HS2

February 2021

Construction noise and vibration Monthly Report – December 2020

London Borough of Ealing

gov.uk/hs2

List of tables

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) (including one monitoring location on the boundary with the London Borough of Hammersmith and Fulham) during the month of December 2020.

Within this period monitoring was undertaken at the following worksites:

- Noise monitoring was undertaken in the vicinity of the Atlas Road worksite (ref. S001-WS02) where drainage works, removal of spoil and crushed stone, installation of hoarding doors, compound site set up, excavation and backfilling and power diversion works were underway.
- Noise and vibration monitoring was undertaken in the vicinity of the Willesden EuroTerminal worksite (ref. S001-WS03), where construction of concrete slabs and walls, installations of steel reinforcement, excavation and drainage works, concrete works on track crossings and installation of new rails, surveys and installation of fencing and hoardings were underway.
- Noise monitoring was undertaken in the vicinity of the Victoria Road worksite (ref. S002-WS01), where installation of piles, excavation and backfilling works, construction of site haul roads, removal of materials, drainage works were underway.
- Noise monitoring was undertaken in the vicinity of the Flat Iron compound (within worksite ref. S002-WS01), where excavation and concrete breaking works, drainage works, ductworks and backfilling works were underway.
- Noise and vibration monitoring were undertaken in proximity of the Old Oak Common depot worksite (ref. S004-WS01), where excavation works, construction of site haul roads, dewatering works and utility works were underway.
- Noise monitoring was undertaken in proximity of the Mandeville Road Badminton Close compound (ref. BC Compound), where power cable diversions were underway.
- Noise and vibration monitoring were undertaken in proximity of the Green Park Way Ventilation Shaft worksite (ref. SS05-SL06), where excavations and backfilling works, surveys, removal of materials, concreate breaking works, hoarding installations and water main connection works were underway.

Further works were also undertaken at Horsenden Lane, Perivale and at The Westgate Ventilation Shaft.

There were no exceedances of the HS2 threshold levels for significant noise impacts during the reporting period at any monitoring position.

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

Six complaints were received during the monitoring period. A description of complaints, the results of investigation and any actions taken are detailed in Table 7 of this report.

Abbreviations and Descriptions

The abbreviations, descriptions and project terminology used within this report can be found in Table 1.

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.
LOAEL	Lowest Observed Adverse Effect Level - the level above which adverse effects on health and quality of life can be detected.
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.
SOAEL	Significant Observed Adverse Effect Level - the level above which significant adverse effects on health and quality of life occur.
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 HS2 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.

1.1.2 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) (including one monitoring location on the boundary with the London Borough of Hammersmith and Fulham) during the month for the period 1st to 31st December 2020.

1.1.3 Active construction sites in the local authority area, where noise and vibration monitoring were conducted during this period, include:

- Atlas Road worksite, ref. S001-WS02 (see plan 3 in Appendix A), where work activities included:
  - Drainage works;
  - Removal of spoil and crushed stone;
  - Installation of hoarding doors;
  - Compound site set up for Grand Union Canal and bridge abutment works;
  - Excavation and backfilling of trial holes,
  - Excavation and removal of redundant piles; and
  - Excavations for duct works and power diversion works.

- Willesden EuroTerminal worksite, ref. S001-WS03 (see plan 3 in Appendix A), where work activities included:
  - Construction of concrete slabs and walls and installations of steel reinforcement;
  - Finalising excavation and ground preparation works of the drainage system;
  - Concrete works on track crossings and installation of new rails;
  - Concrete works to increase footpath width;
  - Unexploded ordnance surveys; and
  - Installation and replacement of fencing and hoardings.
- Victoria Road worksite, ref. S002-WS01 (see plan 3 in Appendix A), where work activities included:
  - Installation of piles;
  - Groundworks (backfilling and excavations);
  - Working platform construction;
  - Construction of site haul roads;
  - Removal of materials from site; and
  - Drainage works and installation of manholes and pipe run.
- Flat Iron compound, within worksite ref. S002-WS01 (see plan 4 in Appendix A), where work activities included:
  - Extension of the vehicle holding area;
  - Excavation and breaking out works;
  - Upgrades and maintenance of the drainage network; and
  - Laying of ductworks and backfilling works.
- Old Oak Common depot worksite, located in the London Borough of Hammersmith and Fulham (LBHF), ref. S004-WS01 (see plan 5 in Appendix A), where work activities included:
  - Excavation works;
  - Construction of site haul road and pile mat;
  - Dewatering works; and
  - Utility works.

- Mandeville Road Badminton Close compound (ref. BC Compound), where work activities included:
  - Power cable diversions.
- Green Park Way Ventilation Shaft worksite, reference SS05-SL06 (see plan 1 in Appendix A), where work activities included:
  - Groundworks (excavations and backfilling);
  - Surveys;
  - Removal of materials;
  - Concrete breaking;
  - Hoarding installation;
  - Waters main connections; and
  - Excavation of trial holes;

1.1.4 Further works, where monitoring did not take place, were undertaken at:

- Horsenden Lane, Perivale as part of water mains diversions; and
- The Westgate Ventilation Shaft, including vegetation clearance, installation of welfare facilities, removal of redundant materials and establishment of site perimeters and pedestrian walkways.

1.1.5 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 Fifteen noise and four vibration monitoring installations were active in December 2020 in the LBE area. Table 2 summarises the position of noise and vibration monitoring installations within the LBE area in December 2020.

1.2.2 Maps showing the position of noise and vibration monitoring installations are presented in Appendix B.

Table 2: Monitoring Locations

Worksite Reference	Measurement Reference	Address
S001-WS02	N032	Shaftesbury Gardens
	N033	Outside The Collective, Atlas Road / Victoria Road
	N060	Atlas Road next to Bashey Road
S001-WS03	N034	Stephenson Street (north)
	N035	Stephenson Street (south)
	N041	Junction of Stephenson Street / Goodhall Street
	V052	Stephenson Street (north)
S002-WS01	N029	Braitrim House, Victoria Road
	N030	Boden House Car Park
	N031	School Road, outside Acton Business Centre
	N049	Flat Iron compound railway fence, Victoria Rd North Acton
	N050	Acton Square, outside North Acton Station
S004-WS01	N027	Old Oak Common Lane
	N028	Old Oak Common Lane, Hilltop Works
	V045	Old Oak Common Lane
	V051	Kildun Court, Old Oak Common Lane
BC Compound	N040	Badminton Close
SS05-SL06	N059	Green Park Way Ventilation Shaft
	V053	Green Park Way Ventilation Shaft

2 Summary of Results

2.1 Summary of Measured Noise and Vibration Levels

2.1.1 Table 3 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.

Table 3: Summary of Measured dB L_{Aeq} Data over the Monitoring Period

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
S001-WS02	N032	Shaftesbury Gardens	Free-field	64.9 (68.2)	66.2 (68.1)	65.2 (68.0)	64.0 (66.4)	61.5 (77.1)	62.1 (63.1)	63.9 (65.2)	64.5 (66.3)	64.1 (66.6)	61.0 (64.5)	63.8 (66.6)	60.2 (65.1)
	N033	Outside The Collective, Atlas Road/Victoria Road	Free-field	66.3 (69.2)	67.7 (70.3)	66.1 (69.1)	65.2 (72.0)	61.9 (67.6)	63.1 (64.9)	65.5 (66.8)	66.2 (67.9)	65.1 (69.3)	62.9 (67.5)	65.1 (71.6)	61.5 (66.3)
	N060	Atlas Road next to Bashey Road	Façade	57.8 (79.4)	64.5 (75.4)	55.0 (66.2)	53.4 (74.2)	53.8 (69.7)	51.6 (53.3)	53.6 (57.5)	52.5 (54.4)	53.3 (58.5)	50.9 (55.1)	52.3 (57.7)	53.2 (65.2)
S001-WS03	N034	Stephenson Street (north)	Free-field	51.7 (56.6)	56.2 (60.3)	52.5 (58.3)	52.0 (58.0)	49.4 (67.9)	50.7 (52.6)	54.2 (59.5)	53.9 (57.2)	53.7 (59.7)	50.7 (55.7)	52.9 (60.9)	47.8 (55.2)
	N035	Stephenson Street (south)	Free-field	53.6 (58.5)	56.2 (62.6)	50.9 (56.6)	50.4 (55.5)	48.9 (62.0)	51.5 (52.8)	55.1 (58.9)	51.7 (53.8)	51.4 (54.8)	50.1 (54.5)	52.0 (56.6)	47.4 (54.0)
	N041	Junction of Stephenson Street/Goodhall Street	Free-field	54.1 (64.2)	57.3 (62.7)	54.4 (59.7)	53.6 (57.6)	50.1 (70.4)	52.2 (53.9)	54.2 (56.5)	55.9 (57.0)	54.9 (58.5)	51.3 (57.8)	54.9 (63.1)	49.7 (55.5)

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
S002-WS01	N029	Braitrim House, Victoria Road	Free-field	51.4 (59.1)	59.0 (65.5)	56.2 (64.3)	56.0 (62.1)	52.7 (63.4)	49.9 (50.7)	55.4 (56.8)	56.3 (58.2)	56.0 (59.5)	51.8 (56.4)	54.2 (57.6)	49.5 (56.5)
	N030	Bodens car park	Free-field	55.0 (57.5)	61.8 (68.8)	54.4 (59.4)	52.9 (55.9)	51.1 (58.7)	51.4 (53.3)	60.3 (69.0)	59.1 (65.8)	56.8 (69.9)	53.2 (62.2)	52.9 (55.5)	49.0 (53.2)
	N031	School Road, outside Acton Business Centre	Free-field	59.2 (62.1)	62.3 (65.1)	60.4 (63.3)	58.2 (66.5)	54.6 (67.1)	55.3 (57.6)	61.6 (65.3)	60.8 (62.5)	59.5 (62.7)	54.3 (59.1)	59.1 (63.6)	53.9 (59.0)
	N049	Flat Iron compound	Free-field	52.0 (58.0)	58.9 (65.4)	53.7 (57.8)	53.8 (60.1)	52.7 (60.3)	51.0 (52.4)	55.5 (60.3)	55.1 (58.5)	54.0 (60.3)	50.8 (55.4)	52.3 (56.6)	50.6 (56.1)
	N050	Acton Square, outside North Acton Station	Free-field	63.7 (67.8)	63.9 (68.2)	63.4 (65.8)	62.2 (70.6)	58.5 (68.4)	61.1 (63.4)	63.0 (65.1)	62.4 (63.8)	63.3 (70.8)	59.8 (63.2)	62.3 (65.9)	58.1 (63.1)

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	61.7	64.1	61.2	59.6	57.6	58.3	60.0	59.8	59.9	58.2	59.5	57.1
				(65.0)	(67.7)	(63.5)	(64.2)	(63.0)	(59.2)	(61.0)	(61.3)	(62.6)	(62.4)	(62.4)	(60.2)
	N028	Old Oak Common Lane, Hilltop Works	Free-field	68.3	69.8	69.1	67.5	63.1	64.8	66.8	67.0	67.9	63.3	66.8	63.2
				(72.9)	(71.8)	(72.1)	(71.8)	(69.2)	(67.1)	(69.0)	(68.1)	(72.0)	(67.2)	(70.7)	(68.2)
BC Compound	N040	Badminton Close	Free-field	54.5	55.8	54.9	54.6	52.4	54.3	55.6	55.2	55.7	51.9	55.1	51.6
				(59.1)	(59.9)	(58.0)	(59.1)	(71.2)	(56.6)	(59.2)	(57.2)	(57.4)	(56.1)	(57.2)	(56.5)
SS05-SL06	N059	Green Park Way Ventilation Shaft	Façade	55.0	59.6	53.7	53.9	53.1	53.9	54.2	55.1	54.4	49.6	54.3	50.9
				(57.6)	(68.1)	(56.4)	(57.9)	(61.8)	(56.7)	(56.1)	(57.3)	(61.7)	(54.2)	(57.3)	(55.6)

2.1.2 Table 4 presents a summary of the measured vibration levels at each monitoring location over the reporting period. The highest PPV measured during the monitoring along any axis is presented in the table.

Table 4: Summary of Measured PPV Data over the Monitoring Period

Worksite Reference	Measurement Reference	Monitor Address	Highest PPV measured in any axis, mm/s
S001-WS03	V052	Stephenson Street (north)	3.75 (X-axis)
S004-WS01	V045	Old Oak Common Lane	1.50 (Y-axis)
S004-WS01	V051	Kildun Court, Old Oak Common Lane	1.21 (Y-axis)
SS05-SL06	V053	Green Park Way Ventilation Shaft	7.85* (Y-axis)

* High vibration levels are due to the proximity of the construction activities to the vibration monitor. The nearest residential receptors are further away (90m for V053 and 300m for V10b) from the works and vibration levels at the receptor will therefore be lower.

2.1.3 Appendix C presents graphs of the 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.

2.2 Exceedances of the SOAEL

2.2.1 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."

2.2.2 HS2 Phase One Information Paper E23: Control of Construction Noise and Vibration sets out the SOAELs for construction noise.

2.2.3 Where reported construction noise levels exceed the SOAEL, relevant periods will be identified. Summary statistics to evaluate ongoing qualification for noise insulation and temporary rehousing are also presented where relevant.

2.2.4 Table 5 presents a summary of recorded exceedances of the SOAEL at each measurement location over the reporting period, including the number of exceedances during each time period.

Table 5: 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
	N060	Atlas Road next to Bashey 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
	N030	Bodens Car Park	All days	All periods	No exceedance
	N031	School Road, outside Acton Business Centre	All days	All periods	Not applicable*
	N049	Flat Iron compound	All days	All periods	No exceedance
	N050	Acton Square, outside North Acton Station	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
SS05-SL06	N059	Green Park Way Ventilation Shaft	All days	All periods	Not applicable*

* The defined SOAEL criteria are not applicable to non-residential properties.

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
-	-	-	-	-	-

2.4 Complaints

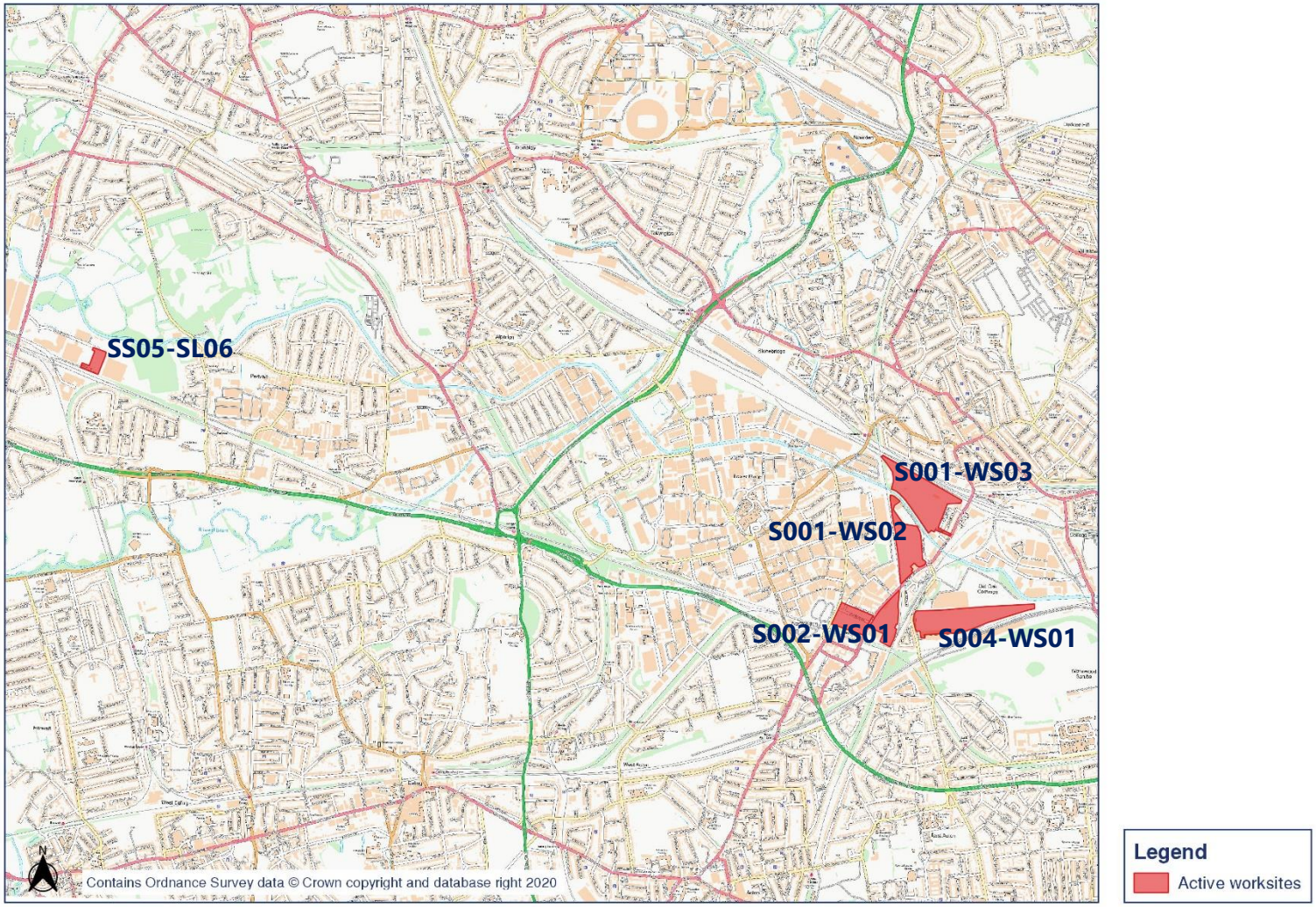
2.4.1 Table 7 provides a summary of complaint information related to noise and vibration received during the reporting period, along with the findings of any investigation.

Table 7: Summary of Complaints

Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
HS2-20-41024-C	S001-WS03	Complaint due to drilling noise originating from a construction site.	The drilling noise was due to necessary work to remove fences on Channel Gate Road. The works are now completed and stakeholder confirmed that no further noise has occurred since then.	Contractor's community engagement team has spoken with the resident and has discussed the results of investigation. Wherever practicable acoustic barriers/noise mitigation solutions will be used for subsequent works on Channel Road Gate.
HS2-20-41070-C	S001-WS03	Complaint due to drilling noise and vibration coming from Stephenson Street site boundary.	Works undertaken 50m from Stephenson Street site boundary were lifting, shuttering, cleaning and jet washing and none of these were likely to cause significant vibration and noise levels.	The complainant has been contacted and information provided. No actions considered to be required for works on site which were in line with the Section 61 application coverage and BPM (Best Management Practices) measures were being employed.
HS2-20-41091-C	S001-WS03	Complaint due to high level of vibrations experienced at the nearest residential properties on Stephenson Street.	Works including lifting, shuttering, cleaning, jet washing and works in the railway sidings to the North of the site (over 50 metres away from Stephenson Street site boundary). The only activity close to the site boundary was movement of stockpiled steel which was not considered to cause excessive vibration levels.	The complainant has been contacted and information provided. Works were in line with Section 61 application and BPM. However, further attended vibration monitoring measures are being carried out by the contractor in response to the resident's concerns.
HS2-20-41053-C	S001-WS02	Complaint due to audible construction noise.	Noise source has been found to come from elsewhere in local area.	A response has provided to the resident and the complaint has been closed.
HS2-20-41054-C	S001-WS02	Complaint due to audible construction noise.	Noise source has been found to come from elsewhere in local area.	A response has provided to the resident and the complaint has been closed.
HS2-20-41076-C	S004-WS01	Complaint due to audible construction noise during night.	Works were undertaken for the installation of measures to mitigate the structural movement of the retaining wall to Old Oak Common Lane. Night time works were required to reduce road traffic impacts and BPM were adopted	A response has provided to the resident.

Appendix A Site Locations

Worksite identification plan - Overview



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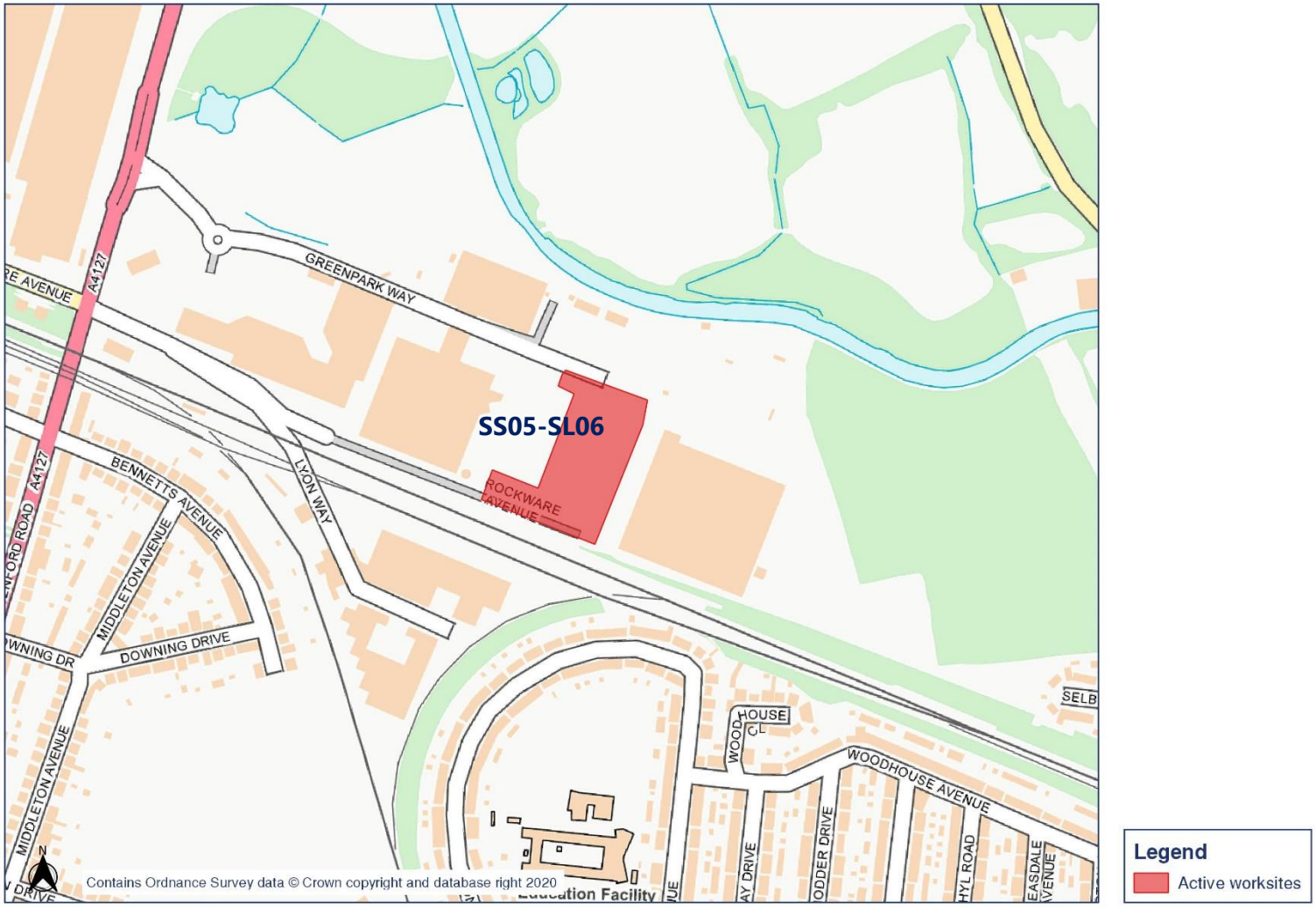
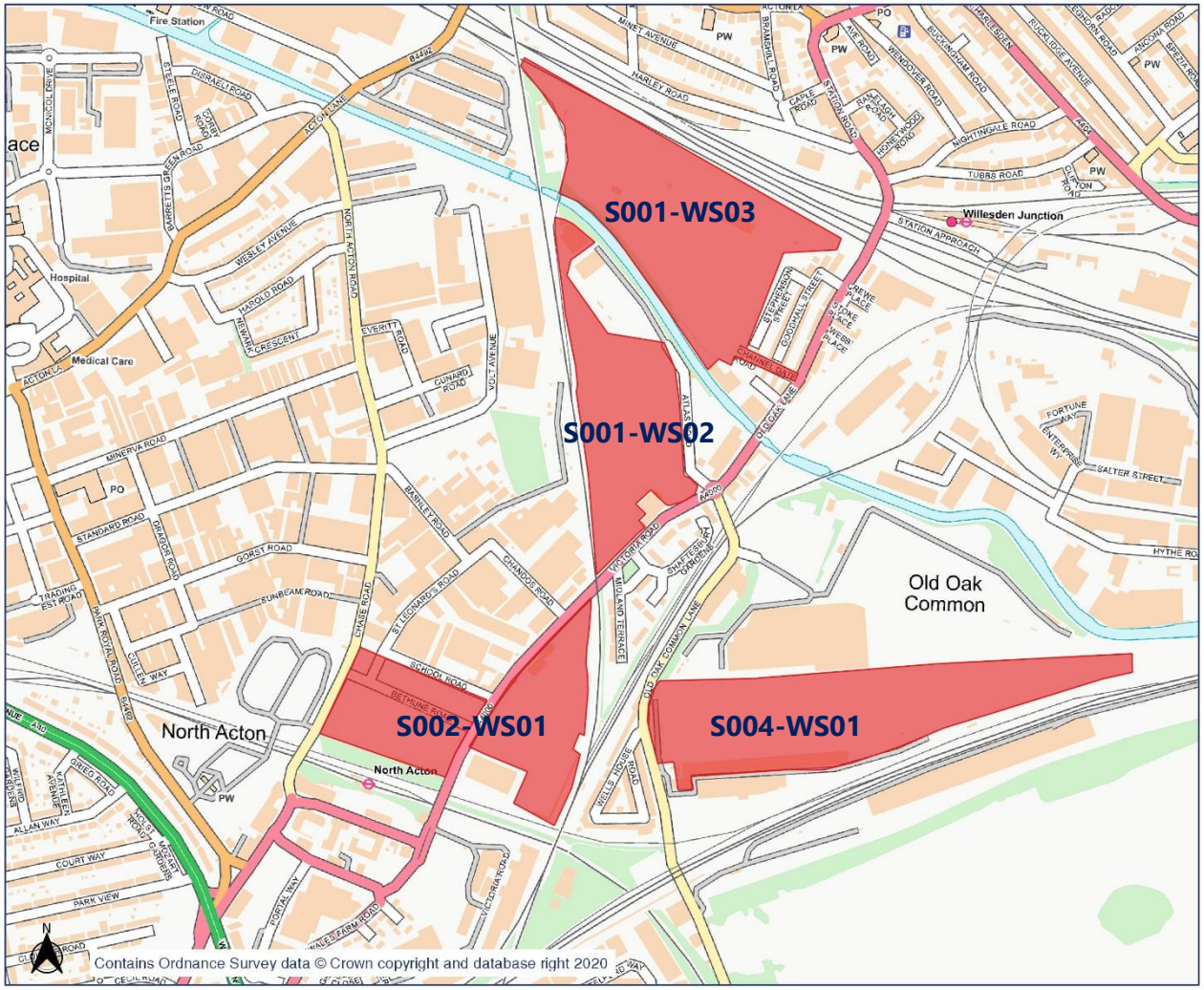
Worksite identification plan - 1



HS2 Worksite identification plan - 2



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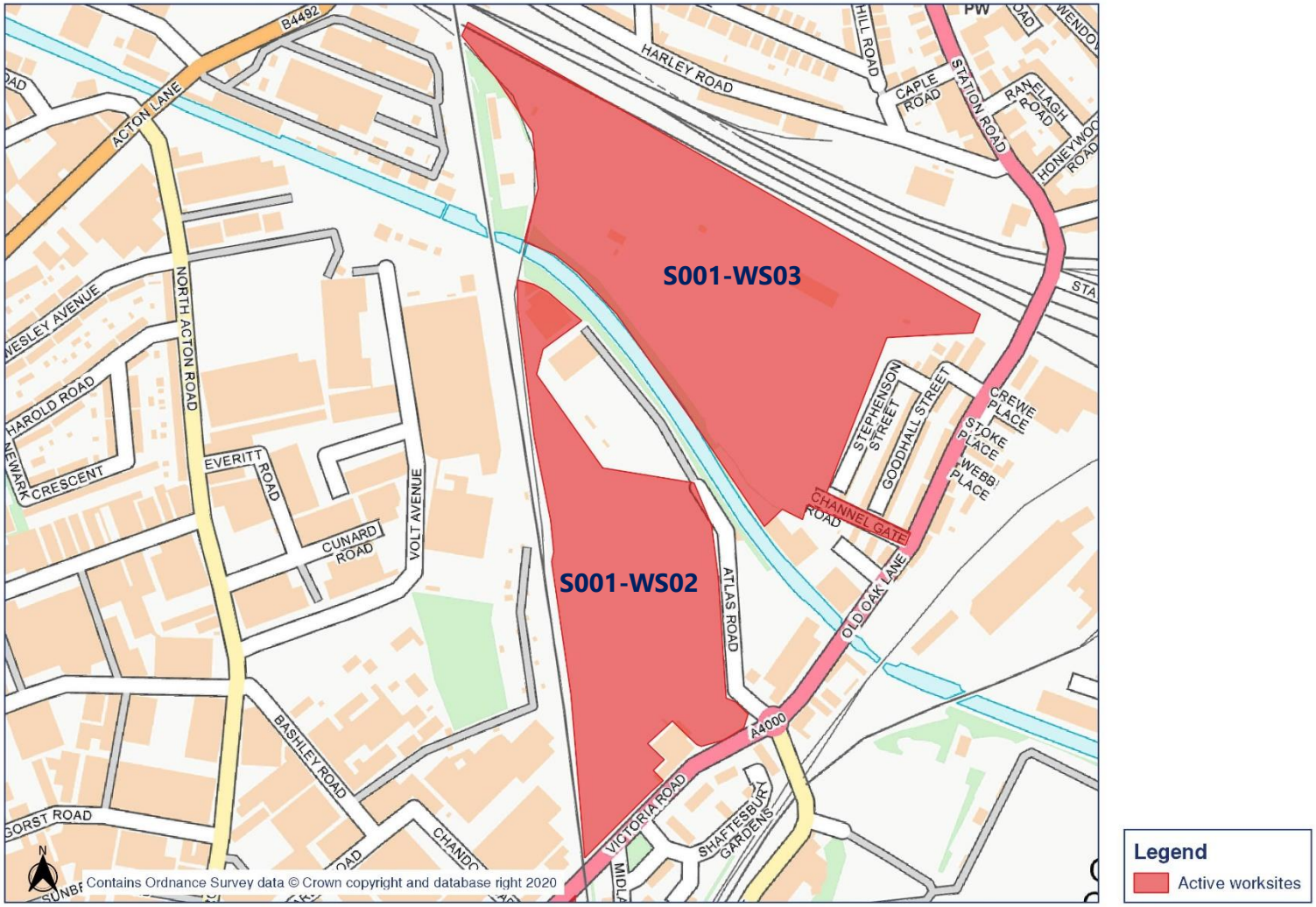

