

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

**London Borough of Ealing**

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# 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 Ealing (LBE) during the month of February 2020.

The report presents data from noise and vibration monitoring installations in the vicinity of Atlas Road worksite (ref.: S001-WS02) where site mobilisation, surveys, plate loading tests, breaking out of kerbs and ground investigations were carried out; Willesden EuroTerminal worksite (ref.: S001-WS03) where main activities included installation of barriers and walkways, plate loading tests, cabling and drainage works; Victoria Road worksite (ref.: S002-WS01) where main activities included movement of lorries and spoil, trial holes, excavations and re-fill, removal of foundations and concrete blocks, installation of wheel wash, installation of ducts, drainage works and cabling; and Old Oak Common depot worksite (ref.: S004-WS01) where groundworks and remediation works were being carried out. Data is also presented from monitoring in the vicinity of Mandeville Road (Badminton Close compound). In proximity to this location utility diversion works were undertaken including saw cutting and breaking of road and road compaction. A new noise monitor was installed in the vicinity of the Victoria Road Main Compound worksite on the 4<sup>th</sup> of February.

Given the nature and location of works currently being undertaken and the high ambient noise in many locations, the measured noise levels are largely dominated by the underlying ambient noise levels, rather than being attributable to construction noise.

The measured noise levels in February did not exceed guideline criteria for significant adverse effects due to HS2 related works at any monitoring location. No exceedances of Section 61 trigger levels due to HS2 related works were measured during the monitoring period. There were also no complaints during the monitoring period.

# 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 $L_{pAeq,T}$	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.
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.
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.
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.
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 Ealing (LBE) for the period 1<sup>st</sup> to 29<sup>th</sup> February 2020.

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

- Atlas Road worksite (ref.: S001-WS02), where works included site mobilisation including delivery of plant and equipment, modifications to the site entrance including to hoarding line, installation of temporary fencing and barriers within the site area, inspections of existing utilities, plate loading tests, breaking out of existing kerbs, surveying and setting out around the site of the new Grand Union Canal Bridge and the site entrance and ground investigations, transformer bay and switchhouse works; and reception pit works;
- Willesden EuroTerminal worksite (ref.: S001-WS03), where works included plate loading tests, installation/relocation of barriers within the site, walkway installation, fencing works in relation to storm events, clearing out existing slot drains, cabling works at existing substation, exchange of site generator, installation of barriers including filling barriers with water to add mass;
- Victoria Road worksite (ref.: S002-WS01), where works included lorry movements, stockpiling of filling materials, delivery arrivals and compliance checks, continuation of CBR testing and testing of spoil for waste classification, excavation in the north-east and south-east corners of the sites followed by laying of geogrid, placement and compaction of fill material to form working platforms, excavation of batter for Bethune road services, removal of concrete foundations and blocks in south-west corner of site, installation of temporary drainage for foul water, delivery, installation

and commissioning of wheel washer, export of spoil from dig area in the southern part of the site, excavation of trial holes for services in the northern part of the site, installation of ducts under the haul road for site services, cabling works on existing substation and installation of cables for site lighting, preparation works for a sewer diversion towards the eastern end of Bethune Road, installation of drainage for site welfare, delivery of new modular cabins for site welfare and briefings and installation, relocation of existing cabins to allow access for cabling works and commencement of excavation in north-west part of the site; and

- Old Oak Common depot worksite (ref.: S004-WS01), where groundworks and remediation works were carried out.

Utility diversion works were undertaken along Mandeville Road including saw cutting of tarmac road, breaking of tarmac and concrete road and compaction of aggregates.

- 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.

## 1.2 Measurement Locations

- 1.2.1 Table 2 summarises the position of noise and vibration monitoring installations within the LBE area in February 2020. A new noise monitor was installed in the vicinity of the Victoria Road compound (worksite S002-WS01) on the 4<sup>th</sup> of February. Maps showing the position of noise and vibration monitoring installations are presented in Appendix B.

Table 2: Monitoring locations

Worksite Reference	Measurement Reference	Address
S001-WS02	N032	Shaftesbury Gardens
	N033	Outside The Collective, Atlas Road / Victoria Road
S001-WS03	N034	Stephenson Street (north)
	N035	Stephenson Street (south)
	N041	Junction of Stephenson Street / Goodhall Street
S002-WS01	N029	Braitrim House, Victoria Road
	N030	Boden House Car Park
	N031	School Road, outside Acton Business Centre
	N049	Victoria Road Main Compound, North Acton
S004-WS01	N027	Old Oak Common Lane
	N028	Old Oak Common Lane, Hilltop Works

Worksite Reference	Measurement Reference	Address
	V045	Old Oak Common Lane
BC compound	N040	Badminton Close

## 2 Summary of results

### 2.1 Exceedances of SOAEL

- 2.1.1 The significant observed adverse effect level (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. For this monitoring period no exceedances of the SOAEL were recorded.

Table 3: Summary of exceedances of SOAEL

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of SOAEL
S001-WS02	N032	Shaftesbury Gardens	All days	All periods	No exceedance
	N033	Outside The Collective, Atlas Road / Victoria Road	All days	All periods	No exceedance
S001-WS03	N034	Stephenson Street (north)	All days	All periods	No exceedance
	N035	Stephenson Street (south)	All days	All periods	No exceedance
	N041	Junction of Stephenson Street / Goodhall Street	All days	All periods	No exceedance
S002-WS01	N029	Braitrim House, Victoria Road	All days	All periods	No exceedance

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of SOAEL
	N030	Bodens Car Park	All days	All periods	No exceedance
	N031	School Road, outside Acton Business Centre	All days	All periods	No exceedance
	N049	Victoria Road Compound	All days	All periods	No exceedance
S004-WS01	N027	Old Oak Common Lane	All days	All periods	No exceedance
	N028	Old Oak Common Lane, Hilltop Works	All days	All periods	No exceedance
BC compound	N040	Badminton Close	All days	All periods	No exceedance

2.1.4 Monitoring of vibration peak particle velocity (PPV) was undertaken with the purpose to ensure construction generated vibration levels were below those with potential to damage adjacent buildings, in accordance with Annex 1: Code of Construction Practice of the High Speed Rail (London-West Midlands) Environmental Minimum Requirements. There are no LOAEL and SOAEL criteria based on PPV applicable to HS2 construction vibration.

## 2.2 Summary of measured noise levels

2.2.1 Table 4 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 Appendix C presents graphs of the noise monitoring data over the month for each of the measurement locations. Data presented includes 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). 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>.

2.2.3 Given the nature and location of works currently being undertaken at worksites in LBE, the measured noise levels are largely dominated by the underlying ambient noise levels rather than being attributable to HS2 related construction noise. However, breaking out of kerbs along with other HS2 works, will have given rise to audible noise beyond the site boundary from time to time.



Table 4: Summary of measured dB L<sub>Aeq</sub> data over the monitoring period

Worksite Reference	Measurement Reference	Site 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
S001-WS02	N032	Shaftesbury Gardens	Free field	67.2 (69.6)	67.6 (69.1)	66.3 (68.4)	65.1 (67.7)	62.1 (67.8)	64.1 (66.3)	66.7 (67.2)	67.0 (68.4)	66.4 (68.9)	62.6 (64.7)	65.2 (68.0)	61.7 (66.2)
	N033	Outside The Collective, Atlas Road / Victoria Road	Free field	69.5 (73.2)	70.3 (73.4)	68.4 (74.3)	66.3 (69.2)	63.7 (70.2)	65.7 (68.1)	69.1 (72.0)	69.9 (72.4)	69.1 (76.4)	64.2 (67.0)	68.3 (74.5)	65.1 (72.9)
S001-WS03	N034	Stephenson Street (north)	Free field	54.3 (56.7)	57.3 (65.5)	54.0 (57.6)	52.6 (56.3)	50.0 (55.0)	52.5 (54.4)	54.8 (56.8)	55.1 (57.2)	54.7 (60.0)	52.0 (58.6)	55.1 (62.8)	50.0 (59.3)
	N035	Stephenson Street (south)	Free field	56.4 (58.3)	57.7 (65.6)	53.1 (59.8)	52.2 (57.0)	50.9 (57.9)	56.5 (60.7)	55.8 (58.4)	54.4 (56.7)	53.9 (59.4)	52.7 (58.6)	55.4 (63.1)	51.2 (58.4)
	N041	Junction of Stephenson Street / Goodhall Street	Free field	57.0 (61.5)	61.1 (73.3)	55.5 (58.2)	54.7 (62.1)	51.3 (59.0)	53.8 (56.2)	57.2 (58.0)	58.9 (64.5)	56.5 (62.9)	52.8 (56.9)	56.9 (62.1)	52.3 (60.7)
S002-WS01	N029	Braitrim House, Victoria Road	Free field	55.0 (60.8)	59.4 (62.9)	54.9 (66.1)	56.5 (66.4)	54.5 (71.8)	54.1 (55.9)	56.5 (58.5)	57.7 (60.2)	56.0 (62.4)	53.9 (60.5)	56.5 (63.8)	52.9 (59.7)
	N030	Bodens car park	Free field	59.8 (63.5)	63.7 (69.5)	56.8 (60.1)	56.1 (58.4)	54.2 (59.1)	57.1 (58.7)	58.4 (59.9)	62.2 (71.7)	58.4 (63.9)	57.0 (64.7)	59.5 (70.2)	55.3 (63.9)
	N031	School Road, outside Acton Business Centre	Free field	64.0 (66.6)	67.4 (72.4)	64.2 (67.4)	61.2 (65.5)	58.2 (65.8)	60.8 (62.7)	63.9 (66.0)	65.6 (67.6)	64.0 (68.9)	58.3 (62.1)	63.8 (69.4)	59.8 (66.9)
	N049	Victoria Road Compound	Free field	56.9 (63.2)	60.8 (62.9)	56.0 (59.8)	56.6 (63.2)	56.3 (68.6)	55.1 (56.9)	57.5 (61.3)	58.1 (61.1)	56.6 (60.8)	55.7 (60.0)	58.3 (65.7)	55.1 (60.8)

Worksite Reference	Measurement Reference	Site 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
S004-WS01	N027	Old Oak Common Lane	Free field	69.1 (71.3)	70.4 (72.0)	68.9 (71.0)	66.9 (69.5)	63.1 (70.2)	65.3 (67.6)	68.4 (69.2)	69.3 (70.2)	68.3 (72.2)	62.9 (65.5)	66.8 (70.2)	62.7 (67.6)
	N028	Old Oak Common Lane, Hilltop Works	Free field	70.1 (72.0)	71.9 (73.7)	70.6 (75.6)	67.8 (70.6)	63.9 (71.6)	66.1 (68.6)	69.4 (69.9)	70.2 (71.2)	69.5 (73.7)	63.9 (66.4)	67.8 (71.4)	64.1 (68.9)
BC compound	N040	Badminton Close	Free field	56.8 (59.5)	57.6 (59.9)	55.8 (58.2)	56.2 (59.9)	54.2 (59.7)	57.4 (58.5)	58.4 (59.5)	58.1 (61.1)	58.1 (62.1)	56.8 (60.6)	59.1 (65.7)	54.8 (59.3)

2.2.4 Table 5 presents a summary of the measured vibration levels at monitoring location V045 over the reporting period. The highest PPV measured during the monitoring along any axis is presented in the table.

Table 5: Summary of measured PPV data over the monitoring period

Worksite Reference	Measurement Reference	Monitor Address	Highest PPV measured in any axis, mm/s
S004-WS01	V045	Old Oak Common Lane	2.68 (X-axis)

## 2.3 Exceedances of trigger level

2.3.1 Table 6 provides a summary of exceedances of the Section 61 trigger noise levels determined to be due to HS2 related construction noise measured during the reporting period, along with the findings of any investigation.

Table 6: 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.

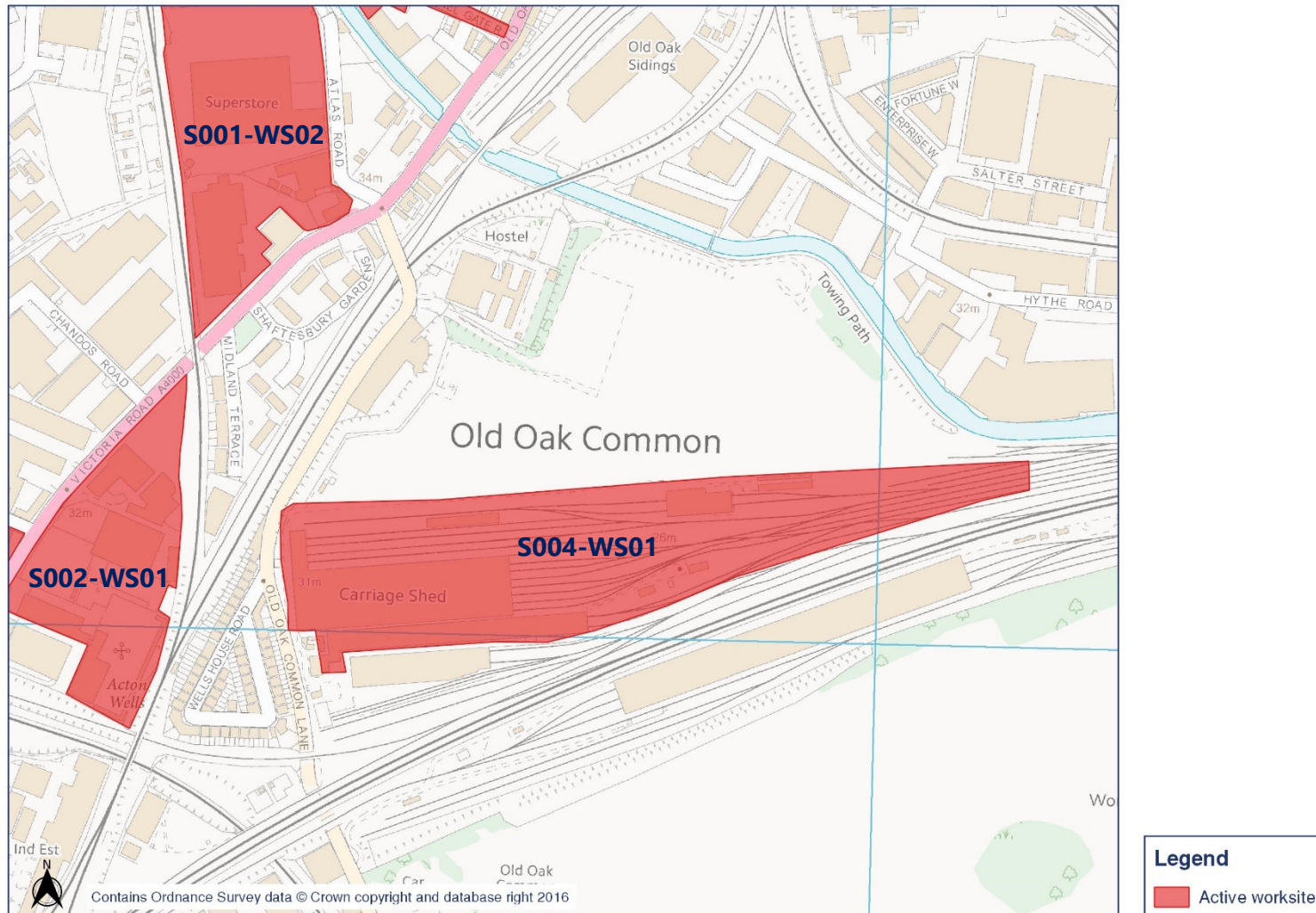
## 2.4 Complaints

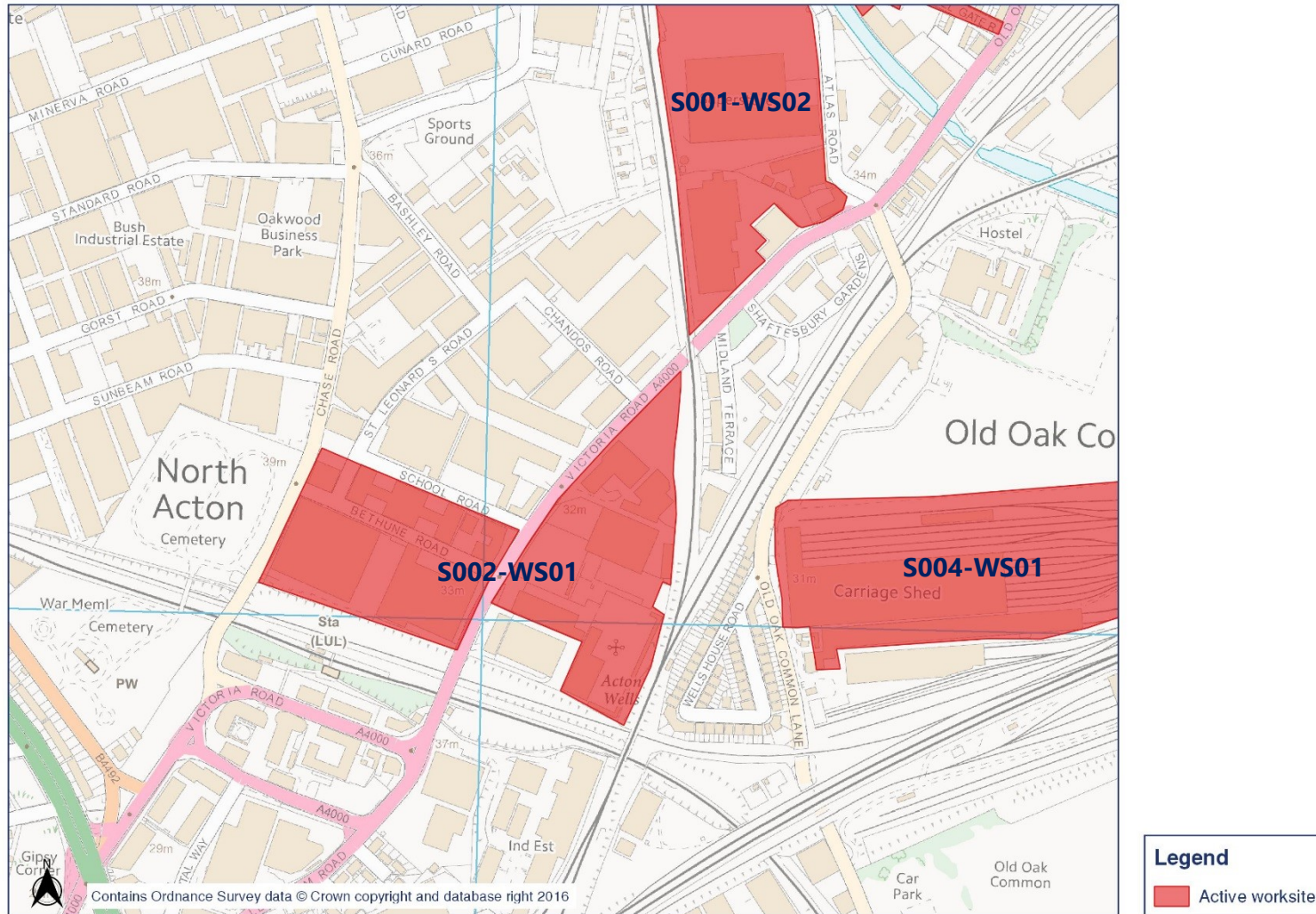
2.4.1 Table 7 provides a summary of complaint information related to noise and vibration received during the reporting period, along with the findings of any investigation. No complaints were received for this monitoring period.

