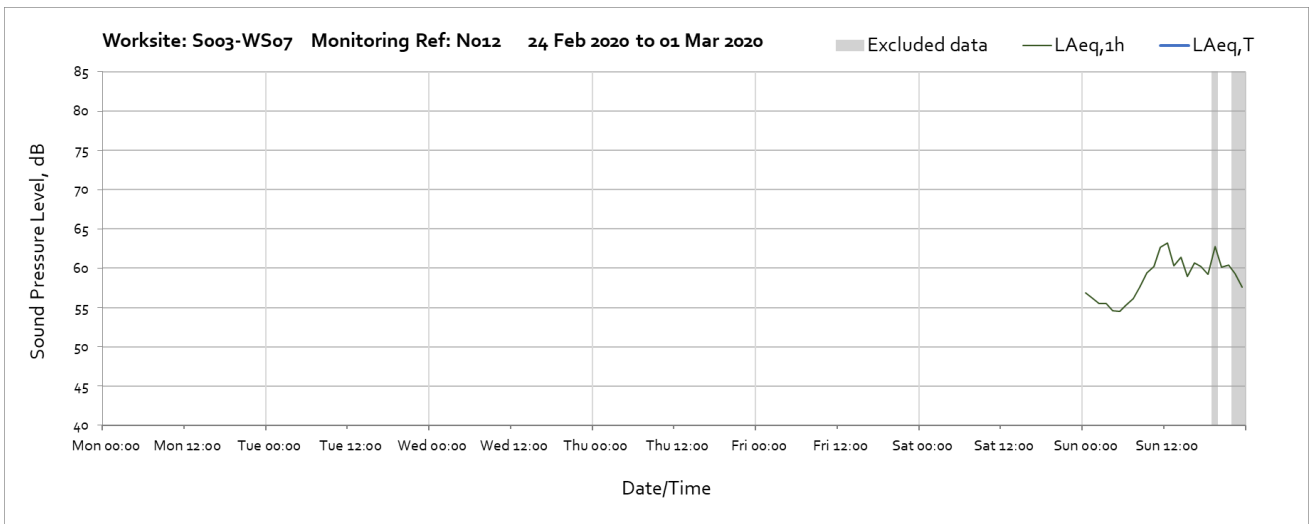


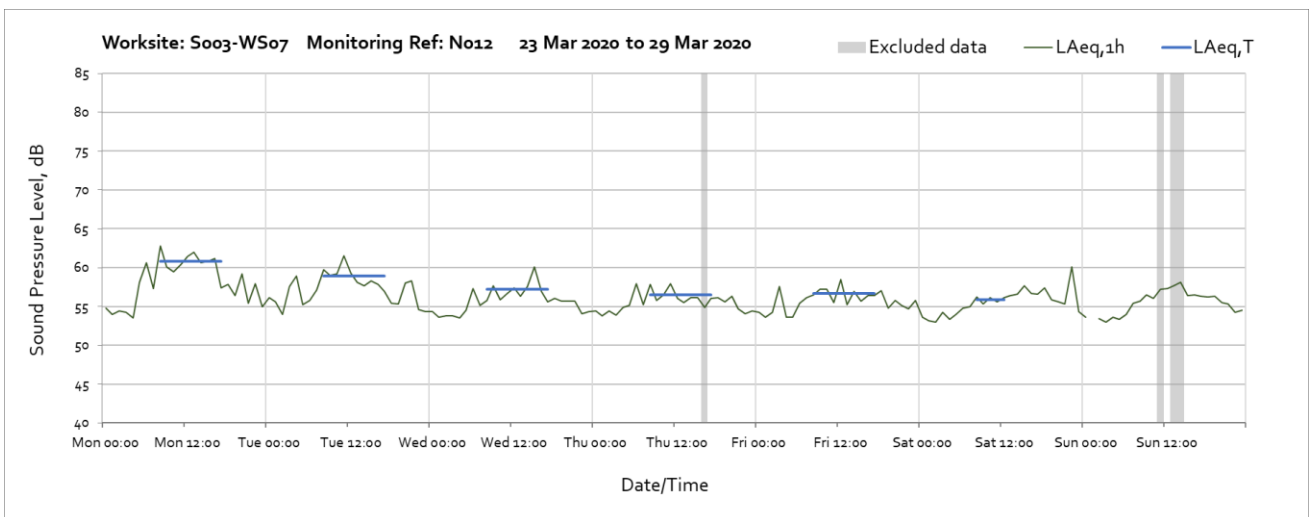
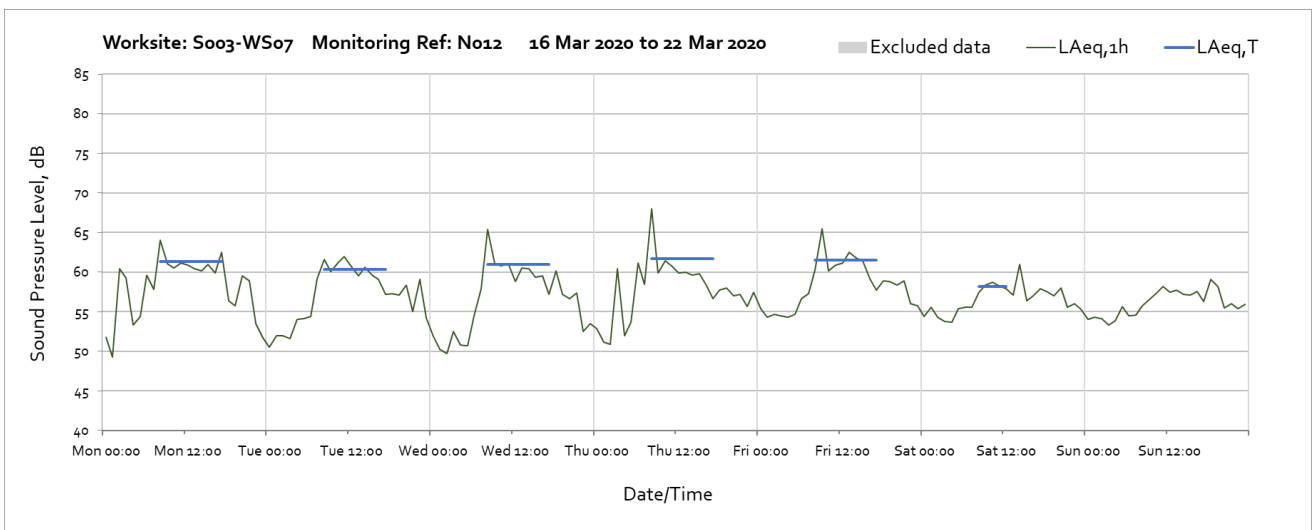
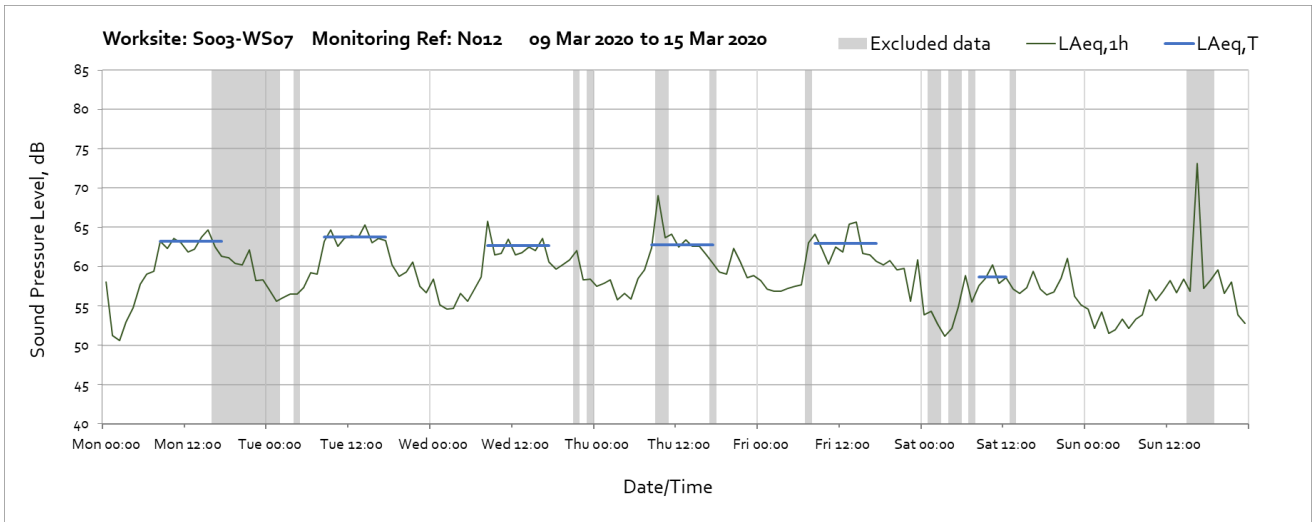


Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.

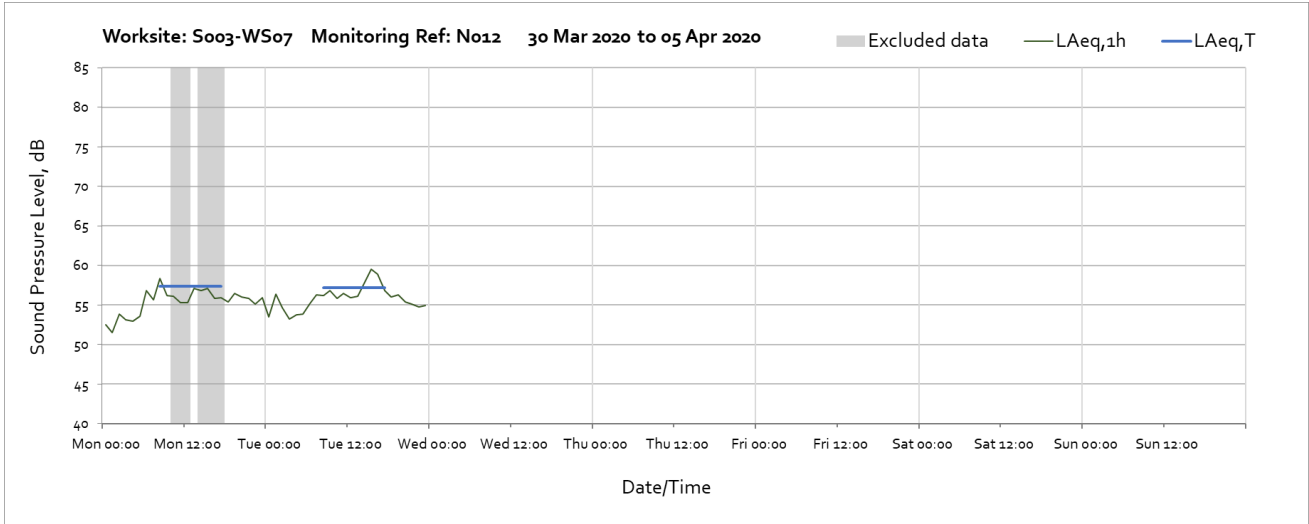


## Worksite: S003-WS07 – Monitoring Ref: N012

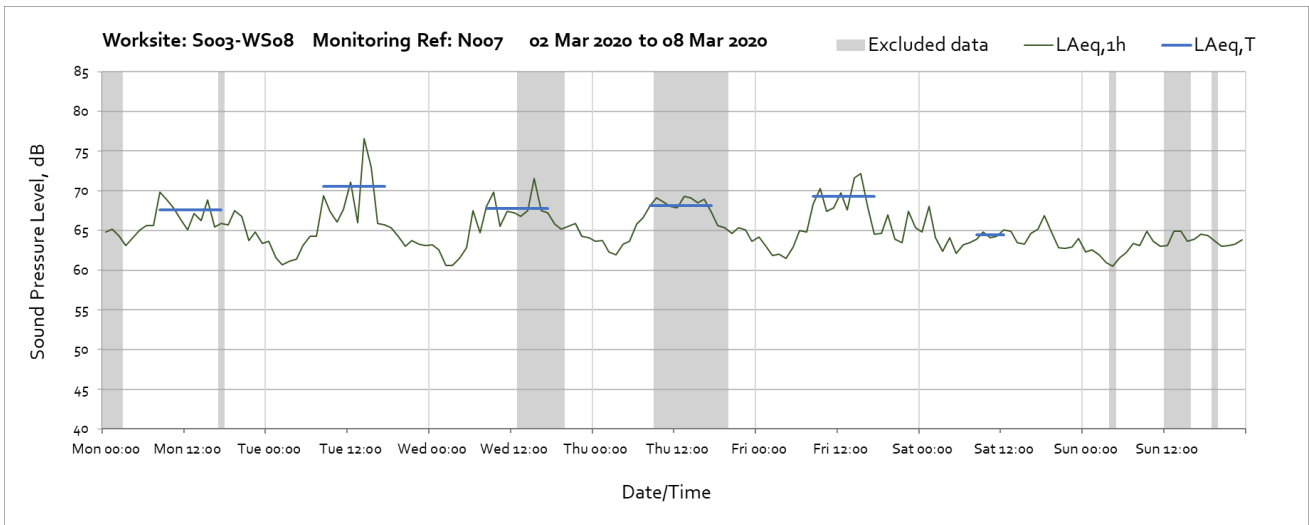
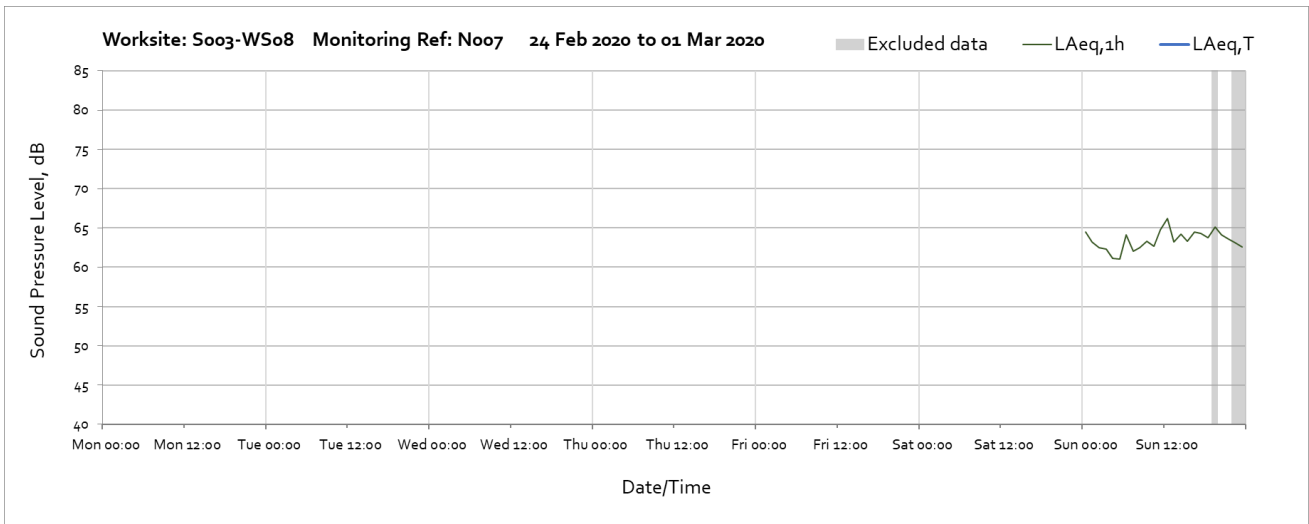