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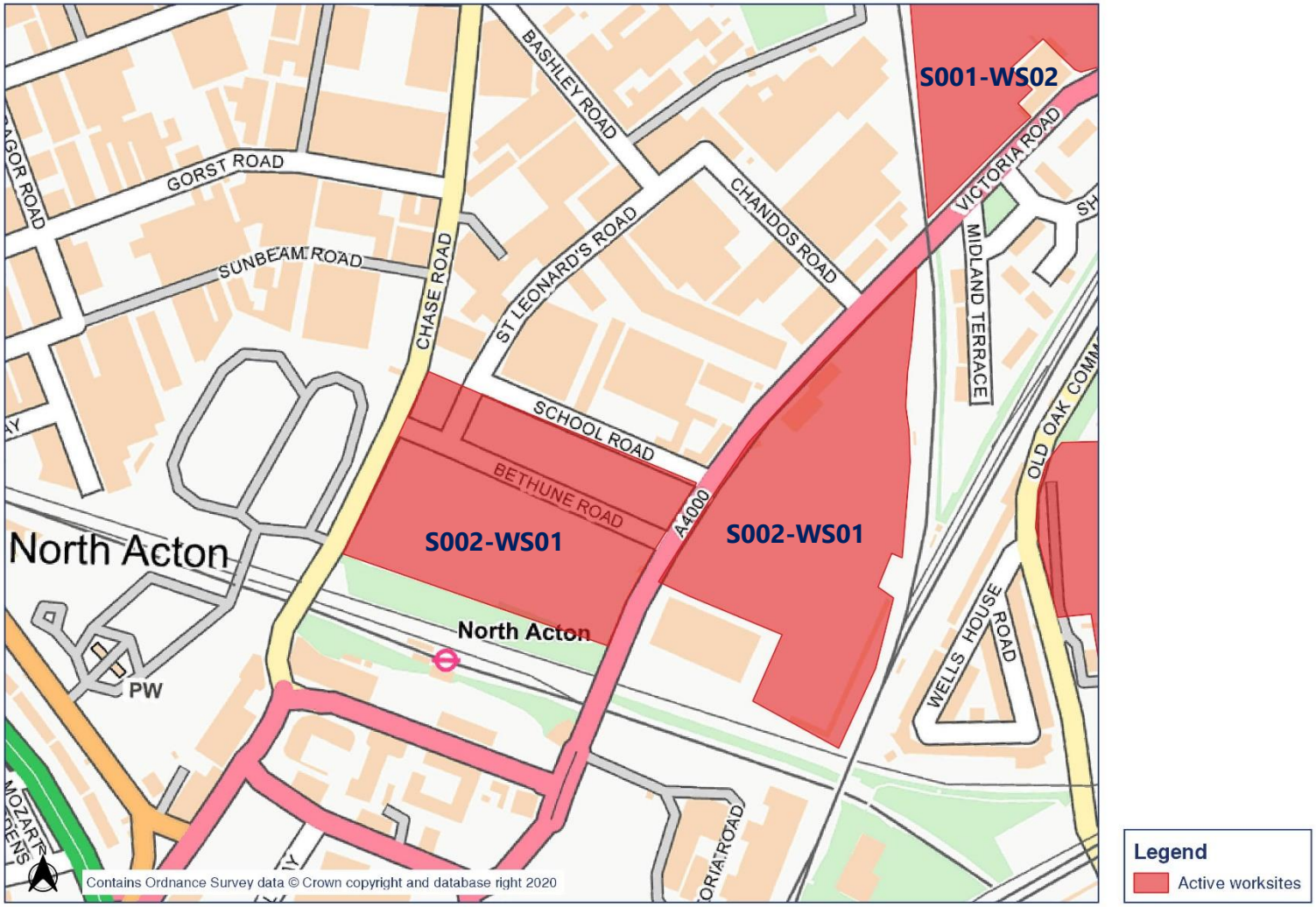
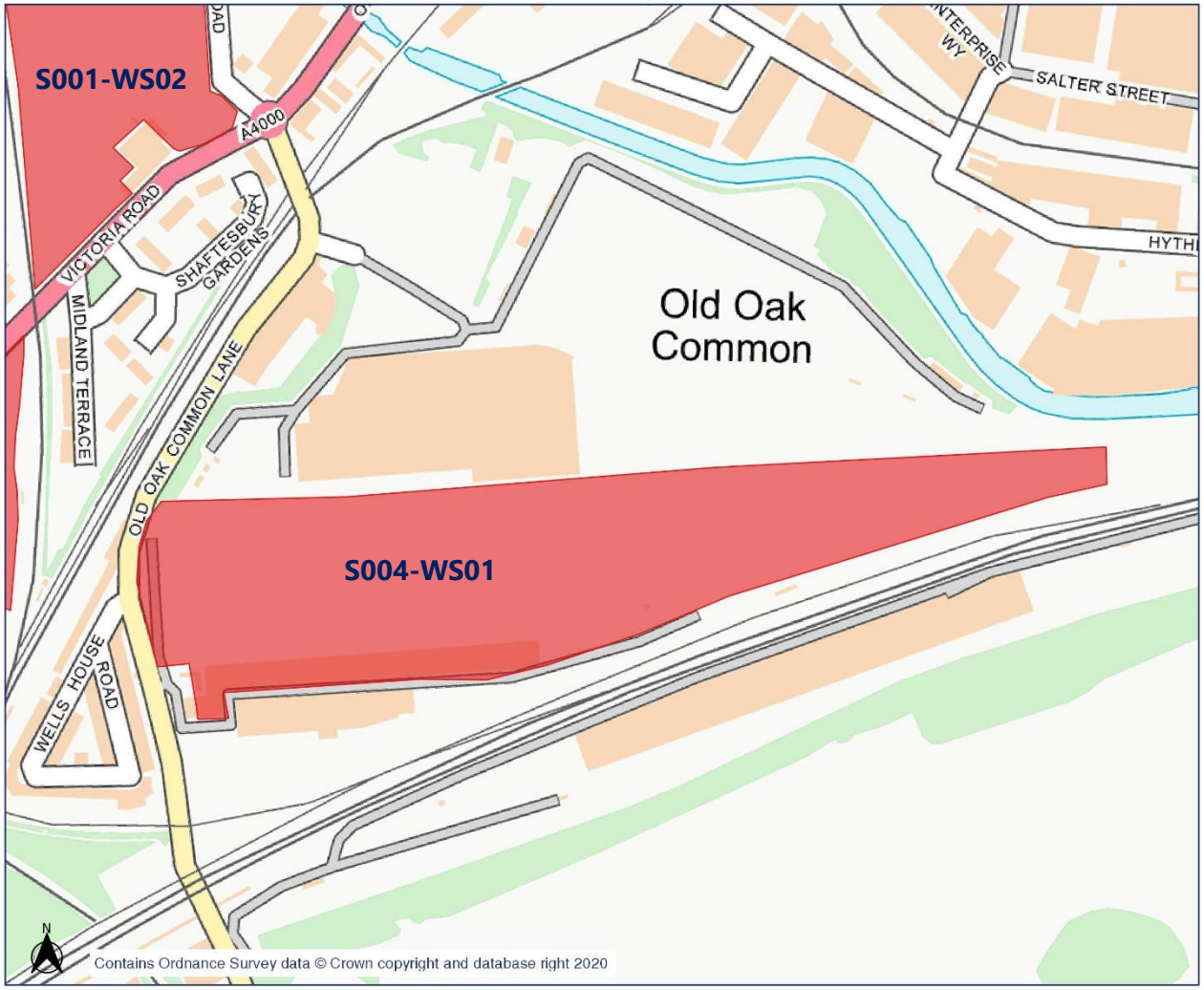
Worksite identification plan - 4



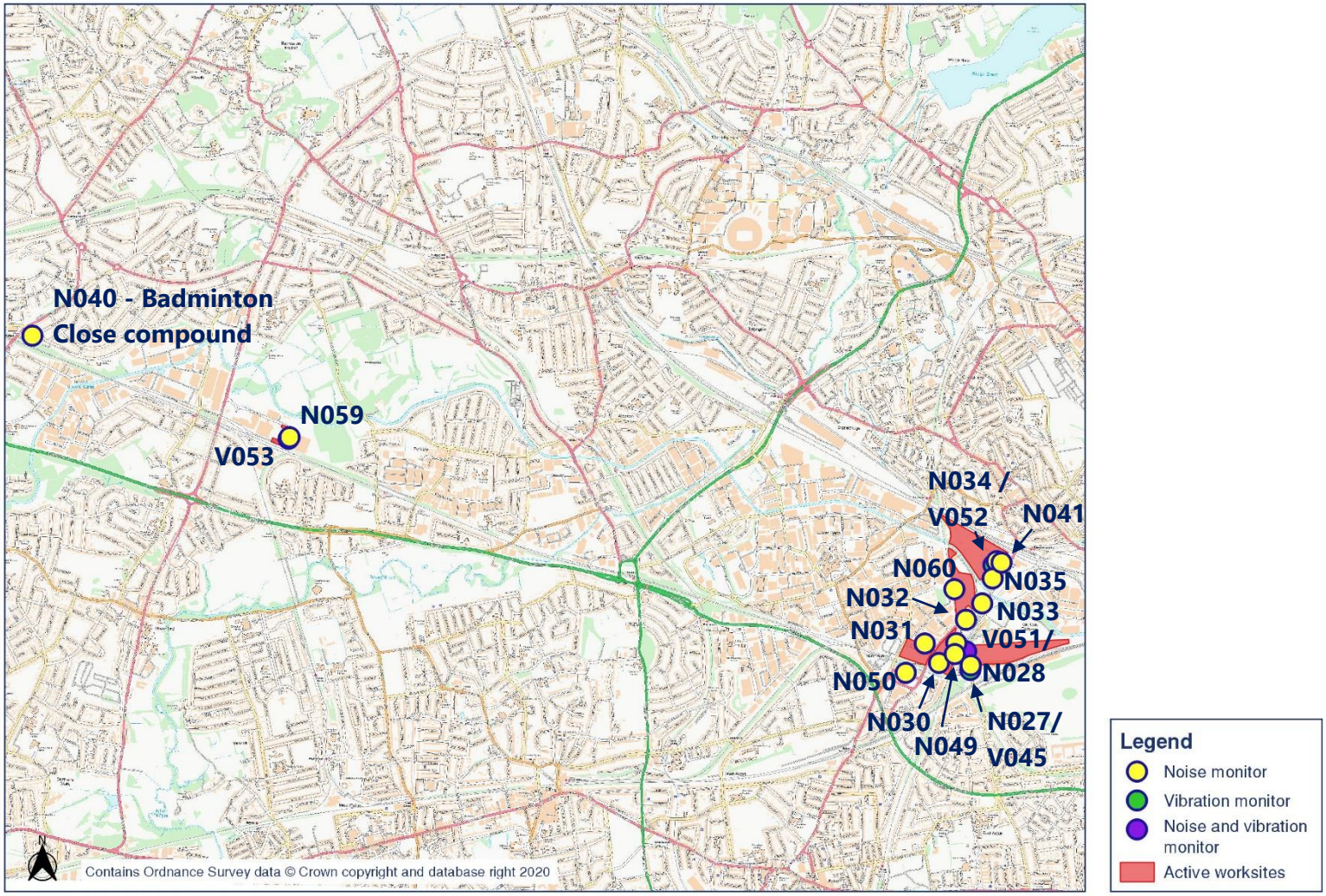
HS2

Worksite identification plan - 5

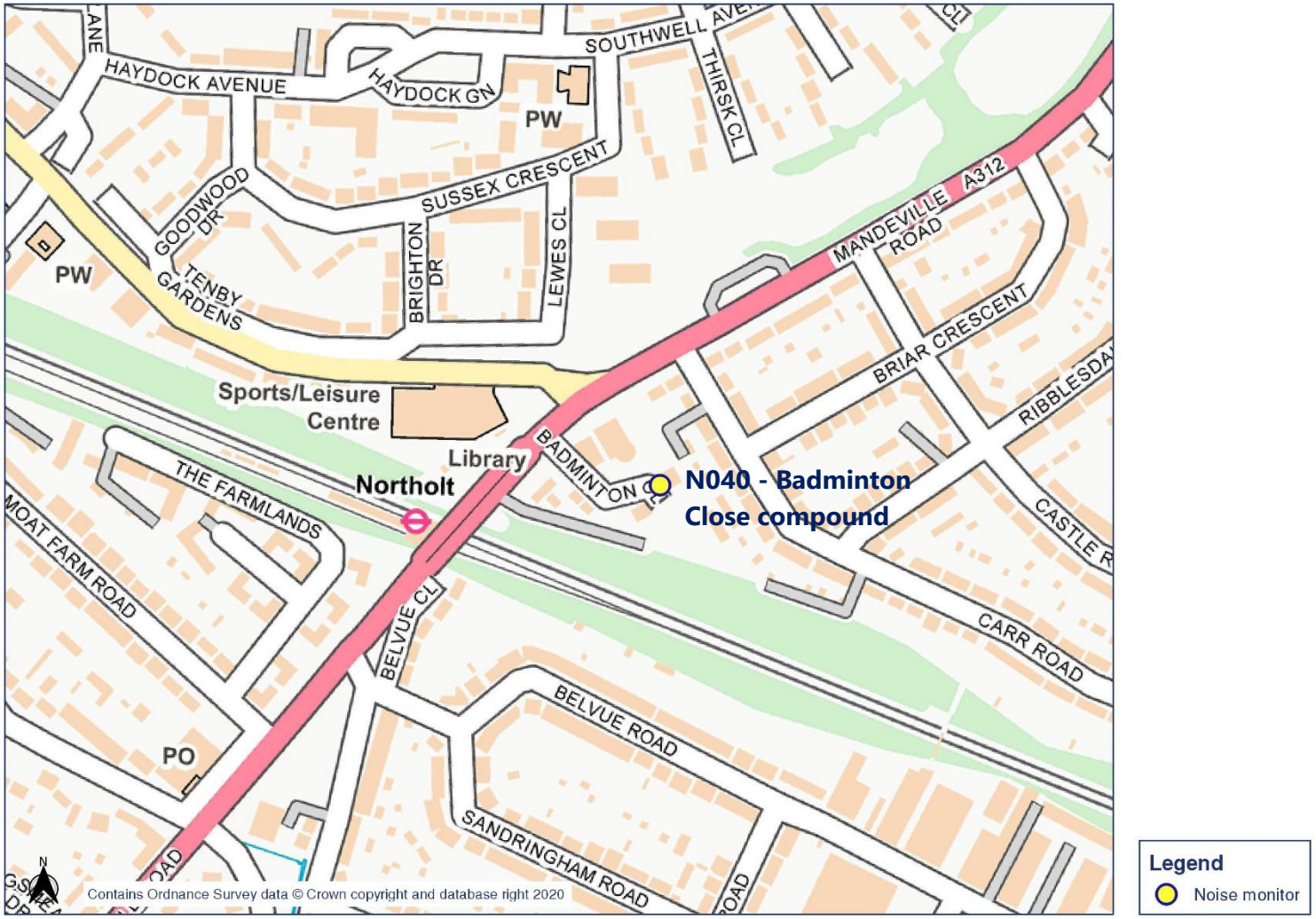


Appendix B Monitoring Locations

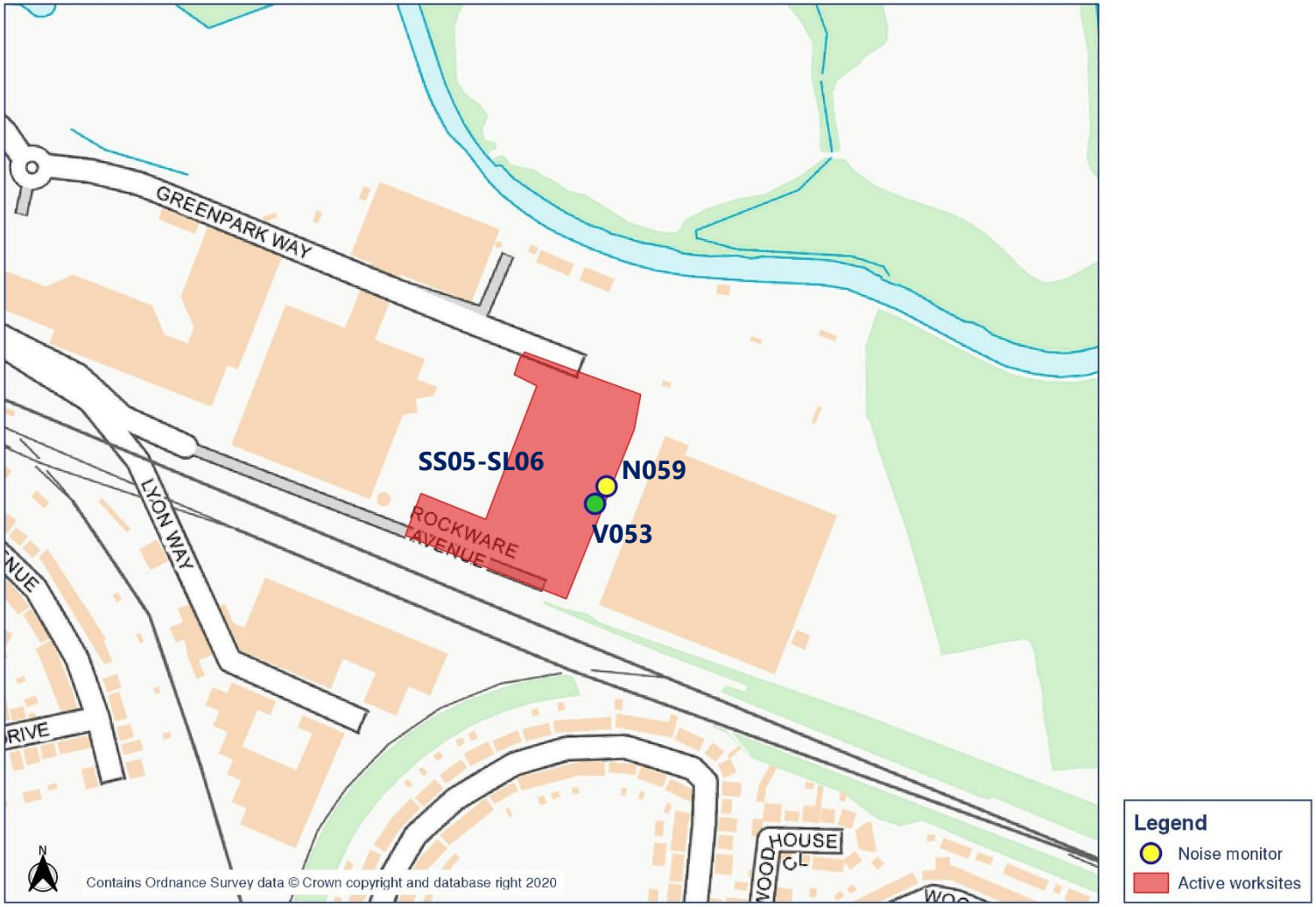
HS2 Noise and vibration monitoring plan - Overview



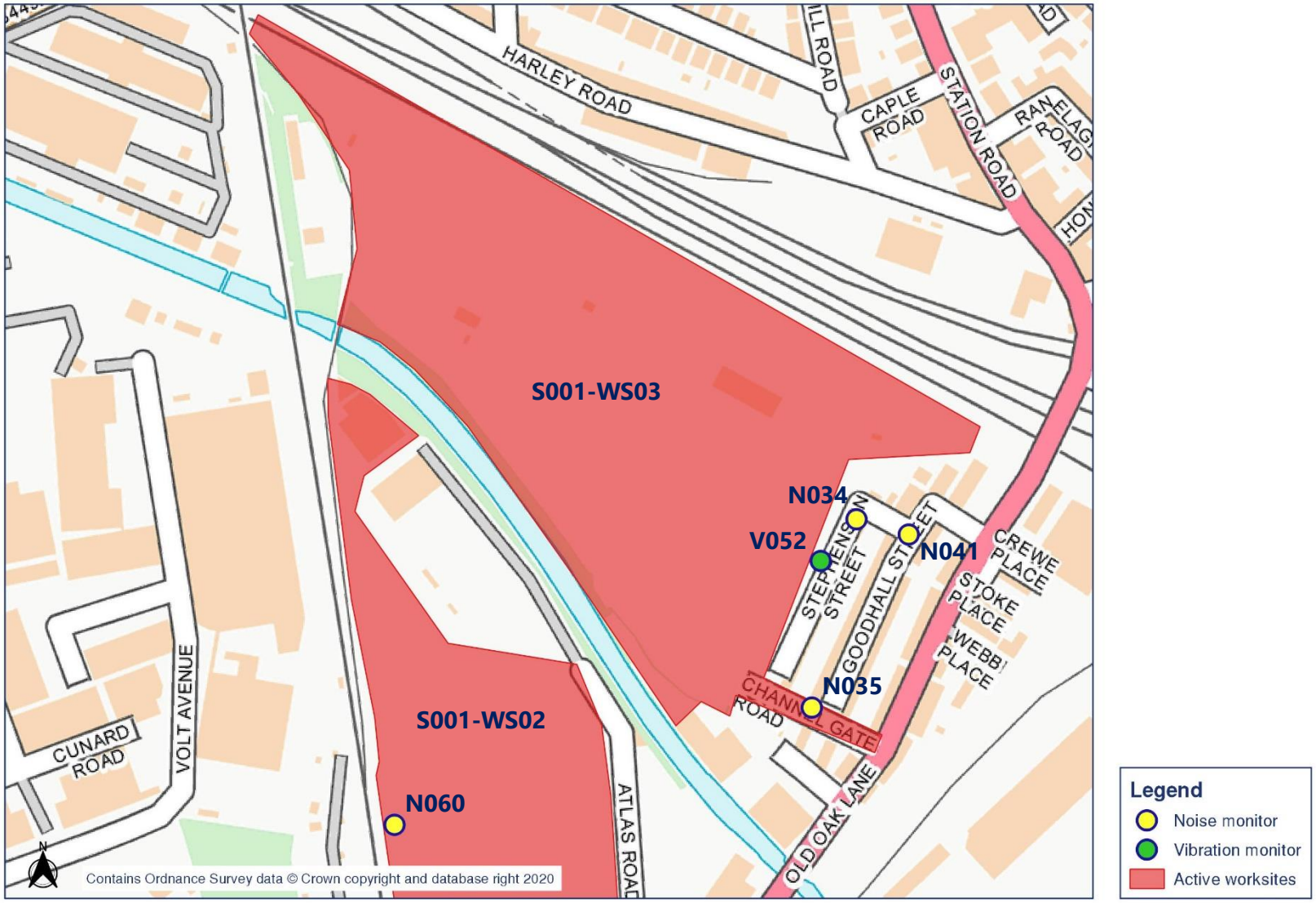
HS2 Noise and vibration monitoring plan - 1



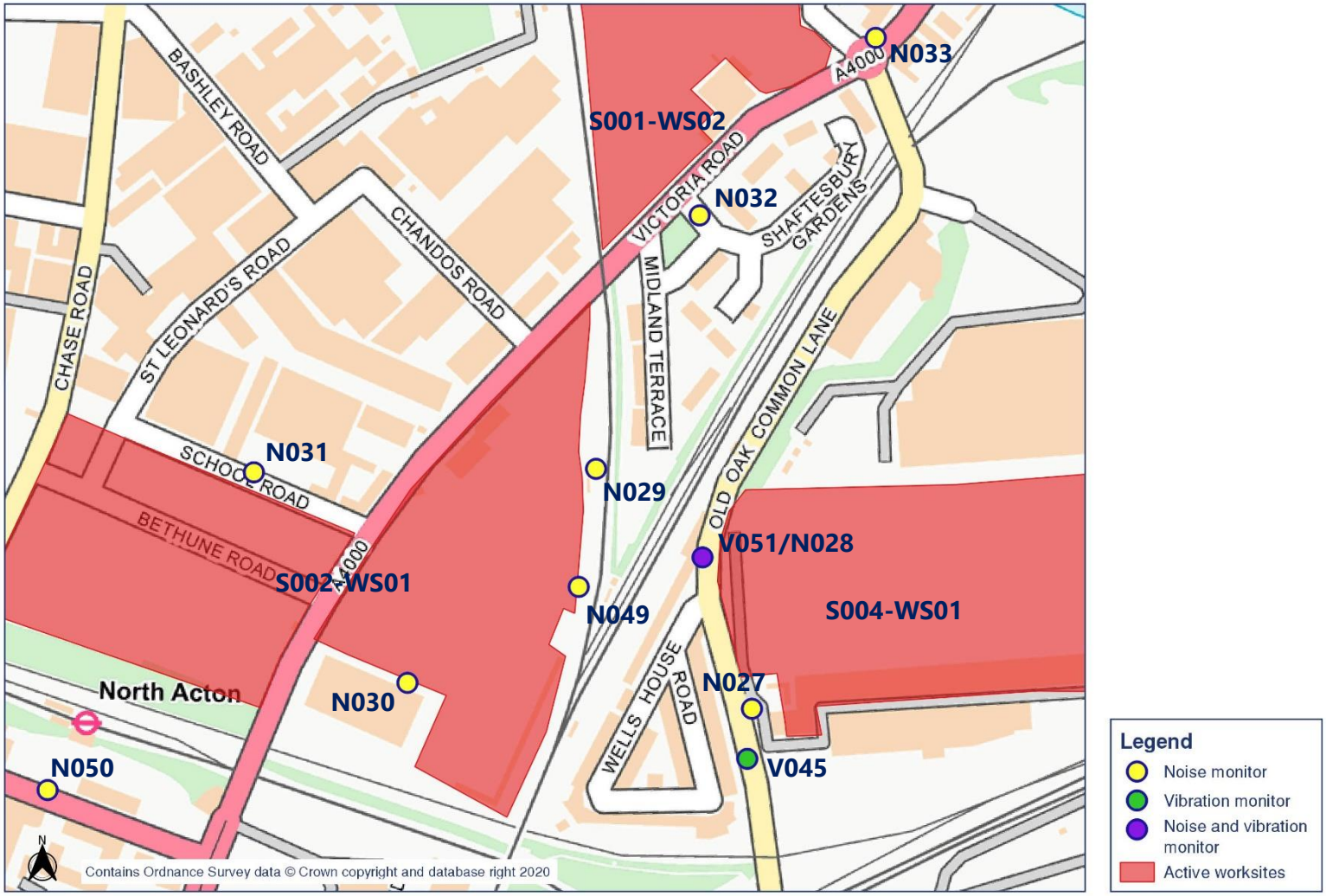
HS2 Noise and vibration monitoring plan - 2



Noise and vibration monitoring plan - 3



HS2 Noise and vibration monitoring plan - 4

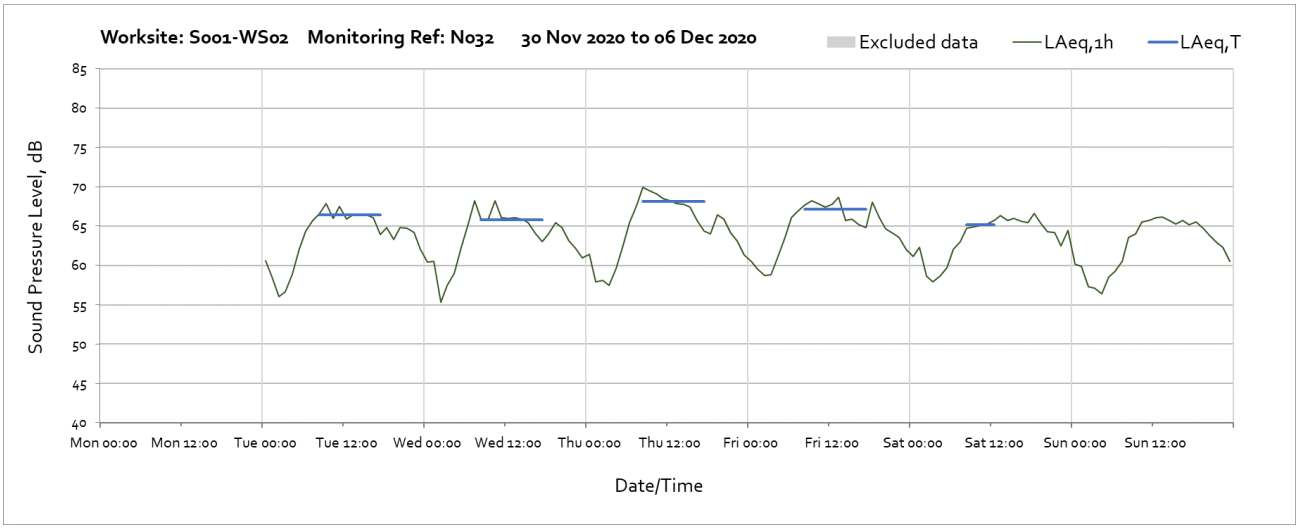


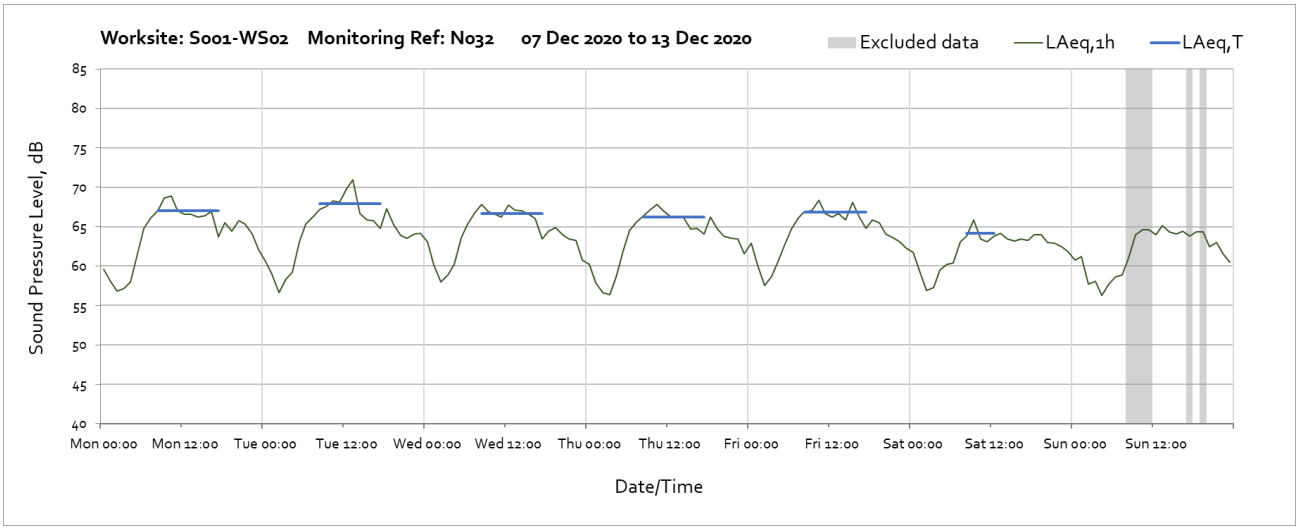
Appendix C Data

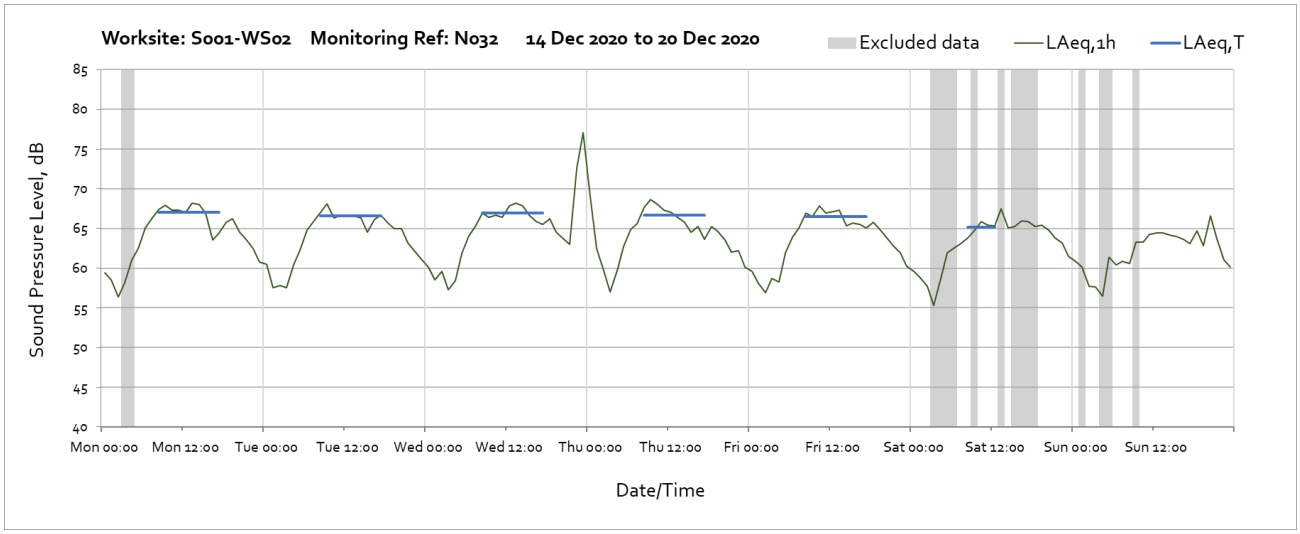
Noise

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 3 of the main report.

