HS2

April 2021

Construction noise and vibration Monthly Report – February 2021

London Borough of Ealing

gov.uk/hs2

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Non-Technical Summary

This Noise and Vibration Monitoring Report fulfils HS2 Limited's commitment detailed in the Environmental Minimum Requirements (EMRs), Annex 1, Code of Construction Practice, to present the results of noise and vibration monitoring carried out within the London Borough of Ealing (LBE) (including one monitoring location on the boundary with the London Borough of Hammersmith and Fulham) during the month of February 2021.

Within this period monitoring was undertaken at the following worksites:

- Noise monitoring was undertaken in the vicinity of the Atlas Road worksite (ref. AR) where construction of concrete slabs; pile proving, drainage works, excavation works, bridge abutment works, installation of shutter and road formers, concrete pouring and breaking out works, surveys, hoarding removal and power utility diversion works were underway.
- Noise and vibration monitoring was undertaken in the vicinity of the Willesden EuroTerminal worksite (ref. WET), where construction of storage bays, drainage works, construction of concrete slabs and concrete works, installation of fencing, demolition works, track maintenance works and stockpiling were underway.
- Noise monitoring was undertaken in the vicinity of the Victoria Road worksite (ref. VRFIC), where excavations, backfilling works, kerbing installation, drainage works, construction of foundations and concrete works were underway.
- Noise monitoring was undertaken in the vicinity of the Flat Iron compound (within worksite ref. VRFIC), where drainage works, hoarding works, removal of asbestos, road asphalting works and power diversion works were underway.
- Noise and vibration monitoring were undertaken in proximity of the Old Oak Common depot worksite (ref. OOC), where drainage dewatering works, pile probing works, installation of pile mat, drilling works, vegetation clearance, formation works for temporary welfare and shuttering works were underway.
- Noise monitoring was undertaken in proximity of the Mandeville Road Badminton Close compound (ref. BC Compound), where utility works, ground preparation works, excavations, drainage works and topography surveys were underway.
- Noise and vibration monitoring were undertaken in proximity of the Green Park Way Ventilation Shaft worksite (ref. GPWVS), where site housekeeping, excavations and backfilling works, dewatering works, utility works, trial holes and hardstanding construction works were underway.

Further works, where monitoring was not undertaken, were also underway at:

- the Westgate Ventilation Shaft (hoarding installation, excavation works cast-in-situ concreting activities);
- the Old Oak Common satellite compound (vegetation clearance);
- at School Road, Bethune Road, Chase Road, Victoria Road, Atlas Road as part of power utility works; and
- at Horsenden Lane, Perivale as part of water utility works.

The HS2 threshold levels for significant noise impacts were exceeded on two occasions due to HS2 works in the London Borough of Ealing during February 2021.

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

Seven 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 28th February 2021.

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. AR (see plan 3 in Appendix A), where work activities included:
  - Construction of concrete slabs;
  - Pile proving;
  - Drainage works and removal of material for excavation works;
  - Grand Union Canal embankment works and bridge abutment works;
  - Installation of shutters and road formers;
  - Concrete pouring and breaking out works;
  - Surveys for establishing the points for conveyor foundations;;
  - Hoarding removal works; and
  - Utility power diversion works.

- Willesden EuroTerminal worksite, ref. WET (see plan 3 in Appendix A), where work activities included:
    - Construction of storage bays;
    - Drainage works;
    - Construction of concrete slabs;
    - Installation of fencing;
    - Demolition works;
    - Track maintenance works;
    - Stockpiling and installation of trial holes;
    - Installation of the bridge connecting Atlas Road to the site; and
    - Concrete works'
- Victoria Road worksite, ref. VRFIC (see plan 3 in Appendix A), where work activities included:
    - Construction of site haul road, including excavation works, backfilling works and installation of kerbing and laying asphalt surfacing;
    - Excavation works and construction of manholes;
    - Drainage works;
    - Installation of trench boxes;
    - Construction of foundations;
    - Installation of new welfare units; and
    - Excavation and concrete works, including pouring of slabs and shaft shutter testing for the Victoria Road Ancillary Shaft.
- Flat Iron compound, within worksite ref. VRFIC (see plan 4 in Appendix A), where work activities included:
    - Site preparation for drainage works;
    - Hoarding works;
    - Asbestos removal works;
    - Power diversion works; and
    - Asphalting of site road access and installation of the footpath.

- Old Oak Common depot worksite, located in the London Borough of Hammersmith and Fulham (LBHF), ref. OOC (see plan 5 in Appendix A), where work activities included:
  - Drainage works;
  - Pile probing works;
  - Installation of pile mat for sheet piling;
  - Drilling works;
  - Dewatering works;
  - Laying track mats;
  - Vegetation clearance to the; and
  - Works for new temporary welfare (including steel fixing and shuttering works.
- Mandeville Road Badminton Close compound (ref. BC Compound), where work activities included:
  - Installation of water main connection and utility works;
  - Construction of the new site walkways;
  - Ground preparation works
  - Excavation of trial pits;
  - Drainage CCTV and jetting works; and
  - Topography surveys.
- Green Park Way Ventilation Shaft worksite, reference GPWVS (see plan 1 in Appendix A), where work activities included:
  - General site housekeeping;
  - Relocation of the storage area;
  - Trial holes;
  - Excavation and construction of the site haul road and plate bearing tests;
  - Dewatering works;
  - Backfilling works and construction of hardstanding;
  - Hoarding installation; and
  - Utility works, including installation of water pipes.

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

- School Road, Bethune Road, Chase Road, Victoria Road, Atlas Road as part of power utility works;
- Horsenden Lane, Perivale, as part of water utility works;
- the Westgate Ventilation Shaft, including hoarding installation, excavation and backfilling works and cast-in-situ concreting activities; and
- the Old Oak Common satellite compound, including vegetation clearance.

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 February 2021 in the LBE area. Table 2 summarises the position of noise and vibration monitoring installations within the LBE area in February 2021.

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
AR	N032	Shaftesbury Gardens
	N033	Outside The Collective, Atlas Road / Victoria Road
	N060	Atlas Road next to Bashey Road
WET	N034	Stephenson Street (north)
	N035	Stephenson Street (south)
	N041	Junction of Stephenson Street / Goodhall Street
	V052	Stephenson Street (north)
VRFIC	N029	Braitrim House, Victoria Road
	N042	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
OOC	N027	Old Oak Common Lane

Worksite Reference	Measurement Reference	Address
	N028	Old Oak Common Lane, Hilltop Works
	V045	25 Wells House Road
	V051	Kildun Court, Old Oak Common Lane
BC Compound	N040	Badminton Close
GPWVS	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
AR	N032	Shaftesbury Gardens	Free-field	65.0 (66.1)	65.9 (67.0)	64.4 (66.5)	62.9 (66.4)	59.9 (64.9)	62.8 (62.9)	64.5 (65.3)	64.3 (65.0)	64.3 (67.2)	58.6 (64.2)	63.0 (65.4)	60.1 (64.3)
	N033	Outside The Collective, Atlas Road/Victoria Road	Free-field	67.6 (69.5)	68.3 (70.0)	65.7 (70.2)	64.6 (73.4)	61.4 (66.9)	64.4 (65.1)	65.4 (66.2)	65.6 (69.5)	65.2 (68.7)	59.6 (63.4)	63.8 (67.7)	61.1 (65.9)
	N060	Atlas Road next to Bashey Road	Façade	56.1 (60.7)	63.0 (65.6)	61.6 (72.8)	54.4 (63.3)	53.0 (65.4)	55.4 (57.4)	60.5 (63.2)	51.8 (52.7)	53.8 (65.5)	49.1 (53.9)	54.1 (63.3)	55.5 (65.4)
WET	N034	Stephenson Street (north)	Free-field	53.2 (57.0)	55.9 (60.1)	52.3 (56.3)	50.3 (54.4)	49.6 (57.0)	50.4 (52.0)	53.4 (54.9)	54.1 (55.6)	53.4 (61.7)	47.9 (52.6)	53.5 (56.6)	48.6 (55.3)
	N035	Stephenson Street (south)	Free-field	55.8 (59.4)	59.0 (74.6)	51.4 (55.2)	49.2 (54.0)	48.0 (55.6)	54.5 (55.8)	59.6 (68.4)	51.9 (52.9)	53.8 (64.2)	48.9 (62.8)	52.8 (57.3)	48.3 (53.6)
	N041	Junction of Stephenson Street/Goodhall Street	Free-field	56.3 (60.7)	57.7 (61.0)	55.0 (62.1)	53.3 (56.9)	49.7 (59.7)	54.8 (55.5)	56.3 (57.4)	56.7 (58.9)	56.0 (60.5)	50.9 (62.6)	54.8 (60.0)	49.9 (54.5)

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
VRFIC	N029	Braitrim House, Victoria Road	Free-field	55.6 (67.3)	58.2 (61.3)	56.6 (64.0)	52.5 (58.9)	51.7 (65.2)	51.1 (52.9)	52.3 (57.7)	51.8 (55.4)	52.8 (60.1)	47.7 (53.7)	51.5 (60.0)	54.3 (64.1)
	N042	Bodens car park	Free-field	55.5 (57.8)	63.3 (66.6)	53.5 (56.4)	52.7 (57.9)	50.2 (55.9)	52.8 (53.1)	55.1 (58.7)	52.8 (53.6)	54.0 (60.6)	50.2 (57.2)	54.8 (63.1)	52.0 (58.7)
	N031	School Road, outside Acton Business Centre	Free-field	58.2 (60.7)	63.0 (72.2)	59.6 (62.6)	57.0 (61.8)	54.3 (63.1)	57.1 (60.3)	60.5 (62.8)	59.0 (61.9)	59.6 (67.3)	52.9 (66.3)	57.7 (63.1)	52.6 (58.8)
	N049	Flat Iron compound	Free-field	54.6 (59.2)	59.7 (63.1)	57.2 (61.5)	54.6 (61.3)	54.0 (62.7)	52.7 (53.2)	53.8 (56.8)	52.5 (53.7)	53.4 (58.2)	47.9 (55.3)	53.2 (62.1)	53.4 (59.1)
	N050	Acton Square, outside North Acton Station	Free-field	64.3 (66.5)	63.8 (65.1)	63.0 (64.2)	62.0 (66.3)	58.0 (64.9)	62.5 (63.8)	62.2 (62.5)	62.3 (62.8)	62.5 (64.5)	57.2 (61.1)	62.3 (65.4)	58.6 (62.4)
OOC	N027	Old Oak Common Lane	Free-field	63.9 (65.7)	64.8 (68.3)	62.3 (64.6)	59.2 (70.1)	56.5 (63.5)	59.1 (61.7)	59.6 (61.3)	59.9 (62.9)	59.5 (64.0)	57.1 (62.3)	58.7 (64.1)	56.9 (66.9)
	N028	Old Oak Common Lane, Hilltop Works	Free-field	67.0 (73.7)	68.2 (70.9)	66.7 (70.9)	65.2 (74.2)	61.3 (68.9)	62.4 (66.2)	65.3 (68.3)	65.3 (68.4)	66.1 (71.4)	60.3 (65.5)	64.1 (69.4)	61.1 (71.2)
BC Compound	N040	Badminton Close	Free-field	54.5 (58.6)	55.6 (57.2)	54.1 (56.6)	53.7 (56.7)	51.3 (58.9)	52.5 (53.9)	52.5 (54.3)	51.9 (52.3)	52.8 (56.3)	49.6 (53.9)	52.4 (56.7)	50.5 (54.6)
GPWVS	N059	Green Park Way Ventilation Shaft	Façade	56.7 (61.4)	62.1 (64.8)	54.5 (58.0)	54.2 (59.6)	54.9 (62.1)	54.4 (57.6)	52.1 (55.1)	51.3 (52.1)	50.9 (55.0)	54.7 (61.3)	53.3 (59.9)	51.7 (61.5)

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
WET	V052	Stephenson Street (north)	2.52 (Y-axis)
OOC	V045	25 Wells House Road	1.00 (Y-axis)
OOC	V051	Kildun Court, Old Oak Common Lane	1.62 (Z-axis)
GPWVS	V053	Green Park Way Ventilation Shaft	6.54* (X-axis)

* High vibration levels are due to the proximity of the construction activities to the vibration monitor. The nearest residential receptors are further away (over 25m away) 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
AR	N032	Shaftesbury Gardens	Saturday	1400-2200	3
	N033	Outside The Collective, Atlas Road / Victoria Road	Saturday Sunday	1400-2200 0700-2200	5 3
	N060	Atlas Road next to Bashey Road	All days	All periods	No exceedance
WET	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
VRFIC	N029	Braitrim House, Victoria Road	All days	All periods	No exceedance
	N042	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
OOC	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	Night	All periods	No exceedance
GPWVS	N059	Green Park Way Ventilation Shaft	All days	All periods	Not applicable*

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

2.2.5 Eleven exceedances of the SOAEL were recorded due to HS2 construction works during February 2021. These were due to works taking place outside normal core hours in line with the Consented Dispensation.

2.2.6 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 6 and may be lower than the total sum of individual exceedances reported in Table 5 for each location.

Table 6: Summary of Total Exceedances of SOAEL

Worksite Reference	Measurement Reference	Monitor Address	Total of SOAEL exceedances in the month
AR	N032	Shaftesbury Gardens	1
	N033	Outside The Collective, Atlas Road / Victoria Road	3

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.

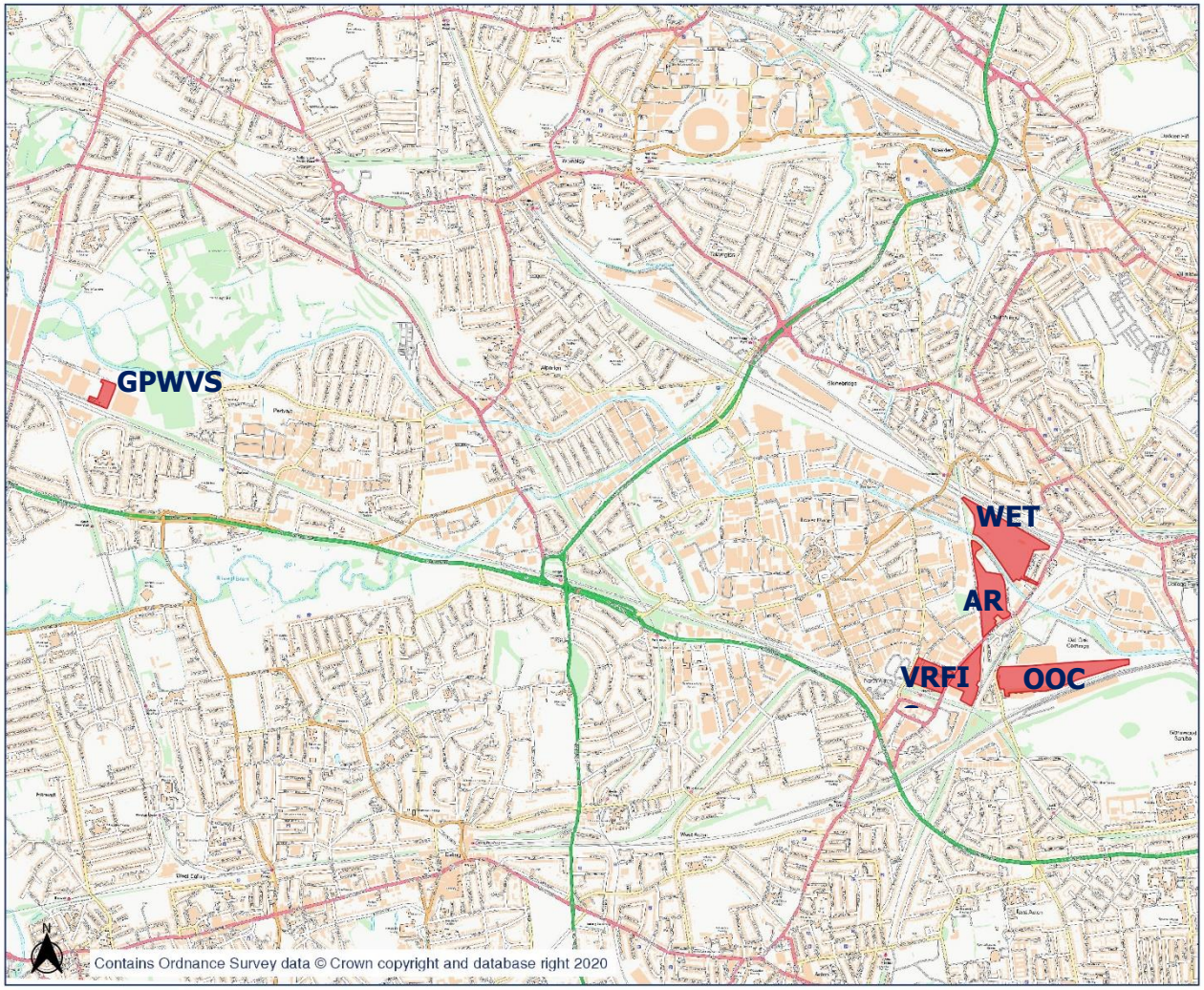
Table 7: Summary of Complaints

Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
HS2-21-54967-E	WET	Complaint due to construction vibration felt within the properties.	Investigations shown that excavation works were underway on the same date of the complaint and close to the site boundary. Monitoring data show that vibration levels were well below values potentially associated with building damage. Works were carried out in line with the Section 61 application and BPM (Best Practical Means).	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. However, the site team has investigated changing to a different excavator type to see if this will reduce the level of vibration.
HS2-21-54818-E	WET	Complaint due to construction vibrations during the day.	Works were carried out in line with the Section 61 application and BPM.	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.
HS2-21-55134-E	WET	Complaint due to construction noise during the day.	Works were carried out in line with the Section 61 application and BPM.	The complainant has been contacted and information provided. No actions considered to be required for works on site which

Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
				were in line with the Section 61 application coverage.
HS2-21-41449-C	VRFIC	Complaint due to construction vibrations.	On-going.	On-going.
HS2-21-41406-C HS2-21-41398-C	OOC	Complaint due to generator noise always on.	Investigations shown that the generator was on only during core working hours.	No actions required.
HS2-21-41410-C	OOC	Complaint due to loud construction noise.	Investigations shows that no works were undertaken at that time that would have resulted in increased noise levels.	No actions required.

Appendix A Site Locations

Worksite identification plan - Overview



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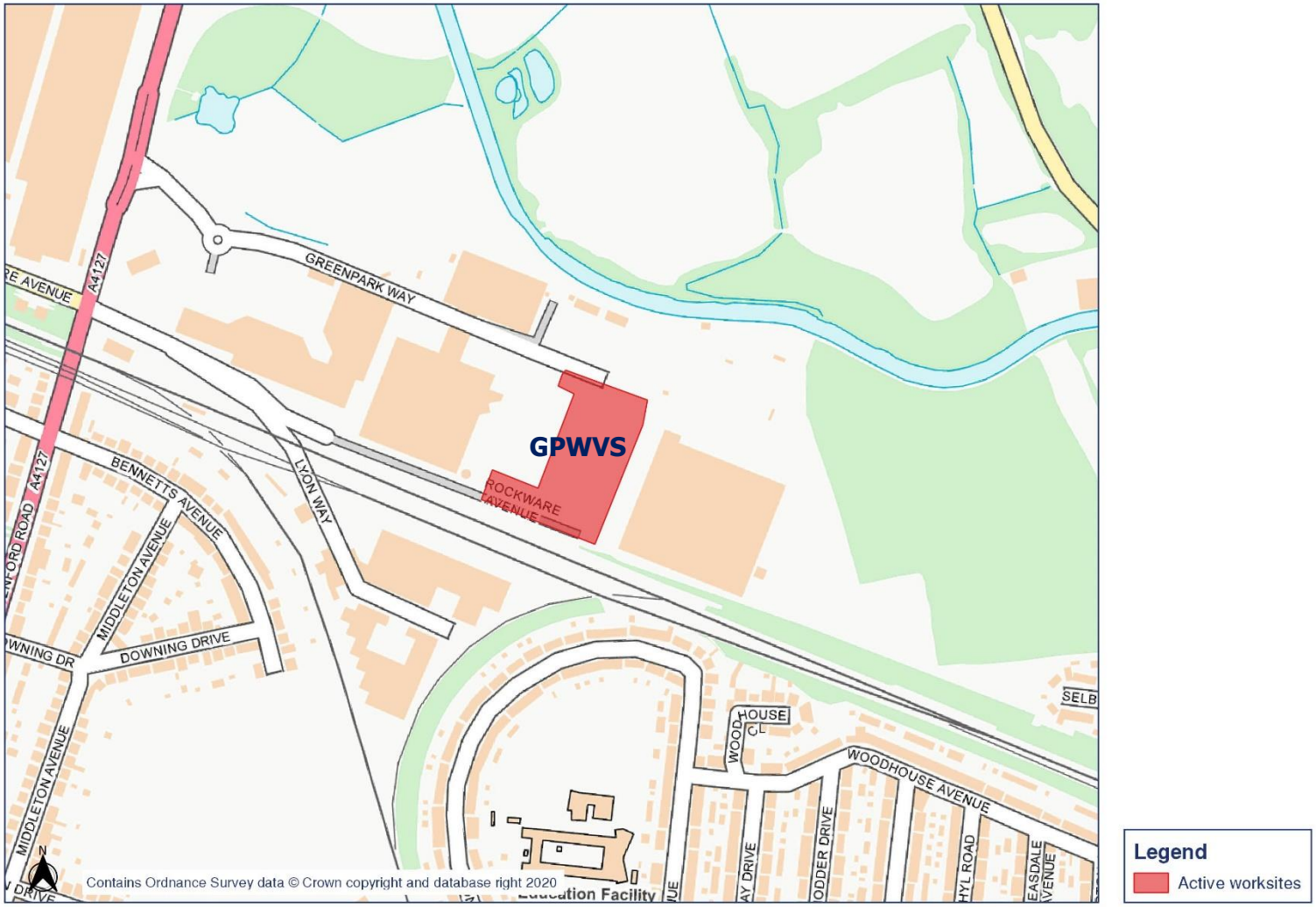
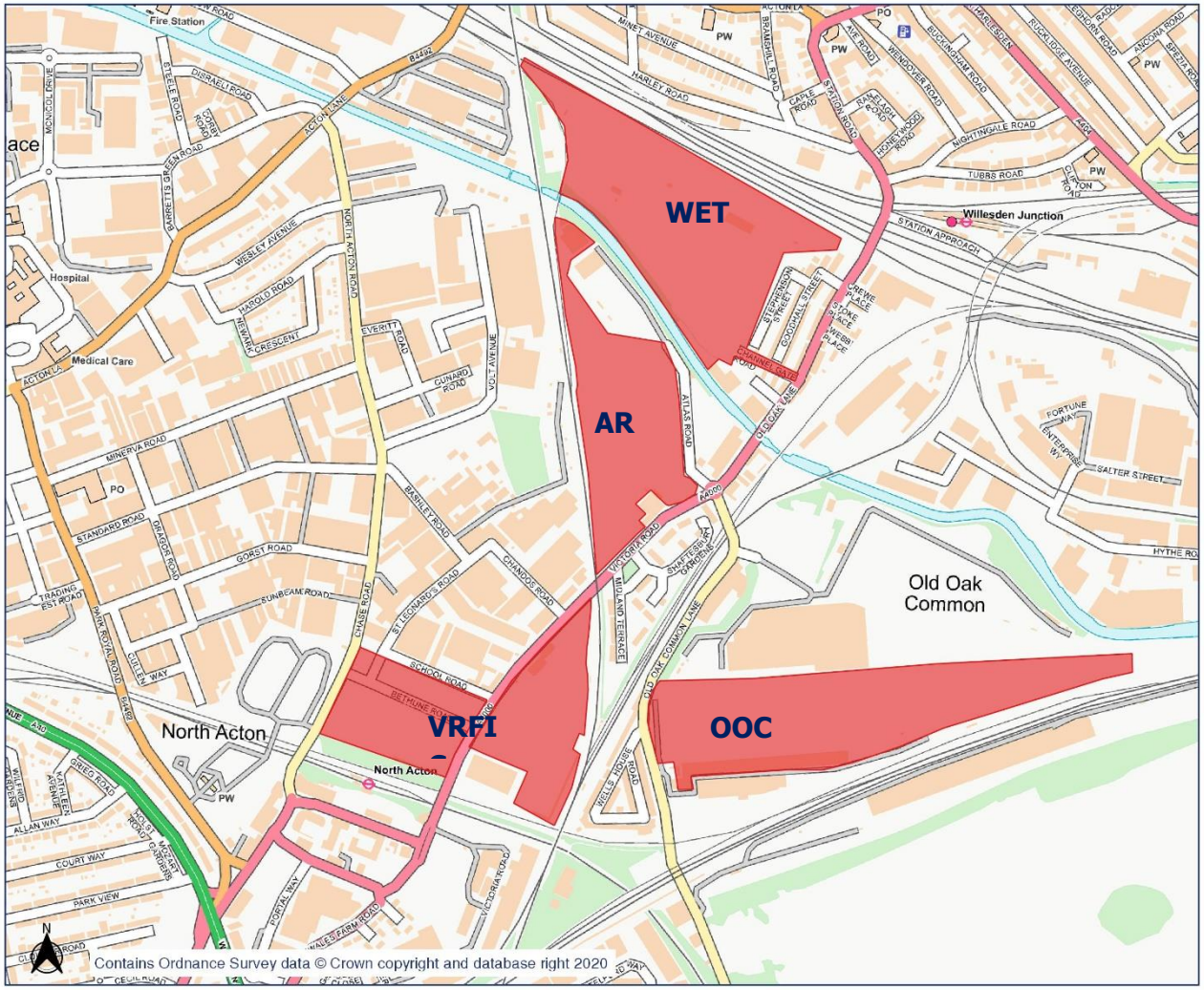
Worksite identification plan - 1



