HS2

January 2023

Construction Noise and Vibration Monthly Report – November 2022

Warwick District Council

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 Warwick District Council (WDC) area during the month of November 2022.

Within this period monitoring was undertaken at the following worksites:

- Noise monitoring was undertaken at the Burton Green Tunnel worksite (ref.: BGT), where the works were temporarily complete.
- Noise monitoring was undertaken at the Bockenden Cutting worksites (ref.: BC), where work activities included water pumping.
- Noise monitoring was undertaken at the A429 Kenilworth Road Overbridge (ref.: A429), where work activities included utility trial holes, utility diversions, platform construction, material hauling and storage as well as pumping.
- Noise monitoring was undertaken at the A46 Compound (ref.: A46C), where work activities included fencing works, general maintenance, dewatering and piling
- Noise monitoring was undertaken at the Stoneleigh Park (ref.: SP), where work activities included plant crossing and haul road operations, drainage works, borehole excavation, silt fencing, stockpile management, piling platform works and compound works.
- Noise monitoring was undertaken at the Cubbington Road (ref.: C), where work activities included removal of redundant gas-main, compound works, utility diversions, road works, installation of new gates as well as parking area and working platform construction.
- Noise monitoring was undertaken at Offchurch Cutting (ref.: OC), where work activities included removal of redundant gas-main, road works., compound works, utility diversion works, gate installation of gates, parking area construction, working platform' creation, embankment stabilisation works, material placement, vegetation and tree stump removal, fencing works, stone deliveries and stockpile movement, sweeper pit construction as well as formwork and reinforcement works.

There were no exceedances of the HS2 threshold levels for significant noise impacts, which are defined in Information Paper E23(https://www.gov.uk/government/publications/hs2-information-papers-environment), during the reporting period.

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

One (1) noise complaint was received during the monitoring period. A description of the complaint, the results of investigations 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 +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 Warwick District Council (WDC) area for the period 1st to 30th November 2022.

1.1.3 Construction sites in the local authority area where monitoring was undertaken during this period include:

- Burton Green Tunnel worksites (ref.: BGT, see plan 1 in Appendix A), where the works were temporarily complete.
- Bockenden Cutting worksites (ref.: BC, see plan 1 in Appendix A), where work activities included:
    - Water pumping.
- A429 Kenilworth Road Overbridge (ref.: A429, see plan 2 in Appendix A), where work activities included:
    - Utility trial holes.
    - Utility diversions.
    - Platform construction.
    - Material haulage and storage.
    - Water pumping.

A46 Compound, (ref.: A46C, see plan 3 in Appendix A), where work activities included:

  - Heras fencing works and general maintenance.
  - Dewatering of cofferdams and platforms.
  - Sheet Piling works.

- Stoneleigh Park, (ref.: SP, see plan 3 in Appendix A), where work activities included:
  - Plant crossing and haul road operations.
  - Drainage works.
  - Borehole excavation.
  - Fencing works.
  - Stockpile management.
  - Piling platform works.
  - Compound works.
- Cubbington Road (ref.: C, see plan 4 in Appendix B), where work activities included:
  - Removal of redundant gas-main.
  - Compound works.
  - Utility diversions.
  - Road works.
  - Installation of new gates.
  - Parking area construction.
  - Working platform creation.
- Offchurch Cutting worksite (ref.: OC, see plan 5 in Appendix A), where work activities included:
  - Removal of redundant gas-main.
  - Road works.
  - Compound works.
  - Utility diversion works.
  - Installation of gates.
  - Construction of parking area.
  - Working platforms' creation.

- Embankment stabilisation works.
- Material placement.
- Vegetation clearance and tree stump removal.
- Fencing works.
- Stone deliveries.
- Stockpile movement.
- Construction of sweeper pit.
- Formwork and reinforcement works.

1.1.4 Further works, where monitoring did not take place, consisted of water utility works at Offchurch and Cubbington, at Burton Green and at Lavender Hall.

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 Sixteen (16) noise and three (3) vibration monitoring installations were active in November in the WDC area. Table 2 summarises the position of the noise and vibration monitoring installations within the WDC area in November 2022.

1.2.2 During November no data were recorded by noise monitor SV-N1 owing to power supply issues and no data were recorded by vibration monitor SV-V1 because access to the land was denied so that the meter's battery could not be changed.

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

Table 2: Monitoring Locations

Worksite Reference	Measurement Reference	Address
Burton Green Tunnel (BGT)	BGT-N1	301 Cromwell Lane, Burton Green, Warwick
	BGT-N2	33 Broadwell Woods Caravan Park, Red Lane, Burton Green, Warwick,
	BGT-V9	33 Broadwell Woods, Red Lane, Burton Green, Kenilworth, CV8 1QF
Bockenden Cutting (BC)	BC-N1	Thistle Estate, Red Lane, Burton Green, Warwick

Worksite Reference	Measurement Reference	Address
A429 Kenilworth Road Overbridge (A429)	A429-N1	Millburn Grange, Coventry Road, Kenilworth
	A429-N2	Brookview, Milburn Grange, Coventry Road, Kenilworth
	A429-N3	16 Kenilworth Road, Kenilworth
A46 Compound (A46C)	A46C-N1	Kingswood Farmhouse, Dalehouse Lane, Kenilworth
Stoneleigh Park (SP)	SP-N1	Stoneleigh, Kenilworth
	SP-N2	Stoneleigh Park, Kenilworth
	SV-N1	The Barnyard Crewe Ln, Stoneleigh, Kenilworth
	SV-N2	5 Birmingham Rd, Stoneleigh, Coventry
	SV-N3	5 Walkers Orchard, Stoneleigh, Coventry
	SP-V1	Stoneleigh, Kenilworth
	SV-V1	The Barnyard Crewe Ln, Stoneleigh, Kenilworth
Cubbington (C)	C-N1	Wychwood, Cubbington Road, Leamington Spa
Offchurch Cutting (OC)	OC-N1	Welsh Road, Offchurch, Leamington
	OC-N2	Valley Fields, Offchurch, Leamington Spa
	OC-N3	Brickyard Cottage, Welsh Road, Offchurch, Warwick

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
BGT	BGT-N1	301 Cromwell Lane, Burton Green,	Free-field	46.6 (52.1)	49.2 (53.2)	43.5 (48.2)	41.9 (53.0)	39.0 (56.0)	42.9 (45.9)	46.6 (48.9)	42.7 (45.0)	50.8 (82.4)	38.3 (51.4)	43.3 (51.6)	36.3 (42.5)
	BGT-N2	33 Broadwell Woods Caravan Park, Red Lane, Burton Green,	Free-field	47.7 (53.2)	52.6 (62.3)	45.4 (67.4)	43.2 (55.9)	40.6 (53.8)	41.9 (43.9)	47.0 (52.3)	42.8 (44.4)	46.8 (67.9)	39.1 (51.8)	43.7 (54.4)	36.9 (43.5)
BC	BC-N1	Thistle Estate, Red Lane, Burton Green	Free-field	42.4 (49.6)	45.4 (63.4)	42.7 (69.0)	40.4 (50.2)	39.2 (51.0)	40.6 (42.2)	42.3 (43.8)	40.9 (42.7)	47.2 (65.6)	38.6 (47.8)	40.8 (49.9)	37.2 (43.9)
A429	A429-N1	Millburn Grange, Coventry Road, Kenilworth	Free-field	52.3 (56.2)	55.2 (60.8)	52.2 (55.7)	51.4 (58.5)	48.8 (58.2)	48.6 (50.8)	51.7 (53.8)	50.3 (51.4)	49.4 (55.9)	41.3 (54.9)	52.0 (64.7)	46.3 (53.7)
	A429-N2	Brookview, Milburn Grange, Coventry Road, Kenilworth	Free-field	51.1 (53.5)	55.2 (64.6)	50.9 (53.8)	50.0 (54.9)	47.1 (54.5)	48.0 (49.3)	52.4 (57.0)	50.2 (50.8)	50.1 (57.5)	43.6 (51.6)	51.0 (66.1)	45.1 (51.4)
	A429-N3	16 Kenilworth Road, Kenilworth	Free-field	56.5 (58.0)	56.7 (59.3)	55.5 (57.3)	53.8 (56.7)	48.4 (58.8)	51.9 (53.7)	55.5 (57.4)	55.3 (56.1)	55.5 (57.3)	48.2 (52.8)	55.4 (66.1)	48.3 (55.3)
A46C	A46C-N1	Kingswood Farmhouse, Dalehouse Lane, Kenilworth	Free-field	62.3 (65.9)	61.6 (66.4)	61.1 (64.5)	59.1 (63.2)	56.2 (64.0)	57.3 (60.1)	59.7 (62.4)	58.9 (62.0)	60.0 (62.2)	54.3 (57.3)	60.1 (62.8)	57.0 (63.6)
SP	SP-N1	Stoneleigh, Kenilworth	Free-field	52.1 (54.2)	54.5 (56.5)	50.0 (54.4)	47.7 (51.4)	44.7 (54.6)	48.5 (50.4)	51.5 (53.6)	51.9 (54.0)	49.8 (58.4)	45.1 (55.4)	50.9 (57.8)	43.1 (50.2)

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
	SP-N2	Stoneleigh Park, Kenilworth	Free-field	55.0 (57.5)	56.5 (58.7)	51.5 (54.5)	47.6 (53.5)	45.8 (53.4)	50.1 (53.0)	53.8 (54.9)	50.6 (53.0)	51.8 (57.0)	45.0 (54.3)	51.9 (60.2)	45.4 (52.0)
	SV-N1*	The Barnyard Crewe Ln, Stoneleigh, Kenilworth	Free-field	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
	SV-N2	5 Birmingham Rd, Stoneleigh, Coventry	Free-field	51.3 (54.5)	53.2 (57.0)	50.8 (53.4)	47.7 (53.7)	43.4 (52.6)	52.8 (53.5)	52.9 (54.2)	53.0 (54.7)	52.0 (56.0)	44.0 (53.7)	54.2 (68.9)	45.0 (56.2)
	SV-N3	5 Walkers Orchard, Stoneleigh, Coventry CV8 3DD	Free-field	49.4 (55.7)	49.7 (61.4)	47.0 (52.3)	45.9 (63.8)	42.4 (52.6)	48.4 (51.4)	50.6 (53.6)	47.6 (50.6)	49.6 (67.4)	39.8 (46.1)	49.9 (69.6)	41.1 (49.1)
C	C-N1	Wychwood, Cubbington Road, Lillington	Free field	48.9 (52.7)	52.7 (64.2)	48.7 (53.3)	47.0 (50.2)	41.6 (56.3)	45.0 (46.8)	49.5 (50.0)	50.9 (52.3)	52.5 (69.3)	40.1 (46.7)	48.6 (52.7)	40.0 (51.0)
OC	OC-N1	Welsh Road, Offchurch	Free-field	49.6 (54.8)	52.1 (56.9)	48.7 (51.1)	44.3 (53.7)	41.3 (51.3)	45.3 (48.8)	50.1 (51.0)	49.7 (57.2)	49.1 (57.0)	39.6 (45.7)	45.6 (53.4)	40.9 (48.9)
	OC-N2	Valley Fields, Hunningham Road, Offchurch	Free field	52.1 (64.4)	57.7 (62.1)	51.2 (54.2)	51.7 (54.8)	49.0 (55.7)	49.4 (51.1)	57.2 (65.5)	46.6 (47.8)	50.3 (53.5)	48.1 (51.5)	49.4 (53.1)	48.7 (52.3)
	OC-N3	Brickyard Cottage, Welsh Road, Offchurch	Free-field	56.6 (59.1)	55.8 (57.7)	55.1 (57.7)	50.4 (53.8)	47.4 (56.6)	50.3 (50.8)	53.3 (54.1)	53.0 (53.7)	52.1 (54.5)	45.7 (52.8)	51.9 (55.2)	47.3 (56.5)

* Note: No data were recorded by noise monitor SV-N1 owing to power issues

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
BGT	BGT-V9	33 Broadwell Woods, Red Lane, Burton Green, Kenilworth, CV8 1QF	0.74 (Y-axis)
SP	SP-V1	Stoneleigh, Kenilworth CV8 2TA	0.86 (X-axis)
SP	SV-V1*	The Barnyard Crewe Ln, Stoneleigh, Kenilworth CV8 2LA	-

* Note: No data were recorded by vibration monitor SV-V1 because access to the land was denied so that the meter's battery could not be changed

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 LOAEL and SOAEL

2.2.1 The lowest observed adverse effect level (LOAEL) is defined in the Planning Practice Guidance – Noise (PPG) as the level above which "noise starts to cause small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life".

2.2.2 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."

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

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

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

Table 5 - Summary of Exceedances of LOAEL and SOAEL

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of LOAEL	Number of exceedances of SOAEL
BGT	BGT-N1*	301 Cromwell Lane, Burton Green	All days	All periods	No exceedances	No exceedances
	BGT-N2	33 Broadwell Woods Caravan Park, Red Lane, Burton Green	All days	All periods	No exceedances	No exceedances
BC	BC-N1*	Thistle Estate, Red Lane, Burton Green	All days	All periods	No exceedances	No exceedances
A429	A429-N1*	Millburn Grange, Coventry Road, Kenilworth	All days	All periods	No exceedances	No exceedances
	A429-N2	Brookview, Milburn Grange, Coventry Road, Kenilworth	Weekday	0800 - 1800	2	No exceedances
	A429-N3	16 Kenilworth Road, Kenilworth	All days	All periods	No exceedances	No exceedances
A46C	A46C-N1*	Kingswood Farmhouse, Dalehouse Lane, Kenilworth	All days	All periods	No exceedances	No exceedances

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of LOAEL	Number of exceedances of SOAEL
SP	SP-N1	Stoneleigh, Kenilworth	All days	All periods	No exceedances	No exceedances
	SP-N2	Stoneleigh Park, Kenilworth	All days	All periods	No exceedances	No exceedances
	SV-N2	5 Birmingham Rd, Stoneleigh, Coventry	All days	All periods	No exceedances	No exceedances
	SV-N3	5 Walkers Orchard, Stoneleigh, Coventry	All days	All periods	No exceedances	No exceedances
C	C-N1	Wychwood, Cubbington Road, Lillington Spa	All days	All periods	No exceedances	No exceedances
OC	OC-N1*	Welsh Road, Offchurch, Leamington,	All days	All periods	No exceedances	No exceedances
	OC-N2	Valley Fields, Hunningham Road, Offchurch, Leamington	Saturday	0800 - 1300	1	No exceedances
	OC-N3*	Brickyard Cottage, Welsh Road, Offchurch,	All days	All periods	No exceedances	No exceedances

* Note: A distance correction has been applied while calculating exceedances of the LOAEL and SOAEL.

2.2.6 LOAEL exceedances were recorded at two (2) monitoring locations. These exceedances were recorded during weekday periods in one case and during a Saturday in the other. No exceedances of the SOAEL were recorded during the reporting period.

2.3 Exceedances of Trigger Level

2.3.1 Table 7 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

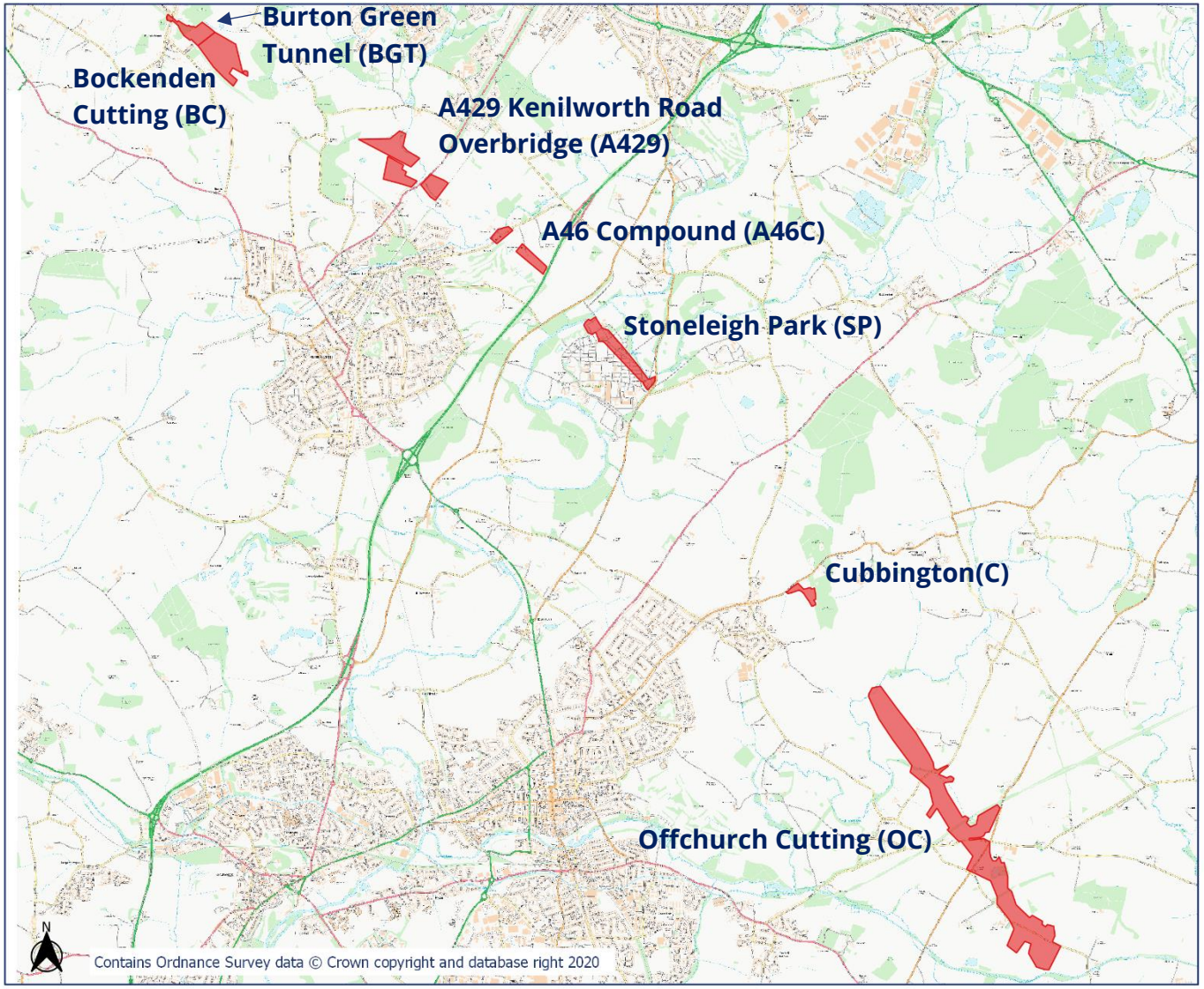
2.4.1 Table 8 provides a summary of complaint information related to noise and vibration received during the reporting period, along with the findings of any investigation.

Table 7 - Summary of Complaints

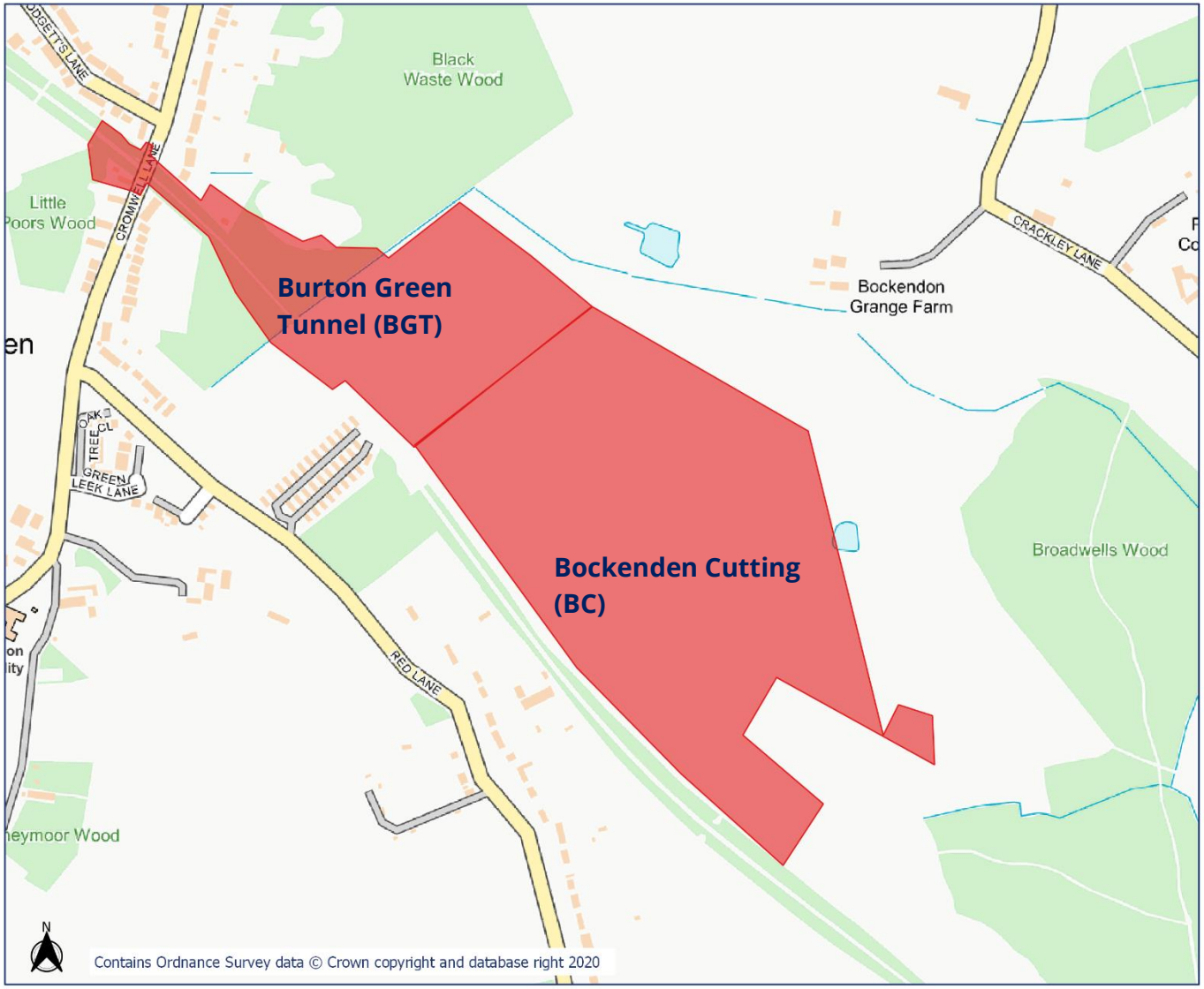
Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
HS2-22-44132-C	BGT/BC	Complaint about noise from generator/pumping installation which is active at all times.	The investigation showed that the acoustic blankets had not been replaced when unit was inspected.	The acoustic blankets have now been replaced. The noise has been monitored and the units will be replaced with newer, quieter, alternatives.

Appendix A Site Locations

HS2 Worksite Identification Plan - Overview



Worksite Identification Plan - 1



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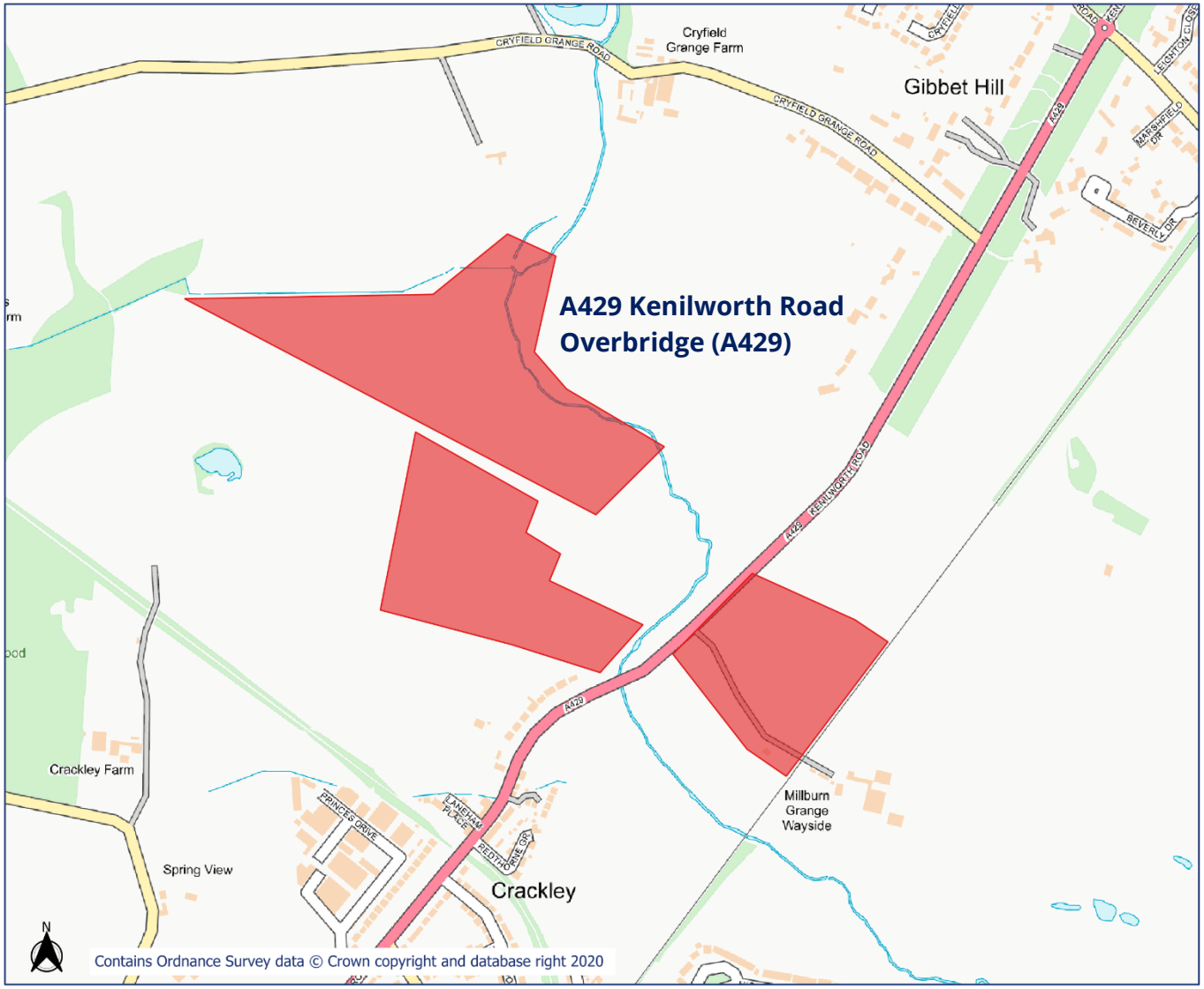

