HS2

August 2023

Construction Noise and Vibration Monthly Report – June 2023

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 June 2023.

Within this period monitoring was undertaken at the following worksites:

- Noise monitoring was undertaken at the Burton Green Tunnel worksite (ref.: BGT), where no works took place during the monitoring period.
- Noise monitoring was undertaken at the Bockenden Cutting worksite (ref.: BC), where no works took place during the monitoring period.
- Noise monitoring was undertaken at the A429 Kenilworth Road Overbridge worksite (ref.: A429), where work activities included earthworks, devegetation and haul road operation.
- Noise monitoring was undertaken at the A46 Compound worksite (ref.: A46C), where work activities included electrical commissioning works.
- Noise monitoring was undertaken at Stoneleigh Village worksite (ref.: SV), where work activities included earthworks.
- Noise monitoring was undertaken at the Stoneleigh Park worksite (ref.: SP), where work activities included operation and maintenance of haul road, asbestos removal, variable head testing, excavation and overbridge construction.
- Noise monitoring was undertaken at the Cubbington Road worksite (ref.: C), where work activities included wall reinforcement, concreting, fill placement, slab construction, topsoiling and drainage blanket works as well as tarmac roadway works.
- Noise monitoring was undertaken at Offchurch Cutting (ref.: OC), where work activities included mains diversion trenching works, earthworks, piling, pile testing and excavation around completed piles as well as stockpiling works.

Further works, where monitoring did not take place, consisted of works at Lavender Hall, where water utility works were underway.

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 noise complaint was received during the monitoring period.

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 June 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 June 2023.

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 no works took place near either of the BGT monitors in June.
- Bockenden Cutting worksites (ref.: BC, see plan 1 in Appendix A), where no works took place during June.
- A429 Kenilworth Road Overbridge (ref.: A429, see plan 2 in Appendix A), where work activities included:
    - Earthworks.
    - Devegetation works.
    - Haul road operation.
- A46 Compound, (ref.: A46C, see plan 3 in Appendix A), where work activities included:
    - Electrical commissioning works
- Stoneleigh Village, (ref.: SV, see plan 3 in Appendix A), where work activities included:

    - Earthworks.
- Stoneleigh Park, (ref.: SP, see plan 3 in Appendix A), where work activities included:
    - Operation and maintenance of haul road.
    - Asbestos removal.
    - Variable head testing.
    - Excavation works.
    - Construction of overbridge.
- Cubbington Road (ref.: C, see plan 4 in Appendix B), where work activities included:
    - Wall reinforcement.
    - Concreting works.
    - Placement of fill to form canal embankment.
    - Concrete slab construction.
    - Topsoiling and drainage blanket works.
    - Tarmac roadway works.
- Offchurch Cutting worksite (ref.: OC, see plan 5 in Appendix A), where work activities included:
    - Trenching works for water main and sewer main diversions.
    - Earthworks.
    - Piling works and pile testing.
    - Excavation around completed piles.
    - Stockpile works.

1.1.4 Further works, where monitoring did not take place, consisted of works at Lavender Hall, where water utility works were underway.

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 four (4) vibration monitoring installations were active in June in the WDC area. Table 2 summarises the position of the noise and vibration monitoring installations within the WDC area in June 2023.

1.2.2 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
BGT	BGT-N1	Cromwell Lane, Burton Green, Warwick (Currently suspended)
	BGT-N2	33 Broadwell Woods Caravan Park, Red Lane, Burton Green, Warwick,
	BGT-V9	33 Broadwell Woods, Red Lane, Burton Green, Kenilworth, CV8 1QF
BC	BC-N1	Thistle Estate, Red Lane, Burton Green, Warwick
A429	A429-N1	Millburn Grange, Coventry Road, Kenilworth
	A429-N2	Brookview, Milburn Grange, Coventry Road, Kenilworth
	A429-N3	16 Kenilworth Road, Kenilworth
A46C	A46C-N1	Kingswood Farmhouse, Dalehouse Lane, Kenilworth
SV	SV-N1	The Barnyard, Crewe Ln, Stoneleigh, Kenilworth
	SV-N2	5 Birmingham Rd, Stoneleigh, Coventry
	SV-N3	5 Walkers Orchard, Stoneleigh, Coventry
	SV-V1	The Barnyard Crewe Ln, Stoneleigh, Kenilworth
SP	SP-N1	Stoneleigh, Kenilworth
	SP-N2	Stoneleigh Park, Kenilworth
	SP-V1	Stoneleigh, Kenilworth
C	C-N1	Wychwood, Cubbington Road, Leamington Spa
OC	OC-N1	Welsh Road, Offchurch, Leamington
	OC-N2	Valley Fields, Offchurch, Leamington Spa
	OC-N3	Brickyard Cottage, Welsh Road, Offchurch, Warwick
	OC-V1	Valley Fields, Hunningham Road, Offchurch

Note: The equipment at Measurement Reference BGT-N1 has been removed from 301 Cromwell Lane and the contractor is currently seeking permission to install the equipment at a nearby property.

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-N2	33 Broadwell Woods Caravan Park, Red Lane, Burton Green,	Free-field	43.5 (48.1)	46.5 (53.8)	43.4 (46.2)	42.2 (48.8)	41.8 (71.4)	42.2 (44.0)	43.7 (44.6)	42.6 (42.9)	42.3 (45.3)	38.8 (48.9)	46.4 (65.6)	39.8 (46.9)
BC	BC-N1	Thistle Estate, Red Lane, Burton Green	Free-field	43.2 (45.7)	44.3 (47.5)	42.4 (48.2)	42.4 (52.8)	41.3 (51.5)	42.0 (43.6)	43.3 (45.5)	40.8 (42.0)	40.9 (44.1)	41.6 (49.5)	44.6 (61.1)	41.6 (50.6)
A429	A429-N1	Millburn Grange, Coventry Road, Kenilworth	Free-field	51.1 (54.8)	55.7 (65.7)	50.6 (54.8)	49.2 (57.4)	46.6 (56.5)	49.5 (50.9)	49.2 (50.4)	47.7 (50.1)	46.9 (50.8)	48.4 (77.5)	62.0 (85.2)	46.5 (54.9)
	A429-N2	Brookview, Milburn Grange, Coventry Road, Kenilworth	Free-field	48.8 (51.6)	52.7 (71.7)	49.0 (51.3)	48.0 (55.5)	45.2 (57.6)	46.7 (47.7)	49.7 (53.9)	46.7 (47.6)	46.3 (49.6)	43.0 (48.3)	48.2 (53.3)	44.7 (51.8)
	A429-N3	16 Kenilworth Road, Kenilworth	Free-field	57.5 (60.5)	56.9 (59.9)	56.5 (58.7)	55.5 (61.1)	50.9 (68.5)	53.8 (54.1)	56.1 (56.6)	56.2 (56.9)	55.7 (58.7)	50.9 (60.2)	55.4 (61.3)	50.6 (59.6)
A46C	A46C-N1	Kingswood Farmhouse, Dalehouse Lane, Kenilworth	Free-field	58.7 (61.0)	60.6 (72.8)	57.3 (60.1)	55.7 (58.8)	53.6 (60.5)	55.7 (58.2)	56.8 (58.1)	57.0 (58.7)	56.5 (60.6)	51.2 (56.4)	55.9 (59.4)	53.3 (59.6)

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
SV	SV-N1	The Barnyard Crewe Ln, Stoneleigh, Kenilworth	Free-field	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
	SV-N2	5 Birmingham Rd, Stoneleigh, Coventry	Free-field	53.3 (59.3)	53.3 (59.6)	52.2 (54.1)	50.0 (54.0)	48.4 (56.8)	50.2 (52.8)	52.5 (55.1)	55.3 (61.9)	52.8 (61.5)	48.6 (57.0)	52.6 (63.9)	47.0 (54.6)
	SV-N3	5 Walkers Orchard, Stoneleigh, Coventry	Free-field	47.7 (55.9)	48.0 (59.9)	45.7 (48.0)	44.6 (51.6)	43.5 (62.0)	46.3 (49.3)	53.3 (54.4)	43.9 (44.4)	45.2 (50.6)	42.7 (51.1)	45.6 (53.2)	42.9 (50.4)
SP	SP-N1	Stoneleigh, Kenilworth	Free-field	50.7 (53.1)	53.9 (61.3)	49.6 (51.5)	47.5 (51.8)	45.6 (57.0)	48.0 (50.2)	49.7 (51.3)	48.6 (49.0)	48.1 (51.2)	46.3 (58.7)	49.5 (55.8)	46.2 (54.8)
	SP-N2	Stoneleigh Park, Kenilworth	Free-field	54.1 (56.8)	55.8 (59.9)	52.2 (56.3)	49.3 (56.6)	44.2 (53.3)	46.9 (51.9)	52.1 (53.7)	52.4 (61.1)	51.9 (62.0)	42.4 (56.1)	52.1 (64.4)	43.9 (51.3)
C	C-N1	Wychwood, Cubbington Road, Lillington	Free field	53.3 (54.6)	54.2 (58.1)	53.2 (58.1)	51.3 (58.5)	48.8 (58.7)	49.5 (50.9)	53.9 (54.8)	53.2 (54.2)	52.5 (56.9)	48.8 (58.0)	53.4 (65.4)	48.6 (57.6)
OC	OC-N1	Welsh Road, Offchurch	Free-field	54.5 (79.8)	55.2 (72.4)	49.7 (53.0)	46.7 (63.3)	45.1 (78.2)	49.1 (51.6)	52.0 (59.9)	46.8 (47.1)	47.7 (58.7)	40.8 (48.7)	58.8 (80.8)	48.9 (71.7)
	OC-N2	Valley Fields, Hunningham Road, Offchurch	Free field	52.1 (55.2)	55.7 (60.4)	49.4 (54.4)	47.6 (62.8)	48.0 (54.2)	49.6 (53.4)	51.9 (55.3)	45.8 (47.7)	47.0 (50.8)	48.4 (51.2)	47.2 (57.5)	48.5 (52.0)
	OC-N3	Brickyard Cottage, Welsh Road, Offchurch	Free-field	55.0 (57.8)	54.7 (58.4)	54.6 (59.2)	51.1 (58.4)	50.4 (81.1)	53.1 (62.0)	55.7 (64.8)	52.2 (52.6)	51.4 (57.2)	46.7 (53.2)	51.8 (55.6)	48.9 (56.4)

Note: At SV-N1, missing data for the entire month was due to a power issue arising from difficulty in accessing the monitor.

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,	2.77 (X-axis)
SV	SV-V1	Barnyard Crewe Ln, Stoneleigh	-
SP	SP-V1	East Lodge, Stoneleigh	2.00 (X-axis)
OC	OC-V1	Valley Fields, Hunningham Road, Offchurch	0.73 (X-axis)

Note: Missing data for SV-V1 during this month was due to a power issue arising from difficulty in accessing the monitor.

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

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of LOAEL	Number of exceedances of SOAEL
A46C	A46C-N1*	Kingswood Farmhouse, Dalehouse Lane, Kenilworth	Weekday	0800-1800	1	No exceedances
SV	SV-N1	The Barnyard Crewe Ln, Stoneleigh, Kenilworth	All days	All periods	No exceedances	No exceedances
	SV-N2	5 Birmingham Rd, Stoneleigh	All days	All periods	No exceedances	No exceedances
	SV-N3	5 Walkers Orchard, Stoneleigh,	All days	All periods	No exceedances	No exceedances
SP	SP-N1	Stoneleigh Park, Kenilworth	All days	All periods	No exceedances	No exceedances
	SP-N2	Stoneleigh Park, Kenilworth	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,	Weekday	0800-1800	1	No exceedances
	OC-N2	Valley Fields, Hunningham Road, Offchurch, Leamington	All days	All periods	No exceedances	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 Exceedances of the LOAEL were recorded at three (3) monitoring locations during weekday working hours.

2.2.7 No SOAEL exceedances were recorded due to HS2 construction works during the reporting period.

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

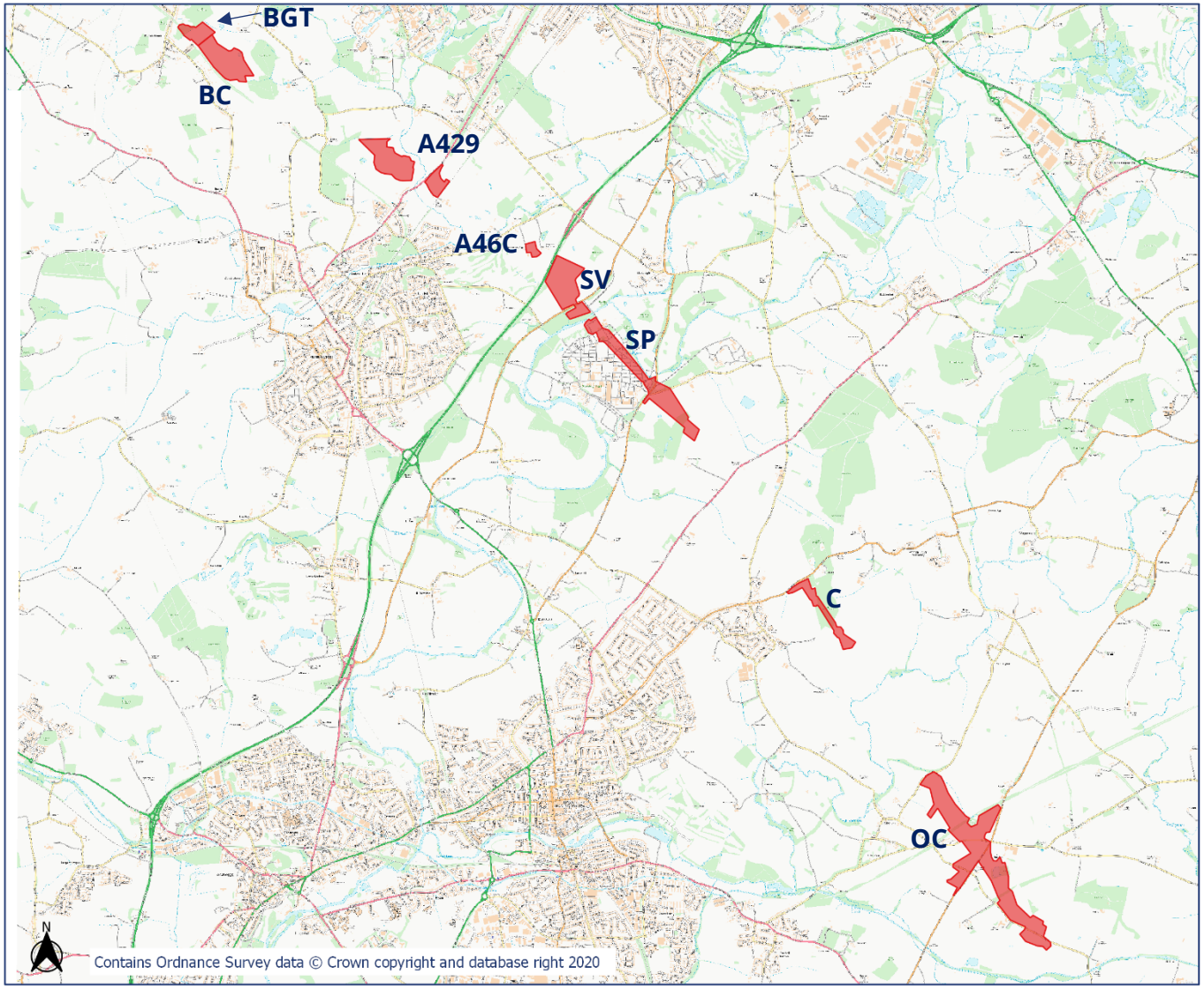
2.4.1 Table 7 provides a summary of complaint information related to noise and vibration received during the reporting period, along with the findings of any investigation.

Table 7: Summary of Complaints

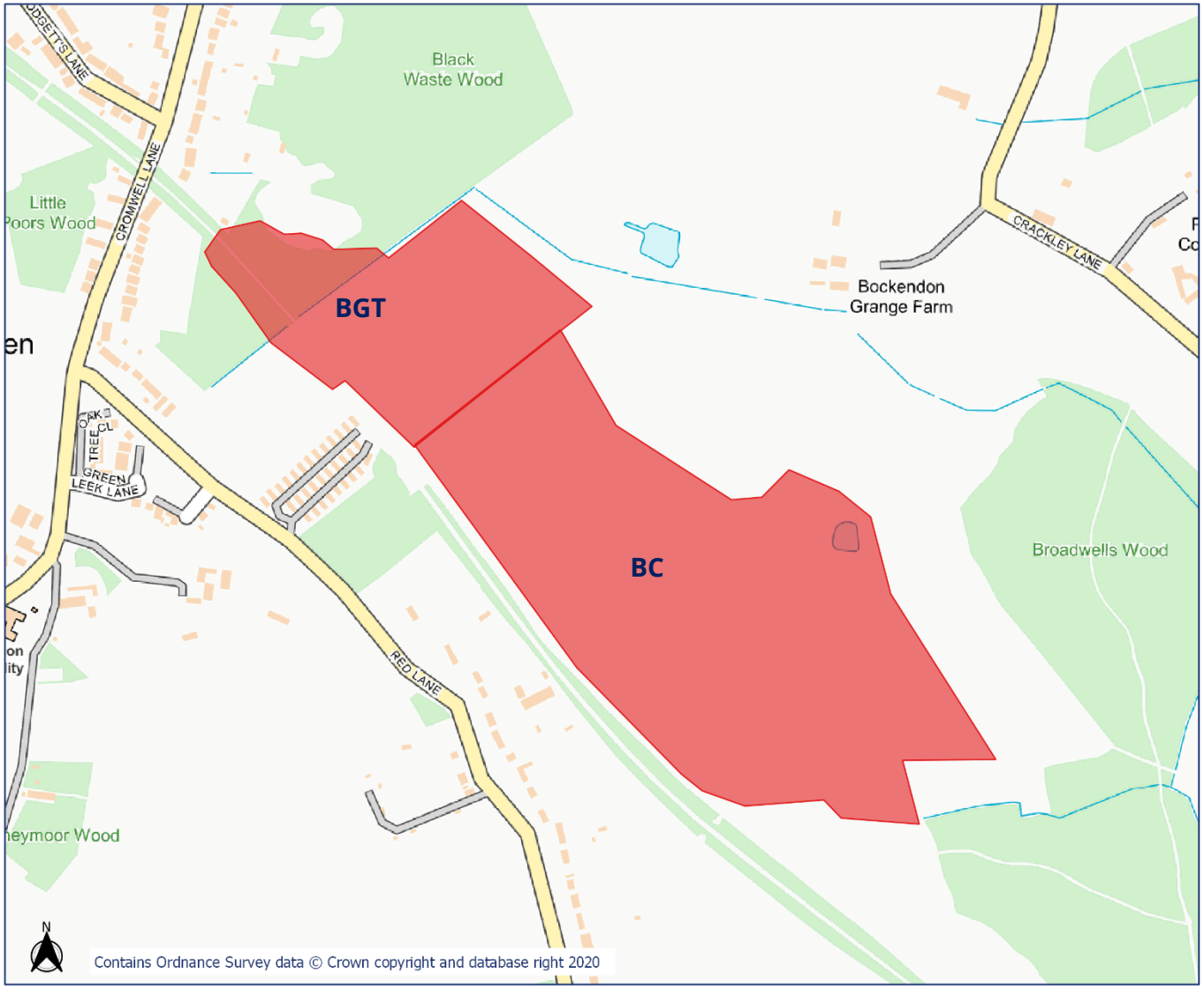
Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
HS2-23-44759-C	BGT, BC	Noise from site at 0730, prior to start time of 0800.	Worksites near to the stakeholder were not active during the month of June, therefore the noise was not associated with HS2 construction.	Complaint closed and stakeholder advised of outcome.