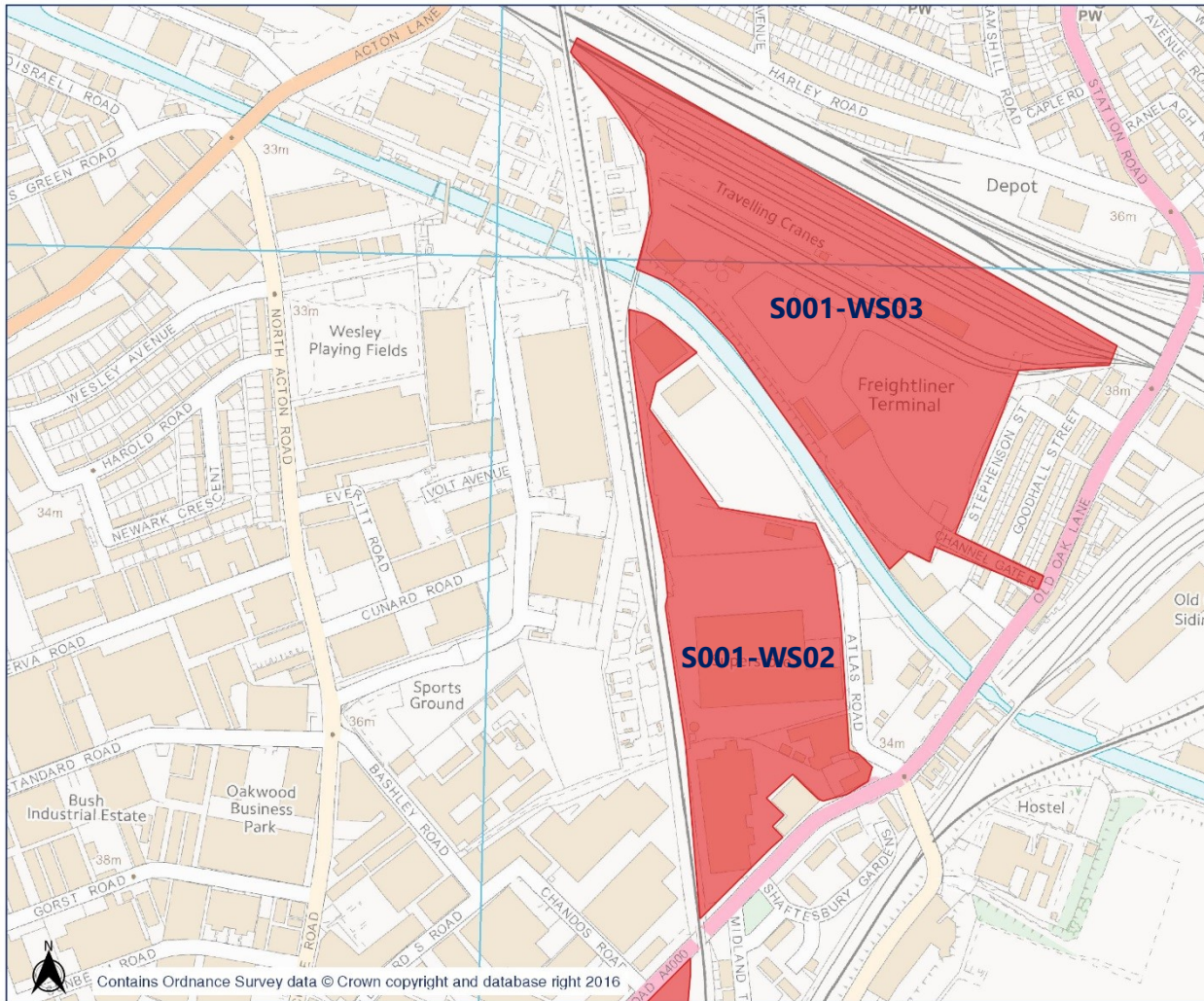
Table 7: Summary of complaints

Complaint reference number	Worksite reference	Description of complaint	Results of investigation	Actions taken
-	-	-	-	-

# Appendix A Site Locations

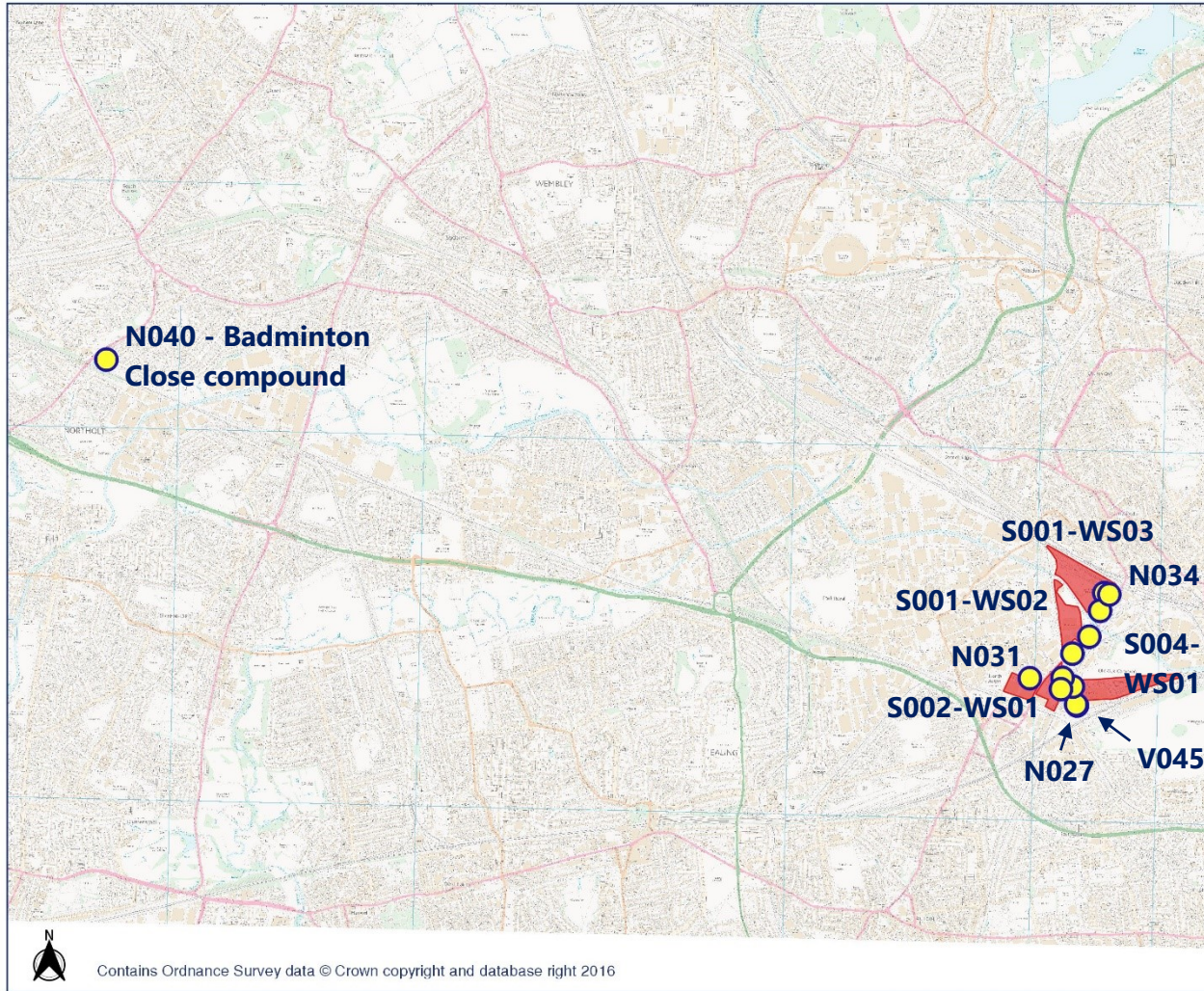


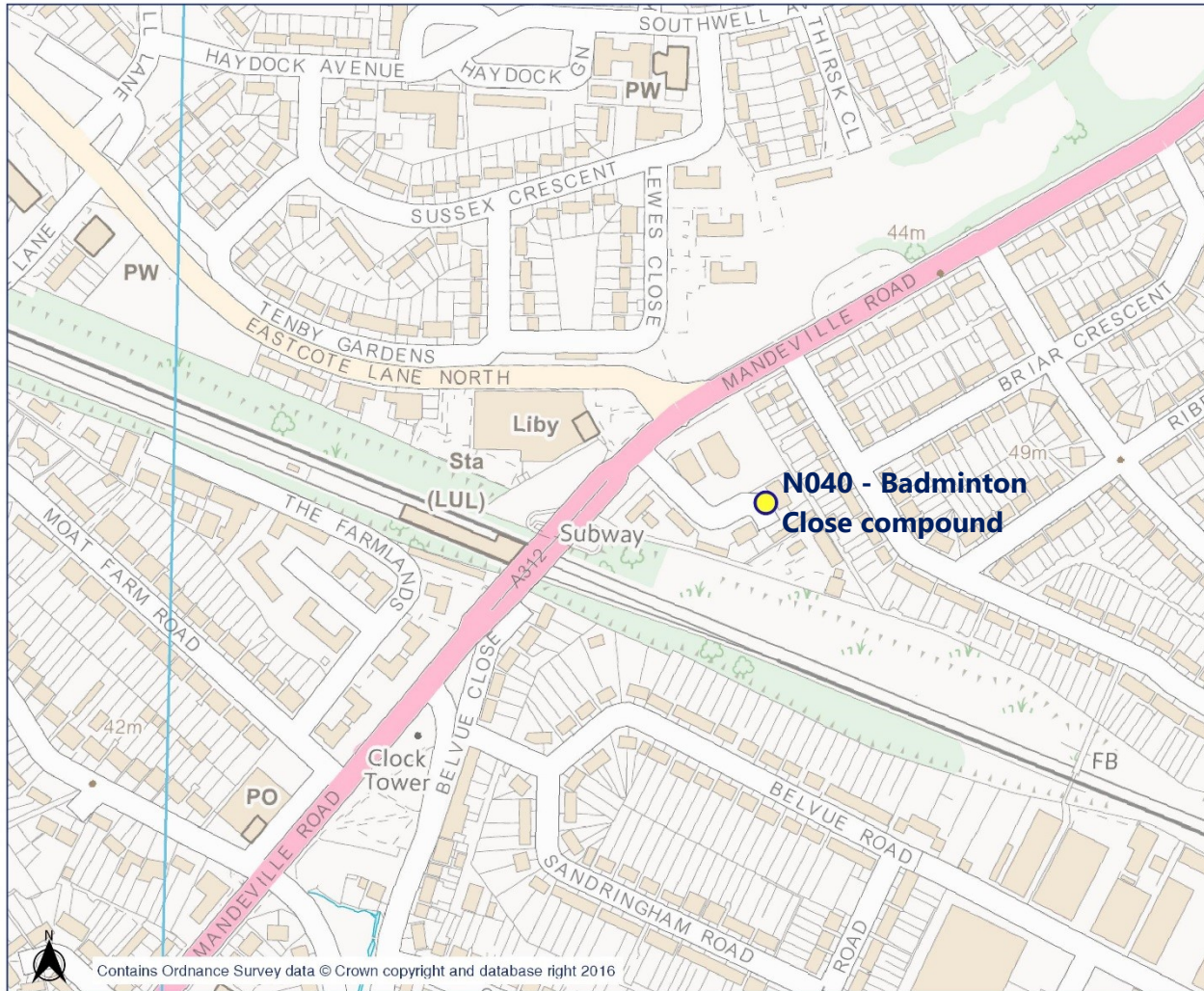




# Appendix B Monitoring Locations

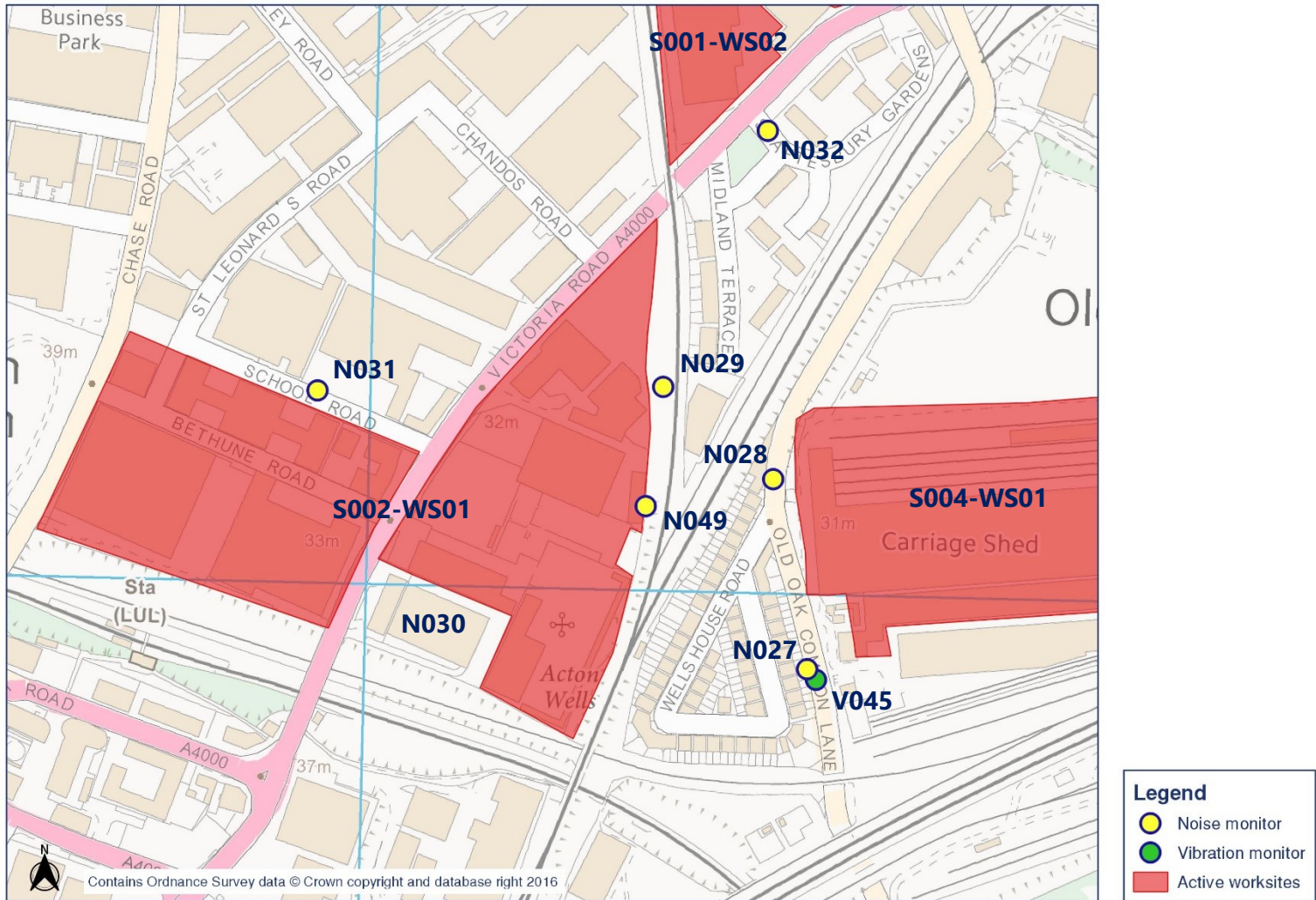


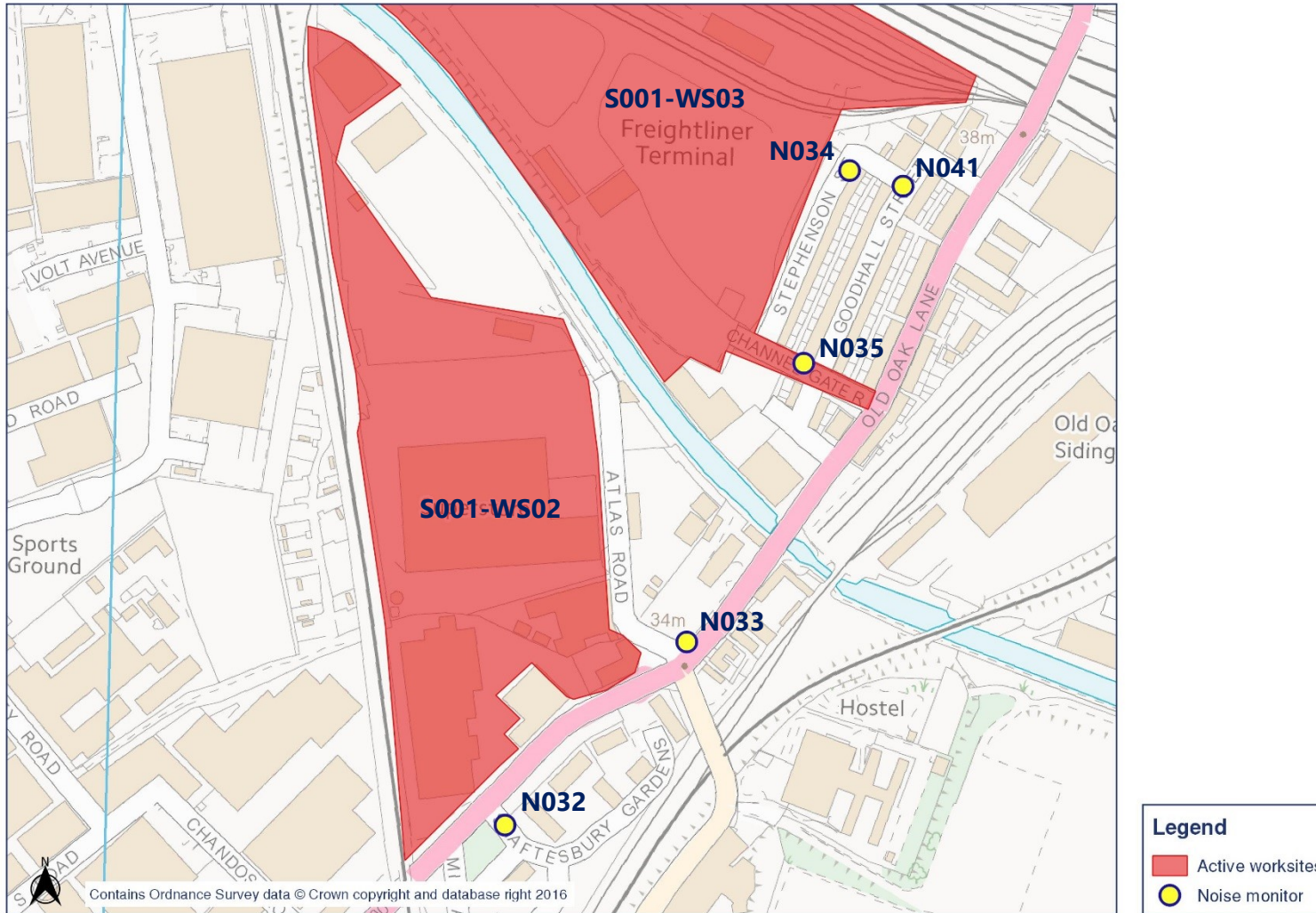




**Legend**

- Active worksites
- Noise monitor

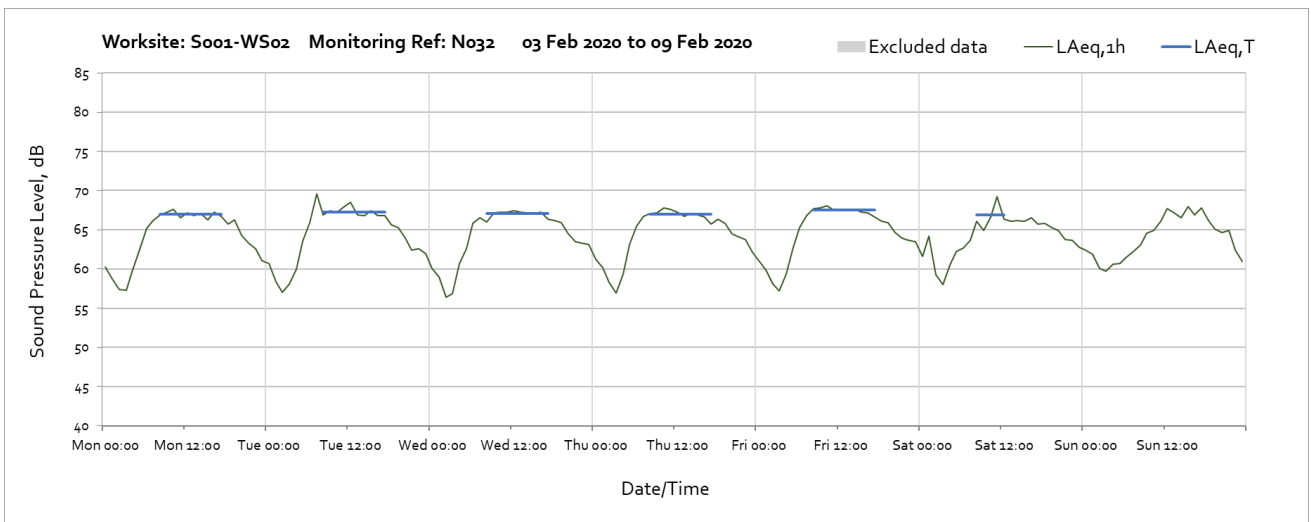
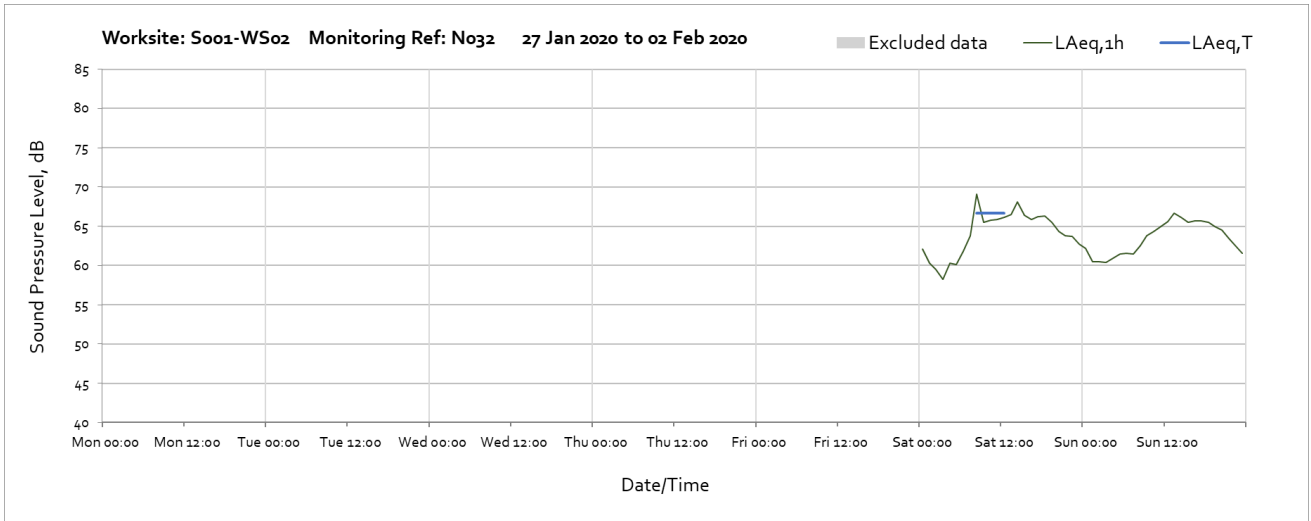