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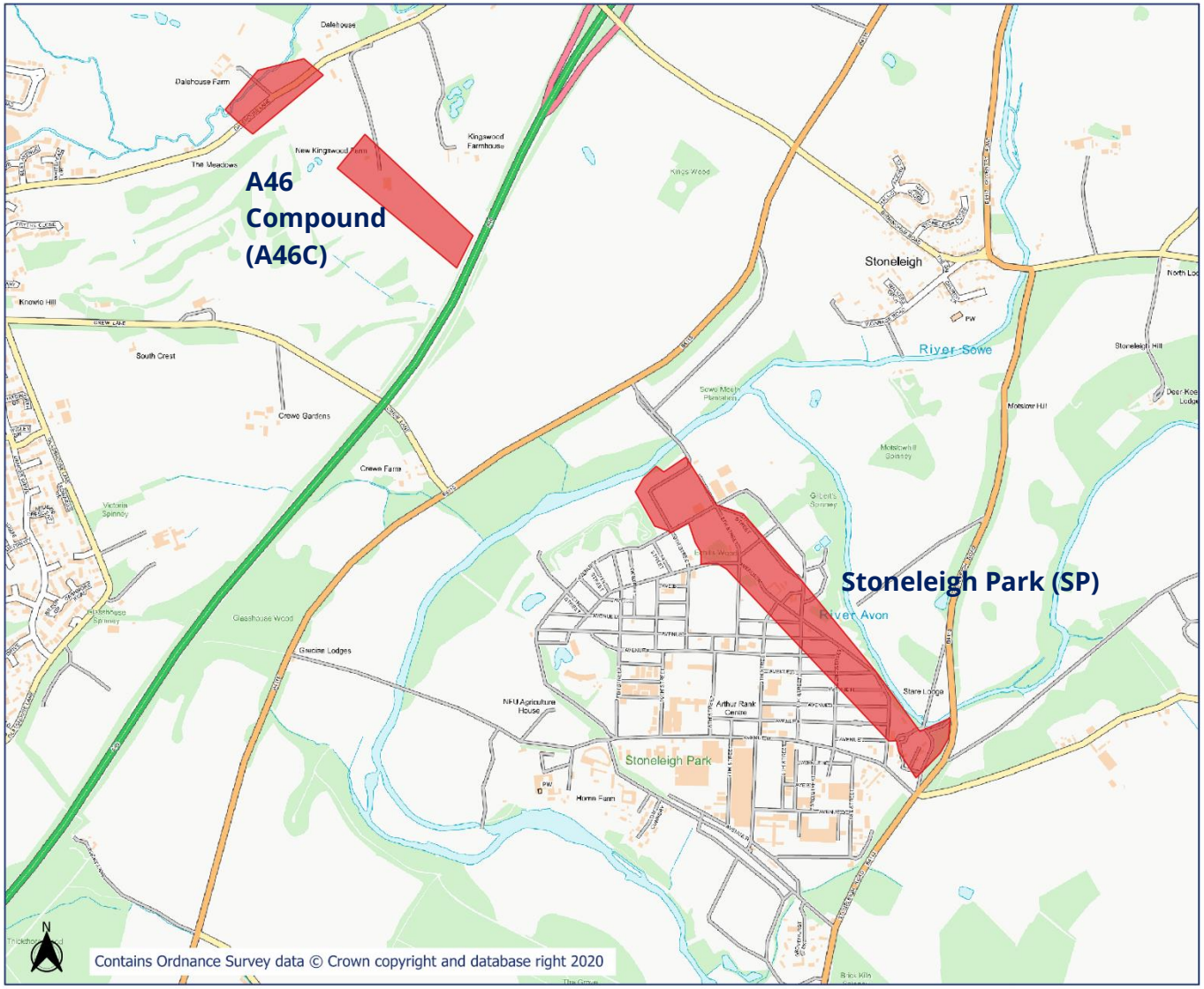
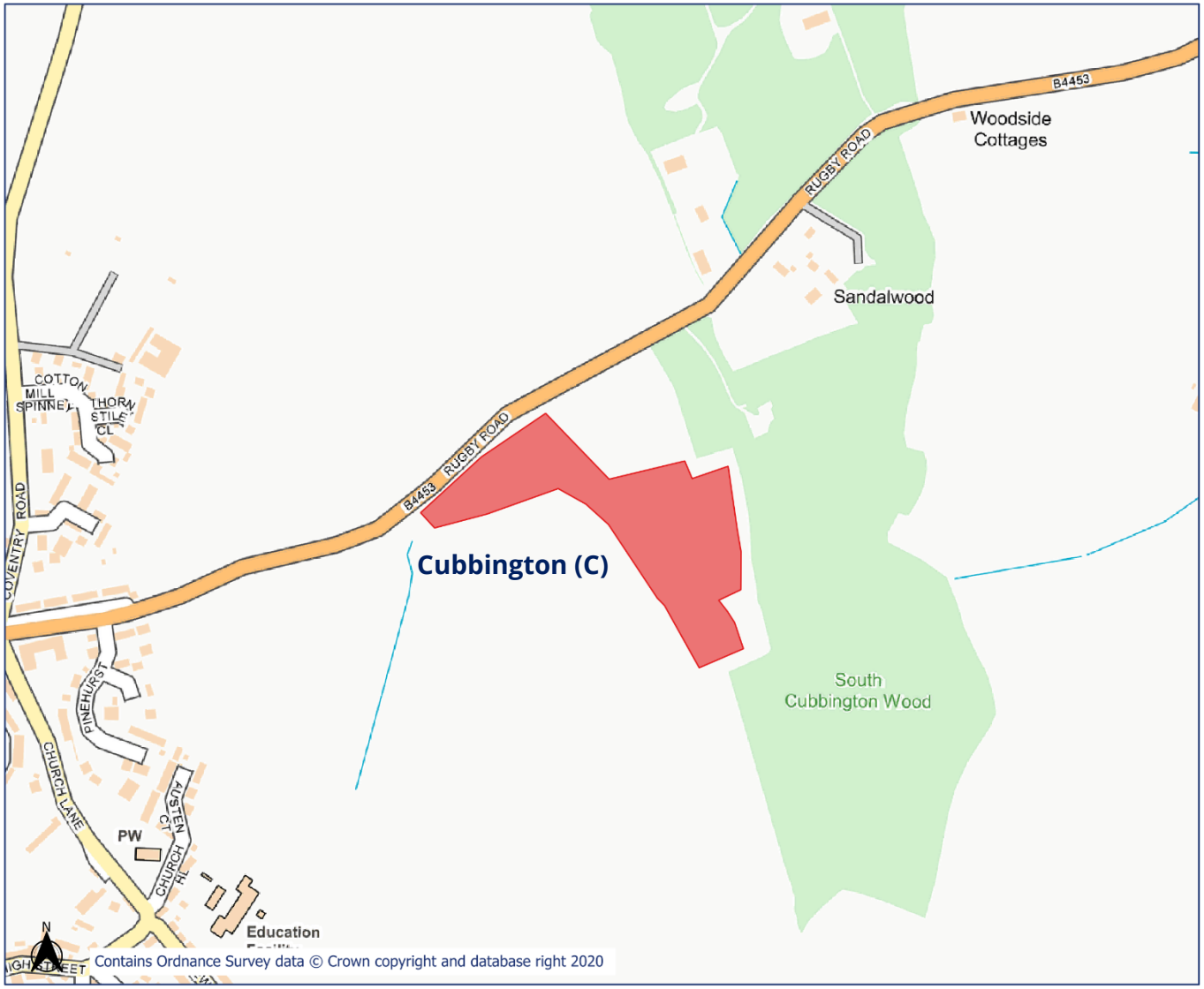


