

## **Construction noise and vibration Monthly Report – June 2021**

**London Borough of Camden**

<b>Non-Technical Summary</b>	<b>1</b>
<b>Abbreviations and Descriptions</b>	<b>4</b>
<b>1 Introduction</b>	<b>5</b>
1.2 Measurement Locations	9
<b>2 Summary of Results</b>	<b>10</b>
2.1 Summary of Measured Noise and Vibration Levels	10
2.2 Exceedances of the SOAEL	15
2.3 Exceedances of Trigger Level	18
2.4 Complaints	19
<b>Appendix A Site Locations</b>	<b>22</b>
<b>Appendix B Monitoring Locations</b>	<b>27</b>
<b>Appendix C Data</b>	<b>34</b>

**List of tables**

Table 1: Table of Abbreviations	4
Table 2: Monitoring Locations	9
Table 3: Summary of Measured dB $L_{Aeq}$ Data over the Monitoring Period	11
Table 4: Summary of Measured PPV Data over the Monitoring Period	15
Table 5: Summary of Exceedances of SOAEL	16
Table 6: Summary of Total Exceedances of SOAEL	18
Table 7: Summary of Exceedances of Trigger Levels	19
Table 8: Summary of Complaints	19

# Non-Technical Summary

This Noise and Vibration Monitoring Report fulfils HS2 Limited's commitment detailed in the Environmental Minimum Requirements (EMRs), Annex 1, Code of Construction Practice, to present the results of noise and vibration monitoring carried out within the London Borough of Camden during the month of June 2021.

Within this period monitoring was undertaken at the following worksites:

- Noise monitoring was undertaken in the vicinity of The Adelaide Road Ventilation Shaft (ref.: ARVS) where site setup, vegetation clearance, stockpile management, wall demolition, removal of foundations, concrete works, monitoring equipment installation, site gate modifications, working platform construction, ducting installation, preparation of foundations, traffic management works and utility works were underway.
- Noise monitoring was undertaken in the vicinity of Euston Throat Retained Cut and Granby Terrace Bridge worksite (ref.: ETRC & GTB) where crane operations, abnormal load deliveries, piling, steel fixing, stockpile management, site cleaning, dewatering, pile mat construction, edge beam construction, demolition and removal of scaffolding were underway.
- Noise monitoring was undertaken in the vicinity of Euston Scissor Cut worksite (ref.: ESC) where piling, site setup, pile mat construction, installation of water feed and power to new polymer tank, demolition, utility works and roadworks were underway.
- Noise and vibration monitoring were undertaken in the vicinity of the Hampstead Road Bridge worksite (ref.: HRB) where vegetation clearance, wall construction, roadworks, hoarding works, utilities setup, excavations, breaking out of water supply route, welfare unit fitout works and haul road modification works were underway.
- Noise and vibration monitoring were undertaken in the vicinity of the Euston Cavern worksite (ref.: ECAV), where wall coring, ground anchor installation, structural tie investigations, survey probing, pile mat construction and guide wall installation were underway.
- Noise monitoring was undertaken in the vicinity of On-Network worksites (ref.: B, C, D, E, F, G and H), where:
  - excavations (worksite E);
  - cabling works and removal of scaffolding (worksite H); and
  - inspections and deliveries (worksites B – H) were underway.

- Noise monitoring was undertaken in the vicinity of the 140 Hampstead Road and Power Signal Box worksite (ref.: S001-WS02), where demolition was underway.
- Noise and vibration monitoring were undertaken in the vicinity of the Wolfson House, Walkden House, 67-75 & 77-79 Euston Road worksite (ref.: S003-WS03) where demolition and removal of redundant basement structures and propping were underway.
- Noise monitoring was undertaken in the vicinity of the Former National Temperance Hospital, 110 Hampstead Road worksite (ref.: S003-WS06), where deliveries were underway.
- Noise monitoring was undertaken in the vicinity of the Former National Temperance Hospital - Euston North worksite (ref.: NTH-EN) where concrete pouring, pile cropping, wall reinforcement works, excavations and hoarding works were underway.
- Noise monitoring was undertaken in the vicinity of the Euston Towers Demolition worksite (ref.: ETD), where earthworks and demolition were underway.
- Noise monitoring was undertaken in the vicinity of the Vehicle Holding Area worksite (ref.: VHA), where concrete slab construction, concrete pouring and site setup were underway.
- Noise monitoring was undertaken in the vicinity of the Traction Substation worksite (ref.: TSS) where excavations, access ramp construction, ventilation fan and noise enclosure installation, delivery and replacement of concrete silos and setup of site electrical and mechanical systems were underway.
- Noise monitoring was undertaken in the vicinity of the Interim Taxi Rank worksite (ref.: ITR), where site setup and maintenance were underway.

Further works, where monitoring did not take place, were:

- Stephenson Way, Regnart Buildings, Euston Street, Gower Street and Harrington Street where utilities works were underway;
- Euston Road where installation of traffic management and ground investigation drilling works were underway; and
- Doric Way, where ground investigation drilling works were underway .

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>) were exceeded four (4) times due to HS2 works in the Local Authority Area during June 2021.

There were no exceedances of trigger levels as defined in section 61 consents during the reporting period.



Fourteen (14) complaints were received during the monitoring period. A description of complaints, the results of investigations and any actions taken are detailed in Table 8 of this report.

# Abbreviations and Descriptions

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

Table 1: Table of Abbreviations

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

# 1 Introduction

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

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

Monitoring data and interpretive reports are to be provided to each relevant local authority on a monthly basis and shall include a summary of the construction activities occurring, the data recorded over the monitoring period, any complaints received, any periods in exceedance of agreed trigger levels, the results of any investigations and any actions taken or mitigation measures implemented. This report provides noise data, and interpretation thereof, for monitoring carried out by HS2 within the London Borough of Camden (LBC) for the period 1<sup>st</sup> to 30<sup>th</sup> June 2021.

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

- The Adelaide Road ventilation shaft, (see plan 2 in Appendix A), where work activities included:
  - site setup;
  - vegetation clearance;
  - stockpile management;
  - wall demolition;
  - removal of wall foundations;
  - concrete slab, foundation and steps construction;
  - monitoring equipment installation;
  - installation of new rollers for site gates;
  - working platform construction;
  - ducting installation;
  - preparation of foundations;

- traffic management works; and
- utility works.
- Euston Throat Retained Cut and Granby Terrace Bridge worksite ref.: ETRC & GTB (see plan 2 in Appendix A), where work activities included:
  - crane operations;
  - abnormal load deliveries;
  - piling;
  - steel fixing;
  - stockpile management;
  - site cleaning;
  - dewatering;
  - pile mat construction;
  - edge beam construction;
  - span demolition; and
  - removal of scaffolding.
- Euston Scissor Cut worksite ref.: ESC (see plan 2 in Appendix A), where work activities included:
  - piling;
  - site setup for line works;
  - pile mat construction;
  - installation of water feed and power to new polymer tank;
  - wall demolition;
  - low voltage utility base construction; and
  - haul road roadworks
- Hampstead Road Bridge worksite ref.: HRB (see plan 3 in Appendix A), where work activities included:
  - vegetation clearance;
  - wall construction;
  - haul road white lining;
  - installation of hoarding;
  - utilities setup;
  - excavation of trial pits;
  - breaking out of water supply route;

- welfare unit fitout works; and
- haul road modification works.
- Euston Cavern worksite ref.: ECAV (see plan 3 in Appendix A), where work activities included:
  - wall coring;
  - ground anchor installation;
  - tie rod investigations;
  - unexploded ordnance survey probing;
  - pile mat construction; and
  - guide wall installation.
- On-Network worksites ref.: B, C, D, E, F, G and H (see plan 3 in Appendix A), where work activities included:
  - excavation of trial holes (worksite E);
  - cabling works (worksite H);
  - removal of scaffolding (worksite H); and
  - inspections and deliveries (worksites B - H)
- 140 Hampstead Road and Power Signal Box worksite ref.: S001-WS02 (see plan 2 in Appendix A), where work activities included:
  - Superstructure and substructure demolition.
- Wolfson House, Walkden House, 67-75 & 77-79 Euston Road worksite ref.: S003-WS03 (see plan 3 in Appendix A), where work activities included:
  - minor demolition works; and
  - removal of redundant basement structures and propping.
- Former National Temperance Hospital, 110 Hampstead Road worksite ref.: S003-WS06 (see plan 3 in Appendix A), where work activities included:
  - deliveries.
- Former National Temperance Hospital - Euston North worksite ref.: NTH-EN (see plan 3 in Appendix A), where work activities included:
  - concrete pouring;
  - pile cropping;
  - wall reinforcement works;
  - excavation of trial pits; and
  - hoarding works.