Worksite identification plan - 2



Legend

Active worksites

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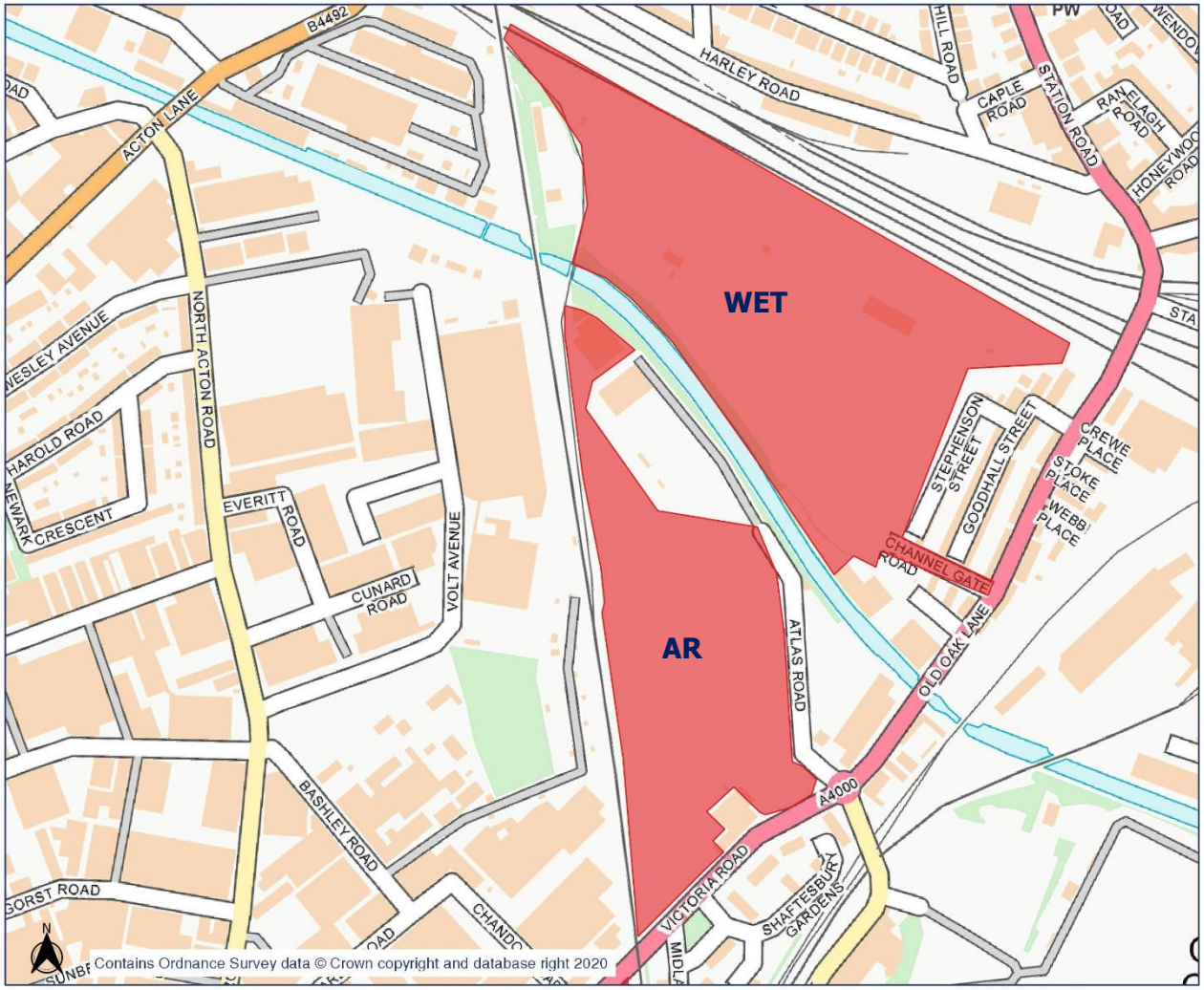
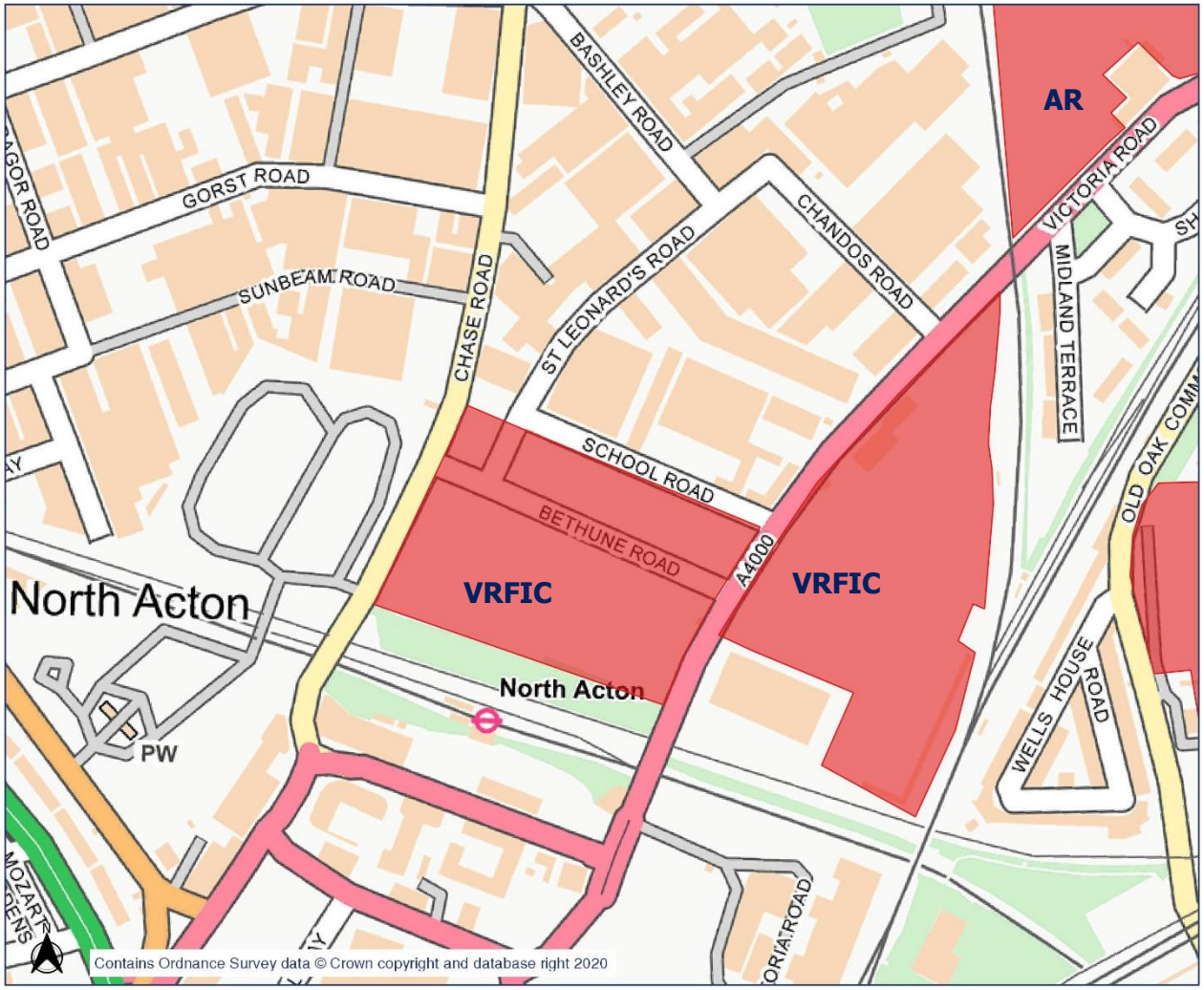
Worksite identification plan - 3

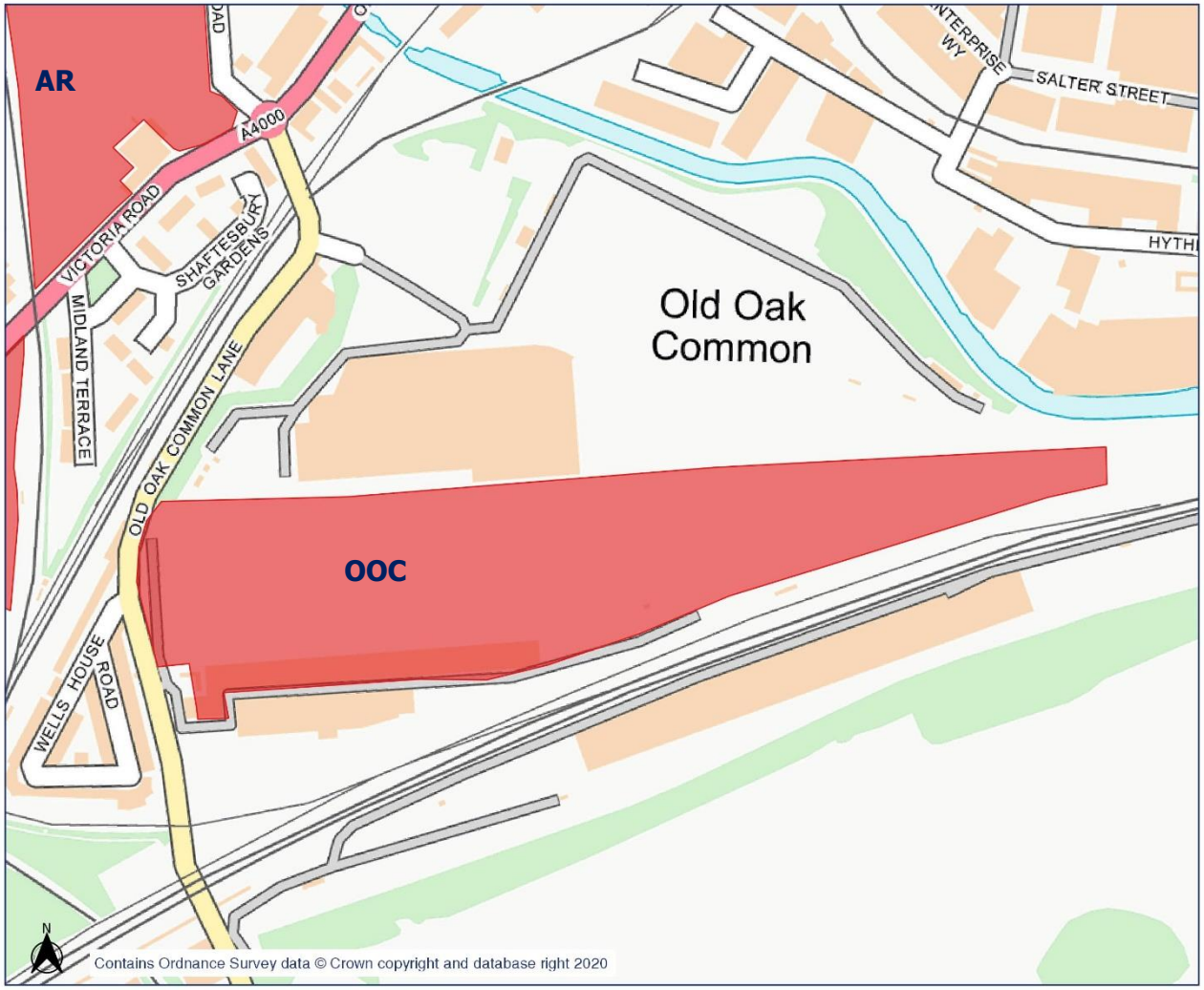


HS2 Worksite identification plan - 4



HS2

Worksite identification plan - 5

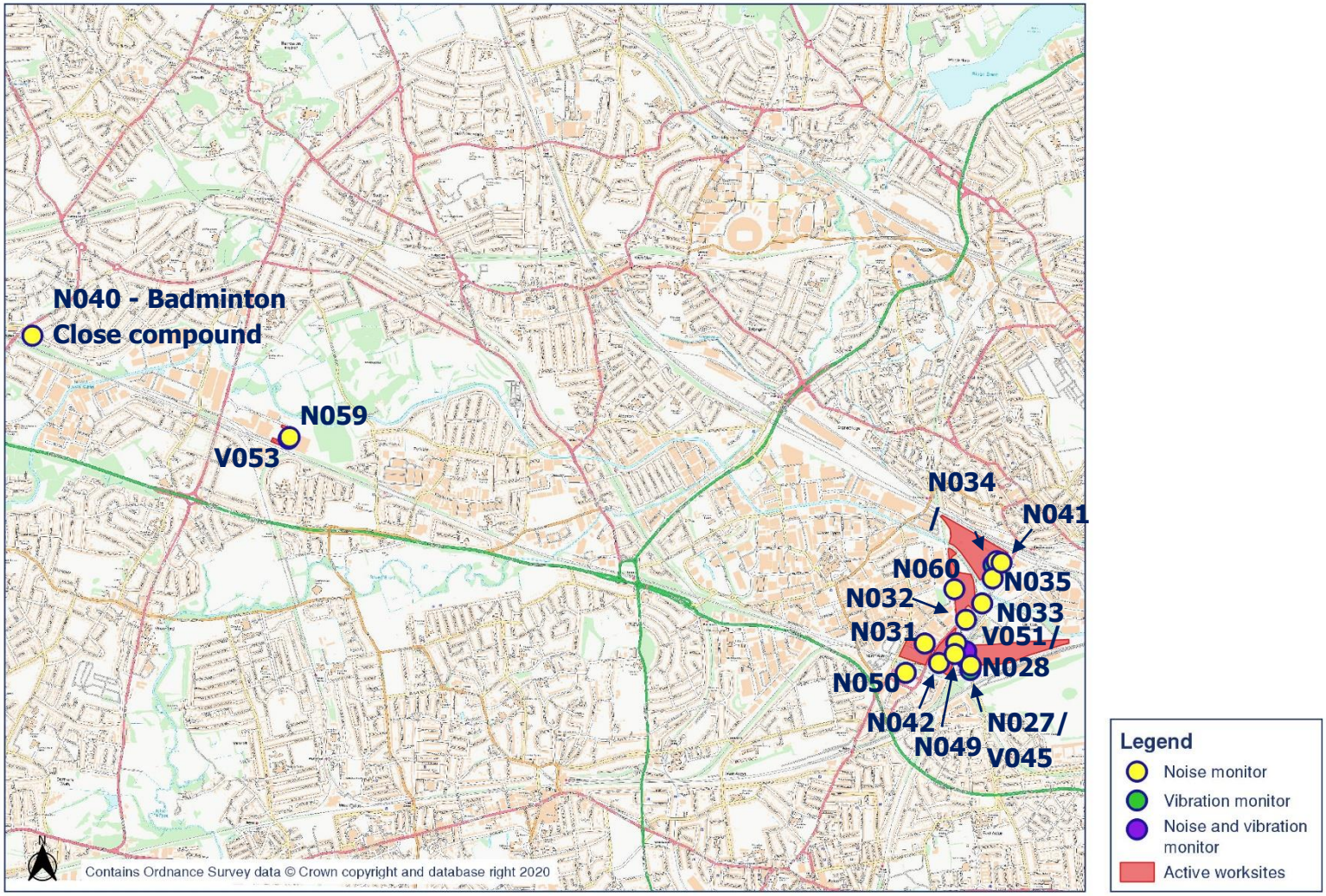


Legend

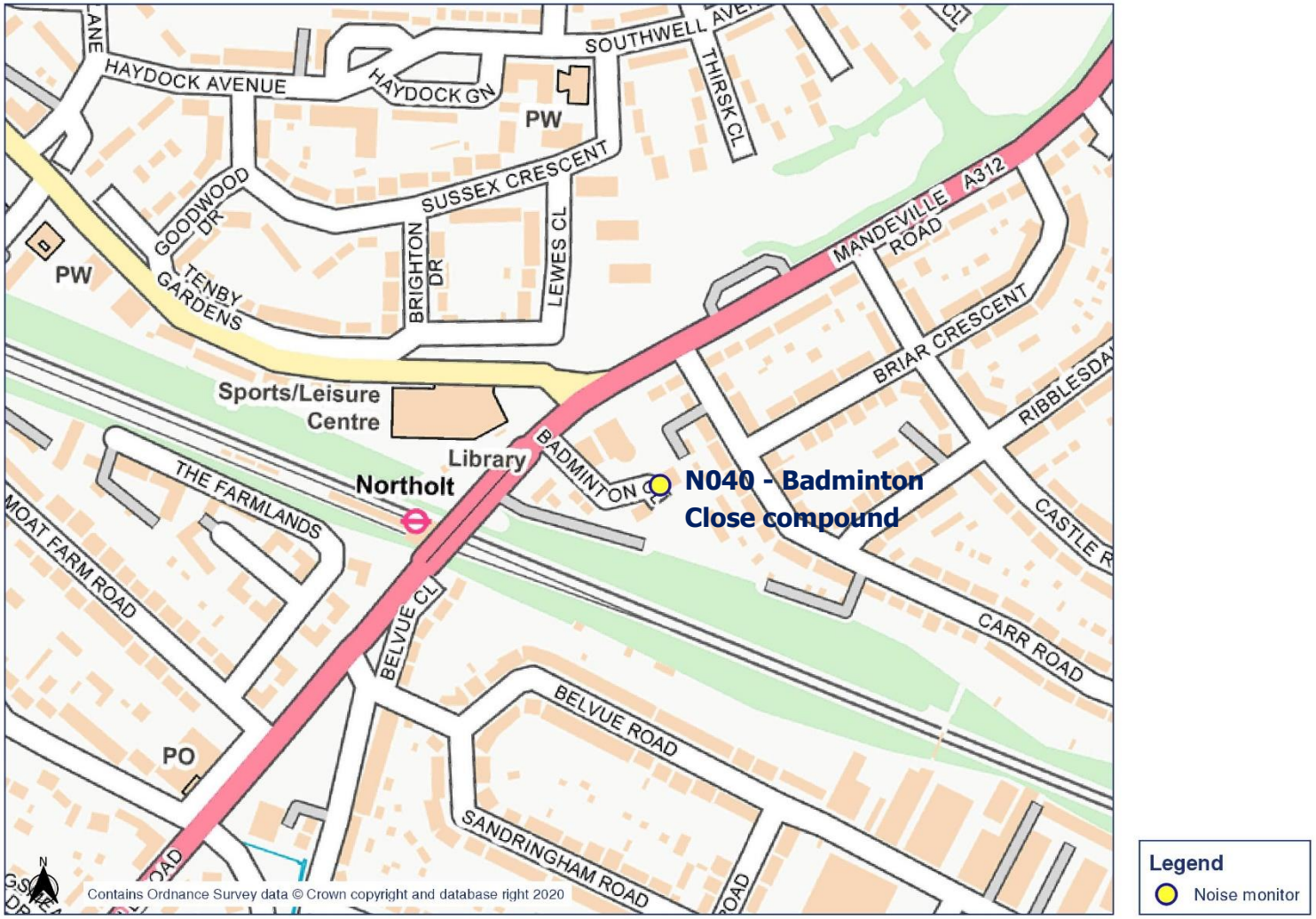
Active worksites

Appendix B Monitoring Locations

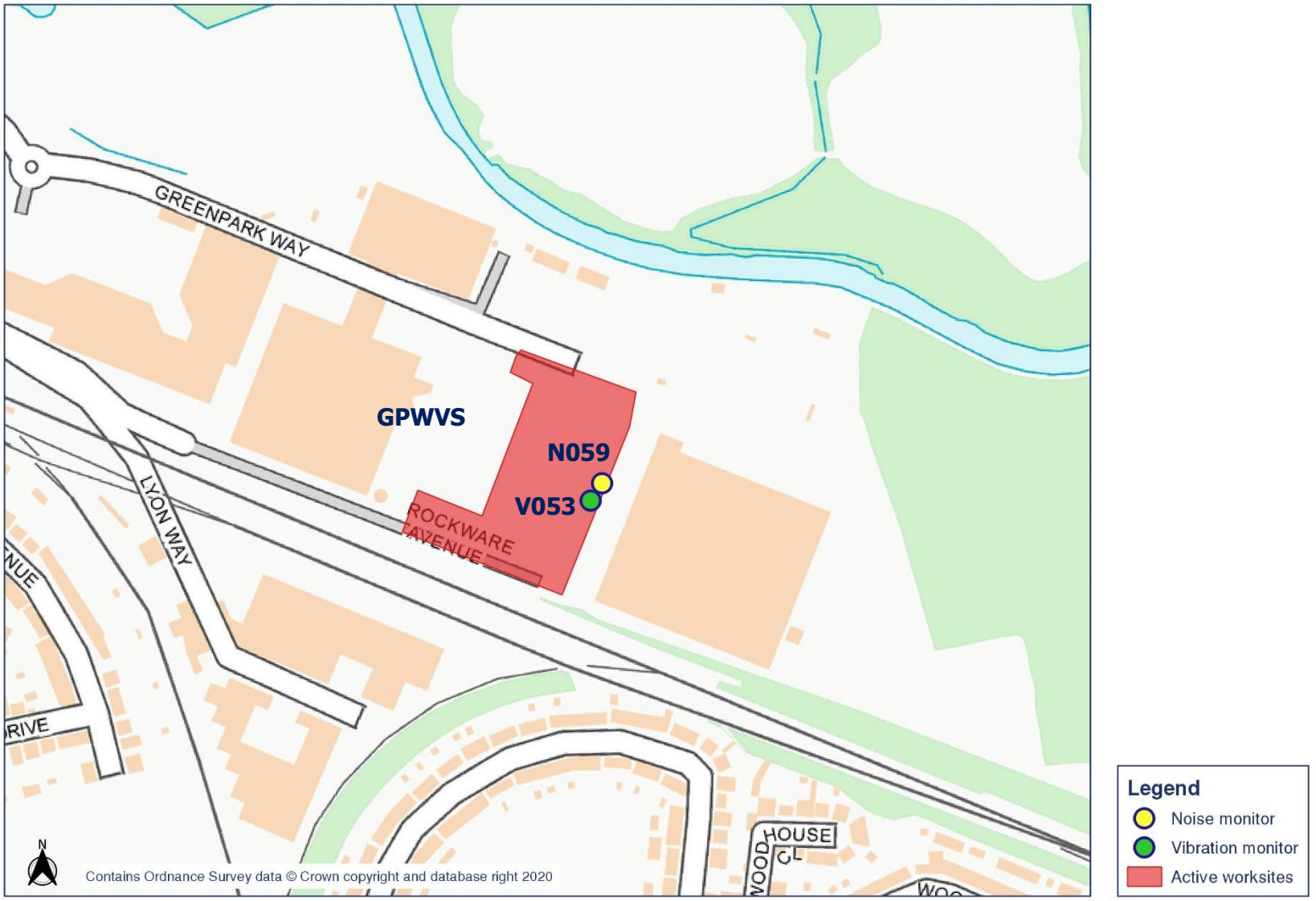
HS2 Noise and vibration monitoring plan - Overview



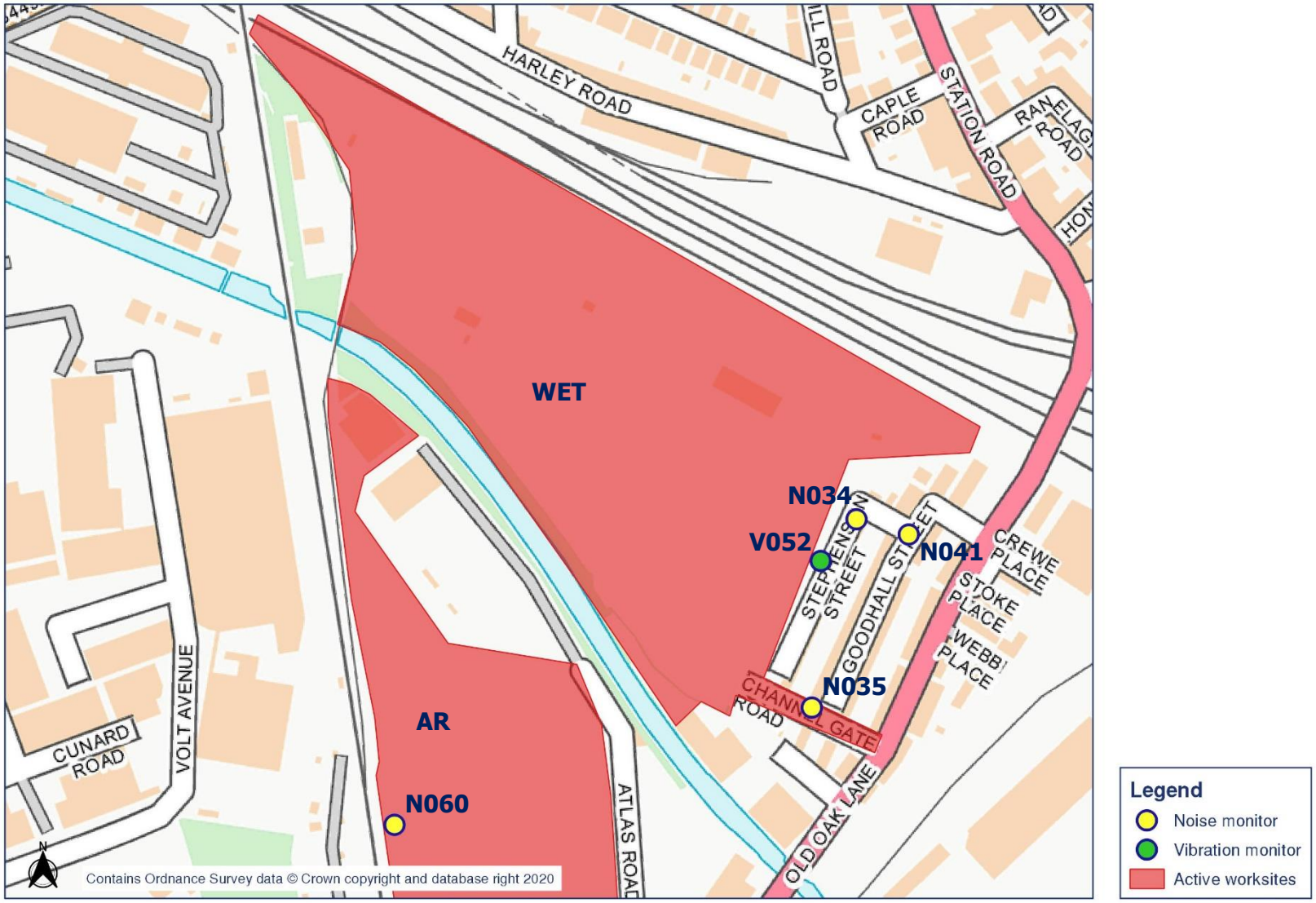
HS2 Noise and vibration monitoring plan - 1