Worksite: S001-WS02 – Monitoring Ref: N032



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Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
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80
75
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55
50
45
40
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
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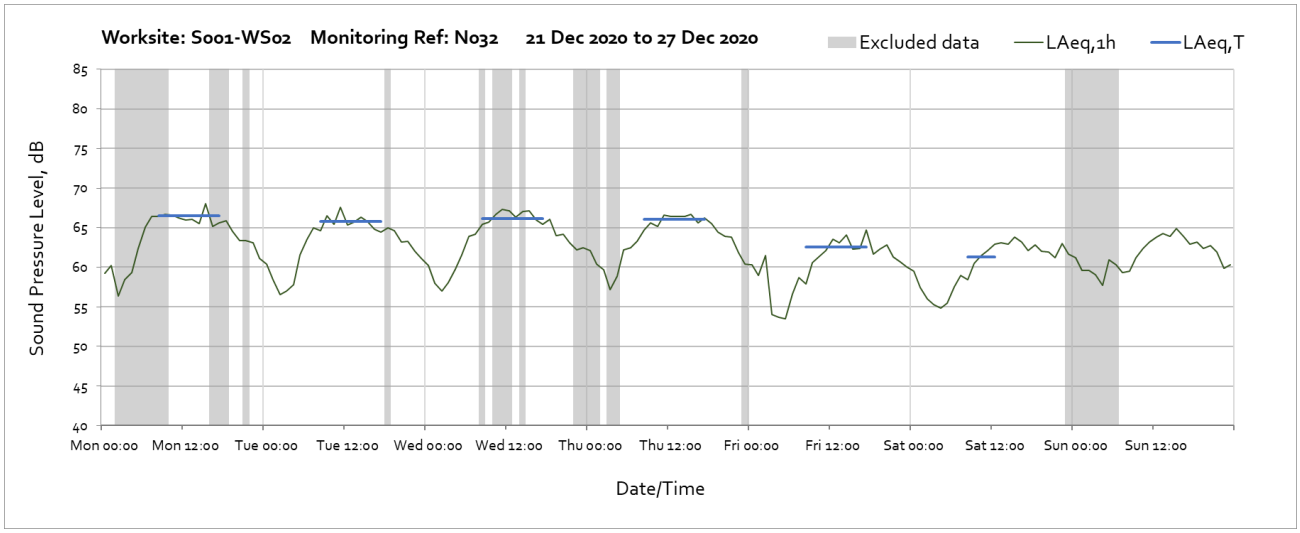
Sun 00:00
Sun 12:00
Date/Time


Worksite: S001-WS02 Monitoring Ref: N032 21 Dec 2020 to 27 Dec 2020
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
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80
75
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Tue 12:00
Wed 00:00
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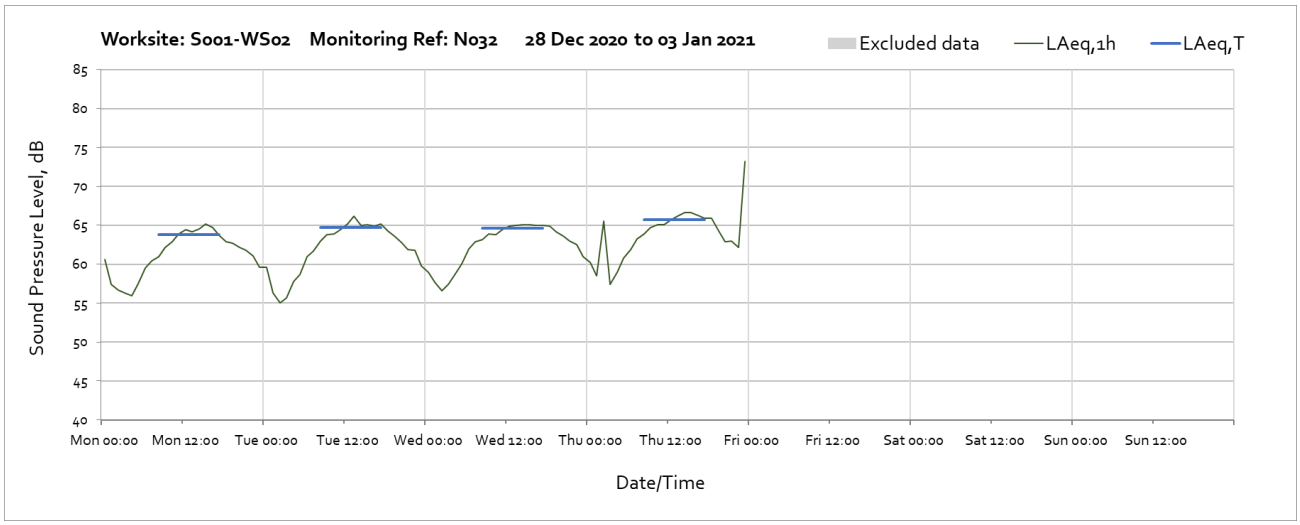
Sun 12:00
Date/Time


Worksite: S001-WS02 Monitoring Ref: N032 28 Dec 2020 to 03 Jan 2021
Excluded data
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LAeq,T
Sound Pressure Level, dB
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Mon 12:00
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Tue 12:00
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Wed 12:00
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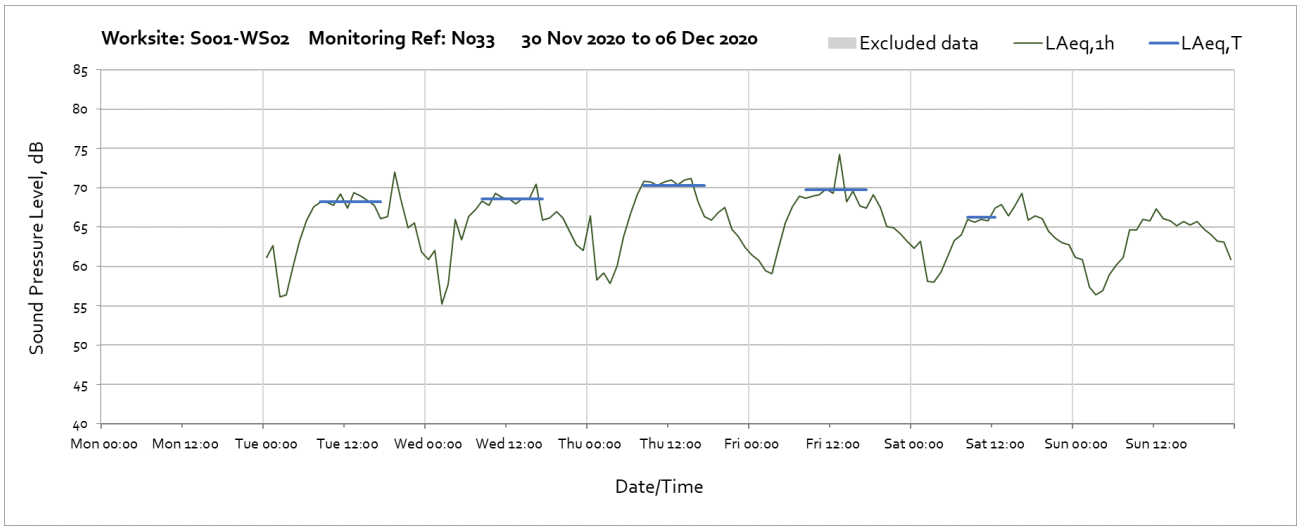
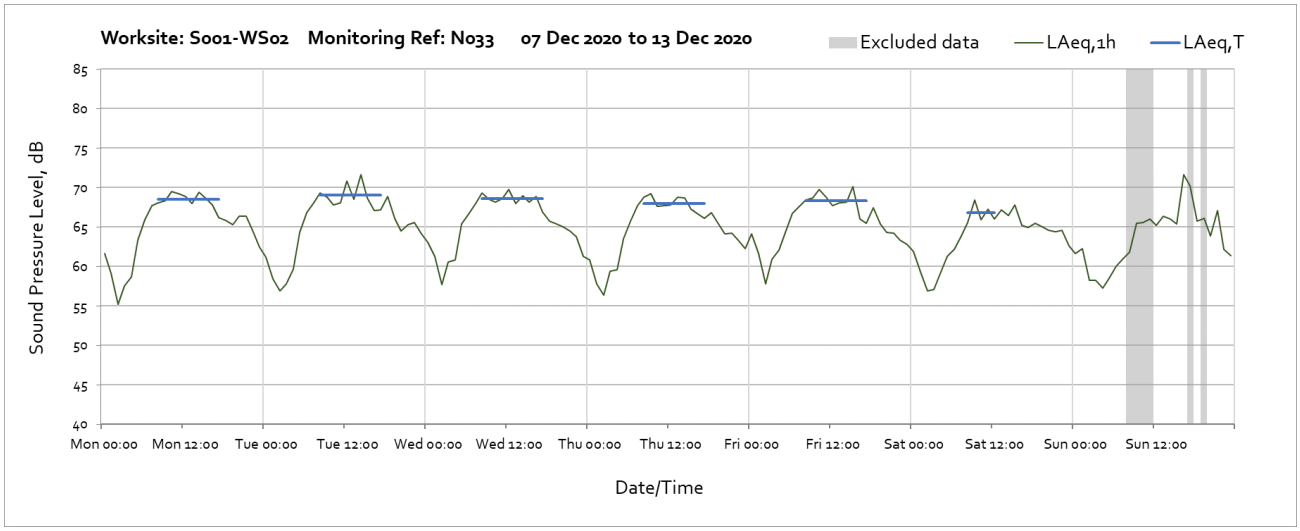
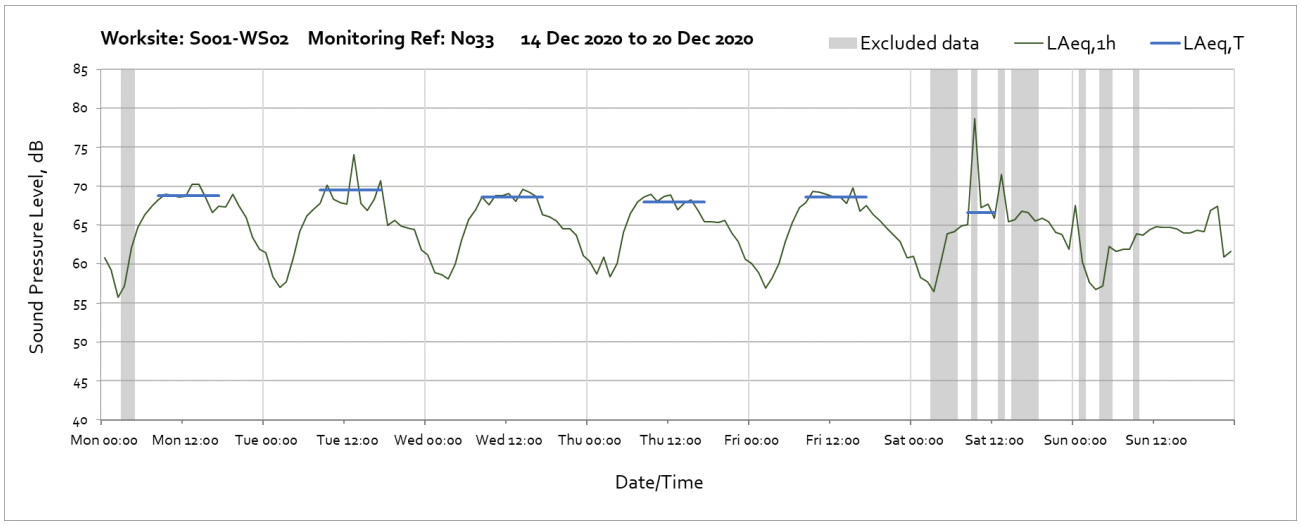
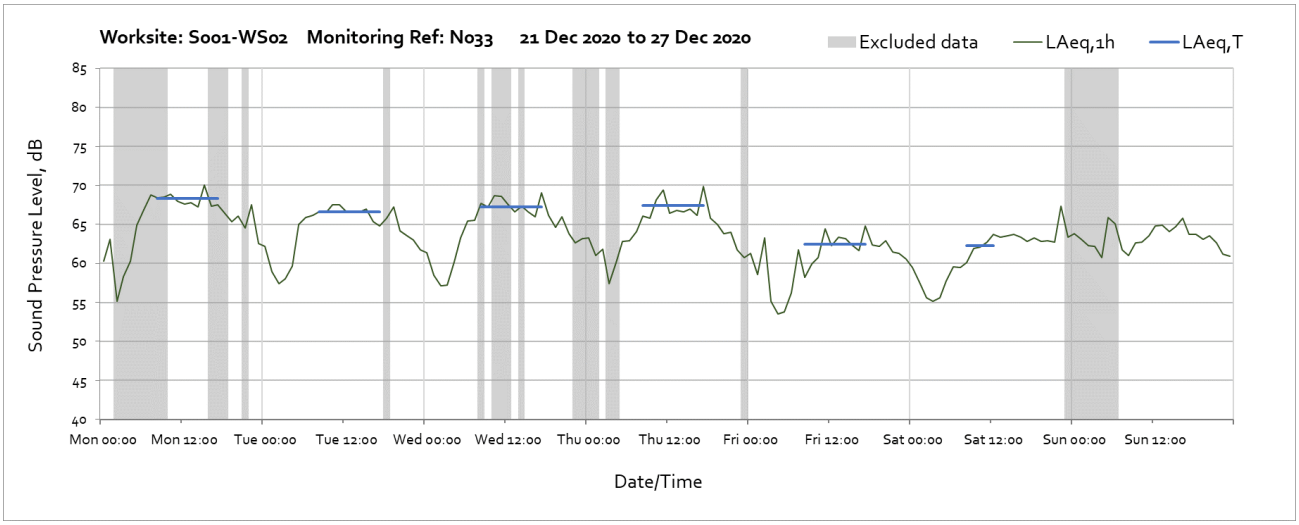
Date/Time

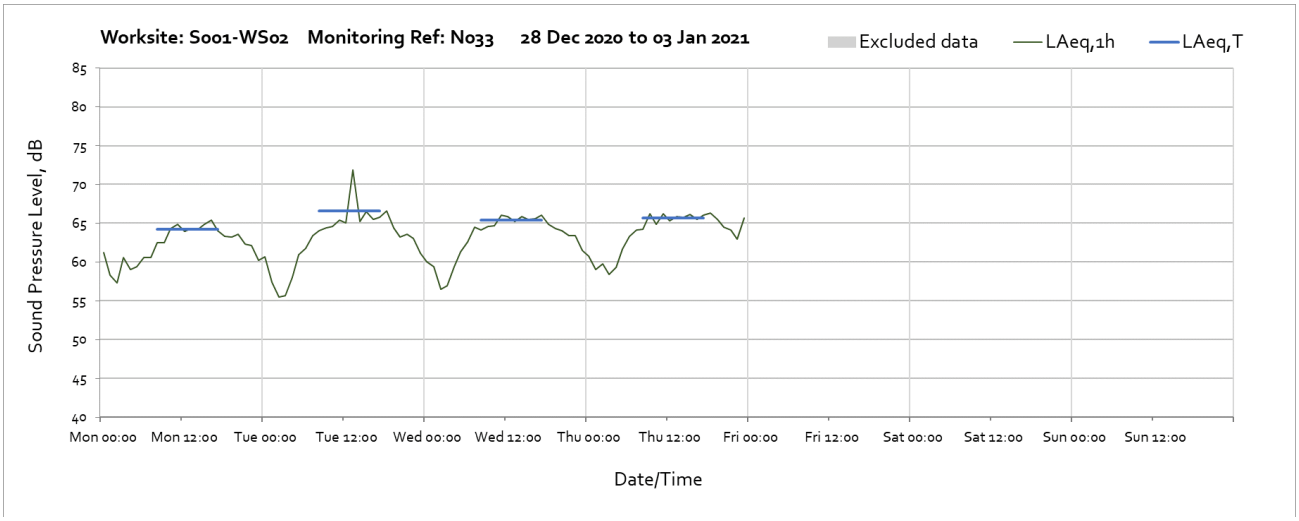
Worksite: S001-WS02 – Monitoring Ref: N033



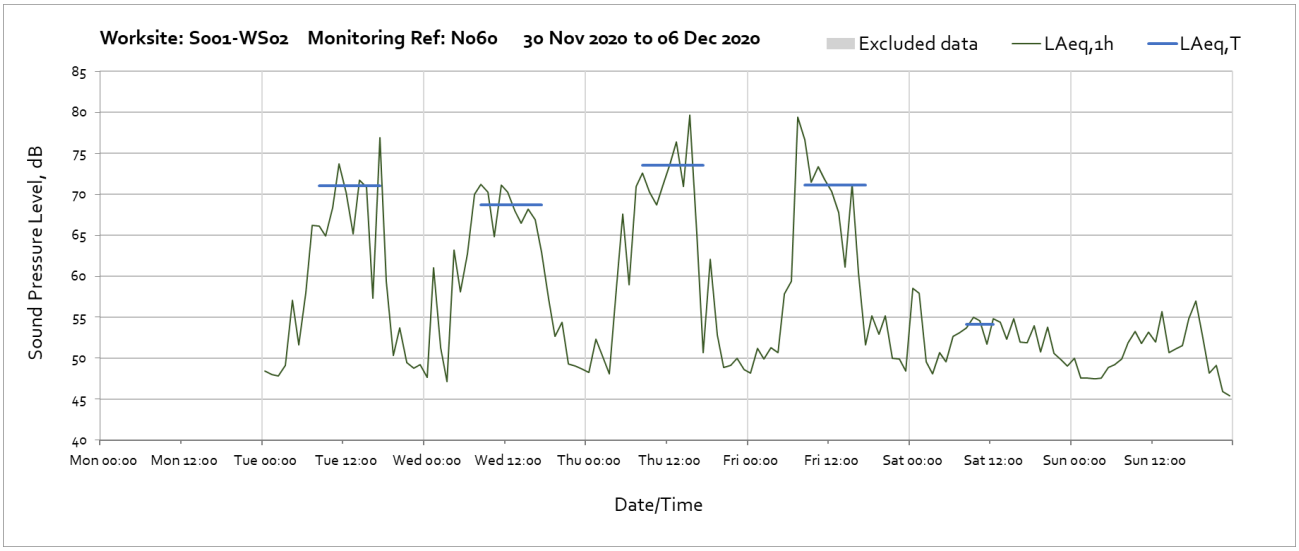


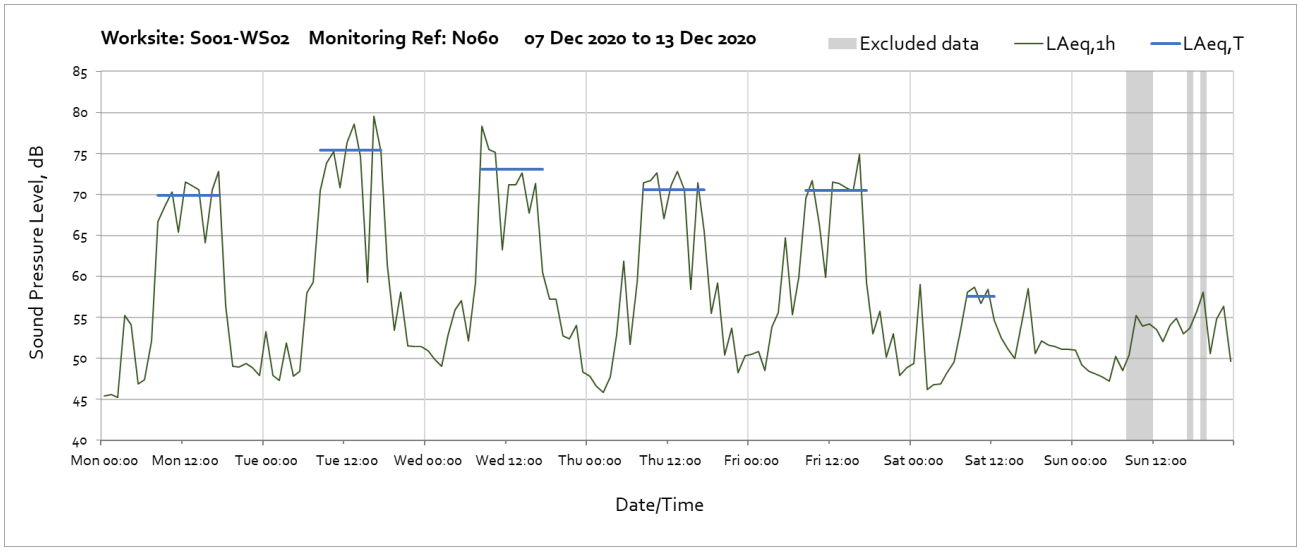






Worksite: S001-WS02 – Monitoring Ref: N060

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Sound Pressure Level, dB
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Mon 12:00
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Tue 12:00
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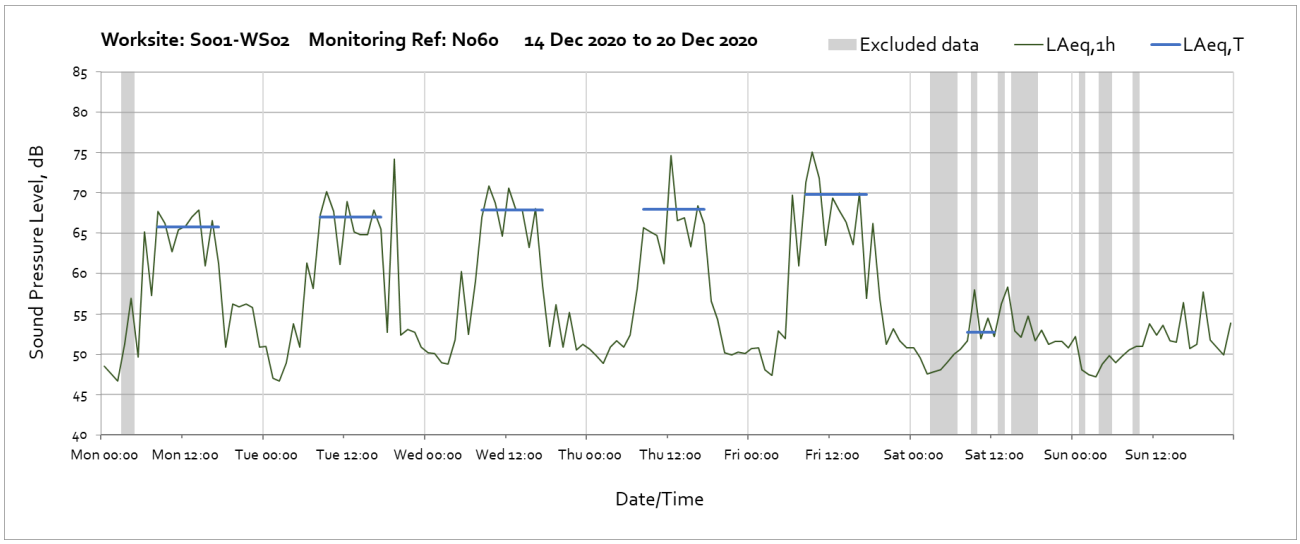
Date/Time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Excluded data
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LAeq,T
Sound Pressure Level, dB
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80
75
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Mon 12:00
Tue 00:00
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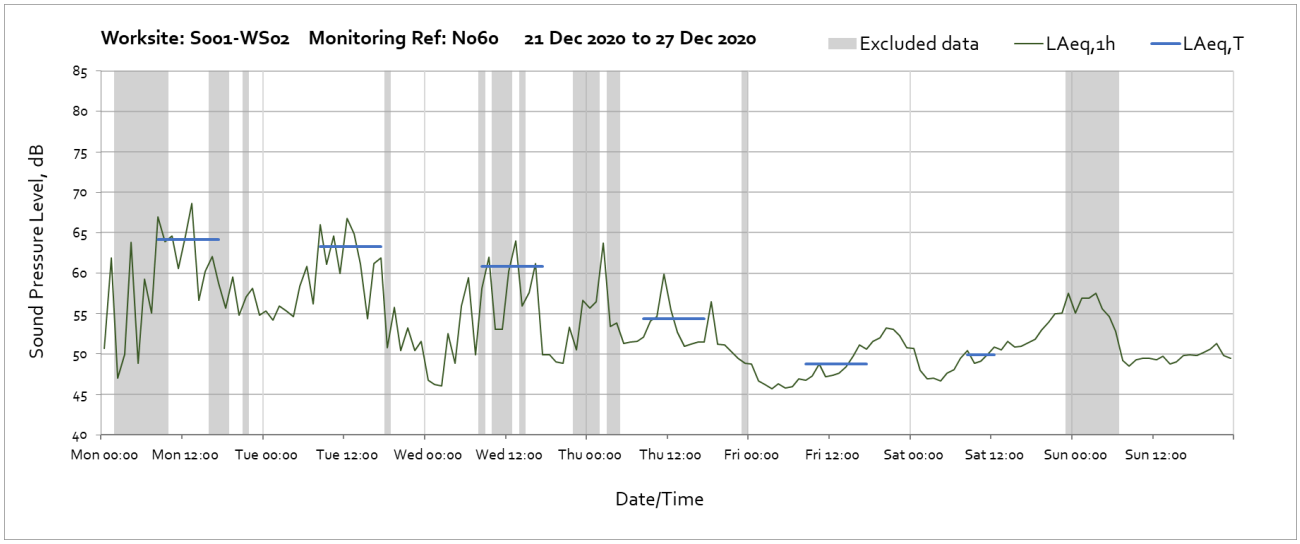
Date/Time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Sound Pressure Level, dB
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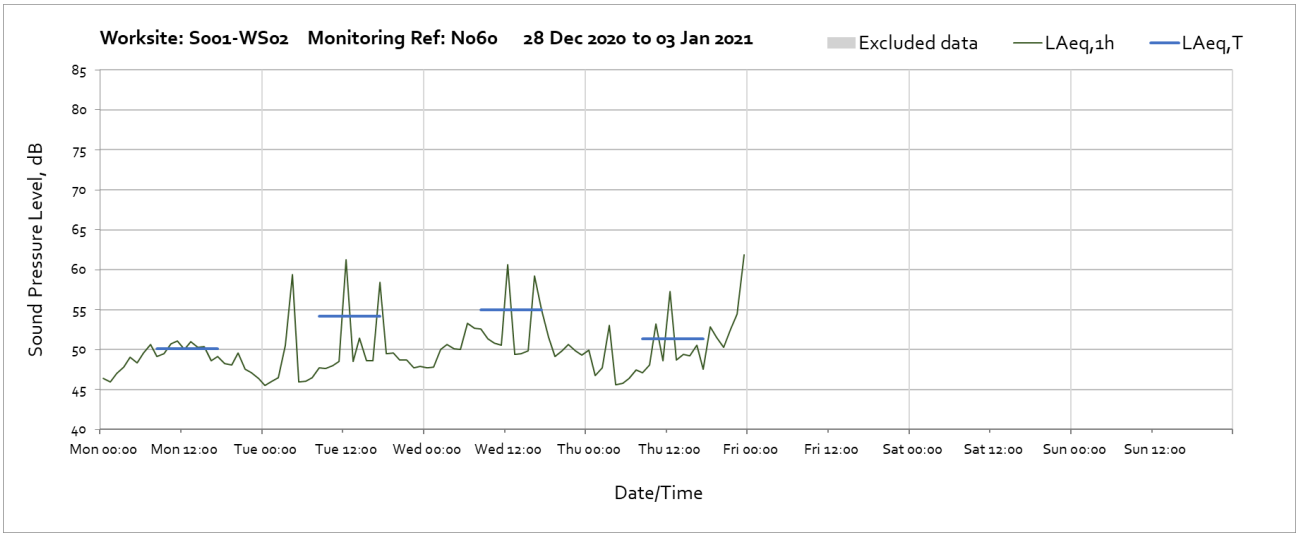
Date/Time



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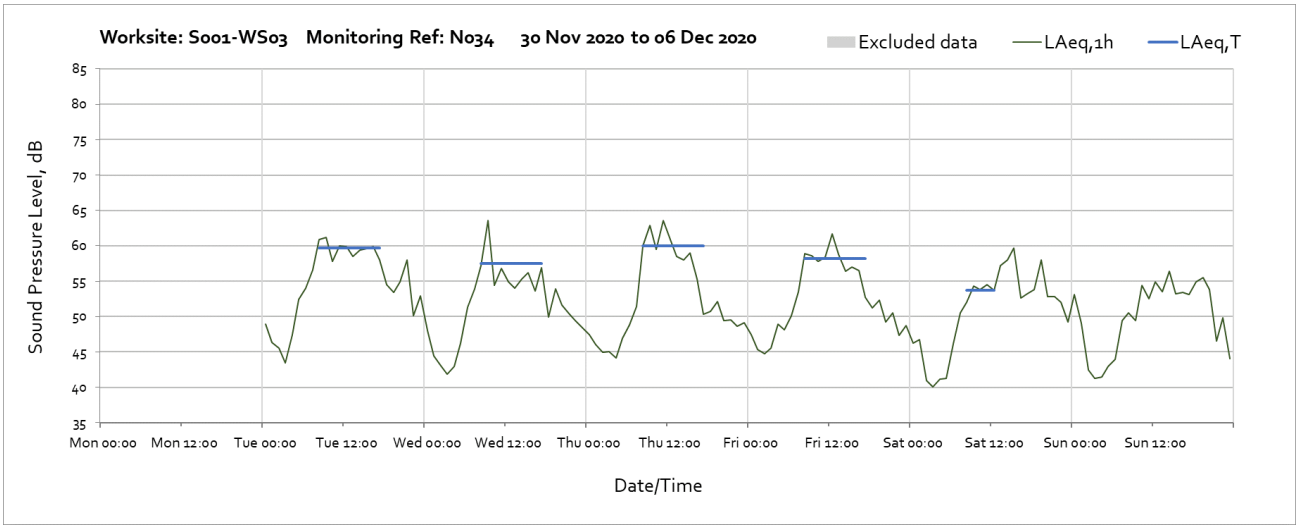

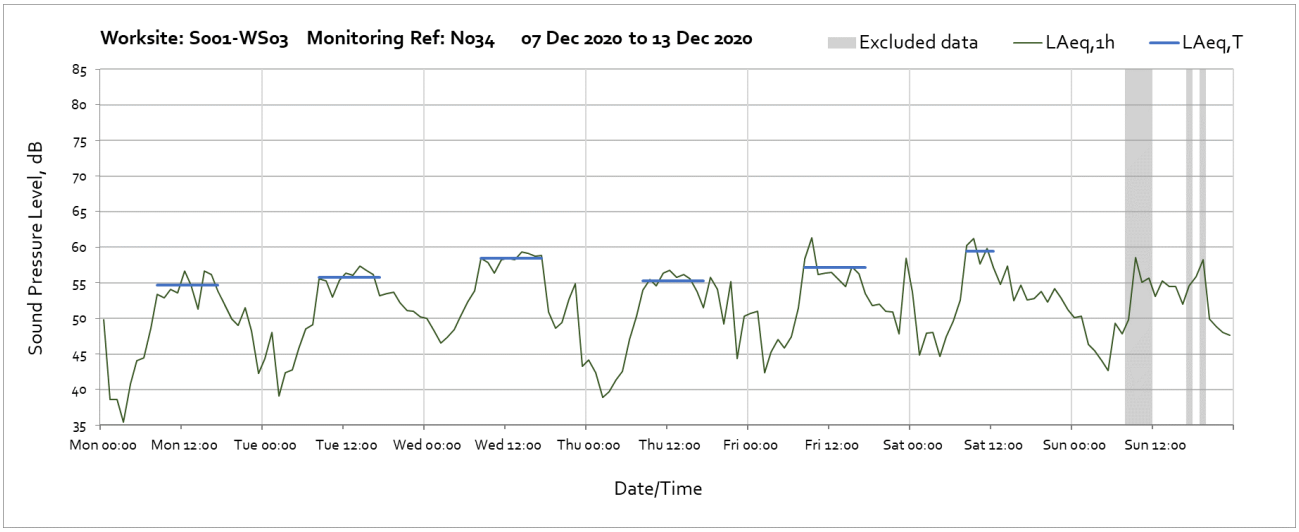

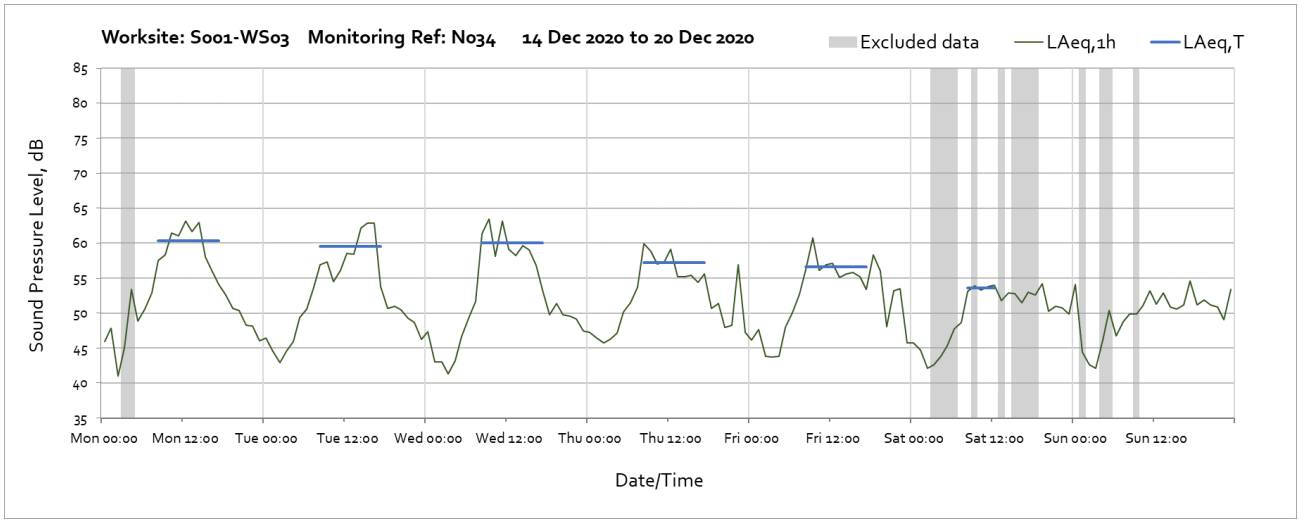
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LAeq,T
Sound Pressure Level, dB
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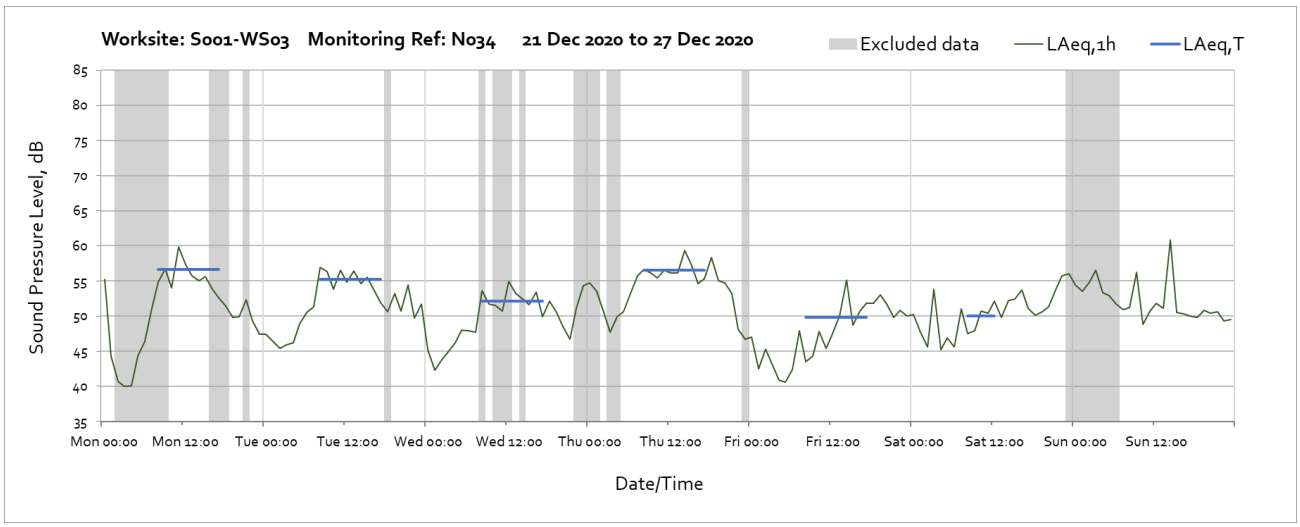
Date/Time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Excluded data
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LAeq,T
Sound Pressure Level, dB
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80
75
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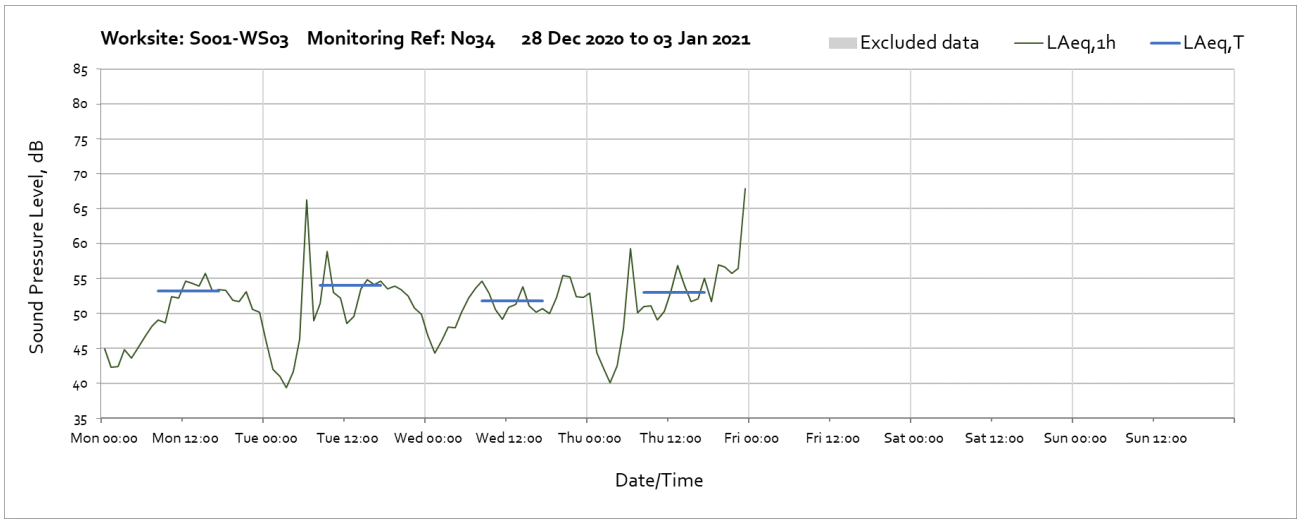
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LAeq,T
Sound Pressure Level, dB
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75
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Date/Time

