

Construction noise and vibration Monthly Report – July 2019

London Borough of Camden

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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 Camden (LBC) during the month of July 2019.

A number of worksites were active during the reporting month in the LBC area. Activities at Network Rail worksite B included works at relocatable equipment build. Works at Network Rail worksites C, D and E mainly included cabling works, works at platforms, surveys and materials movements. Activities at Network Rail worksite F mainly included slab extension, paving, core drilling and cabling works. Drainage and reinforced concrete works were carried out at Network Rail worksite G. Ancillary activities were undertaken at the DB Cargo and former Addison Lee worksite (ref. S001-WS01). Processing and stockpiling of arisings were underway at 132 and 140 Hampstead Road and Petrol Station worksite (ref. S001-WS02). Demolition works were underway at the Regent's Park Estate worksite (ref. S001-WS07), at the Wolfson House, Walkden House, 67-75 & 77-79 Euston Rd, worksite (ref. S003-WS03), at the Thistle Hotel worksite (ref. S003-WS04), at the Ibis Hotel, 3 Cardington Street & 1-3 Cobourg Street worksite (ref. S003-WS05), at 93-103 Drummond Street, 11-15 Melton Street, 54-64 Euston Street, 69 Cobourg Street worksite (ref. S003-WS07) and at One Euston Square, 40 Melton Street, Grant Thornton House, 22 Melton Street worksite (ref. S003-WS09). Archaeological excavations and deconstruction of screening structures were underway at St James's Garden worksite (ref. S003-WS01). Deliveries were carried out at the former National Temperance Hospital, 110-122 Hampstead Road worksite (ref. S003-WS06). Further works were also undertaken as part of the Granby Terrace Bridge utilities diversion on Stanhope Street and Hampstead Road. Works to fit out the tunnelling reception shaft were undertaken at Park Village East. Additional UK Power Network utility diversion works were undertaken at Regents Park Estate.

Noise monitoring was undertaken in the vicinity of Network Rail worksites B, C, D, E, F and G, the DB Cargo worksite (ref. S001-WS01), 132 and 140 Hampstead Road and Petrol Station worksite (ref. S001-WS02), Regent's Park Estate worksite (ref. S001-WS07), St James's Gardens worksite (ref. S003-WS01), Wolfson House, Walkden House, 67-75 & 77-79 Euston Rd worksite (ref. S003-WS03), the Ibis Hotel, 3 Cardington Street & 1-3 Cobourg Street worksite (ref. S003-WS05), former National Temperance Hospital, 110-122 Hampstead Road worksite (ref. S003-WS06), Drummond Street / Euston Street worksites (ref. S003-WS07), Ibis Hotel, Euston Square Gardens (west) worksite (ref. S003-WS08) and the Thistle Hotel (ref. S003-WS04). Further noise monitoring was also undertaken at Regents Park Estate and in the vicinity of Regents Park Lorry Holding Area. Two new noise monitors (N044 and N045) and a new vibration monitor (V039) were installed in July at locations surrounding worksite S001-WS07: monitor N044 installed on 28th June and data was gathered from 1st July at Langdale, N045 was installed on the 18th of July and V039 was installed on 3rd July at Coniston, all within the Regents Park Estate.

Vibration monitoring was undertaken in the vicinity of 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 305 Euston Road (ref. S003-WS09), the basement of the Magic Circle (ref. S003-WS03) and in the basement of the Wesley Hotel (ref.: S003-WS03). One new vibration monitor (V039) was installed in July at a location near worksite ref.: S001-WS07 at Coniston, Regents Park Estate.

Exceedances of the SOAEL were measured at two locations due to night-time activities at worksites B and C. Thirteen complaints were received during the monitoring period. Description of exceedances, complaints, results of investigations and any actions taken are detailed in this report in Section 2.4.

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.
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.
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 1st to 31st July 2019.

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

- Network Rail on-networks HS2 preparatory works: worksite ref. B (see plan 1 in Appendix A)
 - Work activities included relocatable equipment build works.
- Network Rail on-networks HS2 preparatory works: worksite ref. C, D and E (see plan 2 in Appendix A)
 - Work activities included deliver Permanent Way (PWAY) to sidings known as Backing Out Road for unloading, movement of materials, high level walkway survey works, in-line cabling works on platforms, installation of cable management system (CMS), overhead line equipment works, cable running, roller block installation, clearing out under track crossing, installation of troughing in Up Sidings, cable recoveries on platforms, inspection for defects and material recoveries from Park Street Tunnel.
- Network Rail on-networks HS2 preparatory works: worksite ref. F (see plan 2 in Appendix A)
 - Work activities included foundation works slab extension, paving reinstatement, completing cable connections, install fire rated Cable Management System (CMS), fire stopping installed in rooms, core drilling for external CMS onto

Barnby Street, completion of lighting protection, glanding and terminating cables.

- Network Rail on-networks HS2 preparatory works: worksite ref. G (see plan 3 in Appendix A)
 - Work activities included drainage and reinforced concrete works.
- DB Cargo shed and adjacent land on Granby Terrace, worksite ref. S001-WS01 (see plan 2 in Appendix A)
 - Work activities included ancillary activities at the former Addison Lee site.
- 132 and 140 Hampstead Road and Petrol Station, worksite ref. S001-WS02 (see plan 3 in Appendix A)
 - Works activities included processing and stockpiling of arisings.
- Regent's Park Estate, worksite ref. S001-WS07 (see plan 2 and 3 in Appendix A)
 - Works activities included removal of fixtures and fittings and demolition.
- St James's Gardens, worksite ref. S003-WS01 (see plan 2 in Appendix A)
 - Works activities included archaeological excavations and deconstruction of screening structure.
- Wolfson House, Walkden House, 67-75 & 77-79 Euston Rd, worksite ref. S003-WS03 (see plan 3 in Appendix A)
 - Works activities included removal of fixture and fittings, scaffolding and demolition.
- Thistle Hotel, Cardington Street, worksite ref. S003-WS04 (see plan 3 in Appendix A)
 - Works activities included scaffolding and demolition.
- Ibis Hotel, 3 Cardington Street, worksite ref. S003-WS05 (see plan 3 in Appendix A)
 - Work activities included substructure demolition and 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 demolition and construction.
- 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 removal of fixture and fittings, scaffolding and demolition.

Further works were also undertaken as part of the Granby Terrace Bridge utilities diversion (GTB Utilities) on Stanhope Street and Hampstead Road. Works to fit out the

tunnelling reception shaft were undertaken at Park Village East. Additional UK Power Network utility diversion works were undertaken at Regents Park Estate.

- 1.1.3 Please refer to Appendix A for plan identifying active worksites within the London Borough of Camden.
- 1.1.4 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.

1.2 Measurement locations

- 1.2.1 Table 2 summarises the position of noise and vibration monitoring installations within the LBC area in July 2019.
- 1.2.2 Additional noise and vibration monitoring commenced at locations surrounding worksite S001-WS07 in Regents Park Estate. Noise monitor N044 was installed at Langdale on 28th June and data was gathered from 1st July . Noise and vibration monitoring were started at a location external to Coniston whereby noise monitor N045 was installed on the 18th of July and vibration monitor V039 was installed on the 3rd of July.
- 1.2.3 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	CC	Whittlebury Mews West
	JC	Juniper Crescent
C	MT2	Lamppost opposite to 49 Mornington Terrace
	N022	External to 34 Mornington Terrace
	N024	External to Park Village Studios, Park Village East
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

Worksite Reference	Measurement Reference	Address
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
	V039	Coniston, Regents Park Estate
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)
	N016	Margarete Centre roof
	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
Not near worksite	N025	External to 3 Prince Albert Road
Not near worksite	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 LOAEL and SOAEL.

Worksite Reference	Measurement Reference	Monitor Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of SOAEL
B	CC	Whittlebury Mews West	Night	22:00 - 07:00	2
	JC	Juniper Crescent	All days	All periods	No exceedance
C	MT2	Lamppost opposite to 49 Mornington Terrace	Night	22:00 - 07:00	1
	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
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	All days	All periods	No exceedance
	N023	Ampthill 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

Worksite Reference	Measurement Reference	Monitor Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of SOAEL
	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
	N005	5A 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
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
Not near worksite	N025	External to 3 Prince Albert Road	All days	All periods	No exceedance
Not near worksite	N026	Thames Water Compound	All days	All periods	No exceedance

2.1.4 Over the reporting period the SOAEL was exceeded at measurement locations in the vicinity of two on-network worksites during night-time periods. These were due to movement of construction plant and vehicles at worksite B and due to relocatable equipment build works near worksite C.

2.1.5 Construction and demolition works taking place at worksites B, C, D, E, F, G, S001-WS02, S001-WS07, S003-WS03, S003-WS04, S003-WS05, S003-WS07 and S003-WS09 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.

2.1.6 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.

2.1.7 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
B	CC	Whittlebury Mews West, Camden Town, London, NW1 8JB	1
C	MT2	Opposite 49 Mornington Terrace, London NW1 7RT	1

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 B, C, D, E, F, G, S001-WS02, S001-WS07, S003-WS03, S003-WS04, 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_{Aeq} data over the monitoring period.

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
B	CC	Whittlebury Mews West	Free-field	63.2 (66.7)	63.4 (66.1)	65.0 (68.2)	63.6 (68.3)	58.0 (65.5)	63.2 (63.4)	61.4 (63.0)	62.5 (62.9)	63.7 (68.4)	59.7 (72.9)	62.6 (67.8)	57.1 (63.5)
	JC	Juniper Crescent	Free-field	60.0 (62.1)	60.0 (62.2)	60.2 (62.5)	60.3 (63.6)	57.0 (71.0)	59.5 (59.9)	59.7 (60.5)	59.4 (60.5)	58.9 (60.9)	56.0 (66.1)	58.4 (61.4)	54.8 (60.7)
C	MT2	Lamppost opposite to 49 Mornington Terrace	Free field	63.1 (64.2)	63.2 (64.0)	64.2 (65.3)	62.9 (64.6)	58.6 (65.0)	62.3 (64.0)	62.8 (63.5)	63.5 (63.7)	62.7 (64.5)	56.6 (62.1)	61.7 (63.8)	57.8 (62.7)
	N022	52A Mornington Terrace	Free-field	59.5 (61.8)	60.3 (63.4)	60.2 (61.2)	58.9 (62.3)	54.9 (63.2)	58.3 (60.1)	59.4 (60.1)	60.1 (60.9)	58.8 (61.6)	53.6 (58.1)	58.1 (59.8)	54.2 (59.2)
	N024	External to Park Village Studios, Park Village East	Free-field	56.6 (63.1)	62.2 (66.4)	57.1 (60.9)	56.3 (74.2)	52.5 (65.7)	51.8 (52.0)	55.8 (58.7)	54.0 (56.4)	55.0 (62.3)	50.4 (55.1)	56.3 (72.6)	50.9 (62.1)
D	N004	Mornington Terrace, lamppost #7	Free-field	64.3 (67.6)	64.8 (65.7)	65.5 (68.2)	64.6 (69.8)	61.1 (71.0)	63.0 (63.9)	63.9 (65.6)	63.8 (64.0)	63.6 (65.8)	58.2 (63.8)	64.5 (71.2)	61.7 (68.8)
E	N005	5A Granby Terrace	Free-field	66.3 (68.5)	66.5 (67.2)	67.3 (68.3)	65.9 (68.2)	63.2 (69.7)	64.3 (64.3)	65.3 (65.6)	65.1 (65.9)	65.3 (67.2)	62.6 (67.2)	65.3 (68.2)	62.8 (68.0)

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	63.0 (64.5)	63.2 (65.0)	62.6 (64.4)	61.8 (64.6)	59.6 (65.0)	63.6 (63.8)	62.3 (63.6)	61.5 (62.7)	61.2 (64.5)	57.3 (64.0)	61.7 (65.1)	58.6 (63.7)
	N023	Ampthill Estate, Hampstead Road	Free-field	71.5 (73.3)	70.4 (71.1)	70.0 (71.2)	69.5 (73.8)	67.9 (73.3)	69.4 (69.4)	70.1 (71.8)	68.1 (69.3)	69.5 (72.2)	68.3 (71.7)	69.6 (73.0)	67.6 (71.4)
G	HH	Euston Station Parcel Deck, Barnby Street	Free-field	62.2 (67.6)	65.7 (68.3)	62.8 (68.6)	62.8 (70.4)	59.5 (68.2)	59.5 (62.0)	65.6 (69.1)	65.1 (68.7)	63.2 (68.4)	60.9 (68.5)	63.7 (70.1)	59.4 (64.6)
S001-WS01	N001	External to Cubitt Court, 100 Park Village East	Façade	56.6 (59.3)	64.2 (68.3)	58.4 (67.9)	57.2 (63.1)	52.6 (68.7)	54.9 (55.7)	57.5 (59.2)	57.2 (57.9)	56.8 (60.0)	52.5 (56.7)	57.1 (65.0)	51.9 (57.8)
	N002	Richmond Court, Park Village East	Free-field	58.2 (60.2)	60.1 (62.1)	59.6 (62.1)	58.5 (62.0)	53.5 (68.6)	55.9 (56.8)	58.2 (58.8)	58.4 (59.3)	58.7 (63.1)	54.1 (58.2)	58.0 (60.9)	53.4 (58.6)
	N003	Silsoe House, Park Village East	Free-field	58.3 (61.5)	60.0 (64.6)	59.6 (62.4)	58.4 (61.7)	53.6 (66.9)	55.3 (56.5)	59.2 (62.7)	58.1 (58.7)	58.4 (62.0)	56.3 (68.2)	57.7 (62.8)	53.4 (59.1)
S001-WS02	N018	Outside replacement housing, Hampstead Road	Free-field	71.4 (74.0)	72.3 (72.9)	72.3 (75.5)	71.7 (73.5)	70.3 (73.6)	70.2 (70.3)	71.8 (72.1)	71.3 (72.4)	71.6 (73.5)	71.1 (73.5)	72.1 (76.1)	70.2 (73.2)
	N019	Outside Cartmel, Hampstead Road	Free-field	70.2 (72.6)	70.7 (71.8)	71.1 (73.6)	70.4 (73.1)	69.2 (74.5)	69.2 (69.5)	70.6 (71.5)	69.7 (70.6)	70.4 (73.3)	69.7 (71.7)	70.5 (75.4)	69.2 (74.1)

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	52.0 (56.2)	61.3 (68.6)	53.0 (58.9)	52.1 (59.7)	49.4 (65.0)	50.3 (52.2)	54.4 (57.1)	52.0 (53.6)	52.0 (57.3)	50.3 (58.1)	51.3 (55.7)	48.6 (56.3)
	N021	Stanhope Street, lamppost #2	Free-field	54.5 (63.2)	66.5 (70.0)	55.3 (67.4)	54.3 (67.6)	50.0 (67.2)	50.4 (51.0)	56.5 (59.8)	55.4 (57.3)	54.8 (63.2)	50.5 (55.9)	53.1 (56.3)	49.3 (54.5)
	N044	Regents Park Estate west	Free field	50.0 (53.5)	65.3 (71.8)	49.8 (52.3)	49.6 (58.9)	46.9 (66.5)	47.7 (48.4)	51.6 (54.5)	49.6 (50.2)	49.5 (52.6)	46.9 (55.4)	48.8 (52.3)	46.2 (51.1)
	N045	Regents Park Estate south, external to Coniston	Free field	56.2 (57.8)	63.5 (69.6)	56.1 (58.9)	55.9 (59.3)	54.4 (57.8)	57.0 (57.0)	58.0 (58.1)	54.9 (55.2)	55.5 (56.9)	54.2 (58.3)	55.0 (57.4)	53.6 (56.4)
S003-WS03	N006	RCGP Roof level	Free-field	54.3 (58.1)	65.8 (72.3)	54.8 (60.0)	54.1 (58.4)	51.6 (59.1)	55.0 (55.4)	61.7 (68.6)	53.1 (53.7)	52.4 (54.3)	51.7 (58.0)	52.5 (54.1)	51.0 (54.3)
	N008	RCGP Stephenson Way	Façade	65.7 (72.1)	68.0 (72.5)	56.8 (61.6)	56.3 (62.5)	59.5 (77.0)	58.1 (58.7)	64.4 (69.8)	58.5 (61.8)	57.8 (62.9)	54.2 (58.8)	56.8 (67.1)	63.3 (73.8)
	N010	Wesley Hotel	Façade	65.7 (67.4)	67.5 (70.3)	64.6 (66.0)	64.7 (66.1)	60.6 (66.7)	64.1 (64.1)	67.4 (70.2)	65.1 (66.3)	65.0 (66.5)	57.1 (66.4)	64.7 (66.5)	59.3 (66.2)
	N011	Outside 82 Euston Street	Free-field	58.6 (63.8)	61.8 (64.2)	56.4 (60.3)	56.3 (67.1)	54.0 (60.8)	53.7 (54.2)	60.6 (63.9)	57.3 (61.9)	56.0 (60.2)	55.3 (66.5)	54.9 (57.9)	53.9 (58.8)
S003-WS05	N014	Starcross Street	Free-field	55.1 (66.5)	62.6 (66.1)	61.3 (71.8)	61.5 (71.9)	54.2 (68.4)	54.6 (56.2)	60.8 (65.5)	56.3 (58.1)	55.3 (58.8)	50.1 (57.1)	55.4 (61.7)	52.0 (60.0)
S003-WS01	N016	Margaret Centre roof	Free-field	55.9 (57.9)	62.6 (69.8)	55.5 (59.4)	54.9 (57.7)	53.6 (60.9)	55.5 (57.3)	61.8 (65.5)	57.7 (60.6)	55.6 (60.1)	53.7 (59.0)	56.2 (61.6)	53.3 (56.7)

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-WS06	N017	Hampstead Road, lamppost #48	Free-field	71.0 (73.4)	71.8 (73.0)	71.6 (77.0)	70.8 (75.2)	69.2 (73.4)	69.2 (69.3)	71.2 (71.8)	69.8 (71.2)	70.7 (72.7)	69.6 (71.9)	70.9 (75.3)	68.9 (72.2)
S003-WS07	N012	Opposite 92-94 Drummond Street	Free-field	57.9 (61.5)	63.2 (65.0)	58.6 (63.7)	59.7 (64.5)	56.5 (61.0)	56.7 (57.1)	63.2 (65.5)	59.1 (59.4)	59.4 (64.5)	56.8 (59.6)	59.1 (61.3)	57.1 (61.3)
S003-WS08	N007	RCGP, Melton Street	Free-field	66.6 (68.4)	67.2 (68.9)	65.7 (69.3)	65.5 (69.7)	63.9 (69.2)	64.1 (64.3)	66.0 (67.0)	65.0 (65.3)	64.8 (66.9)	63.9 (68.2)	64.5 (66.6)	63.6 (68.3)
Not near worksite	N025	External to 3 Prince Albert Road	Free-field	68.9 (73.4)	68.8 (71.7)	67.2 (70.0)	67.0 (75.6)	64.7 (71.1)	65.4 (65.5)	67.0 (69.5)	67.7 (69.1)	67.1 (70.4)	65.1 (68.8)	66.5 (70.8)	64.0 (67.8)
Not near worksite	N026	Thames Water Compound	Free-field	57.9 (63.9)	64.6 (67.4)	56.1 (58.8)	55.9 (61.6)	51.7 (57.3)	53.3 (53.3)	59.2 (68.7)	57.8 (59.8)	57.2 (69.5)	51.8 (55.8)	54.7 (58.7)	50.9 (54.8)

2.2.3 Table 6 presents a summary of the measured vibration levels at monitoring locations V002, V003, V021, V037, V038 and V039 over the reporting period. During the monitoring high values of PPV were measured at V003, V037 and V039 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	2.60 (Z-axis)
S003-WS03	V002	RCGP. basement boiler room. 305 Euston Road	2.19 (Z-axis)
	V037	Magic Circle, basement	1.61 (Y-axis)
	V038	Wesley Hotel, basement lightwell, Euston Street	1.82 (Y-axis)
S003-WS05	V021	42-44 Cobourg Street (floor)	3.16 (Z-axis)
S003-WS09	V003	RCGP. basement vaults, 305 Euston Road	1.22 (Z-axis)

2.2.4 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.

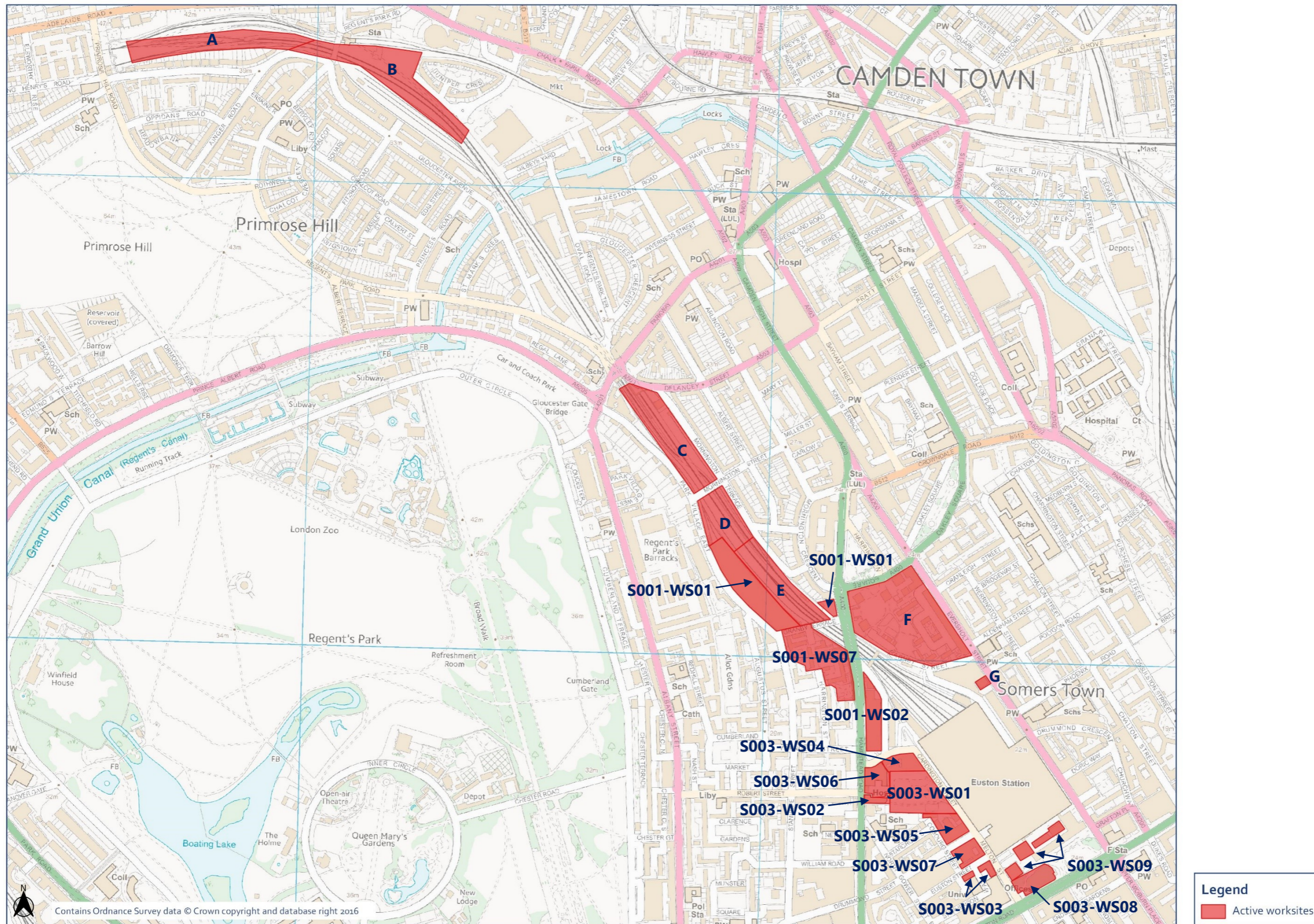
Table 8: Summary of complaints.

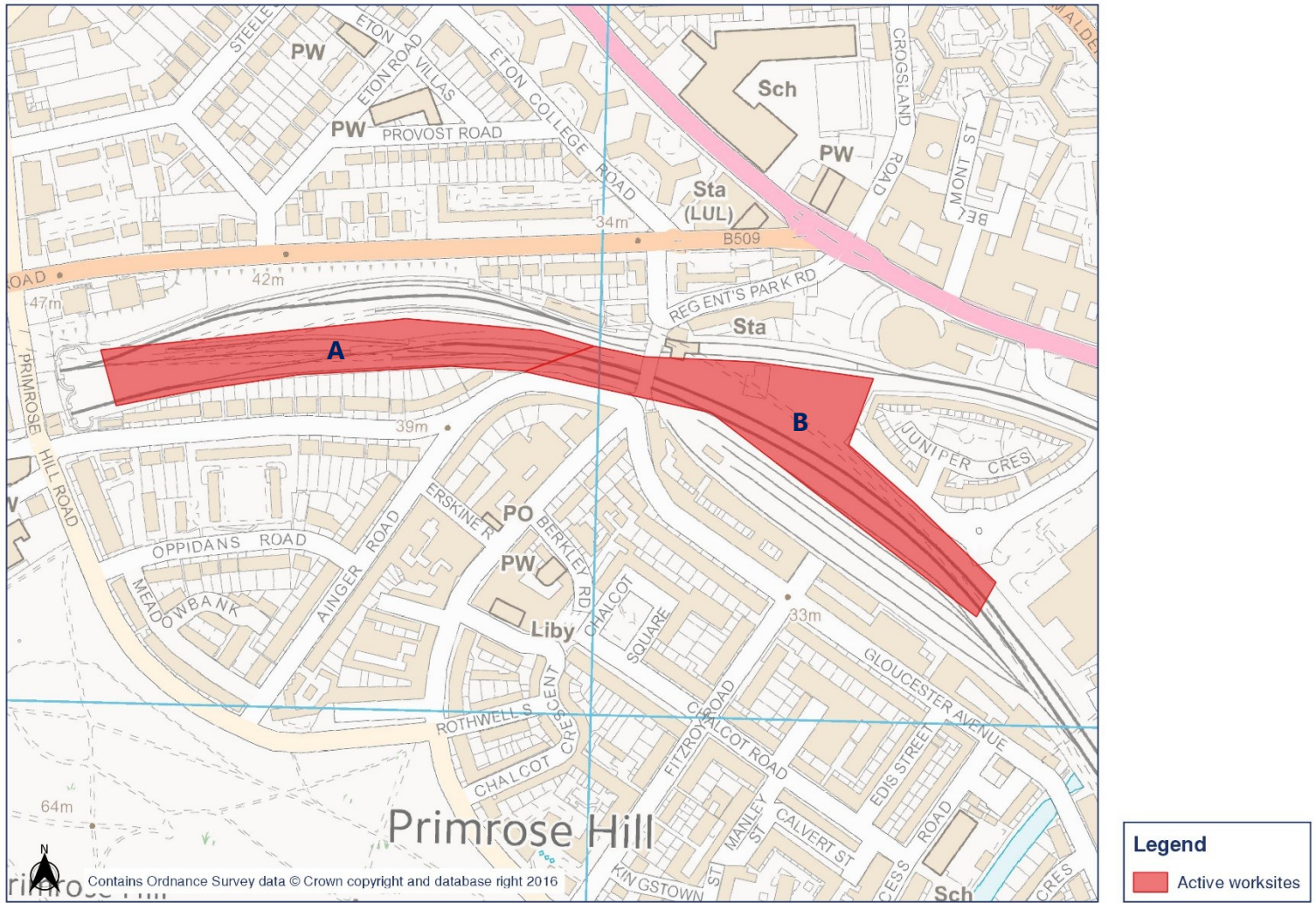
Complaint reference number	Worksite reference	Description of complaint	Results of investigation	Actions taken
N/A	GTB Utilities	Complaint from resident on Stanhope Street regarding noise, including comments regarding noise at night.	Utilities diversion works were taking place in Stanhope Street including saw cutting and breaking out of the road surface on a single day only. Works methodology including use of acoustic barriers was in accordance with BPM and S61 consent. No works taking place outside of core working hours.	No additional measures practicable. Resident was contacted and informed of findings. Saw cutting and breaking out were completed shortly after the complaint.
HS2-19-05161-C	S001-WS02	Complaint from resident on Harrington Street regarding noise from demolition works.	Demolition of basement slab. Works methodology, mitigation and noise levels from demolition works compliant with S61 and no exceedance of SOAEL.	Ongoing monitoring Residents contacted and informed of findings.

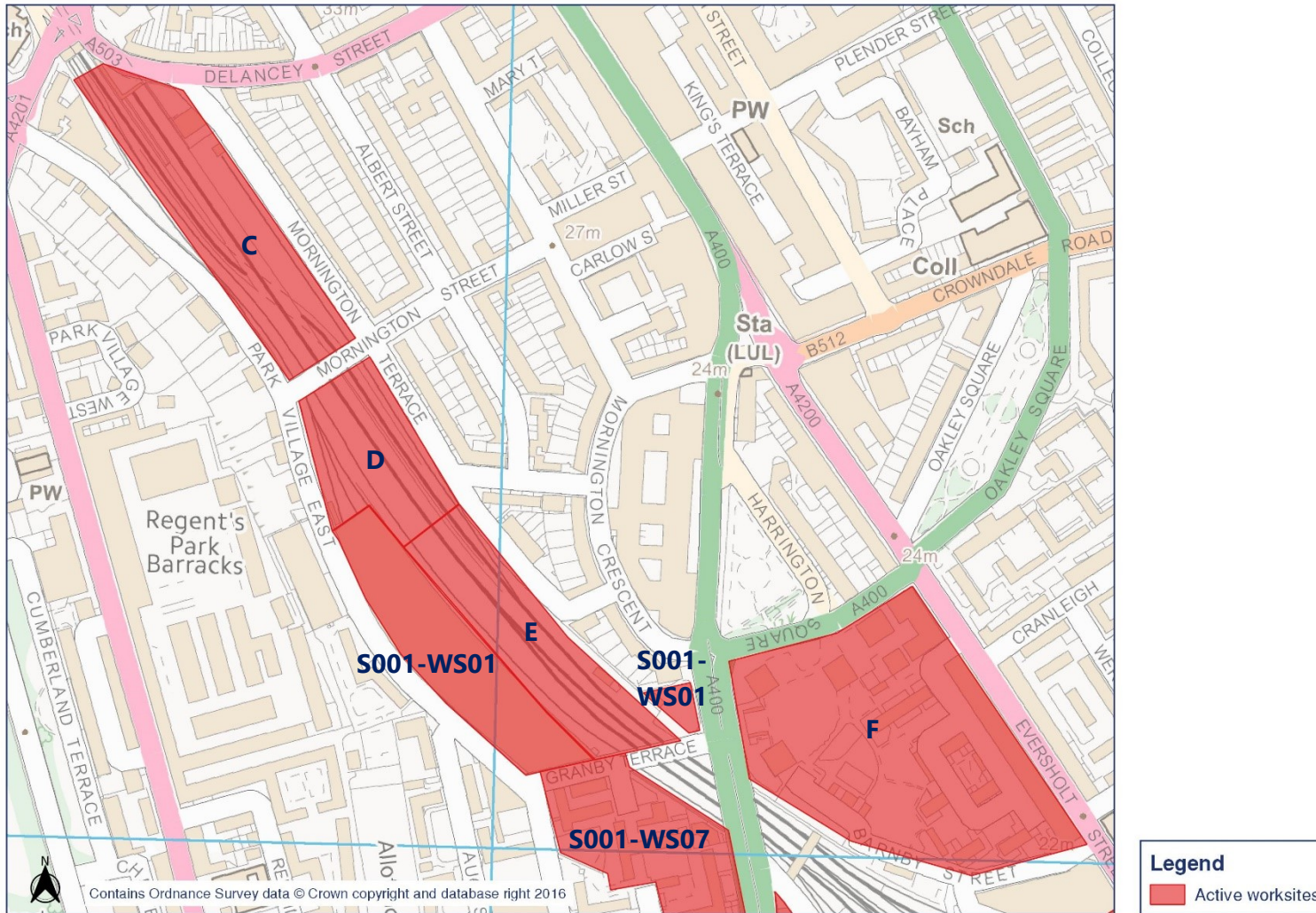
Complaint reference number	Worksite reference	Description of complaint	Results of investigation	Actions taken
HS2-19-05996-C	S003-WS03	Complaint from non-residential property regarding construction noise.	Specific source of noise is unclear; potentially ground investigation works or demolition. Demolition works methodology and monitoring results were compliant with s61 and Trigger Action Plan.	Further information provided regarding ground investigation works programme.
N/A	S003-WS03	Complaint from non-residential property on Melton St/Stephenson Way regarding construction noise.	Specific source of noise unclear. No significant demolition works being undertaken - internal hand demolition and propping only. Third party works taking place at adjacent building site (non-HS2). No evidence of elevated noise levels from monitoring.	Further information provided regarding ground investigation works programme.
190707-000000	C	Complaint from resident of Mornington Terrace regarding noise from the horn of a road-rail vehicle.	HS2 contractors were working near Mornington Terrace. Works were compliant with S61 consent. A short blast of horn is required for safety reason every time an on track plant is about to move (ref. The Network Rail Rule Book for On Track Plant). No SOAEL exceedance at any of the noise monitors was reported at the time of the complaint.	Resident informed of findings and of programme of remaining works.
HS2-19-05009-C	S001-WS01	Complaint from resident on Mornington Terrace requesting clarification on works due to audible construction noise	Complaint likely to have been caused by works during weekend network possession.	Update on works being undertaken provided to resident by National Rail, explaining the reasons for weekend closure works.
HS2-19-05553-C	F / G	Resident situated near to corner of Barnby Street and Eversholt Street awoken due to grinding noise during a night-time period.	Emergency repair work was undertaken due to a defect on a line outside of Euston Station.	Resident informed that noise was not caused by HS2 construction

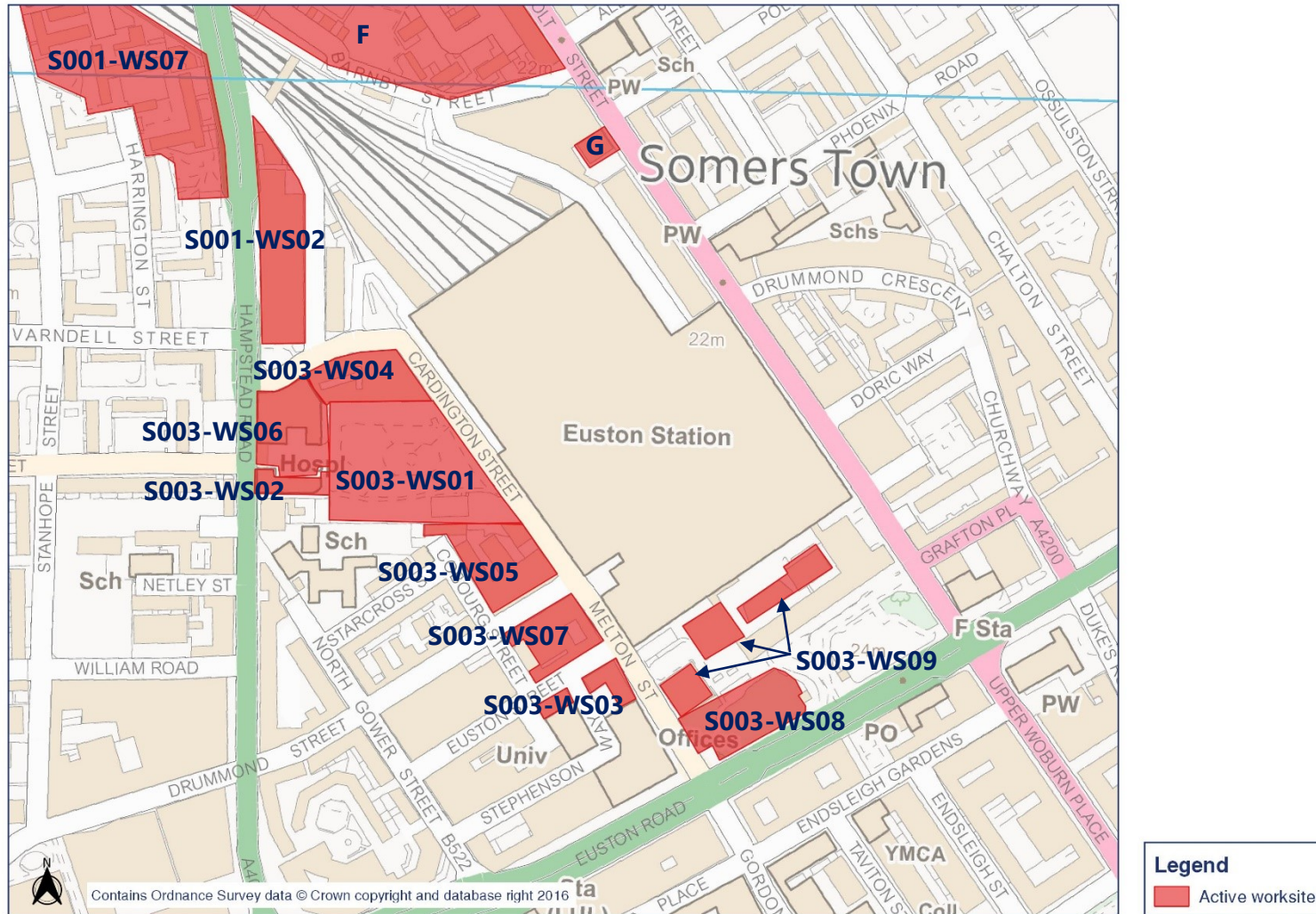
Complaint reference number	Worksite reference	Description of complaint	Results of investigation	Actions taken
HS2-19-05996-C	S003-WS08	Complaint from non-residential property on Euston Square due to HS2 construction noise disturbing a work-based event.	Noise monitoring shows that levels were compliant with S61 consent.	Further information provided regarding ground investigation works programme.
HS2-19-06114-C	S003-WS05 / S003-WS07	Complaint from a resident on Drummond Street due to perceptible vibration with their dwelling.	Investigation established that vibration was not caused by HS2 construction works.	Resident informed that vibration was likely caused by works taking place at Ibis Hotel site.
HS2-19-06278-C	S003-WS08 / S003-WS09	Complaint from non-residential property on Euston Square due to construction noise causing disturbance whilst at work.	Investigation is currently ongoing.	Investigation is currently ongoing.
HS2-19-06511-C	Thames Water Utility Diversions	Complaint from a resident near Park Village West due to perceptible vibration.	The resident's property was outside the zone of influence.	A response was provided to the resident
HS2-19-06516-C	N/A	Complaint from a residential property on Hampsted Road concerned about HS2 construction noise.	The resident was enquiring about the noise insulation programme.	The resident was informed that the property is not eligible for noise insulation
HS2-19-6689- C	S003-WS08 / S003-WS09	Complaint from a residential property on Euston Square with regards to construction noise	Complaint was investigated and no elevated levels or noise of vibration were recorded in the vicinity of Stephenson Way	Response provided to resident to confirm results of investigation