- Euston Towers Demolition worksite ref.: ETD (see plan 3 in Appendix A), where work activities included:
  - termination of temporary works and earthworks (soft soil strip); and
  - ground floor and basement slab demolition.
- Vehicle Holding Area worksite ref.: VHA (see plan 1 in Appendix A), where work activities included:
  - steel fixing of concrete slabs;
  - concrete pouring; and
  - installation of welfare facilities.
- Traction Substation worksite ref.: TSS (see plan 3 in Appendix A), where work activities included:
  - shaft excavation works;
  - access ramp construction;
  - caisson ring excavation;
  - ventilation fan and noise enclosure installation;
  - delivery and replacement of concrete silos; and
  - setup of site electrical and mechanical systems.
- Interim Taxi Rank worksite ref.: ITR (see plan 3 in Appendix A), where work activities included:
  - site setup and maintenance.

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

- Stephenson Way, Regnart Buildings, Euston Street, Gower Street and Harrington Street where utilities works were undertaken;
- Euston Road where installation of traffic management and ground investigation drilling works were undertaken;
- Doric Way, where ground investigation drilling works were undertaken.

1.1.4 The applicable standards, guidance, and monitoring methodology are 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 Thirty-two (32) noise and ten (10) vibration monitoring installations were active across fifteen (15) worksites in June in the LBC area. Table 2 summarises the position of noise and vibration monitoring installations within the LBC area in June 2021.

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

Table 2: Monitoring Locations

Worksite Reference	Measurement Reference	Address
ARVS	N051	Outside 70 Adelaide Road
	N052	Adelaide Road-Beaumont Walk
	V059	Outside 68 Adelaide Road
B	JC	Juniper Crescent
ESC	N024	External to Park Village Studios, Park Village East
	N047	Park Village East/Mornington Street bridge, lamppost #13
	PVS-V1	Park Village Studios
ESC, C	N022	External to 34 Mornington Terrace
	N046	Mornington Terrace near The Edinboro Castle pub, lamppost #18
ETRC & GTB	N001	Park Village East, lamppost #1 (external to Cubitt Court, 100 Park Village East)
	N002	Park Village East, lamppost #2 (external to Richmond Court)
	N003	Park Village East, lamppost #9 (external to Silsoe House)
	SH-V1	Silsoe House
ETRC & GTB, D	N004	Mornington Terrace, lamppost #7 (junction of Mornington Terrace, Mornington Place and Clarkson Row)
ETRC & GTB, E	N005	5A Granby Terrace
ETRC & GTB, F	N023	Lamppost #21 on Hampstead Road
HRB	N020	Mackworth Street, lamppost #1
	N021	Stanhope Street, lamppost #2
	N044	Regents Park Estate west, near Langdale
	N045	Regents Park Estate south, external to Coniston
	V039	Coniston, Regents Park Estate
	V043	Cubitt Court, Park Village East
G, H	HH	Euston Station Parcel Deck, Barnby Street
G	BS	Roof of Stockbeck House, Barnby Street

Worksite Reference	Measurement Reference	Address
S001-WS02	N018	Outside replacement housing, Hampstead Road
	N019	Outside Cartmel, Hampstead Road
S003-WS03, ETD, TSS	N006	Royal College of General Practitioners roof level
S003-WS03, TSS	N008	Stephenson's Way lamppost (external to RCGP)
	N010	Wesley Hotel
	N011	Euston Street, lamppost #4 (external to 82 Euston Street)
S003-WS03	V002	Royal College of General Practitioners basement boiler room by Stephenson Way
	V037	Magic Circle, basement
	V038	Wesley Hotel, basement lightwell, Euston Street
S003-WS03, ETD	N007	Royal College of General Practitioners, Melton Street
	V003	Royal College of General Practitioners basement vaults under Melton St
VHA	N025	External to 3 Prince Albert Road
	N026	Thames Water Compound
NTH-EN, TSS	N012	Drummond Street, lamppost #14 (opposite to 92-94 Drummond Street)
NTH-EN	N014	Starcross Street lamppost (external to Exmouth Arms)
	N016	Margaret Centre roof
	N017	Hampstead Road, lamppost #48
	V021	42-44 Cobourg Street

## 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 LAeq Data over the Monitoring Period

Worksite Reference	Measurement Reference	Site Address	Free-field or Façade Measurement	Weekly Average LAeq,T (Highest Day LAeq,T)					Saturday Average LAeq,T (highest day LAeq,T)					Sunday / Public Holiday Average LAeq,T (highest day LAeq,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
ARVS	N051	Outside 70 Adelaide Road	Free-field	66.7 (72.1)	69.0 (76.4)	67.1 (71.7)	66.5 (72.1)	63.9 (76.9)	66.0 (68.9)	66.6 (67.6)	67.3 (69.4)	66.9 (72.6)	65.2 (70.3)	66.4 (72.5)	63.9 (69.8)
	N052	Adelaide Road-Beaumont Walk	Free-field	66.0 (70.3)	67.7 (69.7)	66.4 (72.7)	66.3 (75.5)	63.4 (78.0)	64.3 (65.0)	66.2 (67.6)	67.5 (69.9)	66.4 (71.1)	65.1 (72.8)	65.0 (71.5)	62.3 (67.1)
B	JC	Juniper Crescent	Free-field	57.1 (60.5)	57.5 (58.7)	56.8 (60.0)	57.9 (61.0)	55.1 (59.2)	57.0 (58.0)	56.8 (57.4)	56.0 (57.3)	56.5 (59.8)	55.5 (68.1)	55.2 (58.7)	54.5 (58.8)
ESC	N024	External to Park Village Studios, Park Village East	Free-field	59.1 (69.1)	61.4 (69.4)	59.0 (62.9)	57.6 (72.8)	53.8 (63.0)	55.3 (58.4)	56.7 (57.2)	58.2 (59.4)	58.1 (66.5)	53.8 (62.5)	56.6 (67.6)	52.4 (58.8)
	N047	Park Village East/Mornington Street bridge, lamppost #13	Free-field	59.5 (63.3)	61.4 (64.8)	60.2 (62.2)	58.8 (65.9)	53.8 (61.2)	55.4 (56.2)	58.2 (59.2)	59.3 (60.5)	59.0 (66.8)	54.4 (59.0)	58.2 (68.6)	53.3 (57.6)
ESC, C	N022	External to 34 Mornington Terrace	Free-field	58.9 (60.9)	60.3 (65.1)	58.9 (60.8)	58.1 (62.8)	53.6 (59.2)	57.3 (57.8)	58.1 (59.1)	58.1 (59.7)	58.0 (64.4)	53.4 (60.4)	56.8 (60.2)	52.6 (56.7)
	N046	Mornington Terrace near The Edinboro Castle pub, lamppost #18	Free-field	62.5 (63.7)	63.1 (64.0)	62.6 (63.5)	62.0 (64.4)	57.6 (63.4)	61.9 (62.3)	62.3 (63.7)	62.0 (63.6)	62.1 (66.0)	57.1 (66.8)	61.0 (63.4)	56.9 (60.9)
ETRC & GTB	N001	External to Cubitt Court, 100 Park Village East	Free-field	59.7 (63.1)	68.7 (76.8)	60.5 (65.2)	58.9 (64.2)	54.4 (58.8)	58.7 (60.4)	68.0 (72.1)	60.8 (63.8)	59.4 (66.7)	55.5 (57.5)	58.8 (70.7)	54.5 (58.3)
	N002	Richmond Court, Park Village East	Free-field	58.2 (59.8)	63.2 (66.9)	60.1 (62.3)	58.4 (66.3)	53.0 (58.6)	54.8 (56.0)	59.6 (60.6)	59.0 (60.0)	59.0 (67.1)	54.2 (61.7)	58.3 (71.7)	52.4 (57.1)