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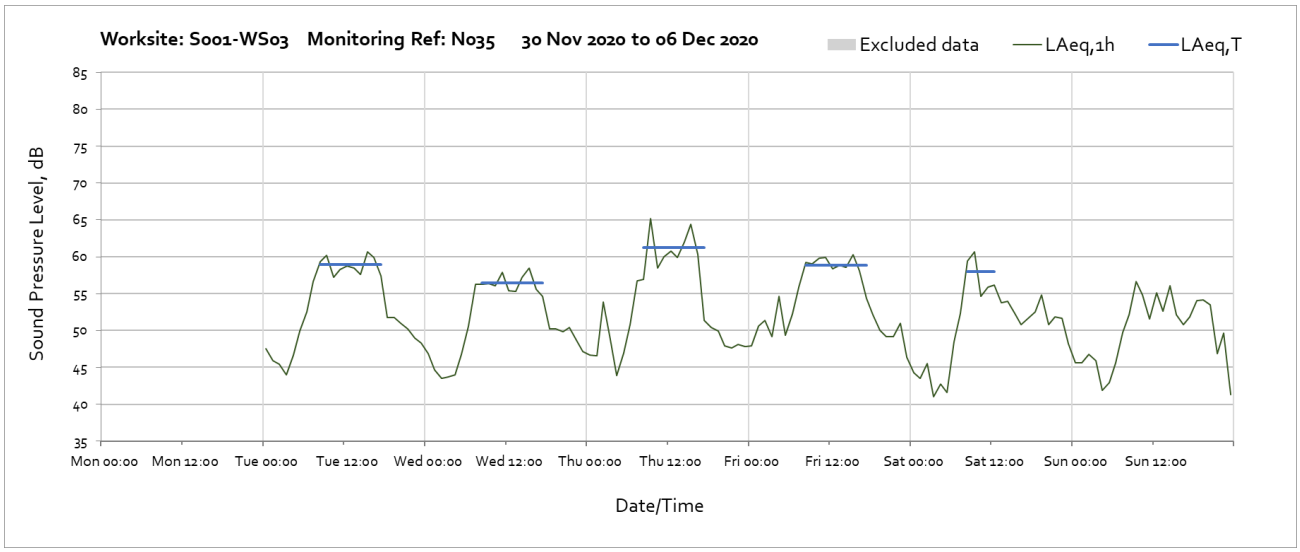

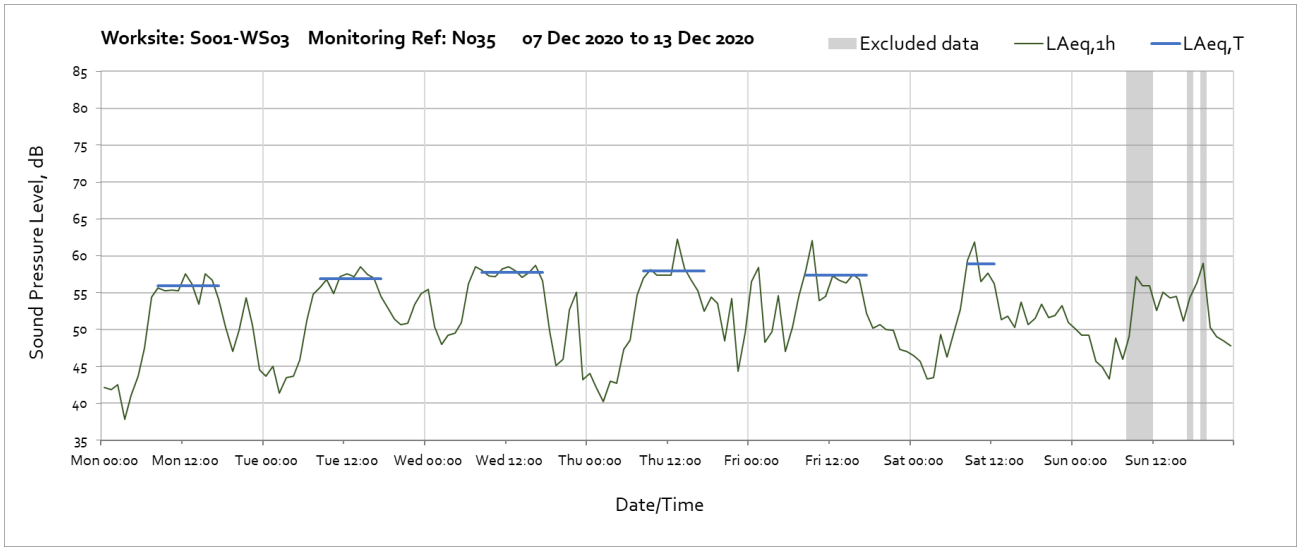

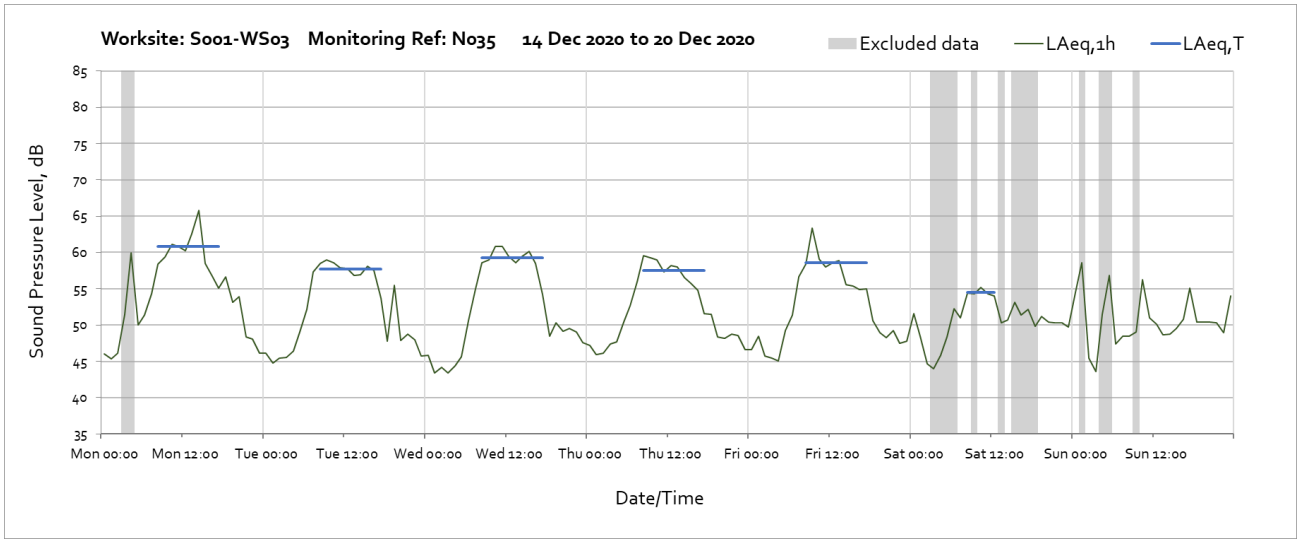

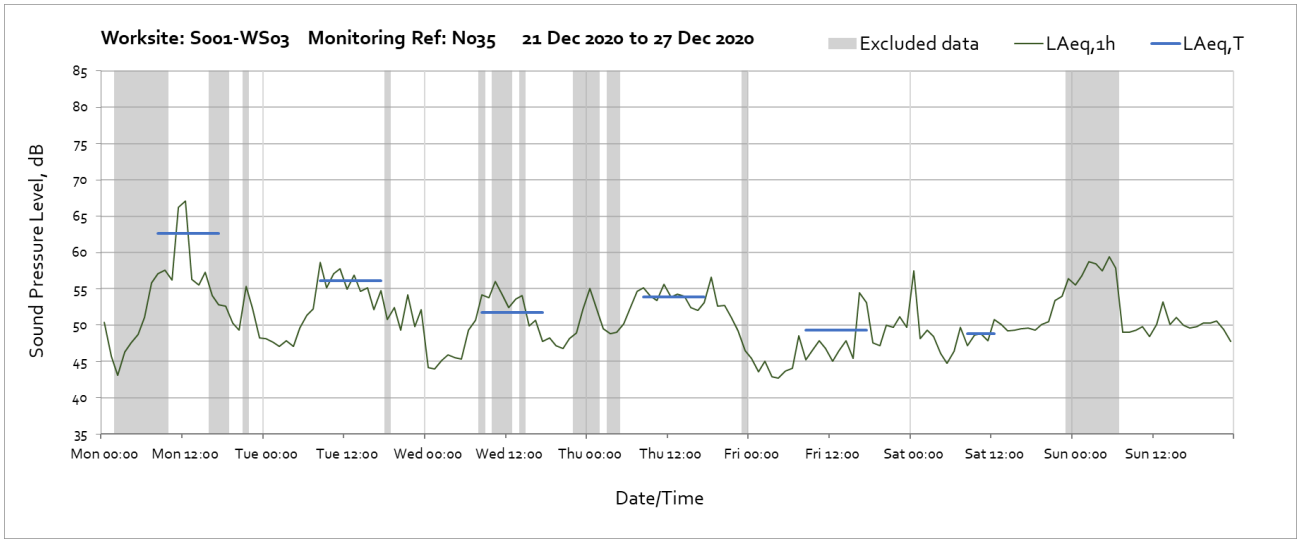

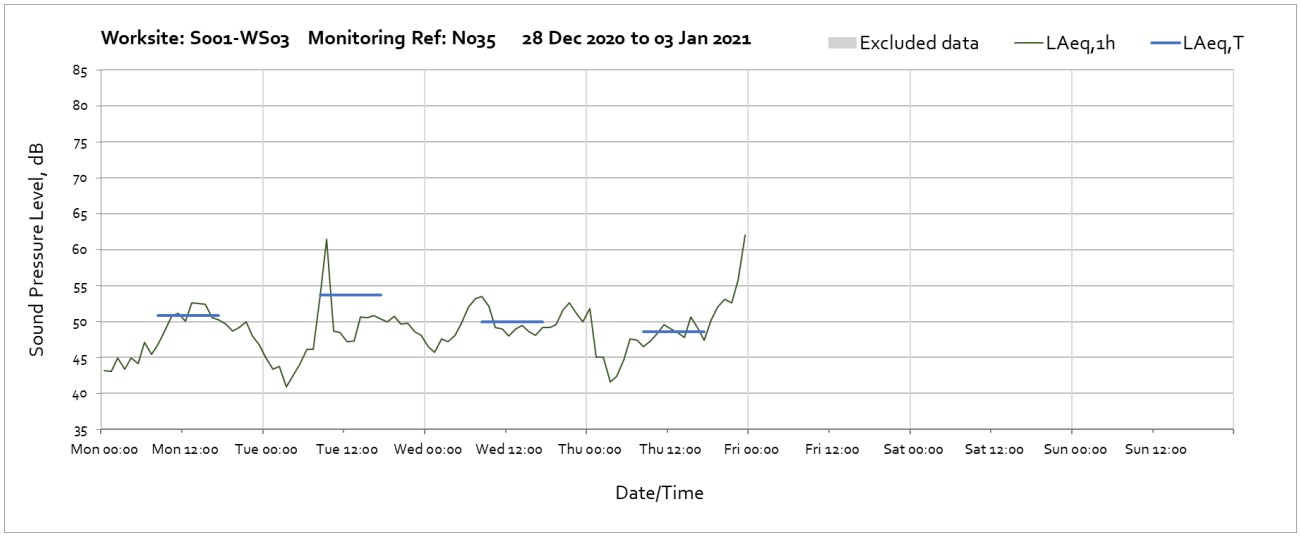

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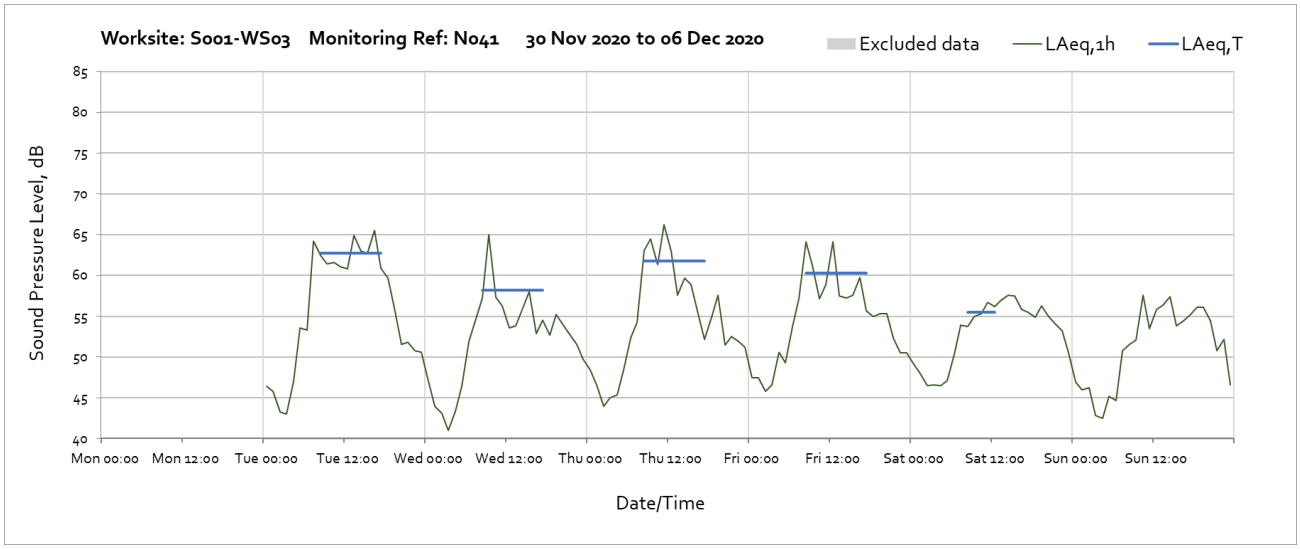

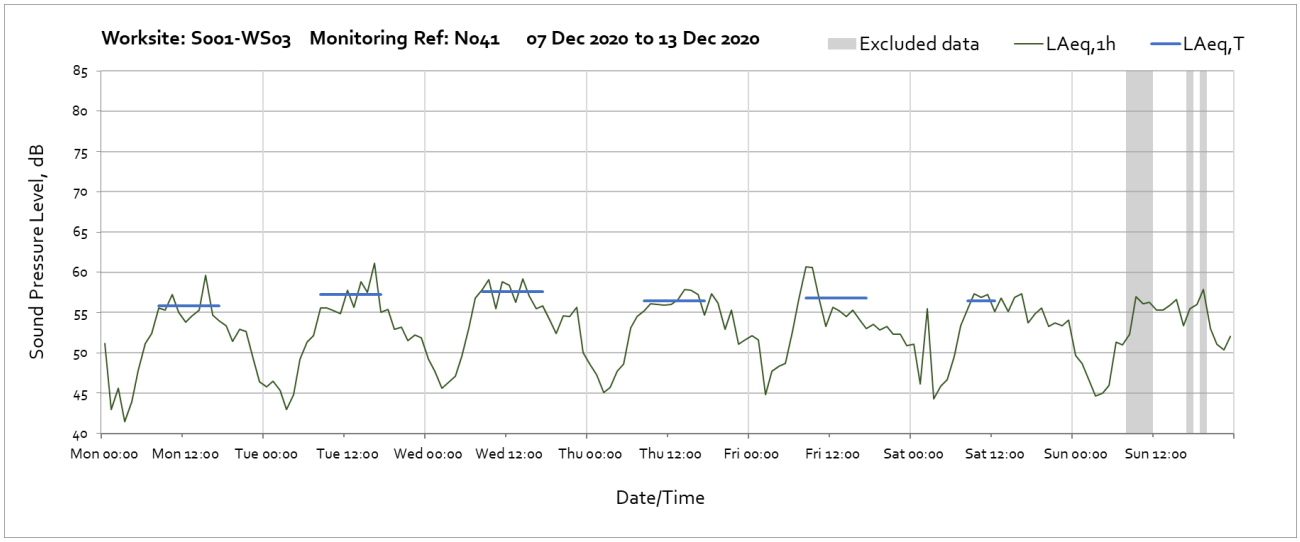
Worksite: S001-WS03 Monitoring Ref: N041 07 Dec 2020 to 13 Dec 2020
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Sound Pressure Level, dB
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75
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Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
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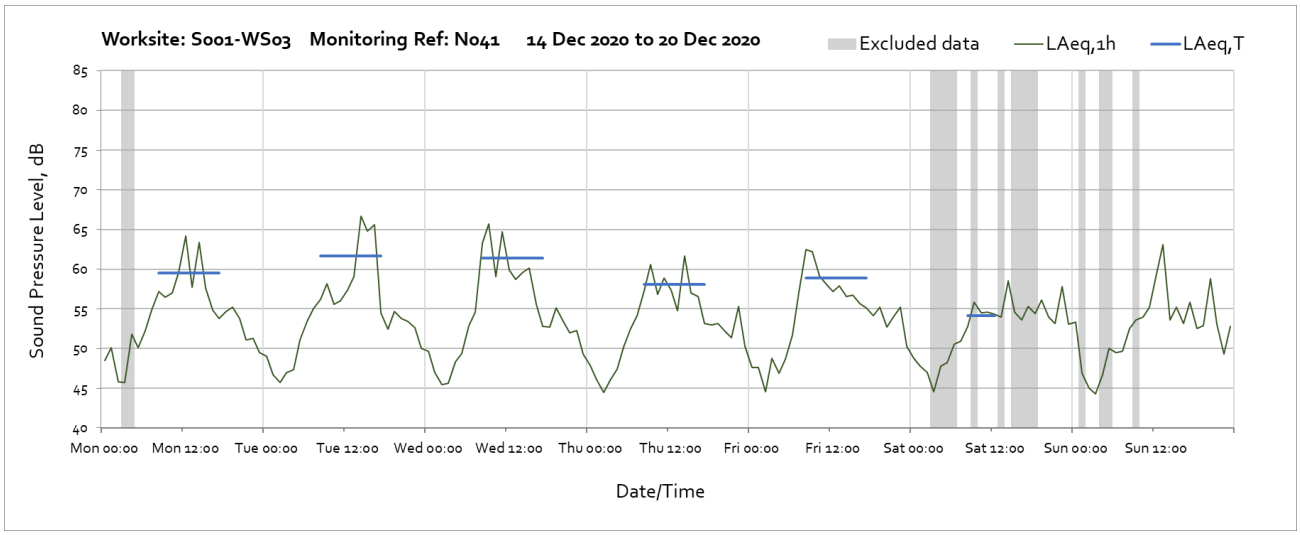
Date/Time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Excluded data
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LAeq,T
Sound Pressure Level, dB
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80
75
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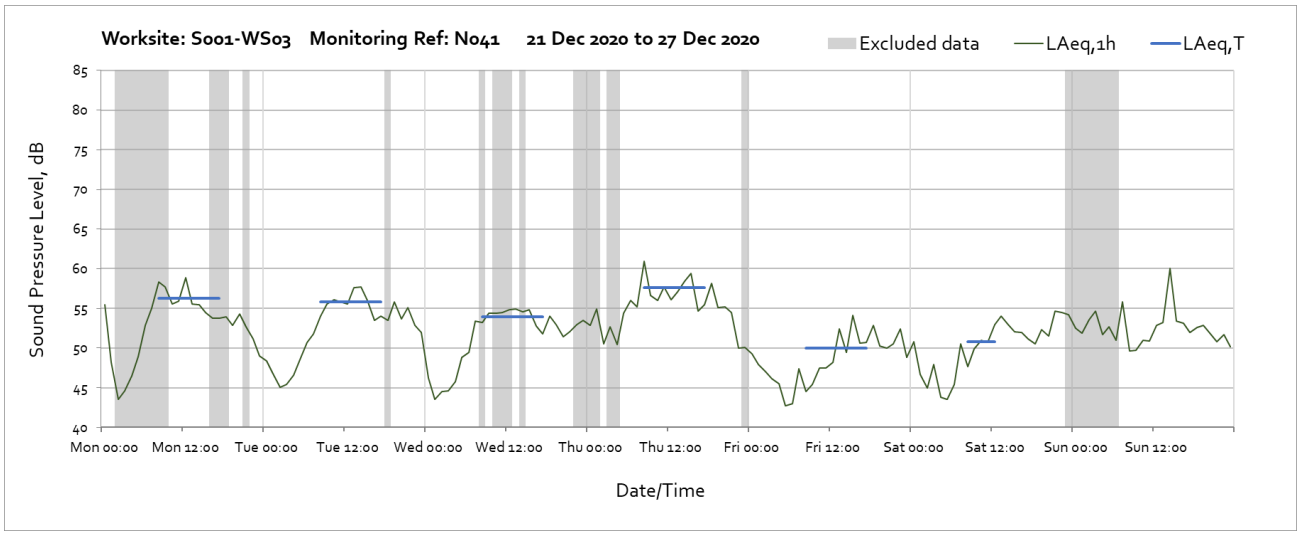
Worksite: S001-WS03 Monitoring Ref: N041 21 Dec 2020 to 27 Dec 2020
Excluded data
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LAeq,T
Sound Pressure Level, dB
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80
75
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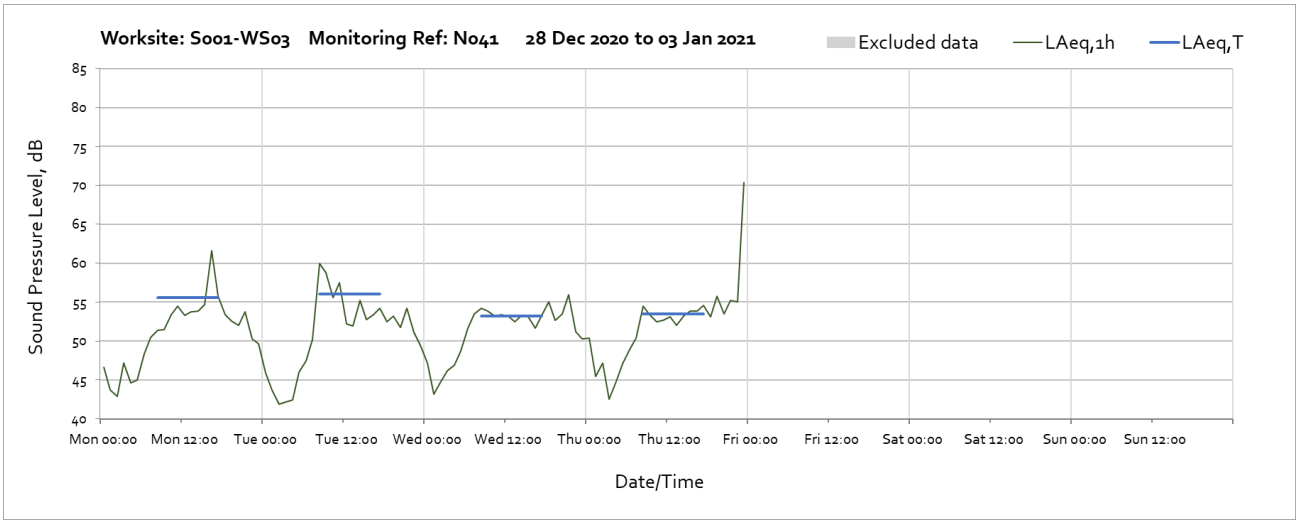
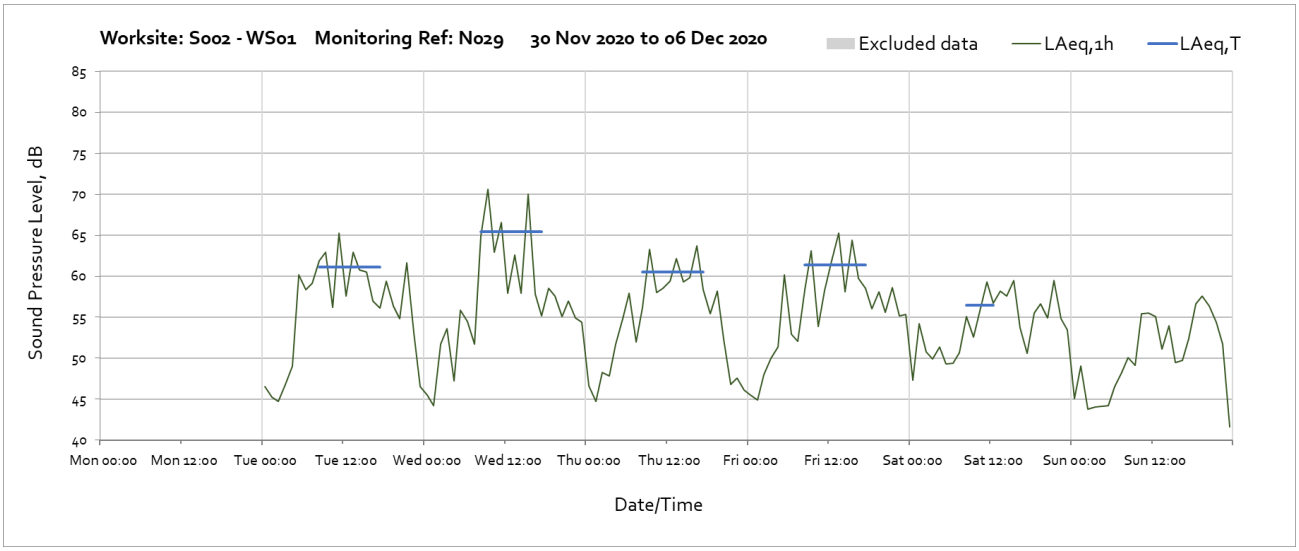
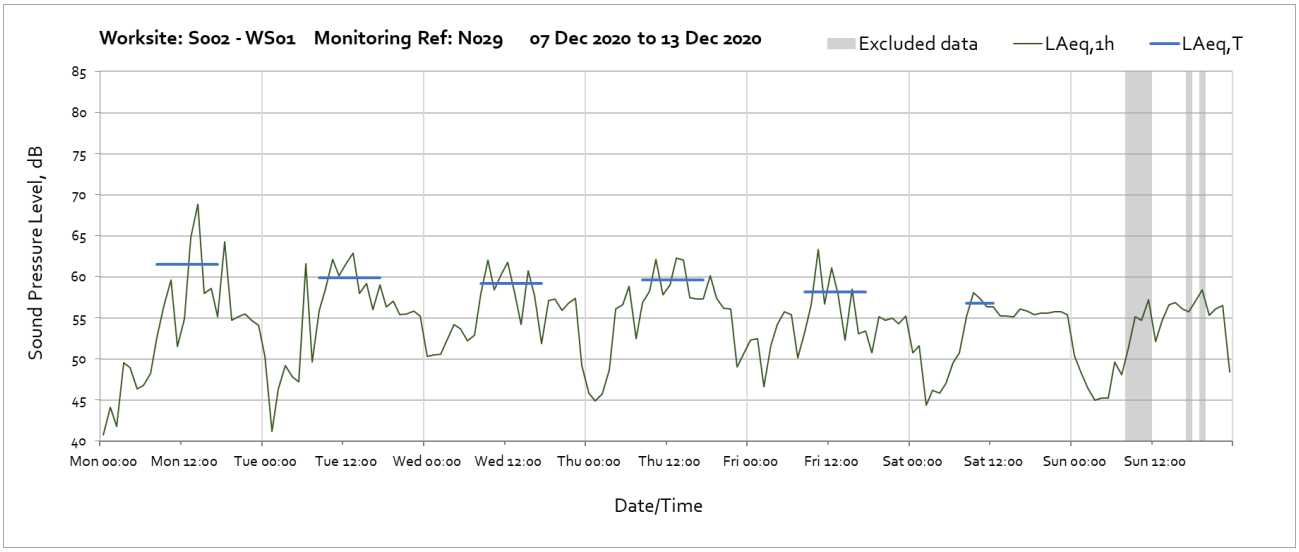
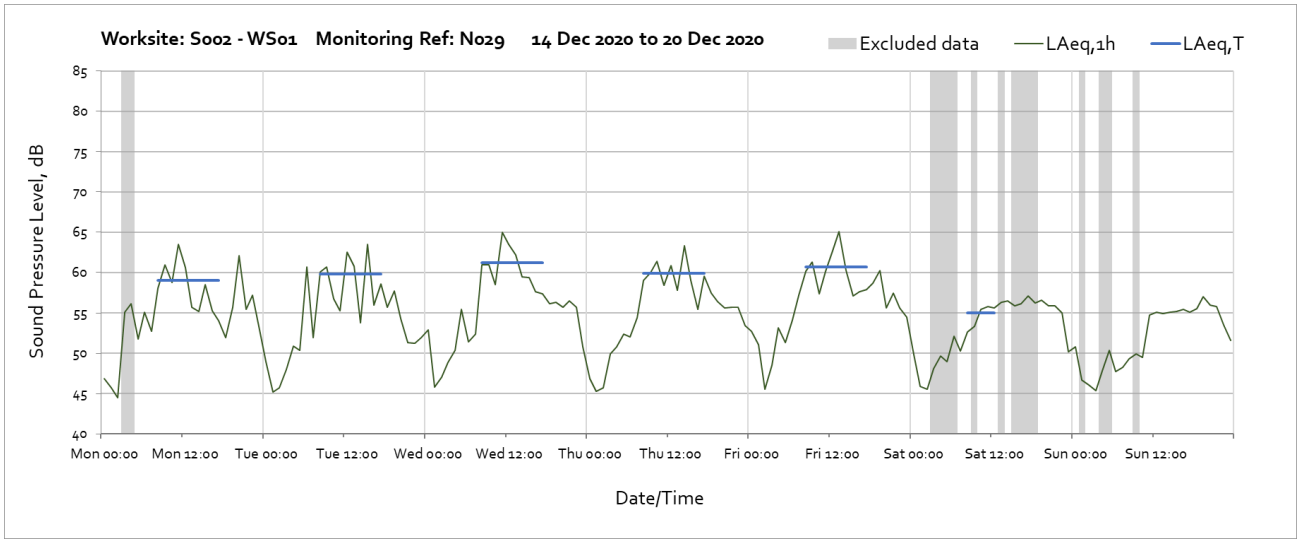
Date/Time



Worksite: S002-WS01 – Monitoring Ref: N029






Worksite: S002 - WS01 Monitoring Ref: N029 14 Dec 2020 to 20 Dec 2020
Excluded data
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LAeq,T
Sound Pressure Level, dB
85
80
75
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Tue 00:00
Tue 12:00
Wed 00:00
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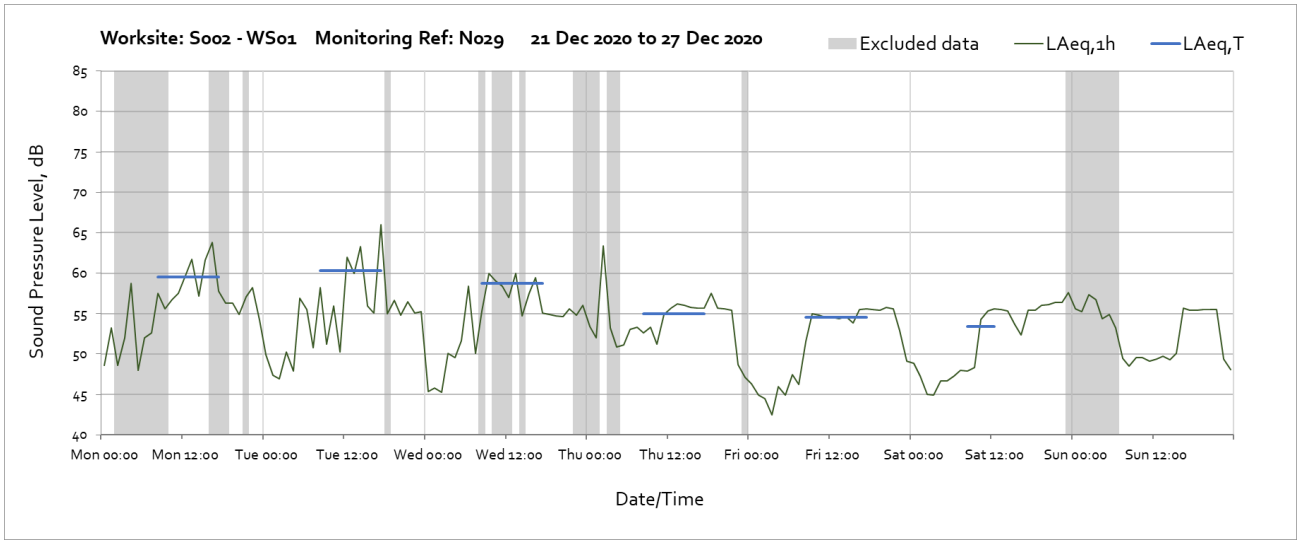
Sun 00:00
Sun 12:00
Date/Time