Appendix A Site Locations

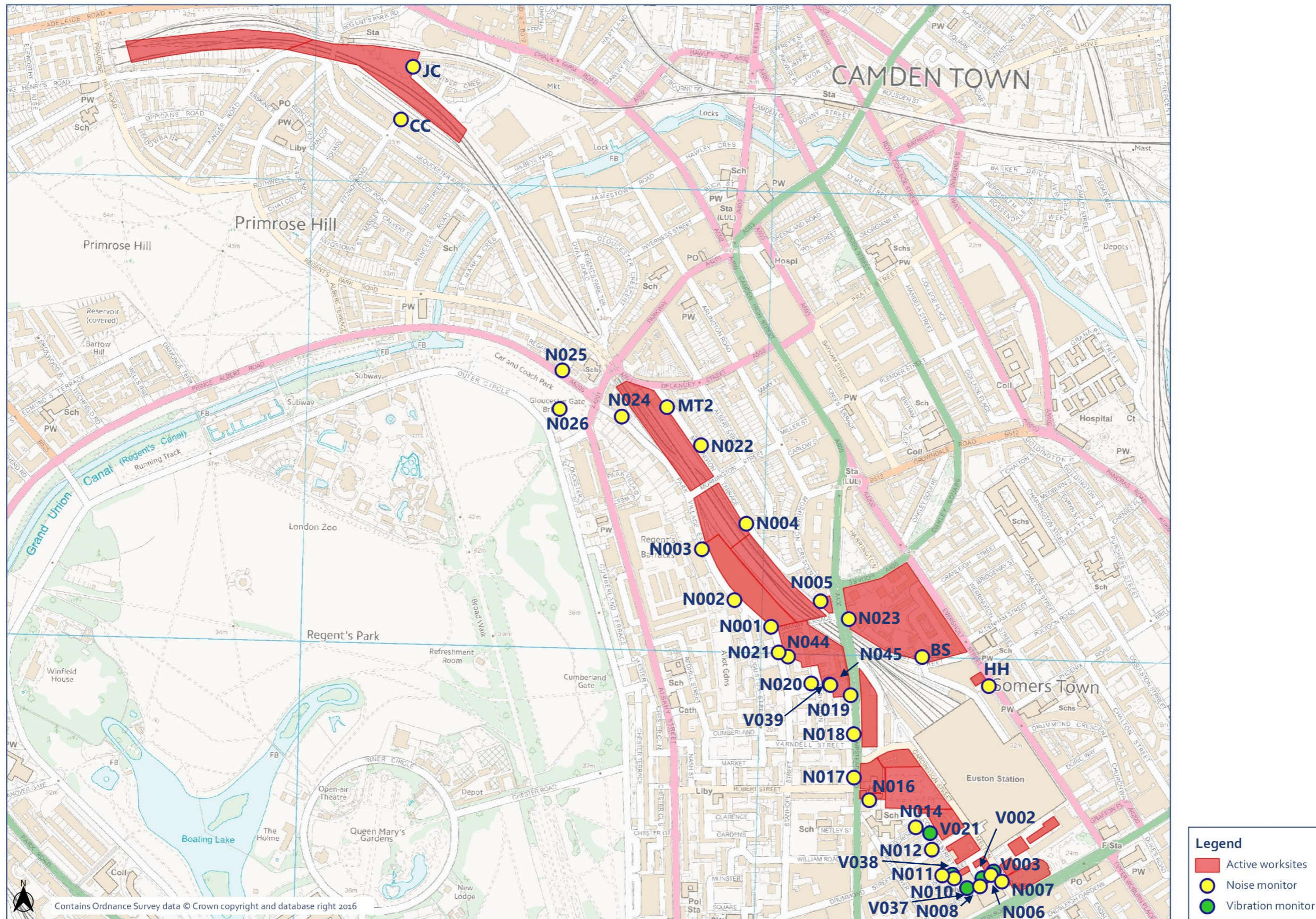


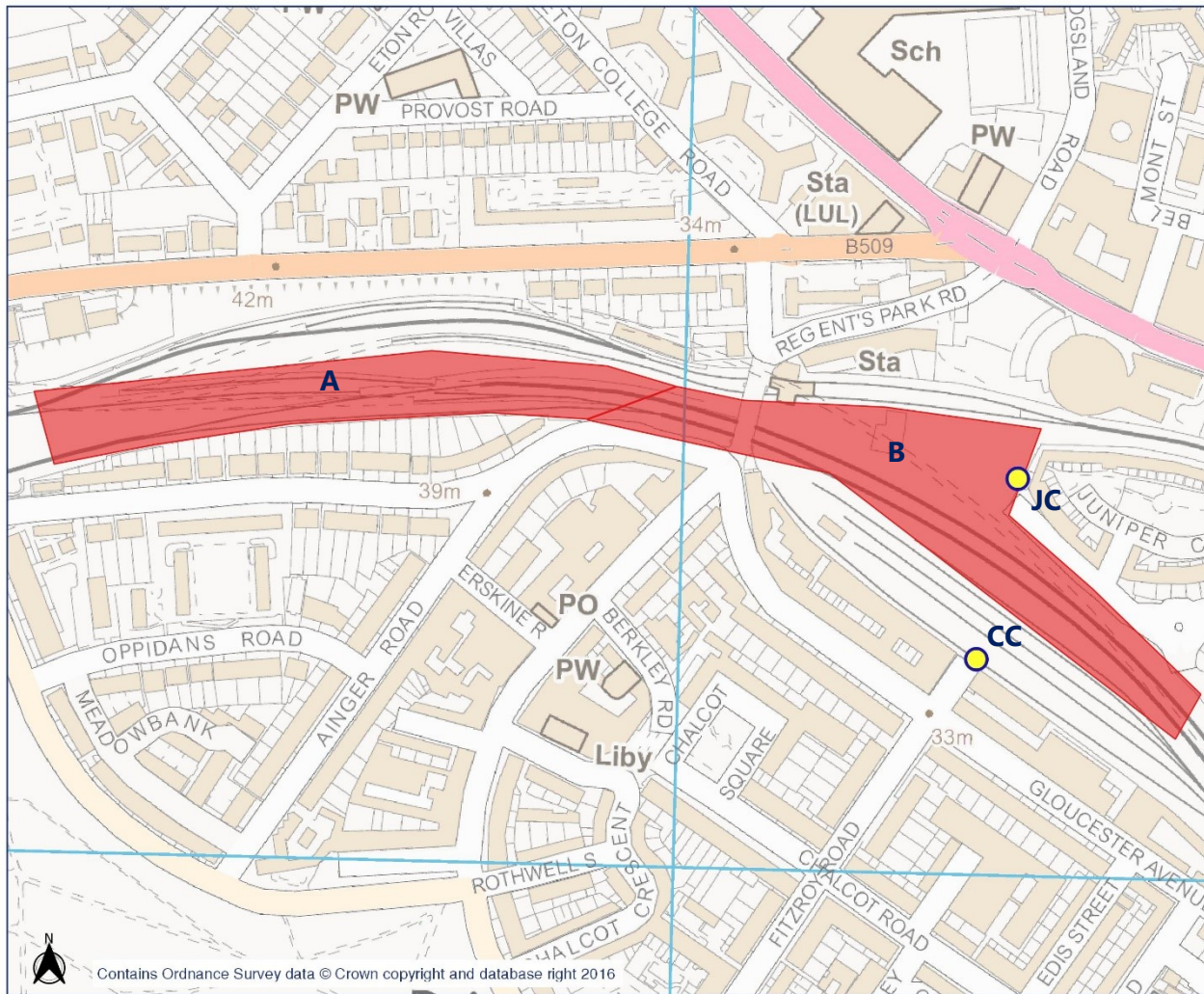


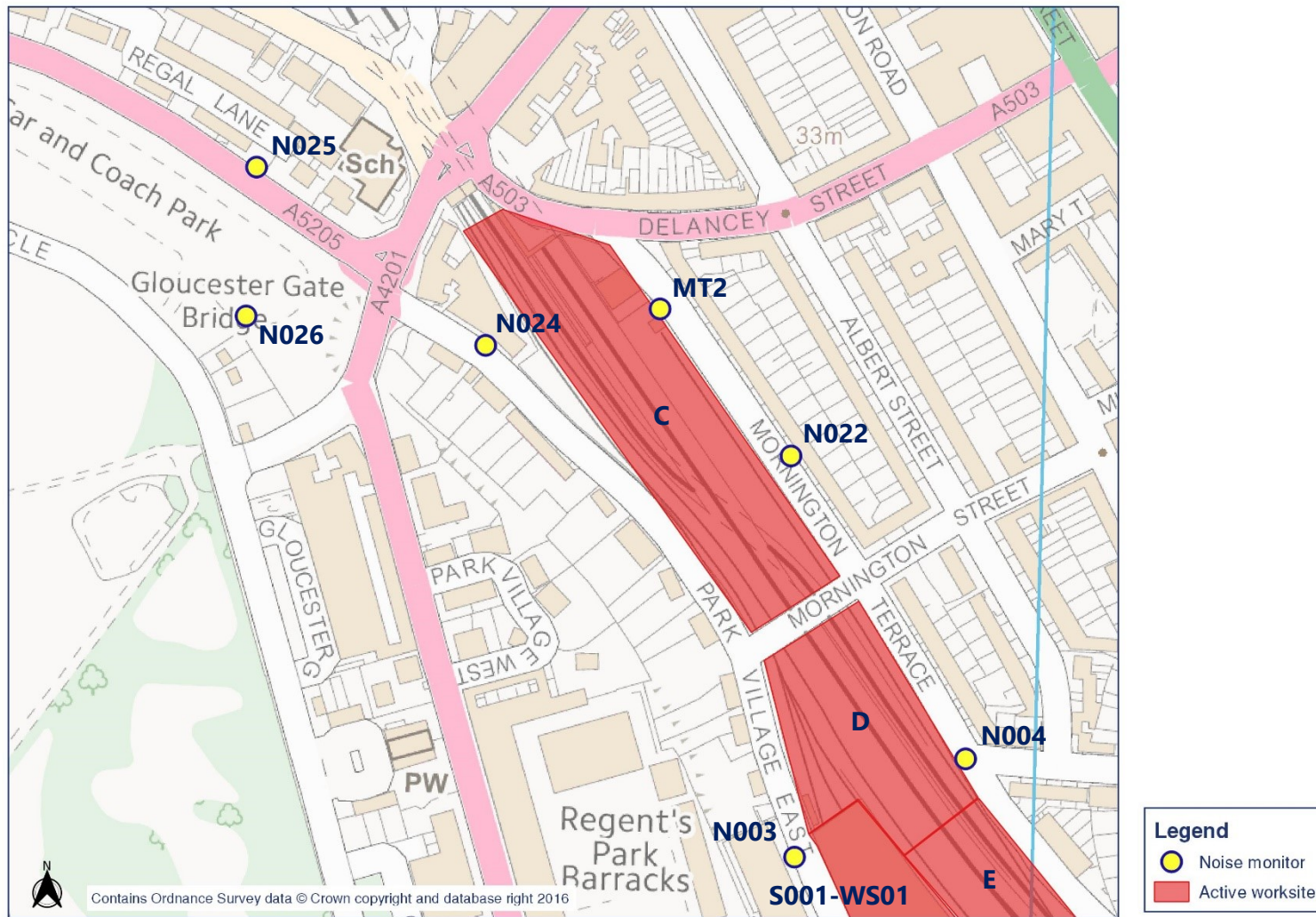


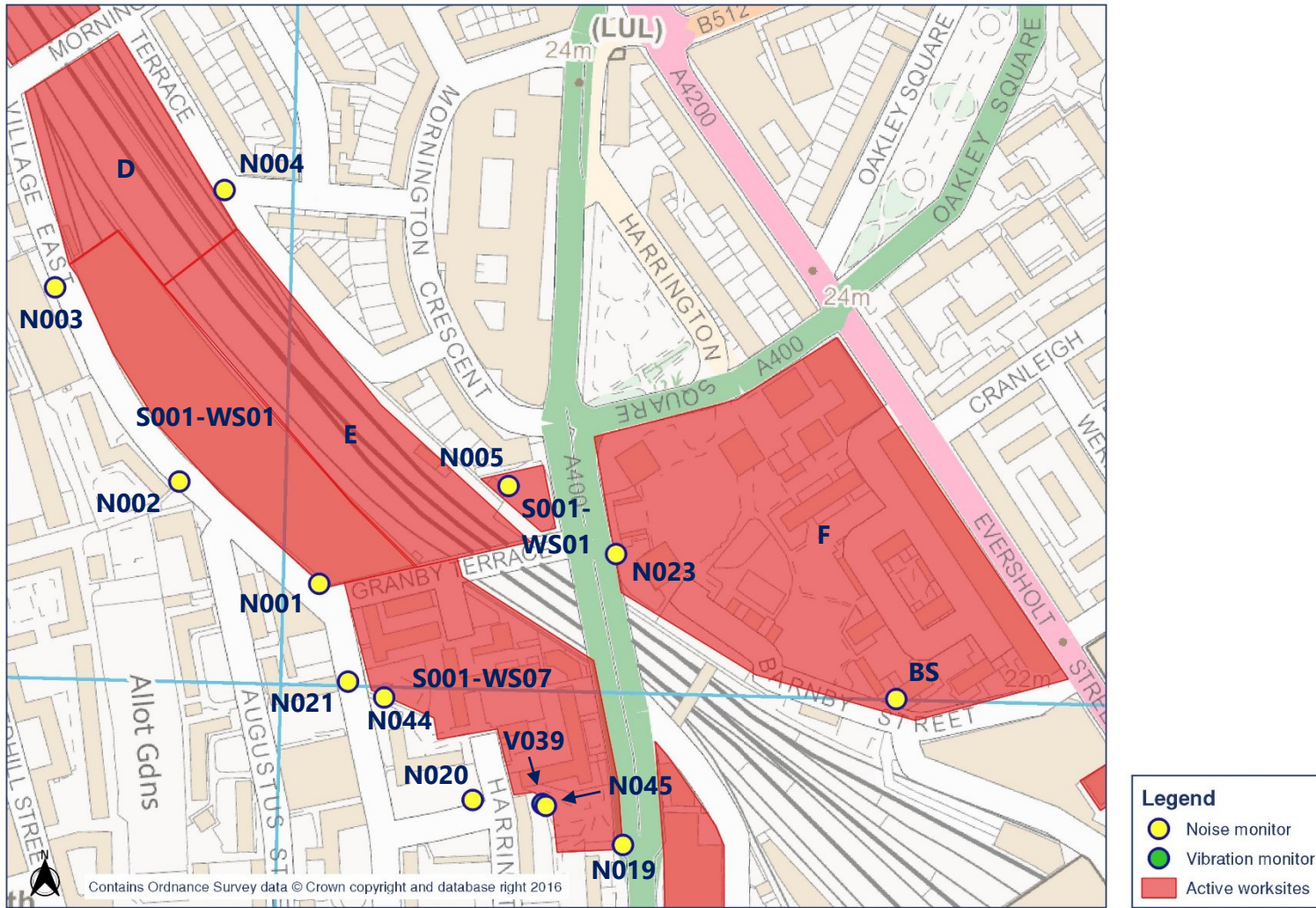


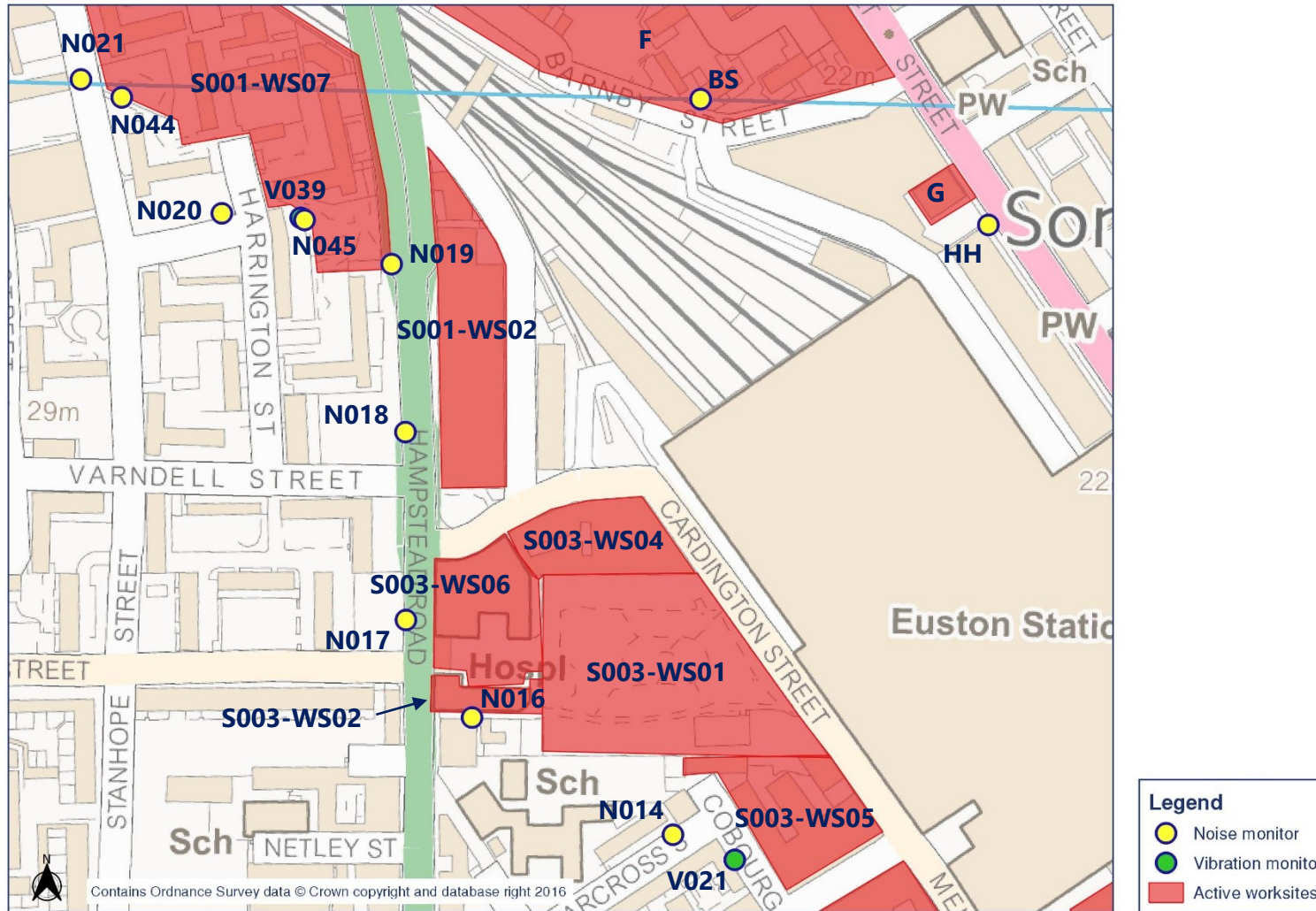
Appendix B Monitoring Locations

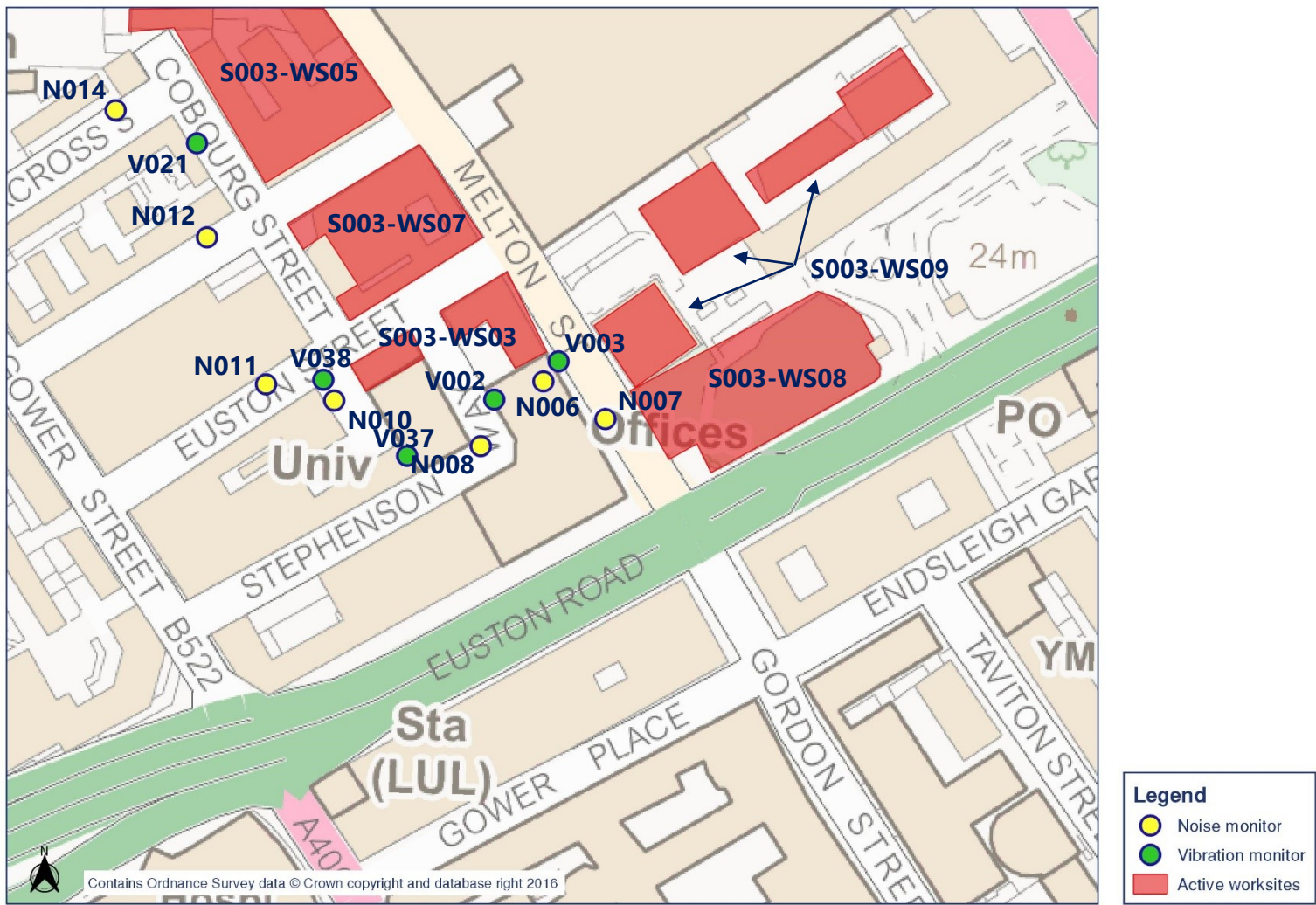










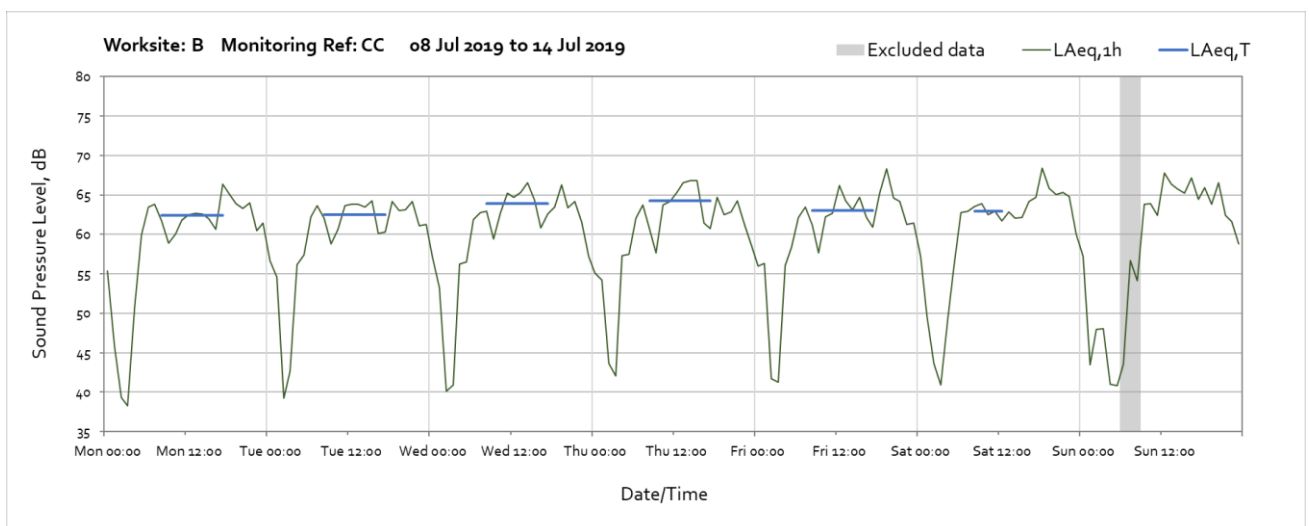
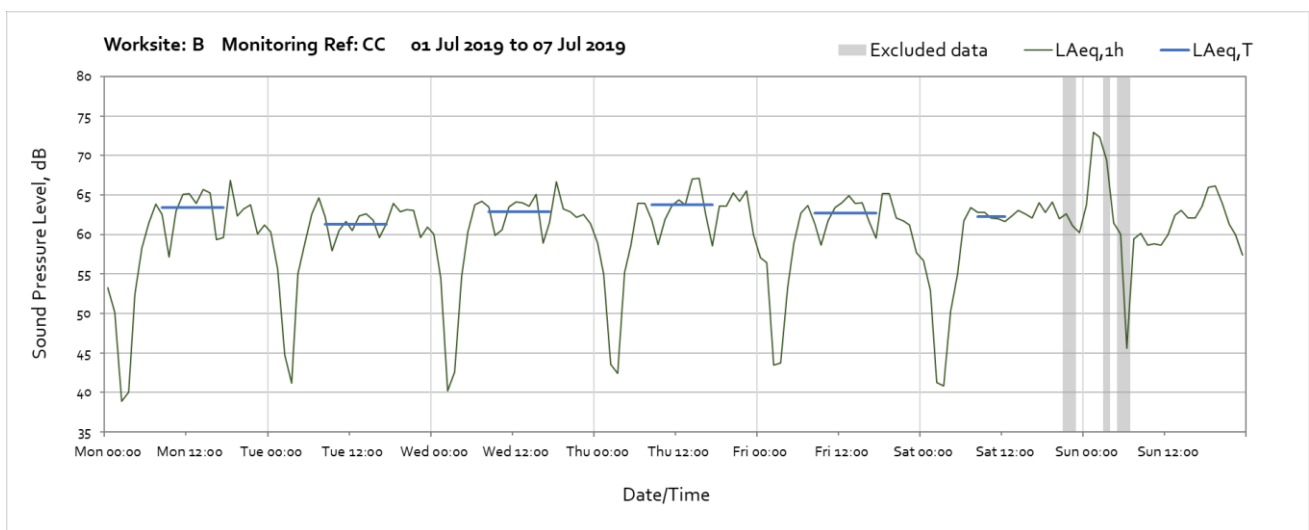


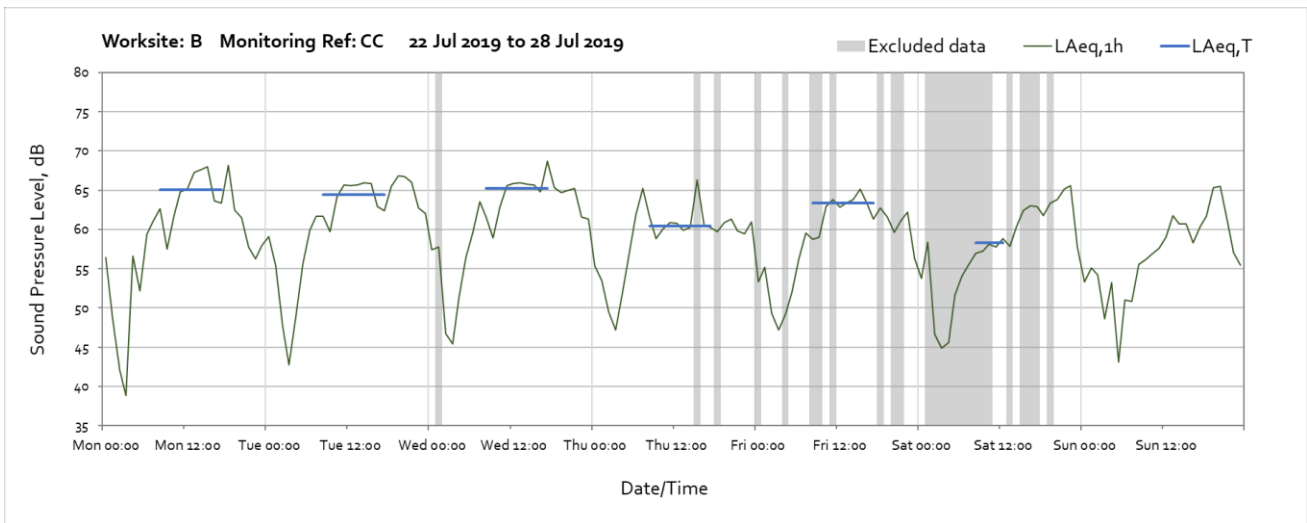
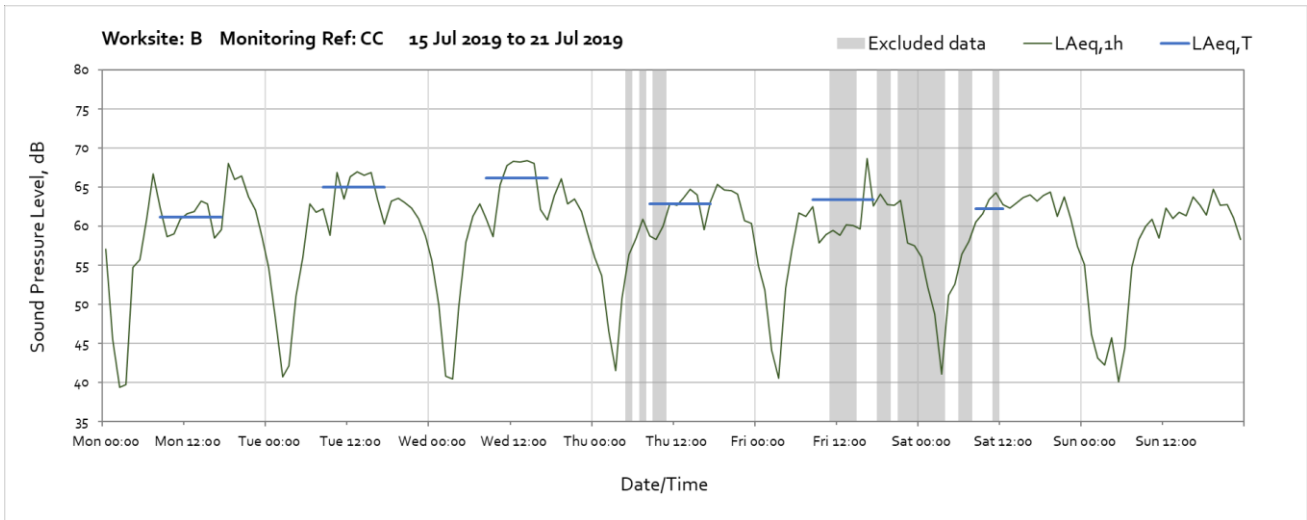
Appendix C Data

Noise

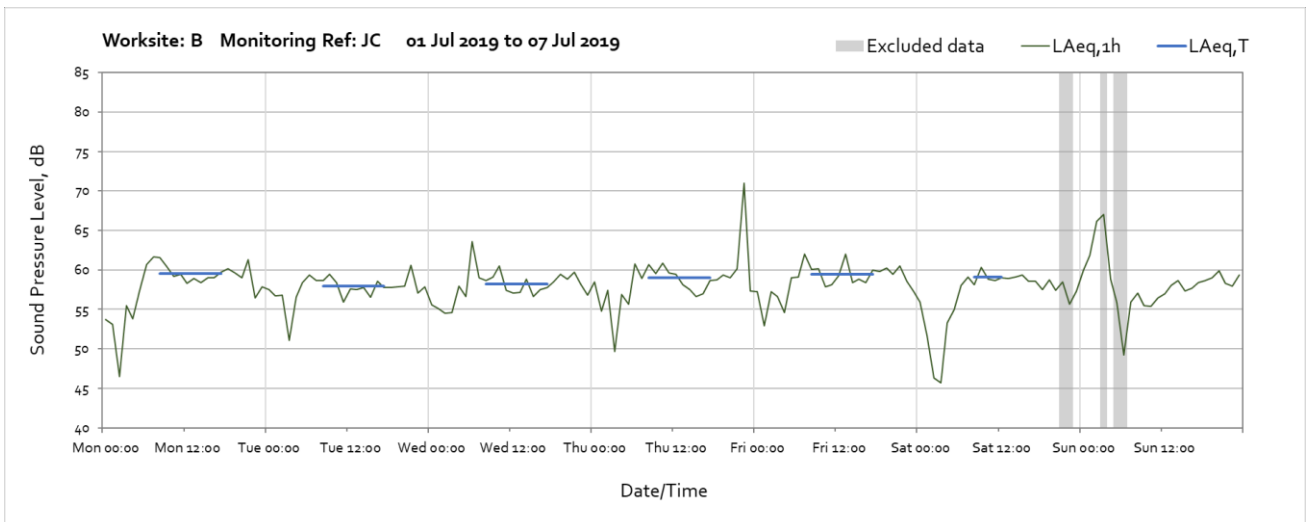
The following graphs show the hourly measured ambient noise level $L_{Aeq,1h}$ and, where relevant, the averaged noise level $L_{Aeq,T}$ values, where the time period T is as specified in Table 1 of HS2 Information Paper E23. Periods with adversely weather affected noise levels are greyed out and have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

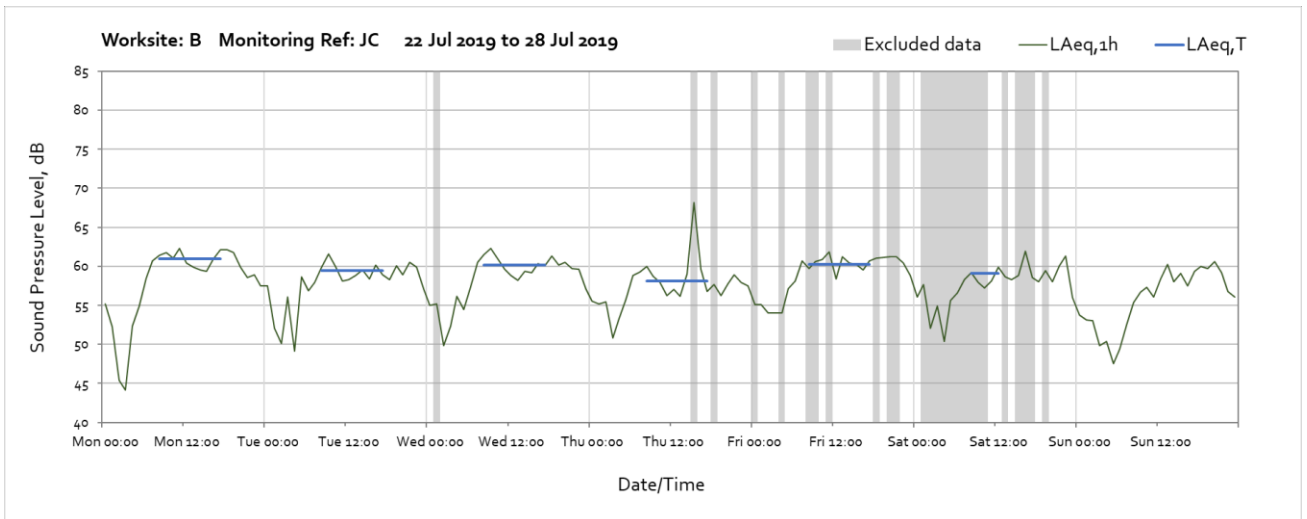
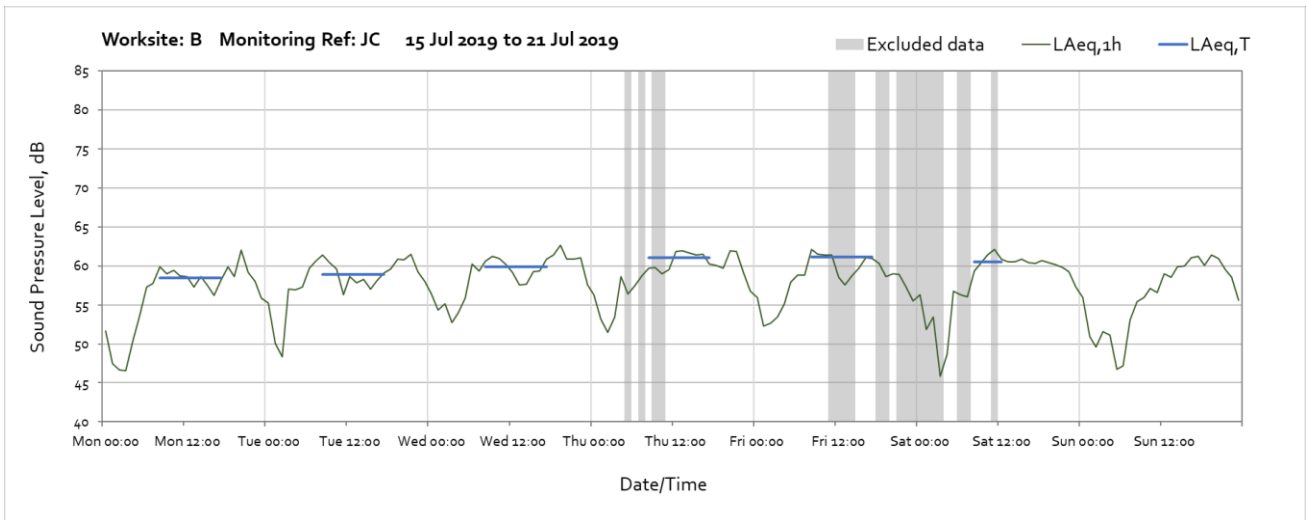
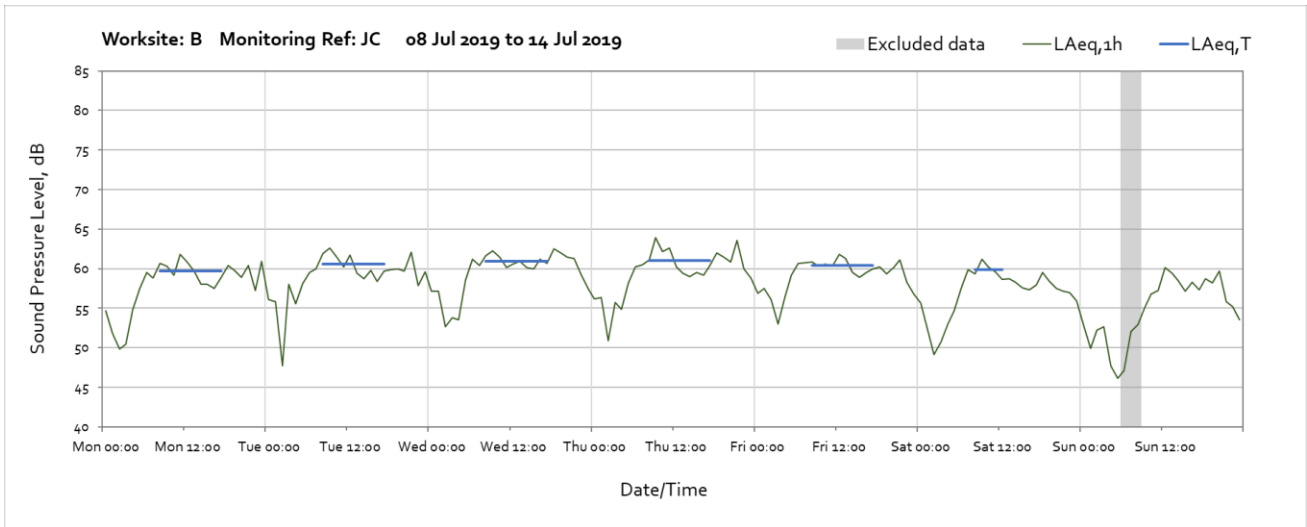
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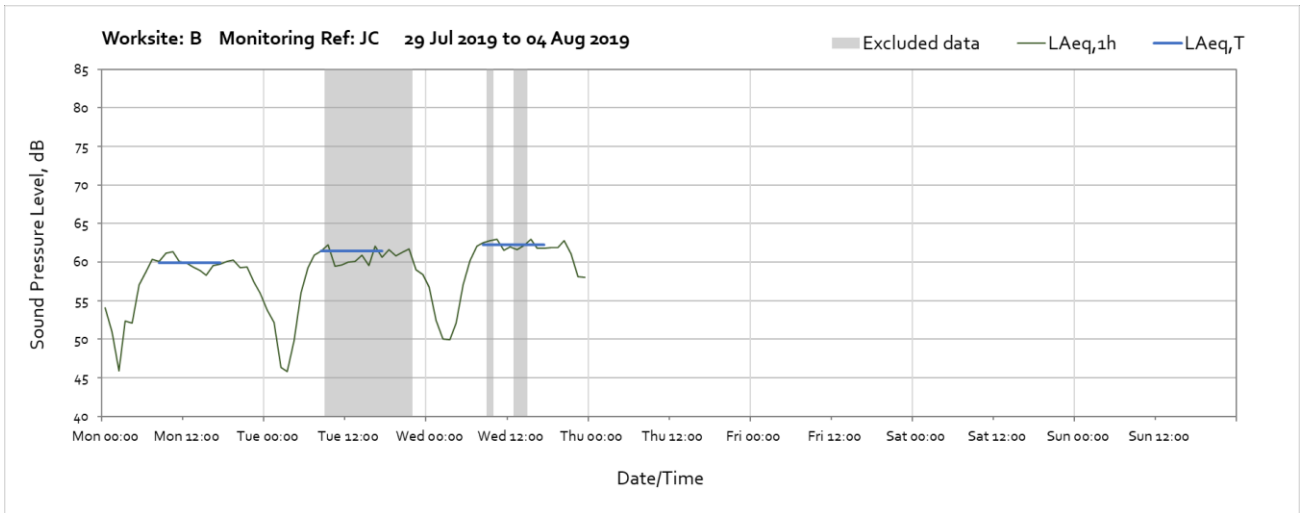




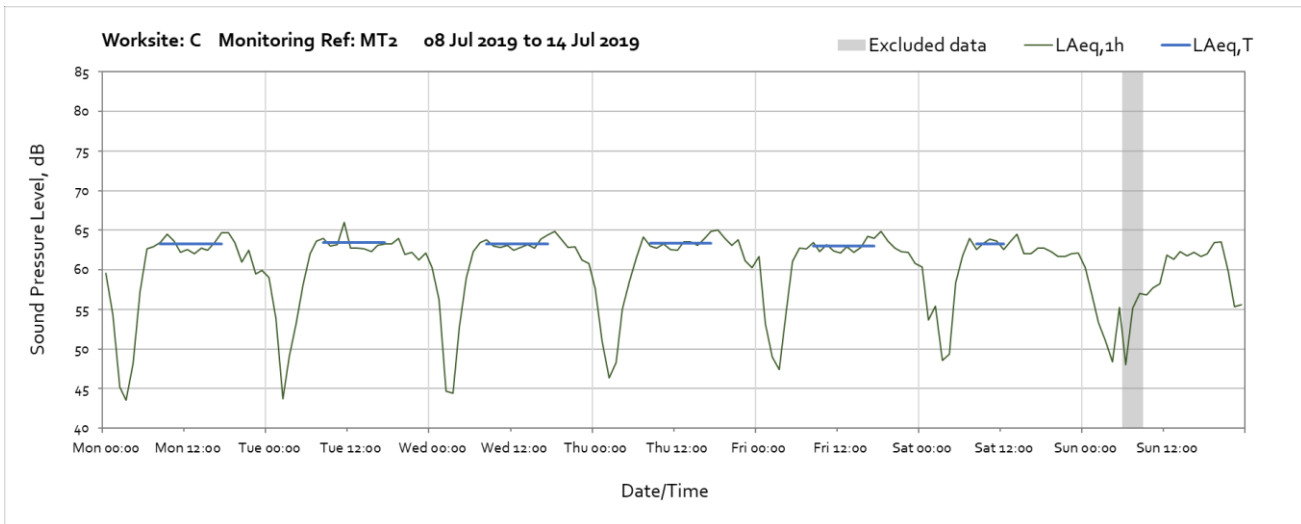
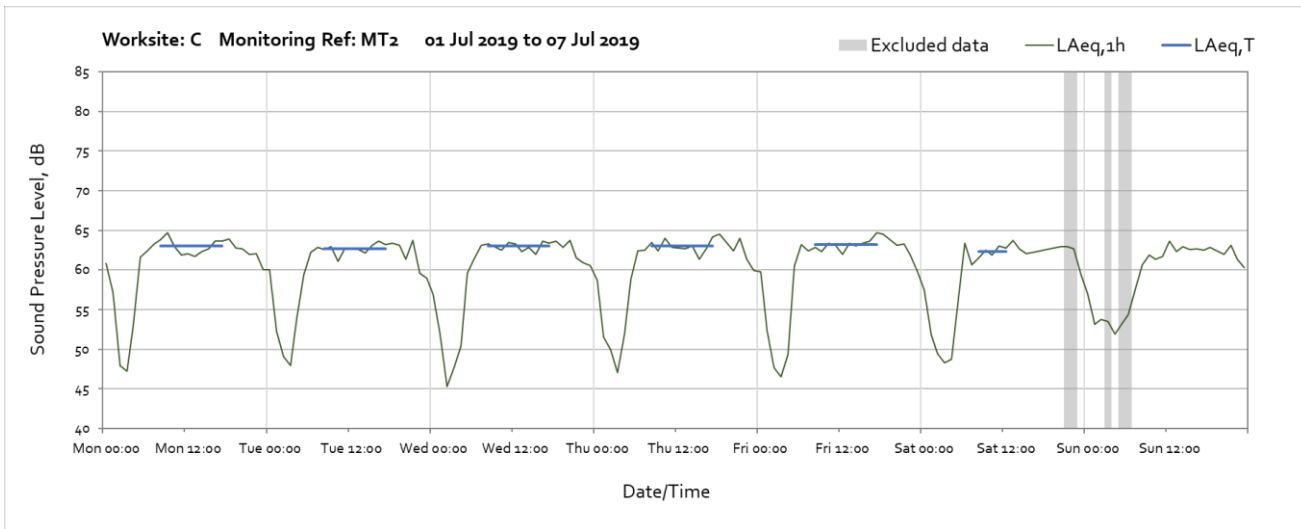
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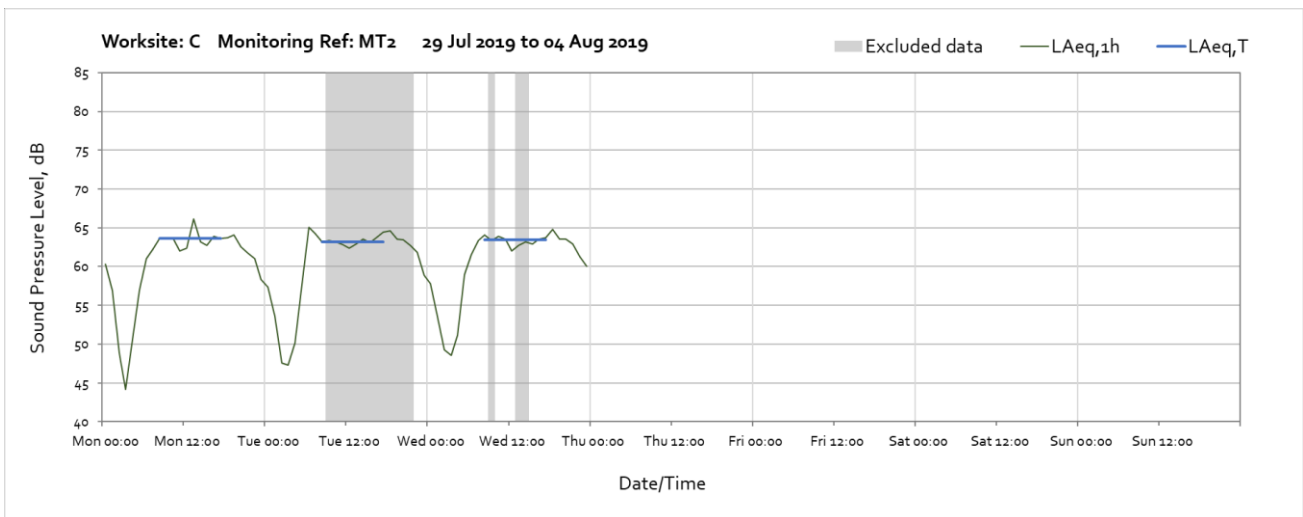
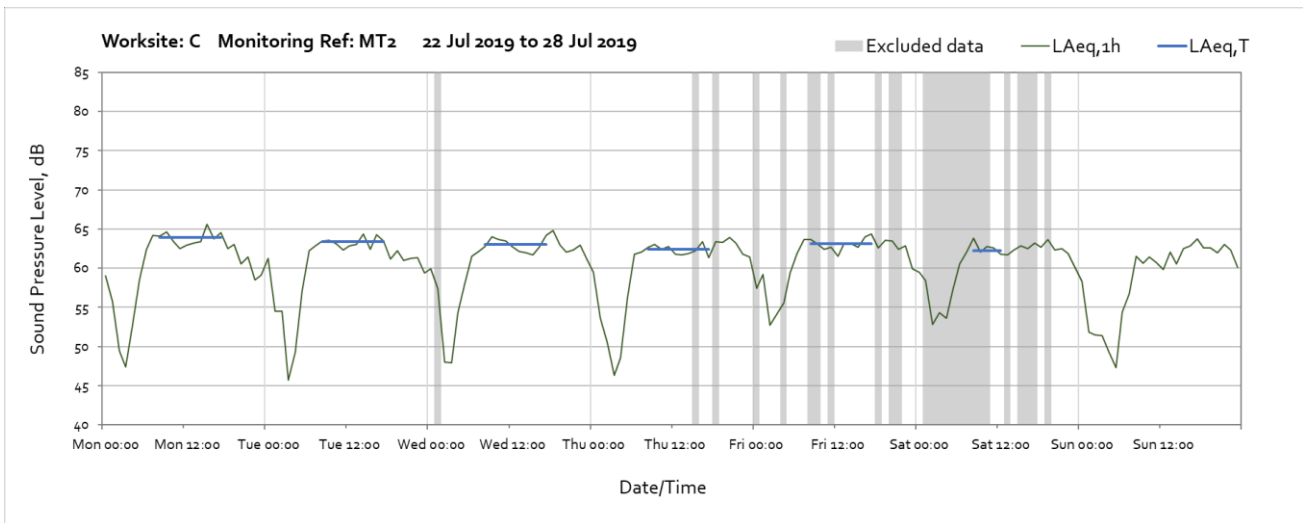
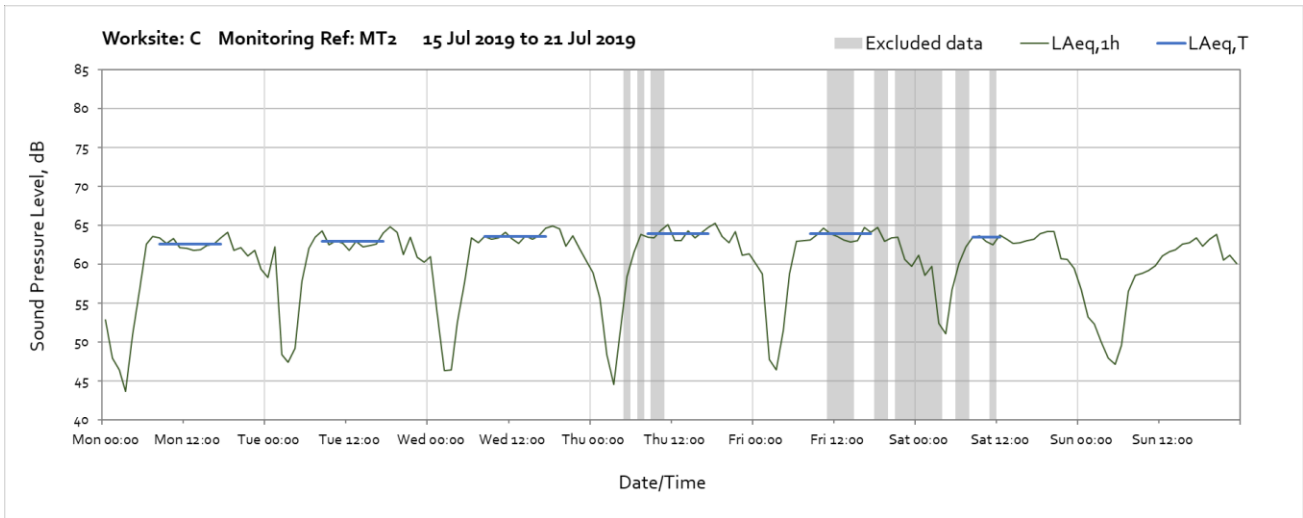




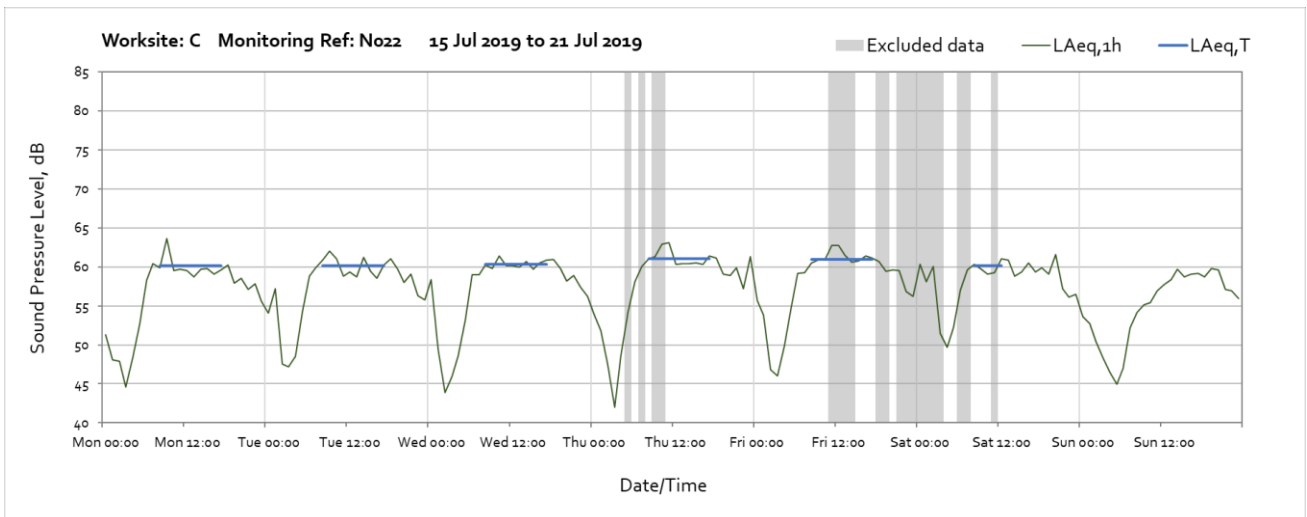
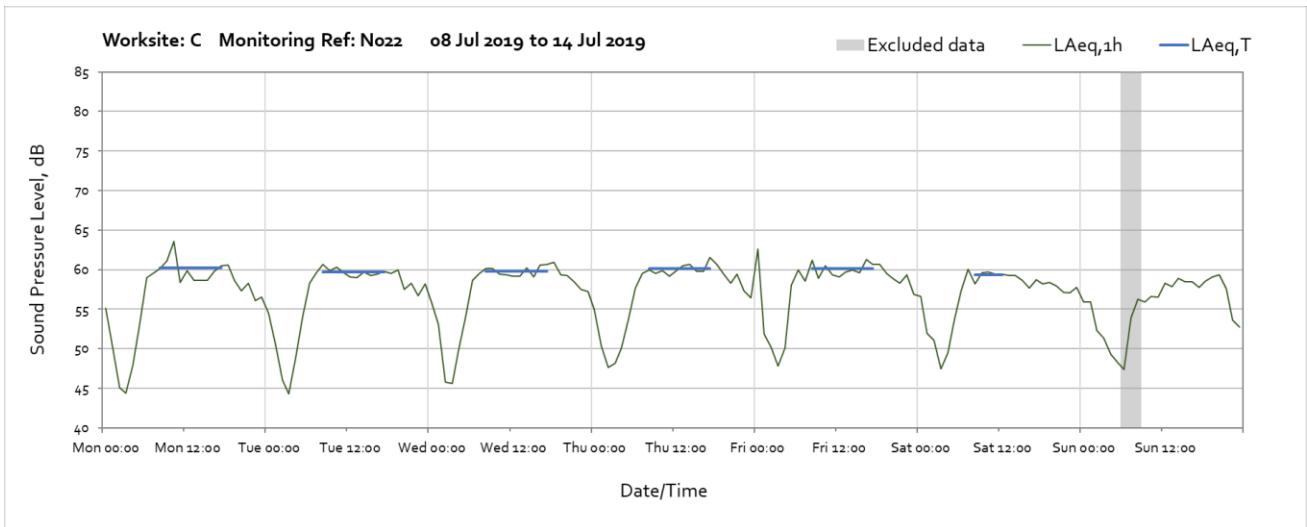
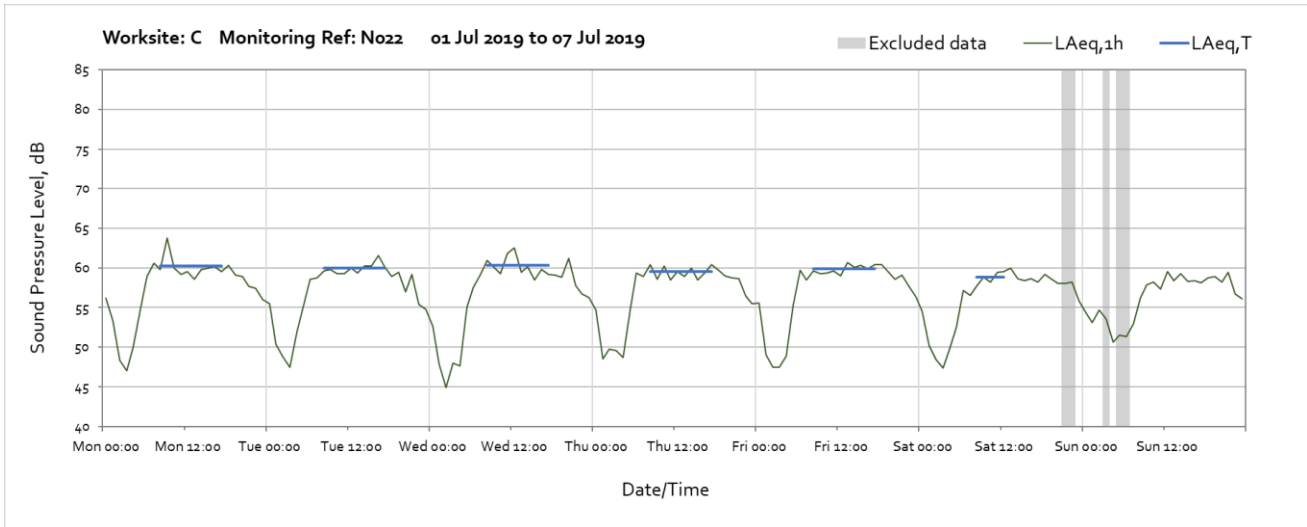


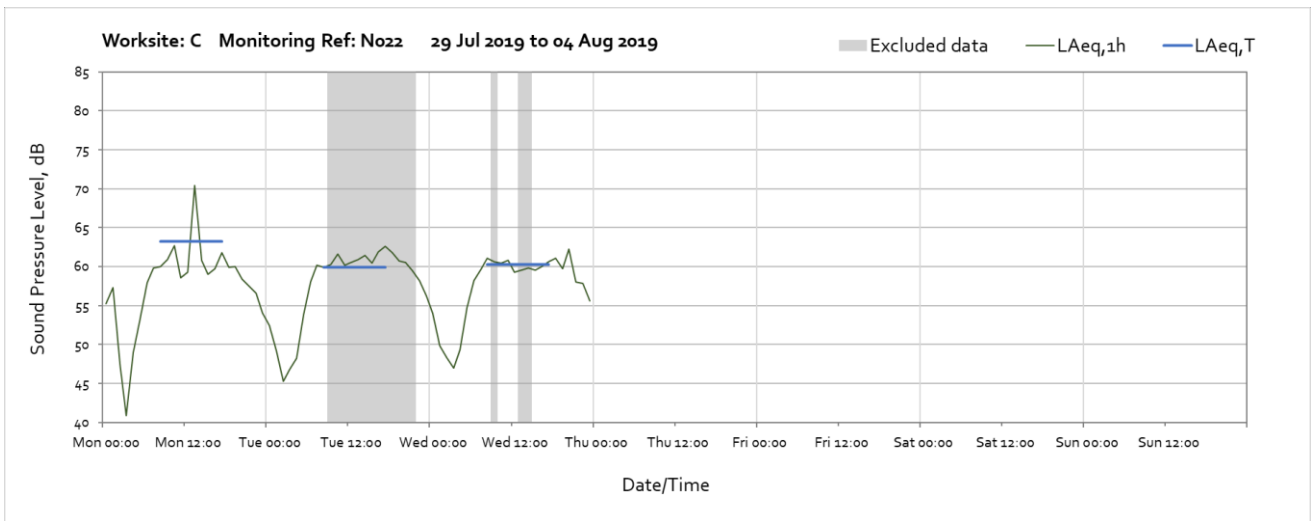
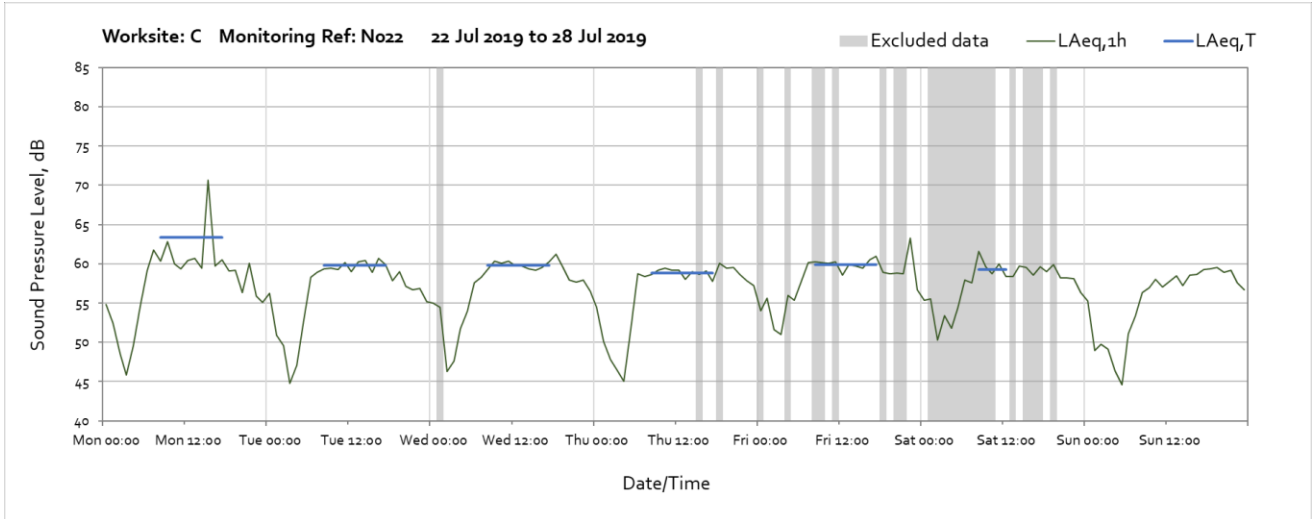
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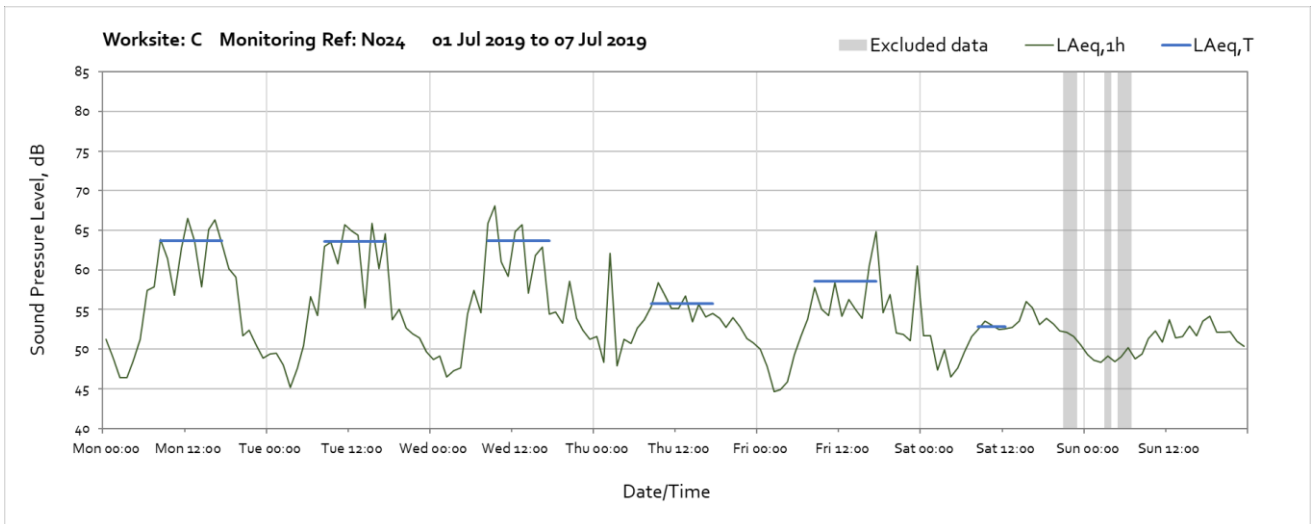