OFFICIAL

Worksite Reference	Measurement Reference	Site Address	Free-field or Façade Measurement	Weekly Average L <sub>Aeq,T</sub> (Highest Day L <sub>Aeq,T</sub> )					Saturday Average L <sub>Aeq,T</sub> (highest day L <sub>Aeq,T</sub> )					Sunday / Public Holiday Average L <sub>Aeq,T</sub> (highest day L <sub>Aeq,T</sub> )	
				0700 - 0800	0800 - 1800	1800 - 1900	1900 - 2200	2200 - 0700	0700 - 0800	0800 - 1300	1300 - 1400	1400 - 2200	2200 - 0700	0700 - 2200	2200 - 0700
	N003	Silsoe House, Park Village East	Façade	58.3 (61.3)	61.5 (64.3)	60.2 (61.2)	58.5 (64.4)	53.4 (59.9)	54.2 (55.0)	58.2 (58.8)	58.7 (59.7)	58.8 (66.0)	54.3 (58.5)	57.8 (69.4)	52.8 (56.8)
ETRC & GTB, D	N004	Mornington Terrace, lamppost #7	Free-field	64.3 (66.5)	67.0 (68.5)	64.7 (67.2)	63.8 (67.5)	60.5 (72.5)	63.5 (63.8)	66.8 (70.6)	65.9 (73.8)	65.6 (72.7)	59.9 (70.2)	64.5 (71.8)	60.0 (70.6)
ETRC & GTB, E	N005	5A Granby Terrace	Free-field	65.6 (68.2)	68.3 (70.0)	65.3 (66.9)	65.2 (69.8)	61.8 (67.1)	63.6 (63.8)	68.1 (68.9)	66.2 (69.1)	64.7 (67.1)	61.9 (66.5)	64.5 (70.4)	62.0 (67.5)
ETRC & GTB, F	N023	Lamppost #21 on Hampstead Road	Free-field	70.0 (73.0)	70.7 (72.0)	68.9 (73.4)	68.4 (73.8)	66.3 (71.6)	67.6 (68.3)	69.3 (70.6)	68.9 (69.8)	68.3 (70.7)	66.9 (71.6)	67.7 (76.5)	66.7 (72.3)
HRB	N020	Mackworth Street, lamppost #1	Free-field	54.5 (64.6)	68.7 (72.4)	52.7 (60.8)	50.9 (61.6)	48.6 (68.1)	51.6 (54.4)	69.6 (72.9)	55.9 (57.2)	51.2 (56.8)	47.7 (52.0)	49.8 (54.9)	47.6 (50.7)
	N021	Stanhope Street, lamppost #2	Free-field	58.4 (61.3)	67.7 (80.3)	58.4 (61.2)	56.4 (59.6)	51.7 (60.3)	54.1 (56.7)	66.7 (74.4)	58.8 (61.1)	57.8 (65.1)	52.4 (56.3)	56.9 (69.7)	51.6 (56.0)
	N044	Regents Park Estate west, near Langdale	Free-field	56.0 (63.4)	68.2 (72.8)	57.7 (70.9)	52.7 (65.1)	48.9 (65.1)	55.3 (65.2)	68.4 (72.2)	63.5 (67.9)	55.2 (67.0)	52.2 (64.9)	53.4 (65.1)	52.3 (65.1)
	N045	Regents Park Estate south, external to Coniston	Free-field	57.5 (62.7)	71.1 (76.3)	57.8 (67.9)	55.6 (69.4)	51.9 (57.3)	56.8 (60.8)	68.7 (75.5)	58.8 (61.8)	55.6 (60.8)	51.4 (54.2)	54.4 (56.8)	52.0 (55.4)
G, H	HH	Euston Station Parcel Deck, Barnby Street	Free-field	56.0 (61.4)	57.5 (62.6)	57.7 (65.0)	58.1 (65.0)	54.8 (61.5)	55.3 (56.3)	56.9 (57.5)	59.4 (62.2)	57.8 (60.2)	58.3 (66.1)	56.8 (62.7)	57.1 (63.7)
G	BS	Roof of Stockbeck House, Barnby Street	Free-field	62.2 (64.6)	63.6 (65.1)	62.0 (64.2)	61.6 (64.2)	58.1 (64.9)	61.0 (62.8)	63.7 (64.9)	62.0 (62.7)	61.7 (63.9)	56.6 (61.6)	61.8 (67.1)	57.8 (63.6)

OFFICIAL

Worksite Reference	Measurement Reference	Site Address	Free-field or Façade Measurement	Weekly Average L <sub>Aeq,T</sub> (Highest Day L <sub>Aeq,T</sub> )					Saturday Average L <sub>Aeq,T</sub> (highest day L <sub>Aeq,T</sub> )					Sunday / Public Holiday Average L <sub>Aeq,T</sub> (highest day L <sub>Aeq,T</sub> )	
				0700 - 0800	0800 - 1800	1800 - 1900	1900 - 2200	2200 - 0700	0700 - 0800	0800 - 1300	1300 - 1400	1400 - 2200	2200 - 0700	0700 - 2200	2200 - 0700
S001-WS02	N018	Outside replacement housing, Hampstead Road	Free-field	69.9 (73.4)	71.5 (73.1)	69.6 (73.4)	70.2 (77.0)	67.4 (77.3)	68.1 (70.5)	69.6 (70.3)	69.0 (71.3)	70.2 (74.6)	68.7 (72.7)	68.7 (76.2)	67.1 (71.0)
	N019	Outside Cartmel, Hampstead Road	Free-field	56.5 (59.2)	62.8 (66.4)	55.3 (59.6)	55.1 (57.9)	53.1 (57.2)	54.2 (55.1)	61.5 (63.8)	57.4 (58.7)	55.5 (59.3)	53.8 (56.3)	54.1 (57.0)	53.3 (56.3)
S003-WS03, ETD, TSS	N006	Royal College of General Practitioners roof level	Free-field	57.6 (61.3)	65.4 (72.6)	56.6 (57.6)	56.3 (59.5)	54.9 (67.7)	56.5 (58.3)	59.7 (64.0)	56.3 (56.7)	56.0 (58.1)	53.9 (55.6)	55.7 (57.0)	53.4 (56.1)
S003-WS03, TSS	N008	Stephenson's Way lamppost (external to RCGP)	Façade	57.6 (68.5)	68.6 (73.6)	54.2 (56.3)	54.3 (56.6)	53.9 (64.5)	59.5 (64.0)	68.5 (73.3)	54.4 (55.0)	54.7 (57.8)	53.0 (54.4)	53.6 (57.4)	54.2 (61.4)
	N010	Wesley Hotel	Façade	64.5 (67.9)	69.4 (72.4)	59.6 (64.7)	59.3 (64.8)	55.4 (64.2)	64.2 (65.6)	68.8 (71.9)	63.2 (63.4)	63.4 (65.8)	61.0 (63.6)	63.0 (64.7)	56.1 (63.6)
	N011	Outside 82 Euston Street	Free-field	56.1 (61.6)	61.4 (64.7)	55.2 (60.7)	54.4 (60.7)	51.9 (63.8)	55.5 (58.6)	59.4 (63.3)	56.1 (58.5)	57.1 (73.3)	51.1 (58.4)	53.9 (59.0)	51.4 (57.0)
S003-WS03, ETD	N007	Royal College of General Practitioners, Melton Street	Free-field	64.7 (66.7)	67.9 (72.6)	63.0 (66.8)	63.0 (67.2)	61.7 (68.0)	64.7 (67.2)	64.0 (65.3)	63.3 (65.2)	62.6 (63.9)	61.6 (64.6)	62.4 (66.4)	61.1 (65.7)
VHA	N025	External to 3 Prince Albert Road	Free-field	66.9 (69.8)	67.0 (69.2)	65.8 (71.4)	65.3 (70.0)	62.4 (68.6)	64.4 (65.7)	66.7 (71.2)	66.0 (69.2)	65.6 (71.6)	63.7 (69.2)	65.3 (70.3)	63.5 (71.1)
	N026	Thames Water Compound	Free-field	55.8 (59.6)	60.7 (65.2)	55.5 (58.8)	54.7 (58.2)	51.5 (59.5)	53.2 (54.0)	55.1 (59.4)	55.3 (58.5)	55.0 (60.0)	54.0 (70.1)	54.5 (59.0)	52.2 (56.9)

Worksite Reference	Measurement Reference	Site 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
NTH-EN, TSS	N012	Opposite 92-94 Drummond Street	Free-field	57.4 (60.4)	61.2 (64.9)	58.7 (64.7)	58.7 (62.2)	55.9 (59.0)	55.7 (57.1)	59.0 (59.5)	57.8 (59.5)	58.6 (60.7)	55.2 (58.5)	58.2 (66.1)	55.9 (59.7)
NTH-EN	N014	Starcross Street lamppost (external to Exmouth Arms)	Free-field	56.0 (63.4)	59.7 (69.2)	60.8 (68.1)	61.0 (72.9)	53.7 (69.4)	53.1 (54.8)	59.3 (68.8)	55.4 (58.5)	56.9 (62.6)	50.3 (55.0)	56.0 (63.5)	52.4 (59.9)
	N016	Margaret Centre roof	Free-field	55.1 (58.2)	58.0 (60.8)	53.8 (57.6)	53.8 (60.3)	51.2 (60.2)	53.0 (53.6)	55.8 (58.0)	54.1 (58.6)	53.7 (56.1)	51.7 (56.6)	52.9 (59.1)	50.9 (54.9)
	N017	Hampstead Road, lamppost #48	Free-field	70.6 (75.0)	71.4 (73.7)	70.7 (77.1)	70.5 (77.3)	67.5 (75.5)	69.2 (71.1)	69.4 (70.1)	69.7 (74.5)	70.8 (73.8)	68.4 (72.1)	68.7 (76.7)	67.2 (70.8)

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
ARVS	V059	Outside 68 Adelaide Road	2.72 (Z-axis)
HRB	V039	Coniston, Regents Park Estate	2.68 (Y-axis)
	V043	Cubitt Court, Park Village East	3.96 (X-axis)
S003-WS03	V002	RCGP basement boiler room, 305 Euston Road	1.73 (Z-axis)
	V003	RCGP basement vaults, 305 Euston Road	1.04 (Y-axis)
	V037	Magic Circle, basement	3.00 (Y-axis)
	V038	Wesley Hotel, basement lightwell, Euston Street	2.14 (Y-axis)
NTH-EN	V021	42-44 Cobourg Street (floor)	0.67 (Z-axis)
ESC	PVS-V1	Park Village Studios	1.14 (Y-axis)
ETRC & GTB	SH-V1	Silsoe House	1.80 (Y-axis)

2.1.3 Appendix C presents graphs of the noise and vibration monitoring data over the month for each of the measurement locations. Noise data presented consists of the hourly  $L_{Aeq}$  values and, where relevant, the  $L_{Aeq,T}$  values (where the time period T has been taken to be the averaging period as specified in Table 1 of HS2 Information Paper E23). Vibration data presented consist of hourly PPV values. The full data set for the monitoring equipment can be found at the following location:

<https://data.gov.uk/dataset/24542ae7-dd44-444f-b259-871c4cc43b5e/environmental-monitoring-data>.