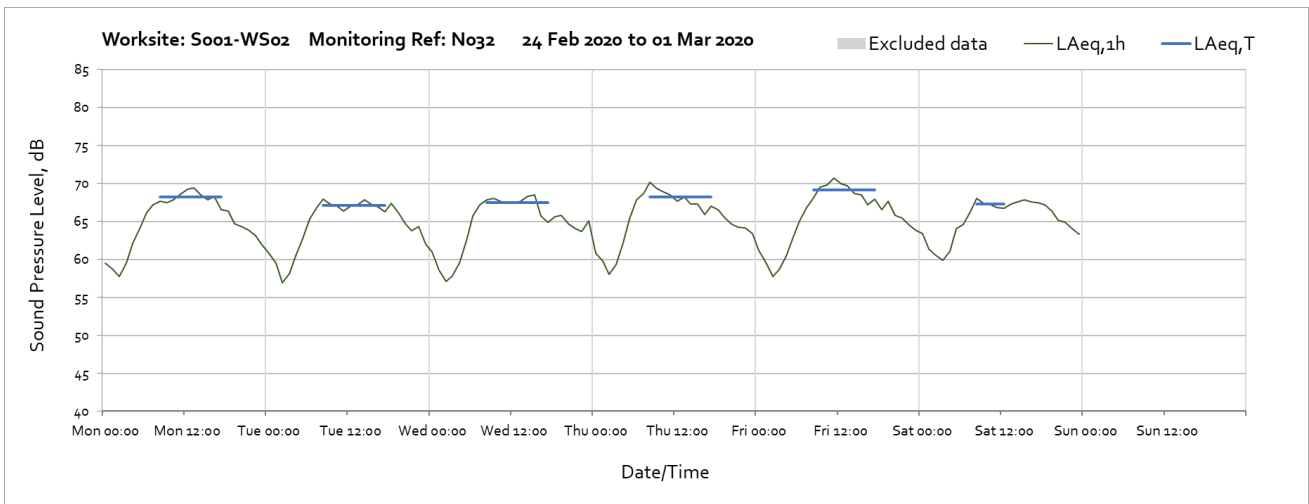
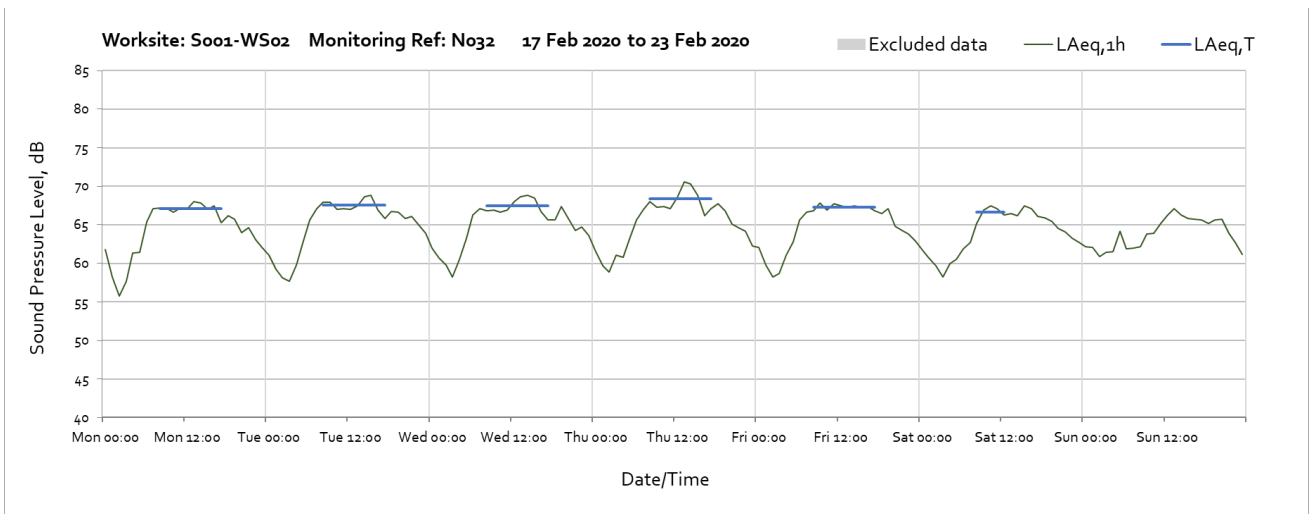
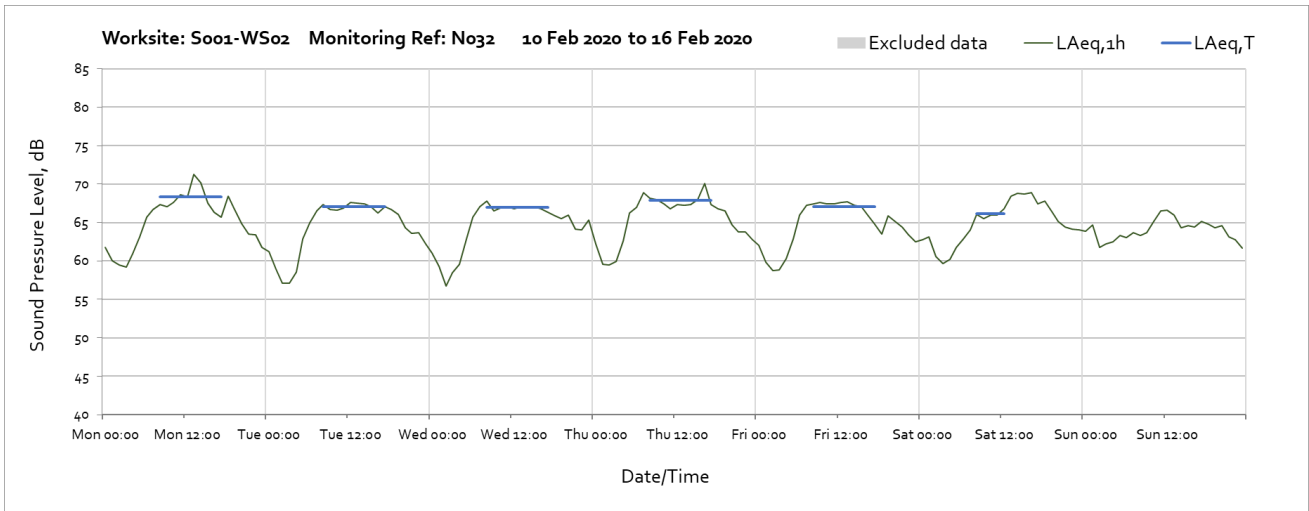


# Appendix C Data

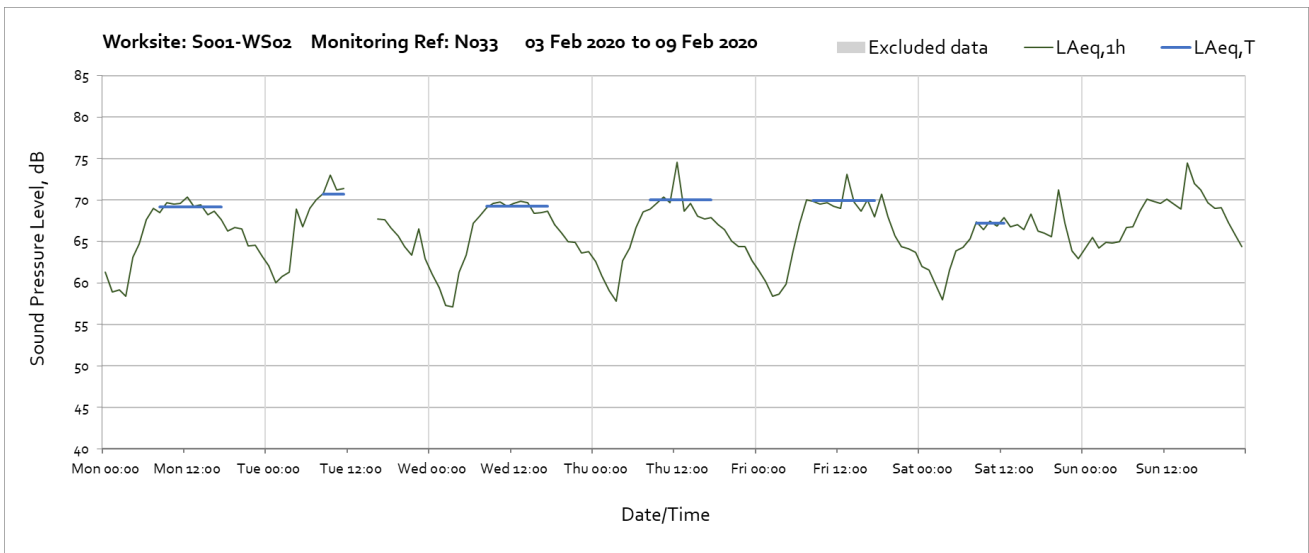
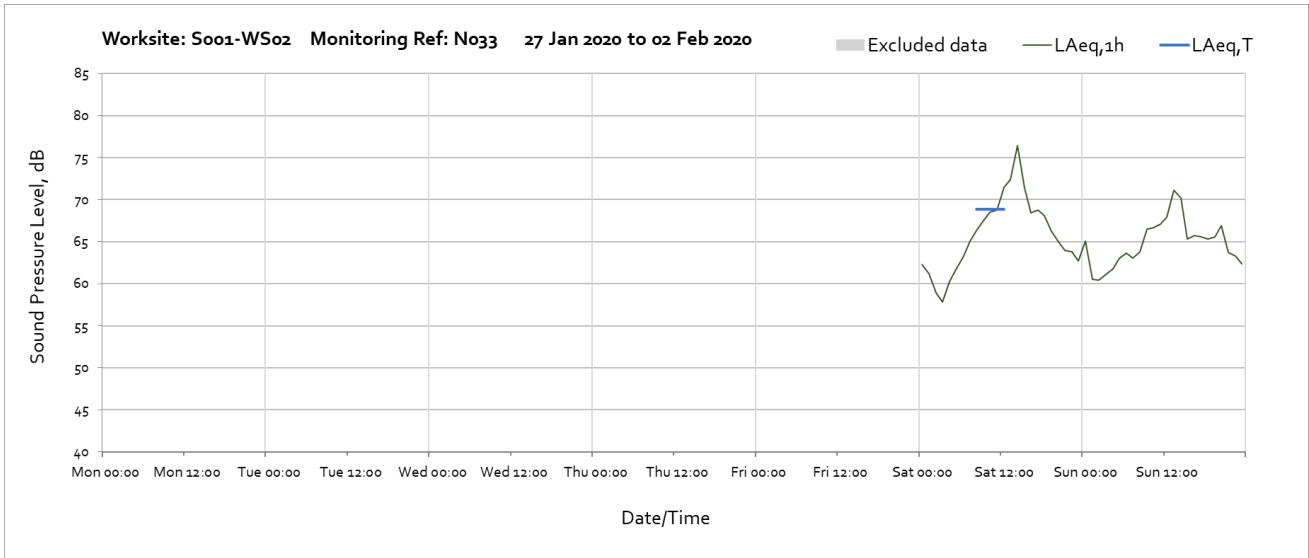
The following graphs show the hourly measured ambient noise level  $L_{Aeq,1h}$  and, where relevant, the averaged noise level  $L_{Aeq,T}$  values, where the time period T is as specified in Table 1 of HS2 Information Paper E23. Periods with adversely weather affected noise levels are greyed out and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

## Worksite: S001-WS02 – Monitoring Ref: N032

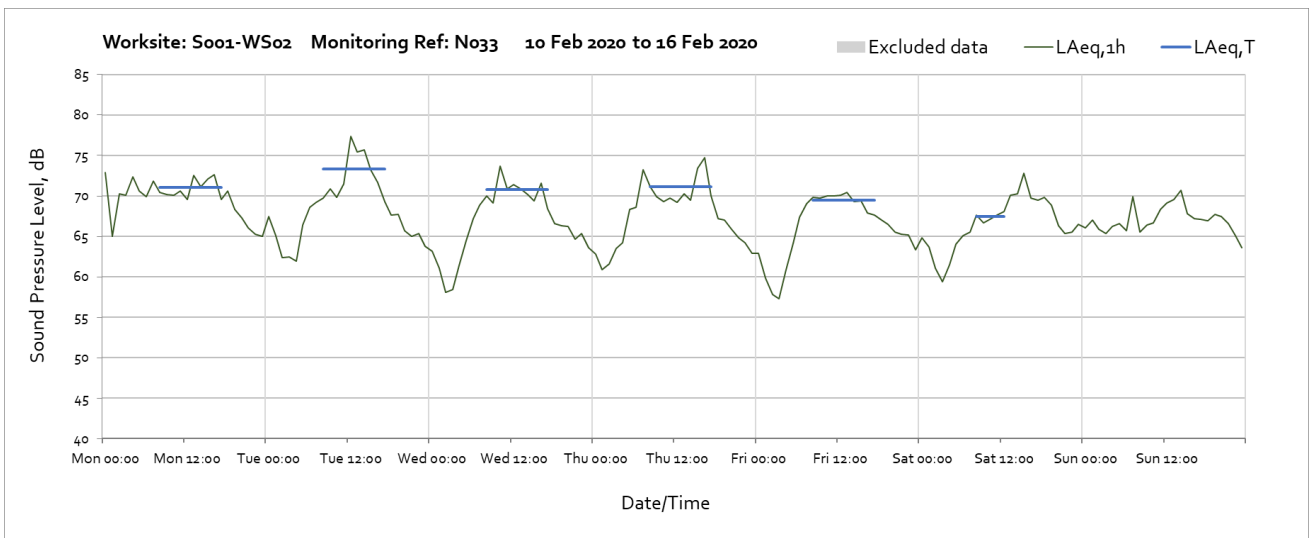


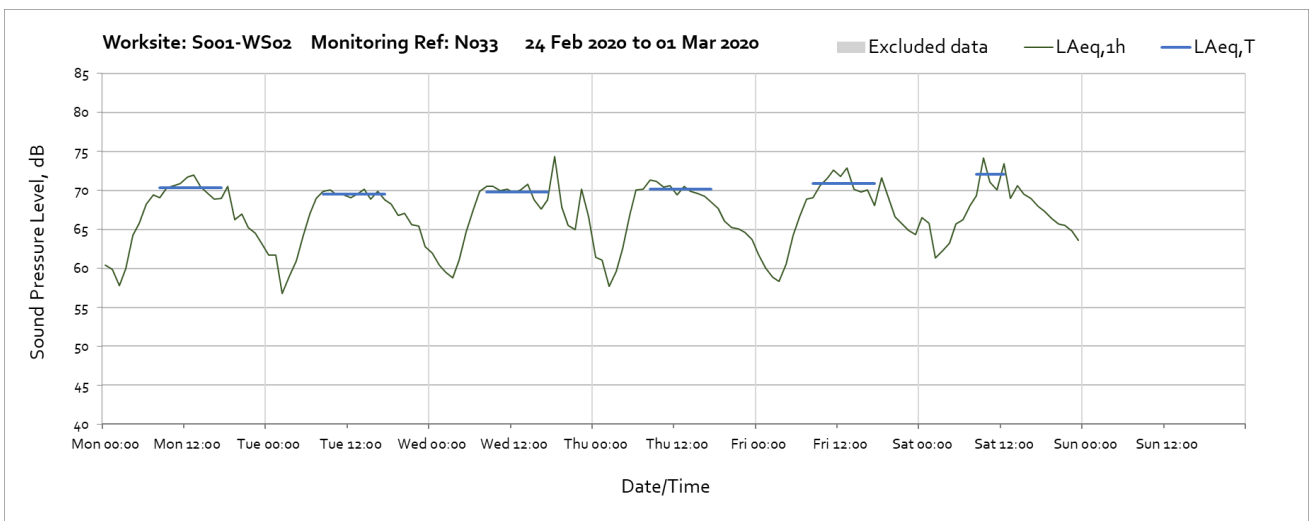
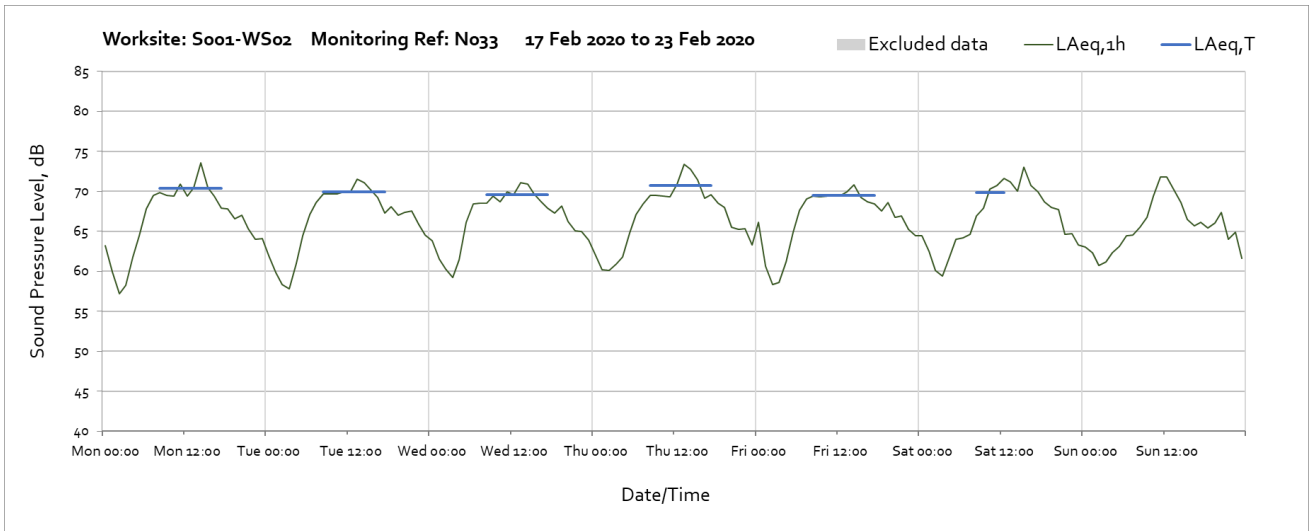


# Worksite: S001-WS02 – Monitoring Ref: N033

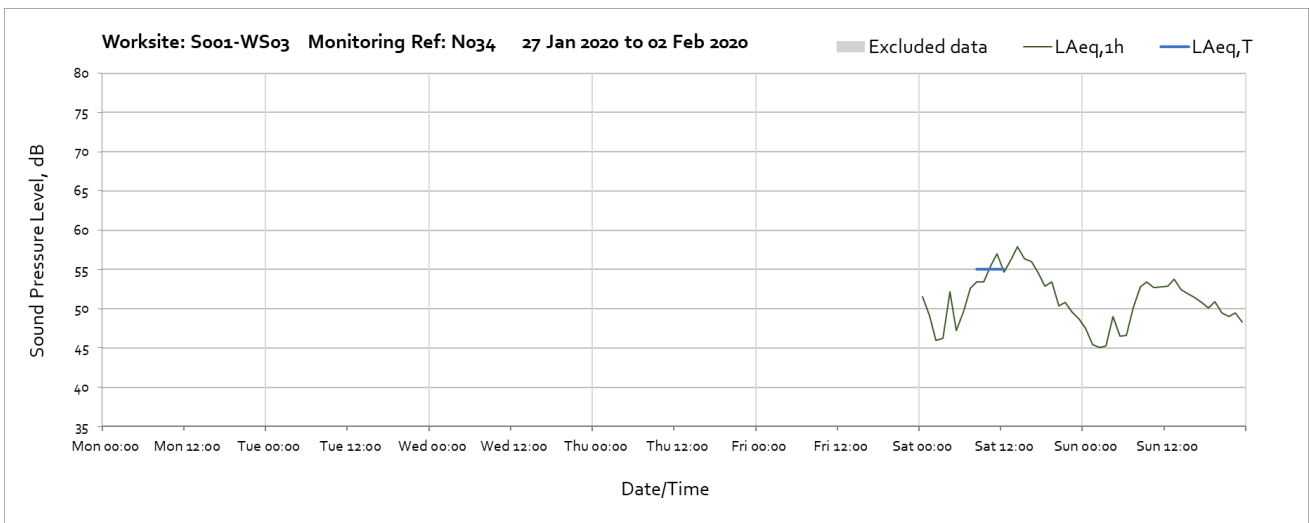


Note: Missing data between 12:00 and 16:00 on Tuesday 4<sup>th</sup> was during a temporary shut down of the monitor for maintenance and calibration.