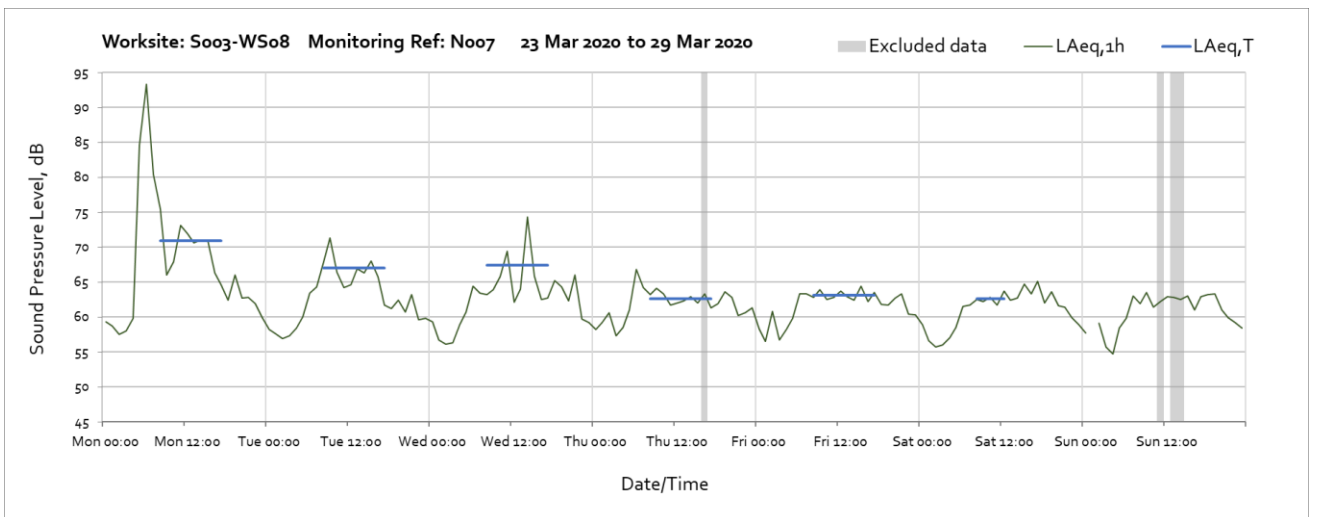
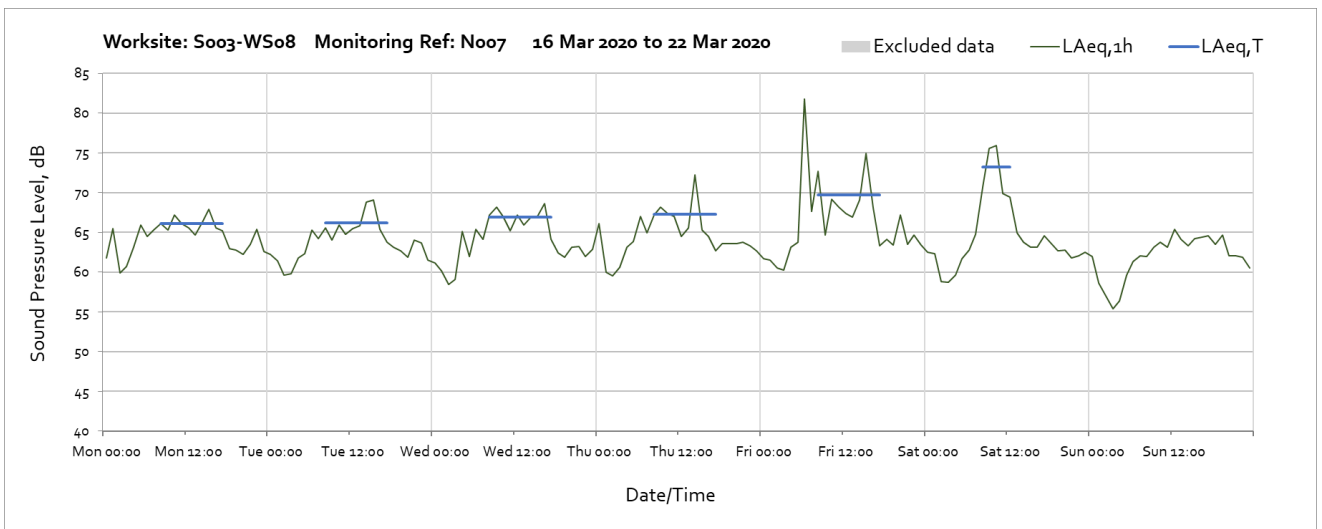
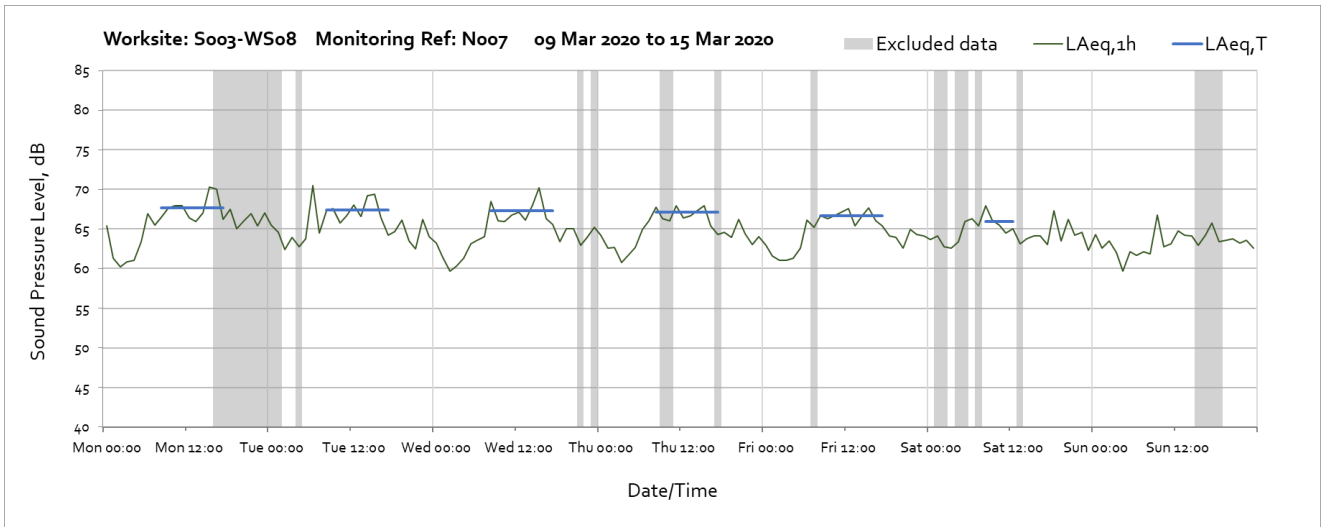


Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.

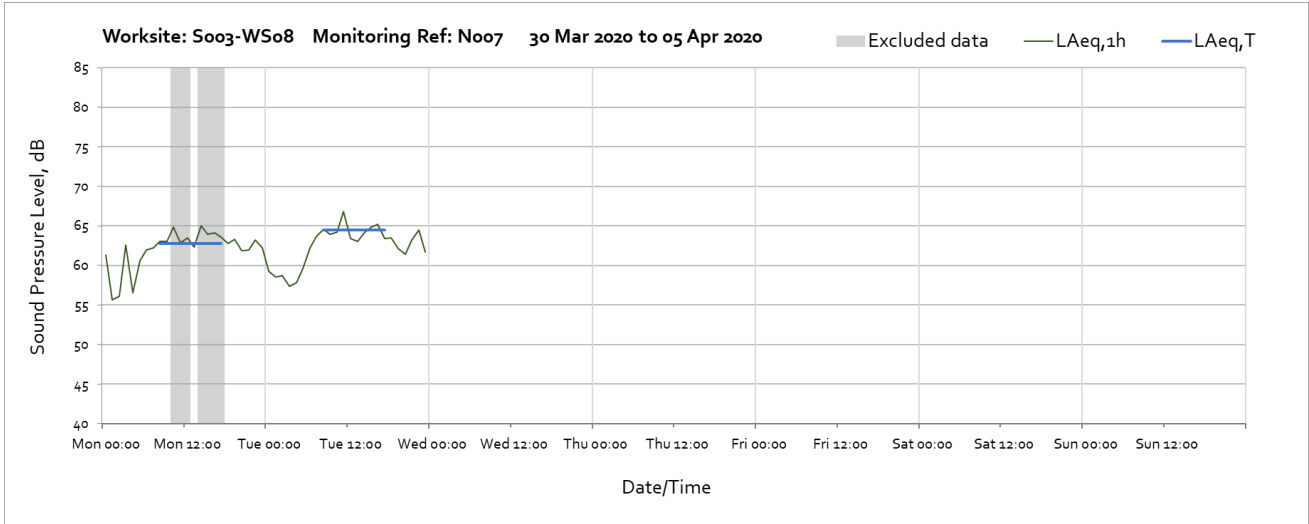


## Worksite: S003-WS08 – Monitoring Ref: N007

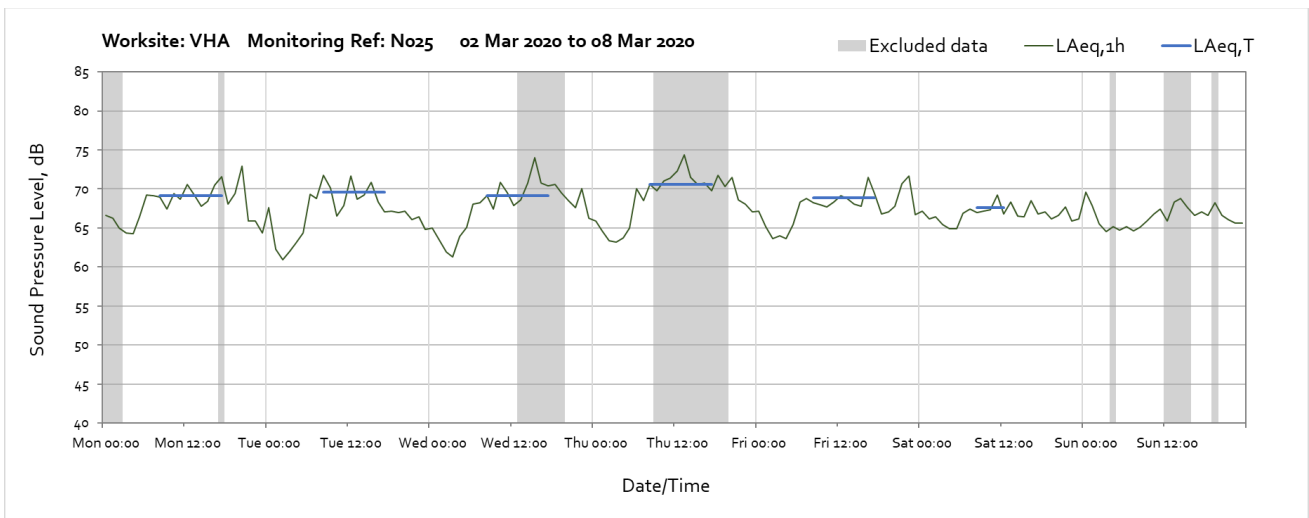
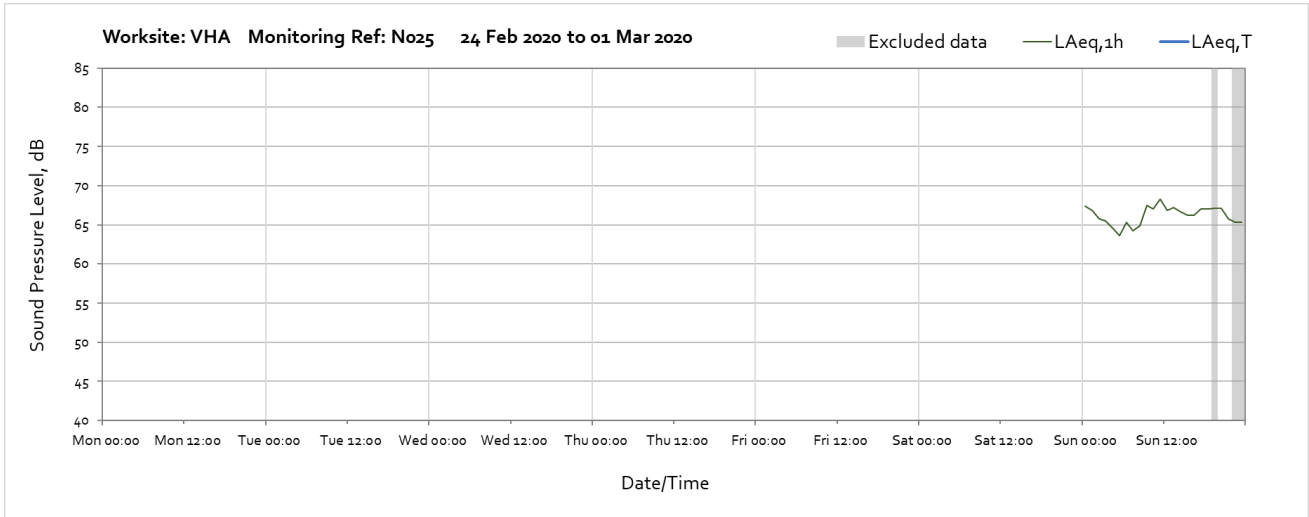




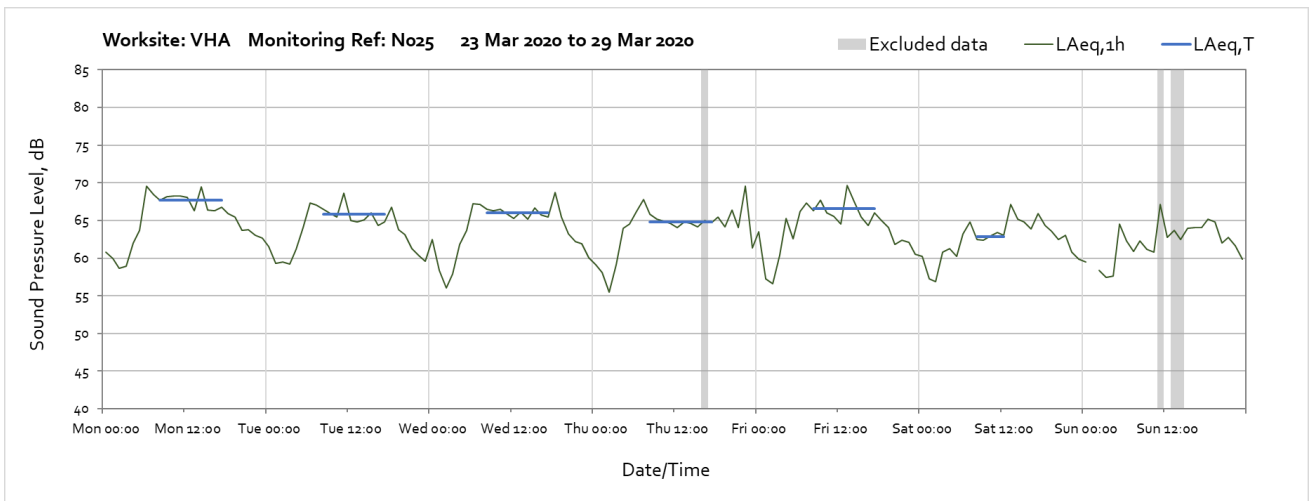
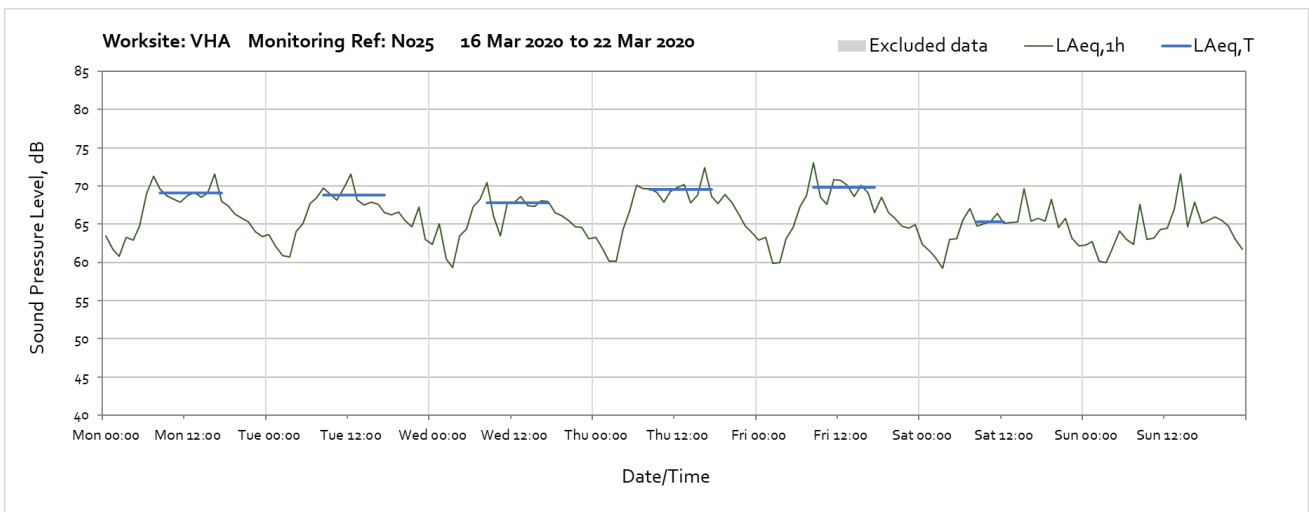
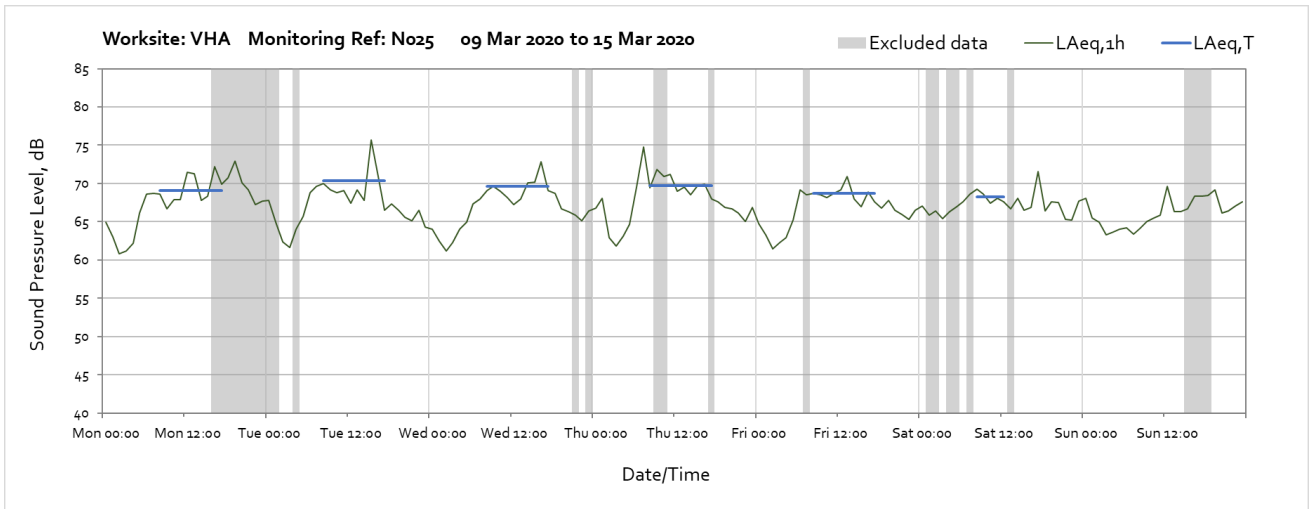
Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.



