

Construction noise and vibration Monthly Report – December 2020

Buckinghamshire

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Non-Technical Summary

This Noise and Vibration Monitoring Report fulfils HS2 Limited's commitment detailed in the Environmental Minimum Requirements (EMRs), Annex 1, Code of Construction Practice, to present the results of noise monitoring carried out within Buckinghamshire (BS) during the month of December 2020.

Within this period monitoring was undertaken at the following worksites:

- Noise and vibration monitoring were undertaken in the vicinity of Bottom House Farm Lane worksite (ref.: BHFL), where earthworks, stockpiling, utility works, roadworks and site management activities were underway.
- Noise monitoring was undertaken in the vicinity of Chalfont St Peter Vent Shaft worksite (ref.: CSP), where structural wall installation works were in progress.
- Noise monitoring was undertaken in the vicinity of Load Test Pile 1 worksite (ref.: LTP #1), where earthworks, drainage works, utility works, roadworks and haul road preparation works were underway.
- Noise monitoring was undertaken in the vicinity of Amersham Vent Shaft worksite (ref.: AM), where site setup works, utility works and earthworks were underway.
- Noise monitoring was undertaken in the vicinity of Quainton Access Road (ref: QAR), where compound hardstanding works, drainage works, earthworks, and road construction works were underway.

Further works, where monitoring did not take place, were also undertaken at the following locations:

- Amersham, Northmoor and Chalfont St Giles as part of water pipeline and pumping station works;
- Aylesbury as part of gas works;
- Calvert as part of electricity diversion, vegetation clearance, compound tarmacking, soil strip, access road construction and test piling works;
- Colne Valley as part of electricity diversion works;
- Great Missenden as part of compound construction and chalk embankment trial works;
- Along the A41 road where tree felling, construction of drainage ditches and ponds, access road works, and temporary compound enabling works were underway.

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

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

No complaints were received within Buckinghamshire during the monitoring period.

Monitors CSP-NMP2, CSP-NMP3 and AM-NMP1 were offline for large periods of December 2020, caused by the loss of solar power due to insufficient sunlight. Following an investigation into alternative power sources replacement monitoring equipment is currently being rolled out and data losses are expected to be eliminated from January 2021 onwards.

Abbreviations and Descriptions

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

Table 1: Table of Abbreviations

Acronym/Term	Definition
$L_{Aeq,T}$	See equivalent continuous sound pressure level
Ambient sound	A description of the all-encompassing sound at a given location and time which will include sound from many sources near and far. Ambient sound can be quantified in terms of the equivalent continuous sound pressure level, $L_{pAeq,T}$
Decibel(s), or dB	Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure (measured in Pascal (Pa)). Because of this wide range, a level scale called the decibel (dB) scale, based on a logarithmic ratio, is used in sound measurement. Audibility of sound covers a range of approximately 0-140dB.
Decibel(s) A-weighted, or dB(A)	The human ear system does not respond uniformly to sound across the detectable frequency range and consequently instrumentation used to measure sound is weighted to represent the performance of the ear. This is known as the 'A weighting' and is written as 'dB(A)'.
Equivalent continuous sound pressure level, or $L_{Aeq,T}$	An index used internationally for the assessment of environmental sound impacts. It is defined as the notional unchanging level that would, over a given period of time (T), deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating sound levels can be described in terms of an equivalent single figure value, typically expressed as a decibel level.
Exclusion of data	Measurement of noise levels can be affected by weather conditions such as prolonged periods of rain, winds speeds higher than 5m/s and snow/ice ground cover. Noise levels measured during these periods are considered not representative of normal noise conditions at the site and, for the purposes of this report, are excluded from the assessment of exceedances and calculation of typical noise levels and are also greyed out in charts. Identifiable incongruous noise and vibration events not attributable to HS2 construction noise are also excluded.
Façade	A facade noise level is the noise level 1m in front of a large reflecting surface. The effect of reflection, is to produce a slightly higher (typically +2.5 to +3 dB) sound level than it would be if the reflecting surface was not there.
Free-field	A free-field noise level is the noise level measured at a location where no reflective surfaces, other than the ground, lies within 3.5 metres of the microphone position.
LOAEL	Lowest Observed Adverse Effect Level - the level above which adverse effects on health and quality of life can be detected.
Peak particle velocity, or PPV	Instantaneous maximum velocity reached by a vibrating element as it oscillates about its rest position. The PPV is a simple indicator of perceptibility and risk of damage to structures due to vibration. It is usually measured in mm/s.
SOAEL	Significant Observed Adverse Effect Level - the level above which significant adverse effects on health and quality of life occur.
Sound pressure level	The parameter by which sound levels are measured in air. It is measured in decibels. The threshold of hearing has been set at 0dB, while the threshold of pain is approximately 120dB. Normal speech is approximately 60dB at a distance of 1 metre and a change of 3dB in a time varying sound signal is commonly regarded as being just detectable. A change of 10dB is subjectively twice, or half, as loud.
Vibration dose value, or VDV	An index used to evaluate human exposure to vibration in buildings. While the PPV provides information regarding the magnitude of single vibration events, the VDV provides a measure of the total vibration experienced over a specified period of time (typically 16h daytime and 8h night-time). It takes into account the magnitude, the number and the duration of vibration events and can be used to quantify exposure to continuous, impulsive, occasional and intermittent vibration. The vibration dose value is measured in $m/s^{1.75}$.

1 Introduction

1.1.1 HS2 is required to undertake noise (and vibration) monitoring as necessary to comply with the requirements of the High Speed Rail (London-West Midlands) Environmental Minimum Requirements, including specifically Annex 1: Code of Construction Practice, in addition to any monitoring requirements arising from conditions imposed through consents under Section 61 of the Control of Pollution Act, 1974 or through Undertakings & Assurances given to third parties. Such monitoring may be undertaken for the following purposes:

- monitoring the impact of construction works;
- to investigate complaints, incidents and exceedance of trigger levels; or
- monitoring the effectiveness of noise and vibration control measures.

1.1.2 Monitoring data and interpretive reports are to be provided to each relevant local authority on a monthly basis and shall include a summary of the construction activities occurring, the data recorded over the monitoring period, any complaints received, any periods in exceedance of agreed trigger levels, the results of any investigations and any actions taken or mitigation measures implemented. This report provides noise data, and interpretation thereof, for monitoring carried out by HS2 within the Buckinghamshire (BS) Local Authority area for the period 1st to 31st December 2020.

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

- Bottom House Farm Lane Worksite, reference - BHFL (see plan 2 in Appendix A), where work activities included:
 - completion of temporary water supply;
 - singling cable ducts and chambers for traffic lights;
 - earthworks;
 - utilities diversion works;
 - road construction;
 - temporary white lining;
 - placement of mass barriers;
 - stockpiling imported fill;
 - relocation of electricity poles.
- Chalfont St Peter Vent Shaft Worksite, reference - CSP (see plan 3 in Appendix A), where works activities included:
 - structural wall installation works including diaphragm wall excavation, rebar and concreting and operation of vacuum truck and centrifuge;

- Load Test Pile 1 Worksite, reference - LTP #1 (see plan 4 in Appendix A), where works activities included:
 - ground investigation and overwater investigation works;
 - earthworks and drainage works;
 - construction of access roads and hardstanding;
 - lay of track matt, temporary fencing and signage.

- Amersham Vent Shaft Worksite, reference - AM (see plan 5 in Appendix A), where works activities included:
 - site management activities including installation of storage facilities; reinforcement, crane bases, workshops, internal site roads, and car parks;
 - utility and drainage works;
 - installation of edge protection posts and fencing above the retaining wall;
 - excavation to shaft piling platform level.

- Quanton Access Road Worksite, reference - QAR (see plan 6 in Appendix A), where works activities included:
 - drainage construction;
 - creation of the compound hardstanding;
 - installation of geogrid and sub-base aggregates;
 - culvert construction and access road construction.

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

- Amersham, Northmoor and Chalfont St Giles as part of water pipeline and pumping station works;

- Aylesbury as part of gas works;

- Calvert where work activities included:
 - electricity diversions;
 - vegetation clearance;
 - compound surfacing;
 - compound soil strip;
 - test piling;
 - access road construction.

- Colne Valley as part of electricity diversion works;

- Along the A41 road where work activities included:
 - tree felling;
 - construction of drainage ditches and ponds;
 - laying down of track matt to provide access;
 - enabling works for temporary compounds.

- Great Missenden, where work activities included:
 - compound construction for ground investigation and devegetation works;
 - cabin installation and compound set-up for chalk embankment trial;
 - expansion of permanent pond;
 - construction of temporary chalk embankment.

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 Seven noise and one vibration monitoring installations were active in December in the BS area. Table 2 summarises the position of noise monitoring installations within the BS area in December 2020.

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

Table 2: Monitoring Locations

Worksite Reference	Measurement Reference	Address
CSP	CSP-NMP1	Chalfont St Peter Vent Shaft Worksite, Chesham Lane, Chalfont St. Peter
	CSP-NMP2	Chalfont St Peter Vent Shaft Worksite, Chesham Lane, Chalfont St. Peter
	CSP-NMP3	Chalfont St Peter Vent Shaft Worksite, Chesham Lane, Chalfont St. Peter
LTP #1	LTP #1-NMP1	Northern boundary, Load Test Pile 1 Worksite, Denham Water Ski Club
BHFL	BHFL-NMP1	Elm Tree Cottage, Bottom House Farm Lane
	BHFL-Vib 1	Pine Cottage, Bottom House Farm Lane
AM	AM-NMP1	Amersham Vent Shaft Worksite, Whielden Lane, Amersham
QAR	QAR-NMP1	1 Woodlands Farm Cottages, Quainton

2 Summary of Results

2.1 Summary of Measured Noise 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.

2.1.2 Monitors CSP-NMP2, CSP-NMP3 and AM-NMP1 were offline for large periods of December 2020 caused by the loss of solar power due to insufficient sunlight. Following an investigation into alternative power sources replacement monitoring equipment is currently being rolled out and data losses are expected to be eliminated from January 2021 onwards.

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

Worksite Reference	Measurement Reference	Address	Free-field or Façade Measurement	Weekly 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
CSP	CSP-NMP1	Chalfont St Peter Vent Shaft Worksite, Chesham Lane, Chalfont St. Peter	Free-field	62.3 (69.6)	64.3 (71.2)	62.1 (69.8)	61.5 (76.7)	58.3 (71.4)	62.1 (67.0)	63.5 (68.8)	61.6 (63.2)	60.0 (62.6)	58.4 (61.1)	59.5 (62.6)	57.8 (59.6)
	CSP-NMP2	Chalfont St Peter Vent Shaft Worksite, Chesham Lane, Chalfont St. Peter	Free-field	-* (-)*	-* (-)*	-* (-)*	-* (-)*	-* (-)*	-* (-)*	-* (-)*	-* (-)*	-* (-)*	-* (-)*	-* (-)*	-* (-)*
	CSP-NMP3	Chalfont St Peter Vent Shaft Worksite, Chesham Lane, Chalfont St. Peter	Free-field	57.8 (58.4)	57.6 (59.4)	57.2 (58.4)	54.8 (56.5)	50.1 (56.5)	58.7 (58.7)	60.5 (60.5)	-* (-)*	-* (-)*	-* (-)*	55.6 (55.6)	-* (-)*
LTP #1	LTP #1-NMP1	Northern boundary, Load Test Pile 1 Worksite, Denham Water Ski Club	Free-field	60.9 (64.0)	62.1 (63.9)	60.0 (62.3)	57.3 (60.4)	54.8 (62.0)	57.9 (60.1)	61.2 (63.0)	61.8 (63.8)	59.8 (68.2)	54.0 (61.2)	60.2 (70.4)	54.7 (62.9)
BHFL	BHFL-NMP1	Elm Tree Cottage, Bottom House Farm Lane	Free-field	52.1 (55.6)	56.7 (63.1)	52.6 (59.1)	49.0 (54.3)	45.7 (54.7)	49.3 (52.0)	53.3 (55.3)	55.0 (58.3)	51.2 (54.6)	44.4 (48.5)	50.9 (54.2)	45.4 (53.2)
AM	AM-NMP1	Whielden Lane, Amersham	Free-field	-* (-)*	-* (-)*	-* (-)*	-* (-)*	-* (-)*	-* (-)*	-* (-)*	-* (-)*	-* (-)*	-* (-)*	-* (-)*	-* (-)*
QAR	QAR-NMP1	1 Woodlands Farm Cottages, Quinton	Free-field	51.7 (56.3)	52.3 (55.8)	49.0 (55.8)	45.1 (53.5)	42.6 (54.0)	47.2 (50.5)	50.8 (52.2)	51.3 (53.8)	49.5 (53.8)	38.5 (45.5)	48.5 (54.5)	41.4 (51.9)