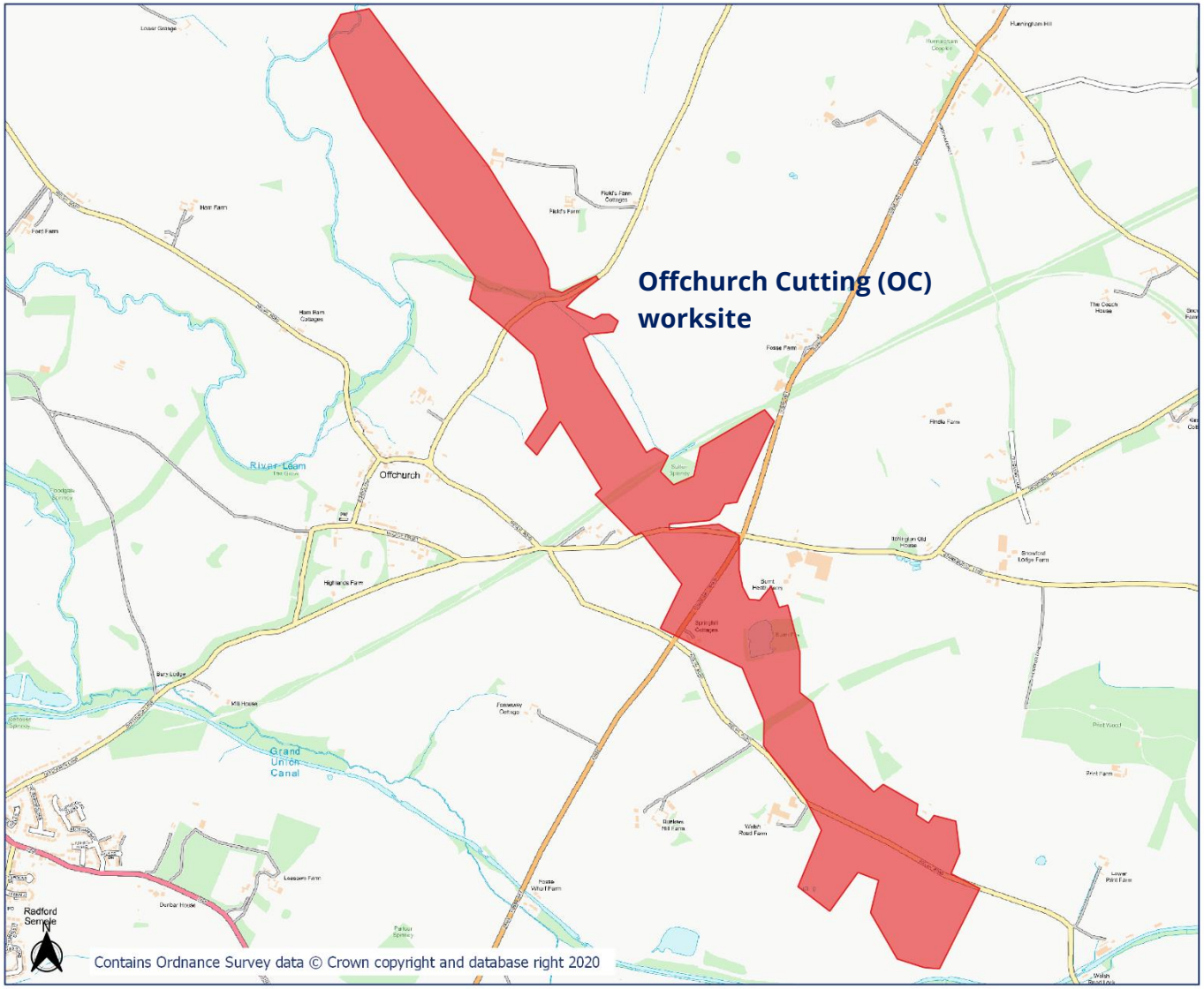
Legend

Active Worksites

Worksite Identification Plan - 4

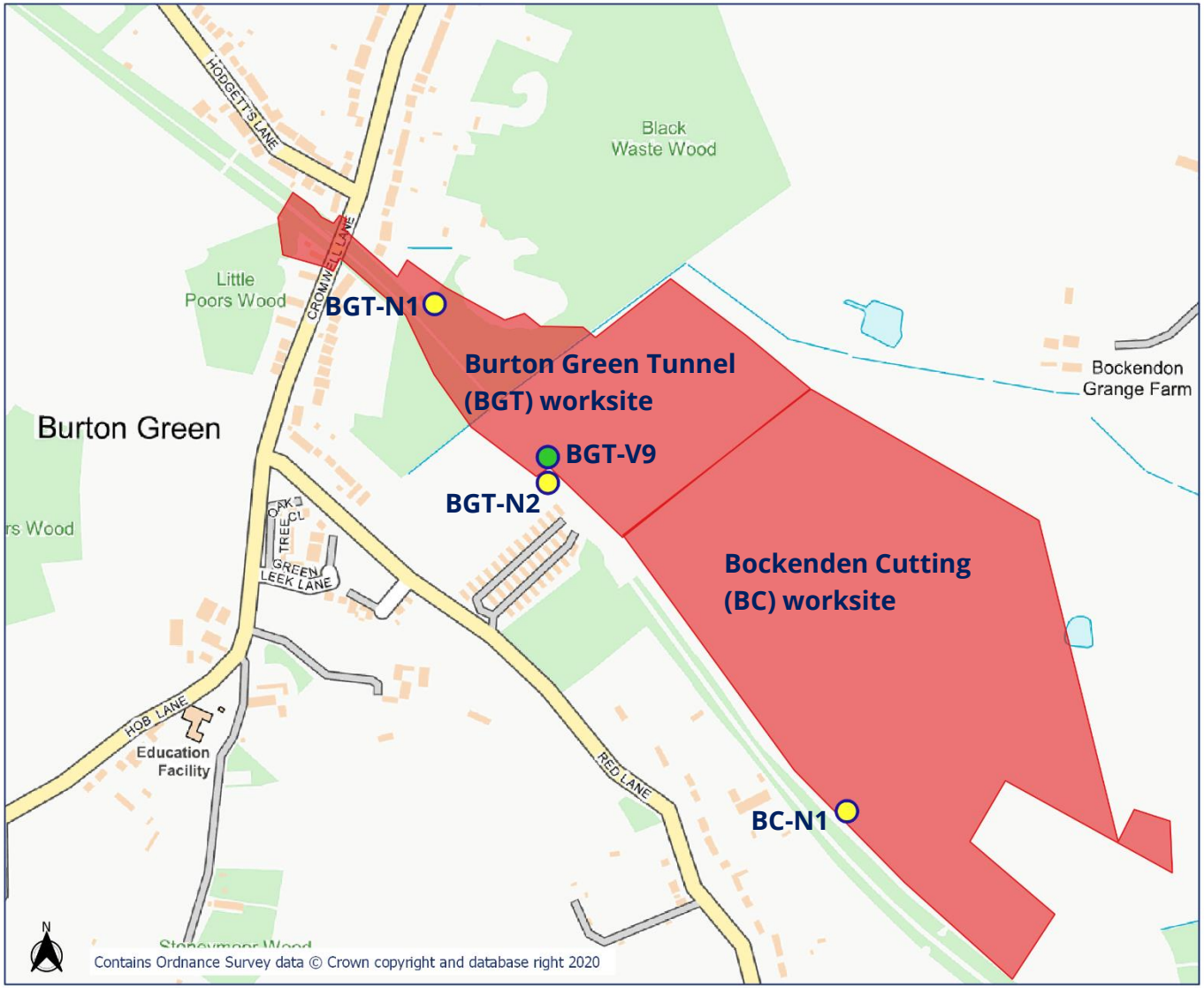


Worksite Identification Plan - 5

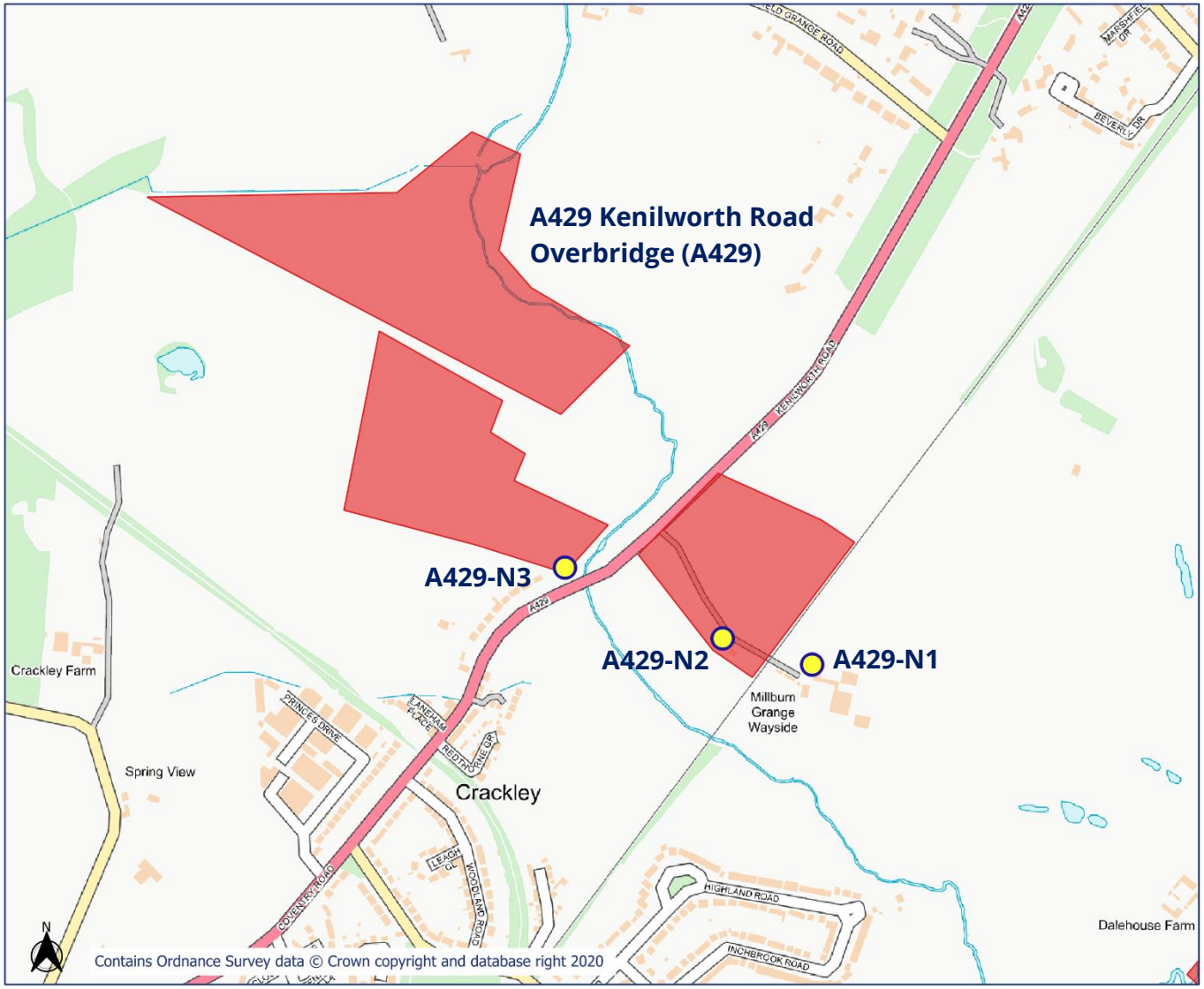


Appendix B Monitoring Locations

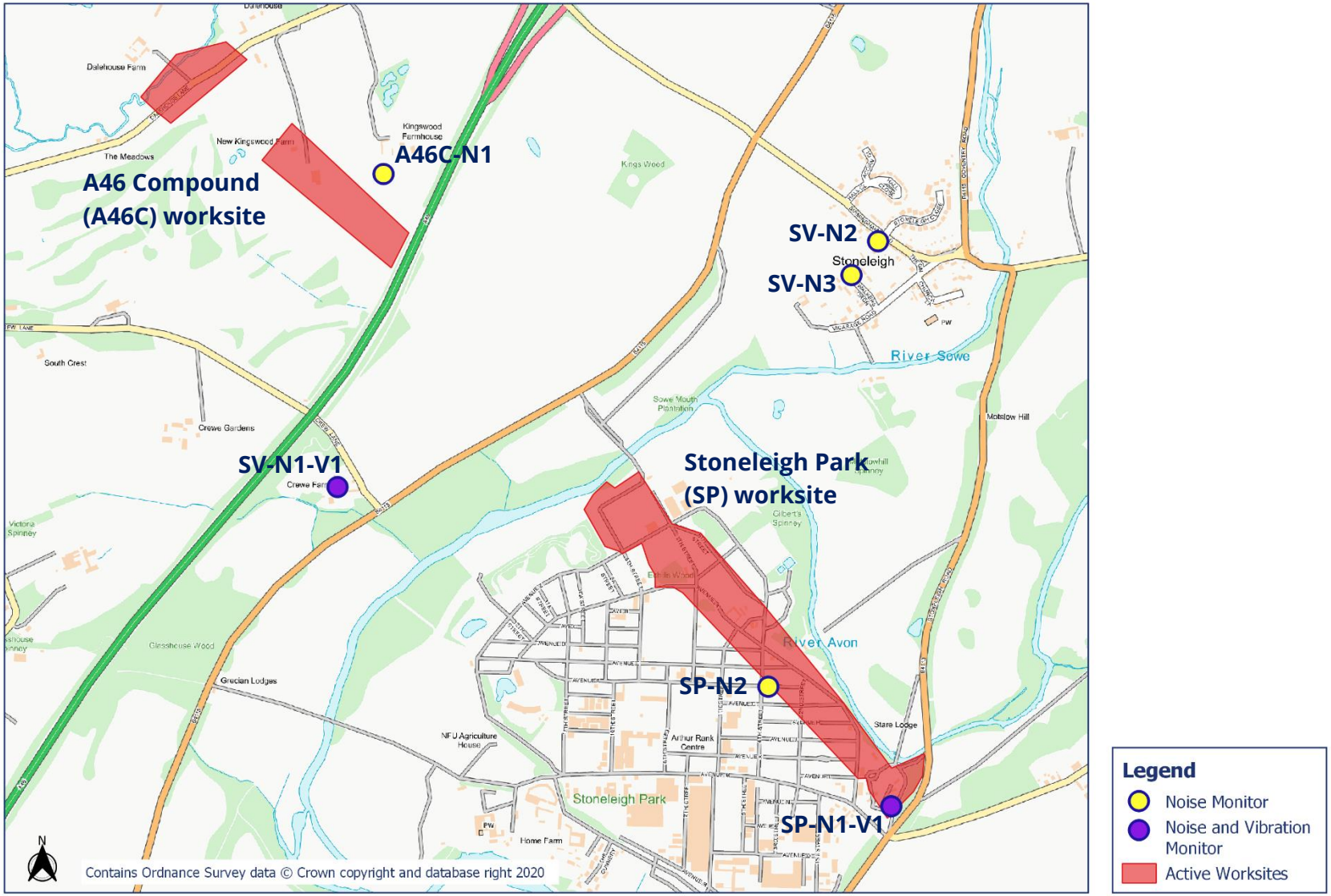
Noise and Vibration Monitoring Plan - 1



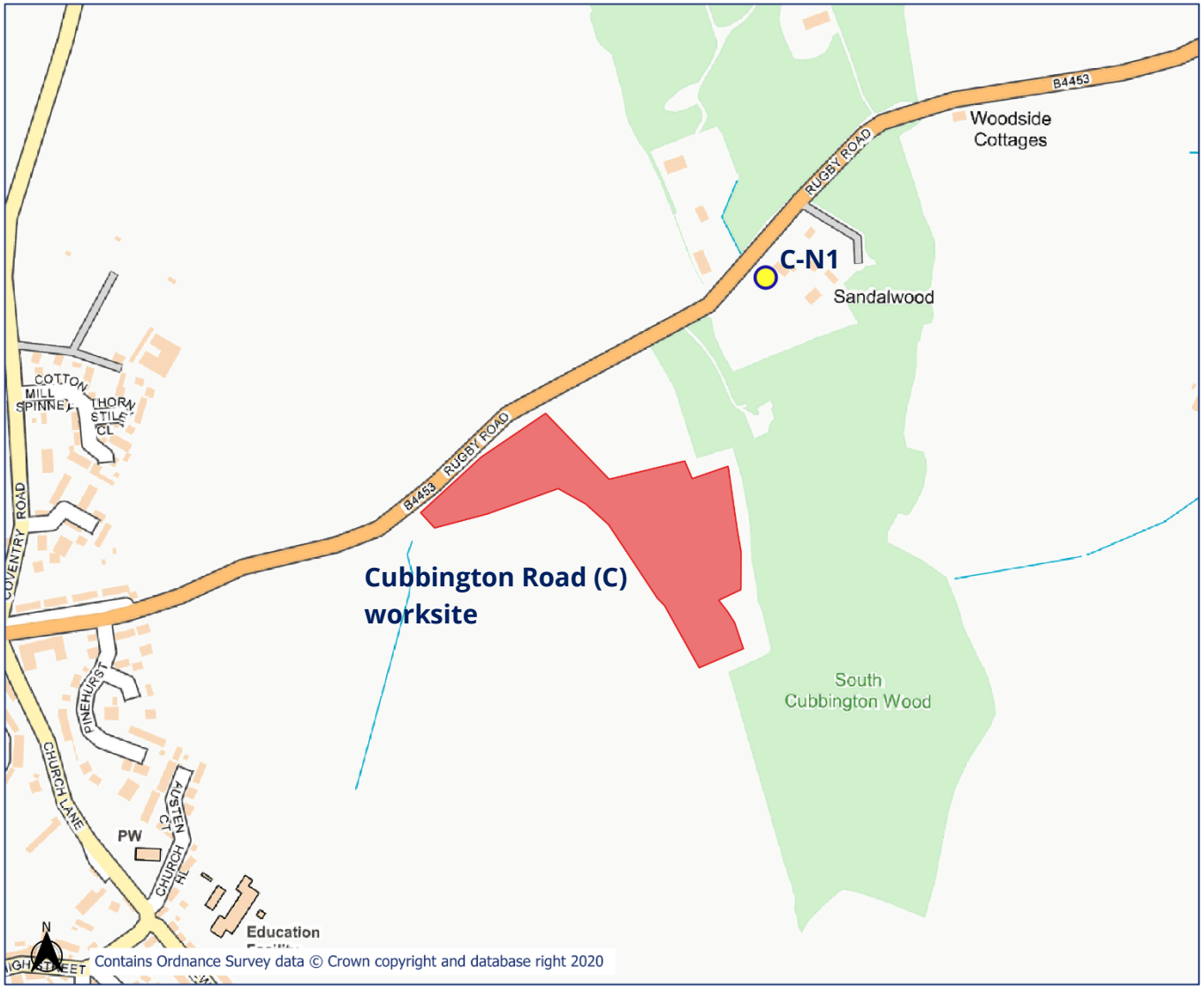
Noise and Vibration Monitoring Plan - 2



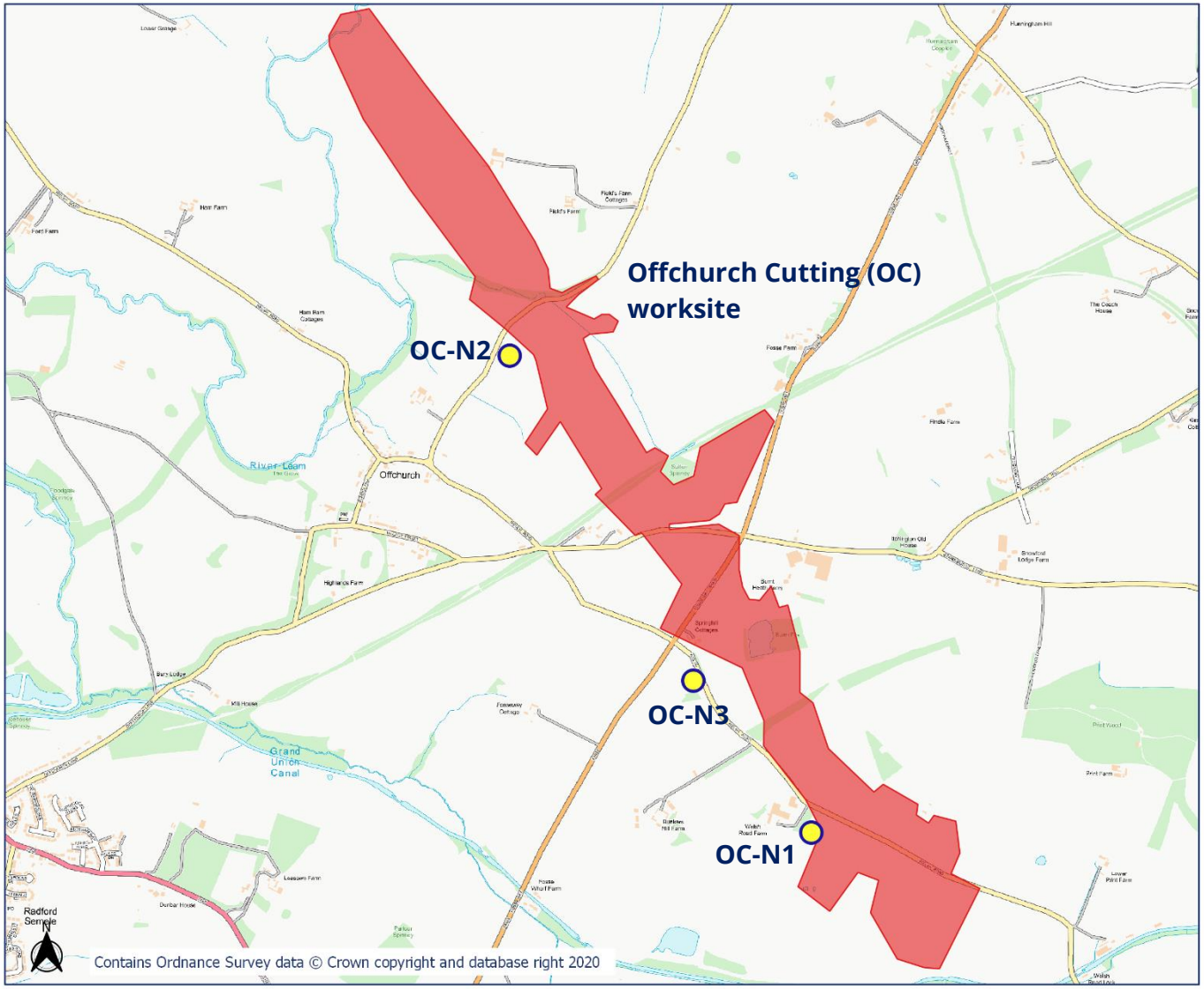
Noise and Vibration Monitoring Plan - 3



Noise and Vibration Monitoring Plan - 4



Noise and Vibration Monitoring Plan - 5

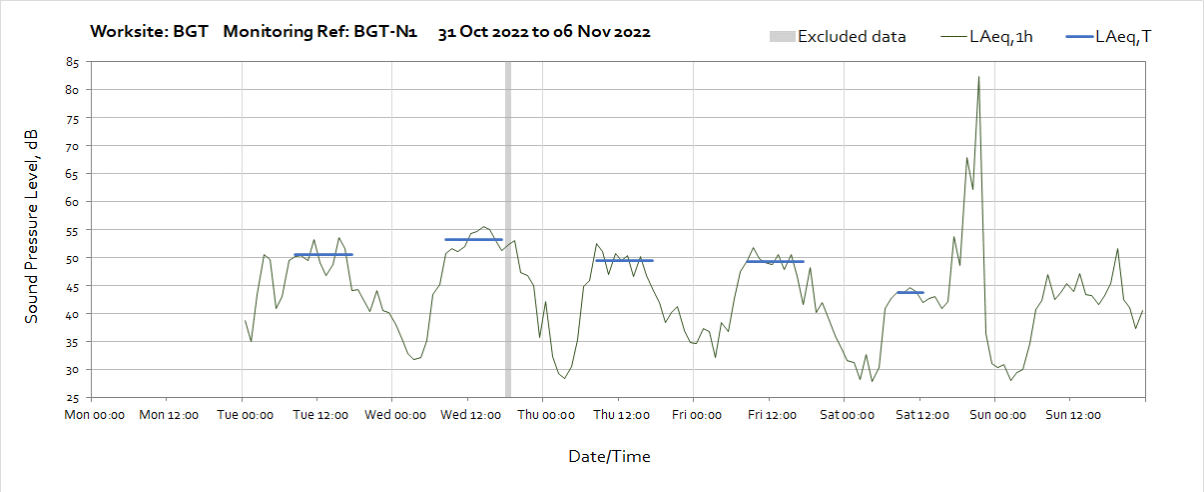


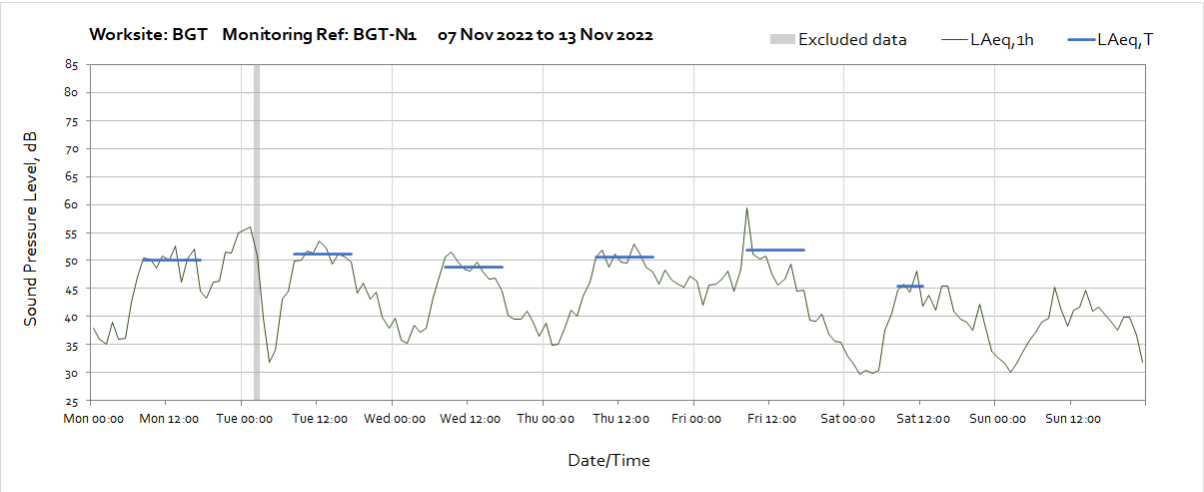
Appendix C Data

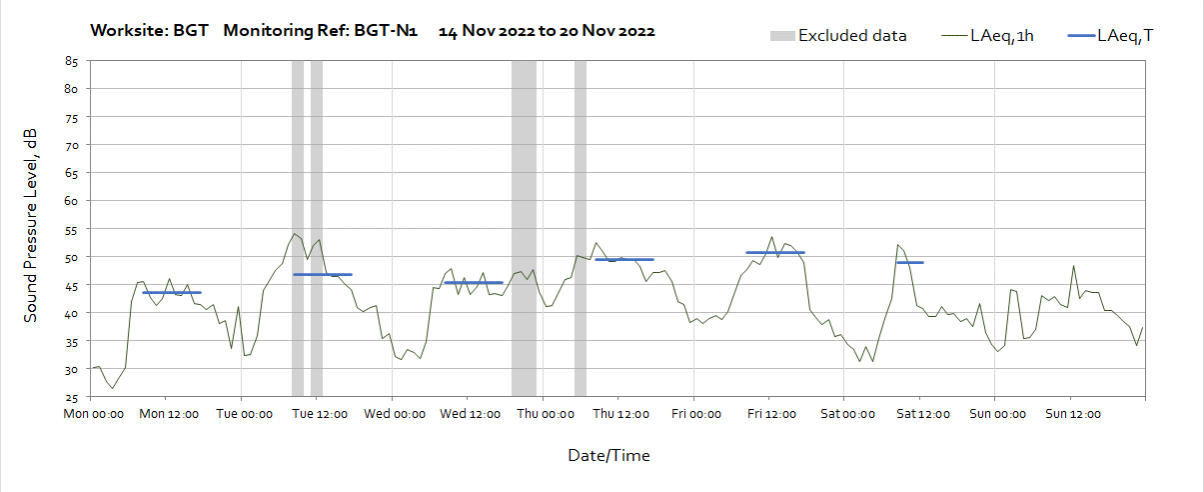
Noise

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: BGT – Monitoring Ref: BGT-N1






Worksite: BGT Monitoring Ref: BGT-N1 14 Nov 2022 to 20 Nov 2022
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
85
80
75
70
65
60
55
50
45
40
35
30
25
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
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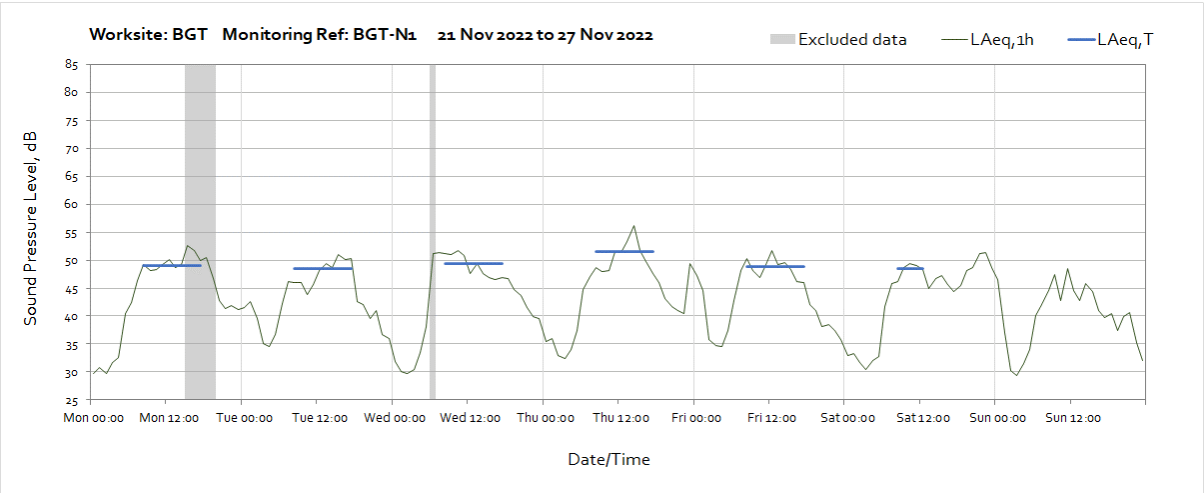
Sun 00:00
Sun 12:00
Date/Time


Worksite: BGT Monitoring Ref: BGT-N1 21 Nov 2022 to 27 Nov 2022
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
85
80
75
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65
60
55
50
45
40
35
30
25
Mon 00:00
Mon 12:00
Tue 00:00
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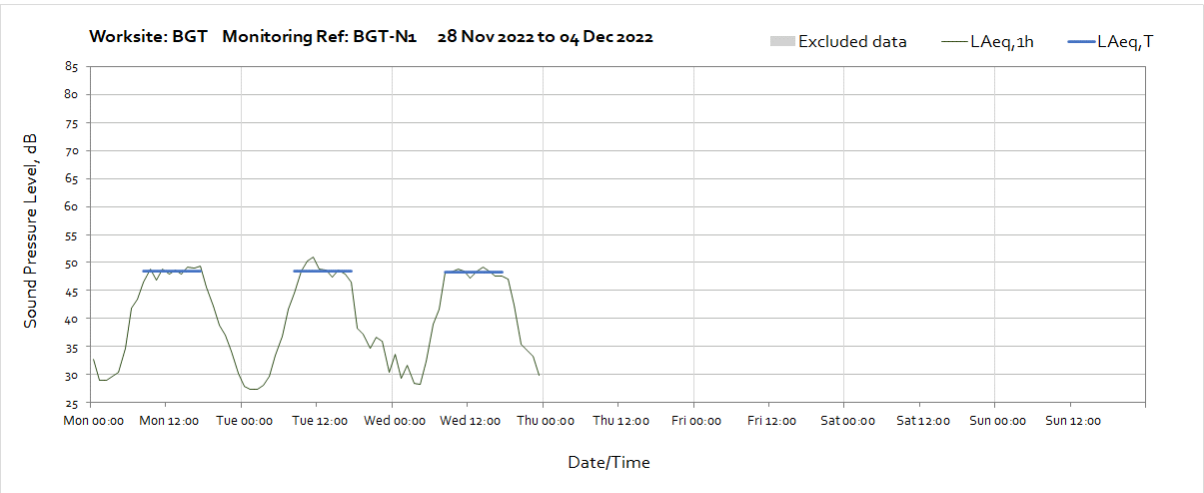
Date/Time


Worksite: BGT Monitoring Ref: BGT-N1 28 Nov 2022 to 04 Dec 2022
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
85
80
75
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65
60
55
50
45
40
35
30
25
Mon 00:00
Mon 12:00
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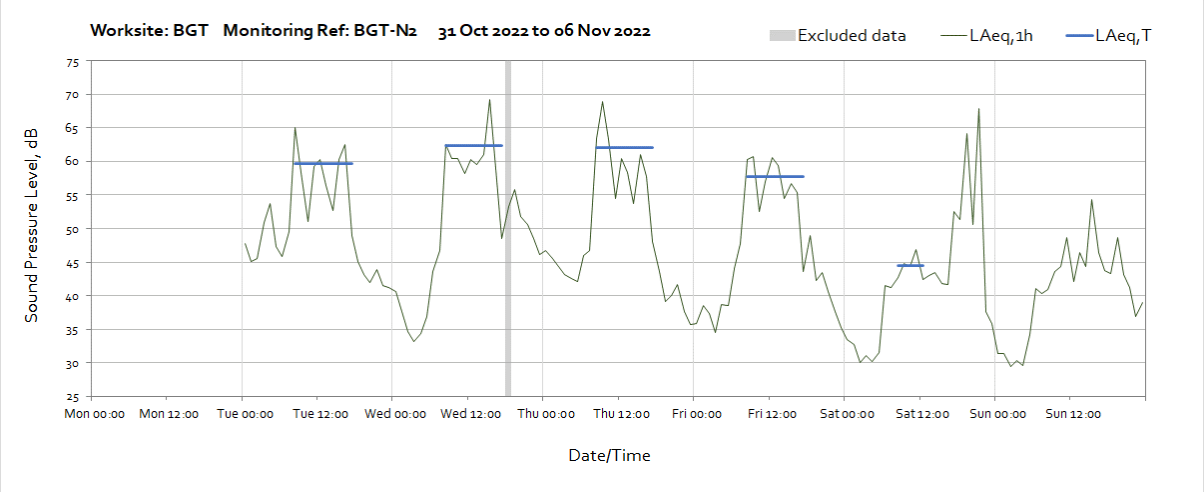
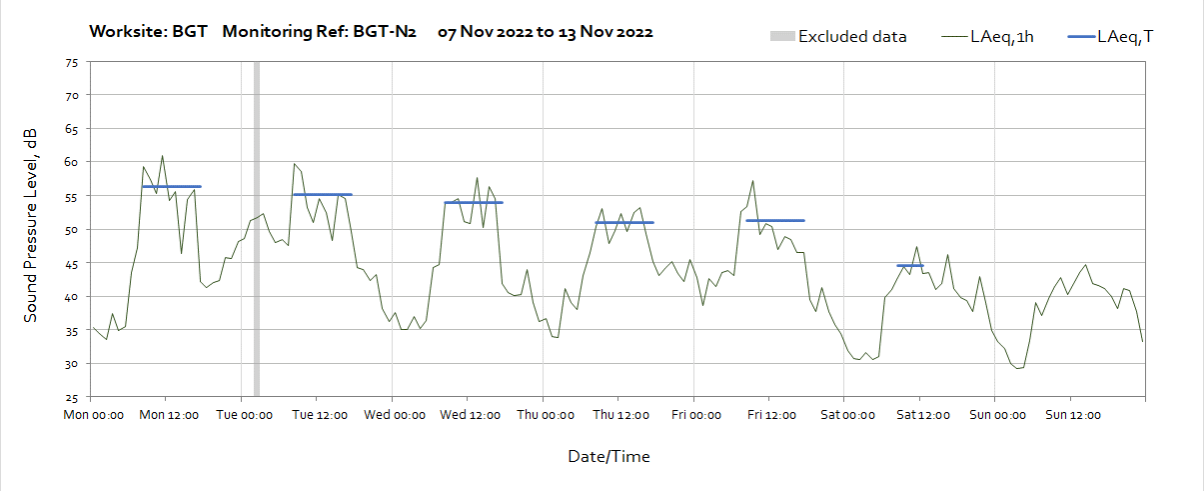
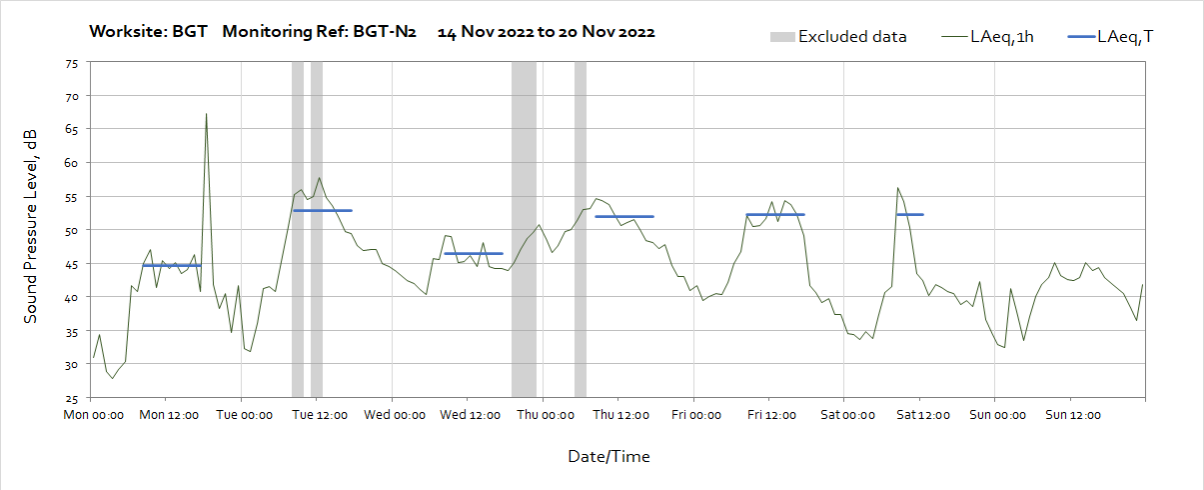
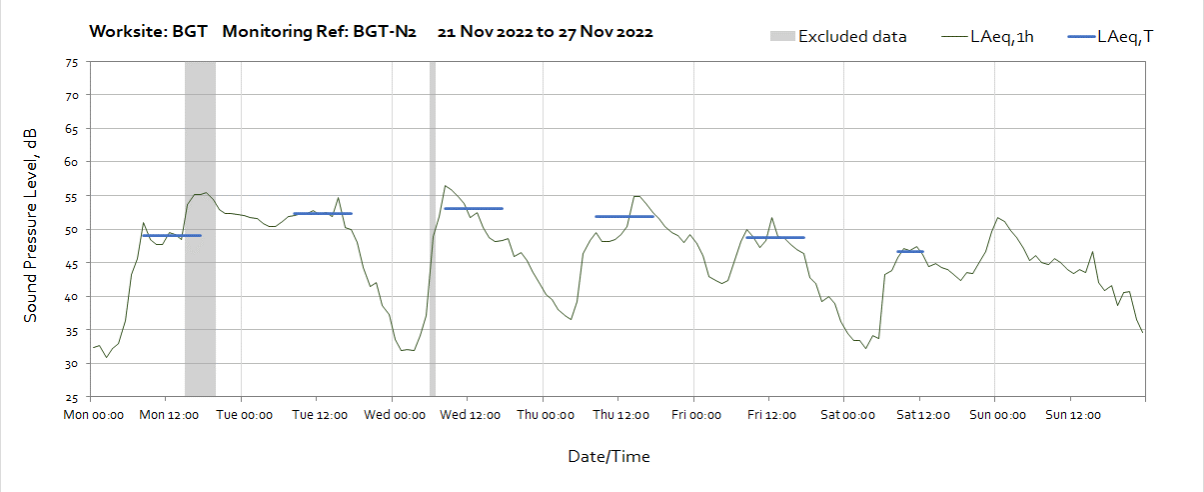
Date/Time

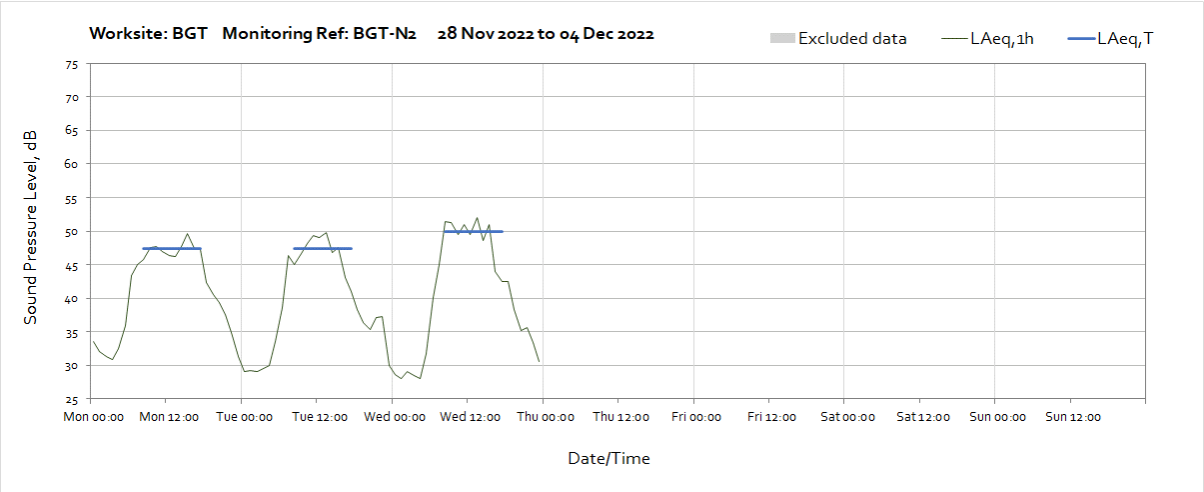
Worksite: BGT – Monitoring Ref: BGT-N2



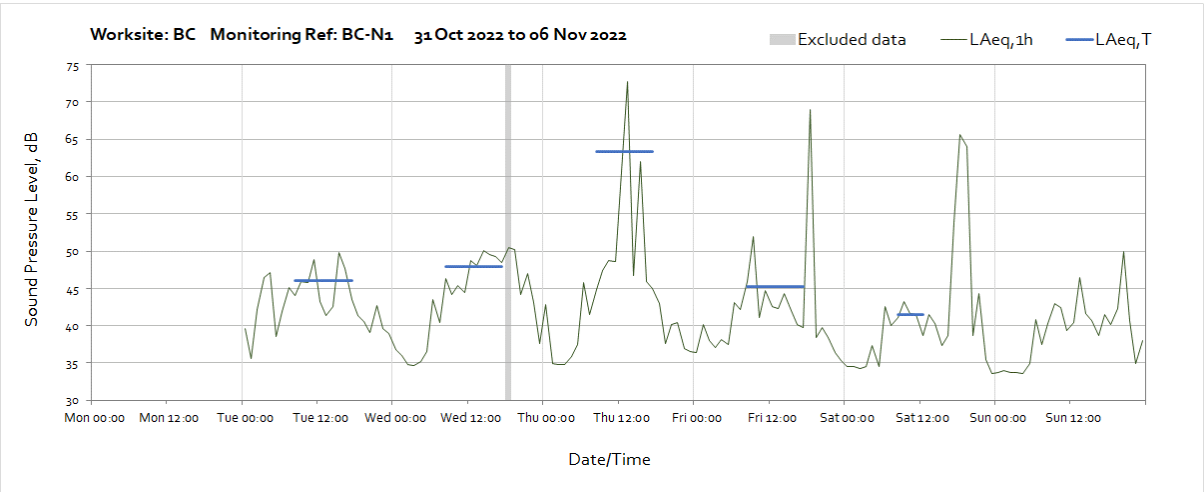


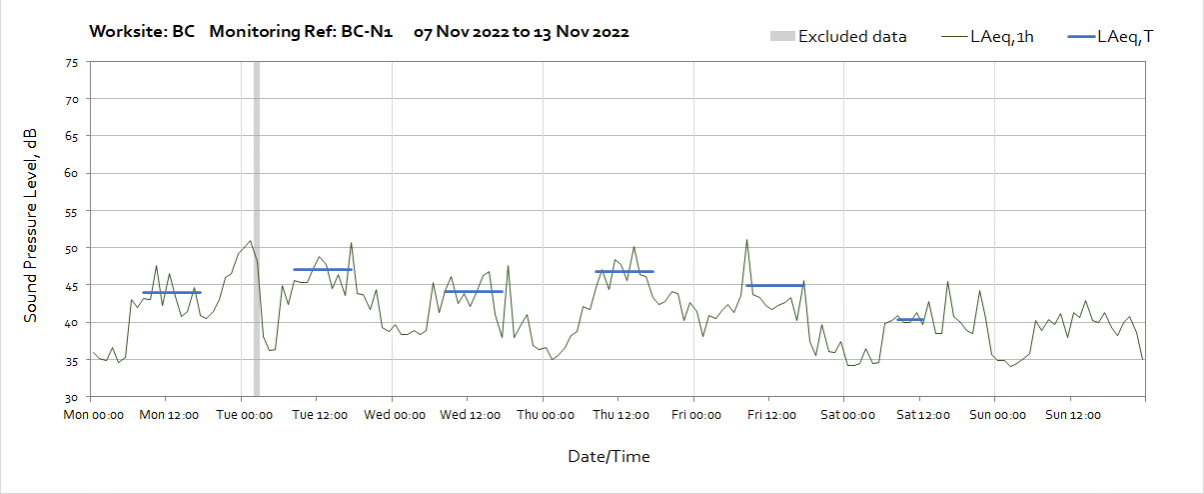






Worksite: BC – Monitoring Ref: BC-N1




Worksite: BC Monitoring Ref: BC-N1 07 Nov 2022 to 13 Nov 2022
Excluded data
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LAeq,T
Sound Pressure Level, dB
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70
65
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45
40
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Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
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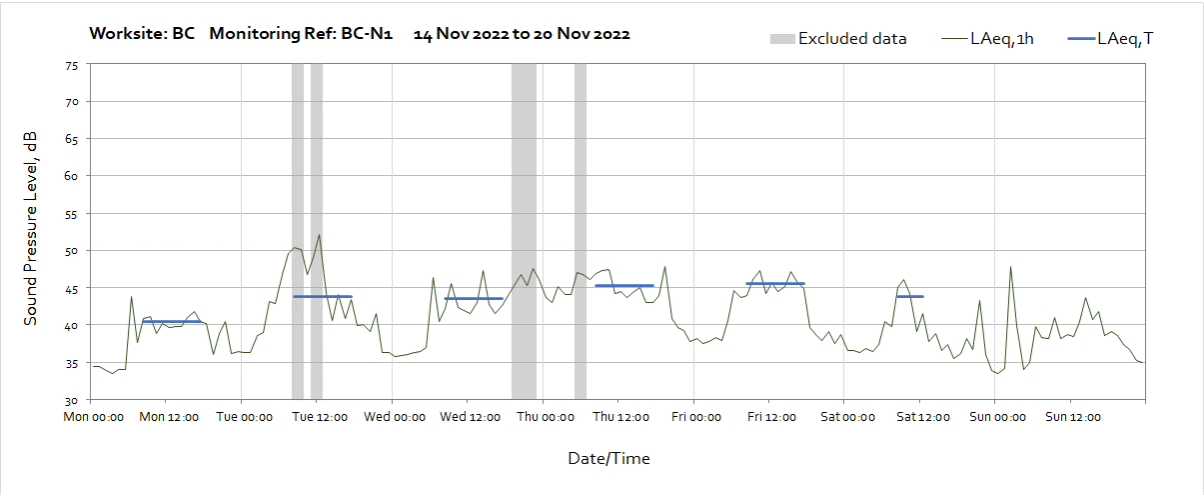
Date/Time