Worksite: S002 - WS01 Monitoring Ref: N029 21 Dec 2020 to 27 Dec 2020
Excluded data
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LAeq,T
Sound Pressure Level, dB
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75
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Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
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Sat 12:00
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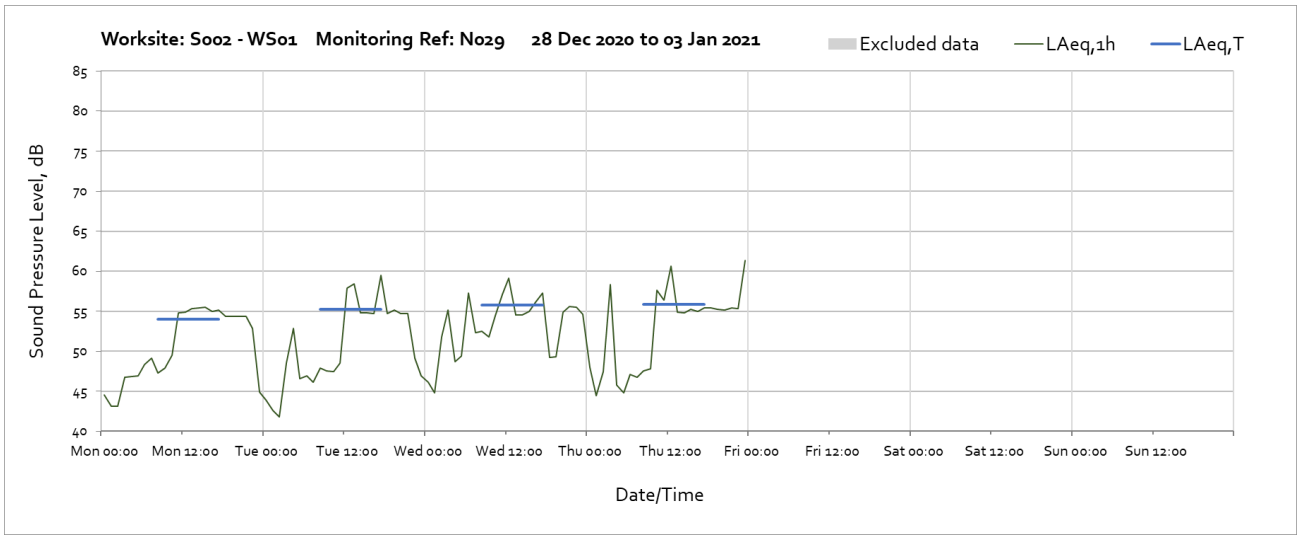
Date/Time


Worksite: S002 - WS01 Monitoring Ref: N029 28 Dec 2020 to 03 Jan 2021
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
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75
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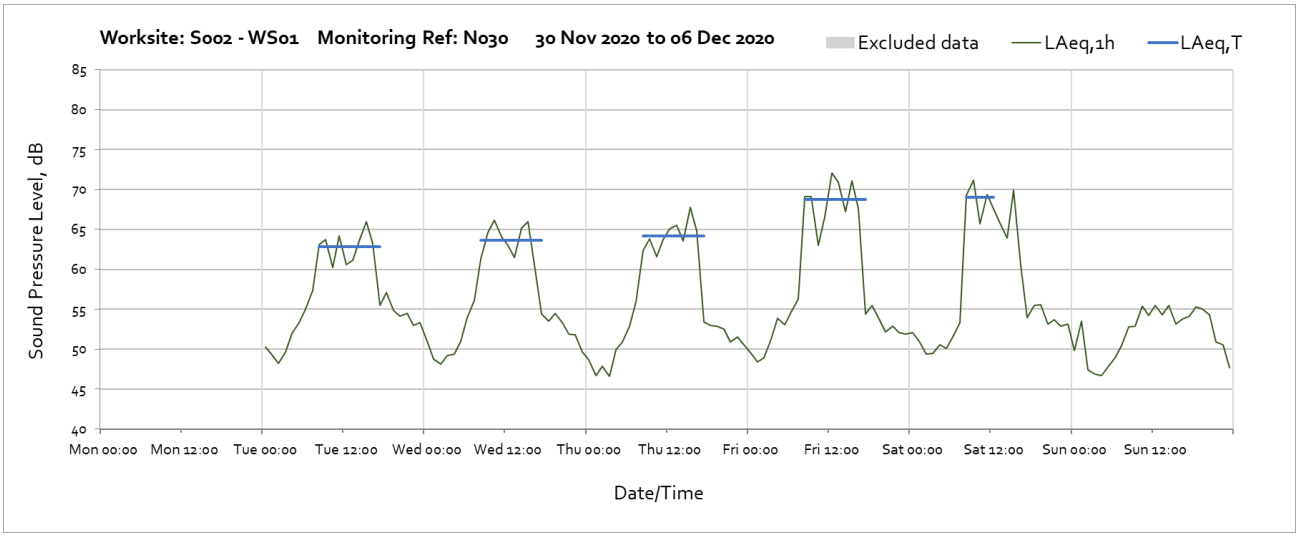
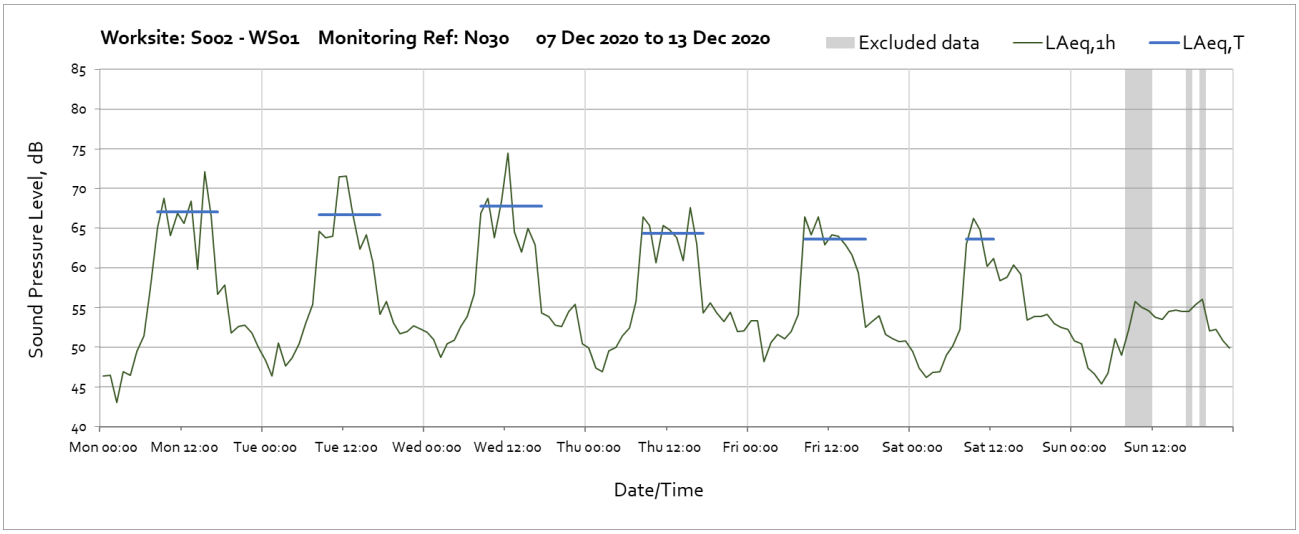
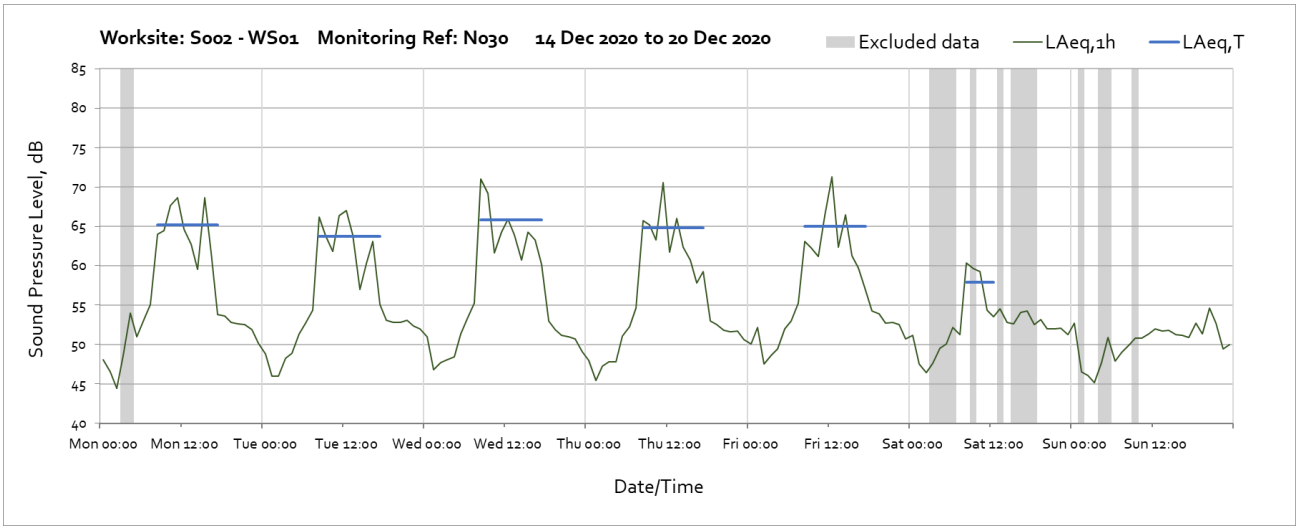
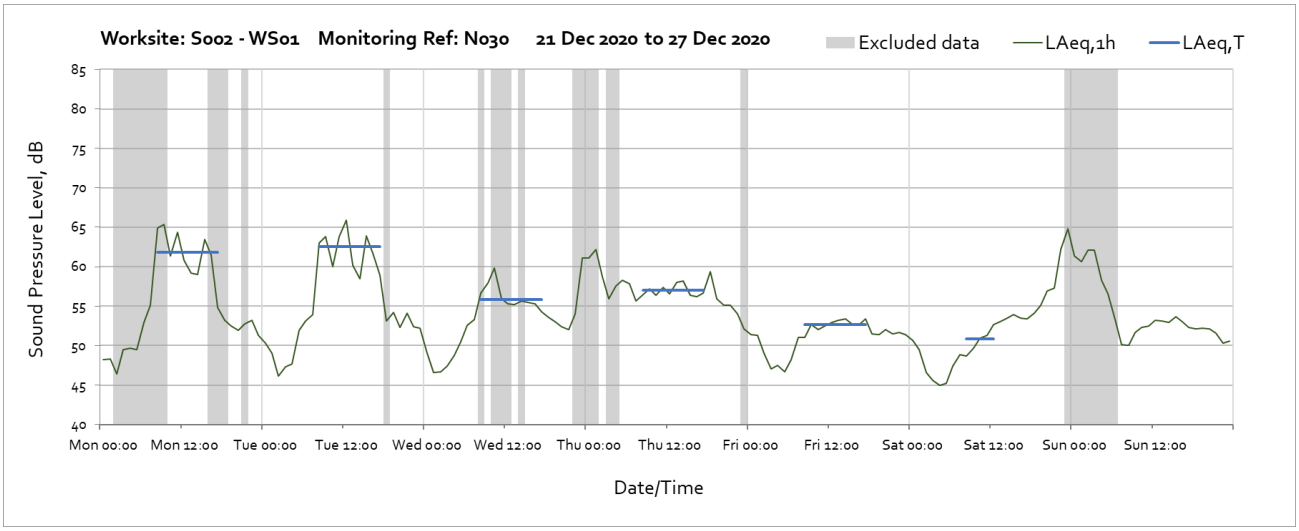
Date/Time

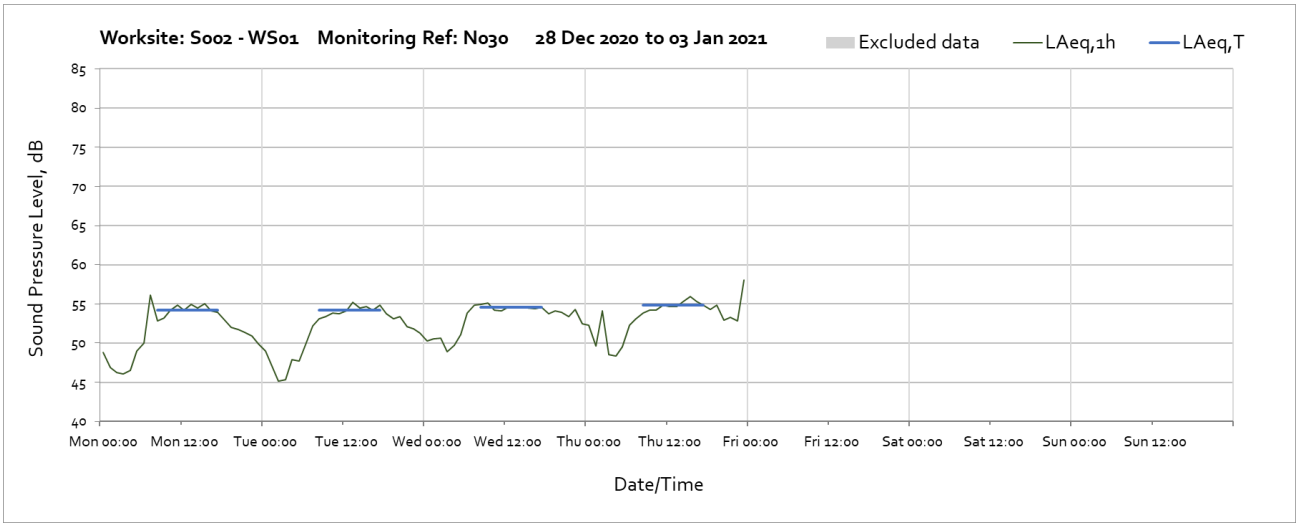
Worksite: S002-WS01 – Monitoring Ref: N030



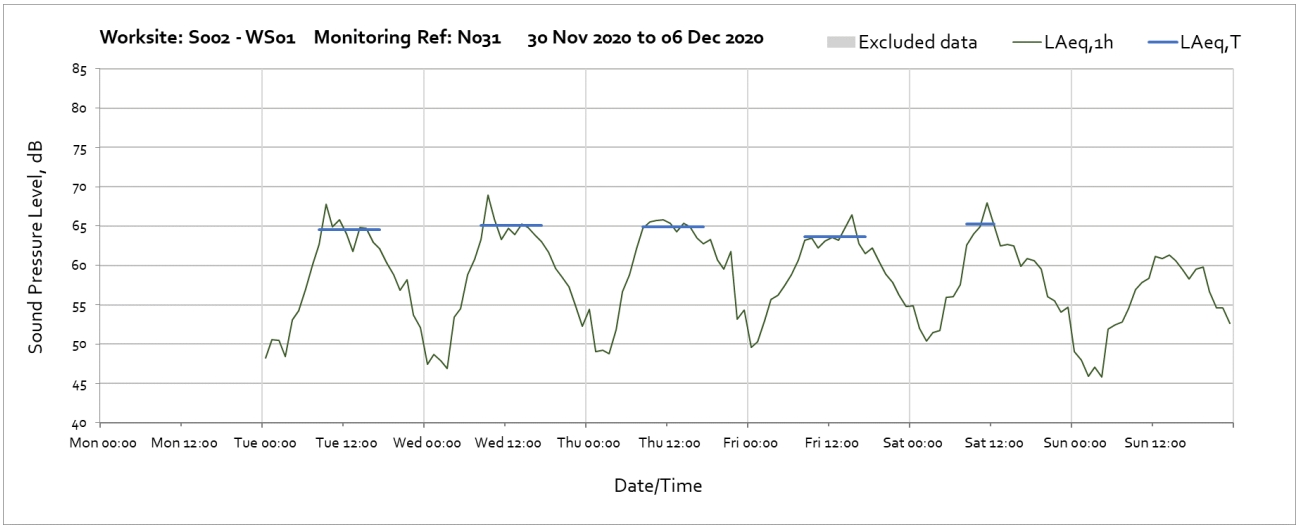


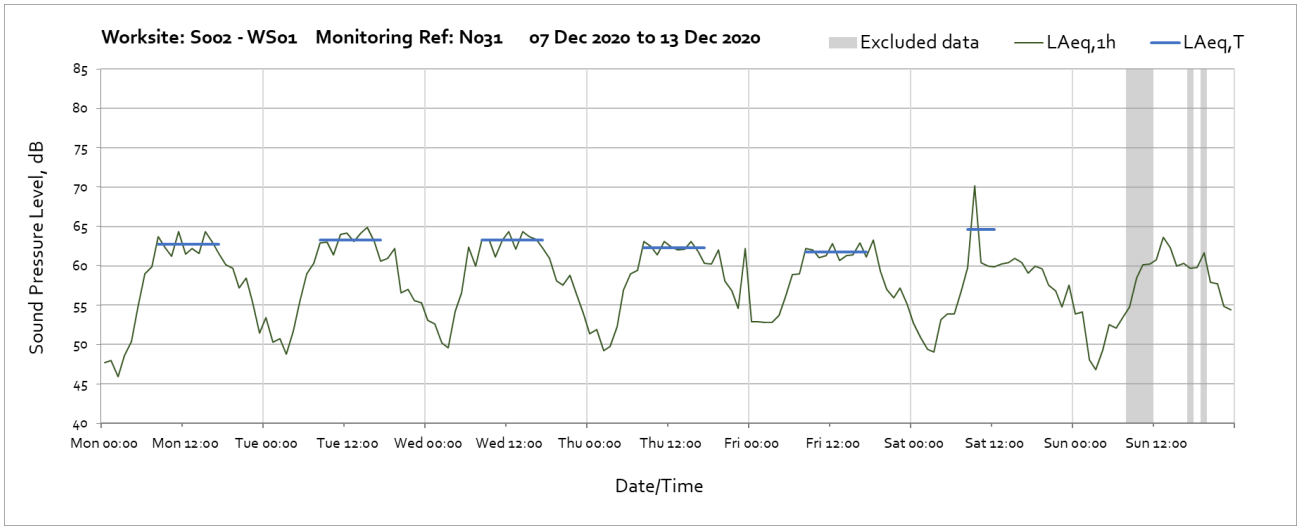






Worksite: S002-WS01 – Monitoring Ref: N031




Worksite: S002 - WS01 Monitoring Ref: N031 07 Dec 2020 to 13 Dec 2020
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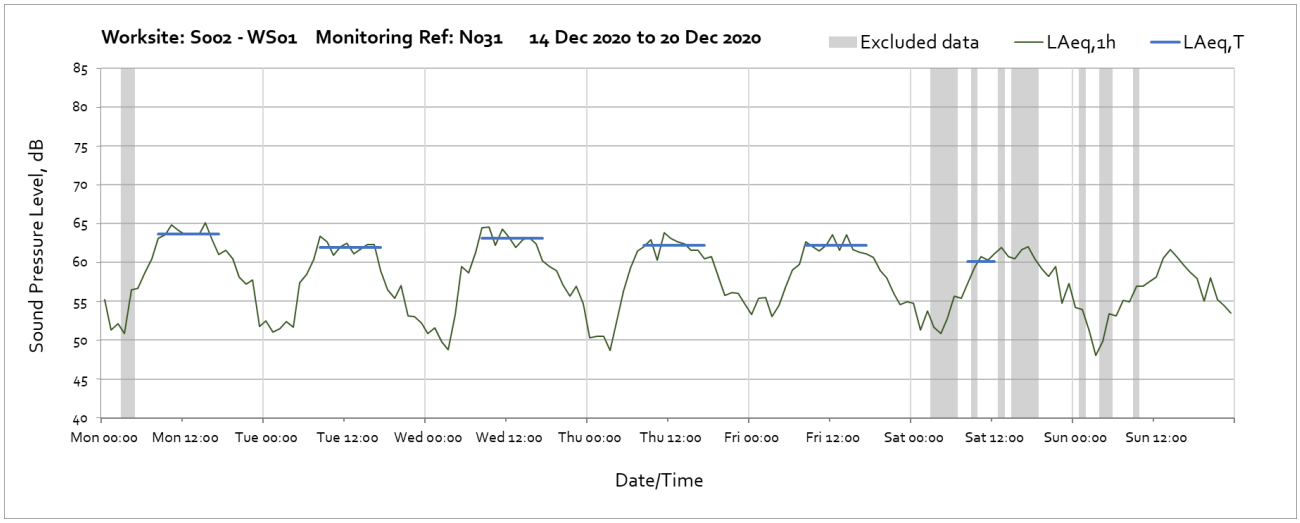
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Sound Pressure Level, dB
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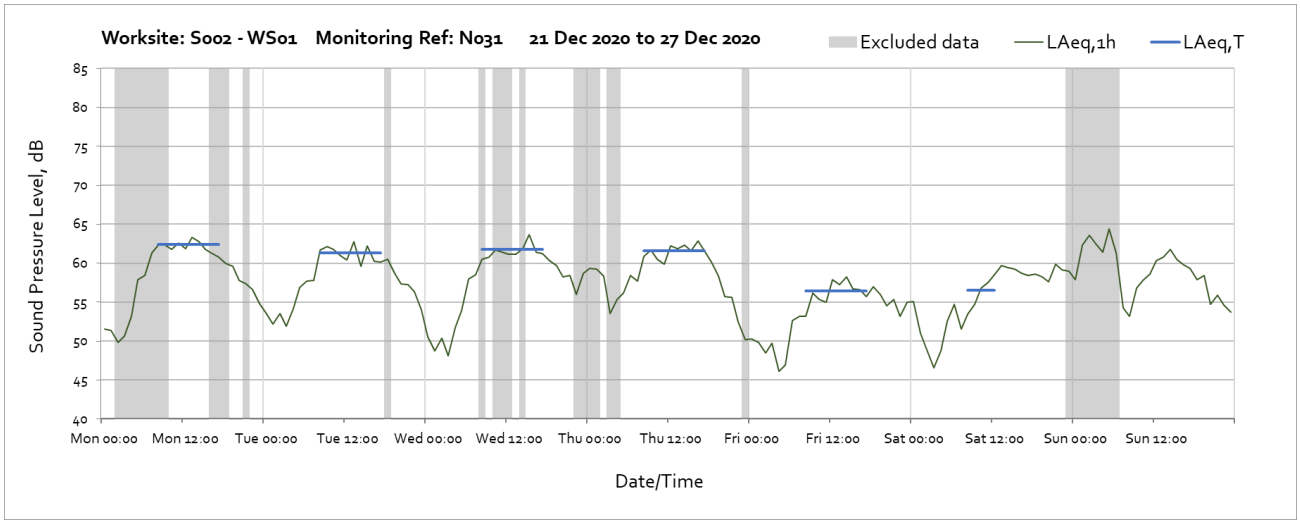
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Sound Pressure Level, dB
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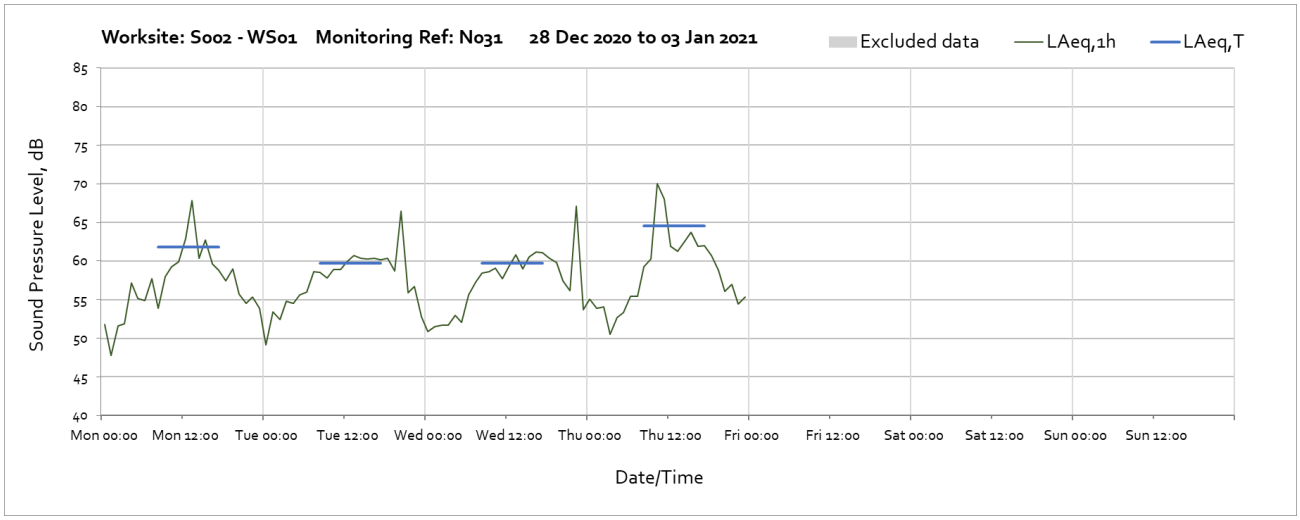
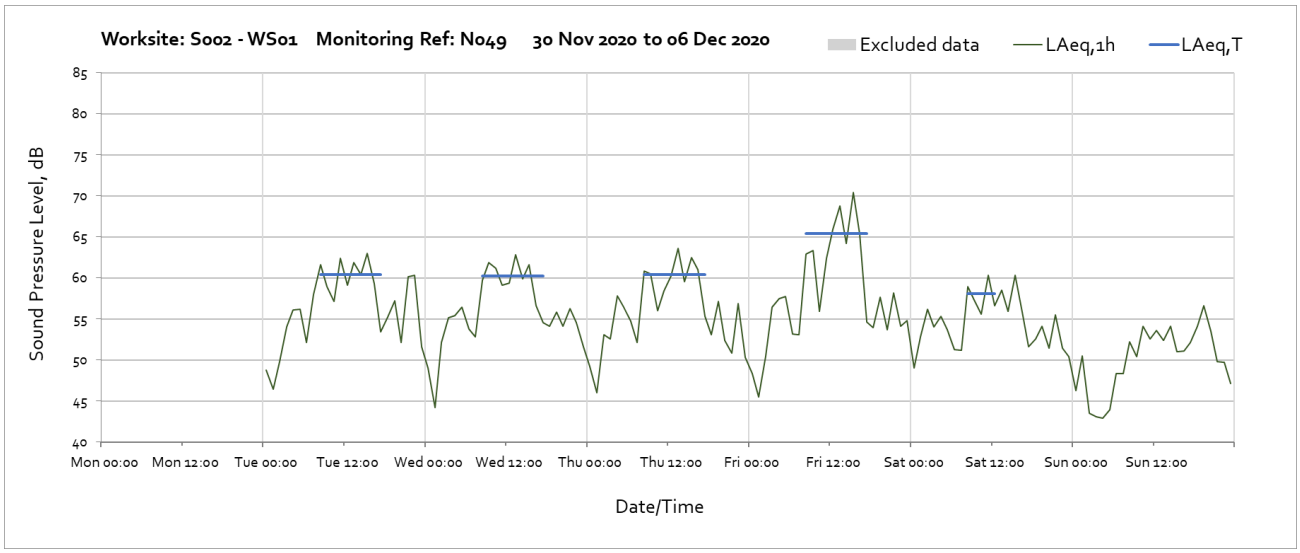
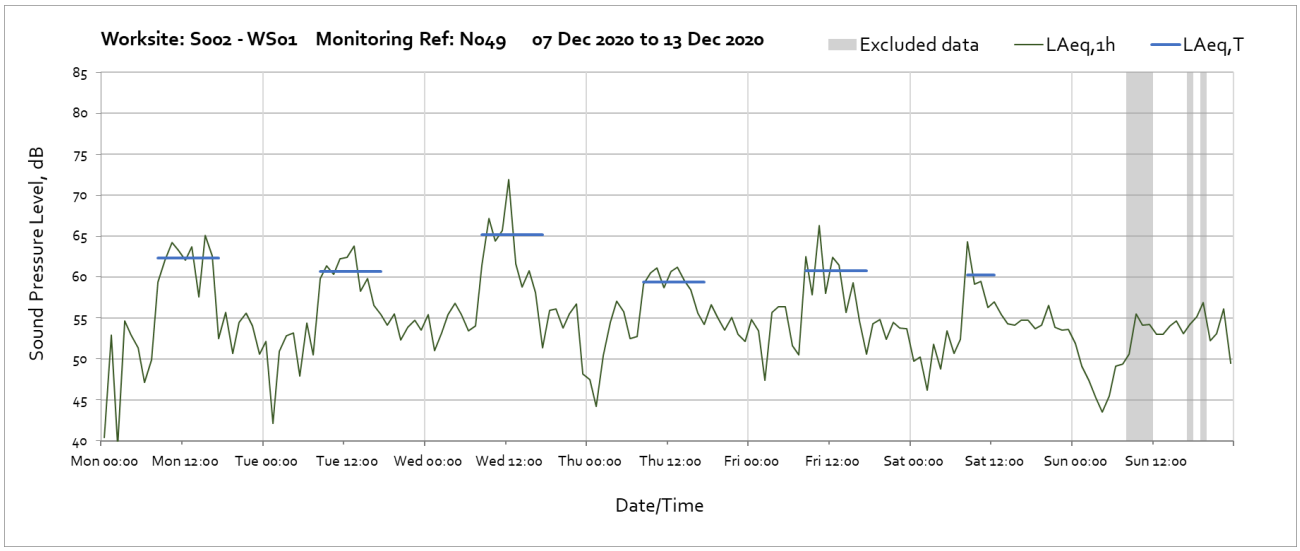
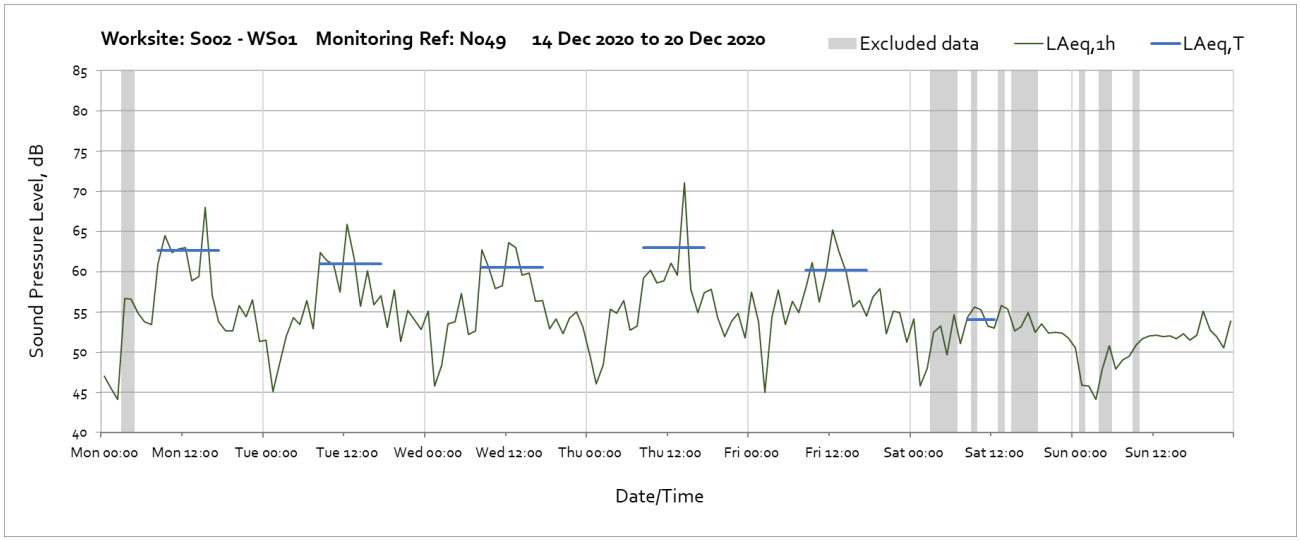