Appendix A Site Locations

Worksite Identification Plan - Overview

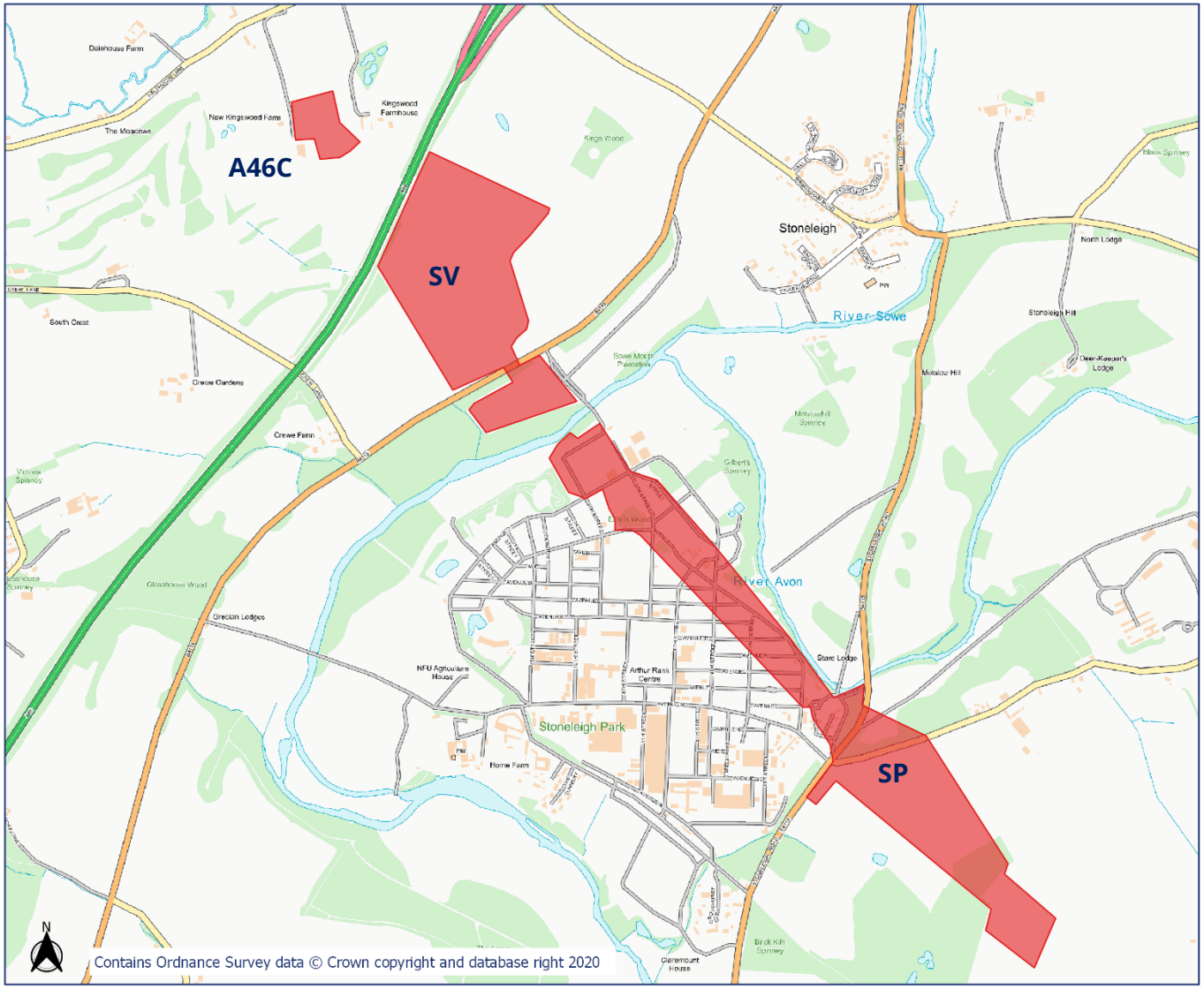


Worksite Identification Plan - 1



Worksite Identification Plan - 2

Worksite Identification Plan - 3



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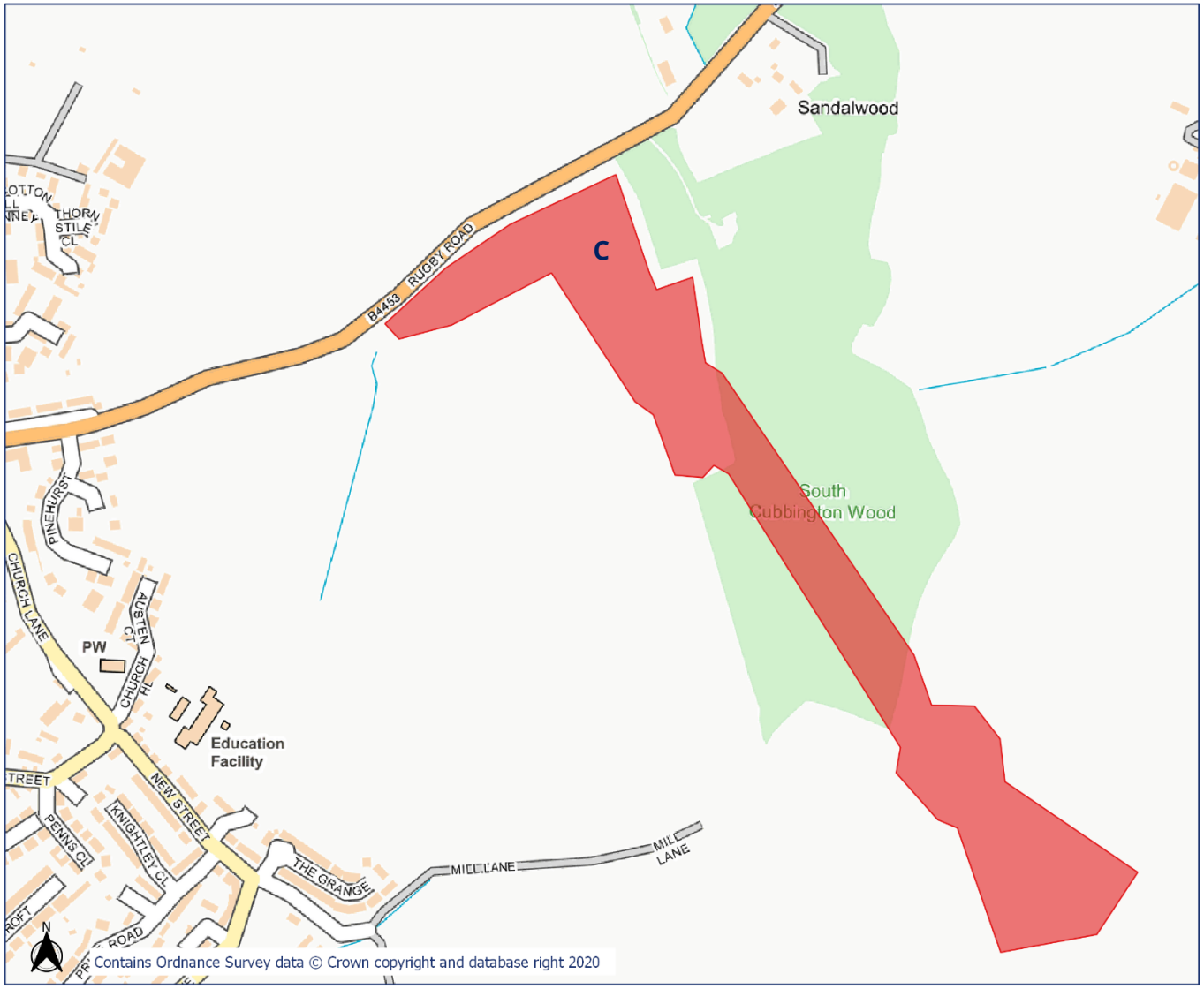
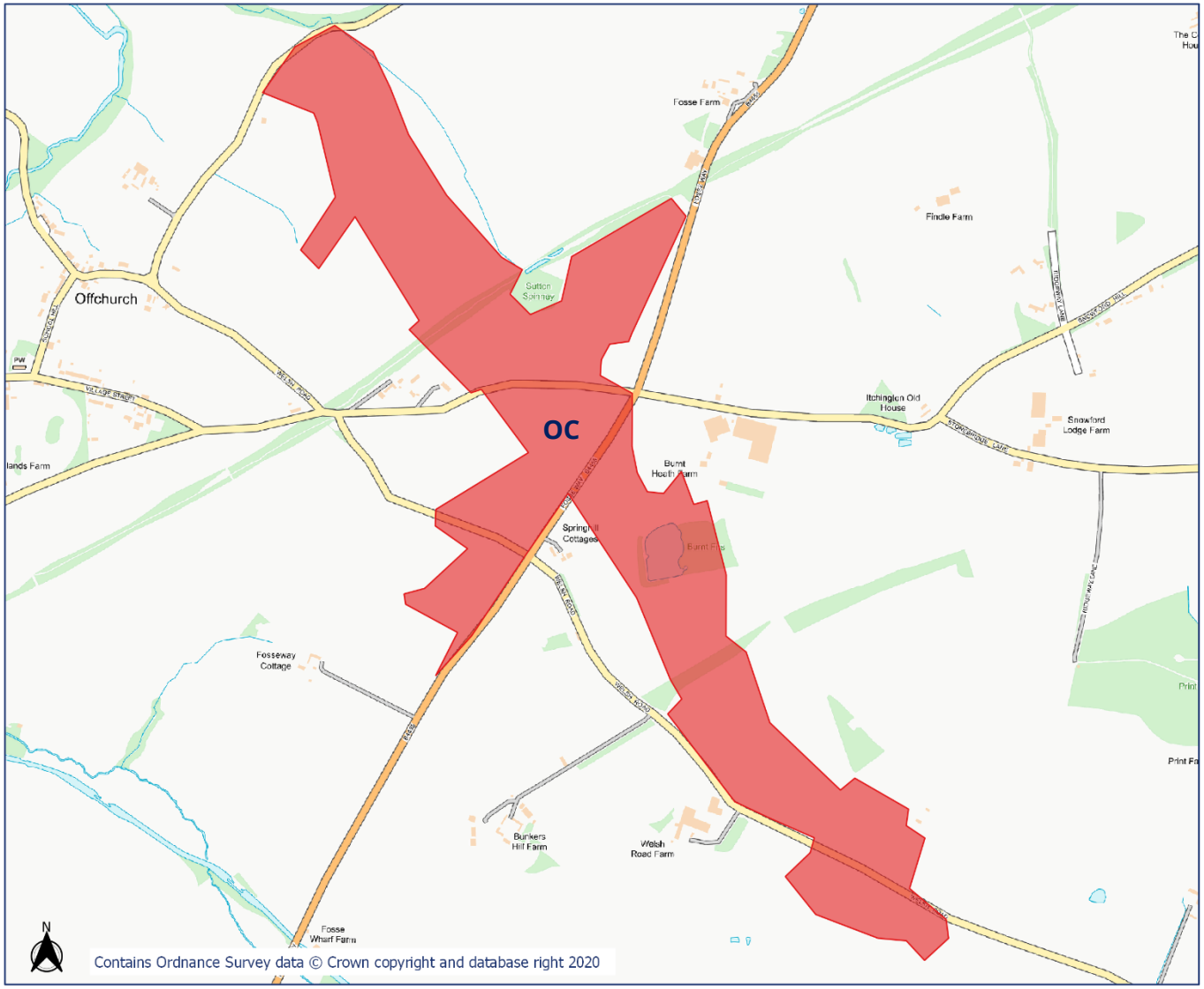
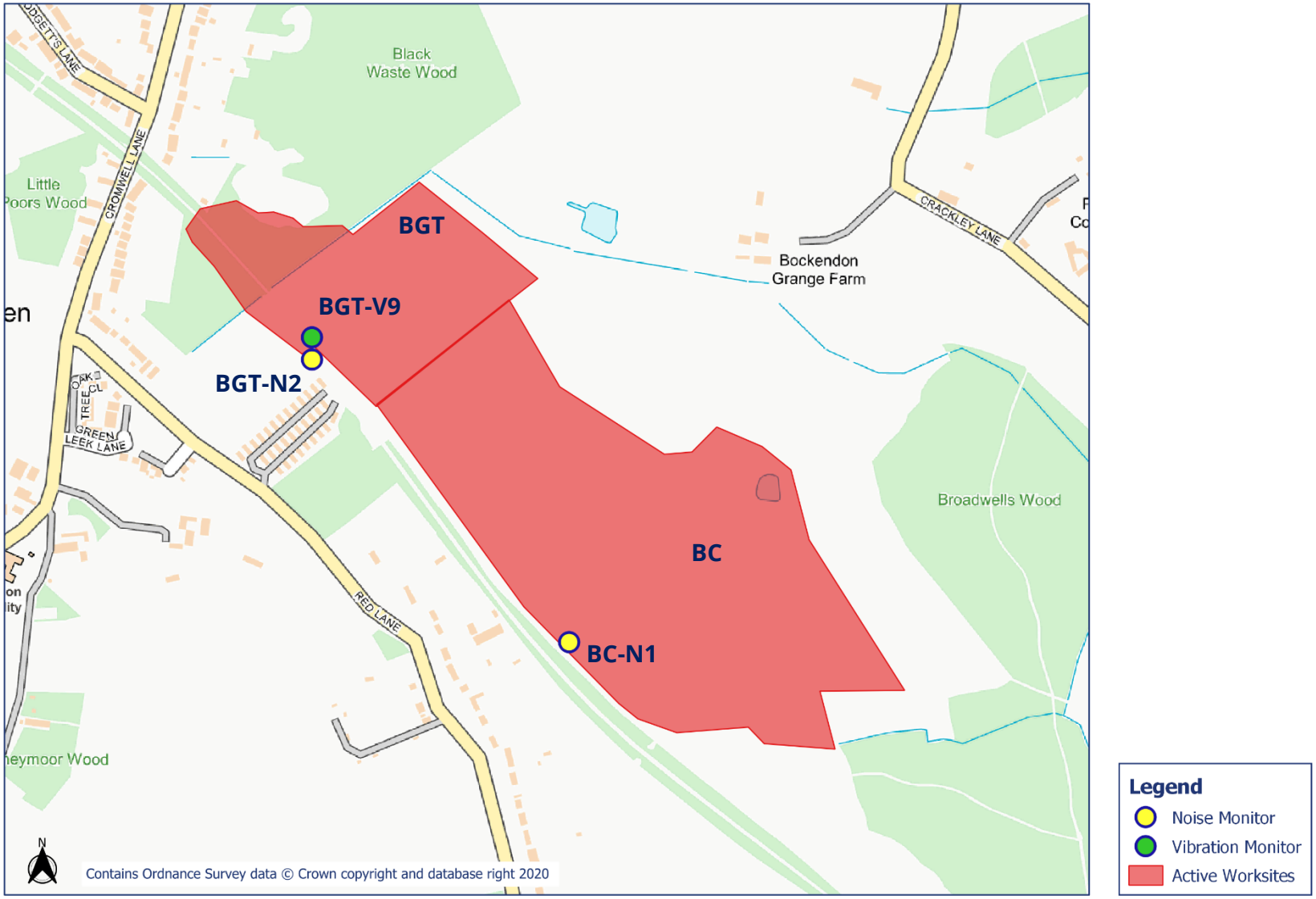


Worksite Identification Plan - 5



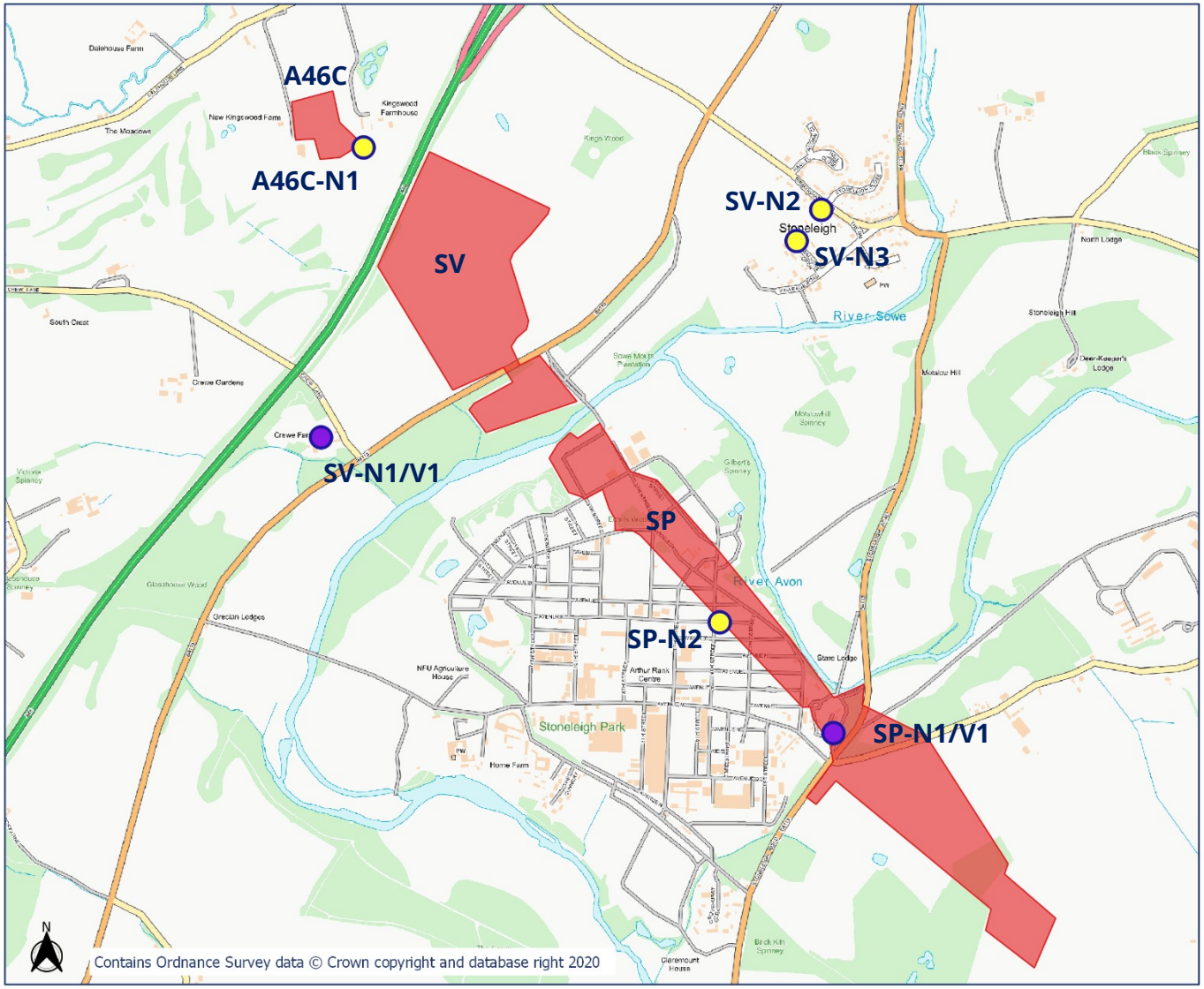
Appendix B Monitoring Locations

Noise and Vibration Monitoring Plan - 1

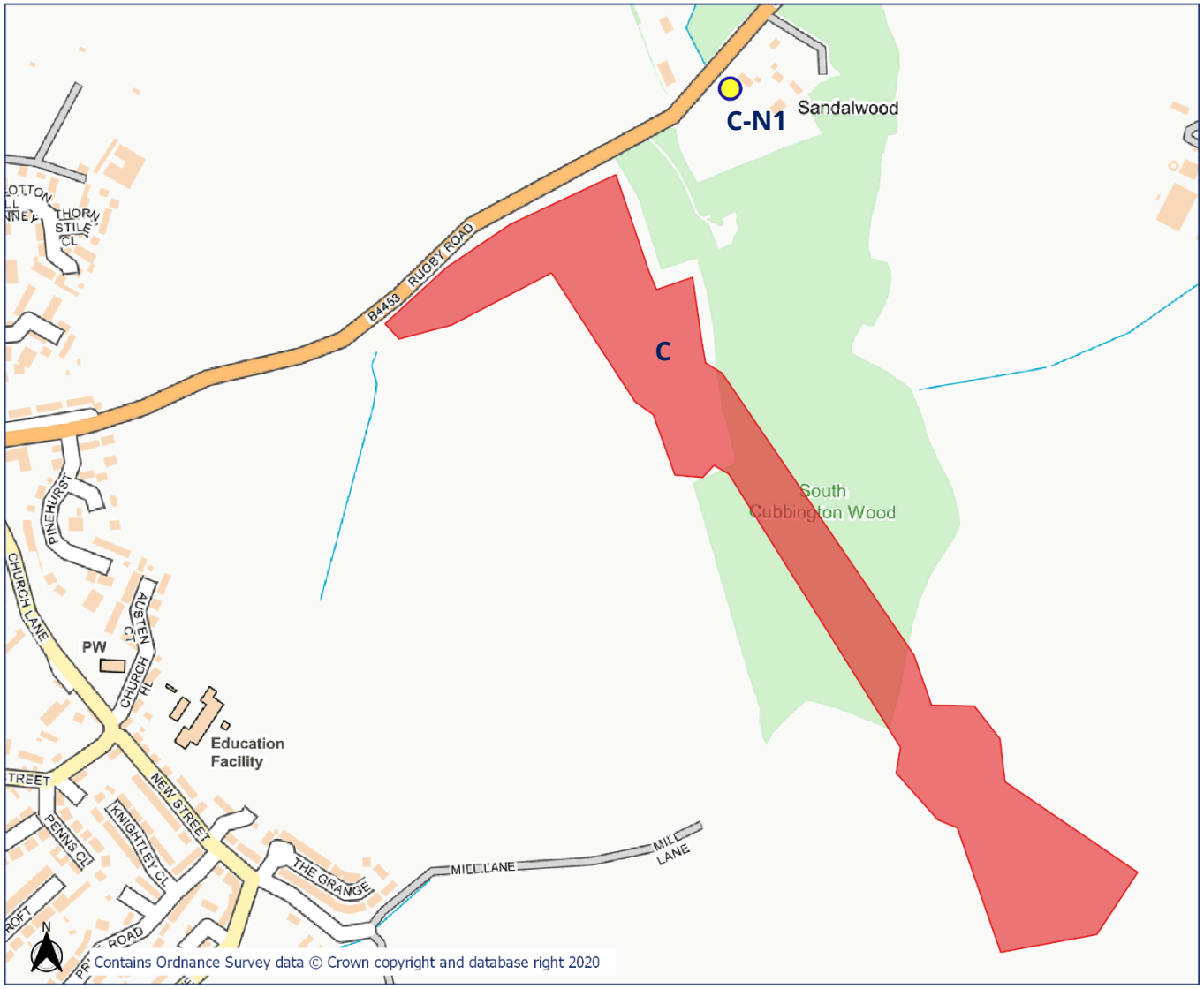


Noise and Vibration Monitoring Plan - 2

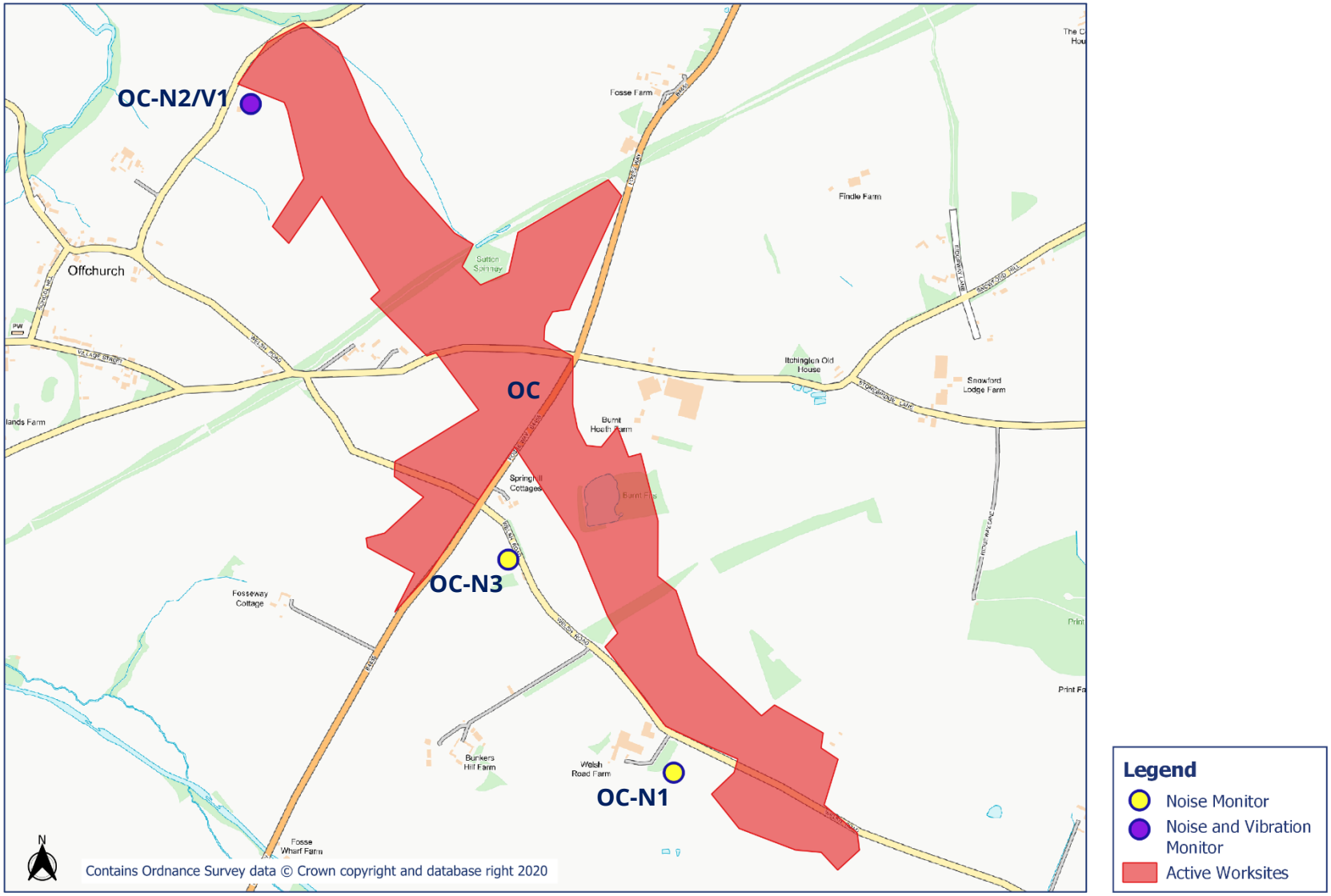
Noise and Vibration Monitoring Plan - 3



HS2 Noise and Vibration Monitoring Plan - 4



Noise and Vibration Monitoring Plan - 5

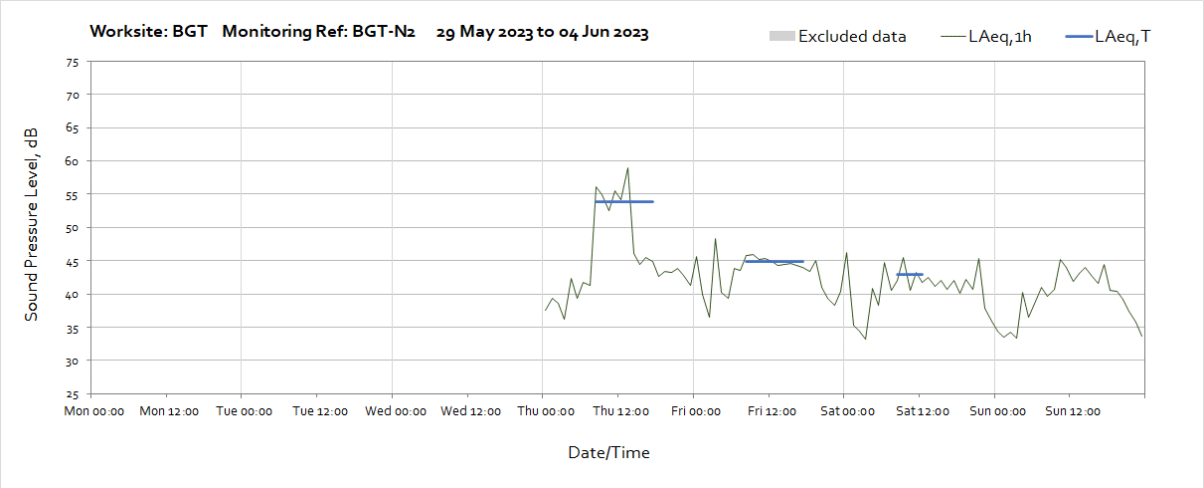


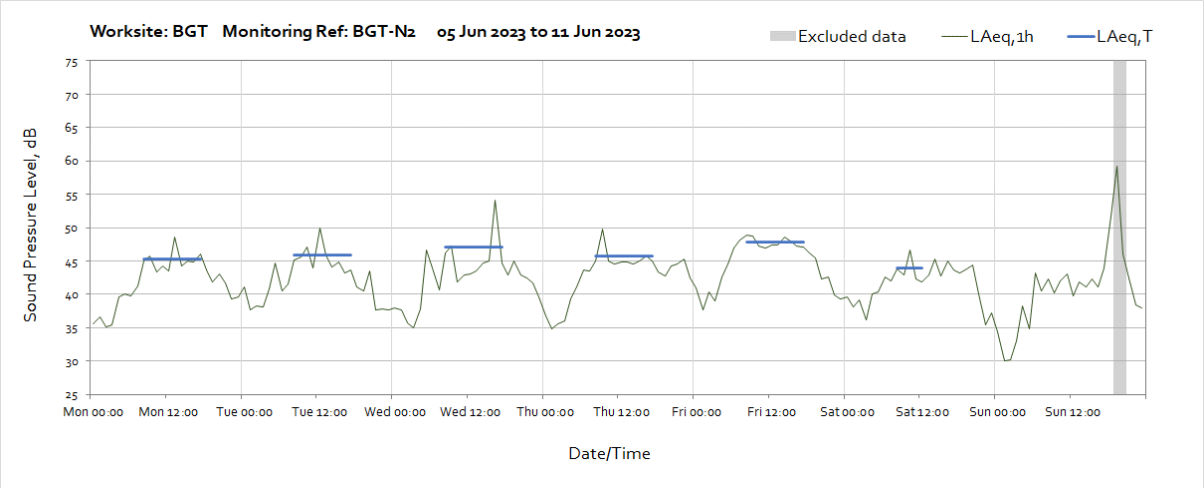
Appendix C Data

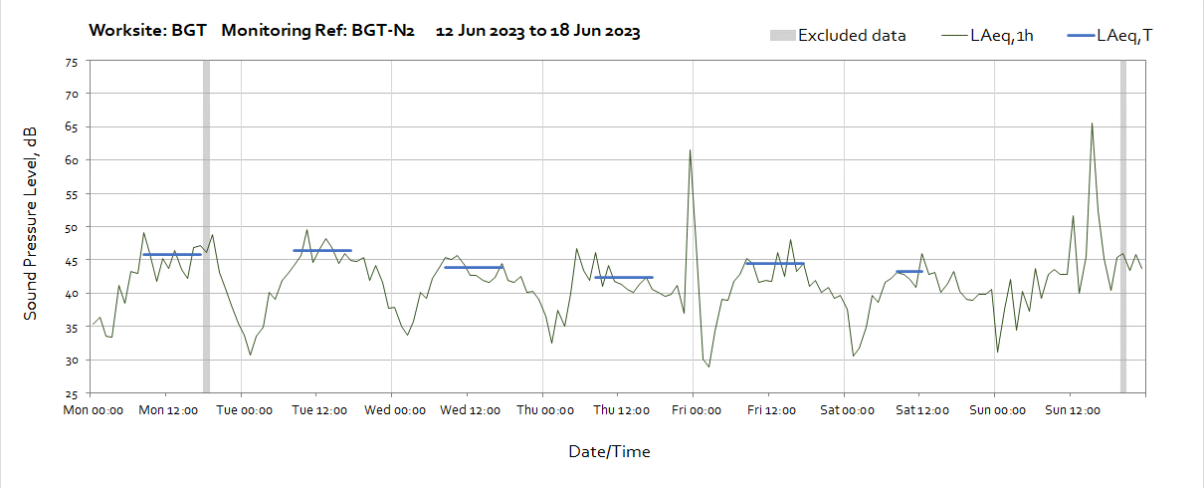
Noise

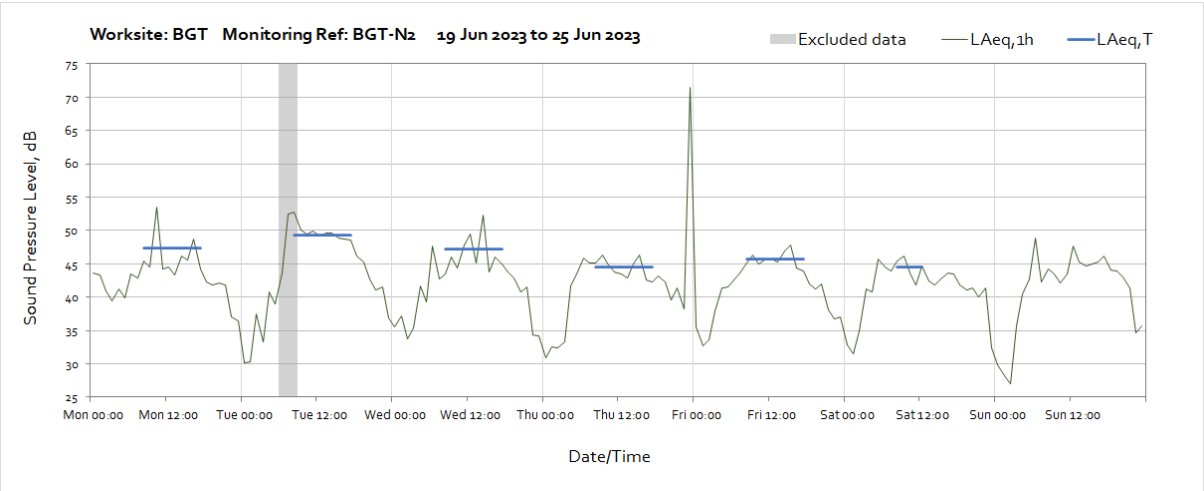
The following graphs show the hourly measured ambient noise level $L_{Aeq,1h}$ and, where relevant, the averaged noise level $L_{Aeq,T}$ values, where the time period T is as specified in Table 1 of HS2 Information Paper E23. Periods with adversely weather affected noise levels are greyed out and have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