## 2.2 Exceedances of the SOAEL

2.2.1 The significant observed adverse effect level (SOAEL) is defined in the 'Planning Practice Guidance – Noise' as the level above which "noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area."

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

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

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

Table 5: Summary of Exceedances of SOAEL

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of SOAEL
ARVS	N051	Outside 70 Adelaide Road	Weekday	0800-1800	2
	N052	Adelaide Road-Beaumont Walk	All days	All periods	No exceedance
B	JC	Juniper Crescent	All days	All periods	No exceedance
ESC	N024	External to Park Village Studios, Park Village East	All days	All periods	No exceedance
	N047	Park Village East/Mornington Street bridge, lamppost #13	All days	All periods	No exceedance
ESC, C	N022	External to 34 Mornington Terrace	All days	All periods	No exceedance
	N046	Mornington Terrace near The Edinboro Castle pub, lamppost #18	All days	All periods	No exceedance
ETRC & GTB	N001	External to Cubitt Court, 100 Park Village East	Weekday	0800-1800	2
	N002	Richmond Court, Park Village East	All days	All periods	No exceedance
	N003	Silsoe House, Park Village East	All days	All periods	No exceedance
ETRC & GTB, D	N004	Mornington Terrace, lamppost #7	All days	All periods	No exceedance
ETRC & GTB, E	N005	5A Granby Terrace	All days	All periods	No exceedance

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of SOAEL
ETRC & GTB, F	N023	Lamppost #21 on Hampstead Road	All days	All periods	No exceedance
HRB	N020	Mackworth Street, lamppost #1	All days	All periods	No exceedance
	N021	Stanhope Street, lamppost #2	All days	All periods	No exceedance
	N044	Regents Park Estate west, near Langdale	All days	All periods	No exceedance
	N045	Regents Park Estate south, external to Coniston	All days	All periods	No exceedance
G, H	HH	Euston Station Parcel Deck, Barnby Street	All days	All periods	No exceedance
G	BS	Roof of Stockbeck House, Barnby Street	All days	All periods	No exceedance
S001-WS02	N018	Outside replacement housing, Hampstead Road	All days	All periods	No exceedance
	N019	Outside Cartmel, Hampstead Road	All days	All periods	No exceedance
S003-WS03, ETD, TSS	N006	RCGP Roof level	All days	All periods	Not applicable*
S003-WS03, TSS	N008	RCGP Stephenson Way	All days	All periods	No exceedance
	N010	Wesley Hotel	All days	All periods	No exceedance
	N011	Outside 82 Euston Street	All days	All periods	No exceedance
S003-WS03, ETD	N007	RCGP, Melton Street	All days	All periods	No exceedance
VHA	N025	External to 3 Prince Albert Road	All days	All periods	No exceedance
	N026	Thames Water Compound	All days	All periods	No exceedance

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of SOAEL
NTH-EN	N012	Opposite 92-94 Drummond Street	All days	All periods	No exceedance
	N014	Starcross Street lamppost (external to Exmouth Arms)	All days	All periods	No exceedance
	N016	Margarete Centre roof	All days	All periods	No exceedance
	N017	Hampstead Road, lamppost #48	All days	All periods	No exceedance

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

2.2.5 For the purpose of assessing eligibility for noise insulation or temporary rehousing, multiple exceedances of the SOAEL in a 24-hour period would be counted as a single exceedance during that day. Over the reporting period, the overall number of SOAEL exceedances at each measurement location is shown in Table 6 and may be lower than the total sum of individual exceedances reported in Table 5 for each location.

Table 6: Summary of Total Exceedances of SOAEL

Worksite Reference	Measurement Reference	Monitor Address	Total of SOAEL exceedances in the month
ETRC & GTB	N001	External to Cubitt Court, 100 Park Village East	2
ARVS	N051	Outside 70 Adelaide Road	2

2.2.6 4 exceedances of the SOAEL were recorded due to HS2 construction works during June 2021. The exceedances occurred at:

- Monitoring location N001 during two daytime periods due to piling; and
- Monitoring location N051 during two daytime periods due to utility trial trench works

## 2.3 Exceedances of Trigger Level

2.3.1 Table 7 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 7: 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.

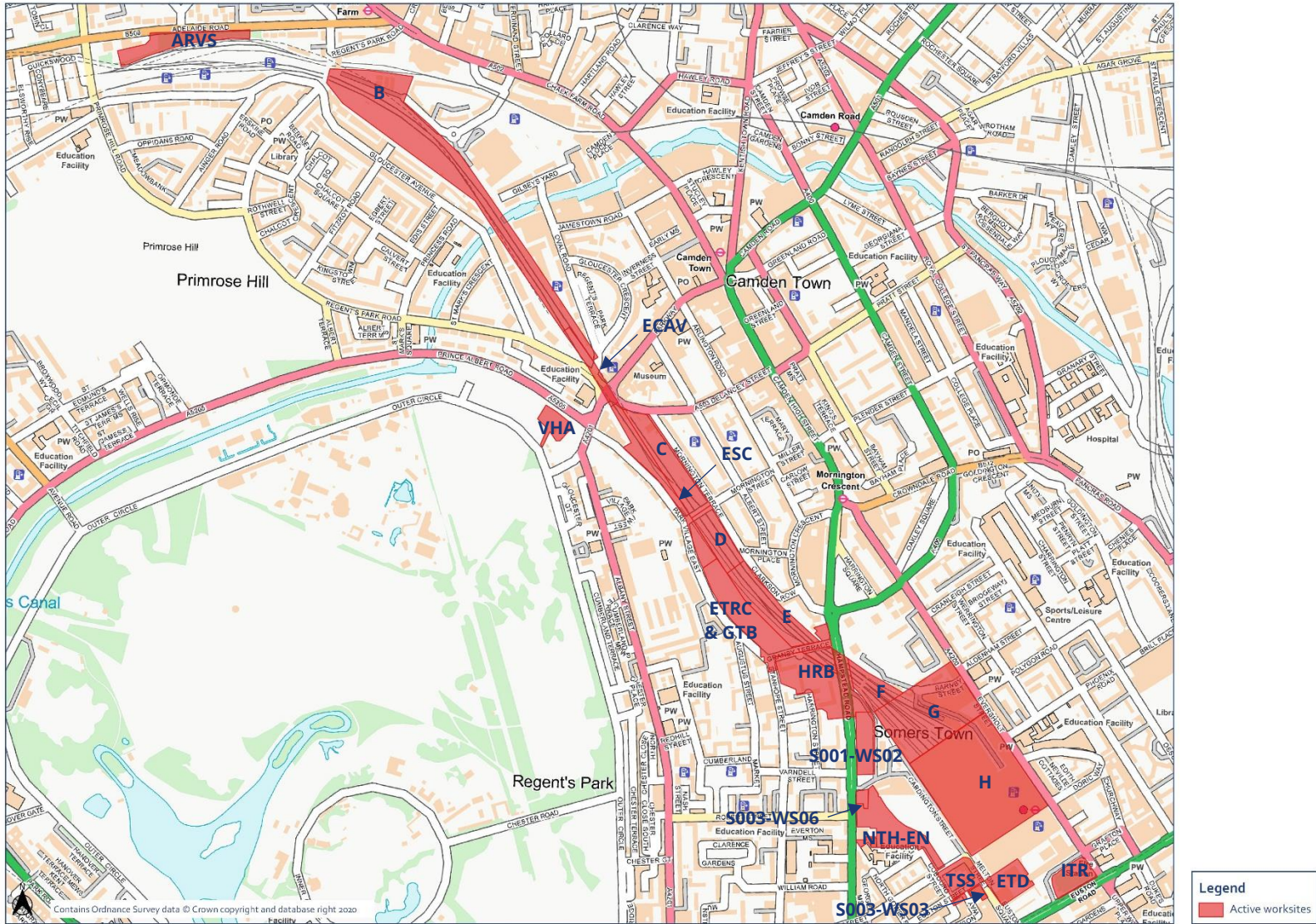
Table 8: Summary of Complaints

Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
HS2-21-42175-C	NTH-EN	Complaint regarding higher than usual levels of construction noise.	A review of measurements from nearby monitoring indicated that noise levels were typical and dominated by non-construction sources. Monitoring data demonstrates compliance with Section 61 requirements.	Use of on-site mitigation was reviewed and site operatives reminded to take steps to minimise noise wherever practicable.
HS2-21-42056-C	HRB	General complaint regarding construction noise.	The construction noise was associated with HS2 utility work. Monitoring data demonstrates compliance with Section 61 requirements.	Information was provided to the stakeholder outlining the noise mitigation measures currently in place and details of the special cases panel.
HS2-21-42058-C	HRB	General complaint regarding construction noise.	The construction noise was associated with HS2 utility work. Monitoring data demonstrates compliance with Section 61 requirements.	Information was provided to the stakeholder outlining the noise mitigation measures currently in place and it was confirmed that the stakeholder will be receiving noise insulation.