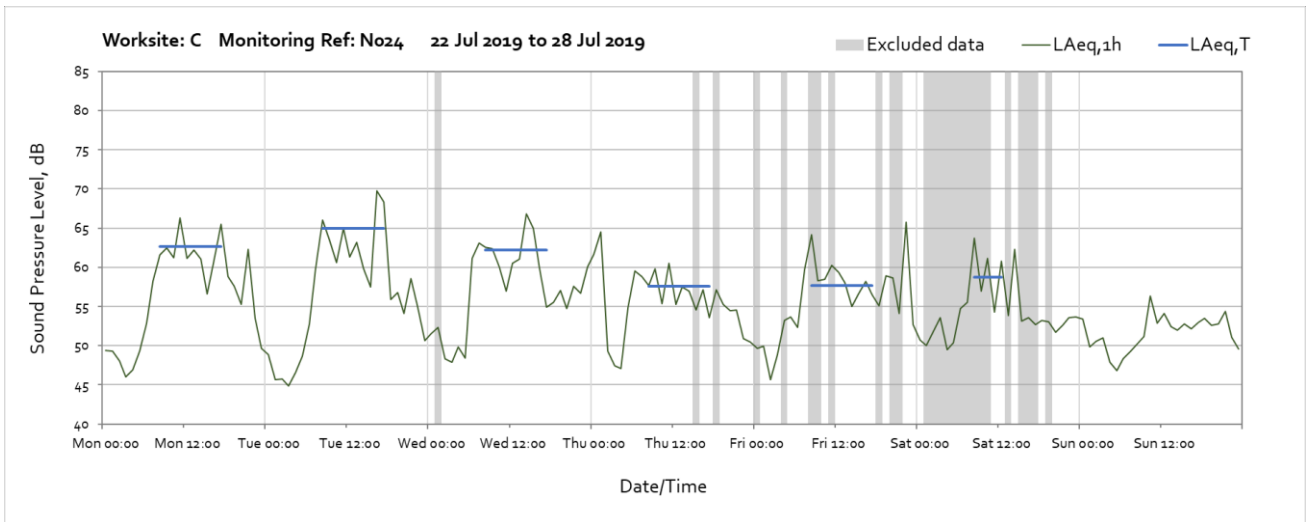
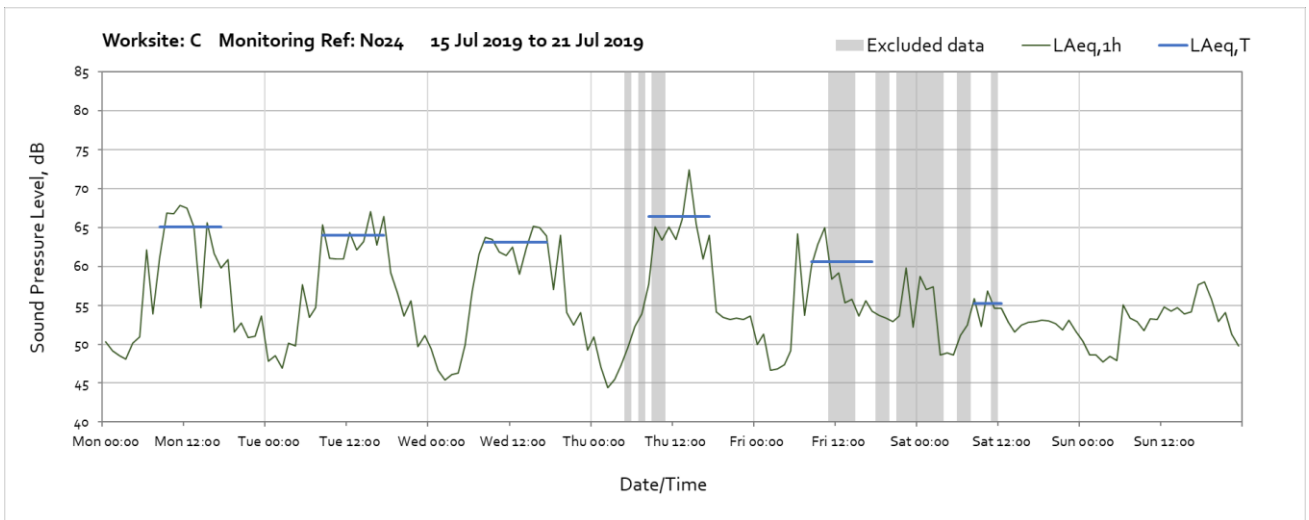
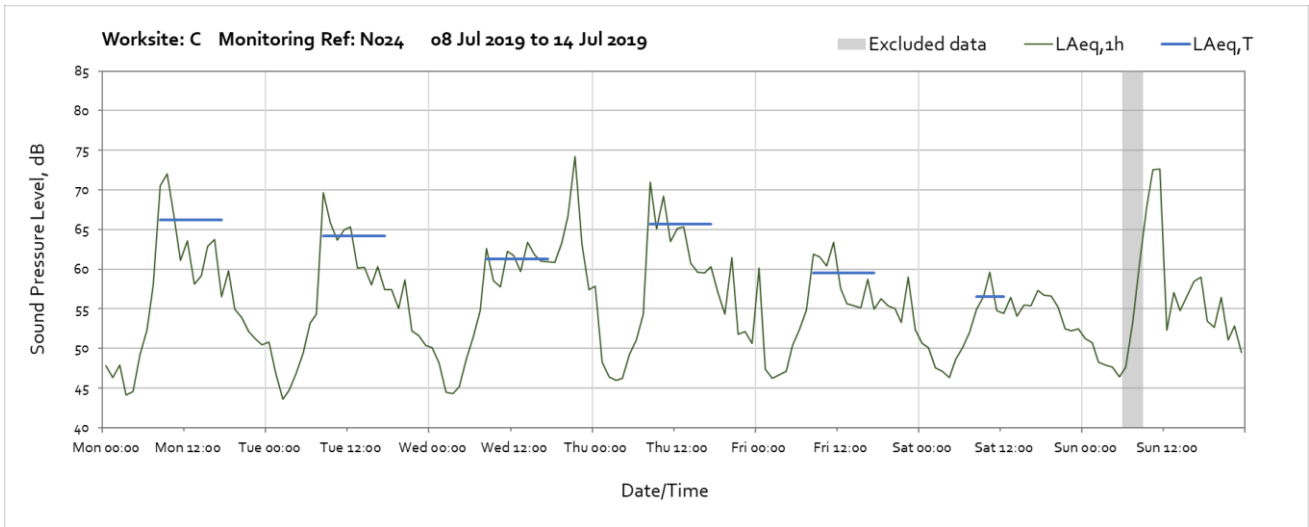
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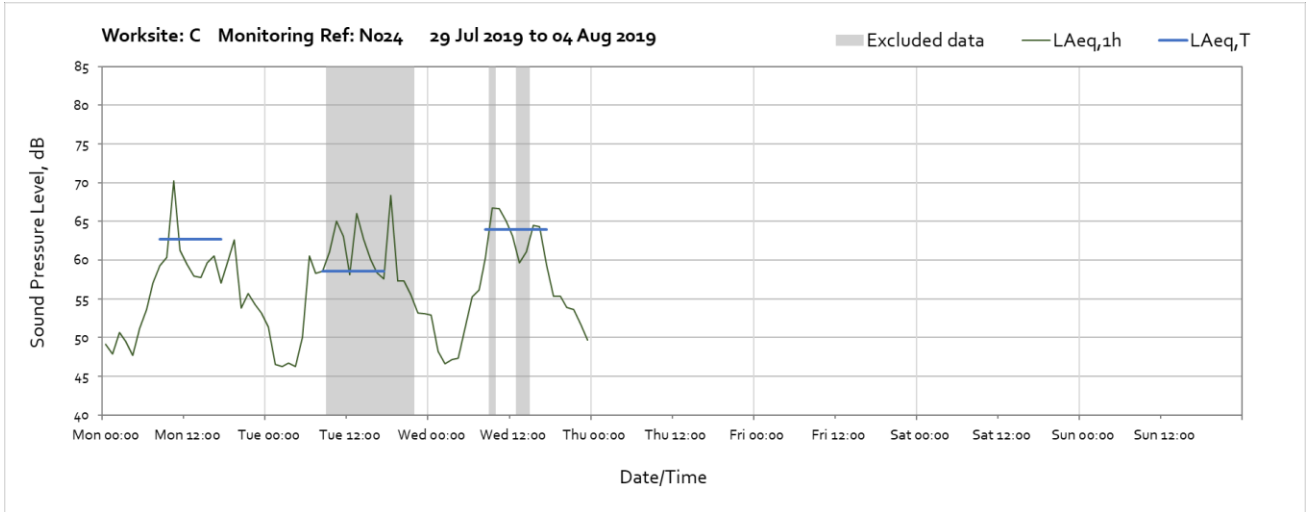




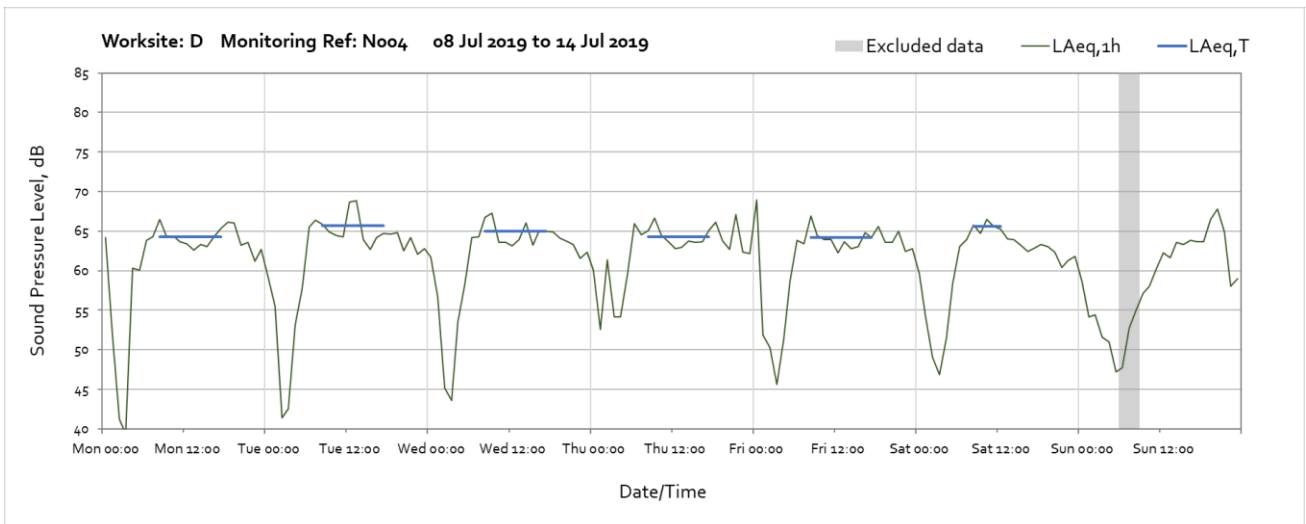
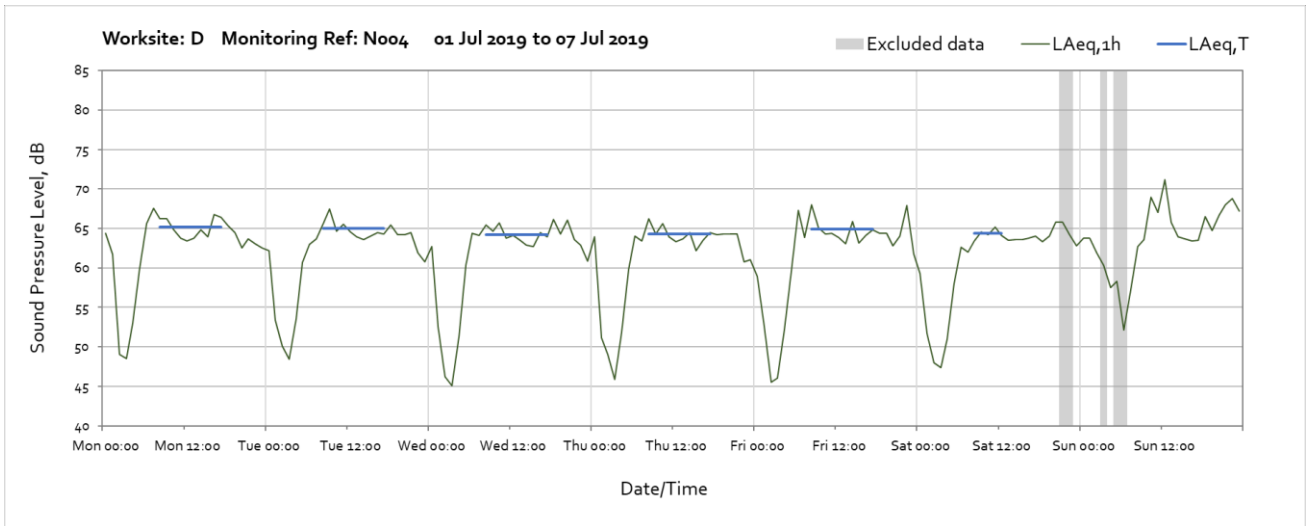
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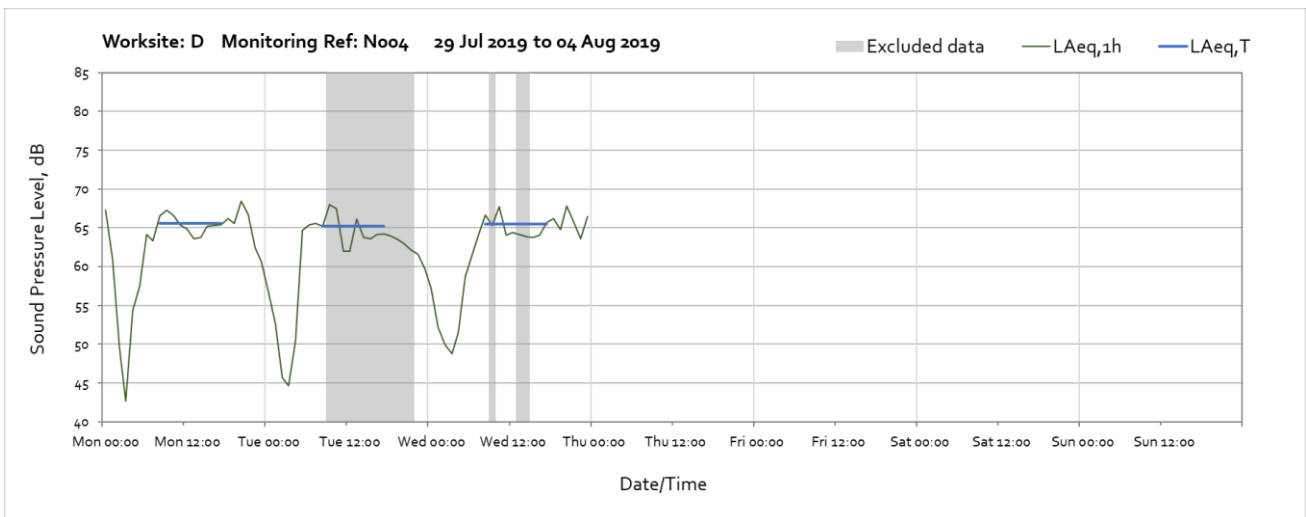
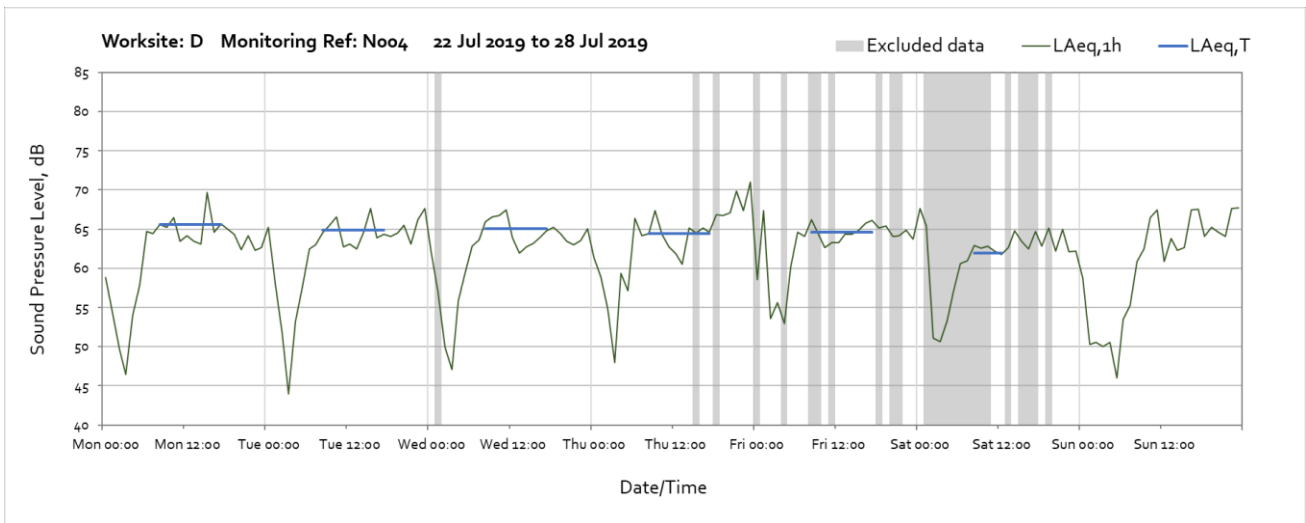
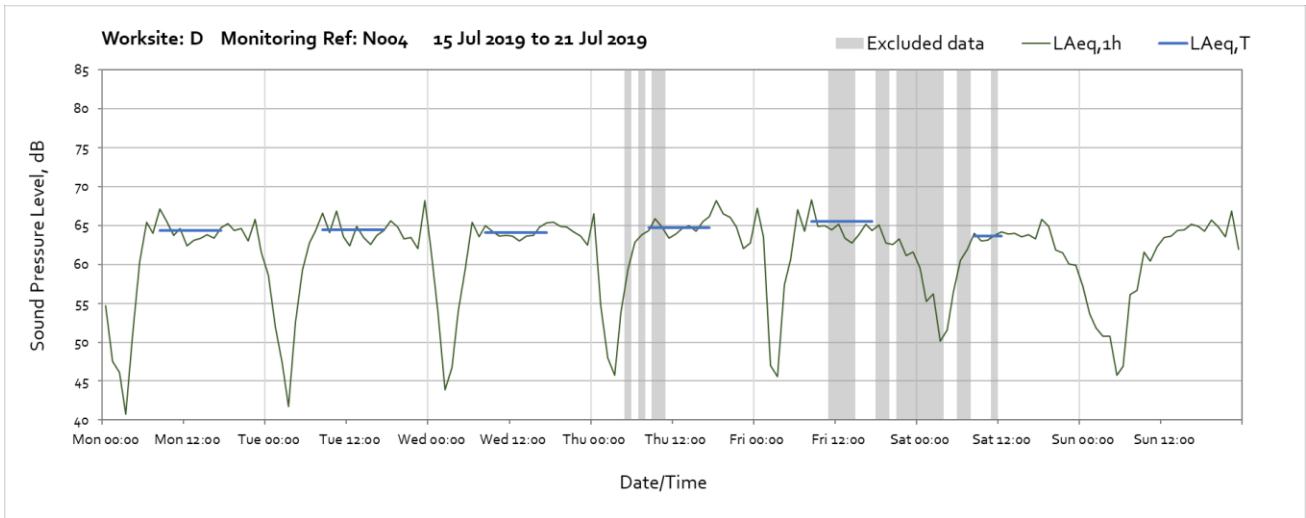




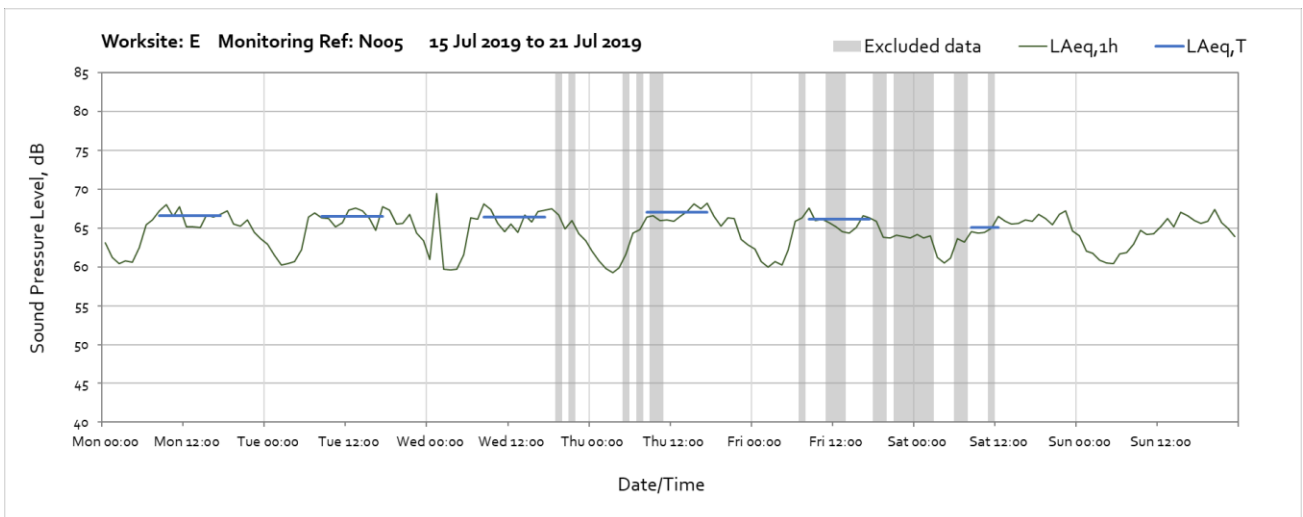
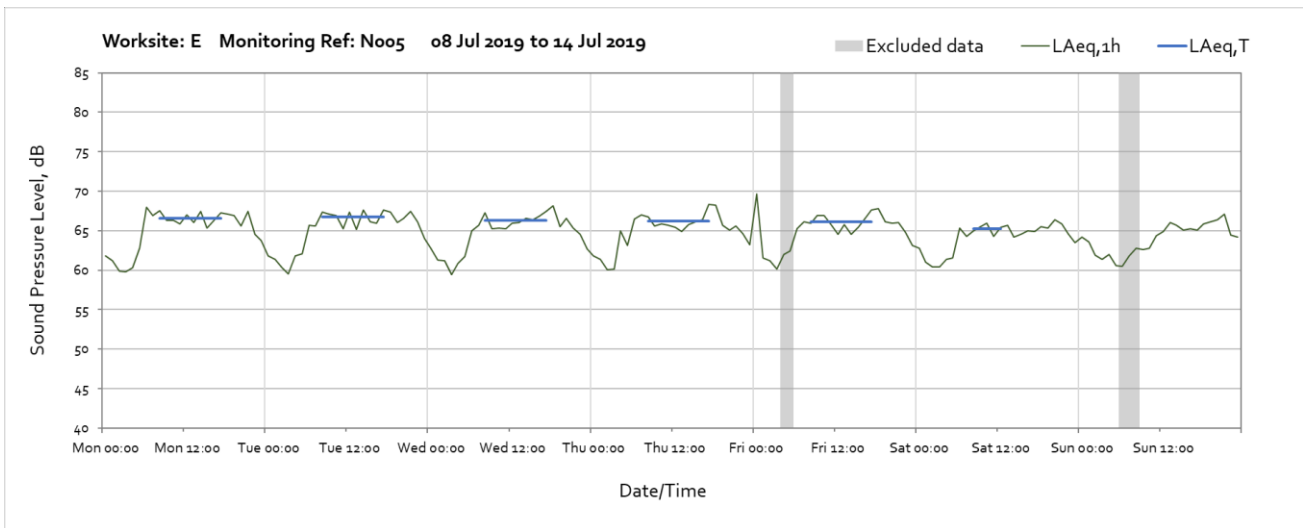
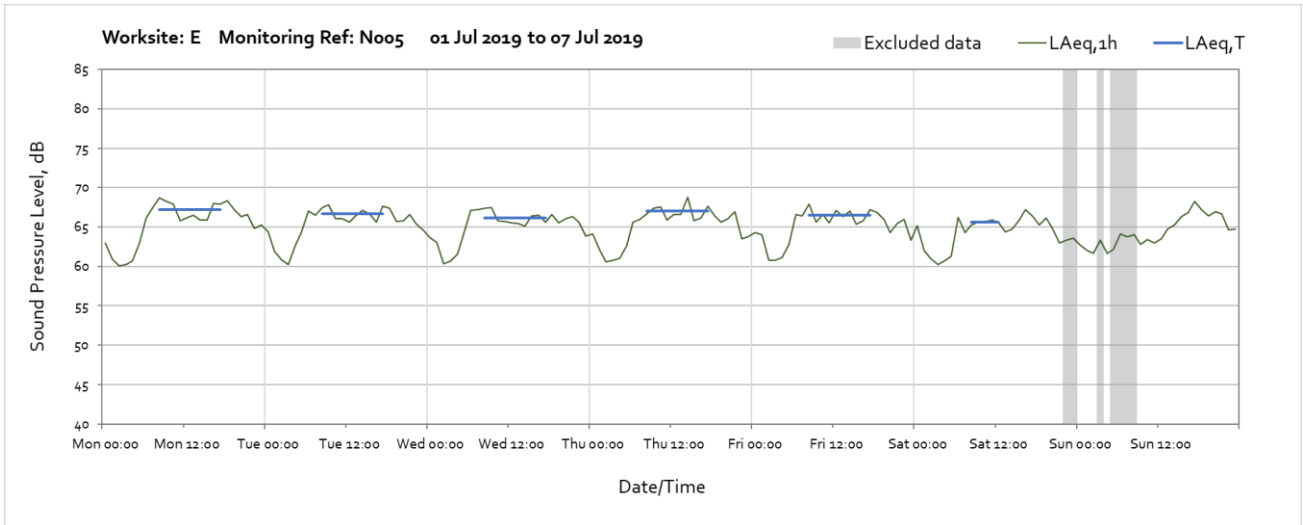


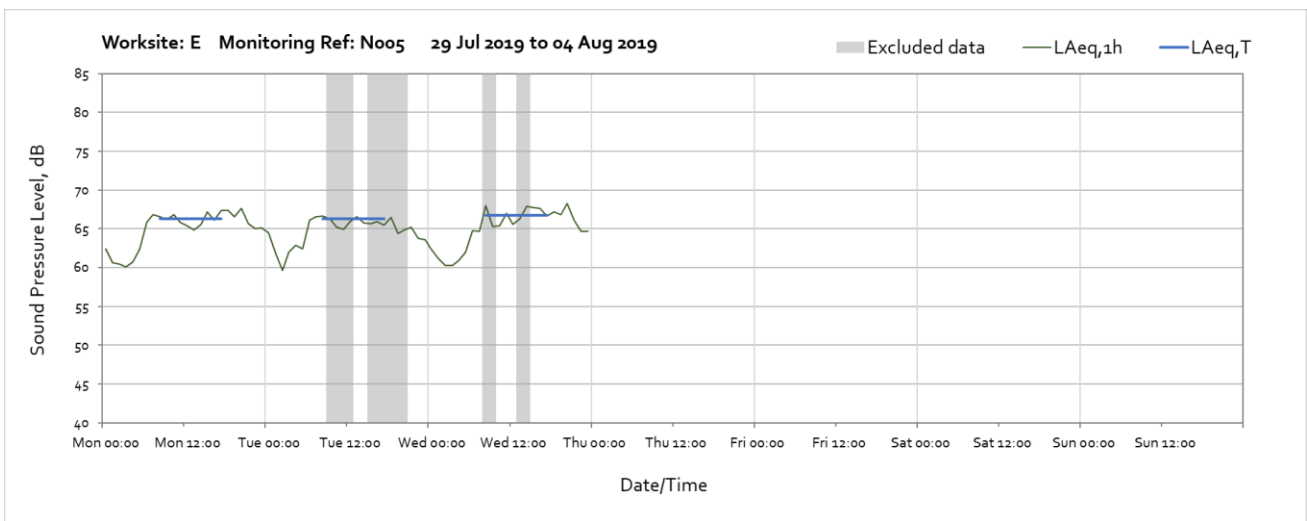
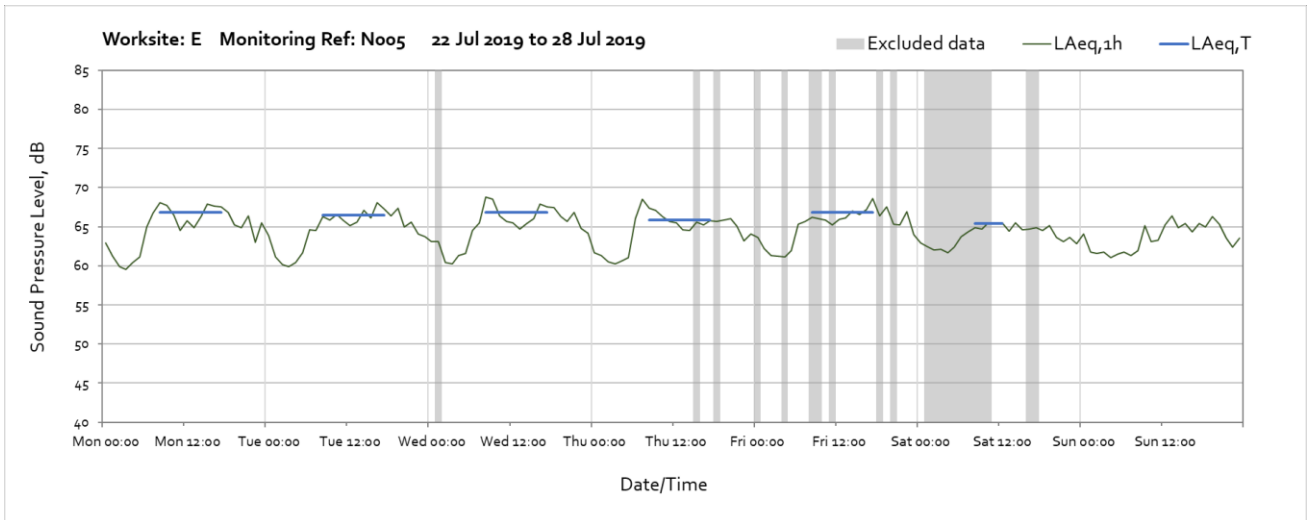
Worksite: D – Monitoring Ref: N004



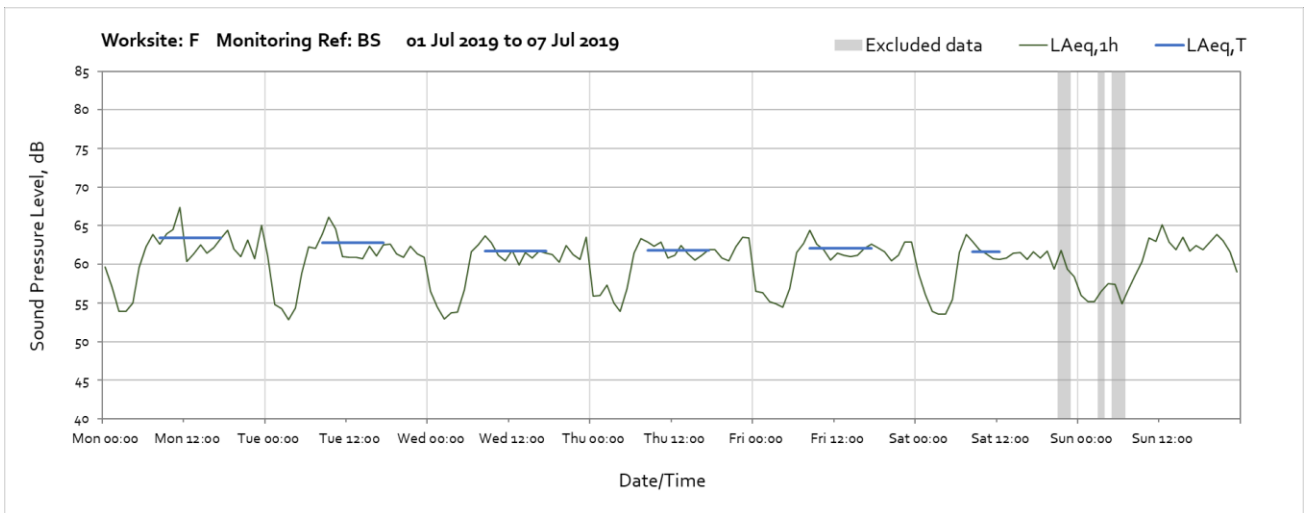


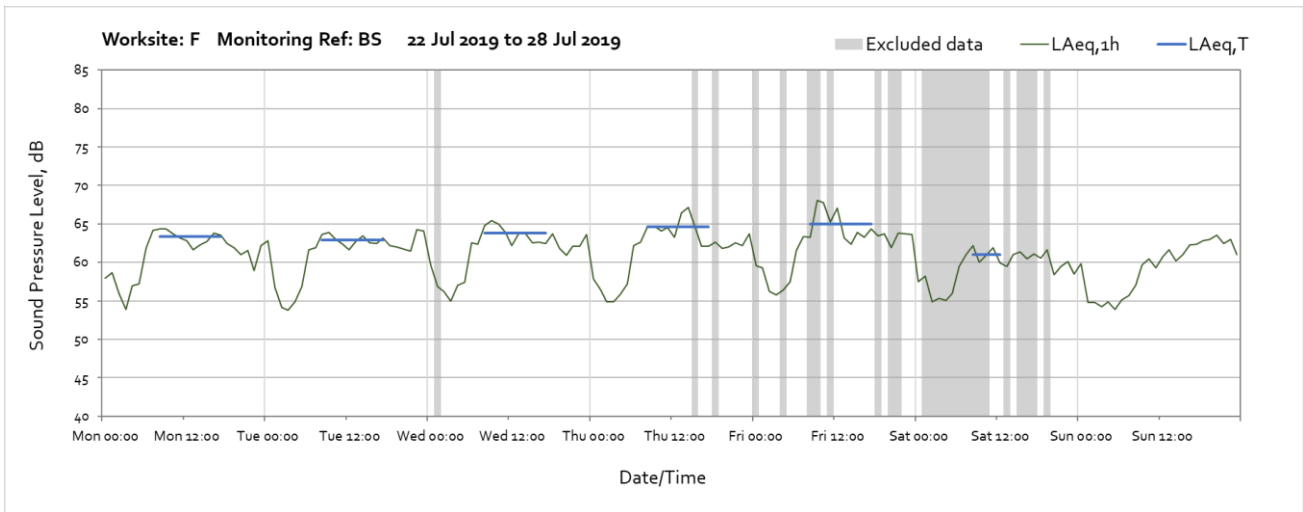
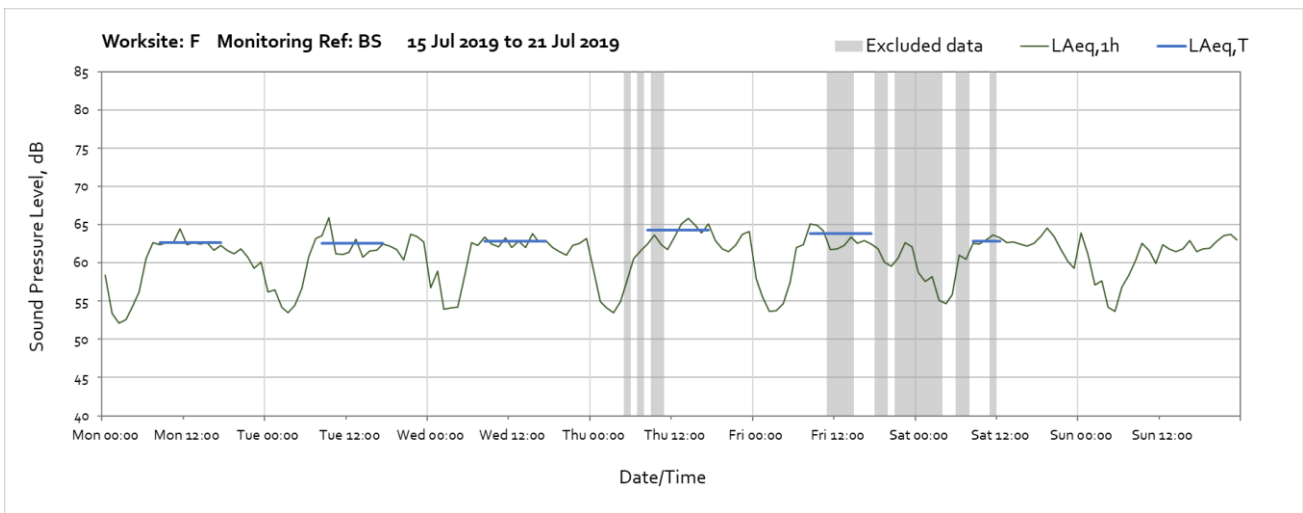
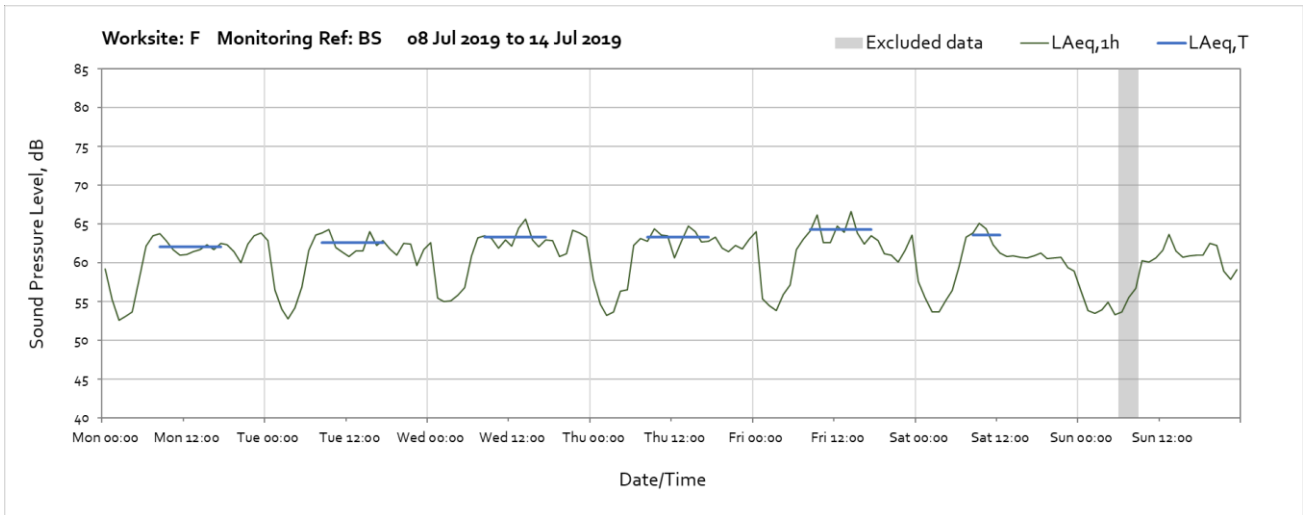
Worksite: E – Monitoring Ref: N005

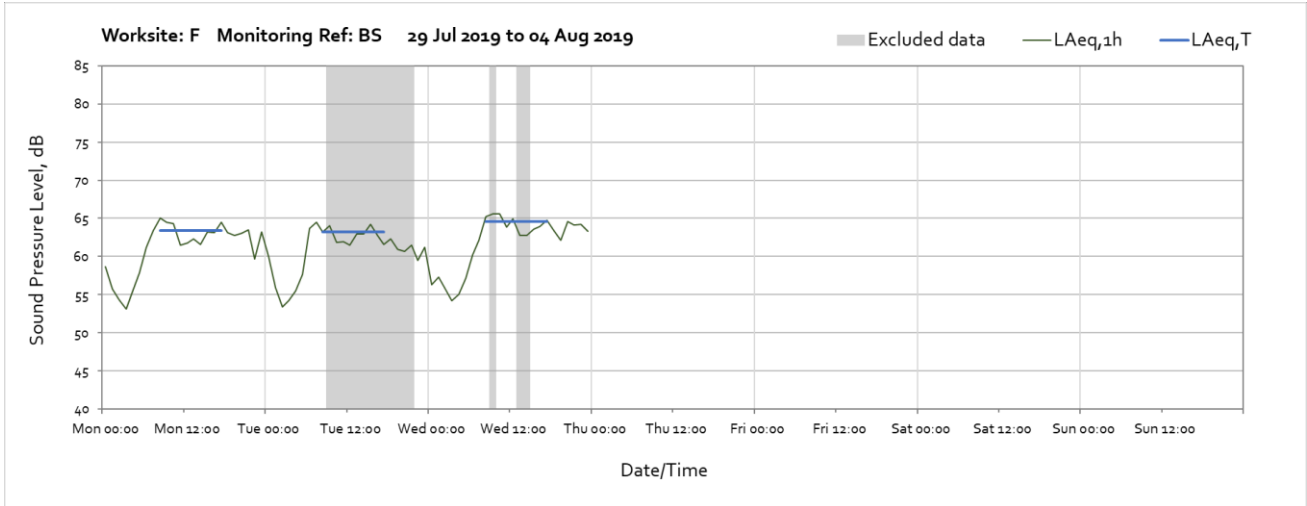




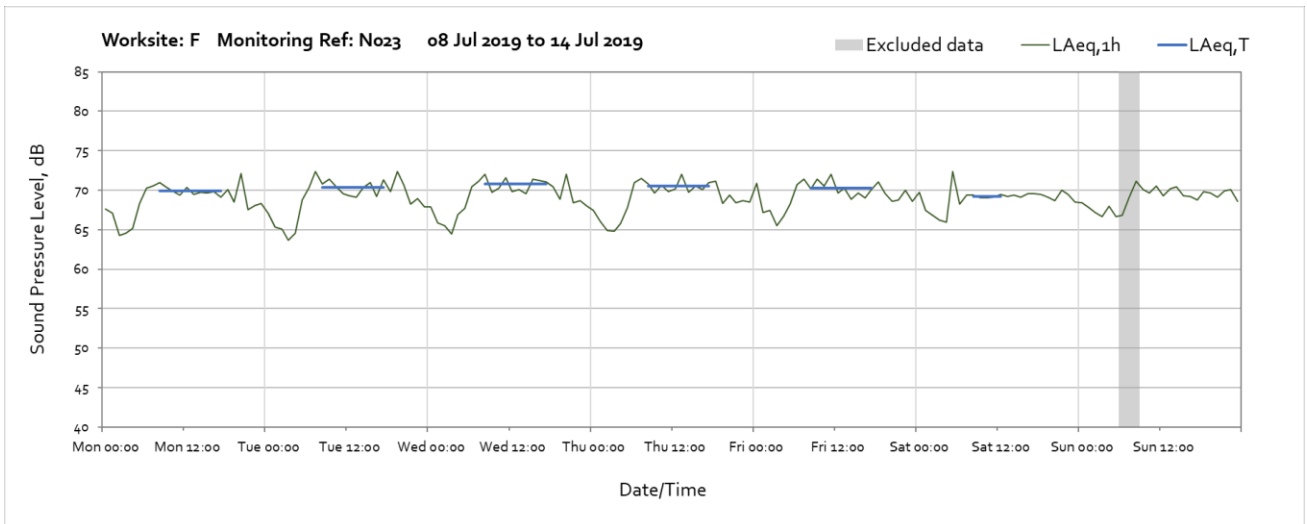
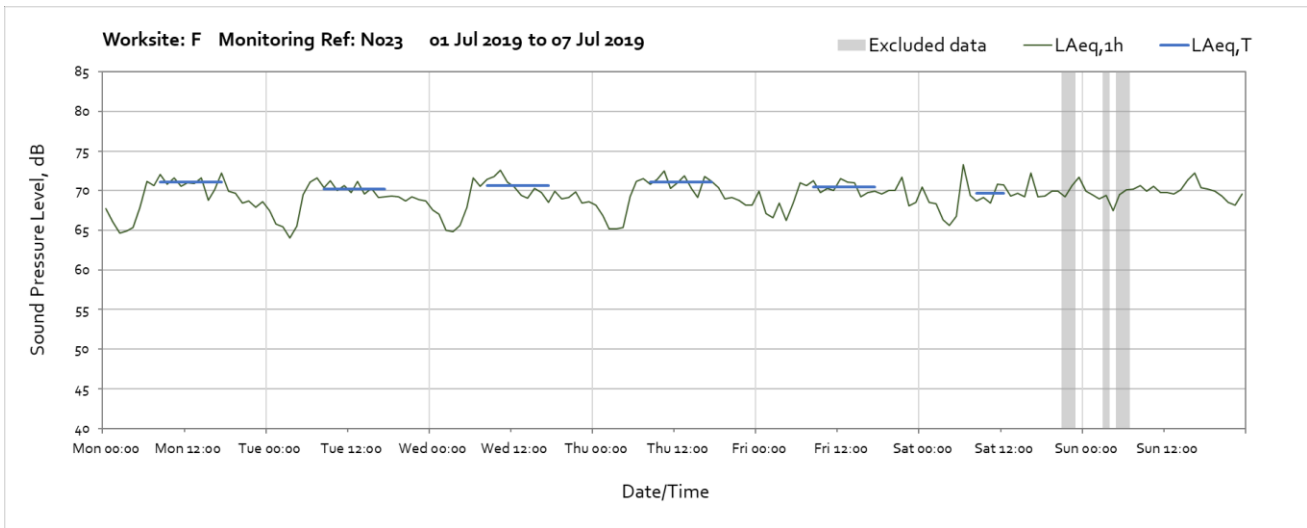
Worksite: F – Monitoring Ref: BS

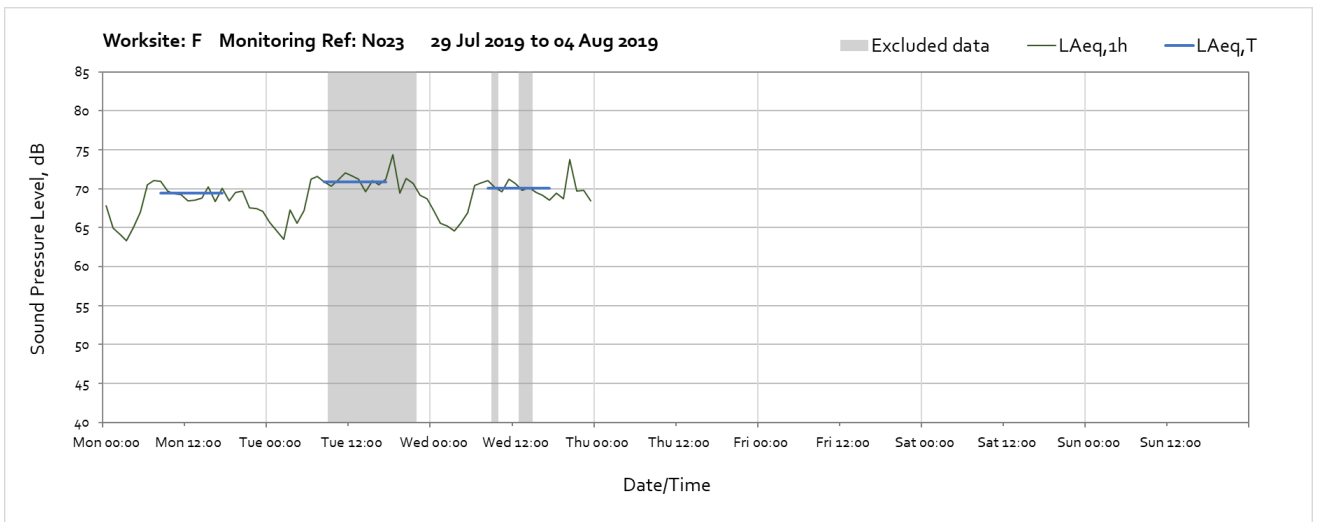
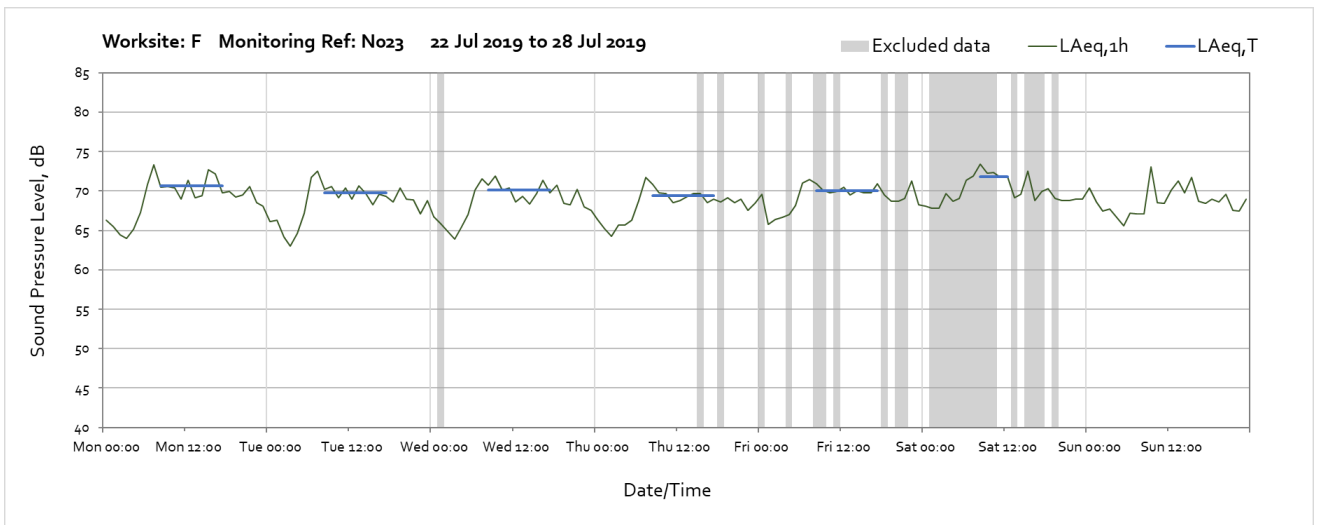
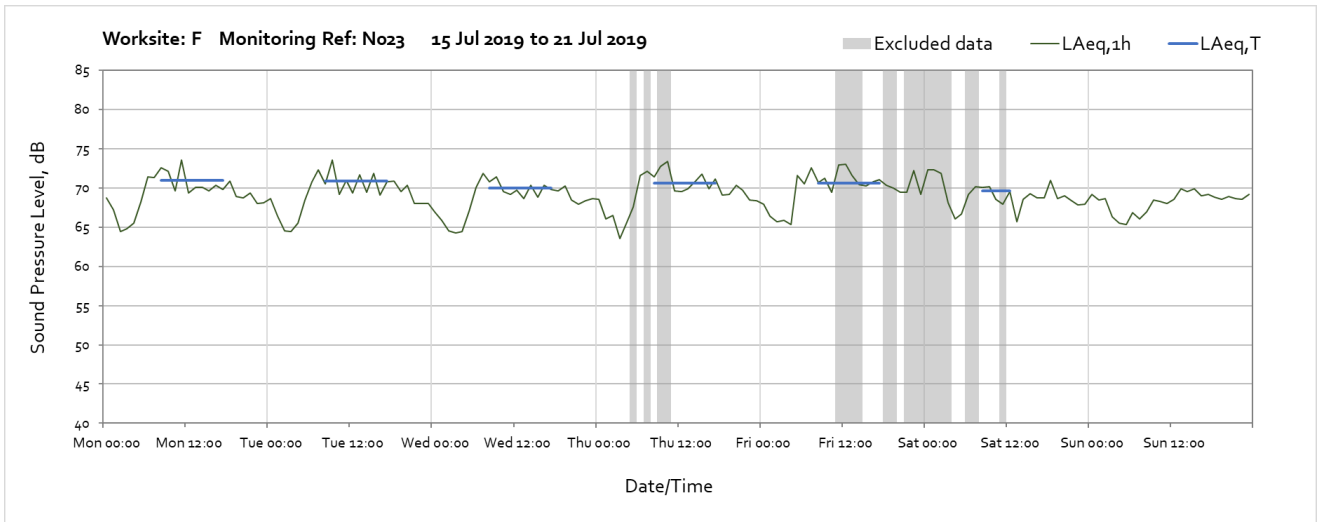




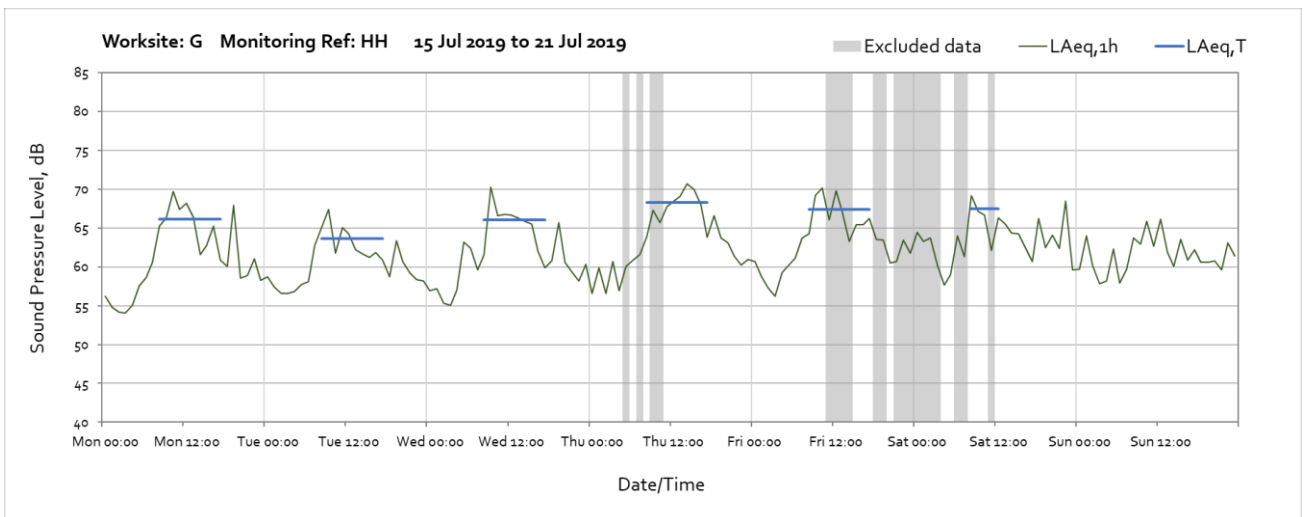
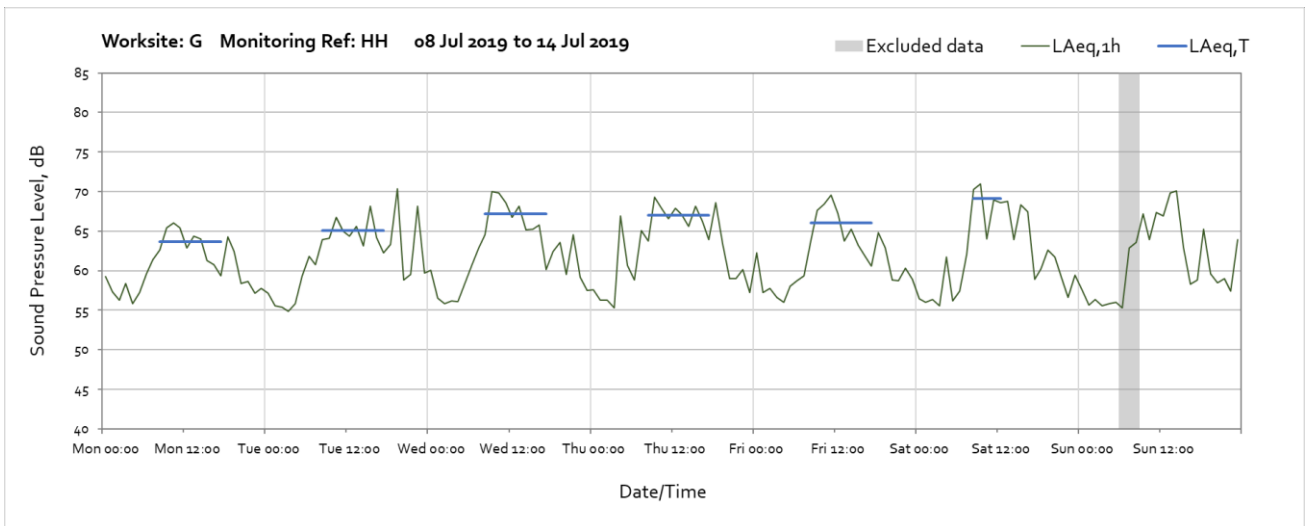
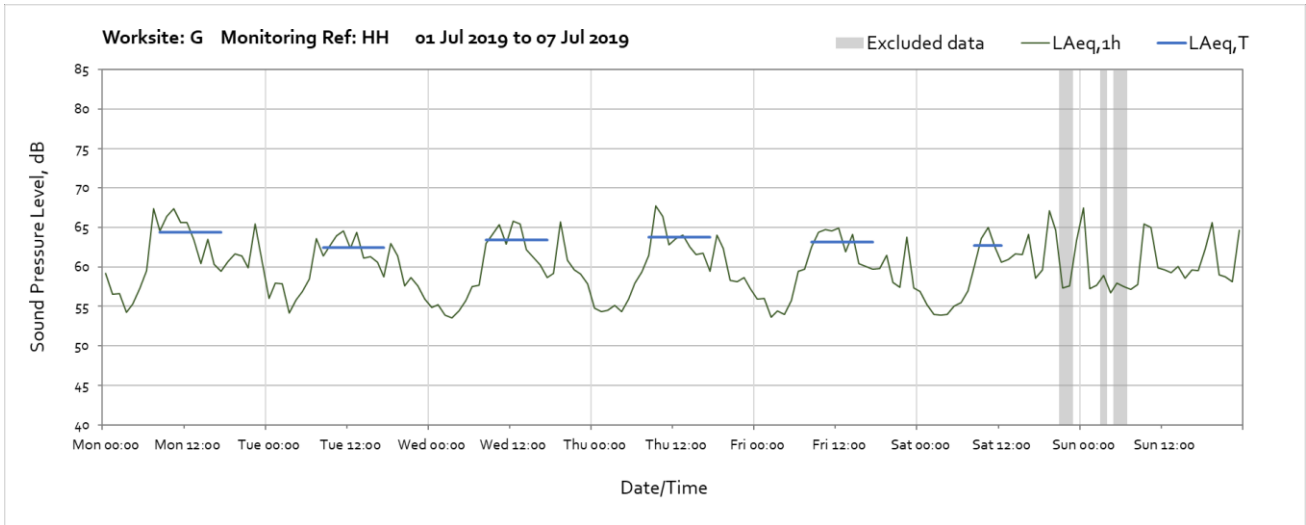