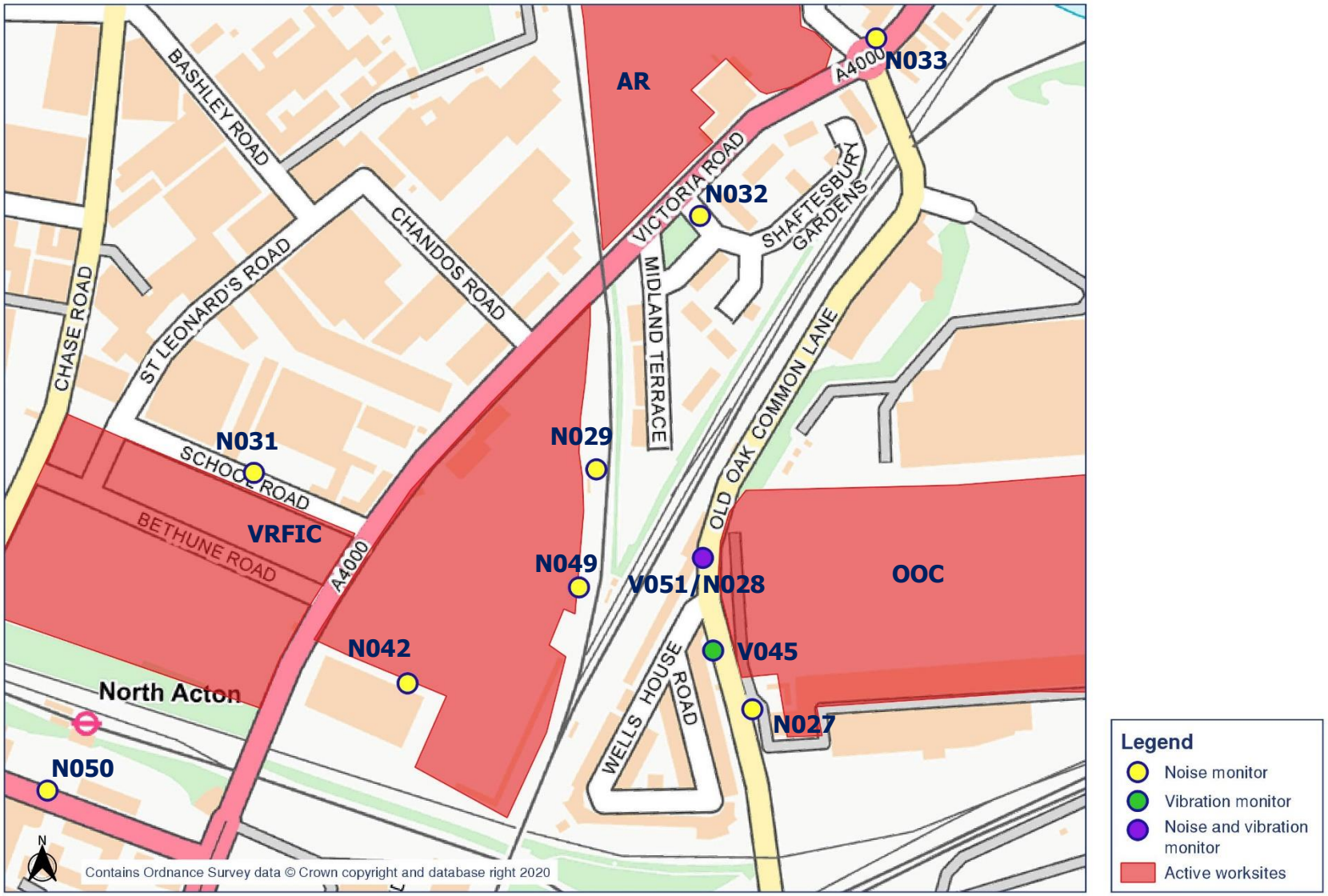
Noise and vibration monitoring plan - 2



Noise and vibration monitoring plan - 3



HS2 Noise and vibration monitoring plan - 4

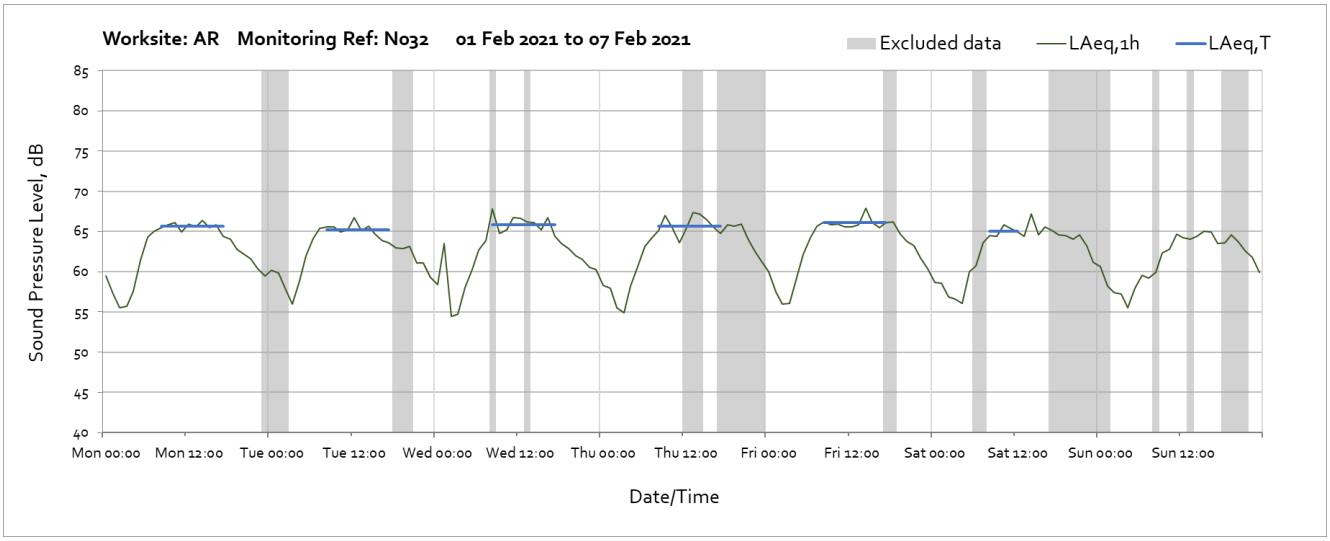


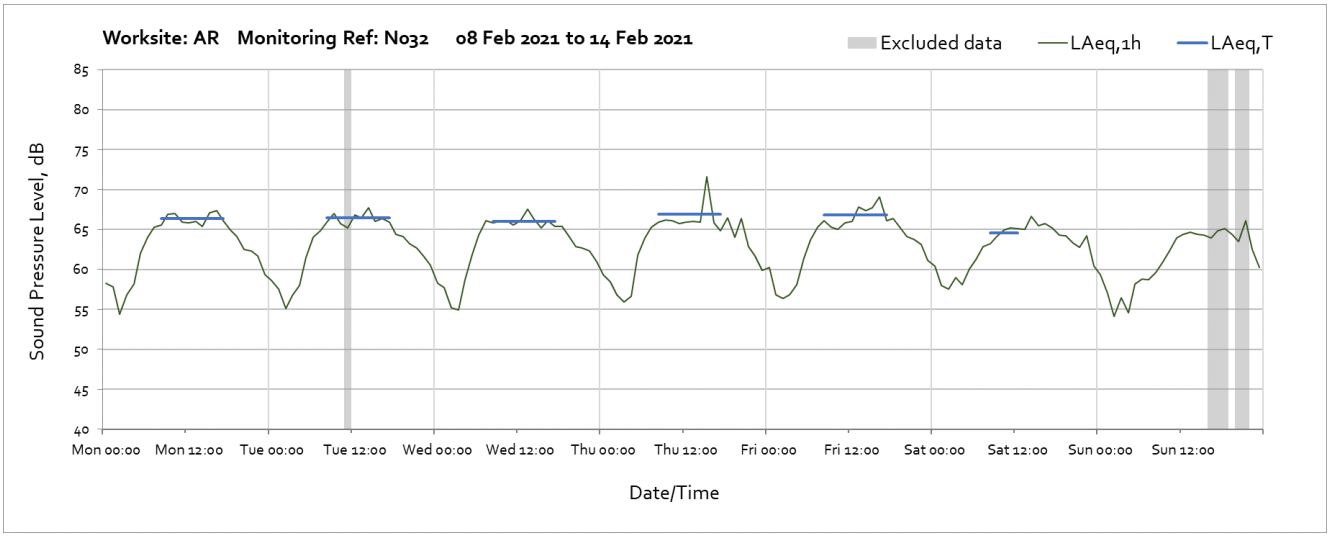
Appendix C Data

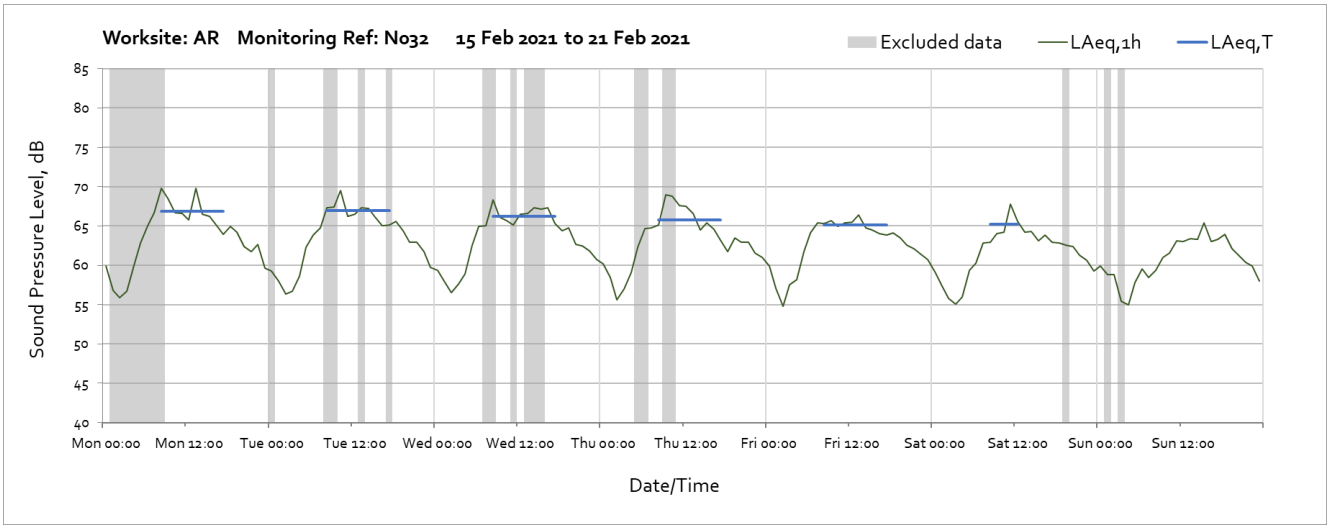
Noise

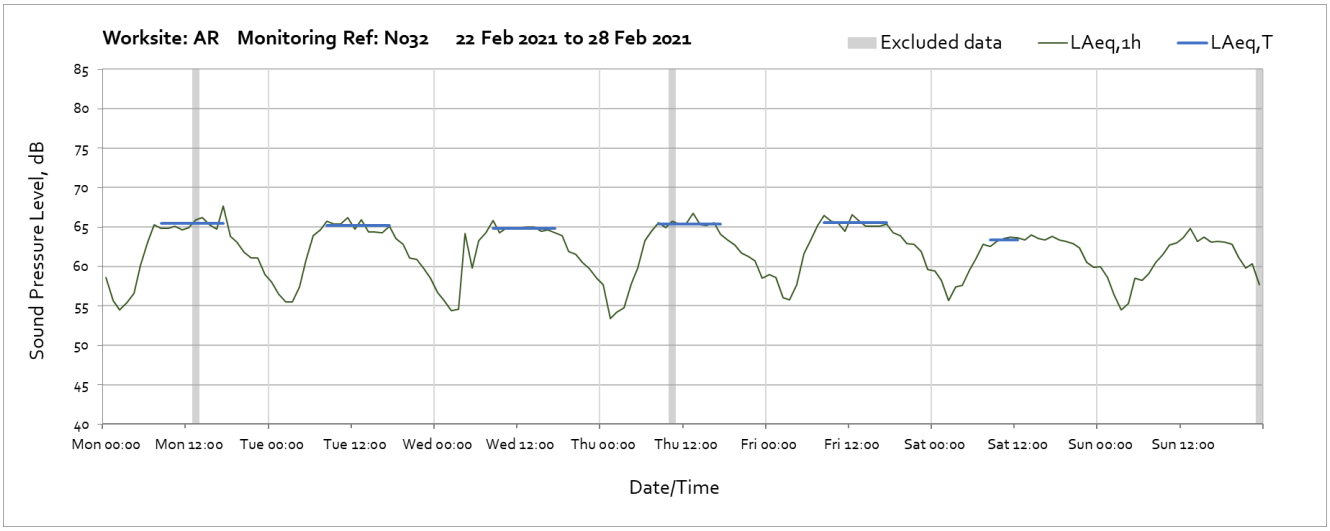
The following graphs show the hourly measured ambient noise level $L_{Aeq,1h}$ and, where relevant, the averaged noise level $L_{Aeq,T}$ values, where the time period T is as specified in Table 1 of HS2 Information Paper E23. Periods with adversely weather affected noise levels are greyed out and have been excluded from the calculation of the $L_{Aeq,T}$ values in Table 3 of the main report.

Worksite: Atlas Road worksite (AR) – Monitoring Ref: N032

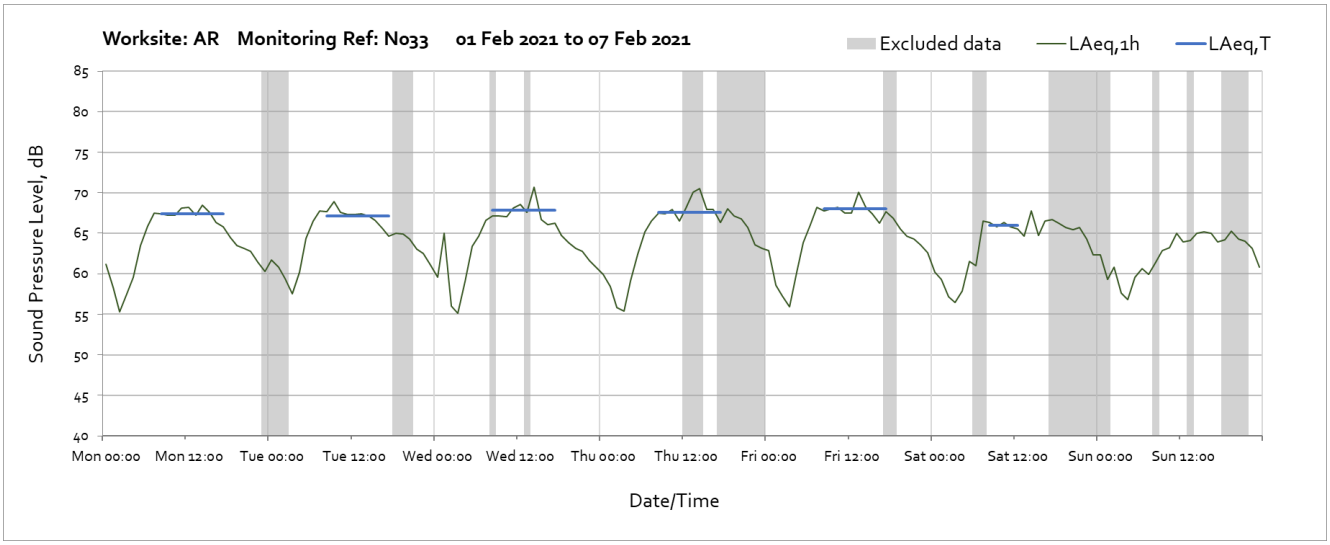


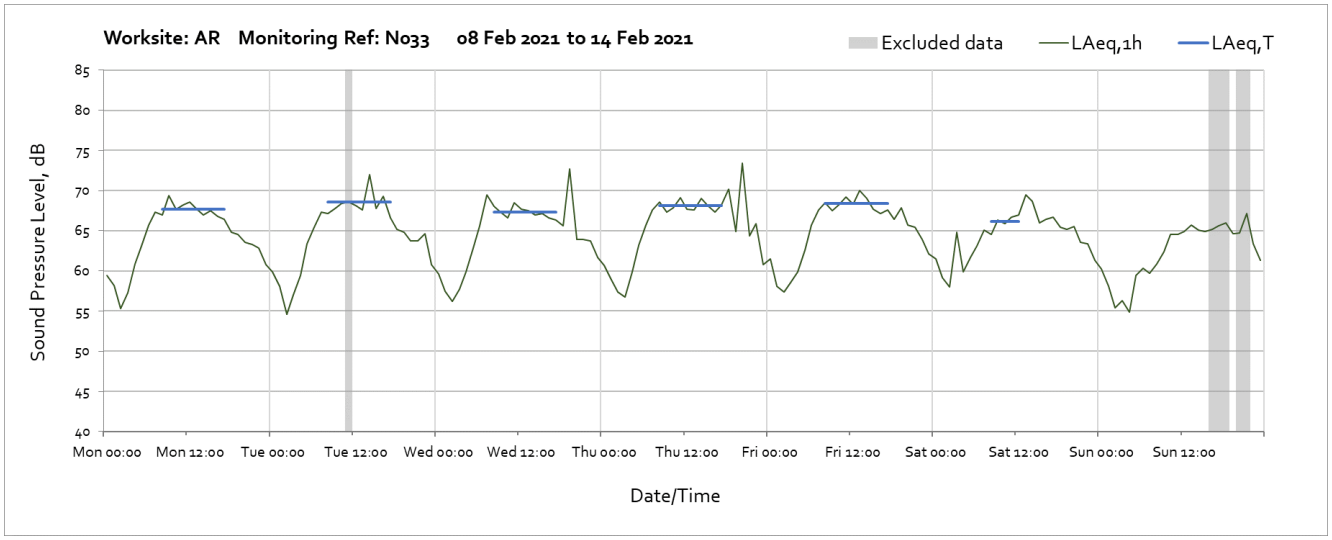






Worksite: Atlas Road worksite (AR) – Monitoring Ref: N033

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LAeq,T
Sound Pressure Level, dB
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75
70
65
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Mon 12:00
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Tue 12:00
Wed 00:00
Wed 12:00
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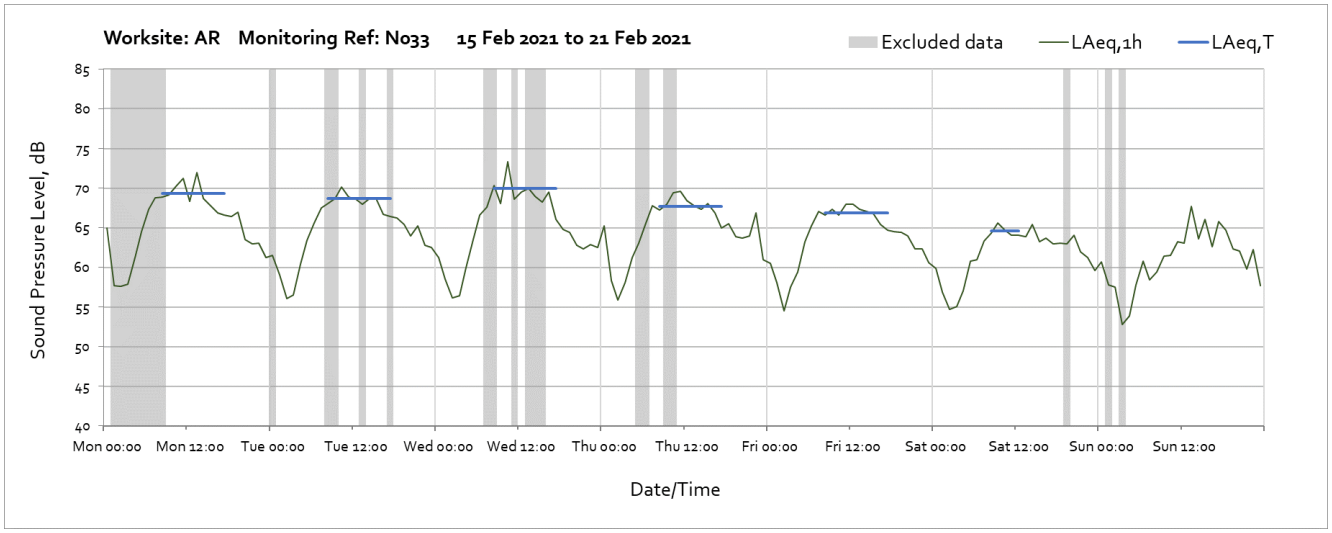
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time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Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
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80
75
70
65
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Mon 12:00
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Tue 12:00
Wed 00:00
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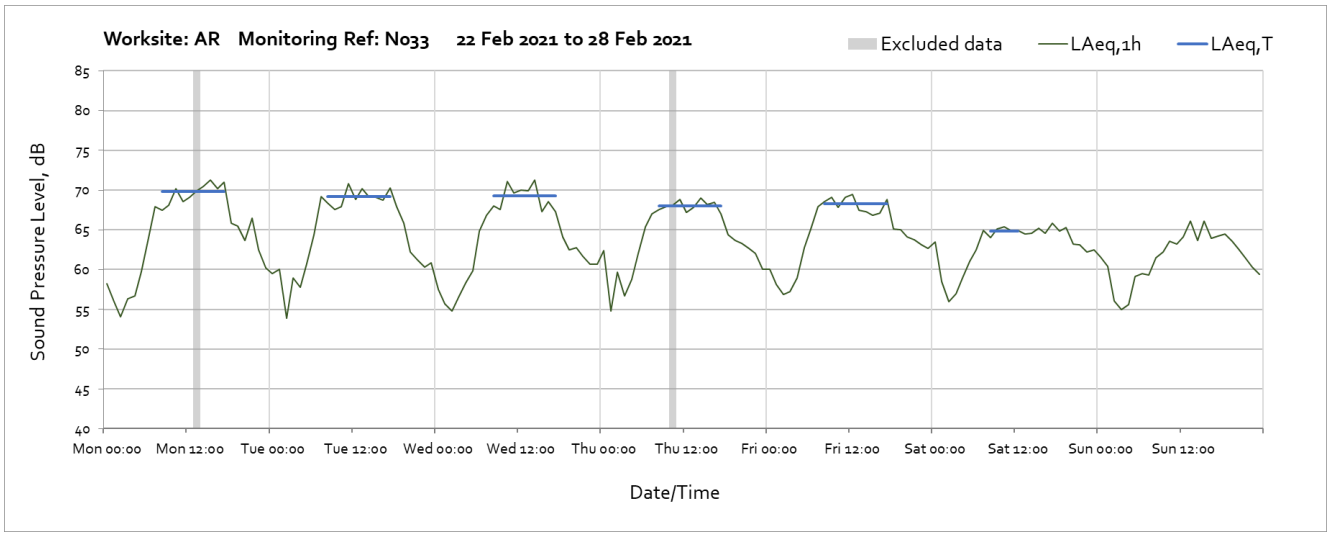
Date/Time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Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
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80
75
70
65
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Mon 12:00
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Tue 12:00
Wed 00:00
Wed 12:00
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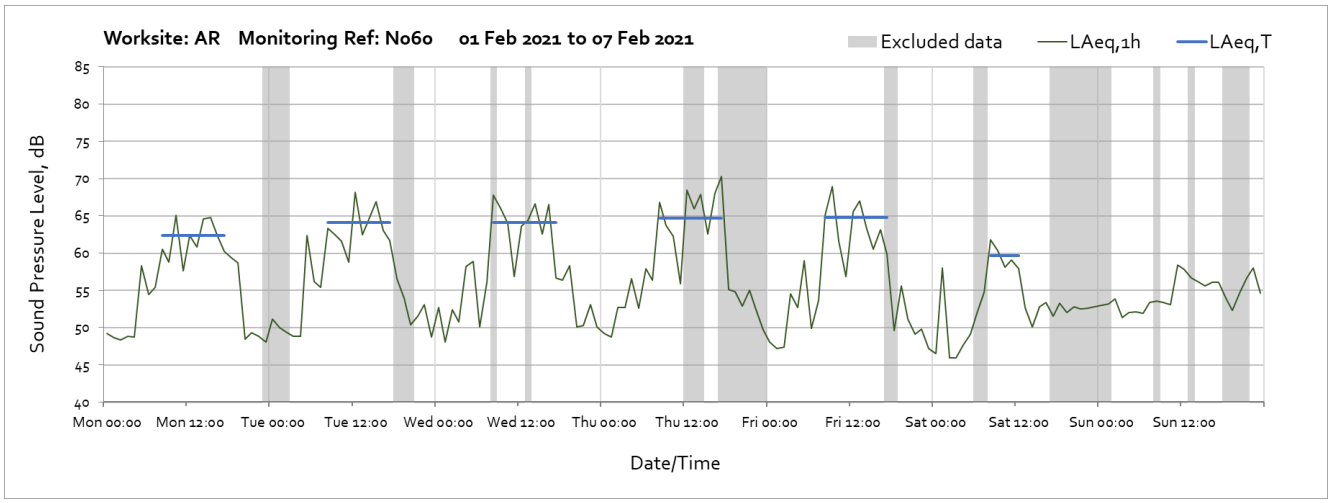
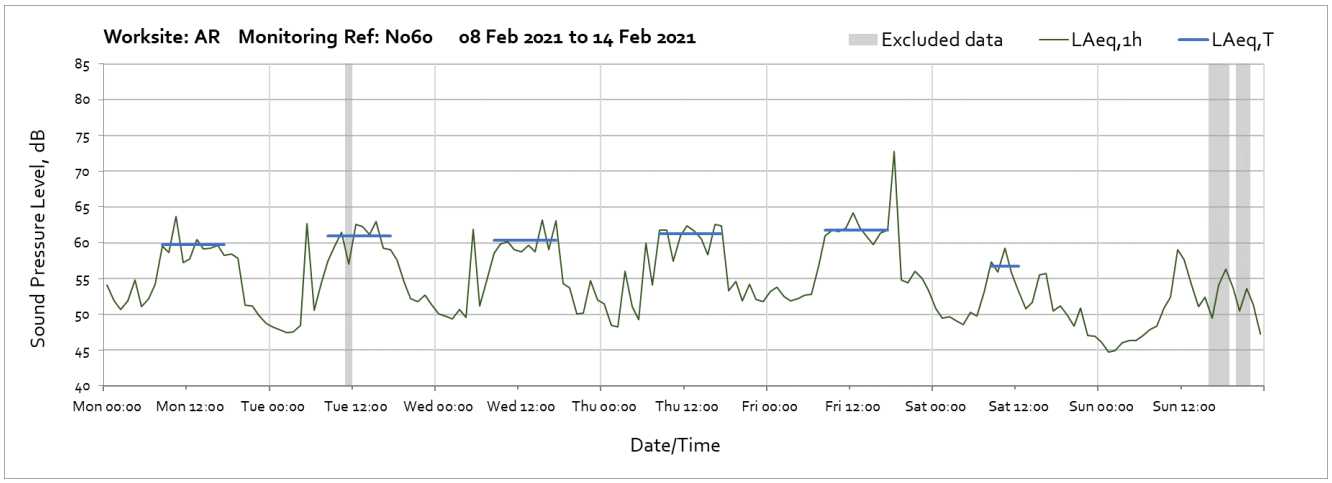
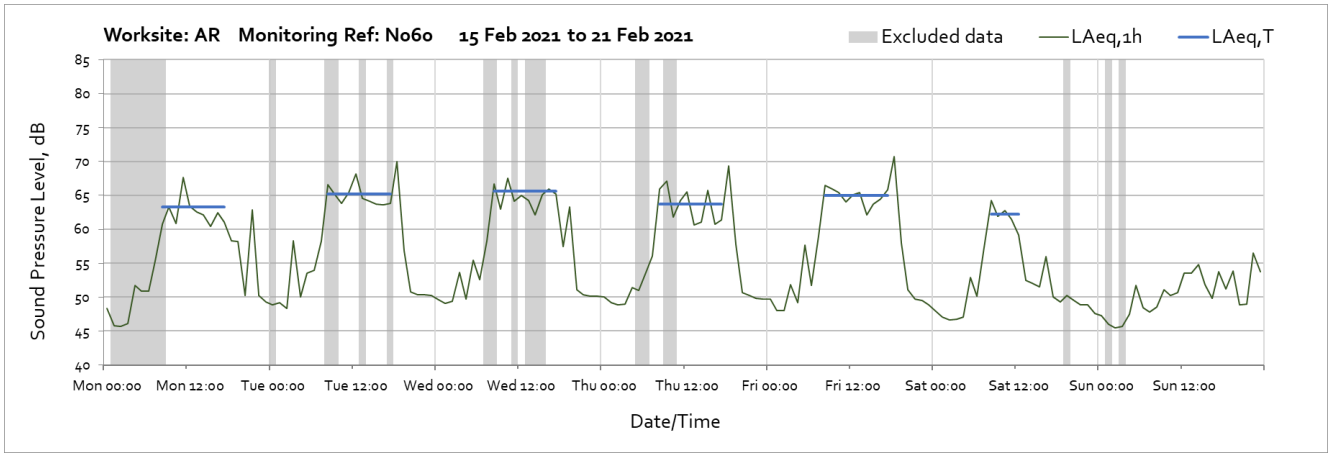
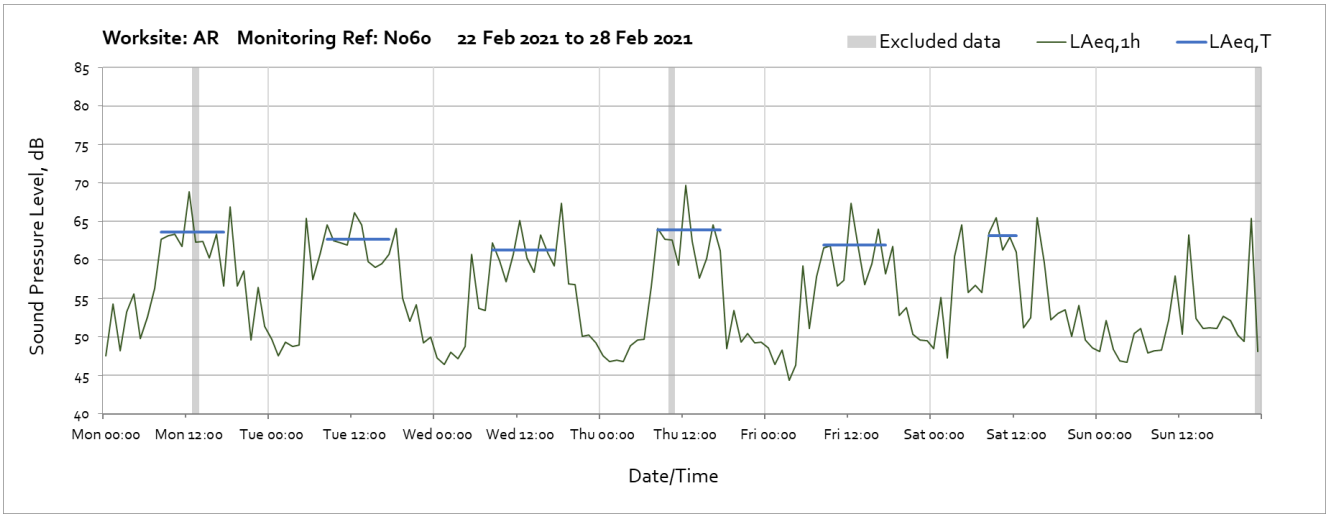
Date/Time