Worksite: BC Monitoring Ref: BC-N1 14 Nov 2022 to 20 Nov 2022
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
75
70
65
60
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45
40
35
30
Mon 00:00
Mon 12:00
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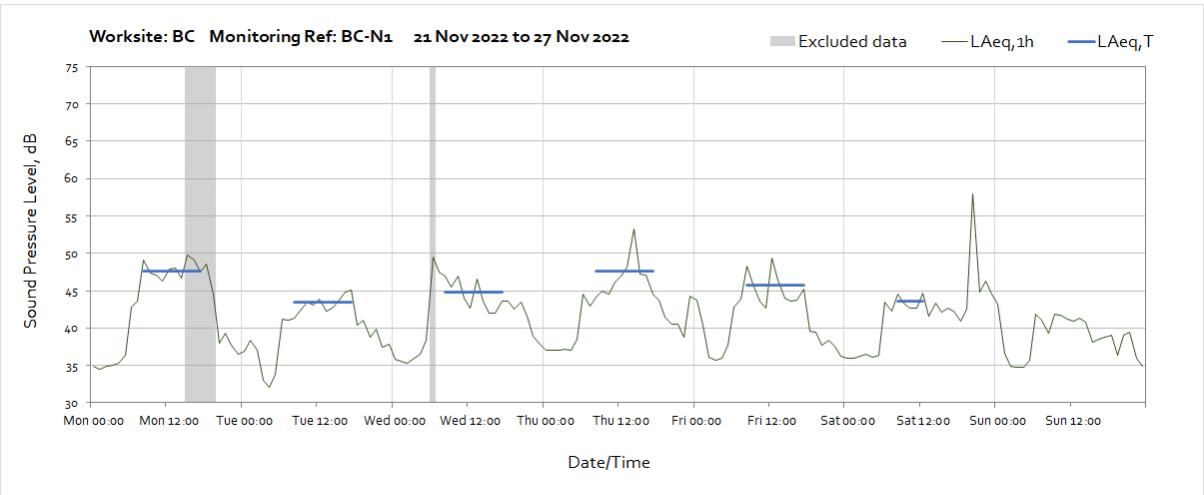
Sun 12:00
Date/Time


Worksite: BC Monitoring Ref: BC-N1 21 Nov 2022 to 27 Nov 2022
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
75
70
65
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45
40
35
30
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
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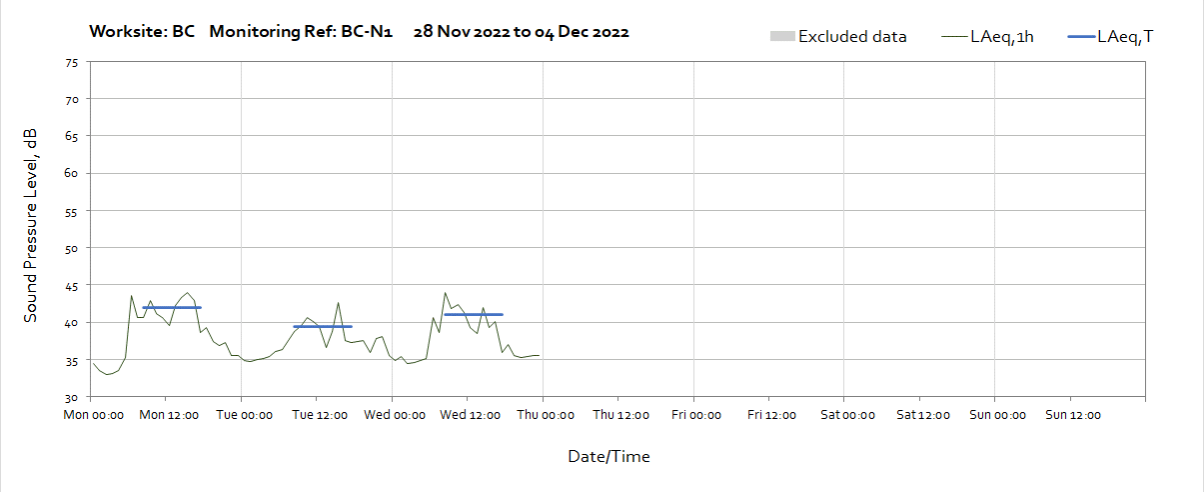
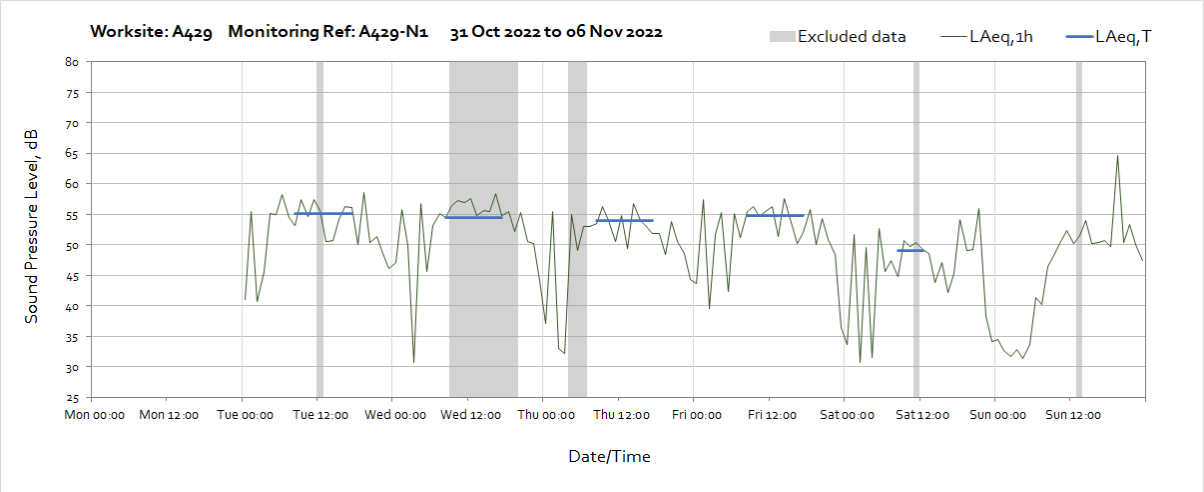
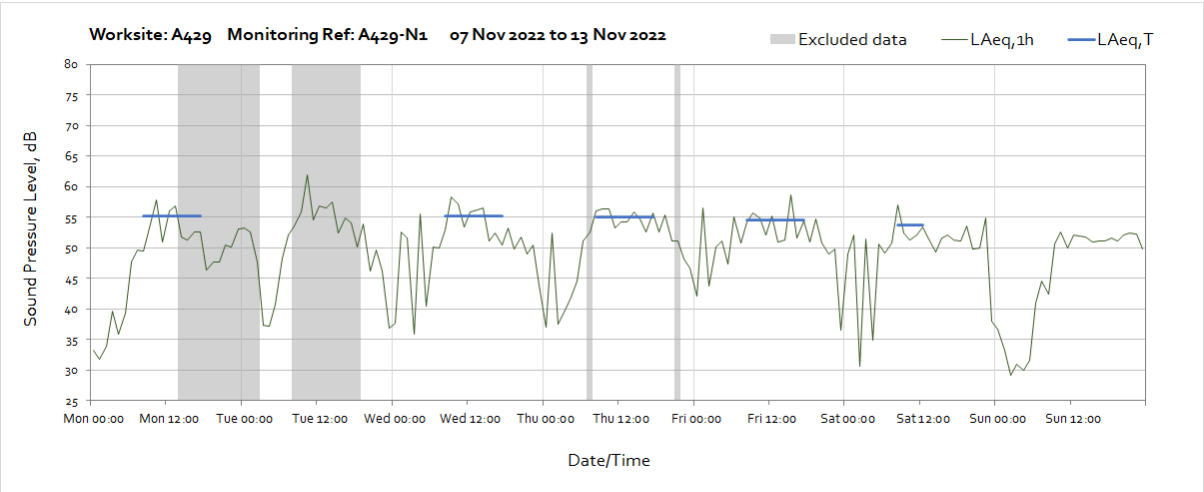
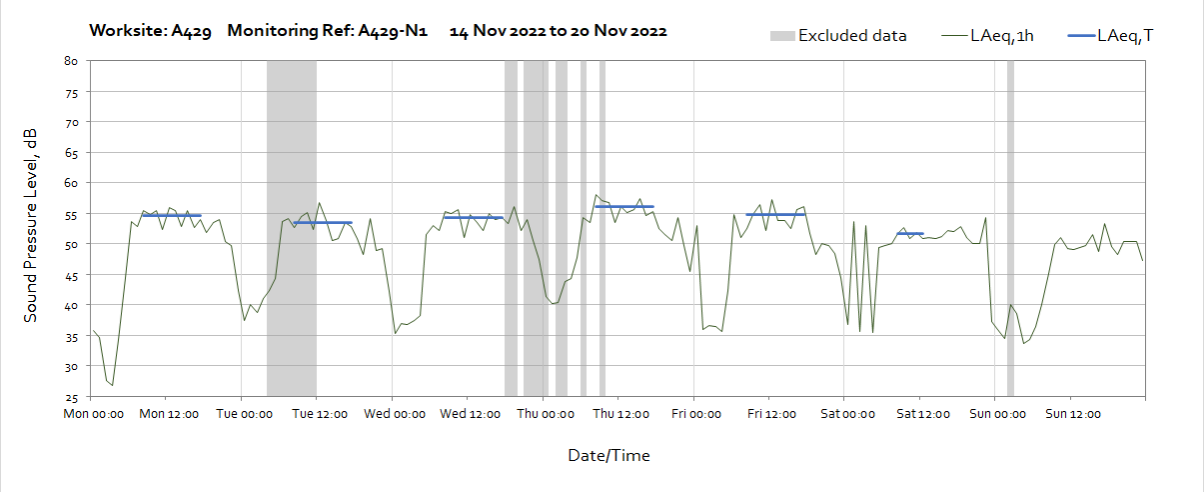
Date/Time



Worksite: A429 – Monitoring Ref: A429-N1



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Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
80
75
70
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Mon 00:00
Mon 12:00
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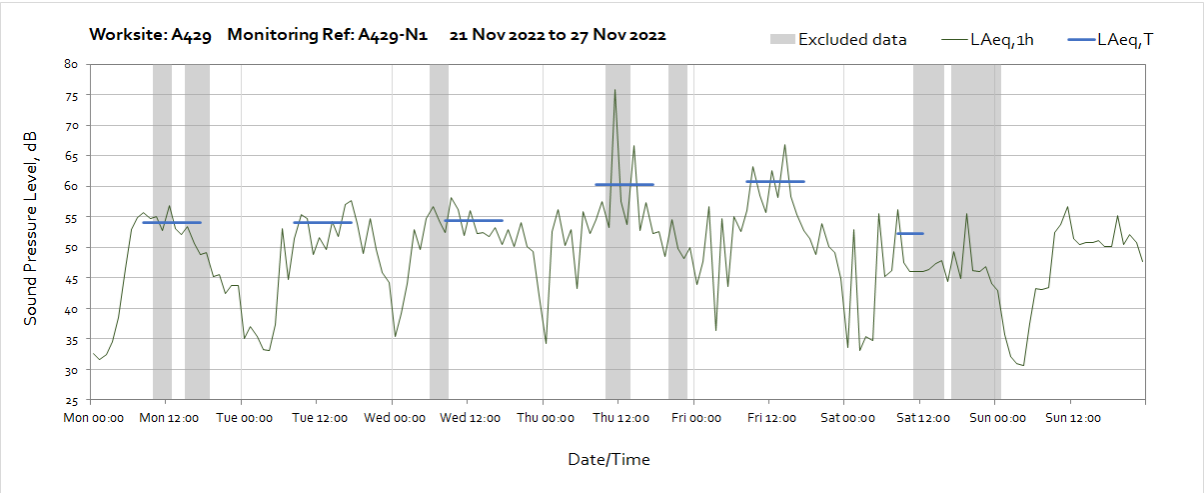
Date/Time


Worksite: A429 Monitoring Ref: A429-N1 21 Nov 2022 to 27 Nov 2022
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
80
75
70
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60
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45
40
35
30
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Tue 12:00
Wed 00:00
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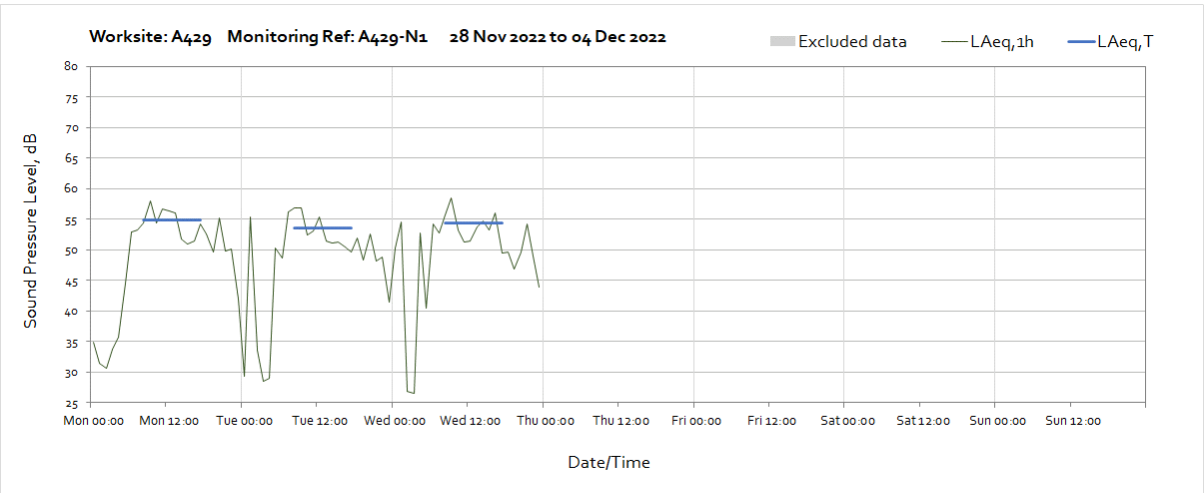
Sun 00:00
Sun 12:00
Date/Time


Worksite: A429 Monitoring Ref: A429-N1 28 Nov 2022 to 04 Dec 2022
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
80
75
70
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60
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40
35
30
25
Mon 00:00
Mon 12:00
Tue 00:00
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Sat 12:00
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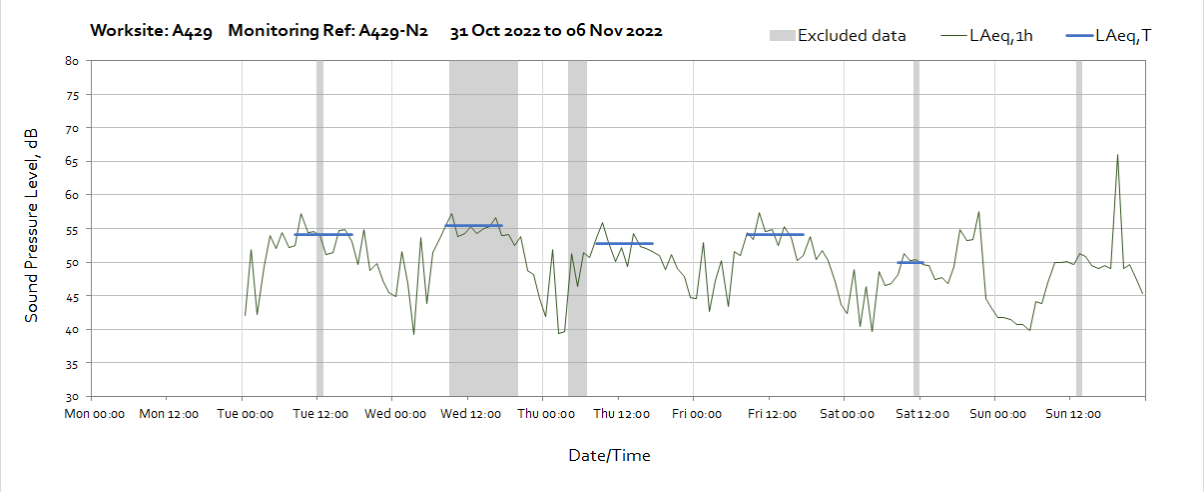
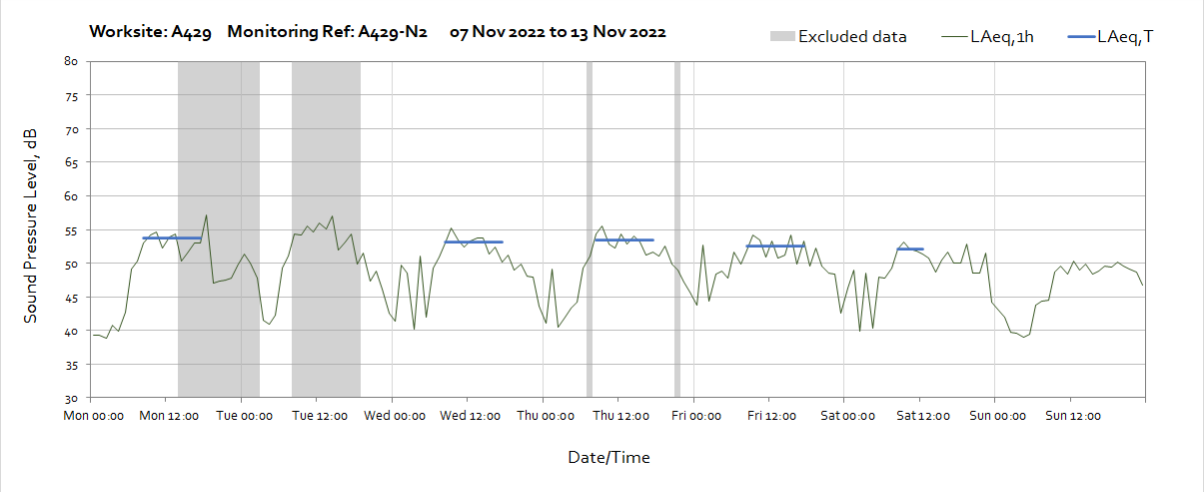
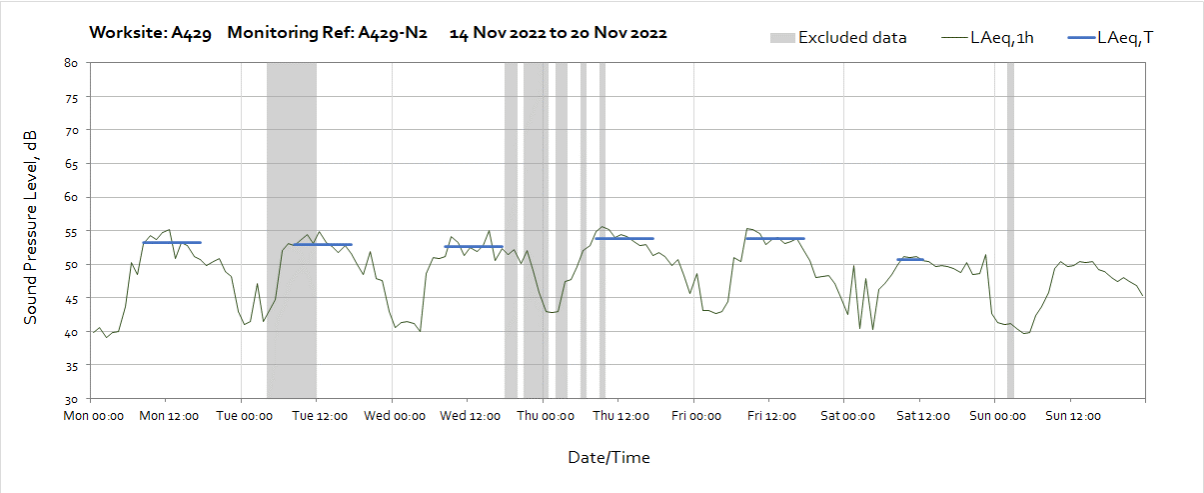
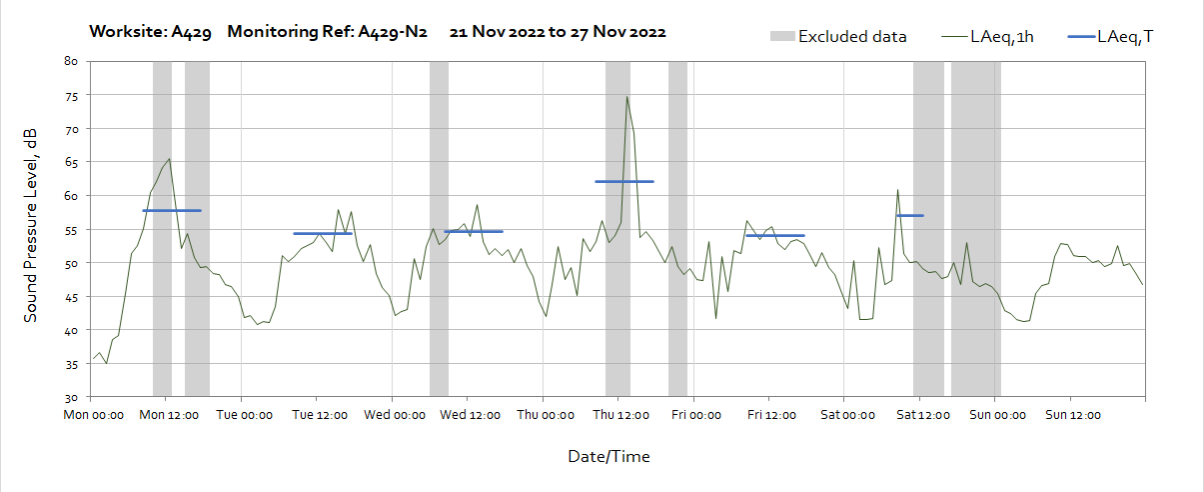
Sun 12:00
Date/Time

Worksite: A429 – Monitoring Ref: A429-N2

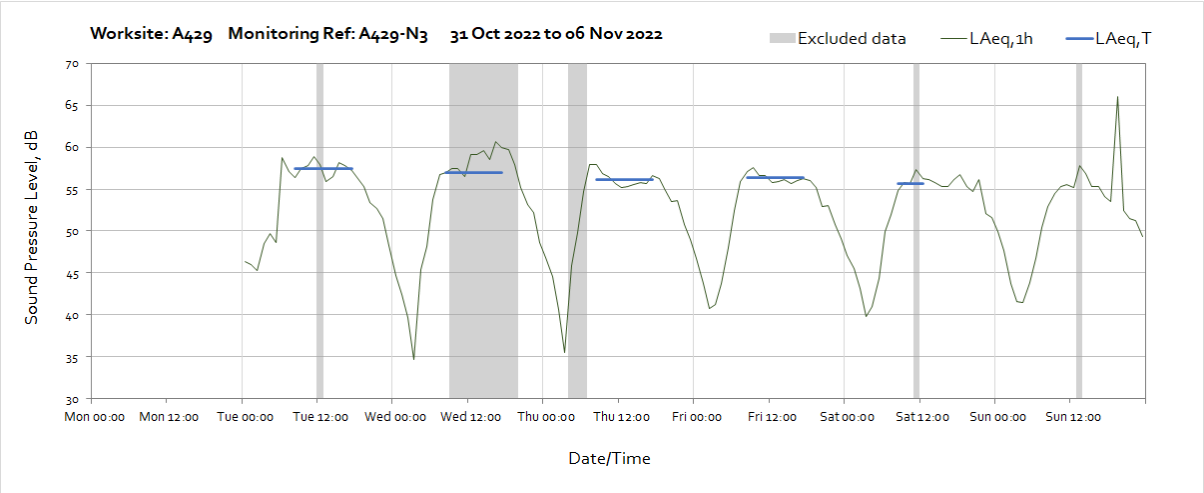


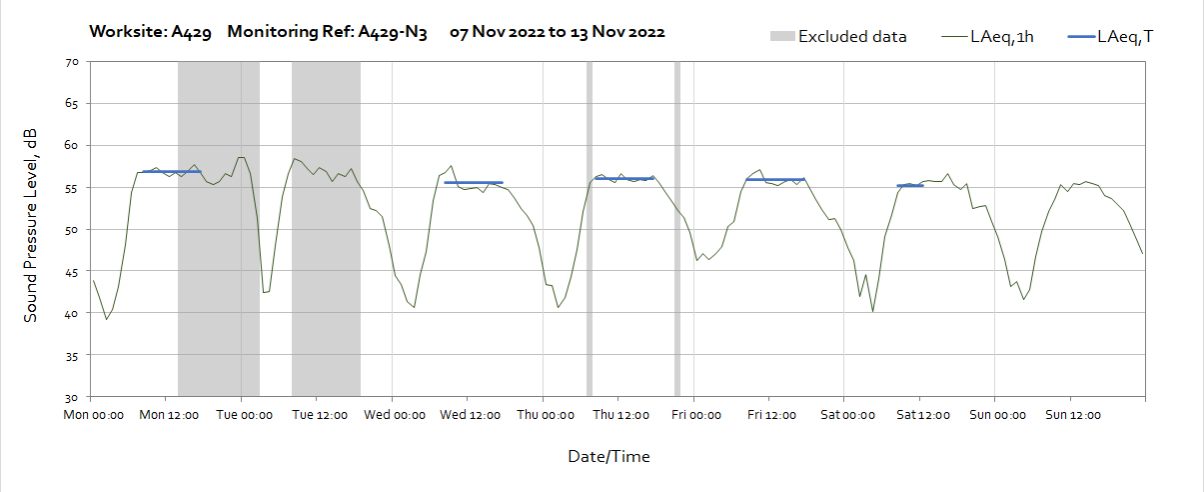






Worksite: A429 – Monitoring Ref: A429-N3




Worksite: A429 Monitoring Ref: A429-N3 07 Nov 2022 to 13 Nov 2022
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
70
65
60
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50
45
40
35
30
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
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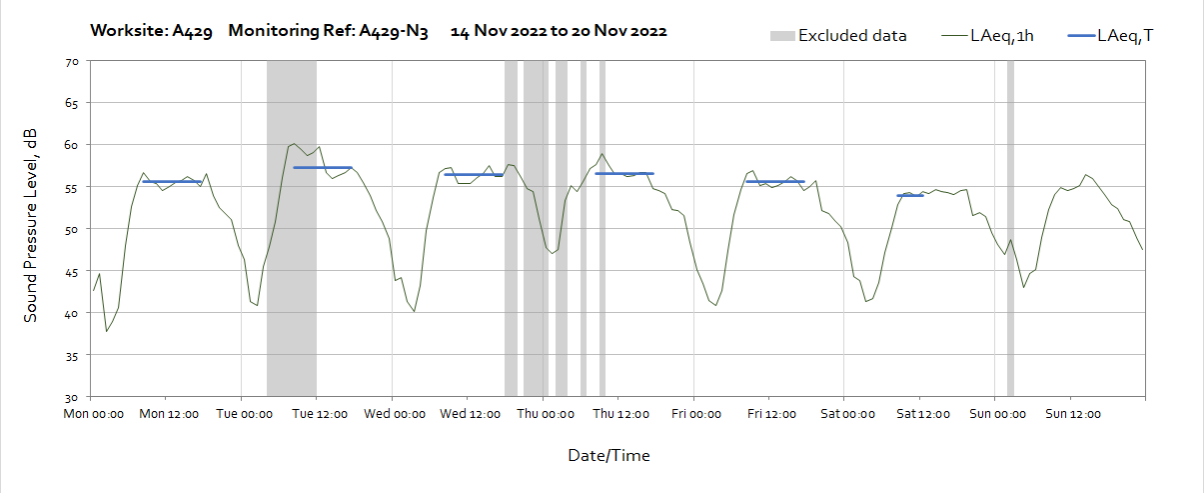
Date/Time