* No data measured within period due to loss of power to the monitor (See paragraph 2.1.2)

2.1.3 Table 4 presents a summary of the measured vibration levels at the 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
BHFL	BHFL-Vib 1	Pine Cottage, Bottom House Farm Lane	1.15 (X-axis)

2.1.4 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	Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of LOAEL	Number of exceedances of SOAEL
CSP	CSP-NMP1	Chalfont St Peter Vent Shaft Worksite, Chesham Lane, Chalfont St. Peter	All days	0700-2200 2200-0700	Continuous Continuous	No exceedance Continuous*
	CSP-NMP2	Chalfont St Peter Vent Shaft Worksite, Chesham Lane, Chalfont St. Peter	All days	All periods	No exceedance	No exceedance
	CSP-NMP3	Chalfont St Peter Vent Shaft Worksite, Chesham Lane, Chalfont St. Peter	All days	All periods	No exceedance	No exceedance
LTP #1	LTP #1-NMP1	Northern boundary, Load Test Pile 1 Worksite, Denham Water Ski Club	All days	All periods	No exceedance	No exceedance
BHFL	BHFL-NMP1	Elm Tree Cottage, Bottom House Farm Lane	All days	All periods	No exceedance	No exceedance
AM	AM-NMP1	Whielden Lane, Amersham	All days	All periods	No exceedance	No exceedance
QAR	QAR-NMP1	1 Woodlands Farm Cottages, Quainton	All days	All periods	No exceedance	No exceedance

* Exceedances of the SOAEL at monitoring position CSP-NMP1 were due to a generator installed 5m from the monitor. Therefore, in consideration of the large separation distance between the monitor and nearby receptors (approximately 70m), noise levels at receptor locations are calculated to be below the SOAEL.

2.2.6 No exceedances of the LOAEL or SOAEL were recorded due to HS2 construction works at sensitive receptors during December 2020.

2.3 Exceedances of Trigger Level

2.3.1 Table 6 provides a summary of exceedances of the S61 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
-	-	-	-	-	-

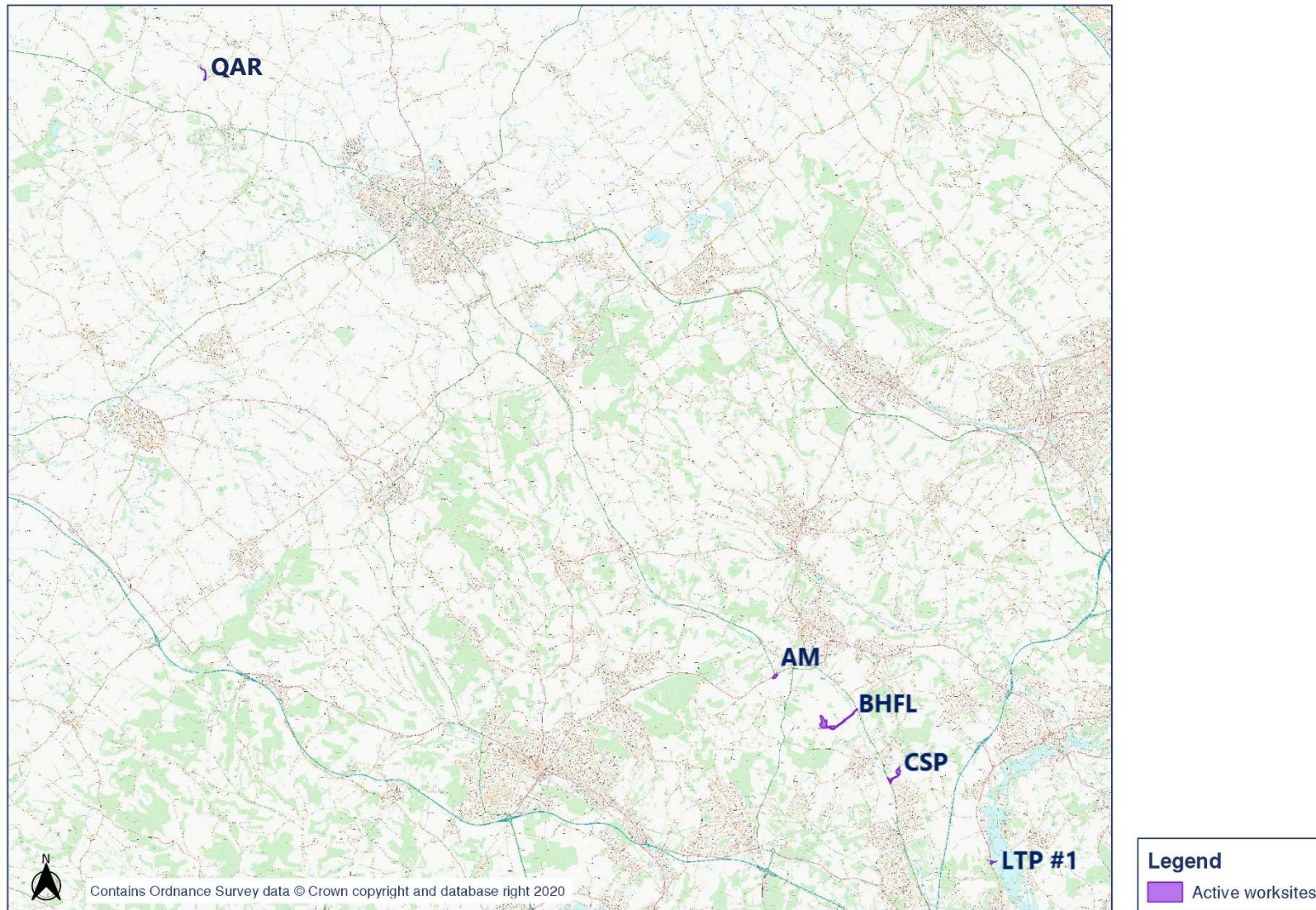
2.4 Complaints

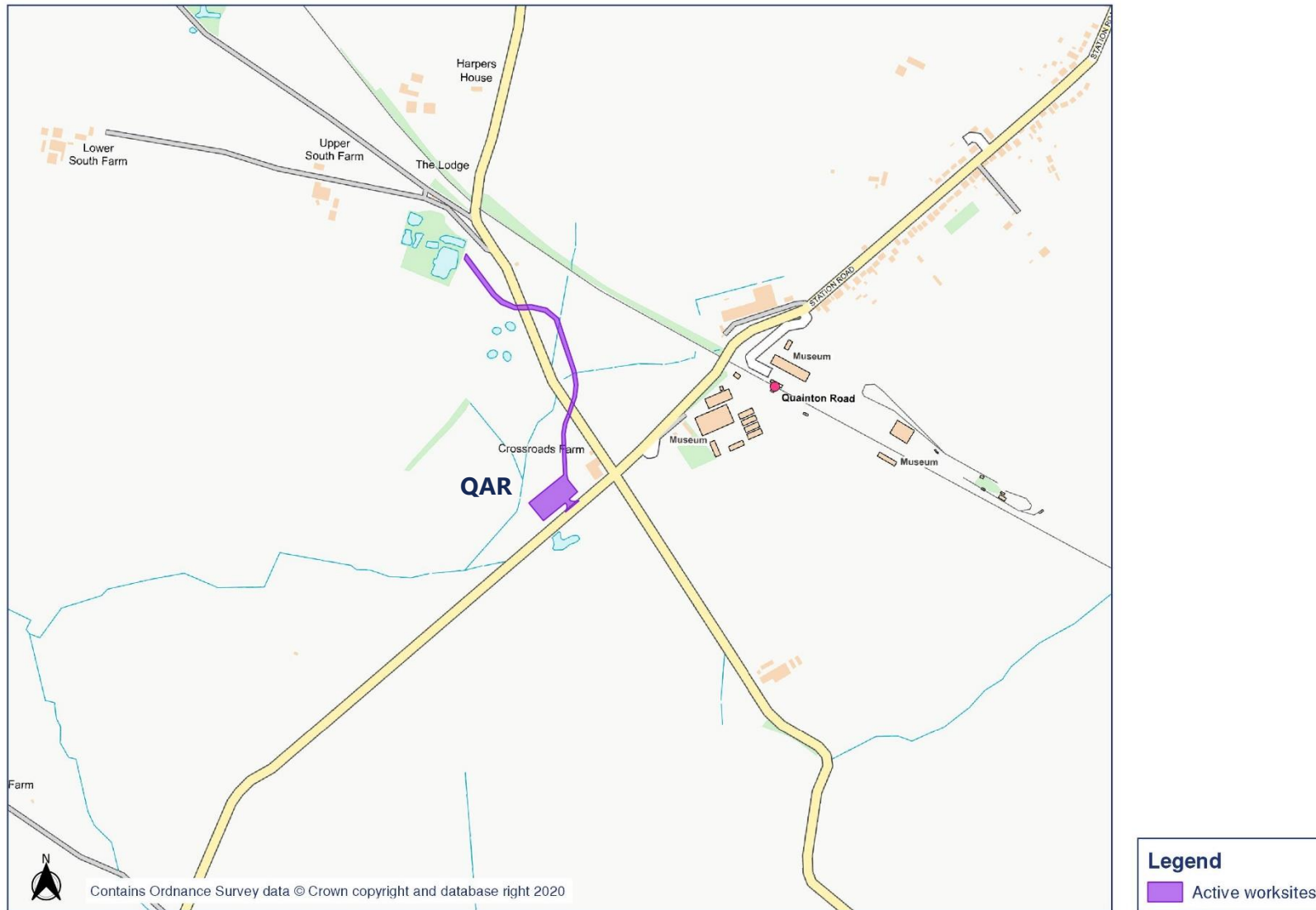
2.4.1 Table 7 provides a summary of complaint information related to noise and vibration received during the reporting period, along with the findings of any investigation.