Worksite: S002-WS01 – Monitoring Ref: N049






Worksite: S002 - WS01 Monitoring Ref: N049 14 Dec 2020 to 20 Dec 2020
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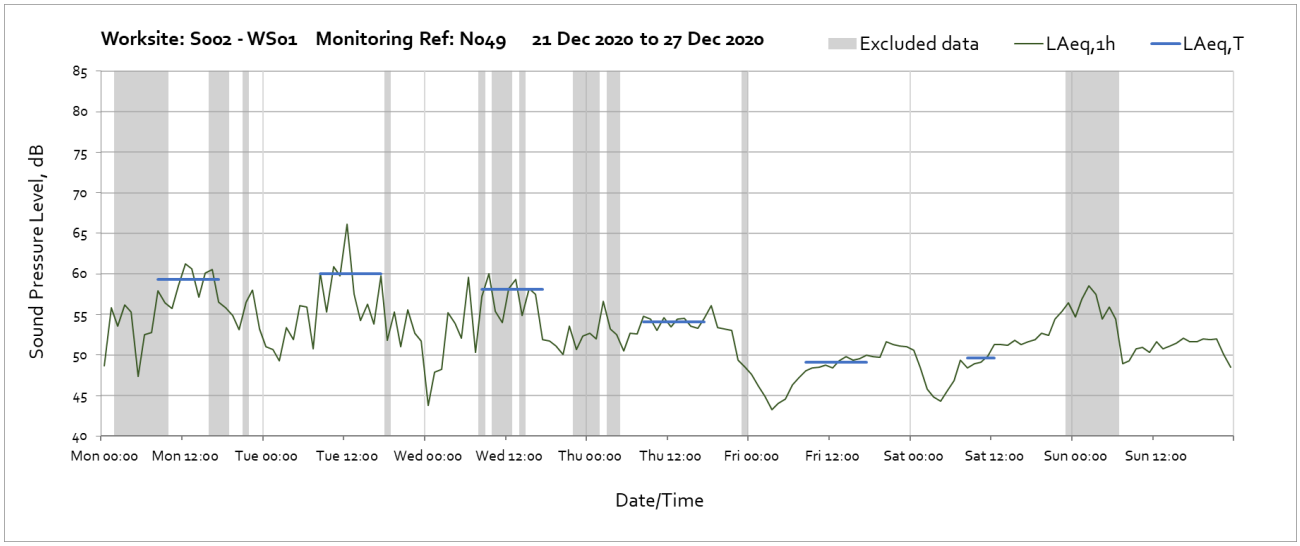
Worksite: S002 - WS01 Monitoring Ref: N049 21 Dec 2020 to 27 Dec 2020
Excluded data
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Sound Pressure Level, dB
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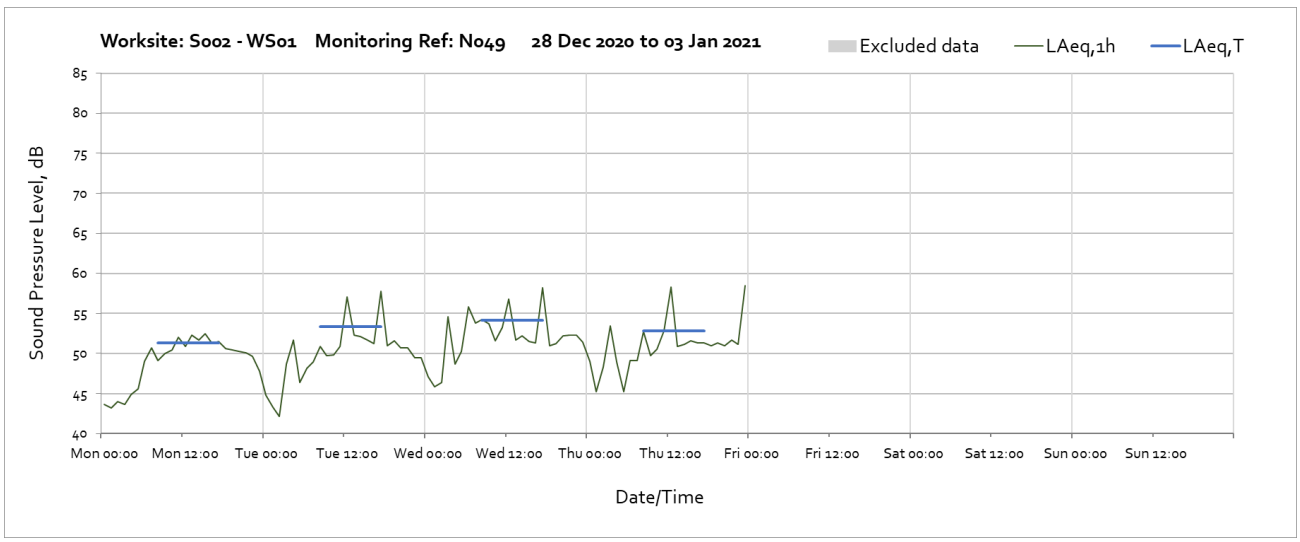
Worksite: S002 - WS01 Monitoring Ref: N049 28 Dec 2020 to 03 Jan 2021
Excluded data
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Sound Pressure Level, dB
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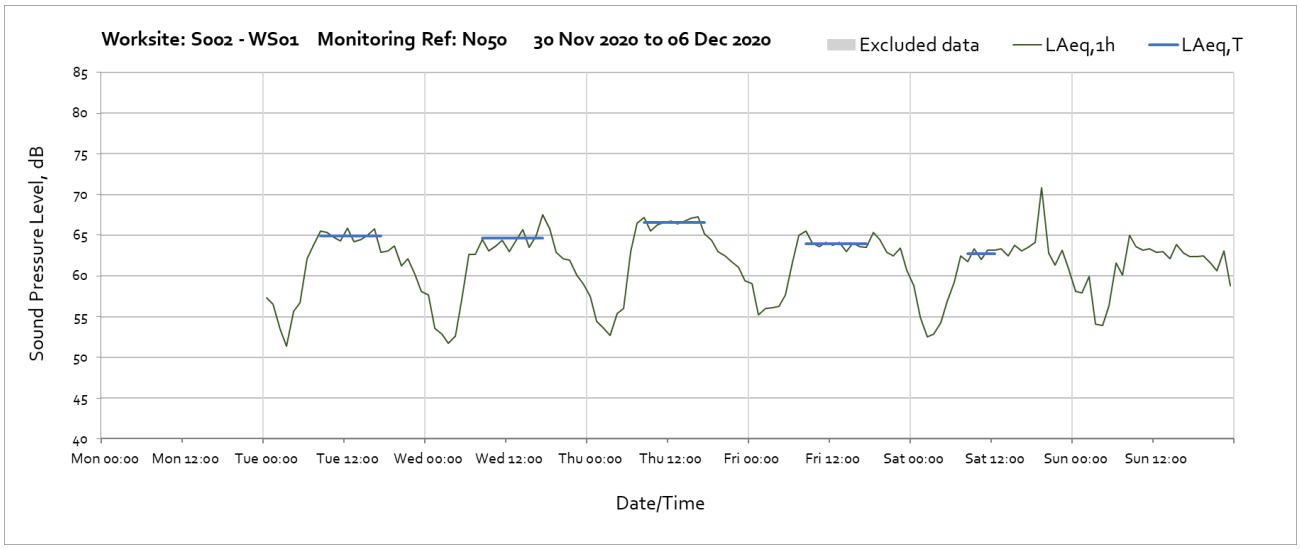
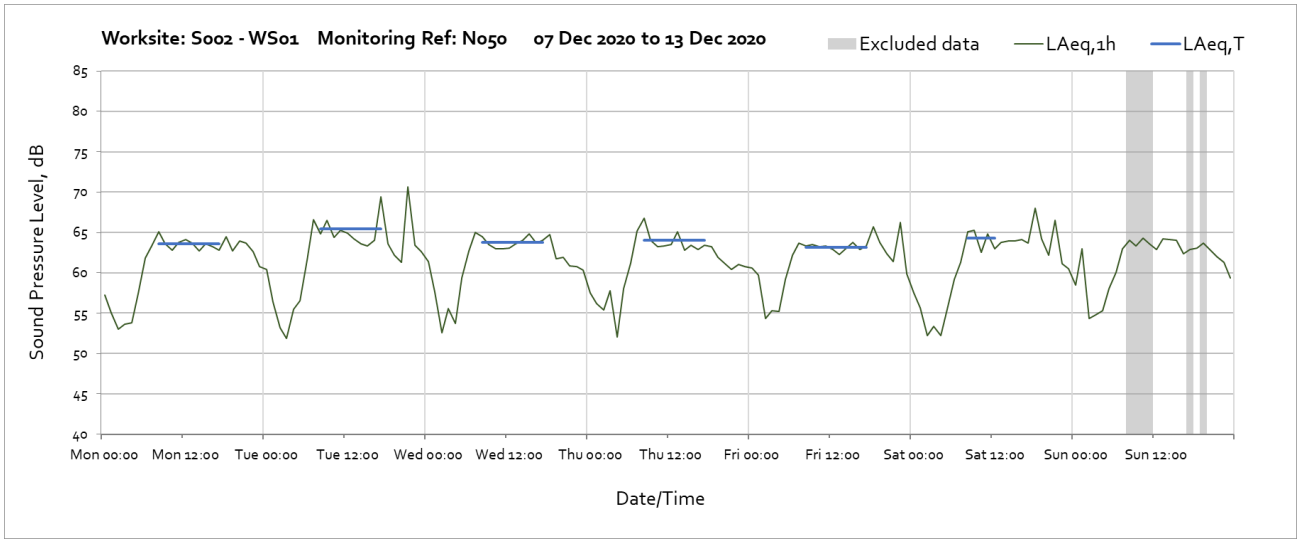
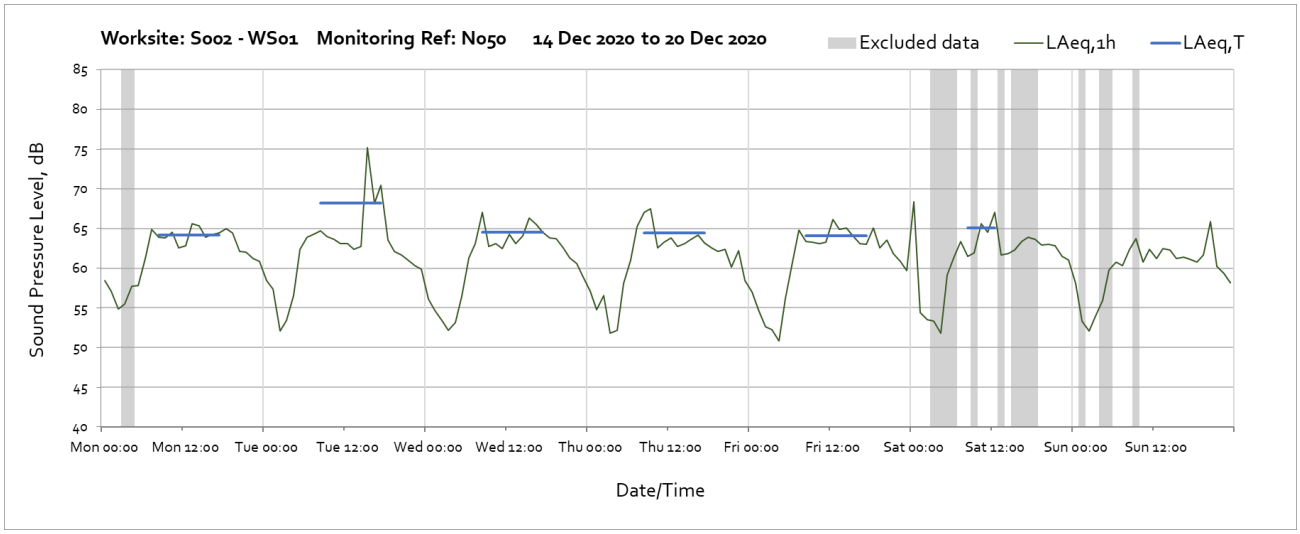
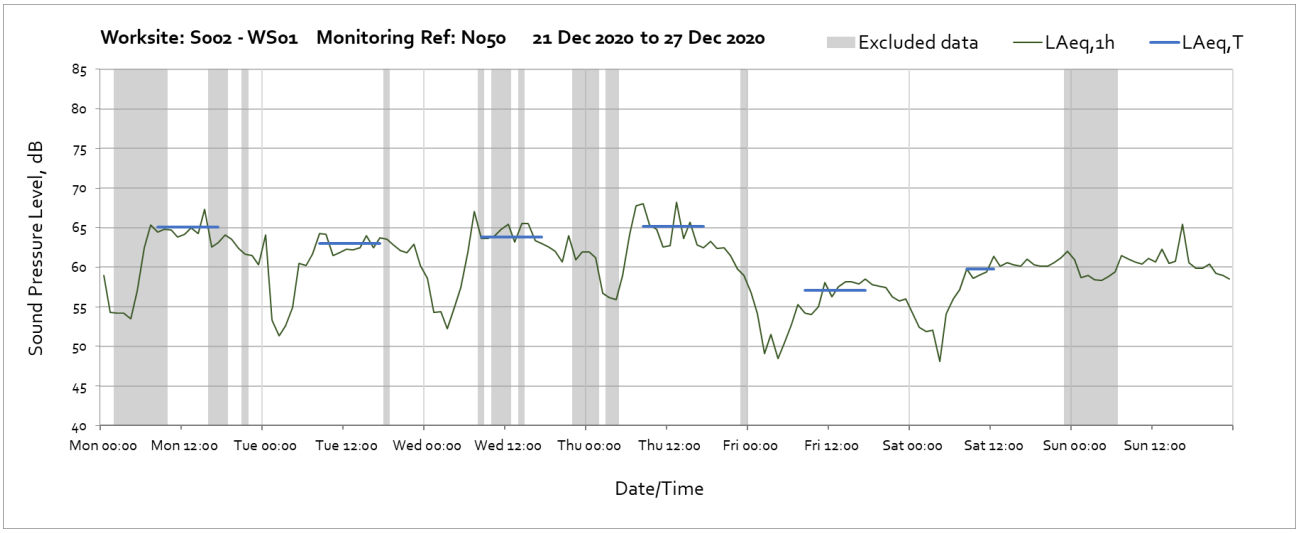
Worksite: S002-WS01 – Monitoring Ref: N050

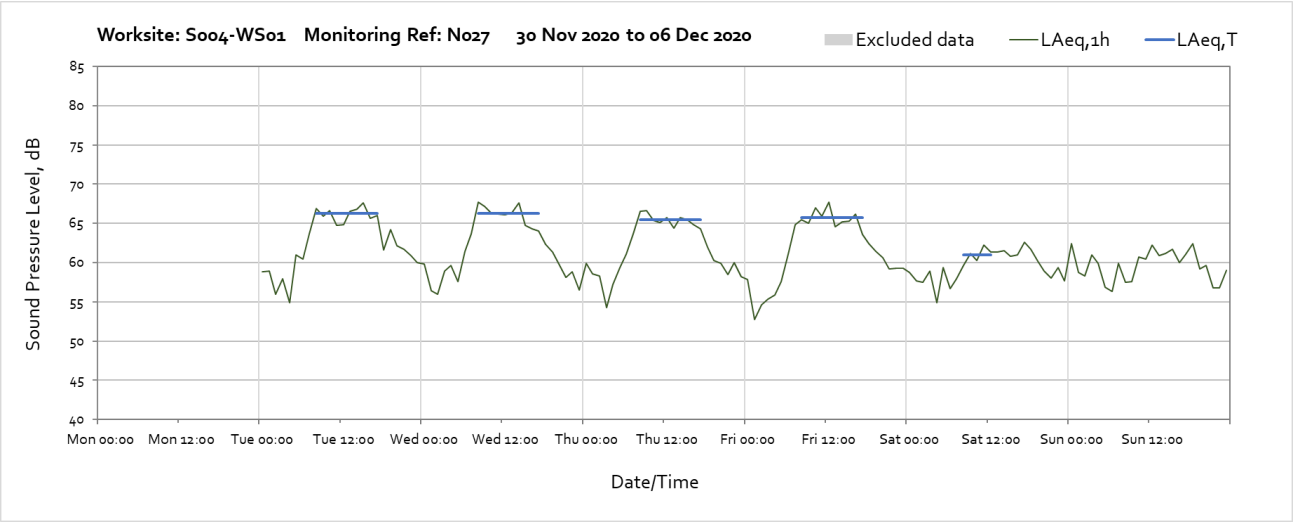


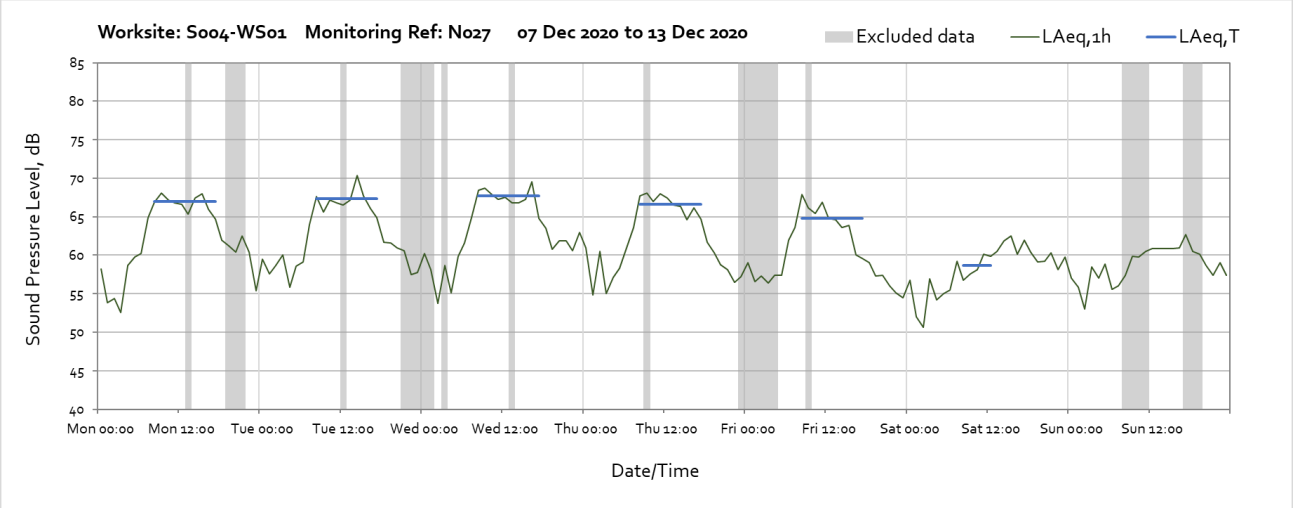






Worksite: S004-WS01 – Monitoring Ref: N027




Worksite: S004-WS01 Monitoring Ref: N027 07 Dec 2020 to 13 Dec 2020
Excluded data
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LAeq,T
Sound Pressure Level, dB
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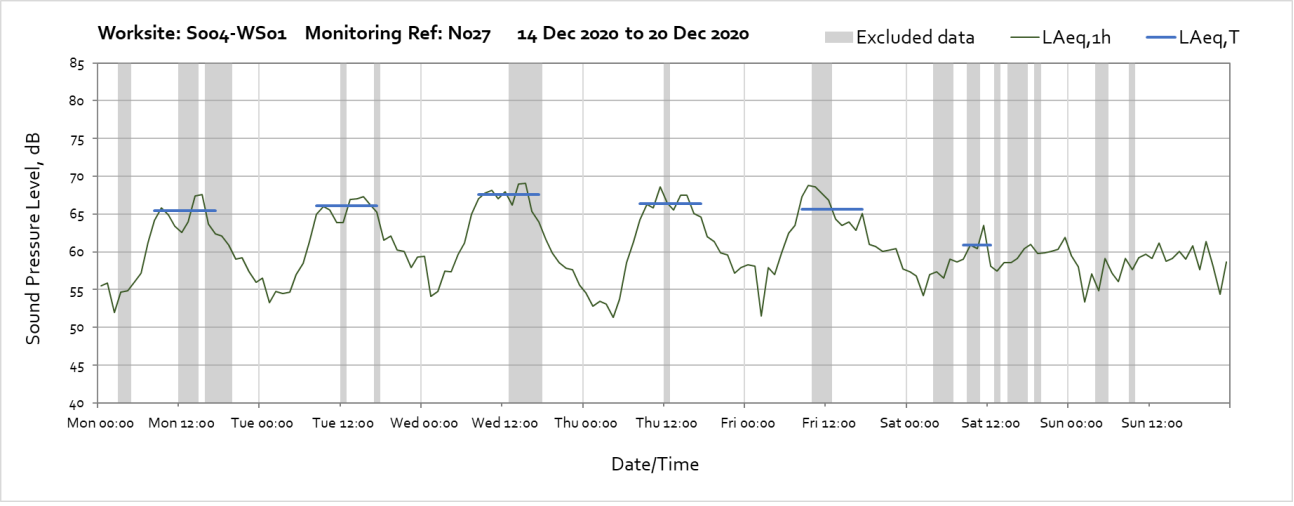
Worksite: S004-WS01 Monitoring Ref: N027 14 Dec 2020 to 20 Dec 2020
Excluded data
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Sound Pressure Level, dB
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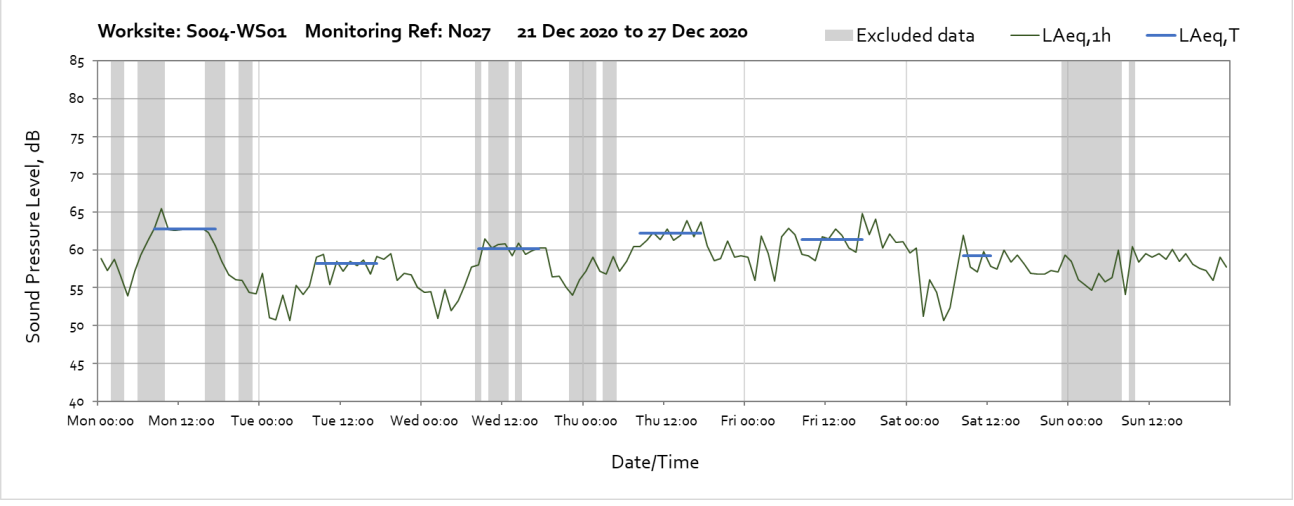
Worksite: S004-WS01 Monitoring Ref: N027 21 Dec 2020 to 27 Dec 2020
Excluded data
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Sound Pressure Level, dB
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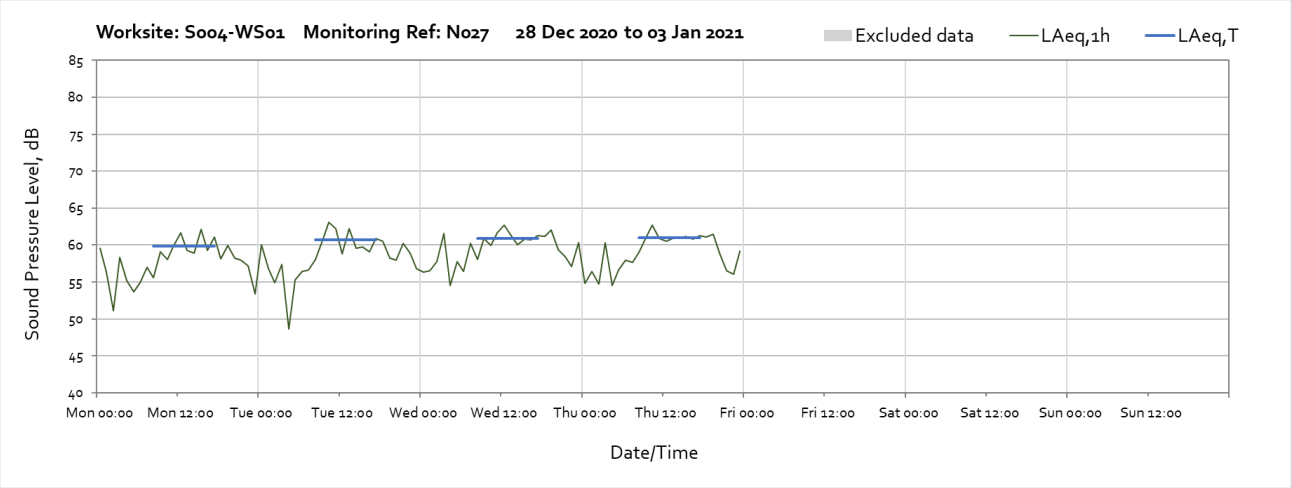
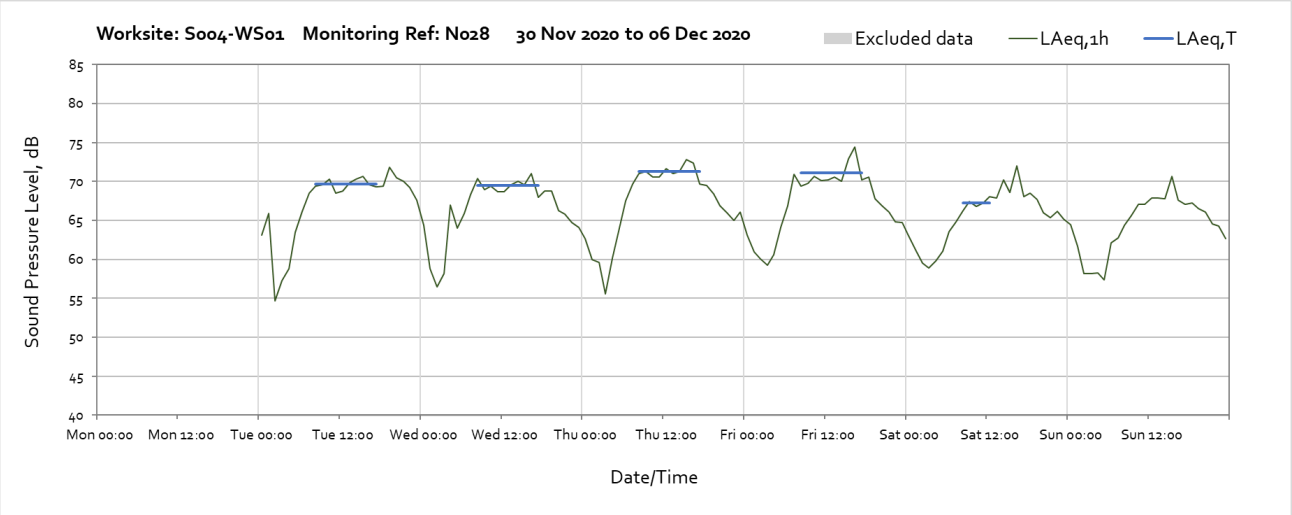
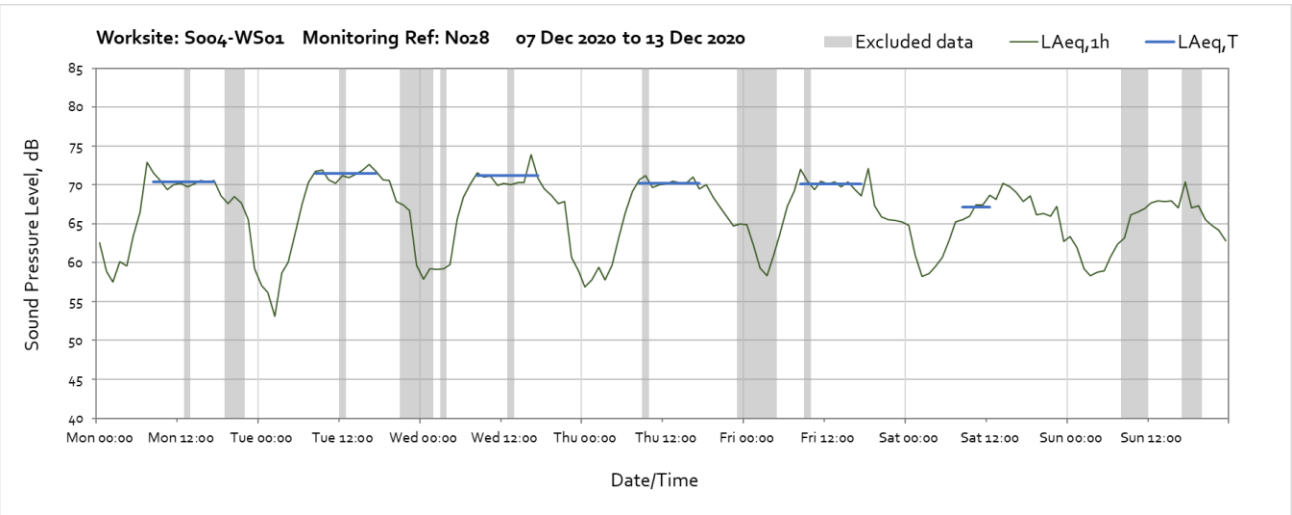
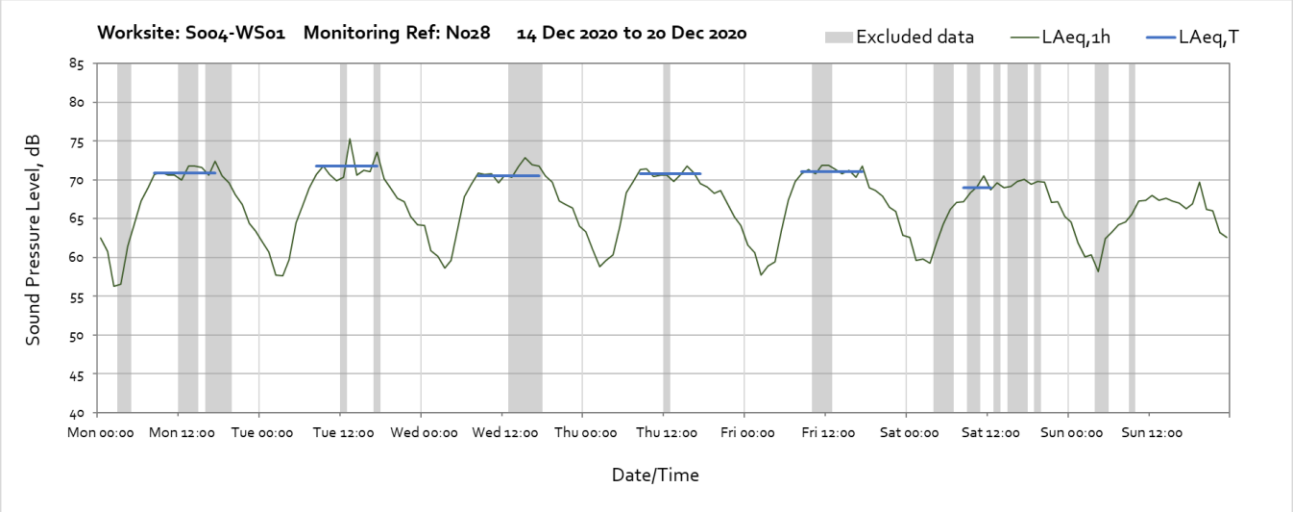
Date/Time