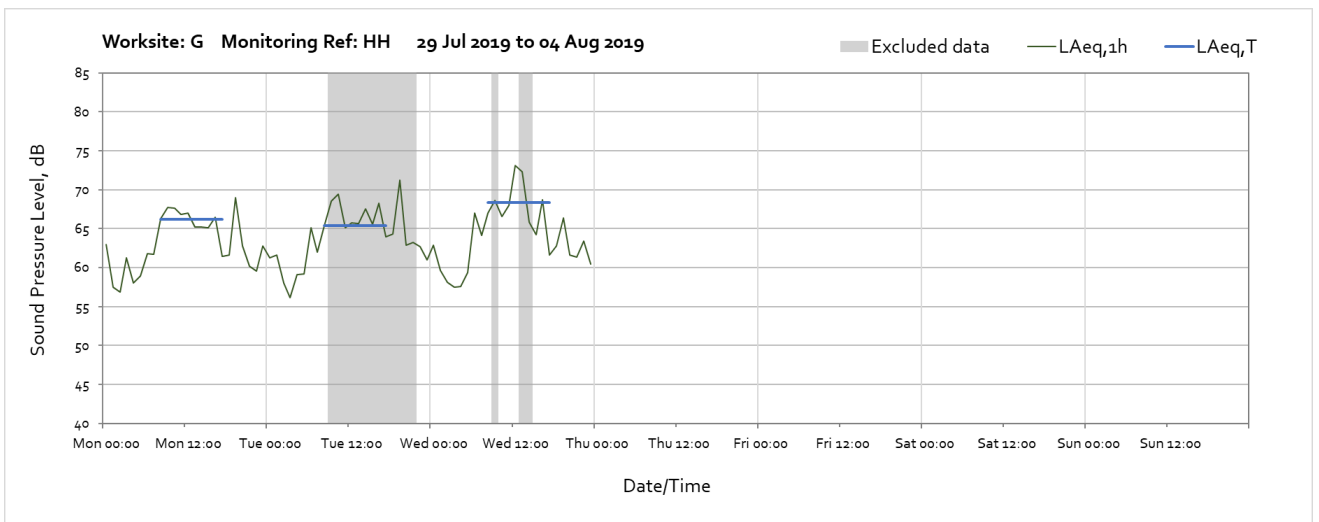
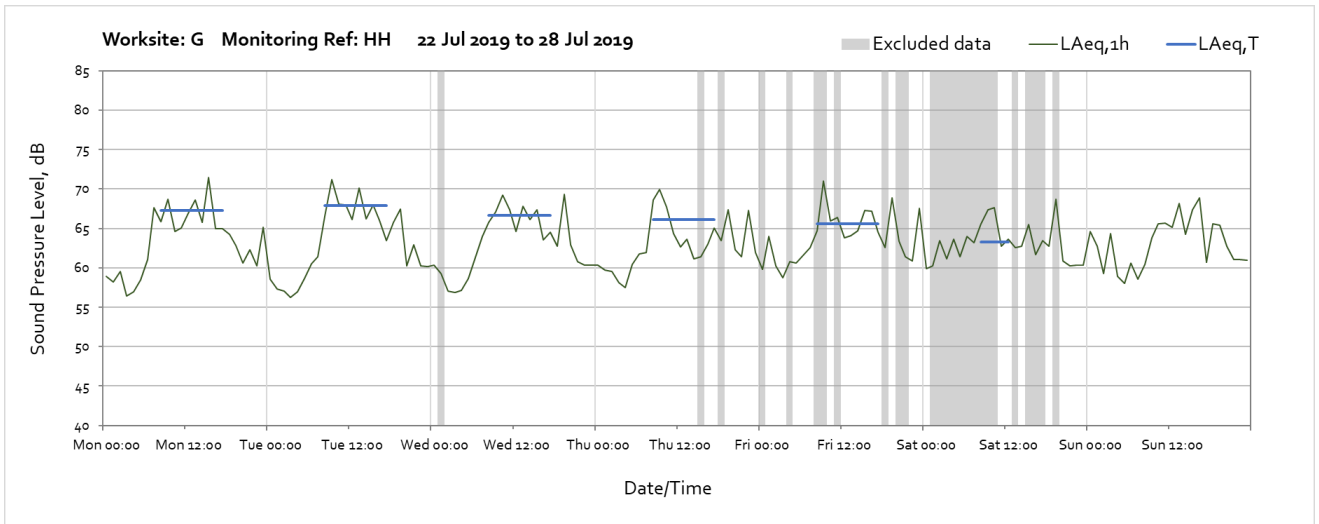
Worksite: F – Monitoring Ref: N023



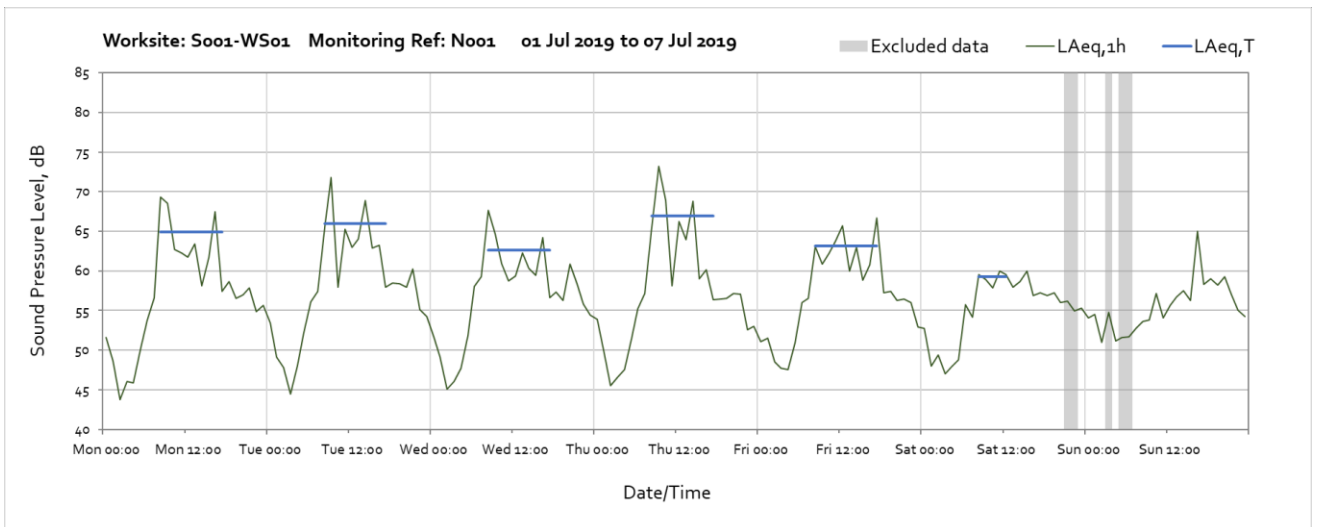


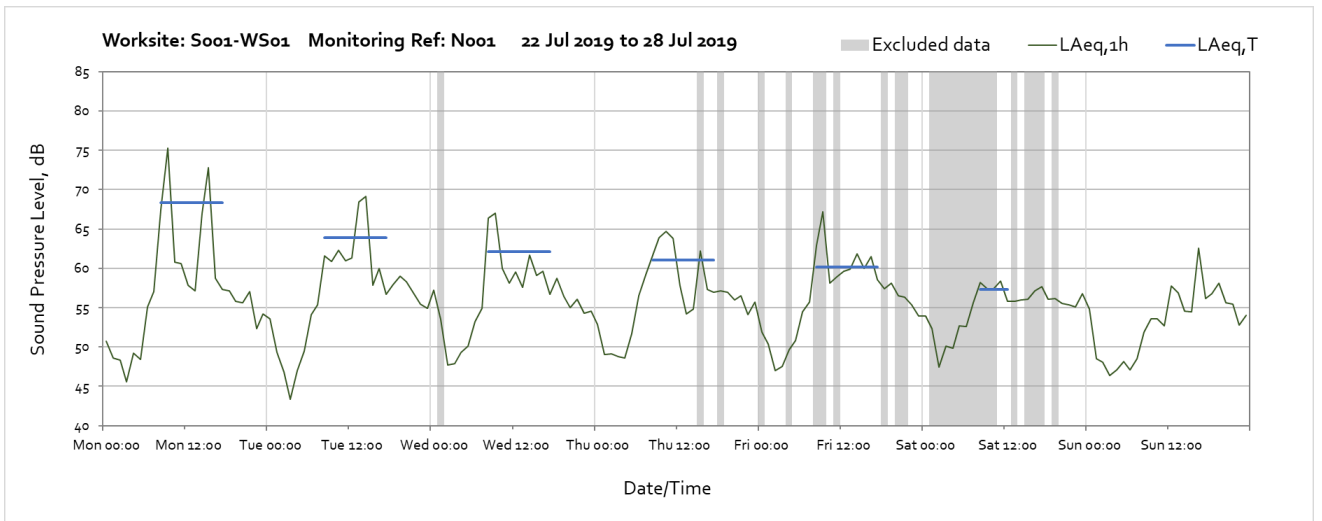
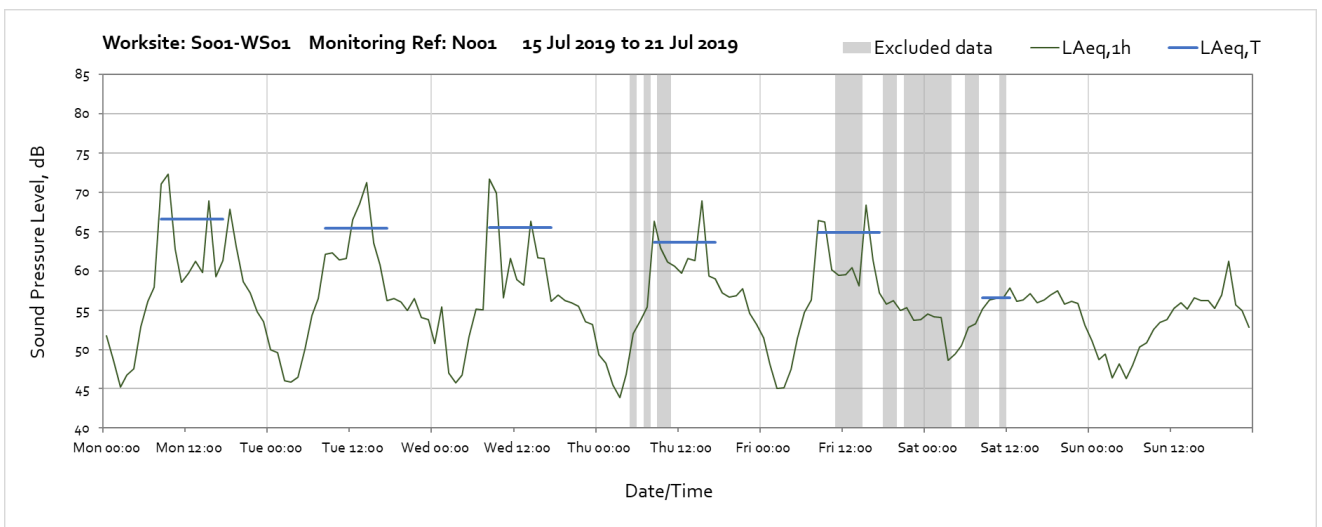
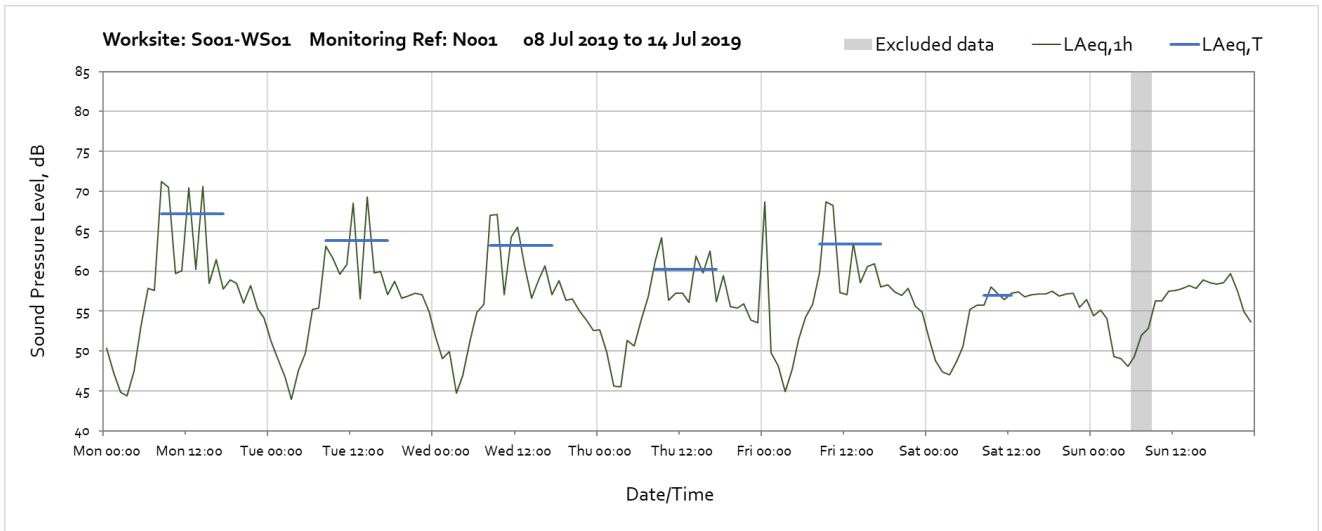
Worksite: G – Monitoring Ref: HH

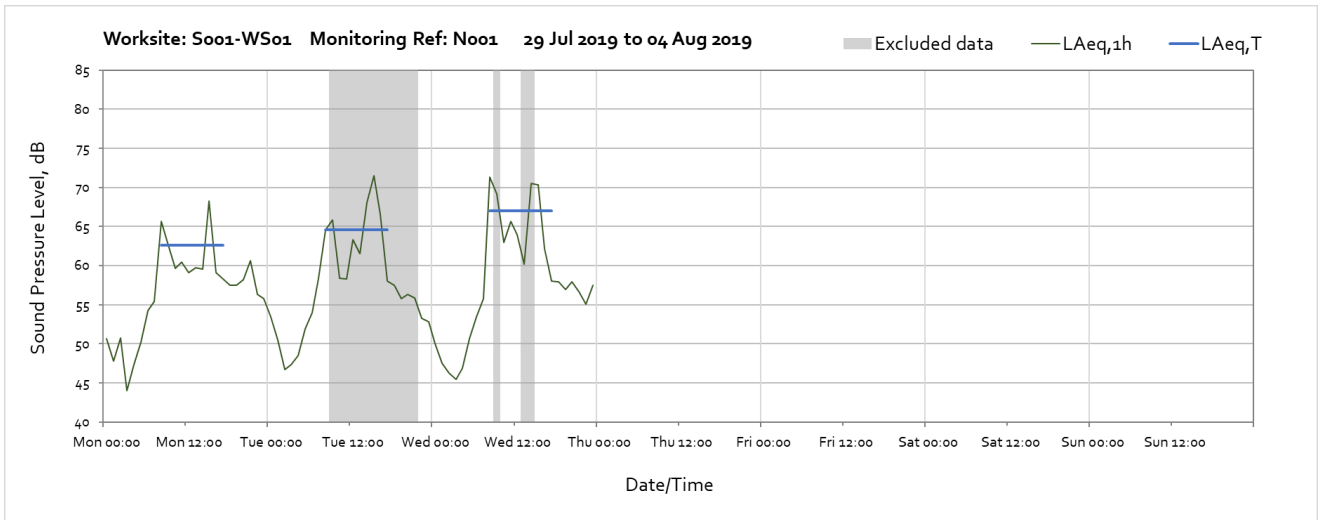




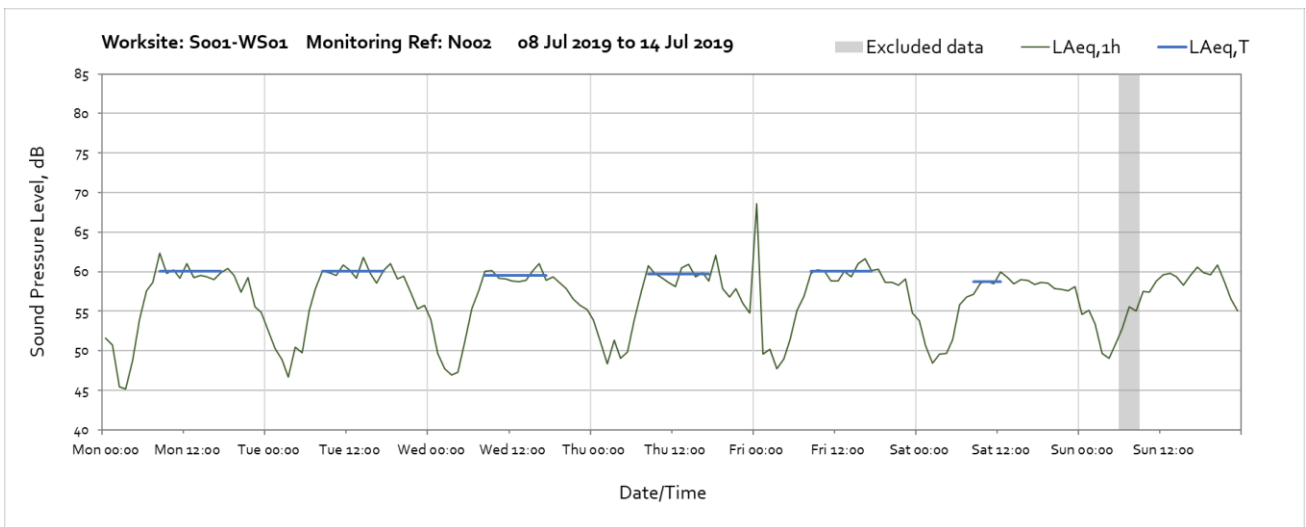
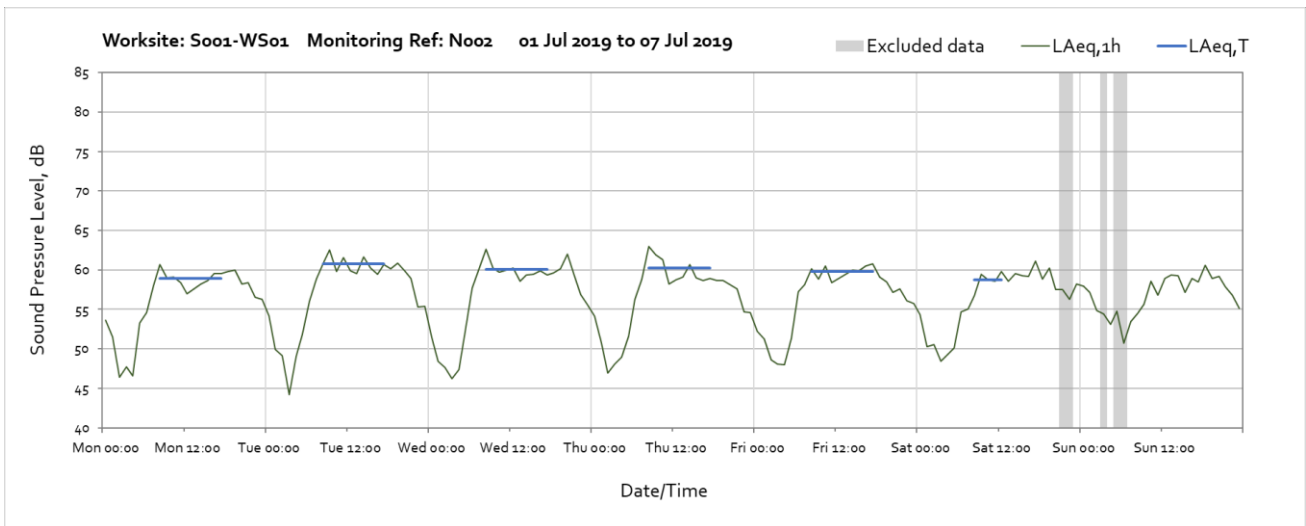
Worksite: S001-WS01 – Monitoring Ref: N001

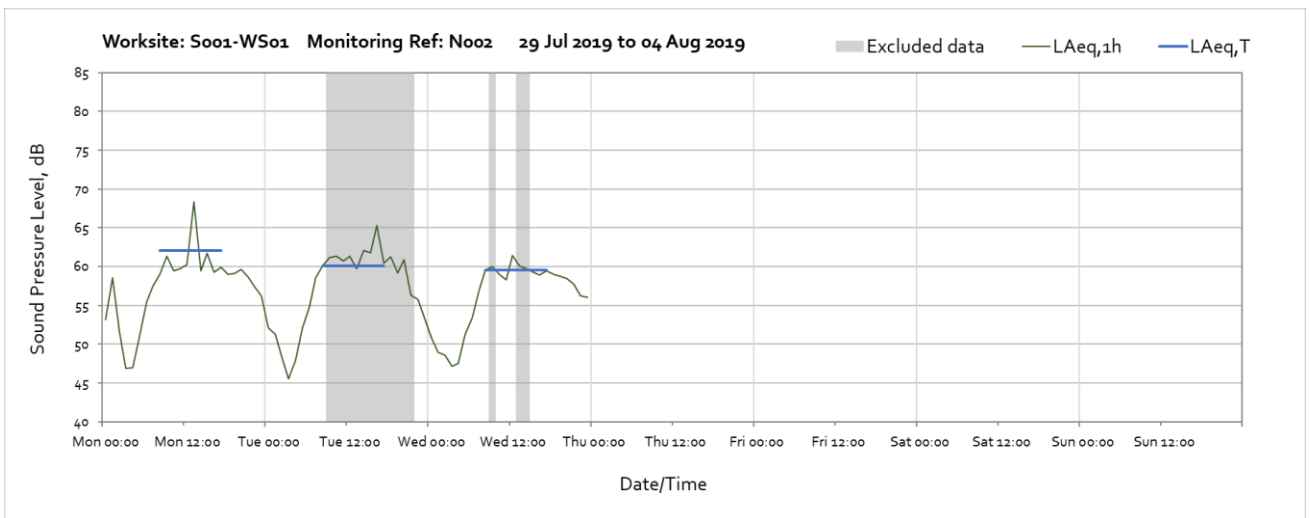
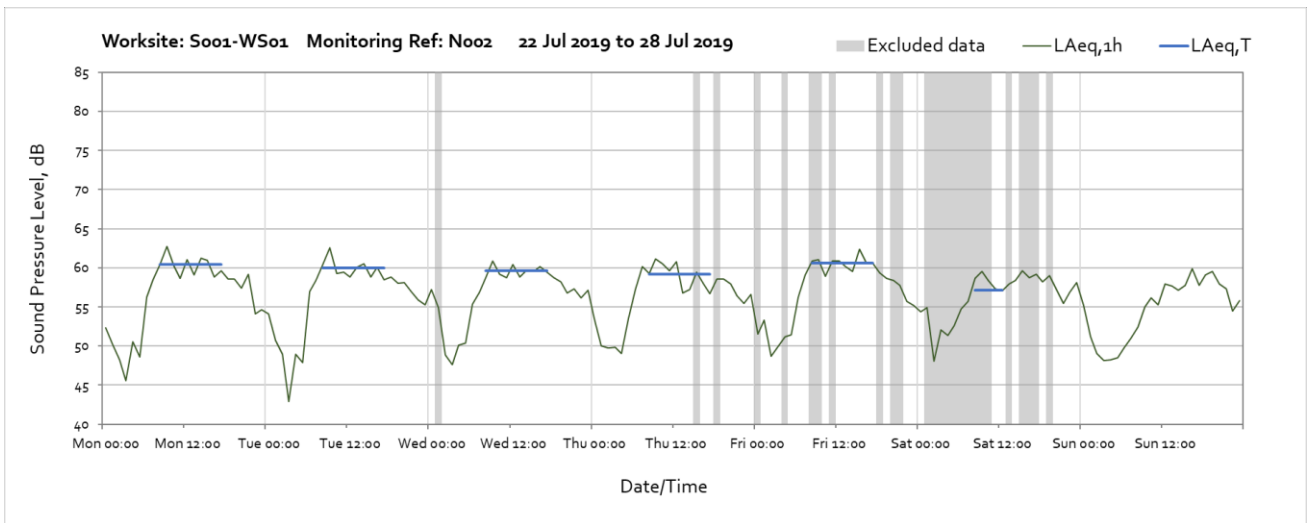
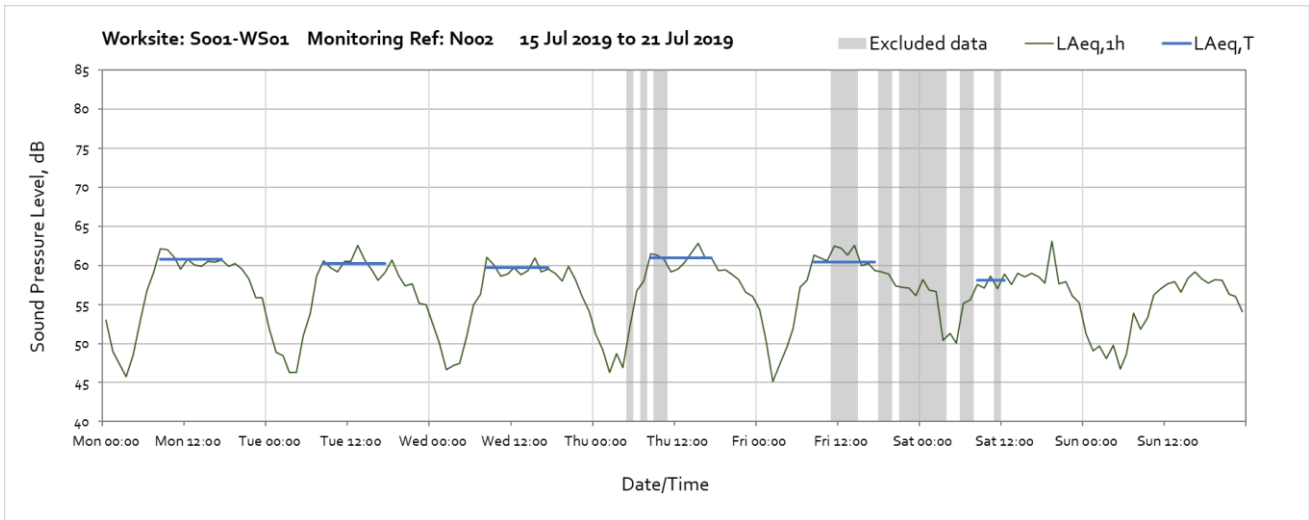




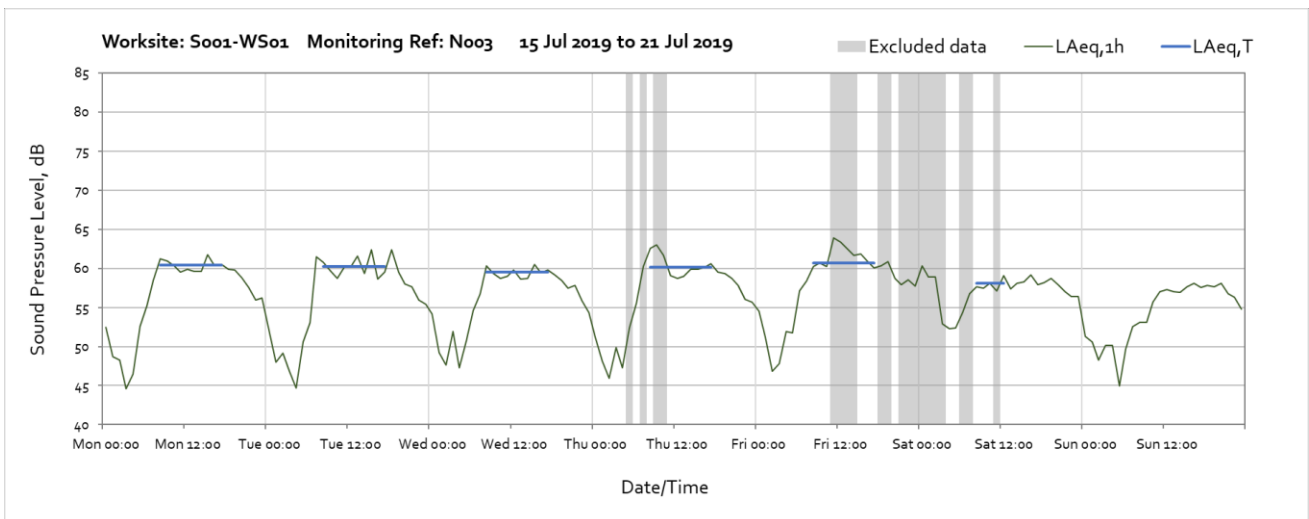
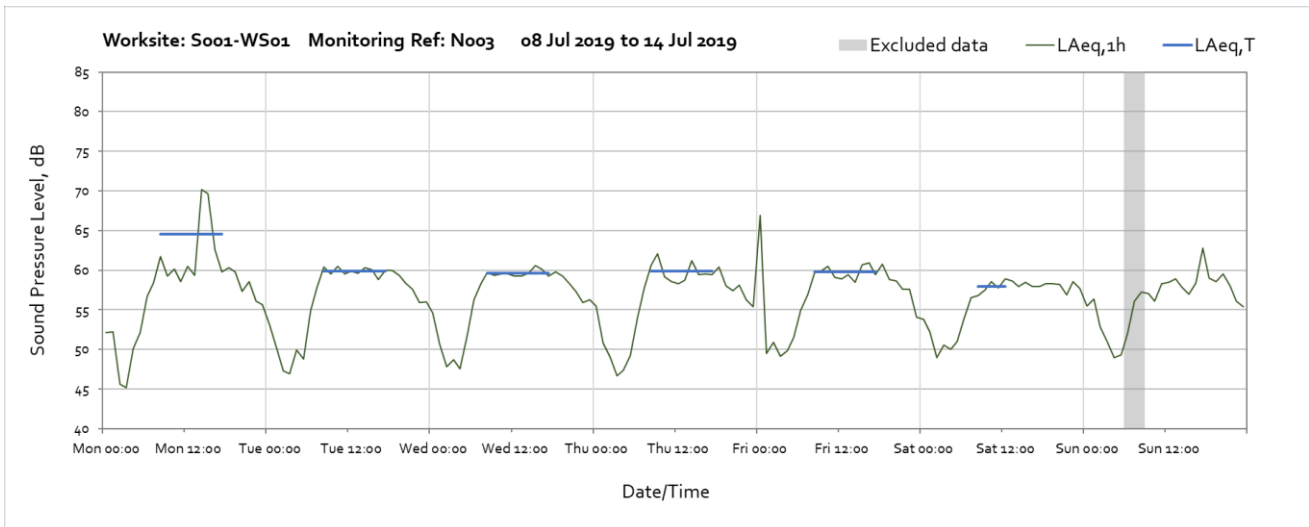
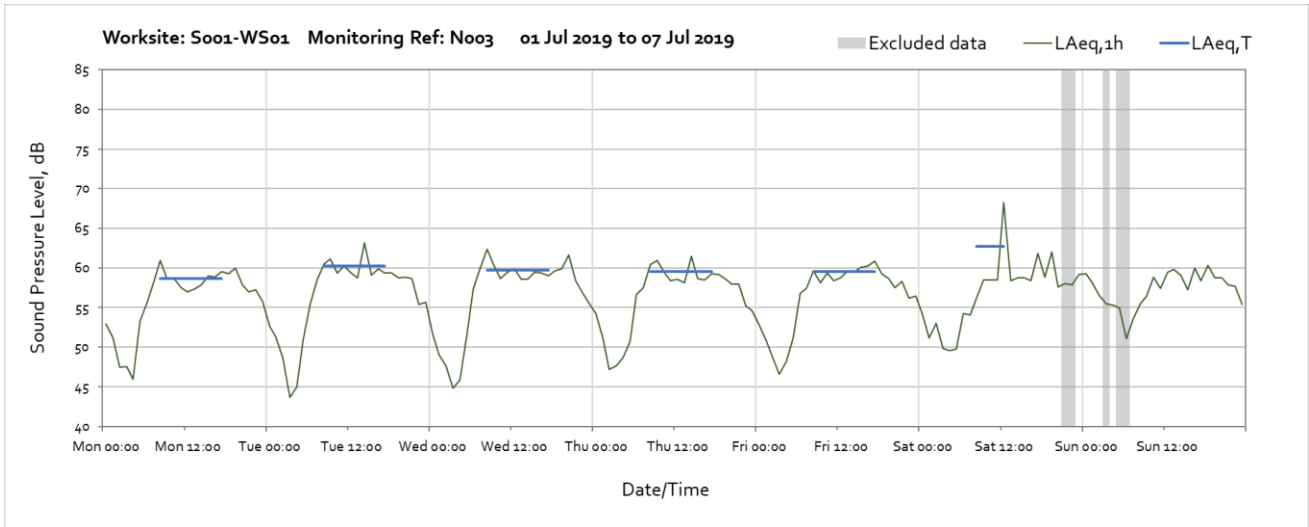


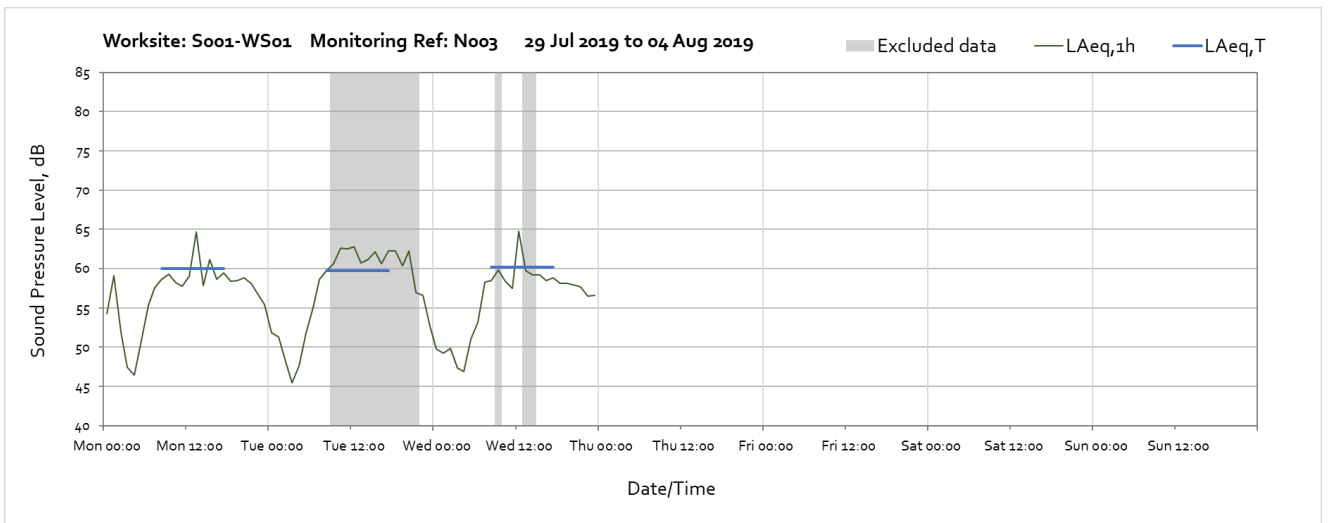
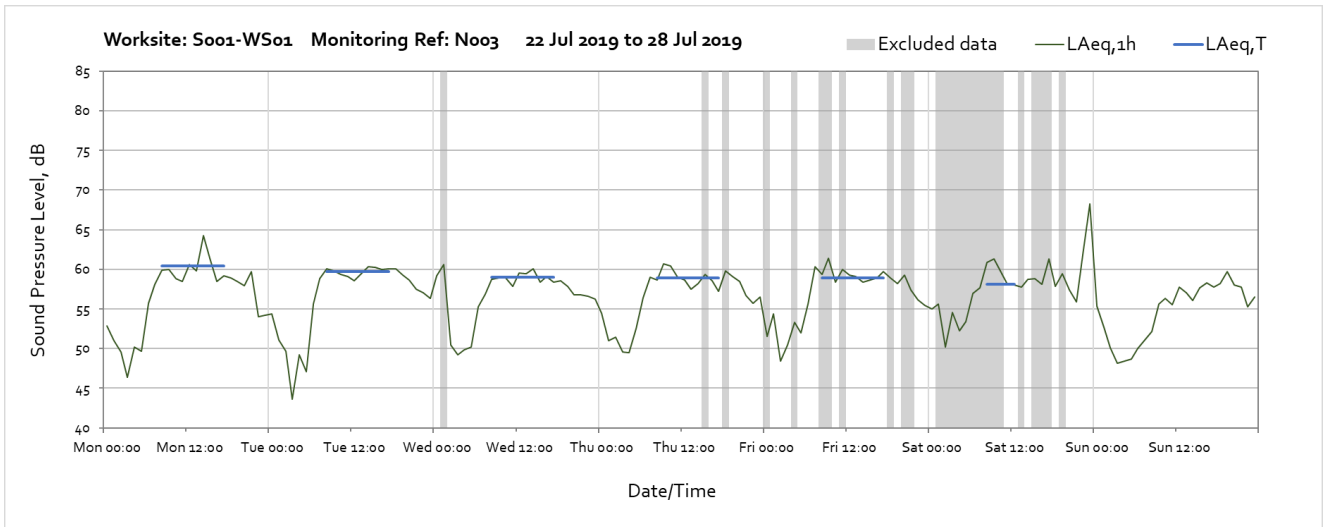
Worksite: S001-WS01 – Monitoring Ref: N002



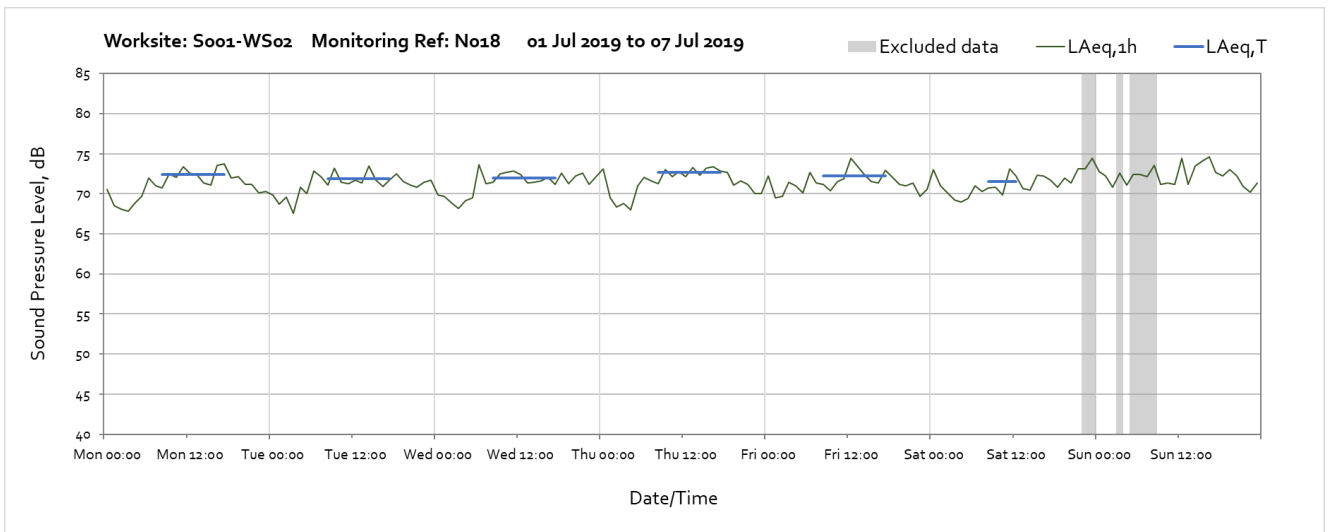


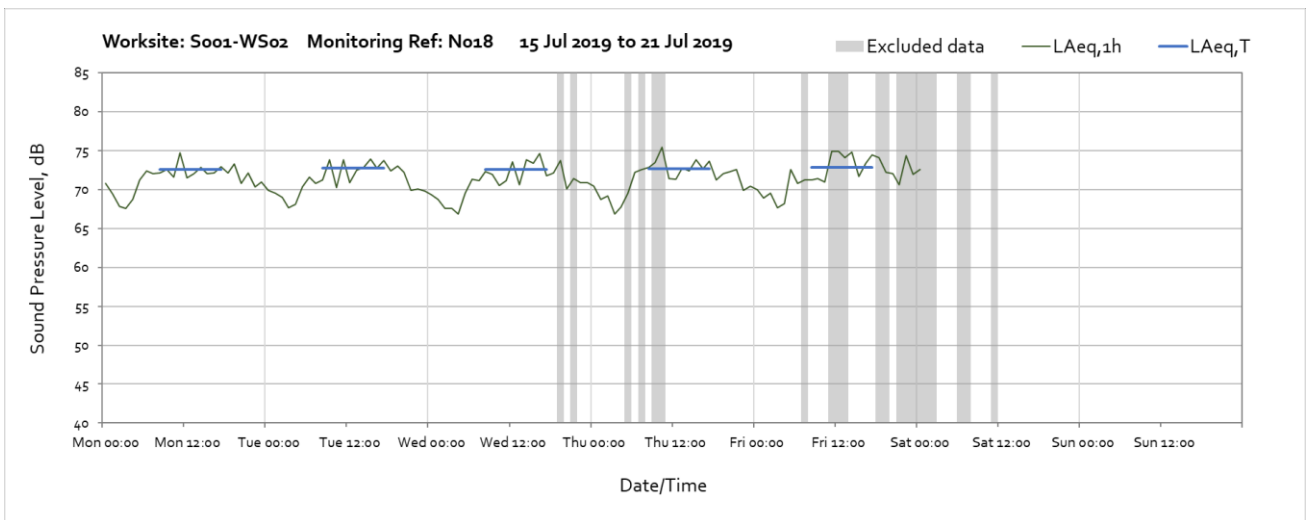
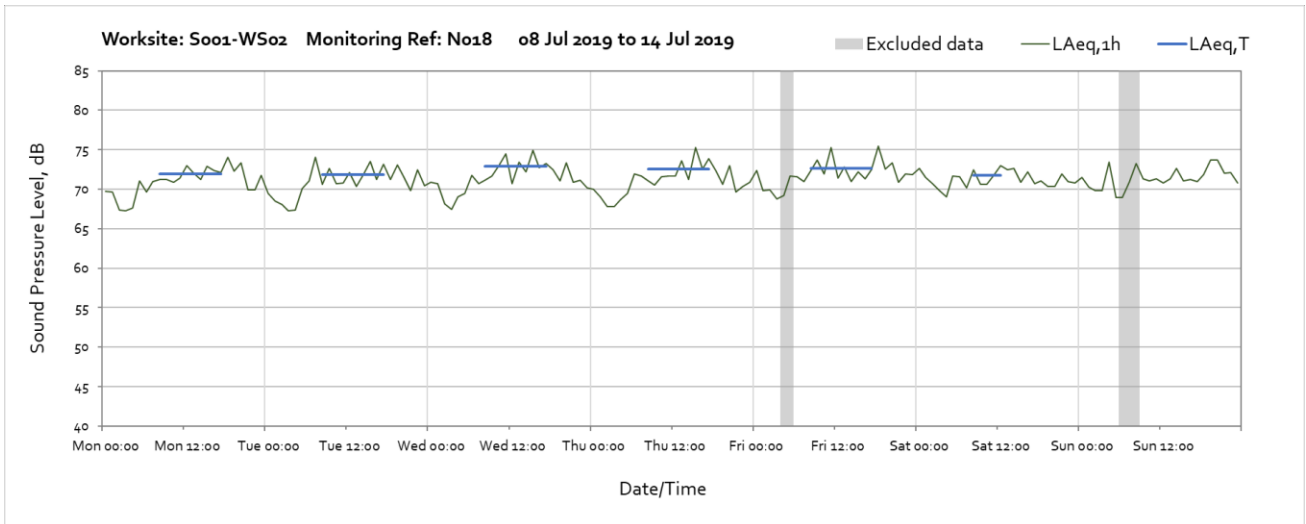
Worksite: S001-WS01 – Monitoring Ref: N003



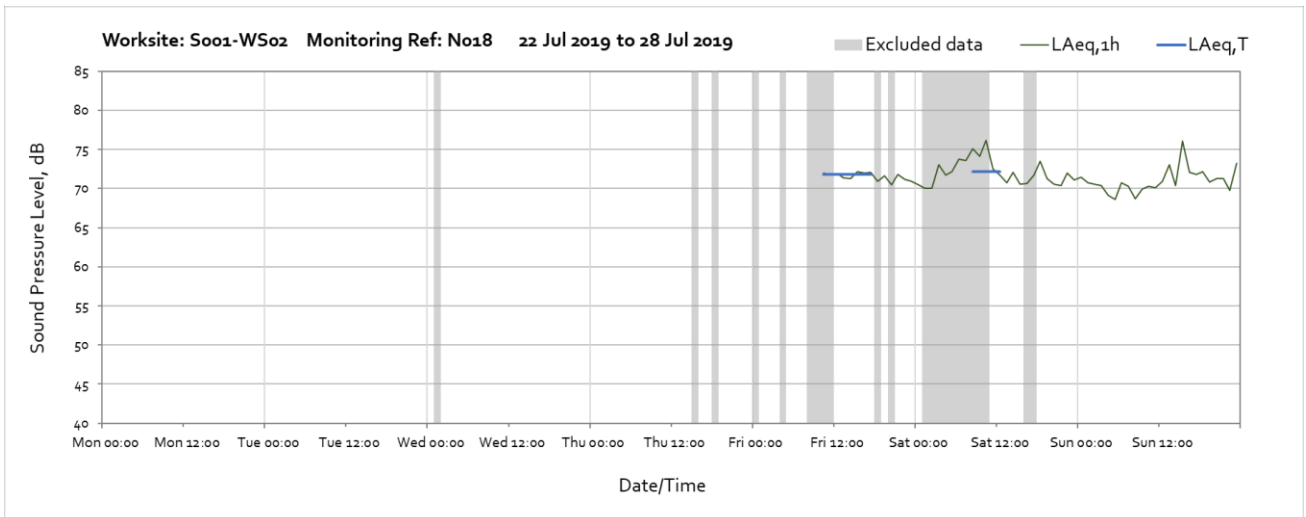


Worksite: S001-WS02 – Monitoring Ref: N018



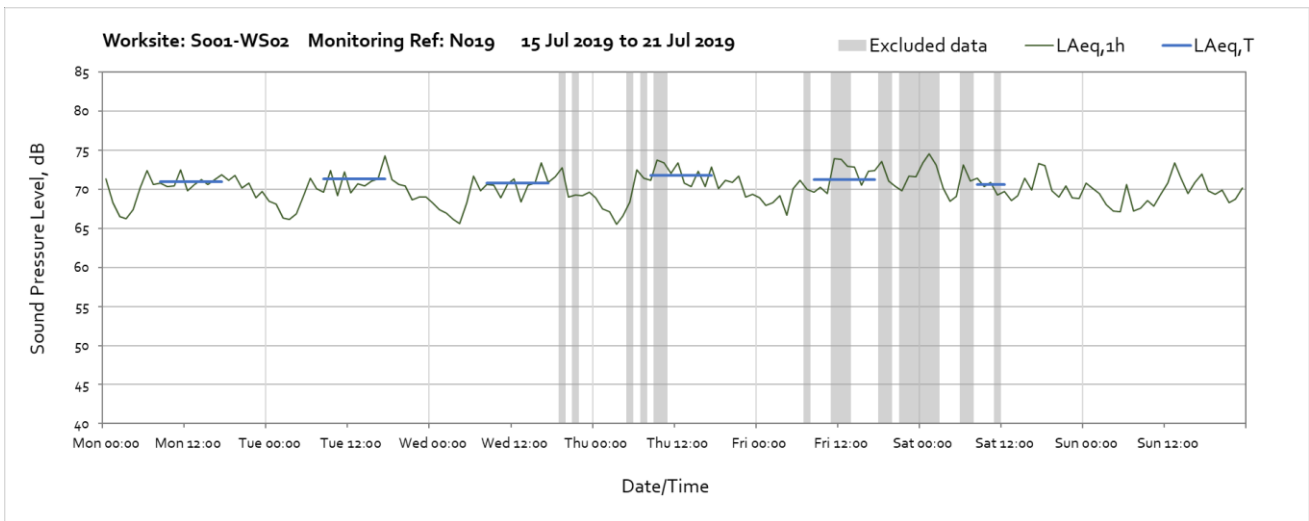
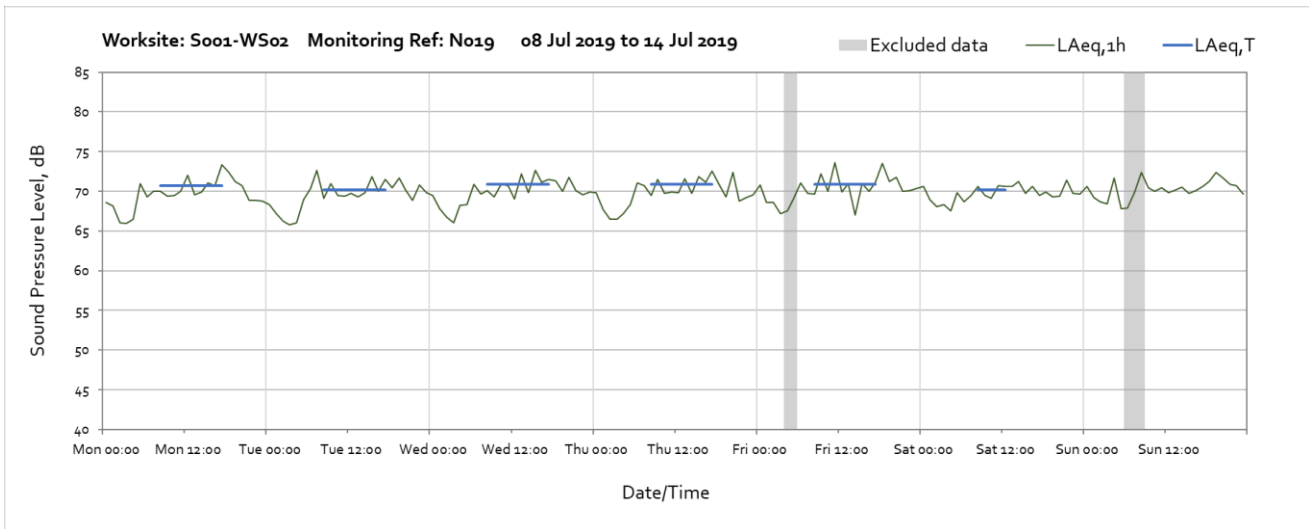
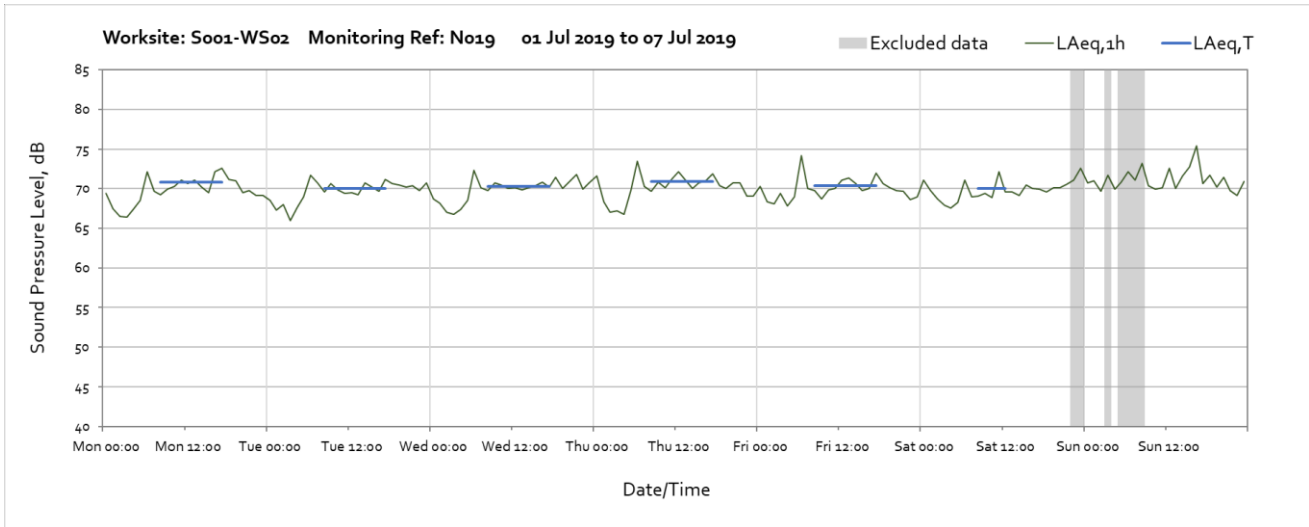


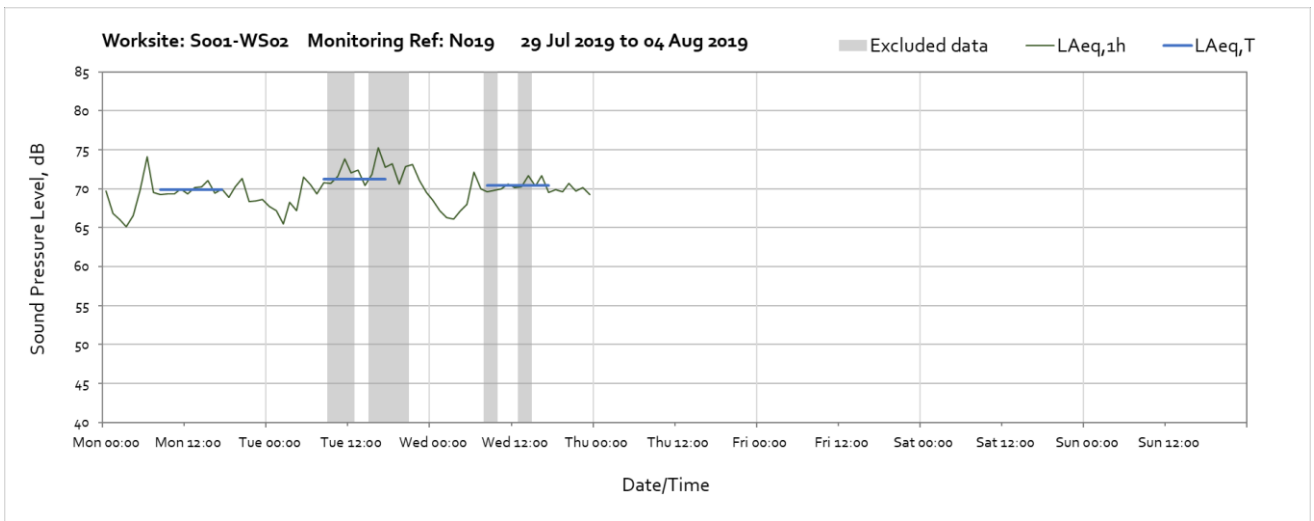
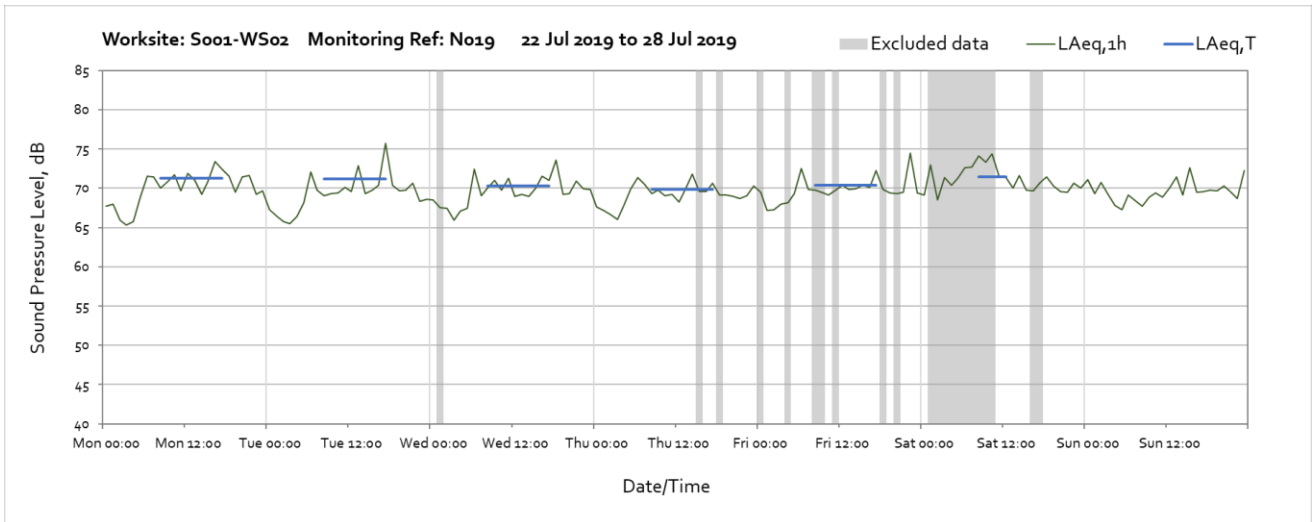
Note: Missing data between 01:00 Saturday 20th and 10:00 on Friday 26th of July was due to electrical fault at the lamp post to which the monitoring station is connected.