Worksite: A429 Monitoring Ref: A429-N3 14 Nov 2022 to 20 Nov 2022
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
70
65
60
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50
45
40
35
30
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
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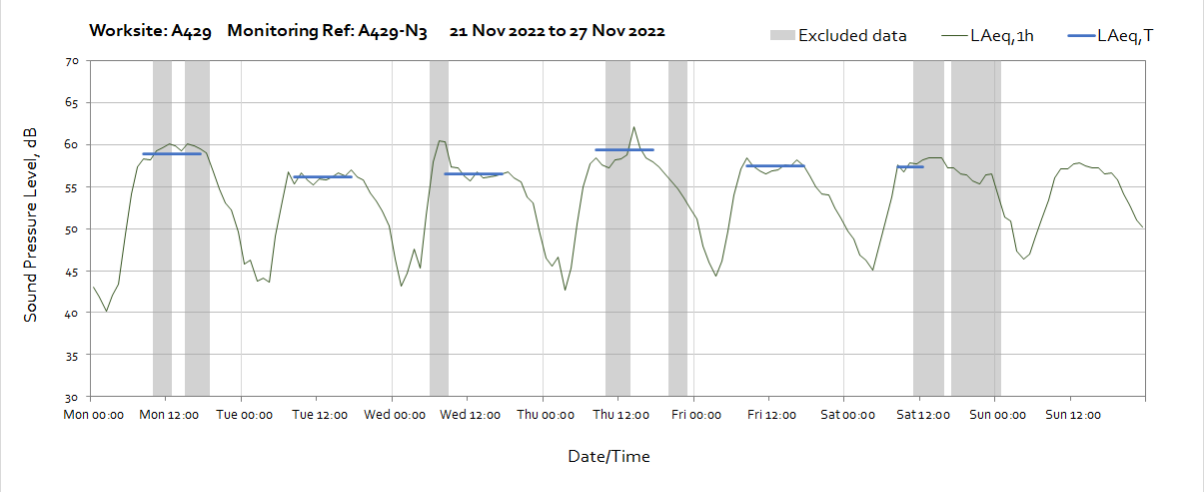
Sun 12:00
Date/Time


Worksite: A429 Monitoring Ref: A429-N3 21 Nov 2022 to 27 Nov 2022
Excluded data
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LAeq,T
Sound Pressure Level, dB
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65
60
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Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
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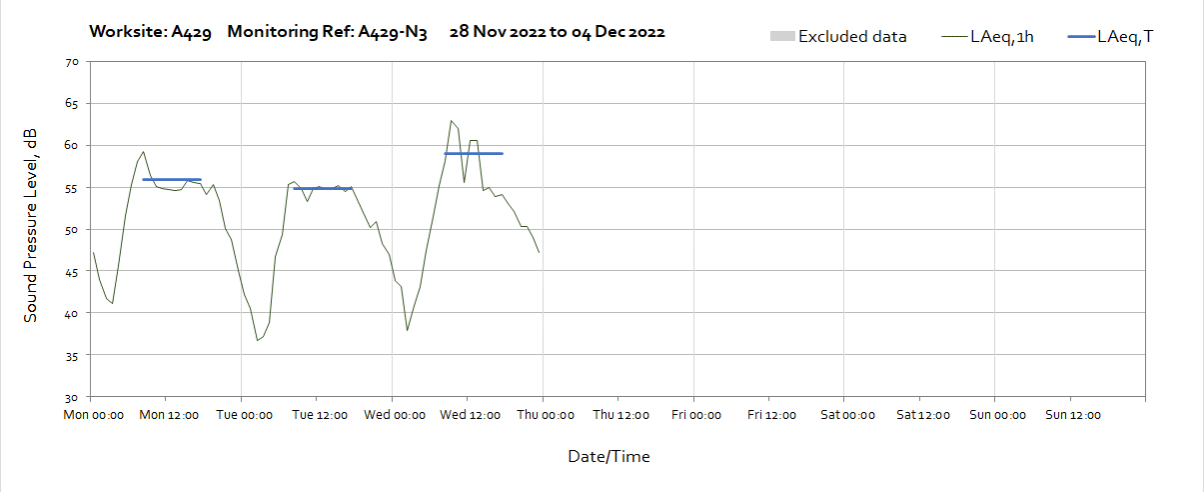
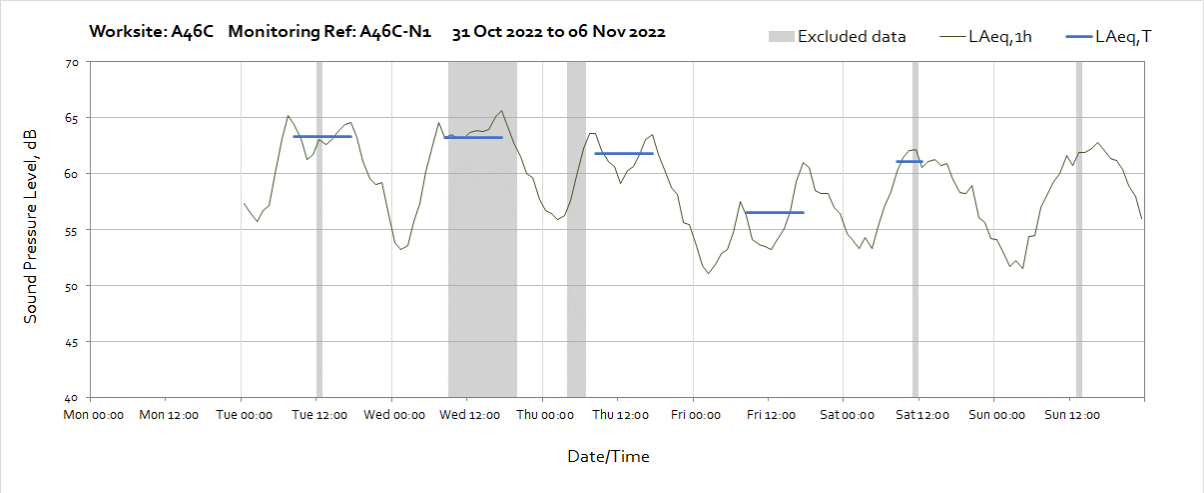
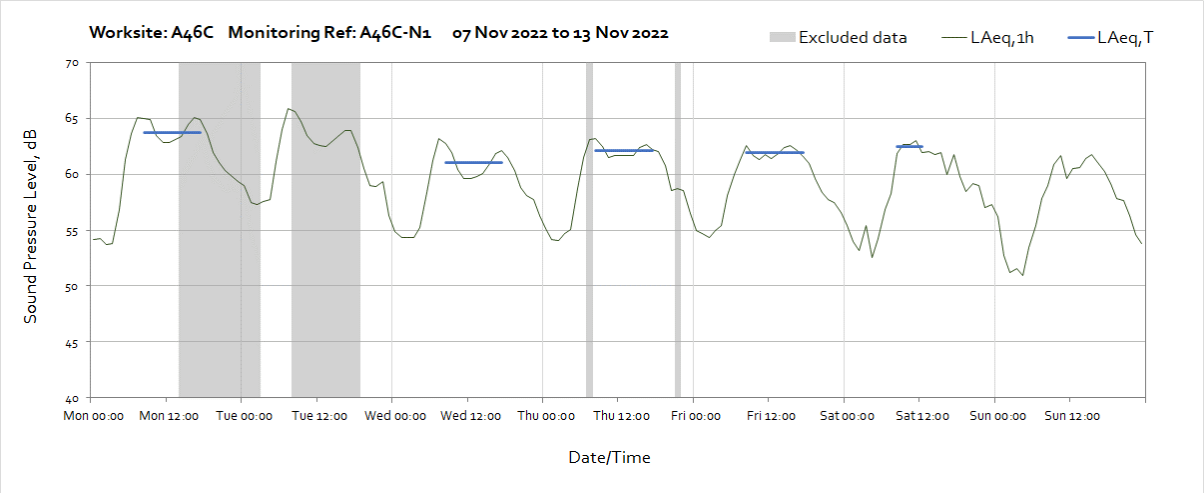
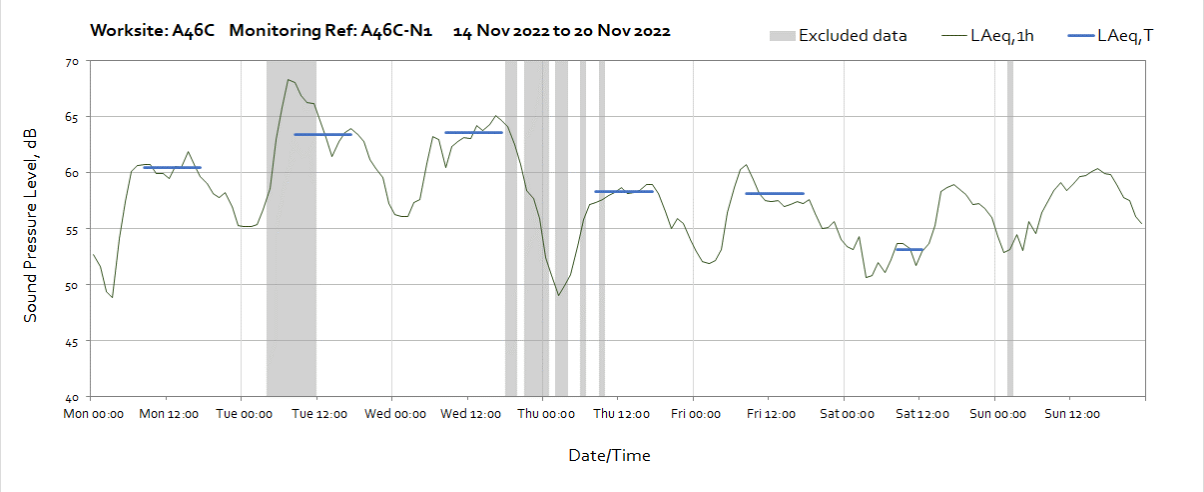
Sun 12:00
Date/Time



Worksite: A46C – Monitoring Ref: A46C-N1






Worksite: A46C Monitoring Ref: A46C-N1 14 Nov 2022 to 20 Nov 2022
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
70
65
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Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
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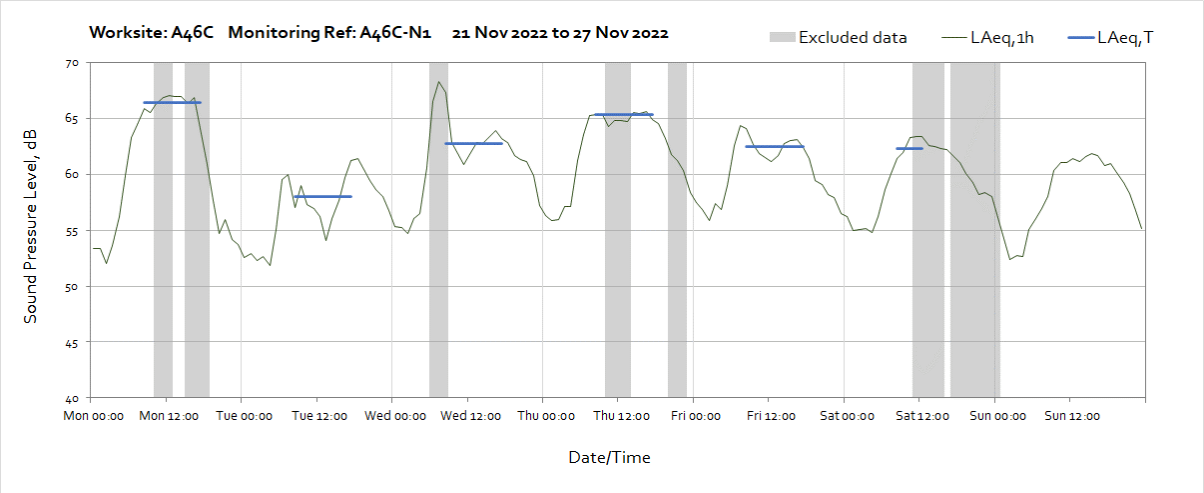
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time


Worksite: A46C Monitoring Ref: A46C-N1 21 Nov 2022 to 27 Nov 2022
Excluded data
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LAeq,T
Sound Pressure Level, dB
70
65
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Tue 12:00
Wed 00:00
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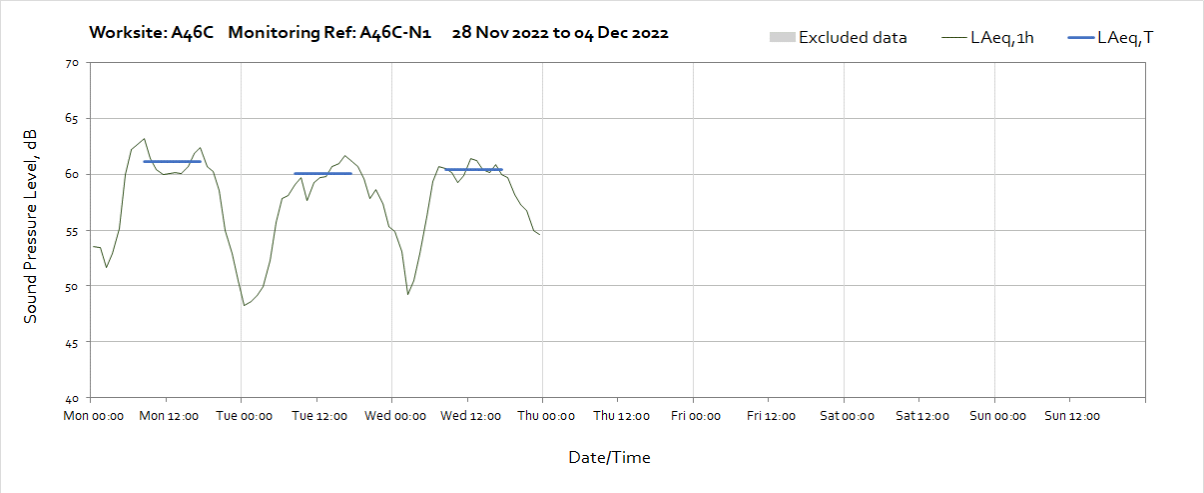
Sun 00:00
Sun 12:00
Date/Time


Worksite: A46C Monitoring Ref: A46C-N1 28 Nov 2022 to 04 Dec 2022
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
70
65
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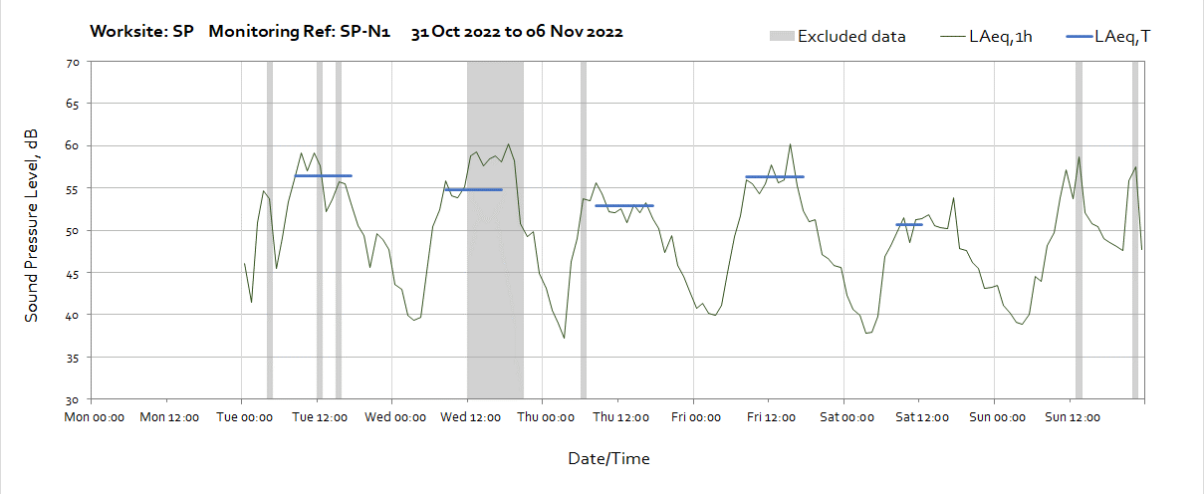
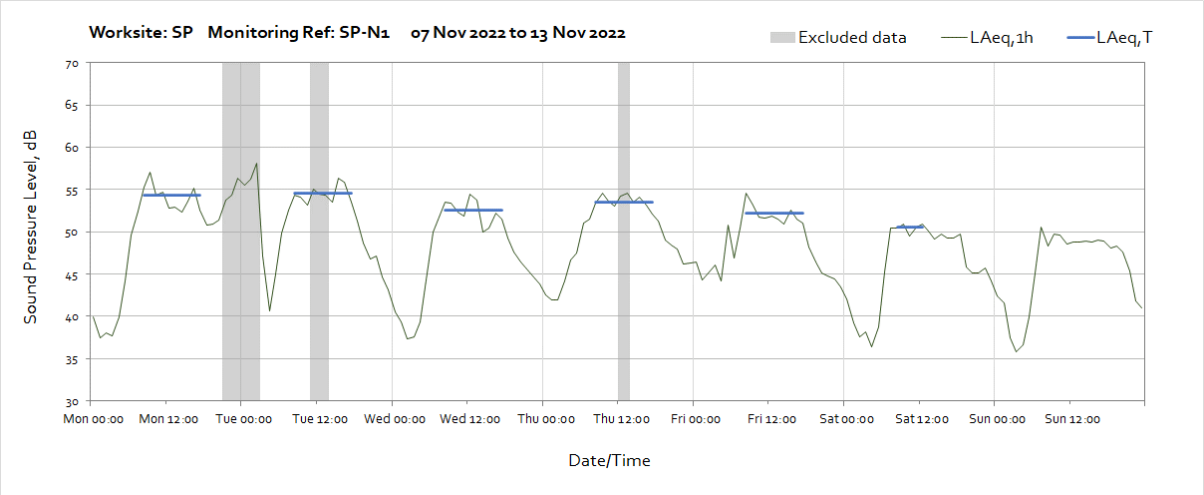
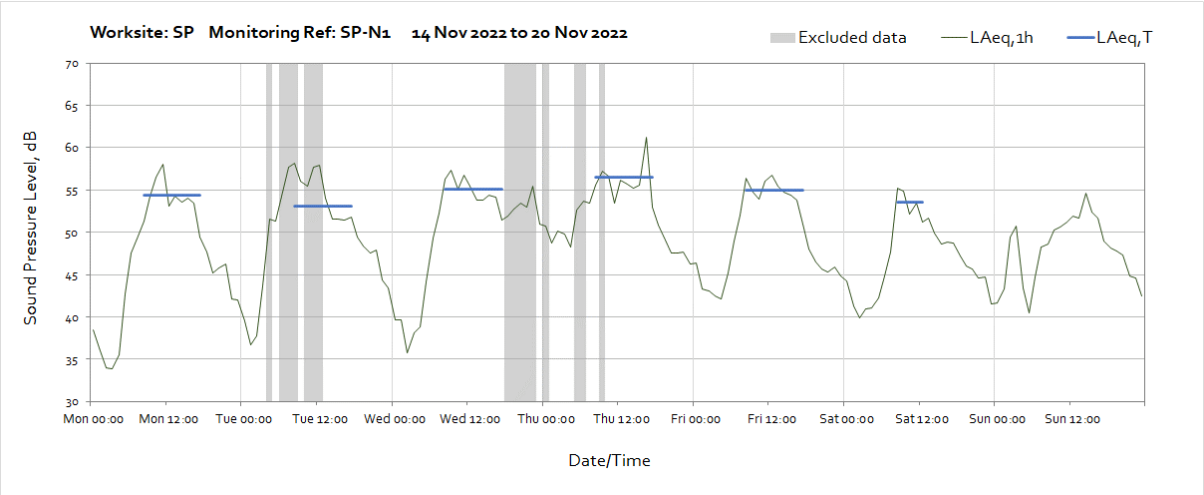
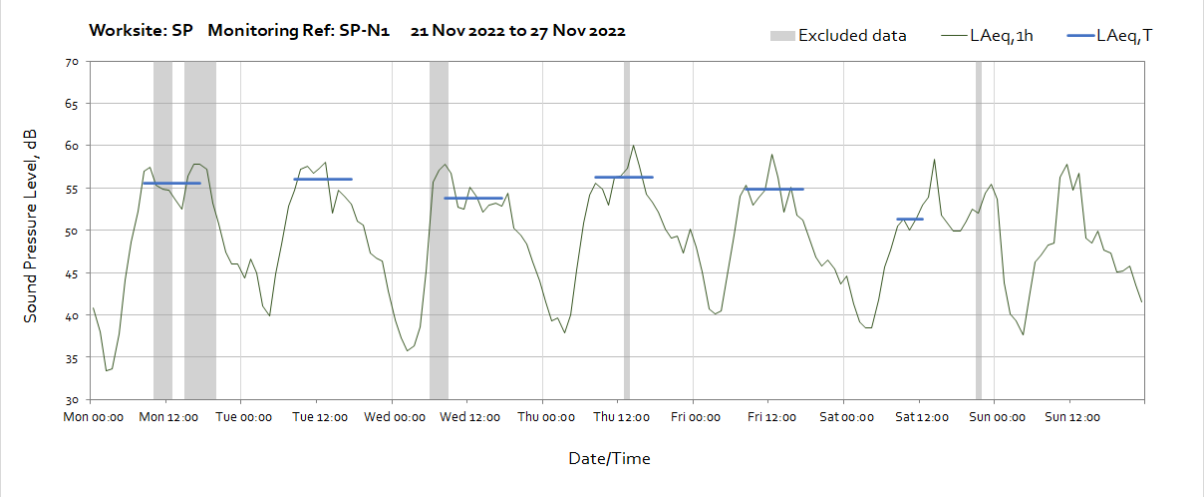
Sun 12:00
Date/Time

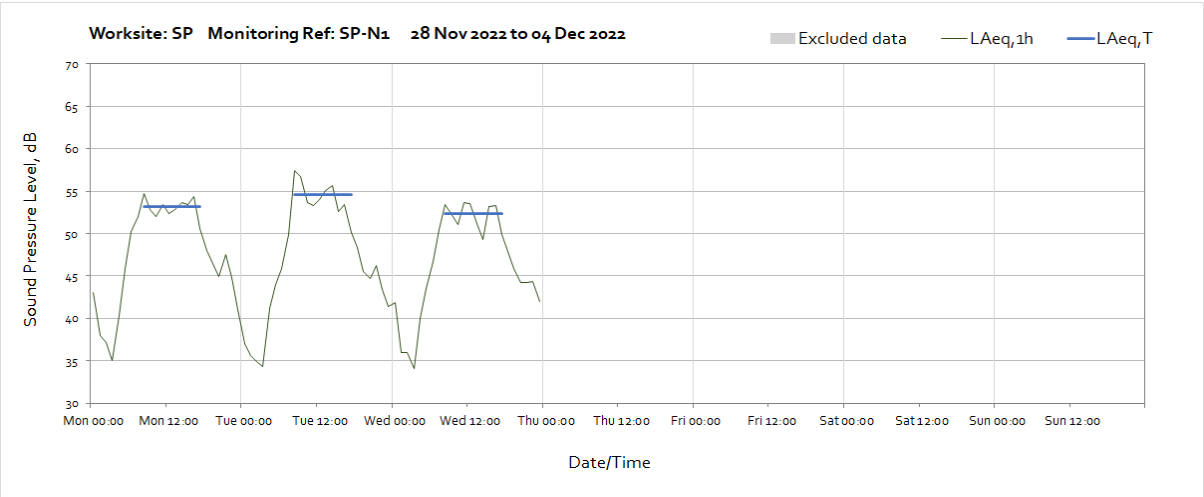
Worksite: SP – Monitoring Ref: SP-N1











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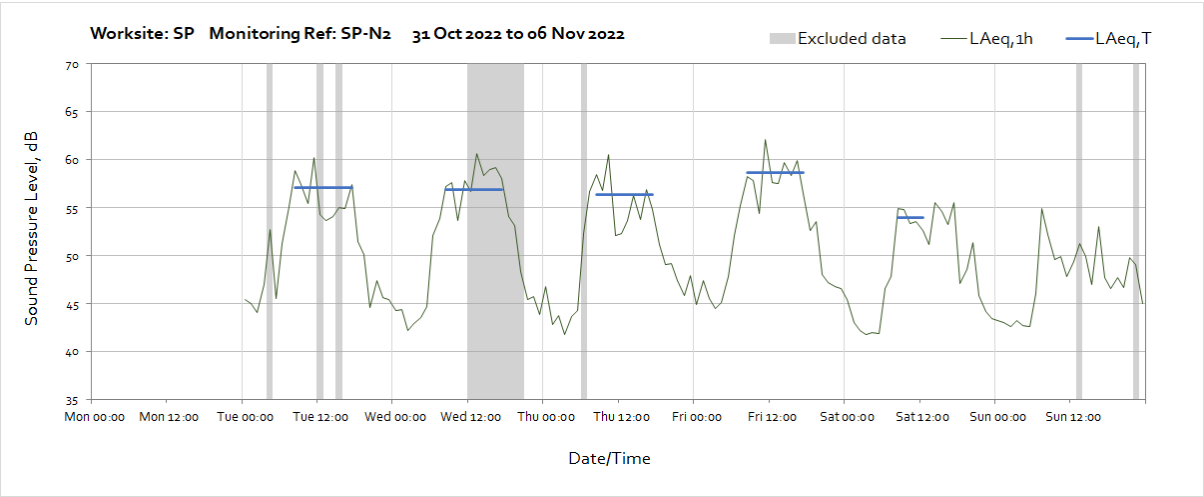