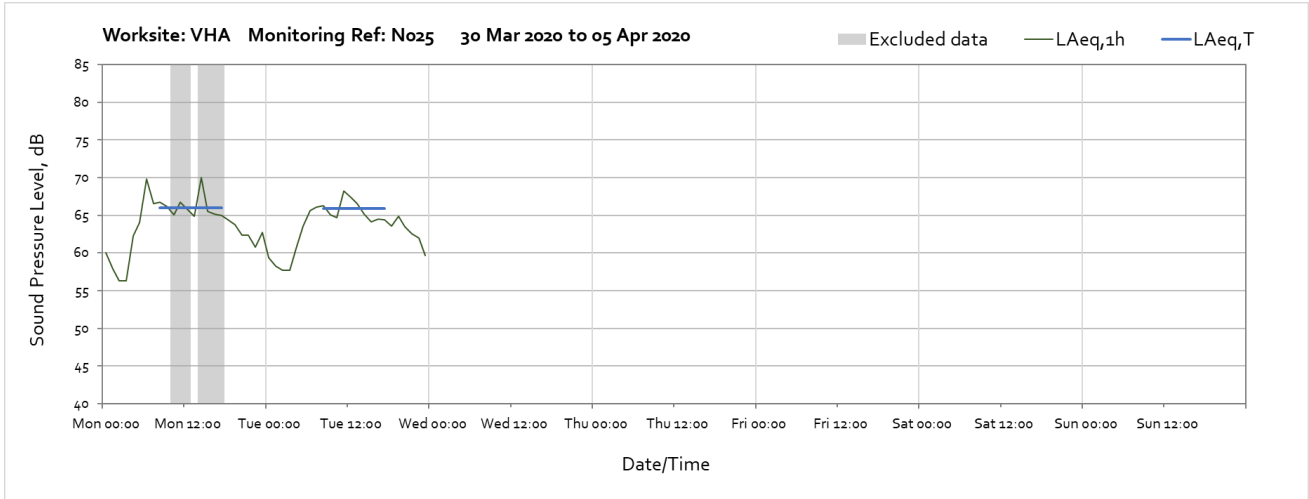
## Worksite: Vehicle Holding Area (VHA) – Monitoring Ref: N025



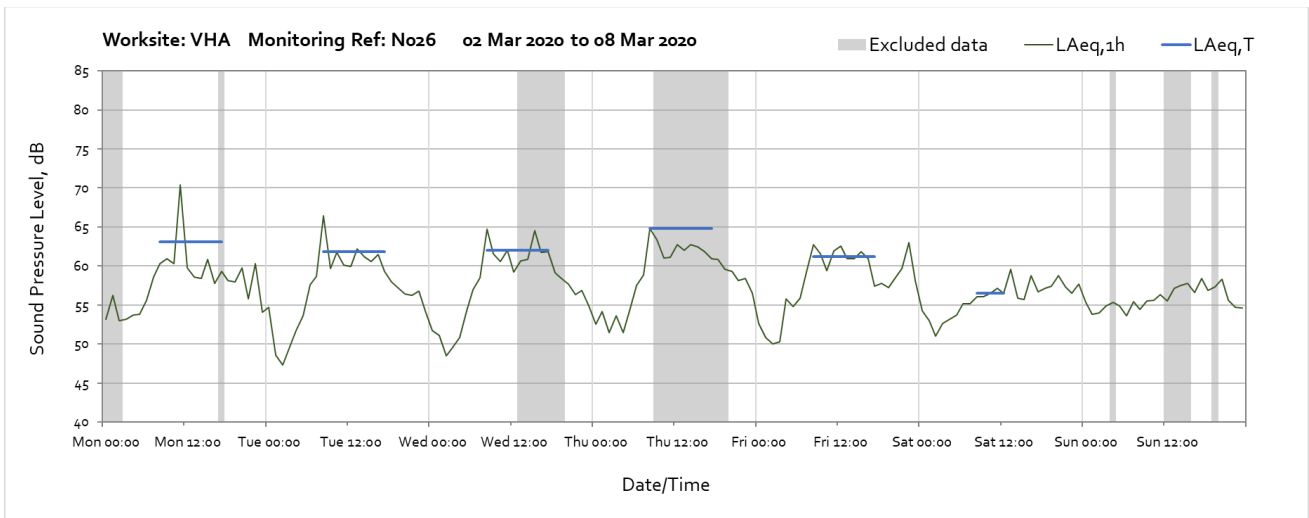
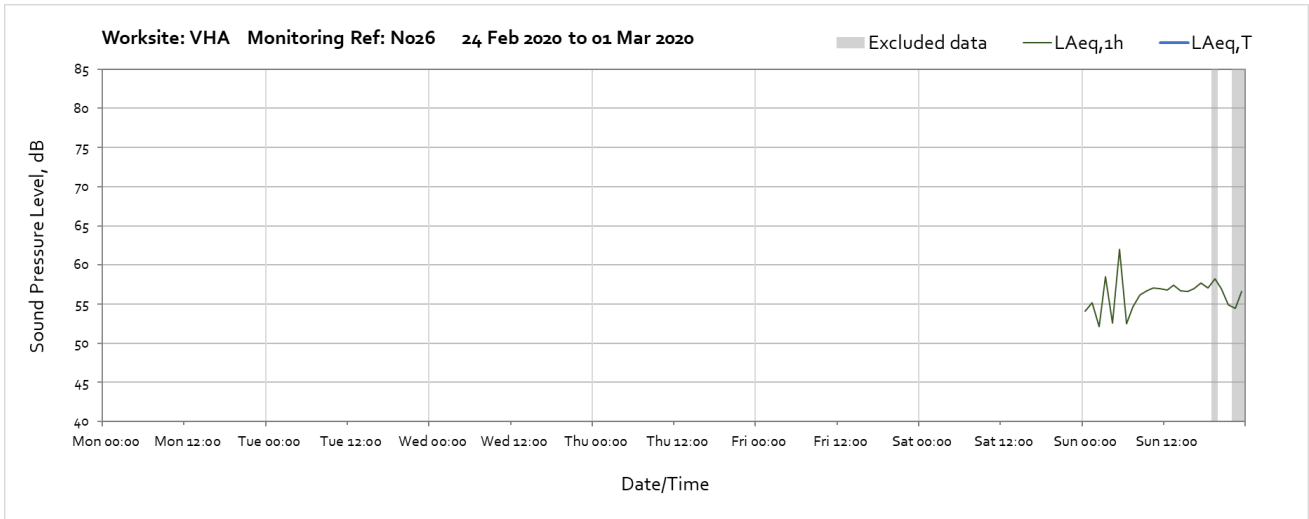


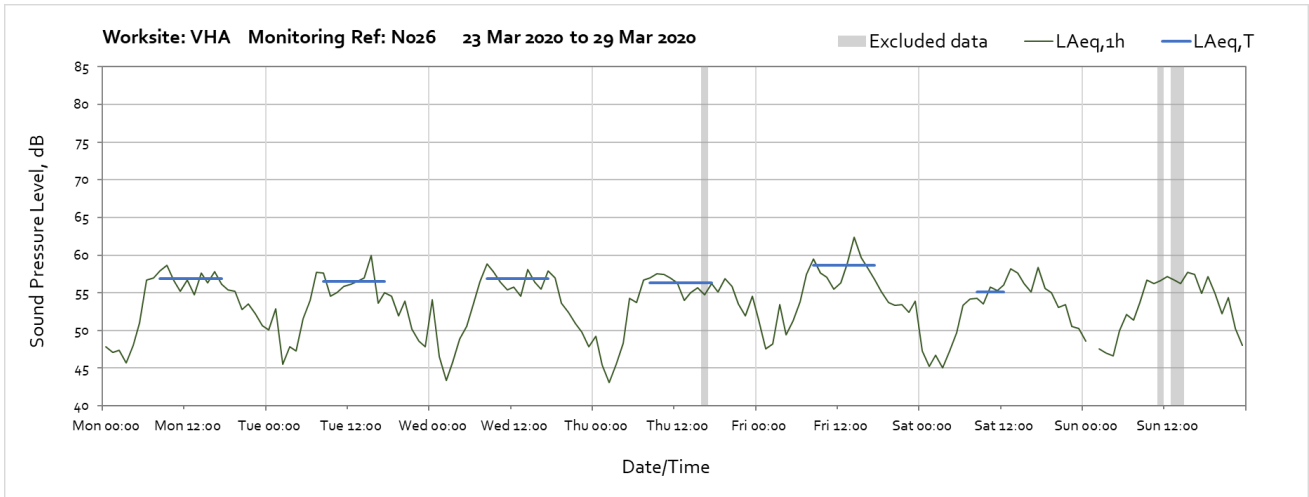
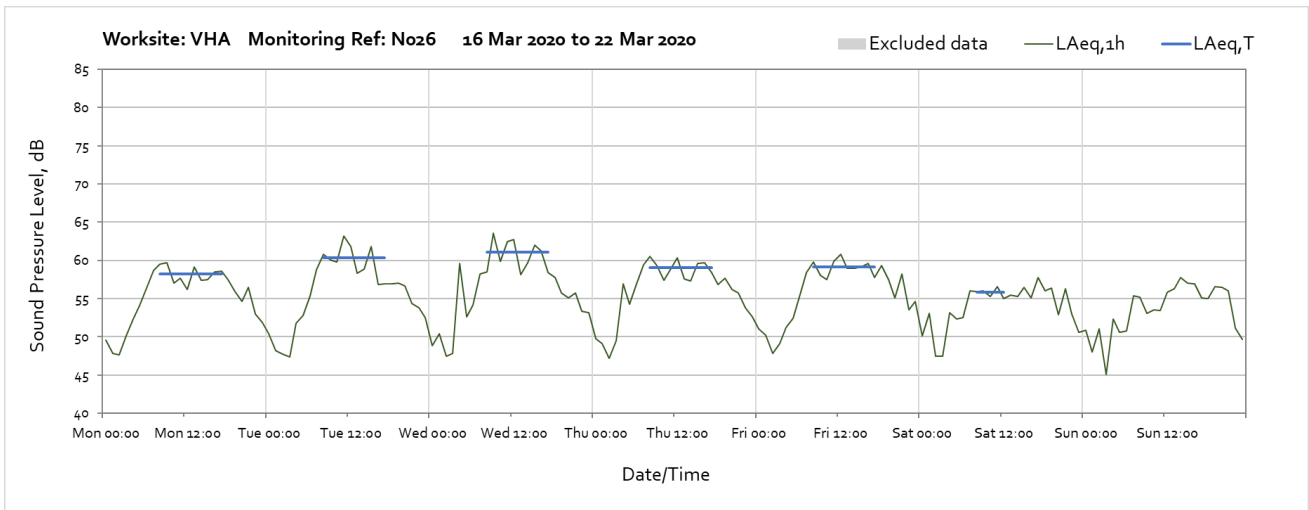
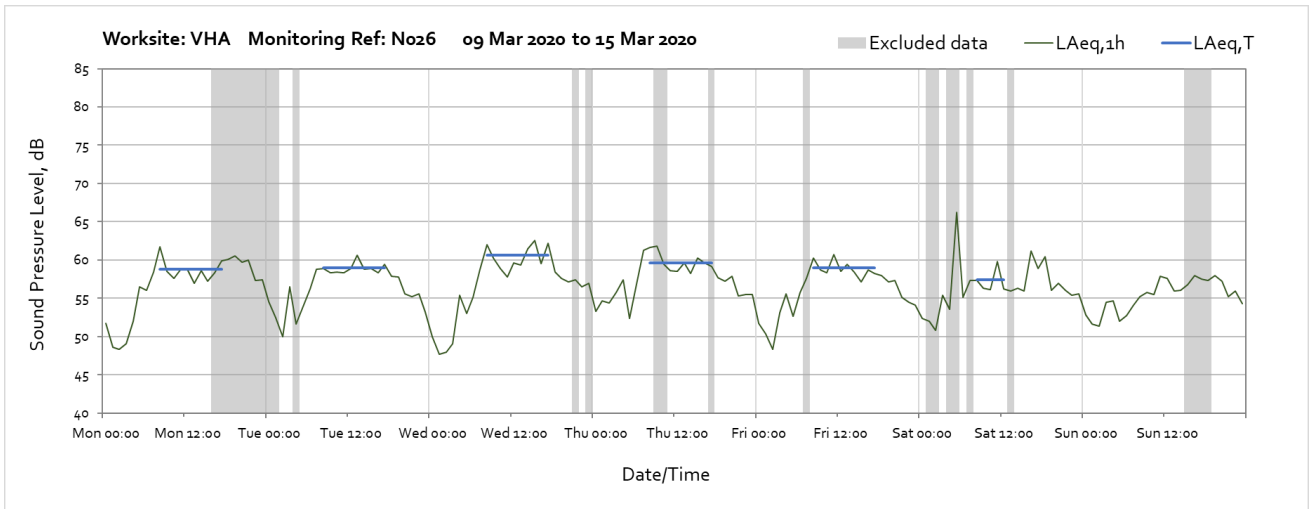


Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.