Worksite: S004-WS01 – Monitoring Ref: N028



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Excluded data
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Sound Pressure Level, dB
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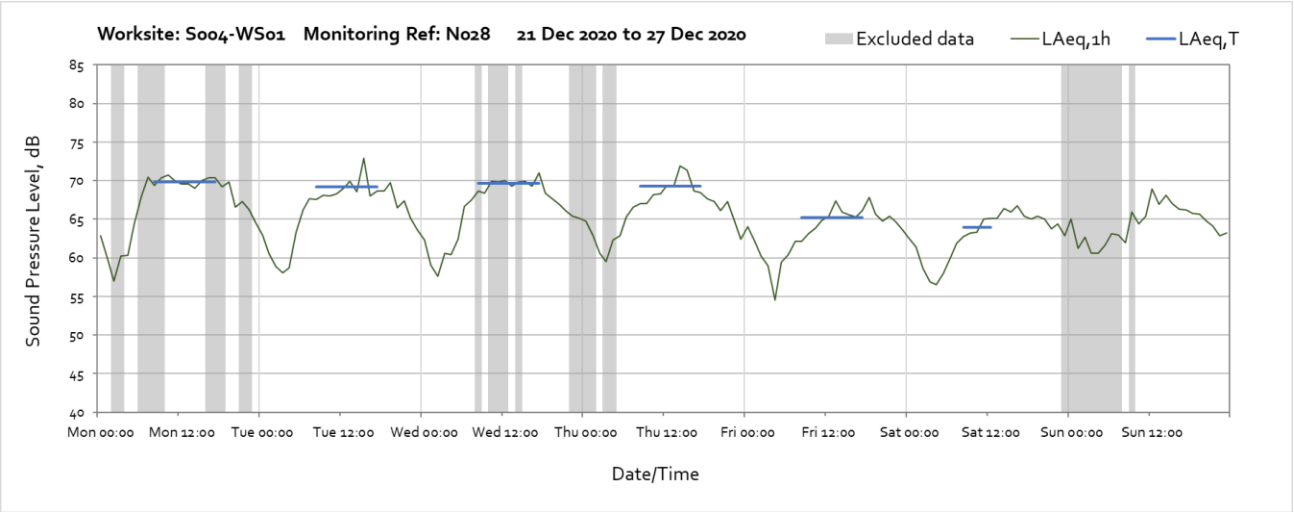
Worksite: S004-WS01 Monitoring Ref: N028 21 Dec 2020 to 27 Dec 2020
Excluded data
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Sound Pressure Level, dB
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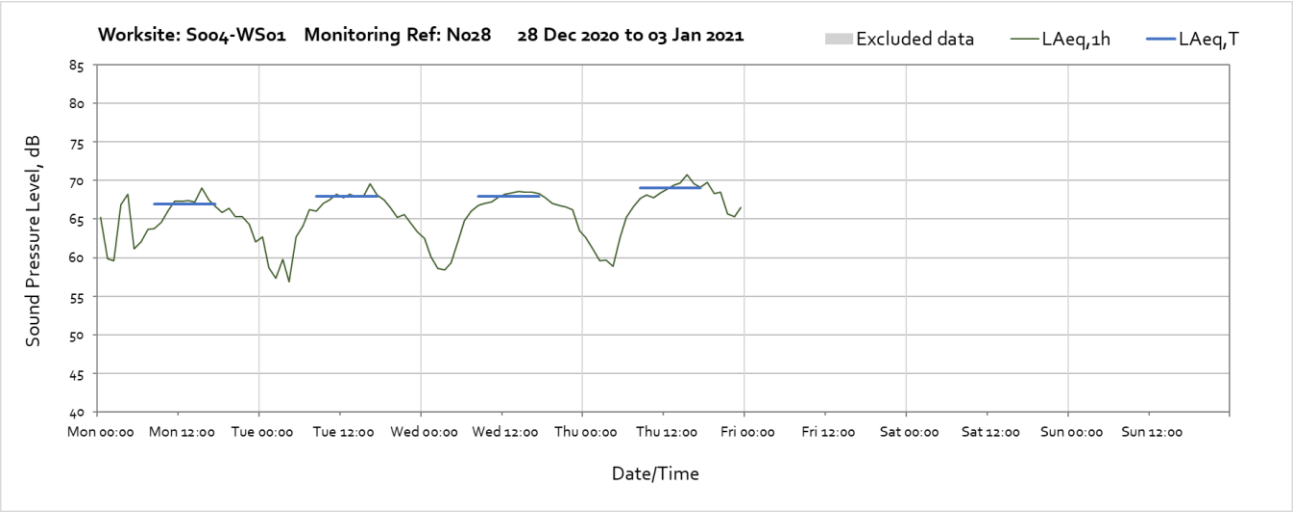
Worksite: S004-WS01 Monitoring Ref: N028 28 Dec 2020 to 03 Jan 2021
Excluded data
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LAeq,T
Sound Pressure Level, dB
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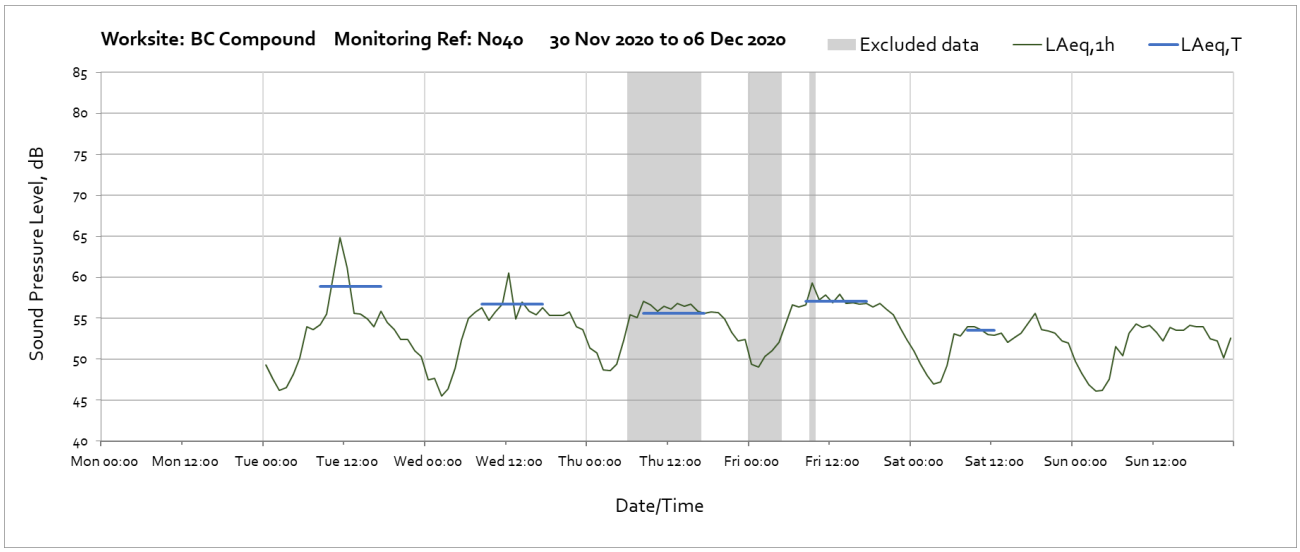
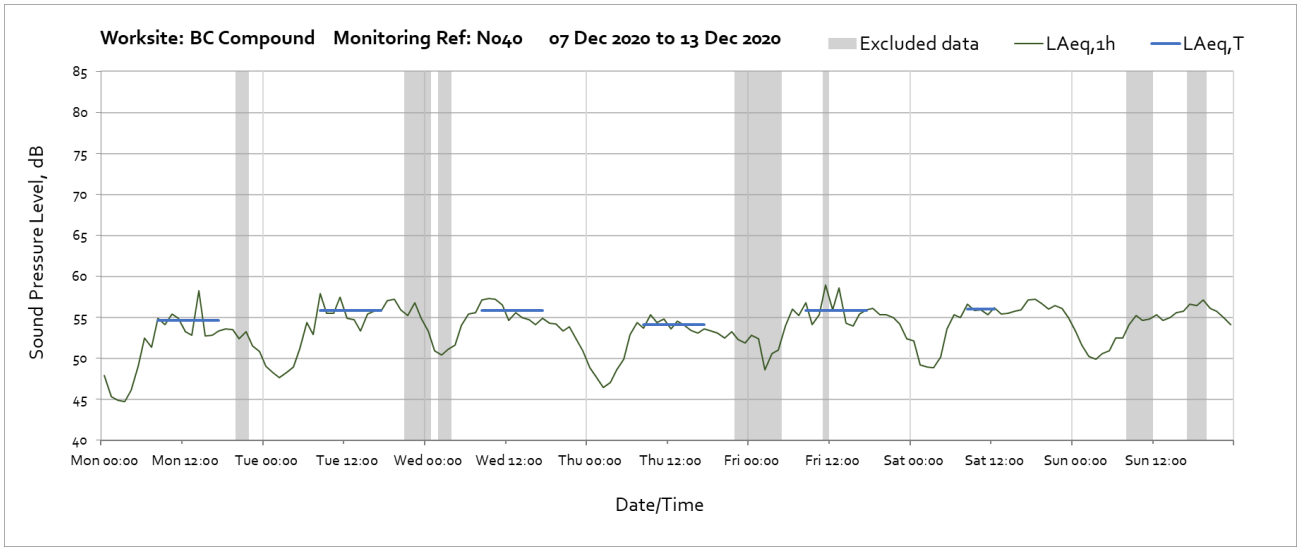
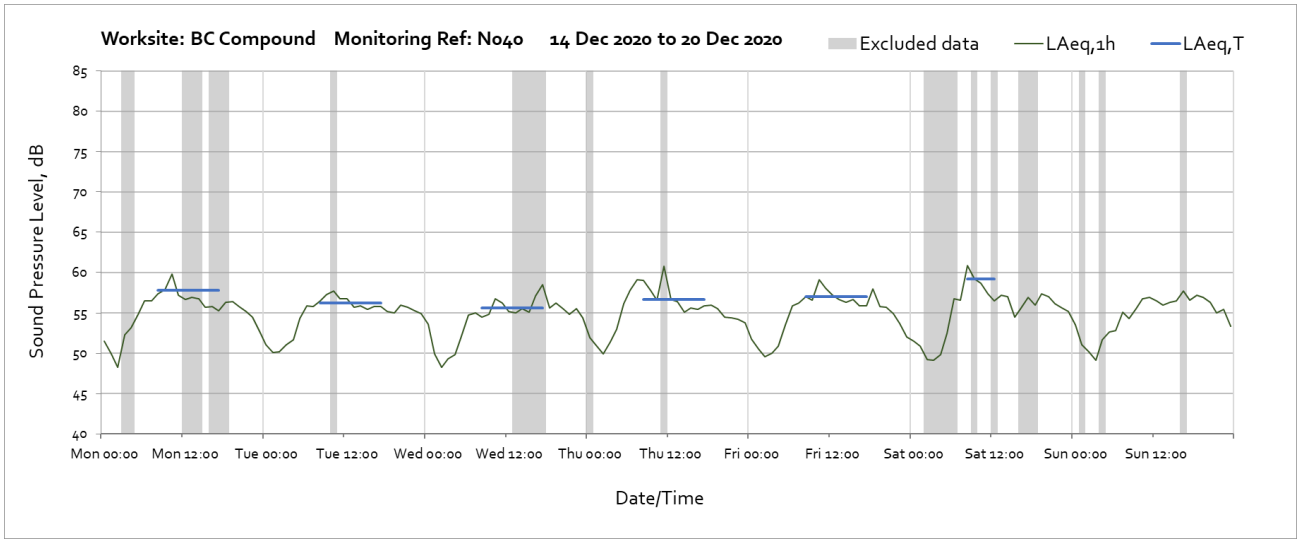
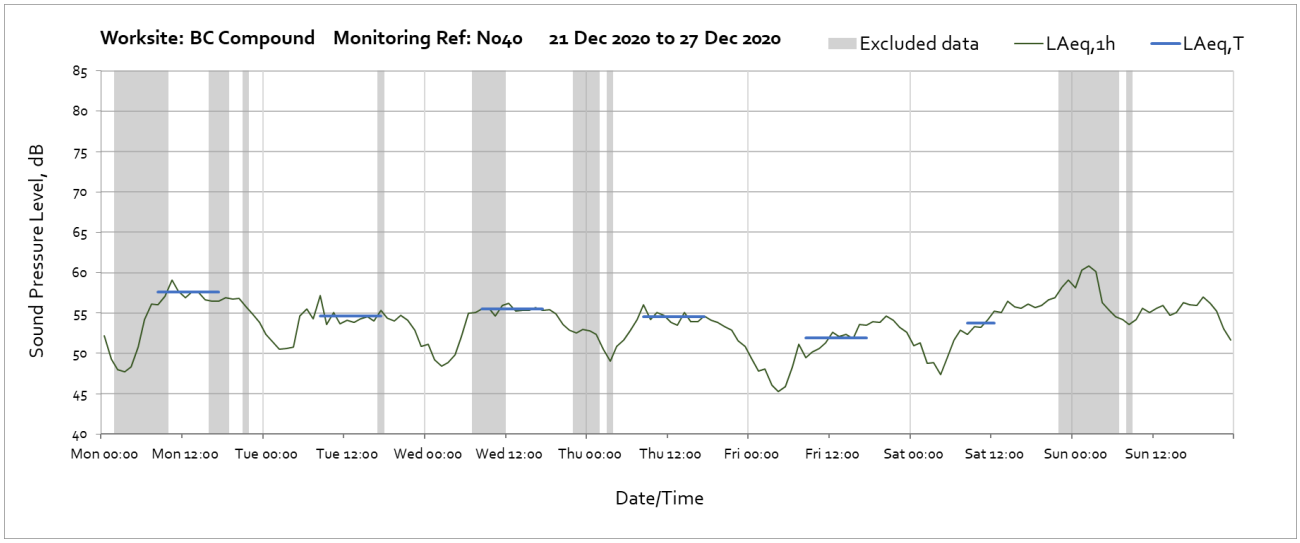
Date/Time

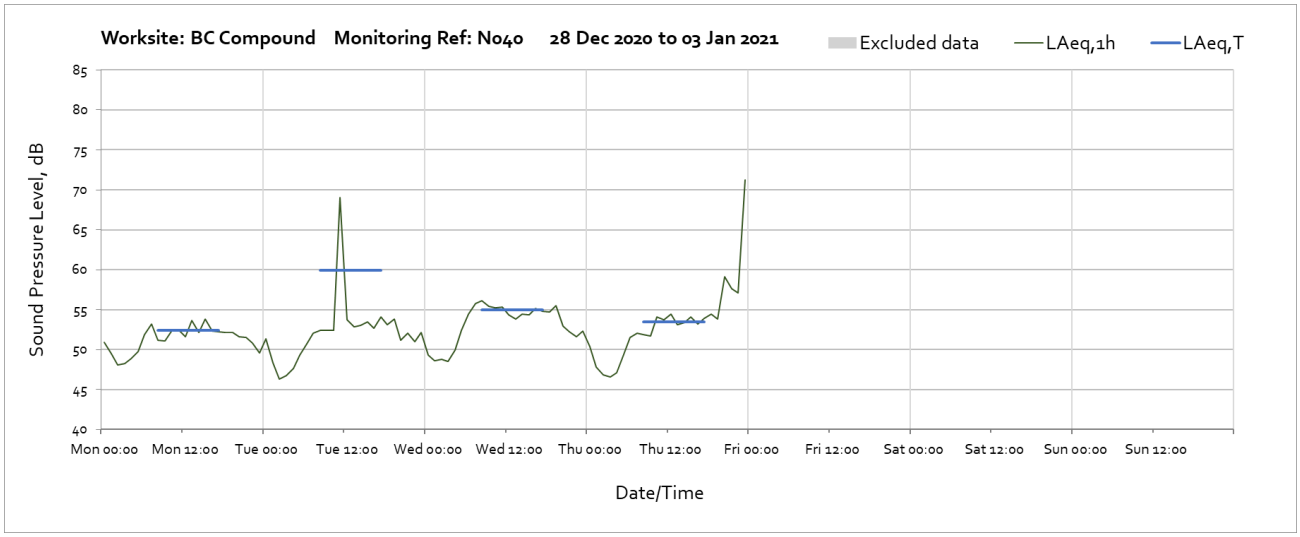
Worksite: BC Compound – Monitoring Ref: N040



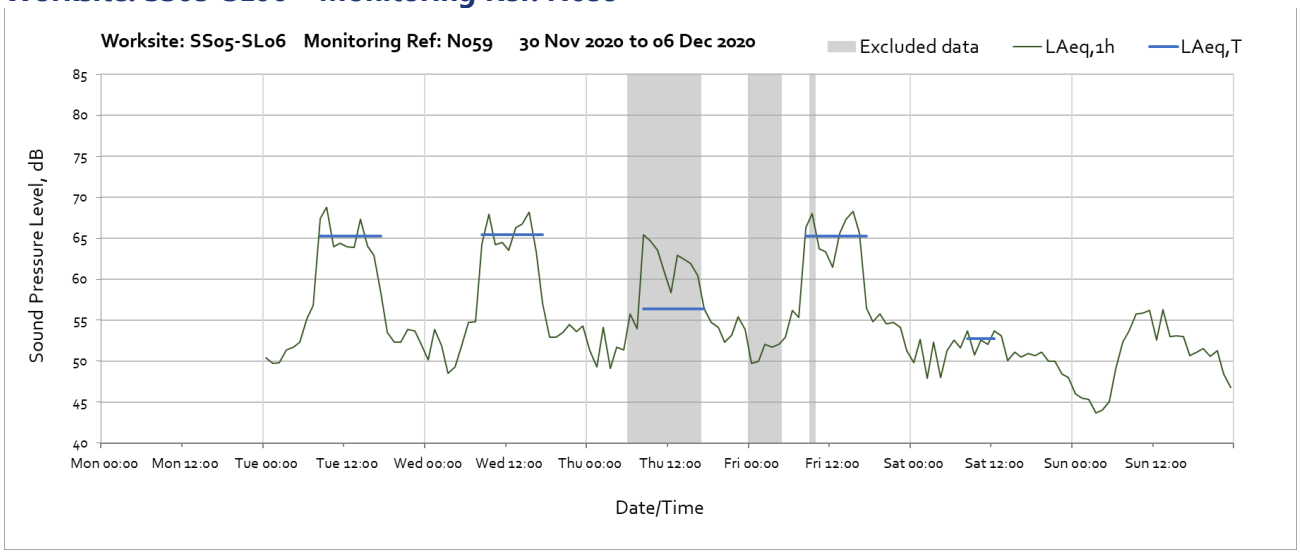


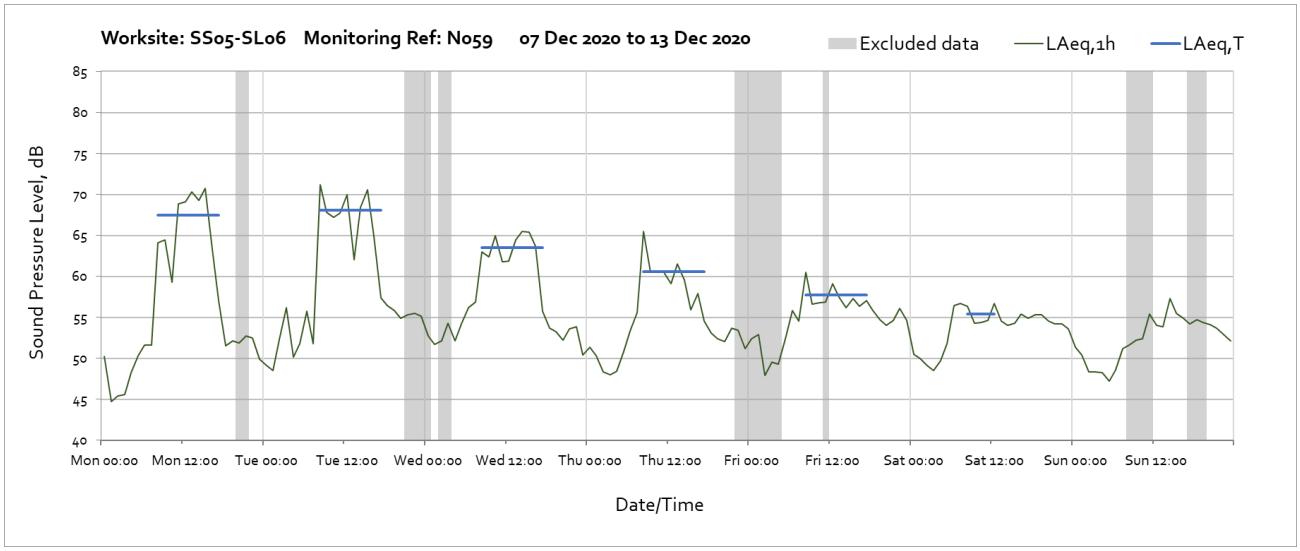






Worksite: SS05-SL06 – Monitoring Ref: N059




Worksite: SS05-SL06 Monitoring Ref: N059 07 Dec 2020 to 13 Dec 2020
Excluded data
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LAeq,T
Sound Pressure Level, dB
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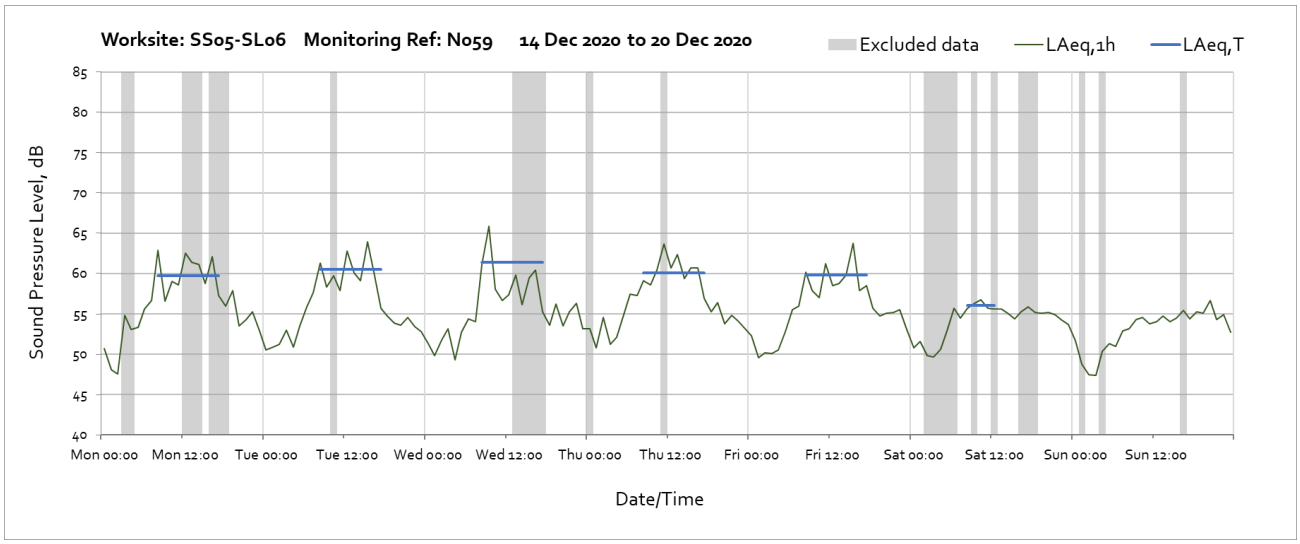
Date/Time


Worksite: SS05-SL06 Monitoring Ref: N059 14 Dec 2020 to 20 Dec 2020
Excluded data
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LAeq,T
Sound Pressure Level, dB
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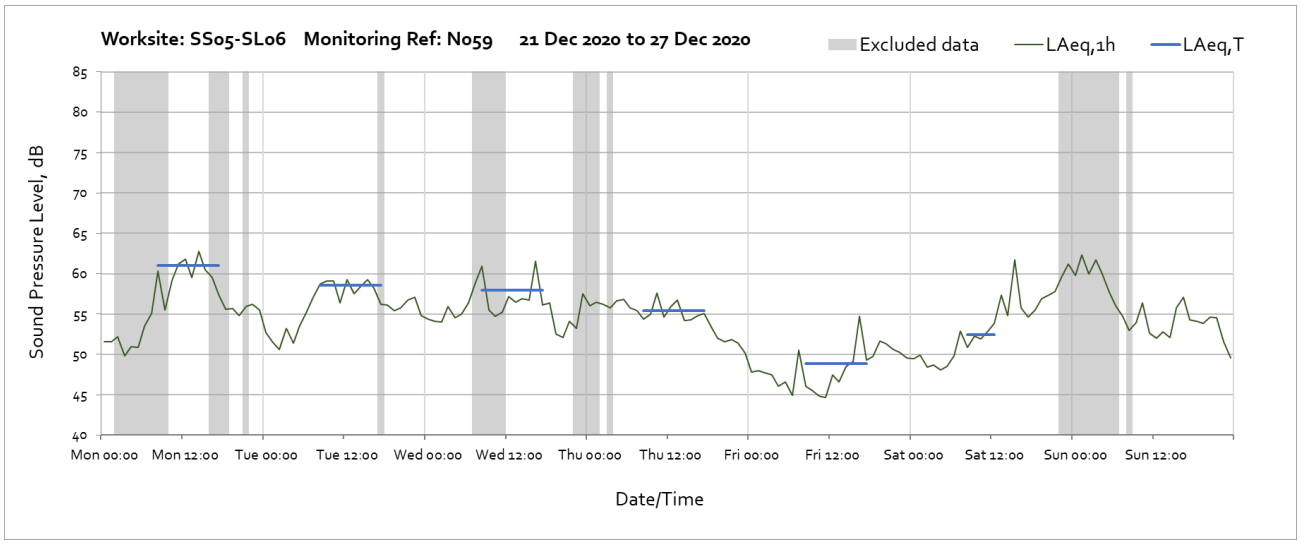
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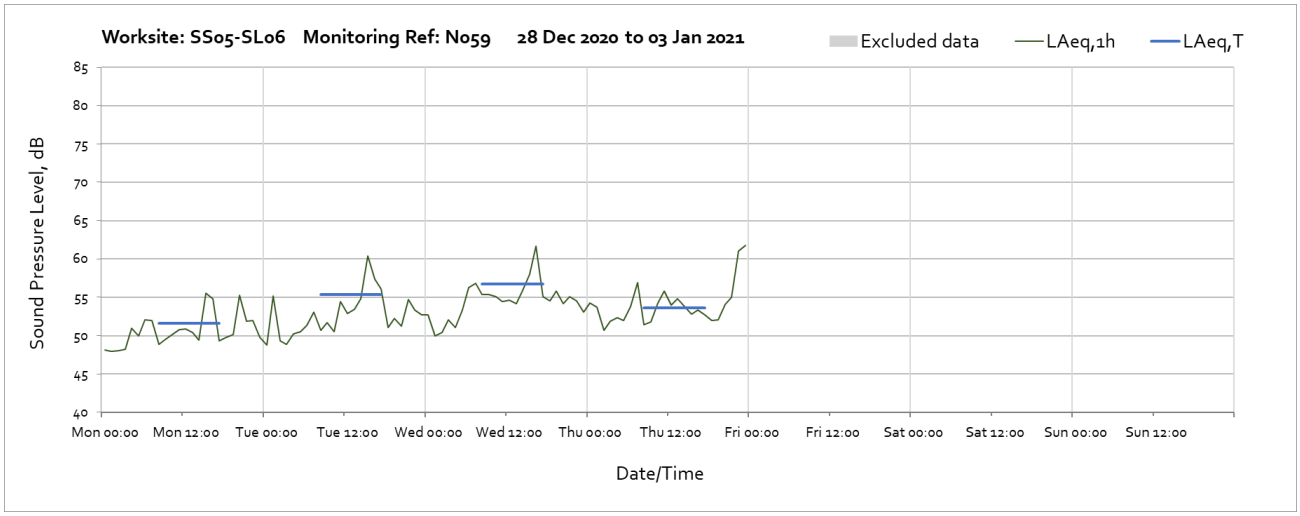
Worksite: SS05-SL06 Monitoring Ref: N059 28 Dec 2020 to 03 Jan 2021
Excluded data
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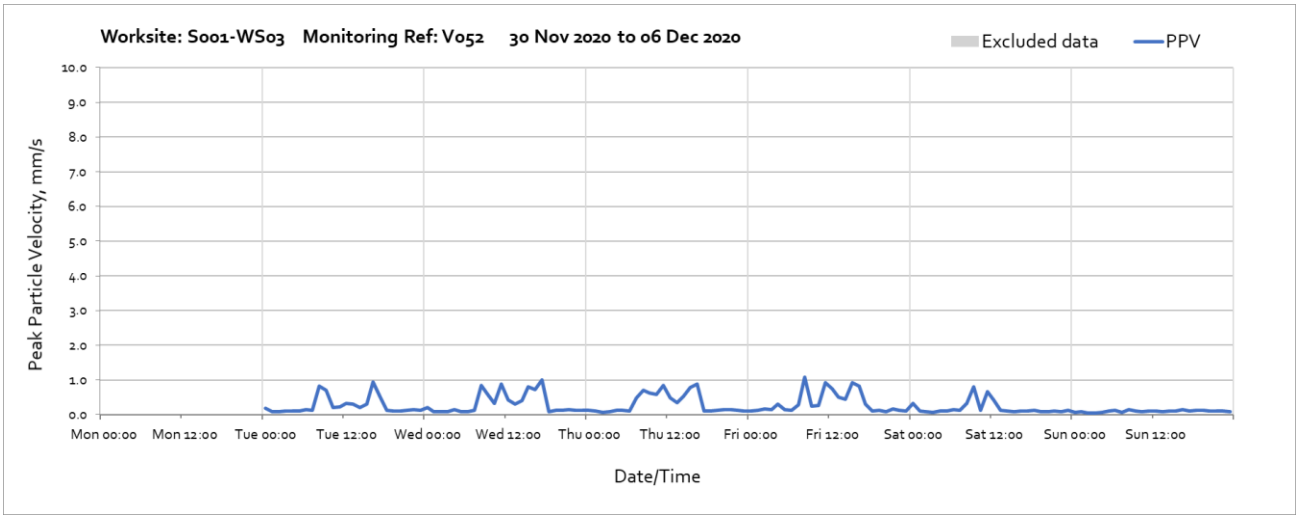
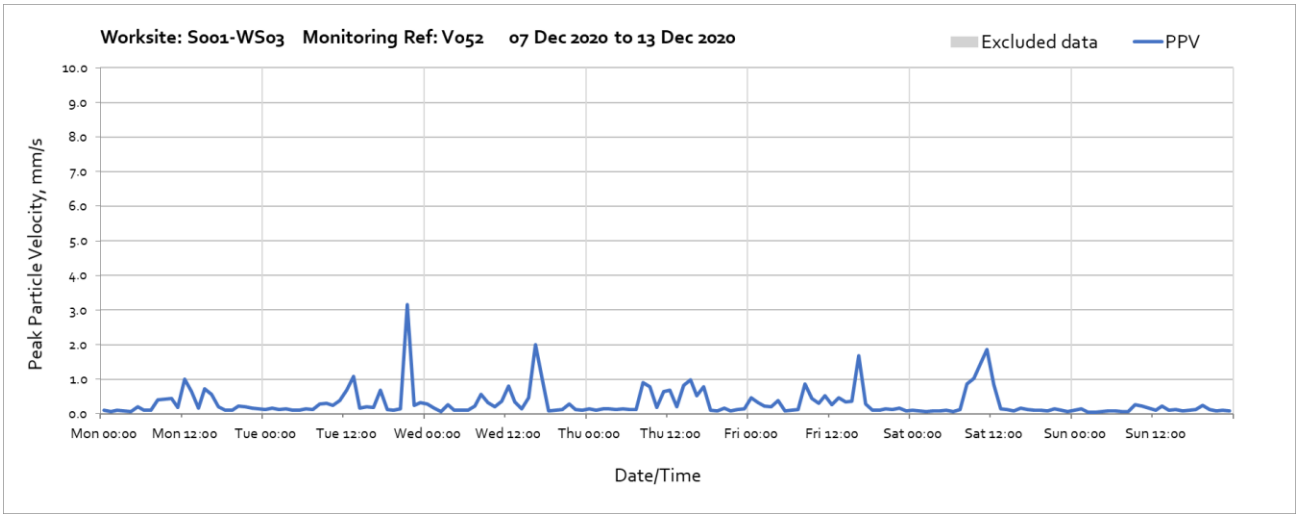
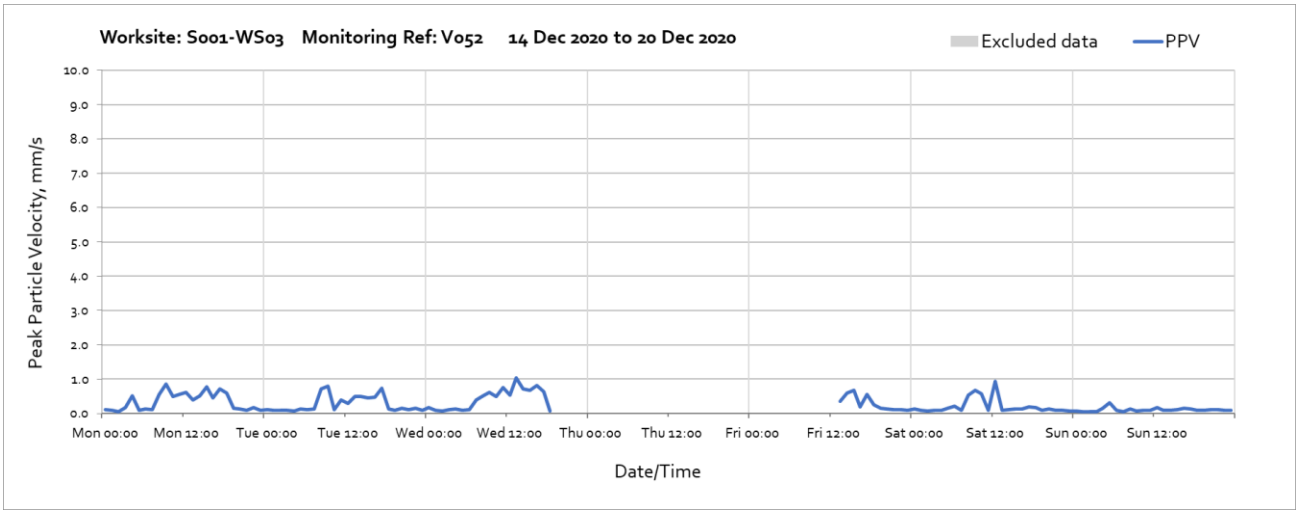
Vibration

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. Where high values of PPV were caused by local interference with the vibration monitor, which are not representative of HS2 construction works, these values have been greyed out in the following charts and have been excluded to calculate values in Table 4 of the main report.