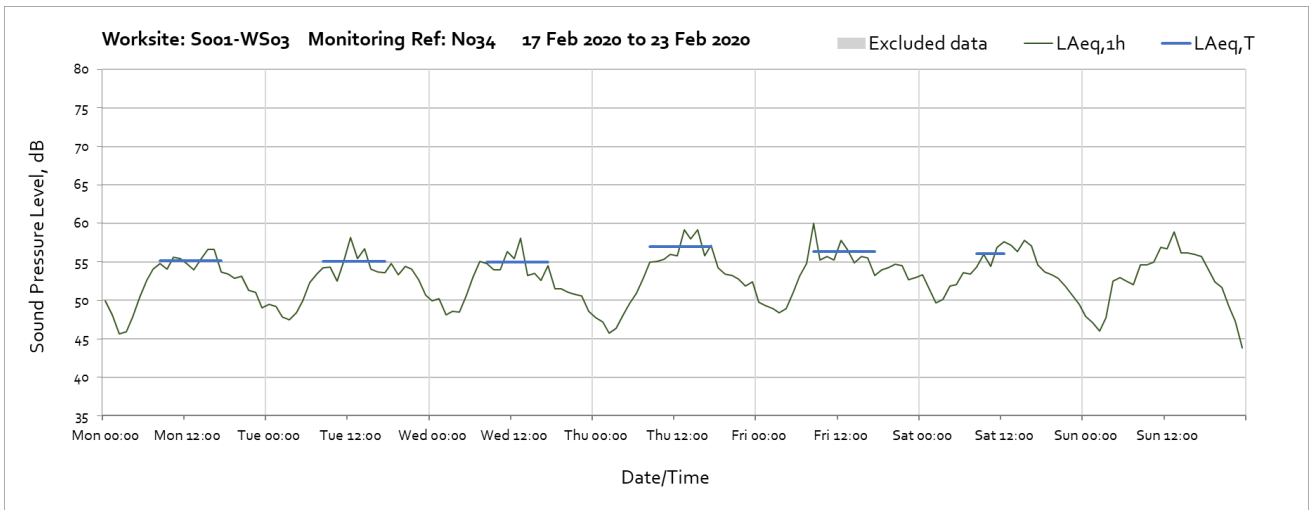
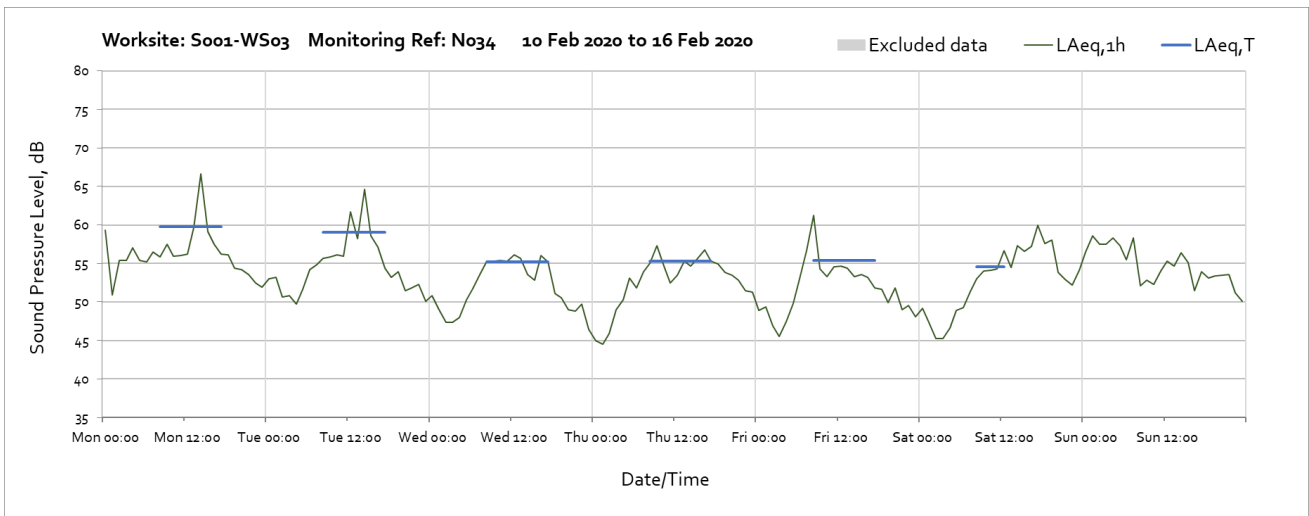
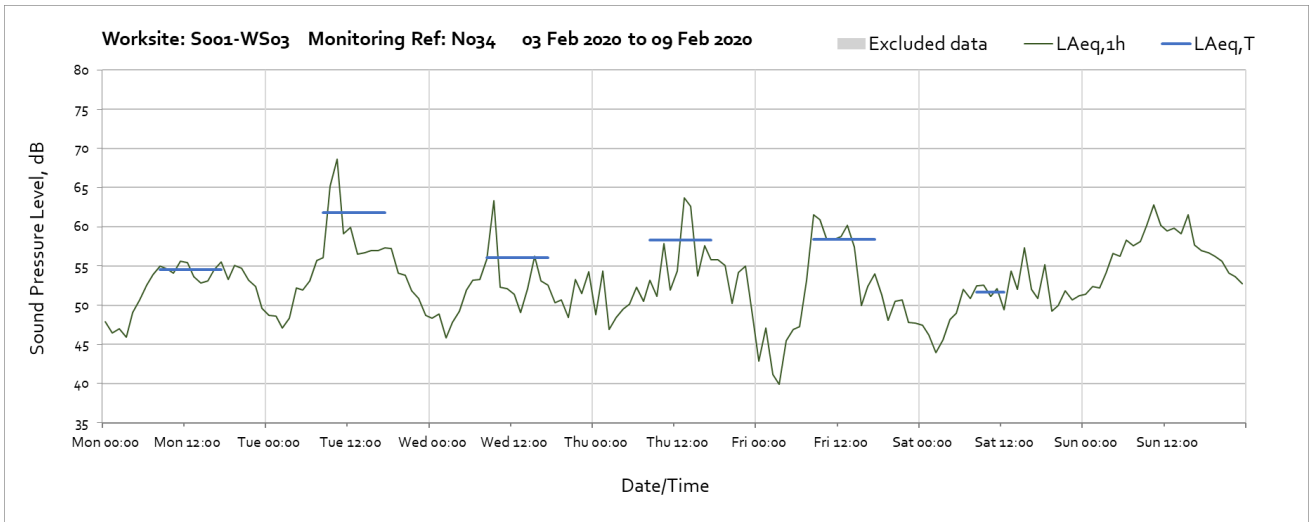


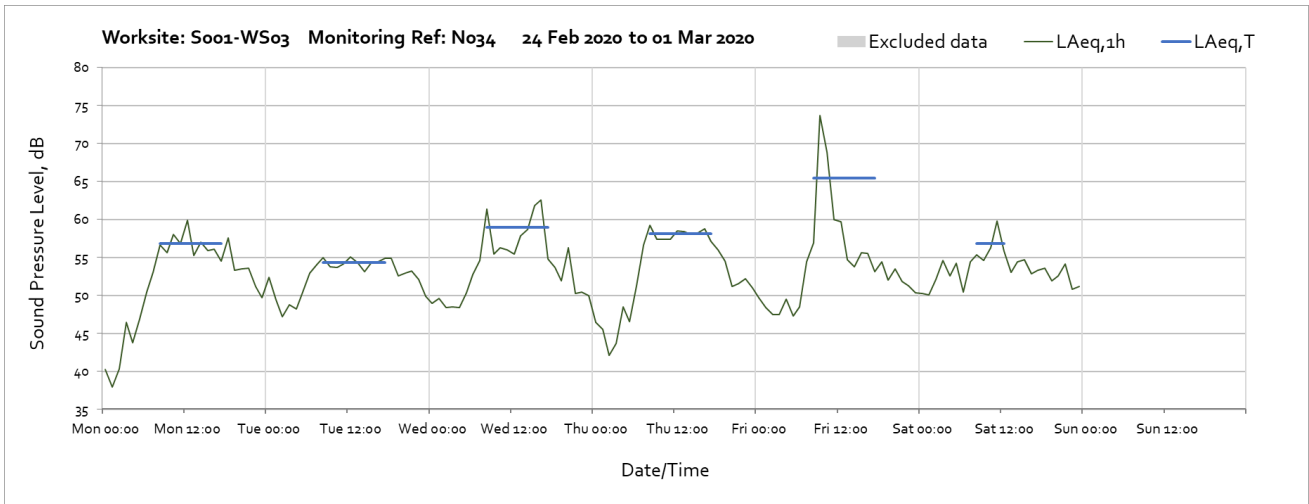


## Worksite: S001-WS03 – Monitoring Ref: N034

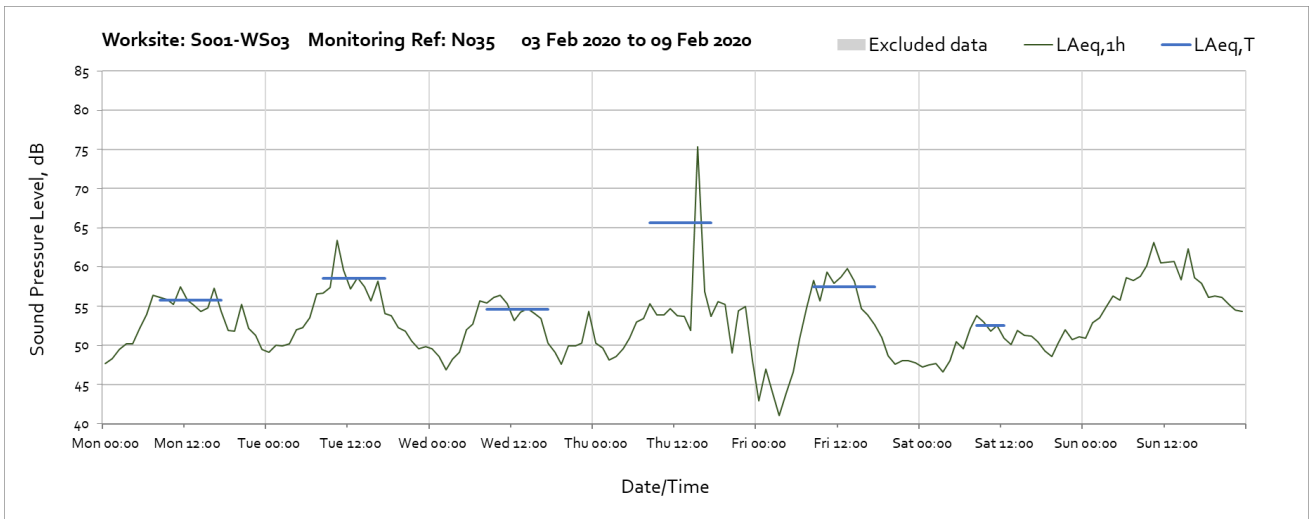
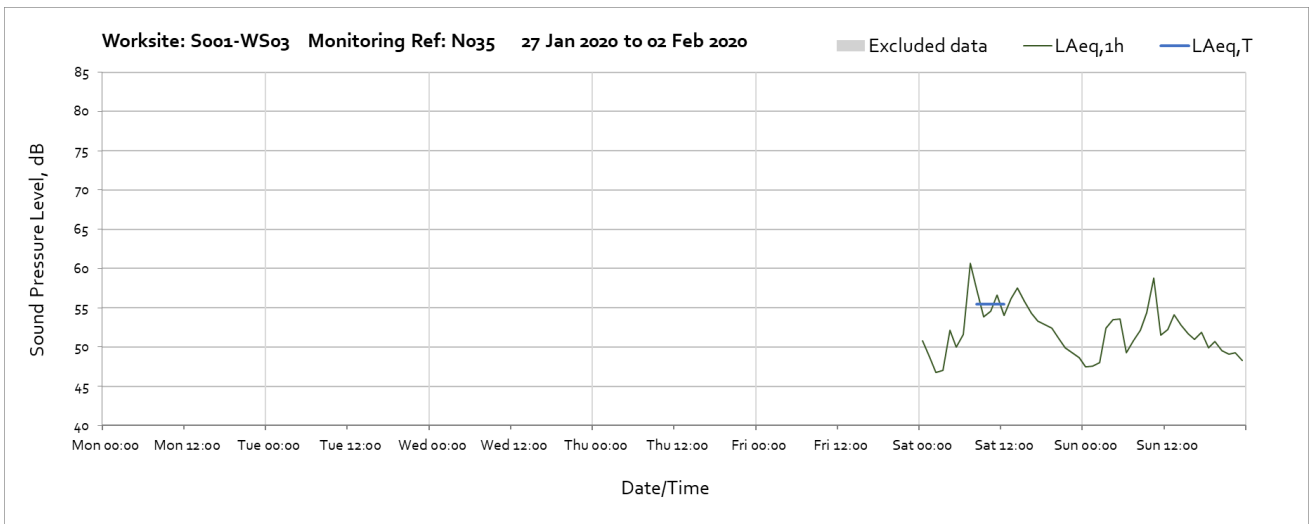


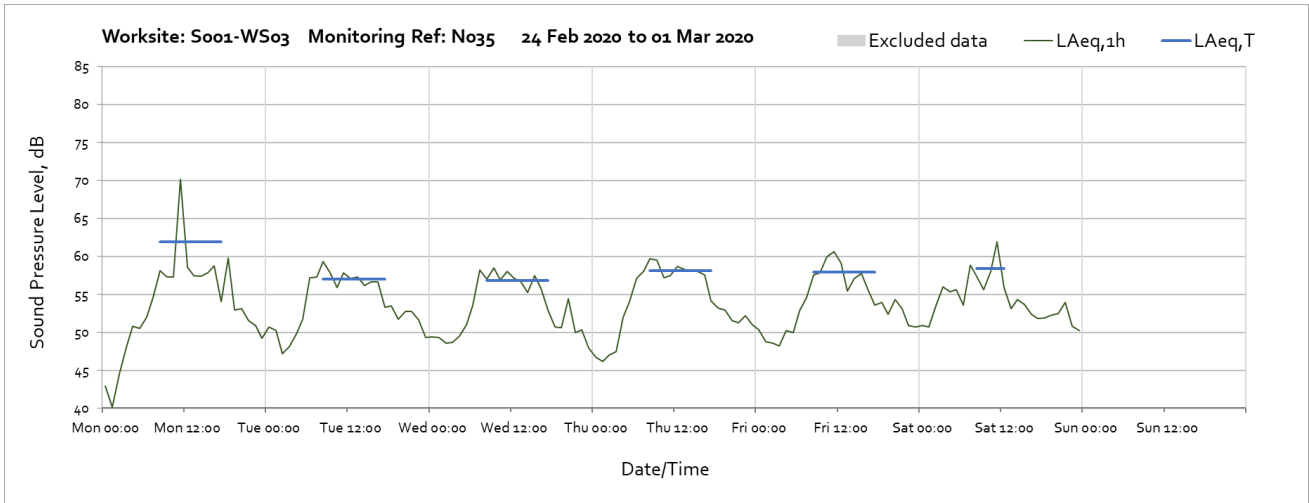
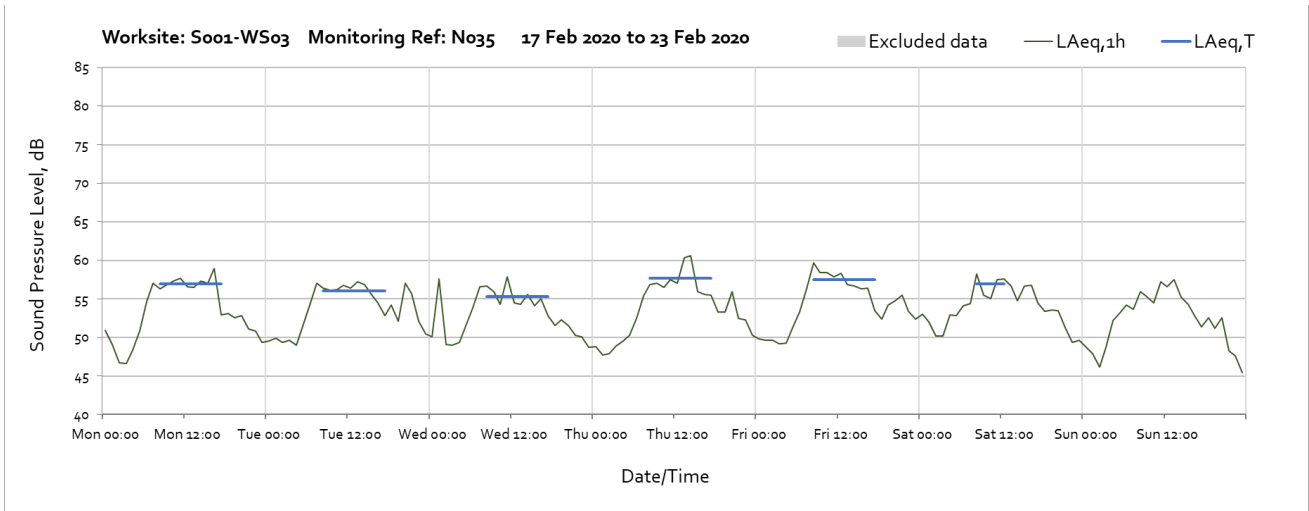
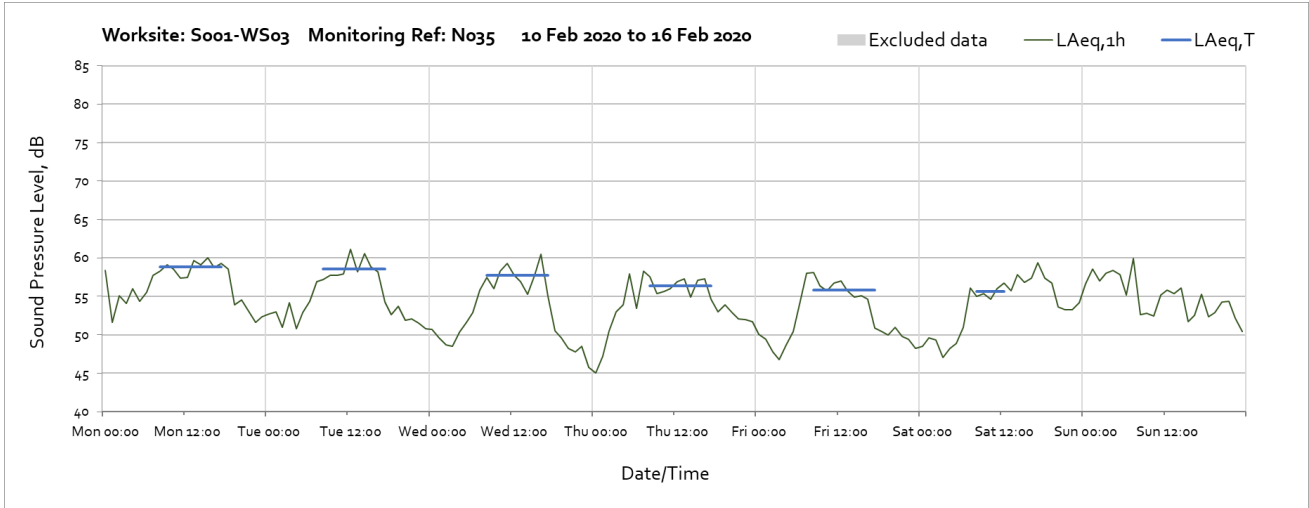