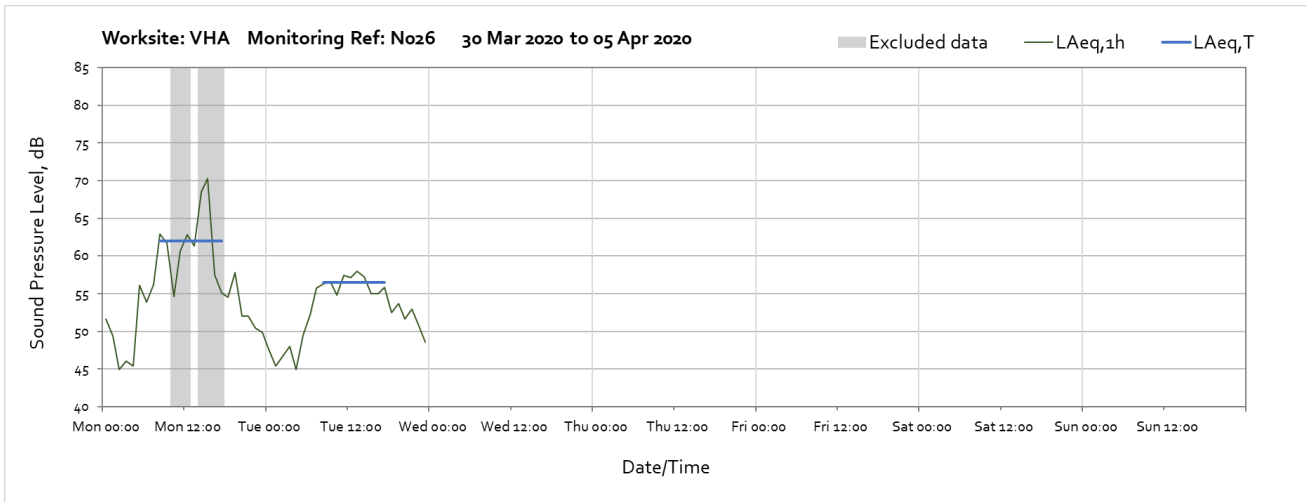


## Worksite: Vehicle Holding Area (VHA) – Monitoring Ref: N026





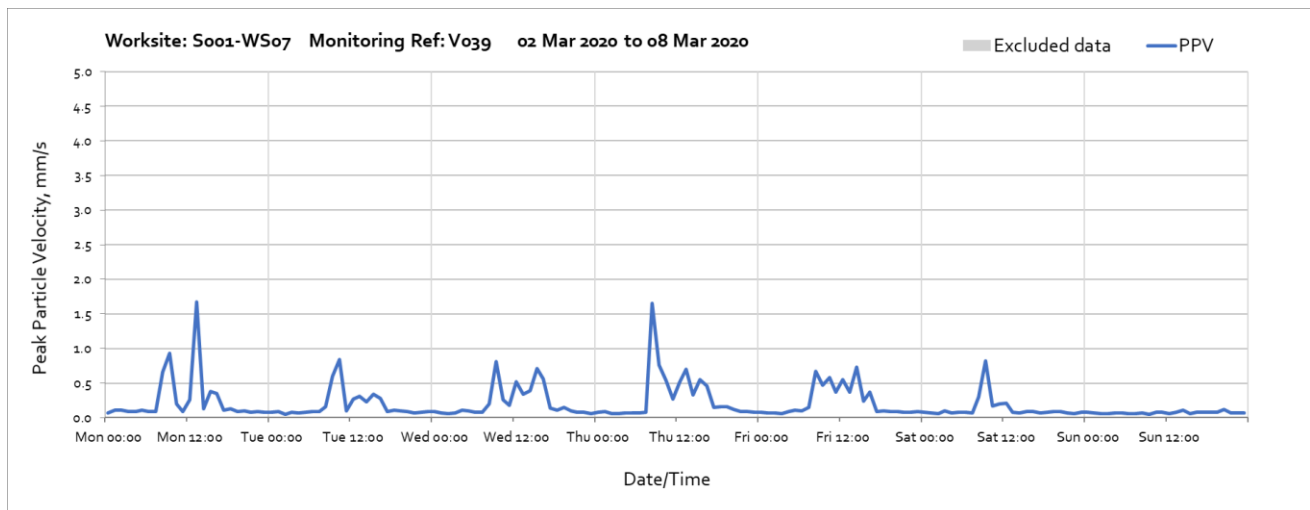
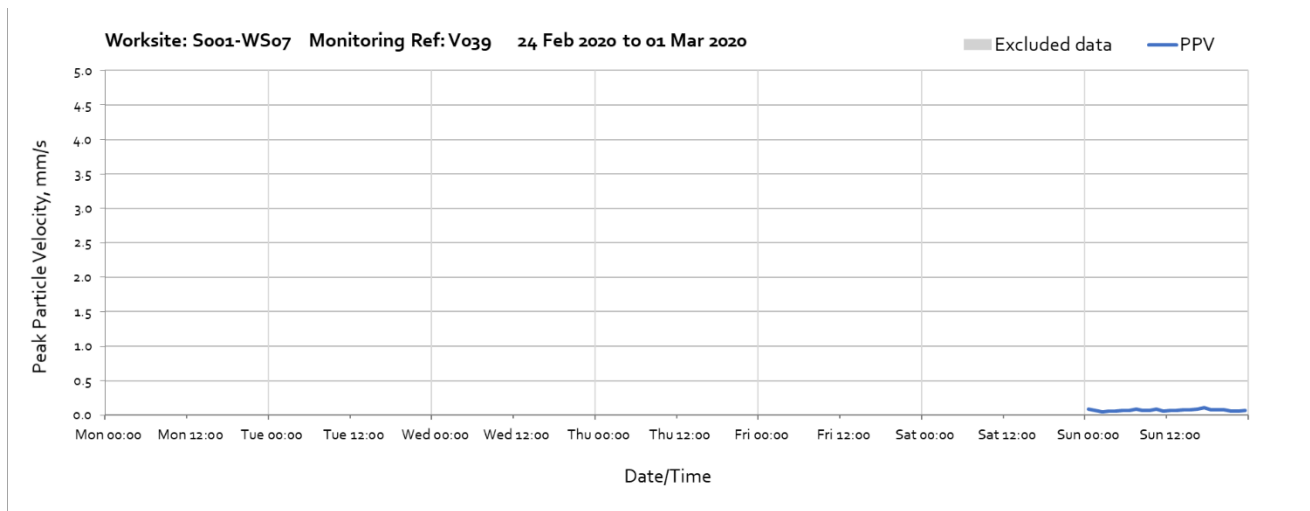
Note: Missing data at 01:00 on Sunday 29<sup>th</sup> March was due to the clocks going forward at the start of British Summertime.

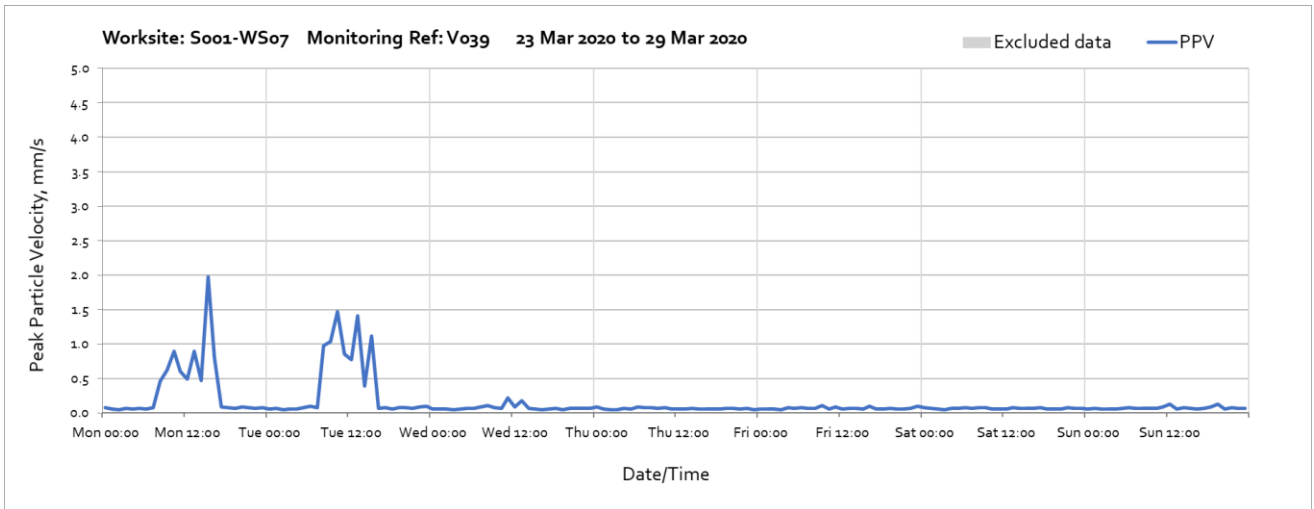
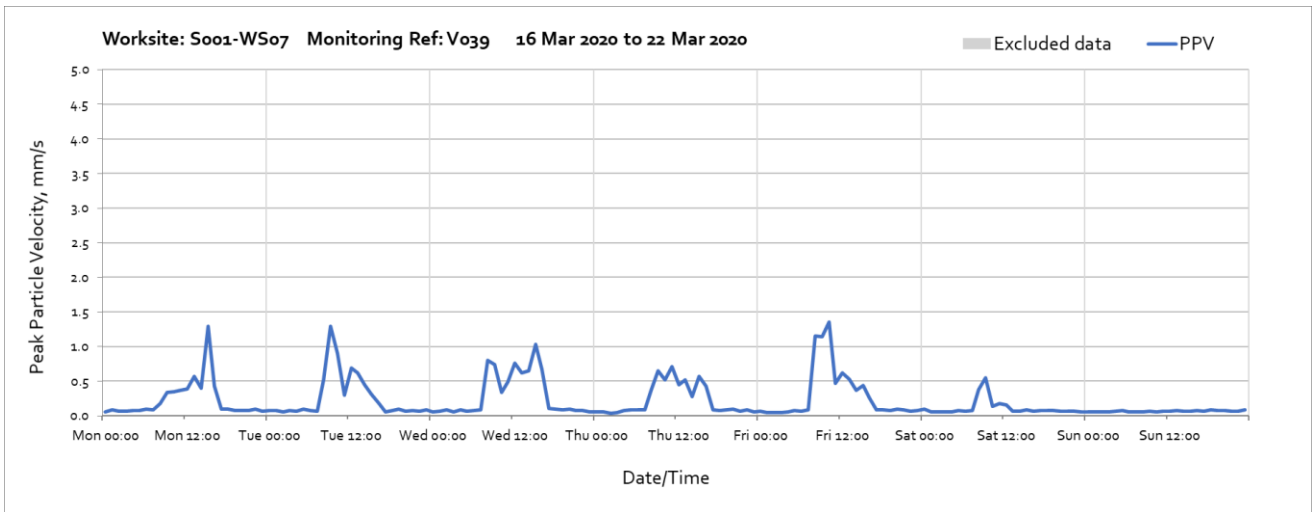
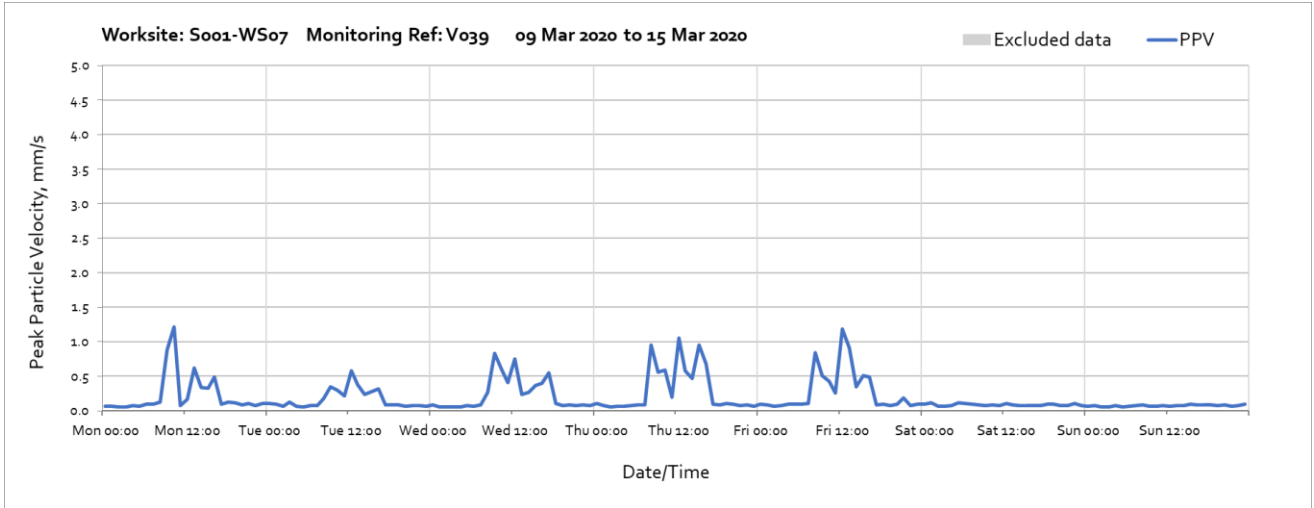


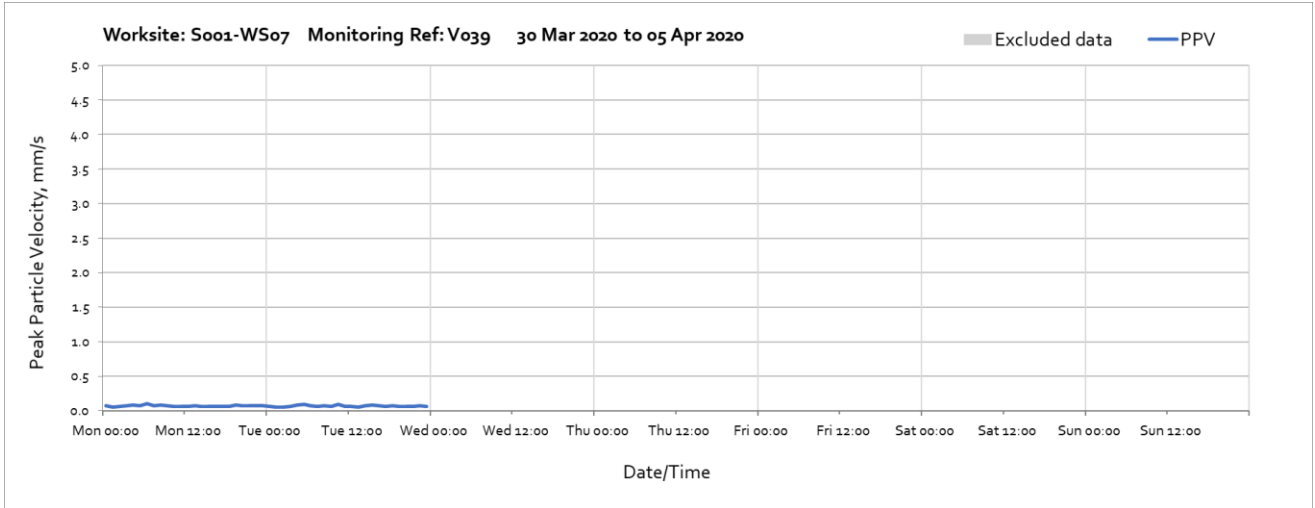
## Vibration

The following graphs show the hourly measured peak particle velocity PPV recorded during the monitoring period. The graphs show the resultant PPV due to vibration components on three orthogonal axis x, y and z. High values of PPV were measured on occasions at V043. These were due to local interference with the vibration monitor and are not representative of HS2 construction works. These data entries have been greyed out in the following charts and have been excluded to calculate values in Table 6.