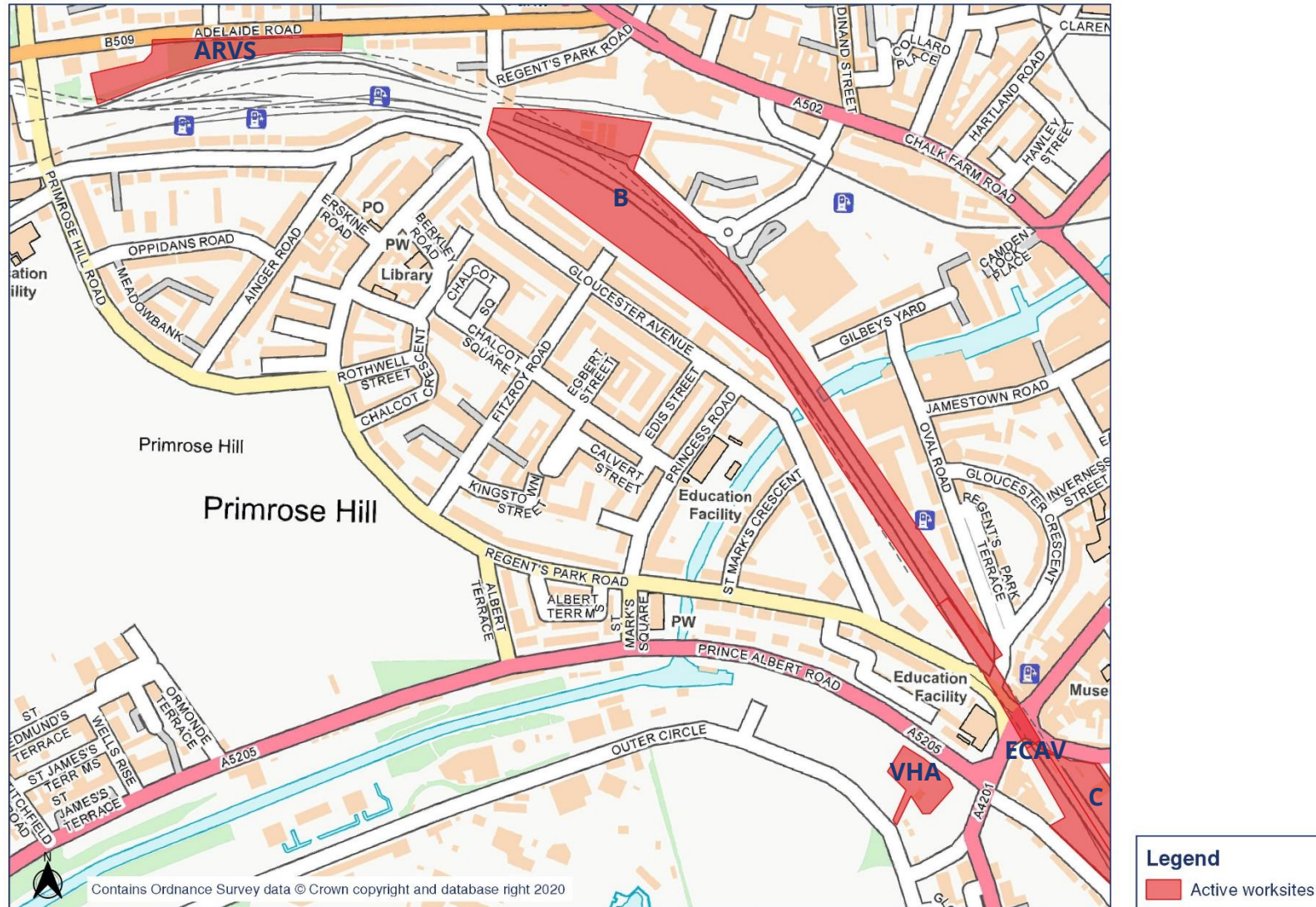
Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
HS2-21-42075-C	HRB	Complaint due to noise from generators.	Generators located by Langdale were used as a temporary means to power site welfare. Onsite measurements of noise from the generators were undertaken prior to use to ascertain no adverse effect was expected.	Information was provided to the stakeholder. Use of generators was suspended in accordance with programme of works. Use is expected to be resumed in late July, full mitigation will be used in accordance with Section 61 consent and best practicable means.
HS2-21-42087-C	S001-WS02, HRB	General complaint regarding construction noise.	Noise monitors were checked for the week the complaint was made. Monitoring data demonstrates compliance with Section 61 requirements.	Information was provided to the stakeholder outlining the hours of work and mitigation measures currently in place to minimise noise.
HS2-21-42098-C	N/A (Utility works)	Complaint due to drilling works being undertaken without acoustic barriers.	On-going.	Contractor manager is to undertake a site visit to assist investigations.
HS2-21-42113-C	ETRC & GTB, HRB	General complaint regarding construction noise during the night-time.	The noise was associated with piling works. Monitoring data demonstrates compliance with Section 61 requirements.	Information was provided to the stakeholder outlining that works were in line with Section 61 consents and details regarding the special cases panel.
HS2-21-42125-C	S001-WS02, HRB	Complaint regarding construction noise after 18:00.	The associated contractor is permitted to carry out concrete works until 22:00 on weekdays for a maximum of 3 days. Monitoring data demonstrates compliance with Section 61 requirements.	Information was provided to the stakeholder outlining the permitted working hours.
HS2-21-42129-C	N/A (Not near worksite)	Complaint due to reversing sirens during the night-time.	The noise was likely due to safety alarms associated with sprayed concrete lining works.	Information was provided to the stakeholder confirming that the noise was due to safety alarms which are a safety requirement for the works. Other safety alarm options are being investigated.

Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
HS2-21-42148-C	S001-WS02, HRB	Complaint regarding construction noise and lack of noise insulation measures.	Noise insulation is currently installed at the stakeholder's property including secondary glazing and mechanical ventilation to two bedrooms and lounge. Monitoring data demonstrates compliance with Section 61 requirements.	Information was provided to the stakeholder confirming that an E23 special case needs to be put forward for secondary glazing to kitchen window.
HS2-21-42175-C	NTH-EN, S003-WS06, S001-WS02	General complaint regarding increased construction noise during the day.	On-going.	On-going.
HS2-21-42194-C	S001-WS02, HRB	Complaint due to generator noise during the night-time.	The generator noise was not associated with HS2.	Information was provided to the stakeholder confirming that the generator noise was not associated with HS2.
HS2-21-59348-E	ARVS	General complaint regarding construction noise during the day.	Utility trial trench works were being undertaken at the time of the complaint. Monitoring data demonstrates compliance with Section 61 requirements.	Best practicable means measures being used were reviewed and additional screening of noise sources were installed. Contact made with stakeholder and response to enquiry provided.
HS2-21-61888-E	ARVS	General complaint regarding construction noise during the day.	Works were being carried out in accordance with current Section 61 consent and best practicable means were used to reduce noise levels.	Contact made with the stakeholder and response to enquiry provided.