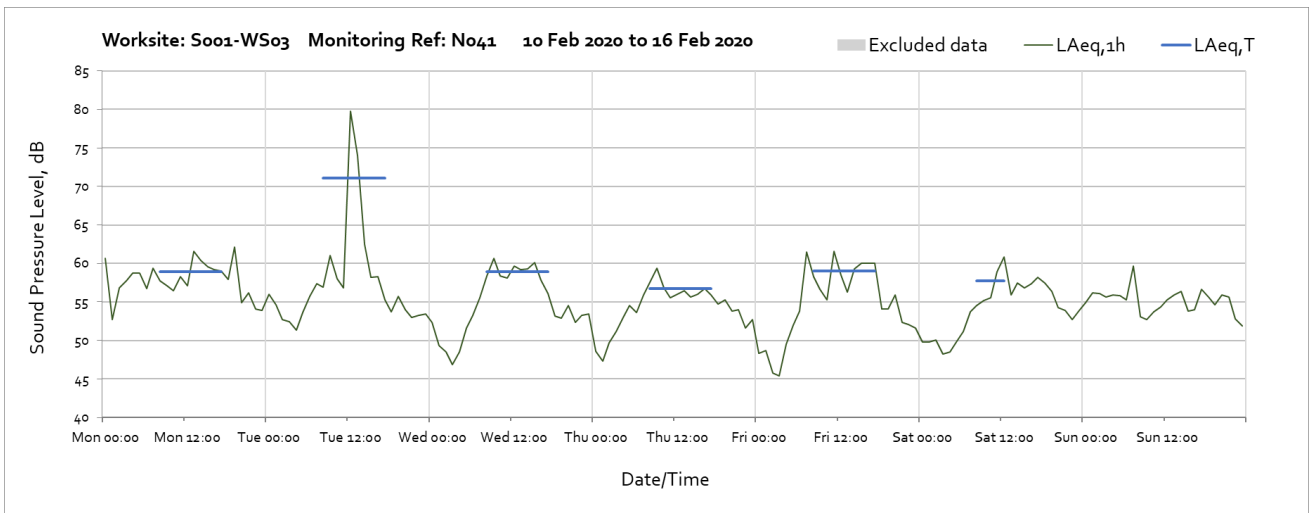
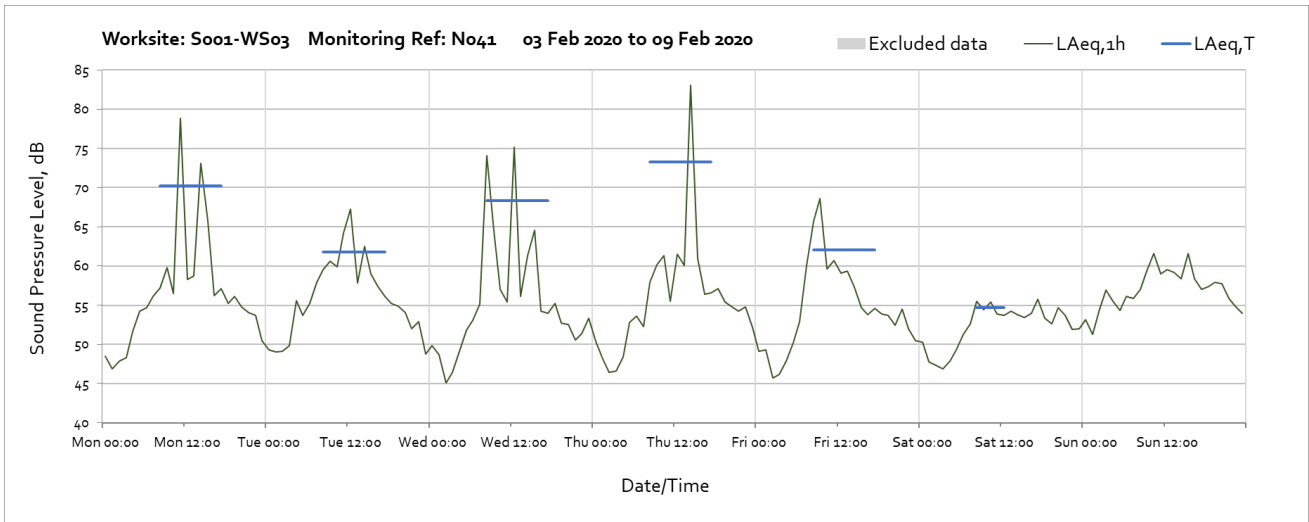
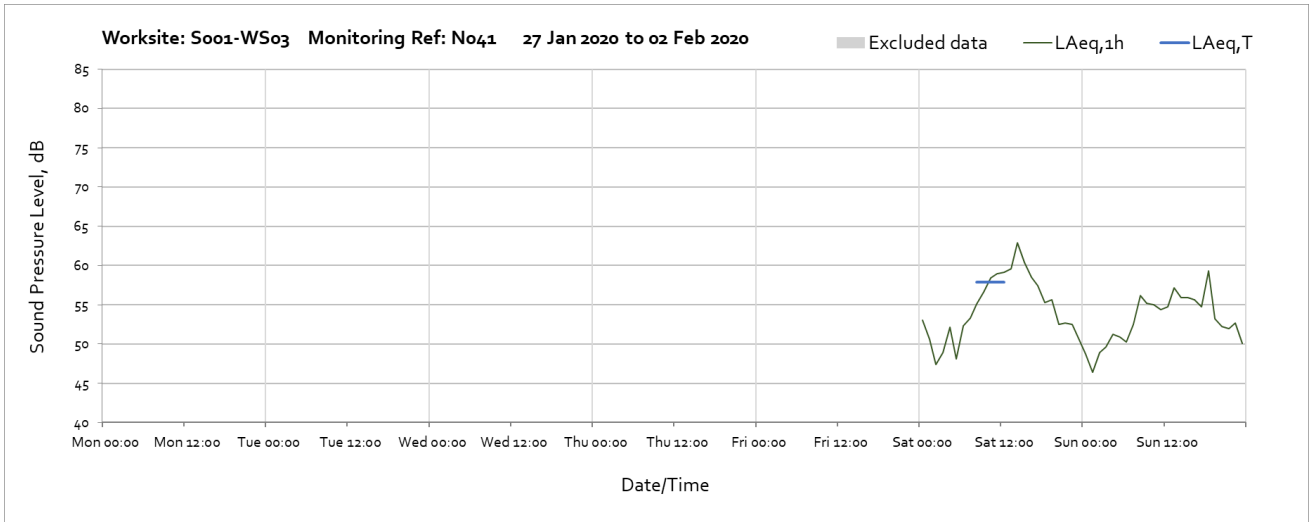


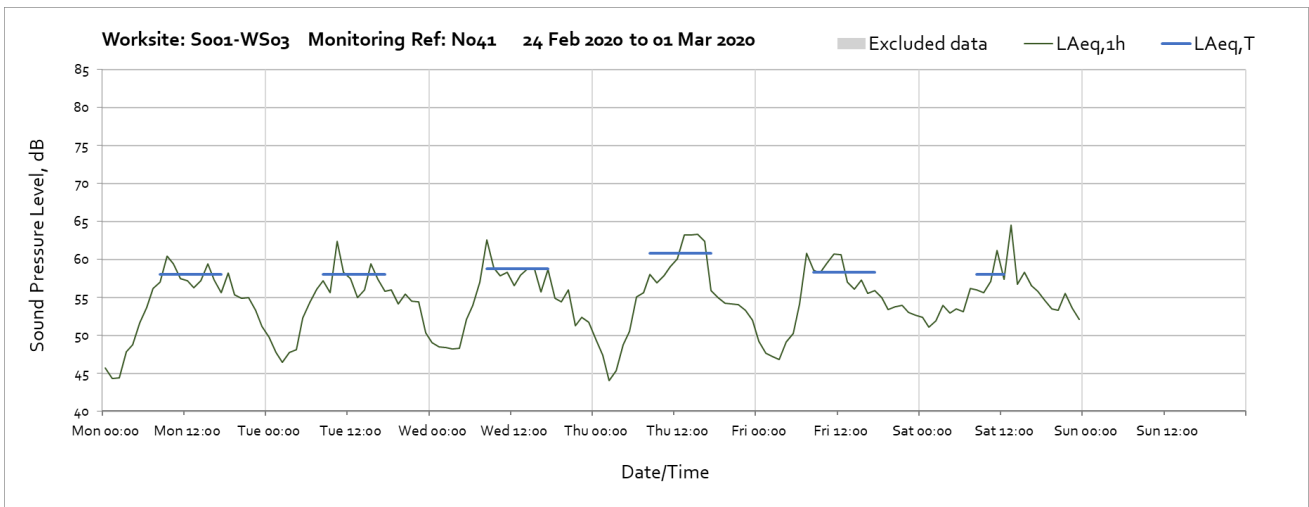
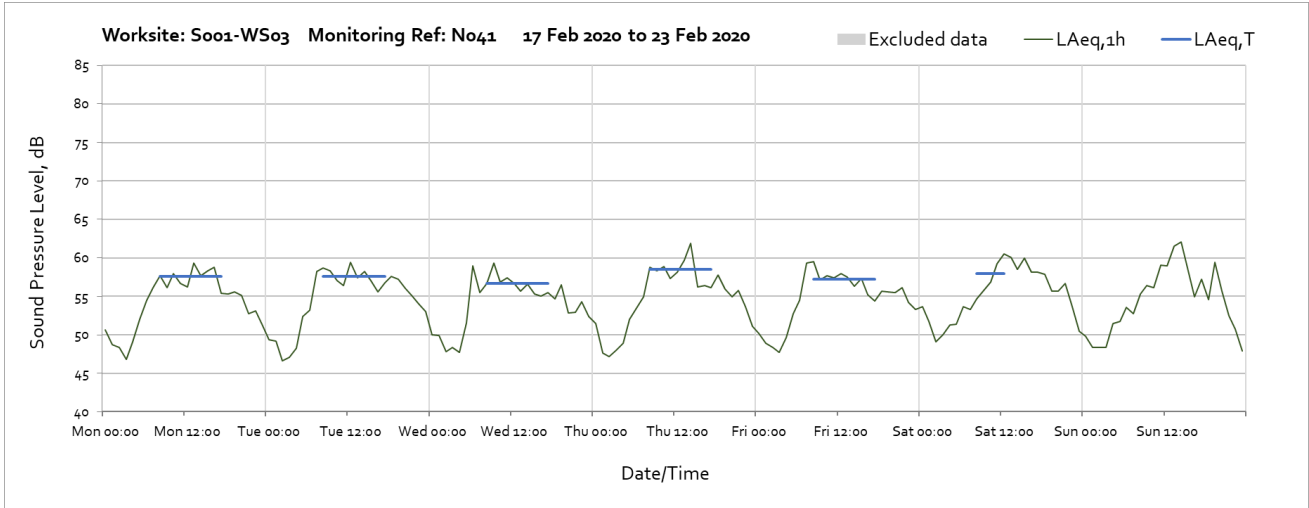
## Worksite: S001-WS03 – Monitoring Ref: N035



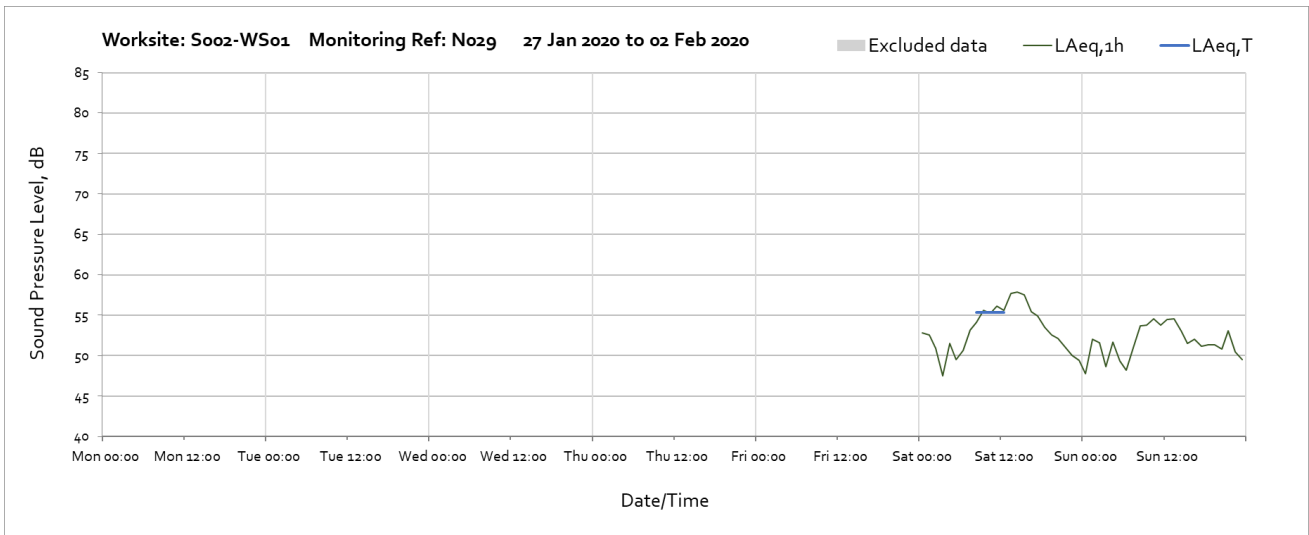


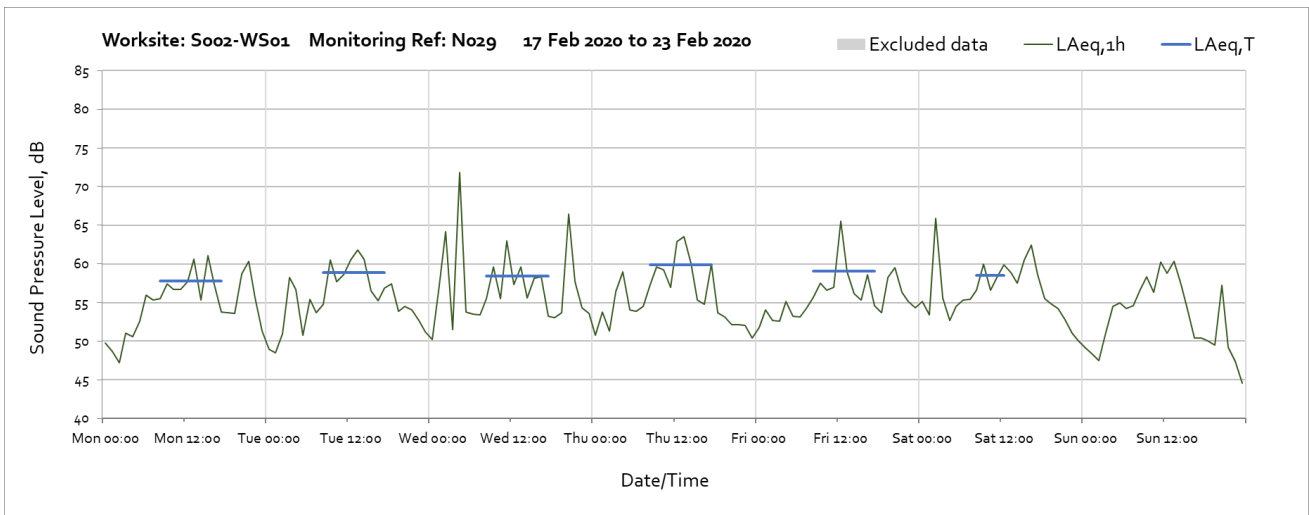
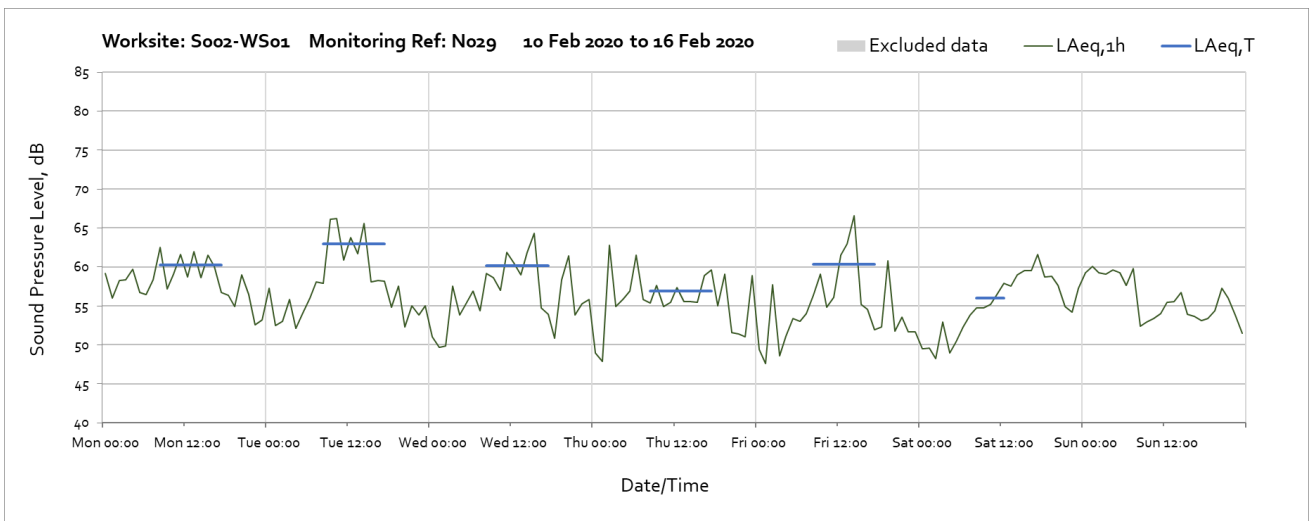
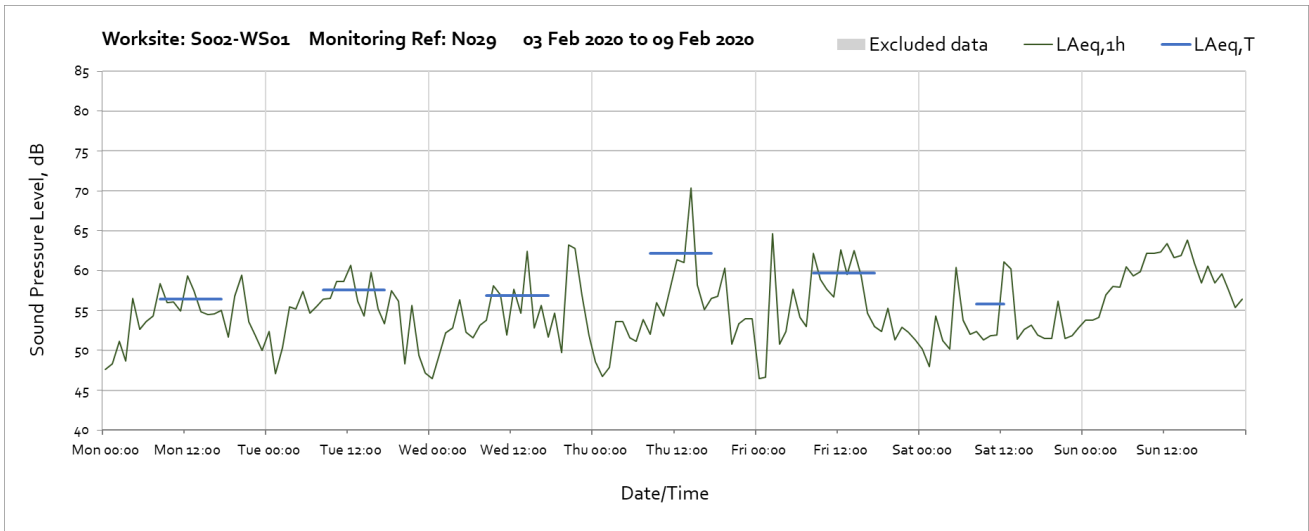
# Worksite: S001-WS03 – Monitoring Ref: N041