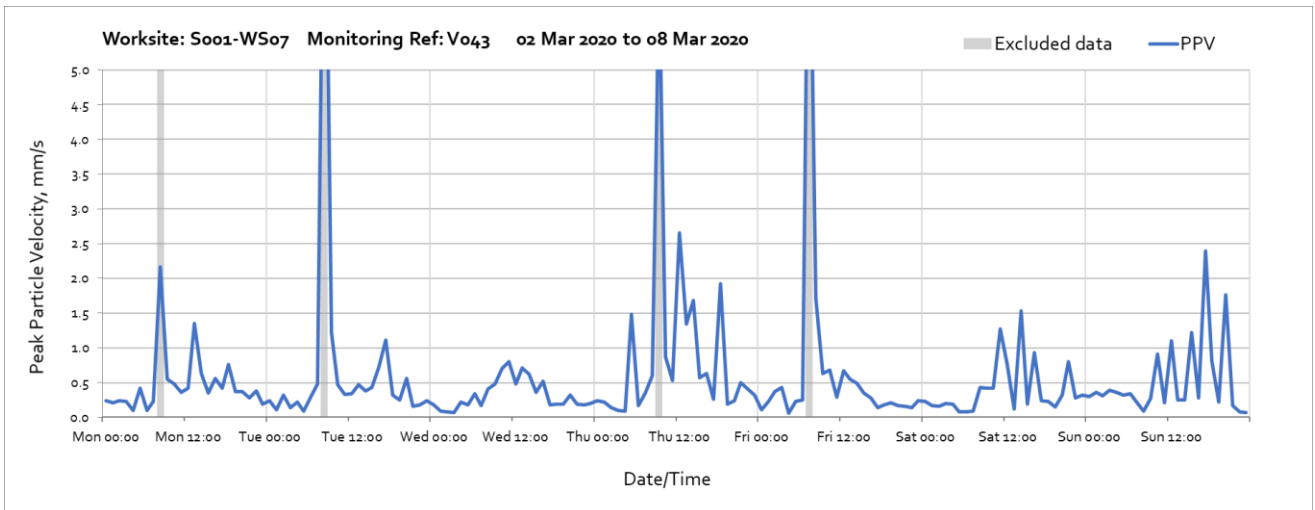
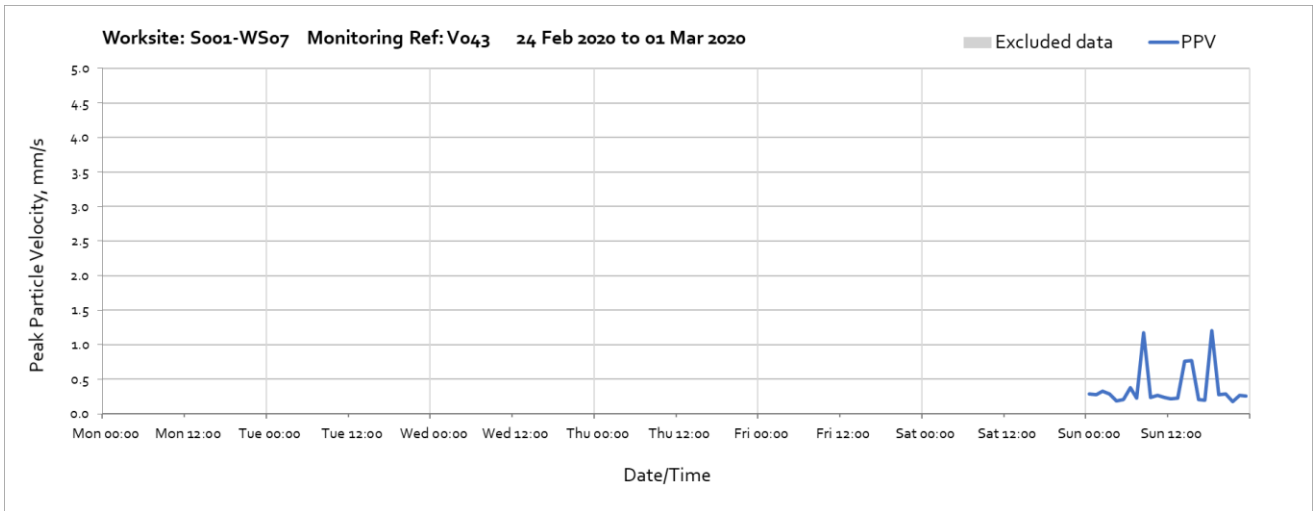
### Worksite: S001-WS07 – Monitoring Ref: V039



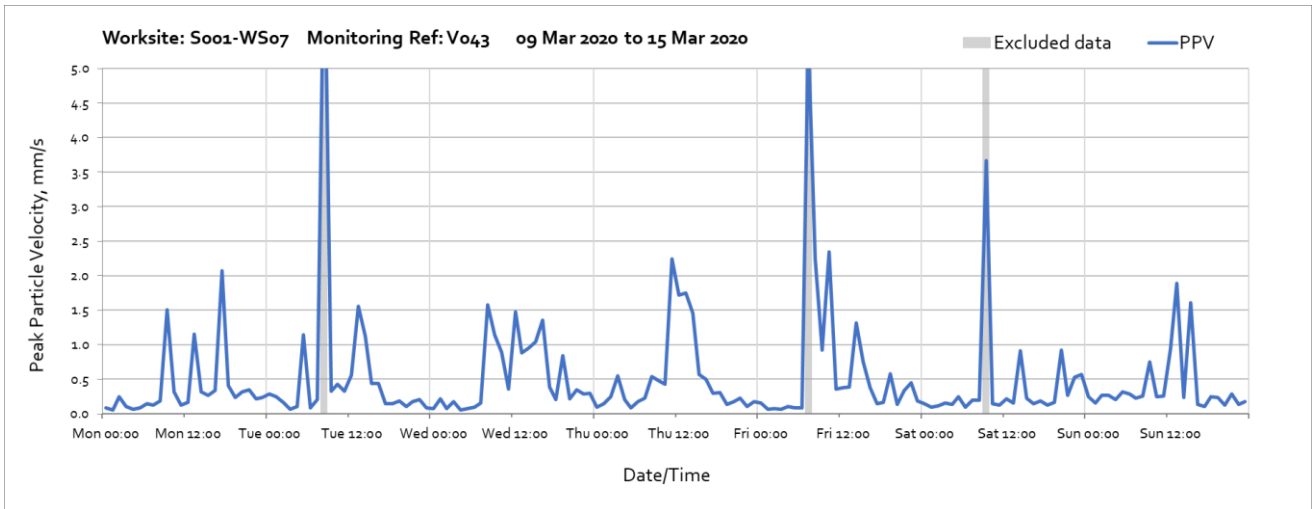




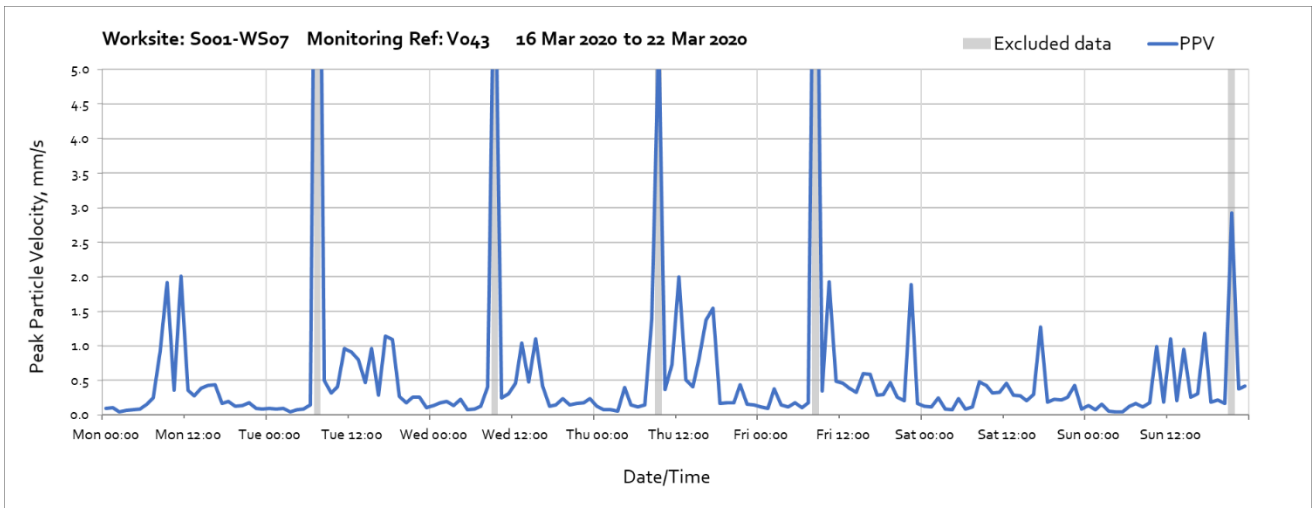
## Worksite: S001-WS07 – Monitoring Ref: V043



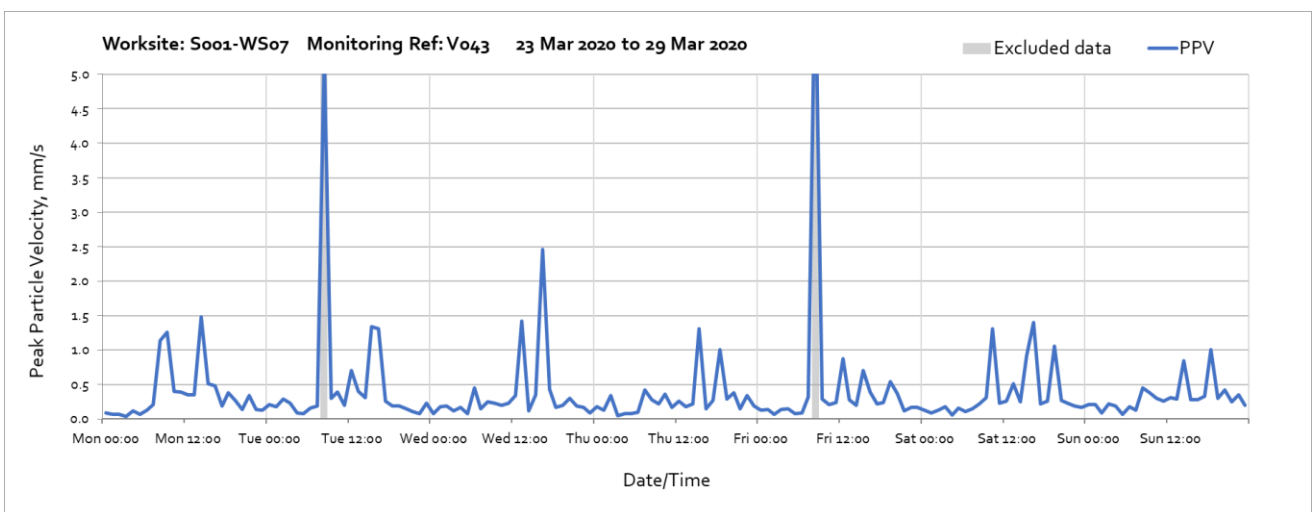
Note: High vibration levels throughout the week were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels.



Note: High vibration levels throughout the week were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels.

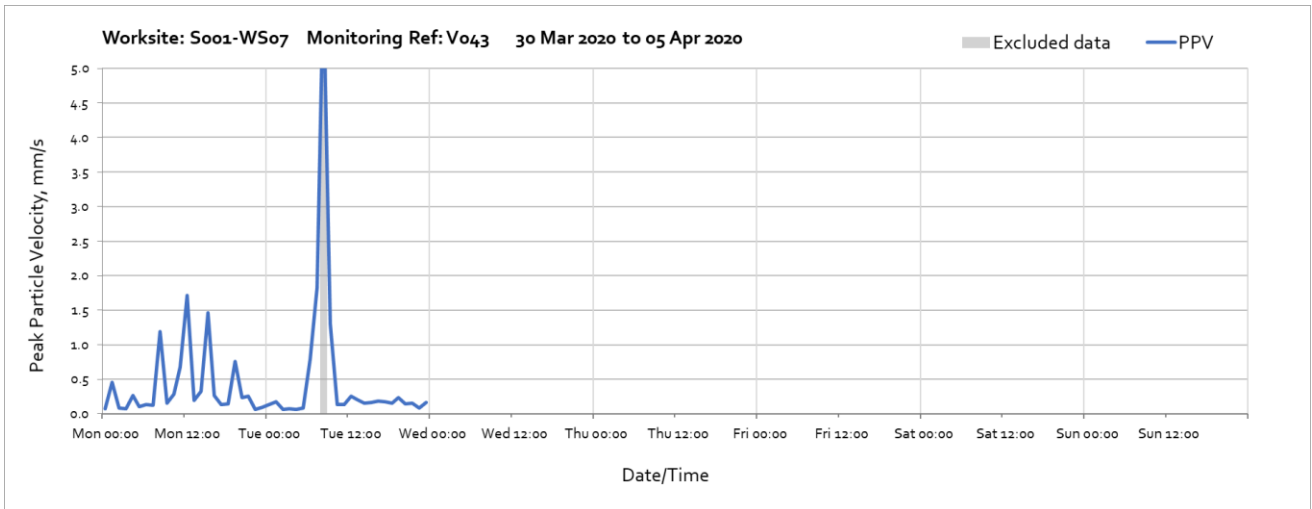


Note: High vibration levels throughout the week were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels.



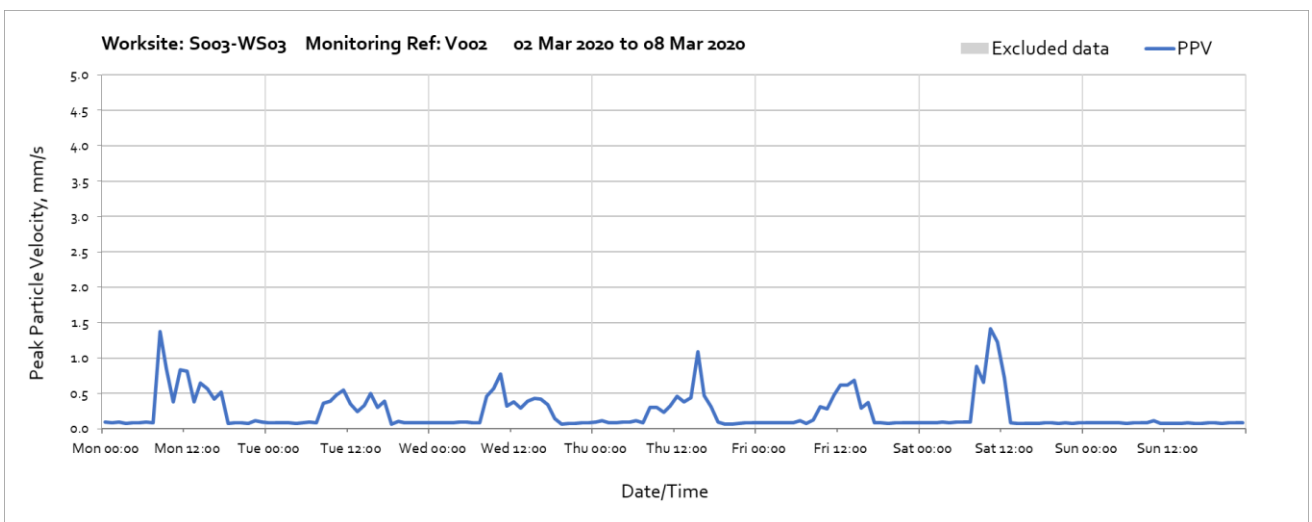
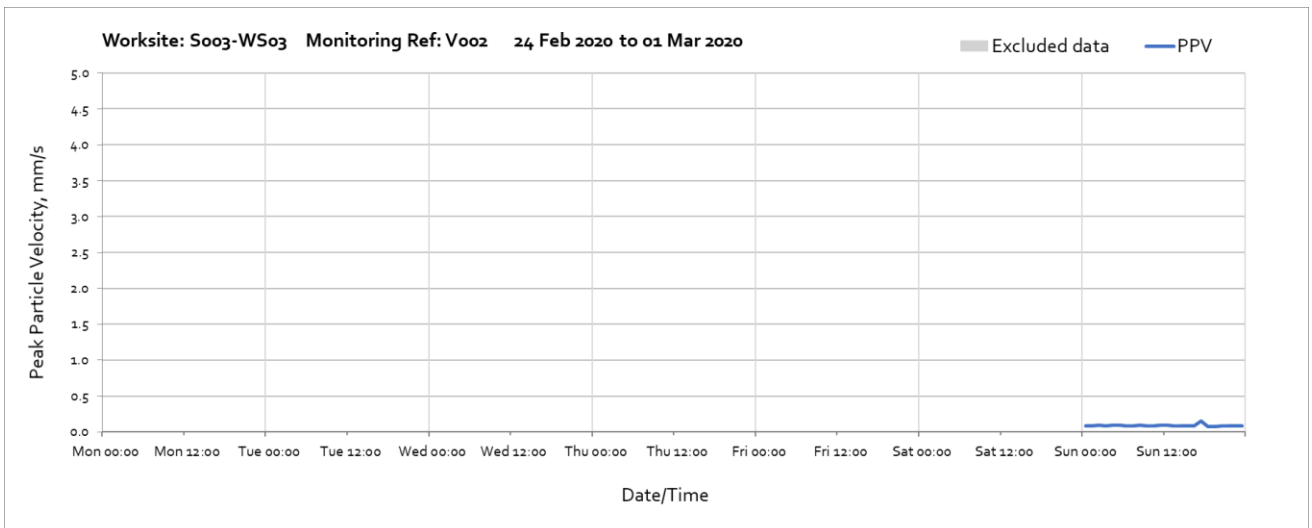
Note: High vibration levels throughout the week were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels.