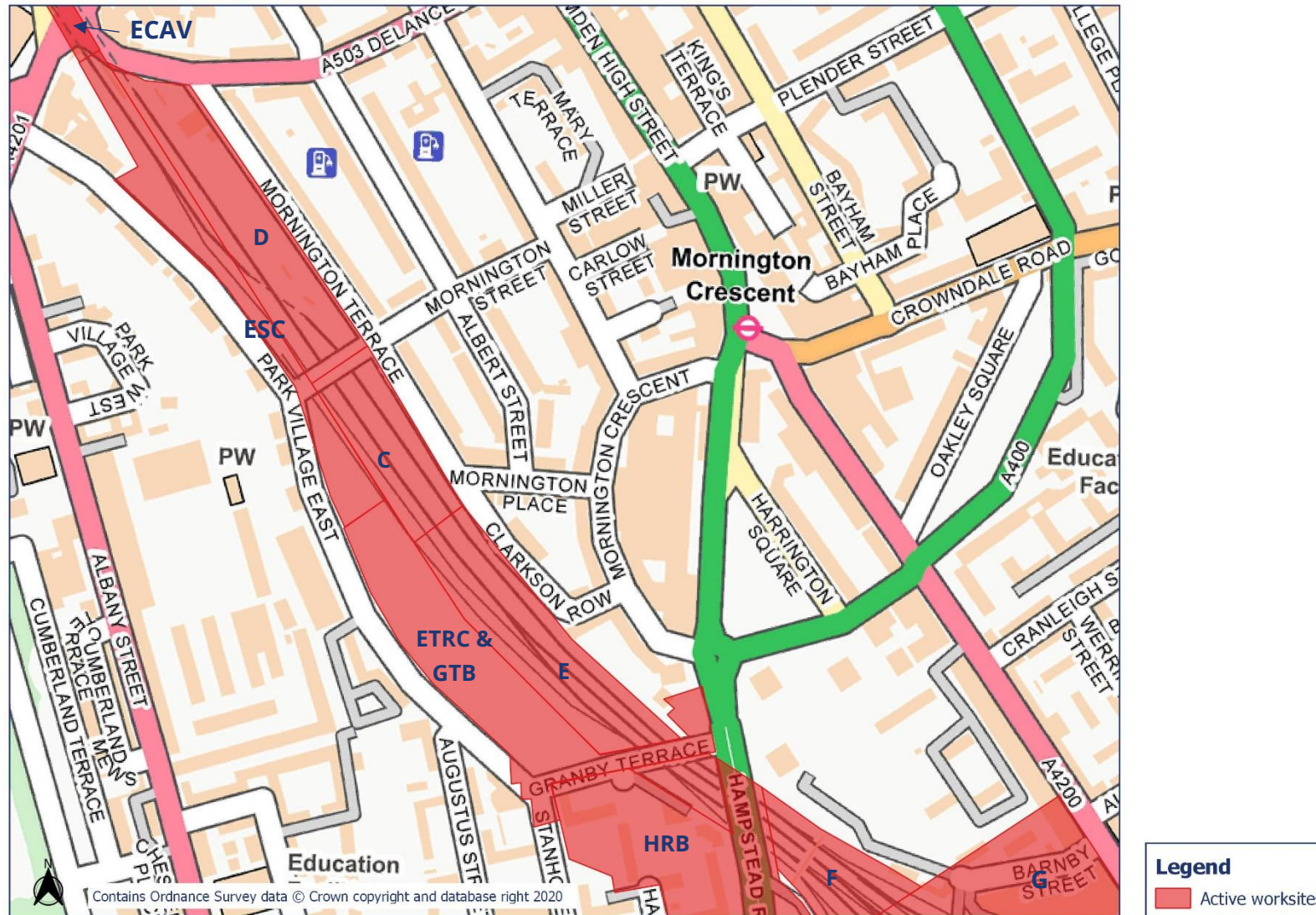
# Appendix A Site Locations



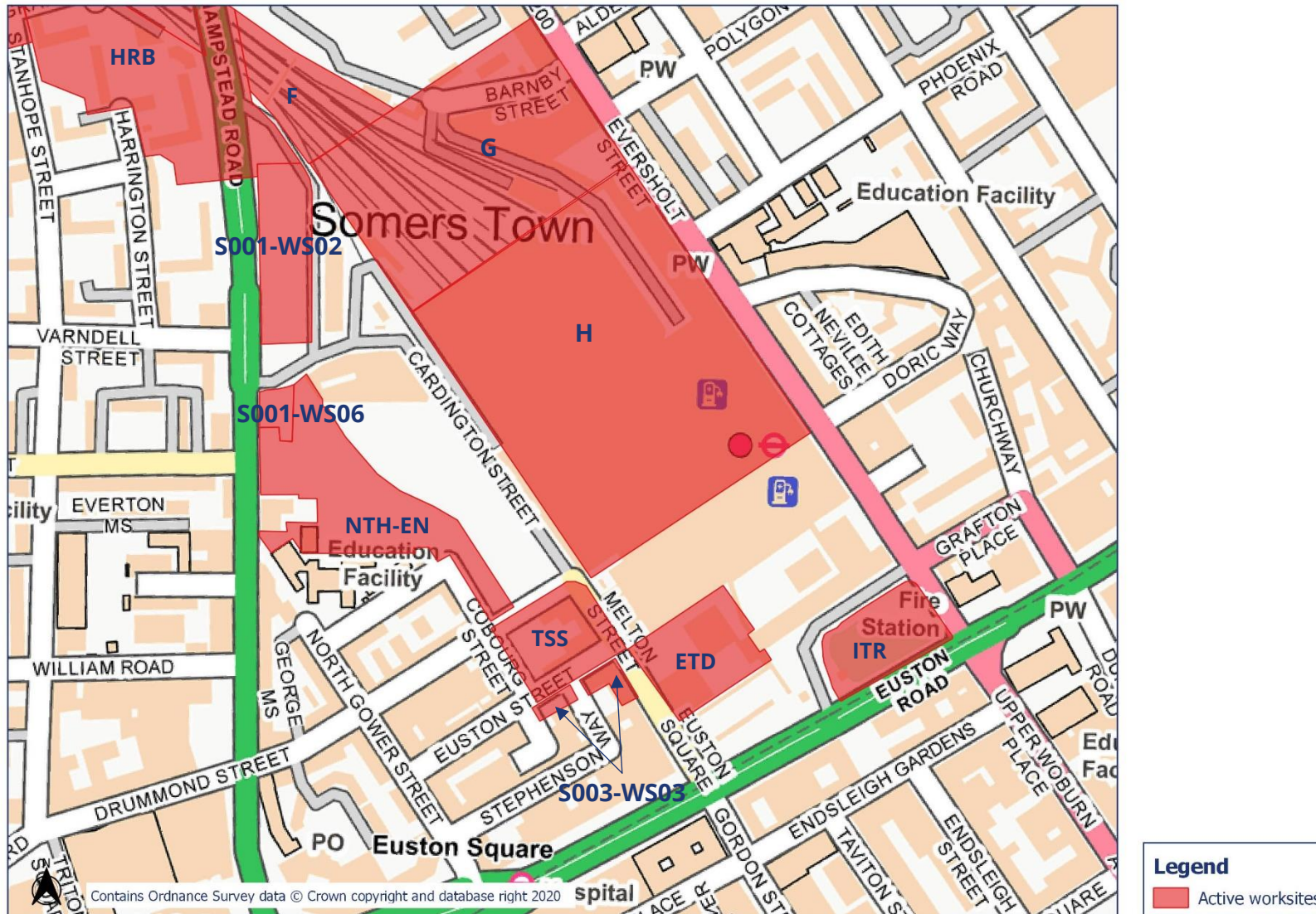






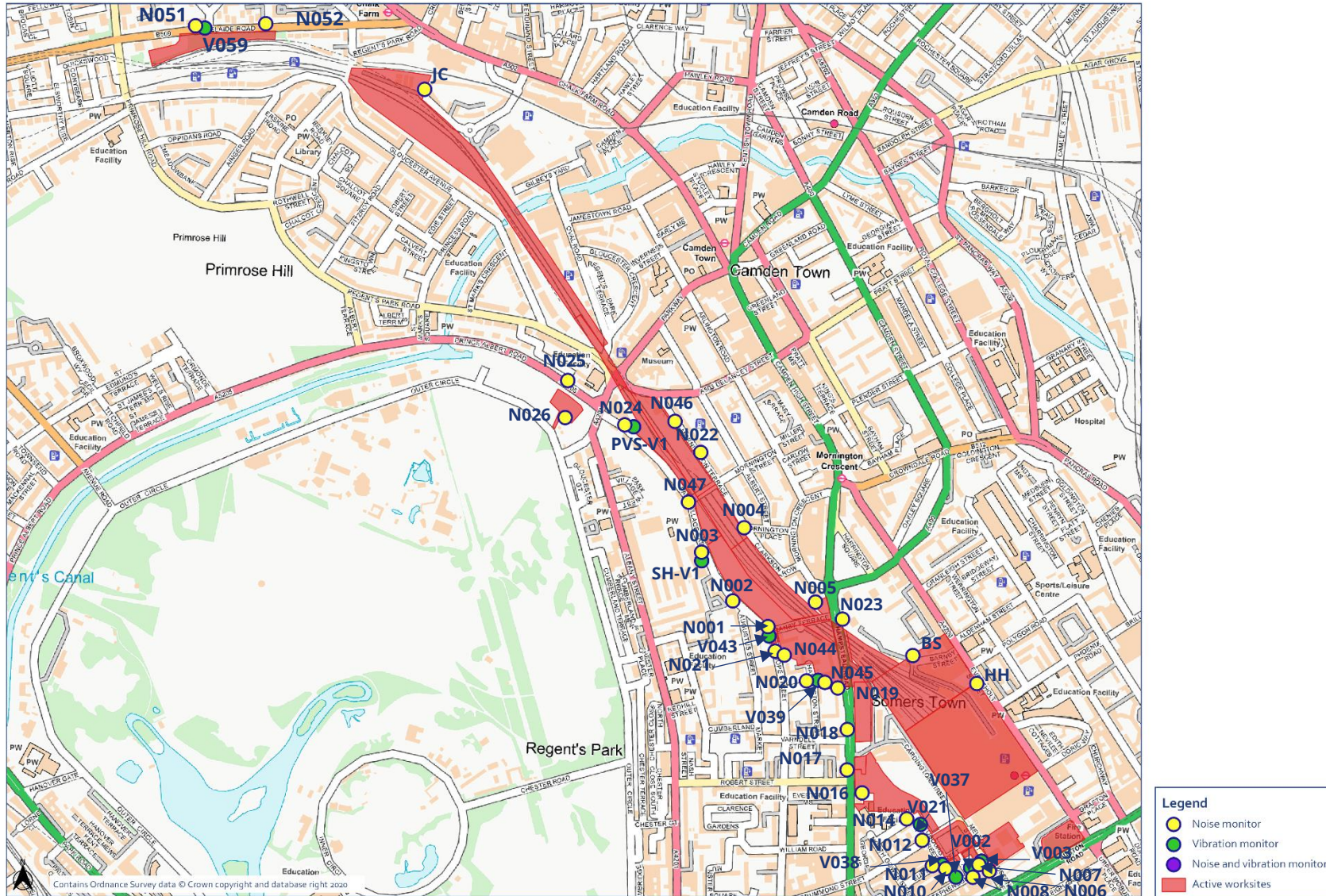