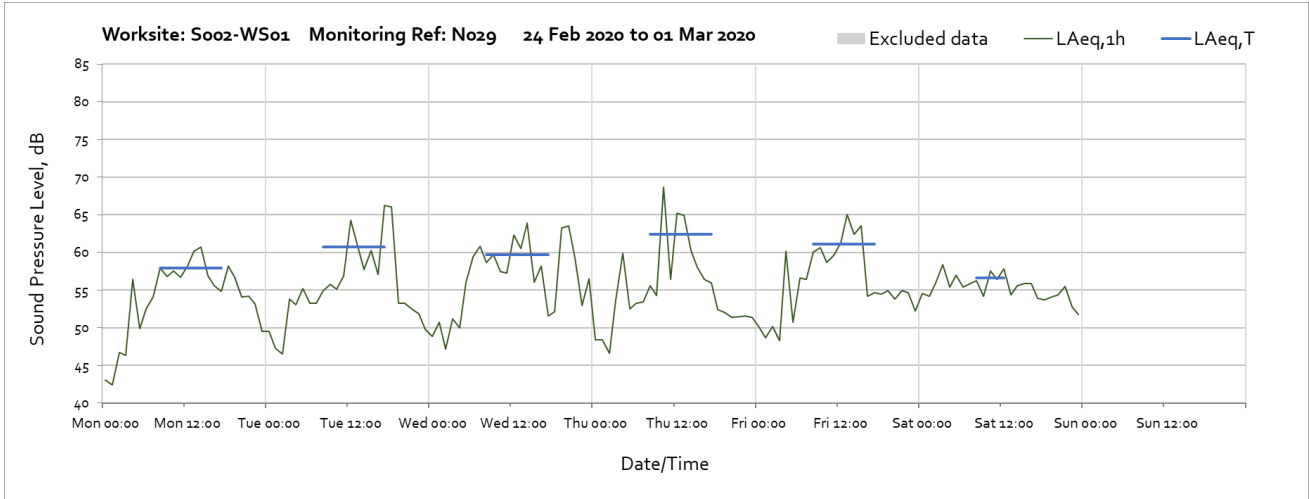




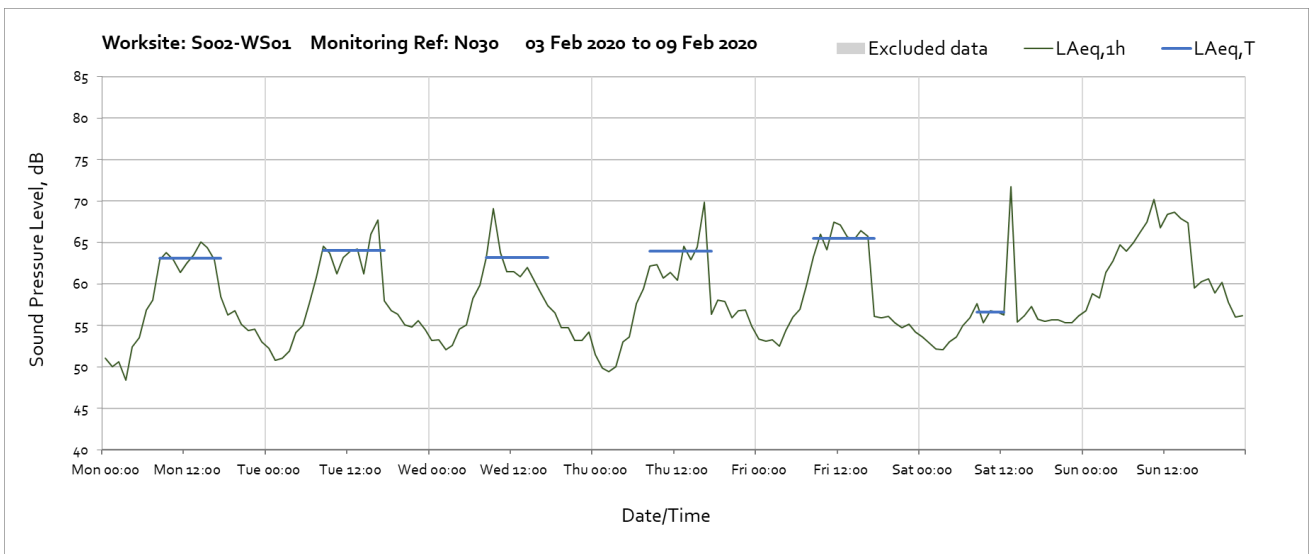
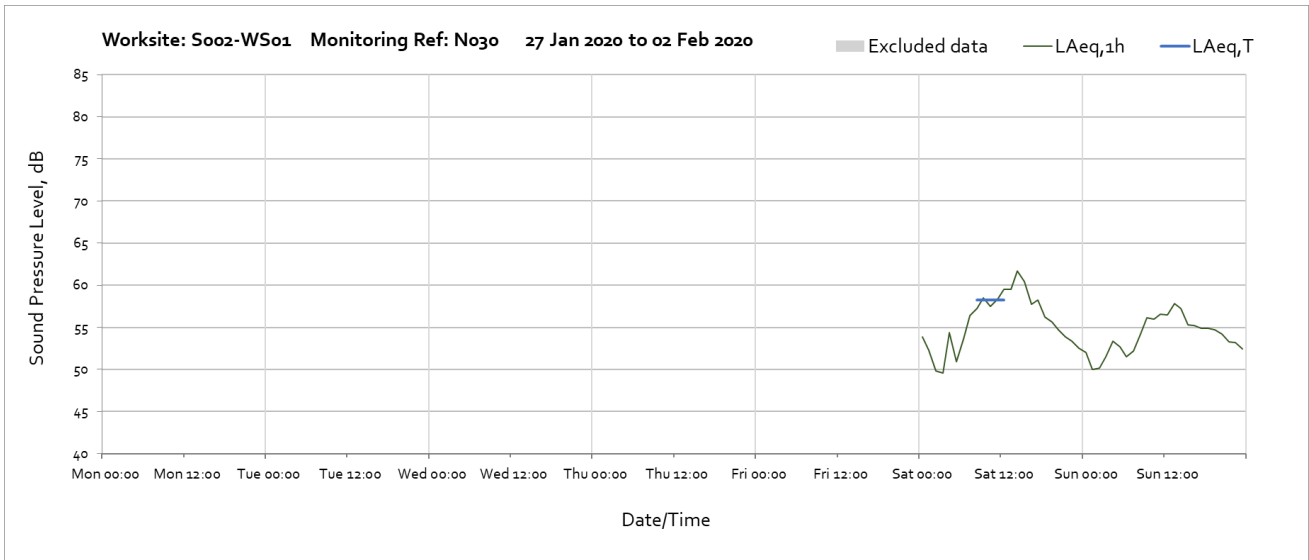
## Worksite: S002-WS01 – Monitoring Ref: N029

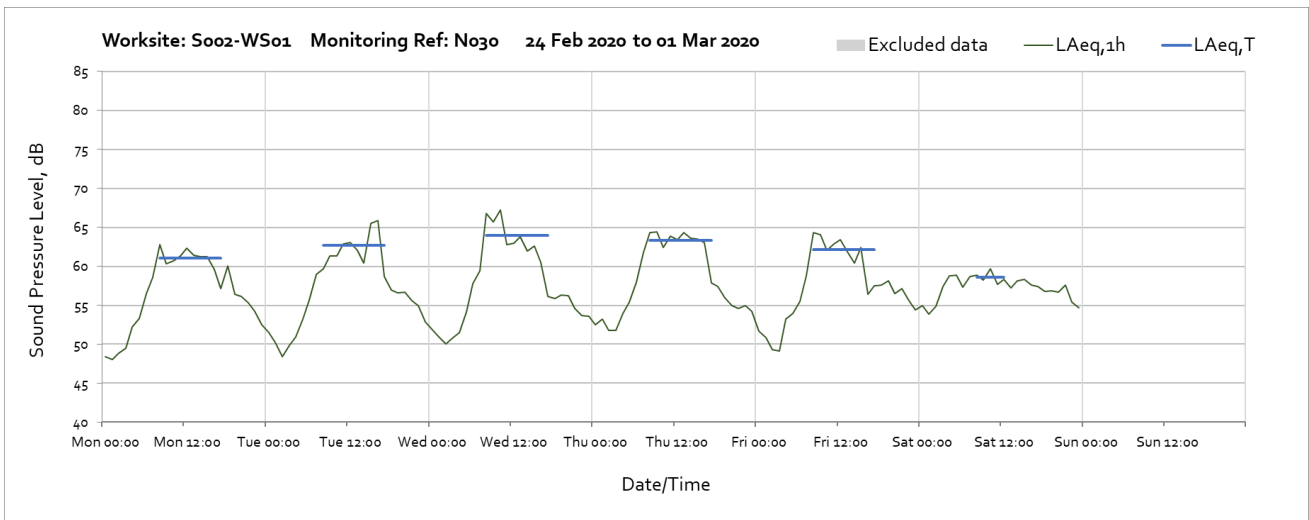
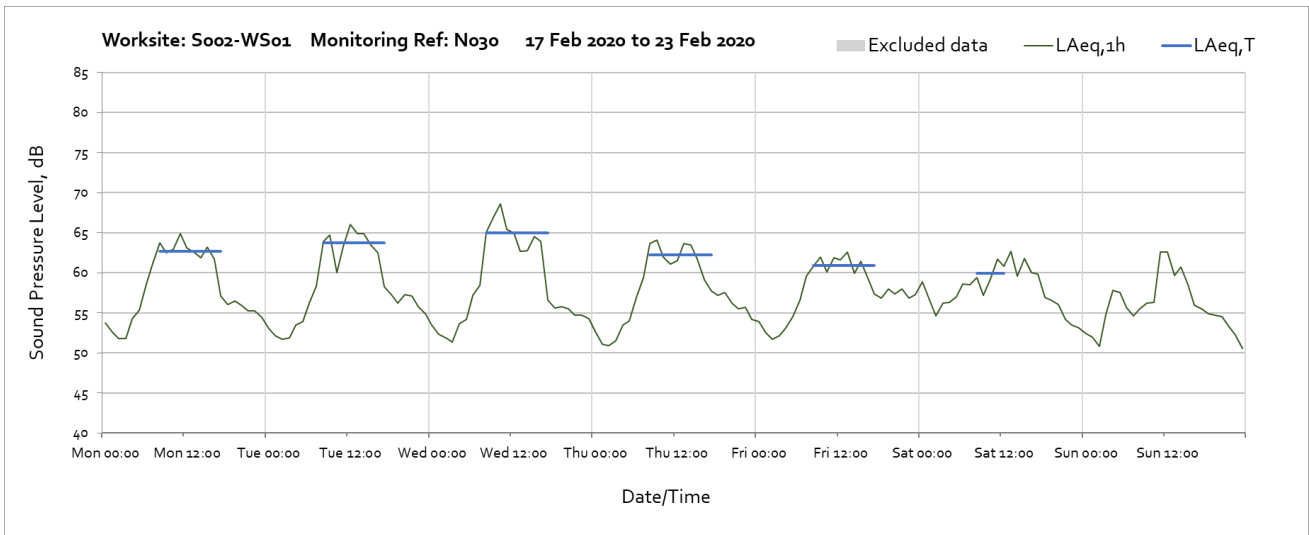
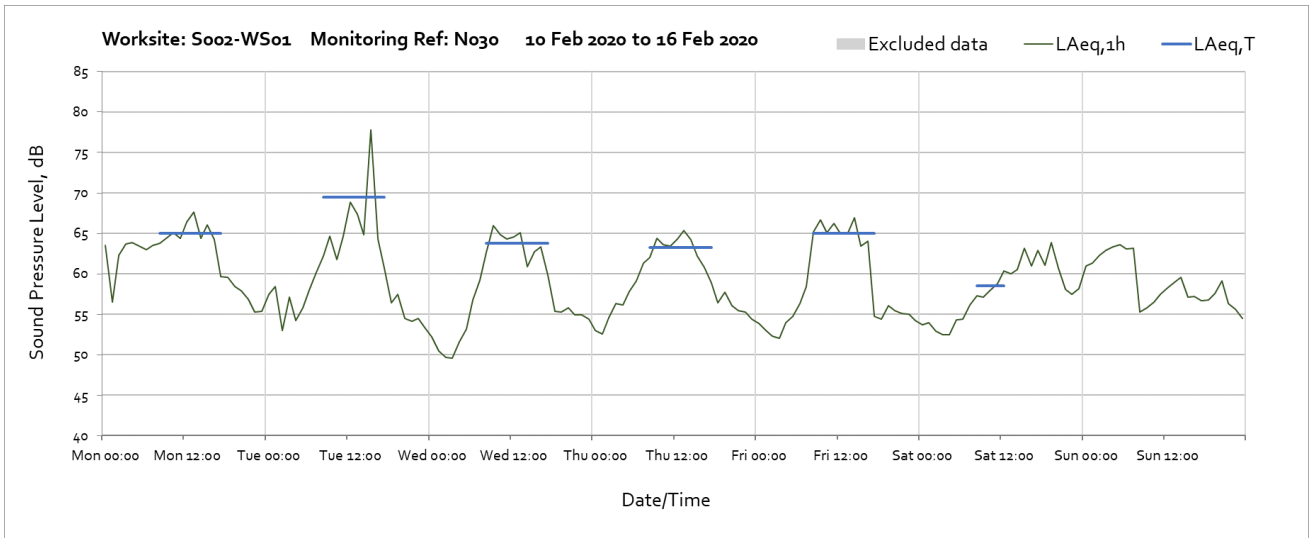






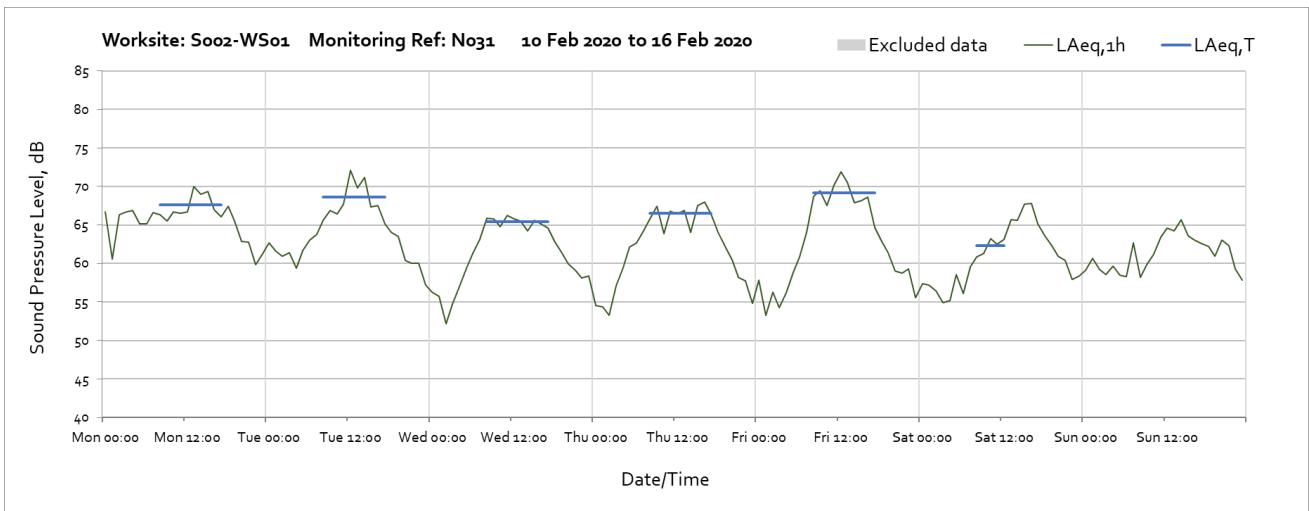
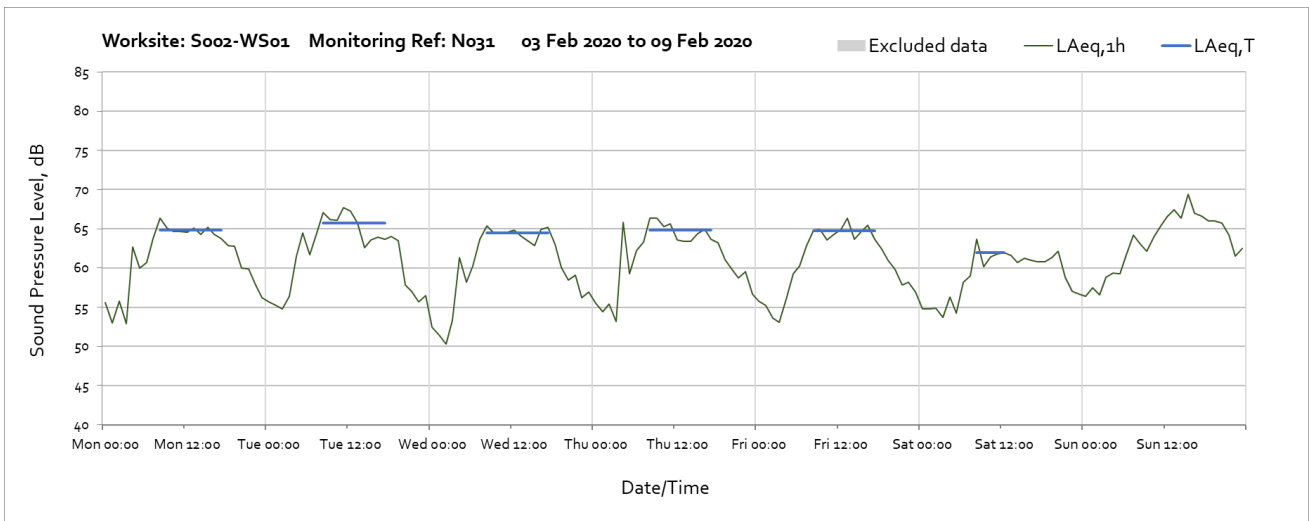
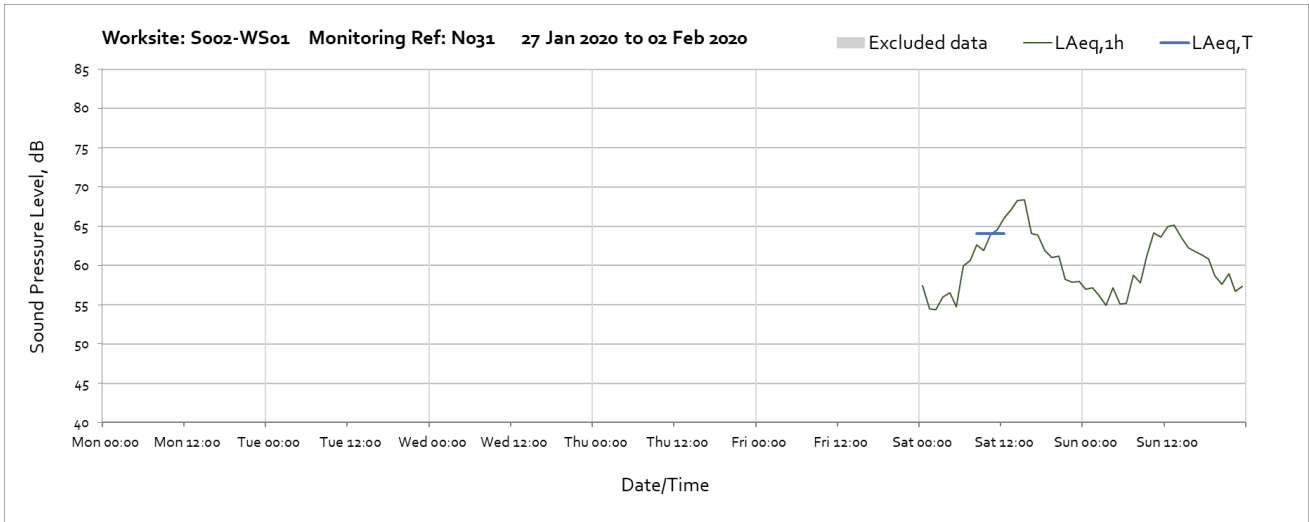
## Worksite: S002-WS01 – Monitoring Ref: N030

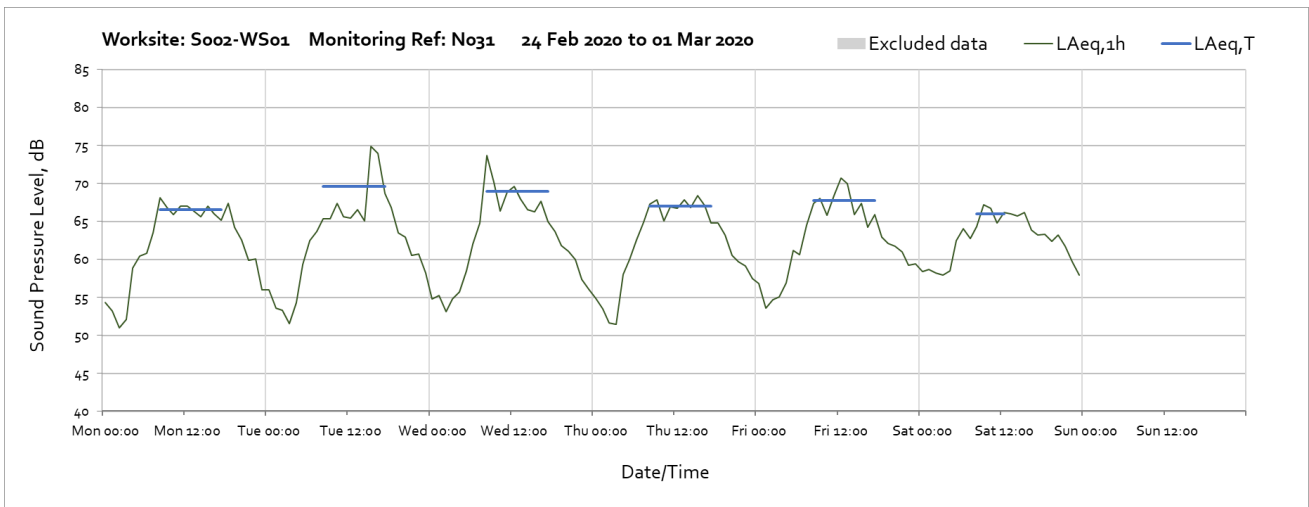
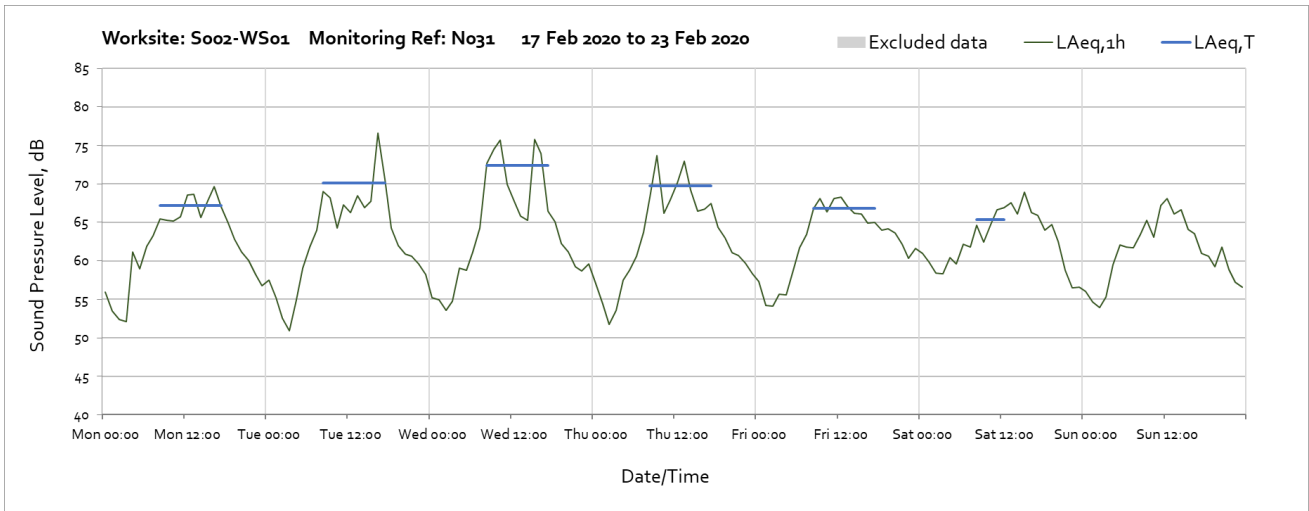