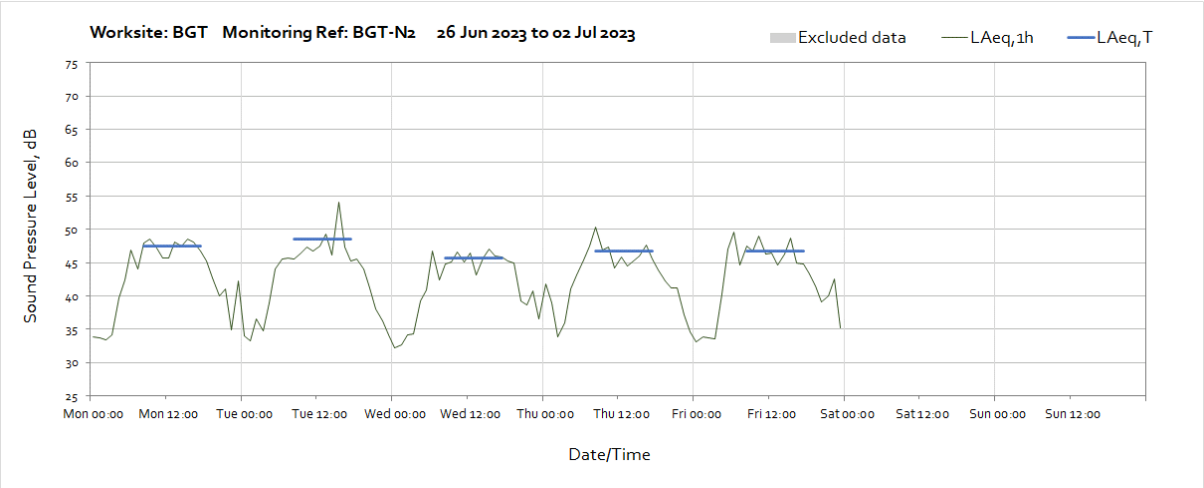
Worksite: BGT – Monitoring Ref: BGT-N2






Worksite: BGT Monitoring Ref: BGT-N2 12 Jun 2023 to 18 Jun 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
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
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-N2 19 Jun 2023 to 25 Jun 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
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
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-N2 26 Jun 2023 to 02 Jul 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
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
Wed 12:00
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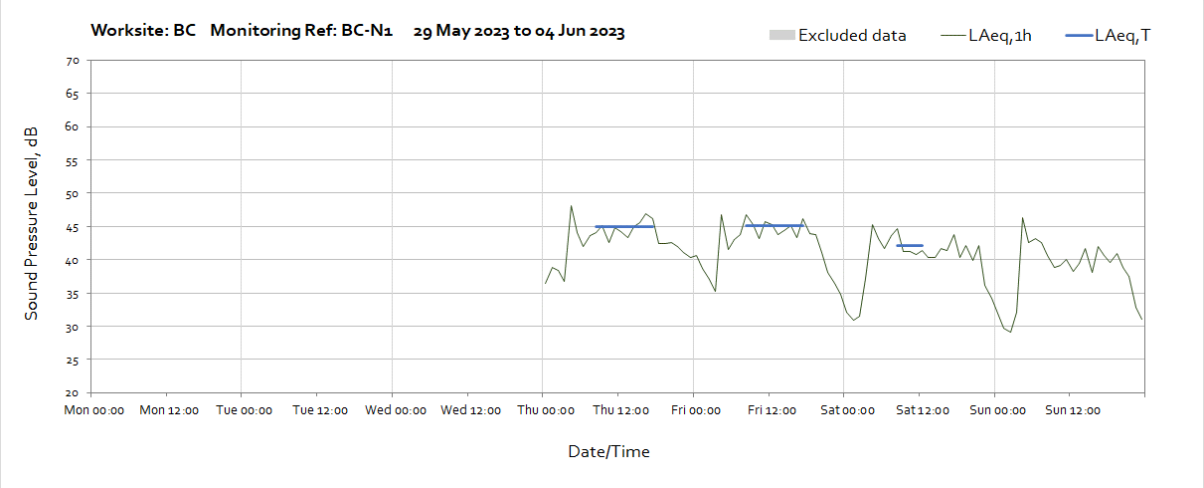
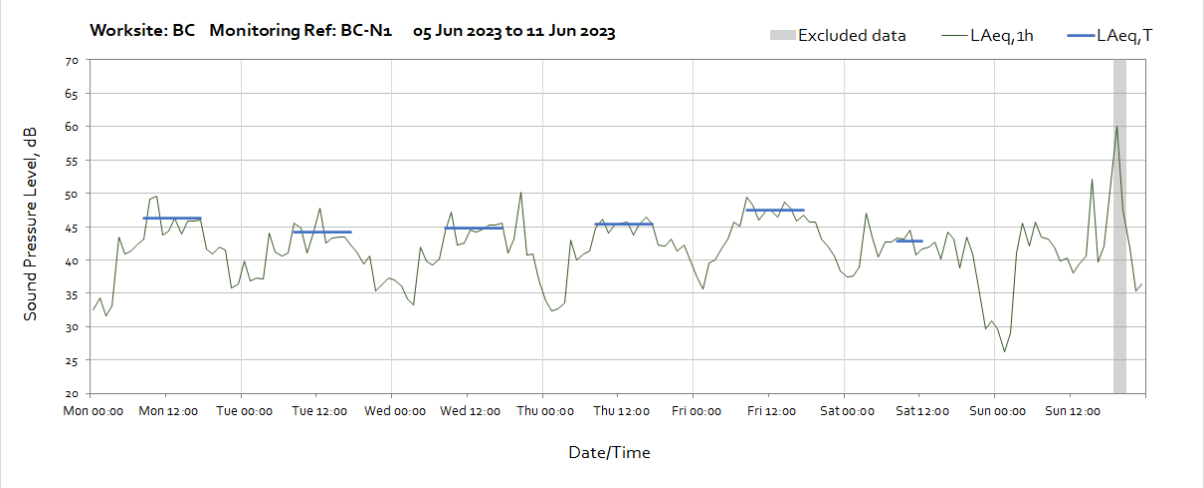
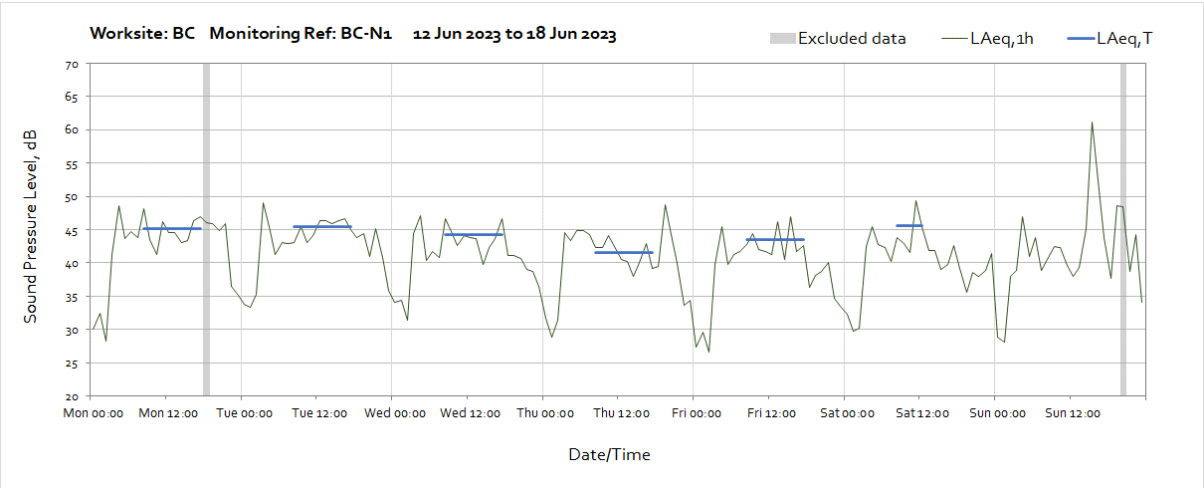
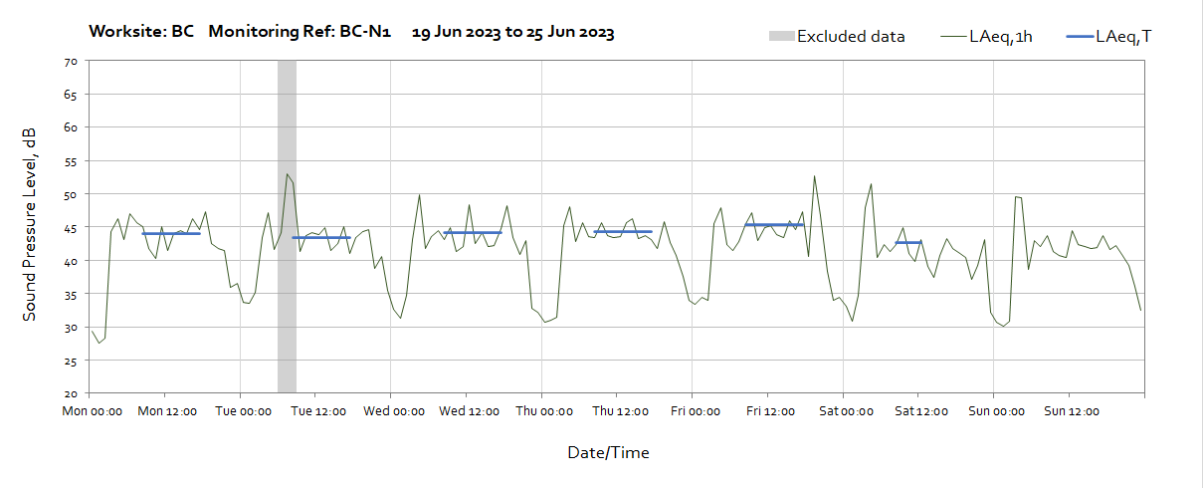
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

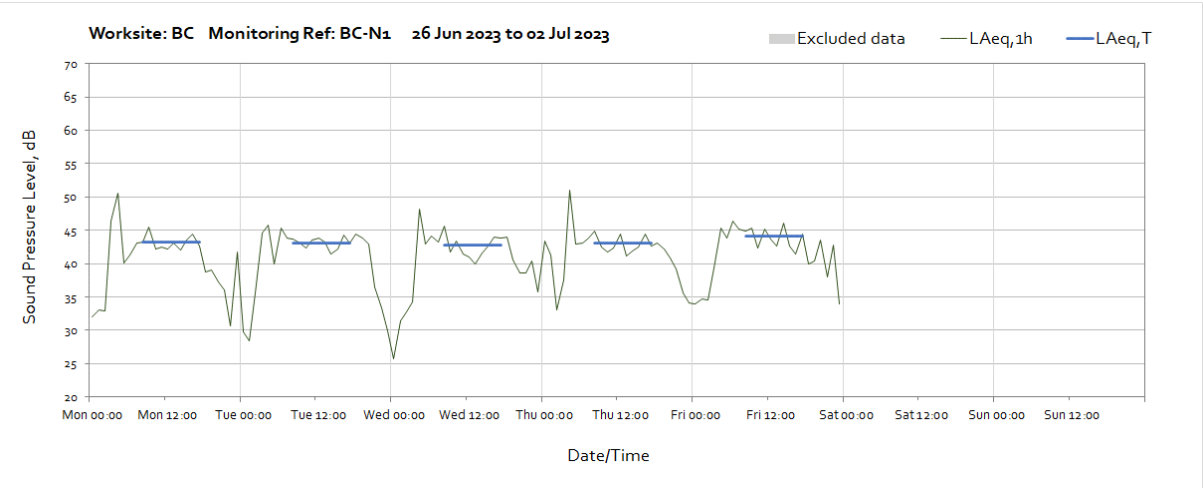
Worksite: BC – Monitoring Ref: BC-N1



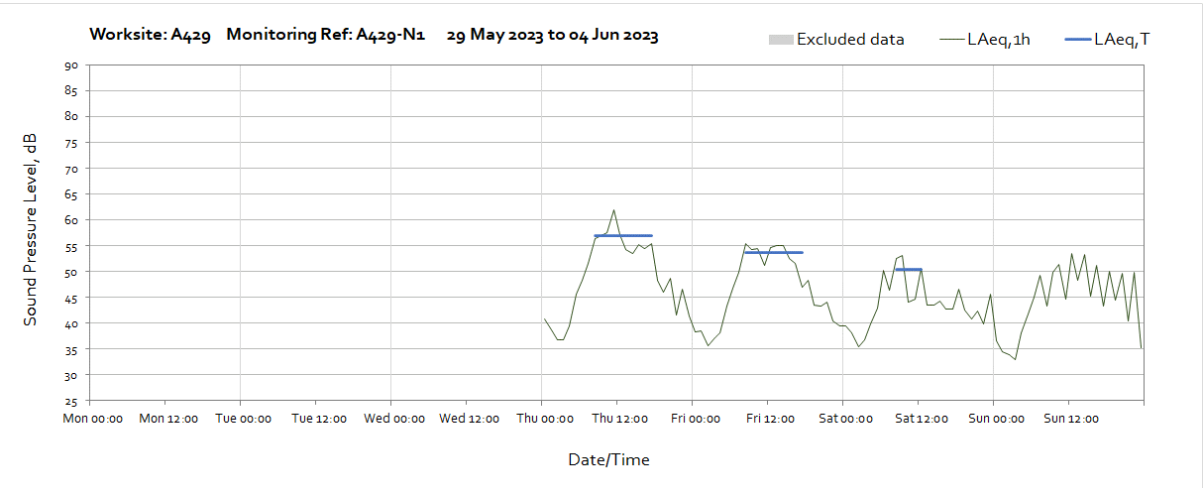


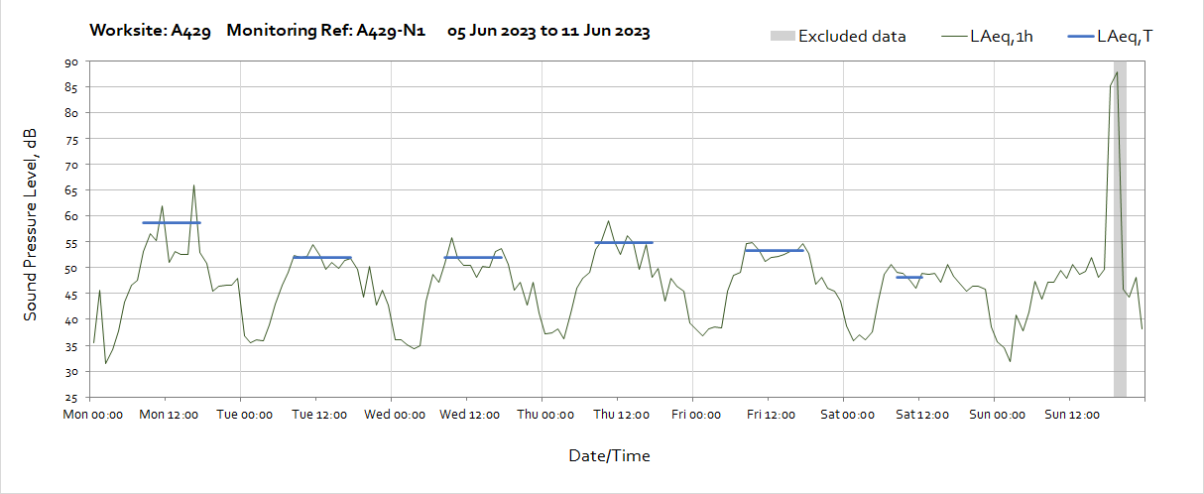






Worksite: A429 – Monitoring Ref: A429-N1




Worksite: A429 Monitoring Ref: A429-N1 05 Jun 2023 to 11 Jun 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
90
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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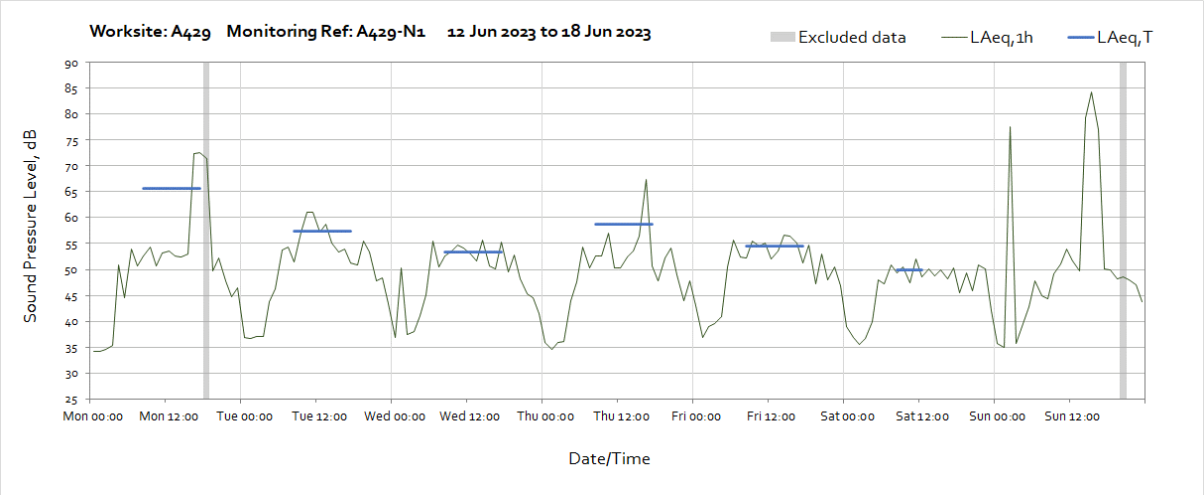
Sun 00:00
Sun 12:00
Date/Time


Worksite: A429 Monitoring Ref: A429-N1 12 Jun 2023 to 18 Jun 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
90
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
Wed 12:00
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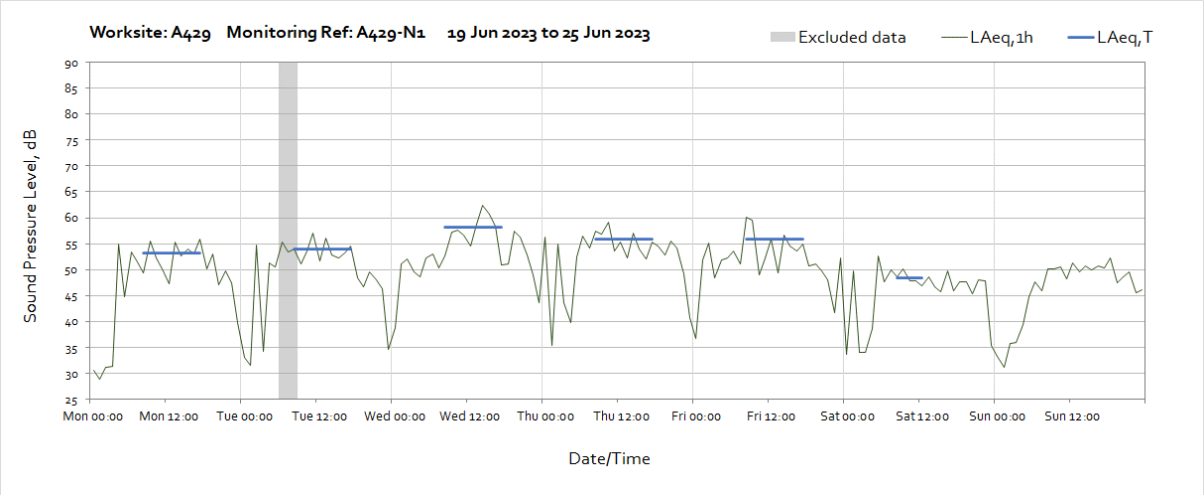
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time


Worksite: A429 Monitoring Ref: A429-N1 19 Jun 2023 to 25 Jun 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
90
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
Wed 12:00
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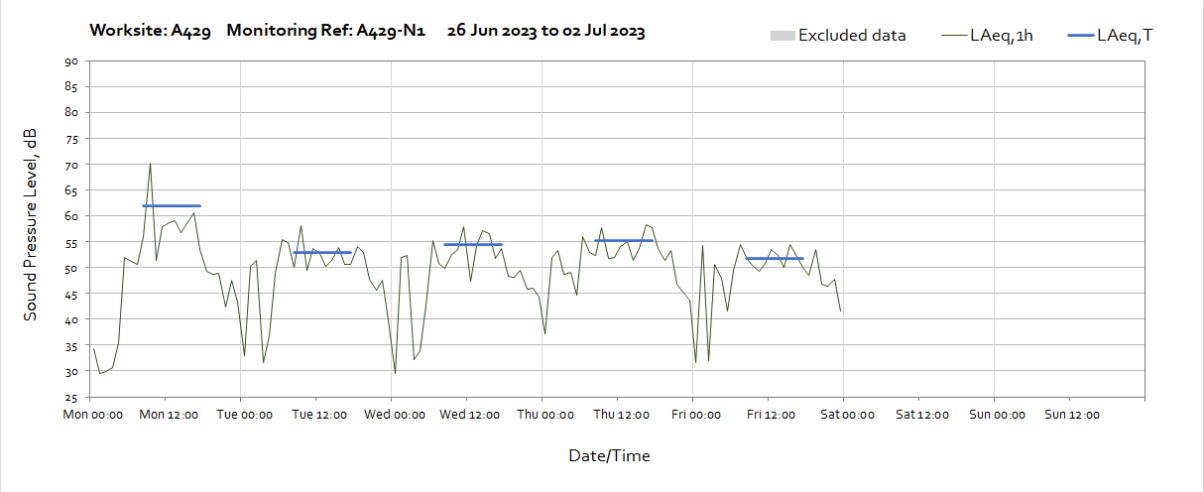
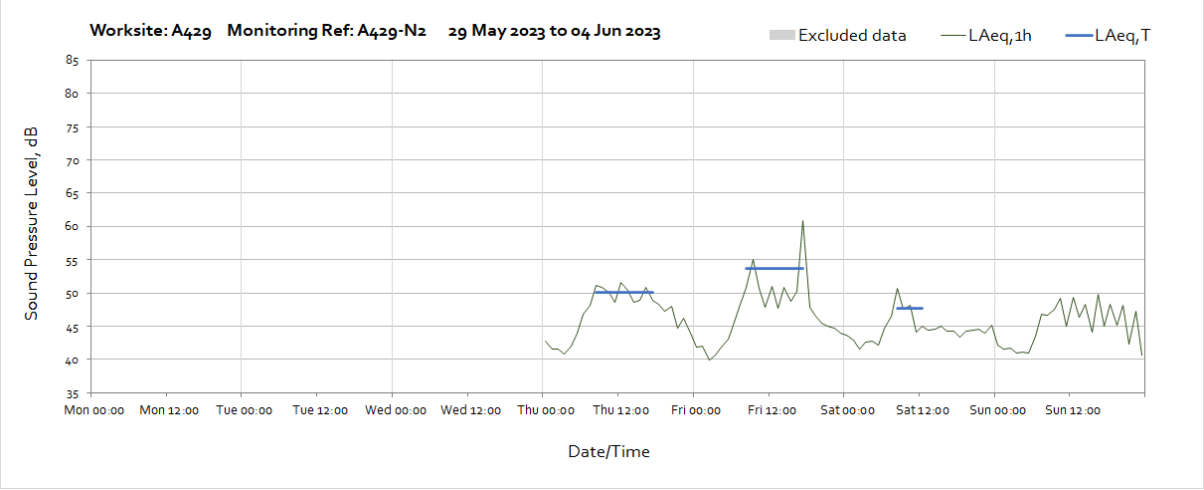
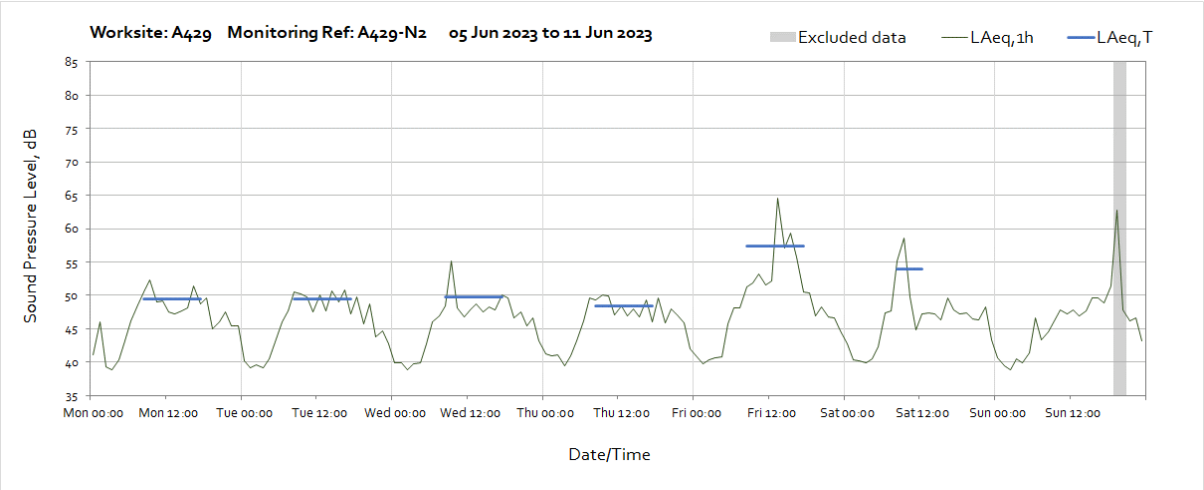
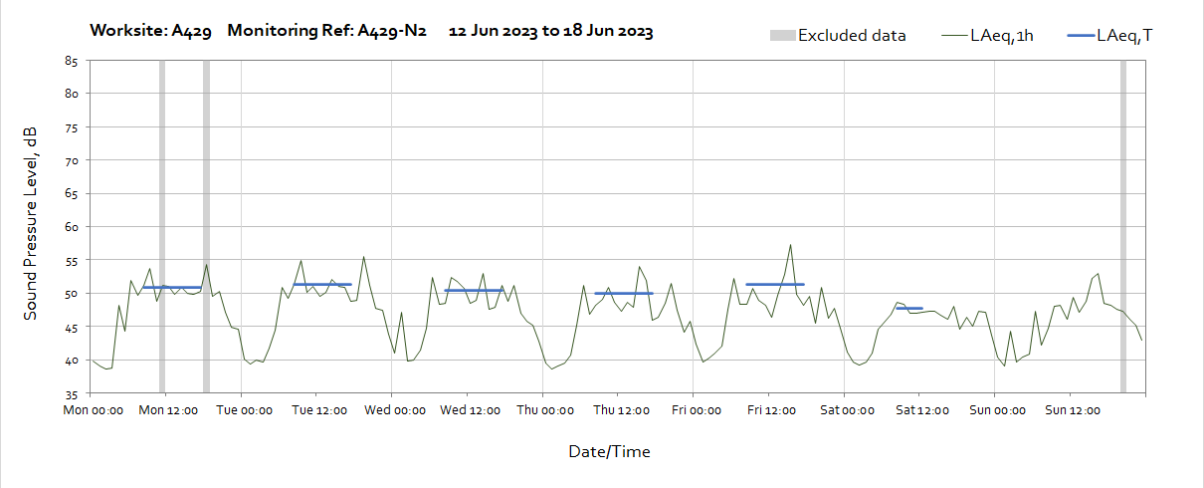
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time