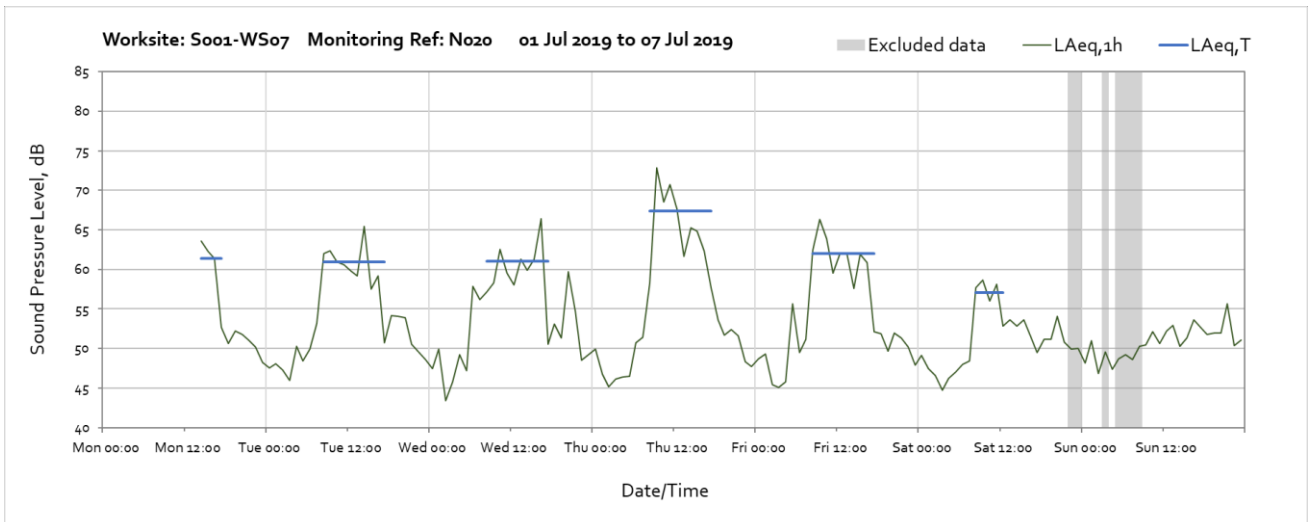
Note: Missing data between 01:00 Saturday 20th and 10:00 on Friday 26th of July was due to electrical fault at the lamp post to which the monitoring station is connected.

Worksite: S001-WS02 – Monitoring Ref: N019

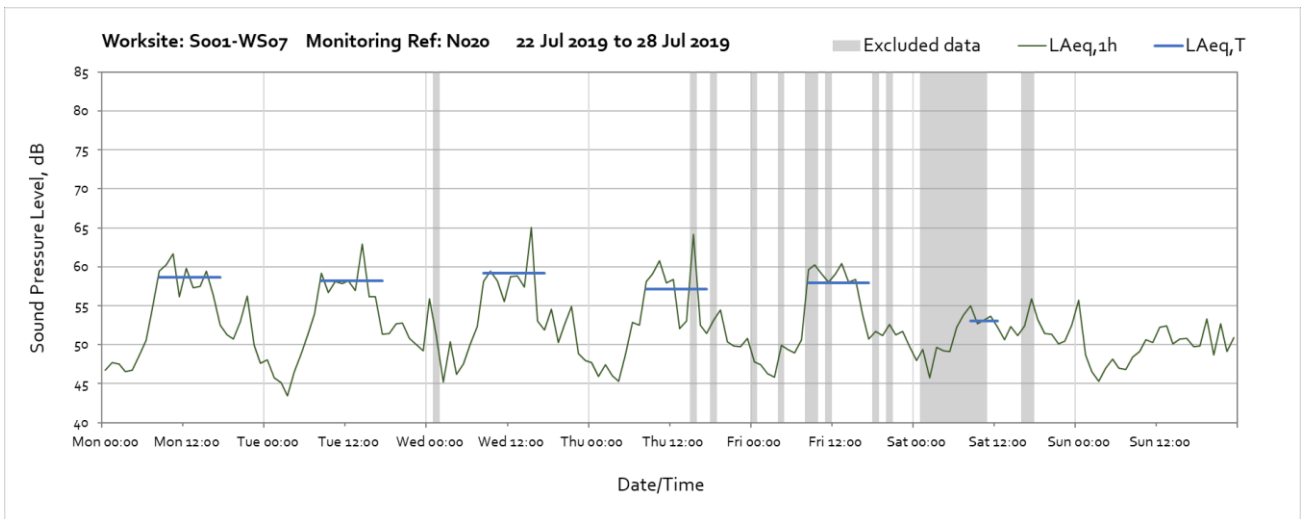
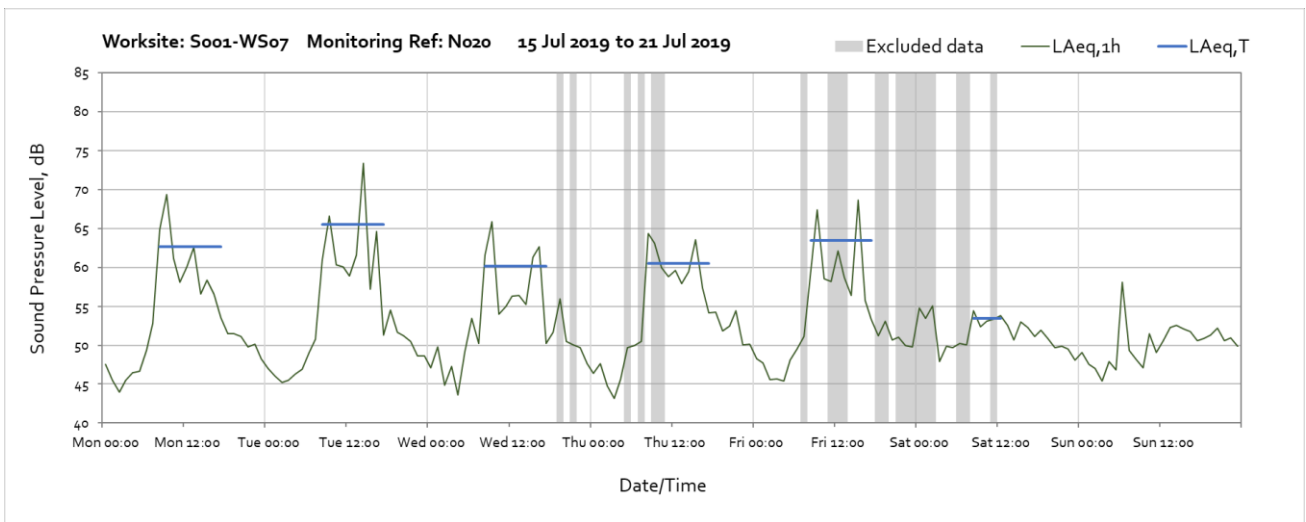
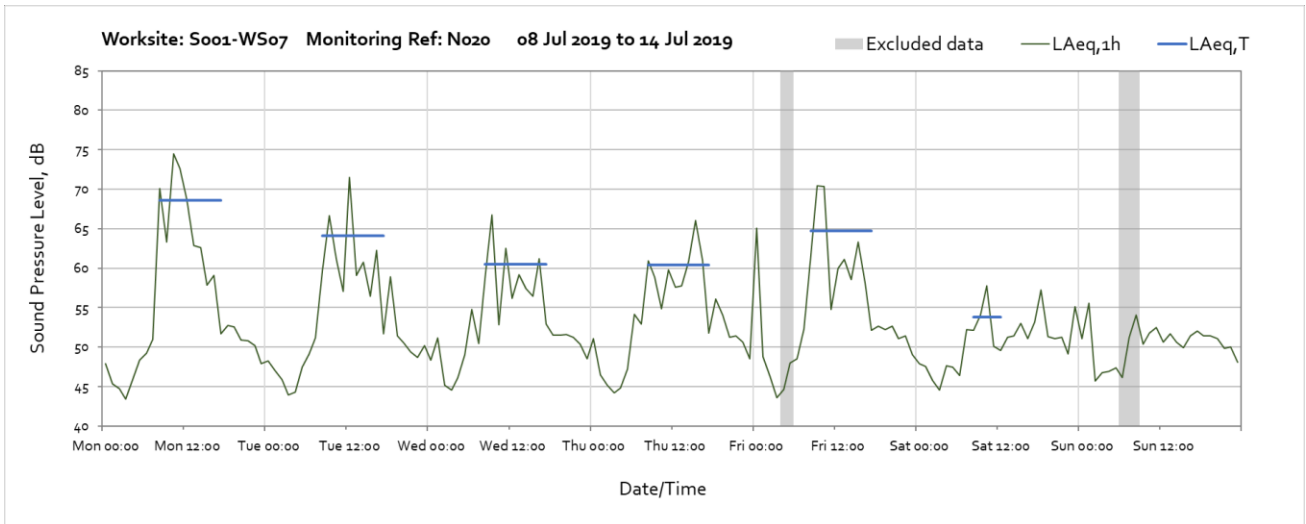


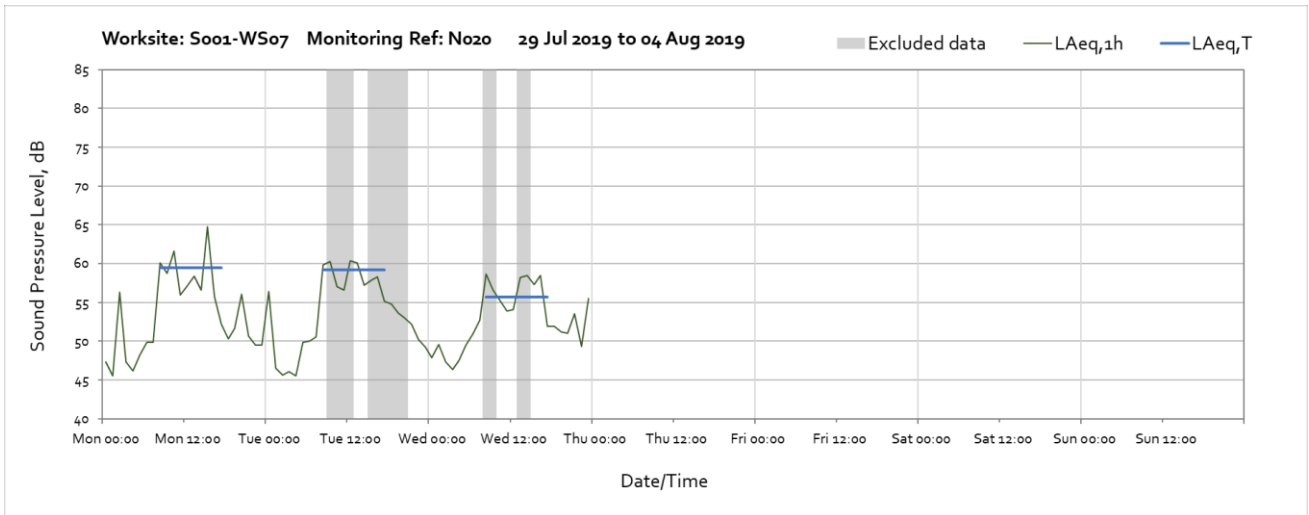


Worksite: S001-WS02 – Monitoring Ref: N020

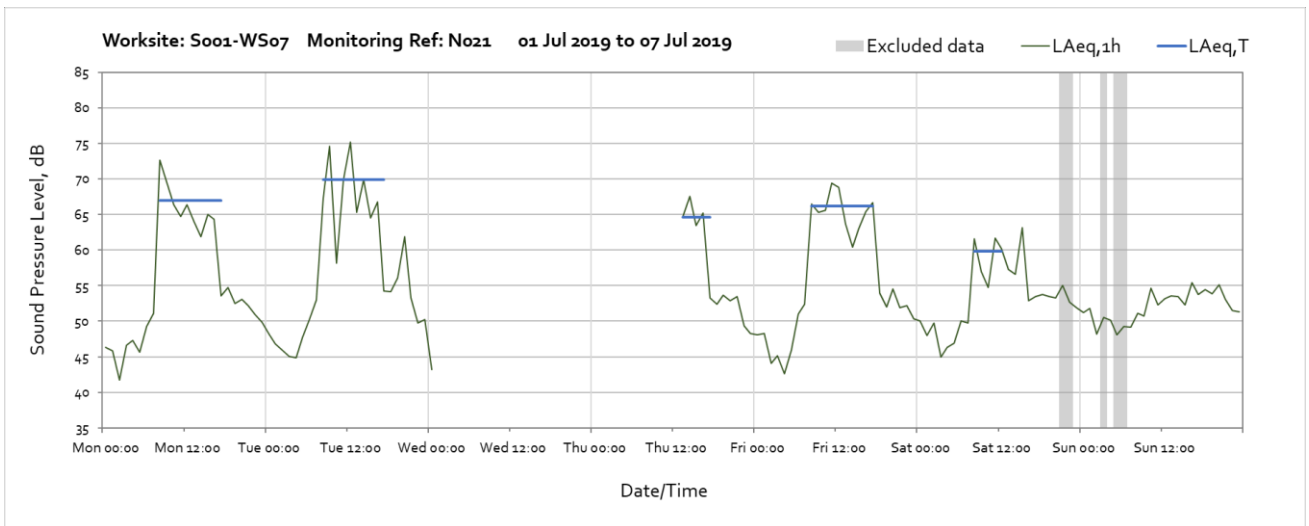


Note: Missing data between 00:00 and 14:00 on Monday 1st of July was due to mishandling of the noise monitor.

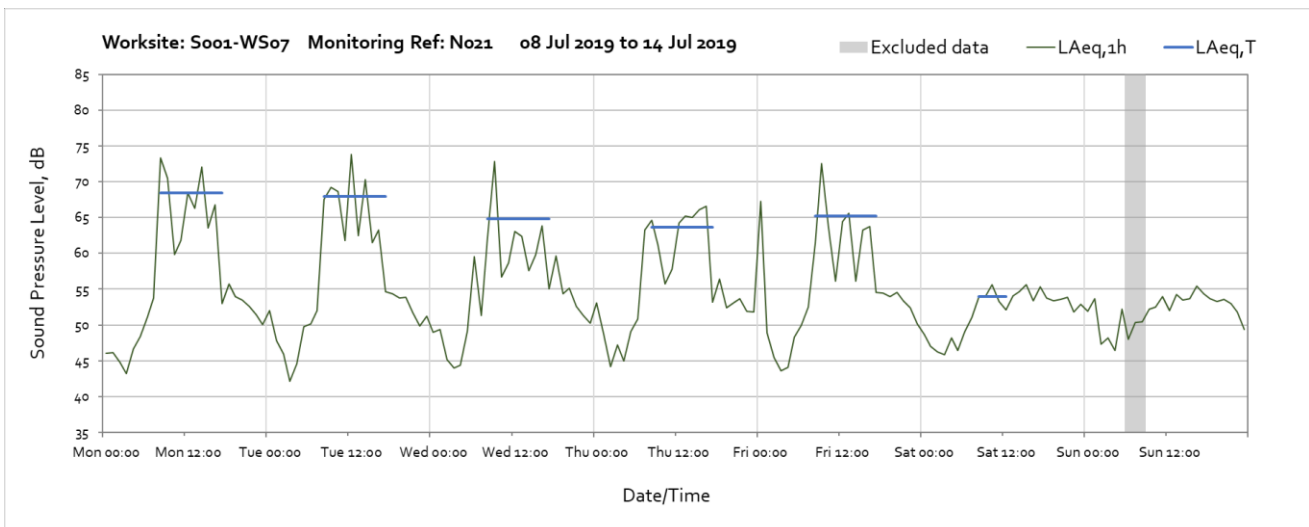


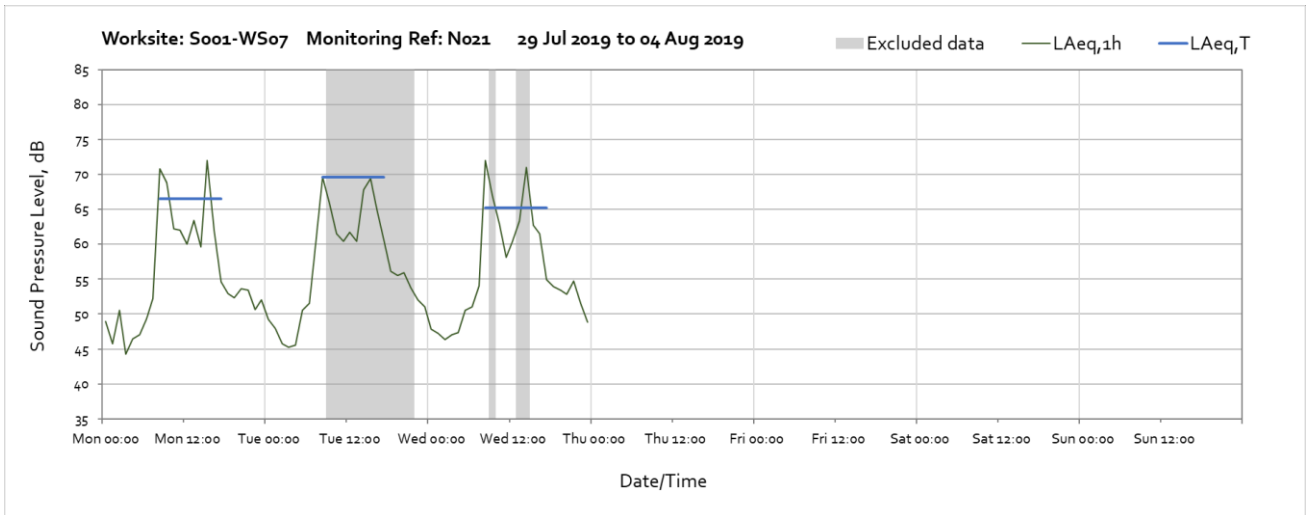
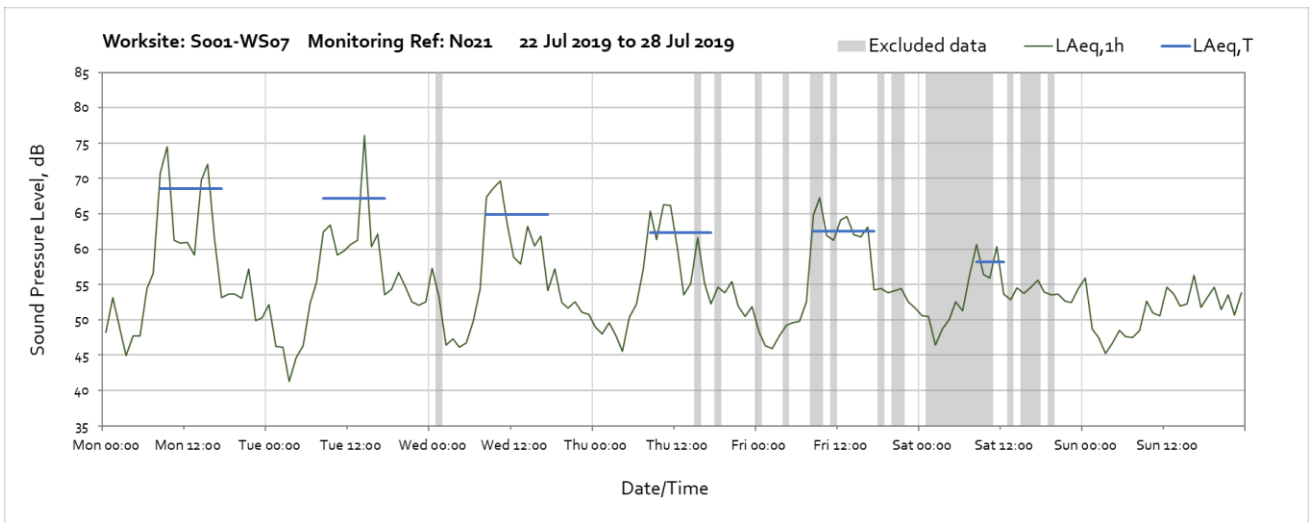
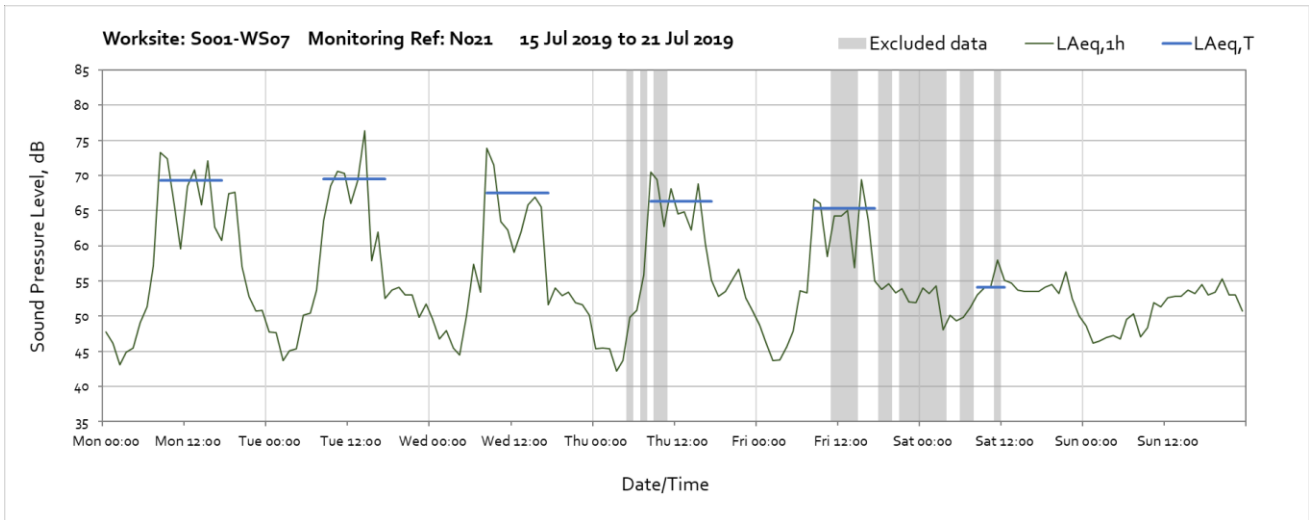


Worksite: S001-WS02 – Monitoring Ref: N021

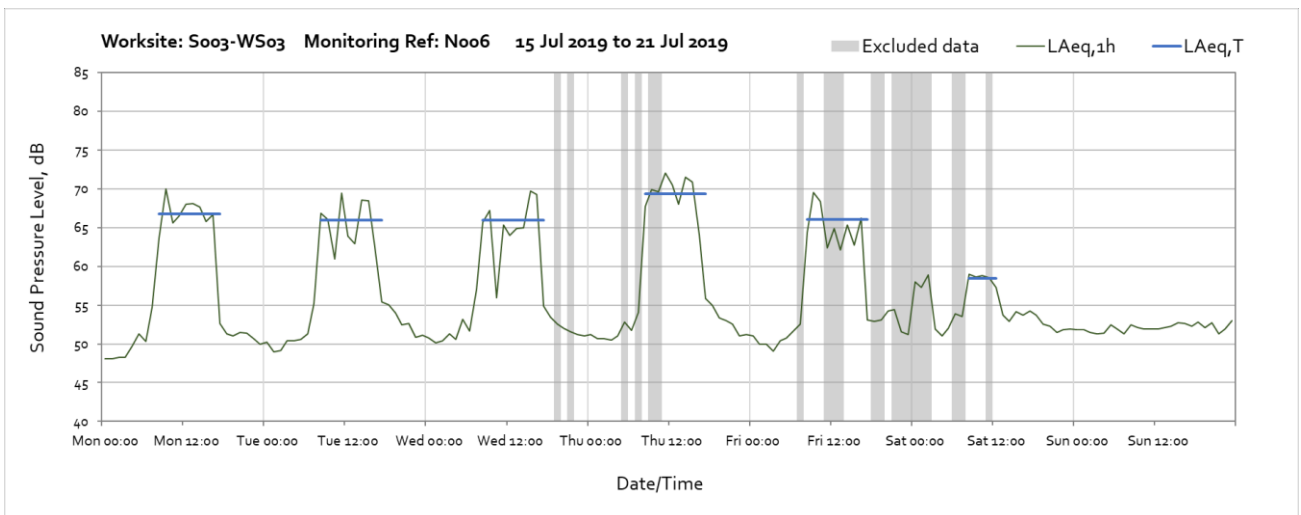
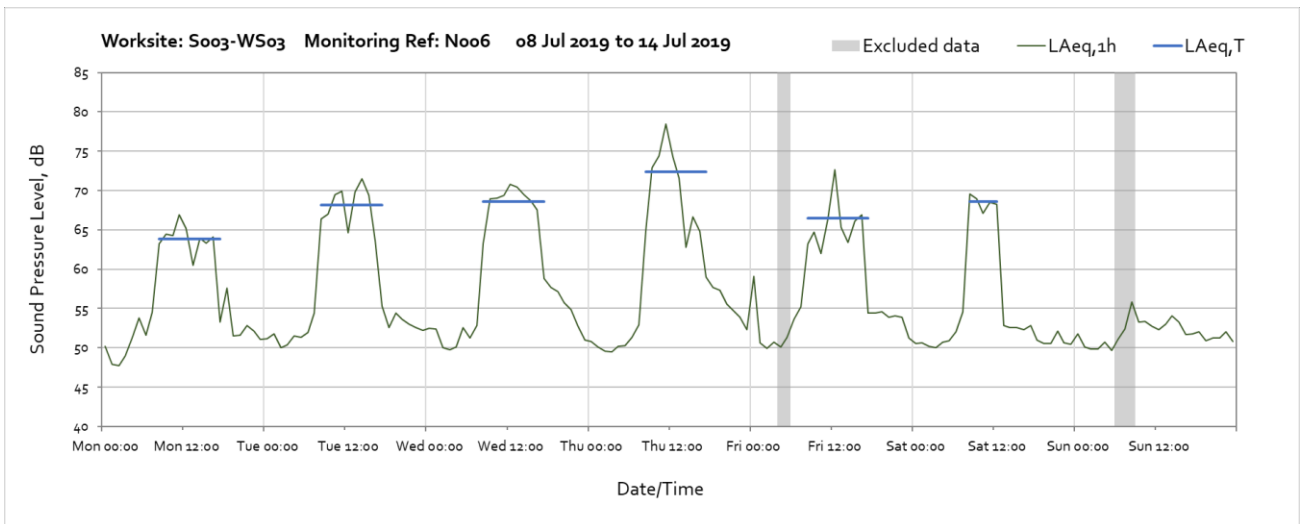
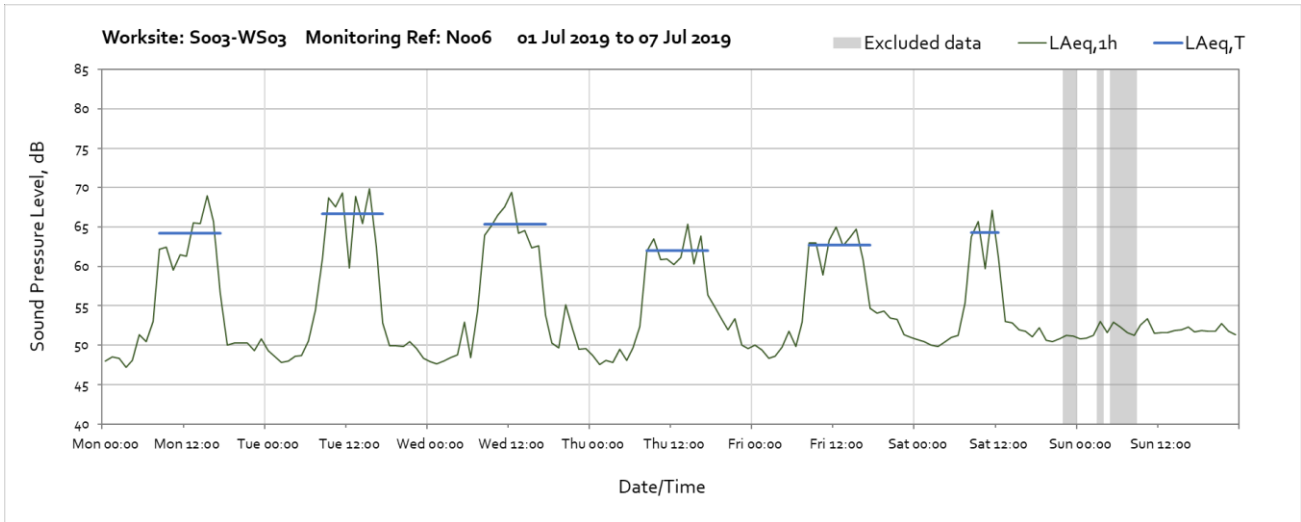


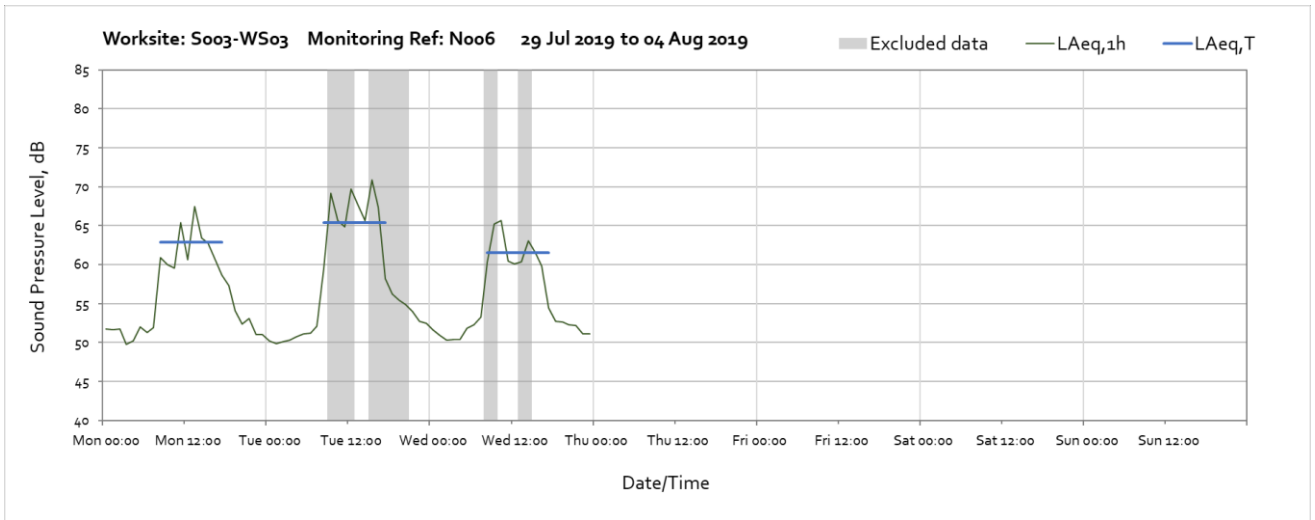
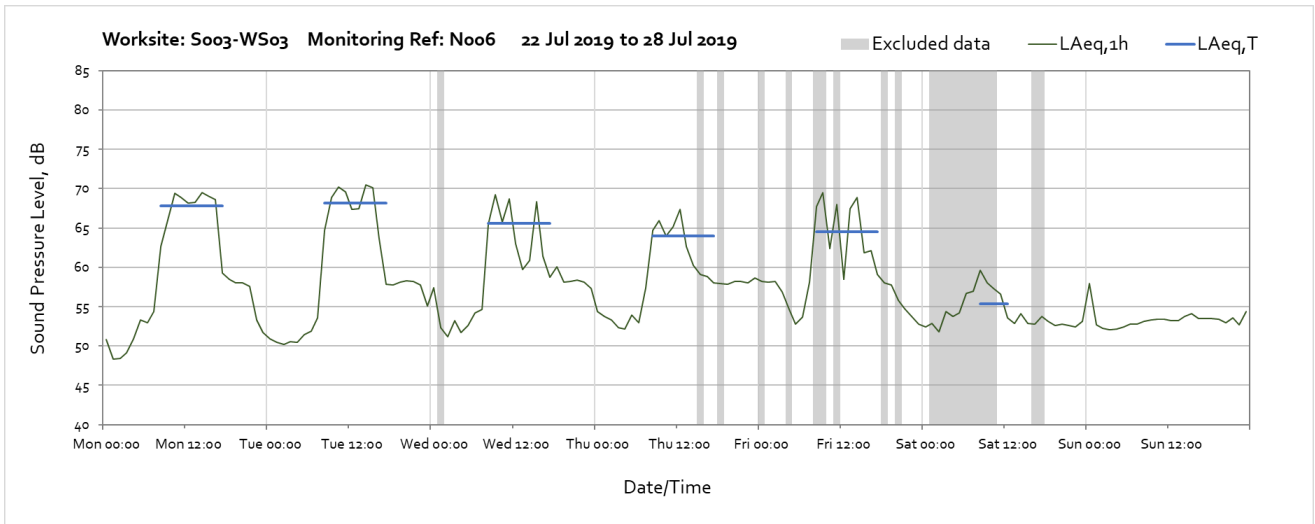
Note: Missing data between 01:00 on Wednesday 3rd and 10:00 on Thursday 4th of July was due to hardware malfunctioning.



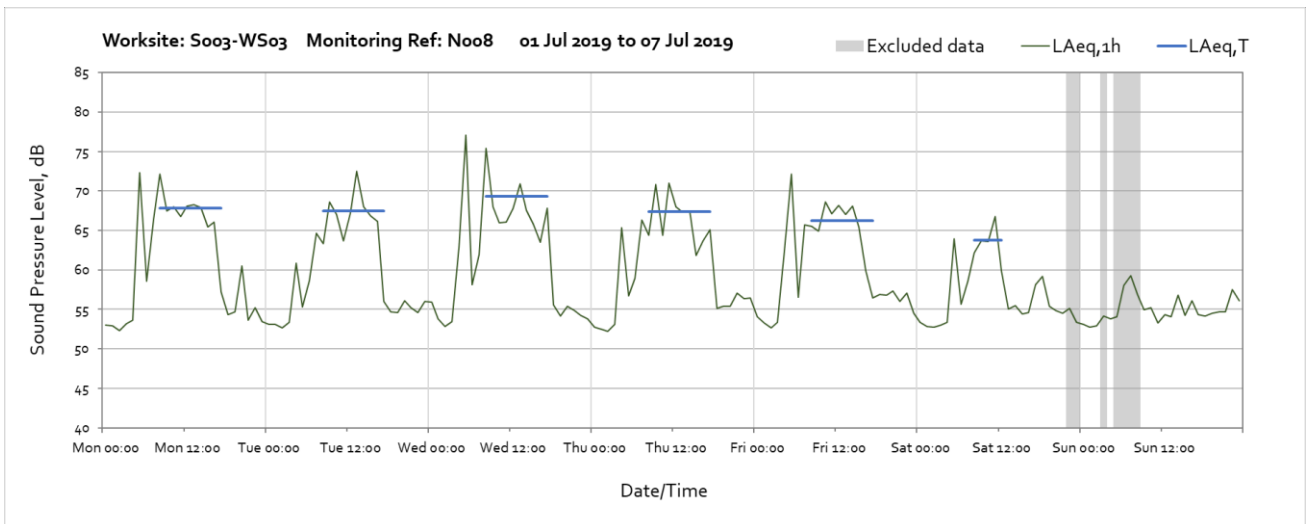


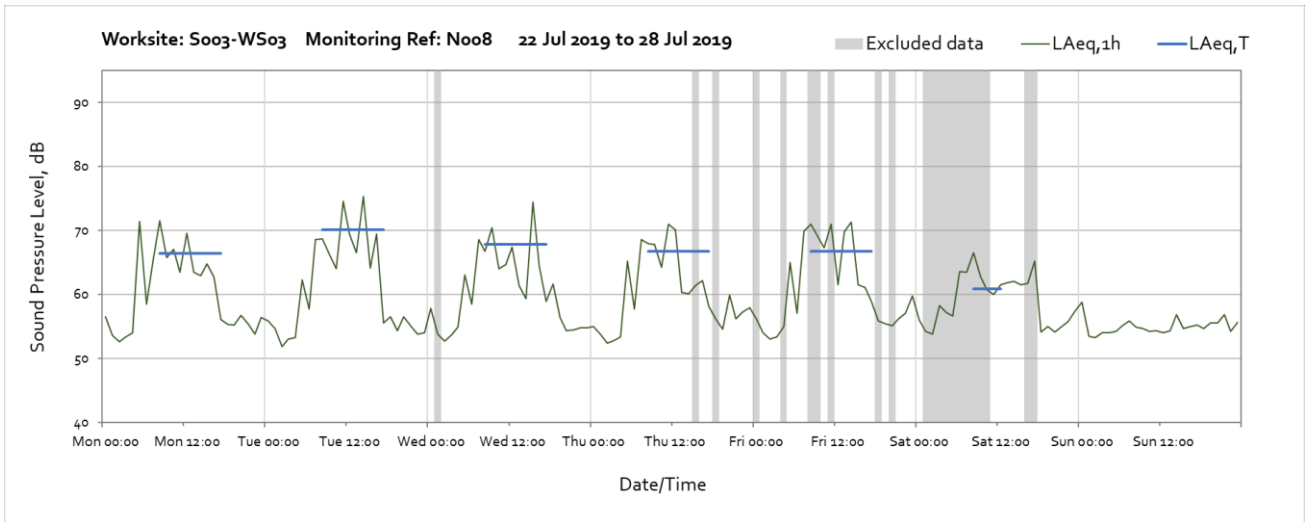
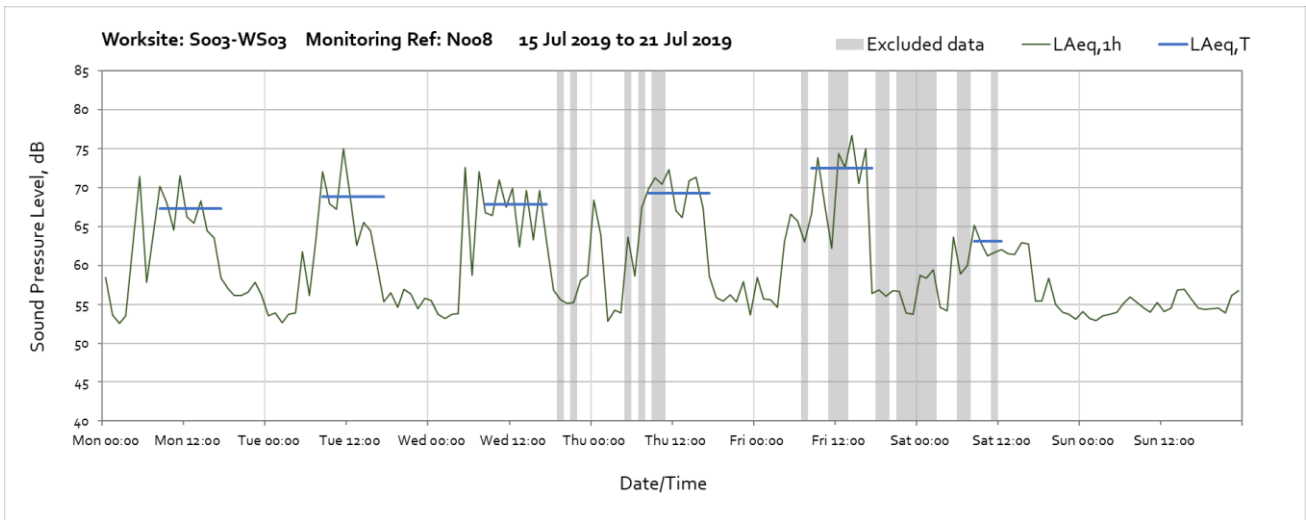
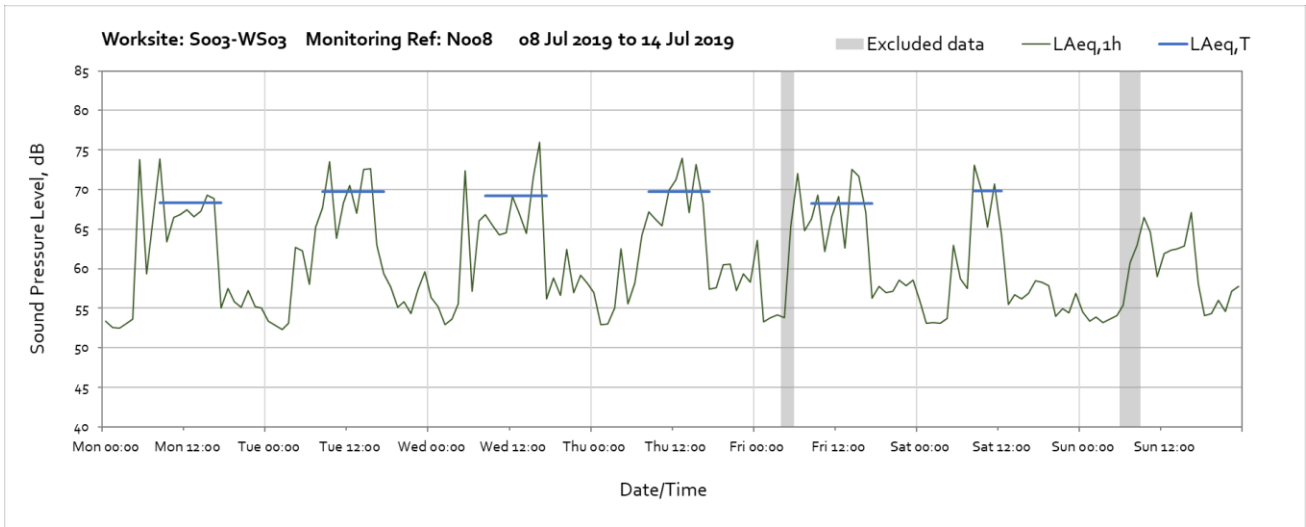
Worksite: S003-WS03 – Monitoring Ref: N006

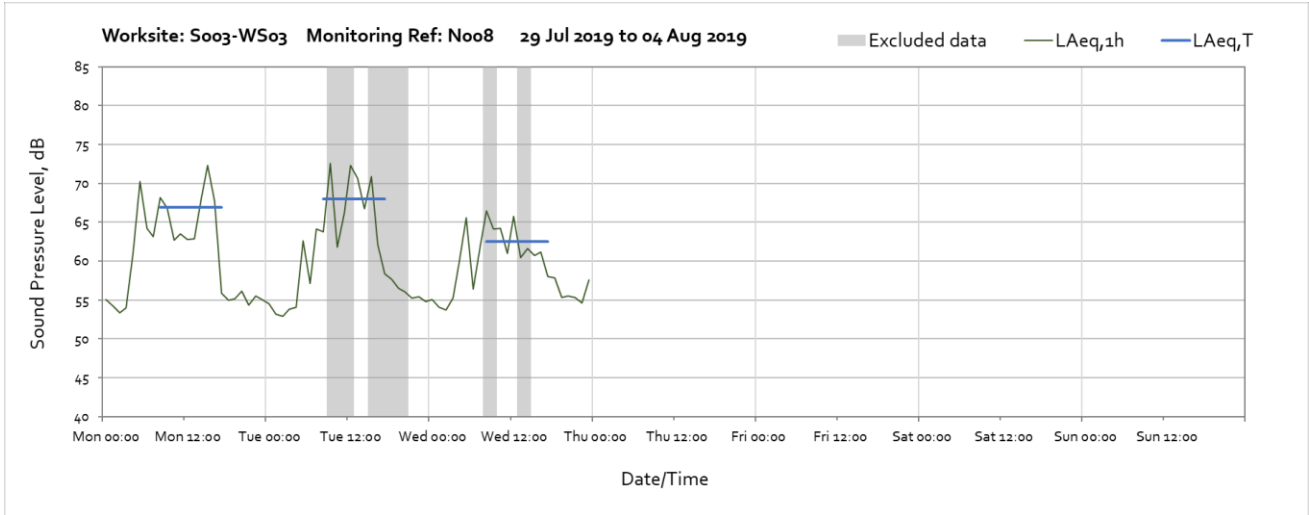




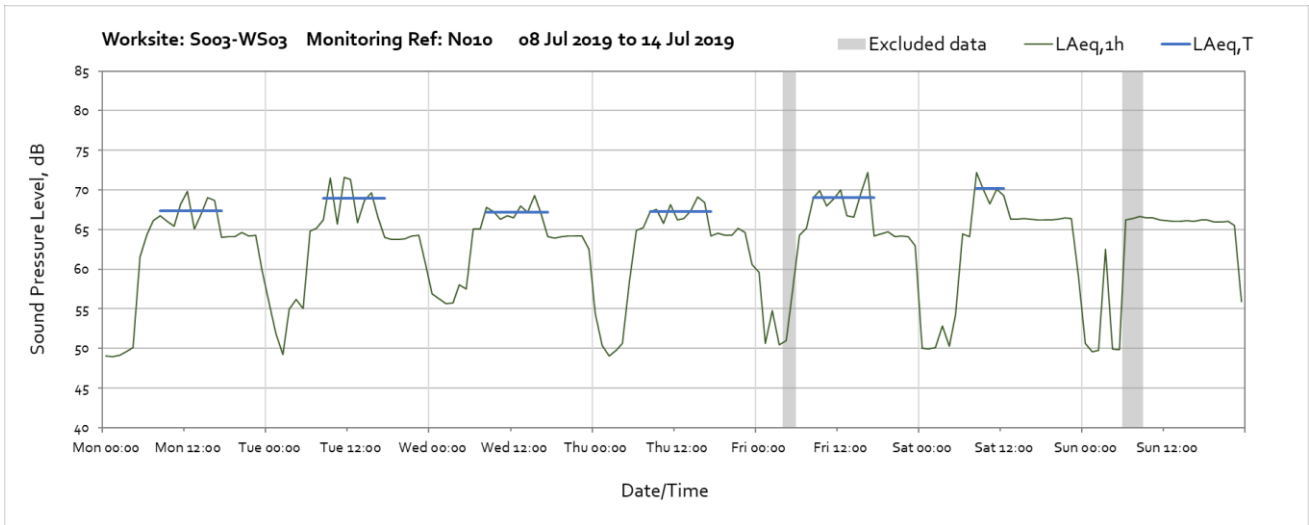
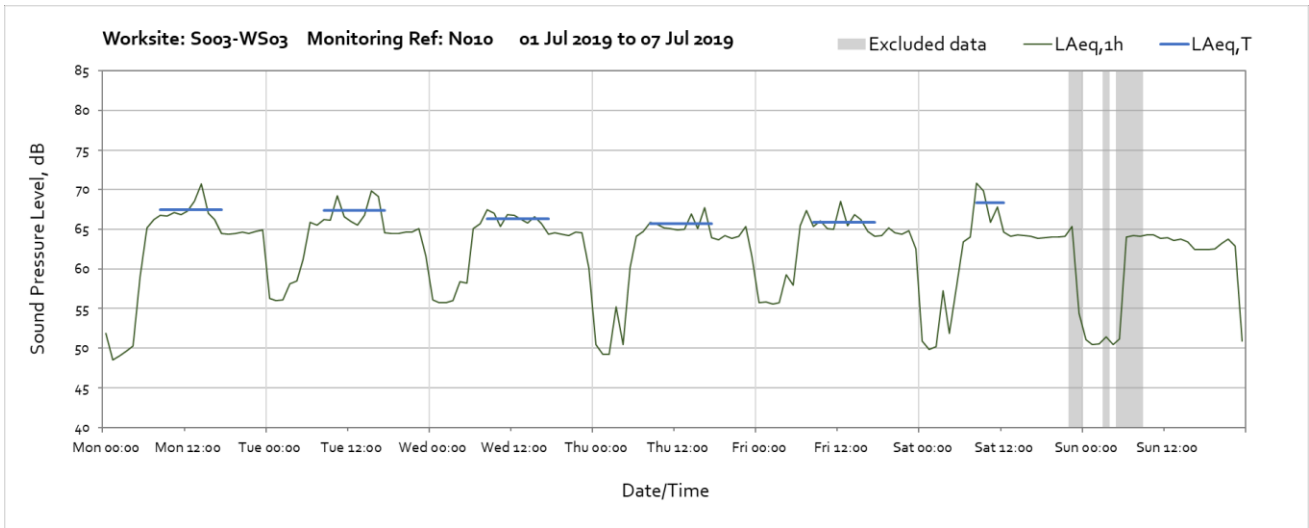
Worksite: S003-WS03 – Monitoring Ref: N008