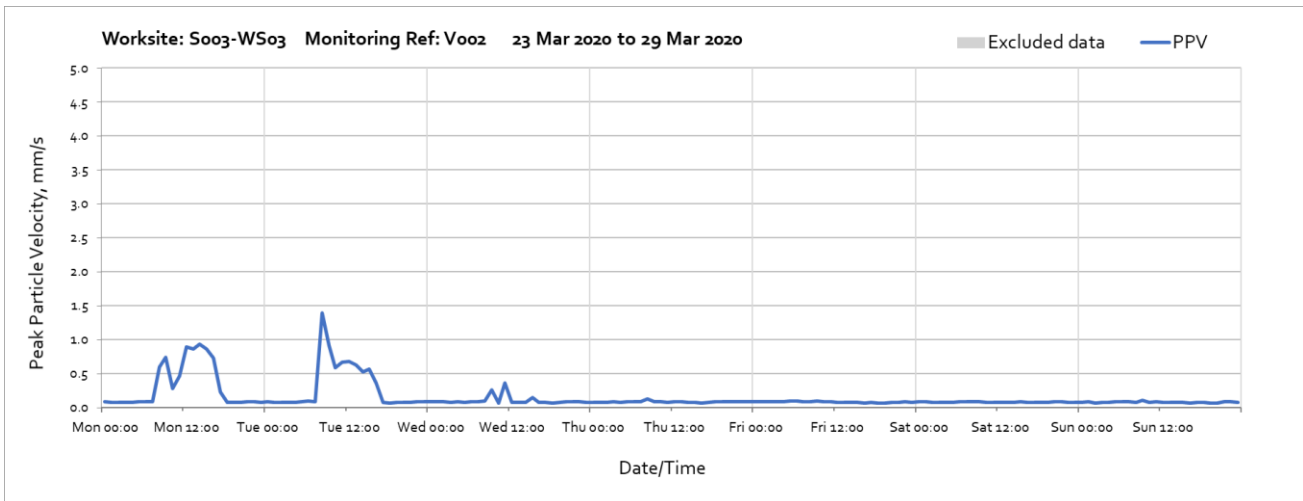
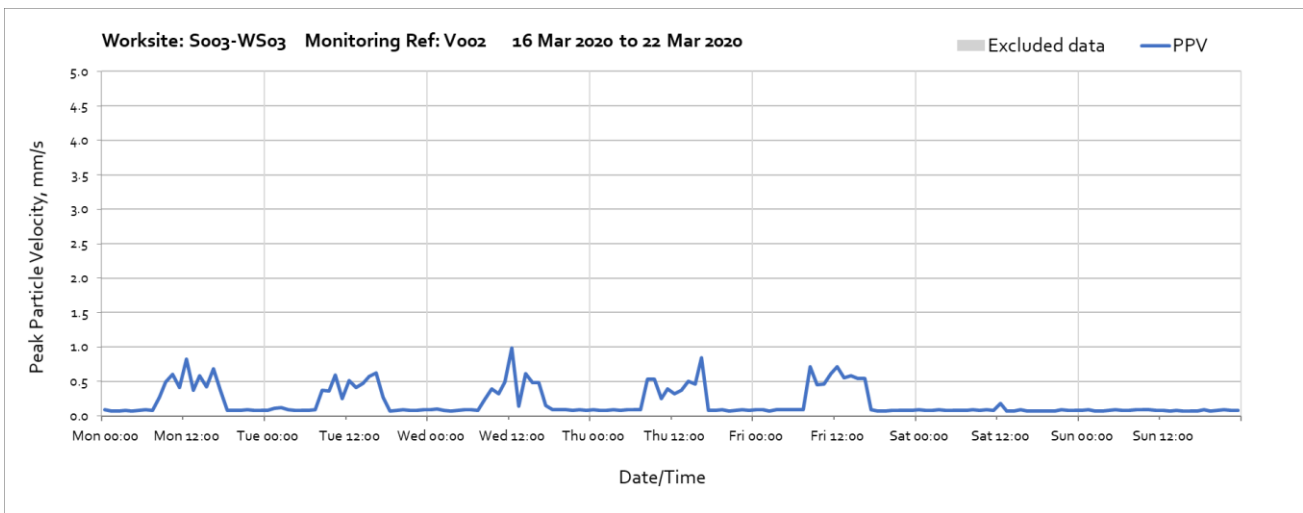
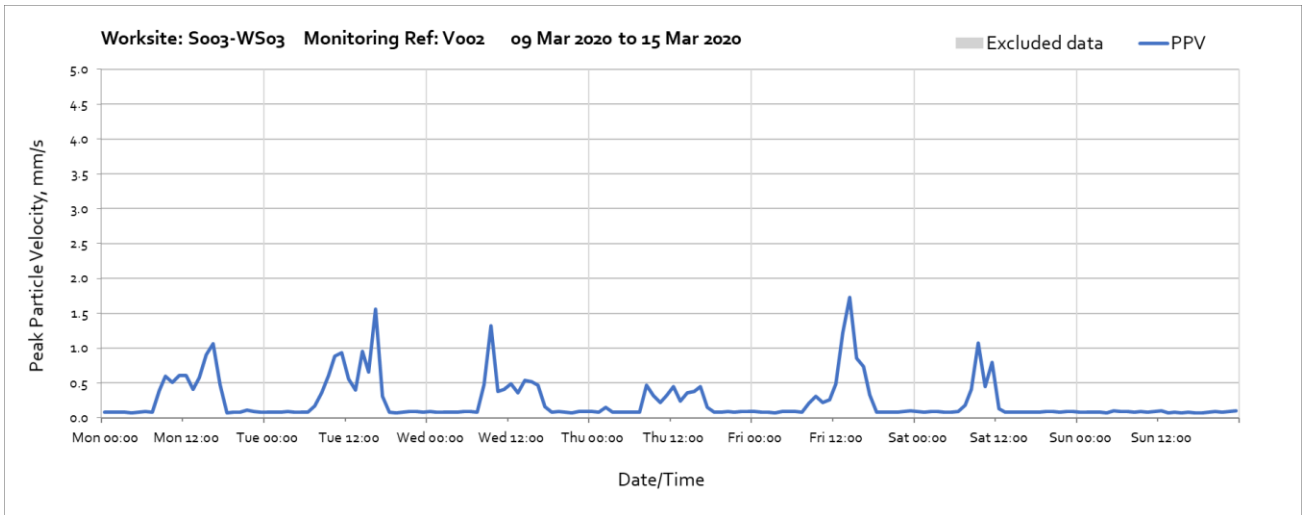


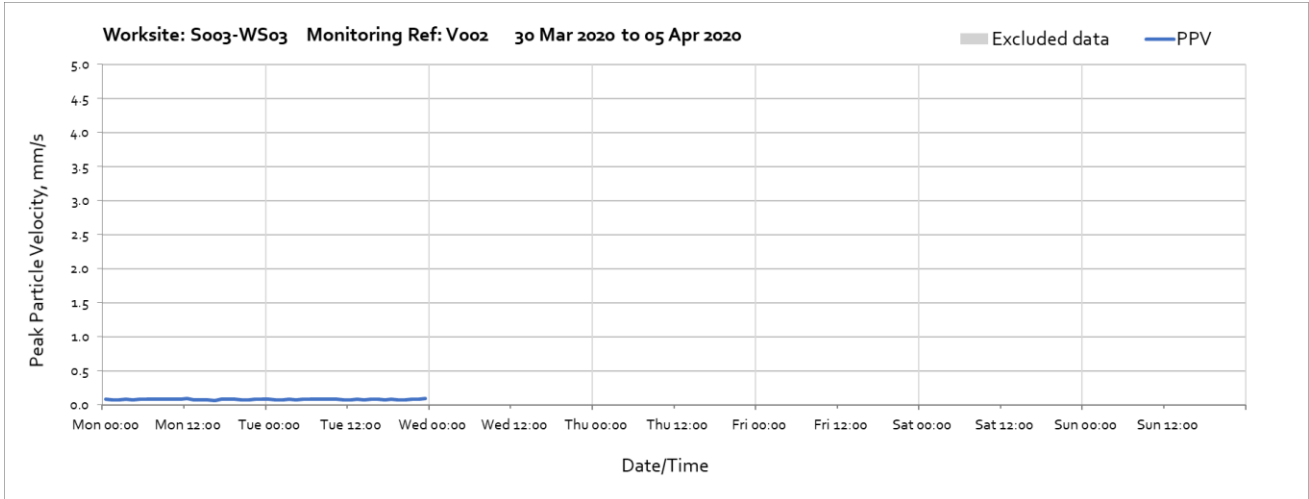


Note: High vibration levels measured at 08:00 on Tuesday 31<sup>st</sup> March were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels.

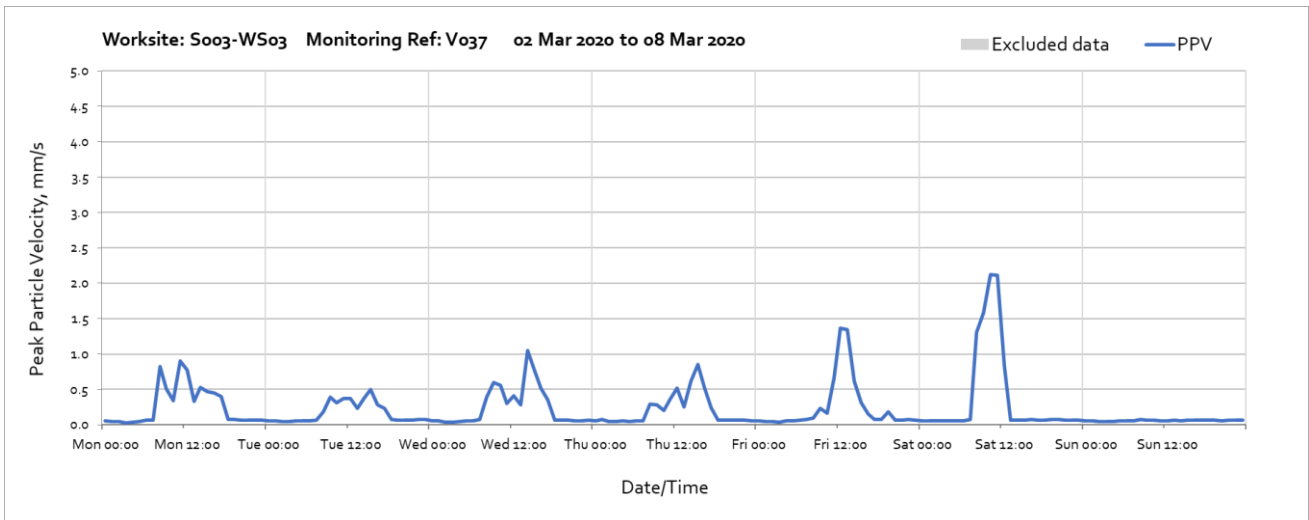
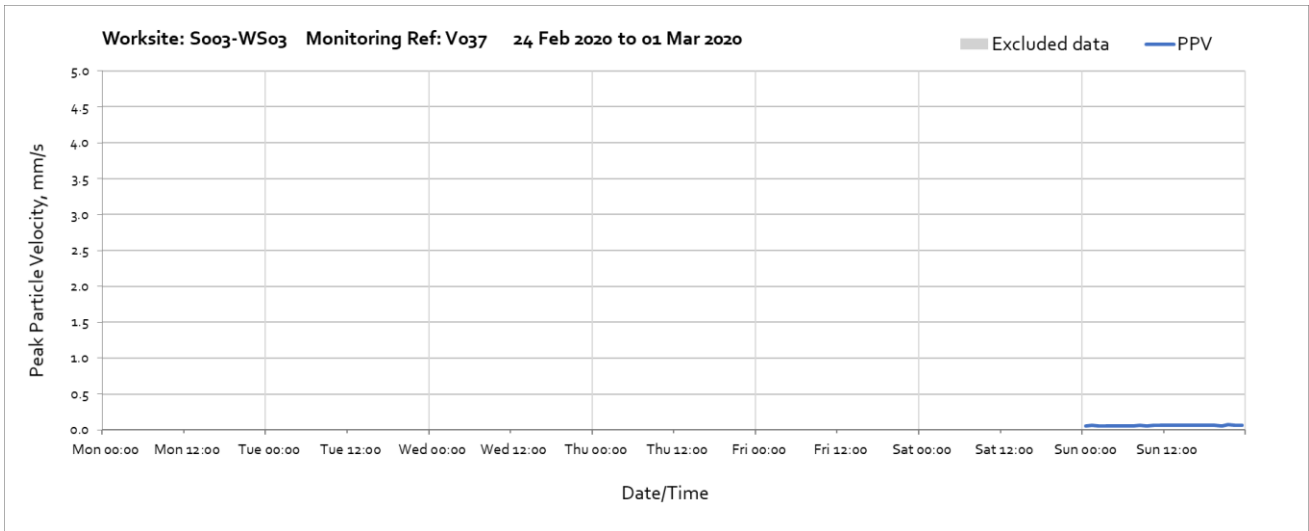
## Worksite: S003-WS03 – Monitoring Ref: V002