Worksite: A429 – Monitoring Ref: A429-N2






Worksite: A429 Monitoring Ref: A429-N2 12 Jun 2023 to 18 Jun 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
85
80
75
70
65
60
55
50
45
40
35
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
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Sun 00:00
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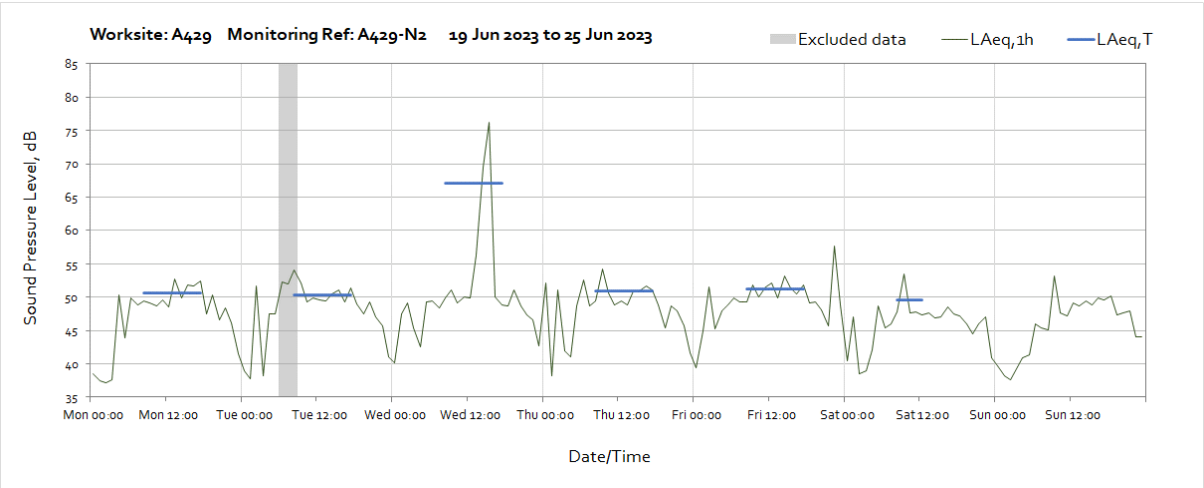
Date/Time


Worksite: A429 Monitoring Ref: A429-N2 19 Jun 2023 to 25 Jun 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
85
80
75
70
65
60
55
50
45
40
35
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
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Fri 12:00
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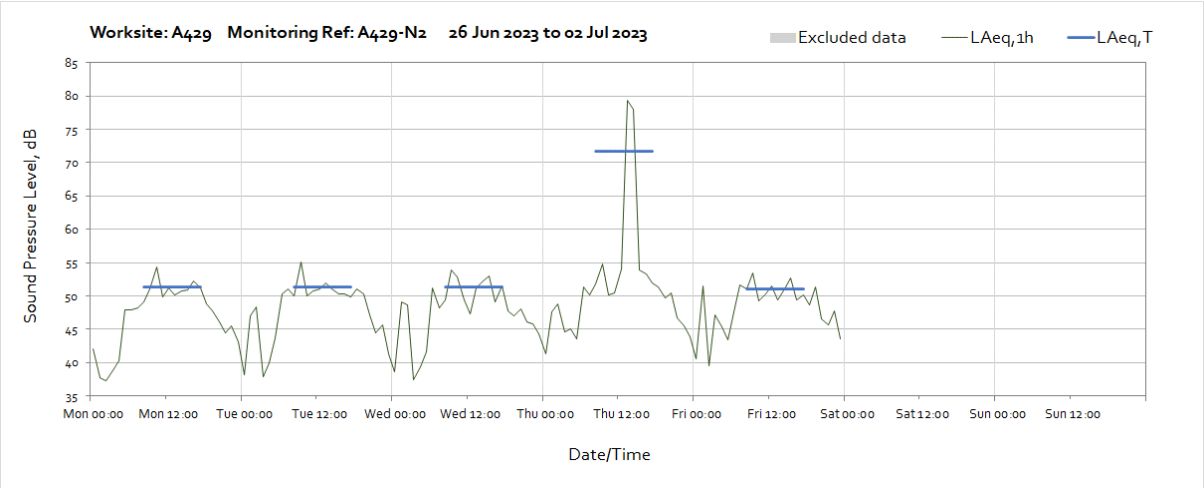
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time


Worksite: A429 Monitoring Ref: A429-N2 26 Jun 2023 to 02 Jul 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
85
80
75
70
65
60
55
50
45
40
35
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
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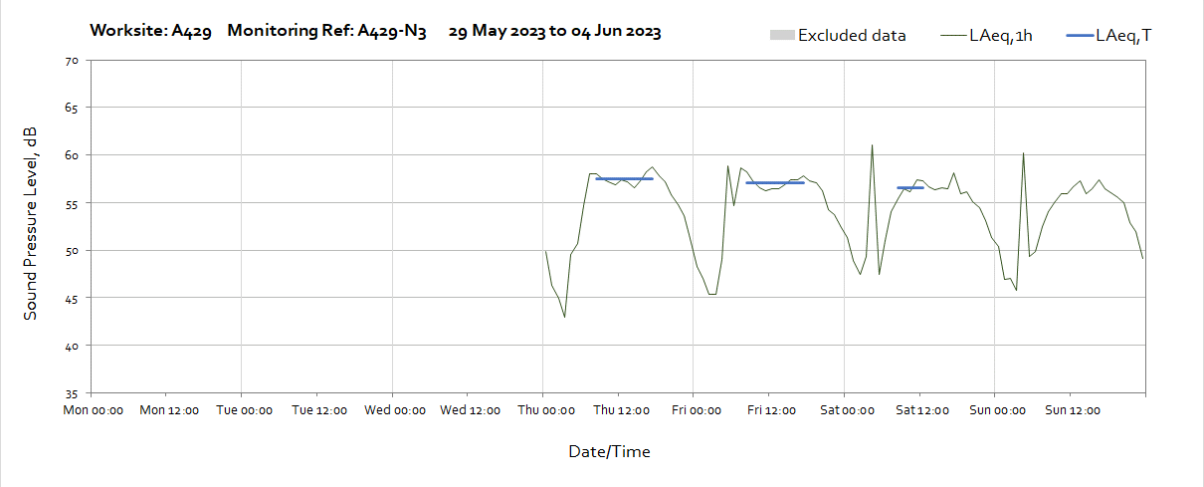
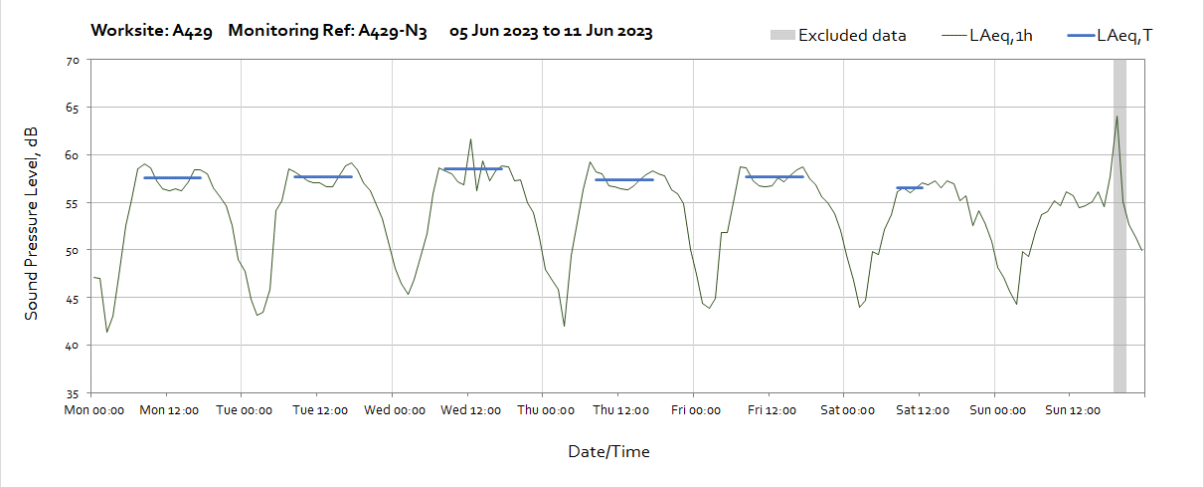
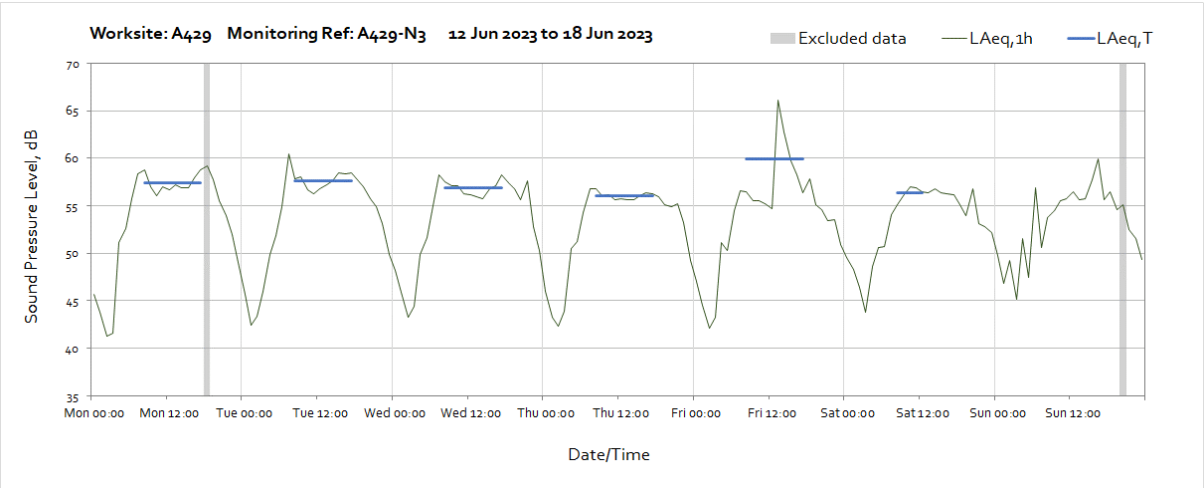
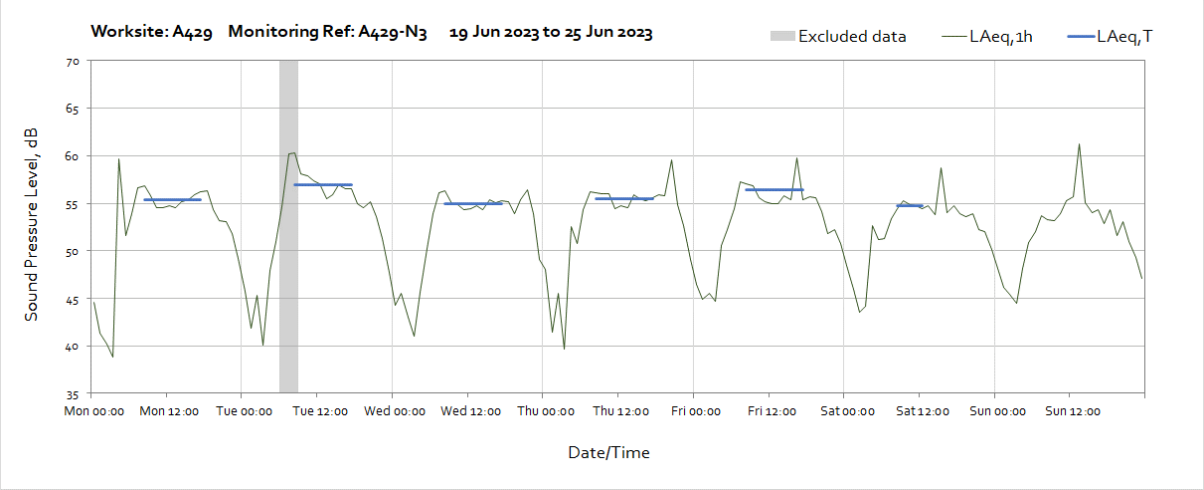
Sun 00:00
Sun 12:00
Date/Time

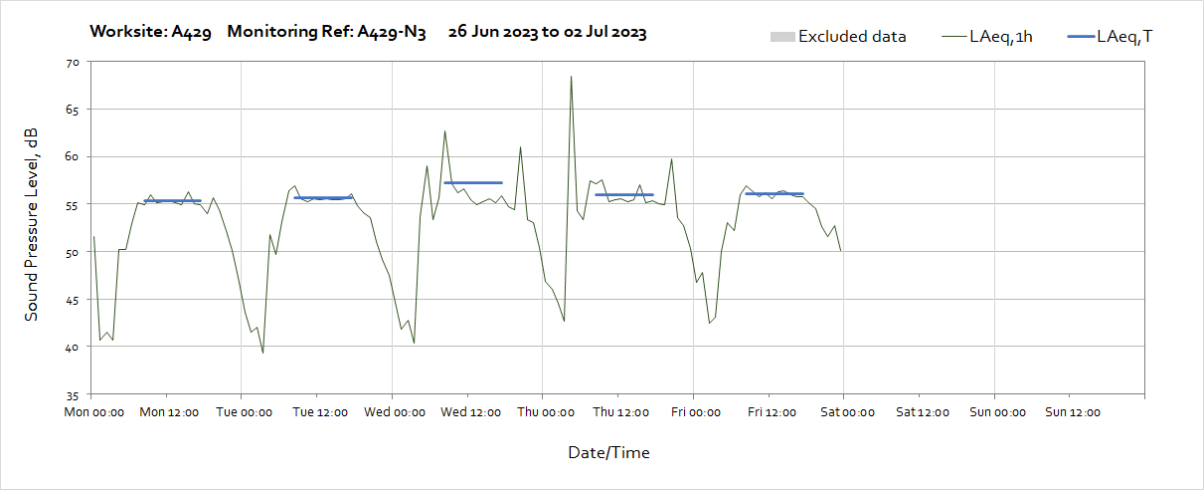
Worksite: A429 – Monitoring Ref: A429-N3



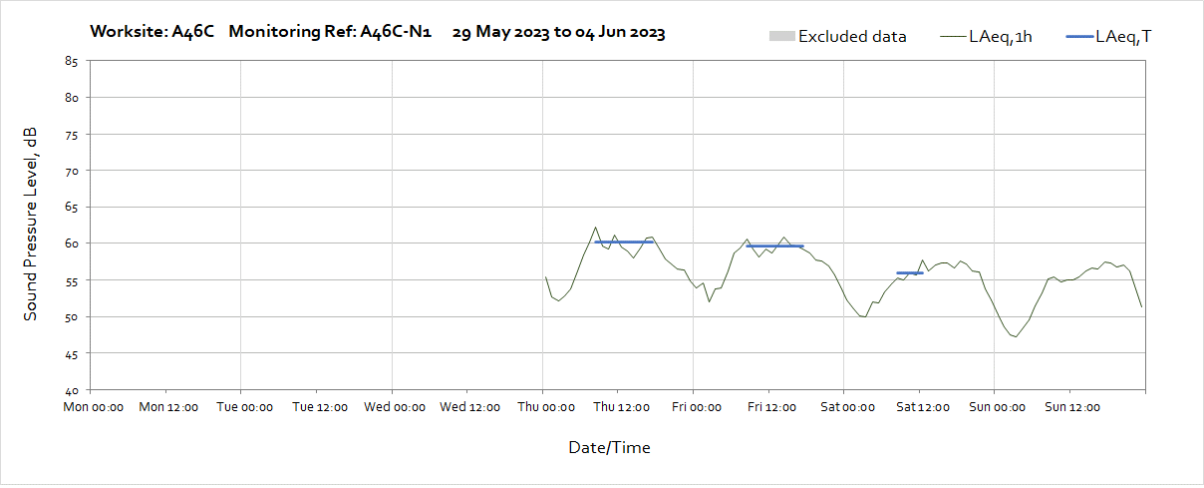


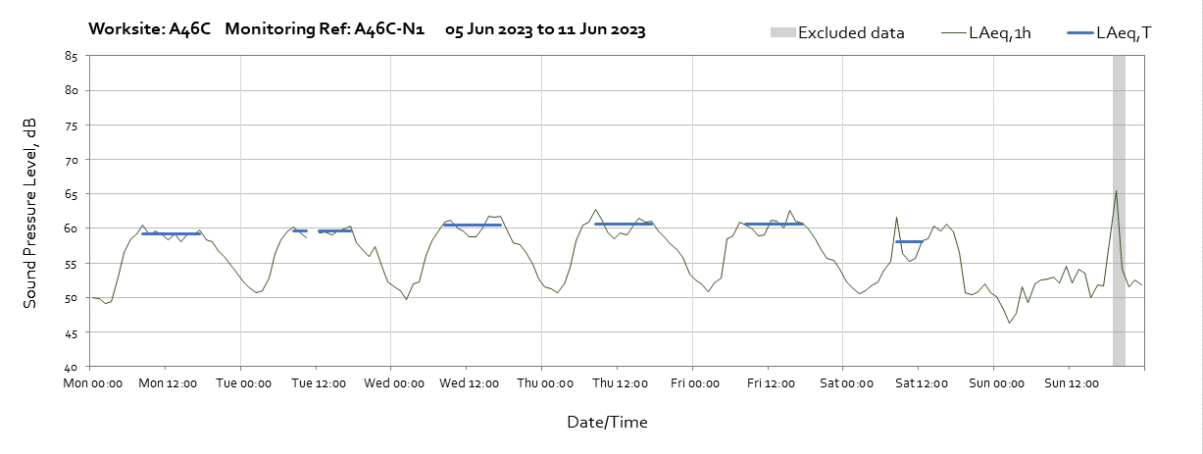




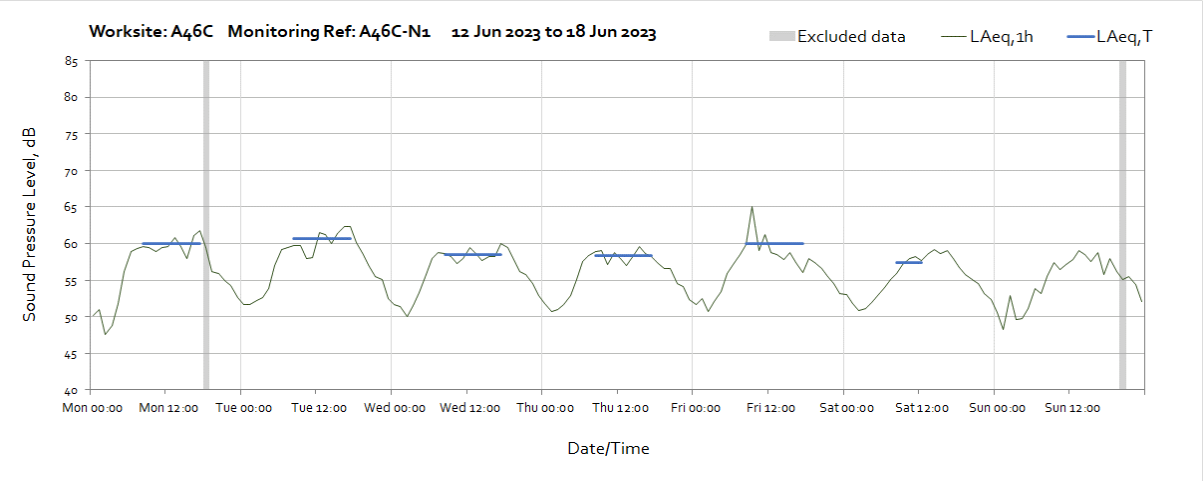


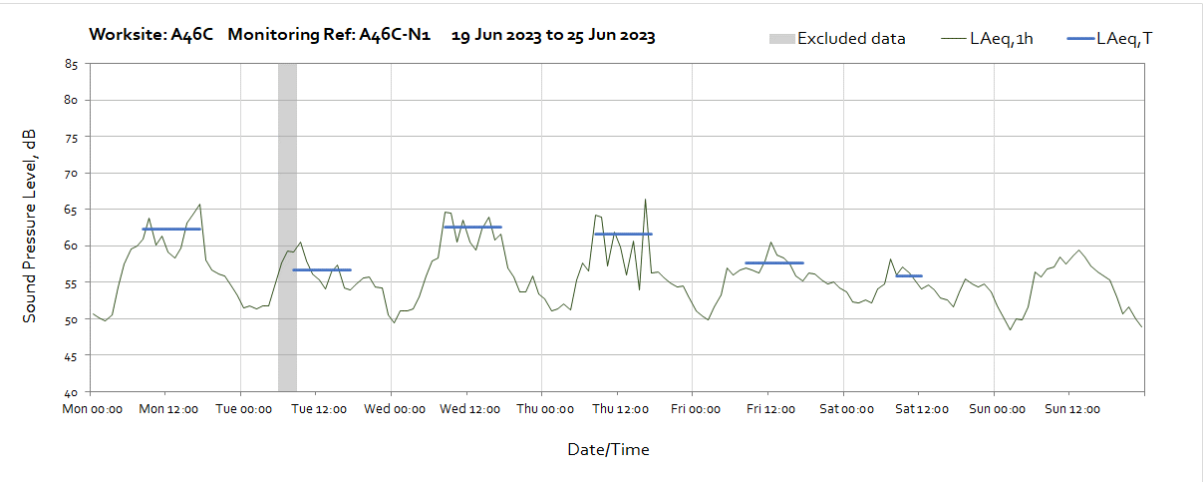
Worksite: A46C – Monitoring Ref: A46C-N1

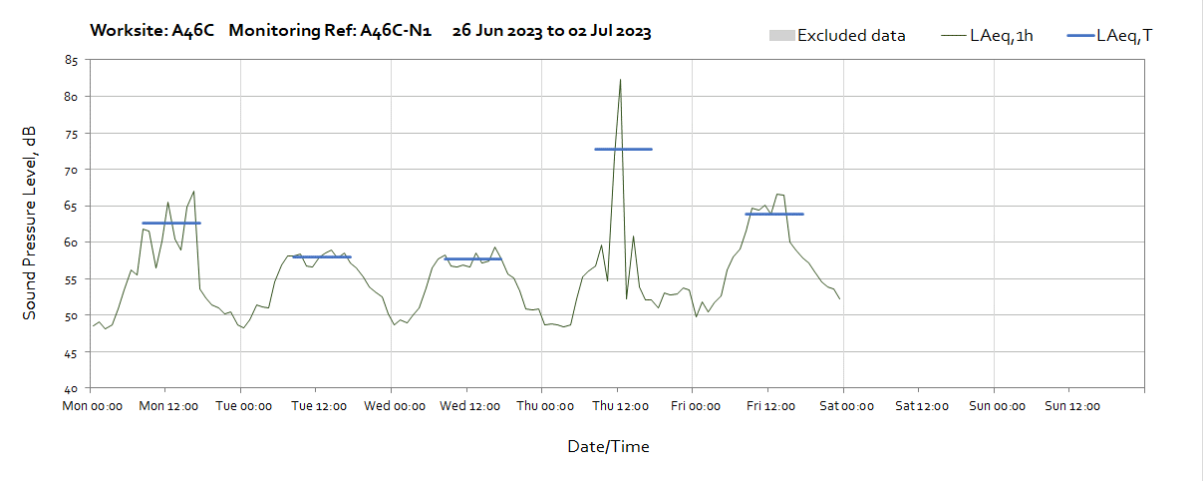




Note: Missing data from 11:00 on Tuesday 6th June to 12:00 on Tuesday 6th June was due to the meter being changed.