Table 7: Summary of Complaints

Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
-	-	-	-	-

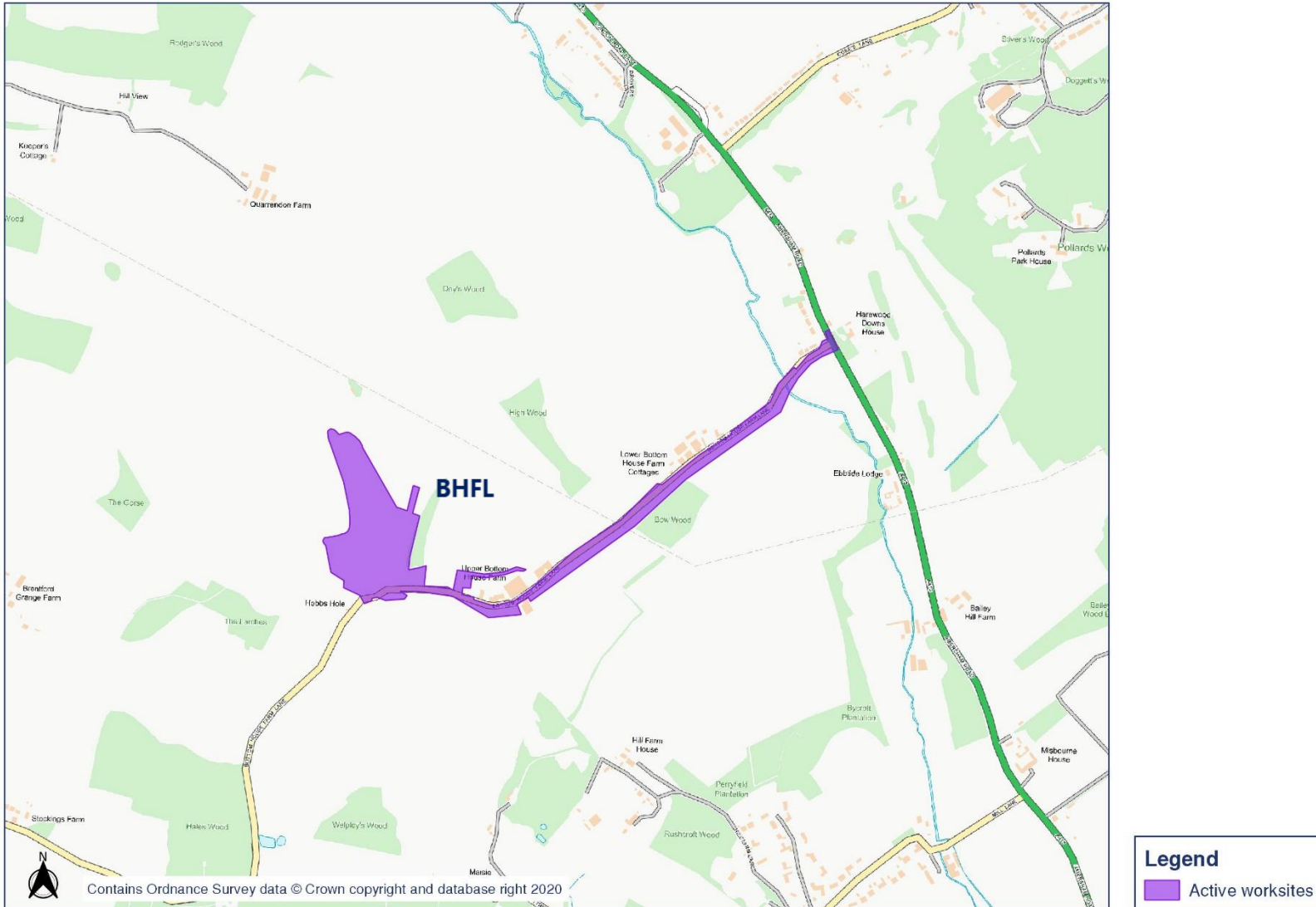
Appendix A Site Locations

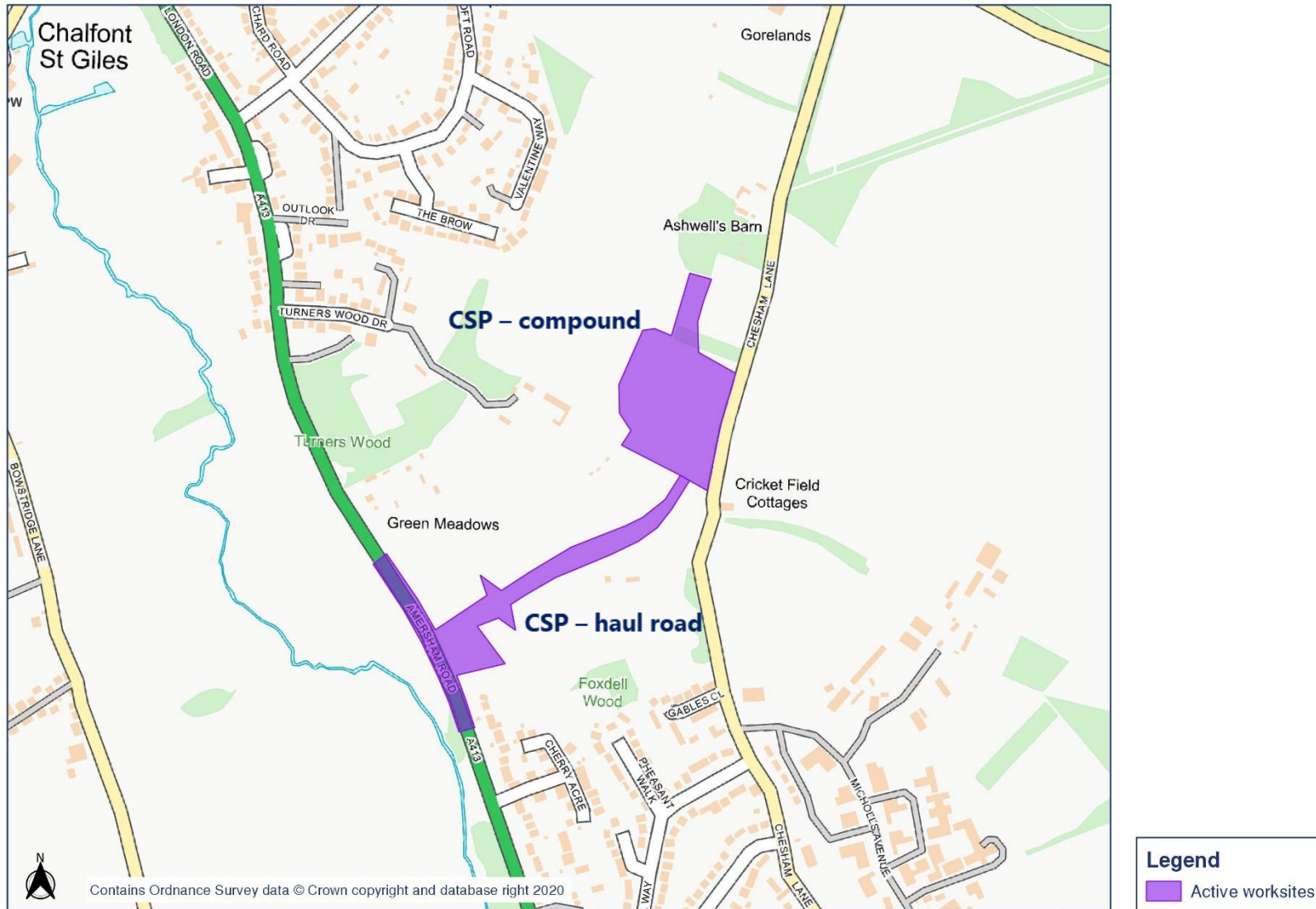




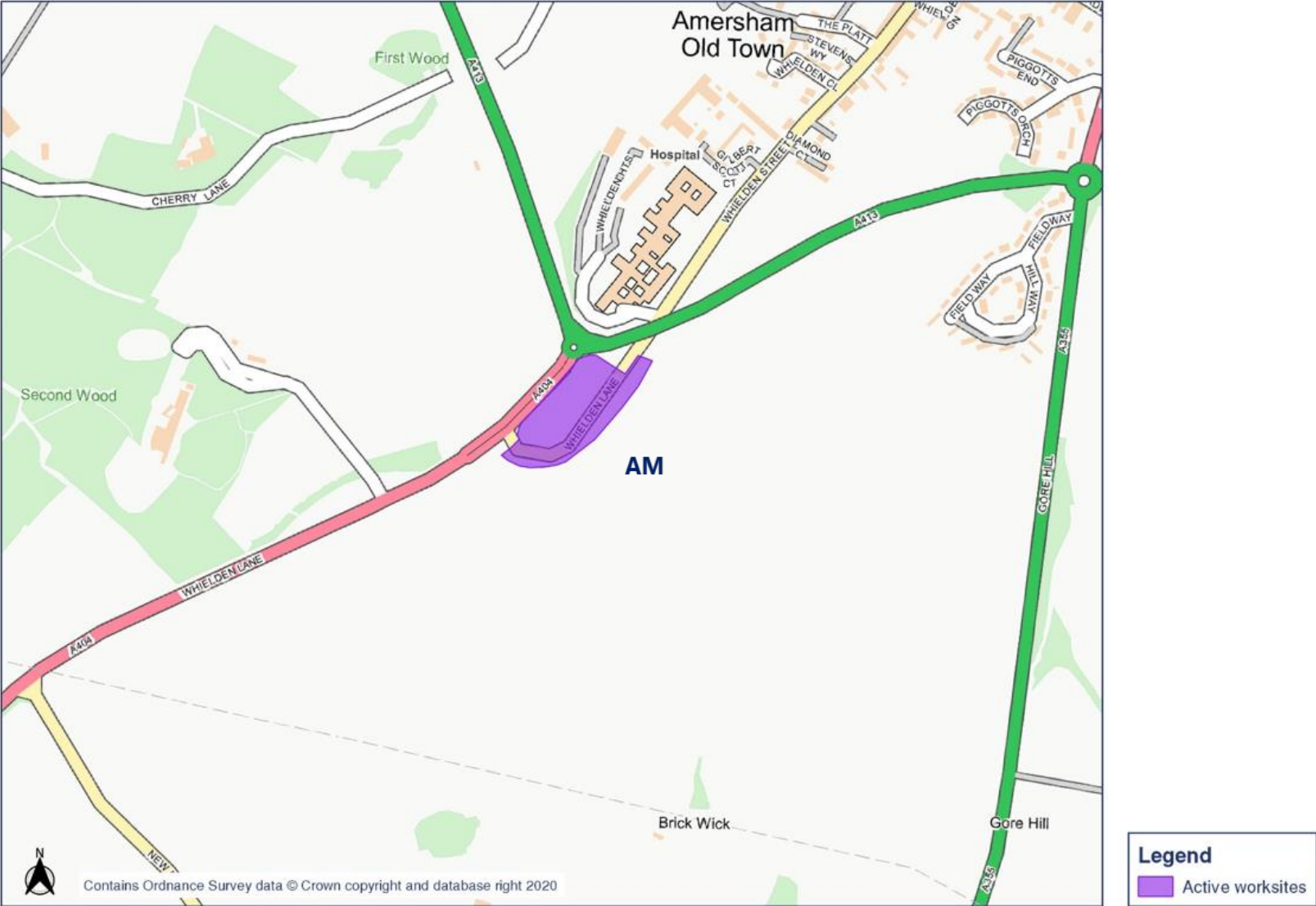
HS2

Worksite identification plan - 3

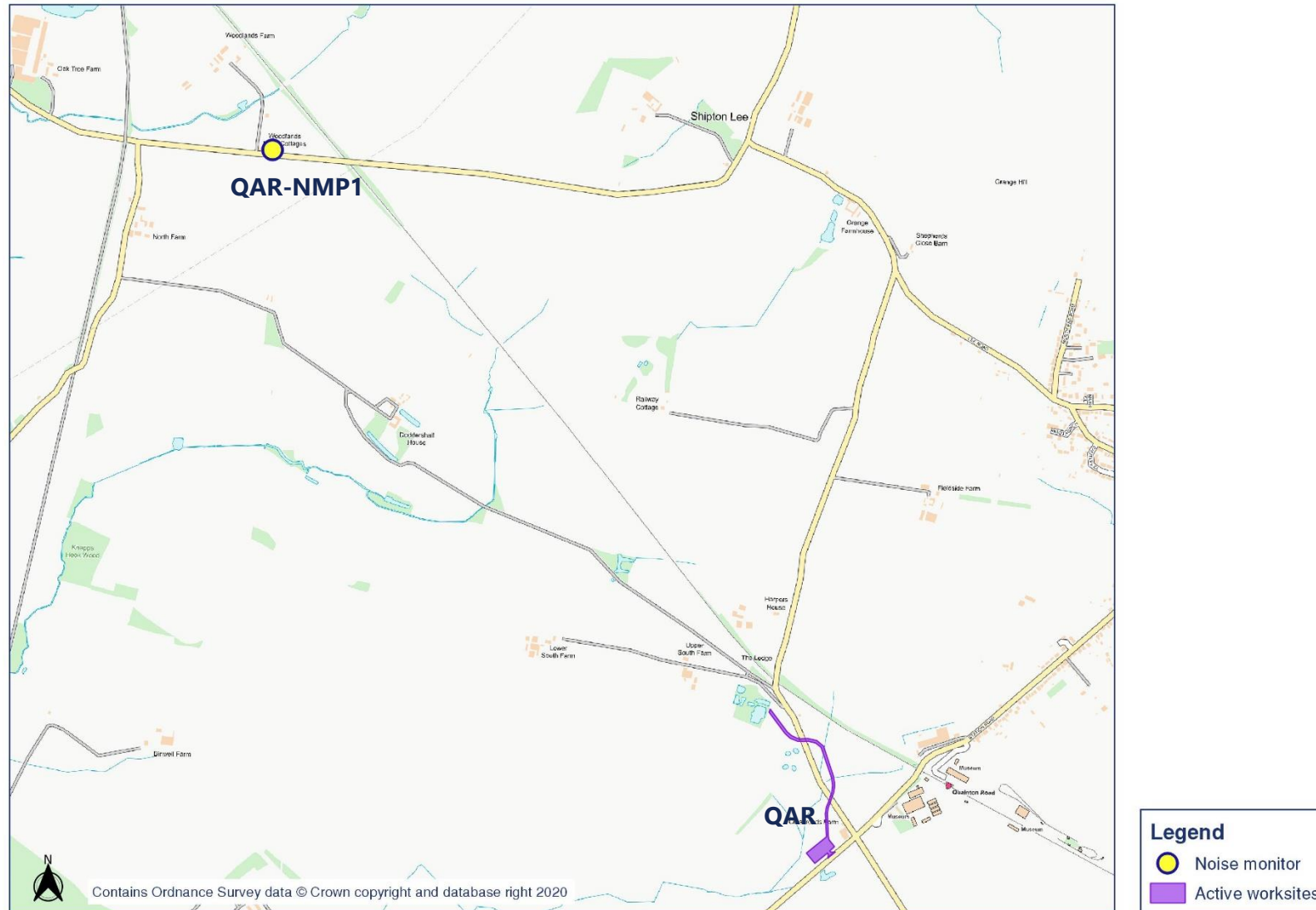


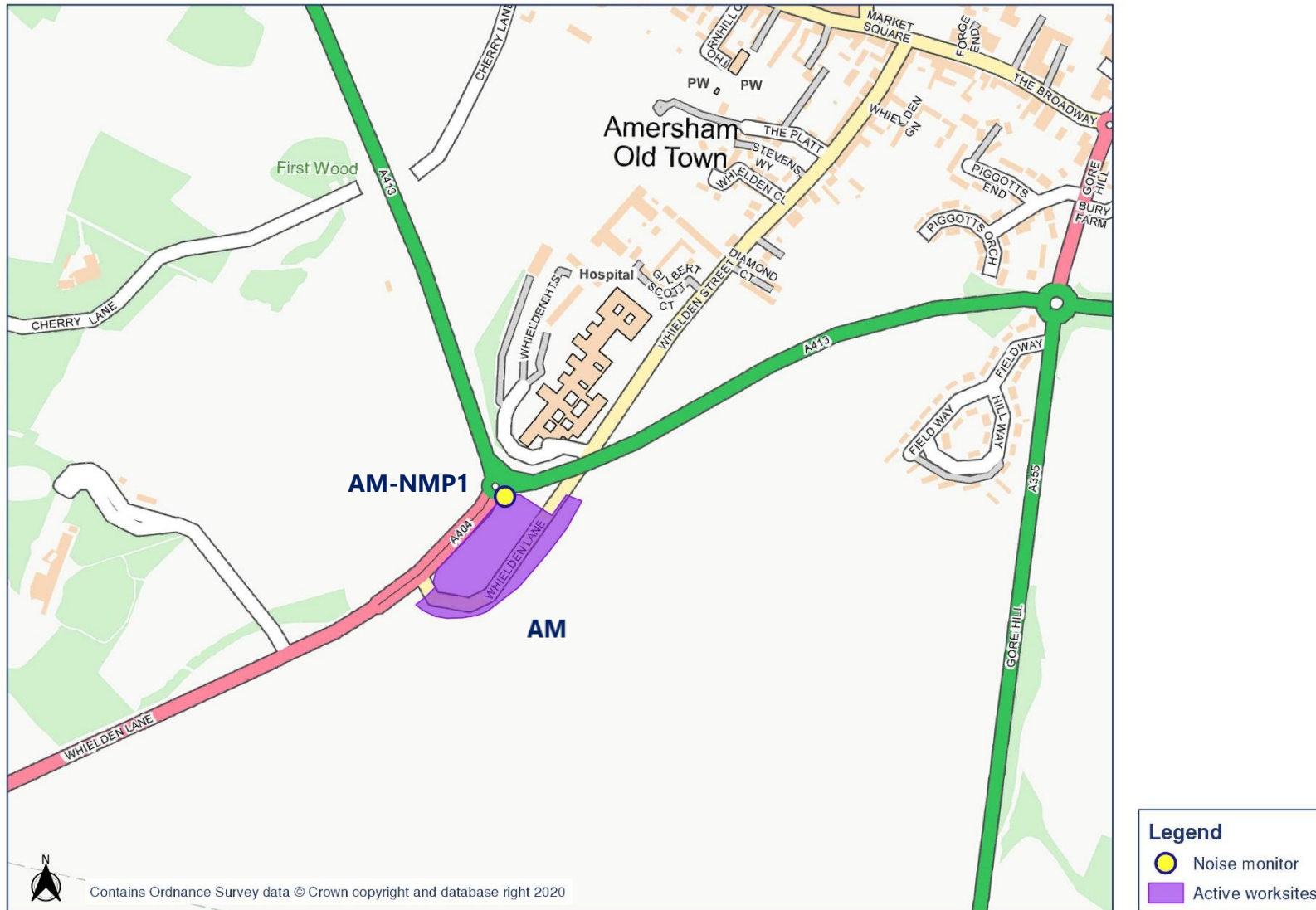