Worksite: Atlas Road worksite (AR) – Monitoring Ref: N060









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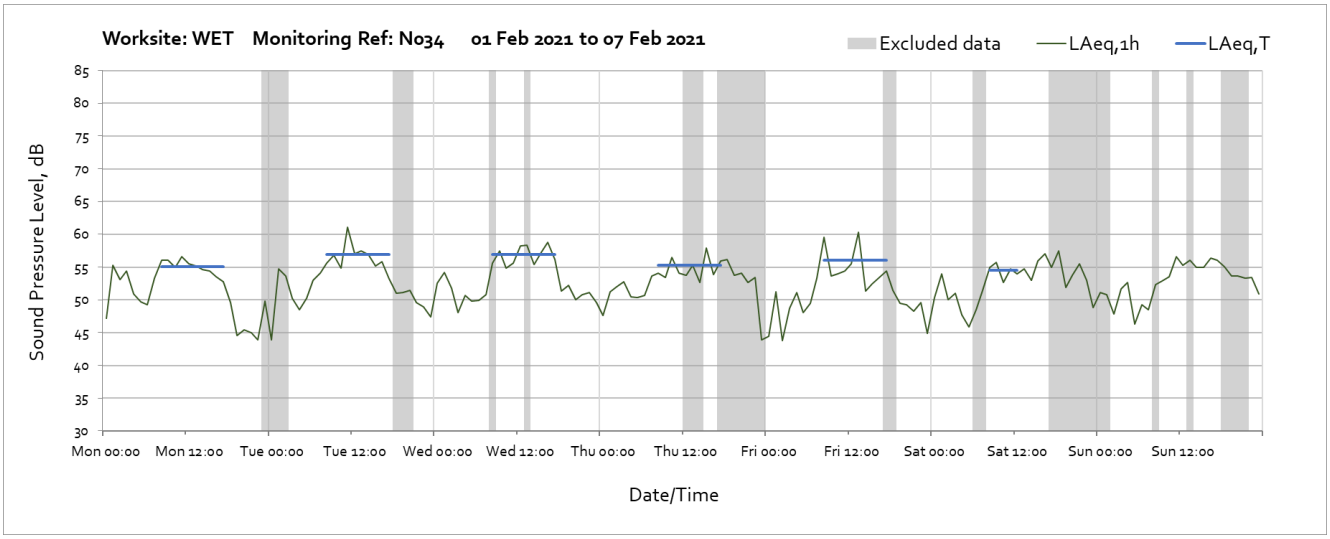
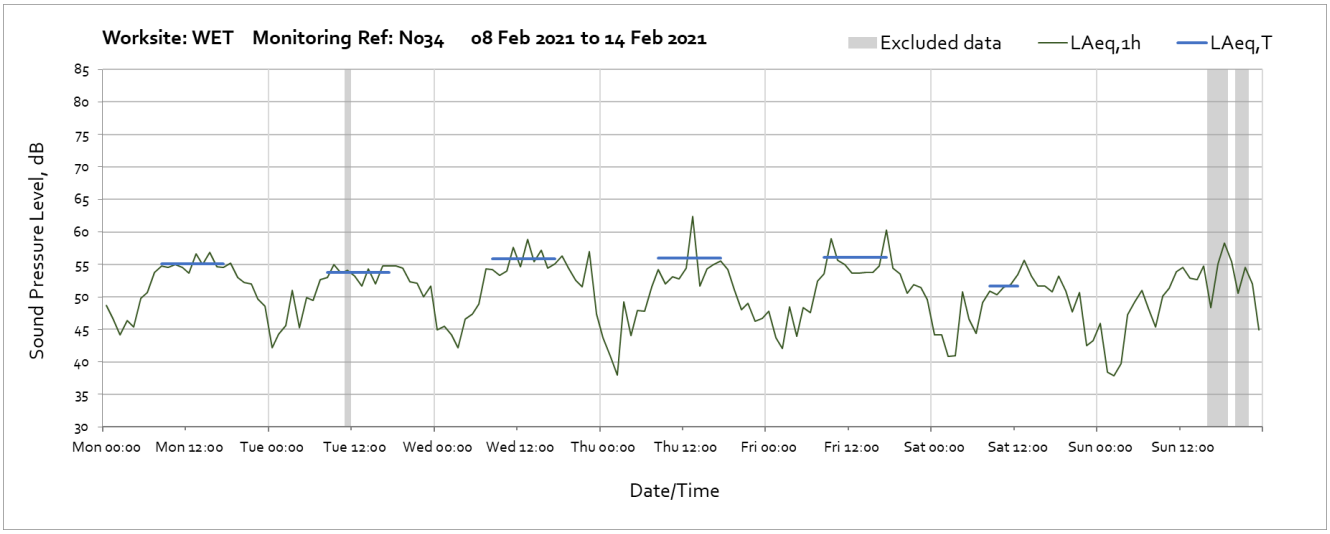
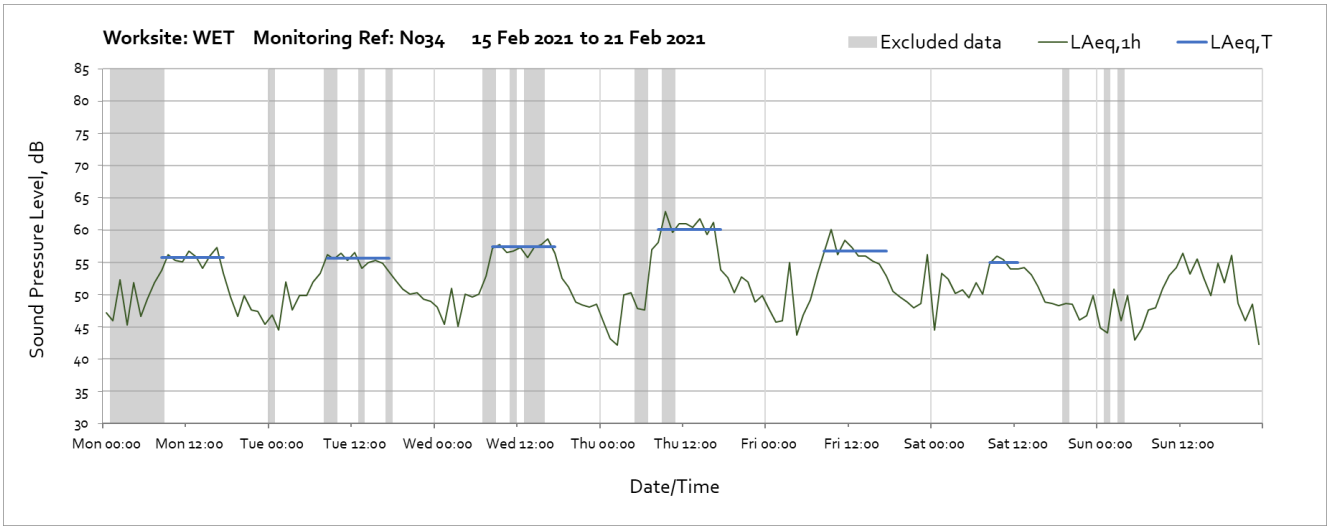
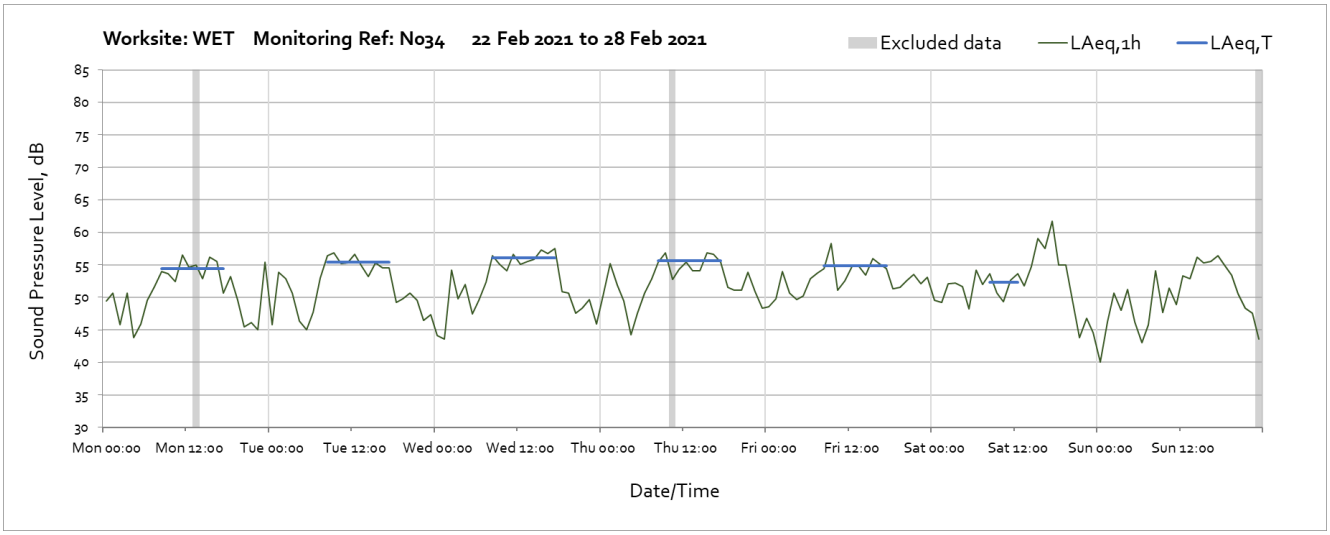
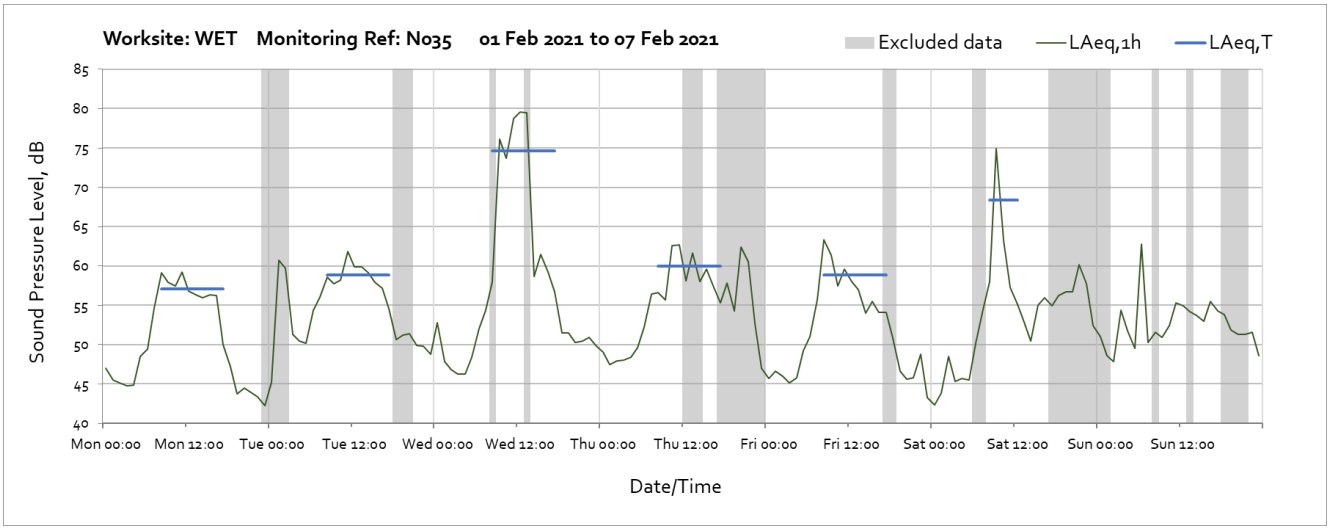


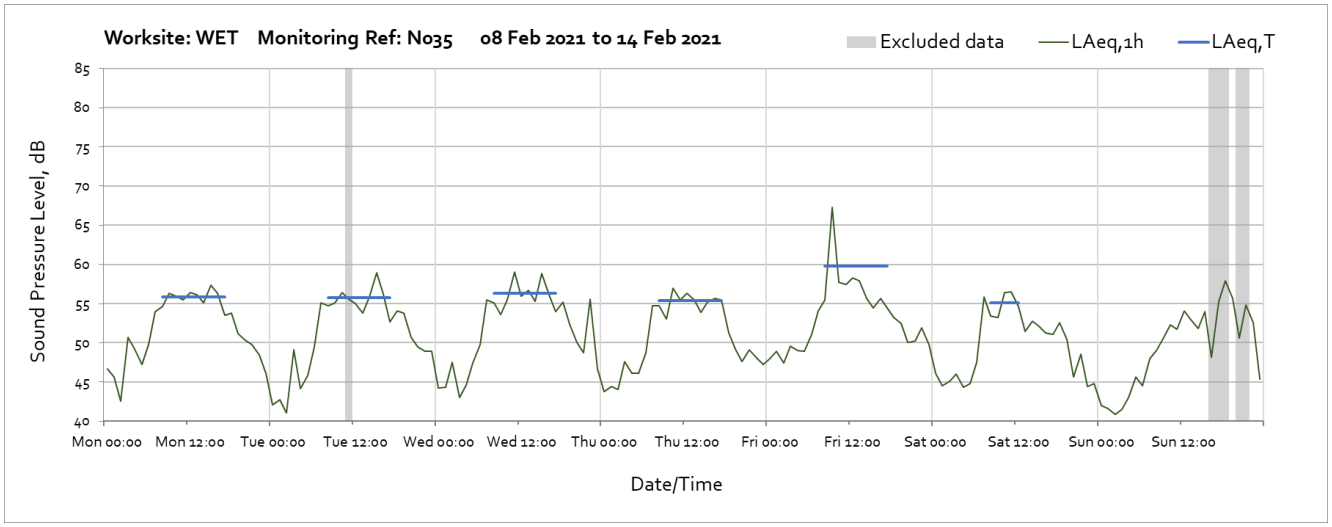






Worksite: Willesden Euro Terminal (WET) – Monitoring Ref: N035

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Tue 12:00
Wed 00:00
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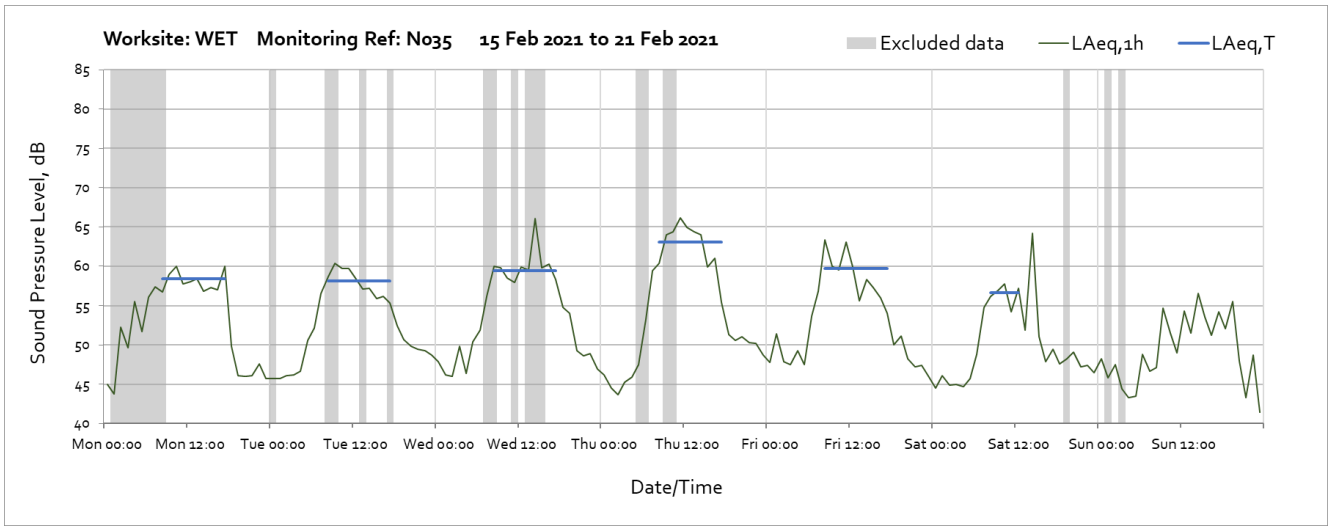
Date/Time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Excluded data
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LAeq,T
Sound Pressure Level, dB
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80
75
70
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Tue 12:00
Wed 00:00
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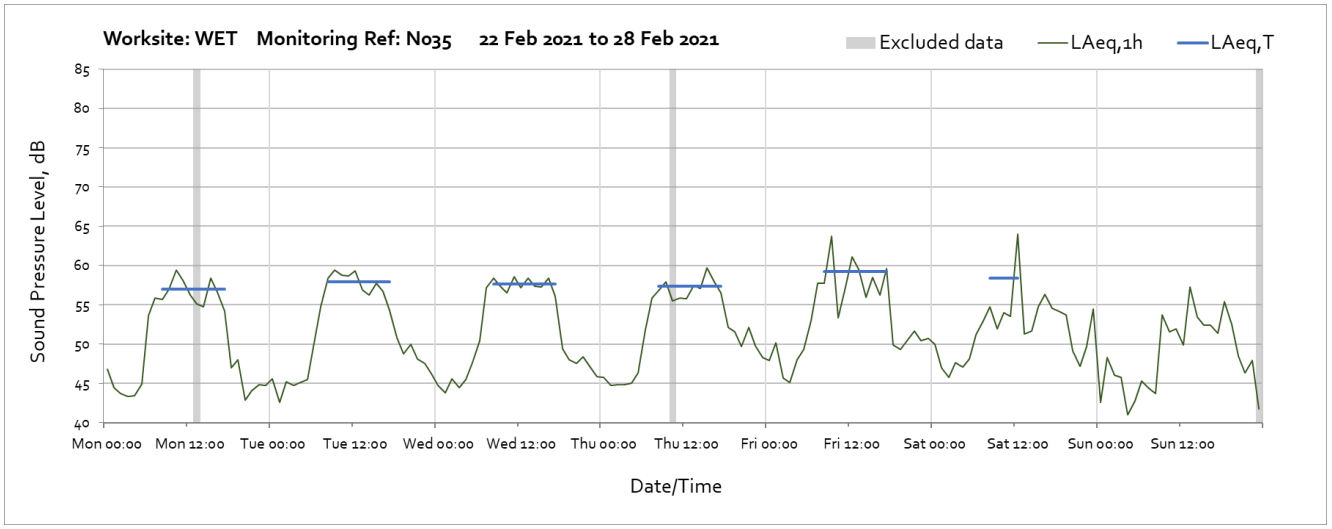
Date/Time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LAeq,T
Sound Pressure Level, dB
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70
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Tue 12:00
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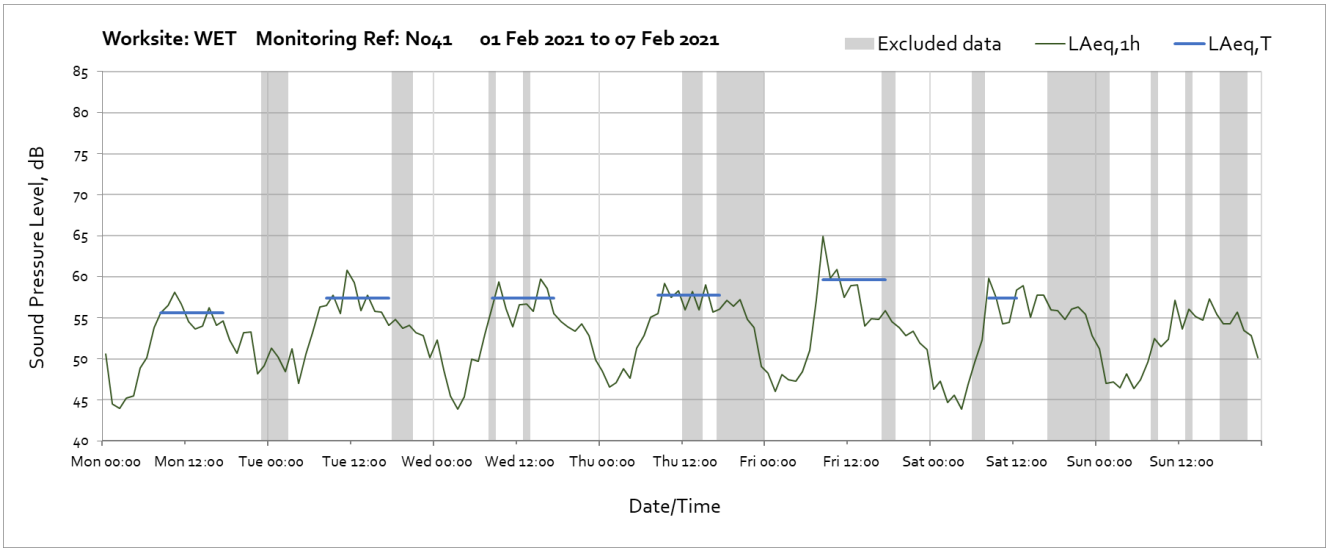
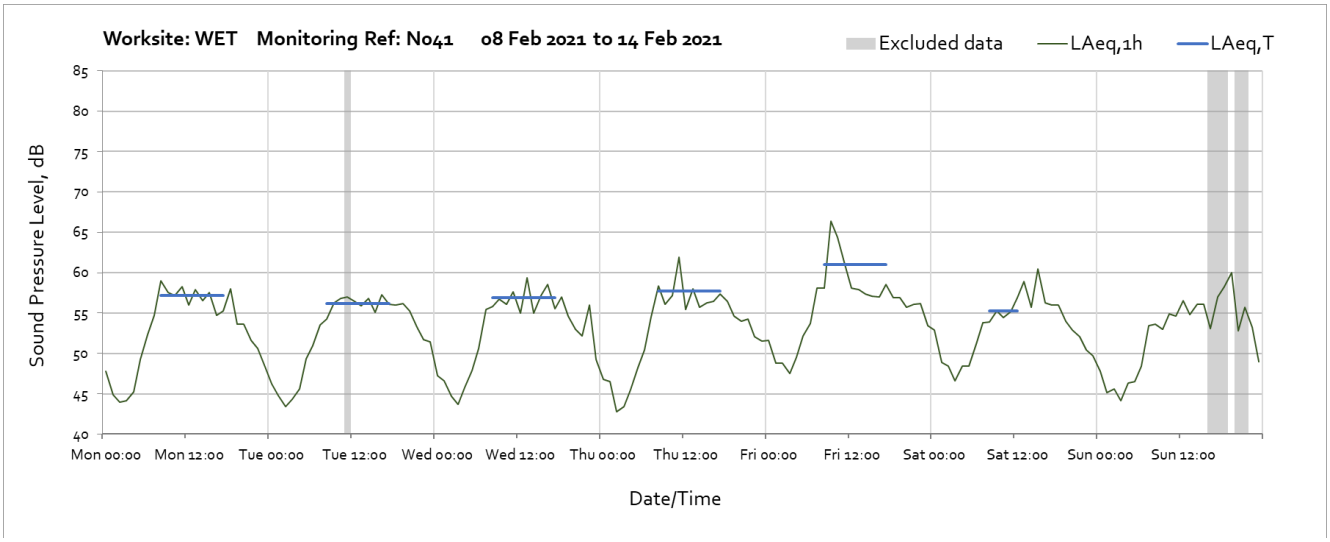
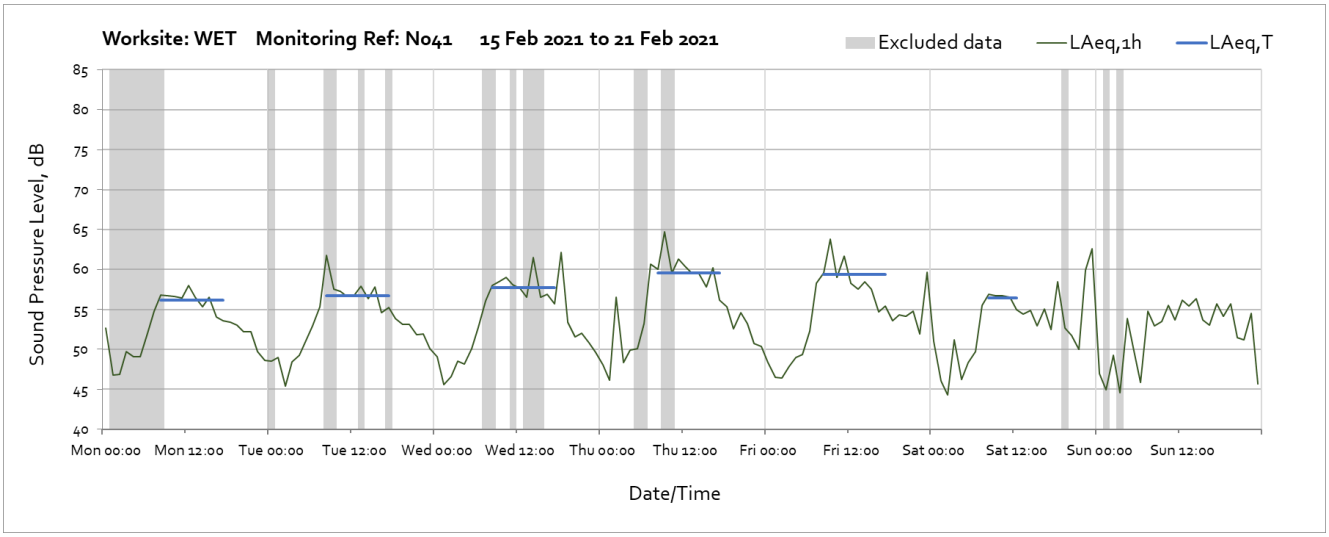
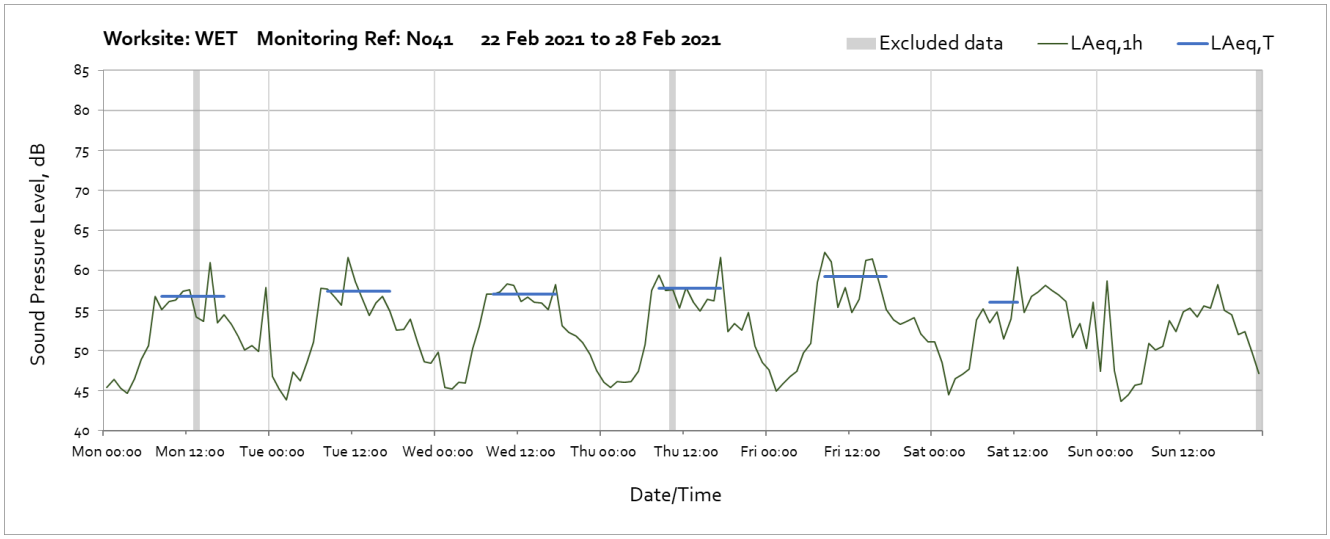
Date/Time