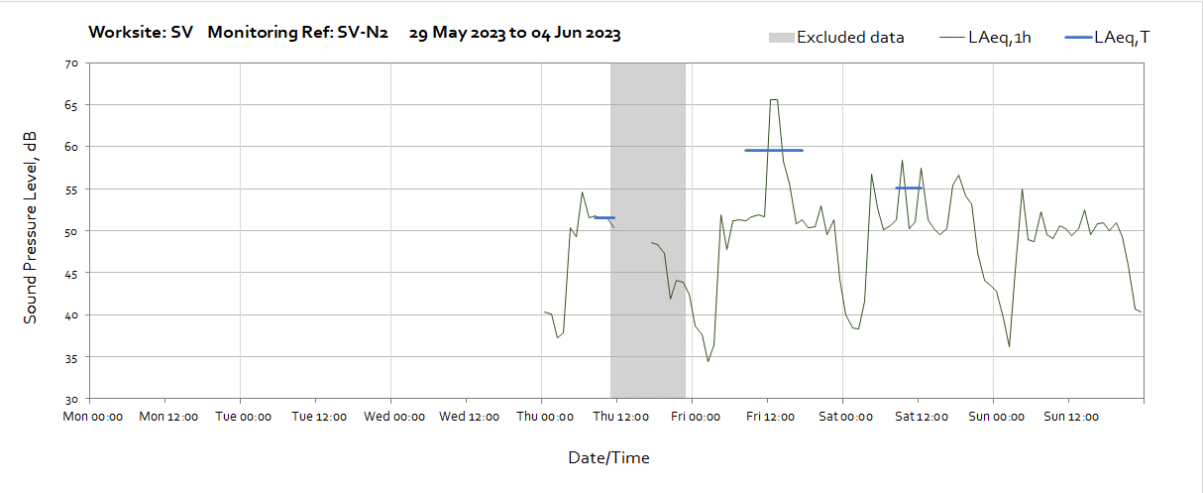




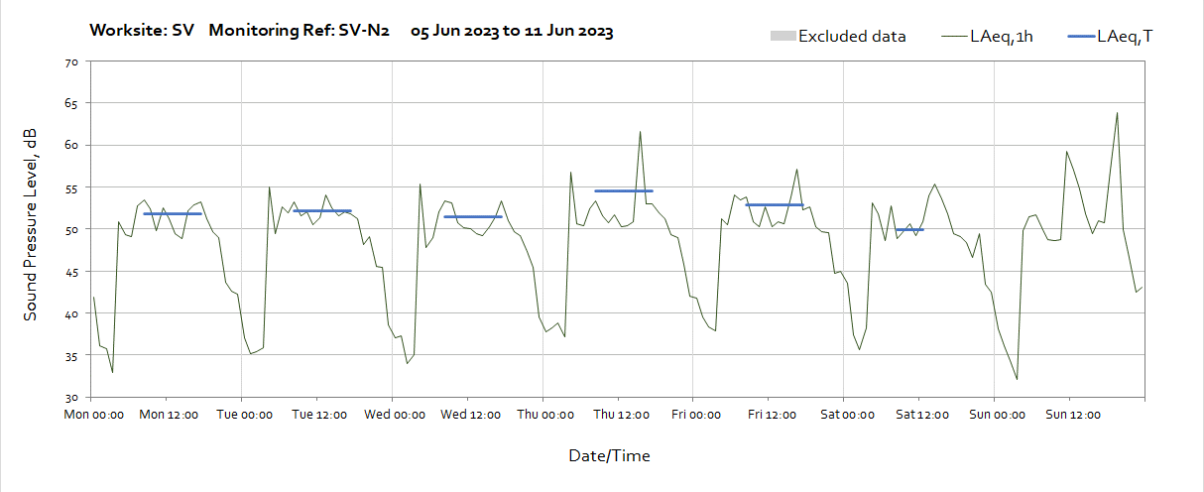
Worksite: SV – Monitoring Ref: SV-N1

Note: Missing data for the entire month was due to a power issue arising from difficulty in accessing the monitor.

Worksite: SV – Monitoring Ref: SV-N2



Note: Partially missing data from 11:00 on Thursday 1st June to 23:00 on Thursday 1st June was due to monitor failure because of water in the case protecting the meter.


Worksite: SV Monitoring Ref: SV-N2 05 Jun 2023 to 11 Jun 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
70
65
60
55
50
45
40
35
30
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
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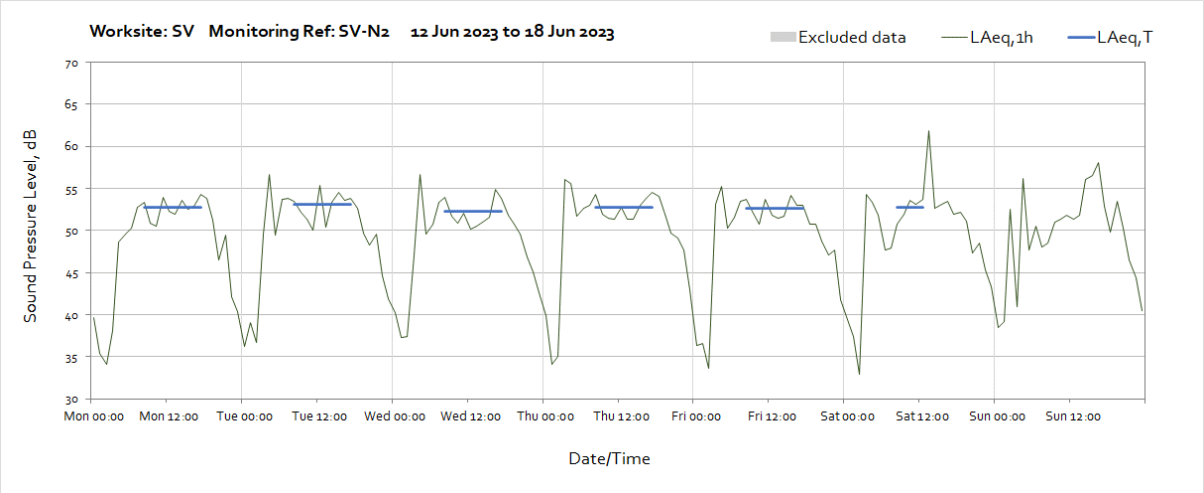
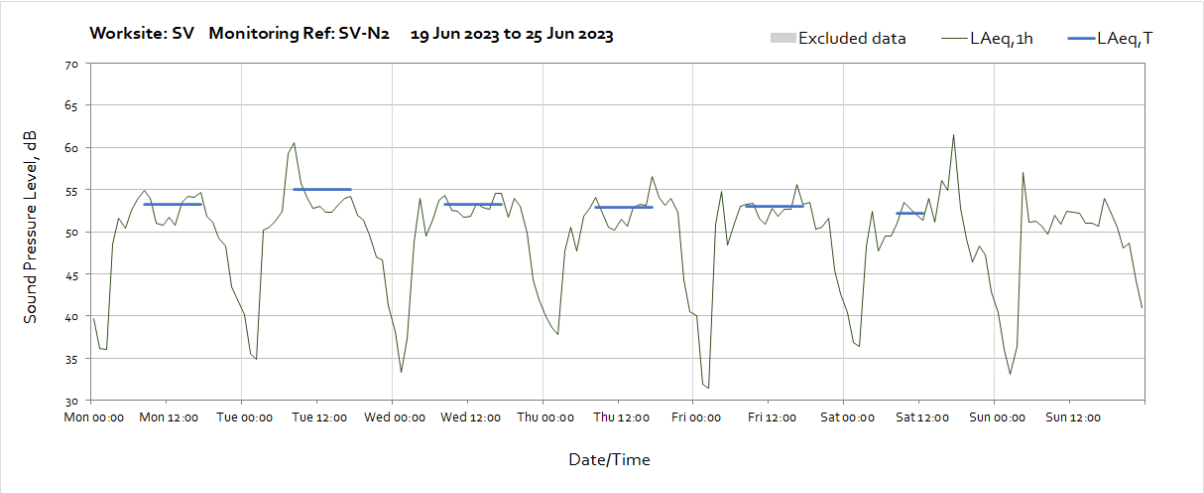
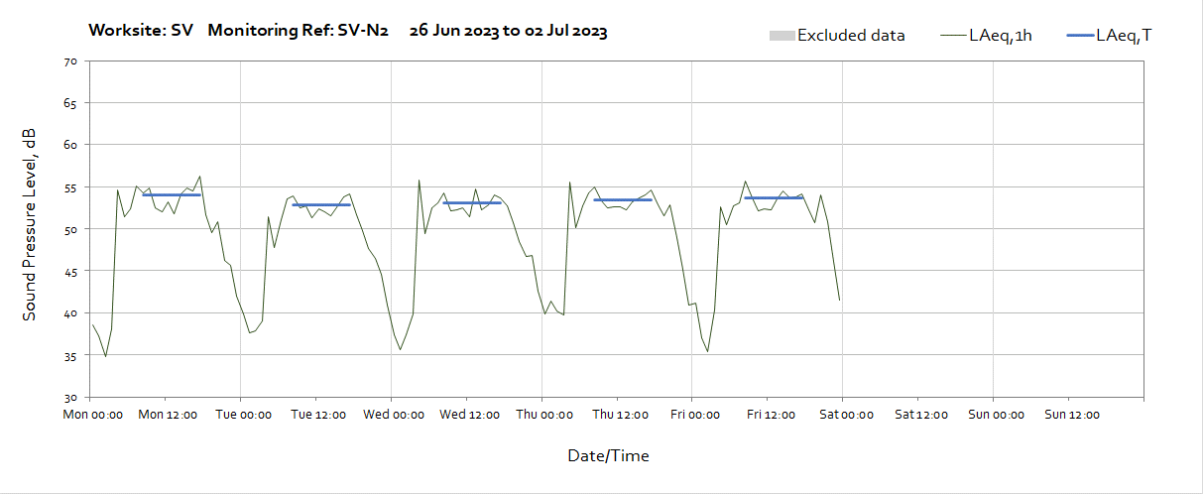
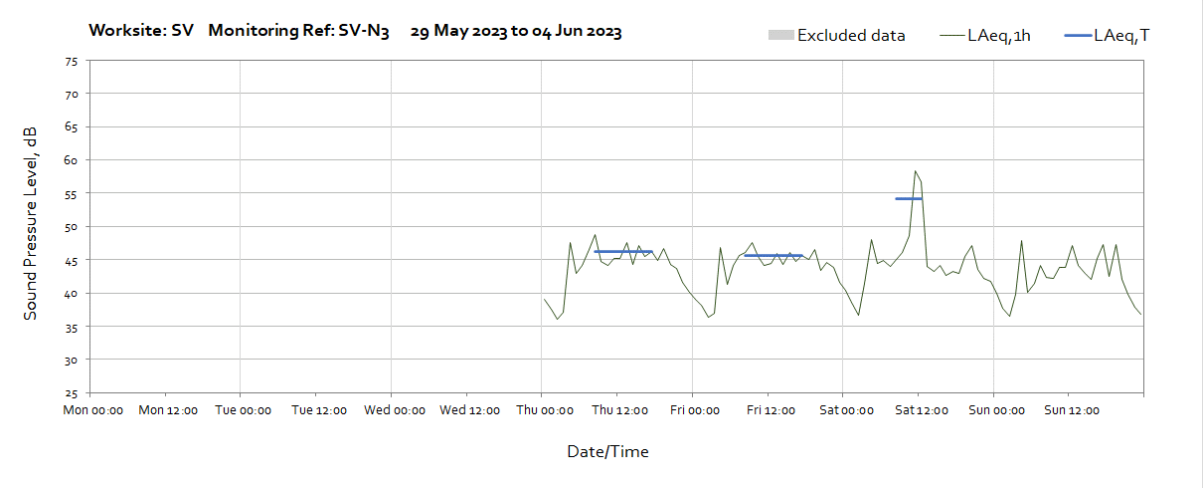
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

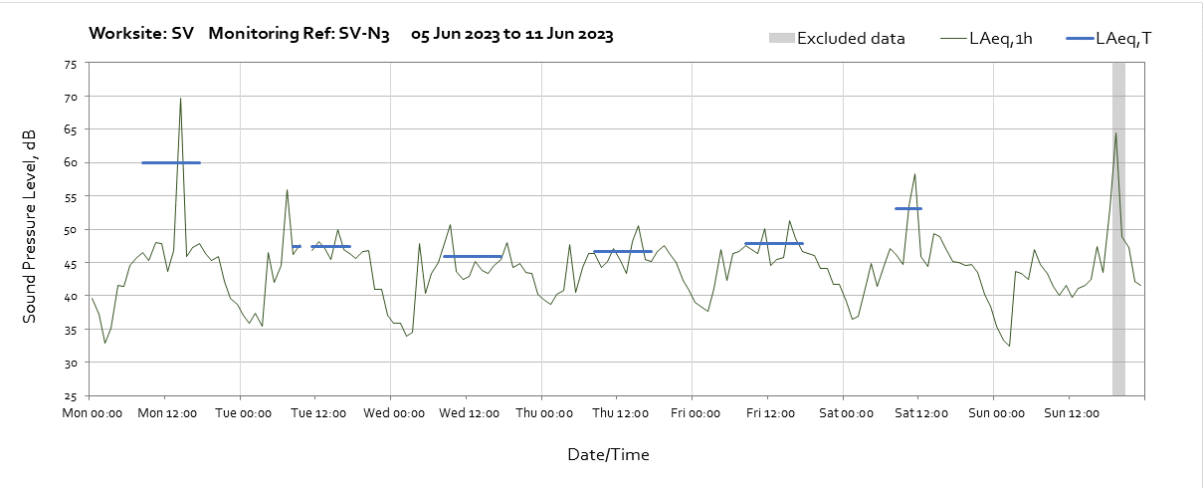

Worksite: SV Monitoring Ref: SV-N2 12 Jun 2023 to 18 Jun 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
70
65
60
55
50
45
40
35
30
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time


Worksite: SV Monitoring Ref: SV-N2 19 Jun 2023 to 25 Jun 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
70
65
60
55
50
45
40
35
30
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

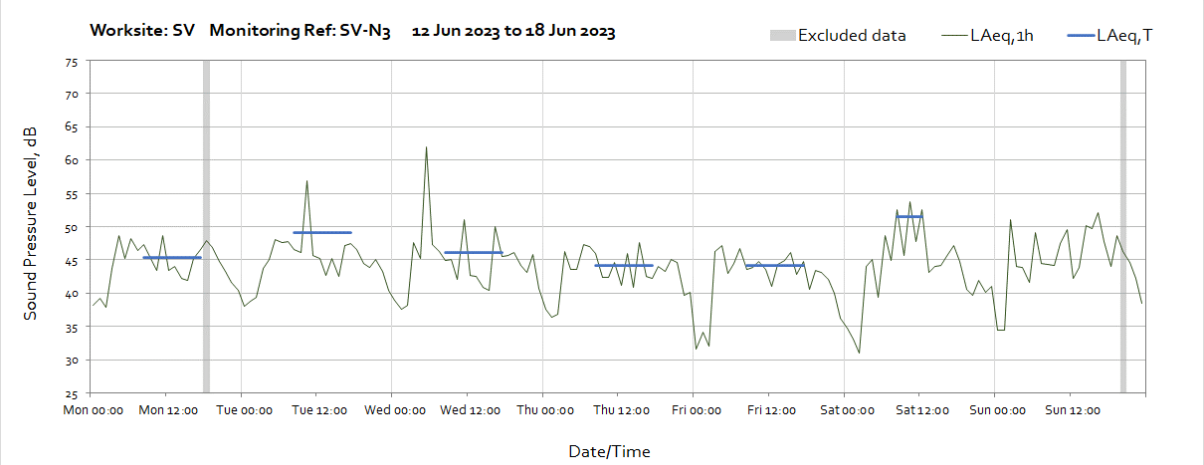


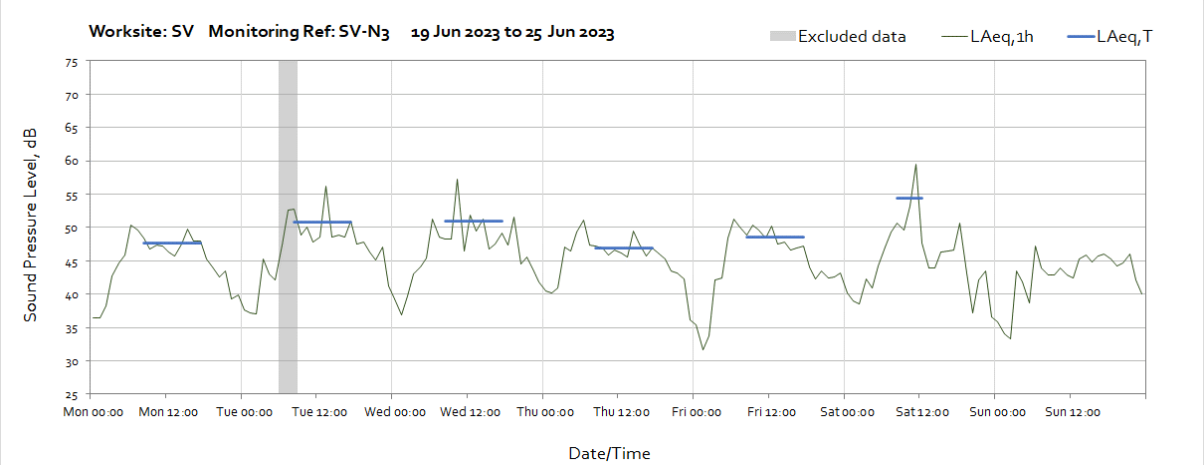
Worksite: SV – Monitoring Ref: SV-N3

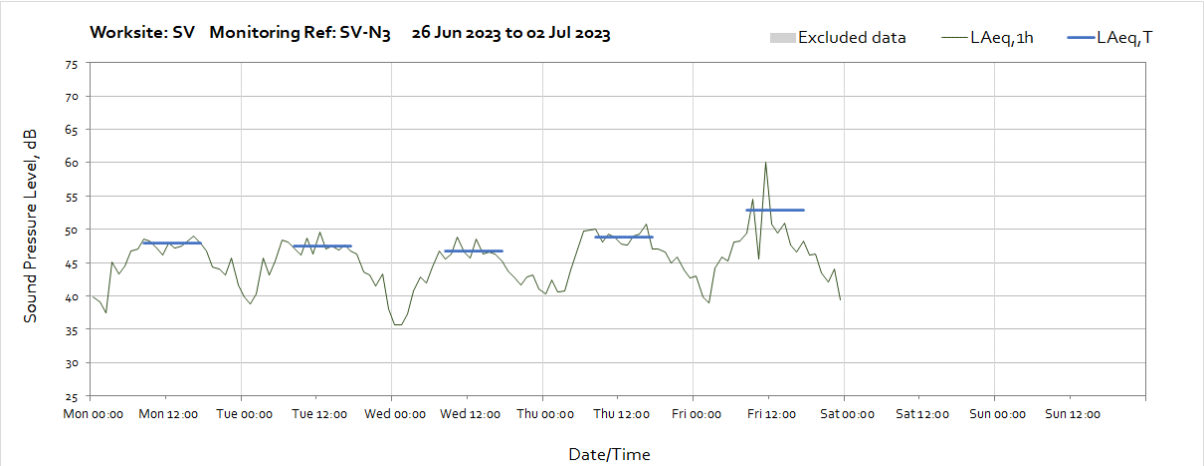




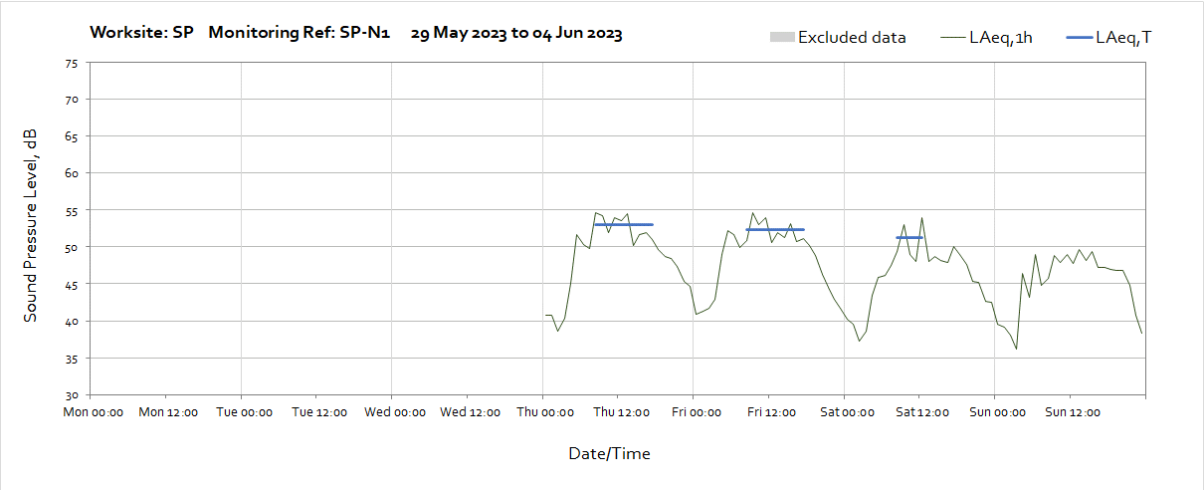
Note: Missing data from 10:00 on Tuesday 6th June to 11:00 on Tuesday 6th June was due to the meter being calibrated.

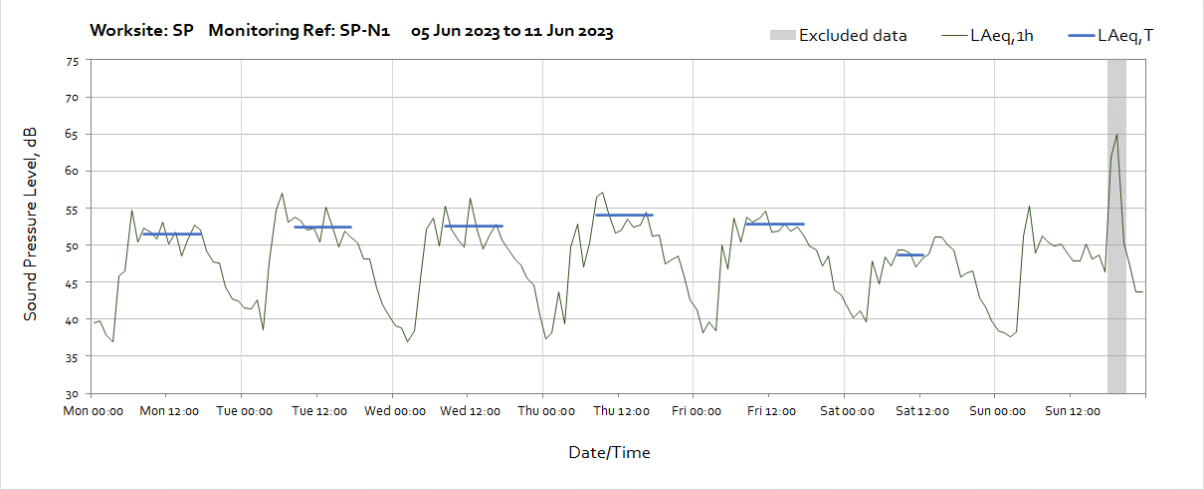

Worksite: SV Monitoring Ref: SV-N3 12 Jun 2023 to 18 Jun 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
75
70
65
60
55
50
45
40
35
30
25
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

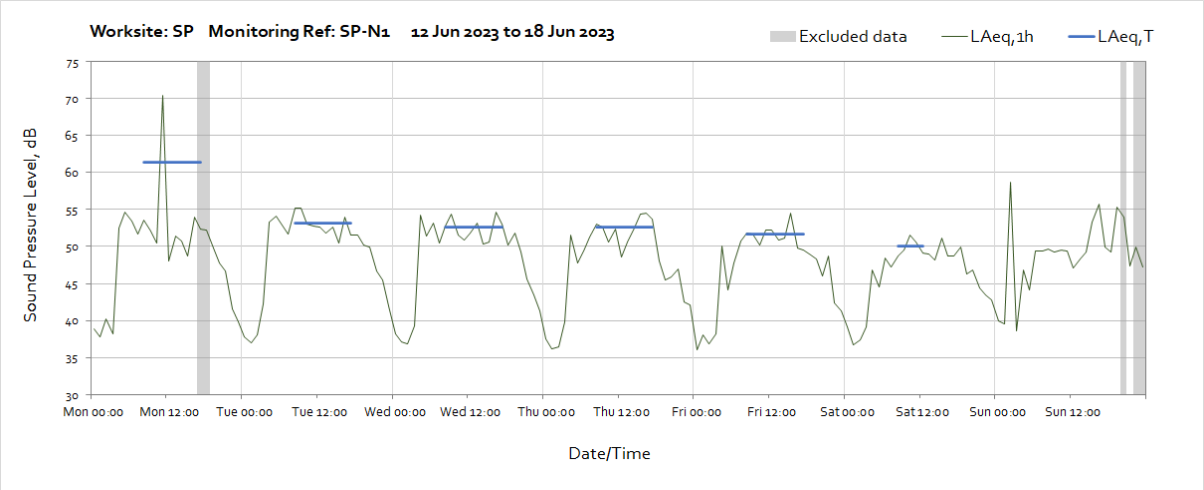

Worksite: SV Monitoring Ref: SV-N3 19 Jun 2023 to 25 Jun 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
75
70
65
60
55
50
45
40
35
30
25
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

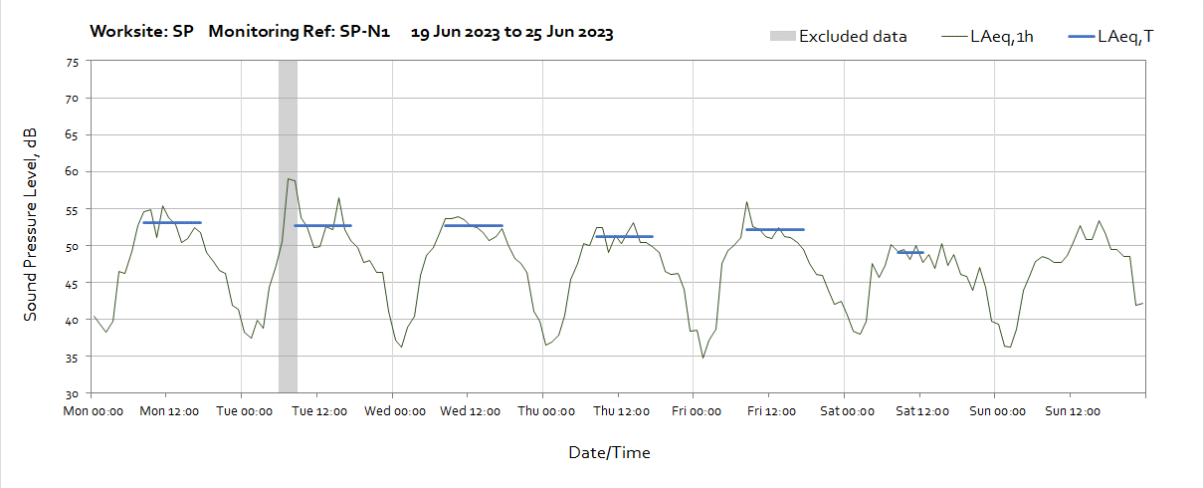

Worksite: SV Monitoring Ref: SV-N3 26 Jun 2023 to 02 Jul 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
75
70
65
60
55
50
45
40
35
30
25
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