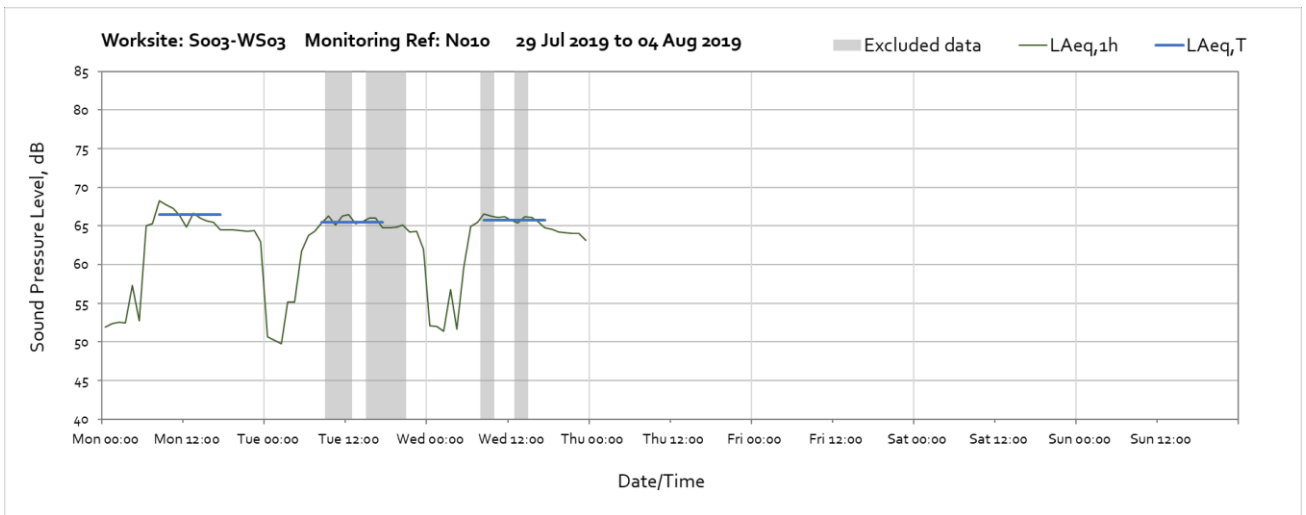
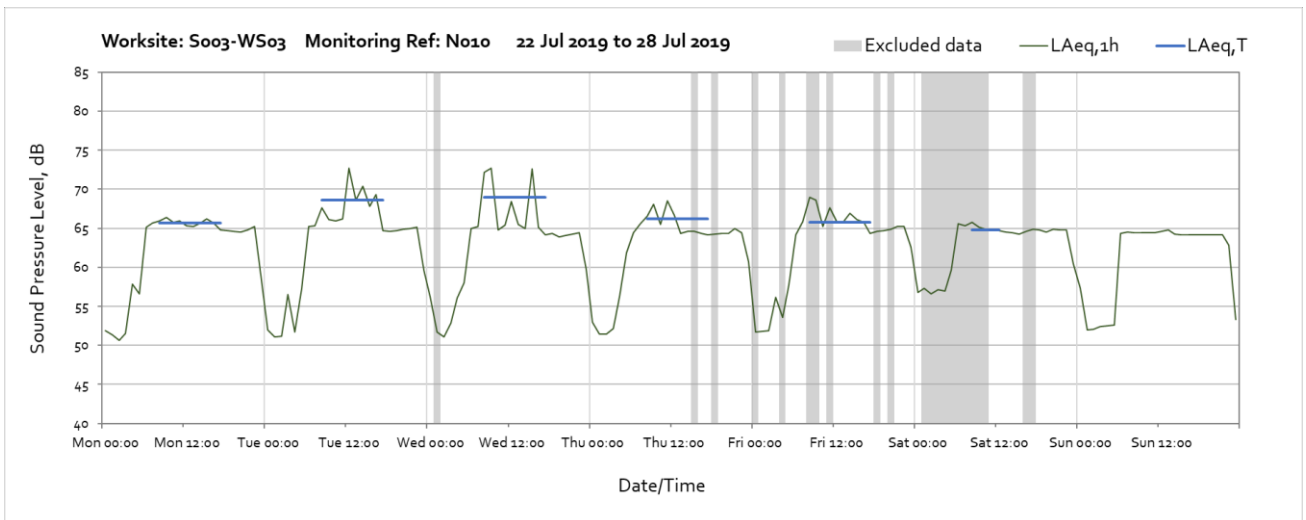
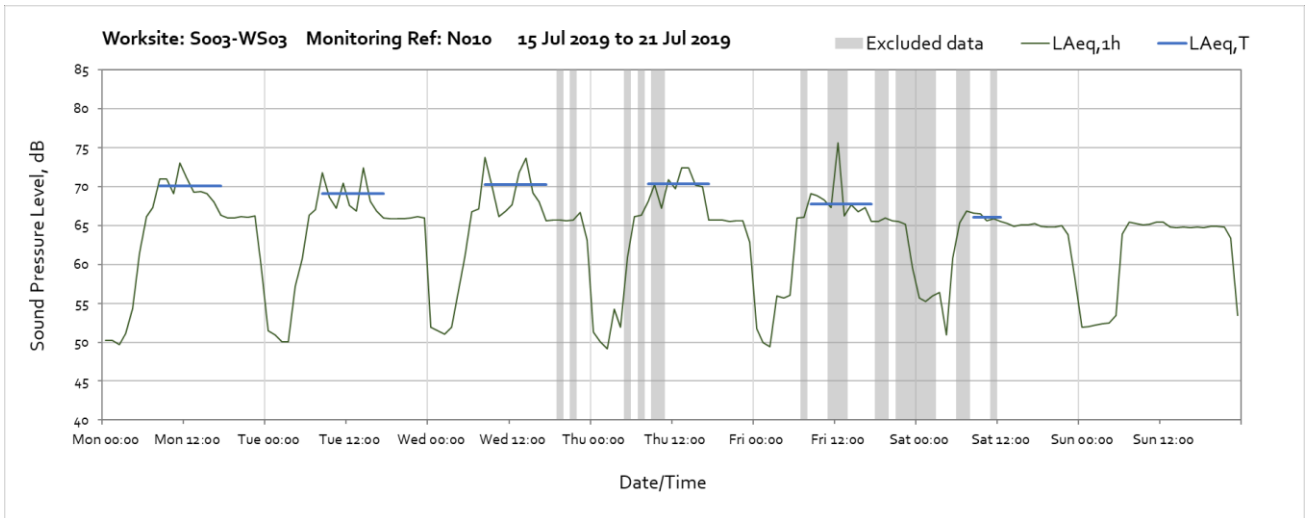




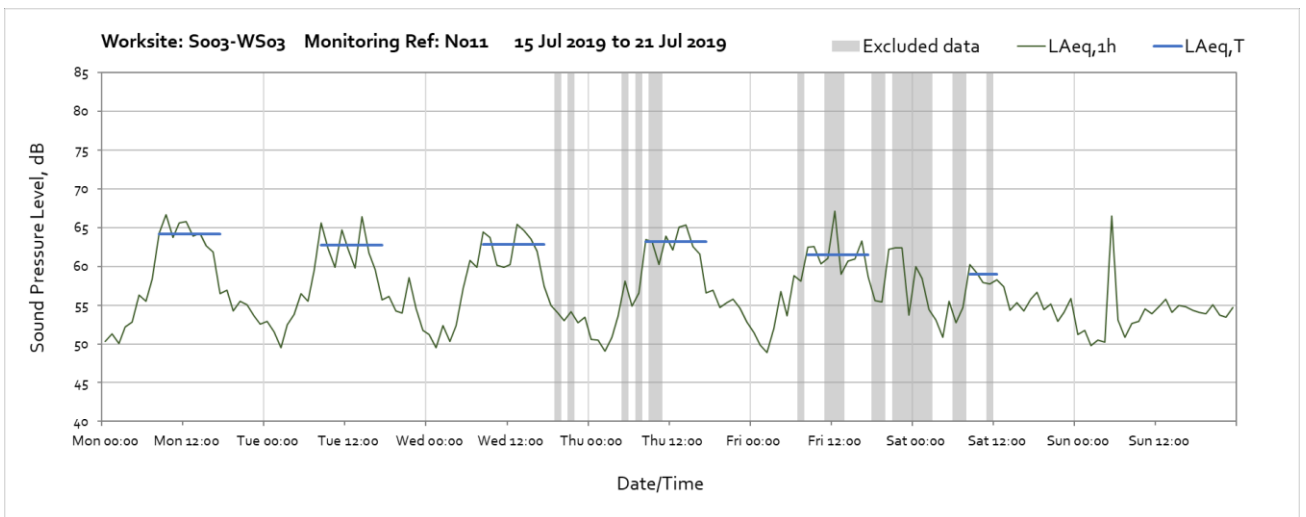
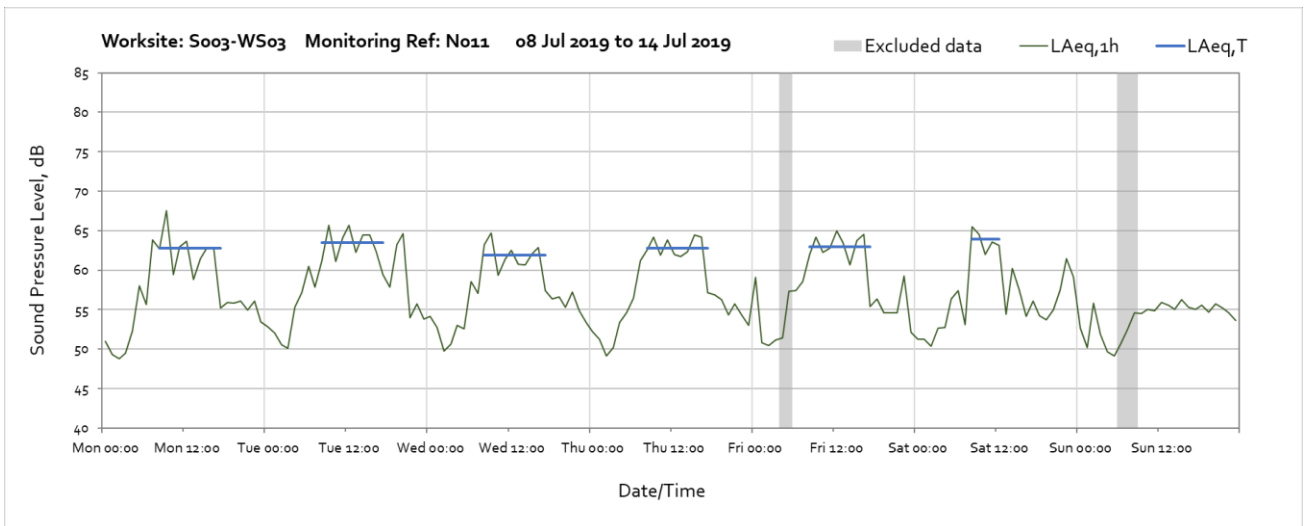
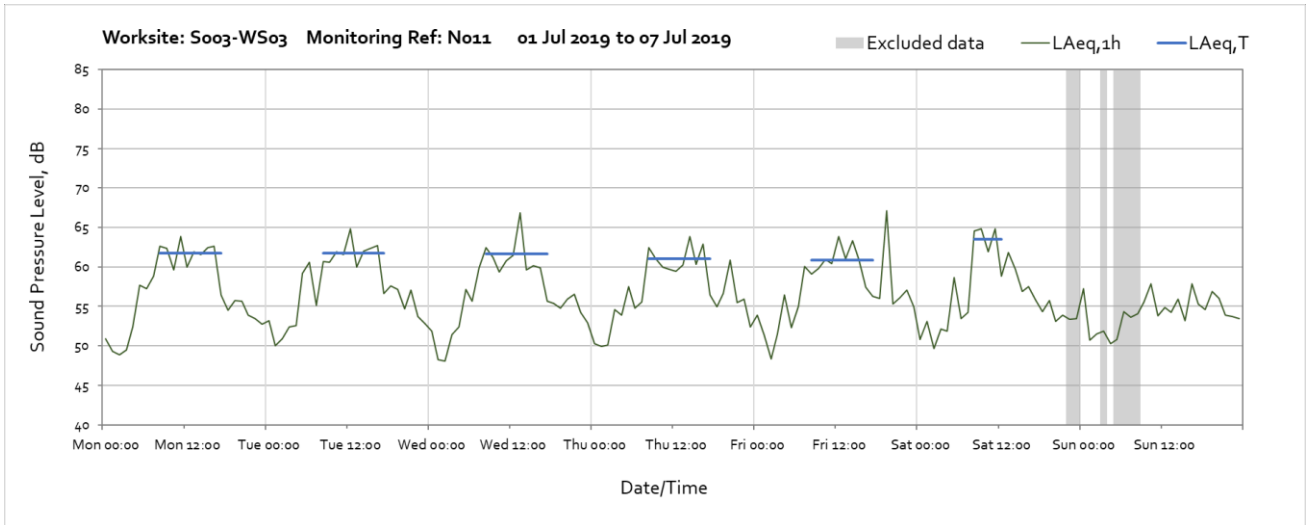


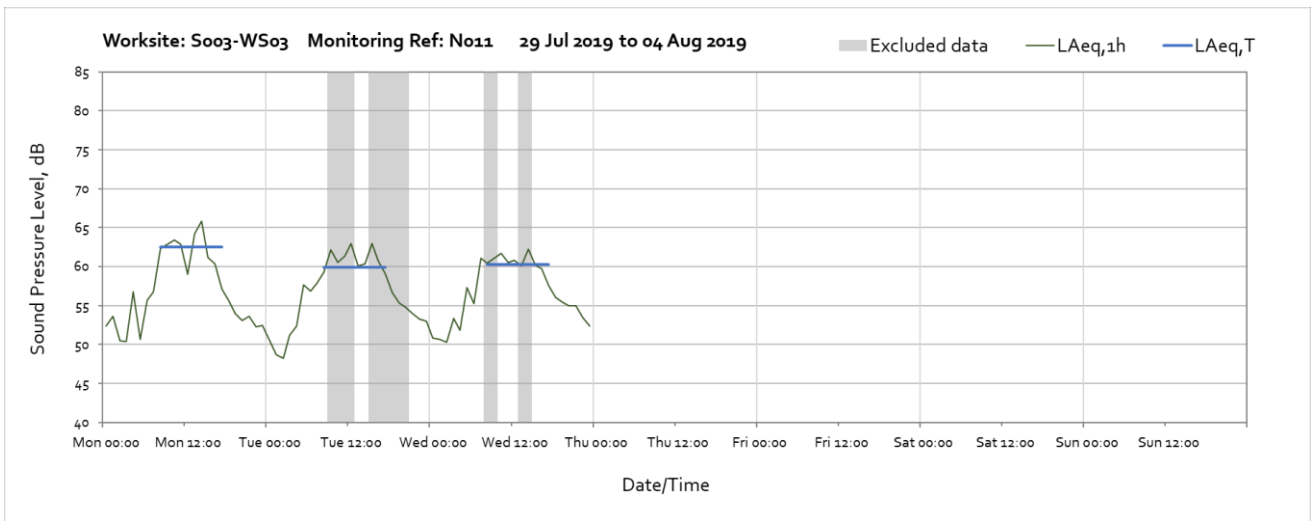
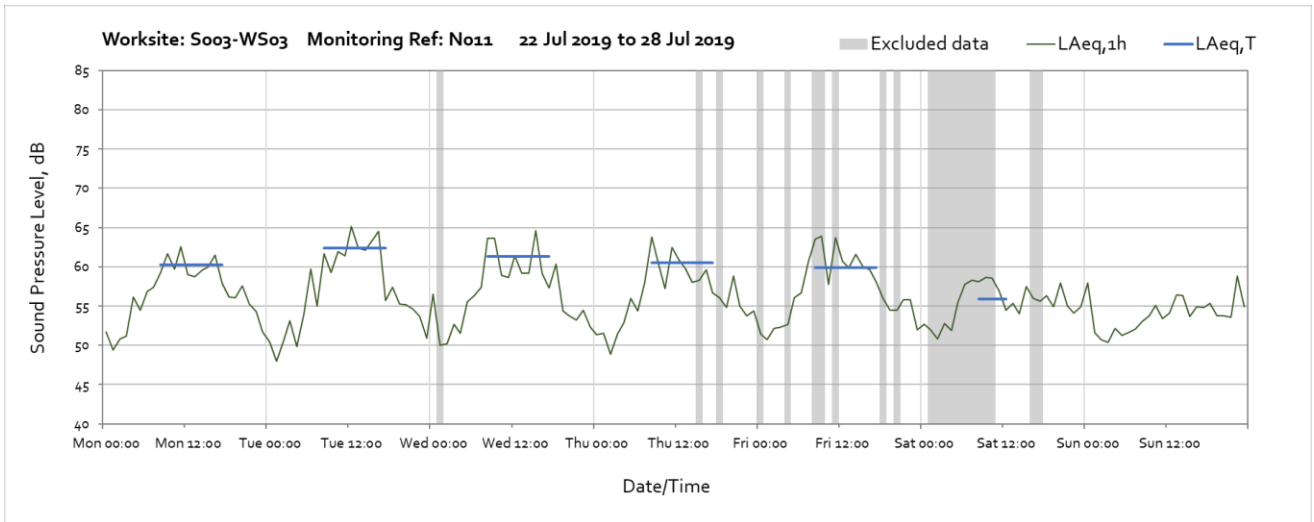
Worksite: S003-WS03 – Monitoring Ref: N010



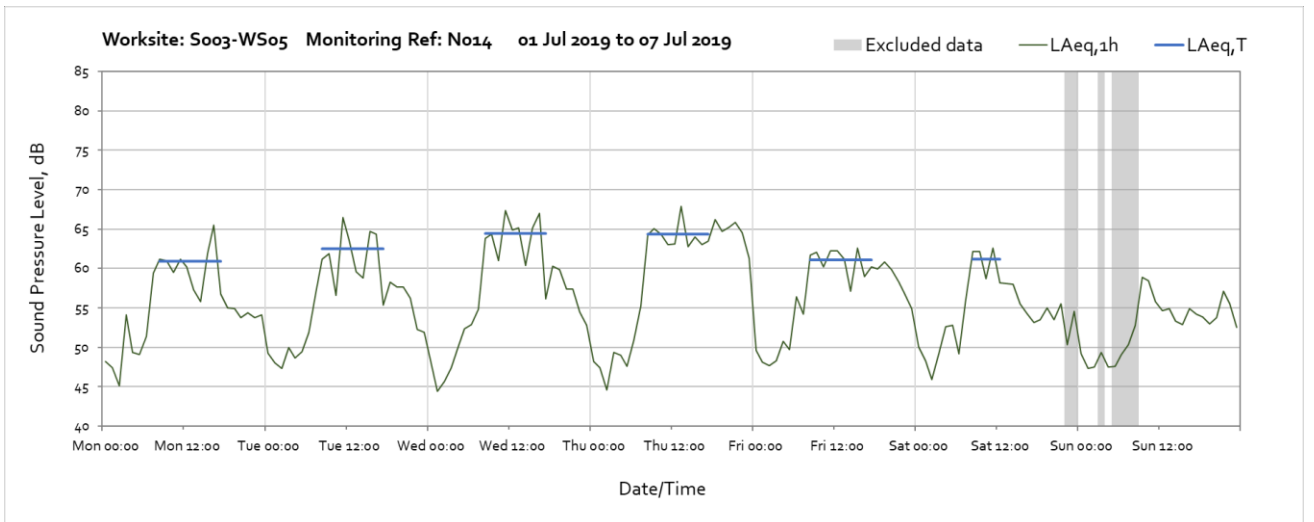


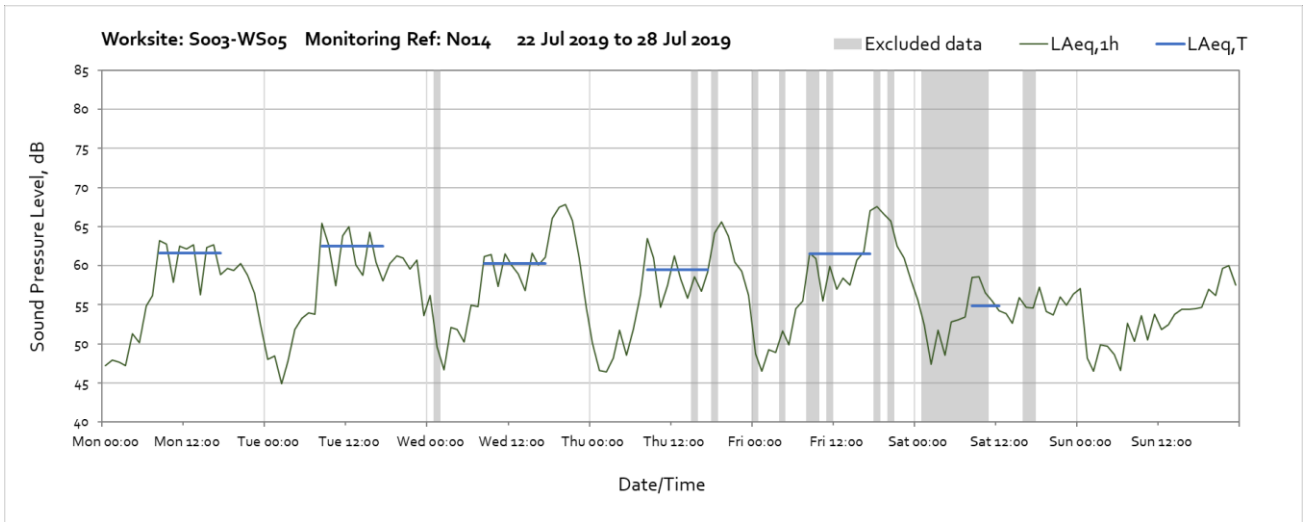
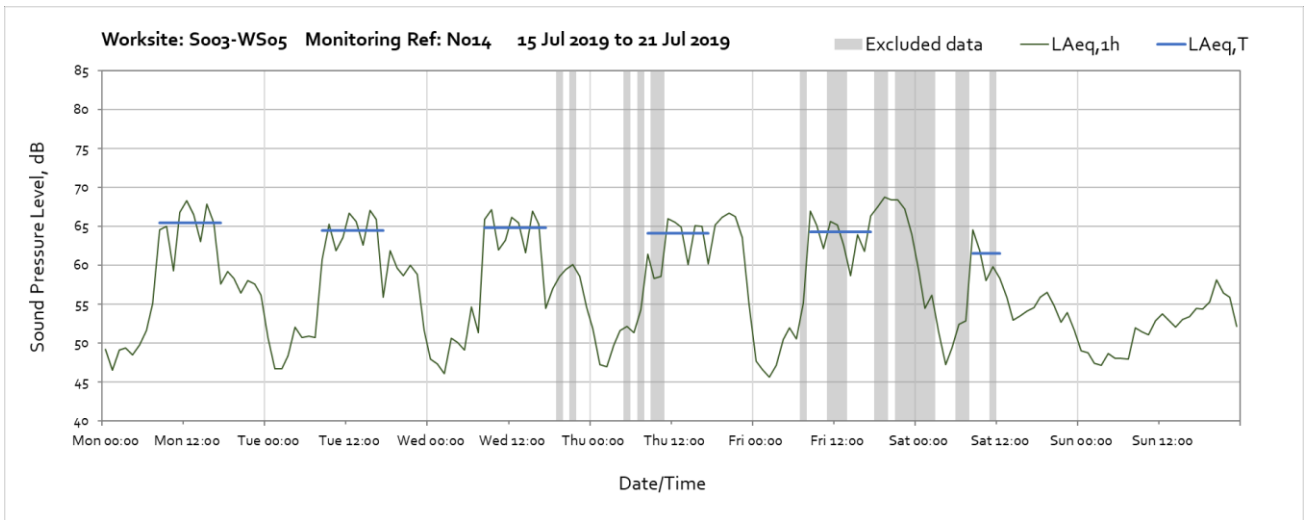
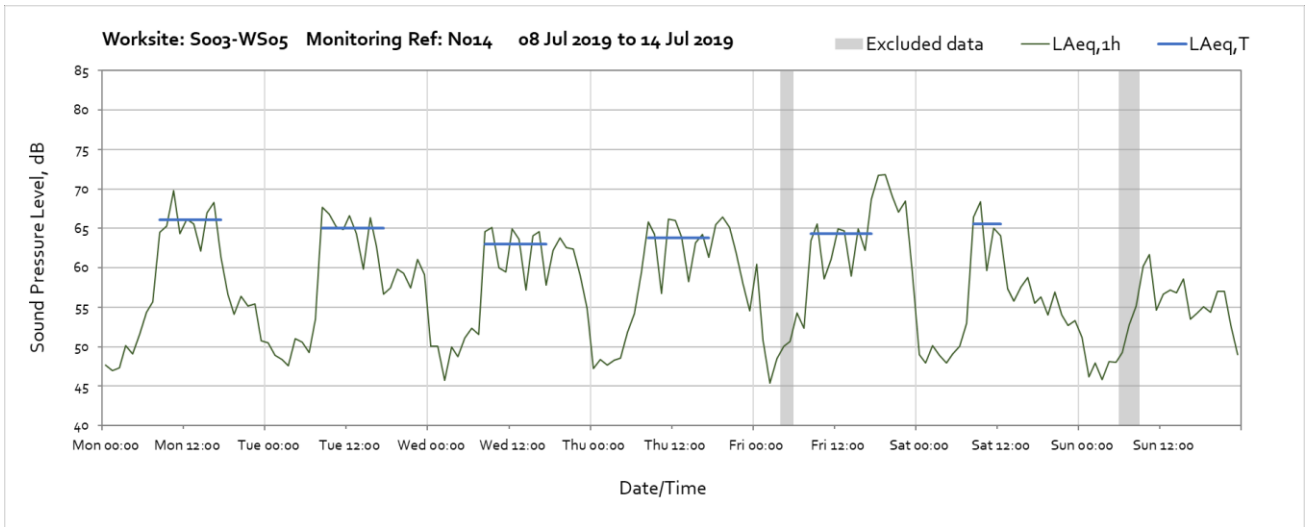
Worksite: S003-WS03 – Monitoring Ref: N011

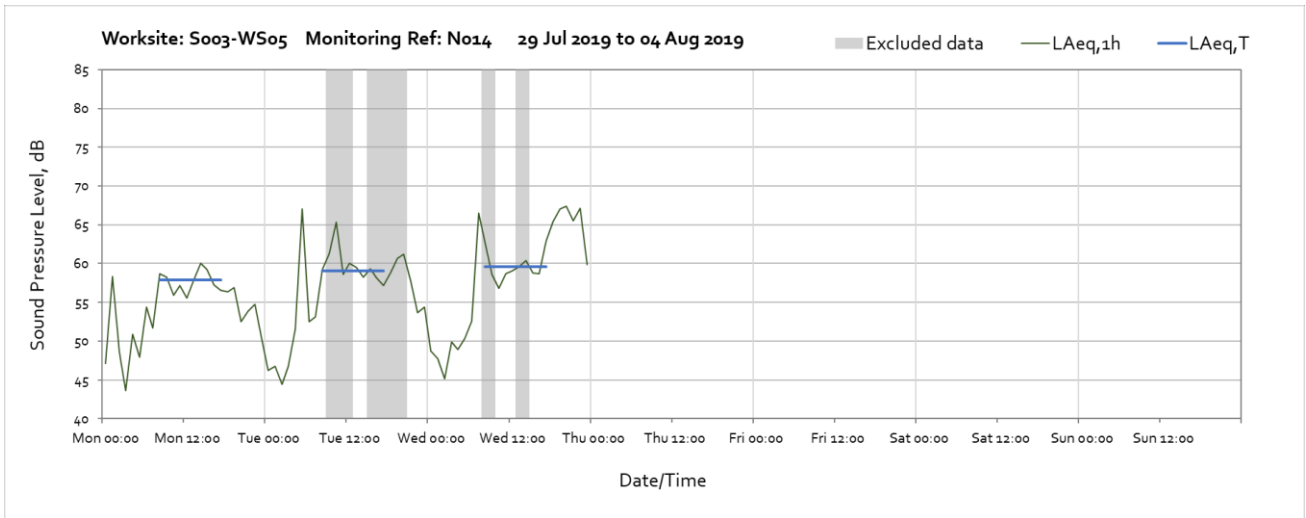




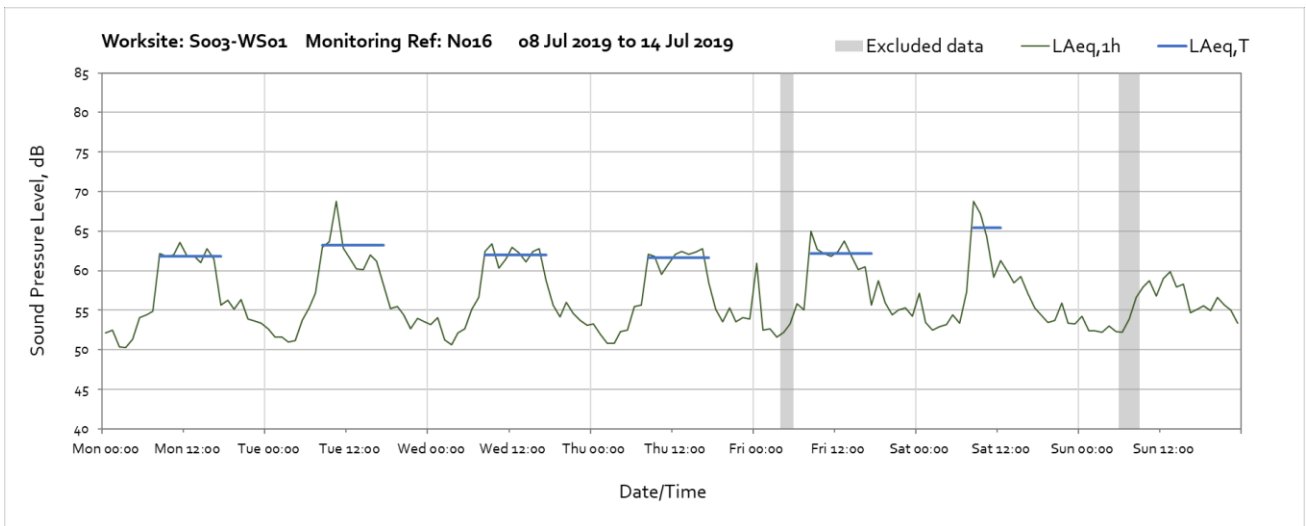
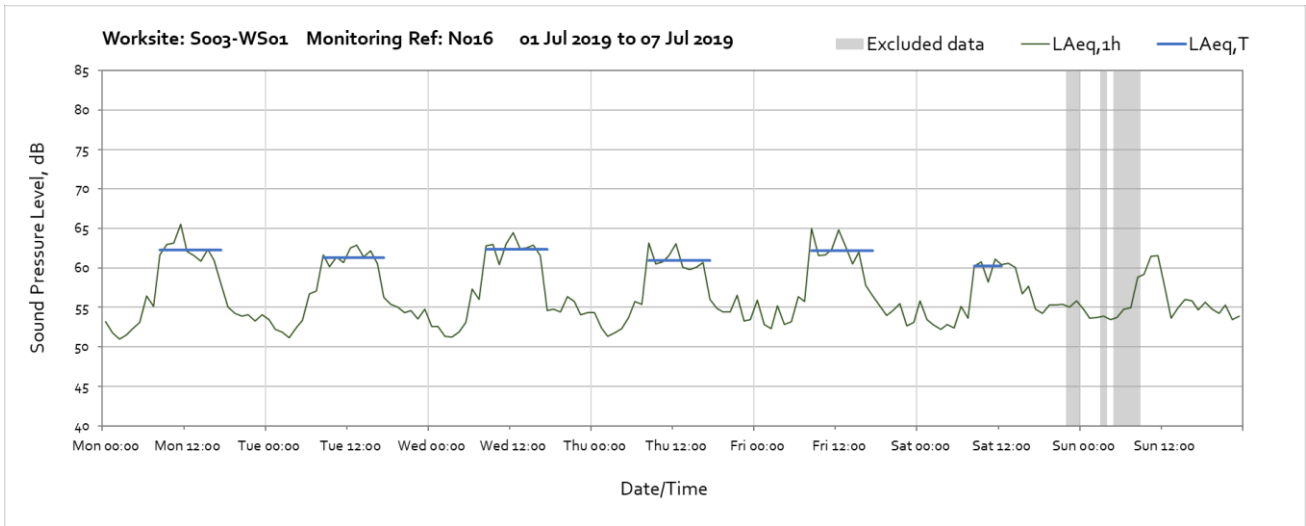
Worksite: S003-WS05 – Monitoring Ref: N014

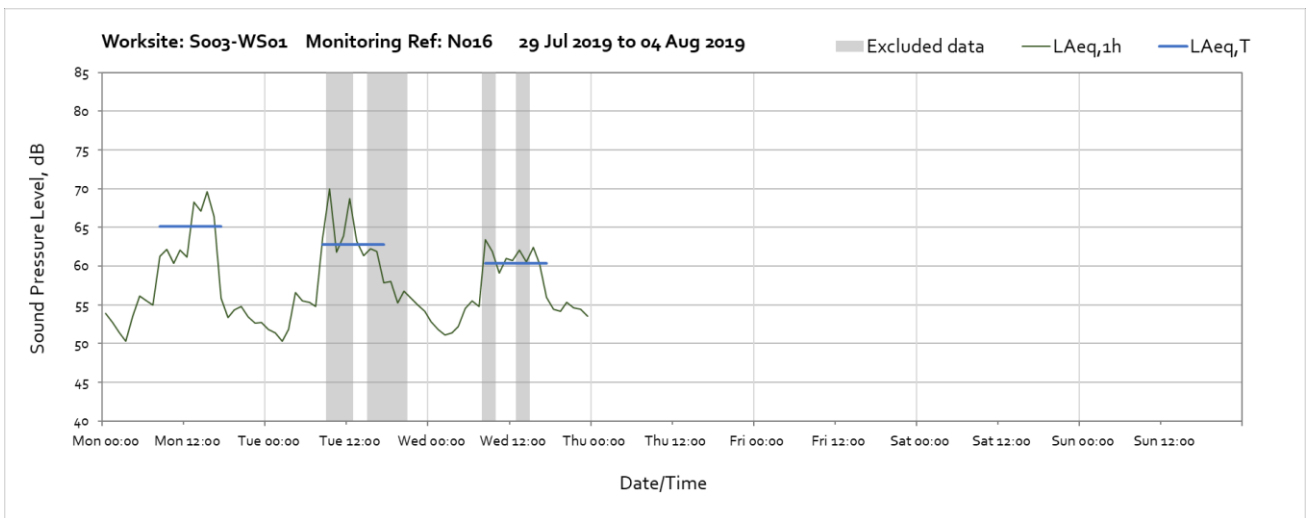
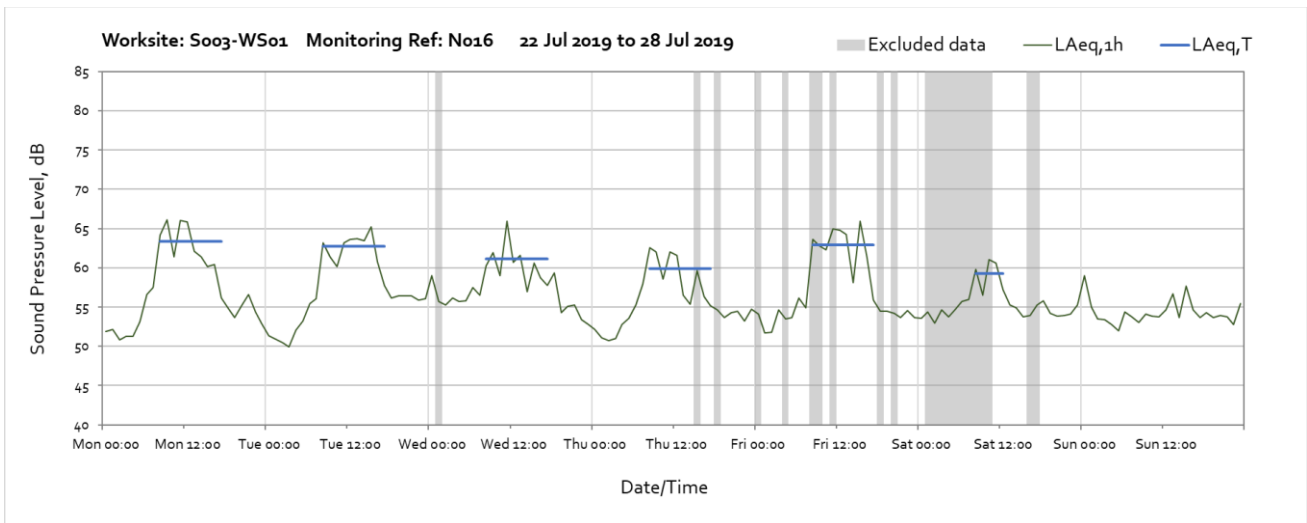
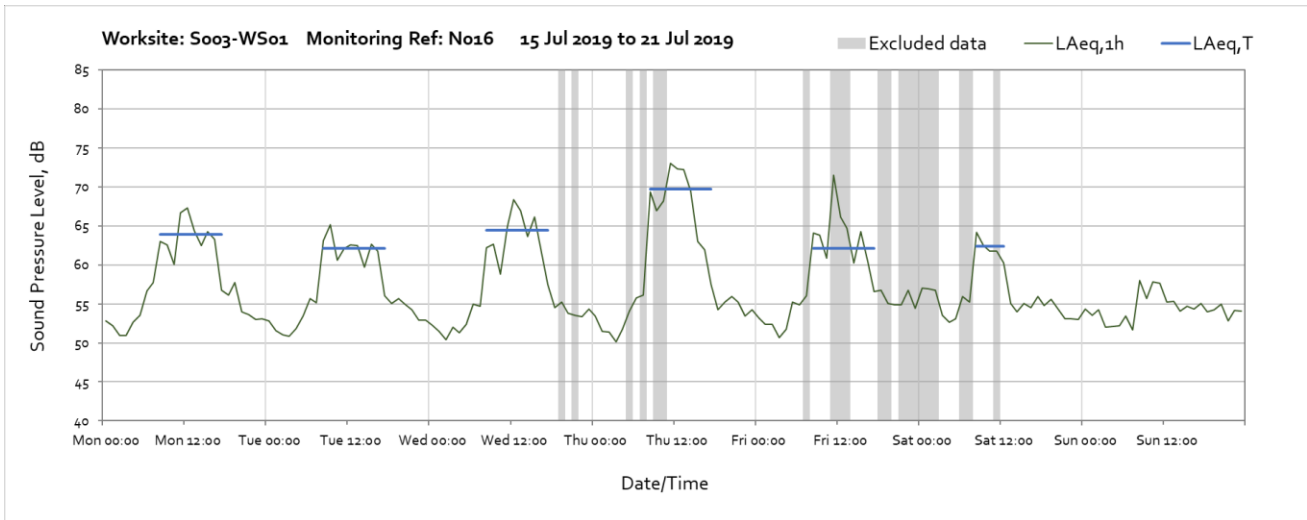




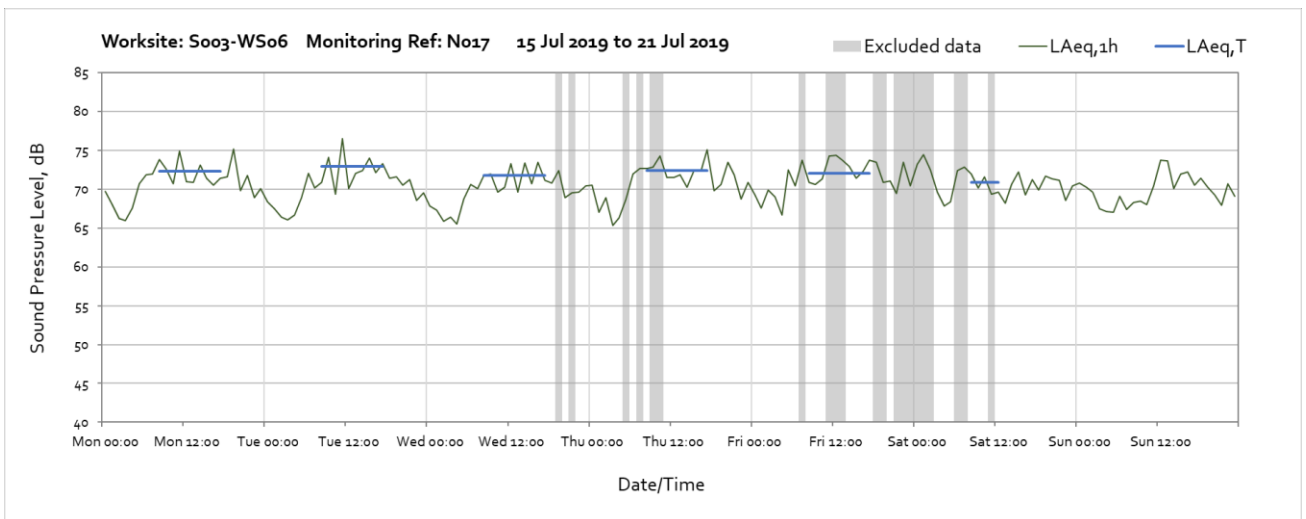
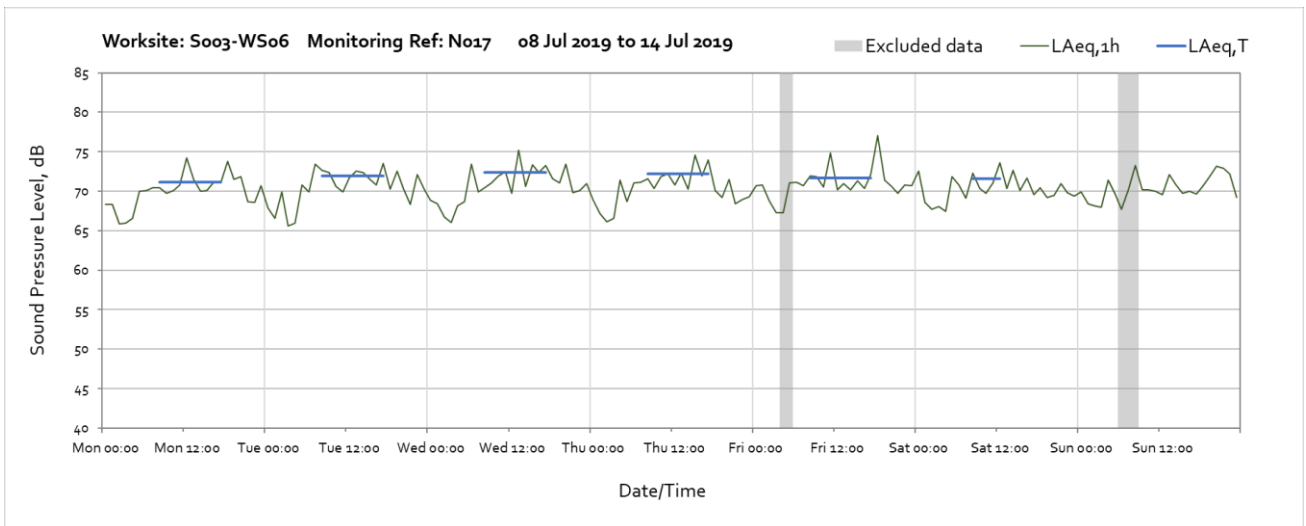
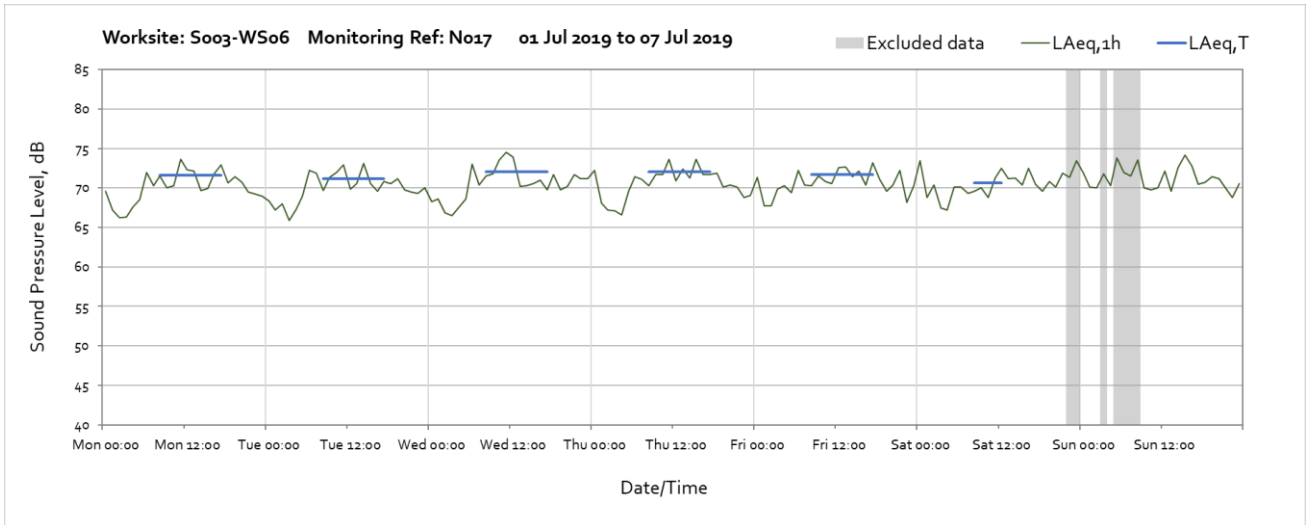


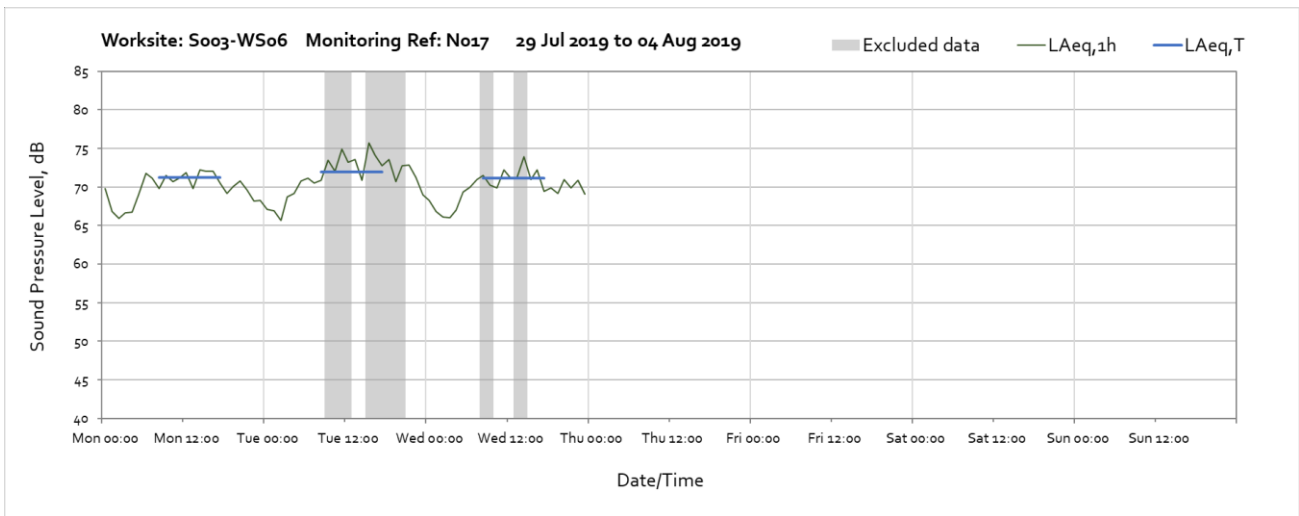
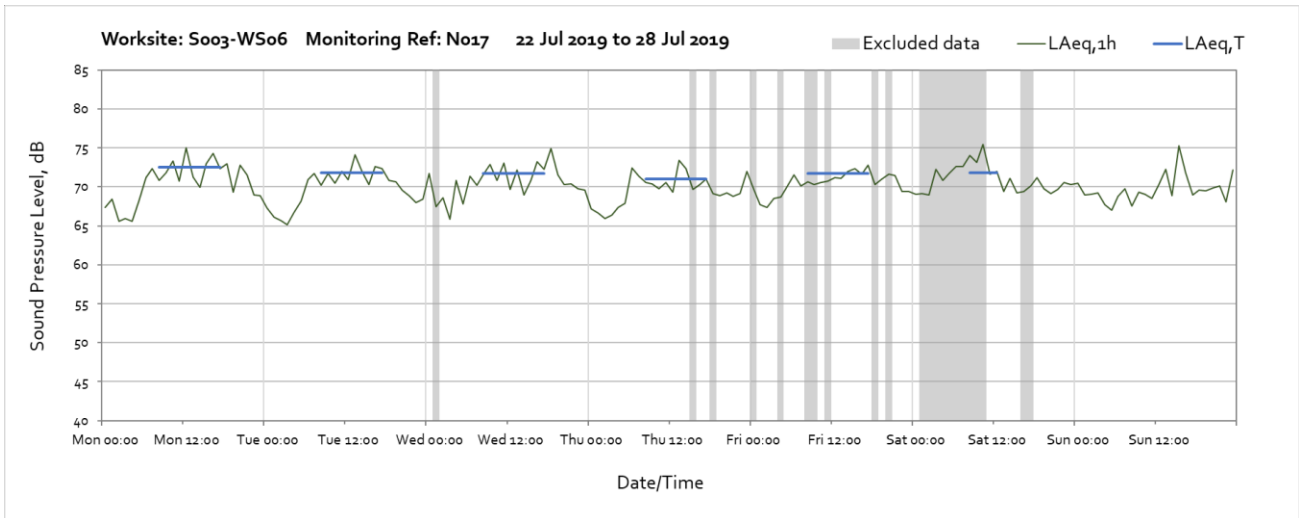
Worksite: S003-WS06 – Monitoring Ref: N016



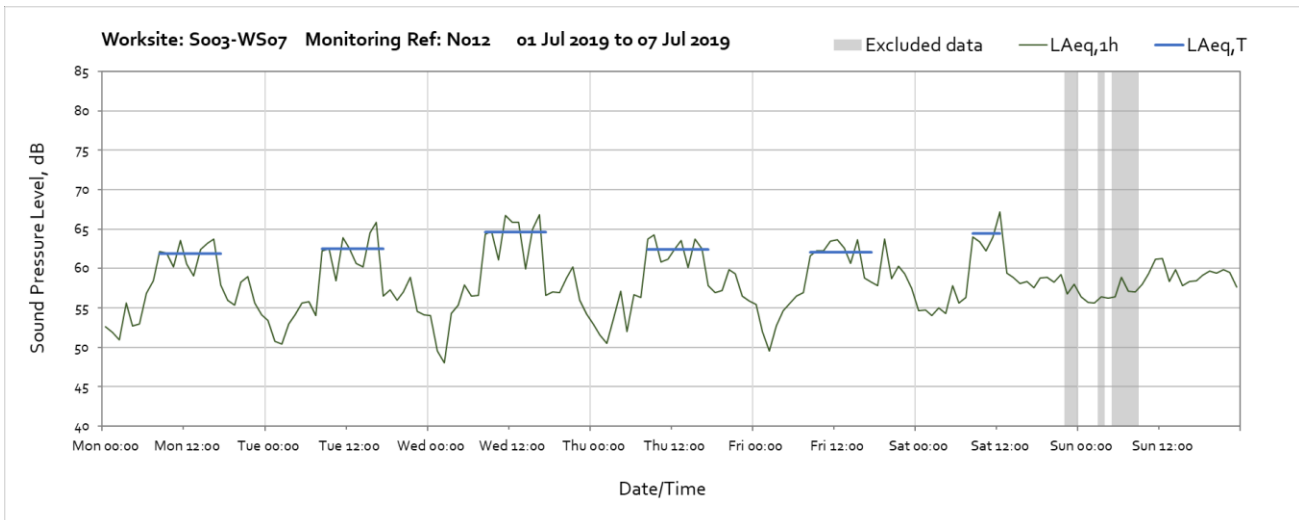


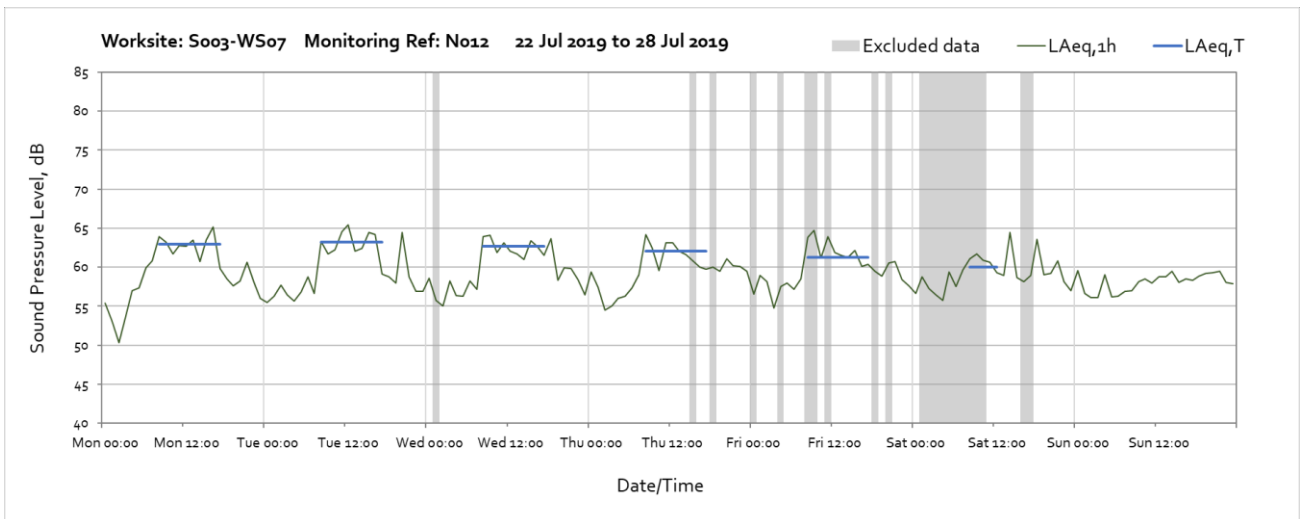
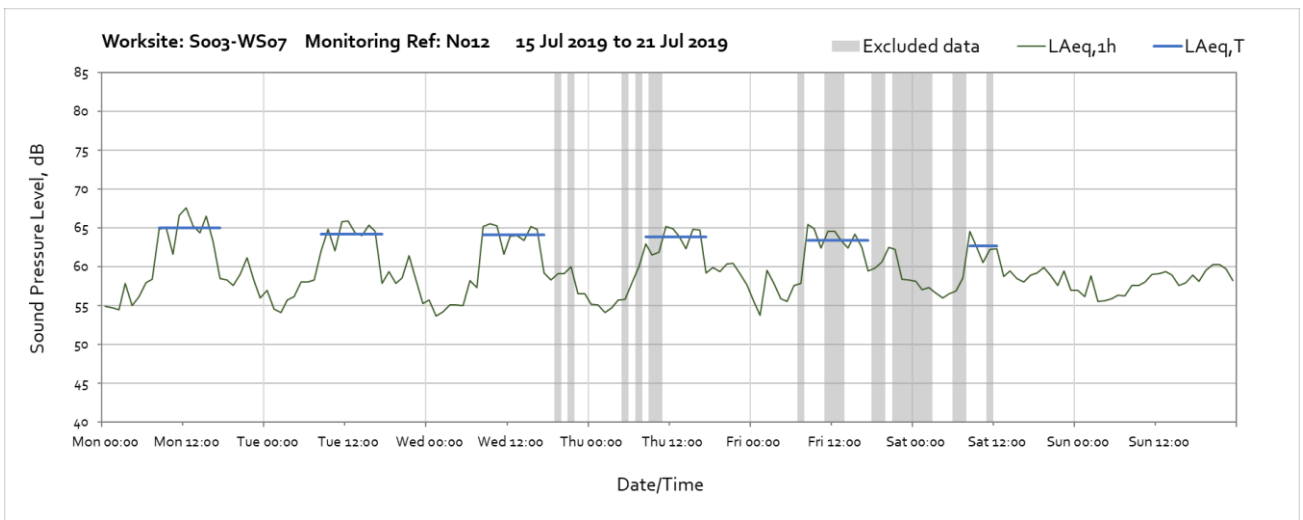
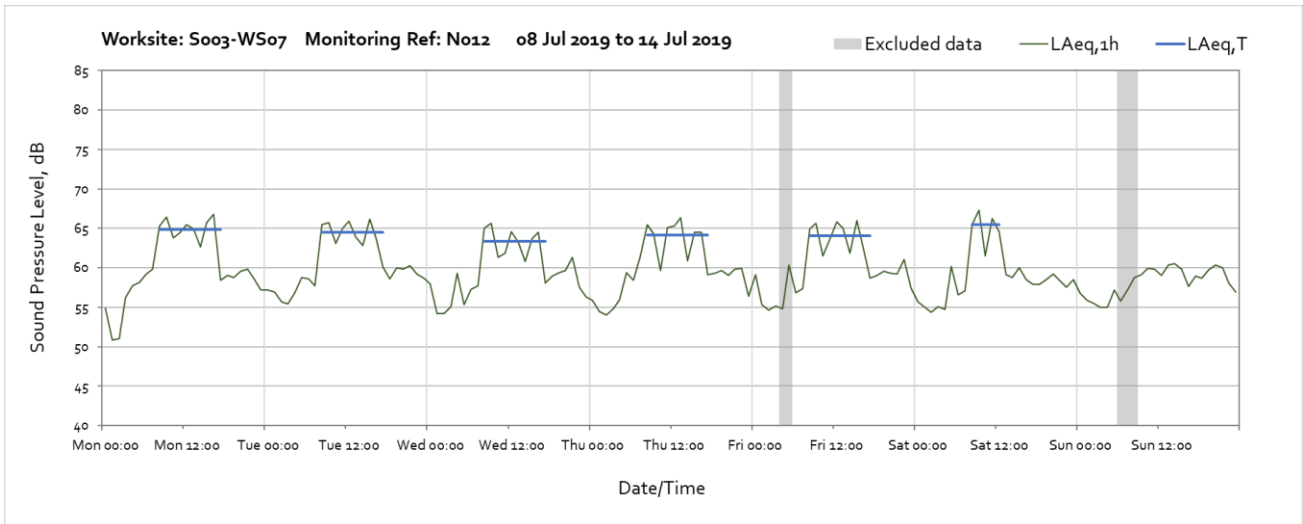
Worksite: S003-WS06 – Monitoring Ref: N017