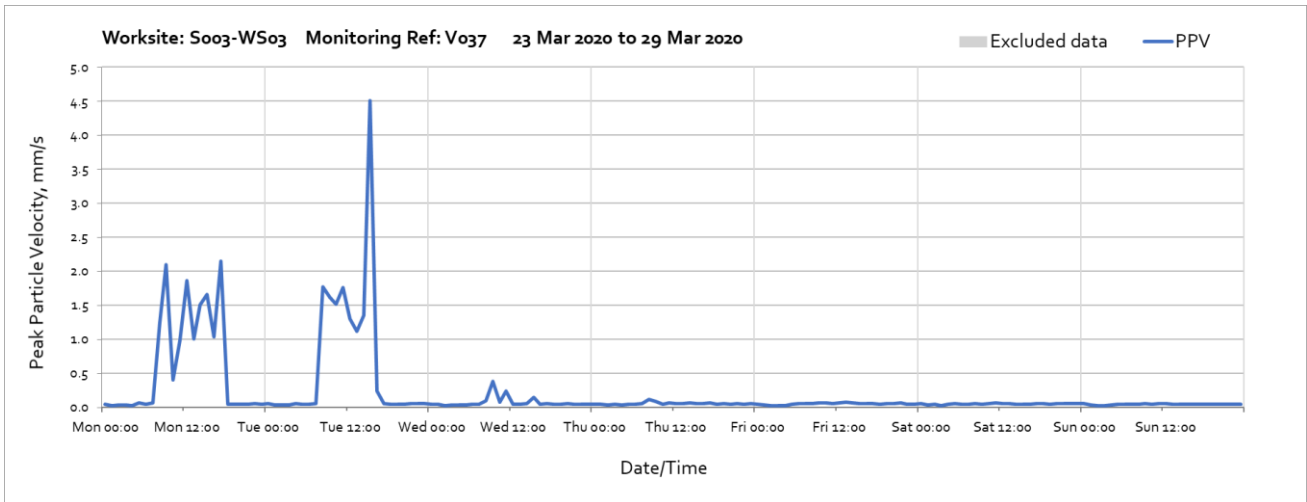
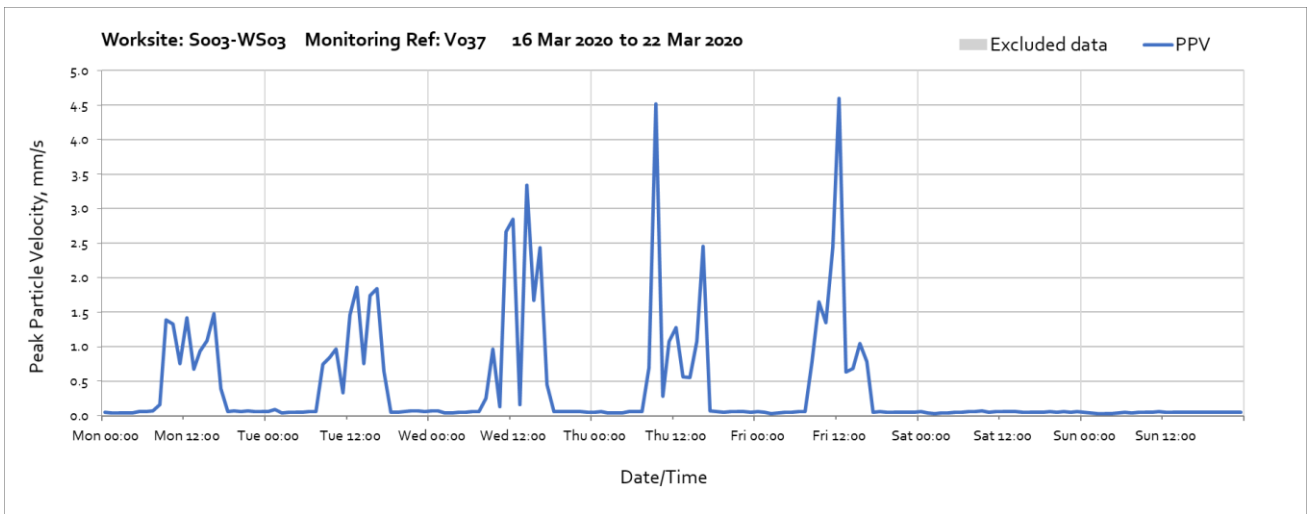
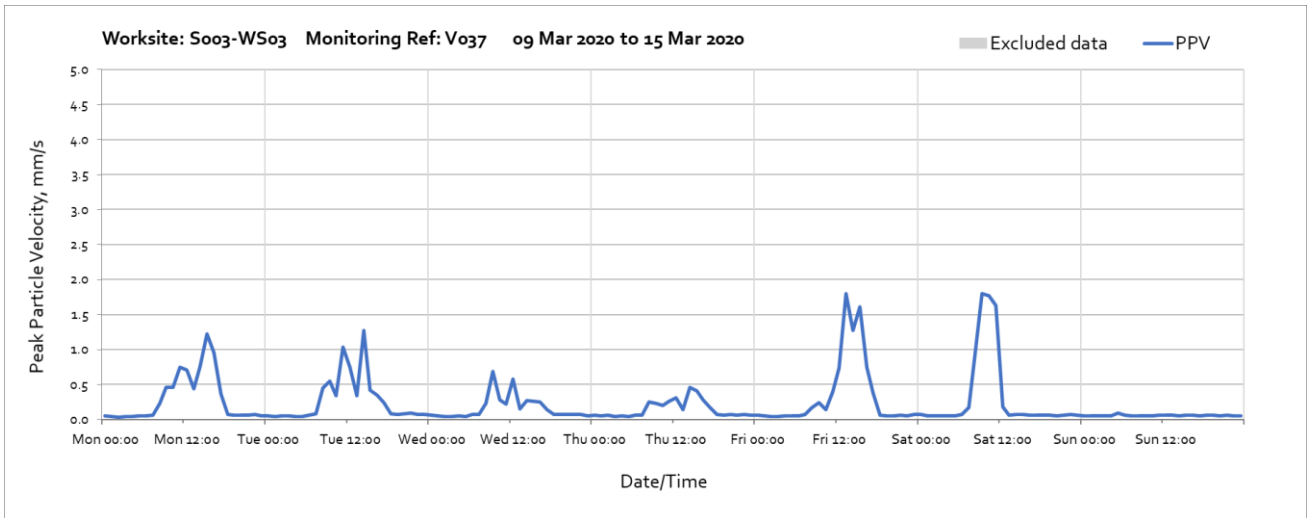


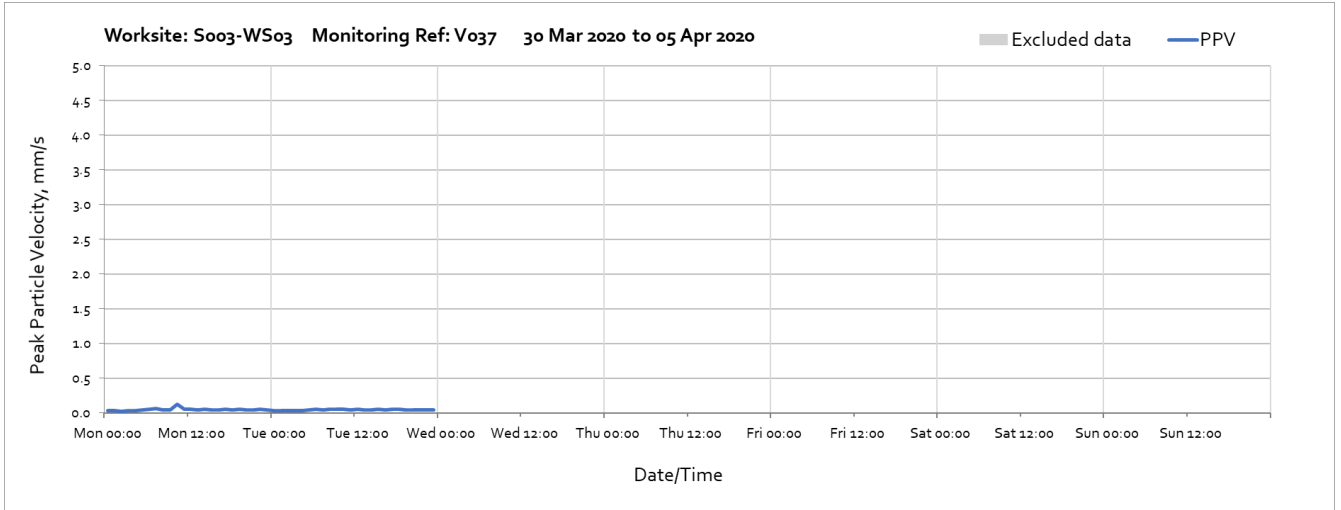




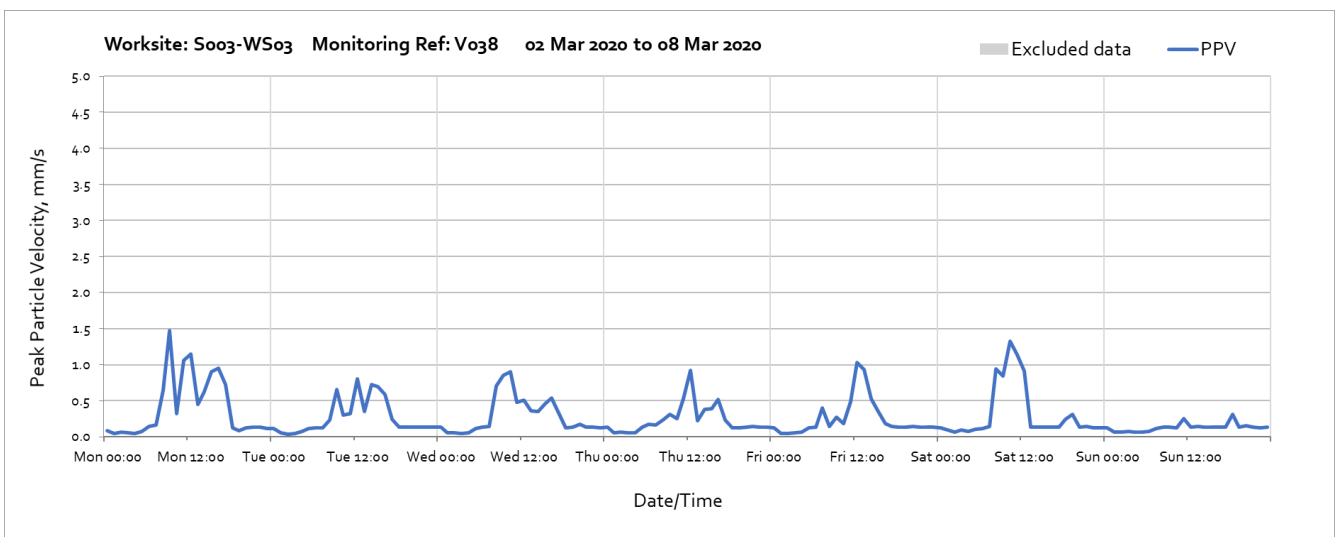
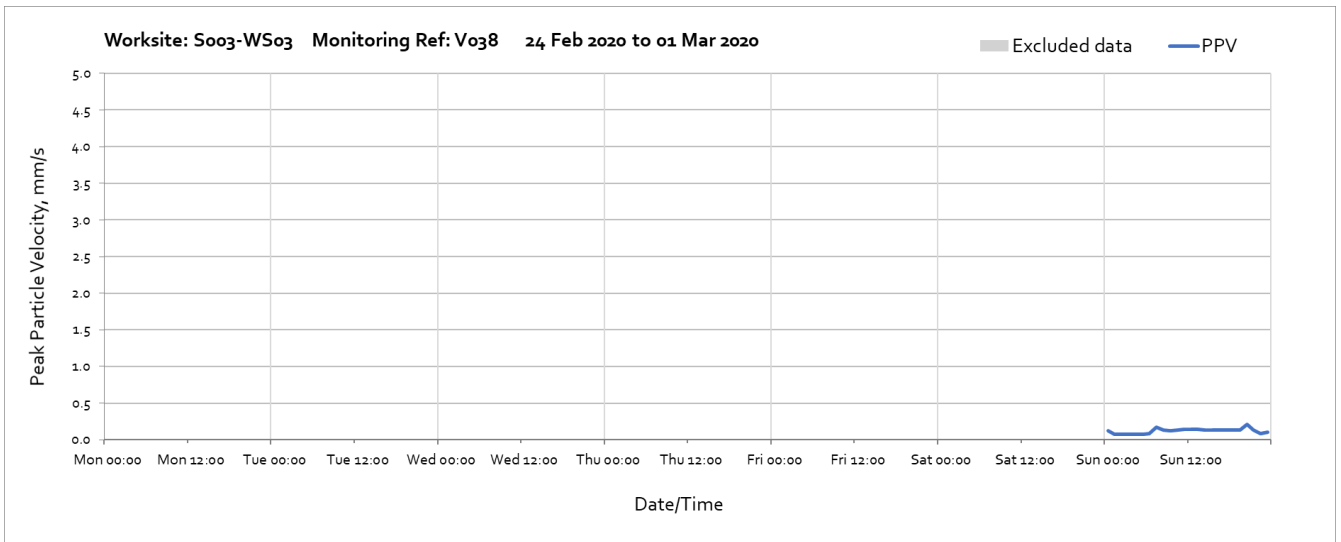
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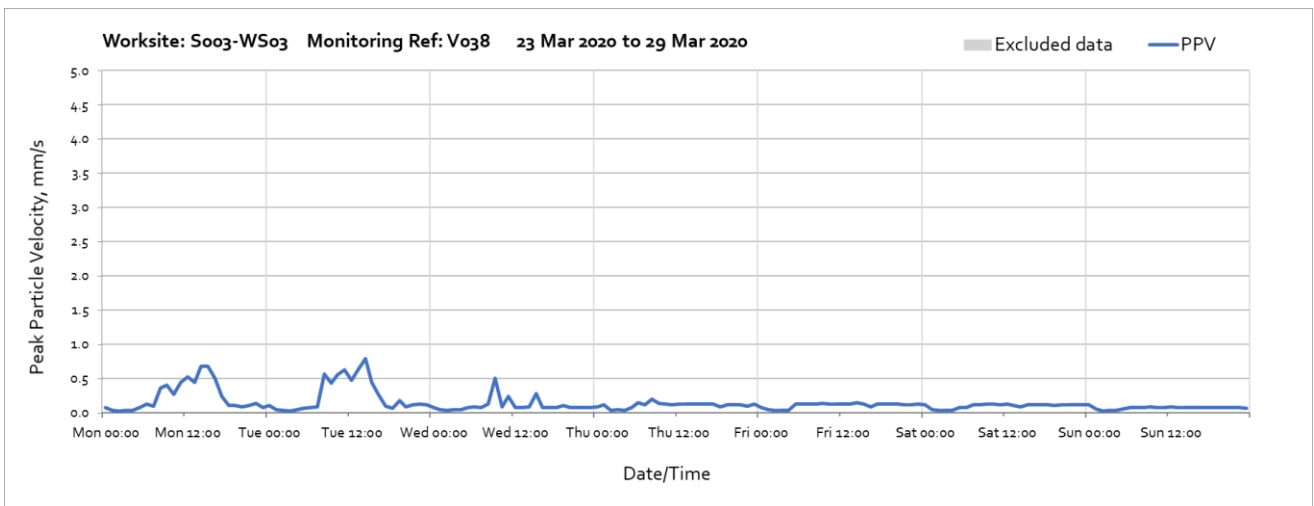
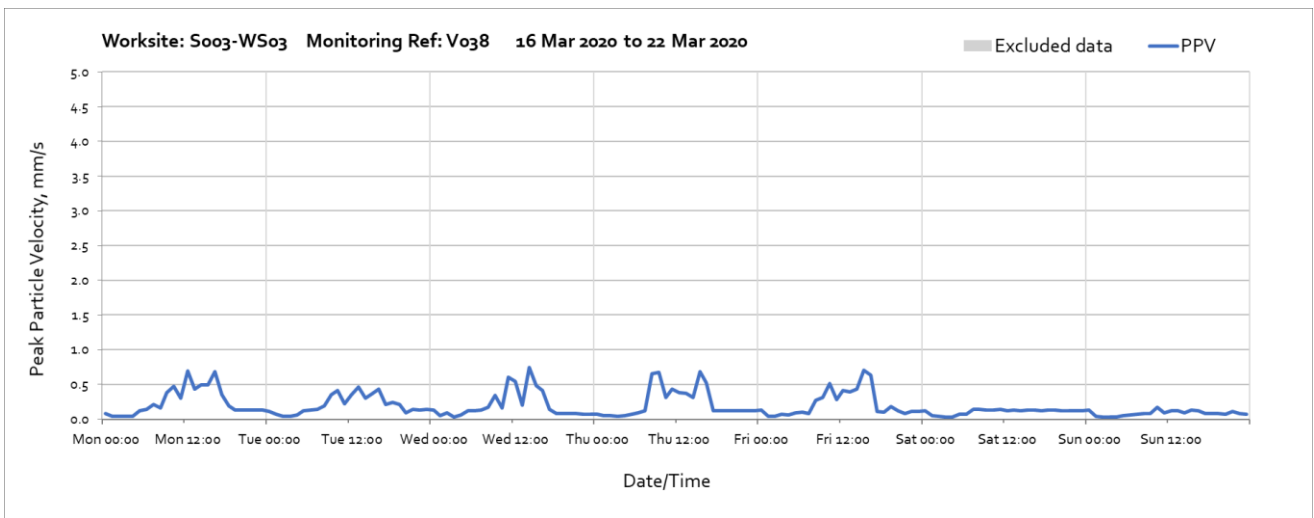
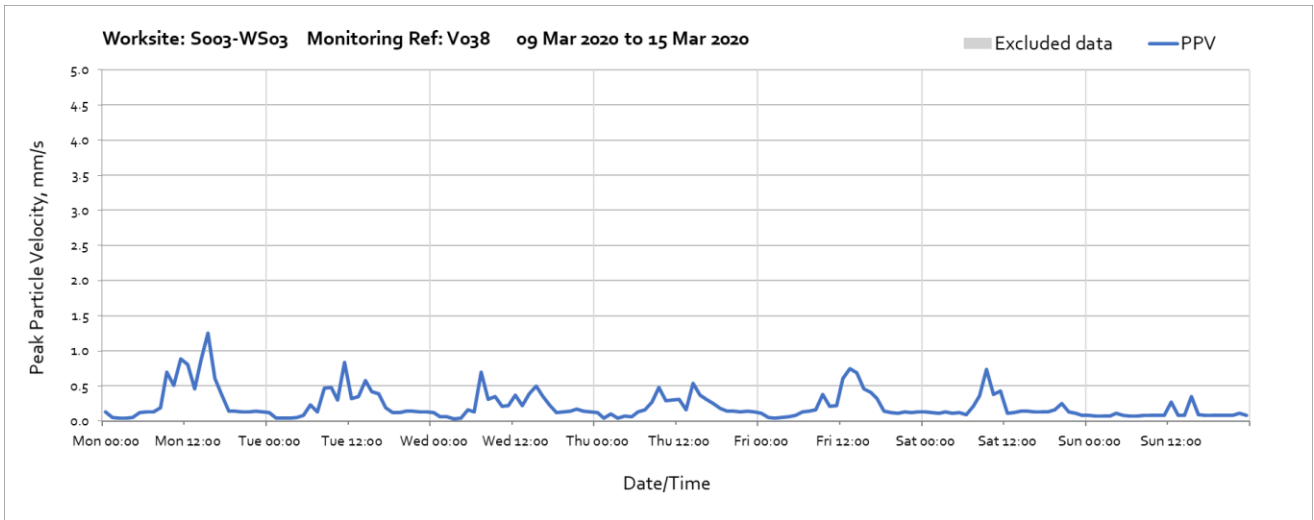