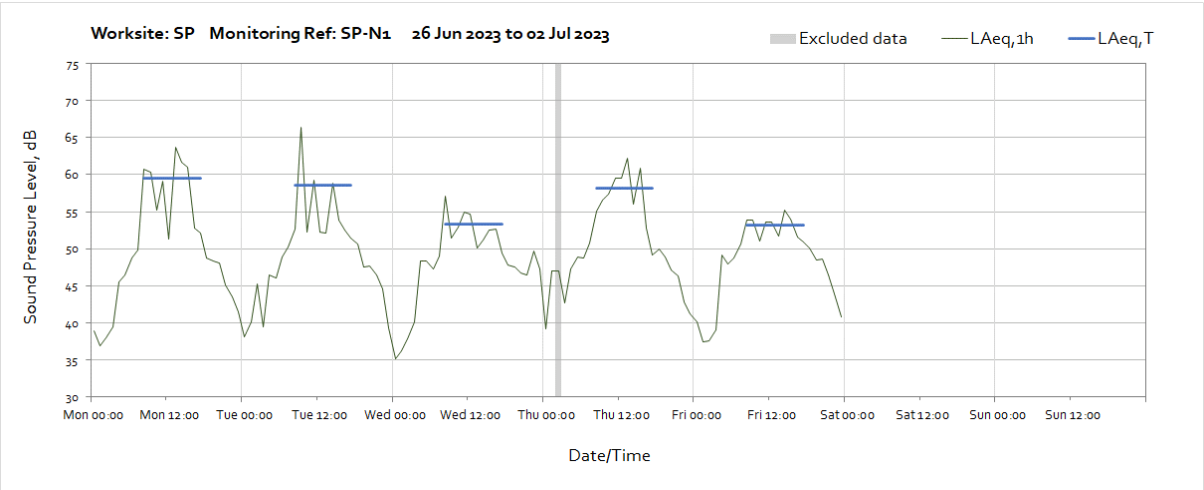
Worksite: SP – Monitoring Ref: SP-N1



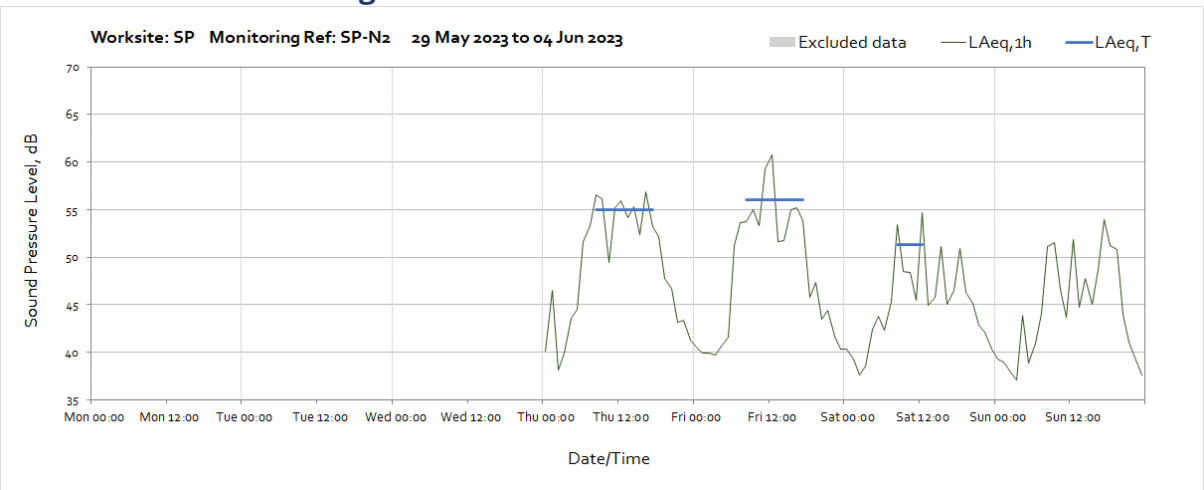


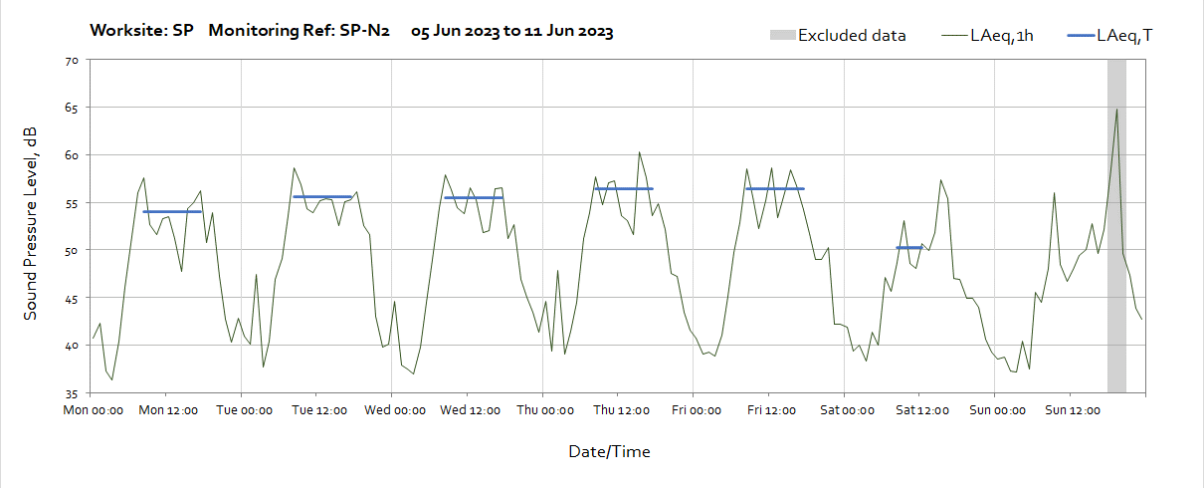


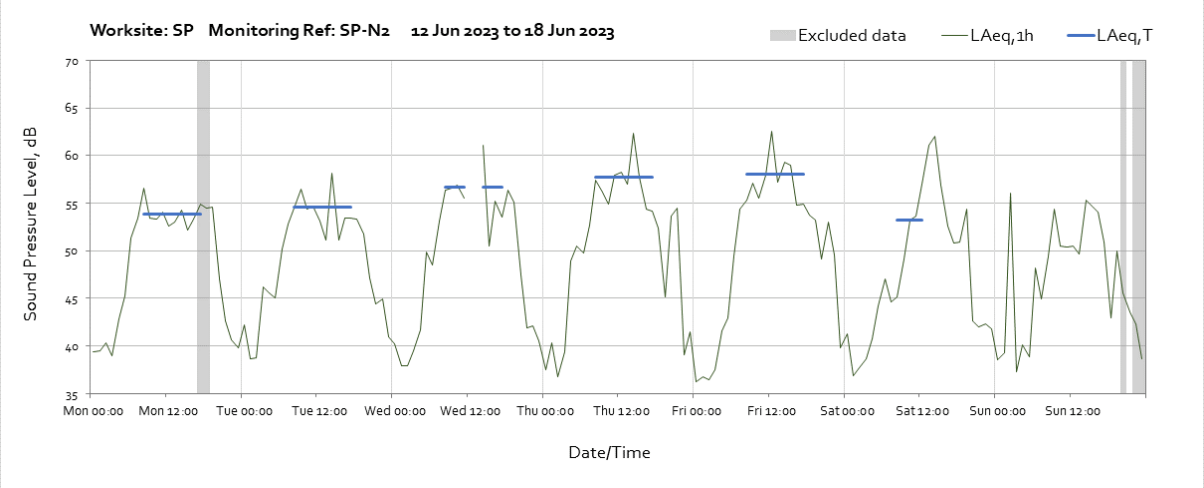




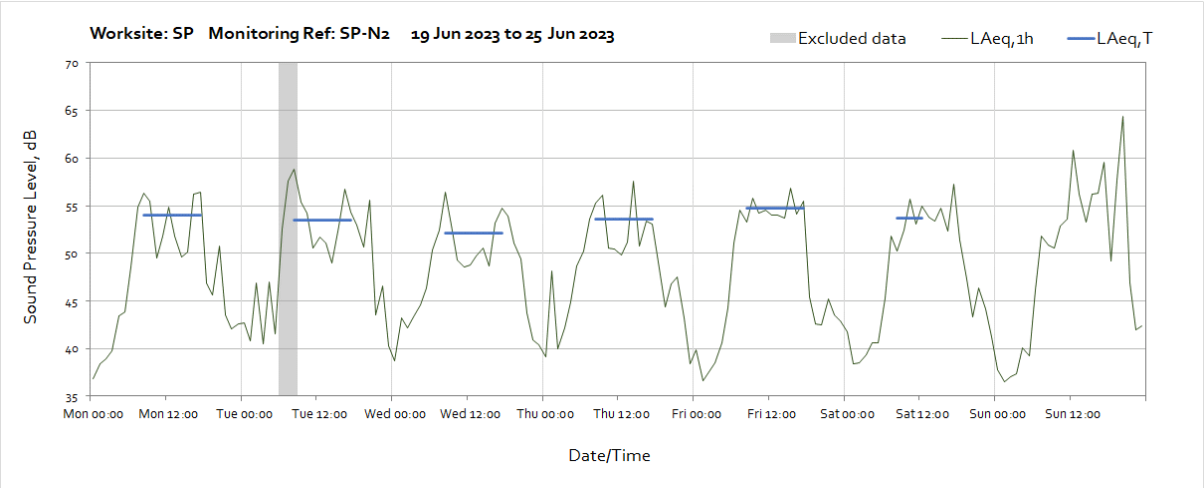
Worksite: SP – Monitoring Ref: SP-N2

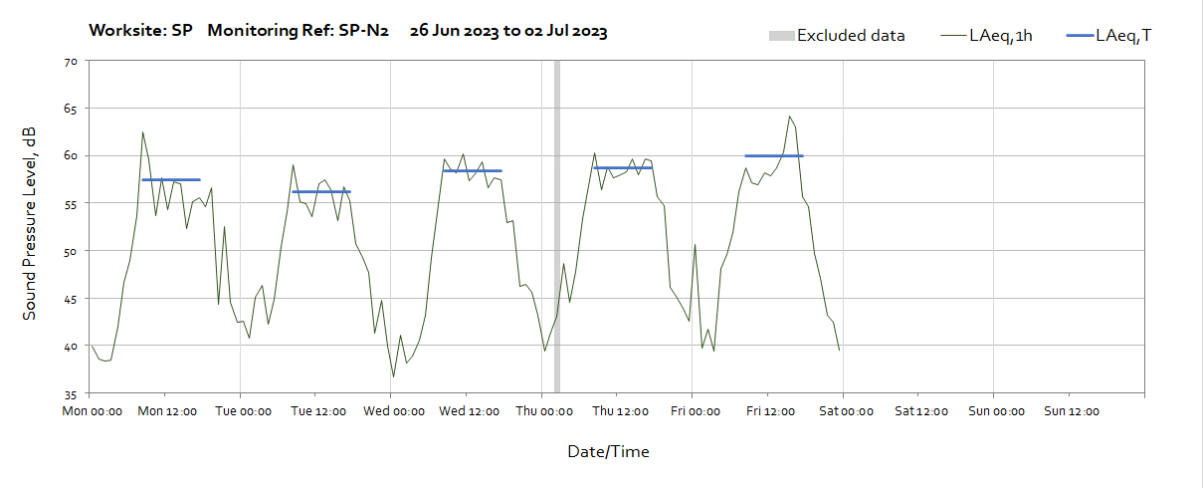




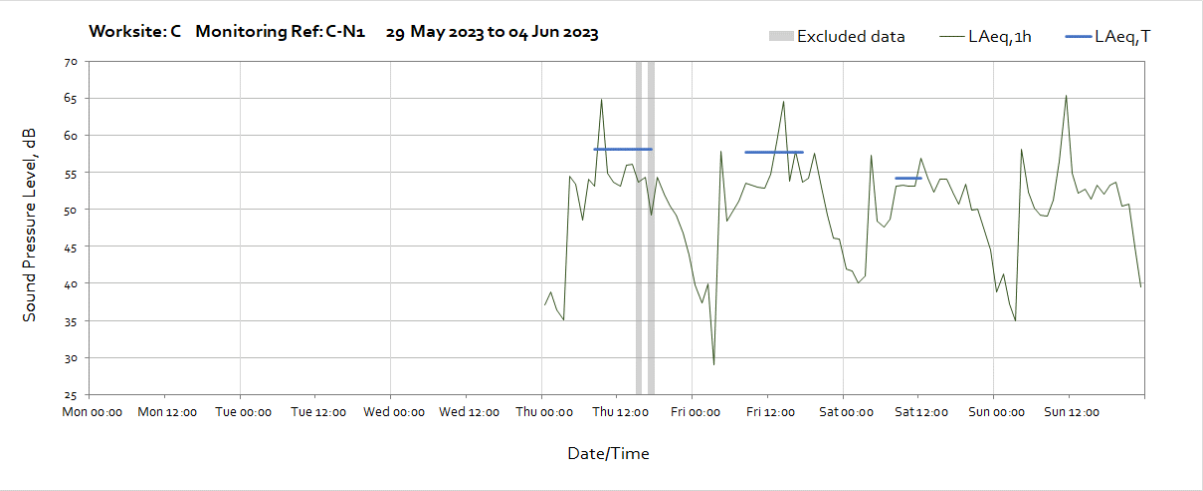


Note: Missing data from 12:00 on Wednesday 14th June to 14:00 on Wednesday 14th June was due to the meter being exchanged for calibration.

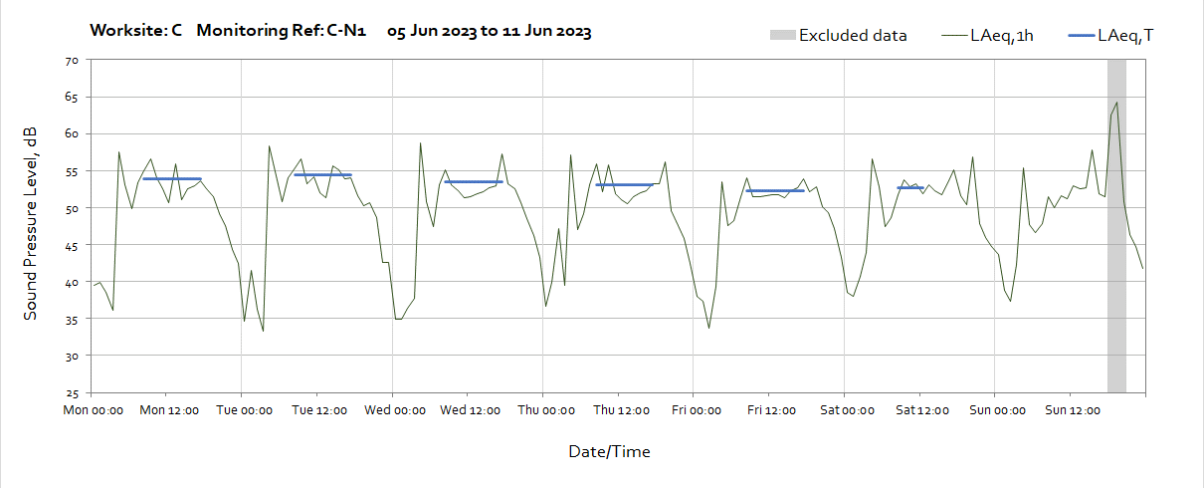


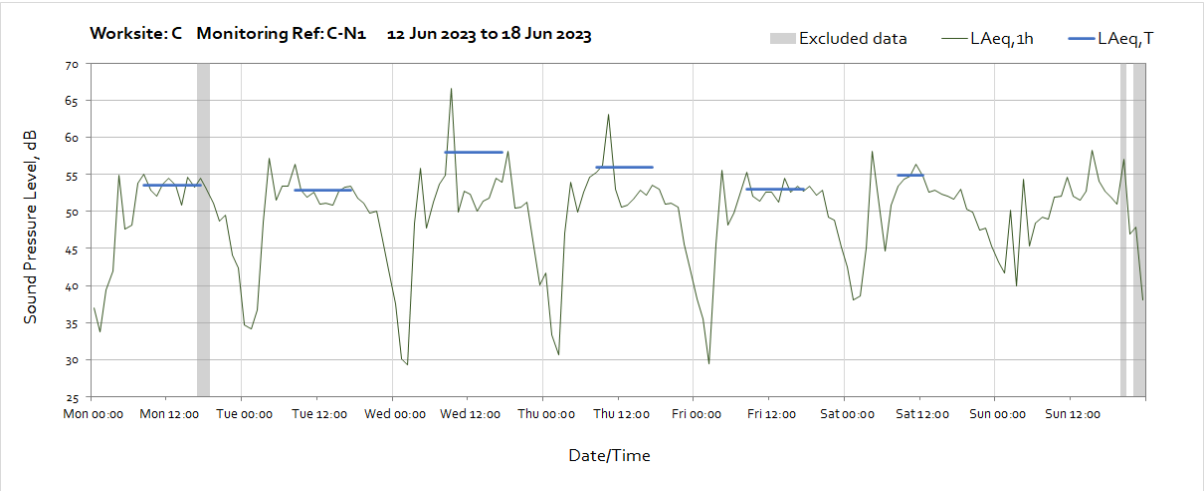


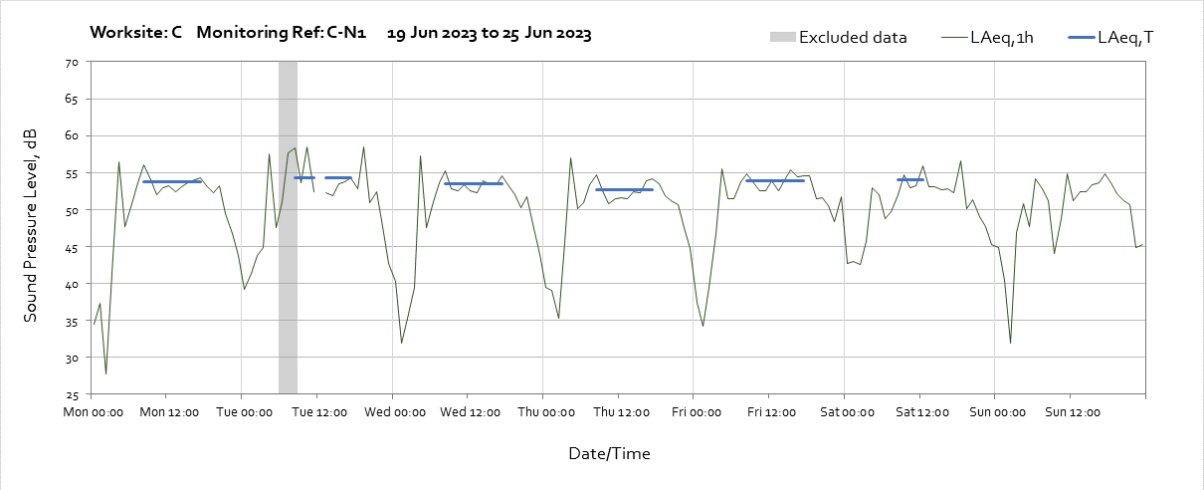
Worksite: C – Monitoring Ref: C-N1



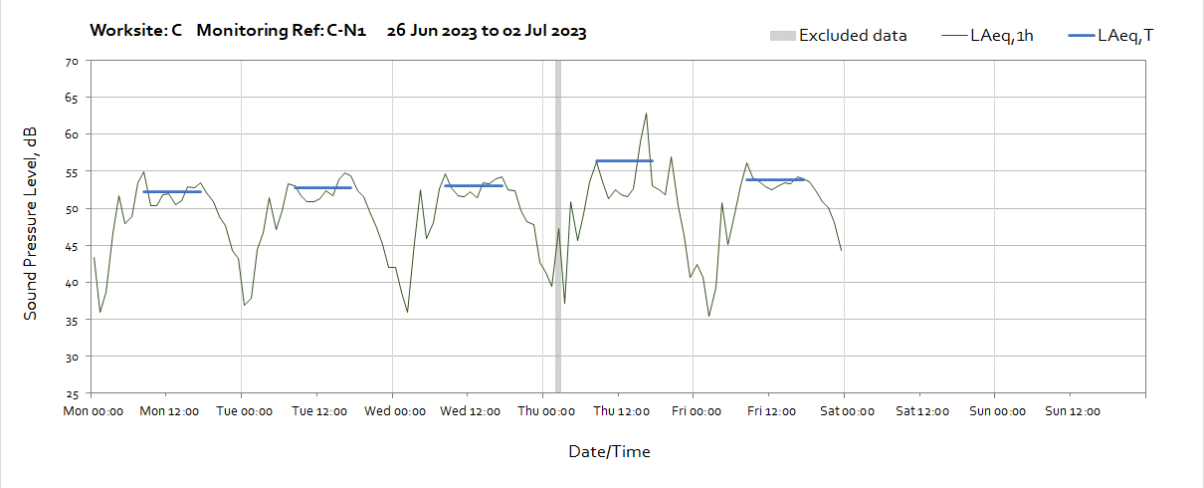
Note: Missing data from 15:00 to 16:00 and from 17:00 to 18:00, both on Thursday 1st June is to be investigated.



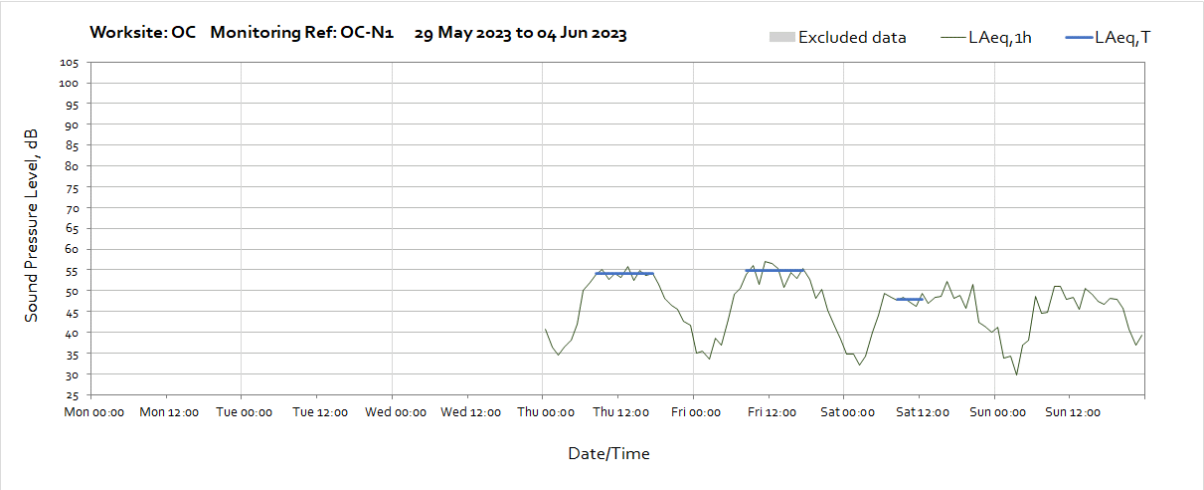


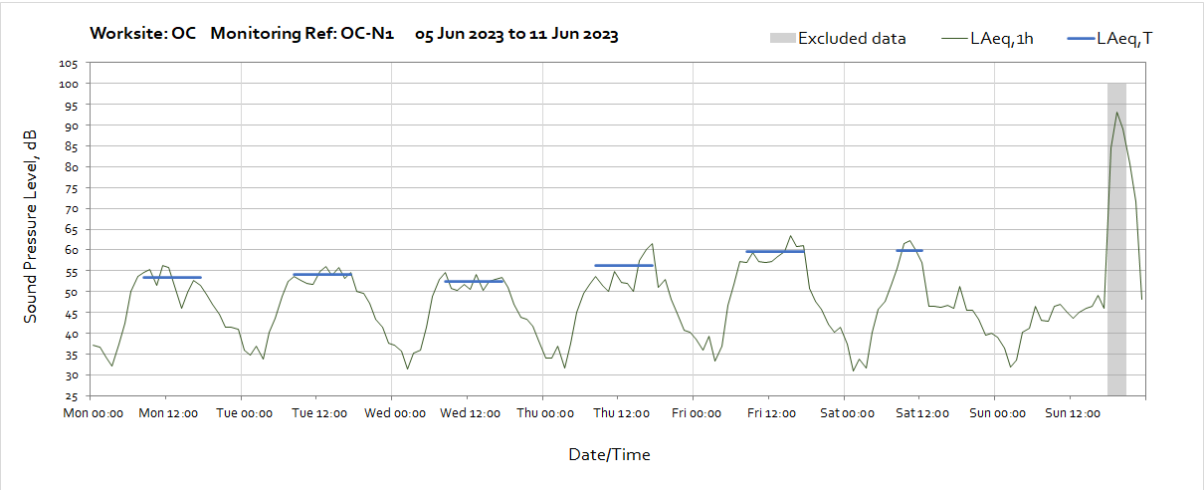


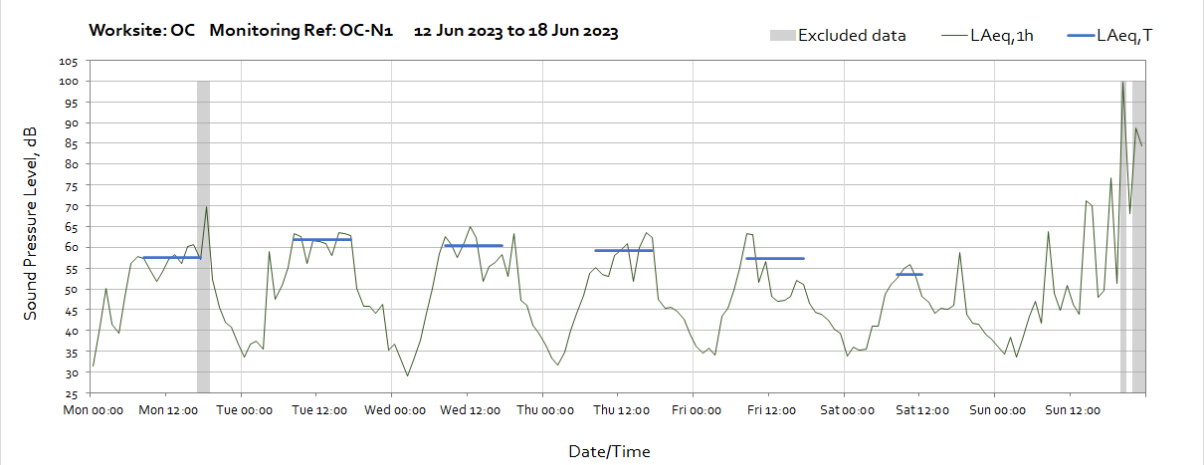
Note: Missing data from 12:00 to 13:00 on Tuesday 20th June is due to replacement of solar panels and field calibration.