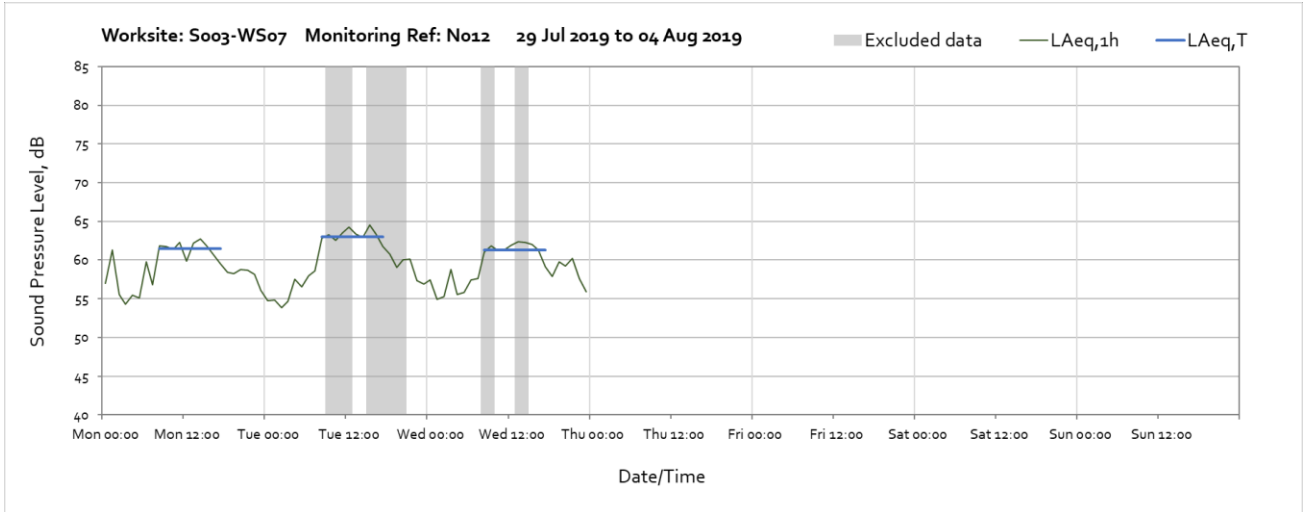




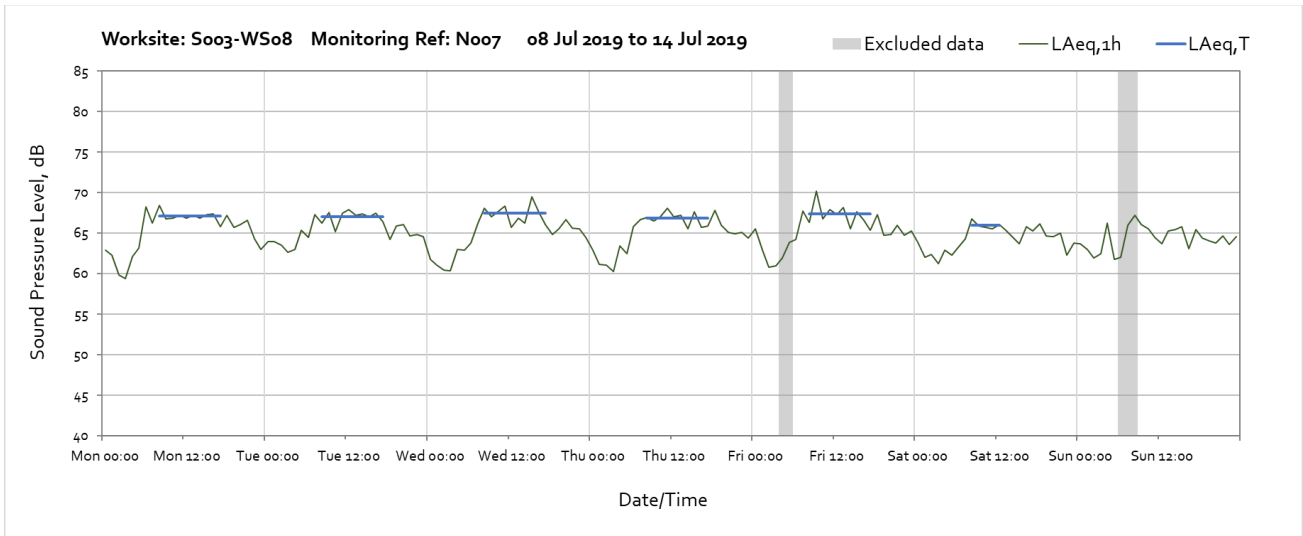
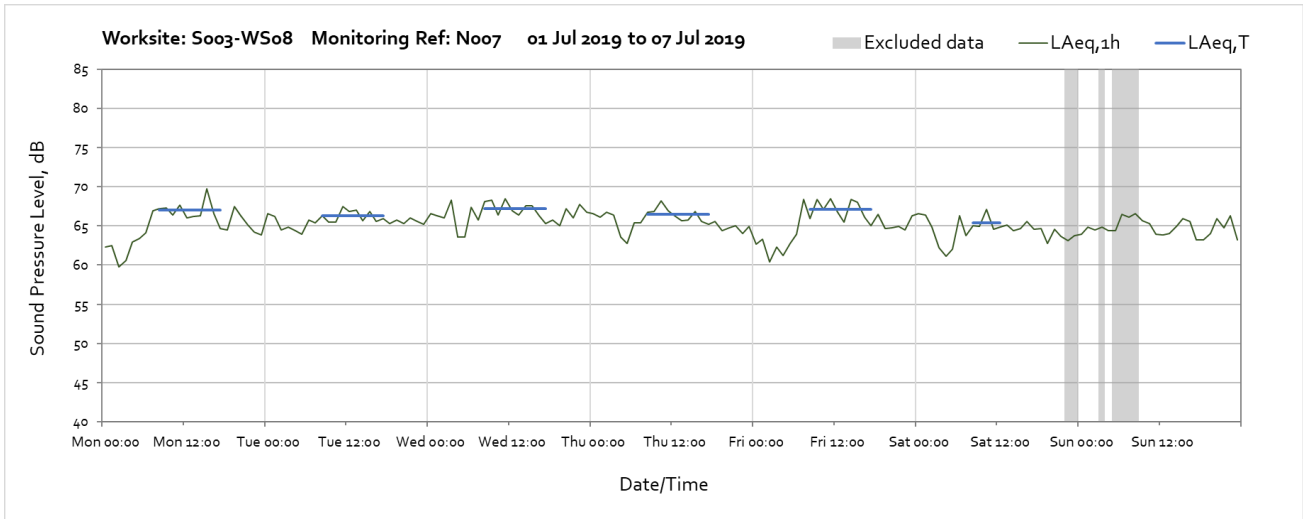
Worksite: S003-WS07 – Monitoring Ref: N012

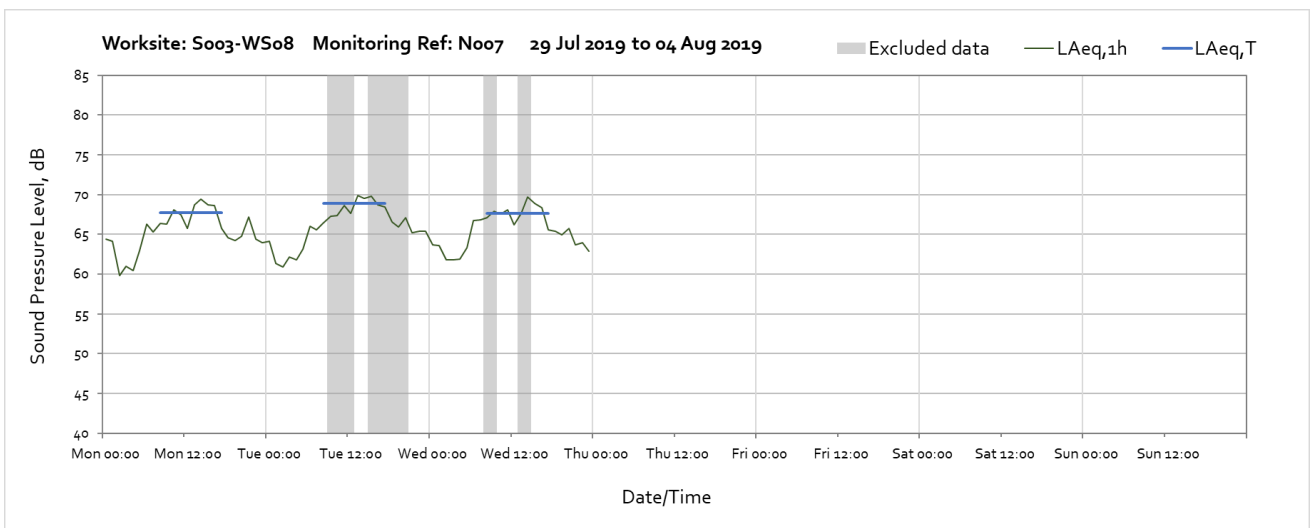
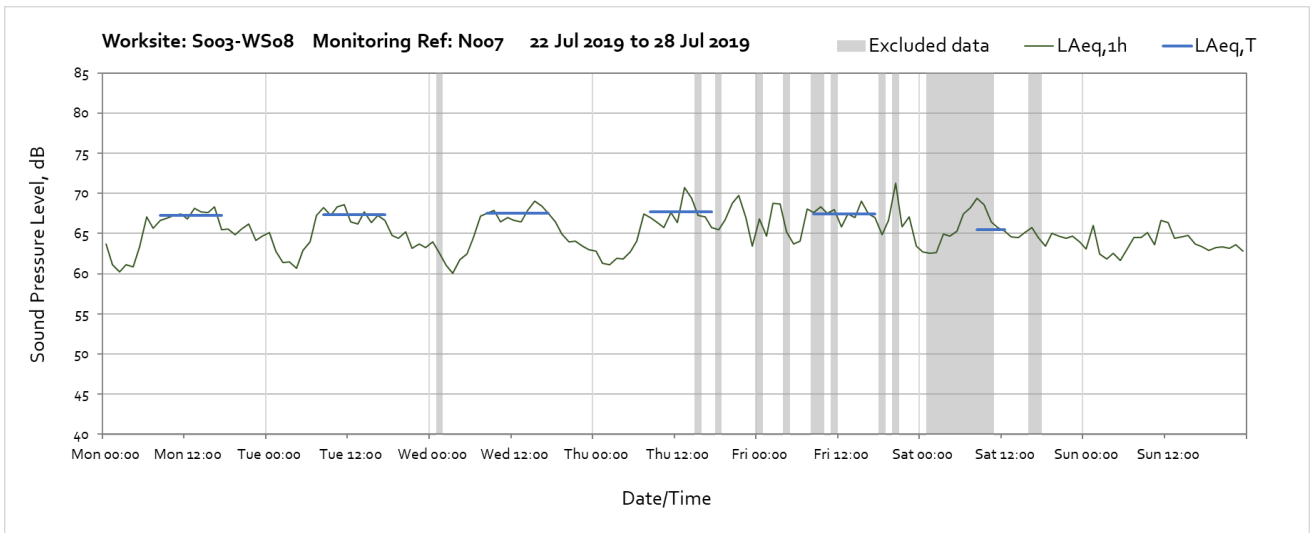
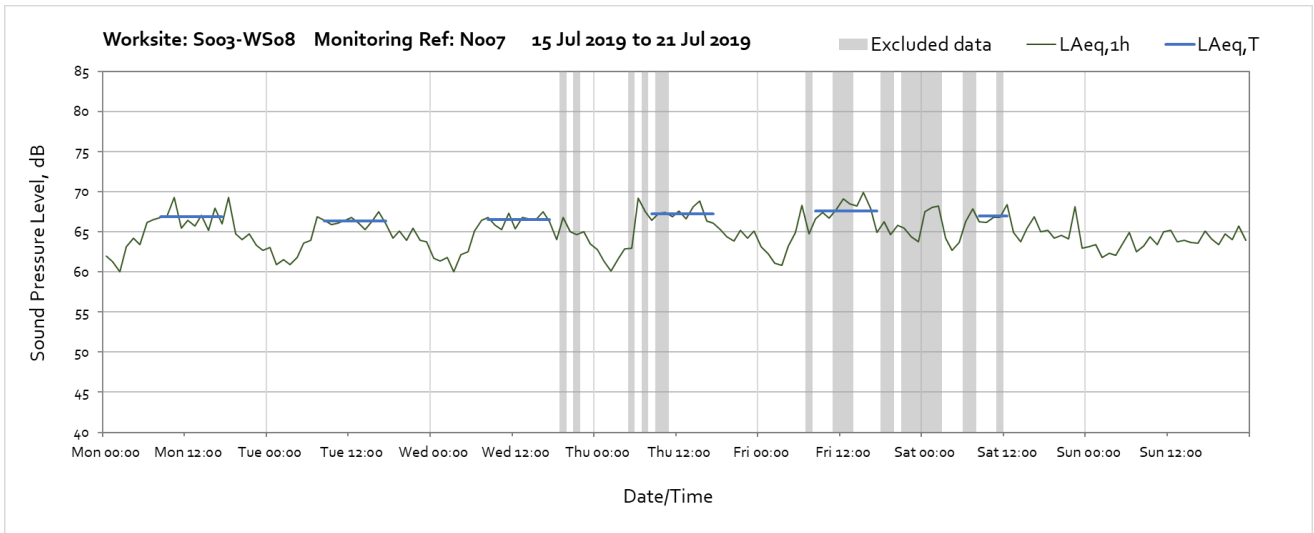




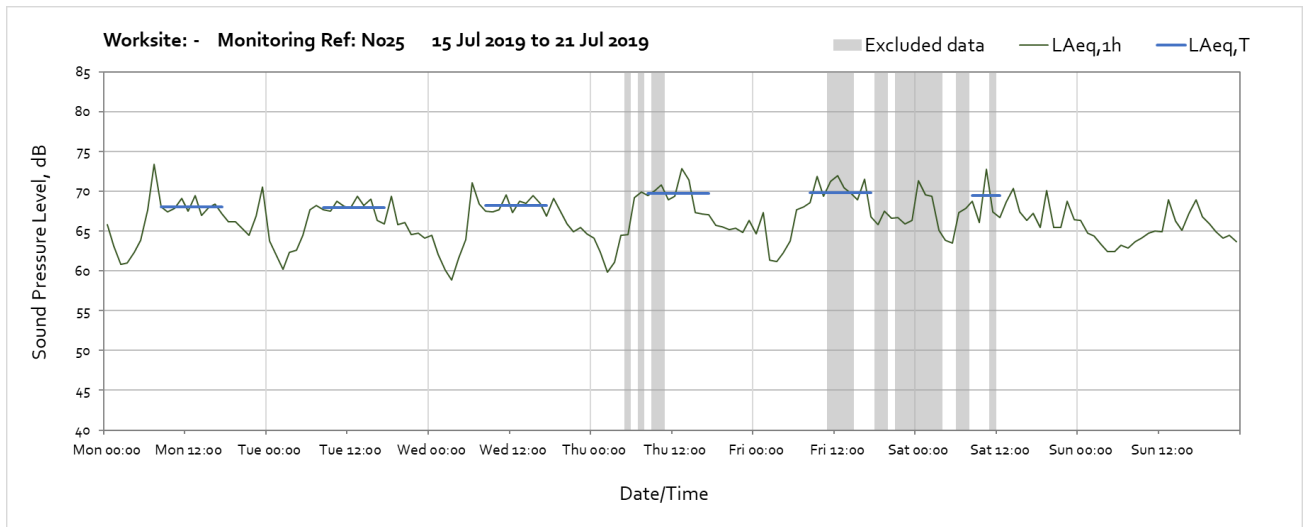
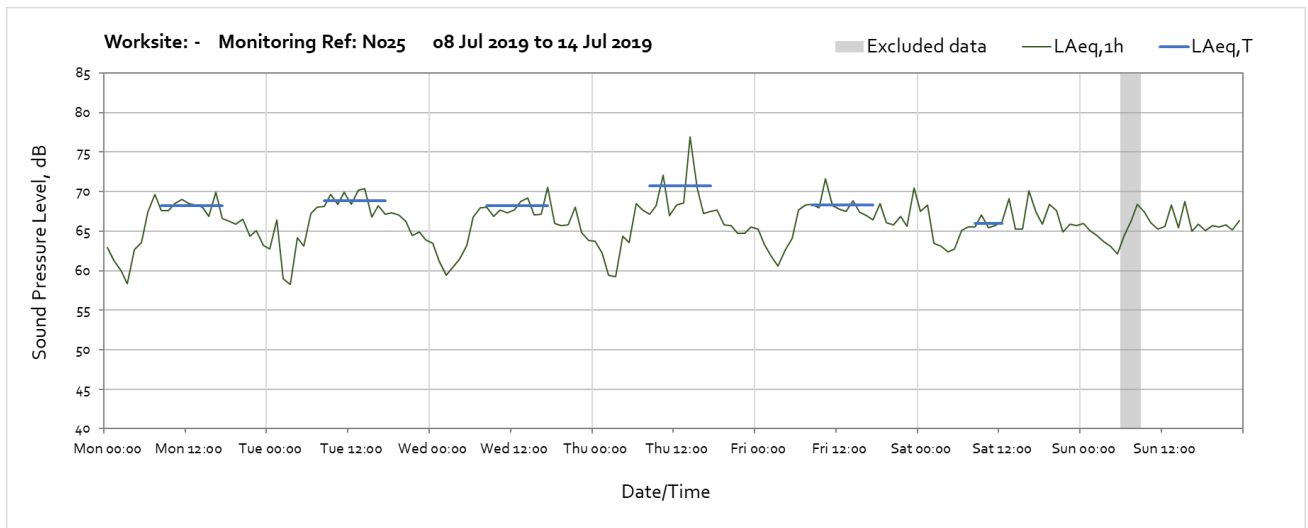
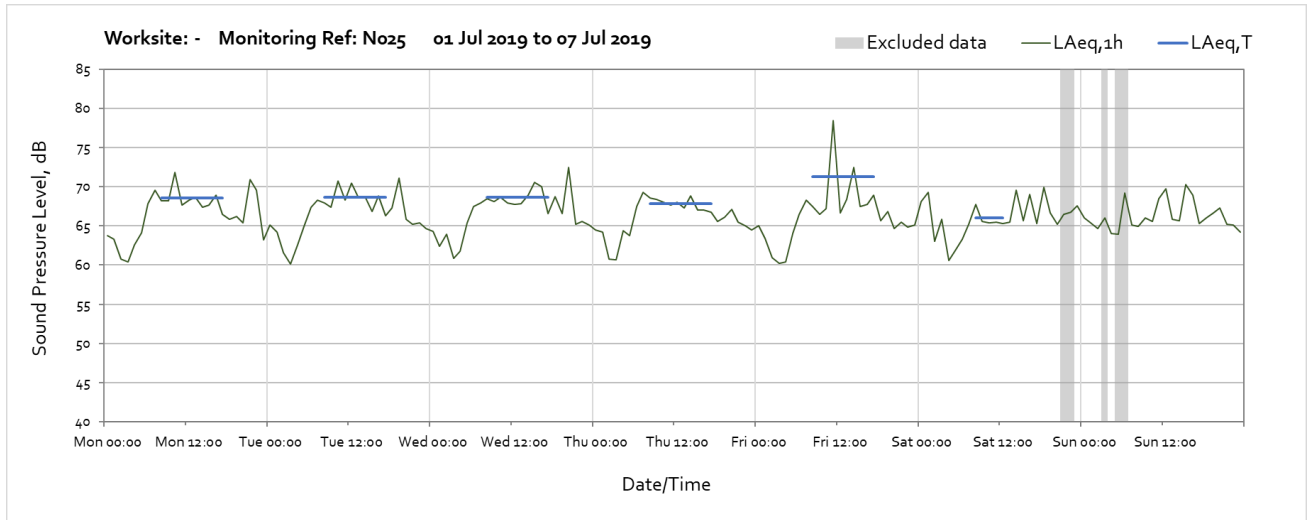


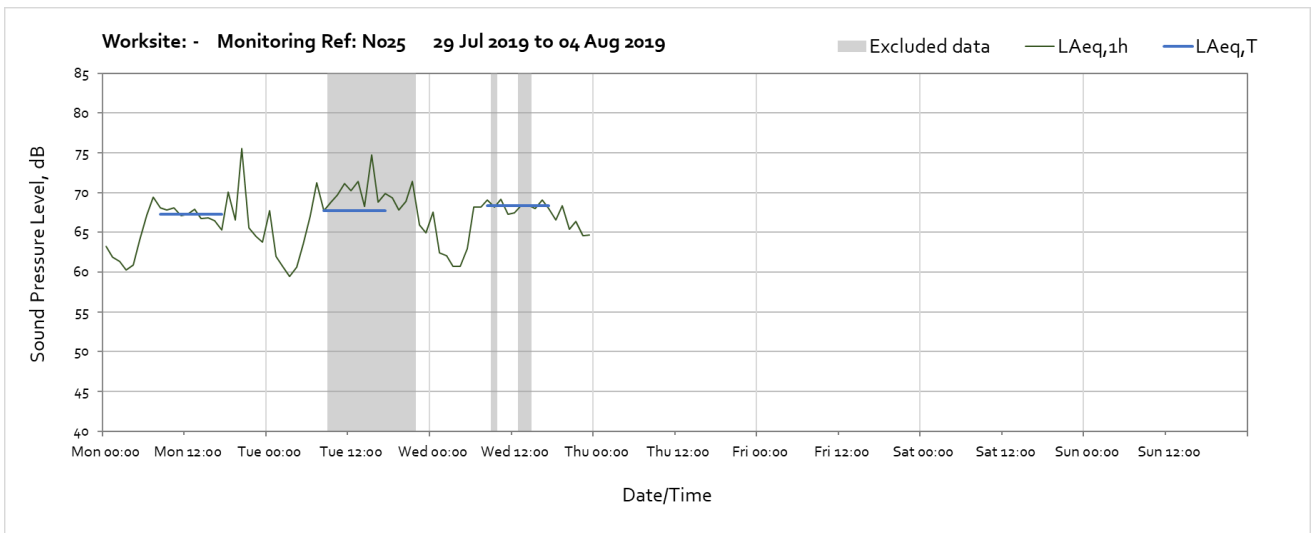
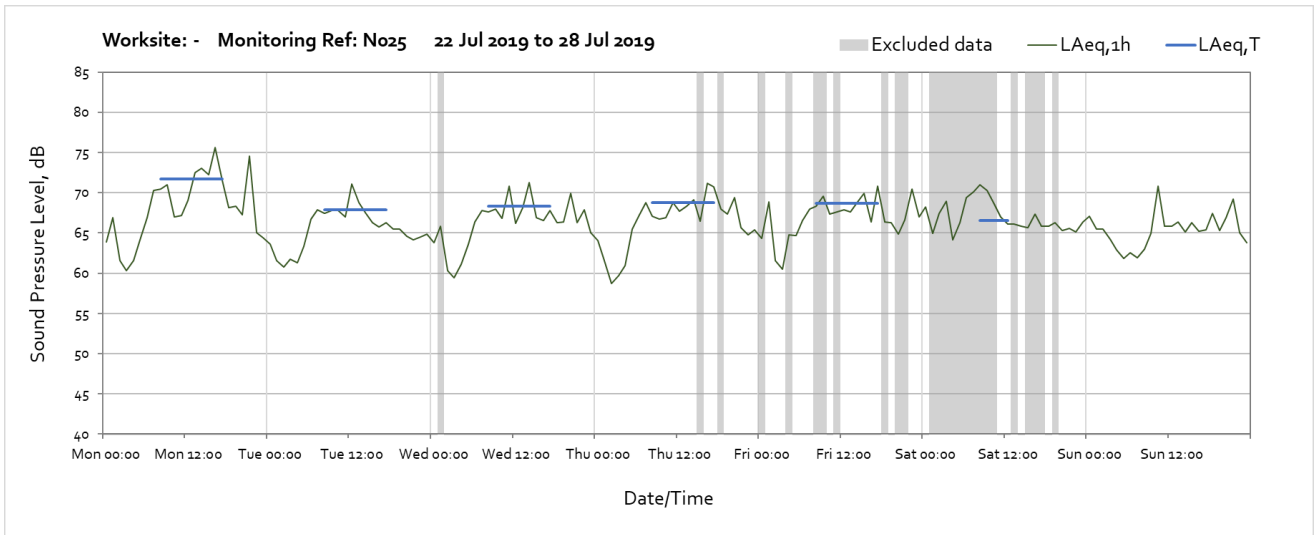
Worksite: S003-WS08 – Monitoring Ref: N007



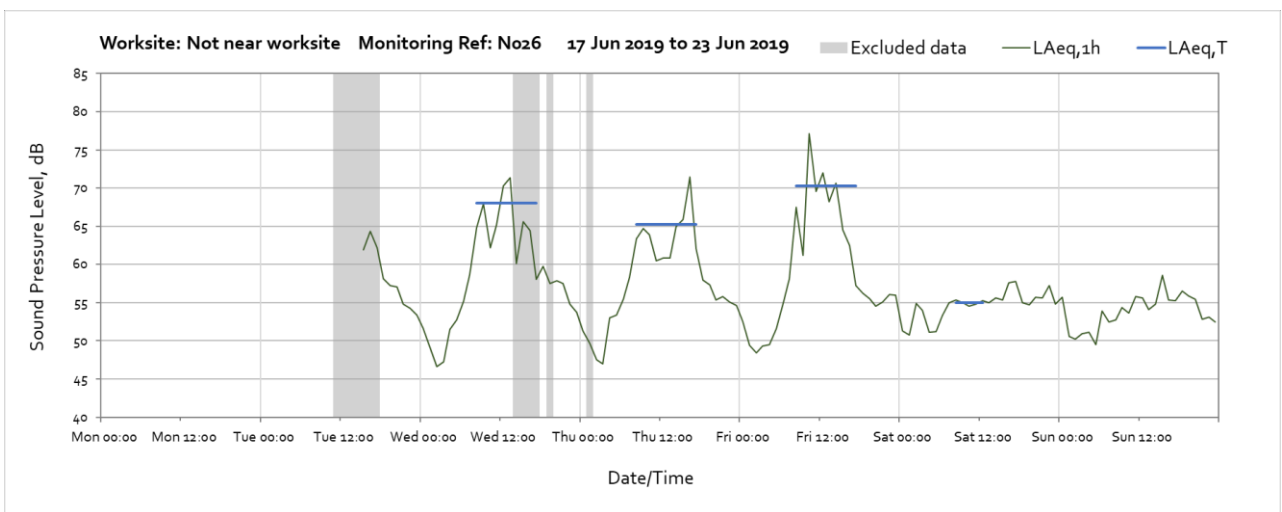


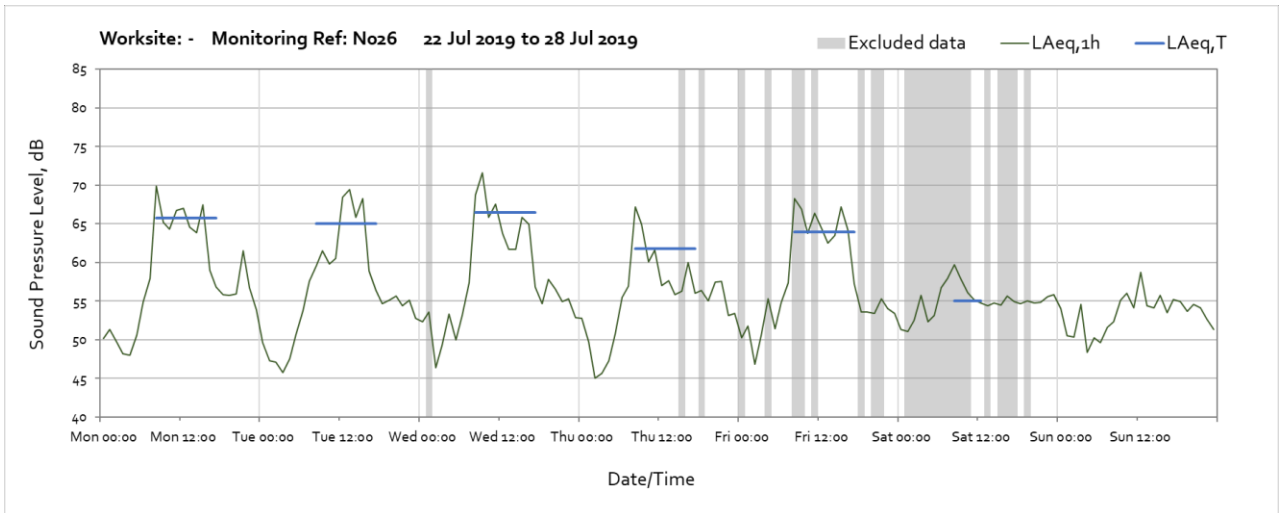
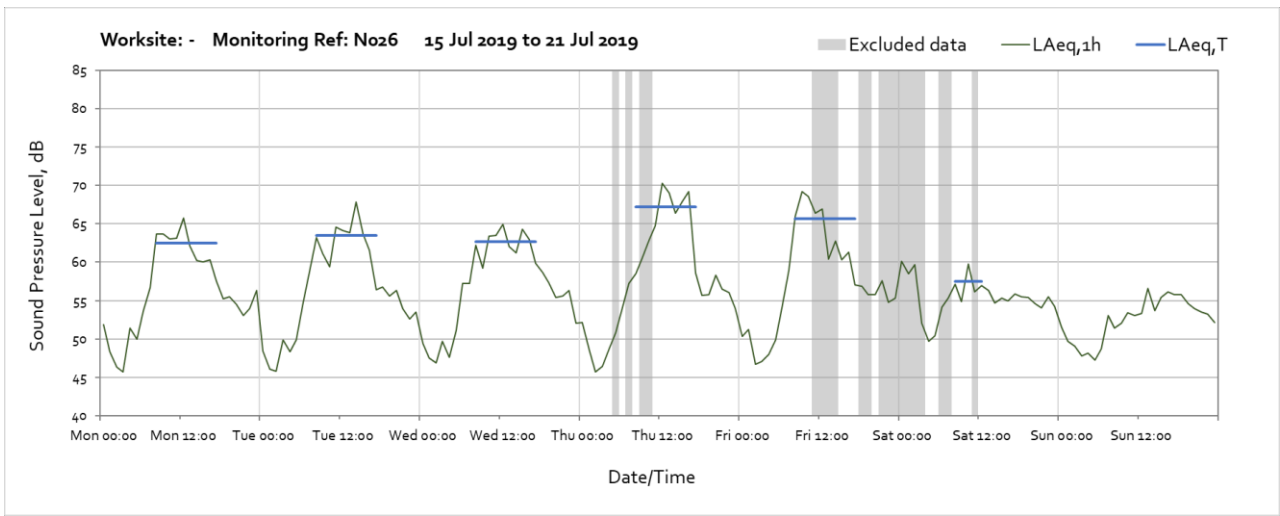
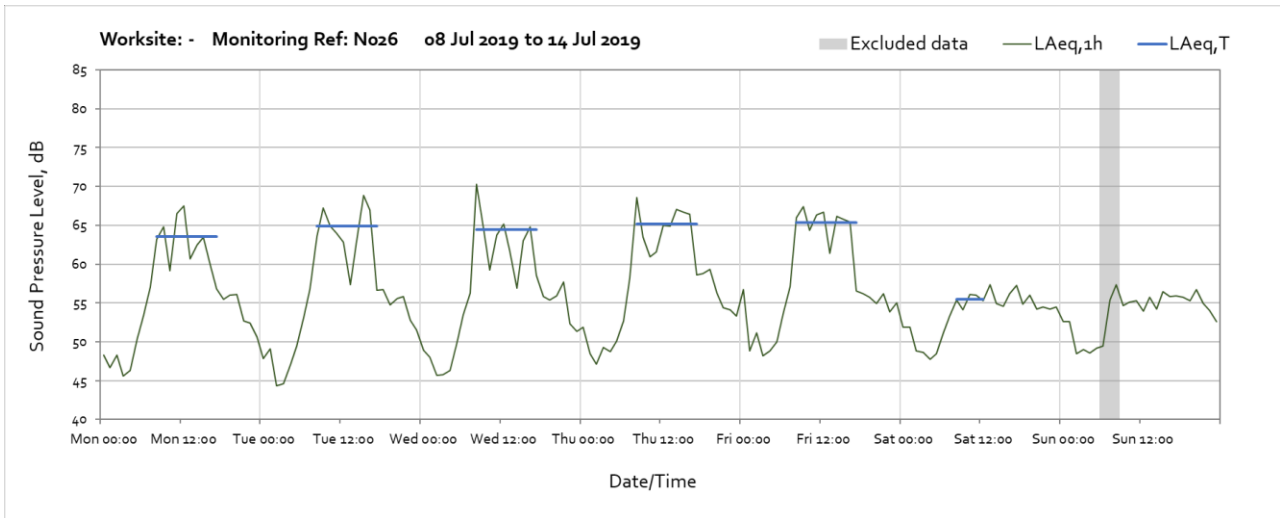
Monitoring Ref: N025

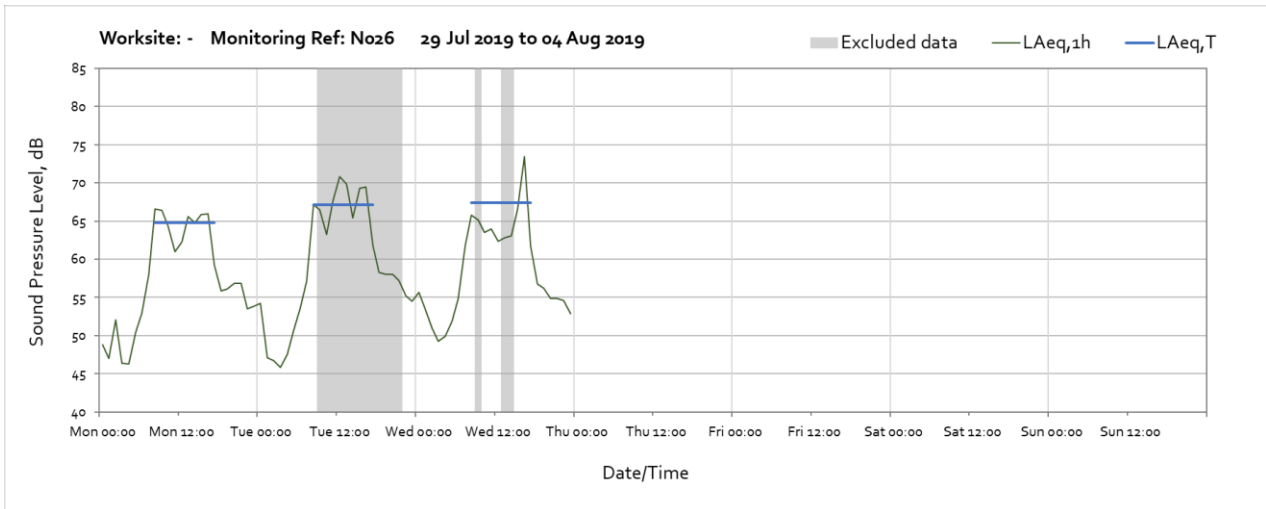




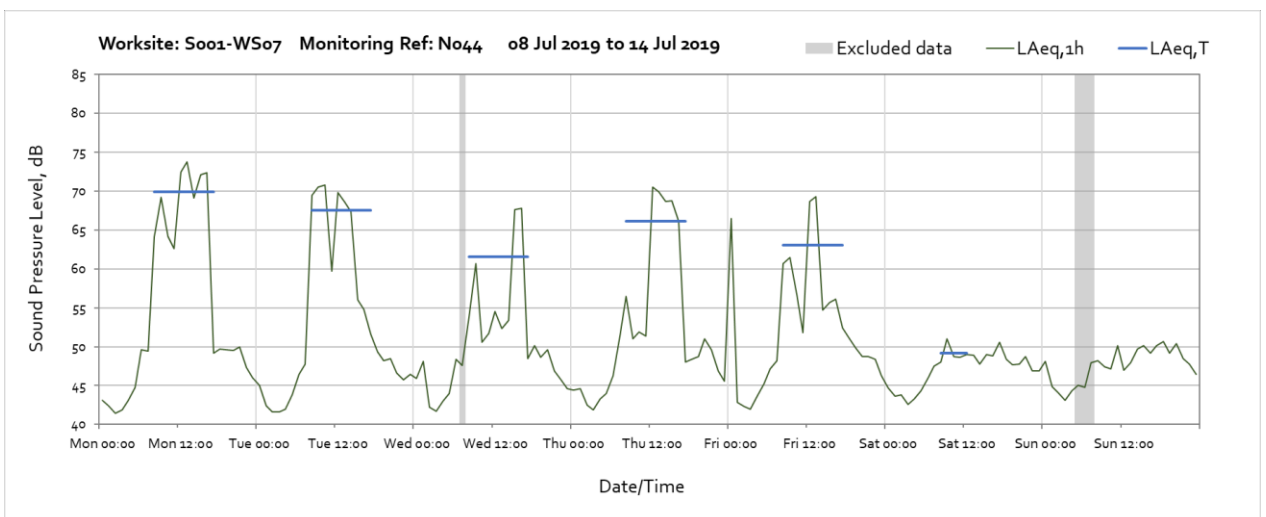
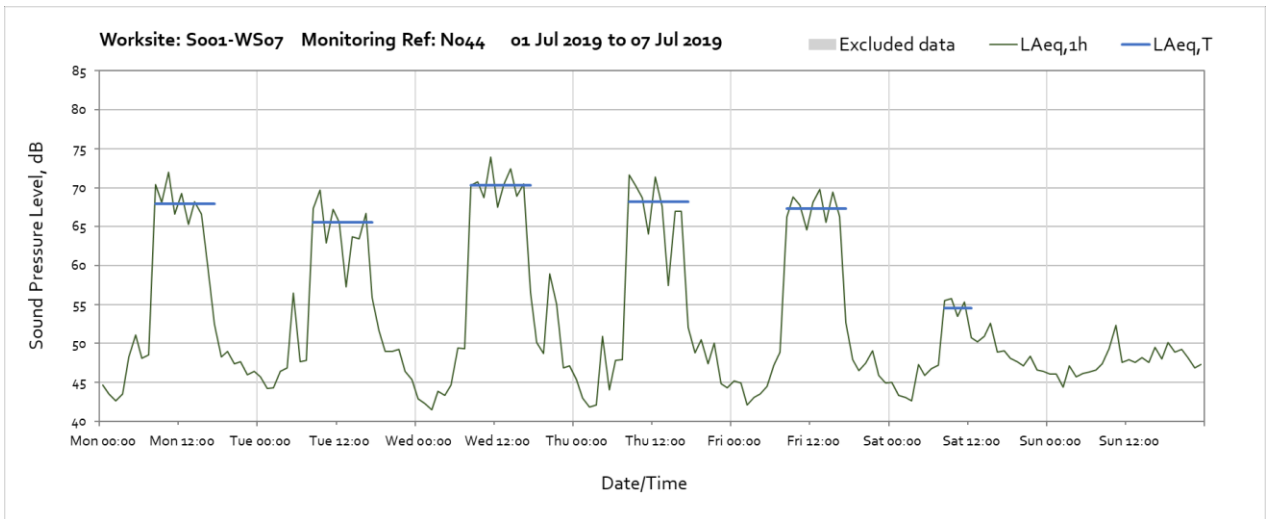
Monitoring Ref: N026

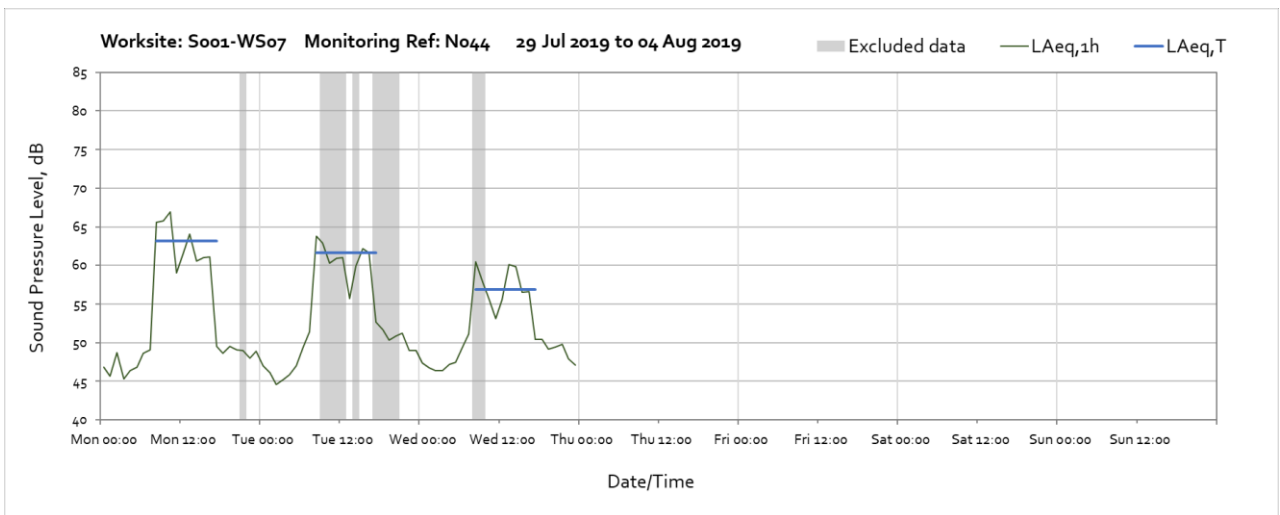
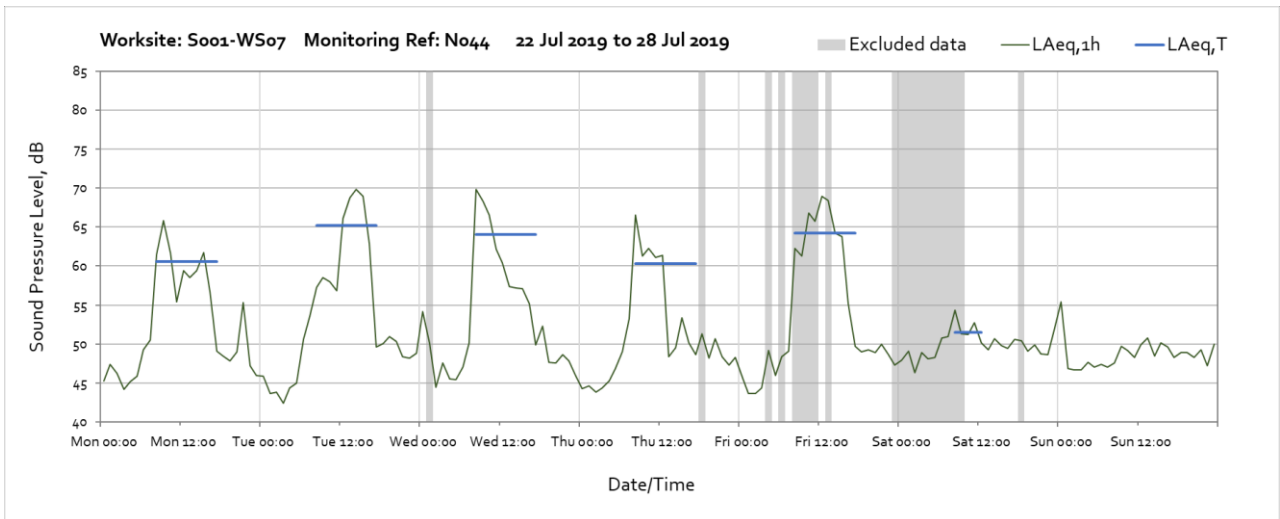
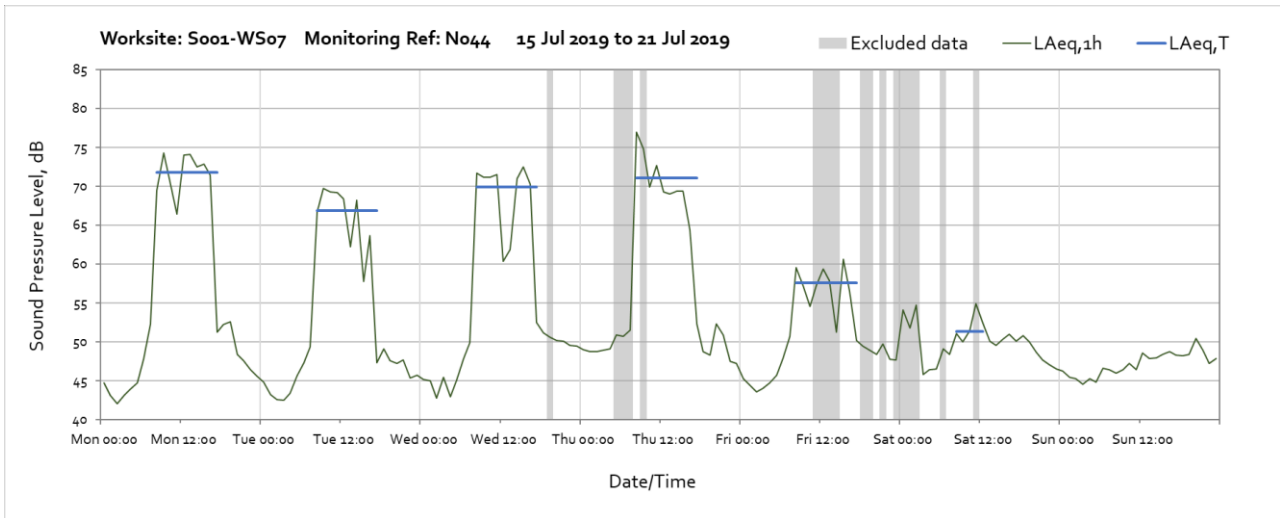




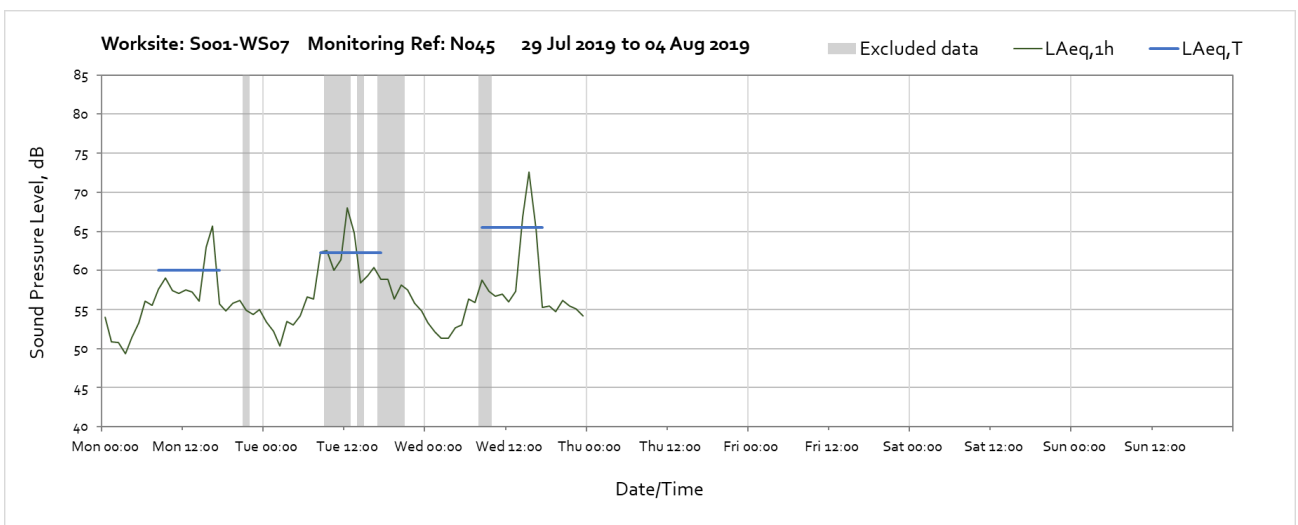
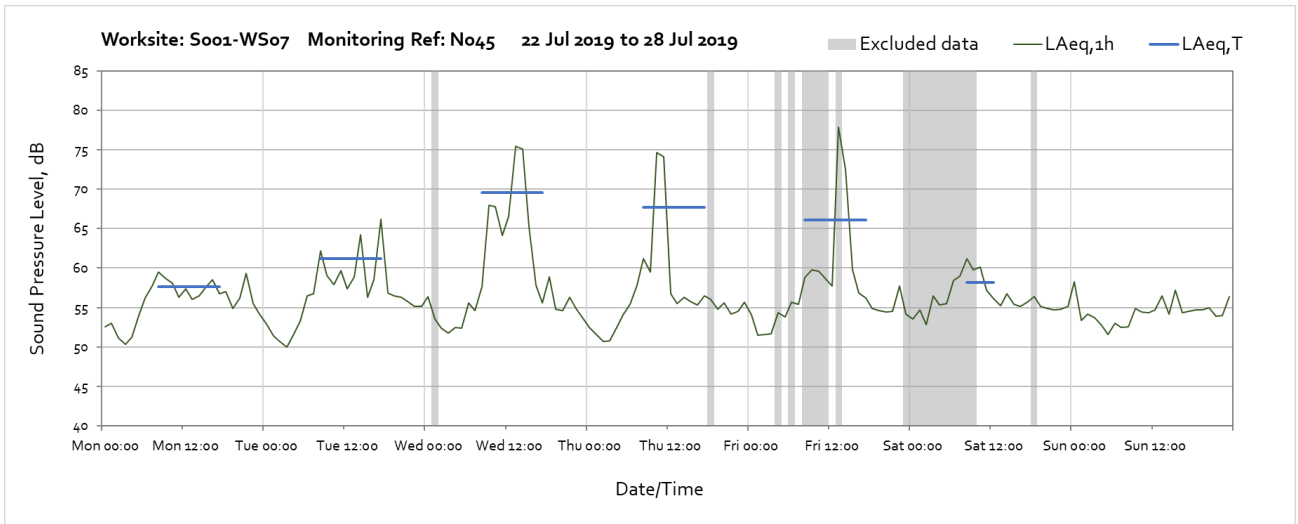
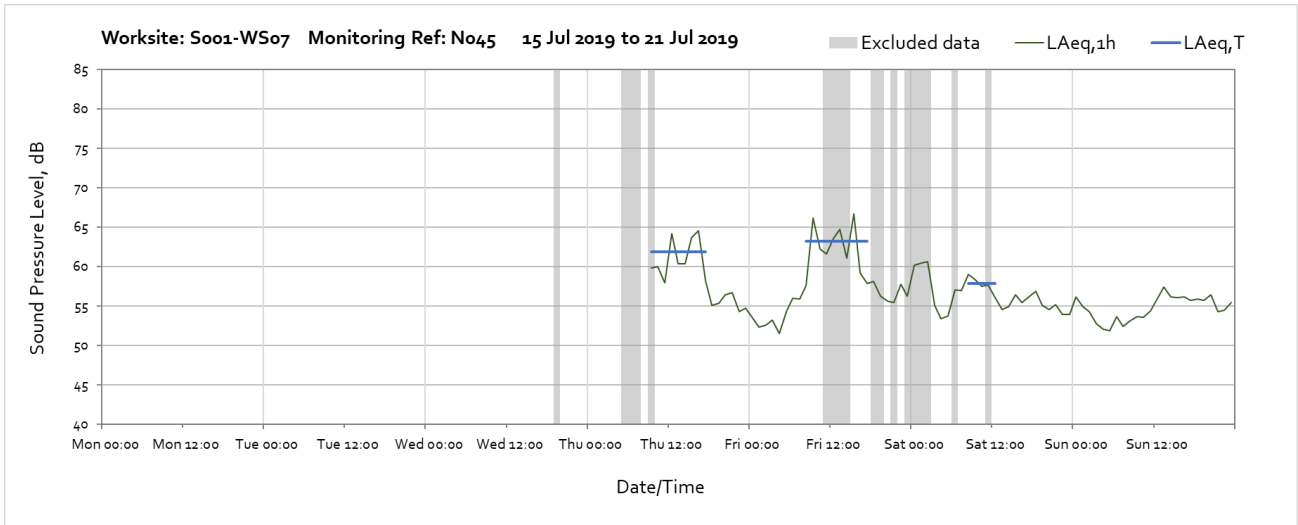