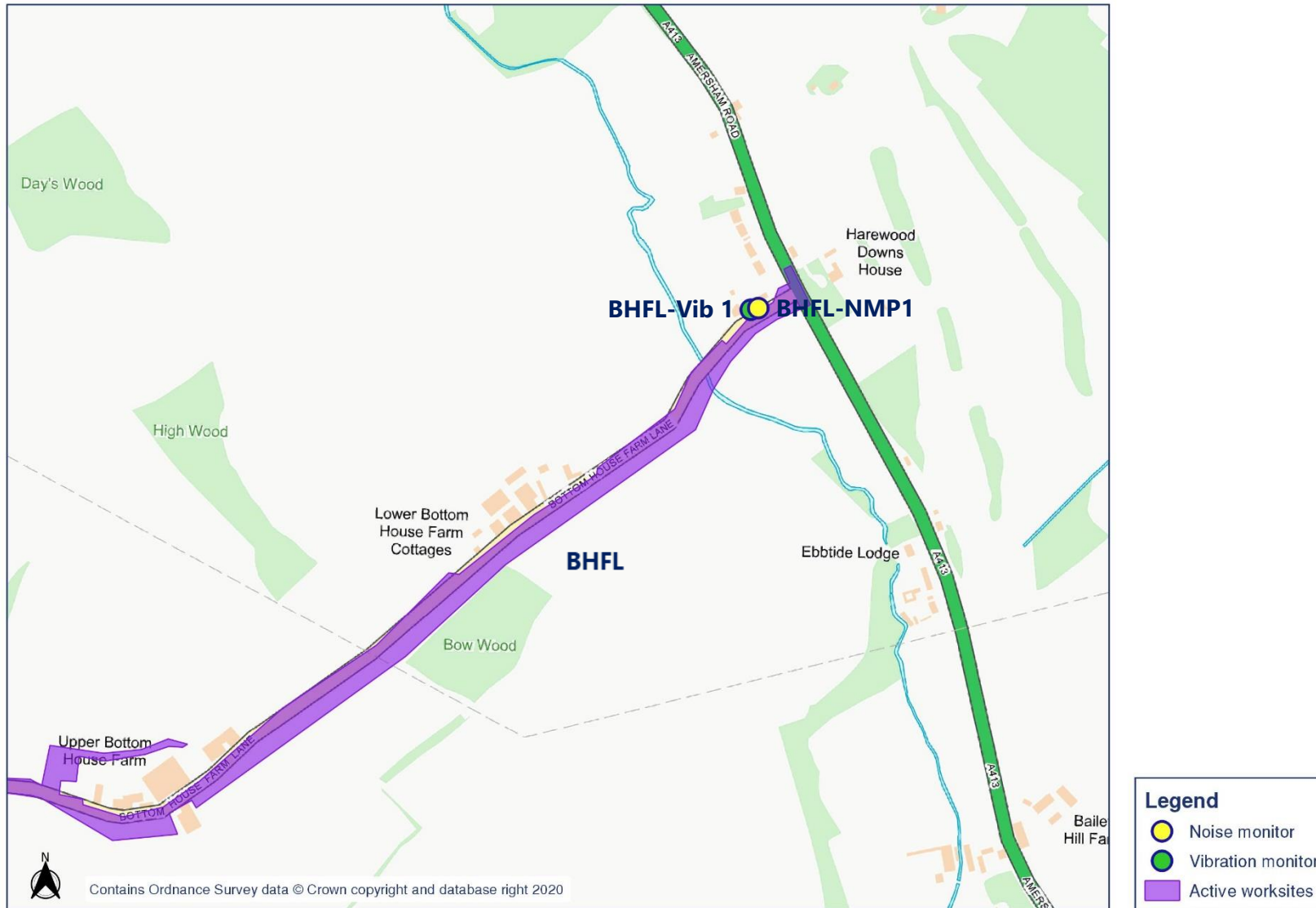


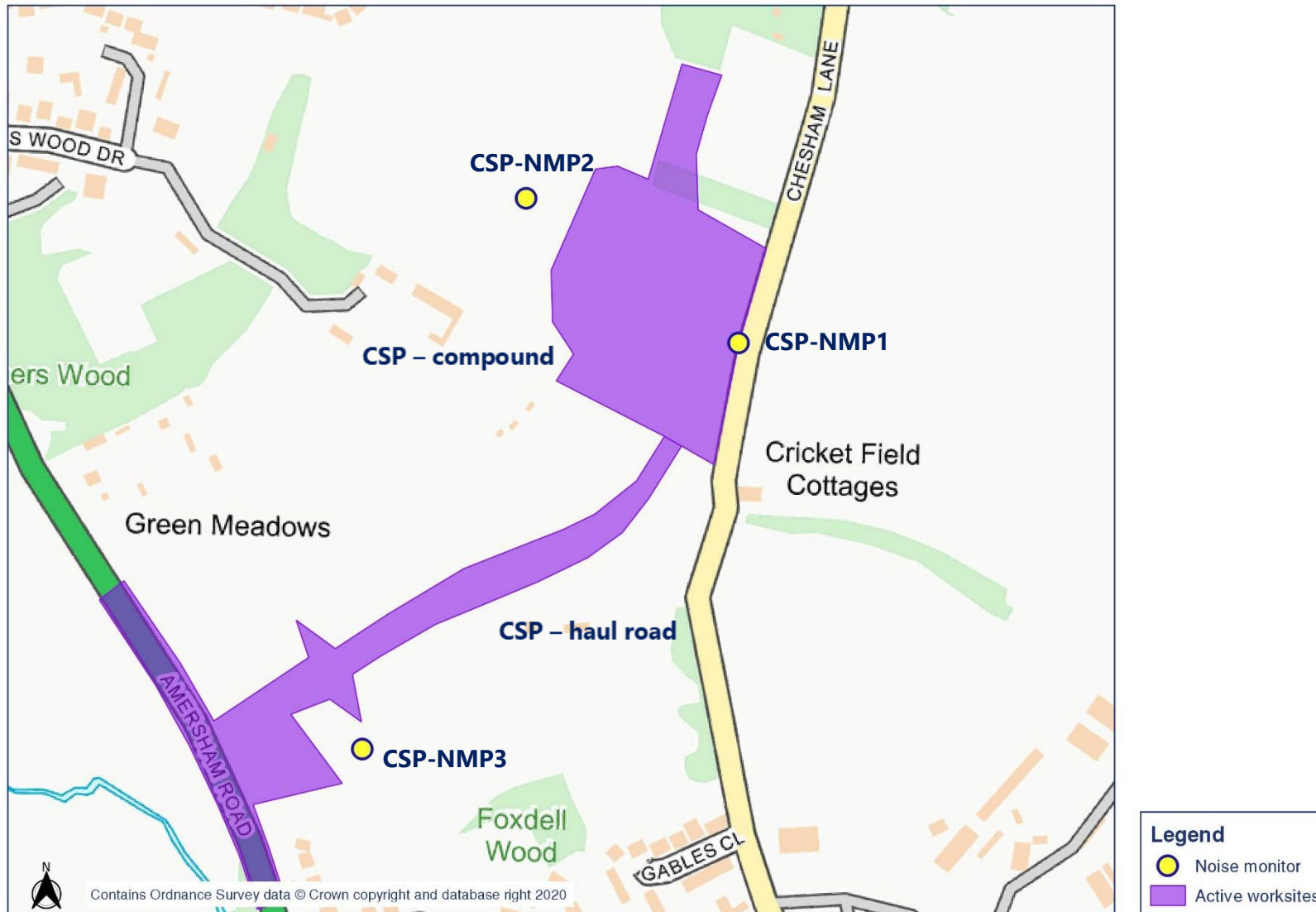


Appendix B Monitoring Locations









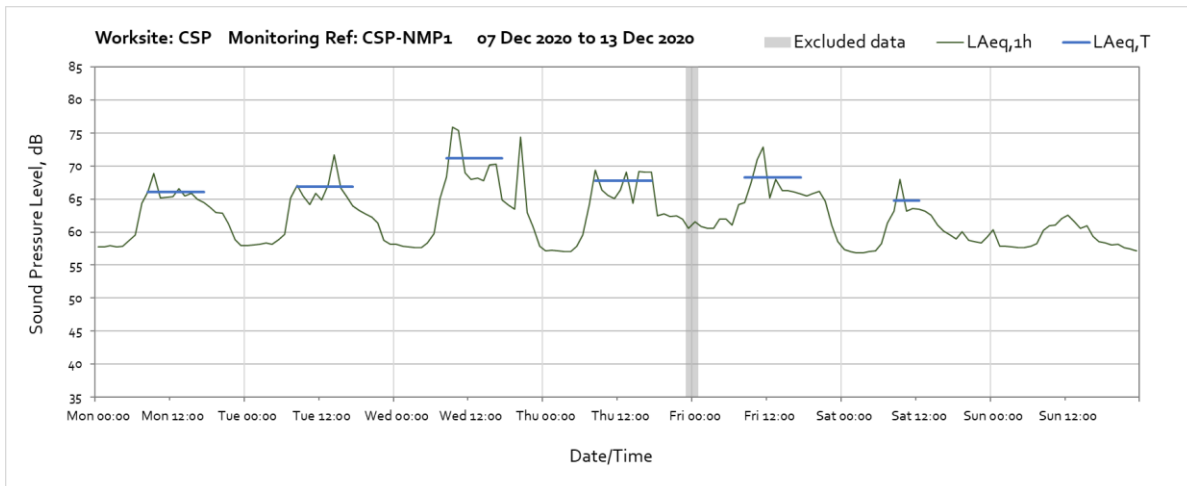
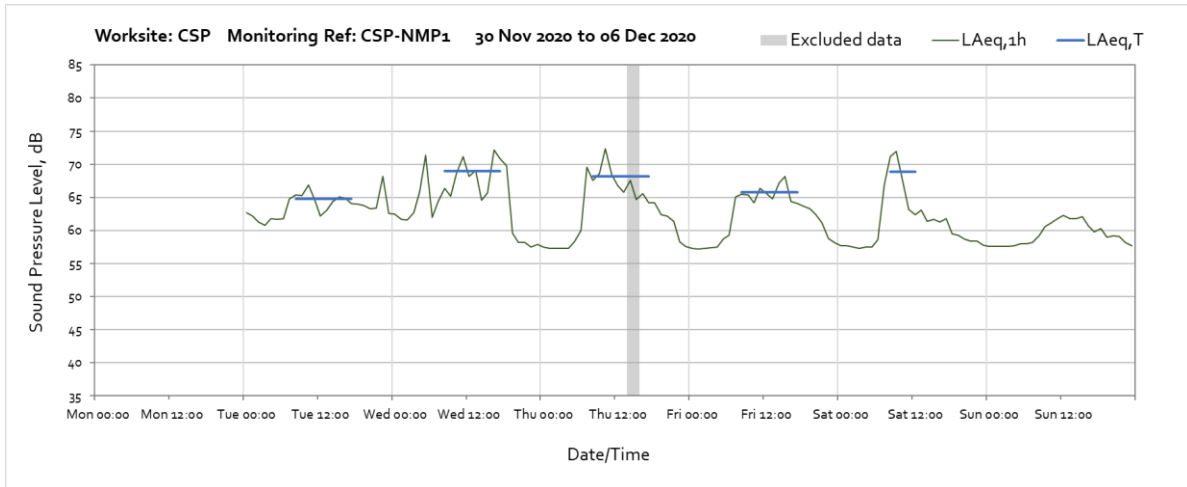


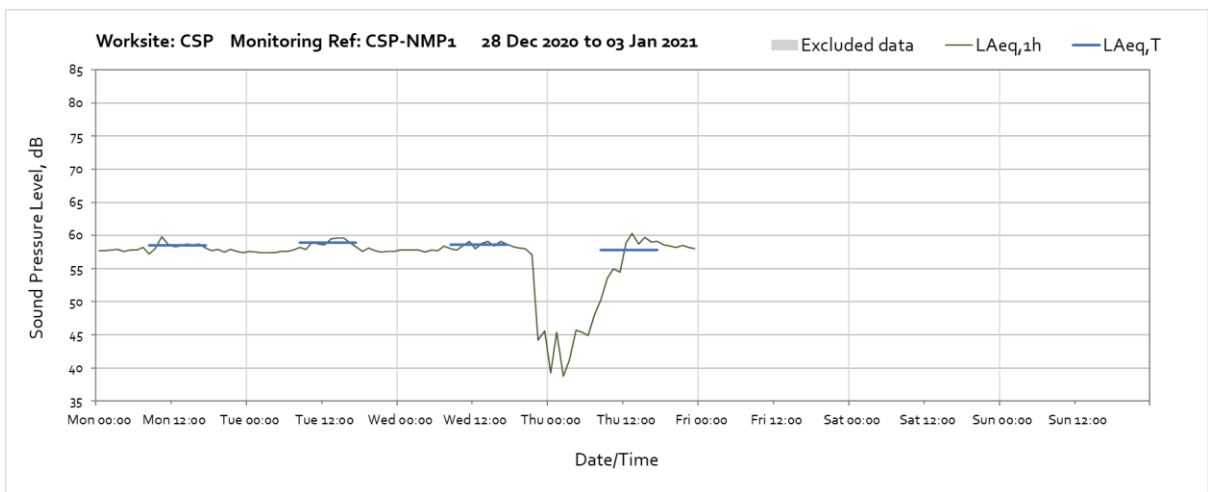
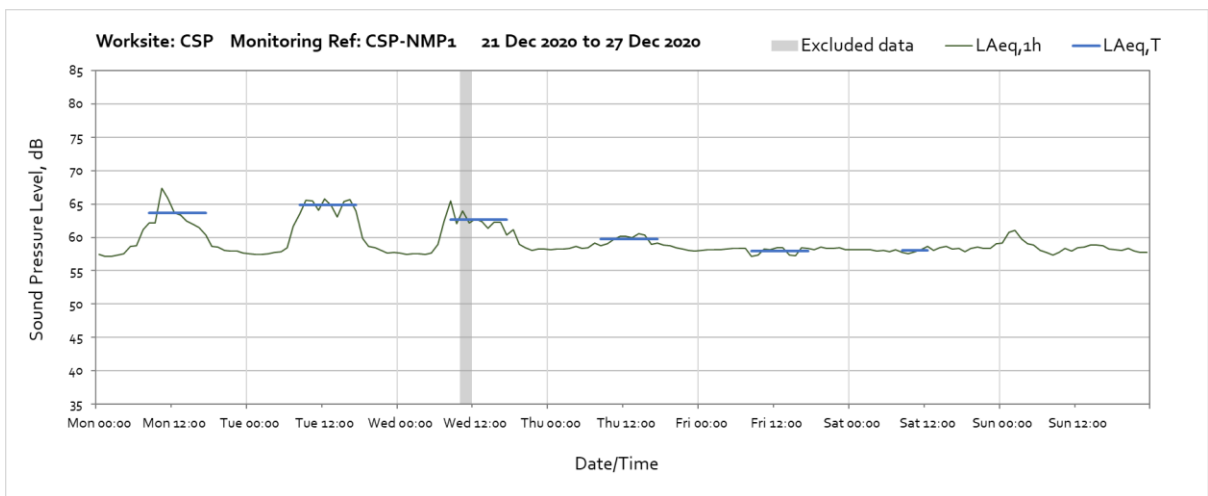
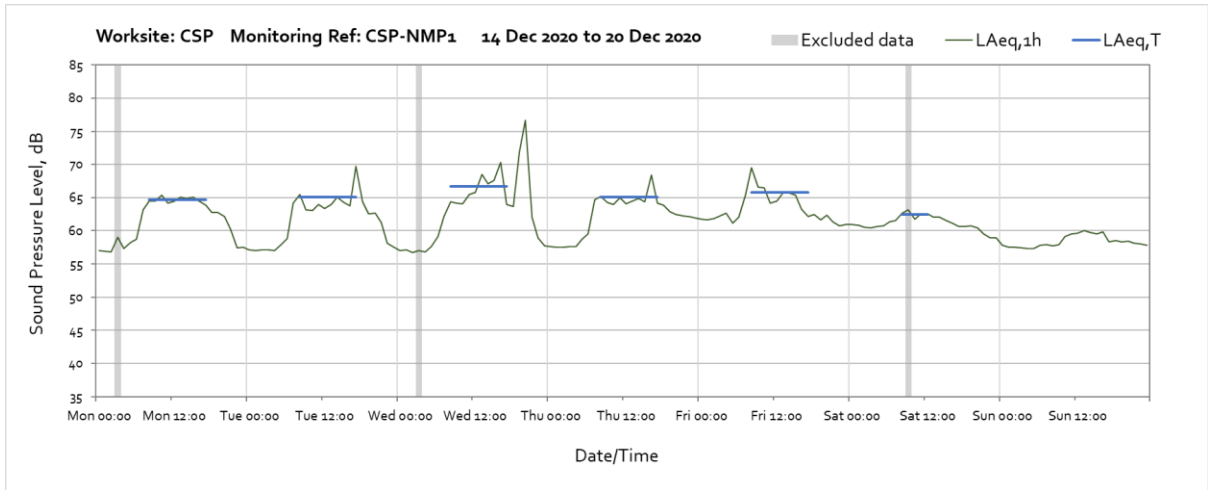
Appendix C Data