Worksite: OC – Monitoring Ref: OC-N1






Worksite: OC Monitoring Ref: OC-N1 12 Jun 2023 to 18 Jun 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
105
100
95
90
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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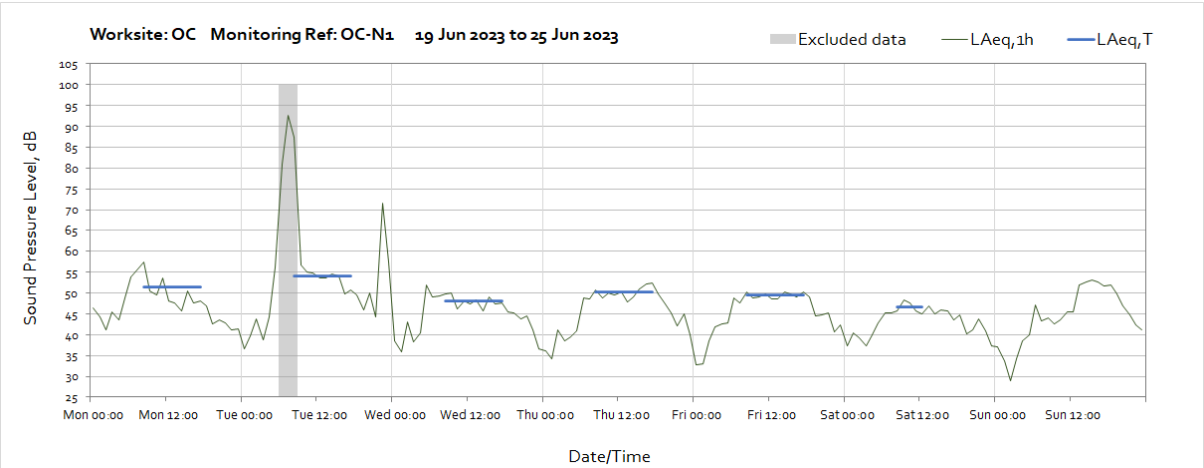
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time


Worksite: OC Monitoring Ref: OC-N1 19 Jun 2023 to 25 Jun 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
105
100
95
90
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
Wed 12:00
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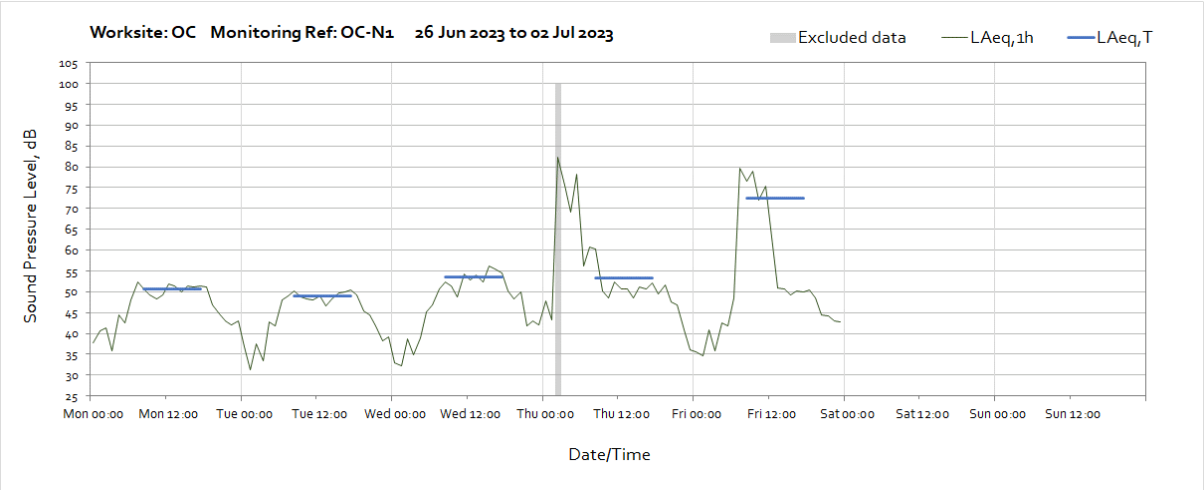
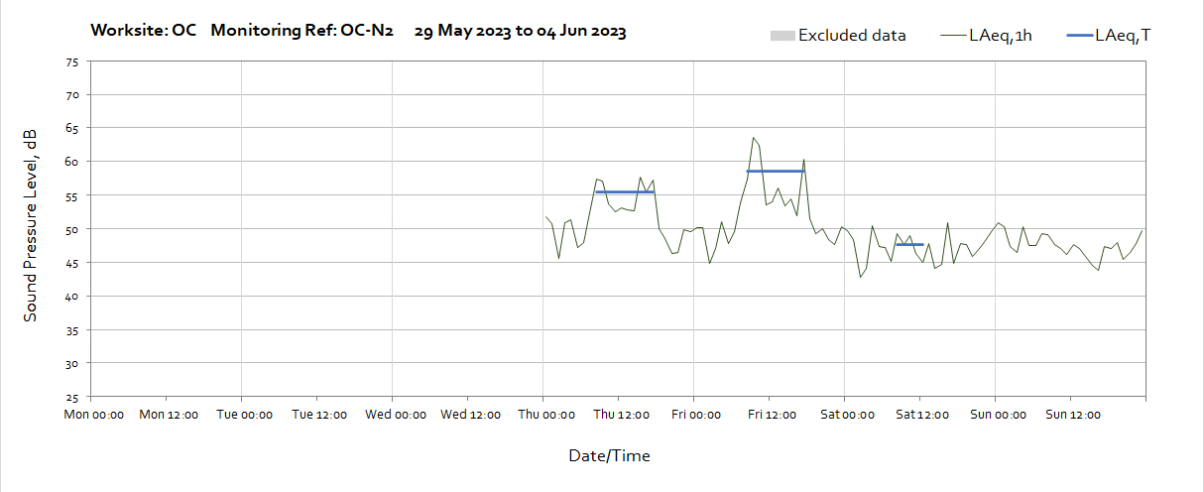
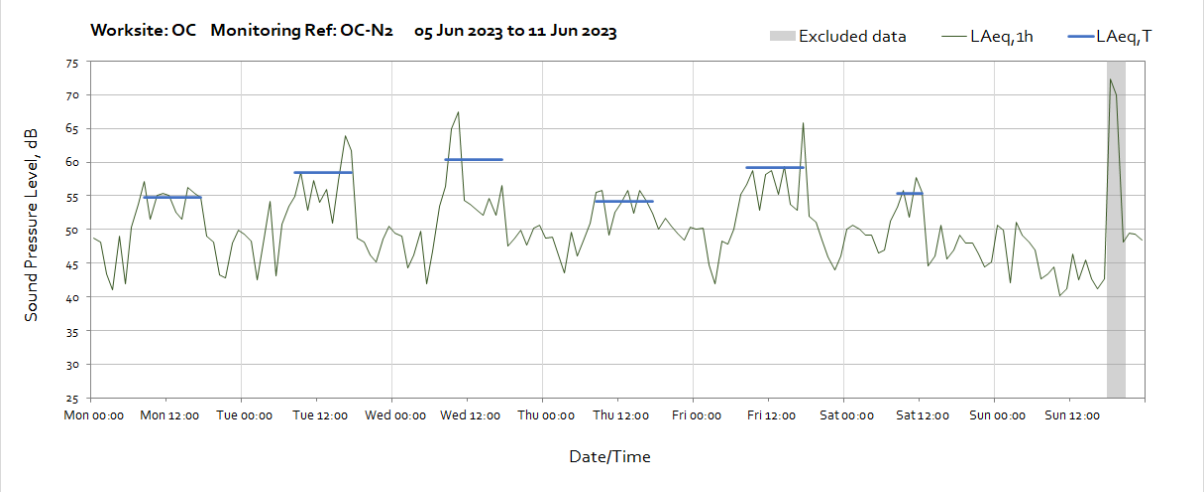
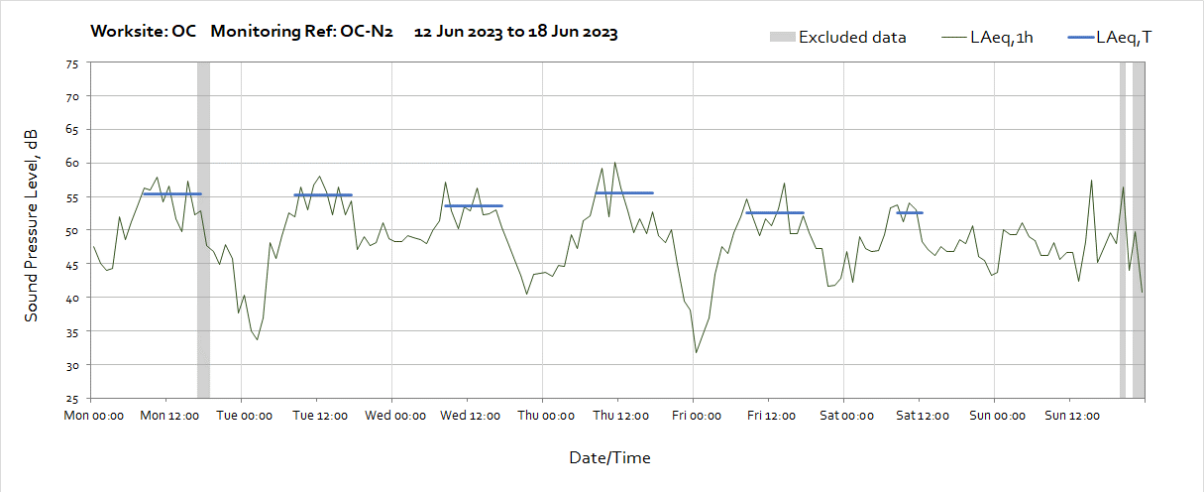
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

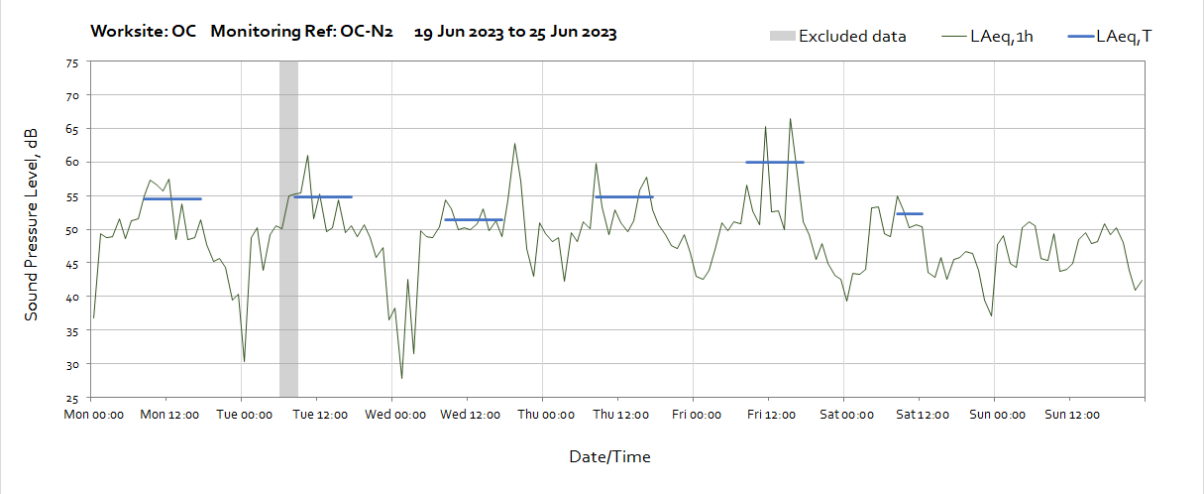

Worksite: OC Monitoring Ref: OC-N1 26 Jun 2023 to 02 Jul 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

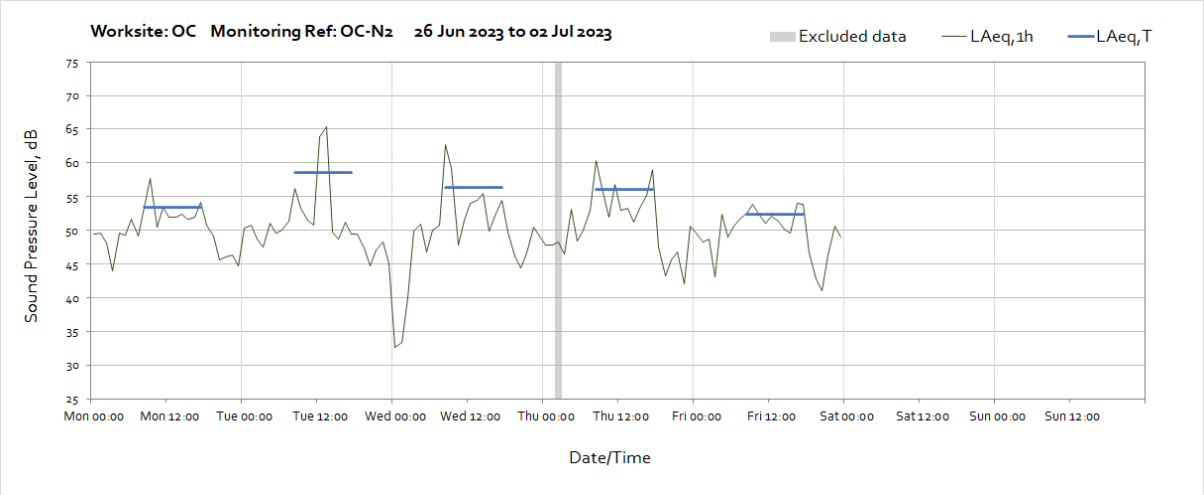
Worksite: OC – Monitoring Ref: OC-N2



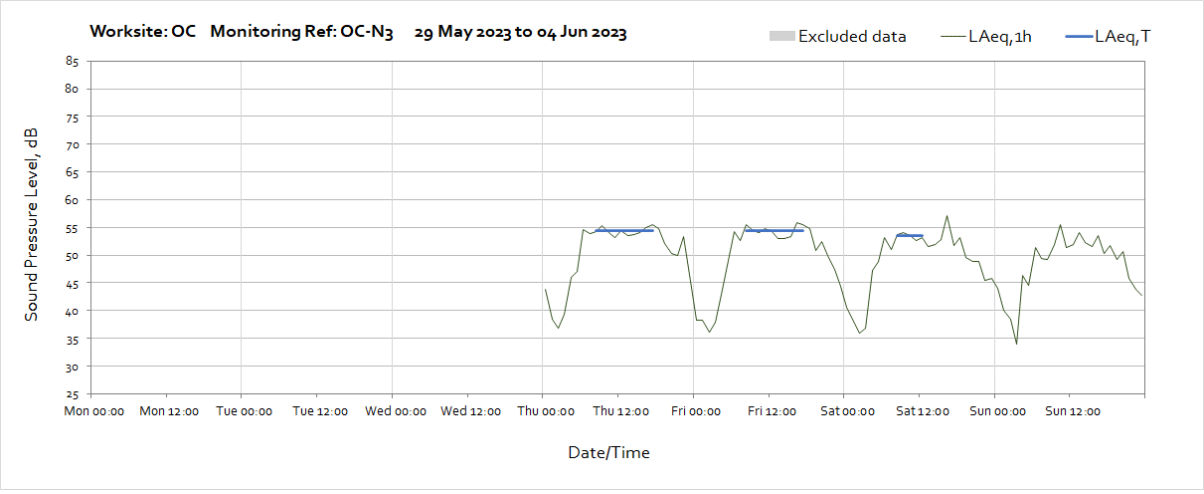


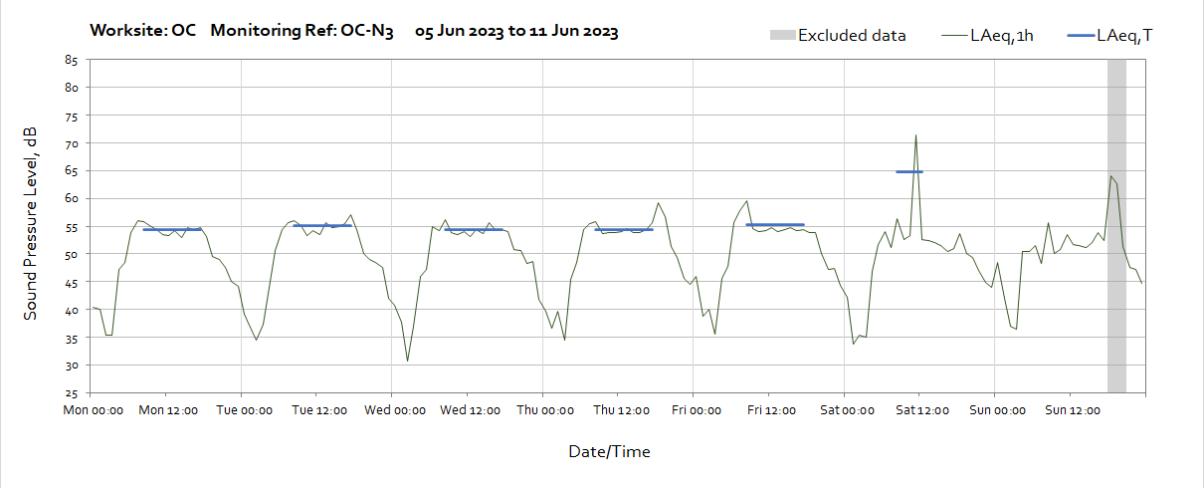


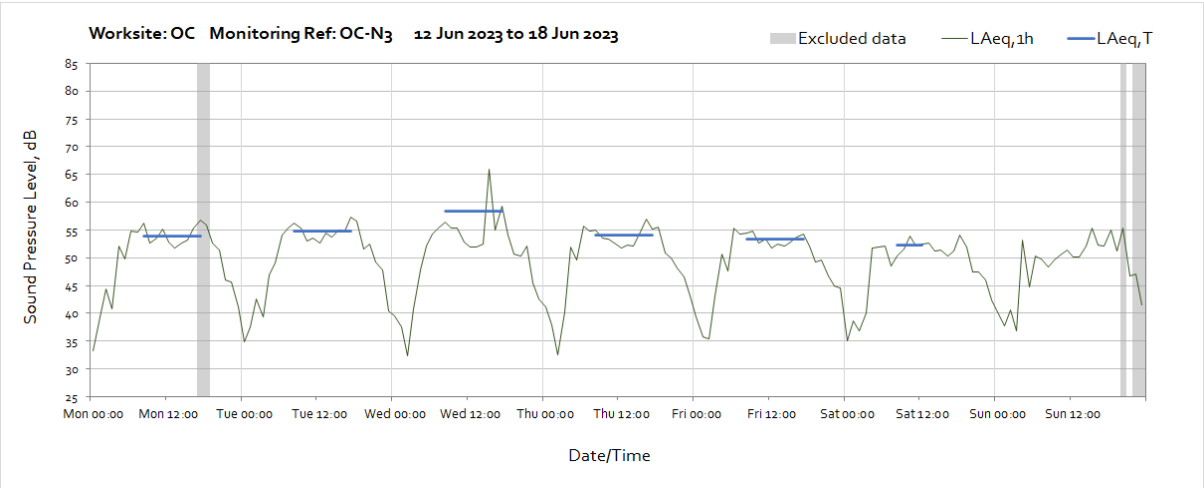


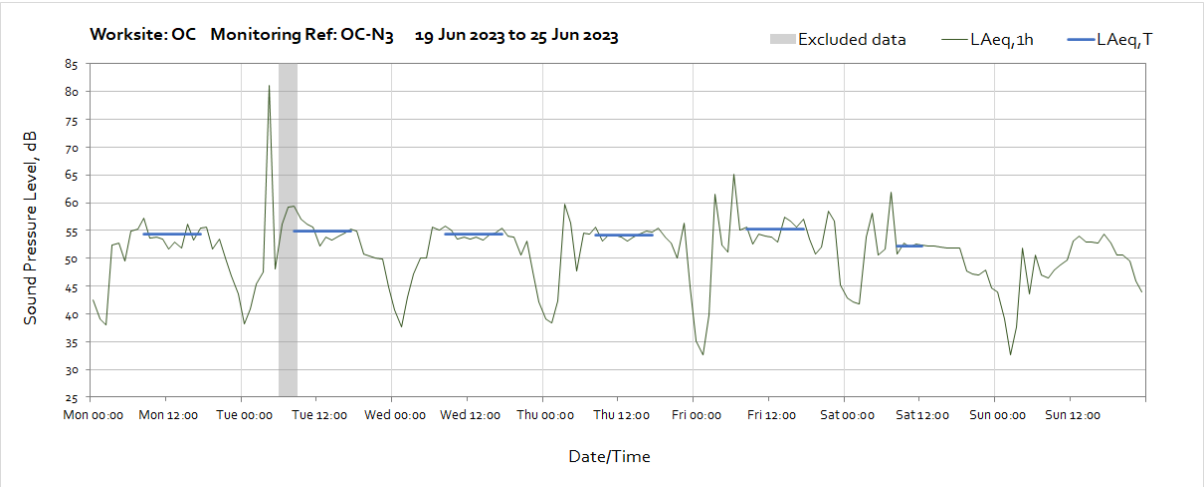


Worksite: OC – Monitoring Ref: OC-N3




Worksite: OC Monitoring Ref: OC-N3 05 Jun 2023 to 11 Jun 2023
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
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: OC Monitoring Ref: OC-N3 12 Jun 2023 to 18 Jun 2023
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
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: OC Monitoring Ref: OC-N3 19 Jun 2023 to 25 Jun 2023
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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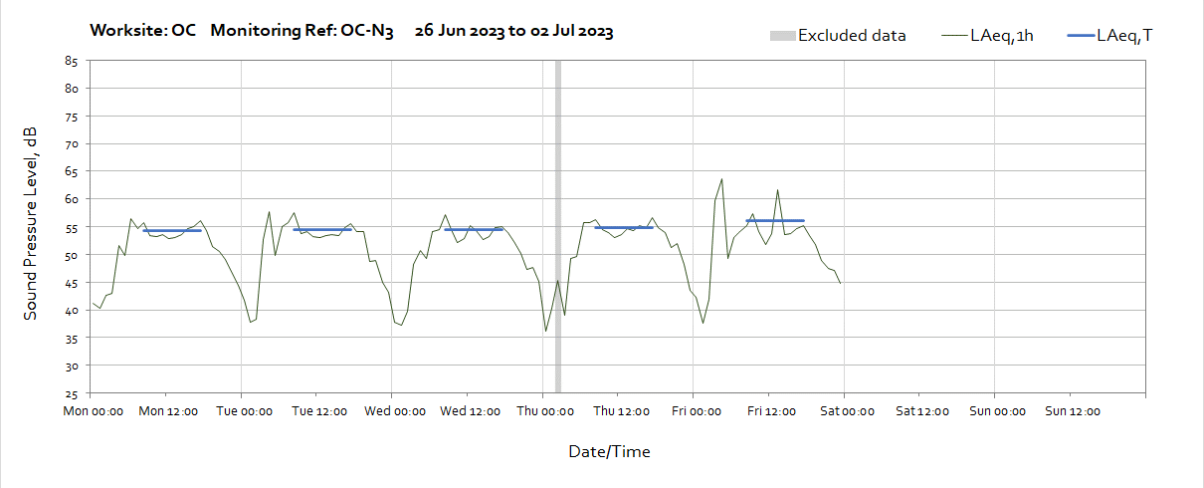
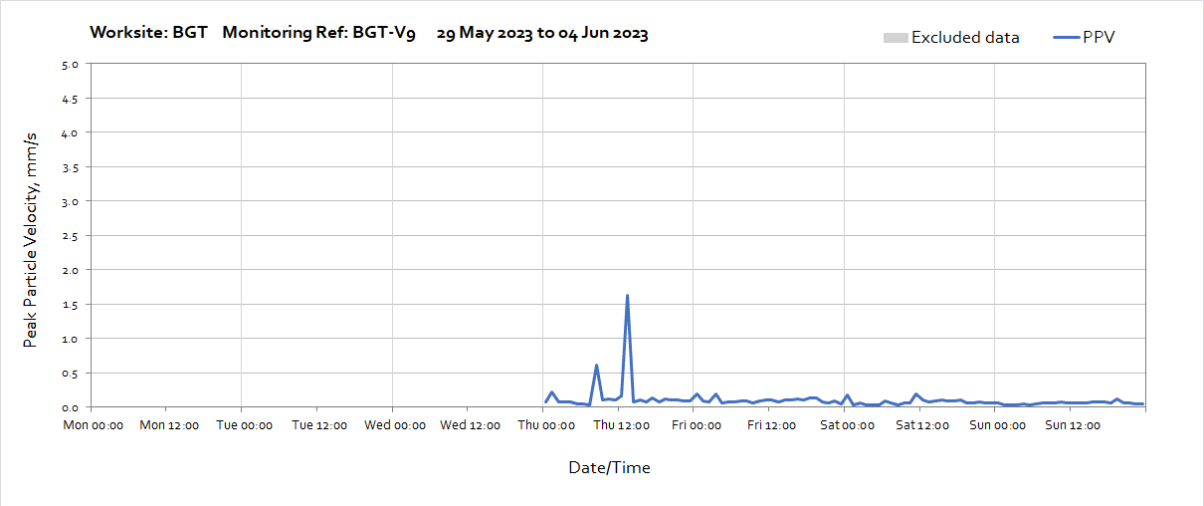
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