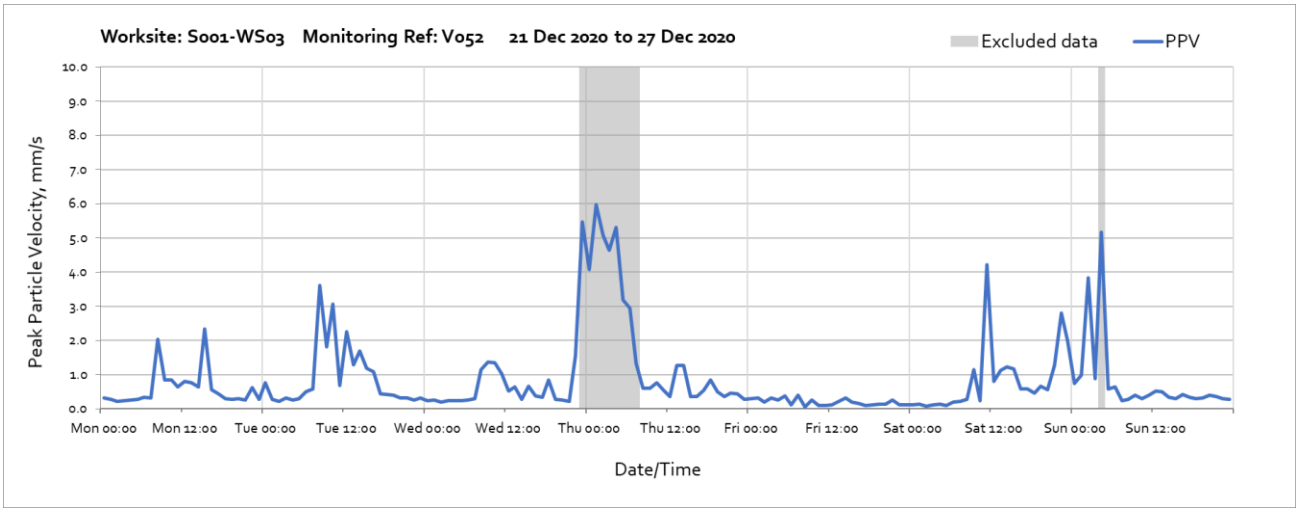
Worksite: S001-WS03 – Monitoring Ref: V052



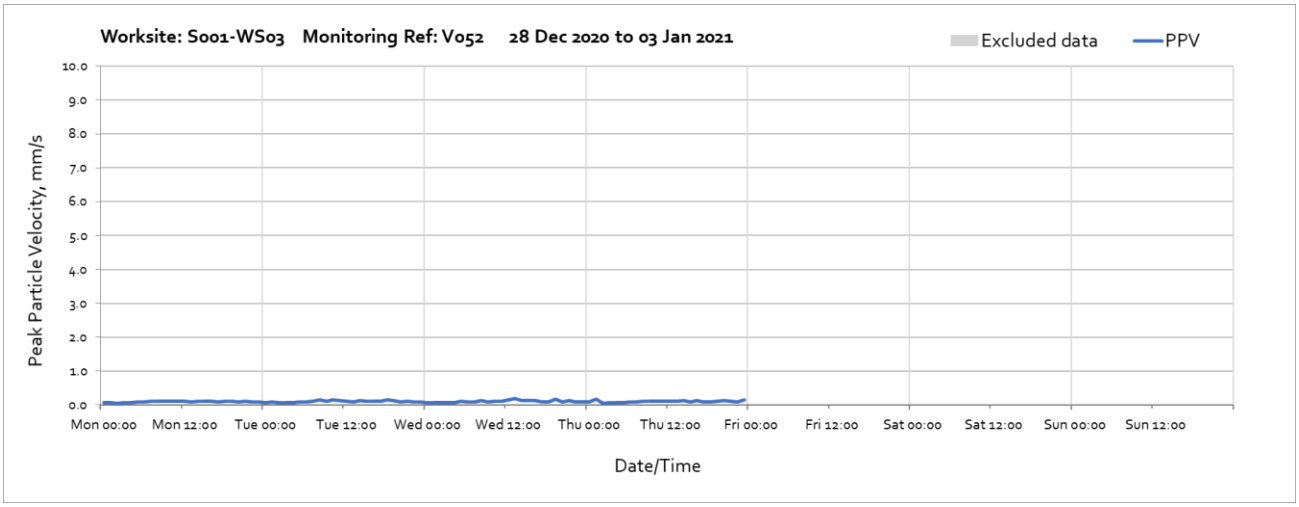




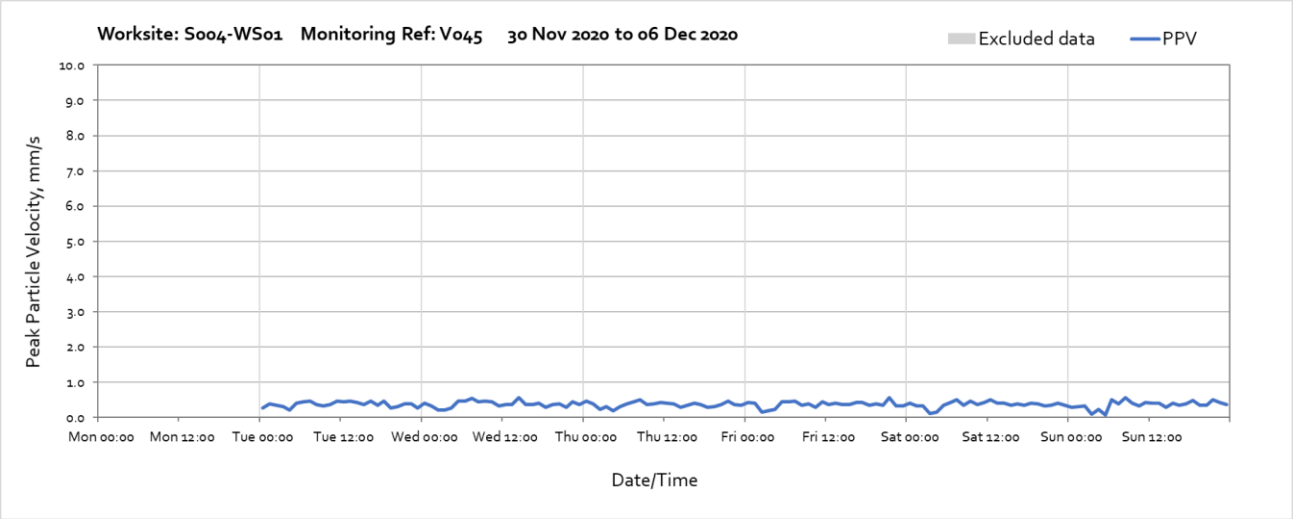
Note: Missing data between 19:00 on Wednesday 16th and 12:00 on Friday 18th December was due to monitor handover bewteen contractors.

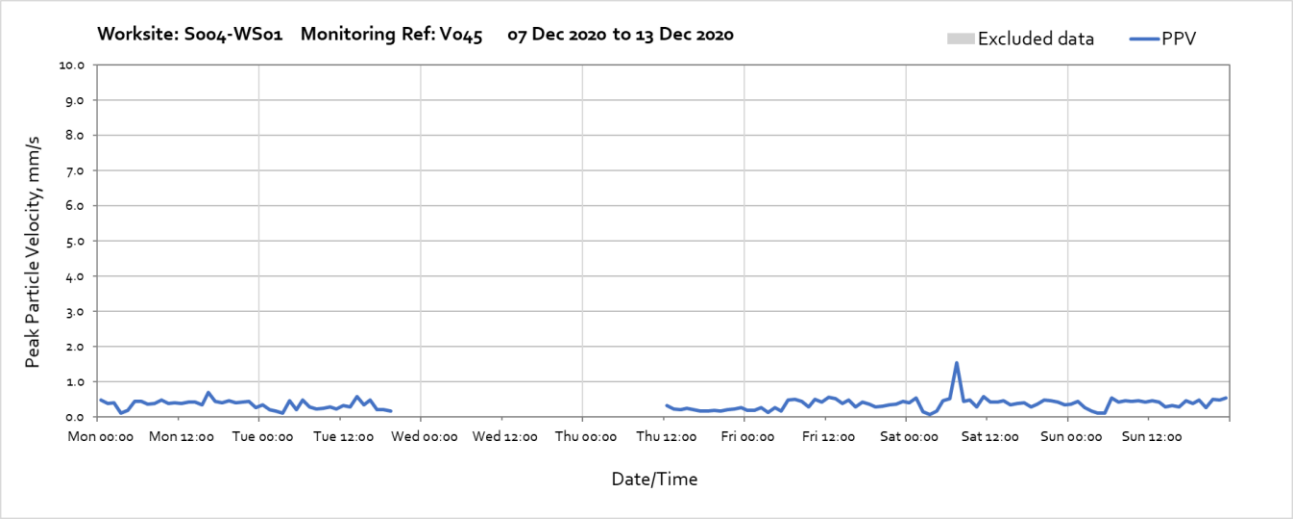


Note: High vibration levels measured between 23:00 on Wednesday 23th and 07:00 on Thursday 24th December, between and at 04:00 on Sunday 27th December were due to local disturbance of the monitor and are not representative of HS2 construction vibration.

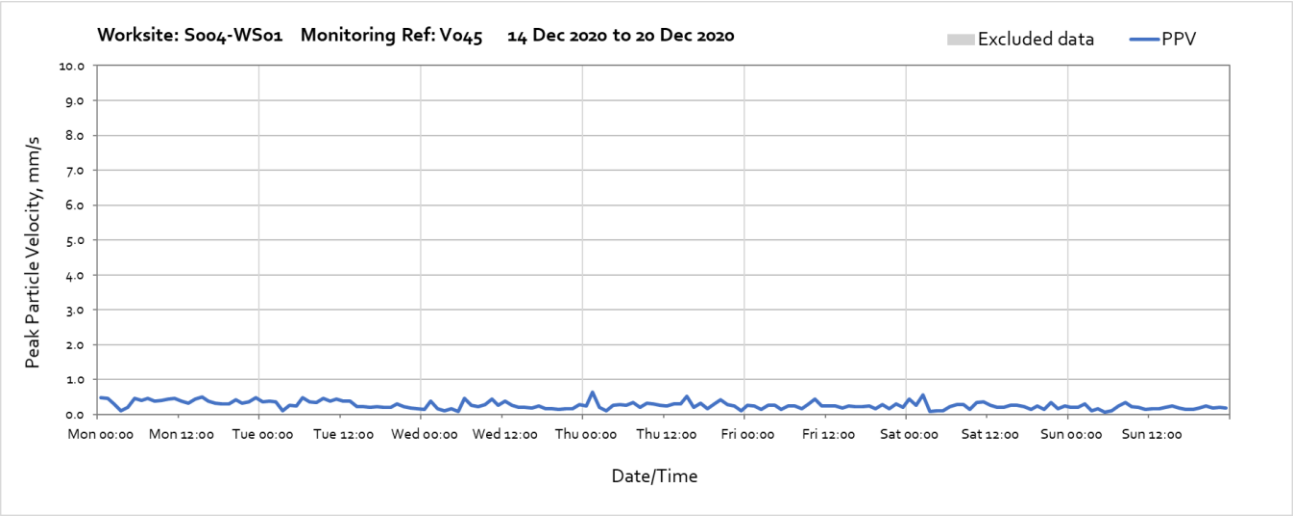


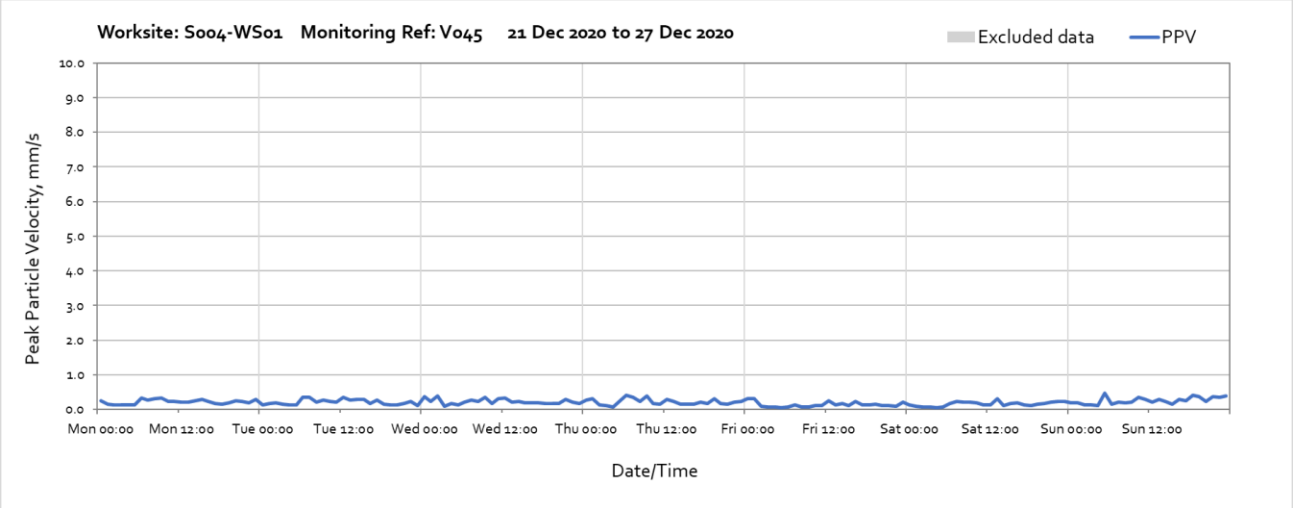
Worksite: S004-WS01 – Monitoring Ref: V045

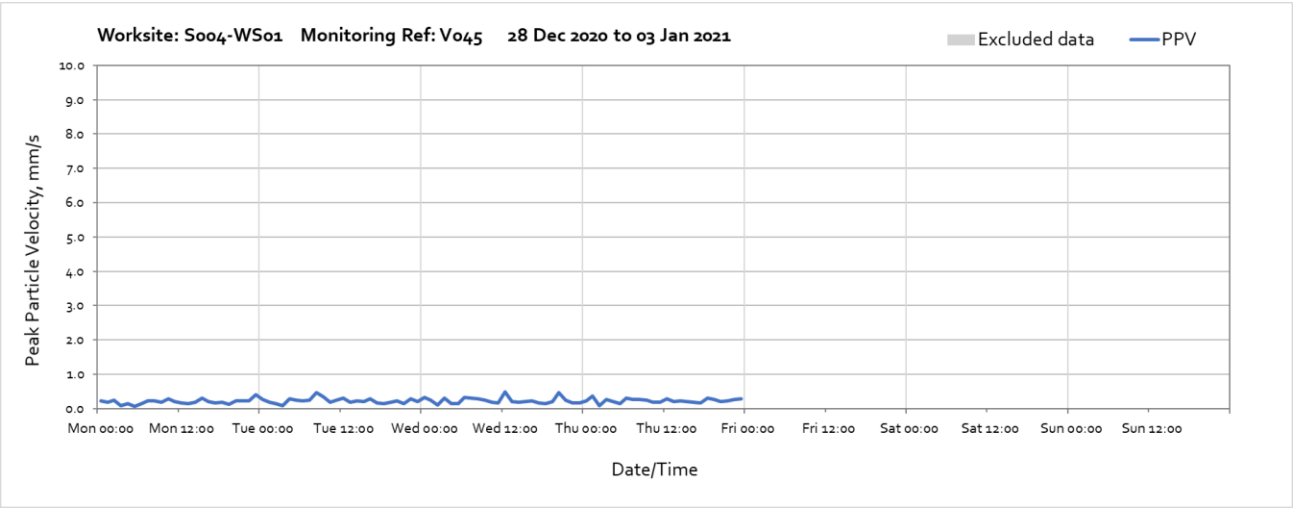




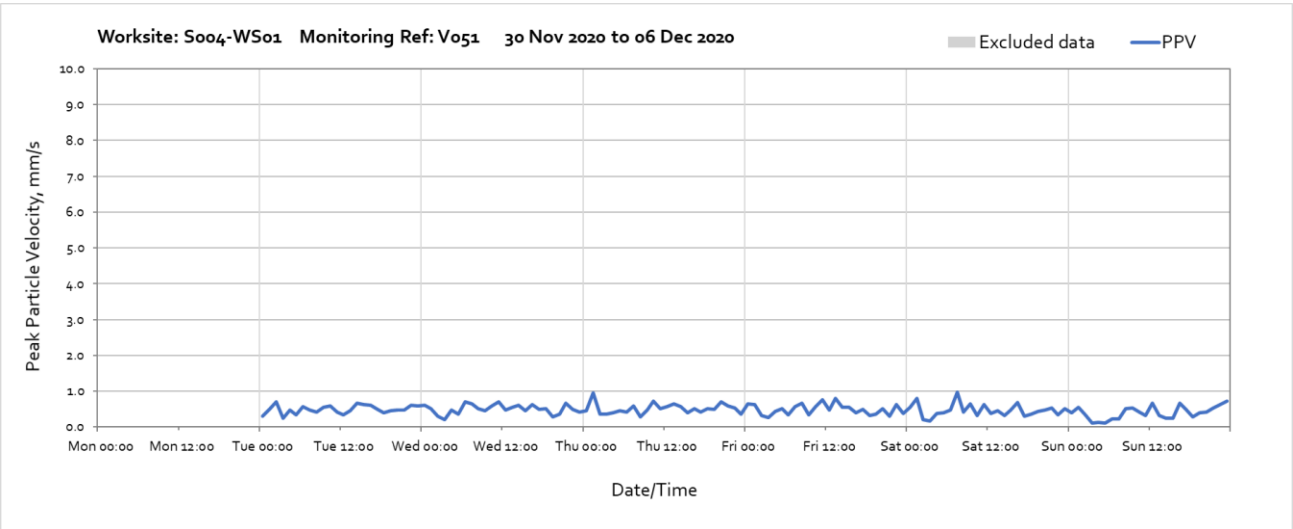
Note: Missing data between 19:00 on Tuesday 8th and 11:00 on Thursday 10th December was due to monitor handover between contractors.

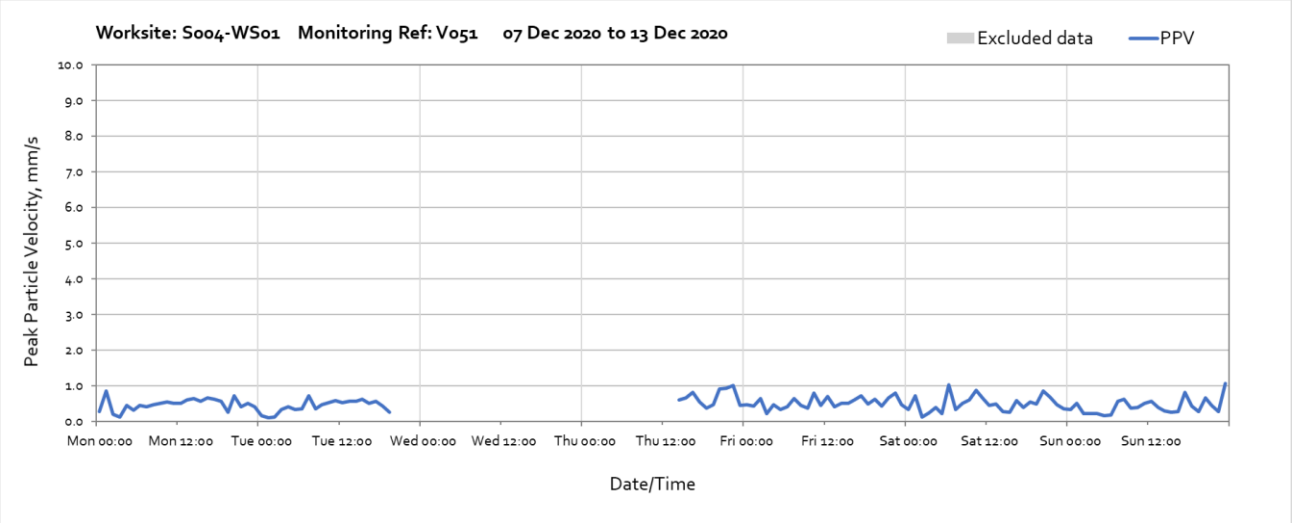




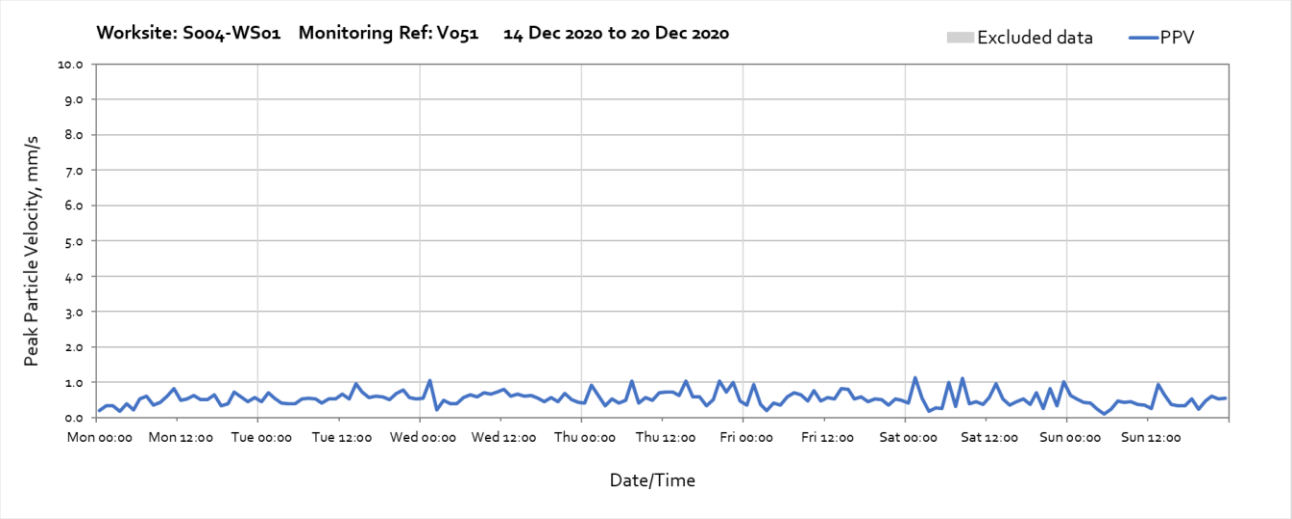


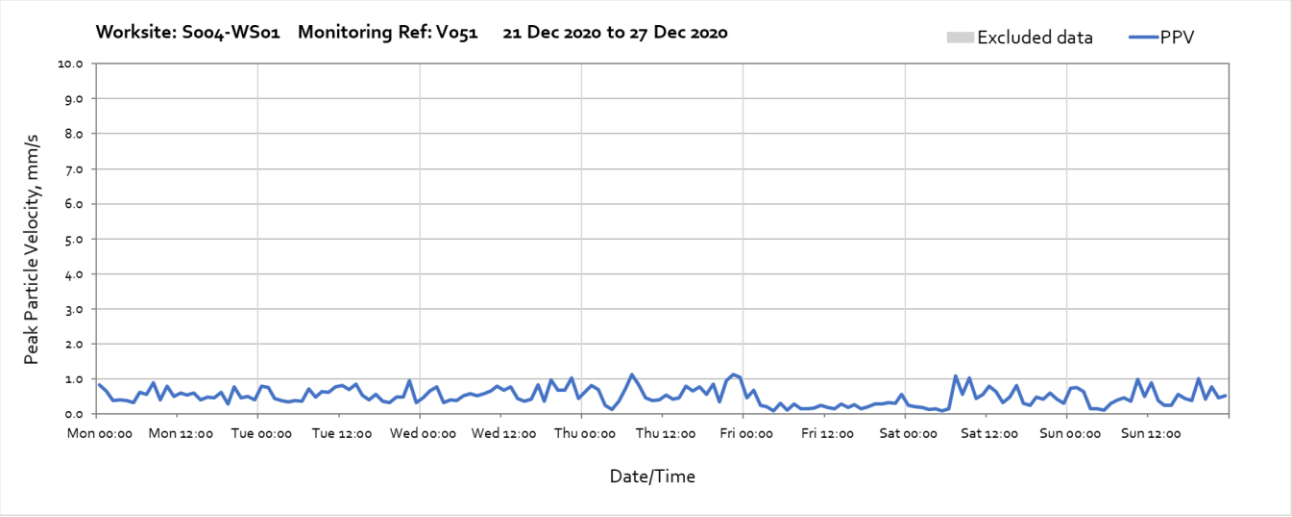
Worksite: S004-WS01 – Monitoring Ref: V051

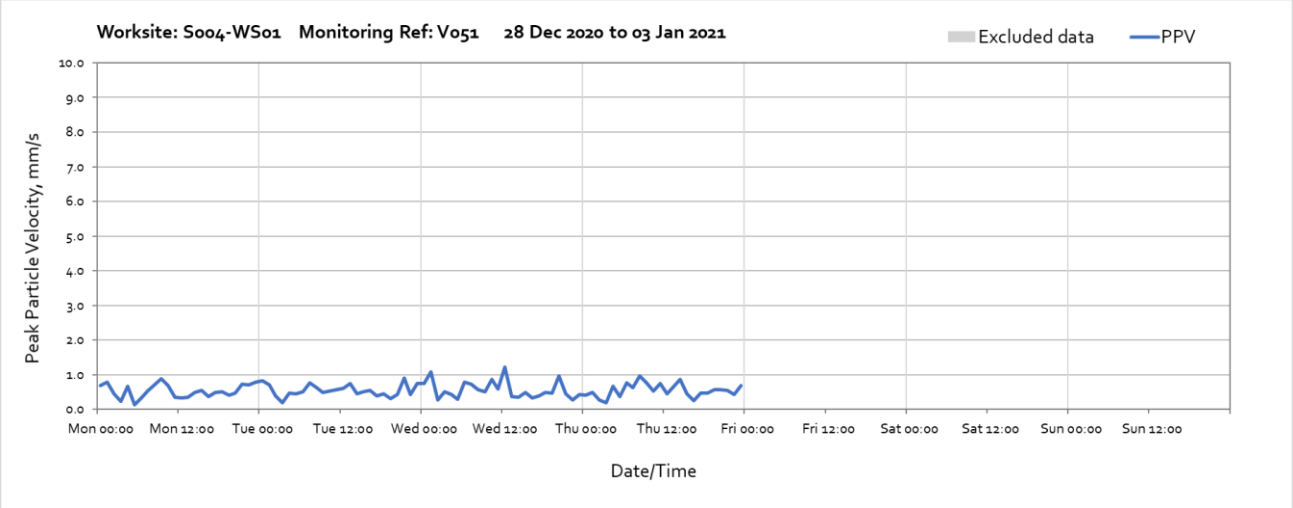




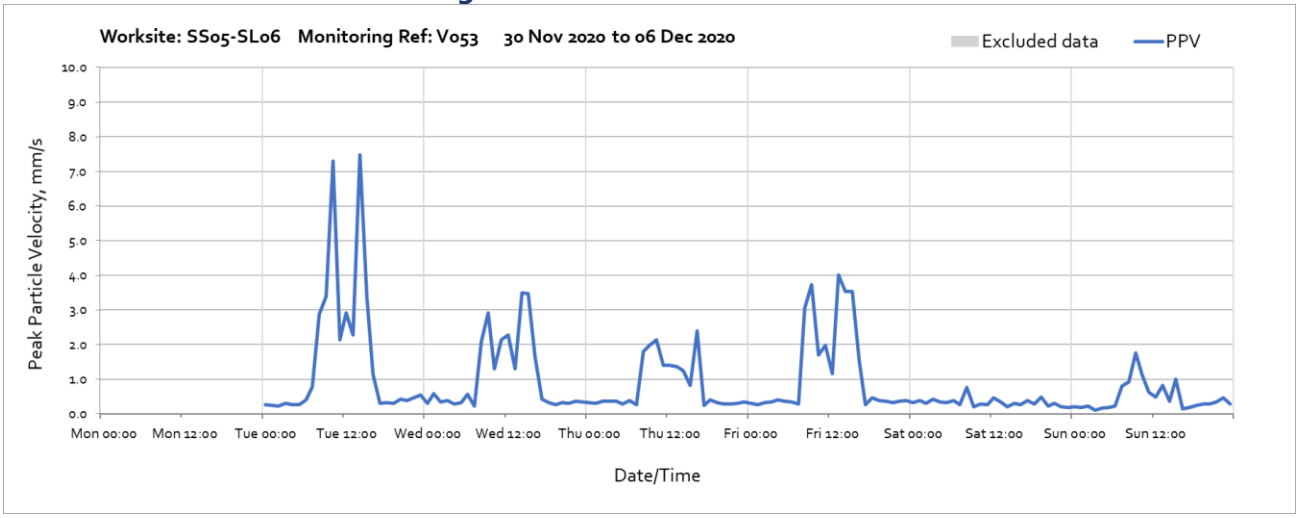
Note: Missing data between 20:00 on Tuesday 8th and 13:00 on Thursday 10th December was due to monitor handover between contractors.

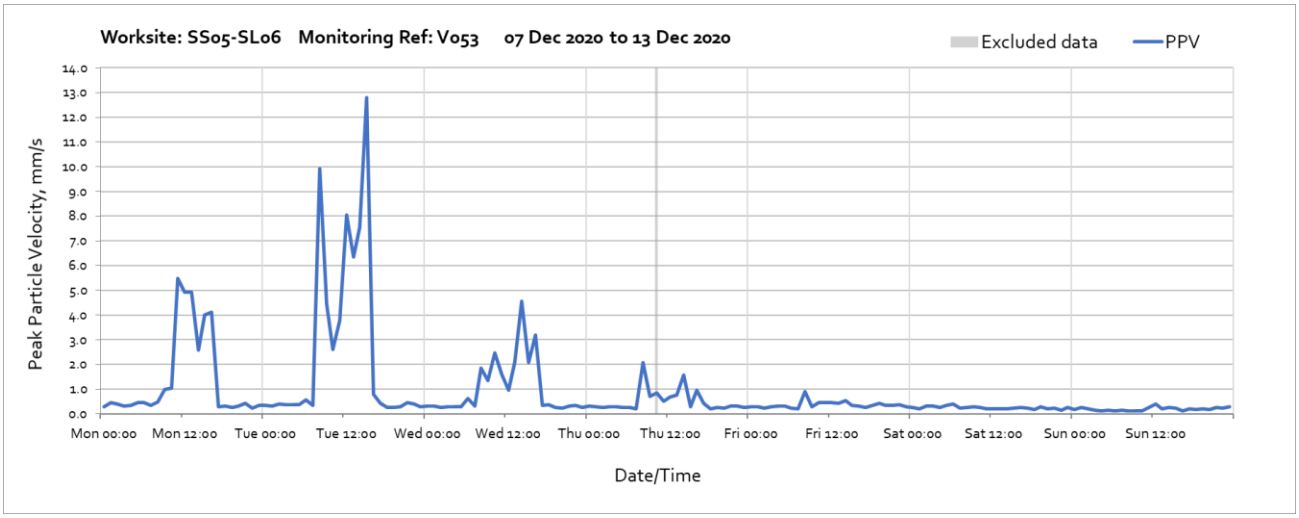


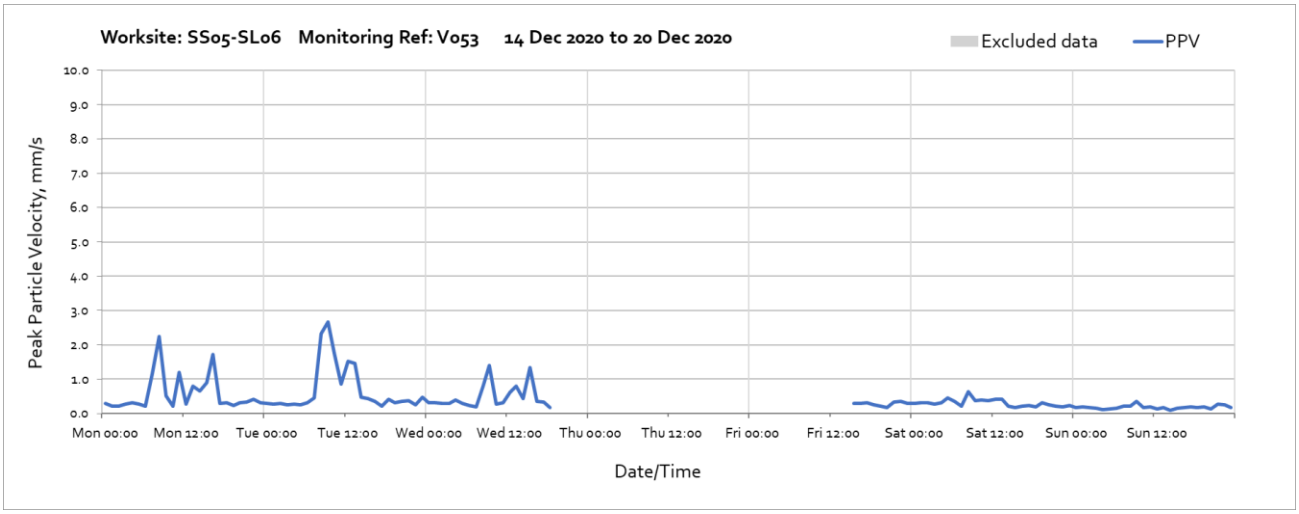




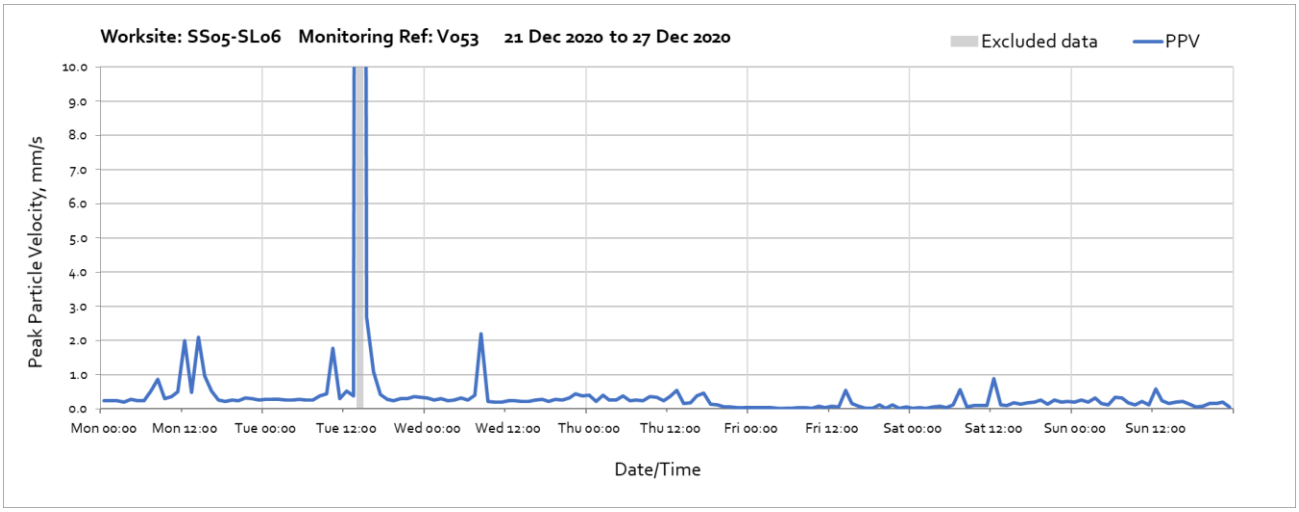
Worksite: SS05-SL06 – Monitoring Ref: V053







Note: Missing data between 19:00 on Wednesday 16th and 14:00 on Friday 18th December was due to monitor handover bewteen contractors.



Note: High vibration levels measured at 14:00 on Tuesday 22nd December was due to local disturbance of the monitor and are not representative of HS2 construction vibration.