Noise

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

Worksite: CSP – Monitoring Ref: CSP-NMP1

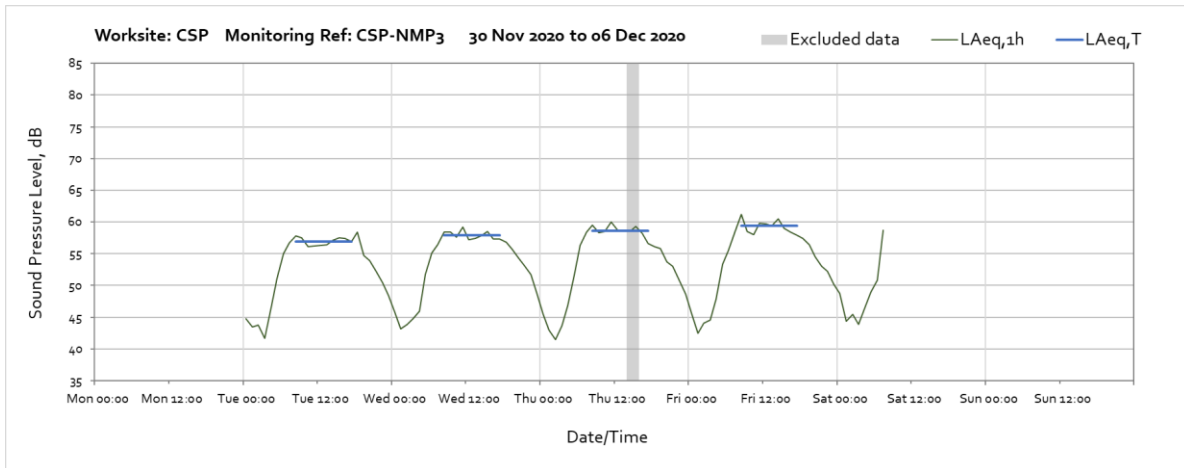




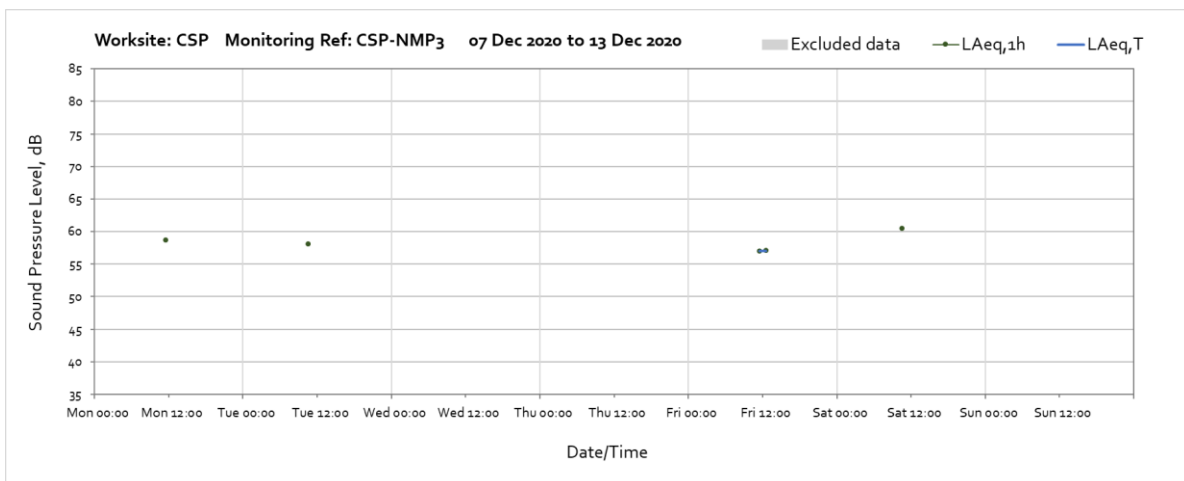
Worksite: CSP – Monitoring Ref: CSP-NMP2

No data recorded due to loss of solar power due to insufficient sunlight and fault with monitor following battery replacement.