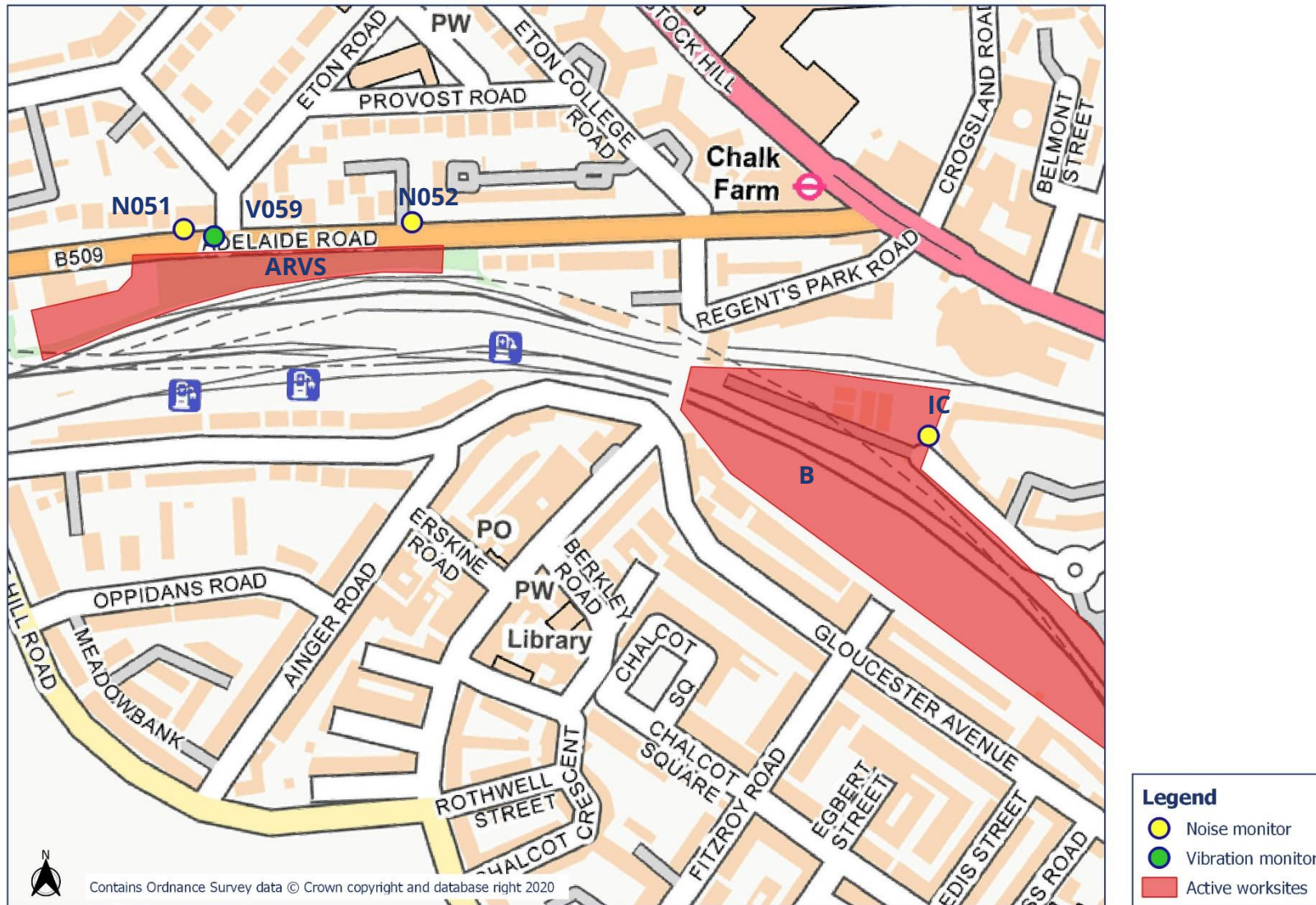




# Appendix B Monitoring Locations





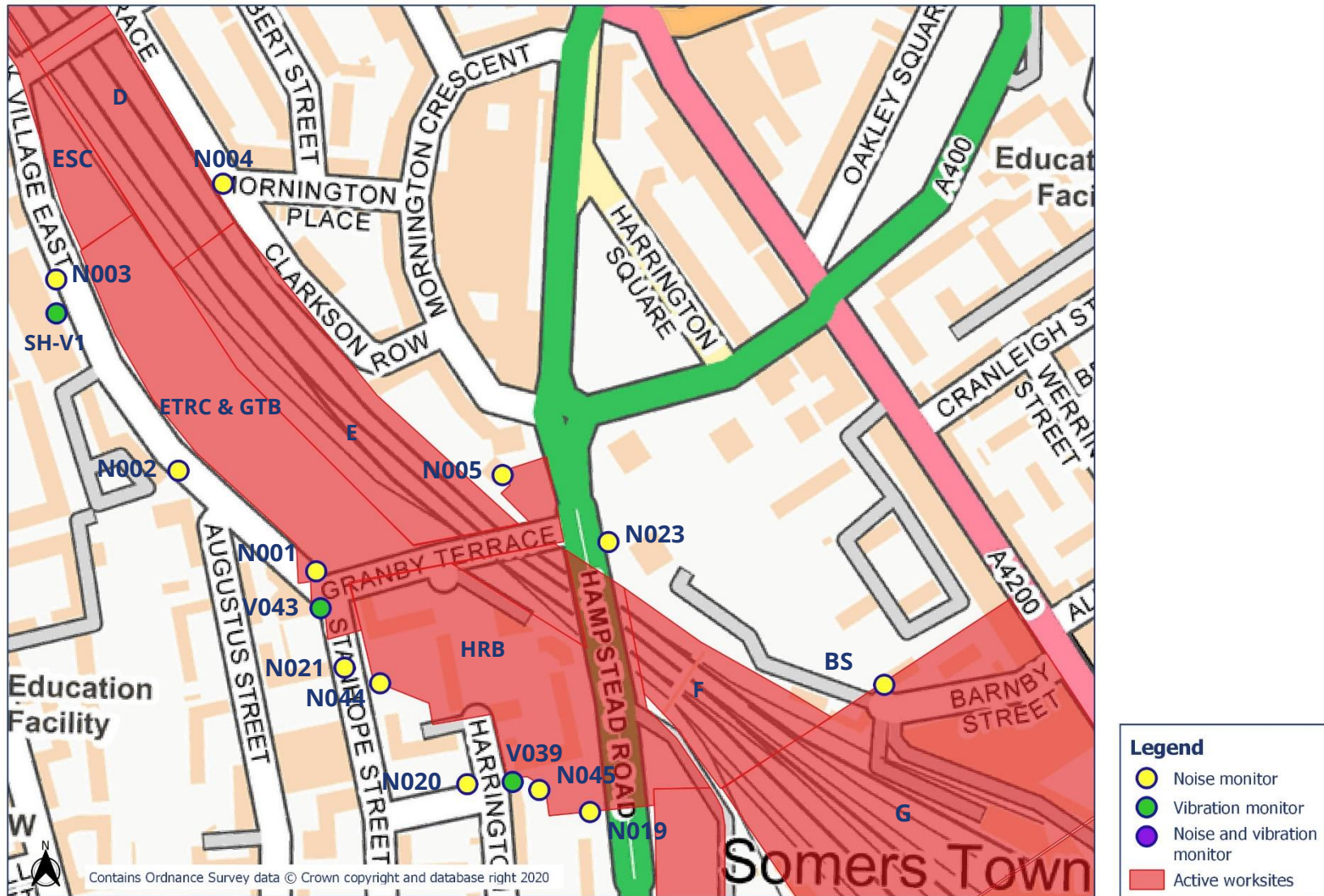






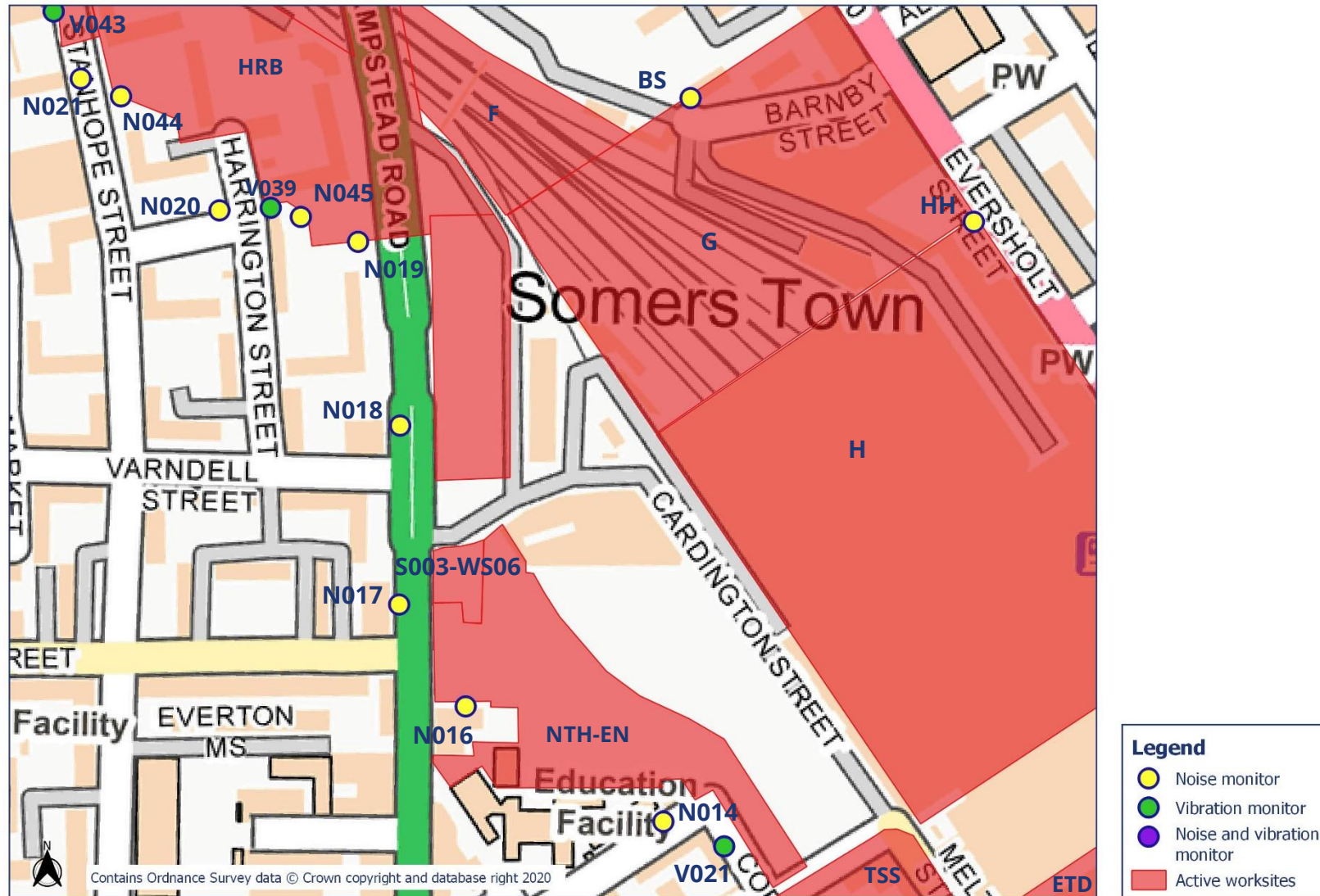