Worksite: S003-WS07 – Monitoring Ref: N044





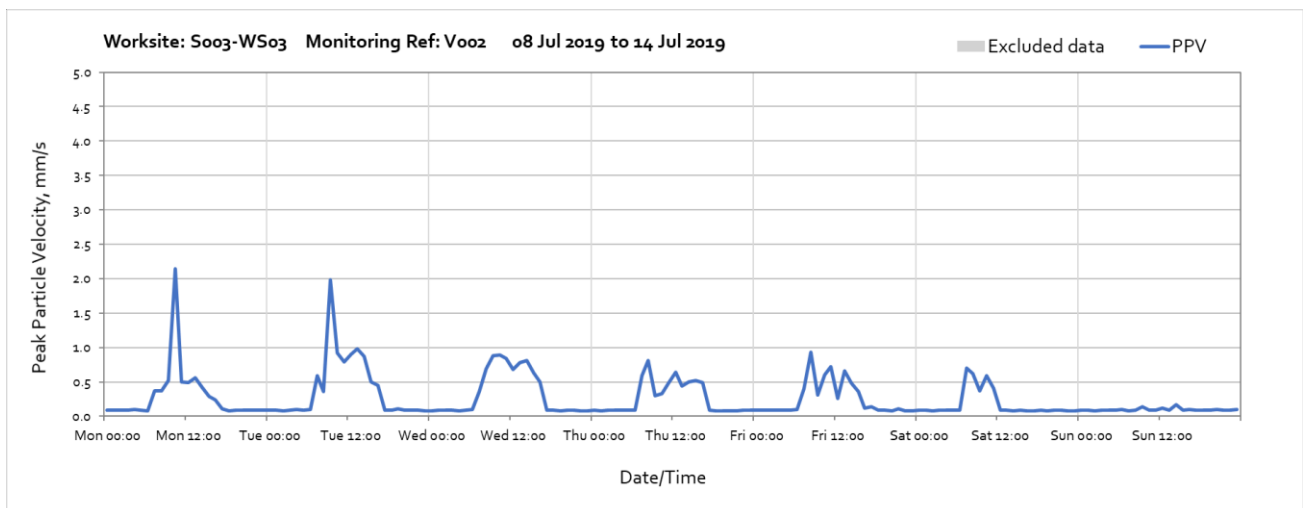
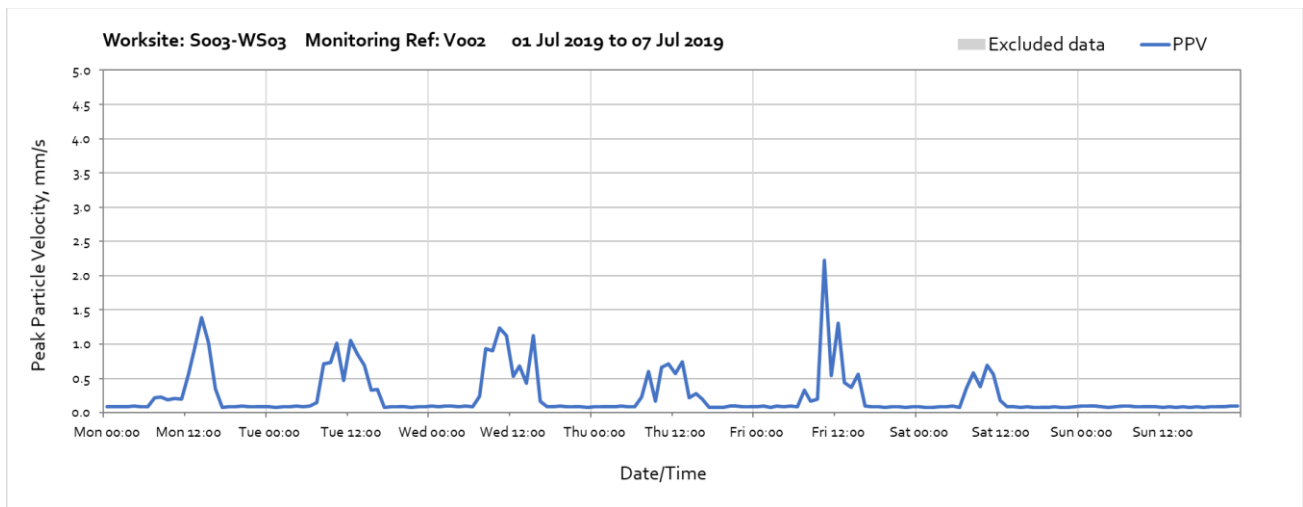
Worksite: S003-WS07 – Monitoring Ref: N045

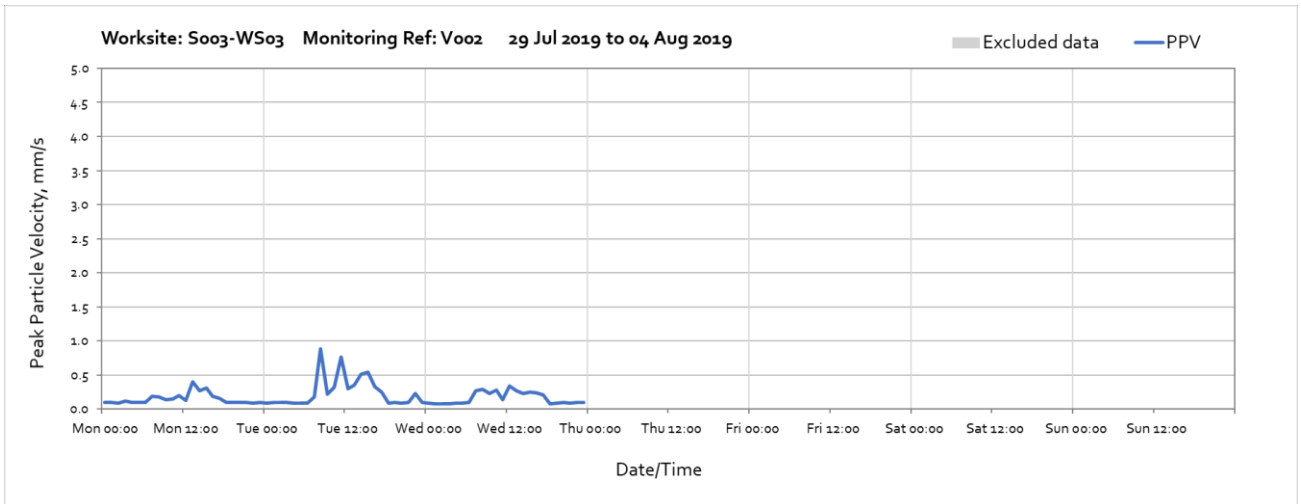
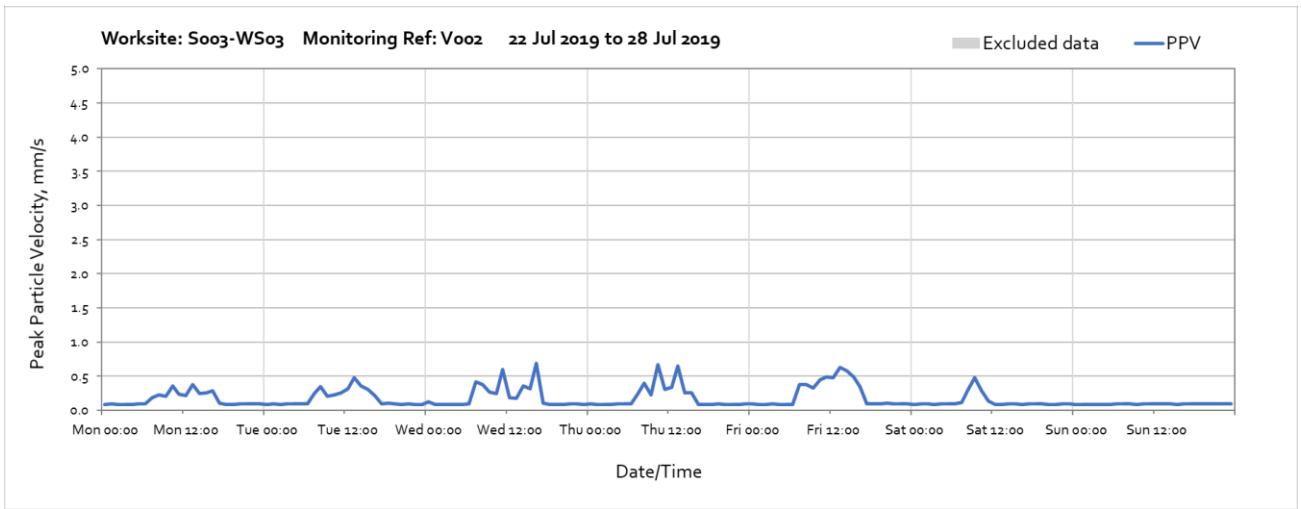
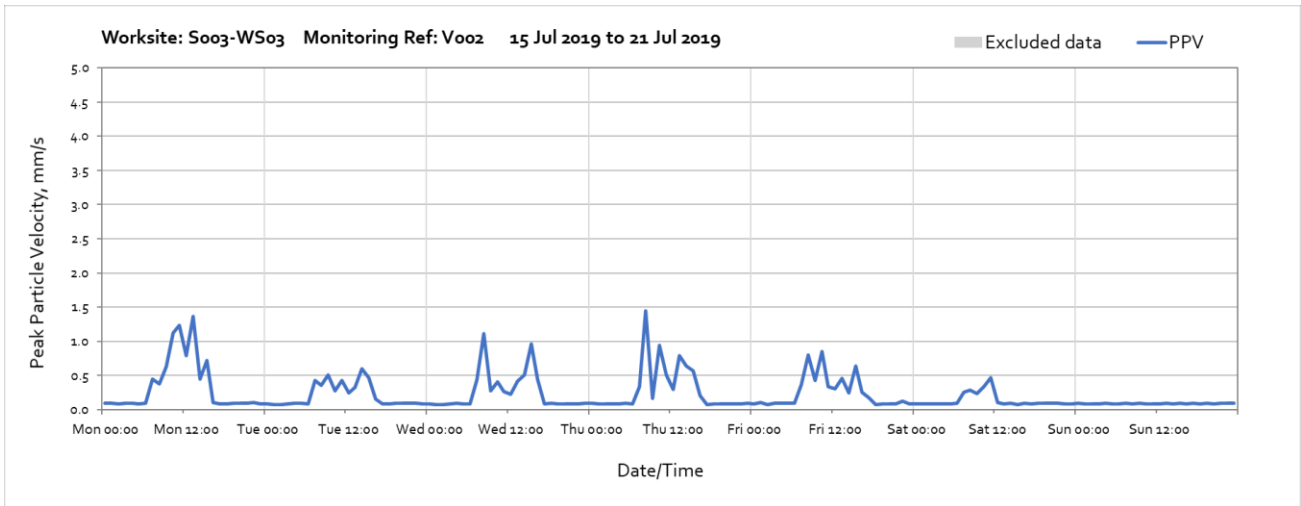


Vibration

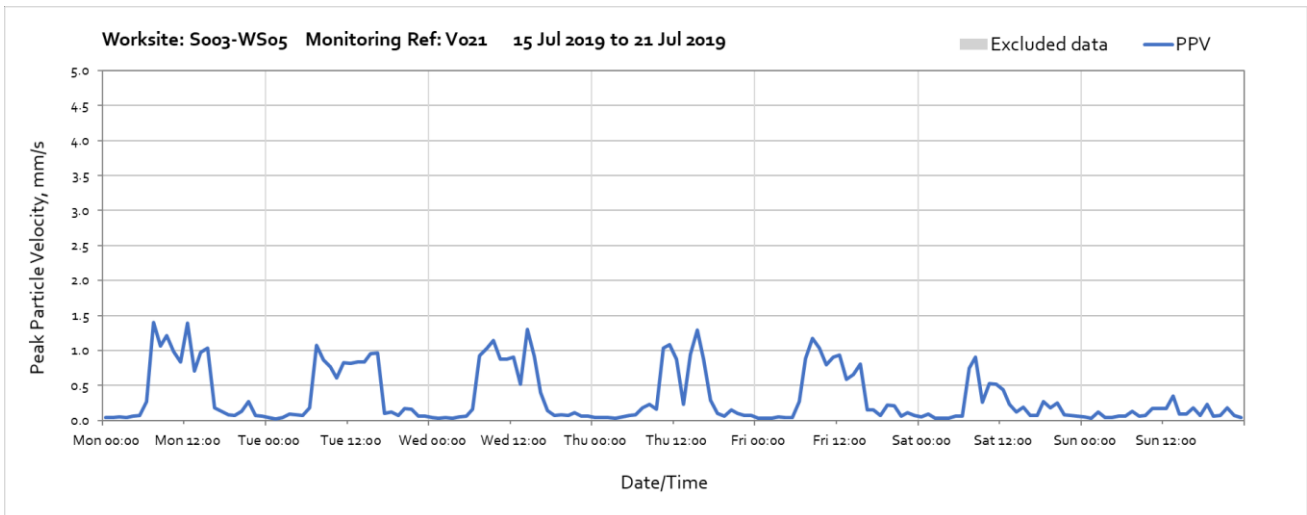
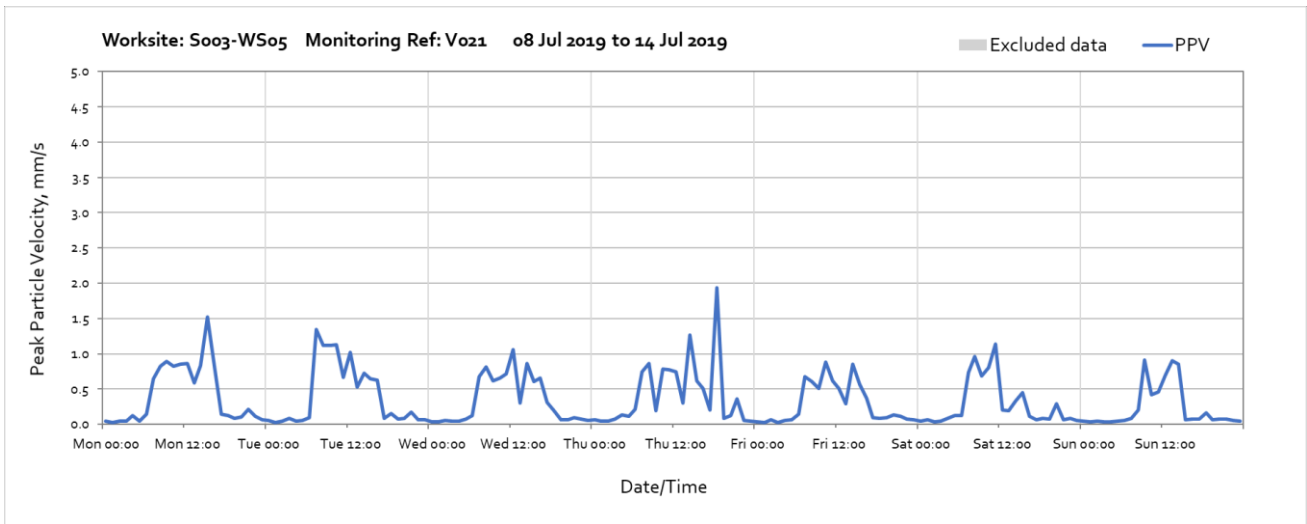
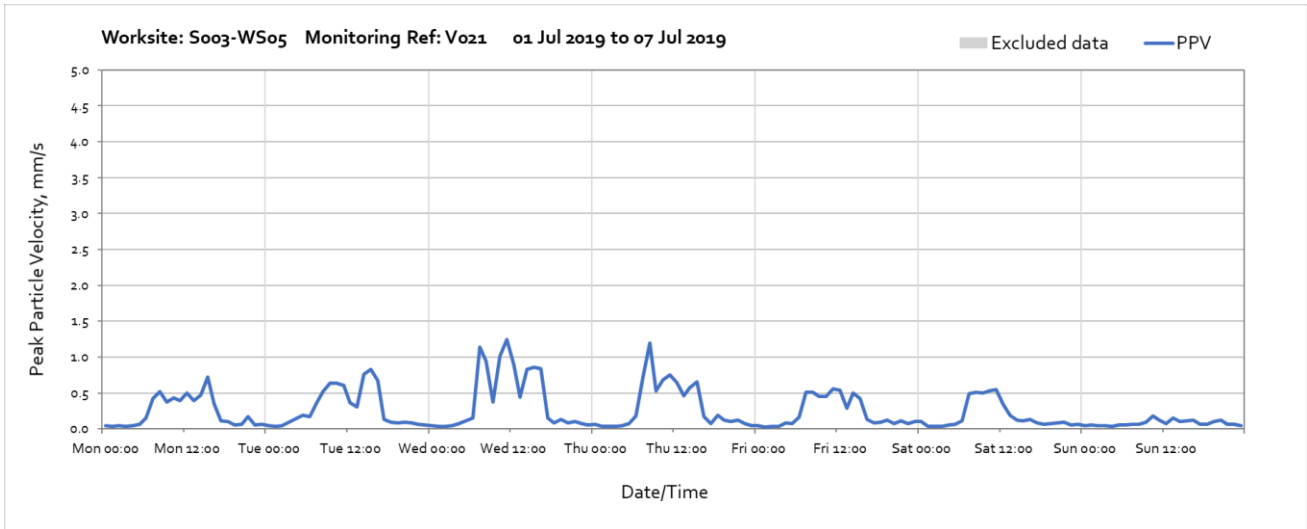
The following graphs show the hourly measured peak particle velocity PPV recorded during the monitoring period. The graphs show the resultant PPV due to vibration components on three orthogonal axis x, y and z. High values of PPV were measured on occasions at V021. These were due to local interference 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.

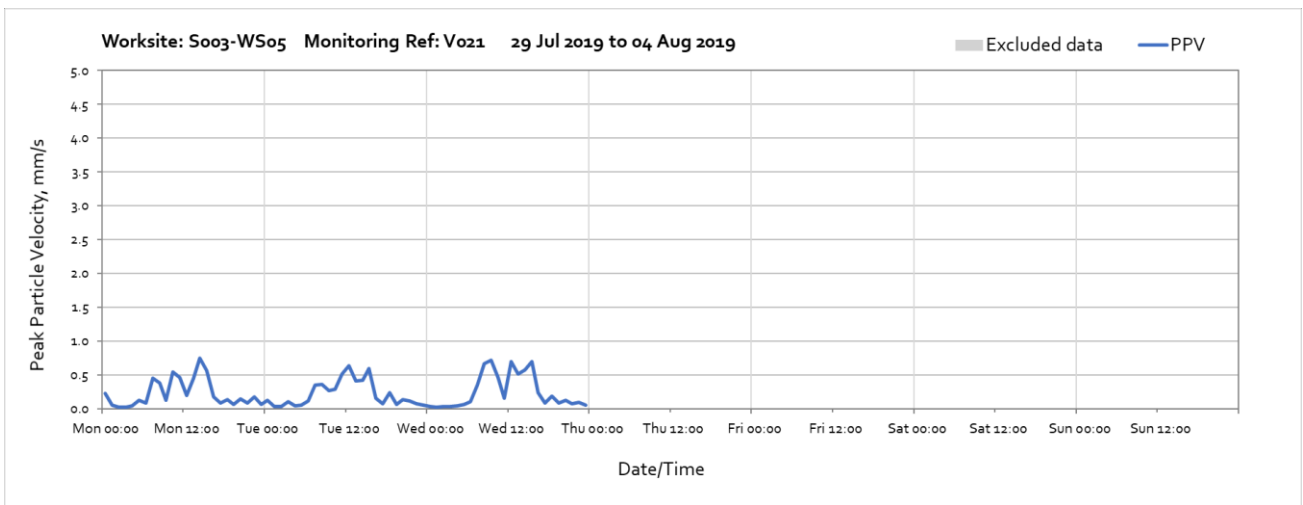
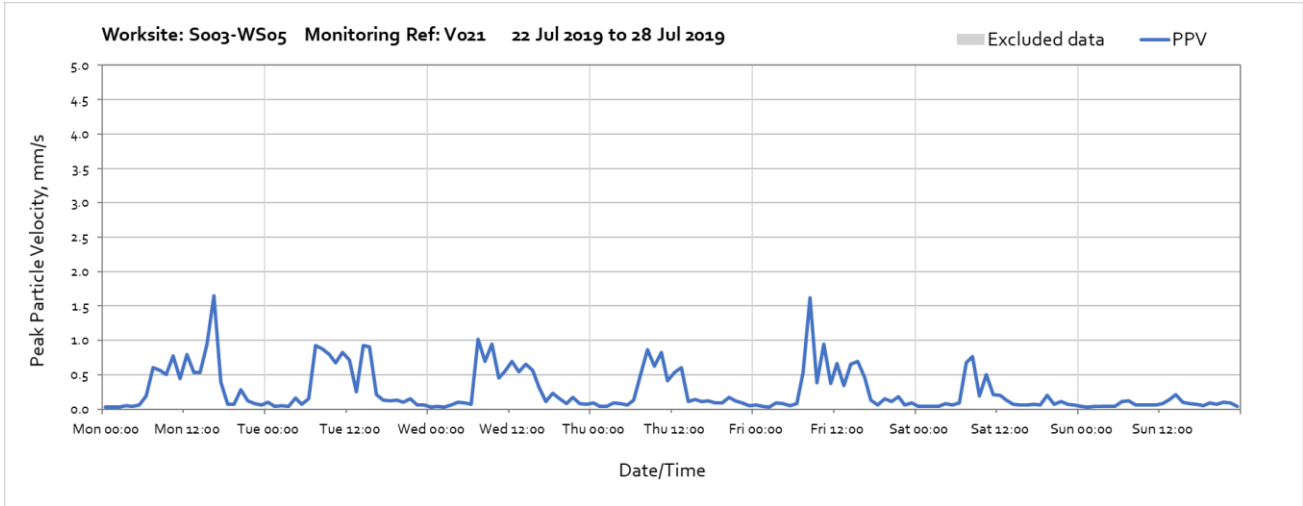
Worksite: S003-WS03 – Monitoring Ref: V002



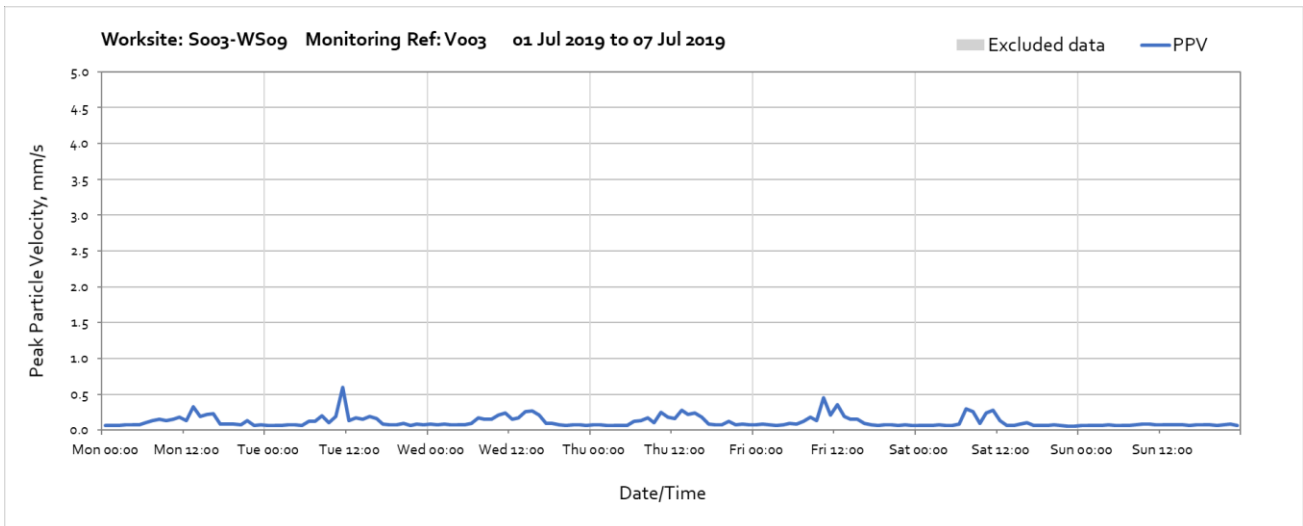


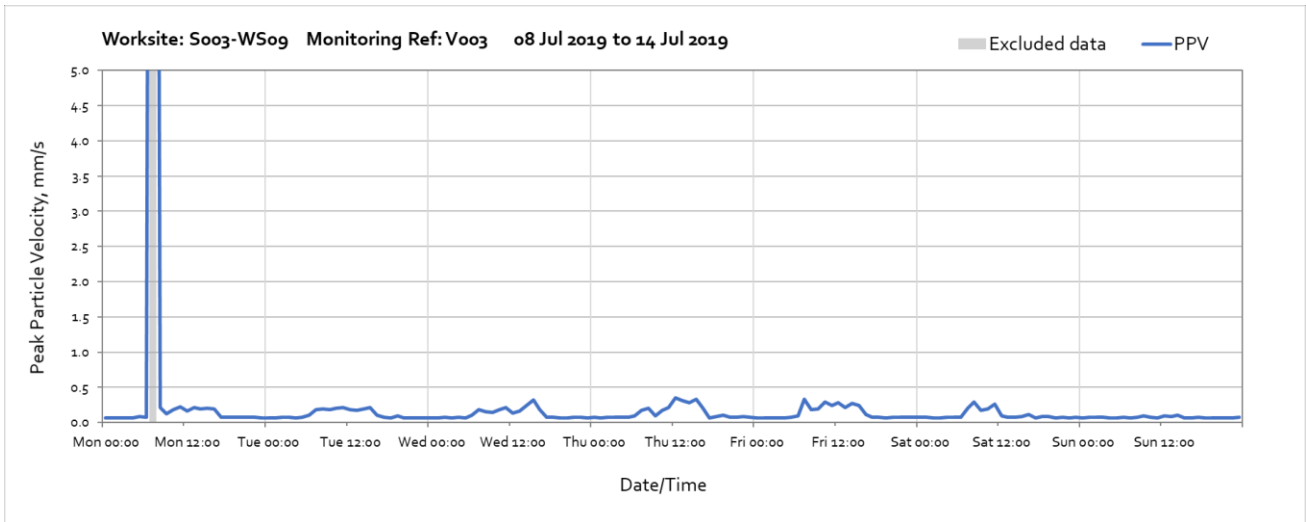
Worksite: S003-WS05 – Monitoring Ref: V021



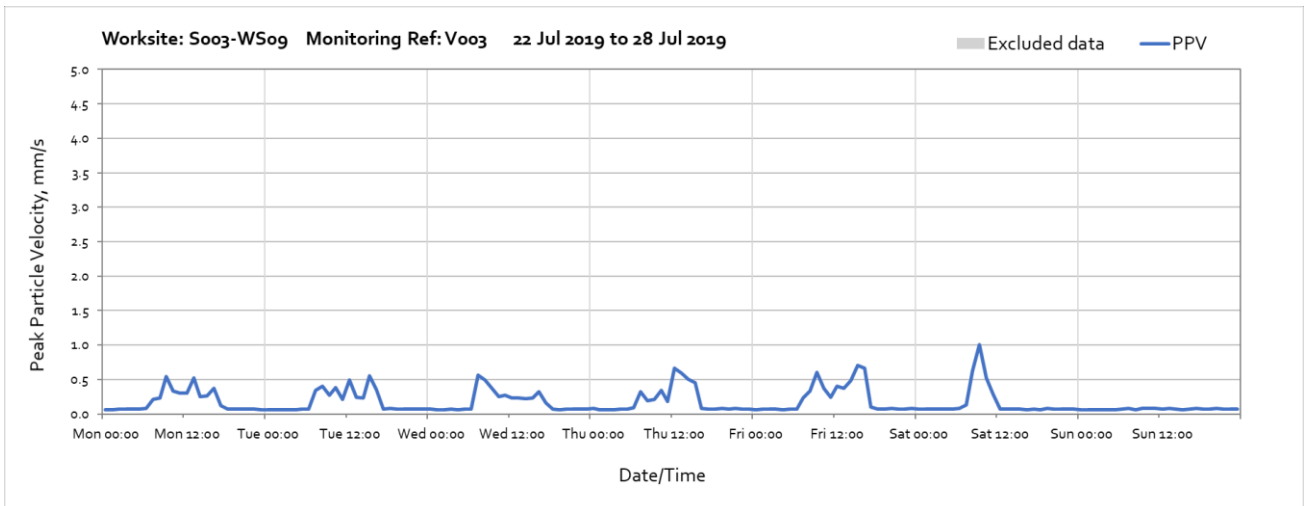
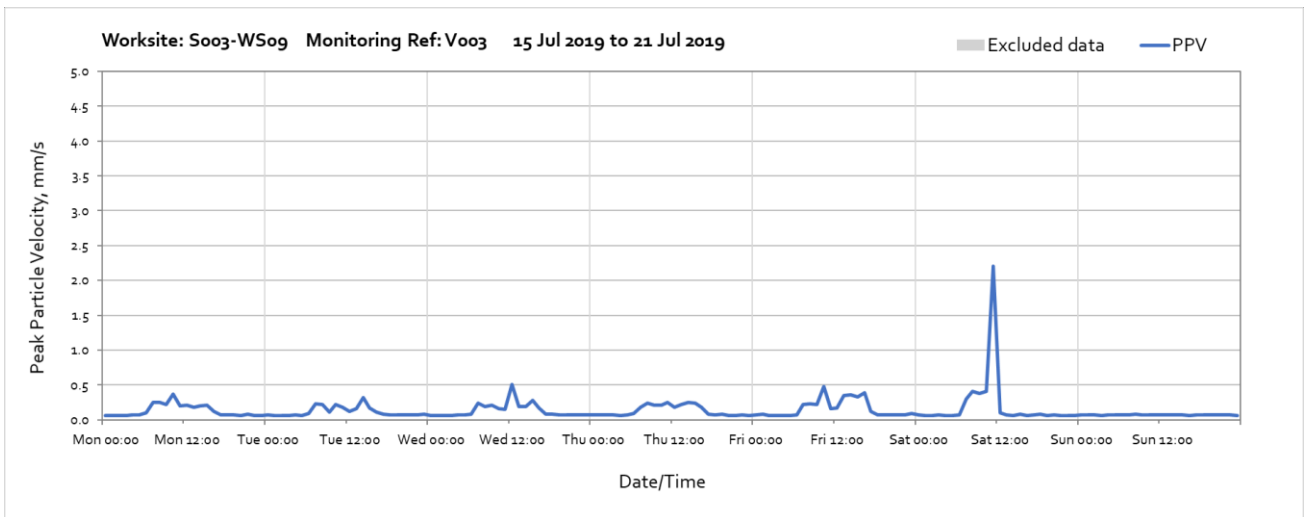


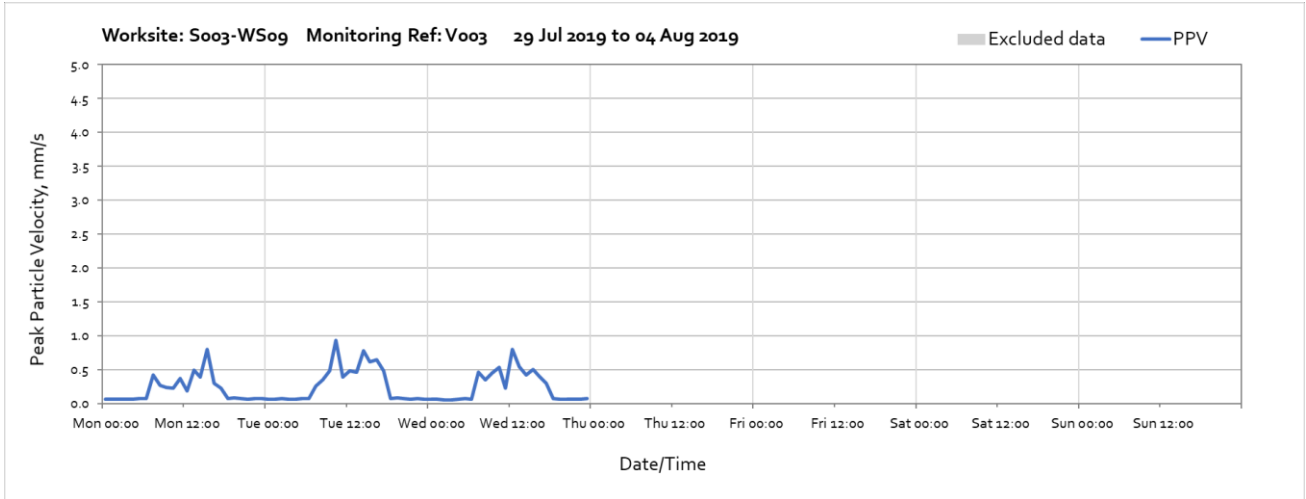
Worksite: S003-WS09 – Monitoring Ref: V003



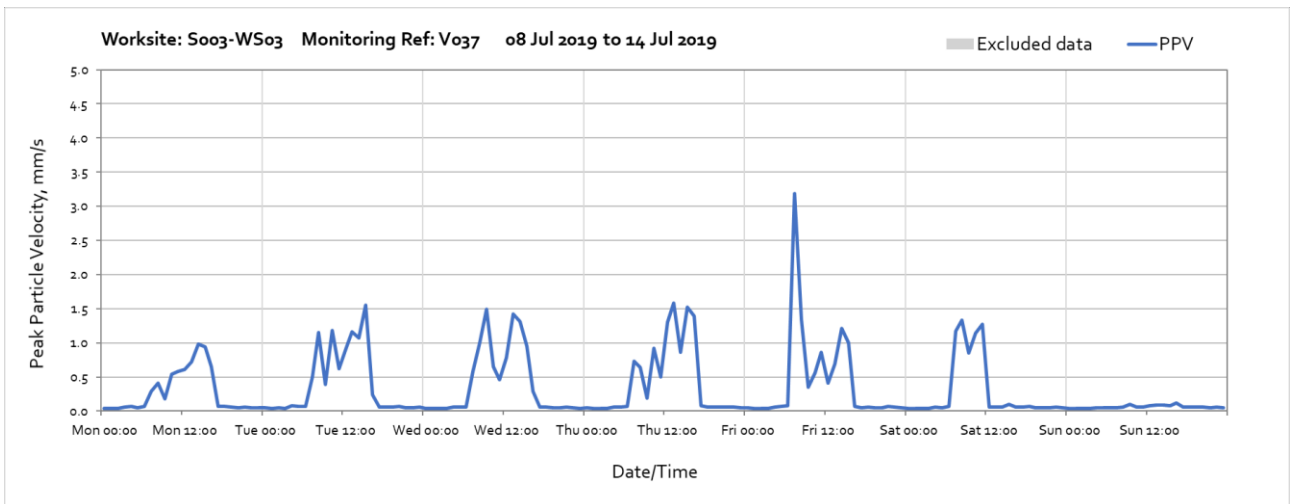
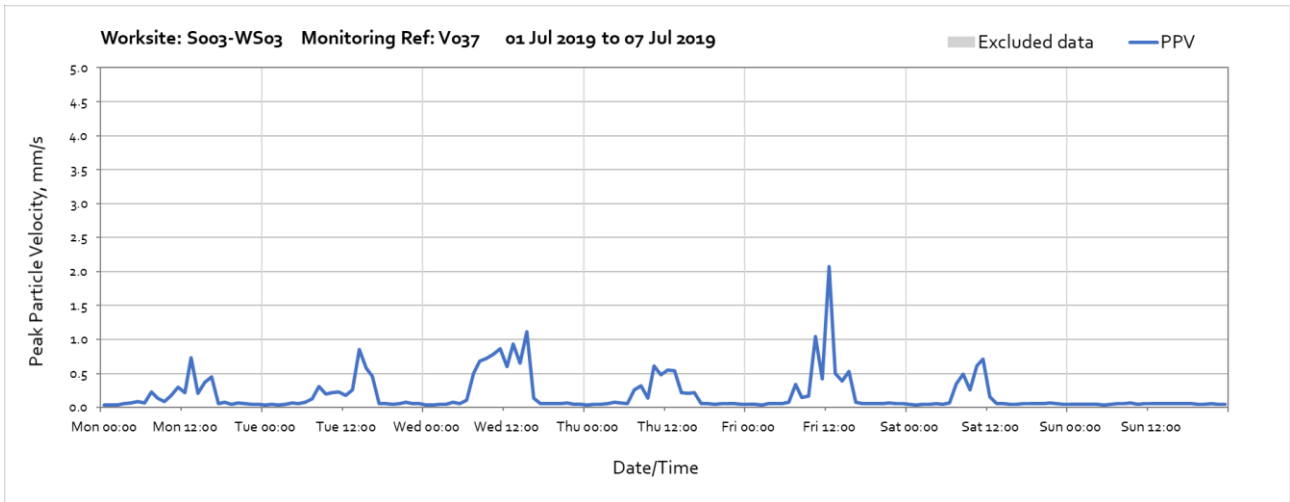


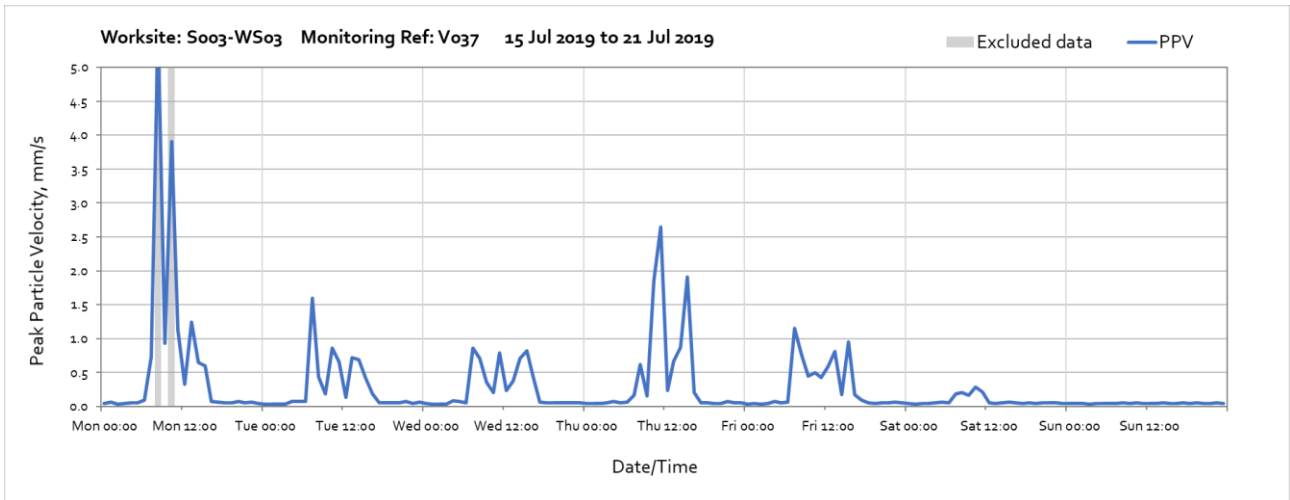
Note: High vibration levels at 07:00 on Monday 8th of July were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels.



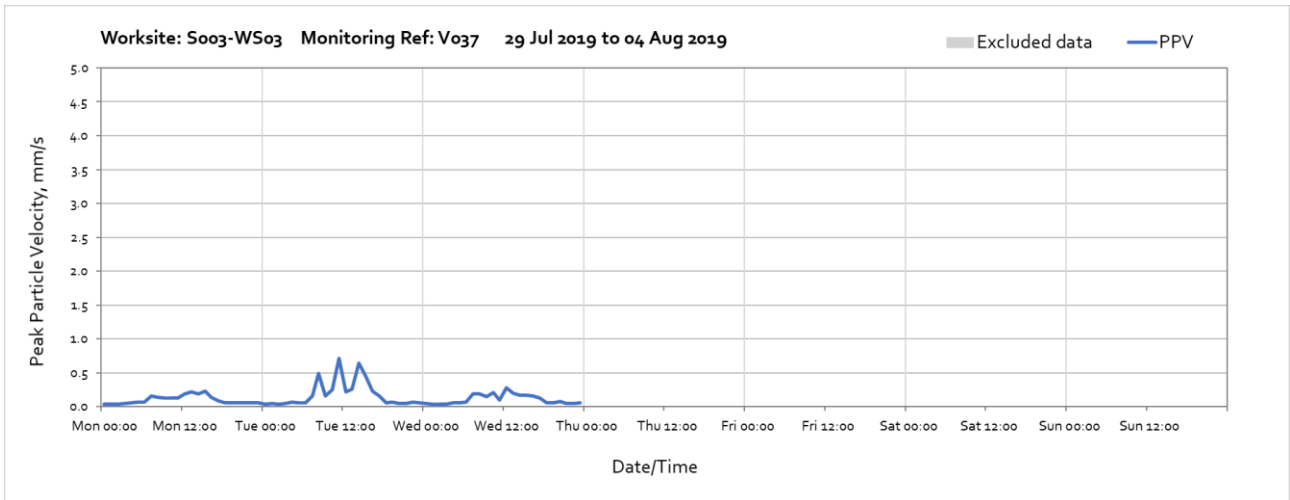


Worksite: S003-WS03 – Monitoring Ref: V037

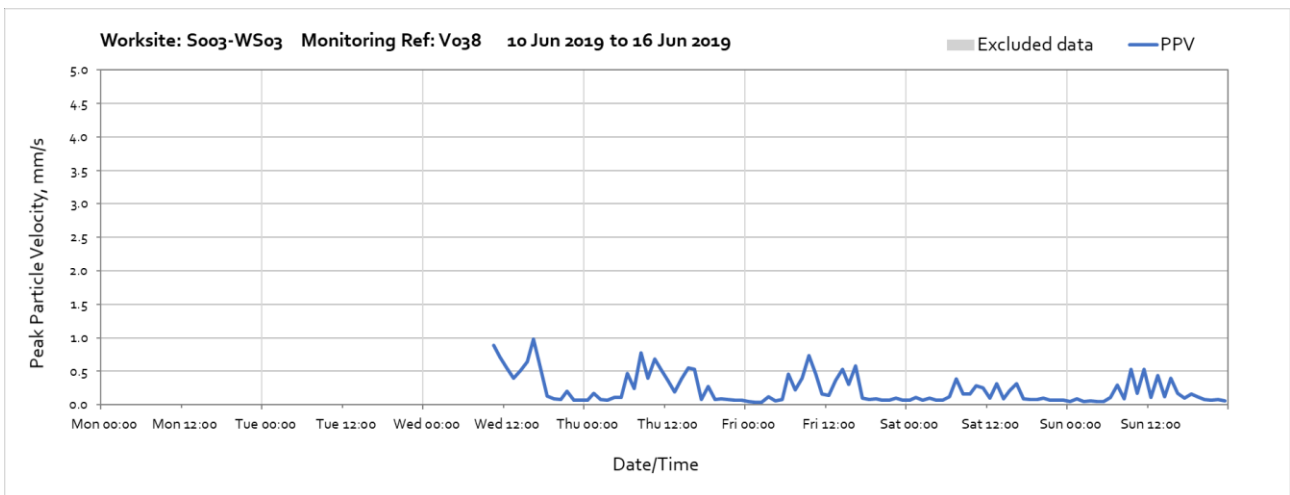


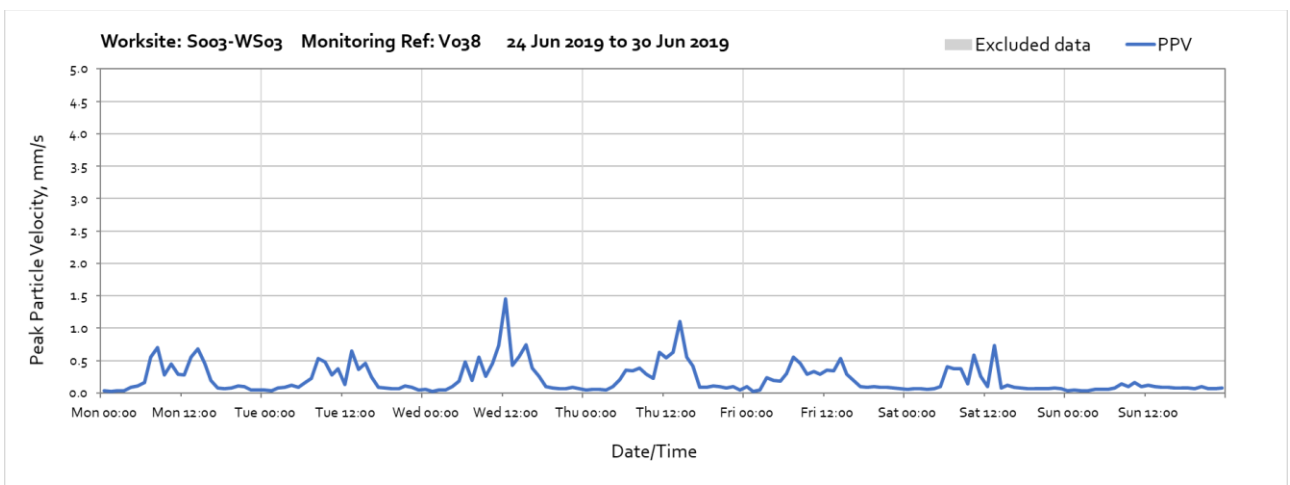
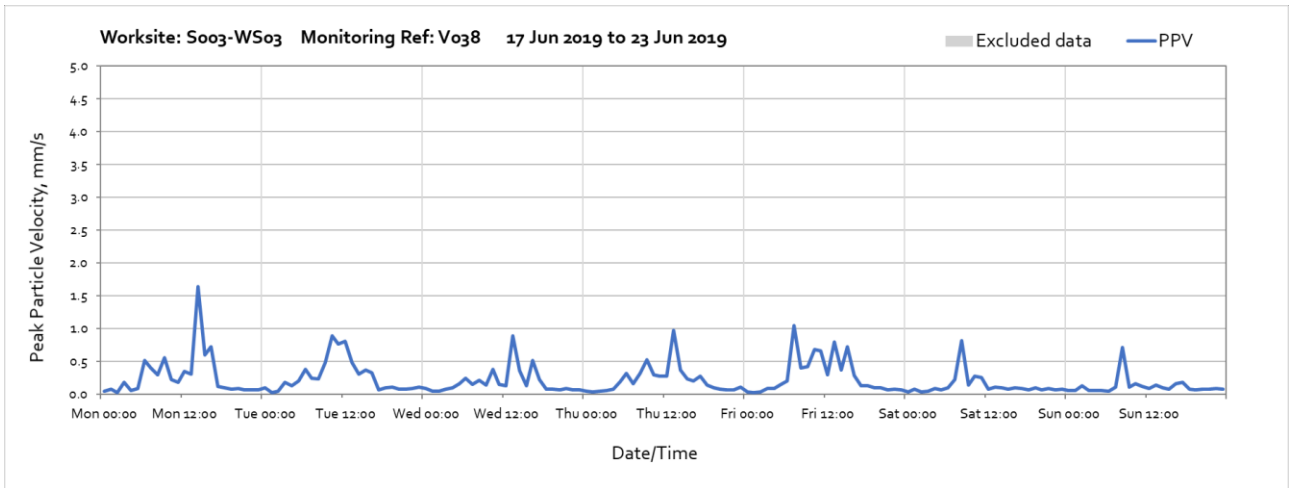


Note: High vibration levels at 08:00 and 10:00 on Monday 15th July were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels.

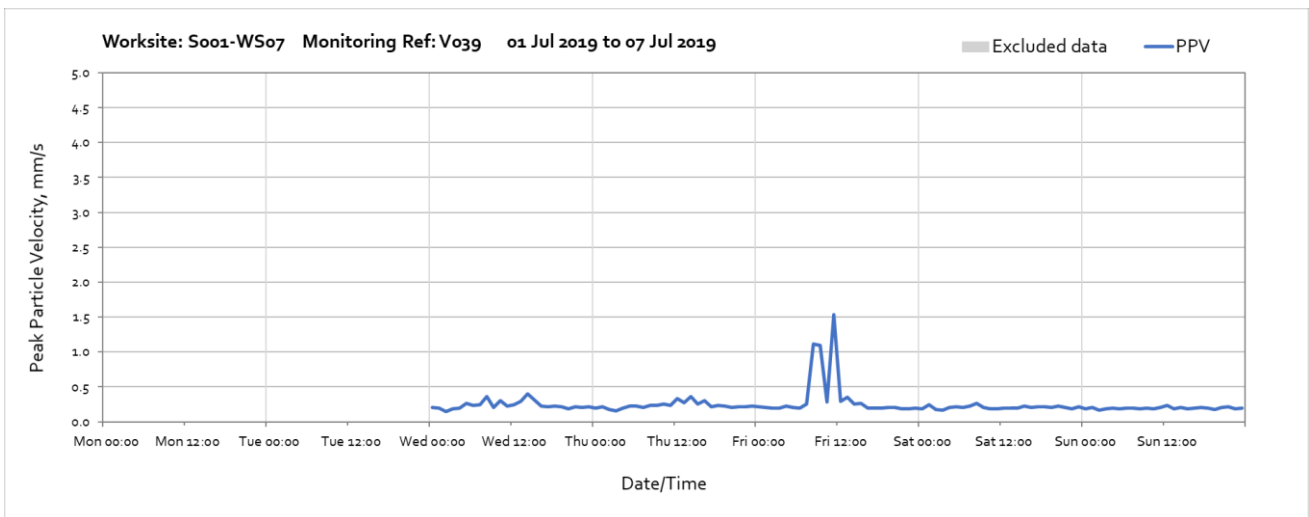


Worksite: S003-WS03 – Monitoring Ref: V038

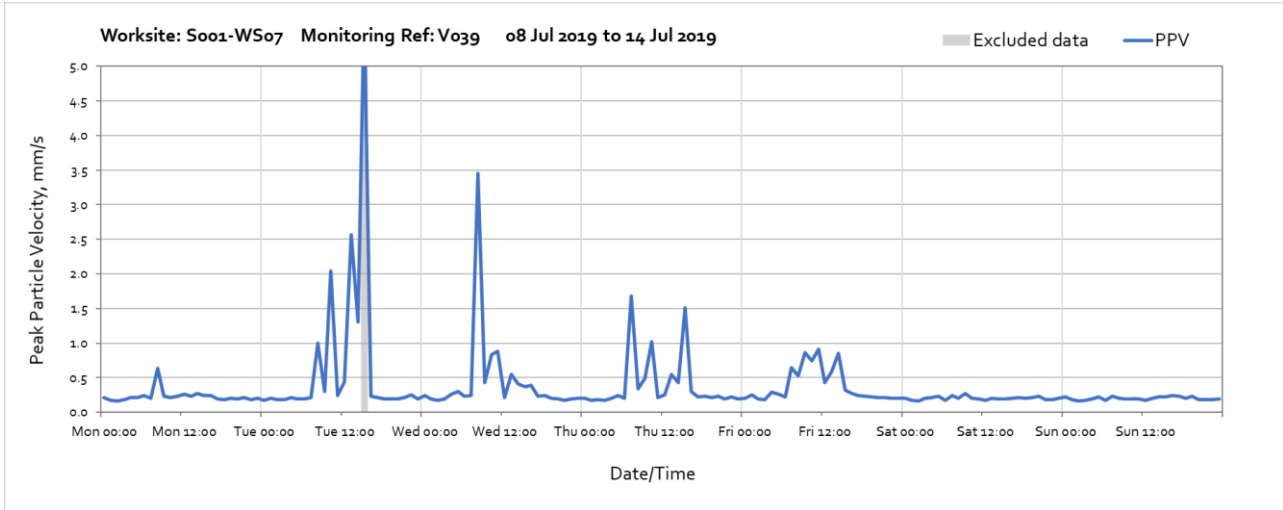




Worksite: S003-WS07 – Monitoring Ref: V039



Note: Vibration monitoring was started at 00:00 on Wednesday the 3rd of July.



Note: High vibration levels at 15:00 on Tuesday 9th of July were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels.