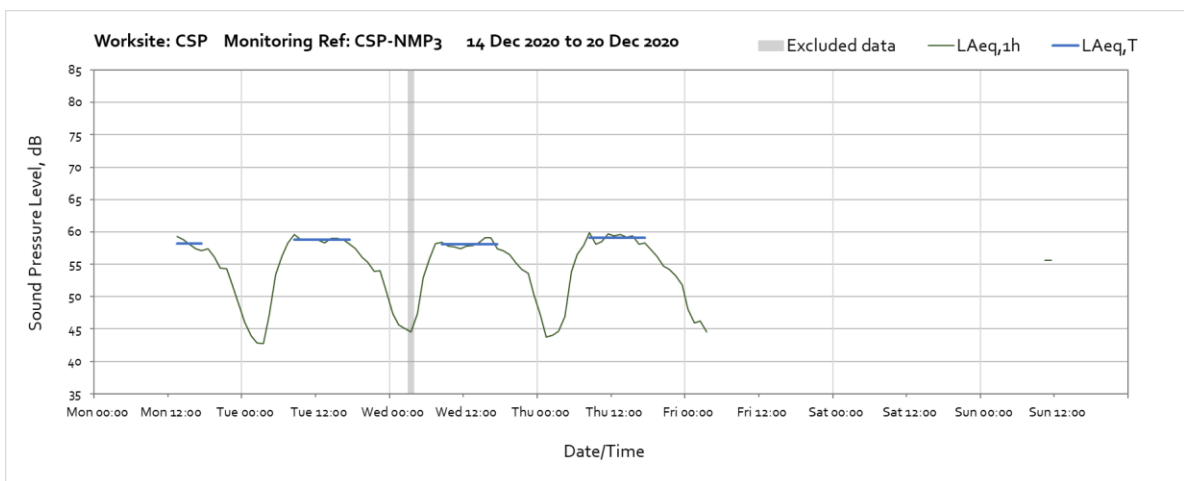
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Note: Missing data throughout December was due to loss of solar power due to insufficient sunlight.

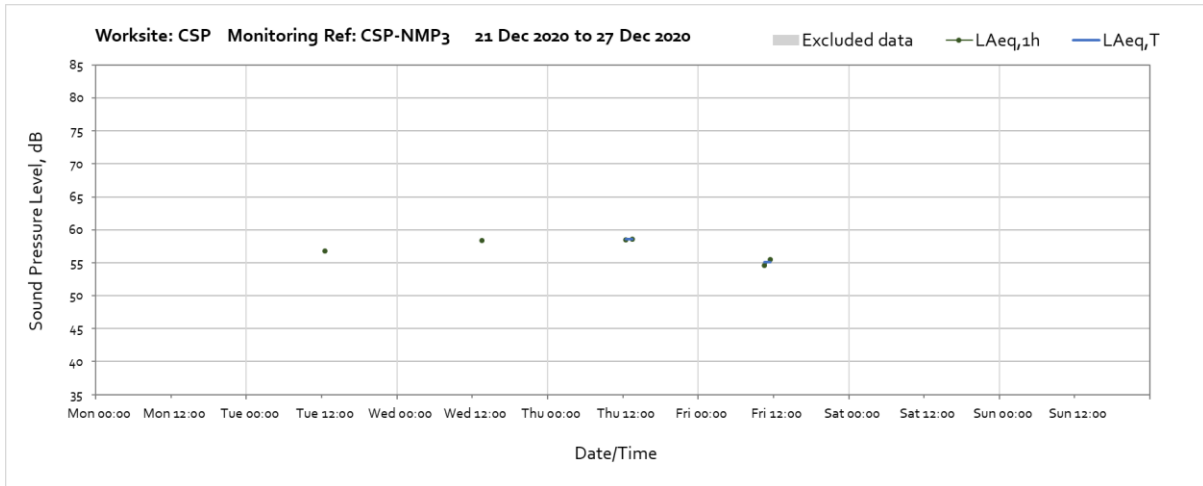


Note: Missing data throughout December was due to loss of solar power due to insufficient sunlight.

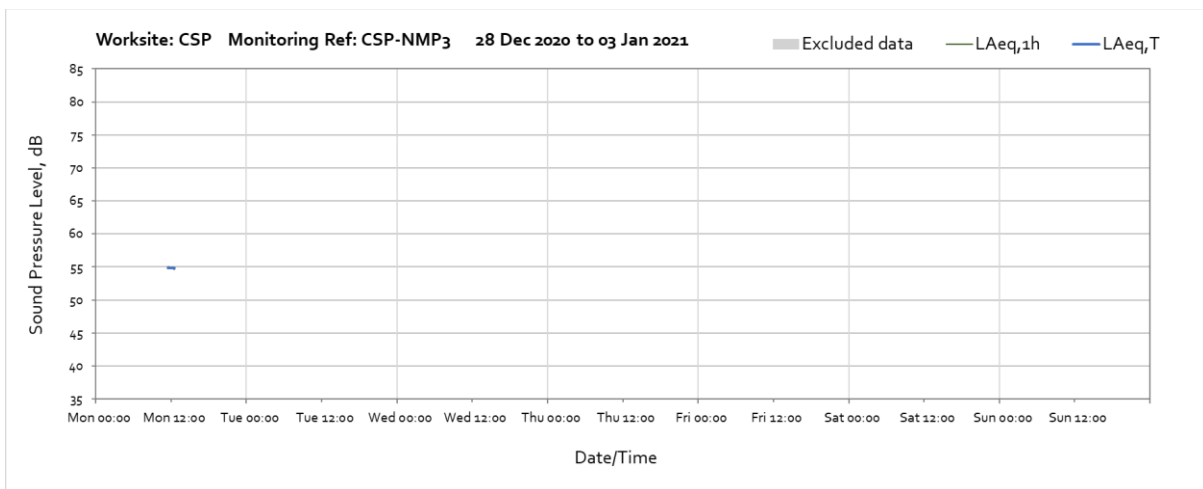


Note: Missing data throughout December was due to loss of solar power due to insufficient sunlight.

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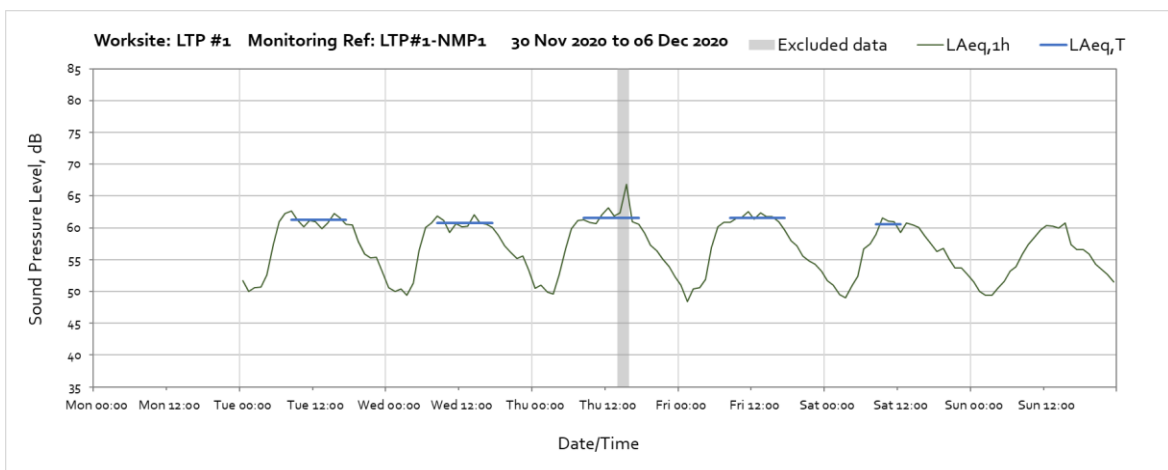


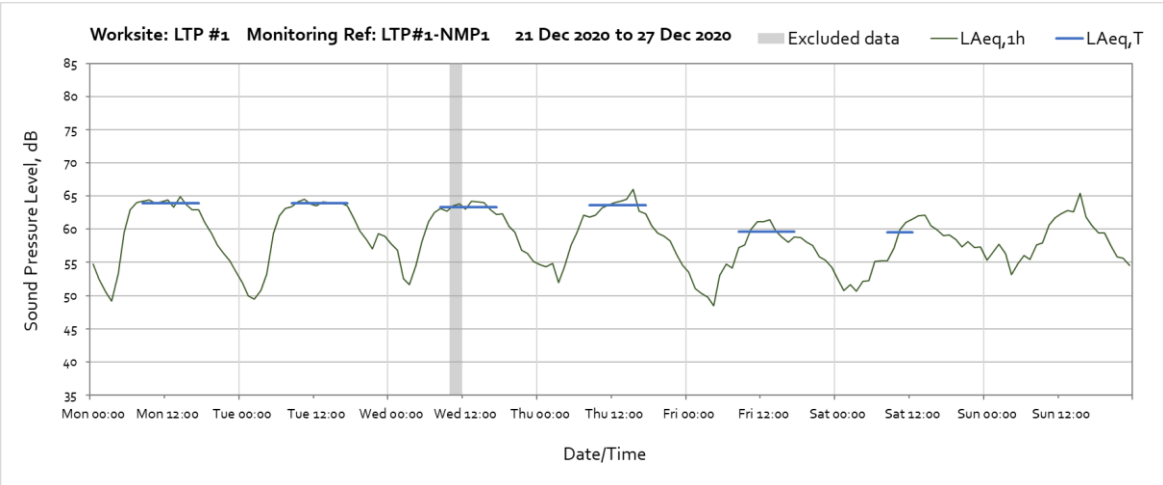
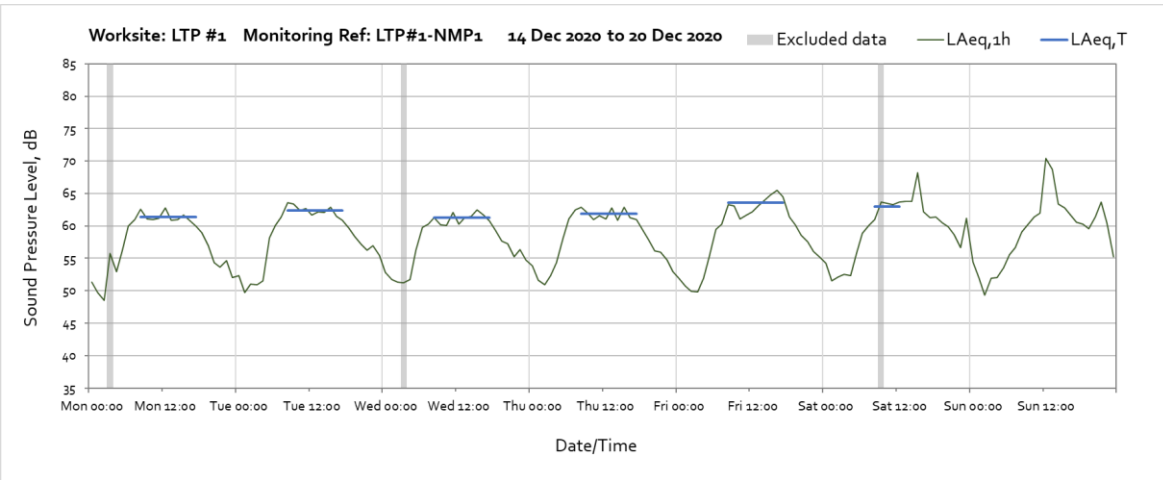
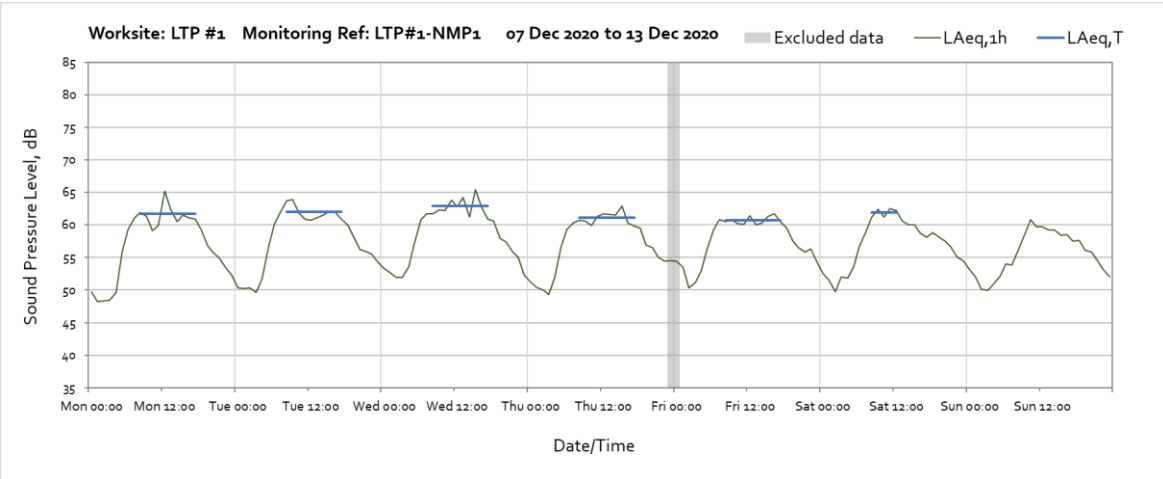
Note: Missing data throughout December was due to loss of solar power due to insufficient sunlight.