Worksite: Willesden Euro Terminal (WET) – Monitoring Ref: N041

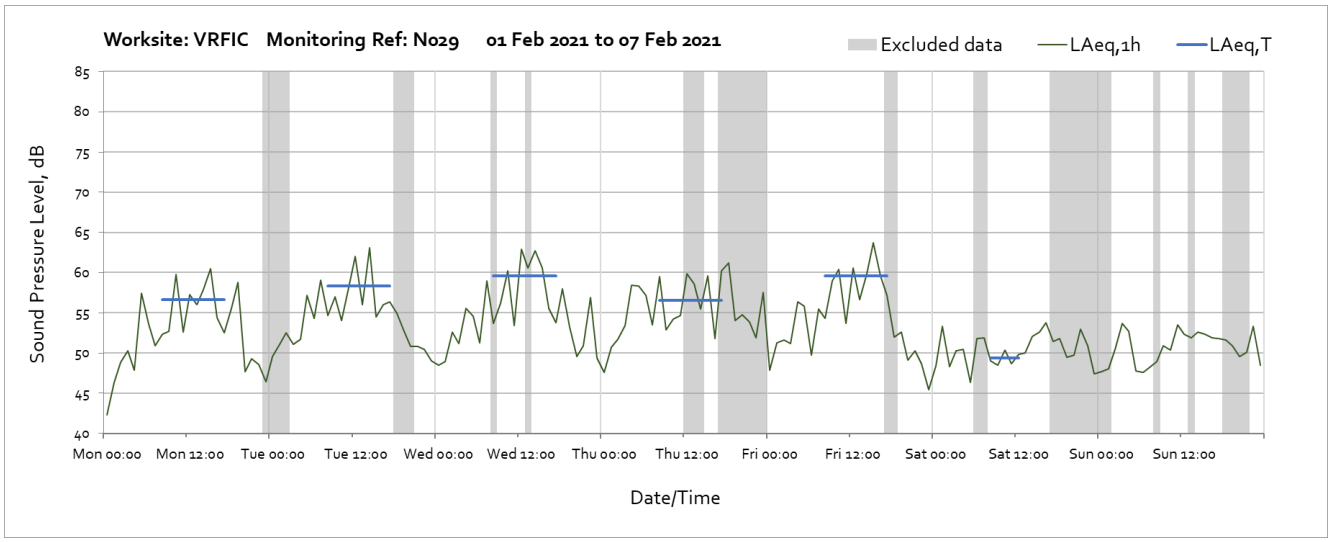


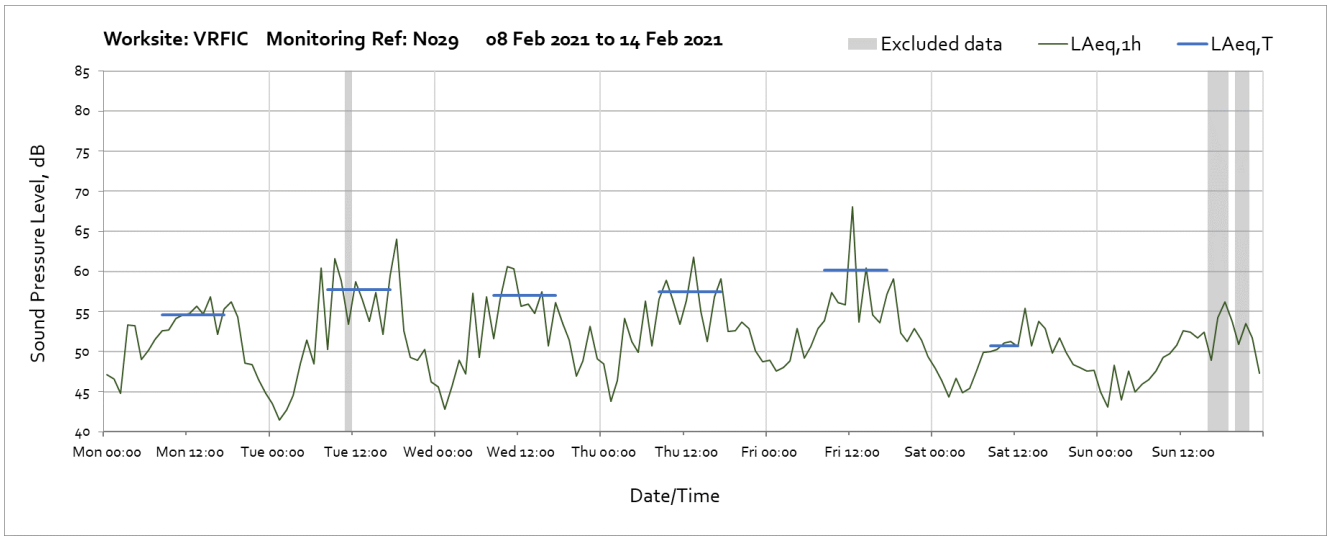


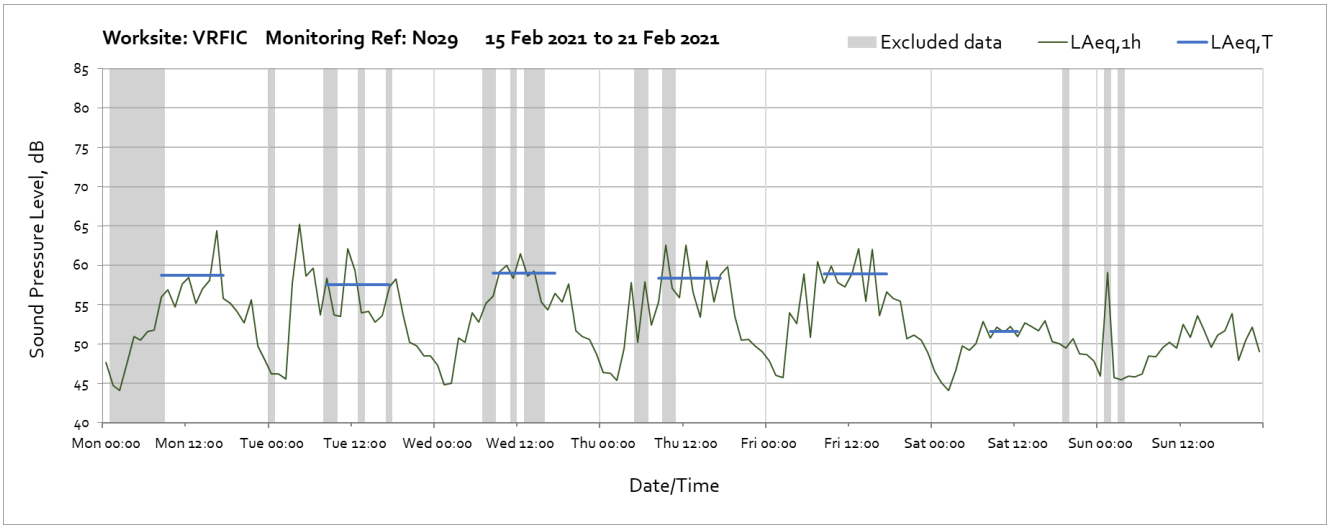


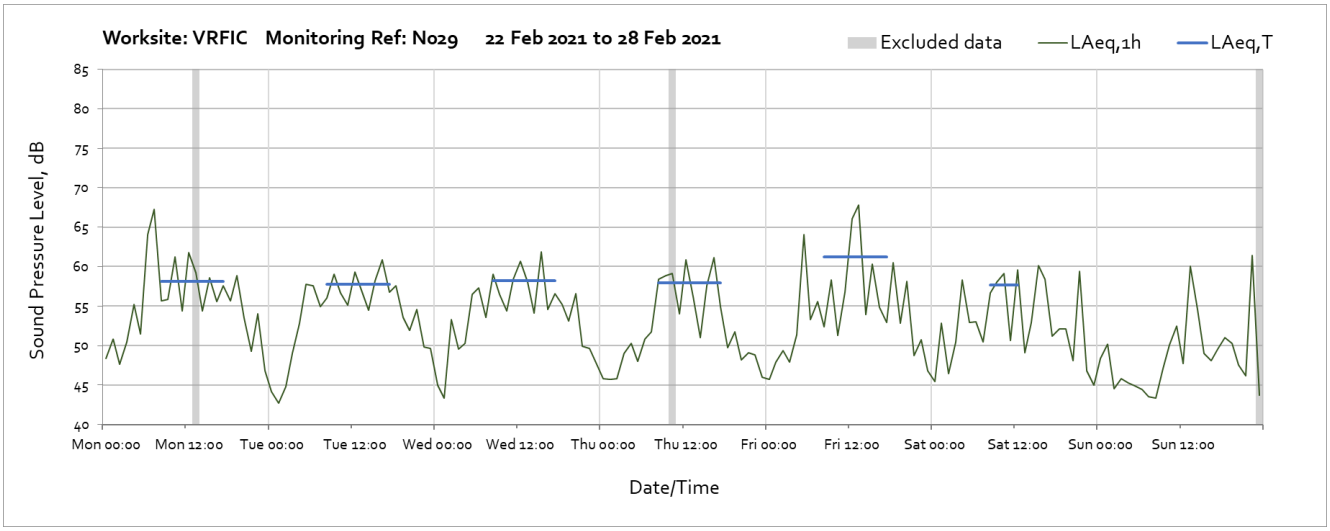


Worksite: Victoria Road and Flat Iron Compound (VRFIC) – Monitoring Ref: N029









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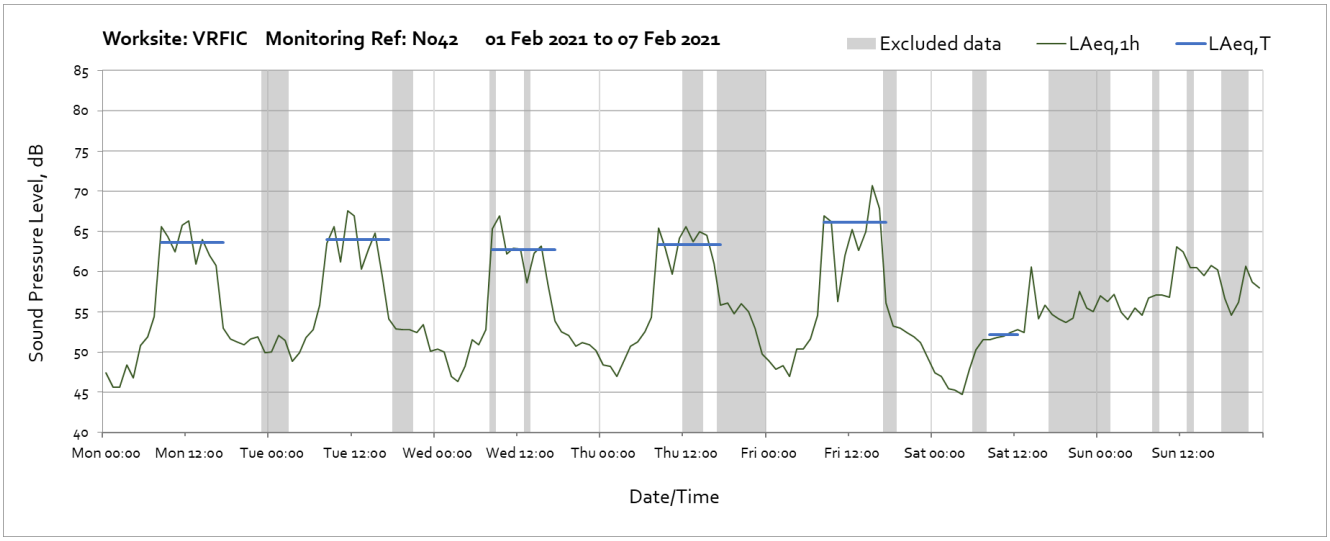

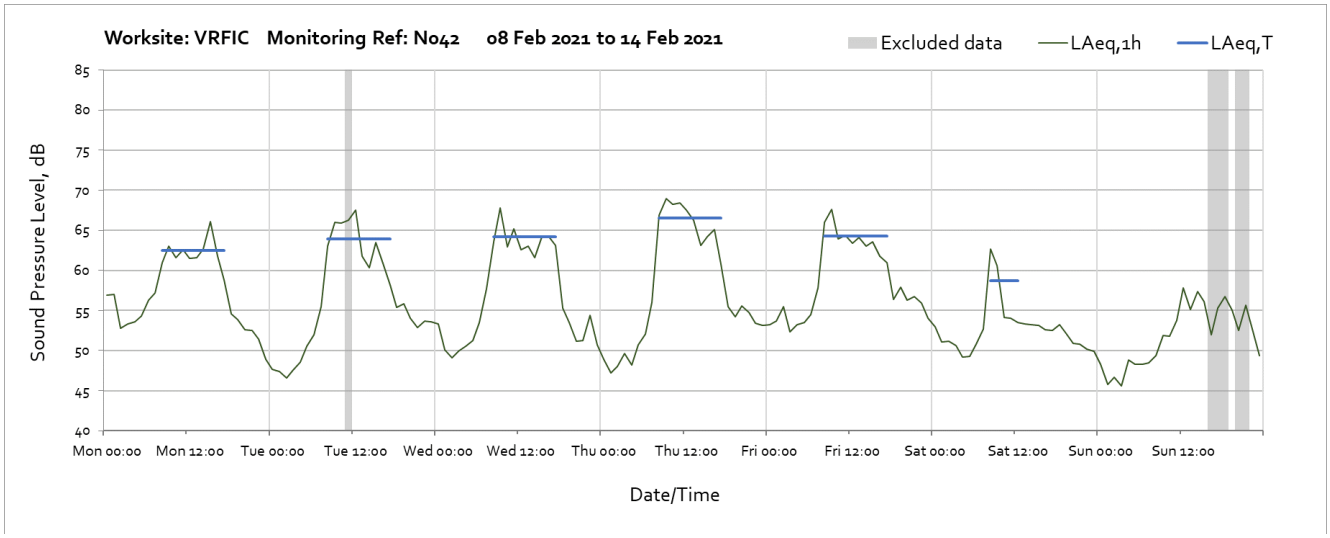
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LAeq,T
Sound Pressure Level, dB
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75
70
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Tue 12:00
Wed 00:00
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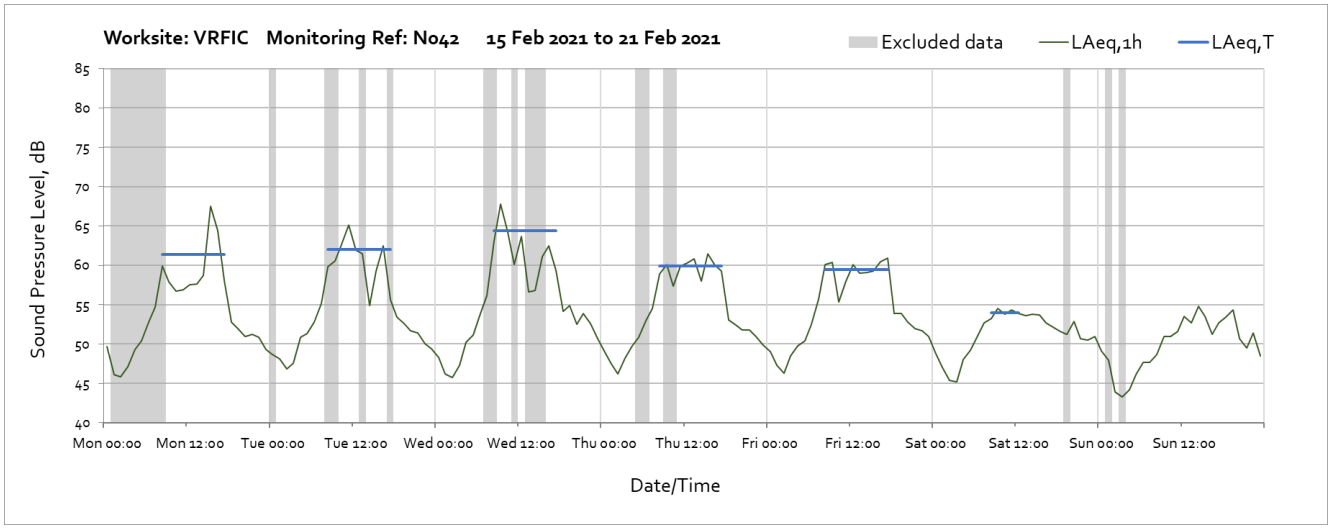
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time


Worksite: VRFIC Monitoring Ref: No42 15 Feb 2021 to 21 Feb 2021
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
85
80
75
70
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Tue 12:00
Wed 00:00
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Fri 00:00
Fri 12:00
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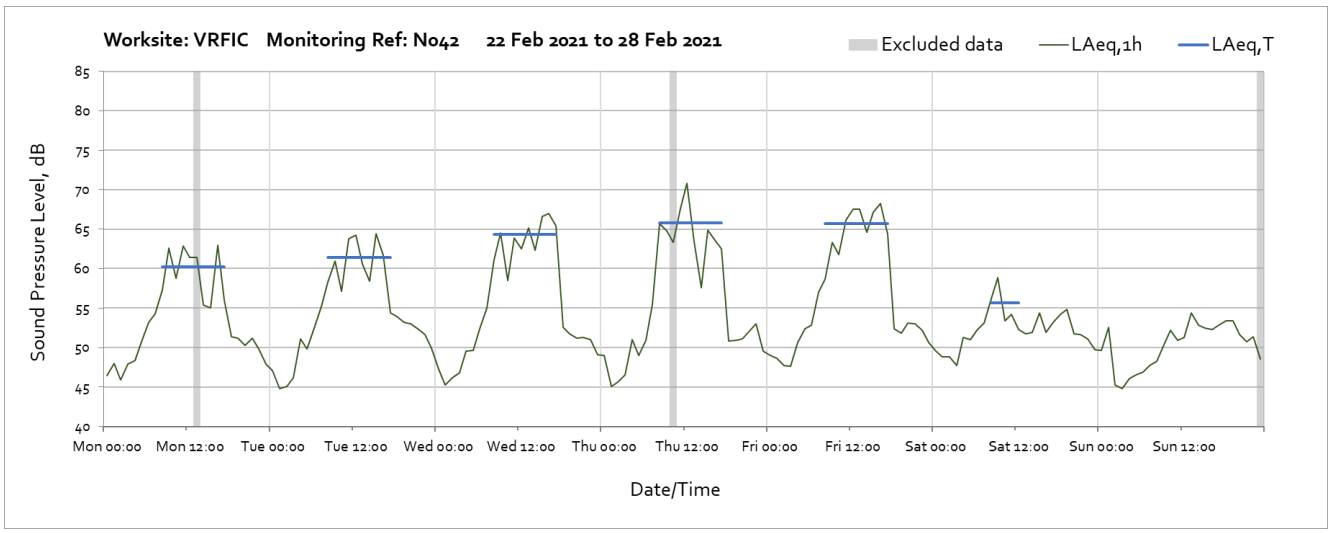
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time


Worksite: VRFIC Monitoring Ref: No42 22 Feb 2021 to 28 Feb 2021
Excluded data
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LAeq,T
Sound Pressure Level, dB
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80
75
70
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Tue 12:00
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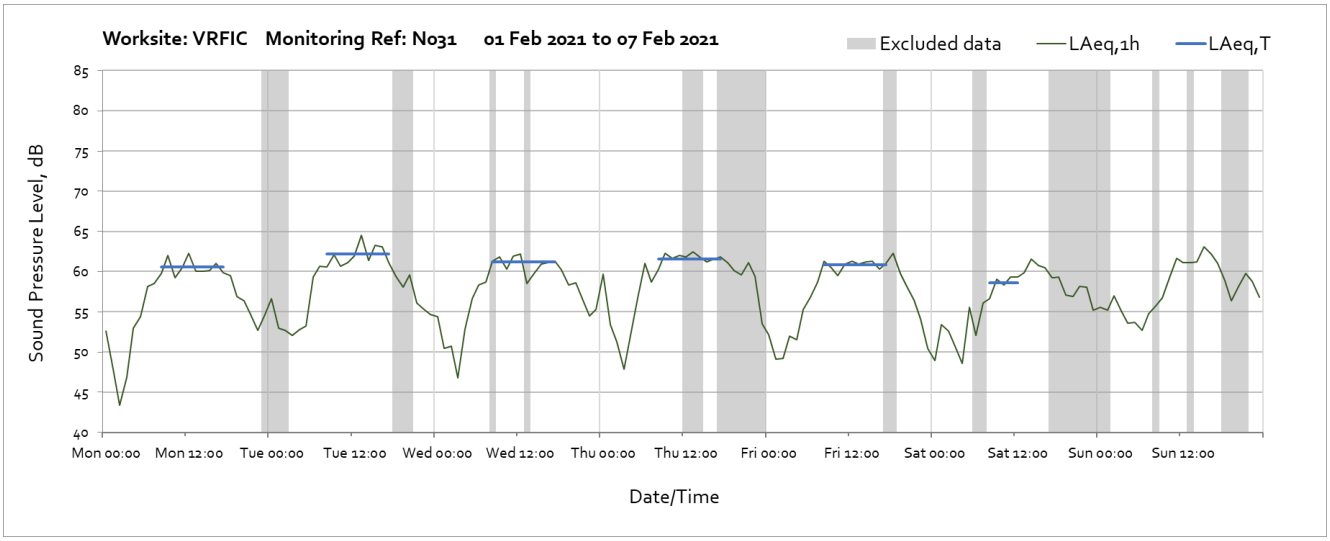
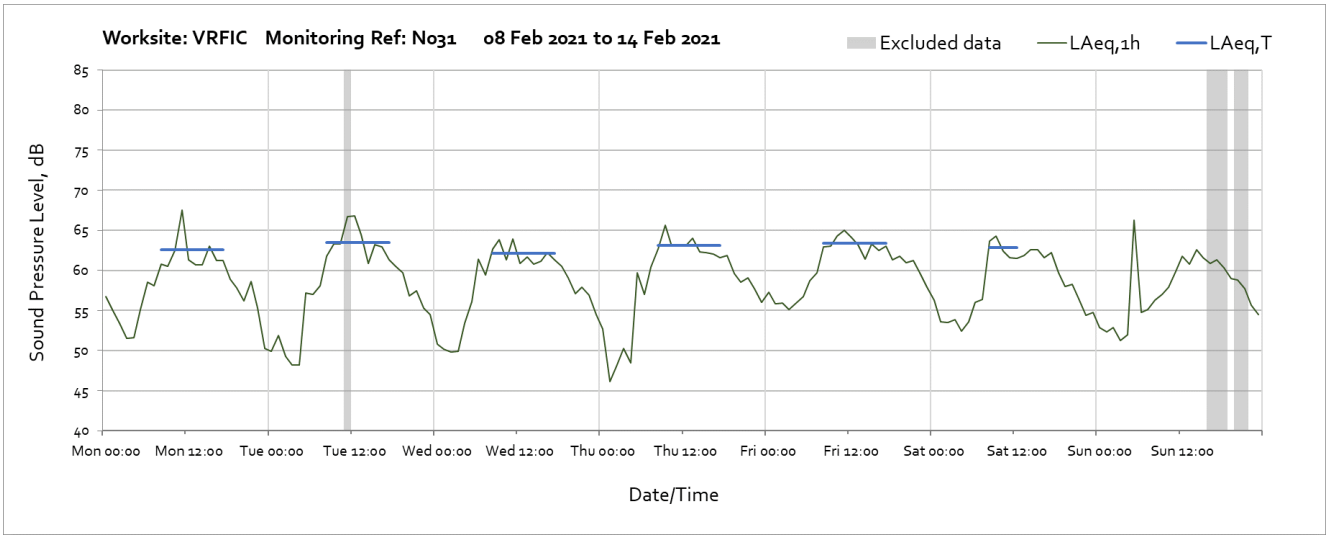
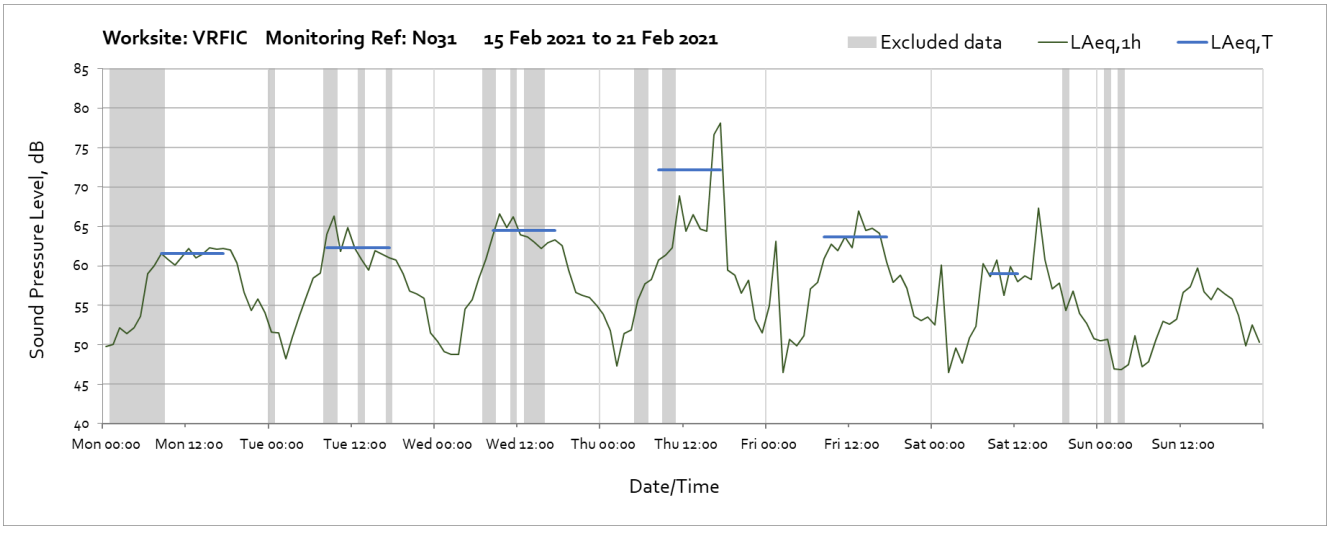
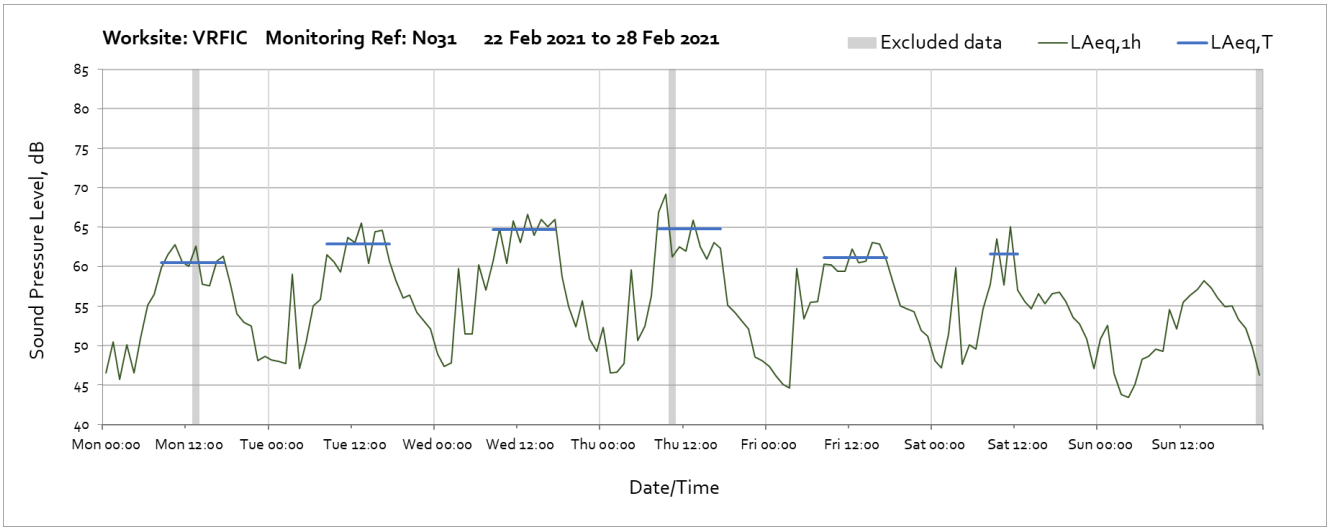
Date/Time