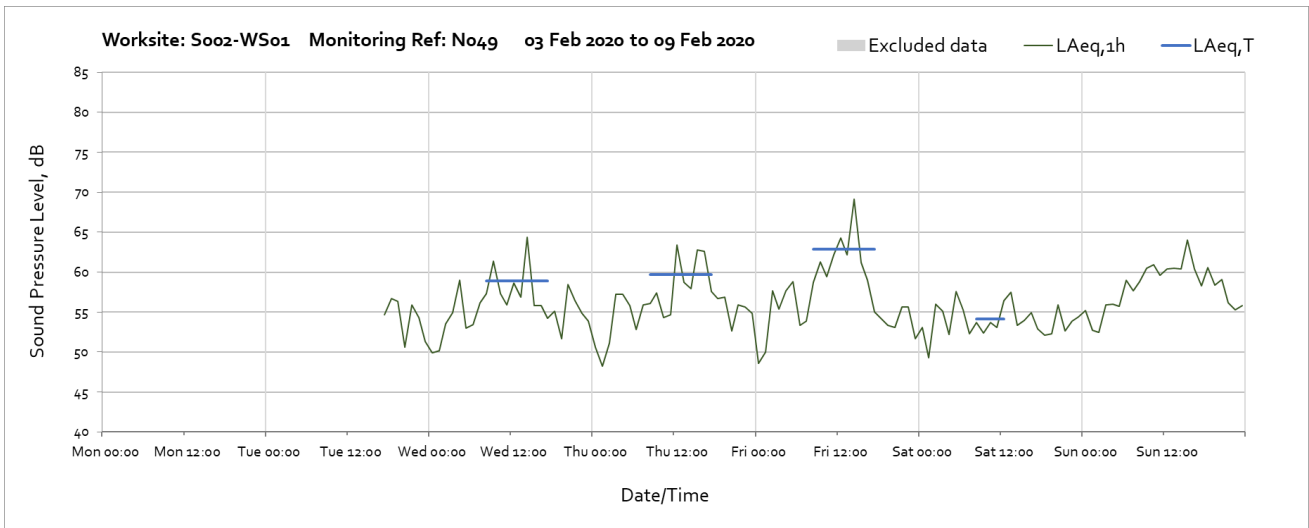


# Worksite: S002-WS01 – Monitoring Ref: N031

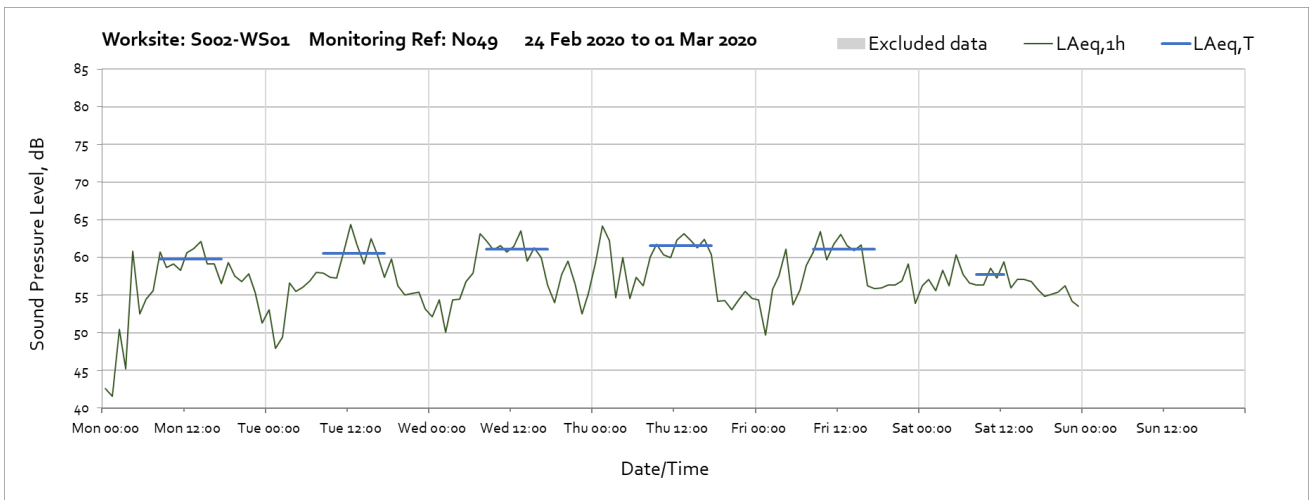
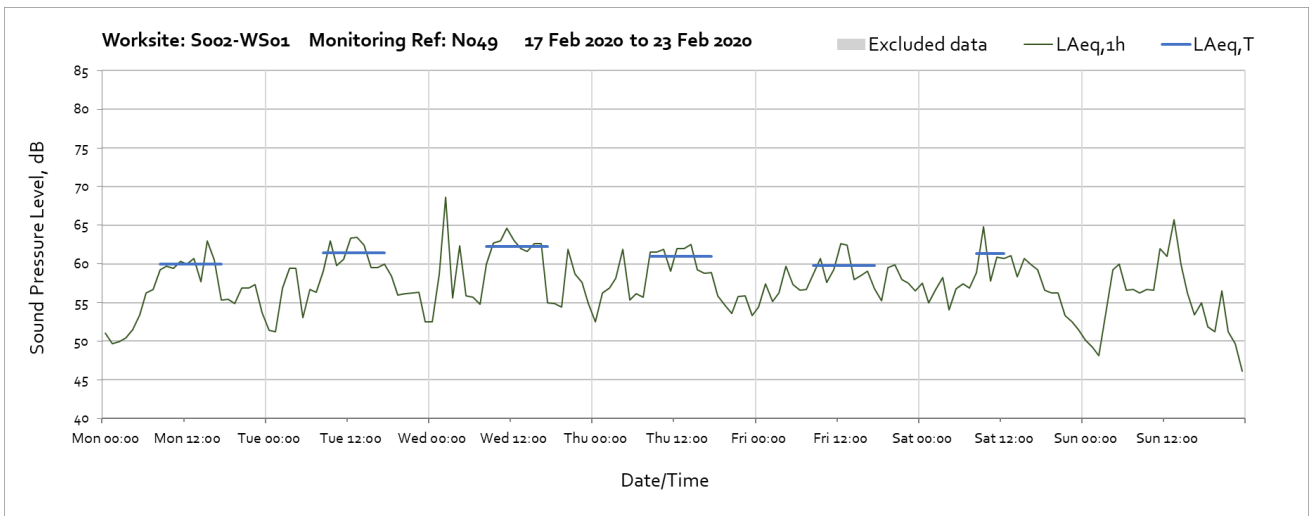
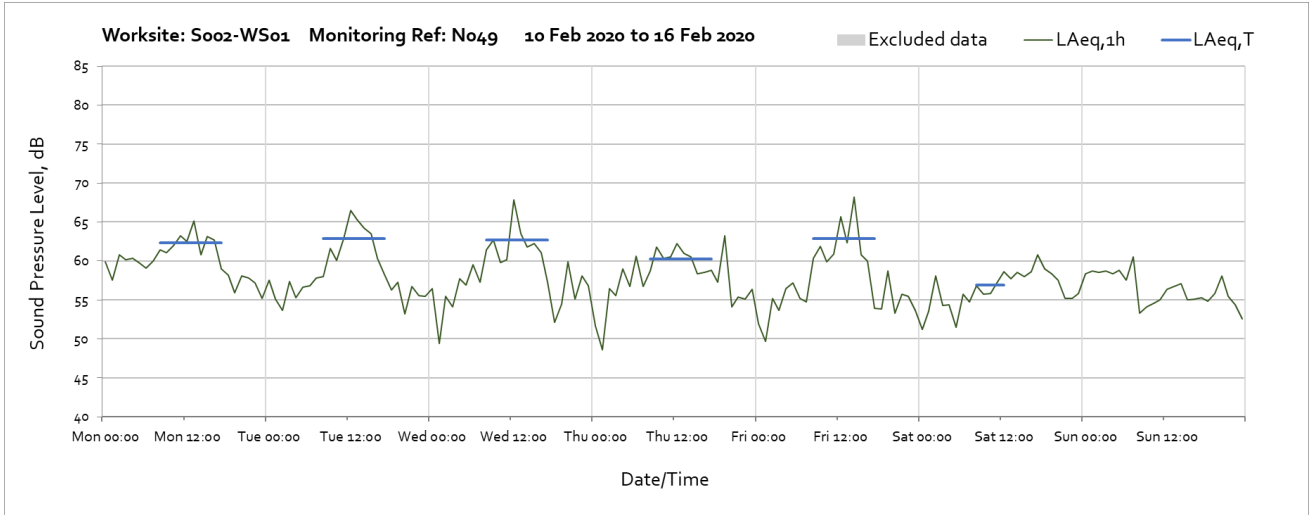




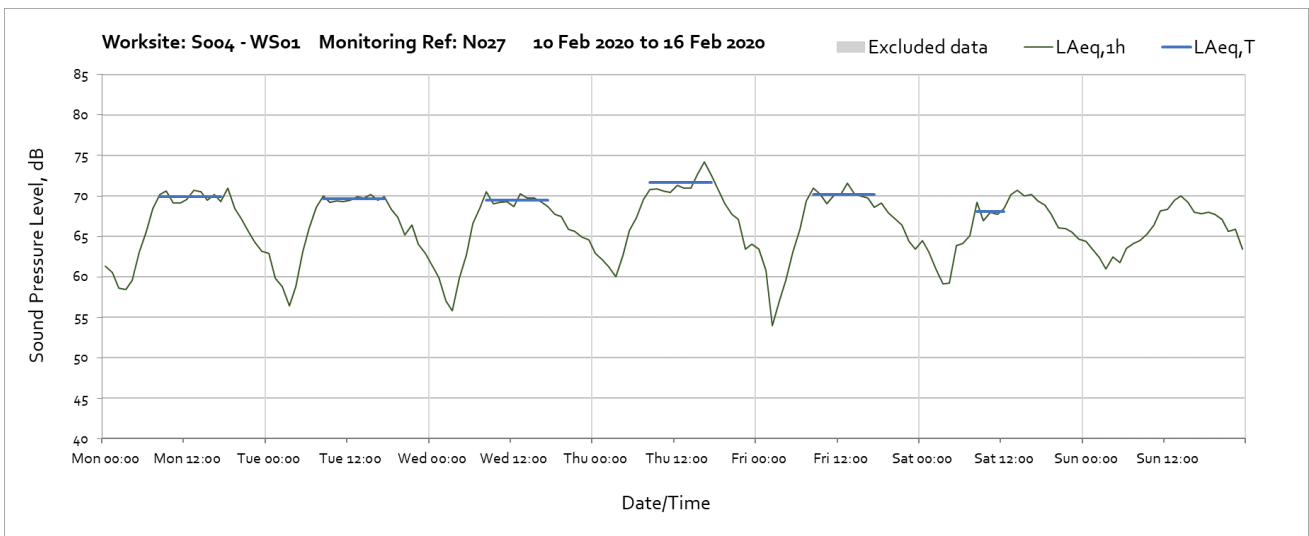
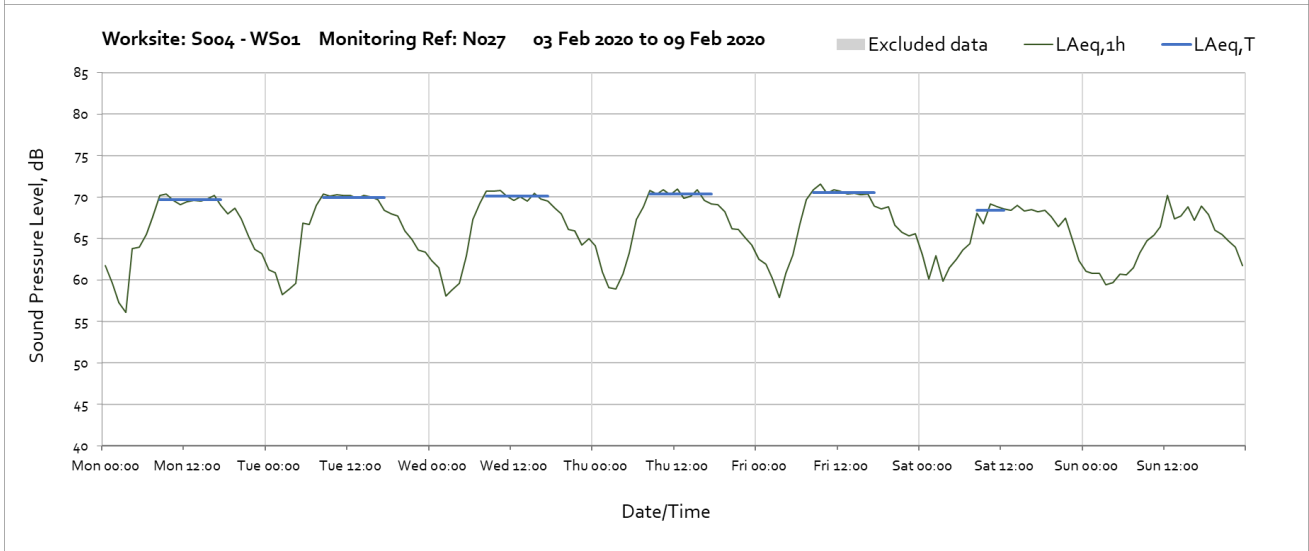
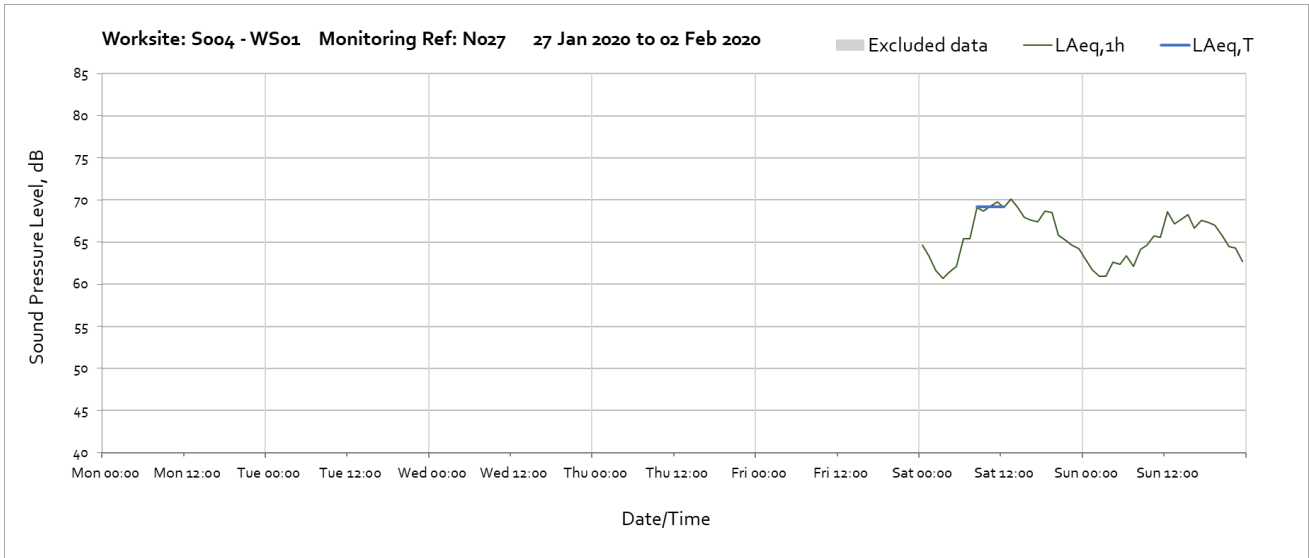
## Worksite: S002-WS01 – Monitoring Ref: N049

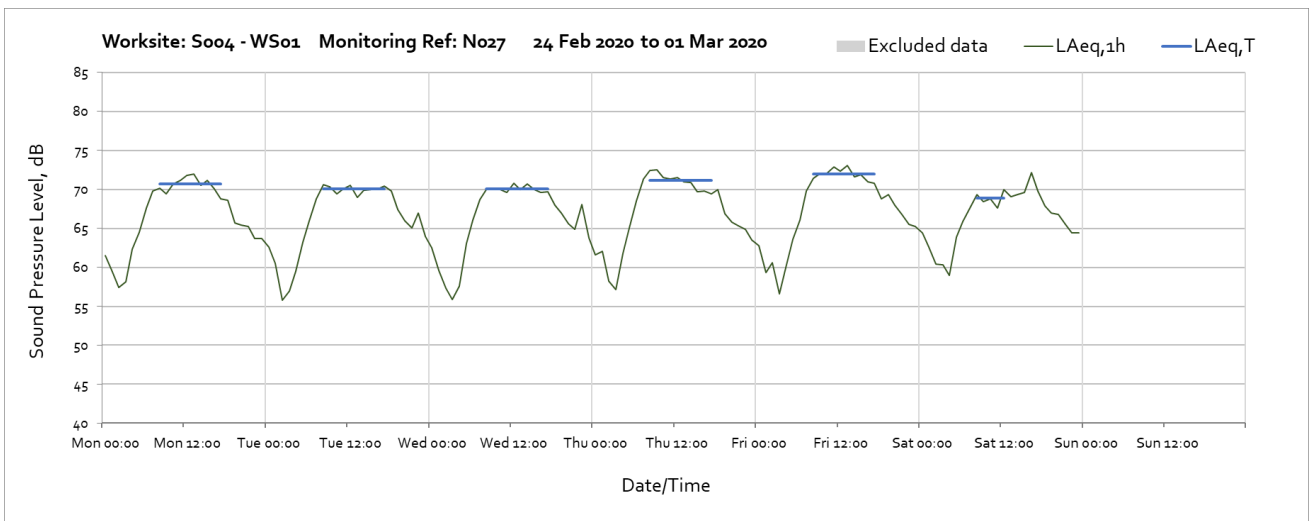
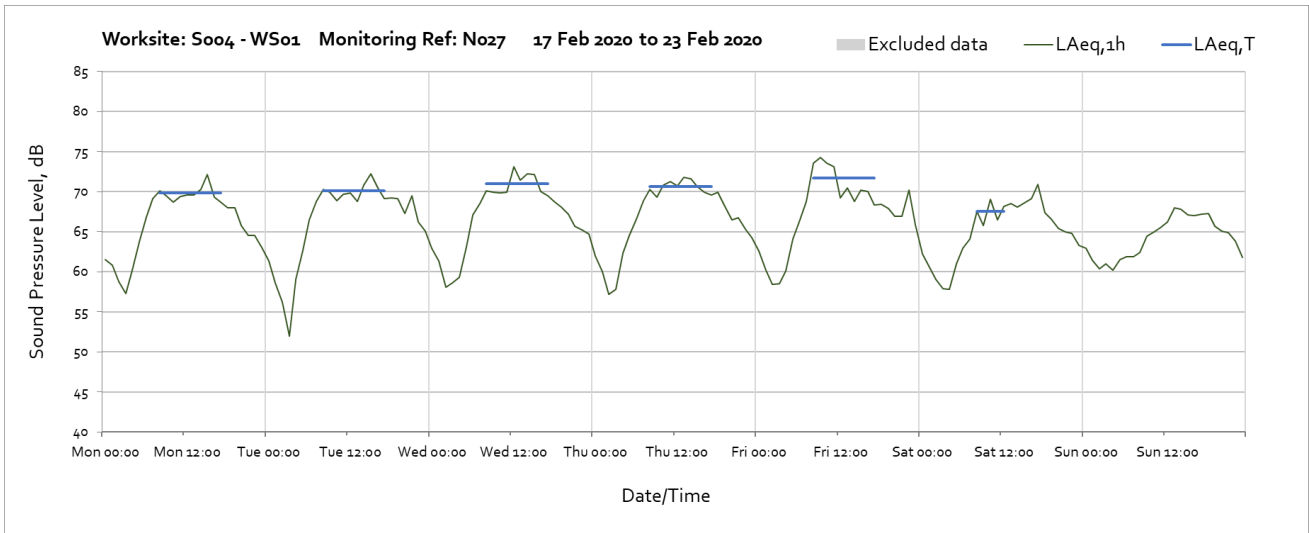


Note: The monitor was installed at 17:00 on Tuesday the 4<sup>th</sup> of February.