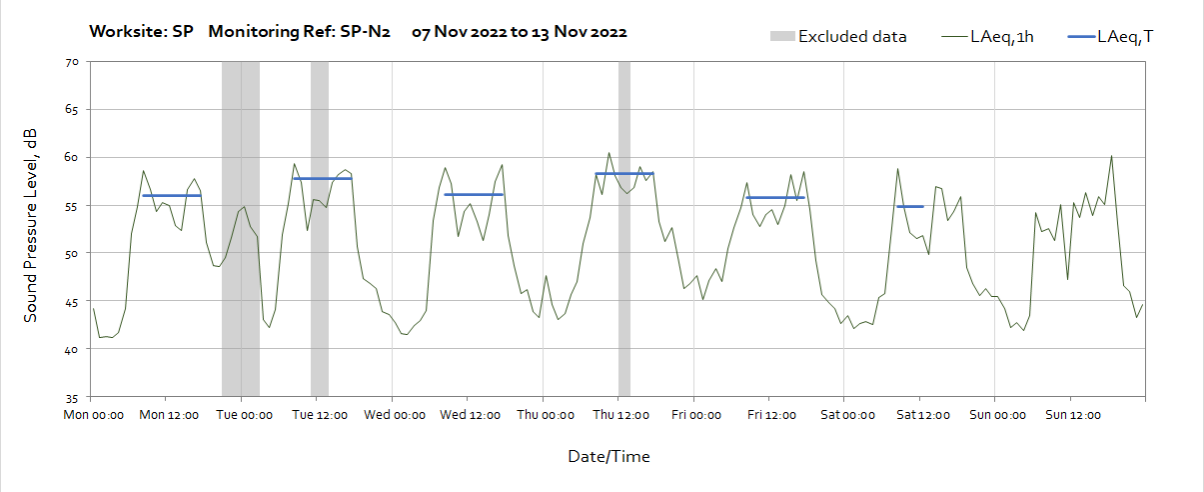
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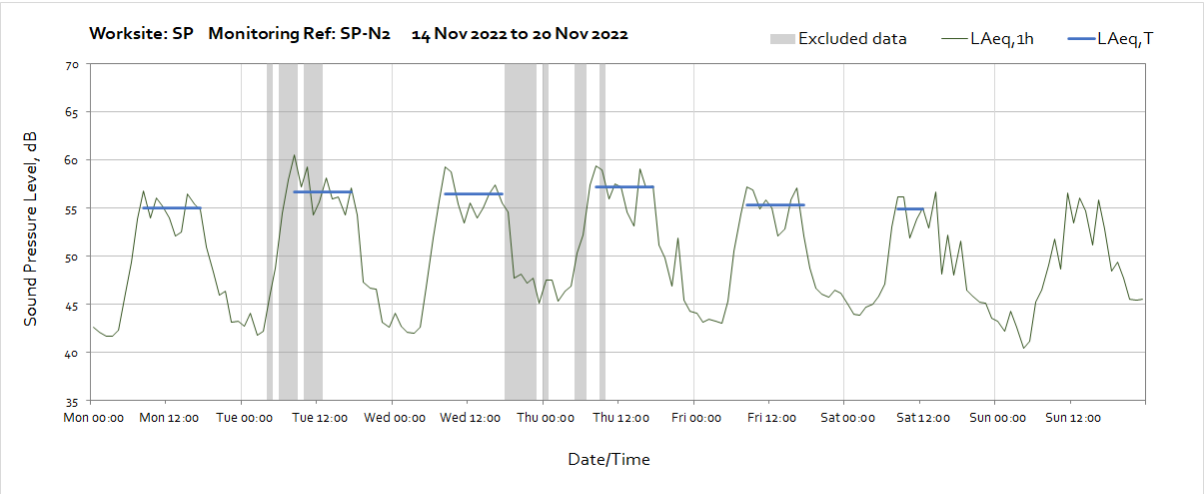
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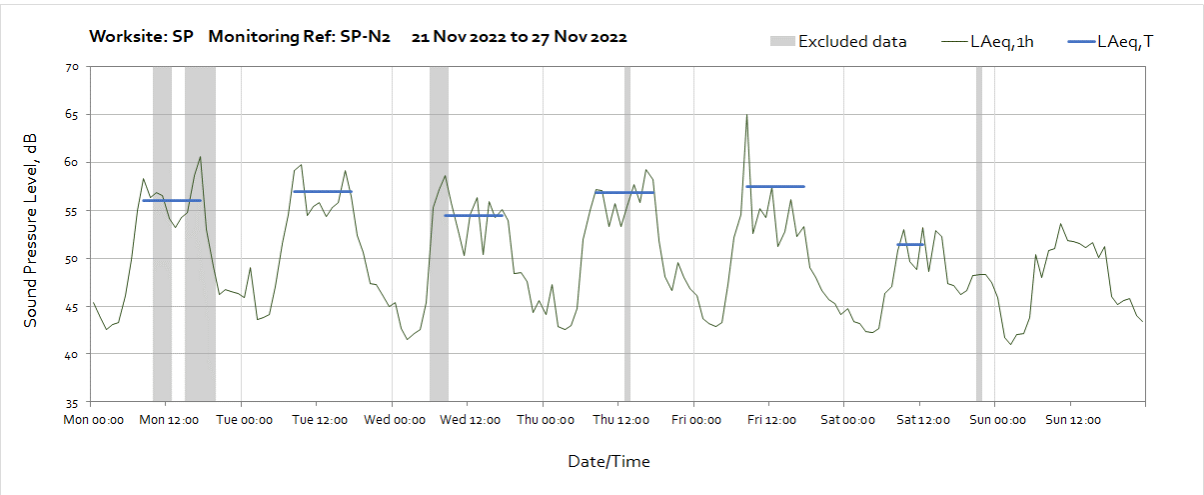
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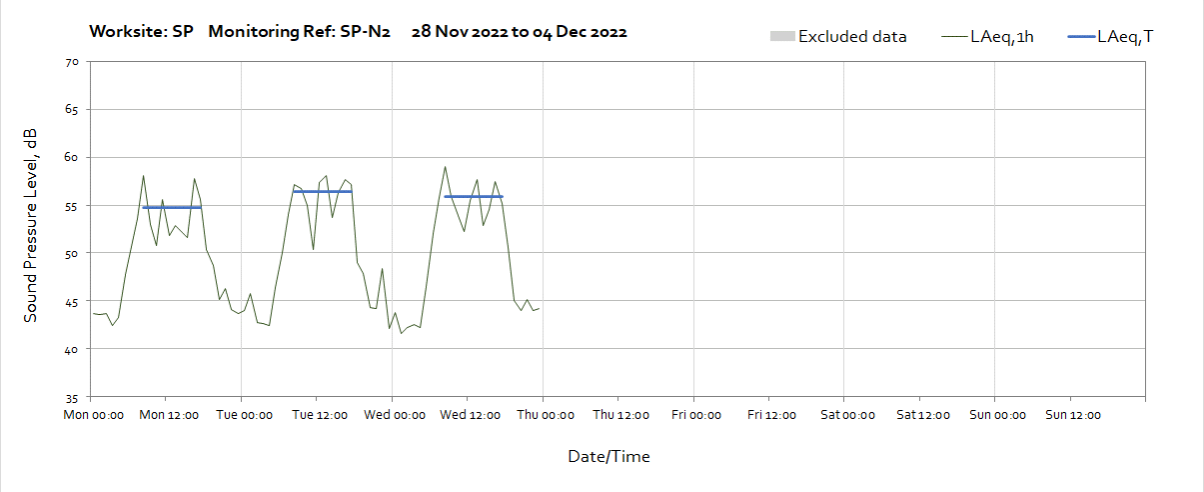

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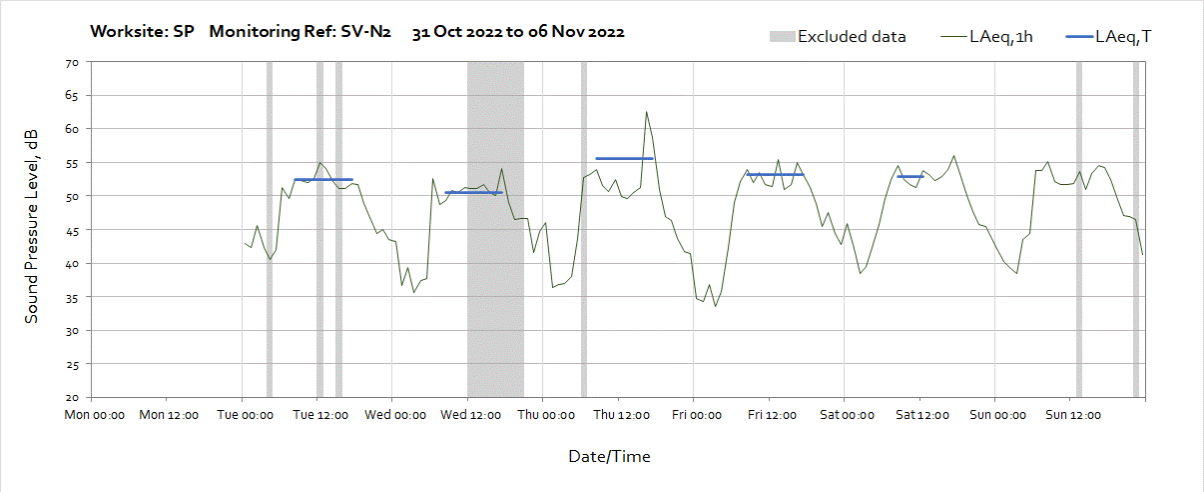

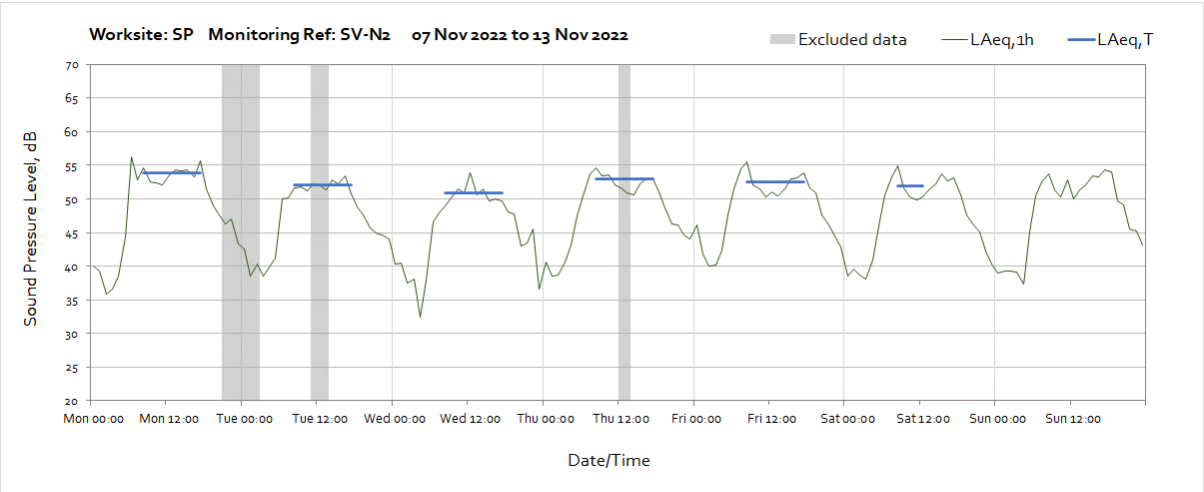

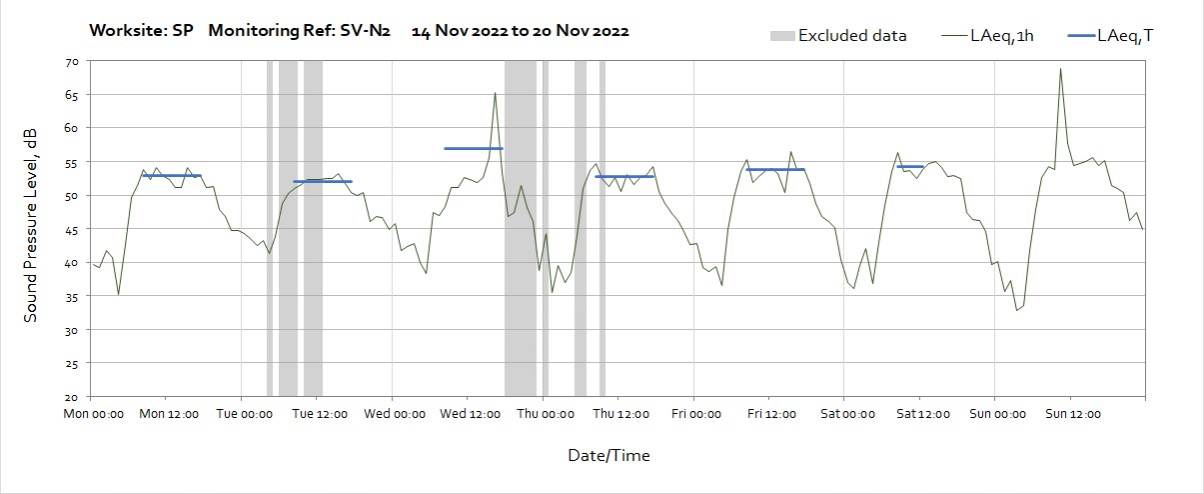
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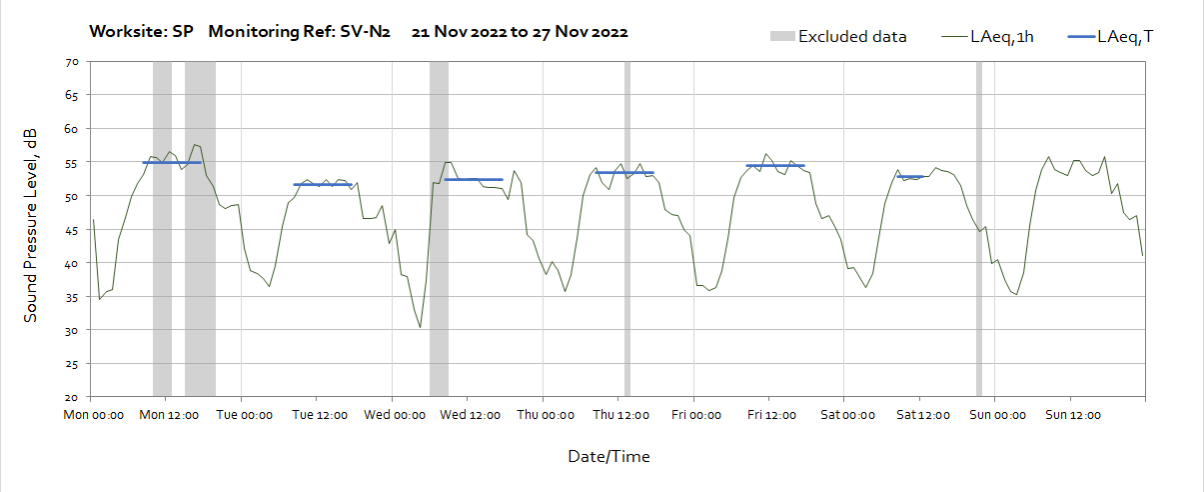
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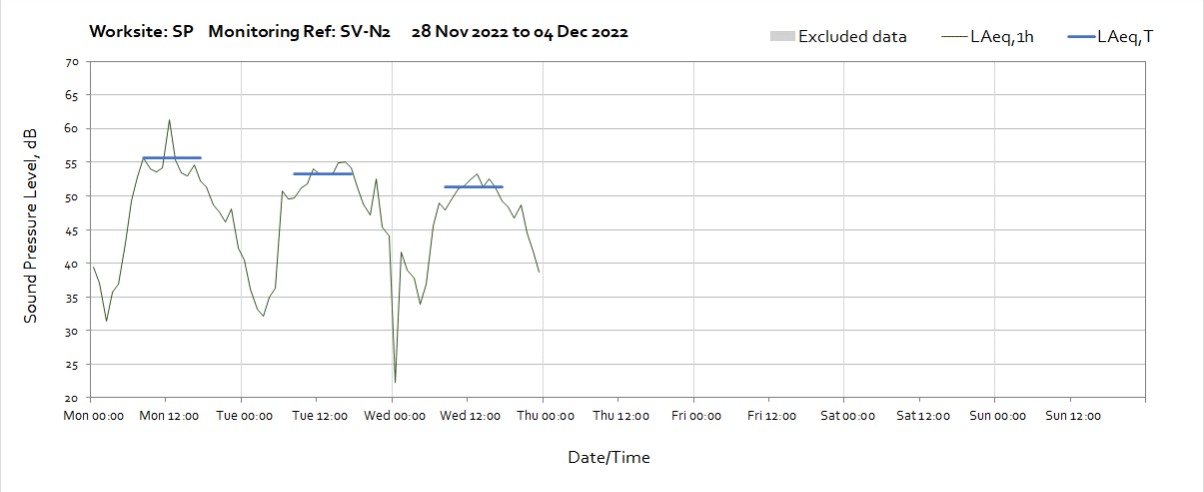
Date/Time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Sound Pressure Level, dB
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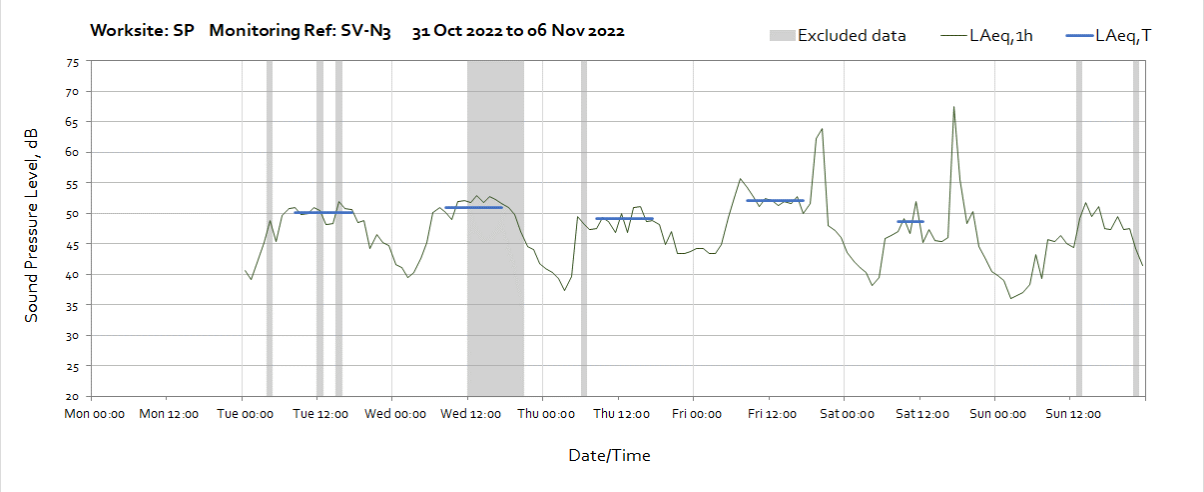
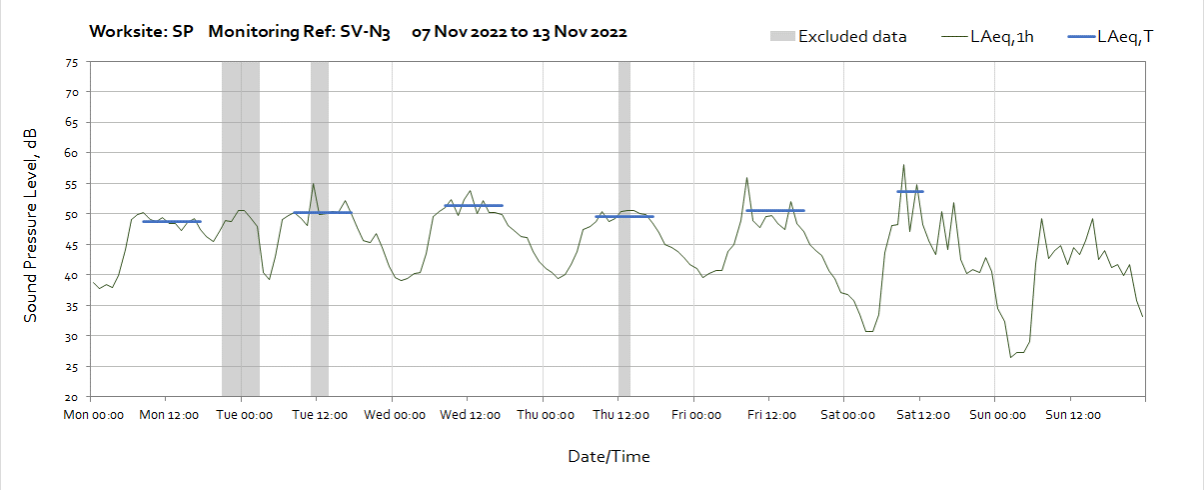
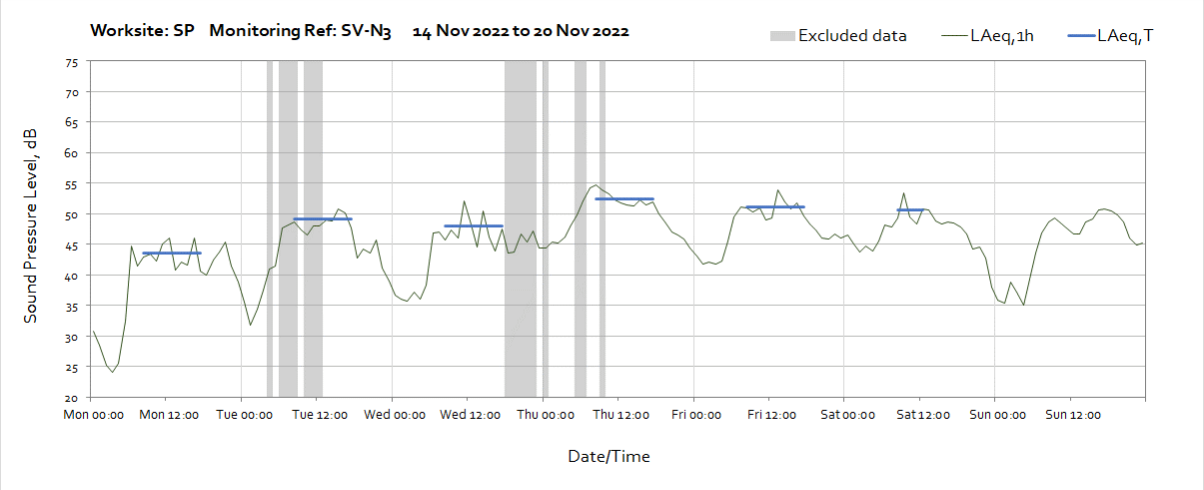
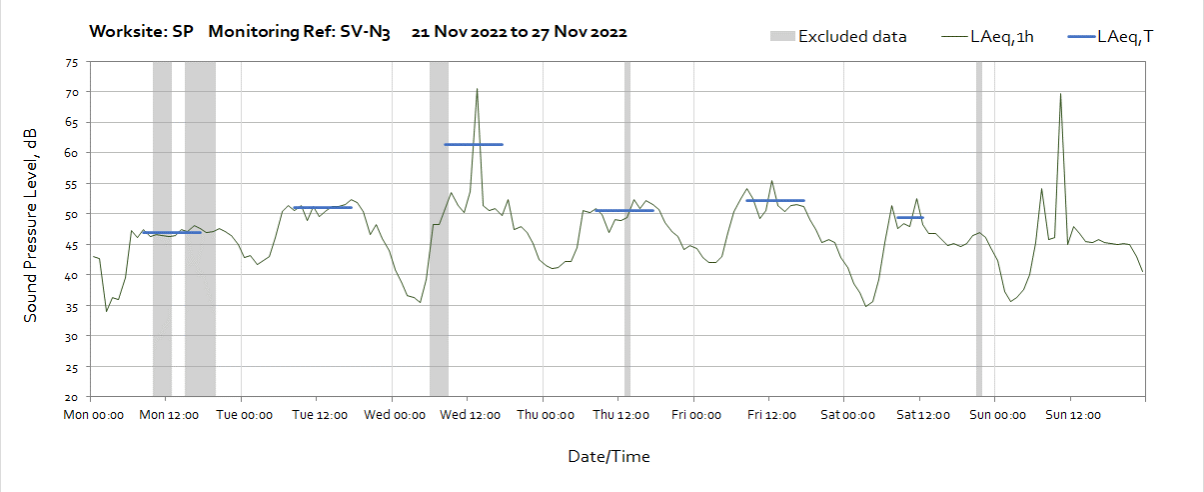
Date/Time