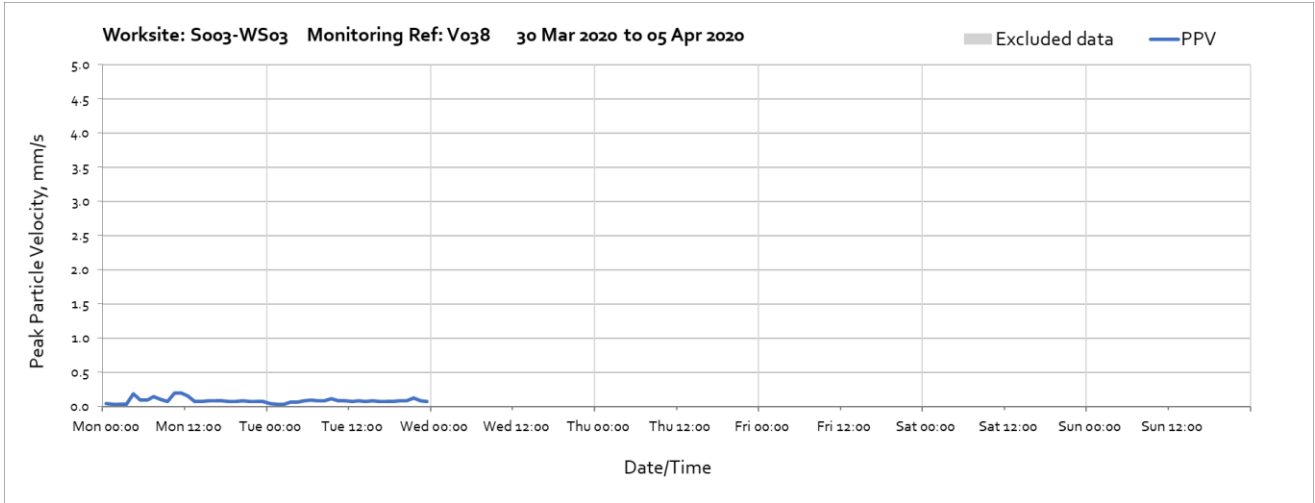




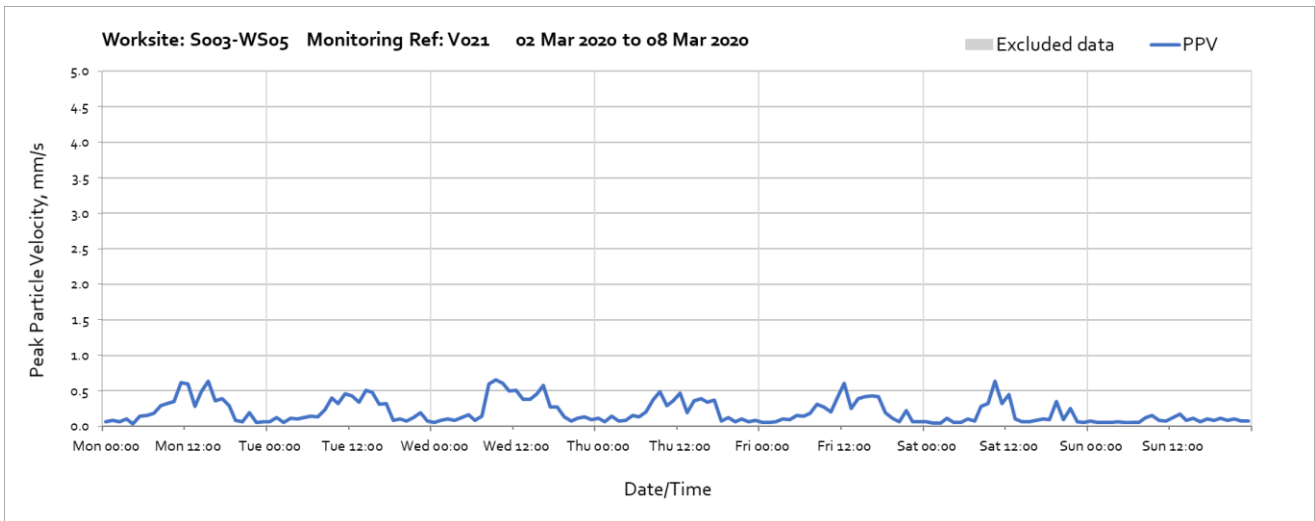
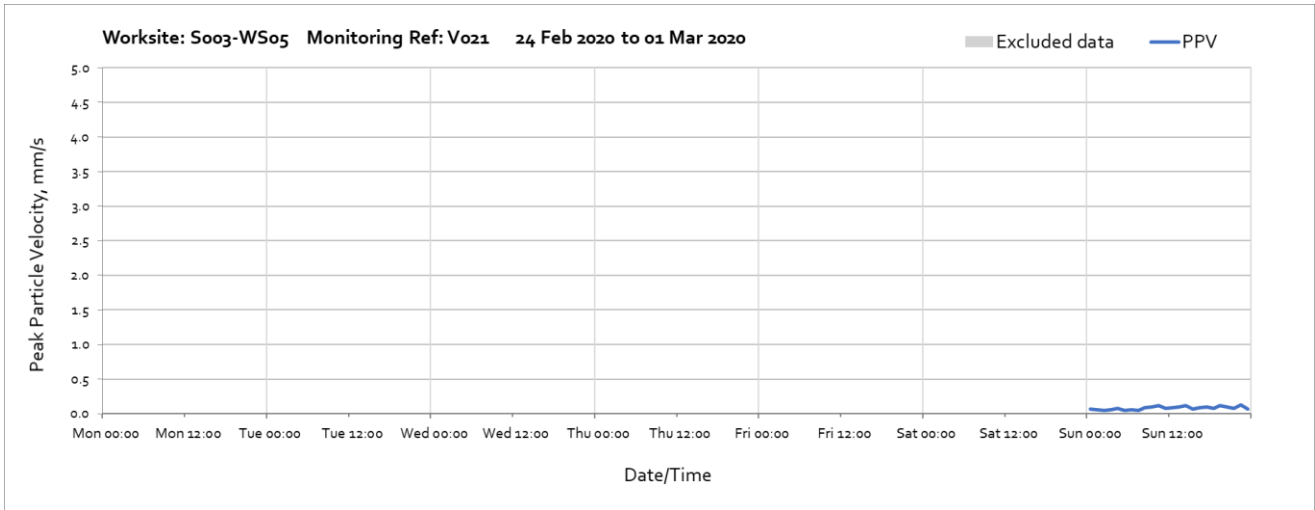
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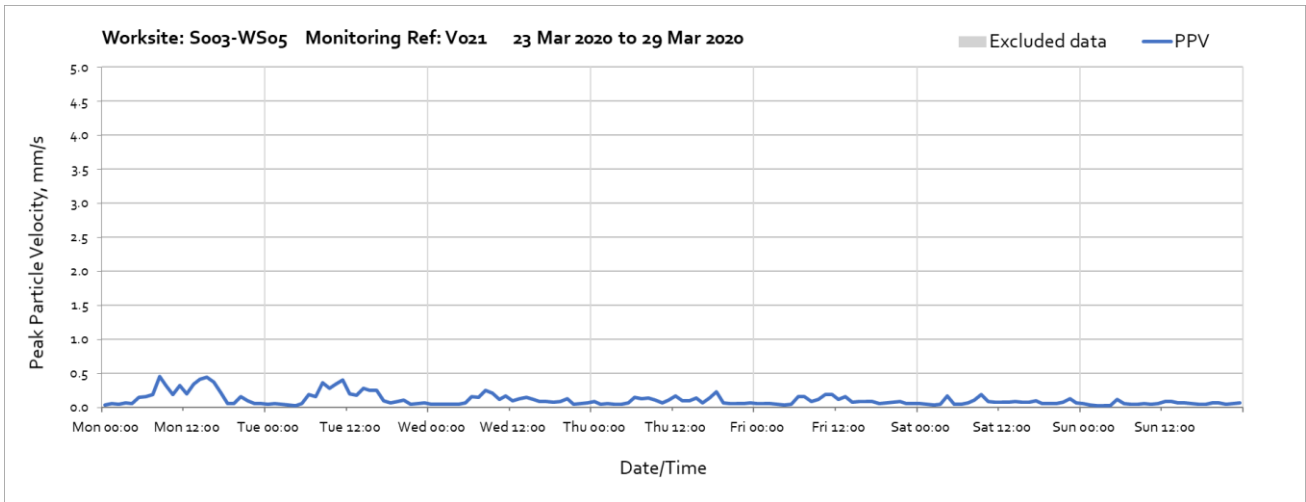
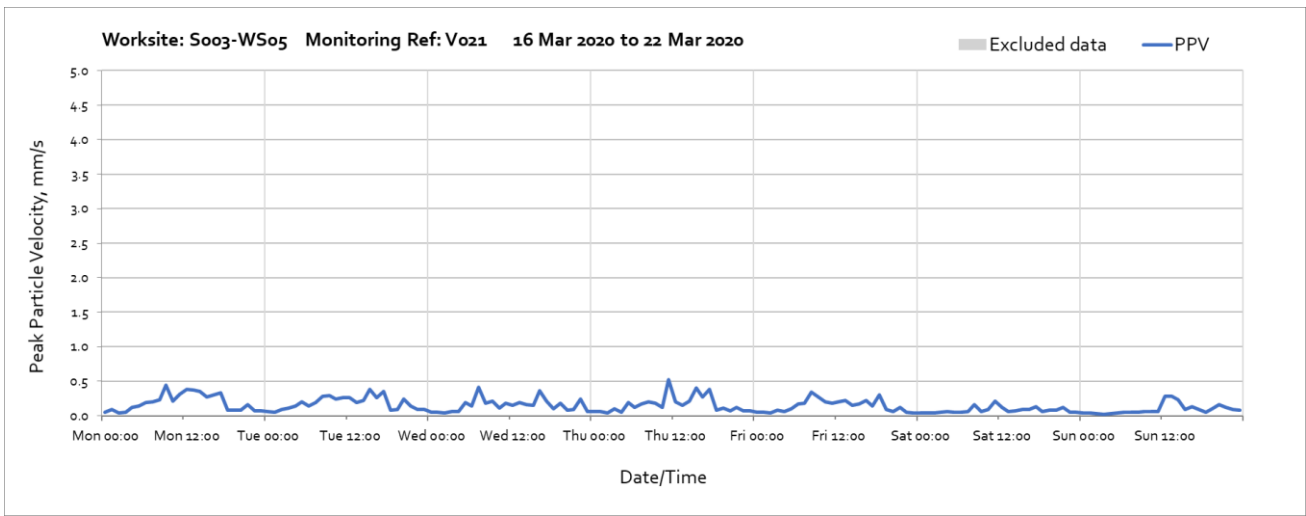
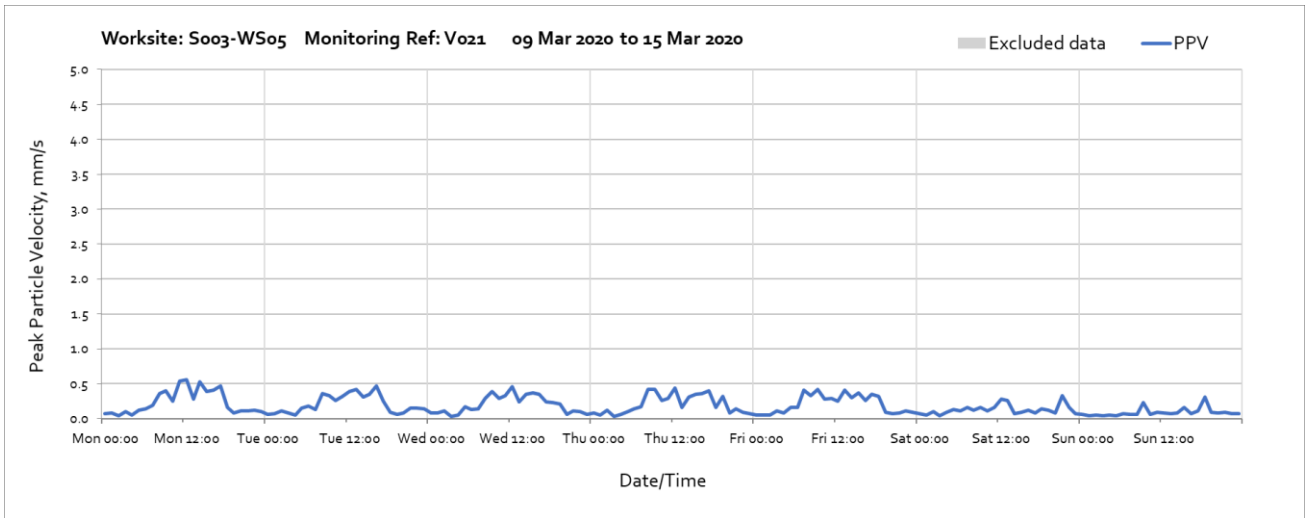




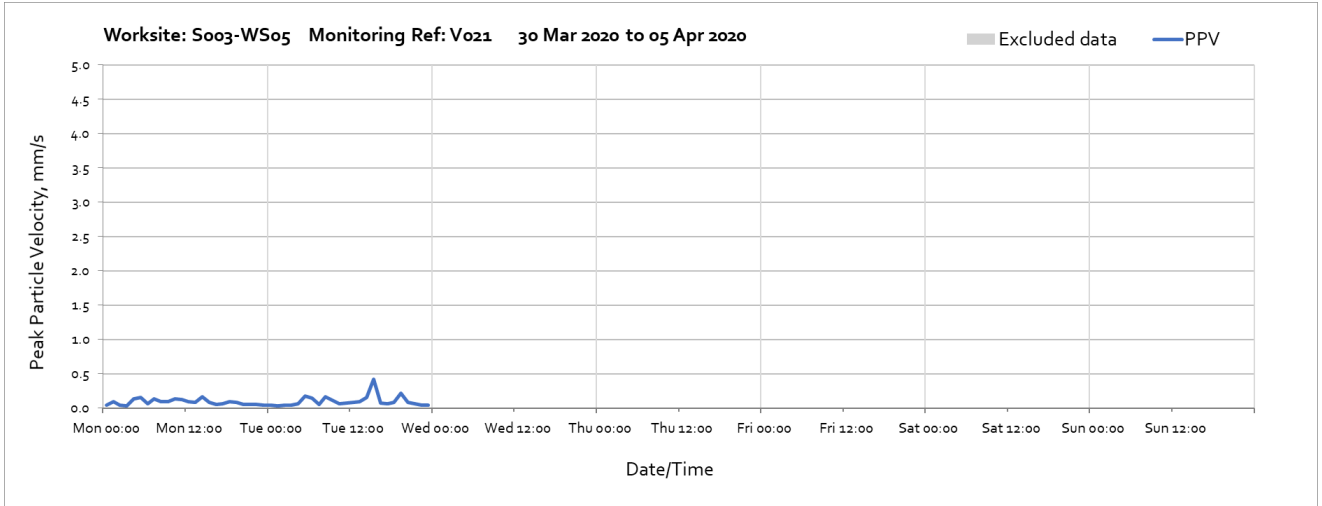


## Worksite: S003-WS05 – Monitoring Ref: V021









## Worksite: S003-WS09 – Monitoring Ref: V003