Worksite: Victoria Road and Flat Iron Compound (VRFIC) – Monitoring Ref: N031

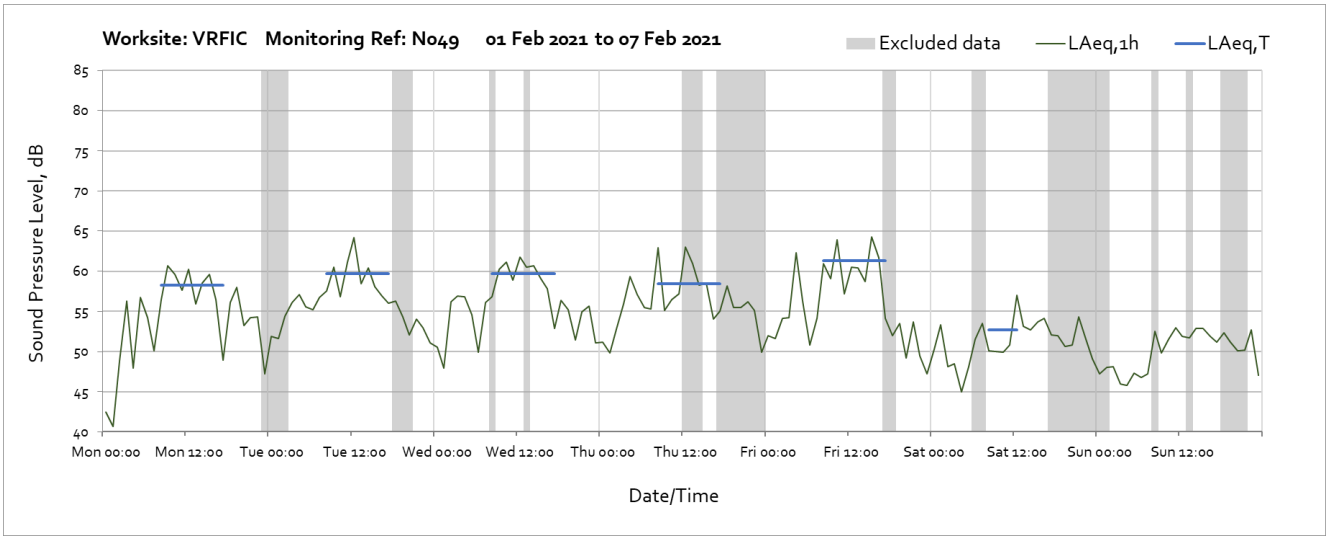


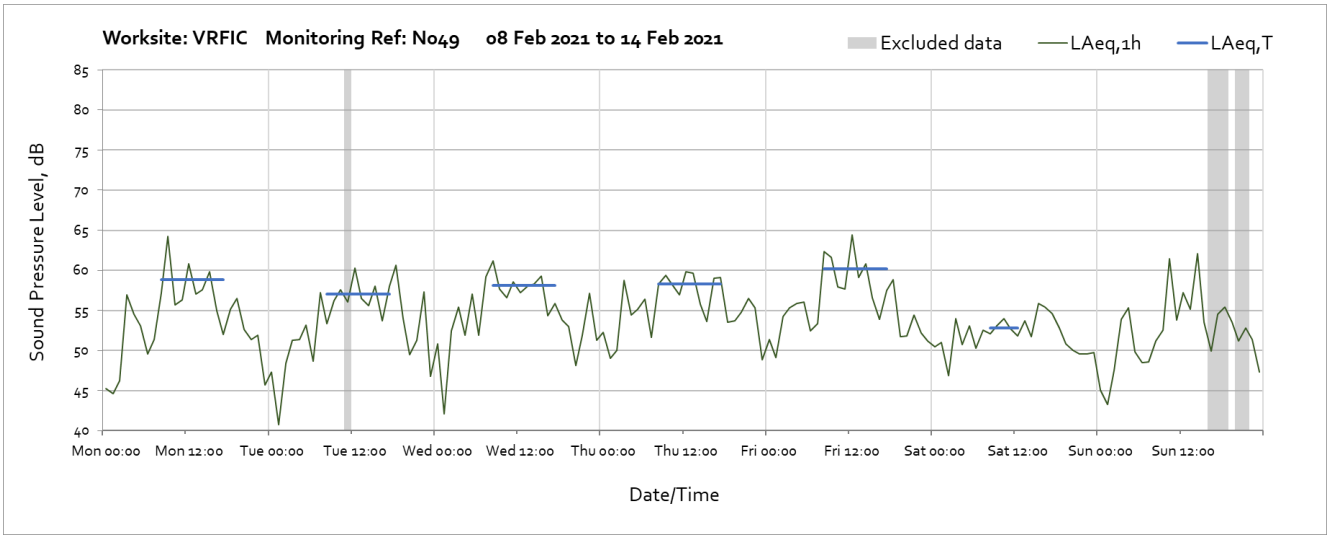


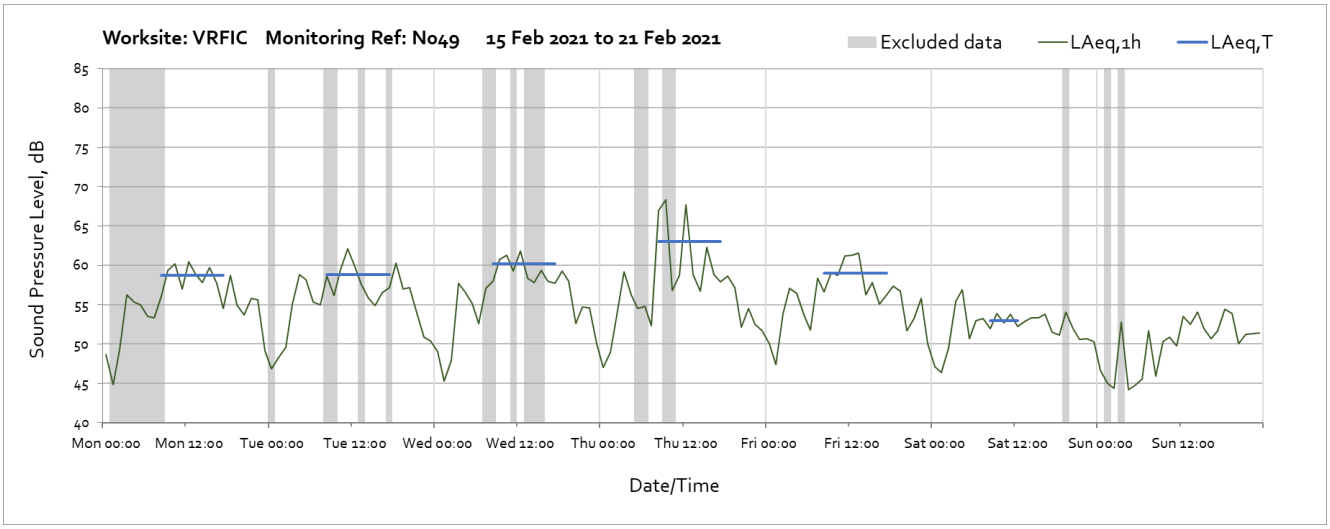


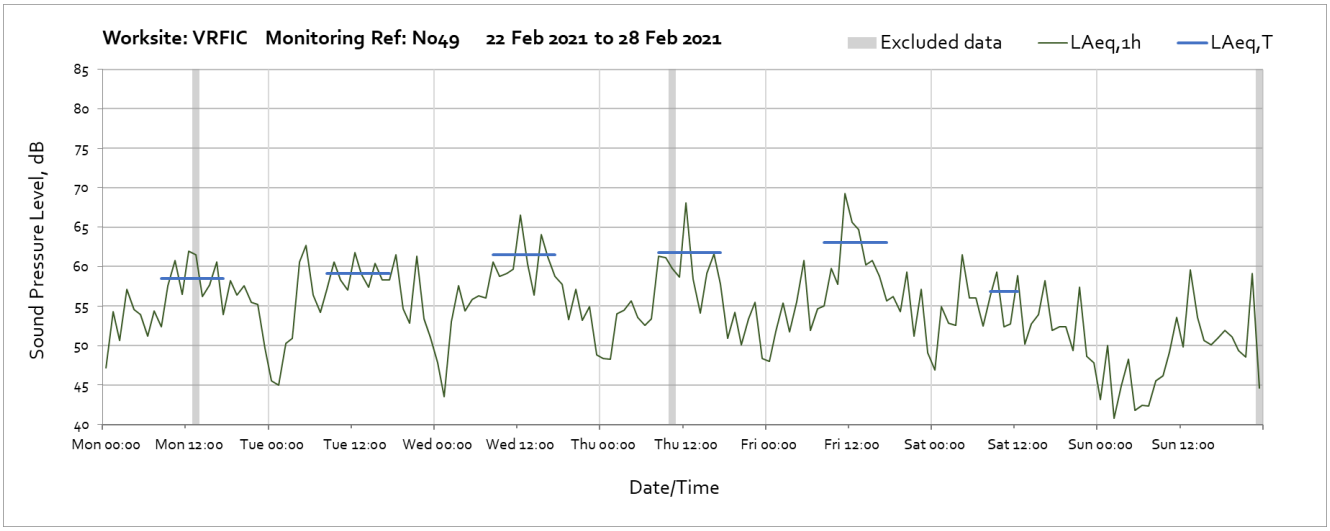


Worksite: Victoria Road and Flat Iron Compound (VRFIC) – Monitoring Ref: N049

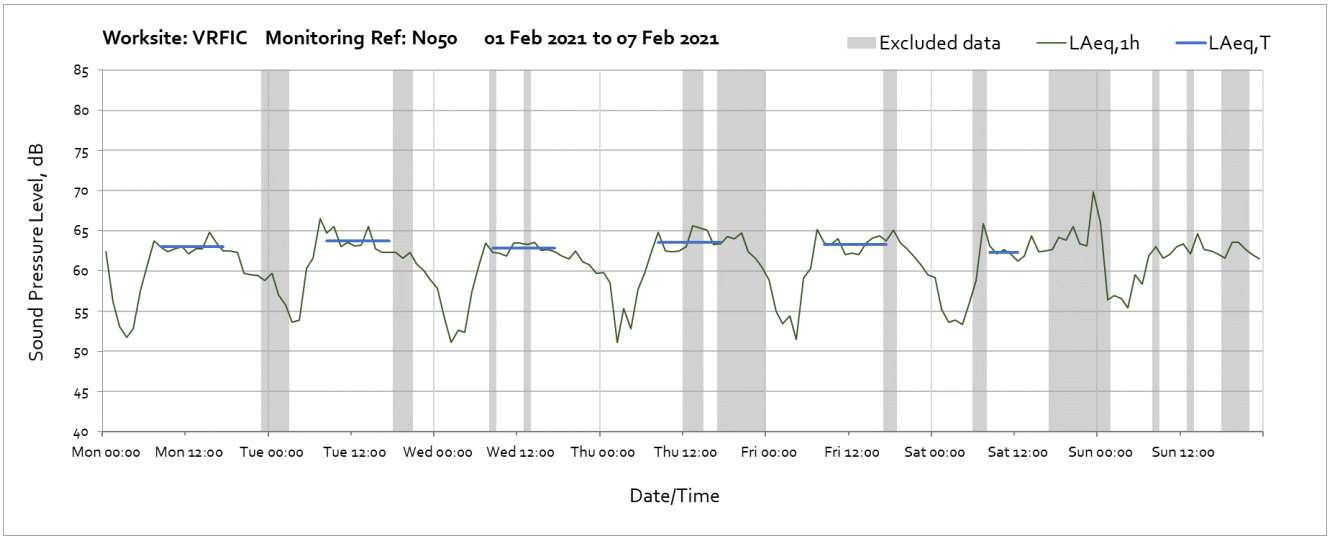


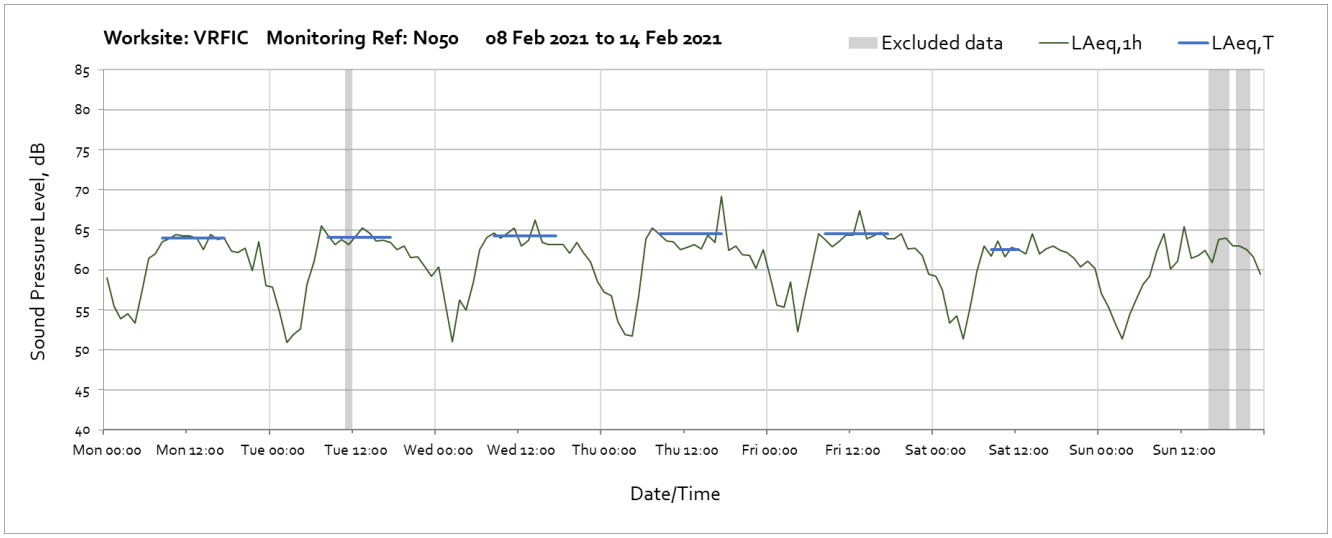






Worksite: Victoria Road and Flat Iron Compound (VRFIC) – Monitoring Ref: N050




Worksite: VRFIC Monitoring Ref: No50 08 Feb 2021 to 14 Feb 2021
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
85
80
75
70
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60
55
50
45
40
Mon 00:00
Mon 12:00
Tue 00:00
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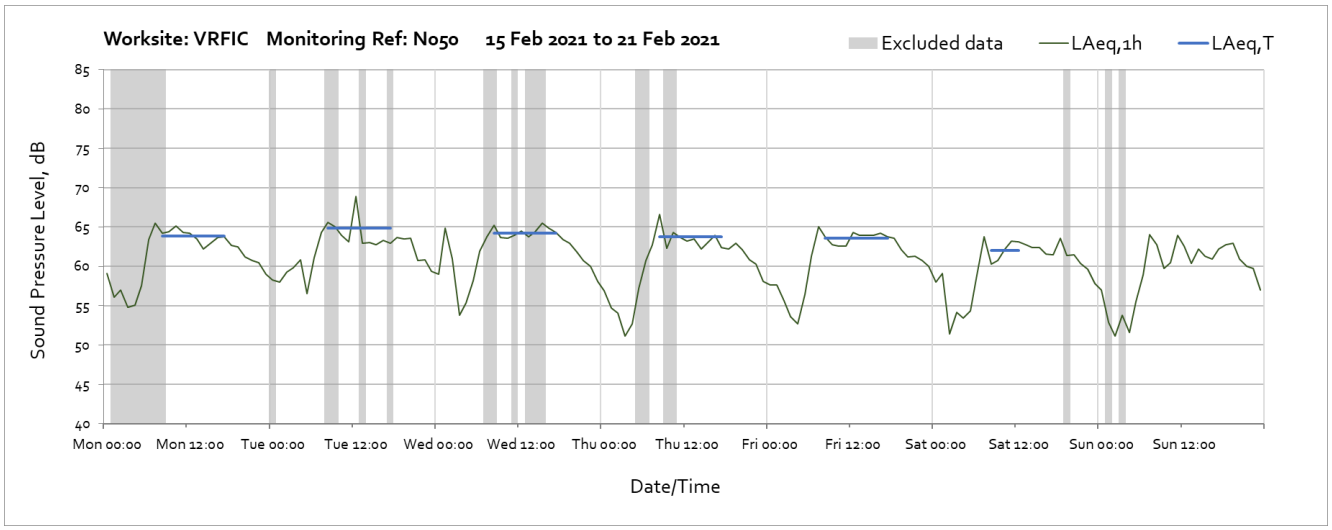
Sun 00:00
Sun 12:00
Date/Time


Worksite: VRFIC Monitoring Ref: No50 15 Feb 2021 to 21 Feb 2021
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
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80
75
70
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55
50
45
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Mon 00:00
Mon 12:00
Tue 00:00
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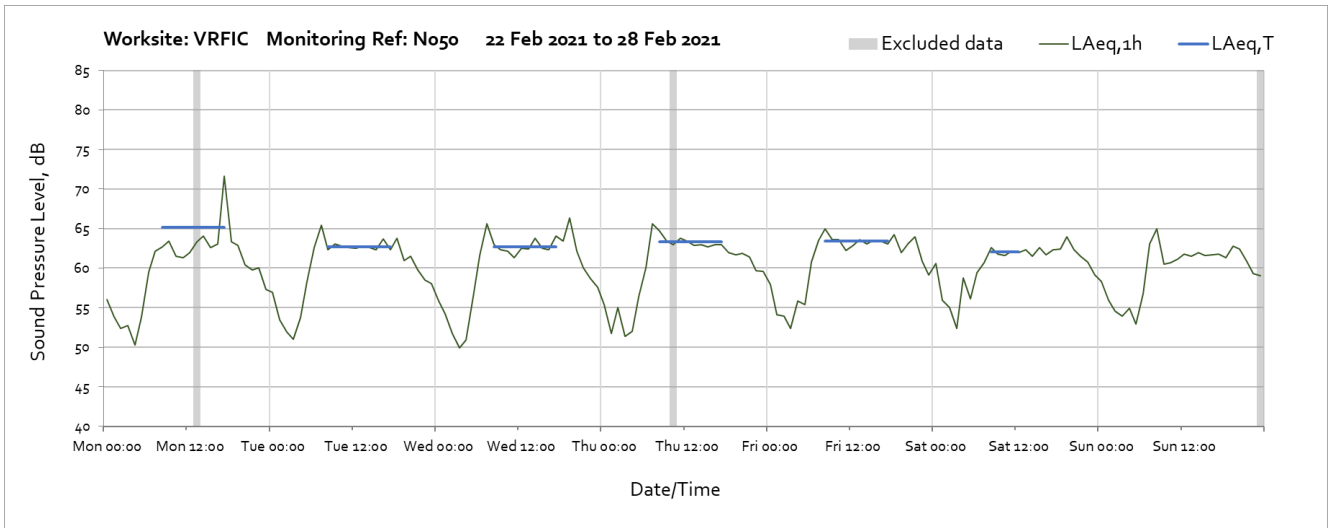
Sun 12:00
Date/Time


Worksite: VRFIC Monitoring Ref: No50 22 Feb 2021 to 28 Feb 2021
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
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80
75
70
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55
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Mon 00:00
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Tue 00:00
Tue 12:00
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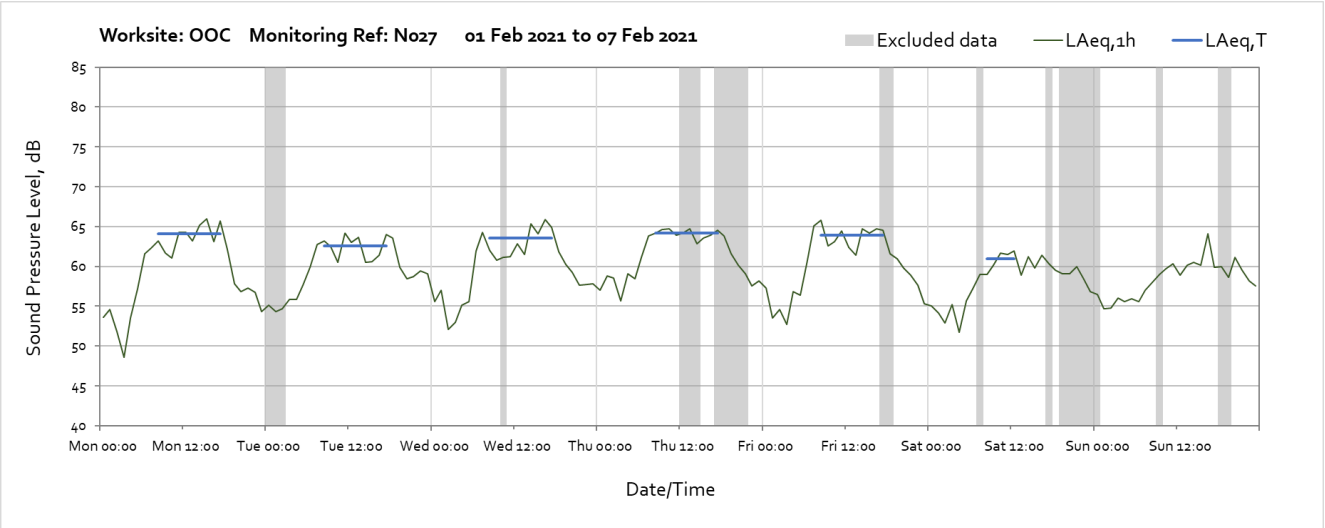
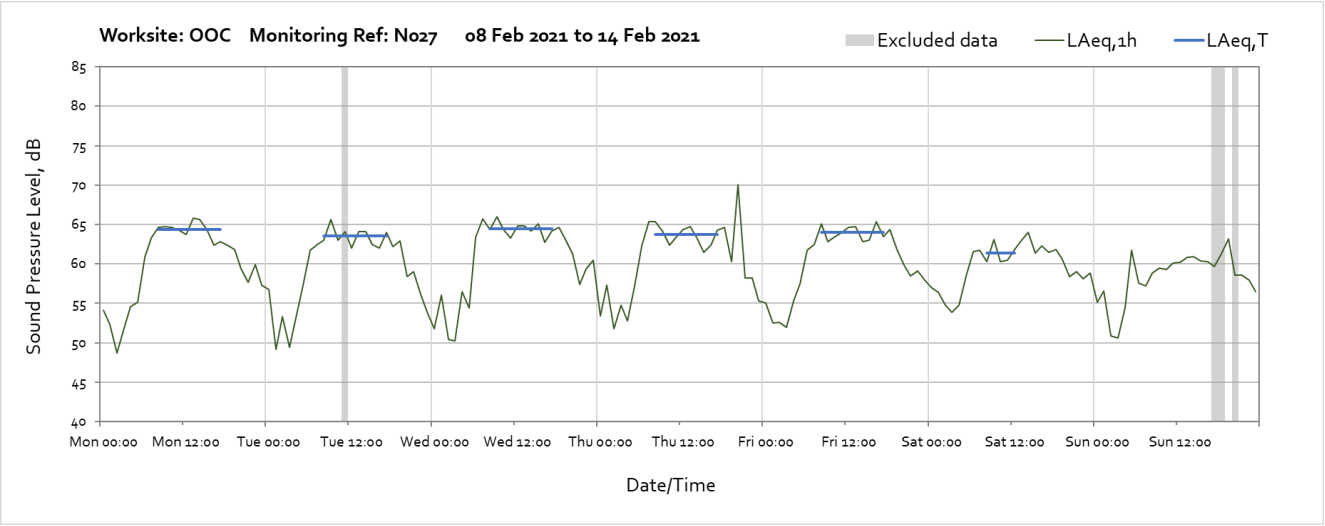
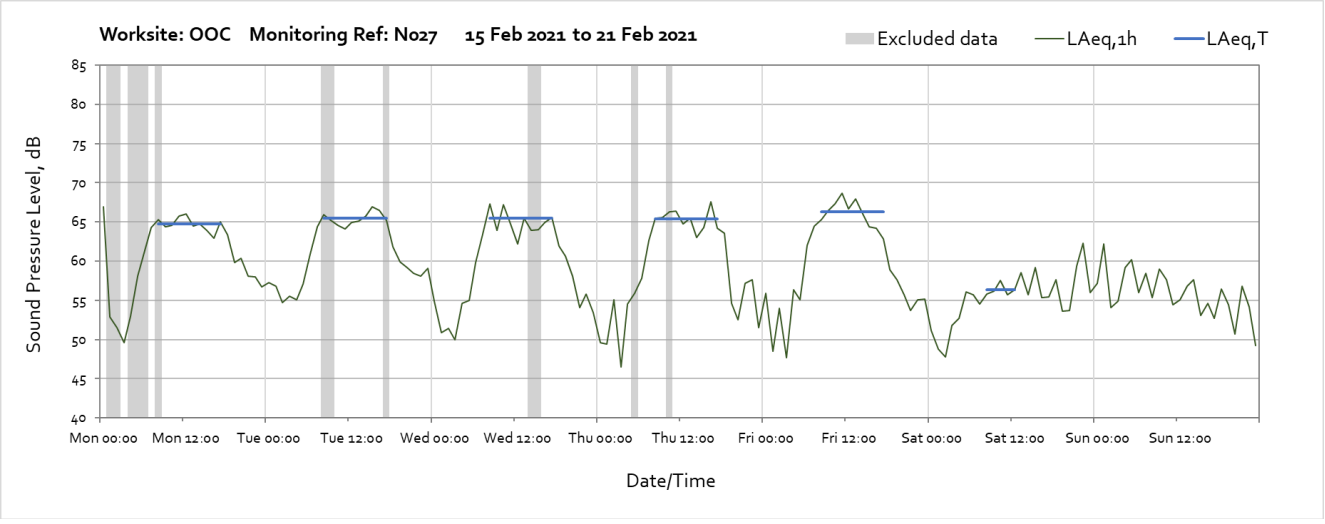
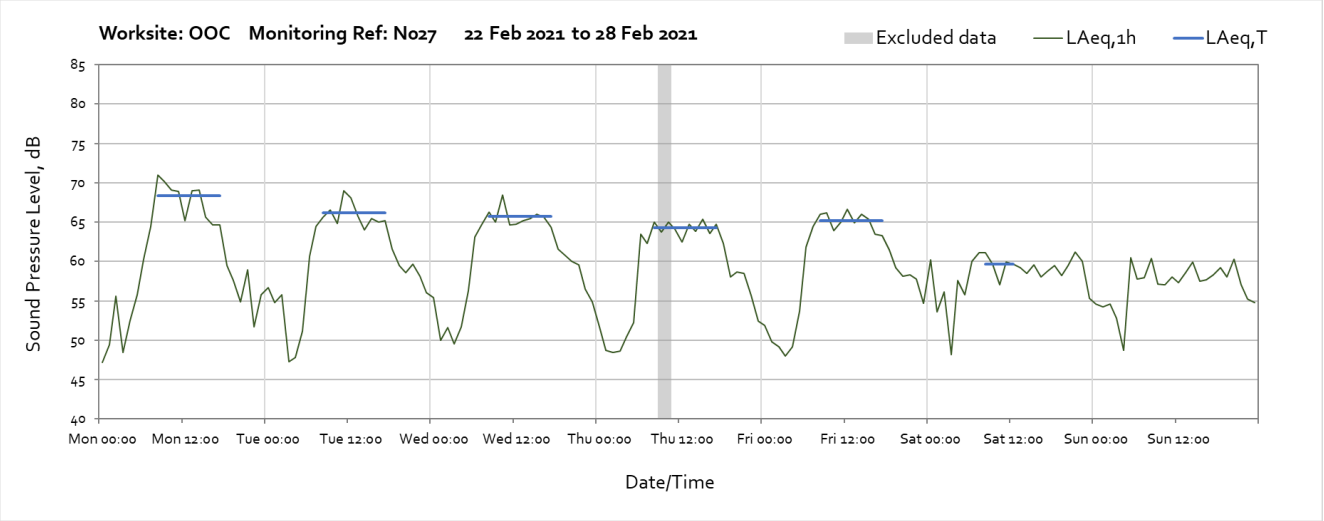
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