Worksite: SP – Monitoring Ref: SV-N3





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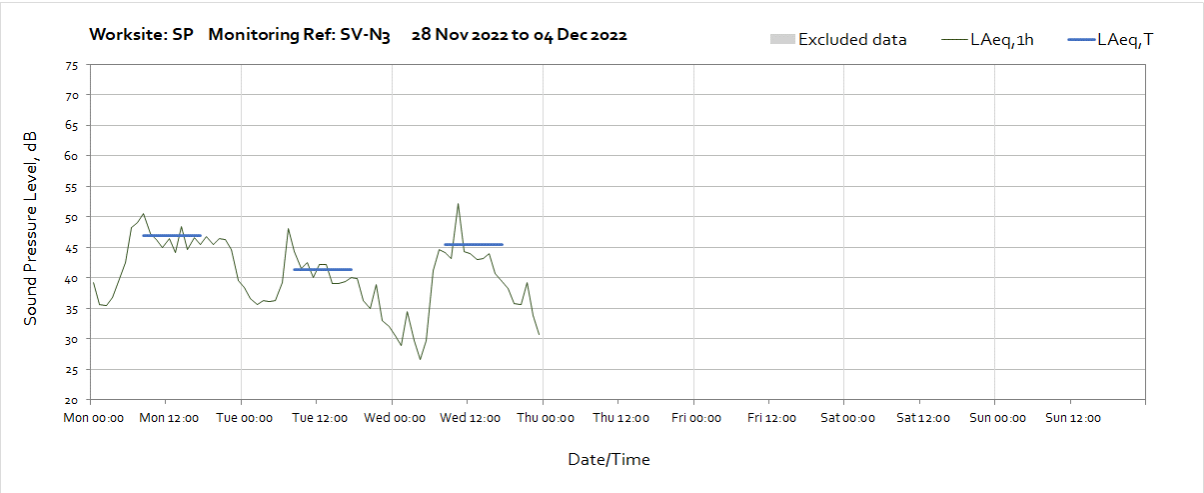
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Sound Pressure Level, dB
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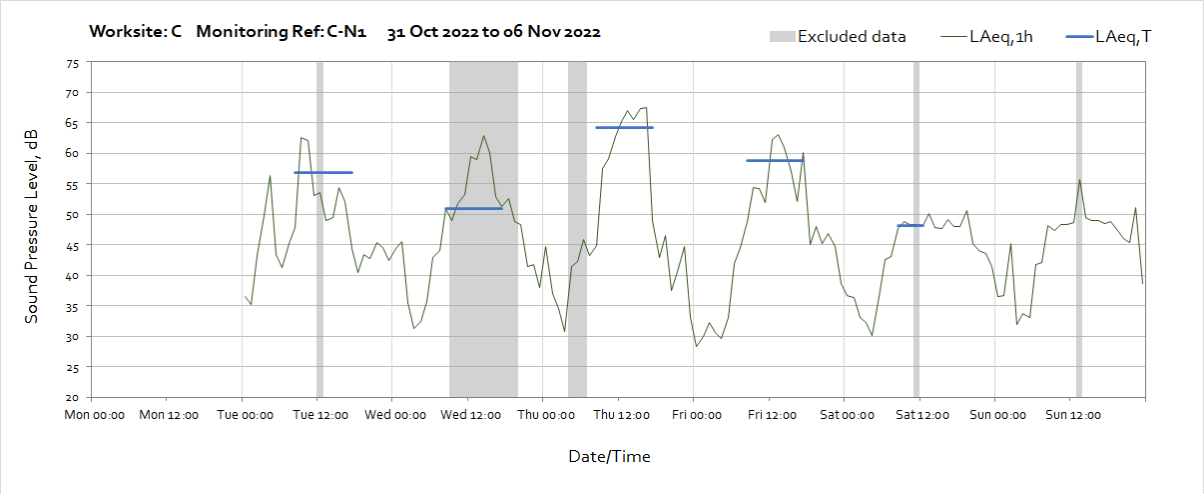
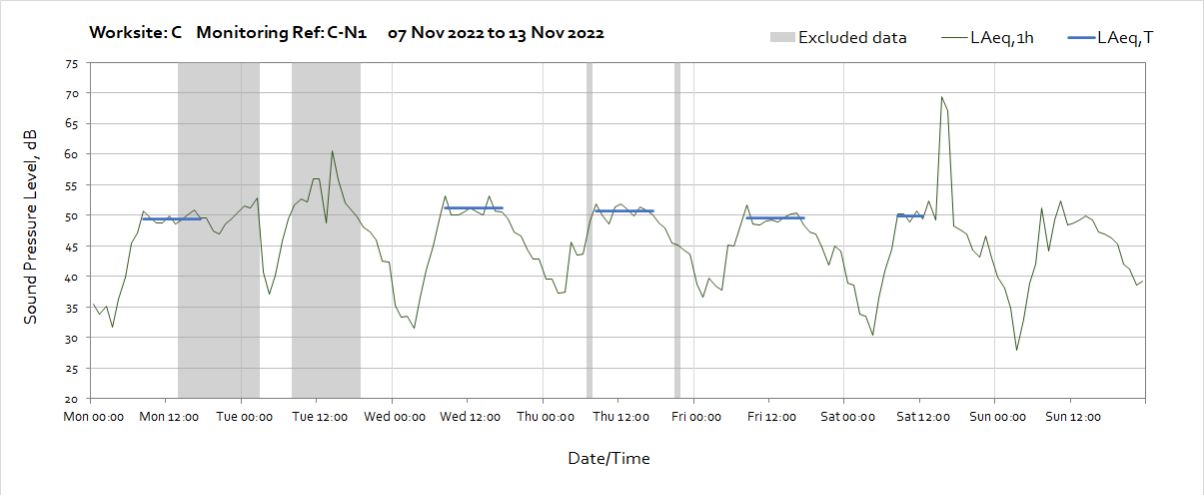
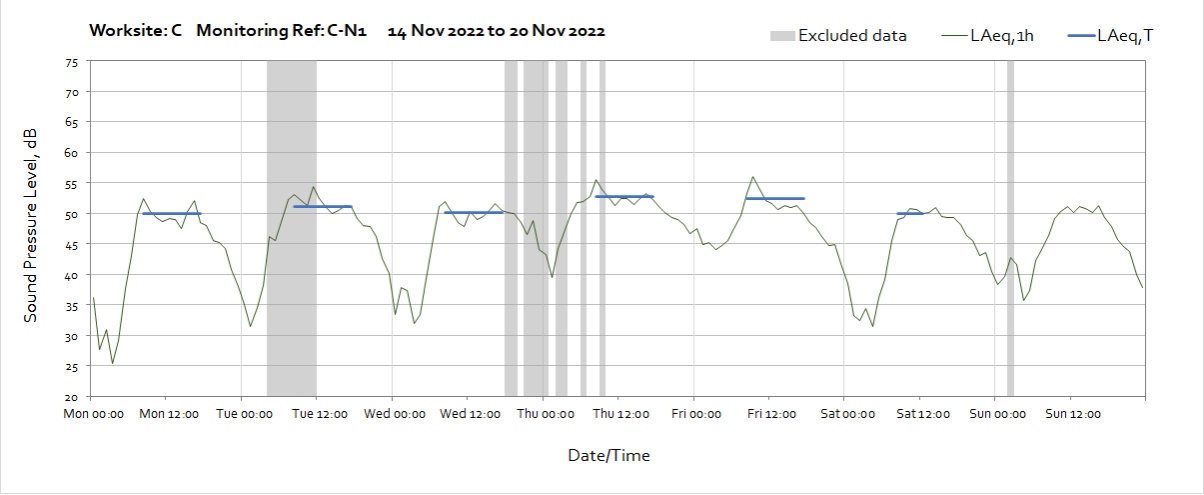
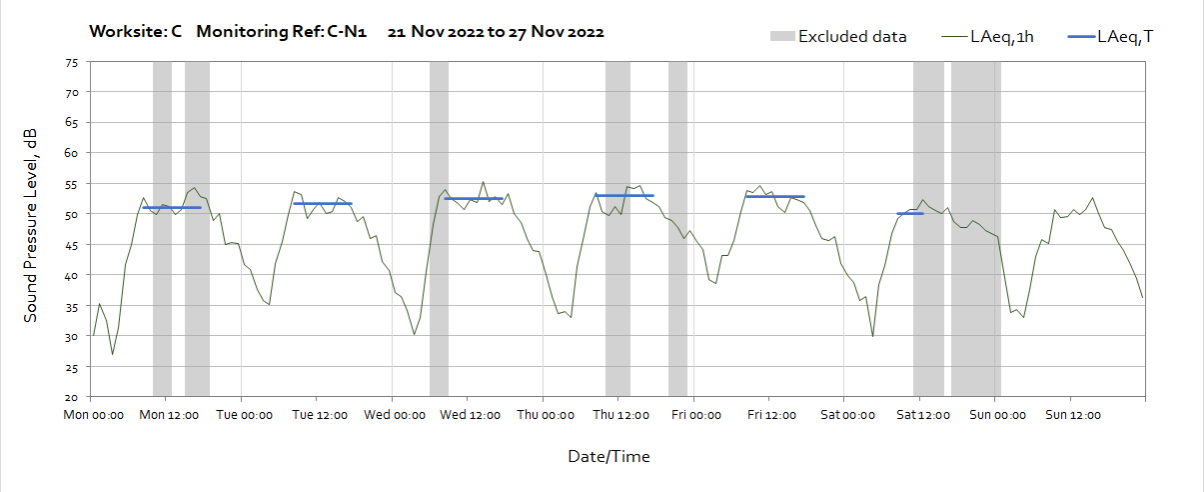
Date/Time

Worksite: C – Monitoring Ref: C-N1

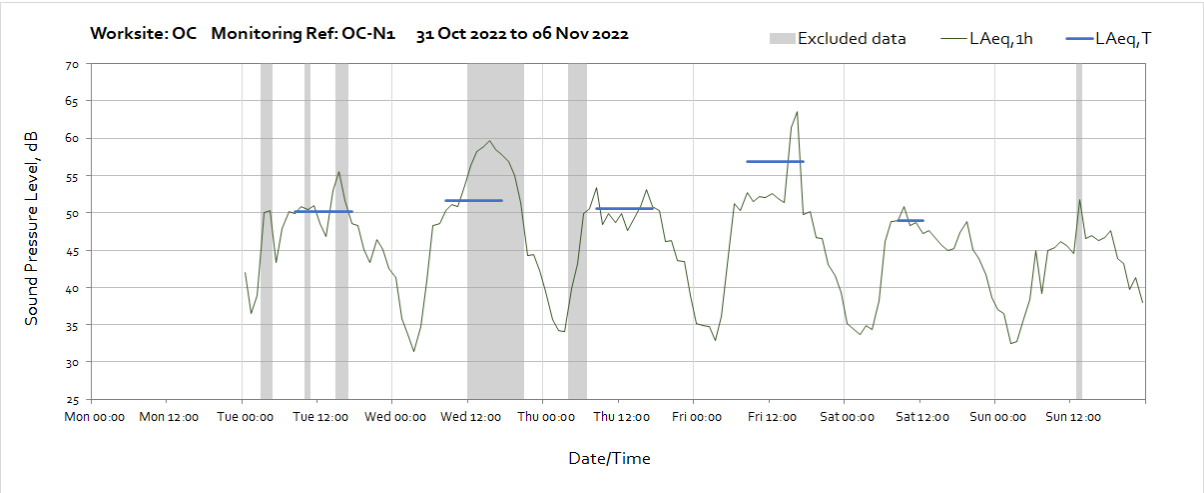


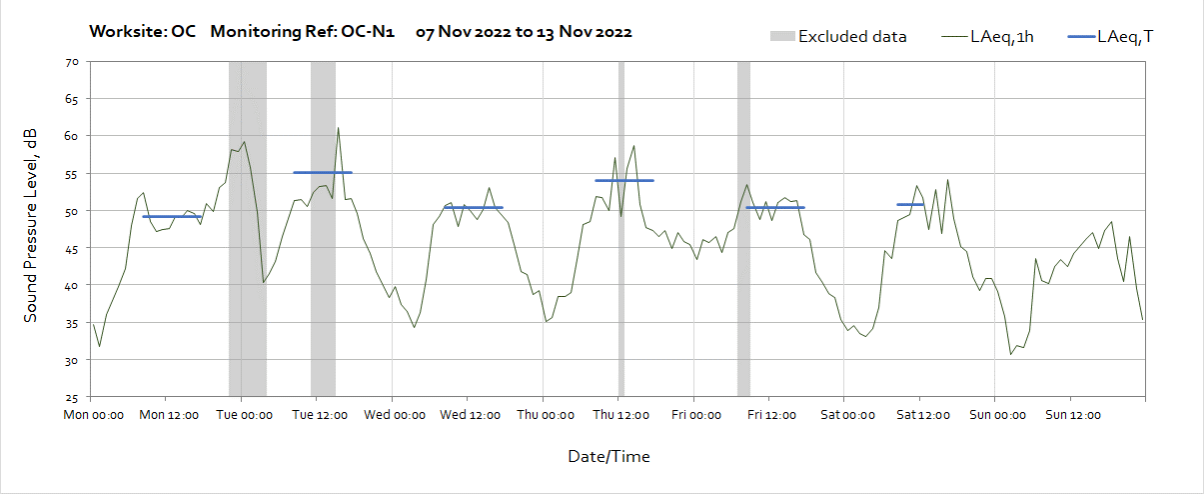






Worksite: OC – Monitoring Ref: OC-N1

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LAeq,T
Sound Pressure Level, dB
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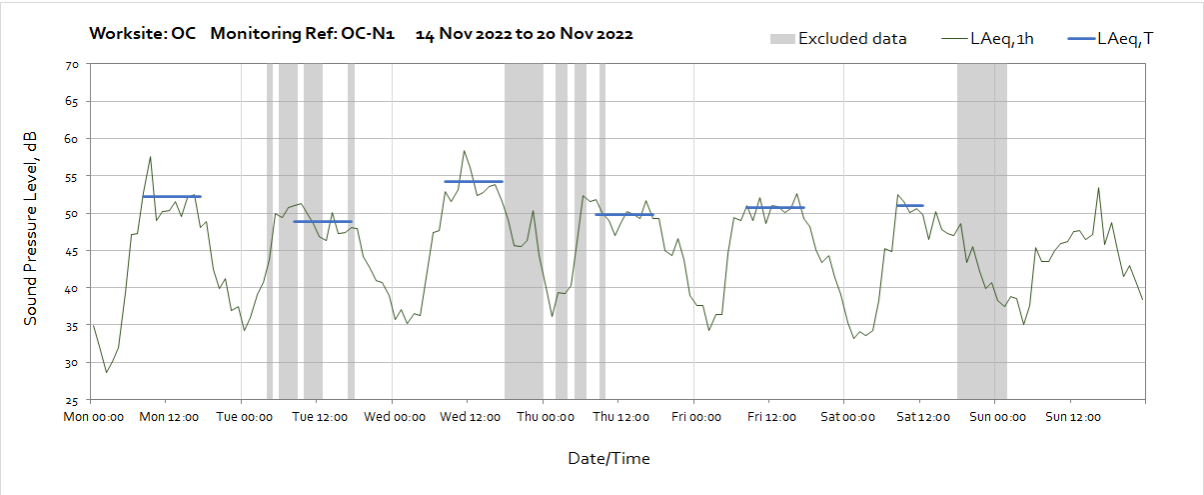
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Sound Pressure Level, dB
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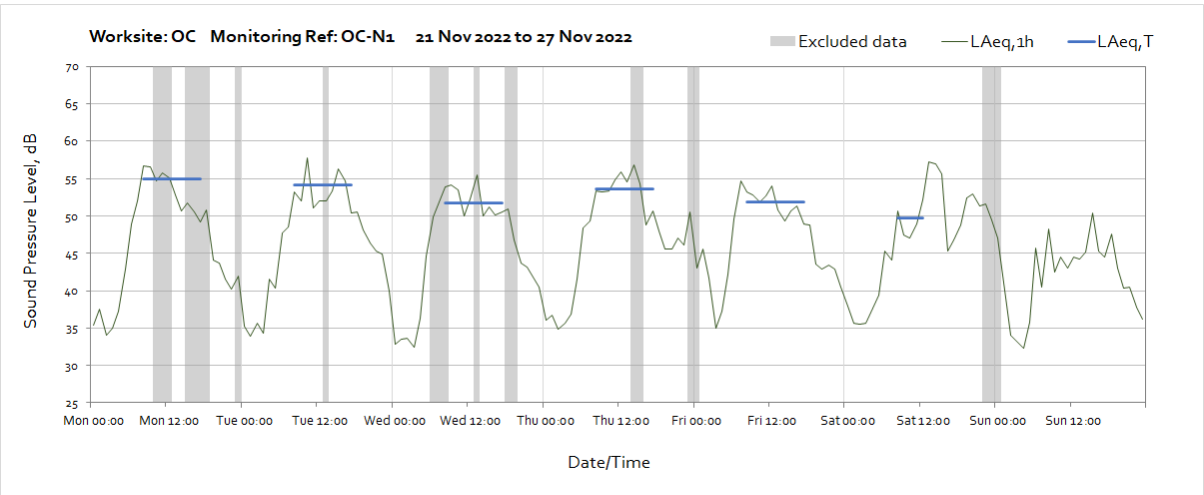
Date/Time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LAeq,T
Sound Pressure Level, dB
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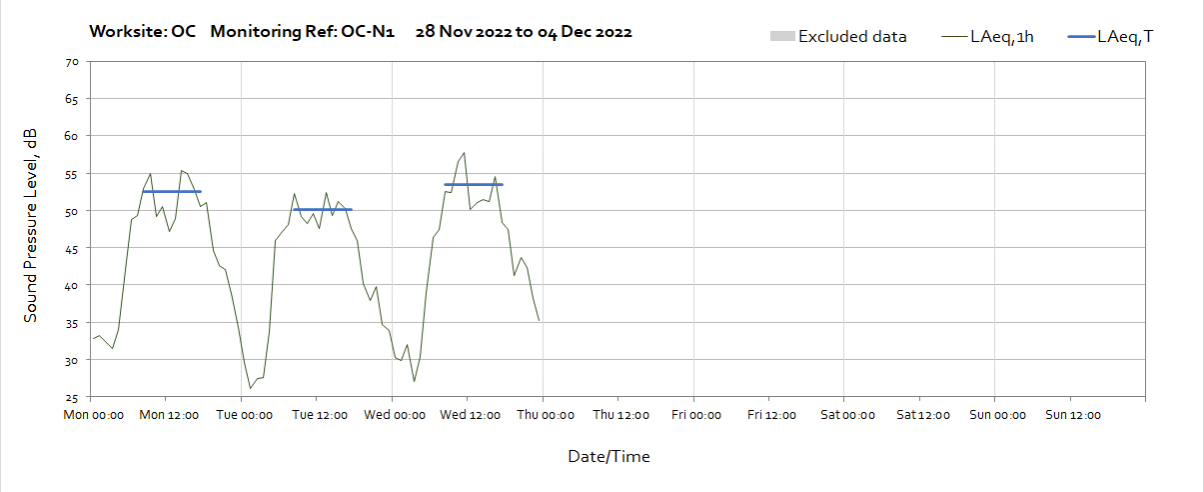
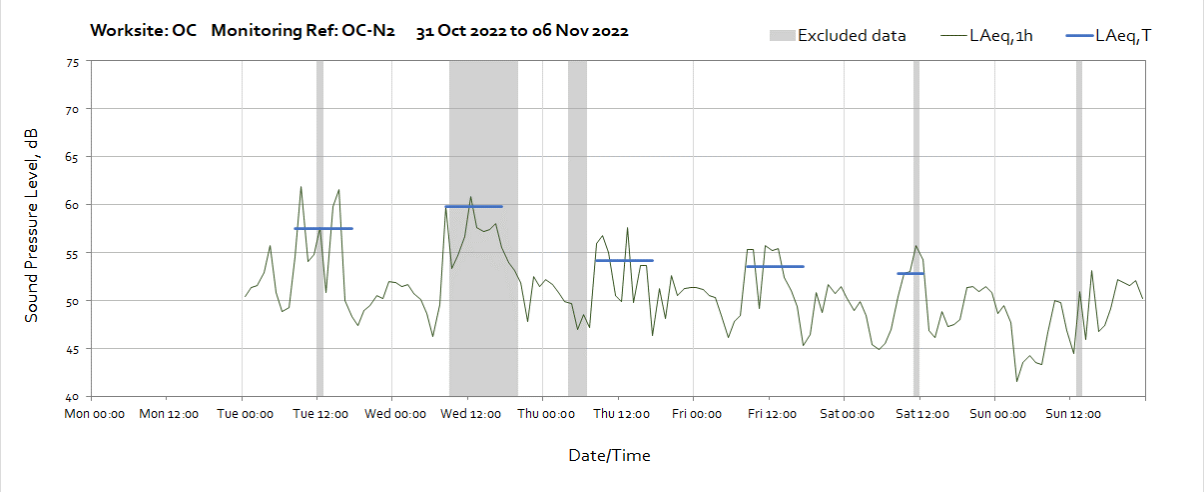
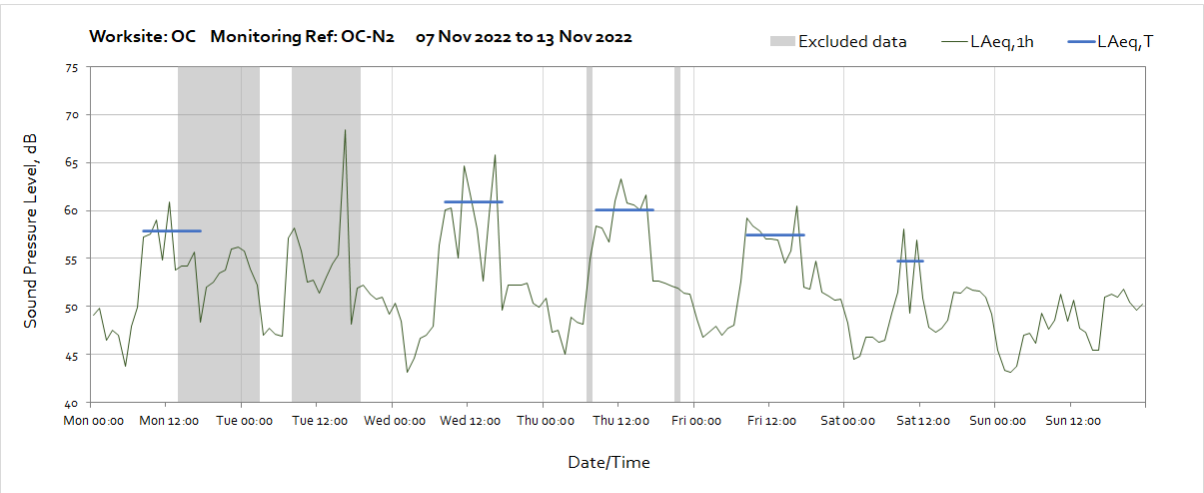
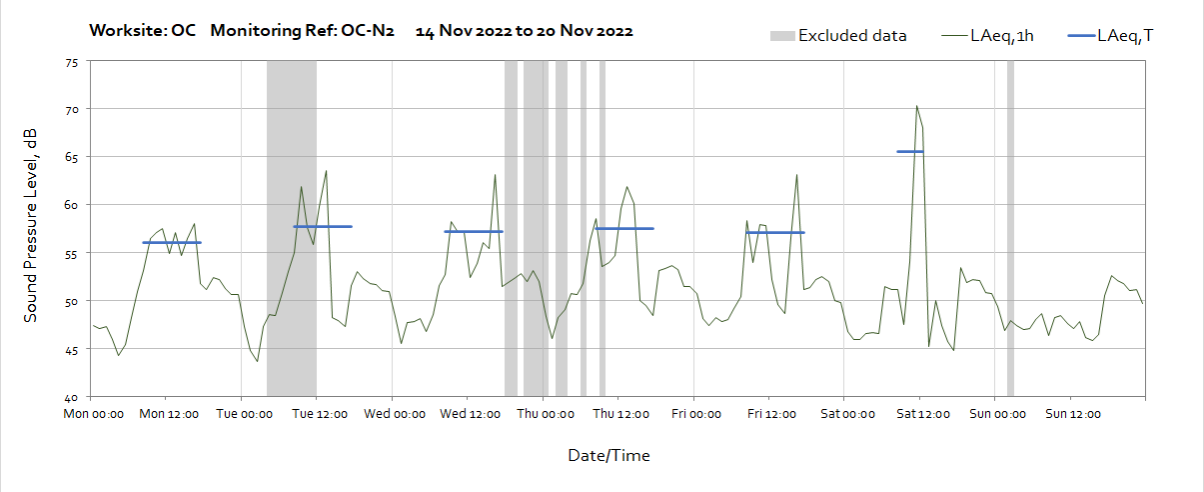


Worksite: OC – Monitoring Ref: OC-N2



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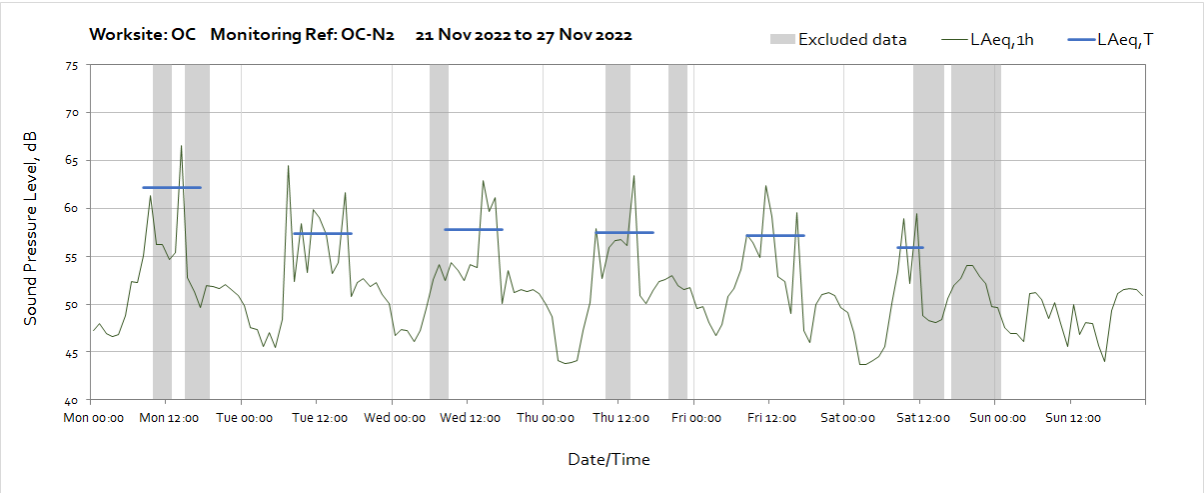
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Excluded data
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Sound Pressure Level, dB
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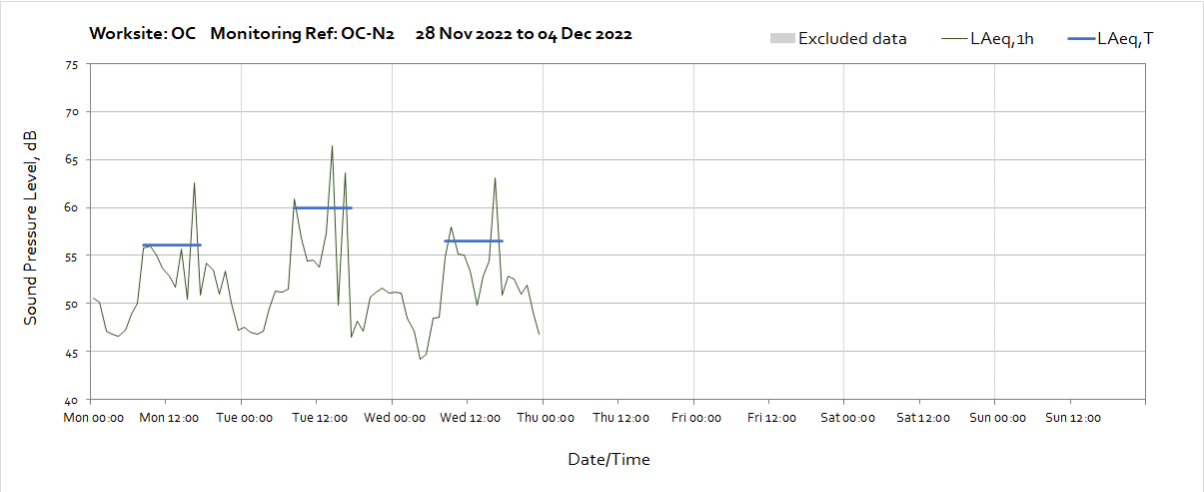
Date/Time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Sound Pressure Level, dB
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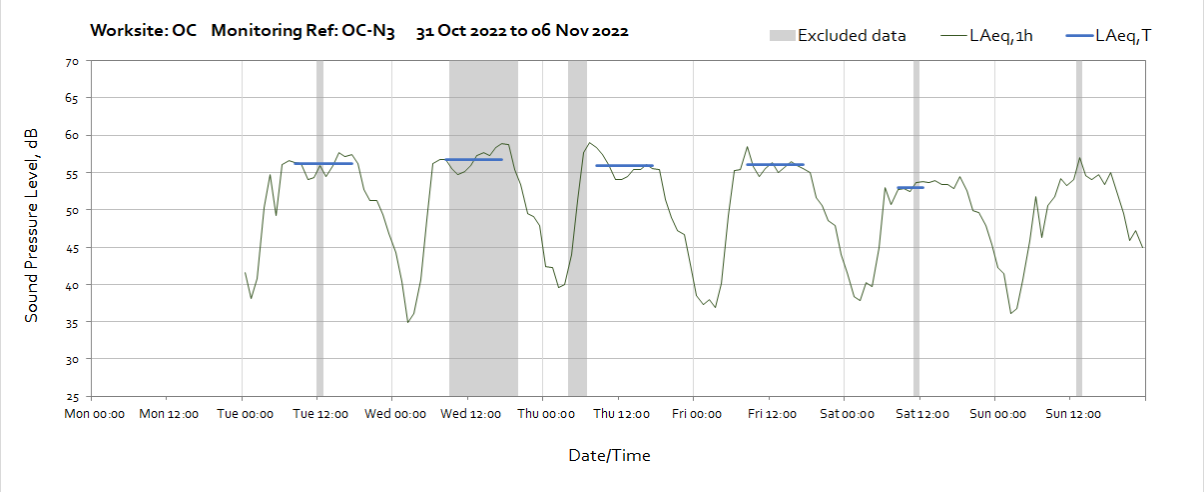
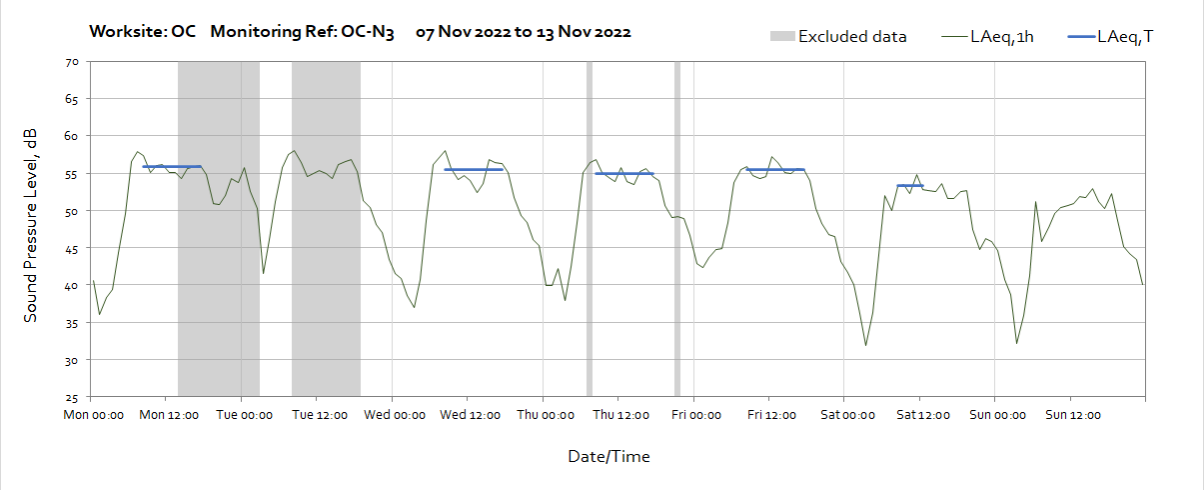
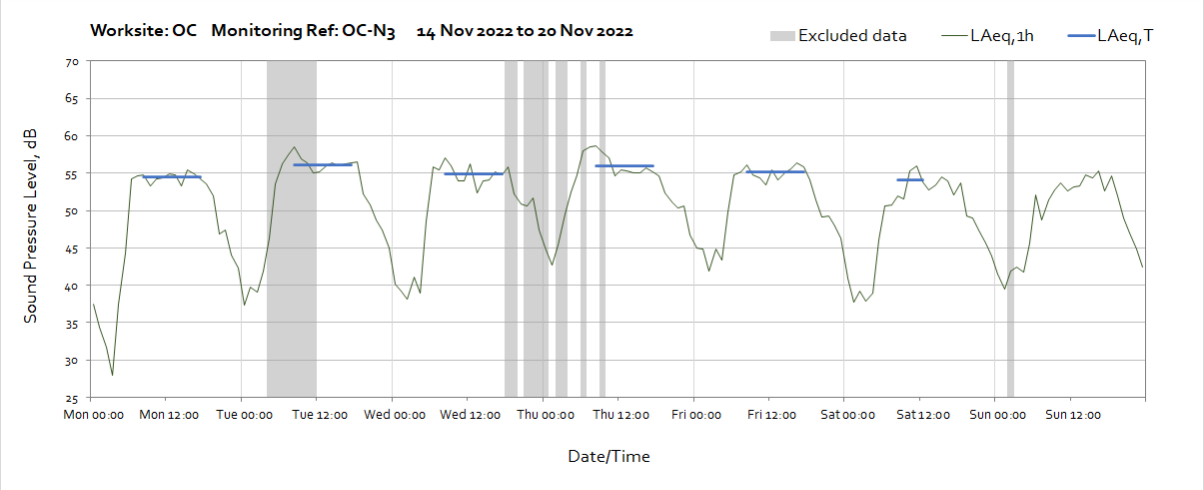
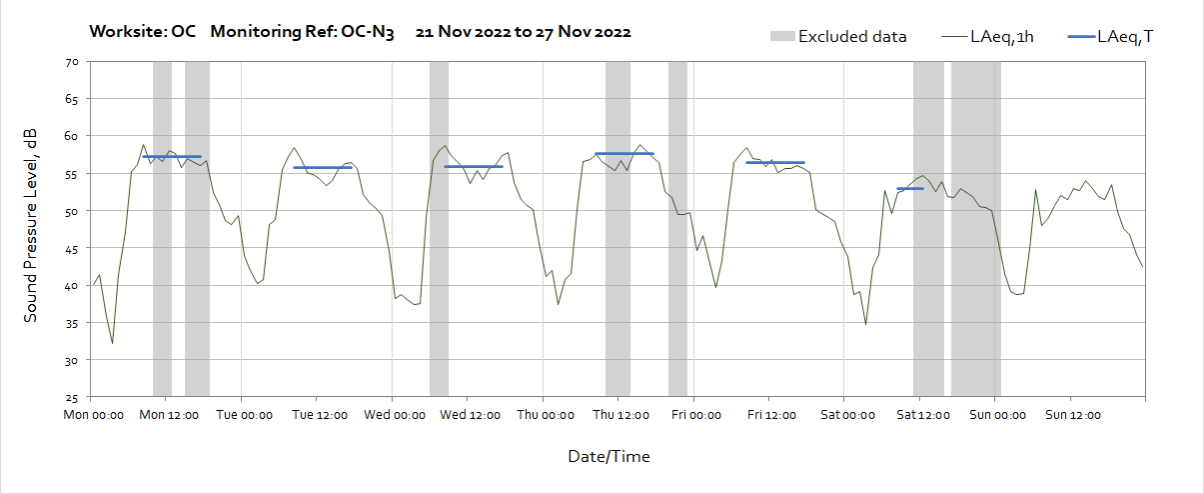
Date/Time