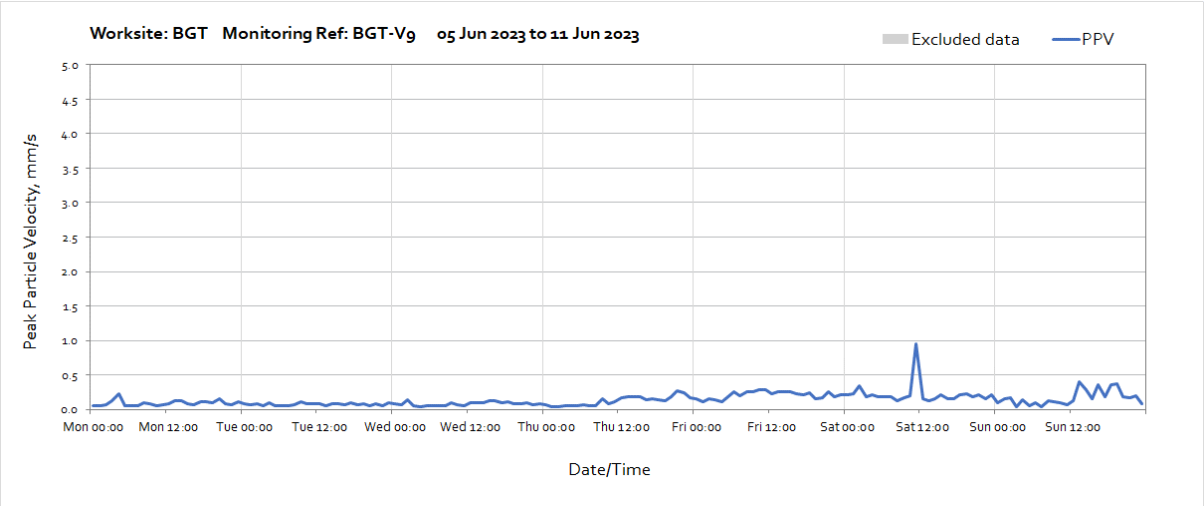

Worksite: OC Monitoring Ref: OC-N3 26 Jun 2023 to 02 Jul 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
85
80
75
70
65
60
55
50
45
40
35
30
25
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

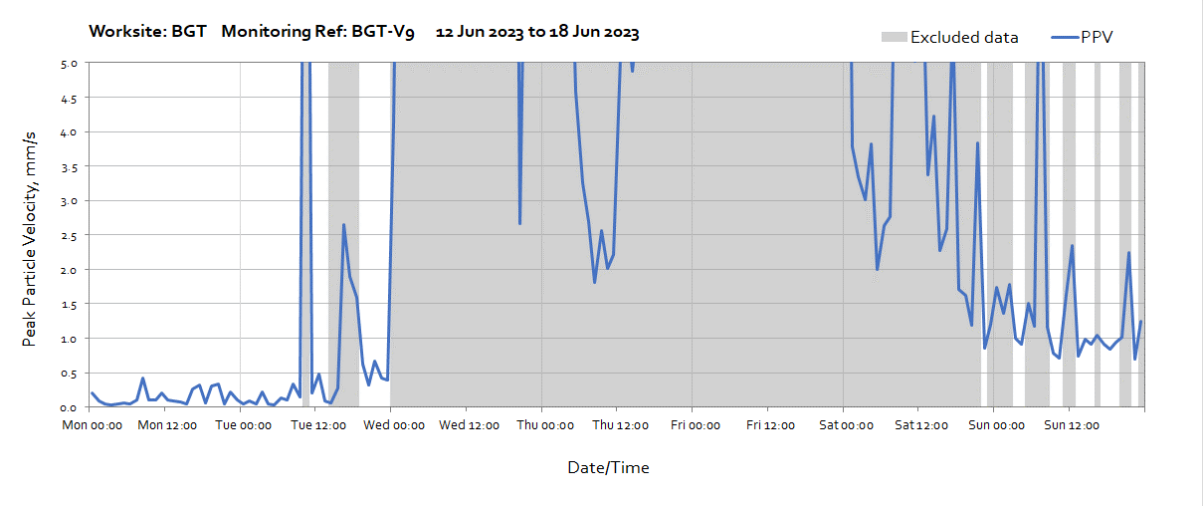
Vibration

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 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.

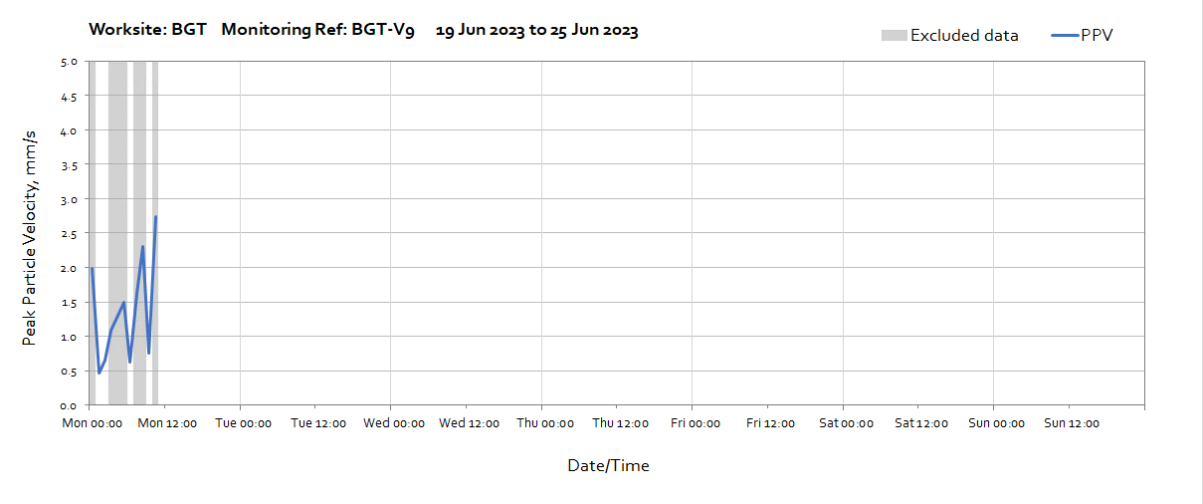
Worksite: BGT – Monitoring Ref: BGT-V9







Note: High vibration levels from 10:00 to 11:00 on Tuesday 13th June was due to a field calibration. From 14:00 to 19:00 on the same day high levels occurred that have been attributed to mole activity. High vibration levels due to mole activity occurred from 15th June onwards.

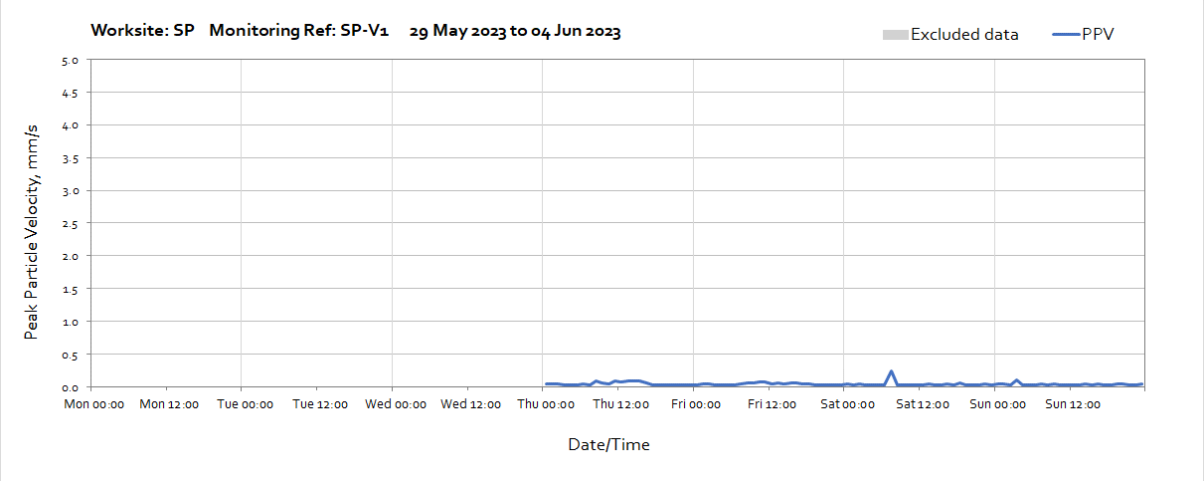


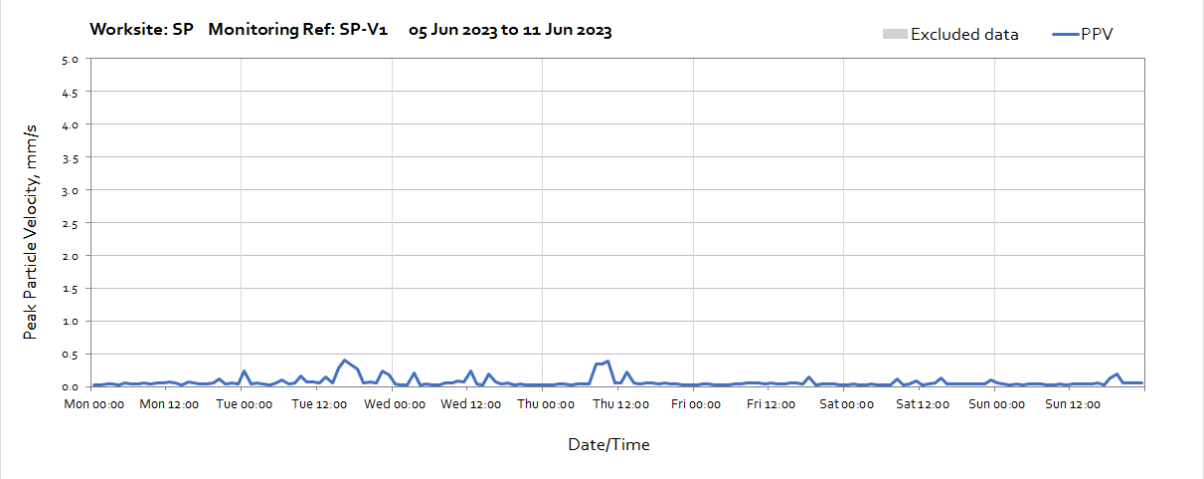
Note: High levels of vibration have been attributed to mole activity. The monitor was decommissioned at 11:00 on Monday 19th June.

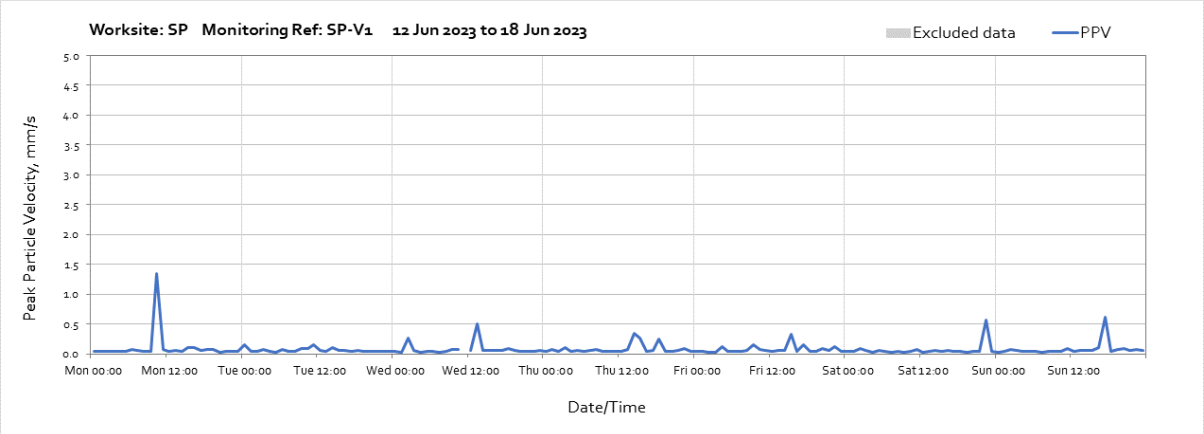
Worksite: SV – Monitoring Ref: SV-V1

Note: Missing data during this month was due to a power issue arising from difficulty in accessing the monitor.

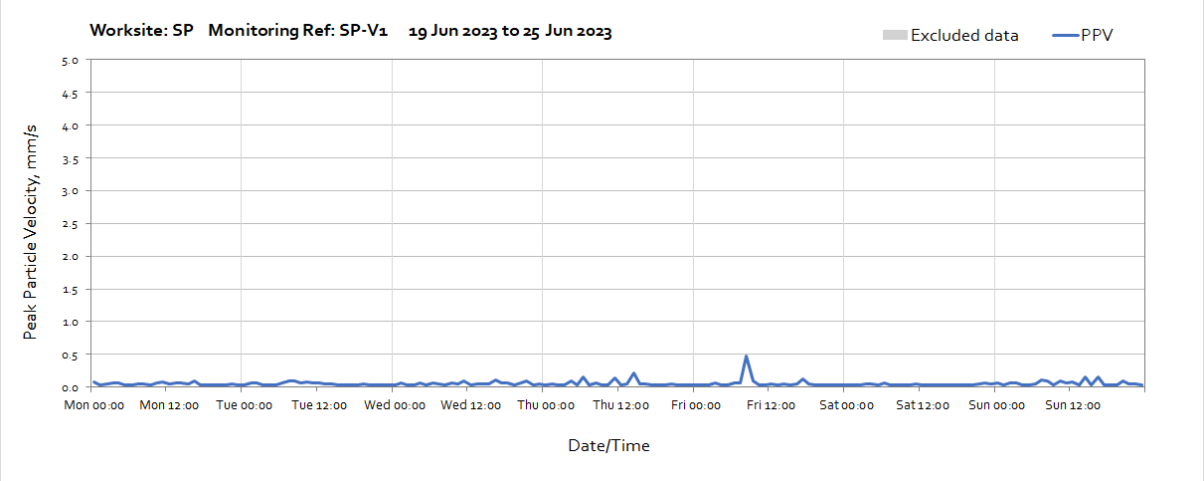
Worksite: SP – Monitoring Ref: SP-V1

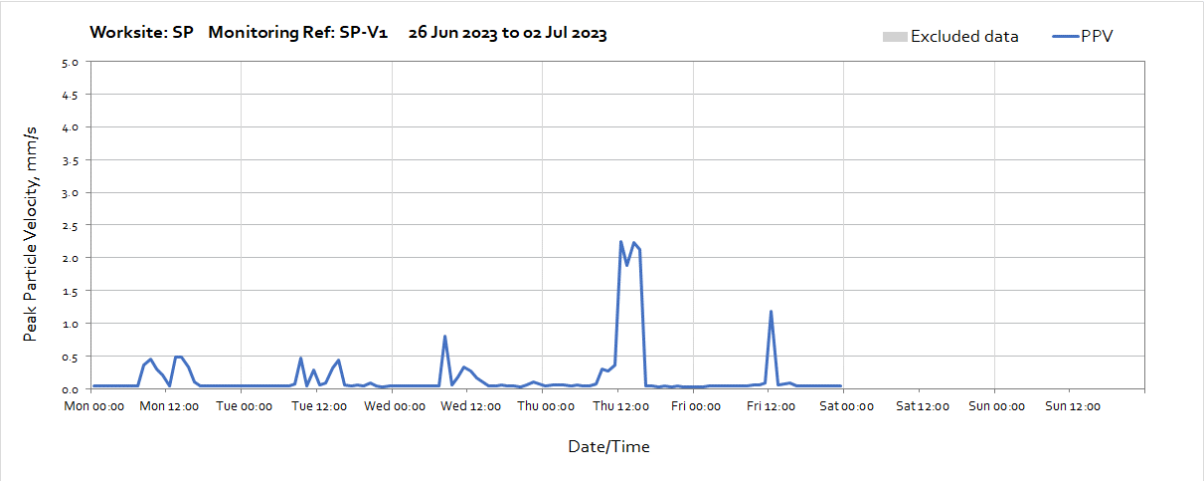




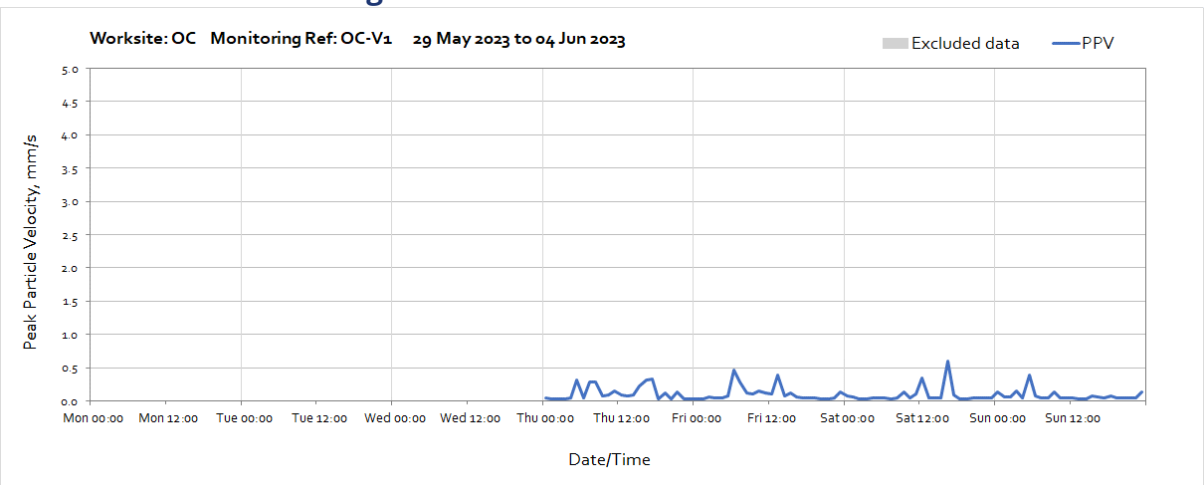


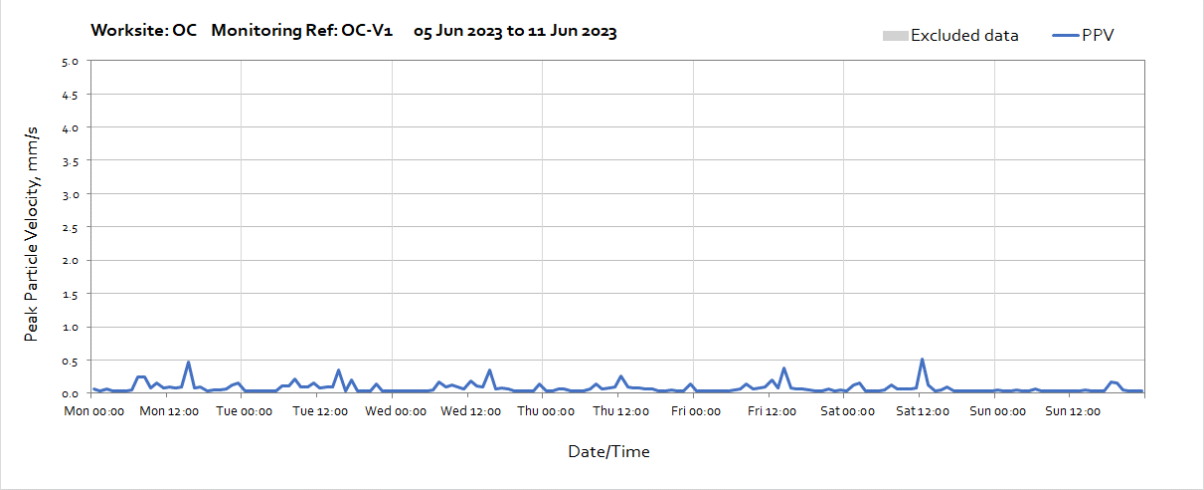
Note: Missing data from 11:00 to 12:00 on Wednesday 14th June is due to replacement of solar panels and field calibration.

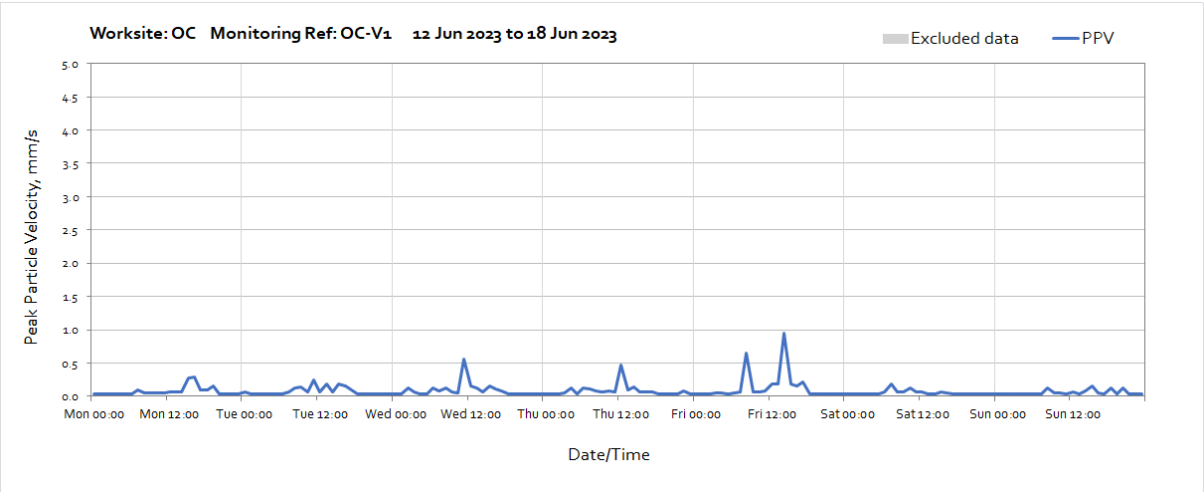


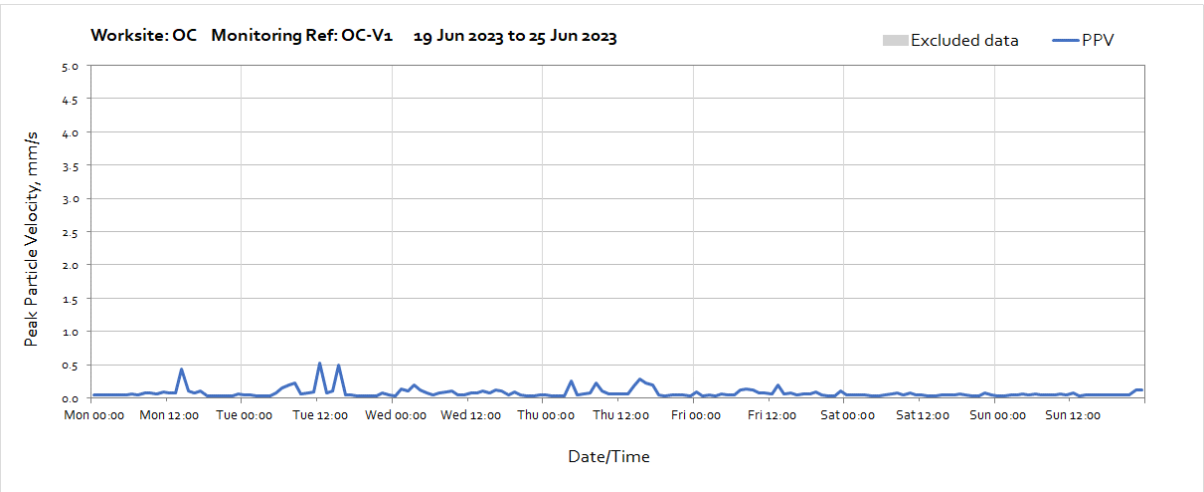


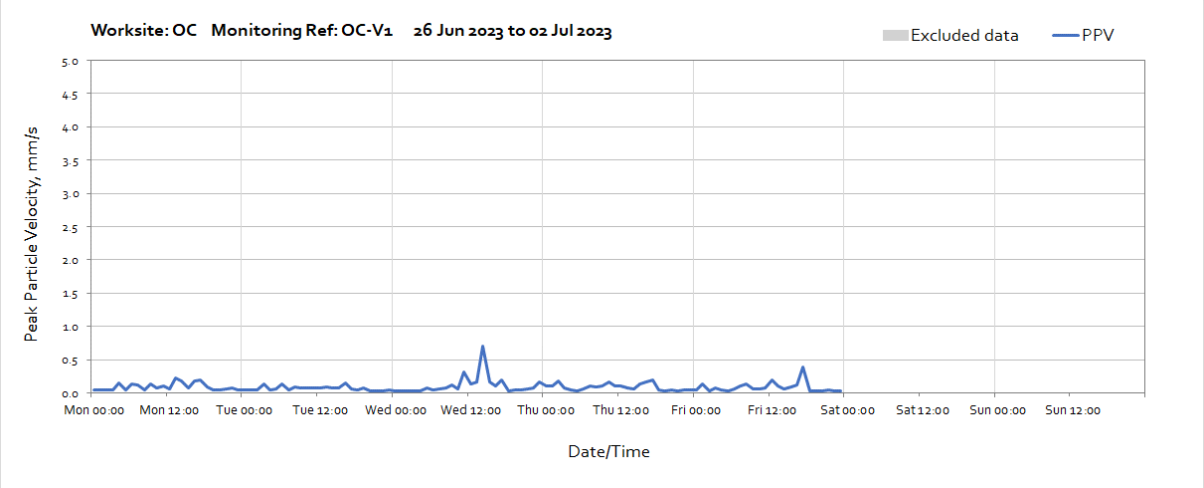
Worksite: OC – Monitoring Ref: OC-V1




Worksite: OC Monitoring Ref: OC-V1 05 Jun 2023 to 11 Jun 2023
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: OC Monitoring Ref: OC-V1 12 Jun 2023 to 18 Jun 2023
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: OC Monitoring Ref: OC-V1 19 Jun 2023 to 25 Jun 2023
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: OC Monitoring Ref: OC-V1 26 Jun 2023 to 02 Jul 2023
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
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Fri 00:00
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Sat 12:00
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Sun 12:00
Date/Time