Worksite: Oal Oak Common (OOC) – Monitoring Ref: N027

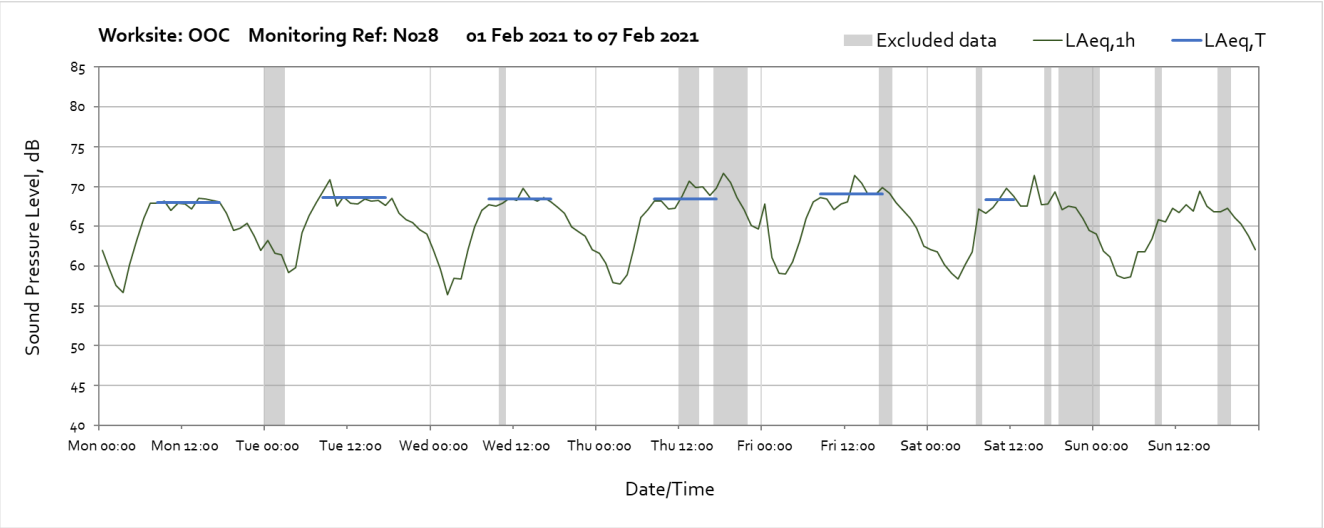


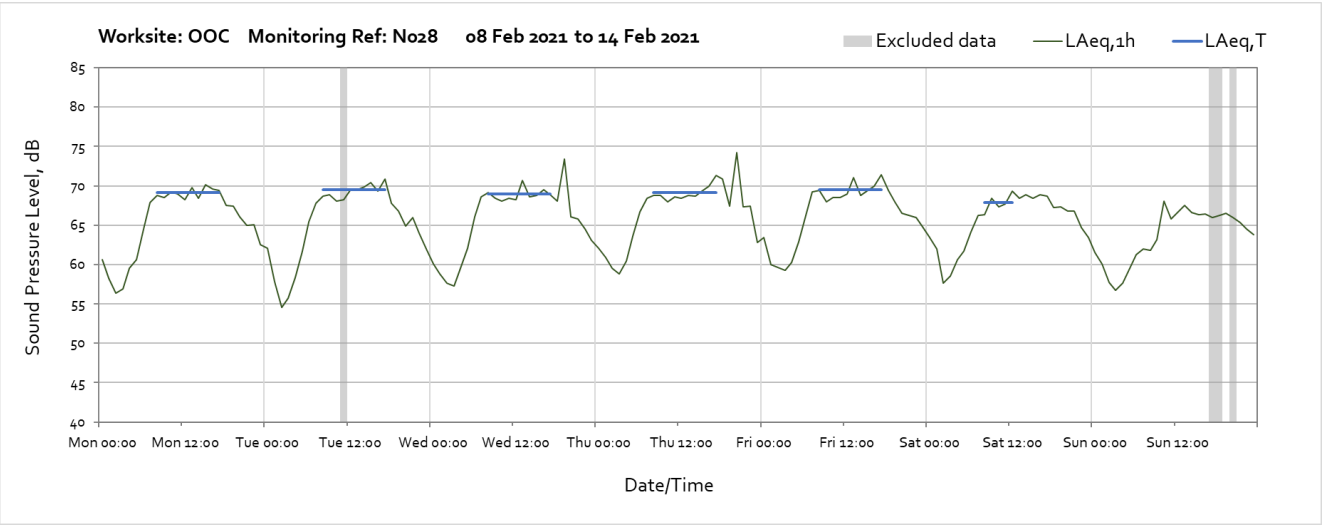


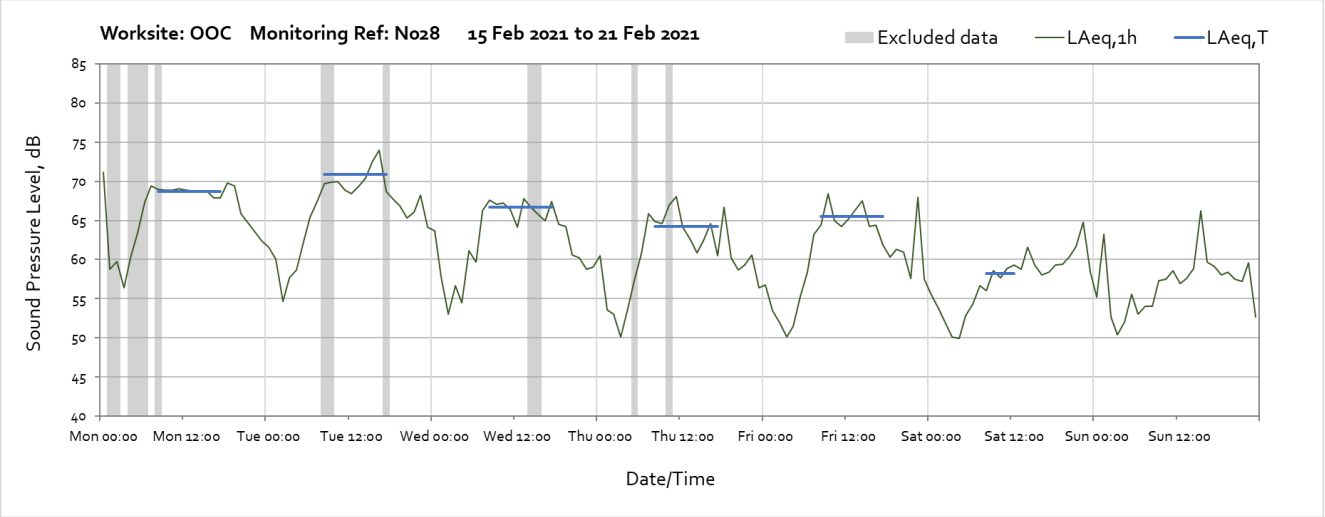


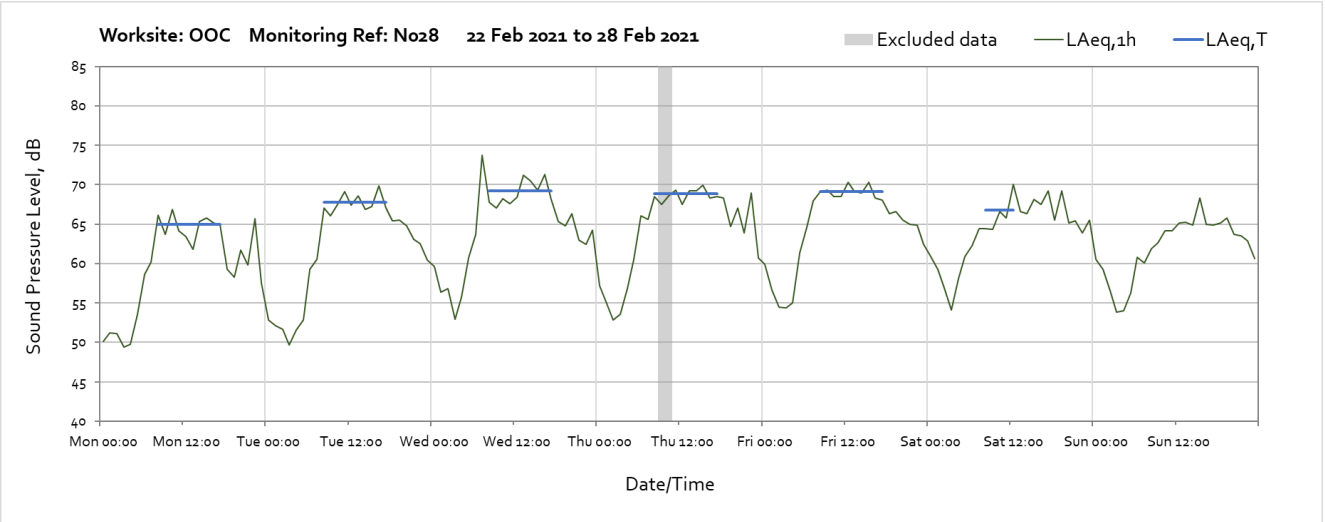


Worksite: Oal Oak Common (OOC) – Monitoring Ref: N028



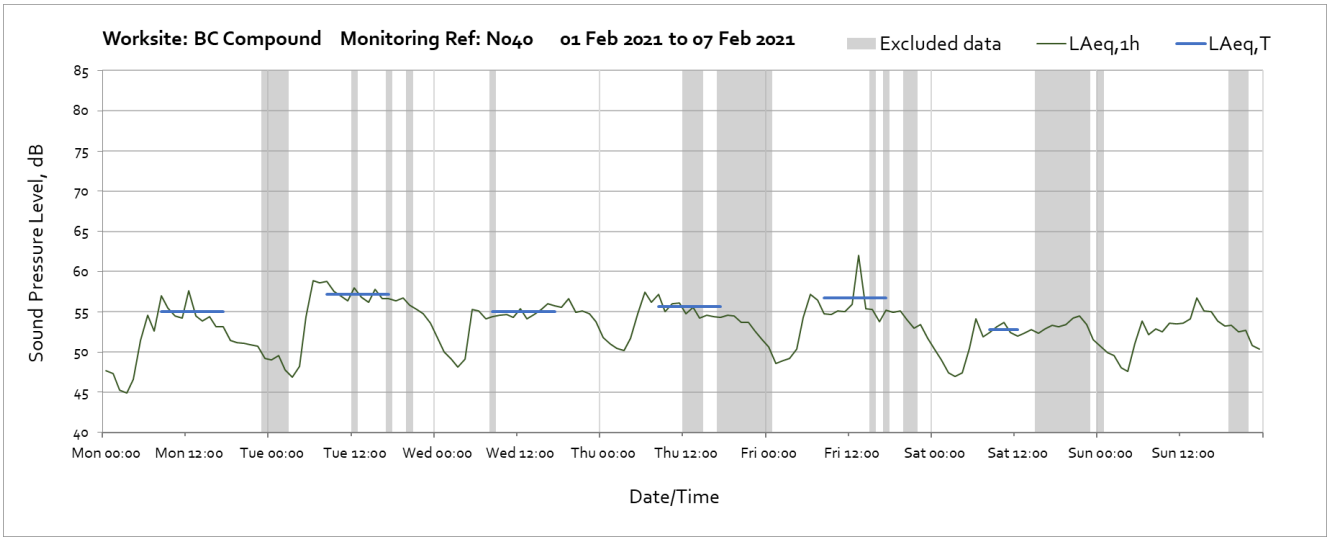


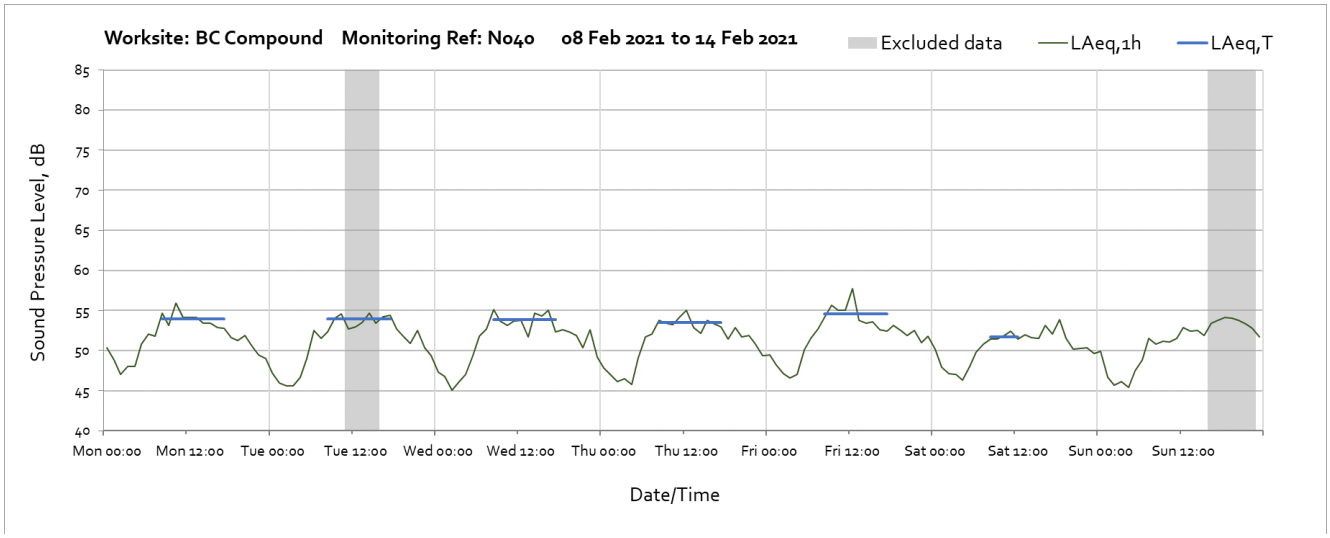




Worksite: Mandevill Road Badminton Close compound (BC Compound)

Monitoring Ref: N040




Worksite: BC Compound Monitoring Ref: No40 08 Feb 2021 to 14 Feb 2021
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
85
80
75
70
65
60
55
50
45
40
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
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Fri 12:00
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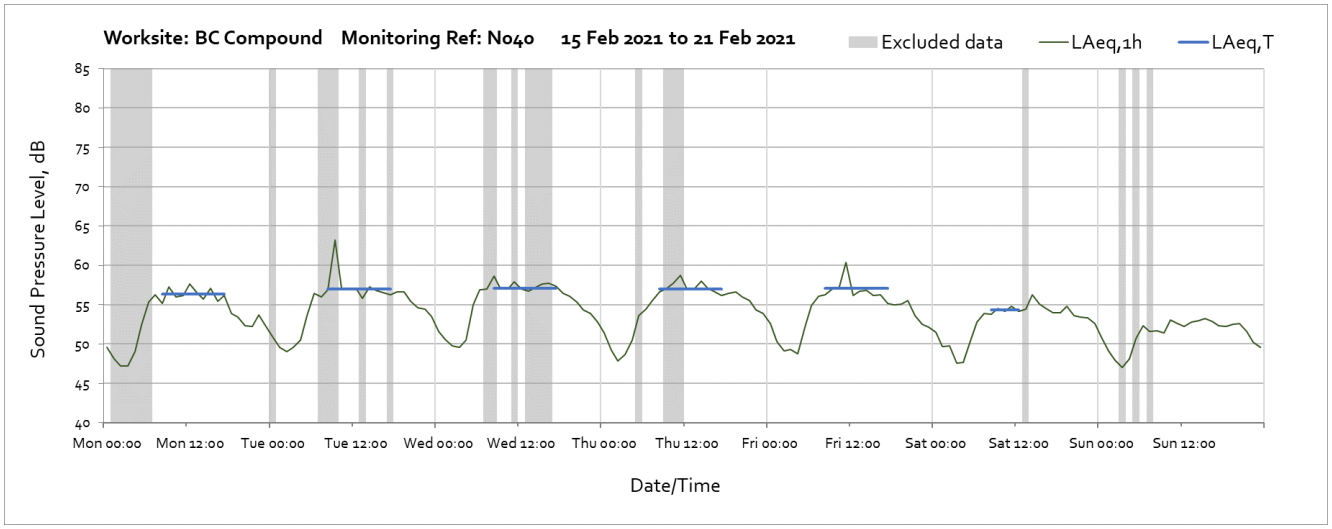
Sun 00:00
Sun 12:00
Date/Time


Worksite: BC Compound Monitoring Ref: No40 15 Feb 2021 to 21 Feb 2021
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
85
80
75
70
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60
55
50
45
40
Mon 00:00
Mon 12:00
Tue 00:00
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Wed 00:00
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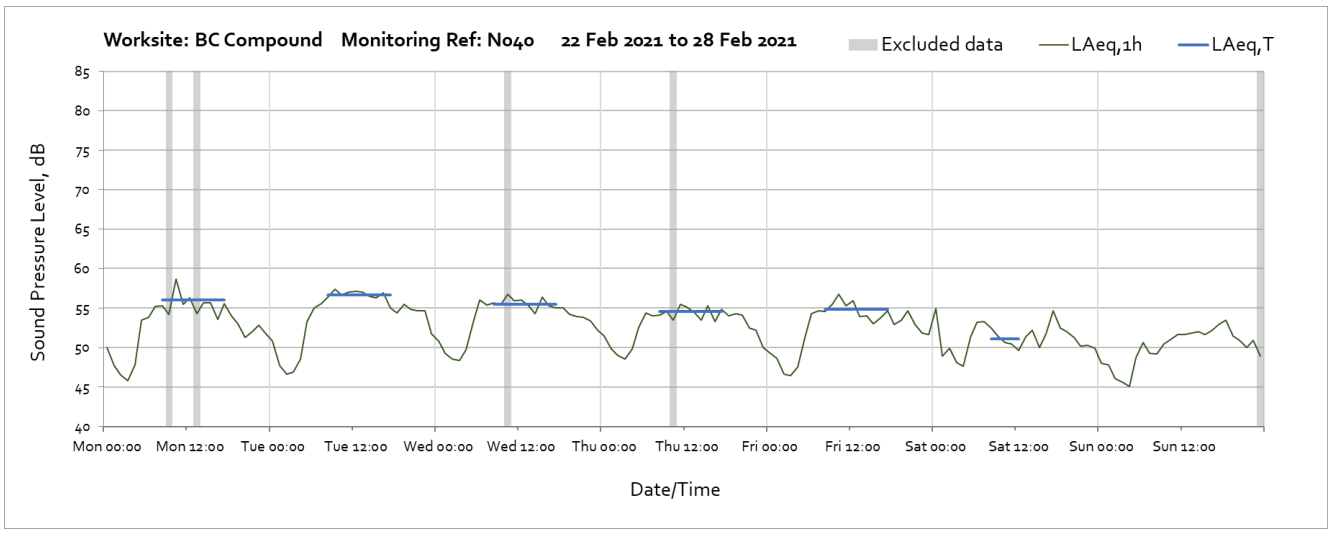
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time


Worksite: BC Compound Monitoring Ref: No40 22 Feb 2021 to 28 Feb 2021
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
85
80
75
70
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55
50
45
40
Mon 00:00
Mon 12:00
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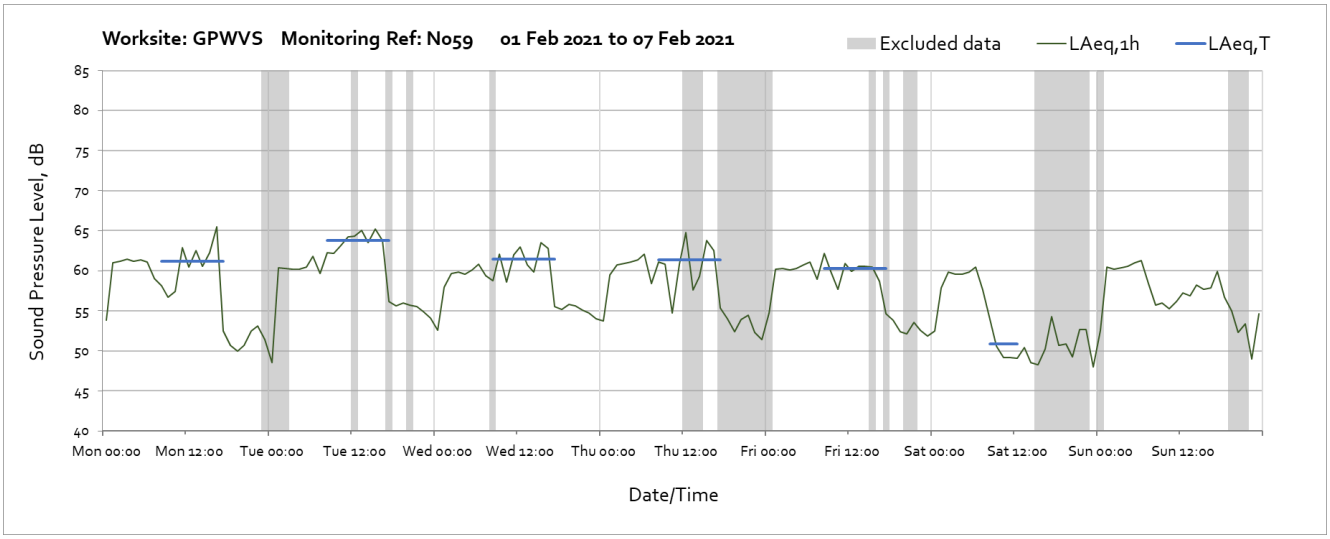
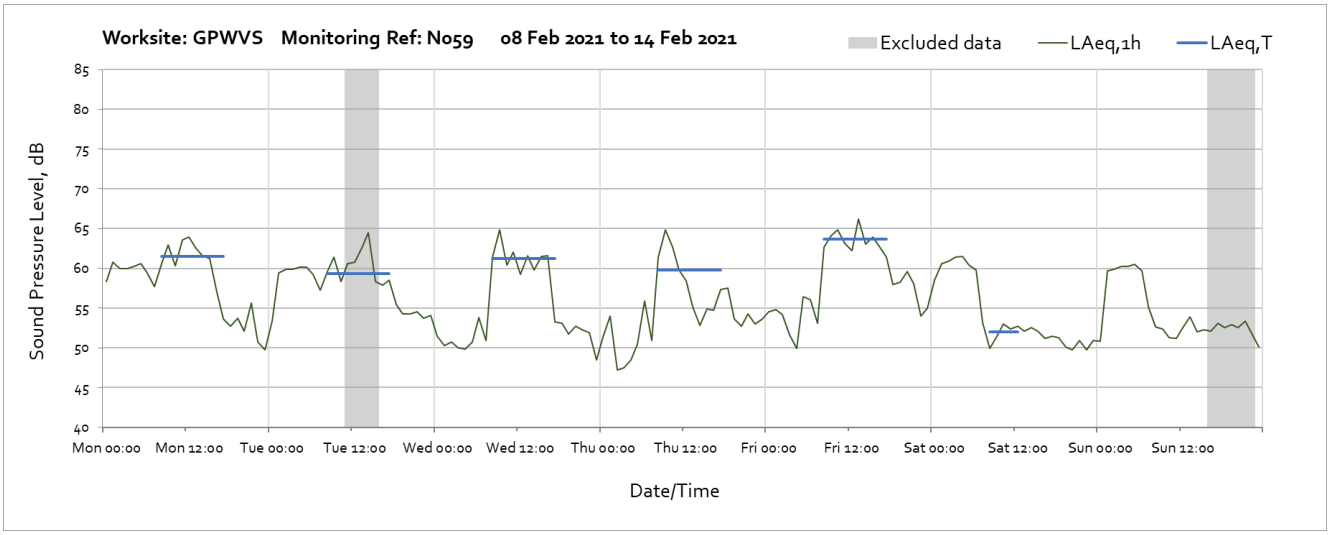
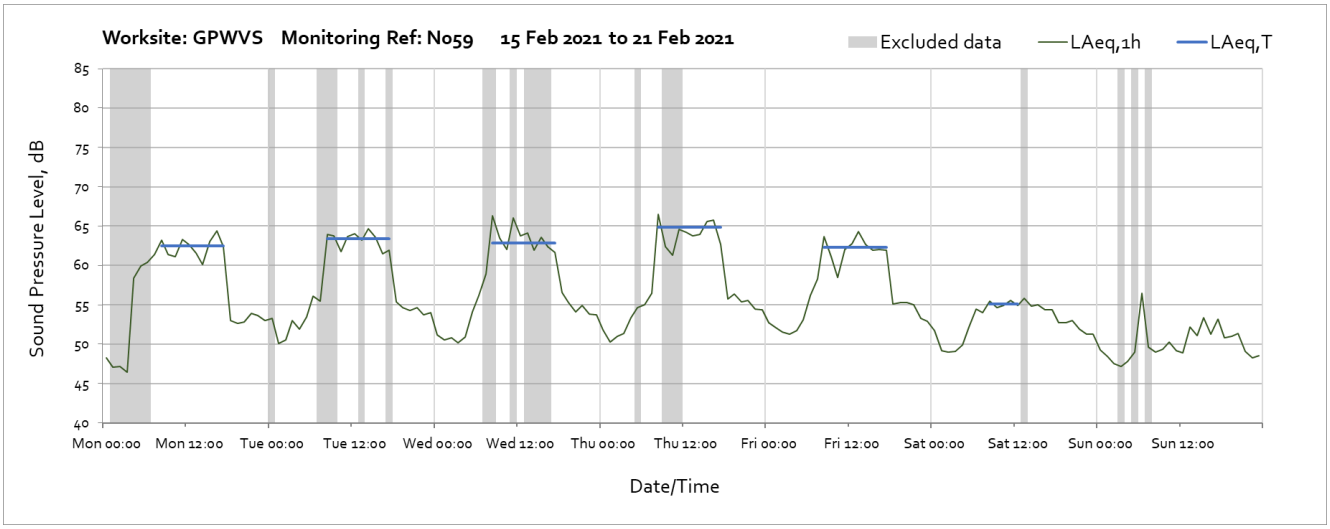
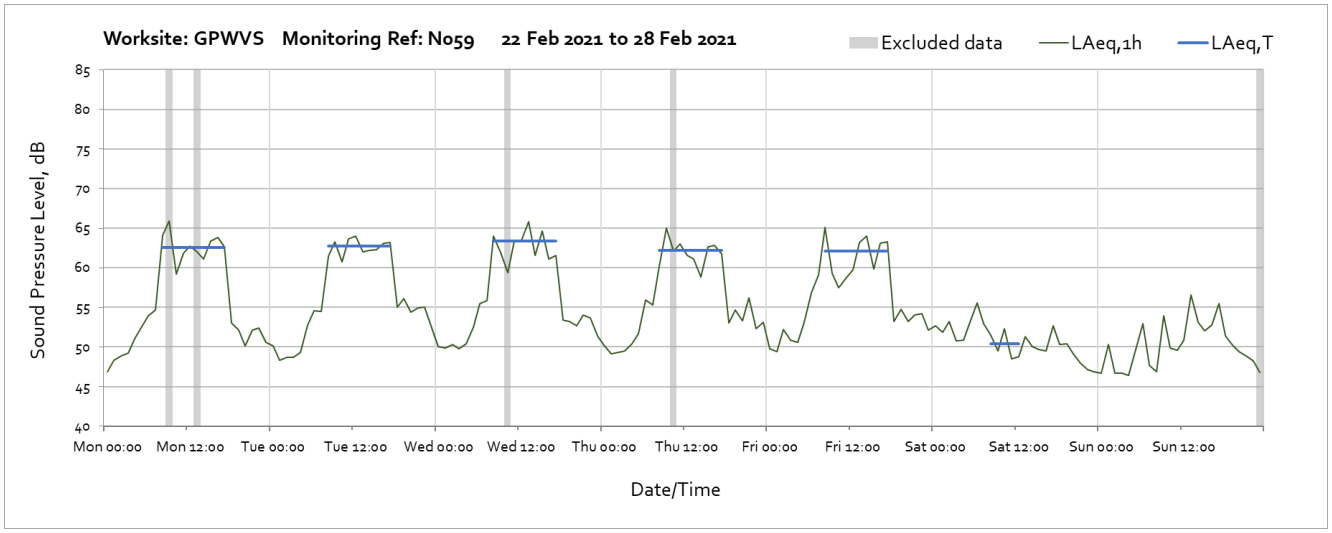
Sun 12:00
Date/Time

Worksite: Green Park Way Vent Shaft (GPWVS) – Monitoring Ref: N059








Worksite: GPWVS Monitoring Ref: No59 22 Feb 2021 to 28 Feb 2021
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
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80
75
70
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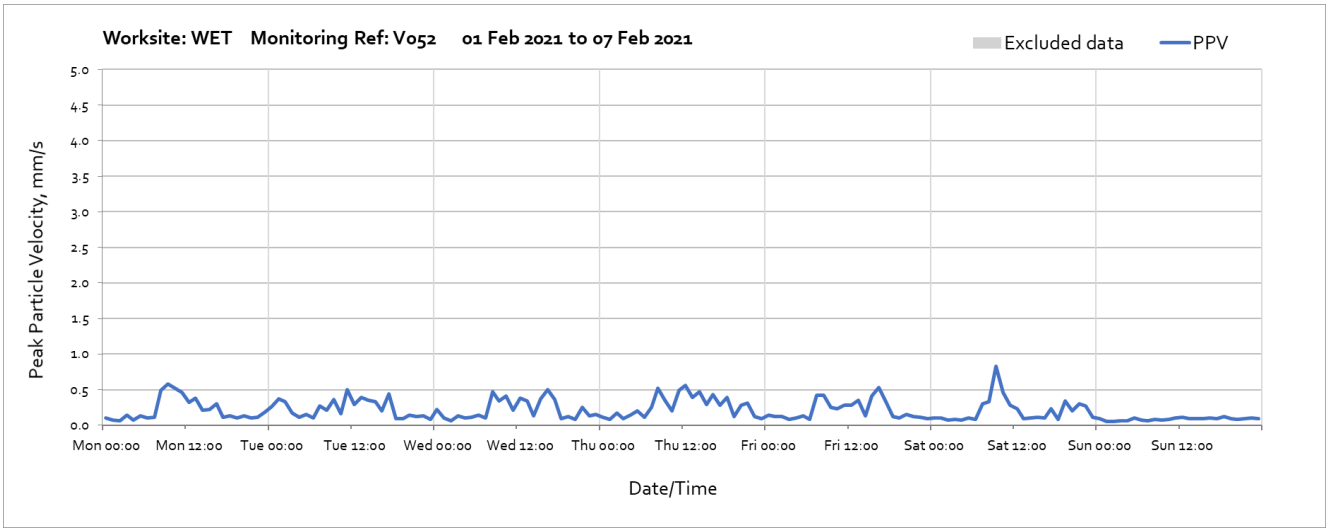
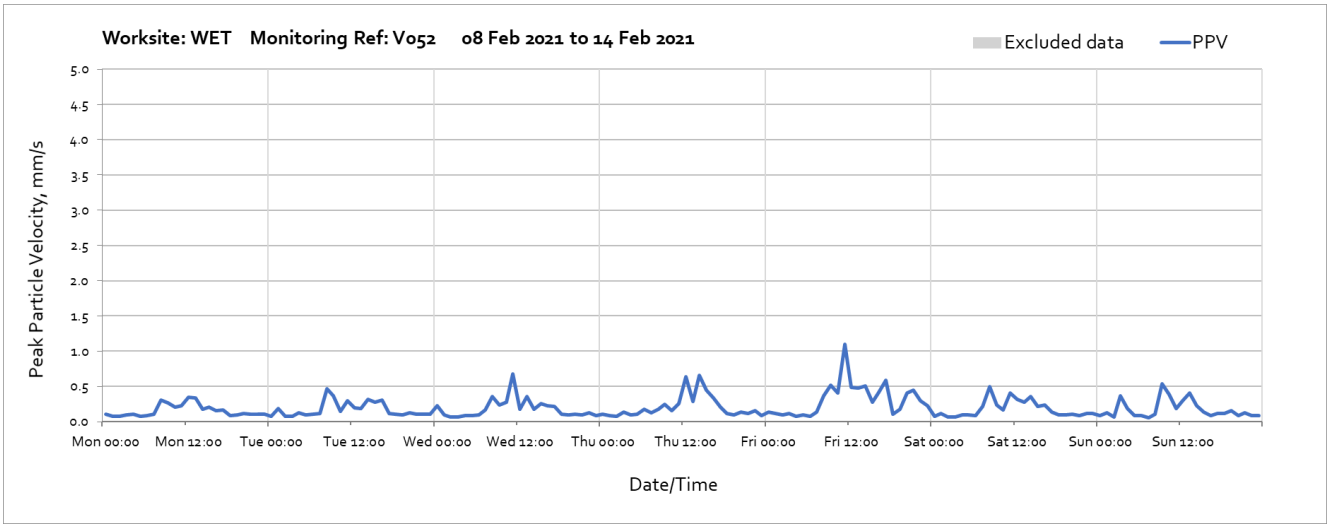
60
55
50
45
40
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

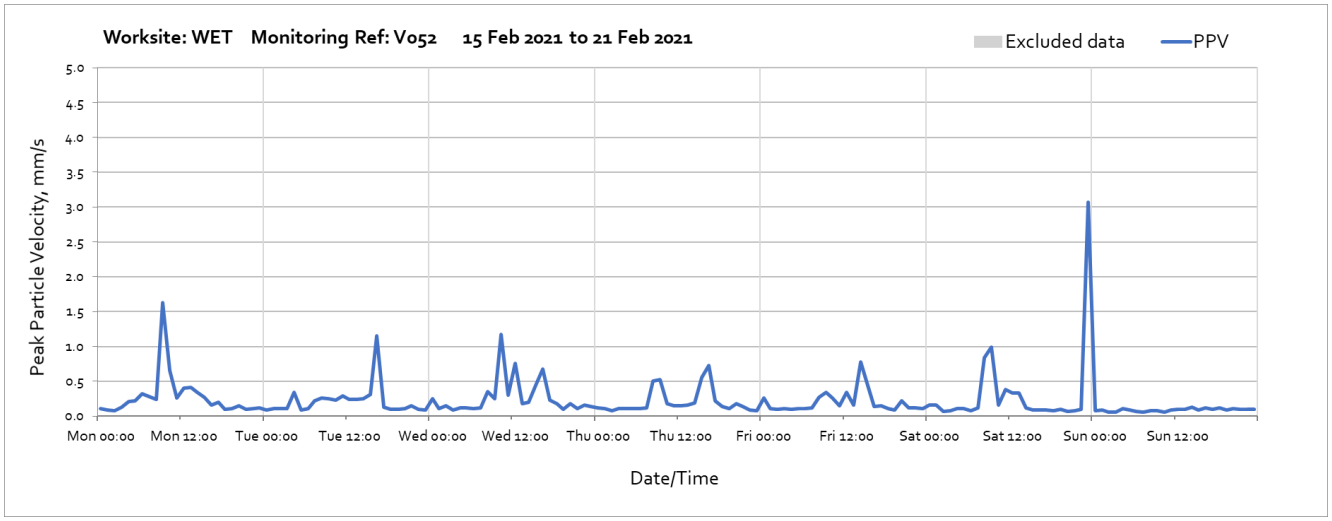
Vibration

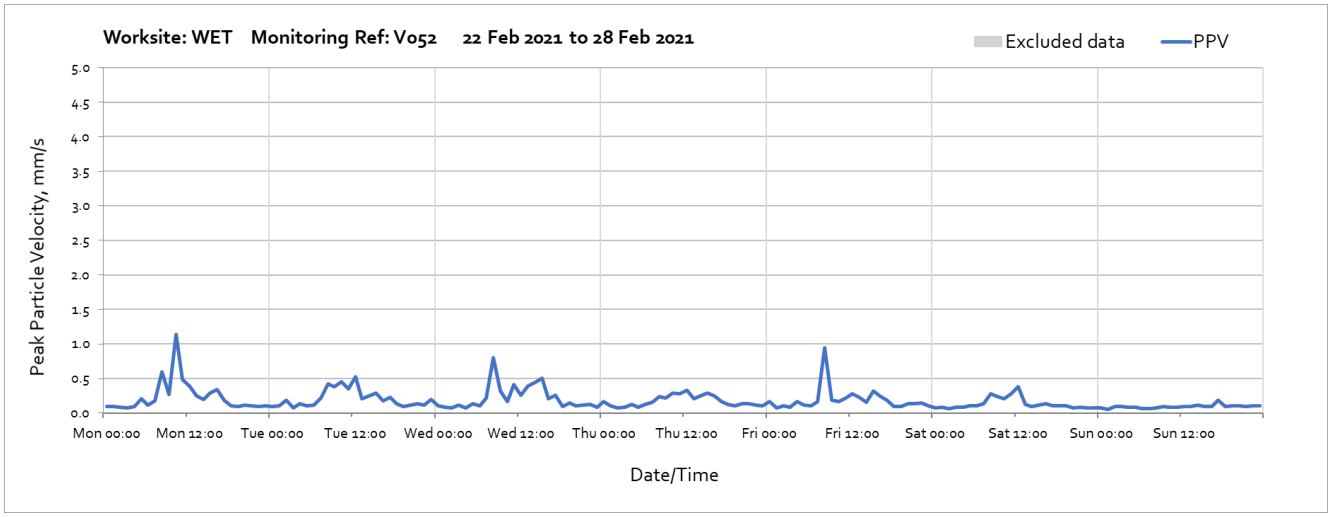
The following graphs show the hourly measured peak particle velocity PPV recorded during the monitoring period. The graphs show the resultant PPV due to vibration components on three orthogonal axis x, y and z. Where high values of PPV were caused by local interference with the vibration monitor, which 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: Willesden Euro Terminal (WET) – Monitoring Ref: V052