Worksite: OC – Monitoring Ref: OC-N3





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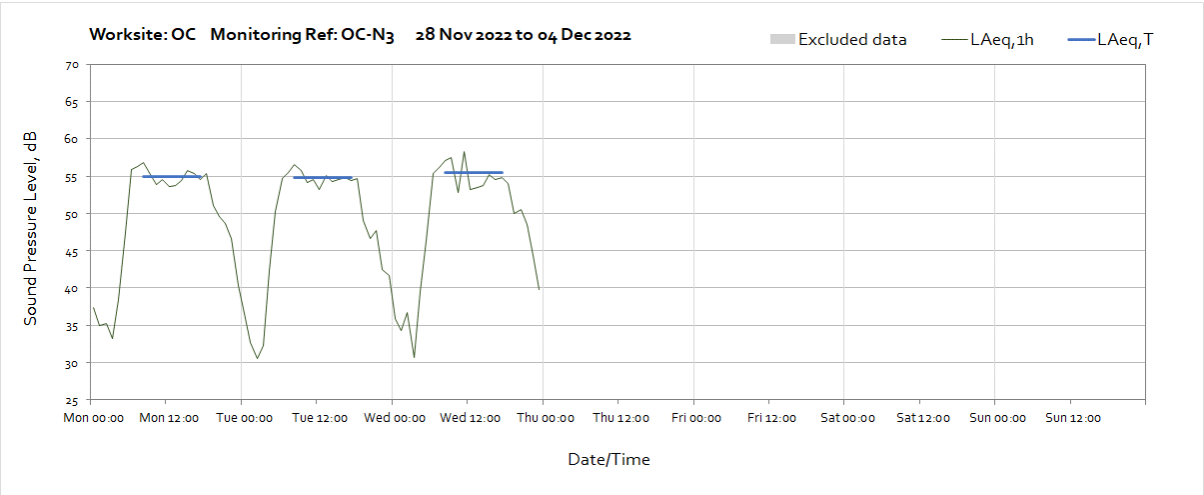
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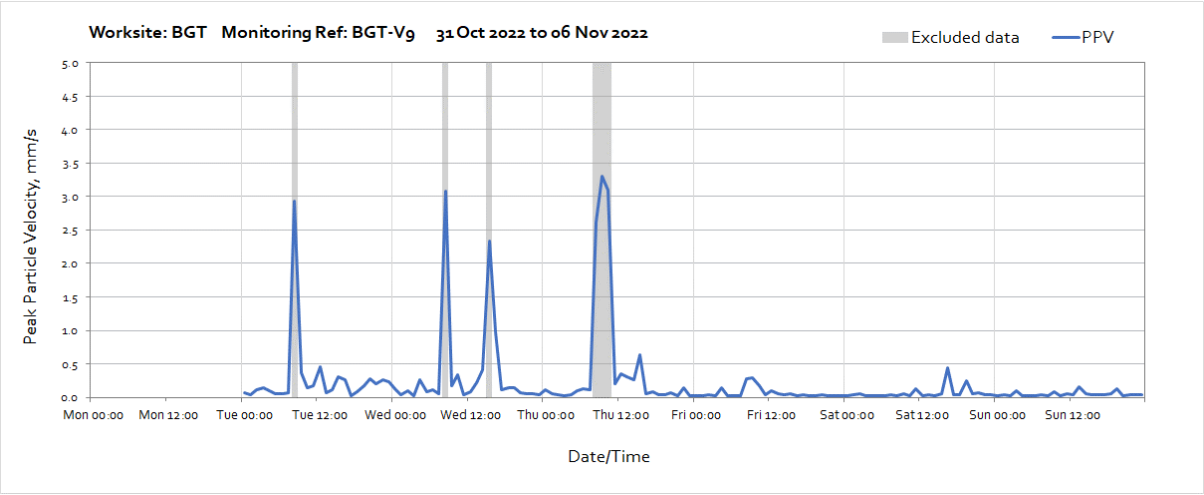
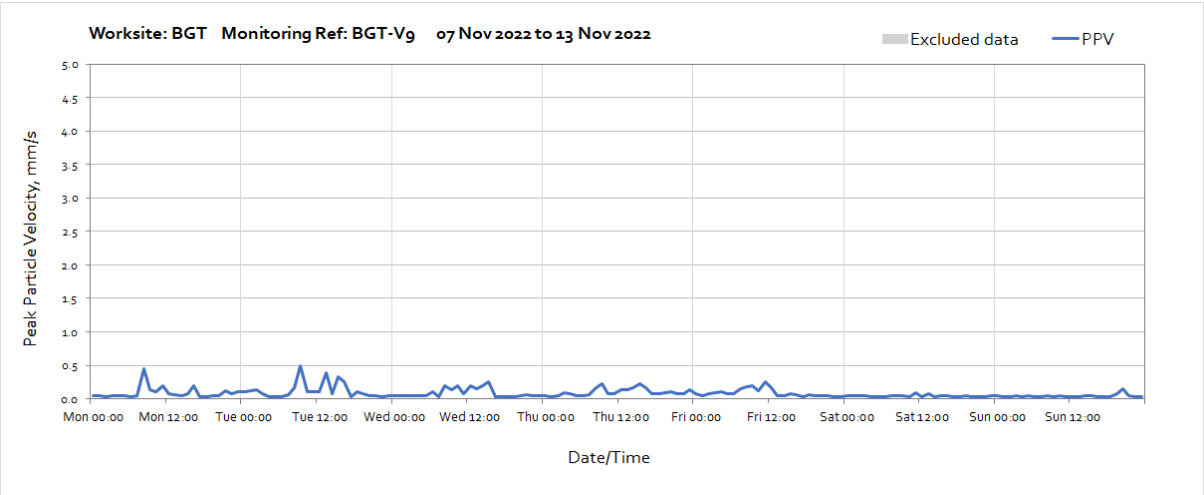
Date/Time

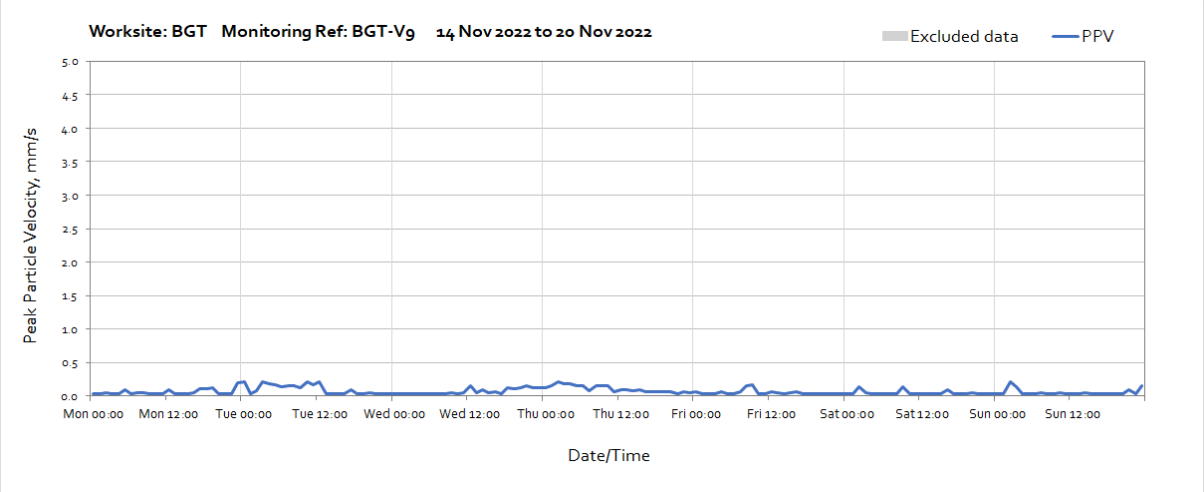
Vibration

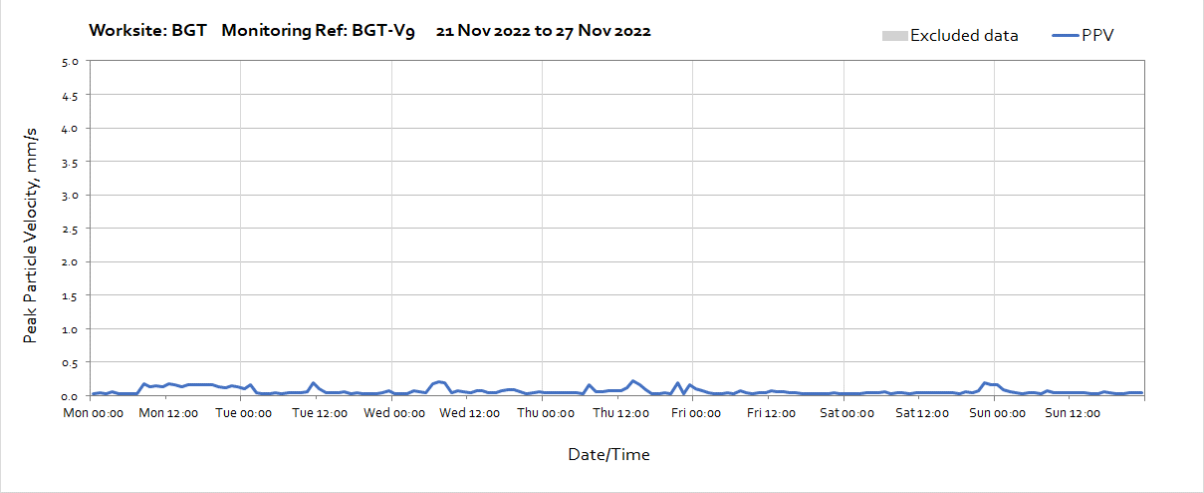
The following graphs show the hourly measured peak particle velocity PPV recorded during the monitoring period. The graphs show the resultant PPV due to vibration components on three orthogonal axes x, y and z. Where resultant PPV data is not available, the highest vibration component in either of the three axes is presented for each 1hr measurement period respectively. 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.

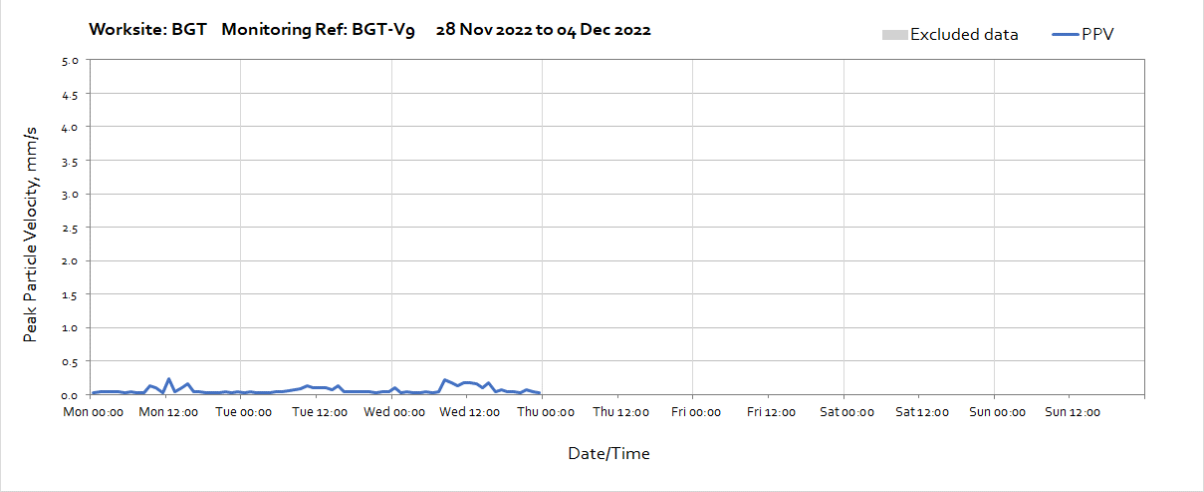
Worksite: BGT – Monitoring Ref: BGT-V9



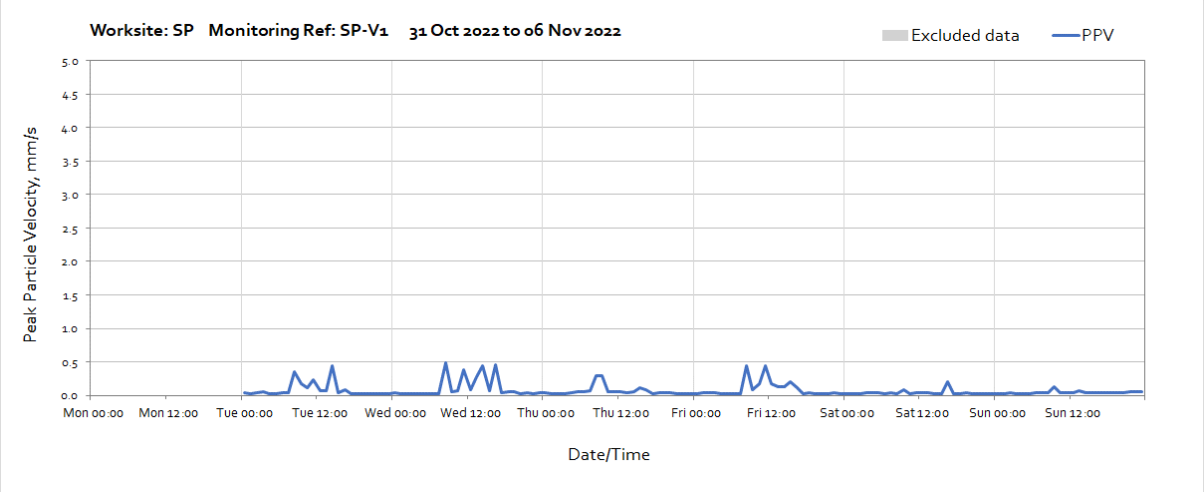


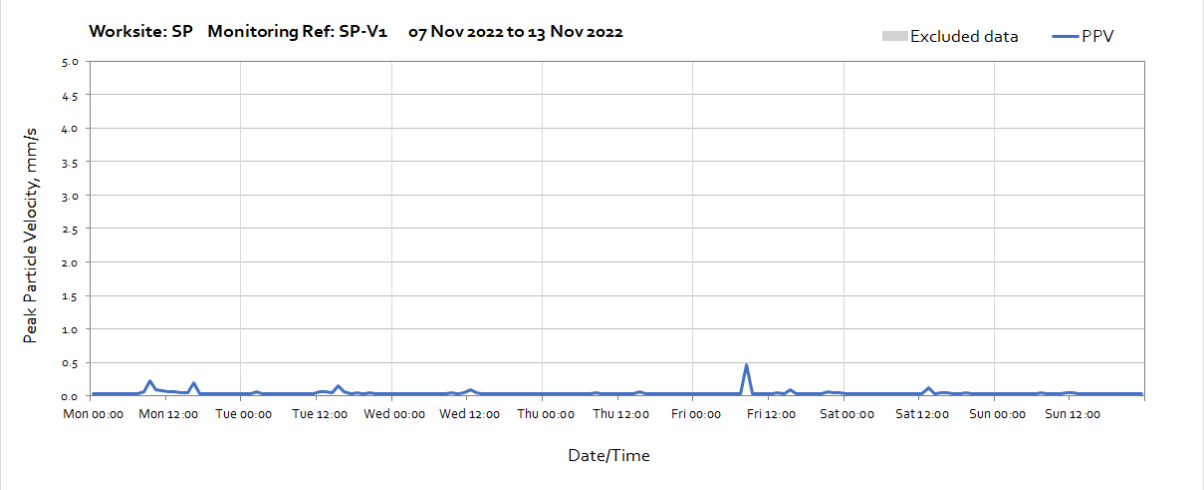

Worksite: BGT Monitoring Ref: BGT-V9 14 Nov 2022 to 20 Nov 2022
Excluded data
PPV
Peak Particle Velocity, mm/s
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

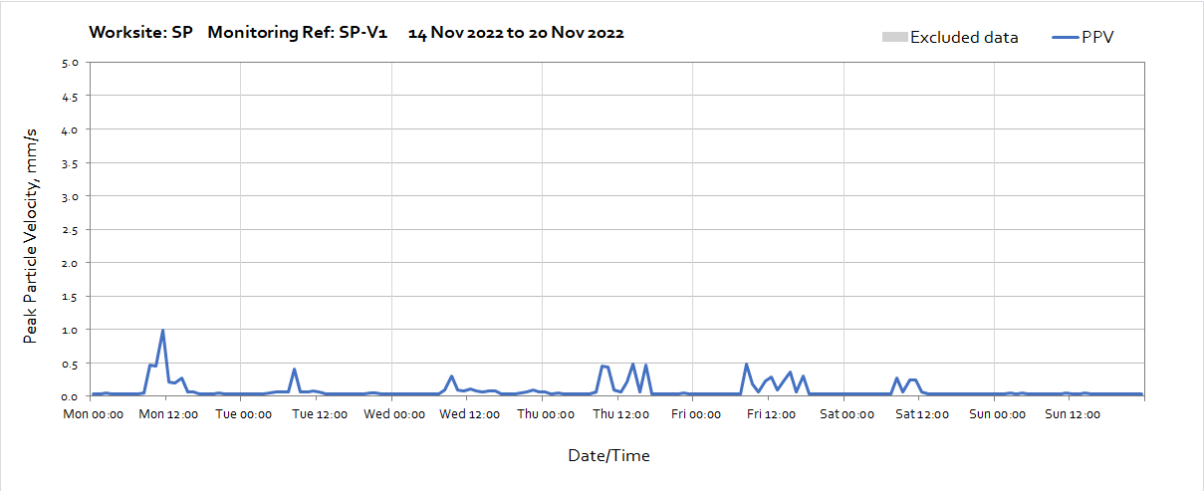

Worksite: BGT Monitoring Ref: BGT-V9 21 Nov 2022 to 27 Nov 2022
Excluded data
PPV
Peak Particle Velocity, mm/s
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

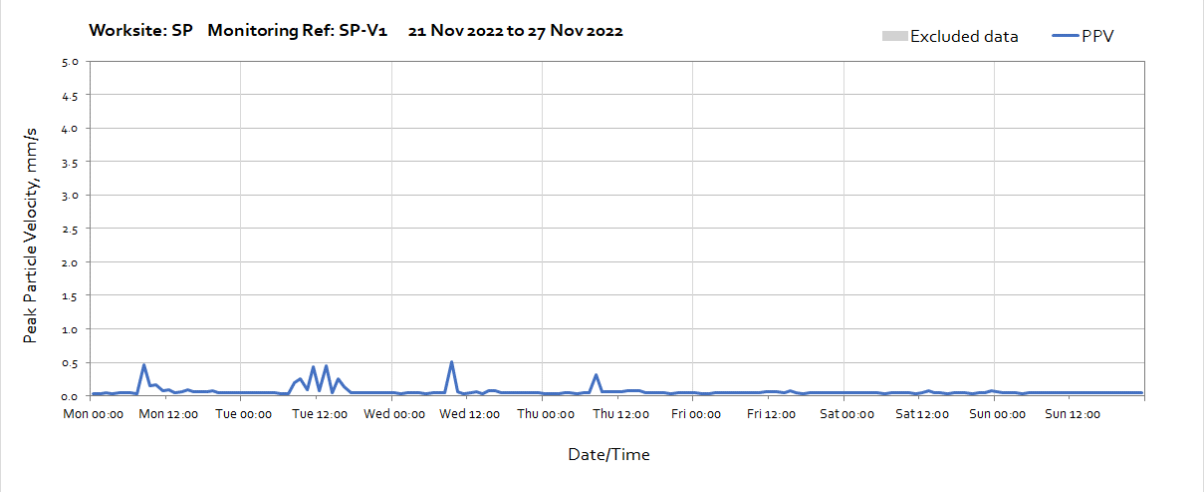

Worksite: BGT Monitoring Ref: BGT-V9 28 Nov 2022 to 04 Dec 2022
Excluded data
PPV
Peak Particle Velocity, mm/s
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

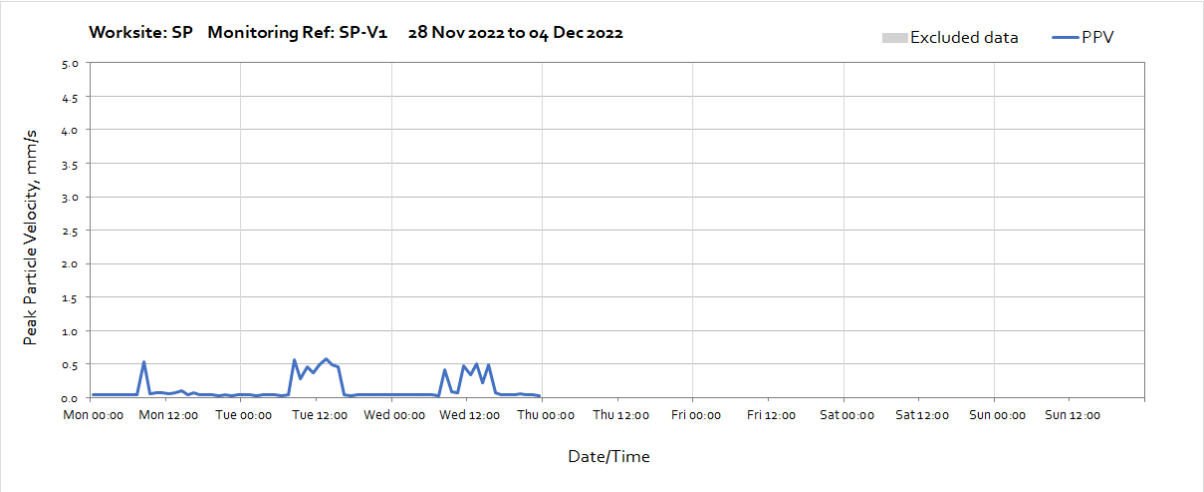
Worksite: SP – Monitoring Ref: SP-V1








Worksite: SP Monitoring Ref: SP-V1 21 Nov 2022 to 27 Nov 2022
Excluded data
PPV
Peak Particle Velocity, mm/s
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
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


Worksite: SP Monitoring Ref: SP-V1 28 Nov 2022 to 04 Dec 2022
Excluded data
PPV
Peak Particle Velocity, mm/s
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
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