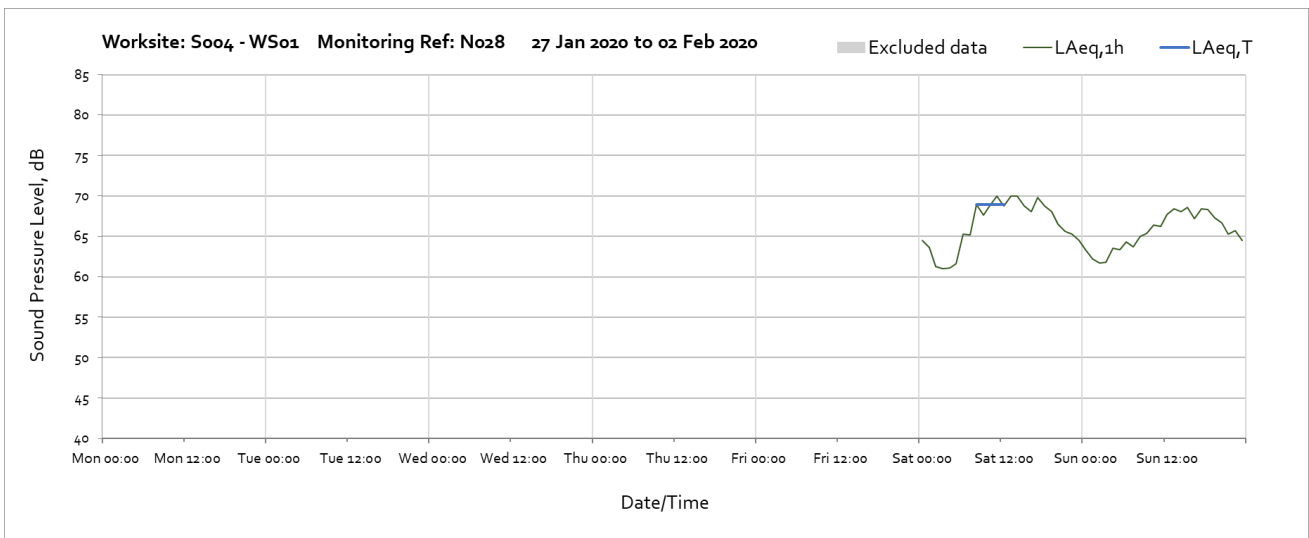


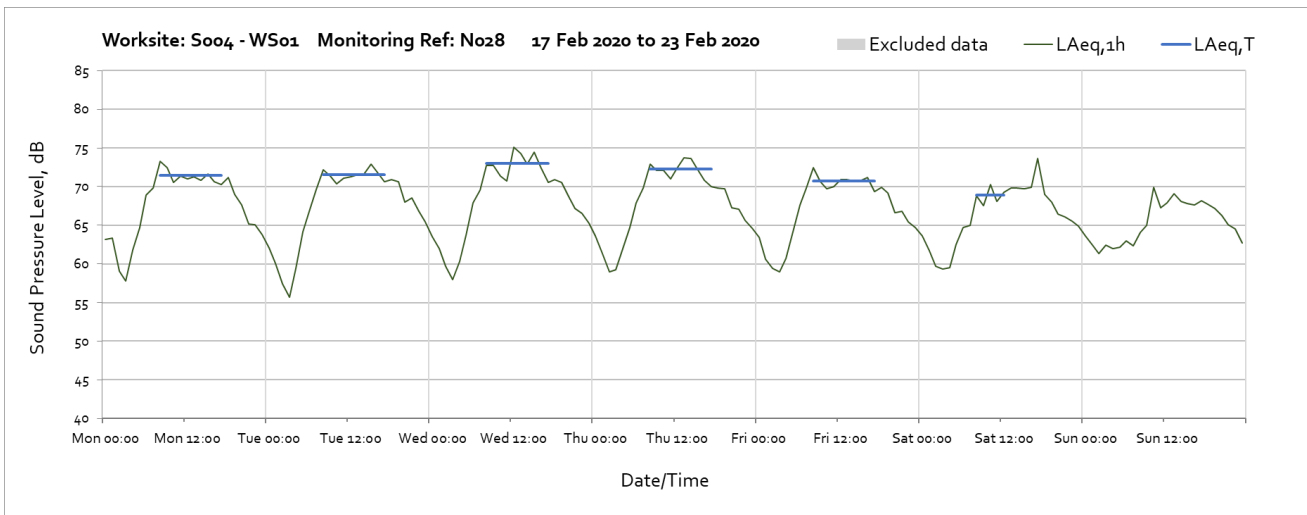
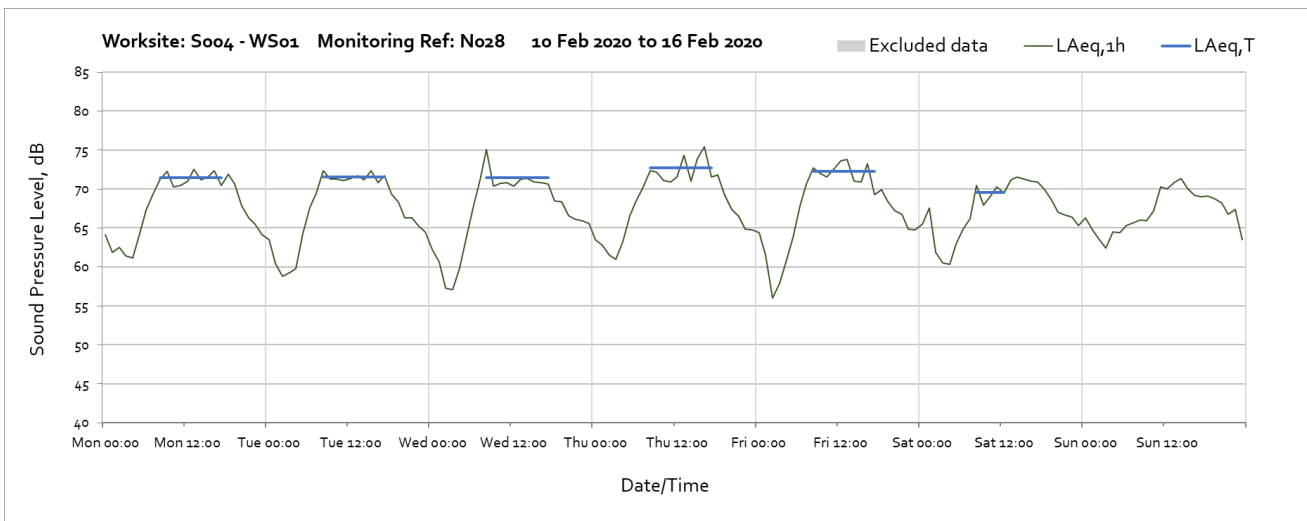
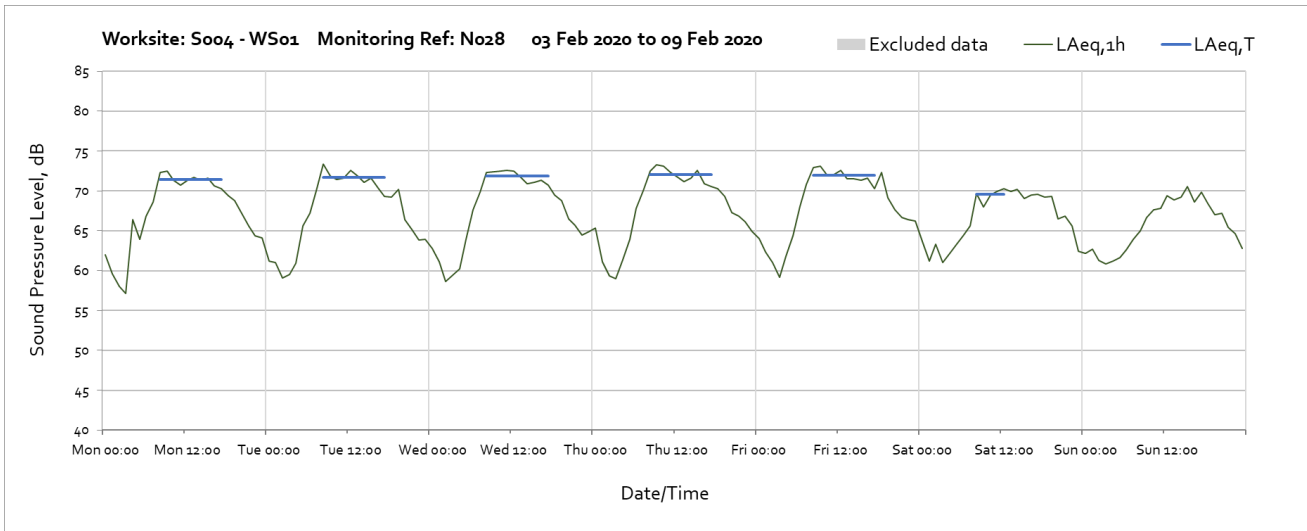
# Worksite: S004-WS01 – Monitoring Ref: N027

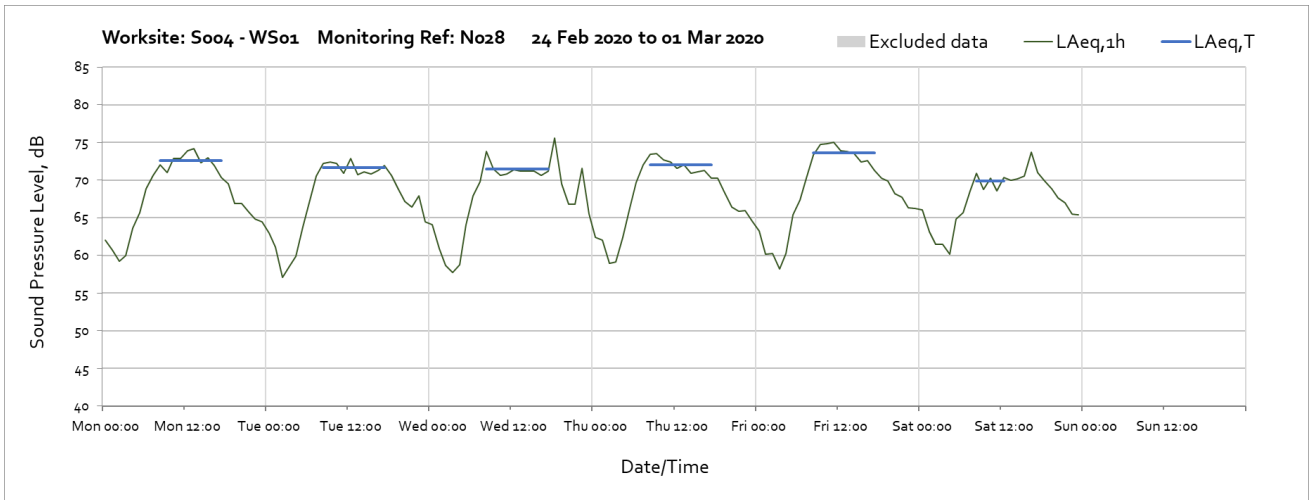




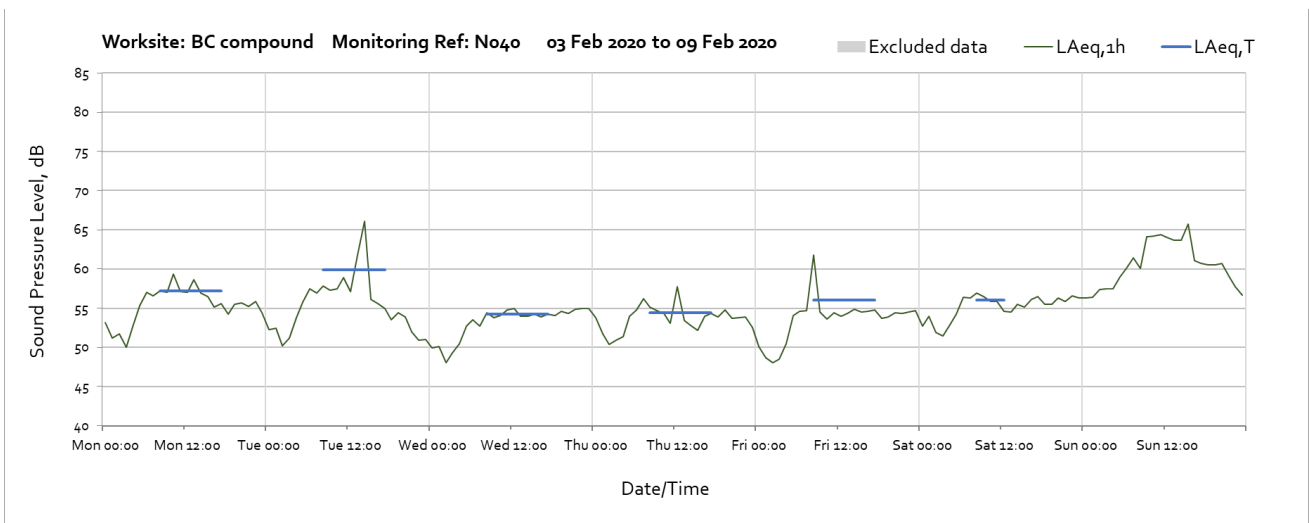
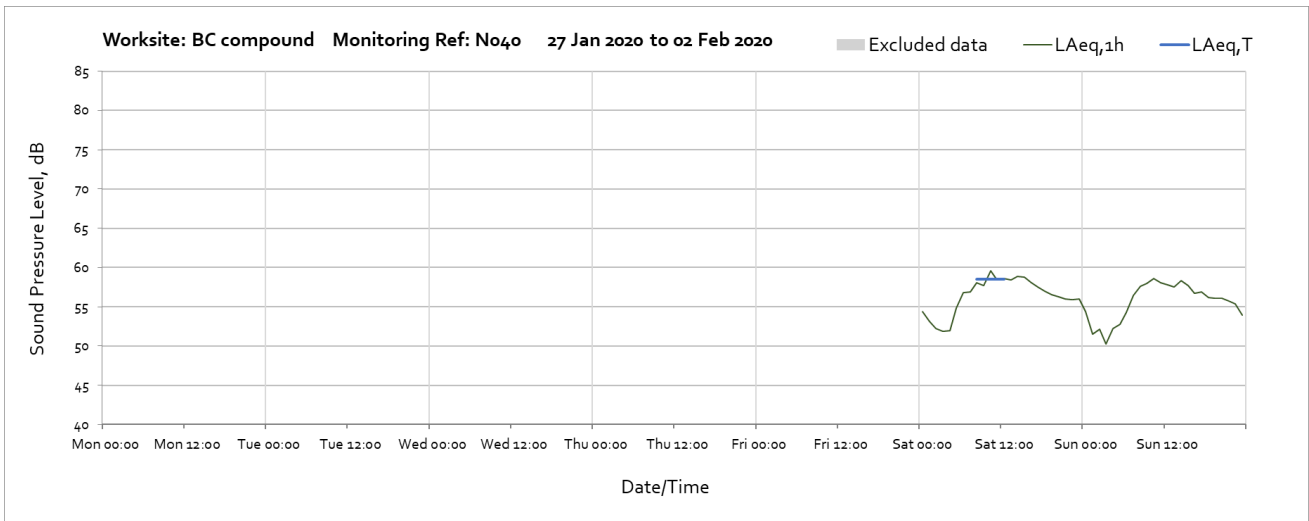
## Worksite: S004-WS01 – Monitoring Ref: N028

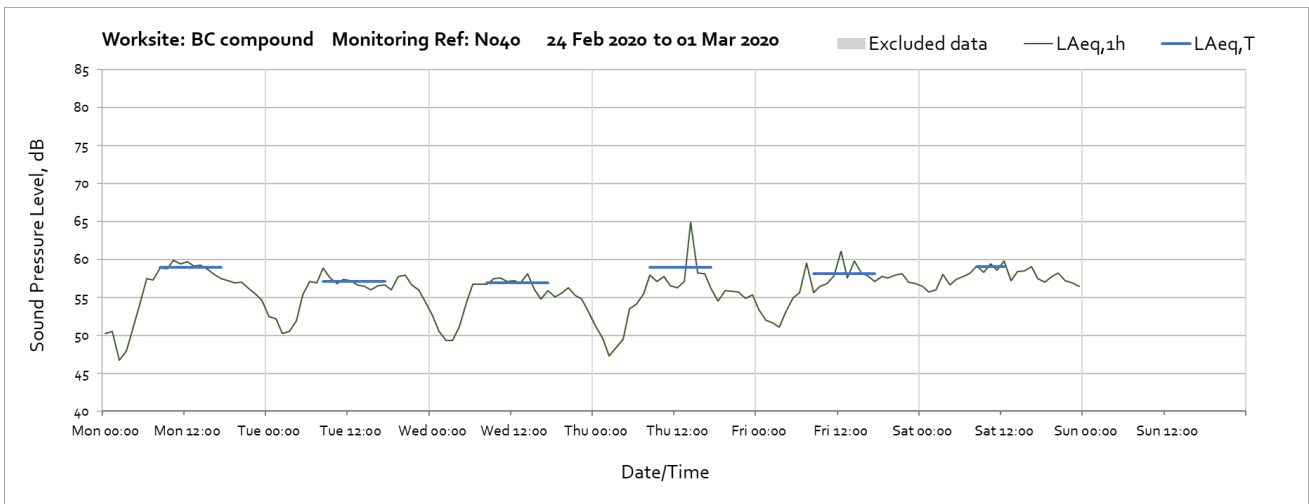
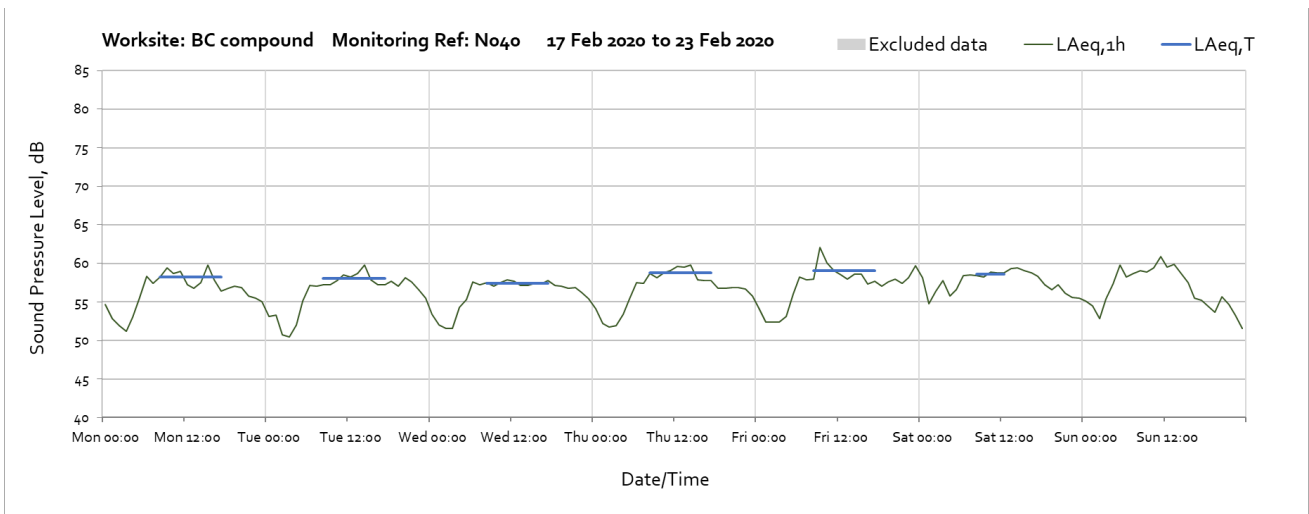
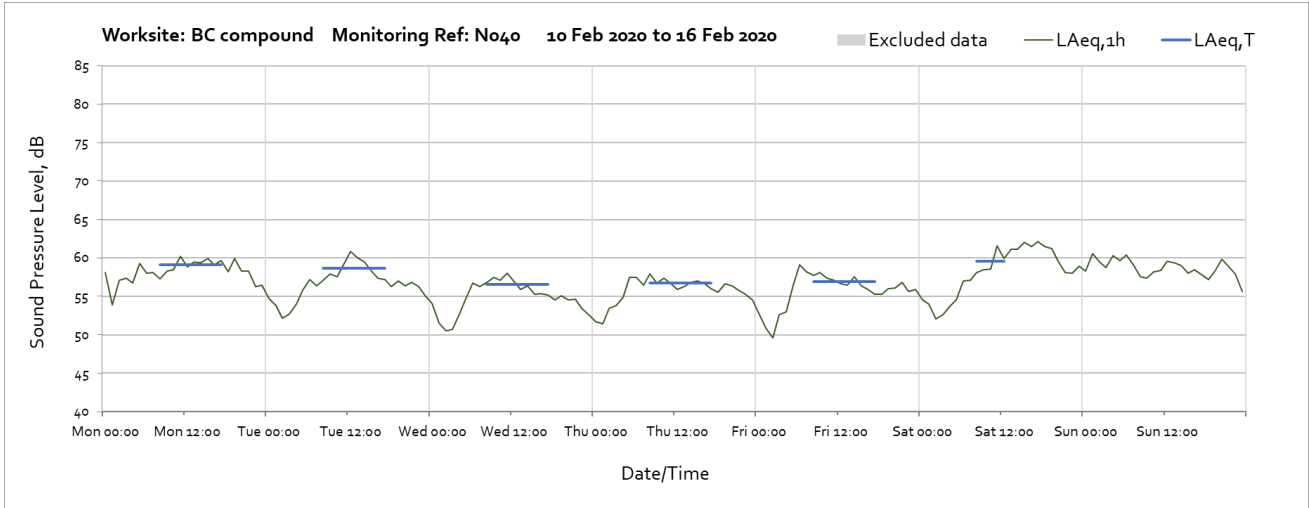






## Worksite: Badminton Close compound – Monitoring Ref: N040







## 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.

### Worksite: S004-WS01 – Monitoring Ref: V045