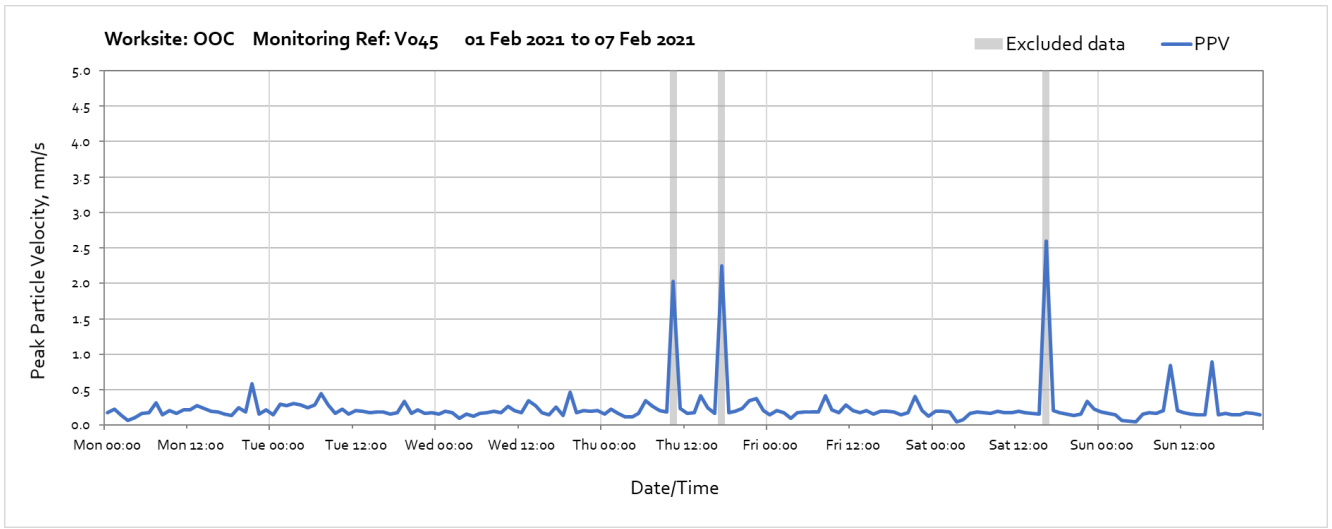




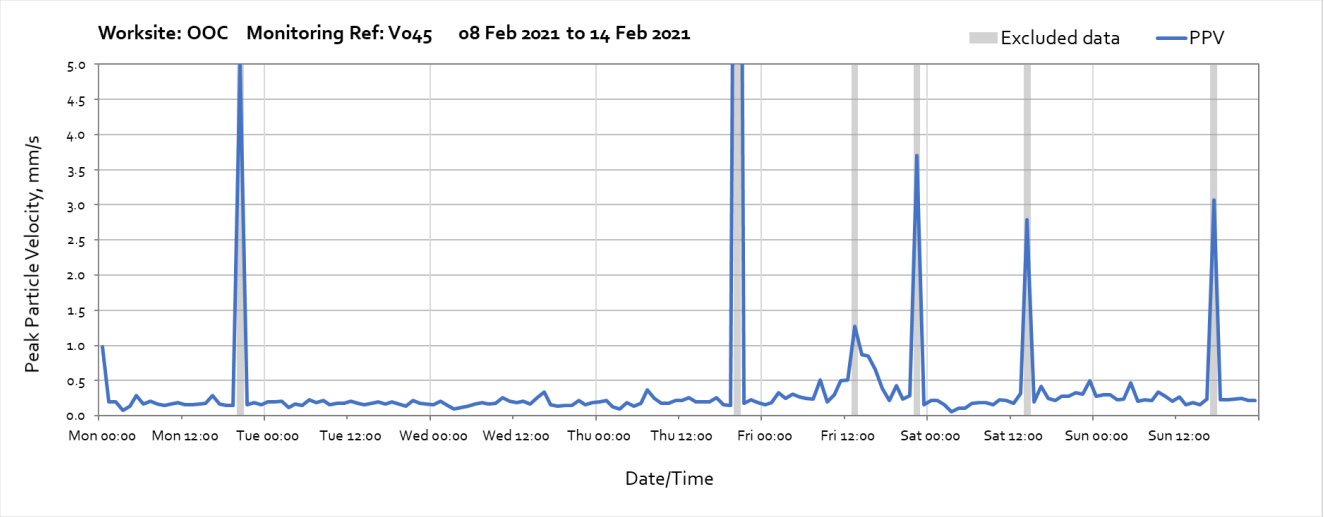




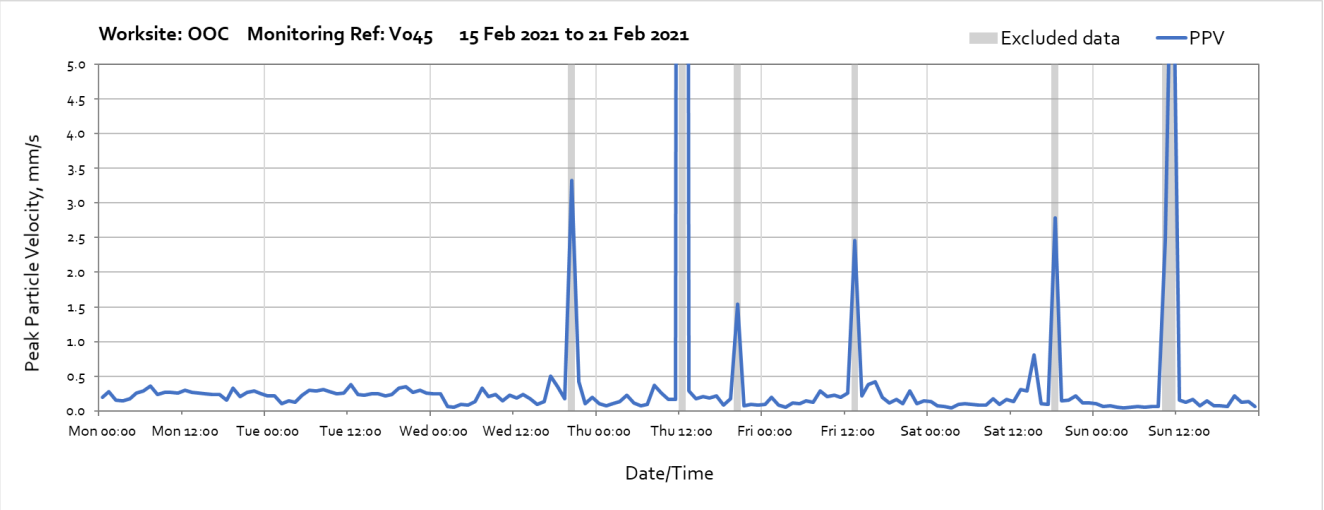
Worksite: Oal Oak Common (OOC) – Monitoring Ref: V045



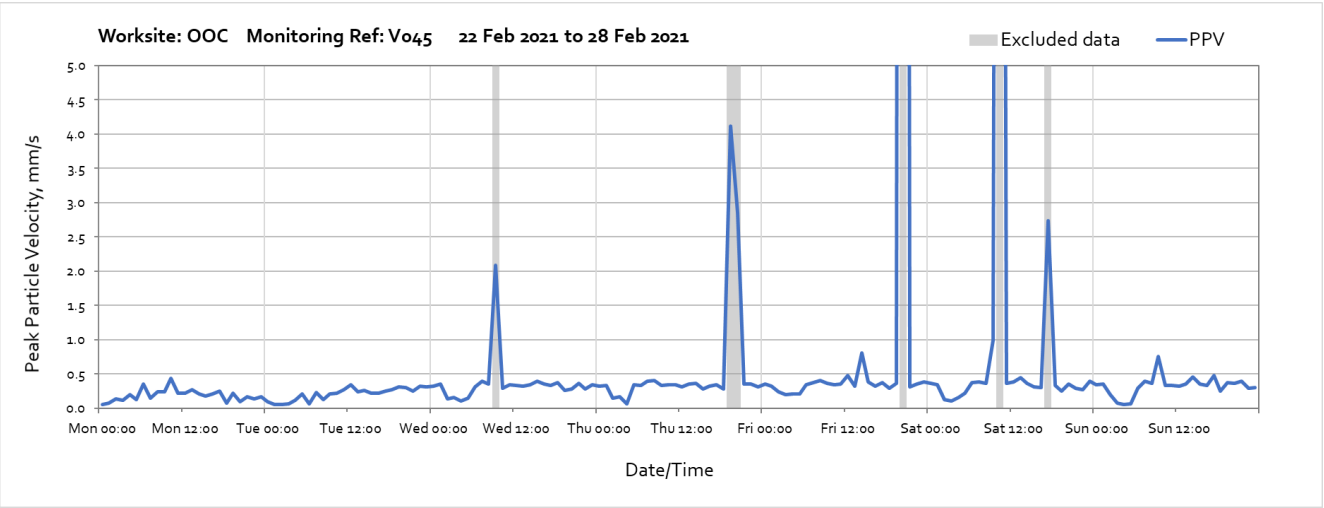
Note: High vibration levels measured at 10:00 and 17:00 on Thursday 4th and at 16:00 on Saturday 6th February 2021 was due to disturbance at the monitor location and not representative of HS2 construction vibration.



Note: High vibration levels measured at 20:00 on Monday 8th and on Thursday 11th, at 13:00 and 22:00 on Friday 12nd, at 14:00 on Saturday 13th and at 17:00 on Sunday 14th February 2021 was due to disturbance at the monitor location and not representative not representative of HS2 construction vibration.



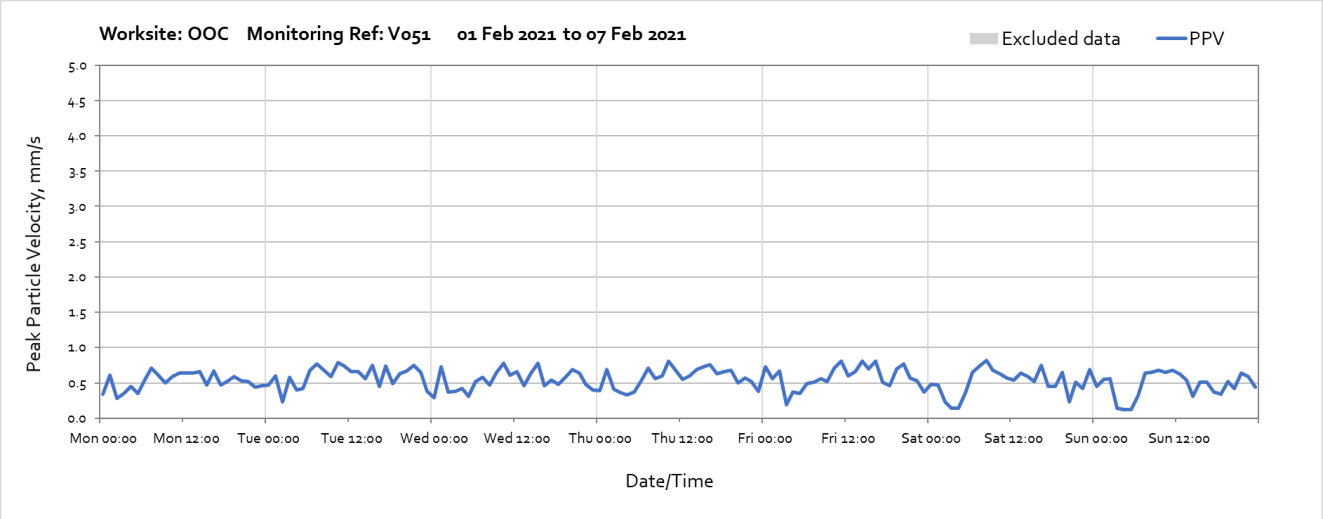
Note: High vibration levels measured at 20:00 on Wednesday 17th, at 20:00 on Thursday 18th, at 13:00 on Friday 19th, at 18:00 on Saturday 20th and between 10:00 and 12:00 on Sunday 21st February 2021 was due to disturbance at the monitor location and not representative not representative of HS2 construction vibration.

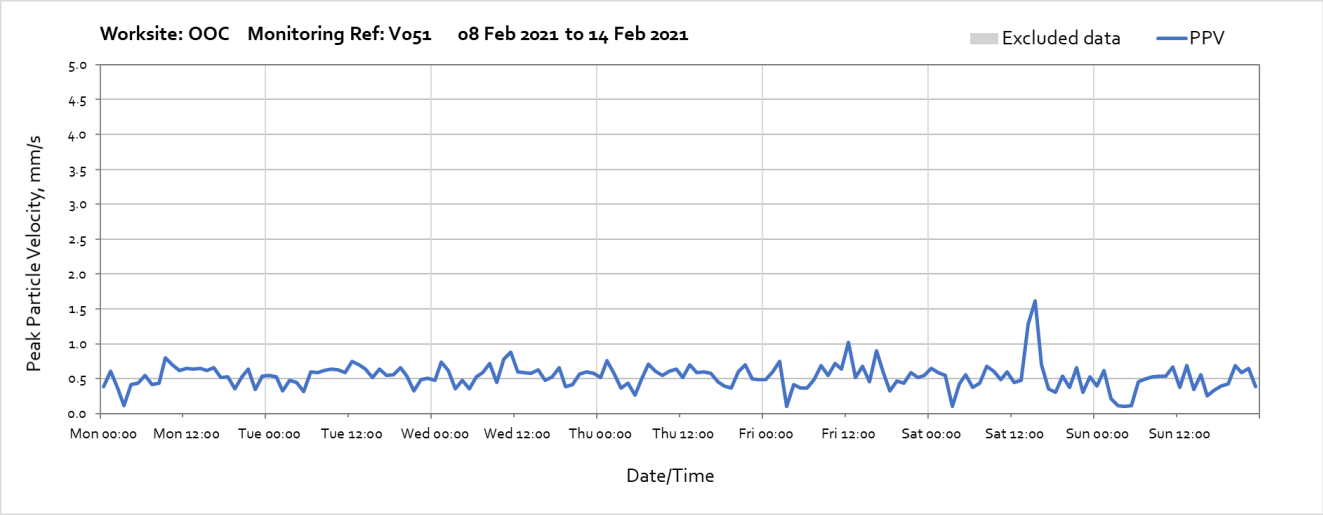


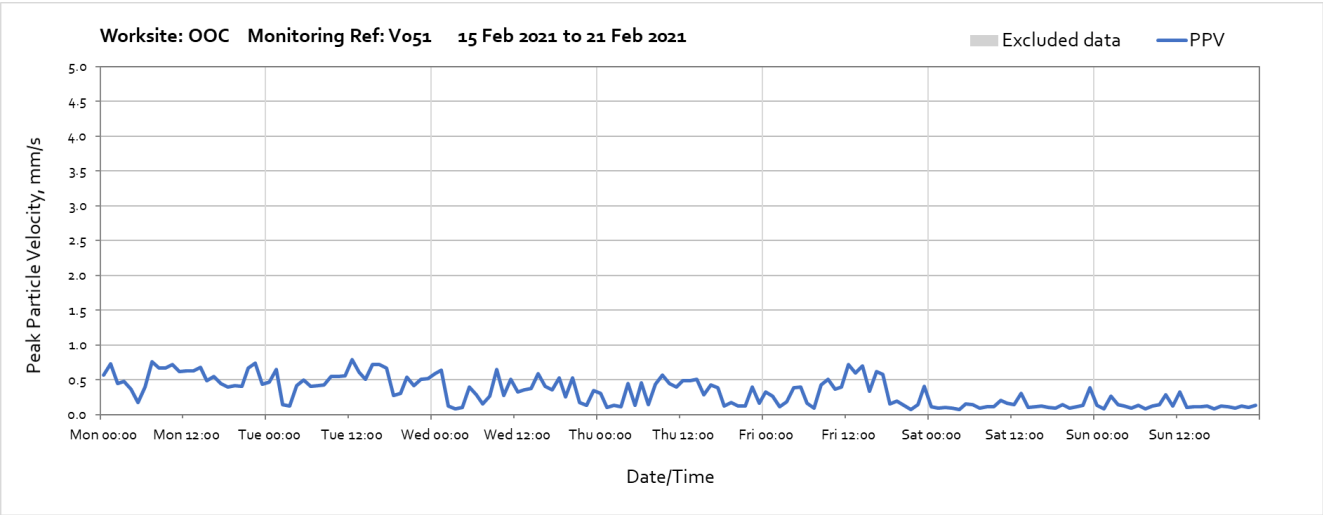
Note: High vibration levels measured at 09:00 on Wednesday 24th, between 19:00 and 20:00 on Thursday 25th,

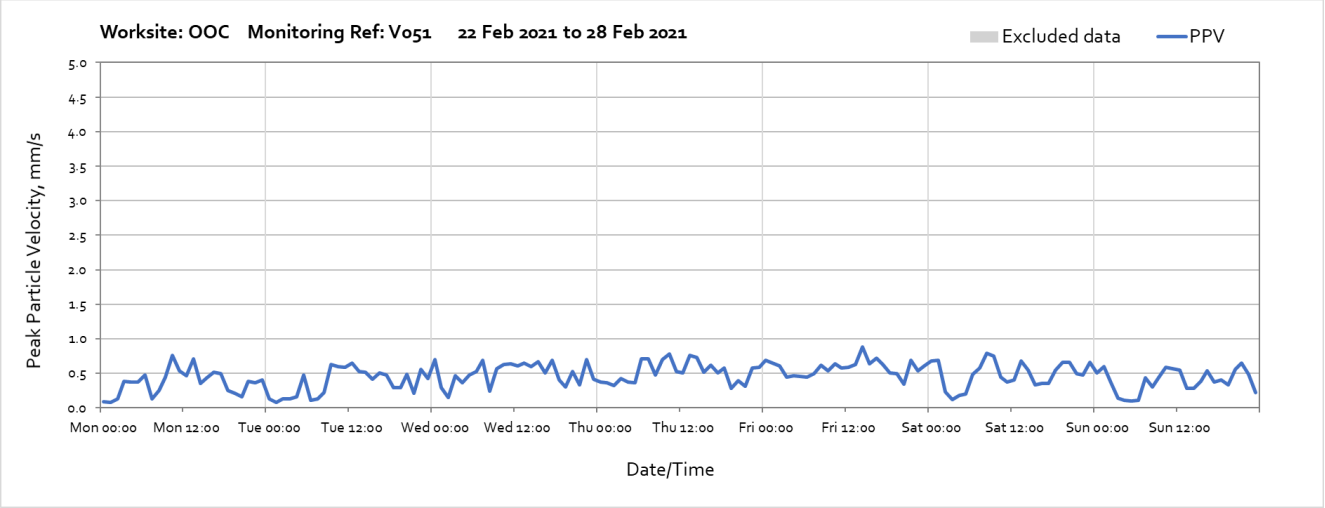
at 20:00 on Friday 26th and at 10:00 and 17:00 on Saturday 27th February 2021 was due to disturbance at the monitor location and not representative not representative of HS2 construction vibration.

Worksite: Oal Oak Coomon (OOC) – Monitoring Ref: V051

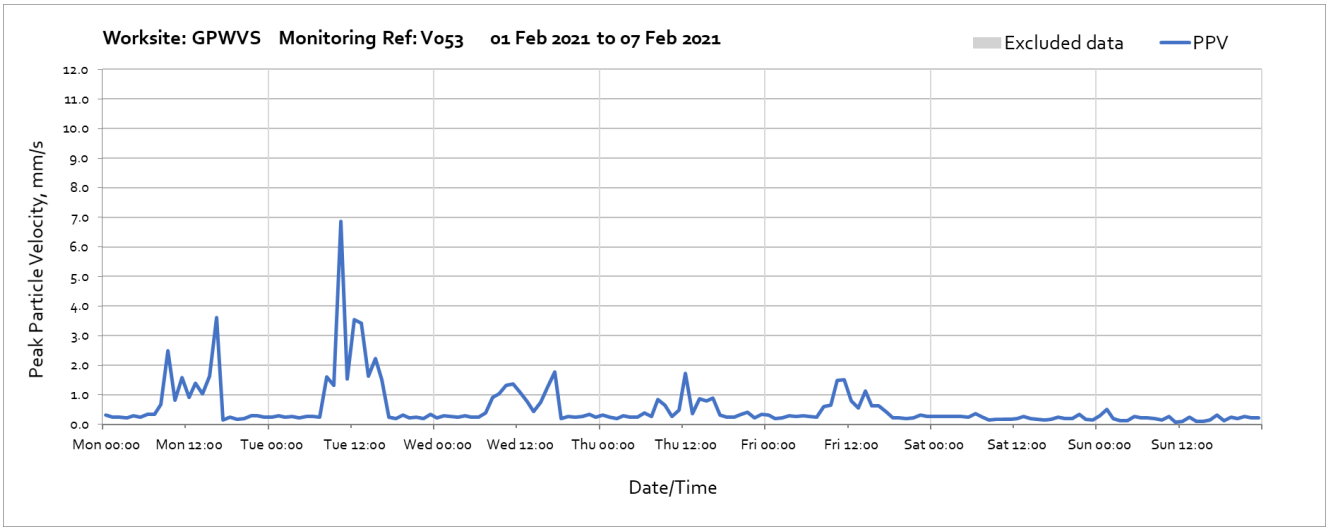


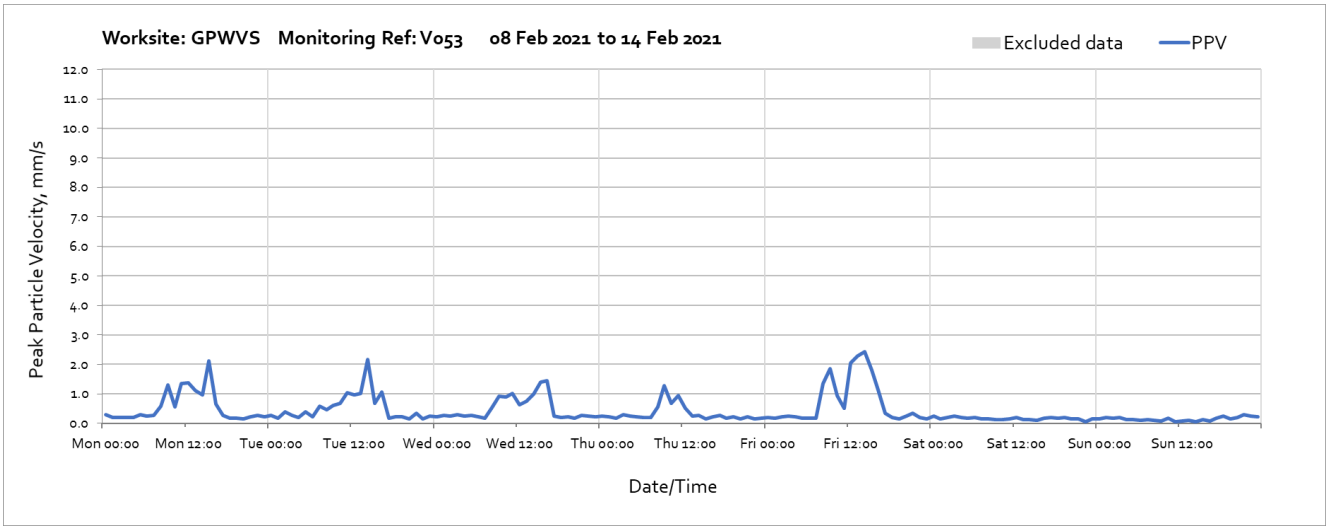


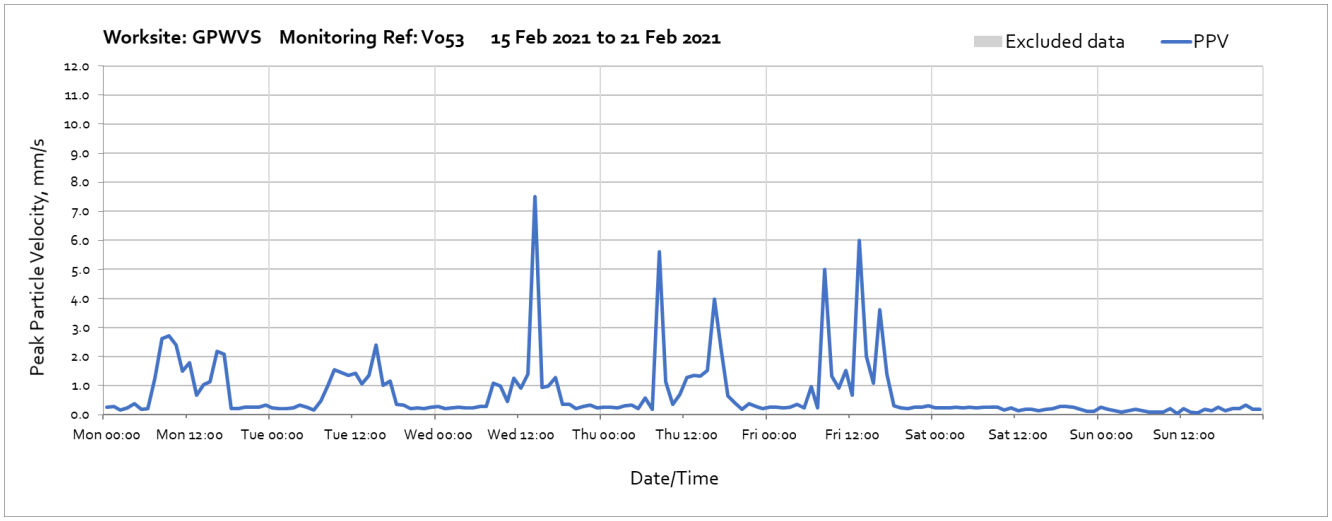


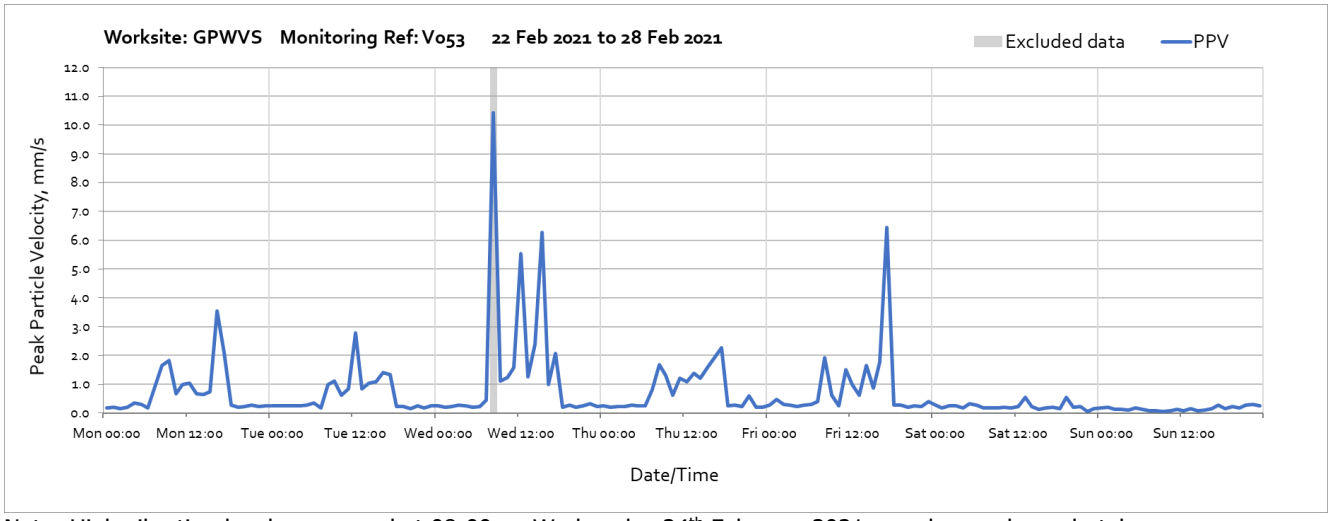


Worksite: Green Park Way Vent Shaft (GPWVS) – Monitoring Ref: V053









Note: High vibration levels measured at 08:00 on Wednesday 24th February 2021 was due works undertaken close to the monitor and are not representative of HS2 construction vibration.