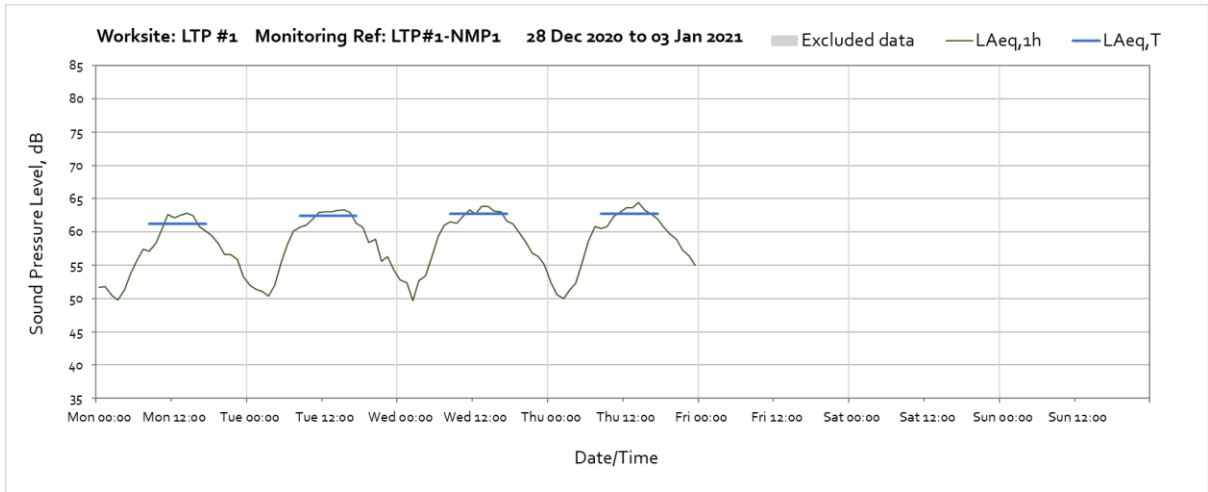


Note: Missing data throughout December was due to loss of solar power due to insufficient sunlight.

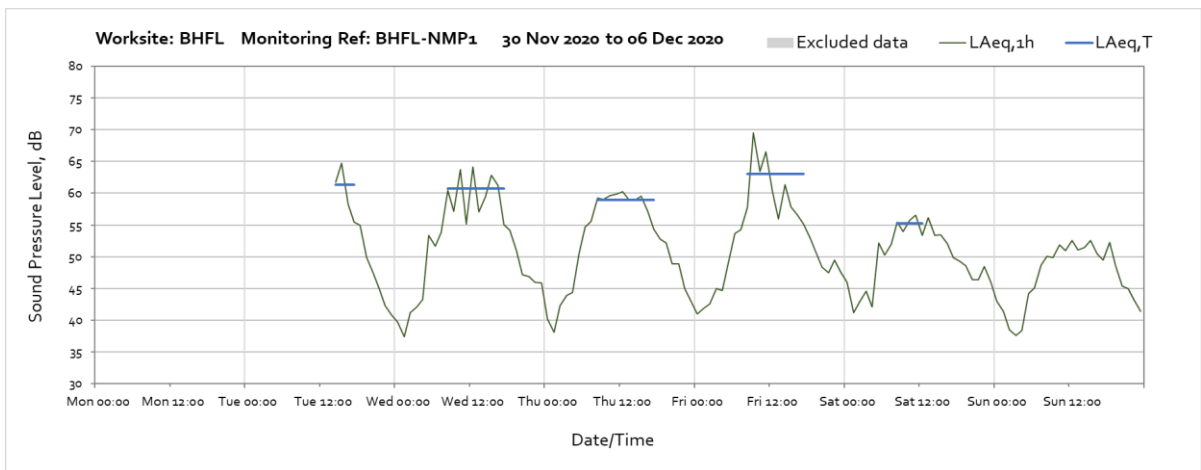
Worksite: LPT#1 – Monitoring Ref: LPT#1-NMP1



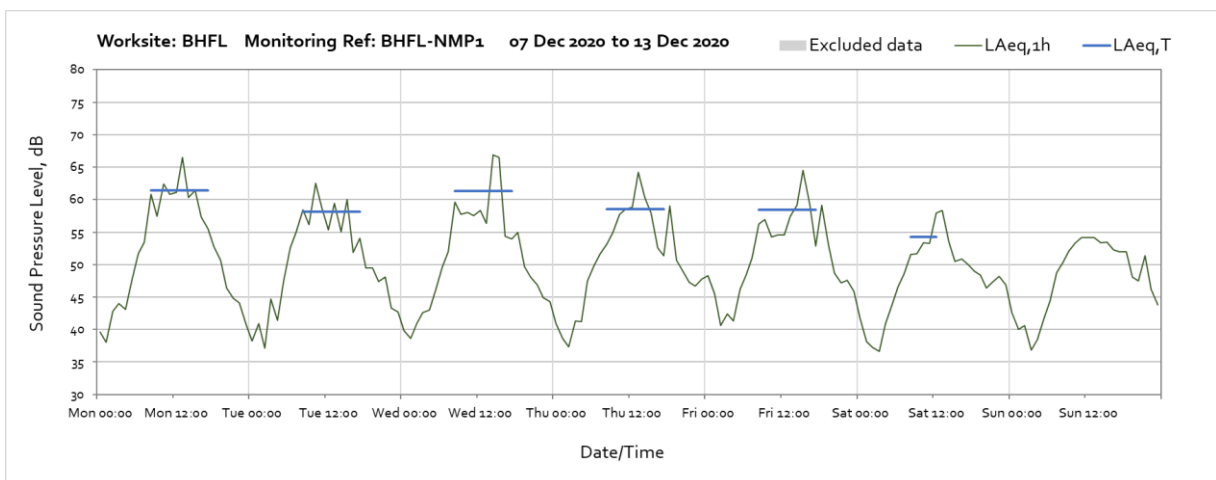


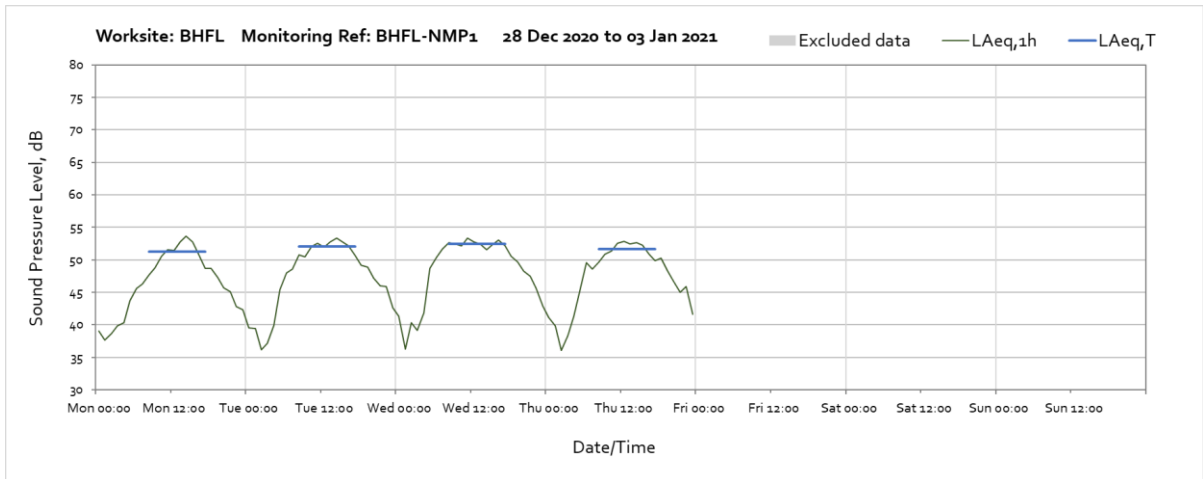
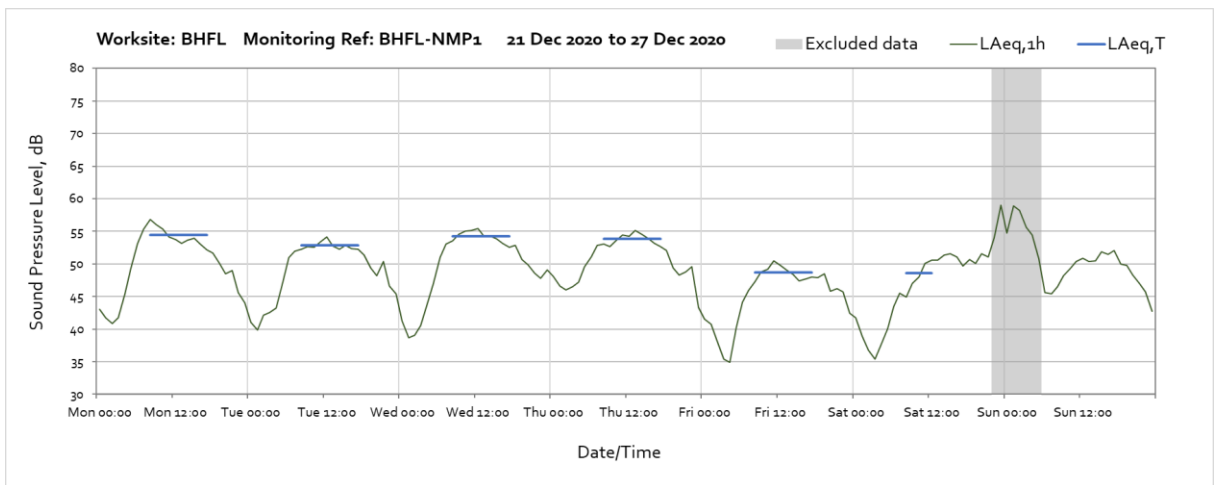
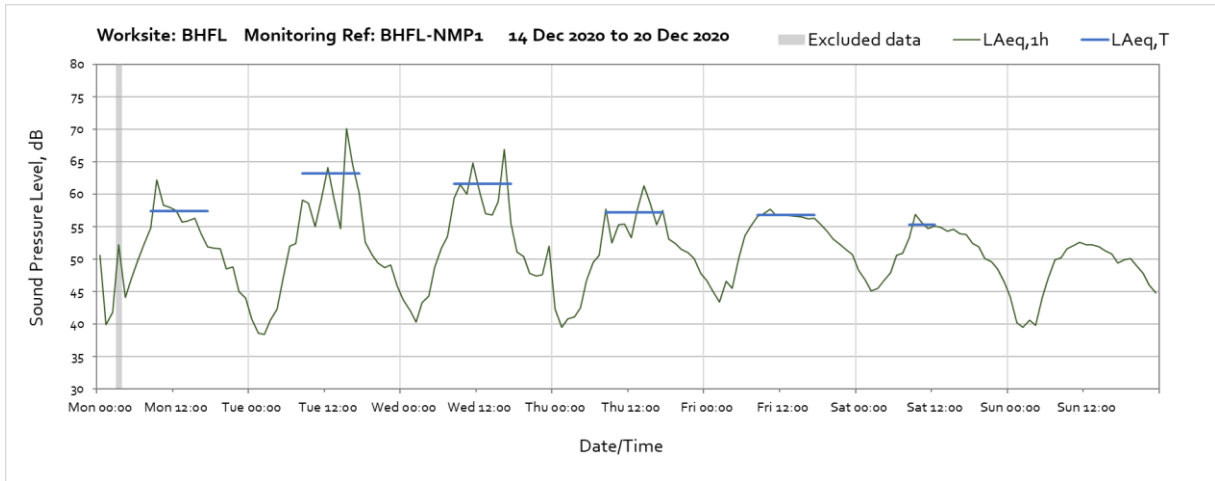


Worksite: BHFL – Monitoring Ref: BHFL-NMP1



Note: Missing data from 00:00 until 14:00 on Tuesday 2nd December was due to the monitor being taken offline for routine maintenance.



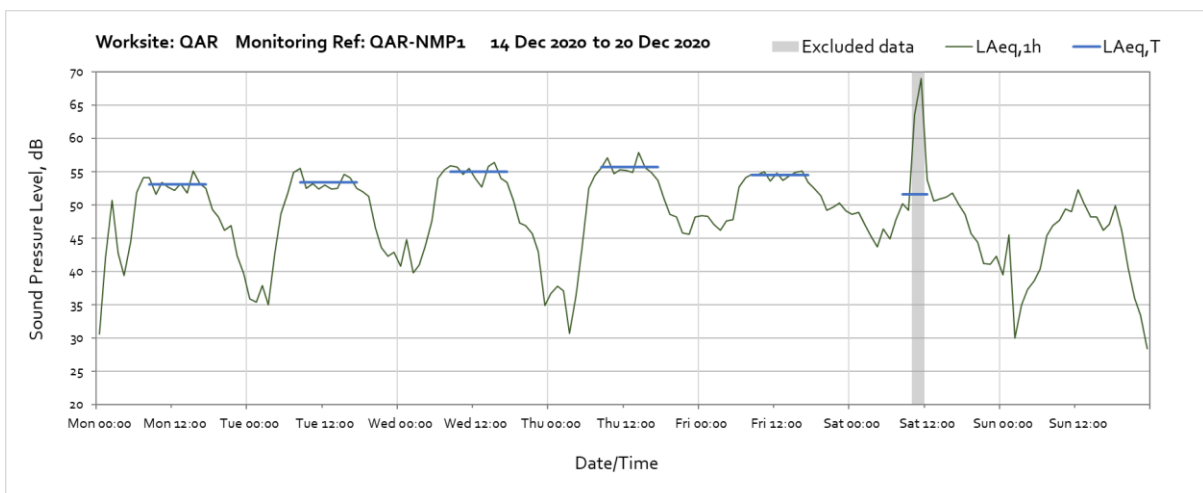
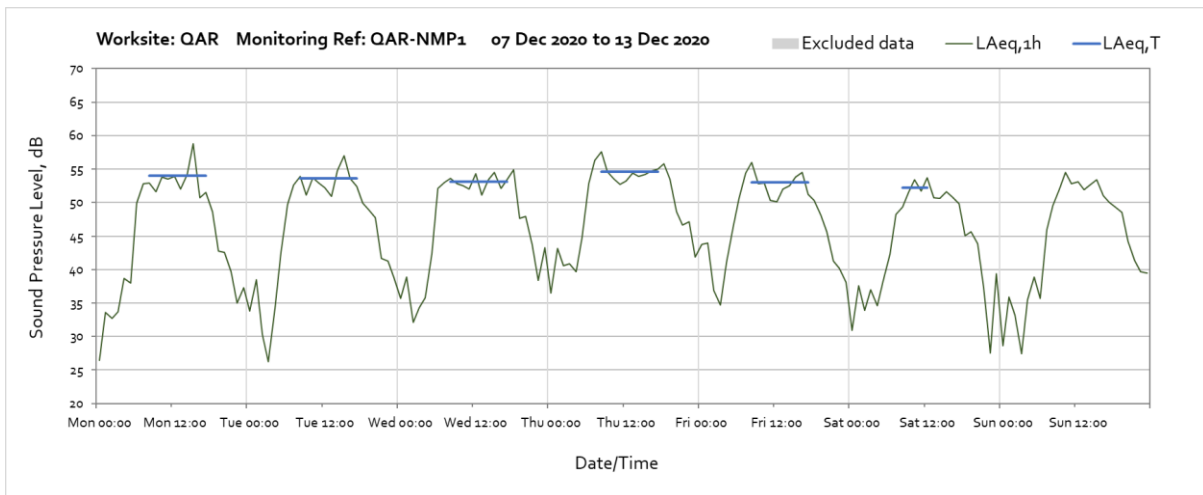
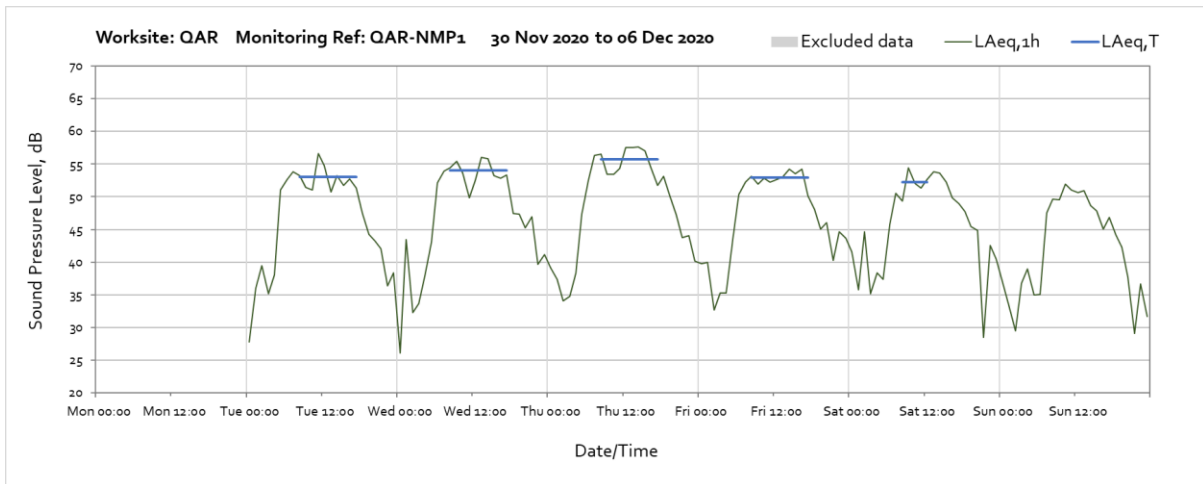


Worksite: AM – Monitoring Ref: AM-NMP1

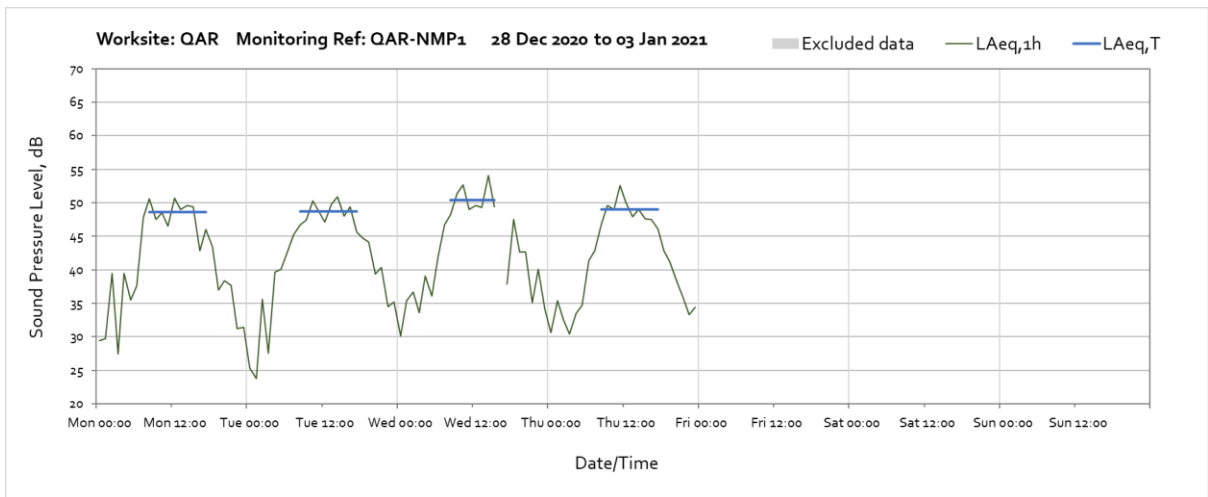
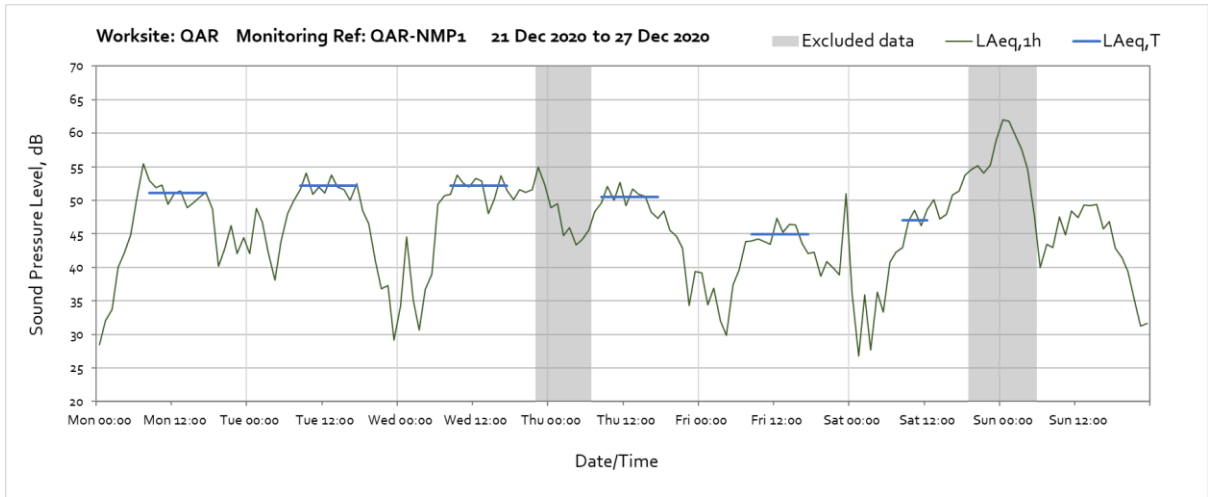
No data recorded due to loss of solar power due to insufficient sunlight.

OFFICIAL

Worksite: QAR – Monitoring Ref: QAR-NMP1



OFFICIAL



Note: Missing data from 16:00 until 17:00 on Wednesday 30th December was due the monitor being taken offline for routine maintenance.

Vibration

The following graphs show the hourly measured peak particle velocity PPV recorded during the monitoring period. The graphs show the highest PPV of the three orthogonal axes x, y and z. Where high values of PPV were caused by local interference with the vibration monitor, which are not representative of HS2 construction works, these values have been greyed out in the following charts and have been excluded to calculate values in Table 4 of the main report.

Worksite: BHFL – Monitoring Ref: BHFL-Vib 1