# HS2

## Noise and vibration monitoring plan - 3



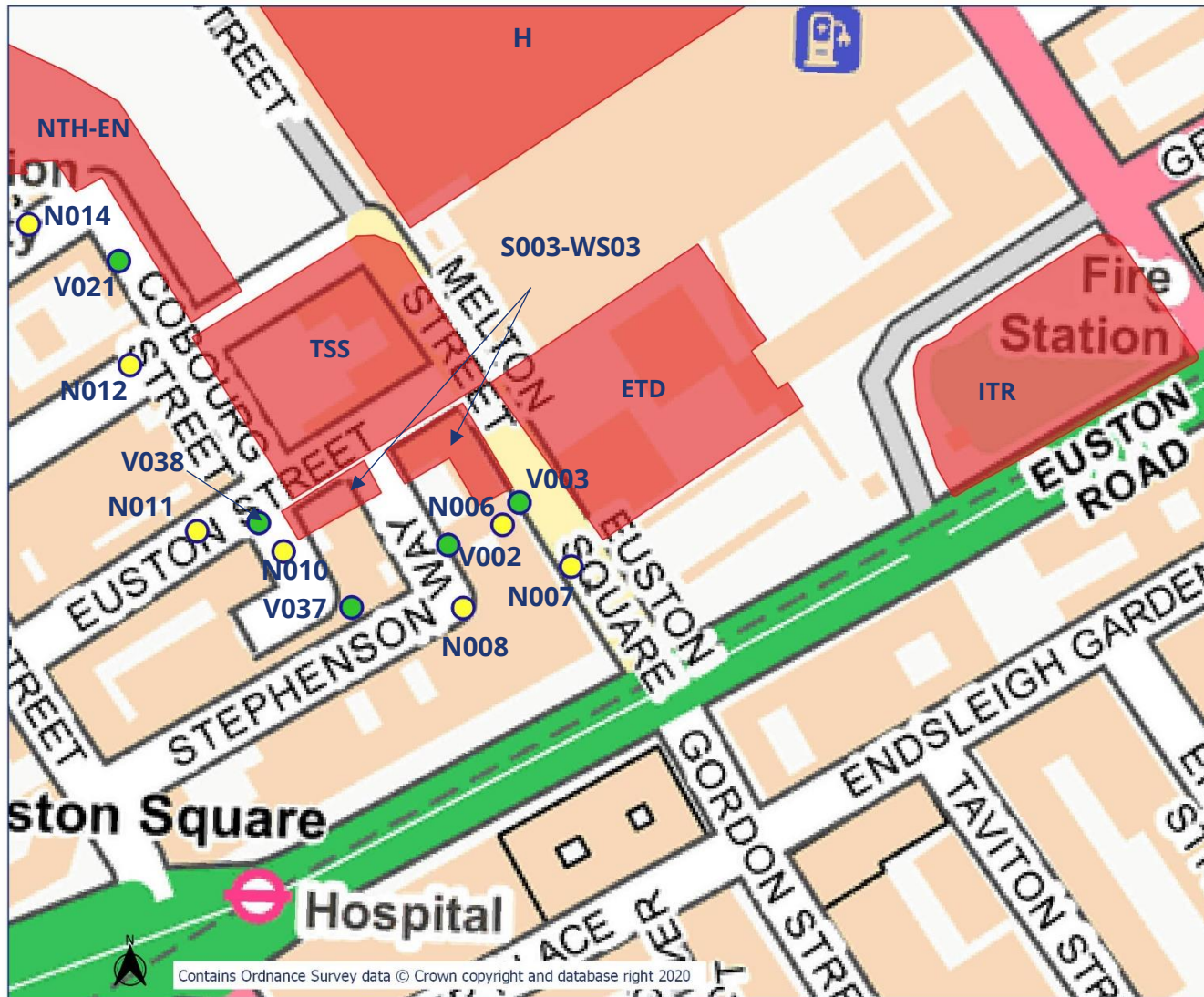
# HS2

## Noise and vibration monitoring plan - 4





# HS2 Noise and vibration monitoring plan - 5



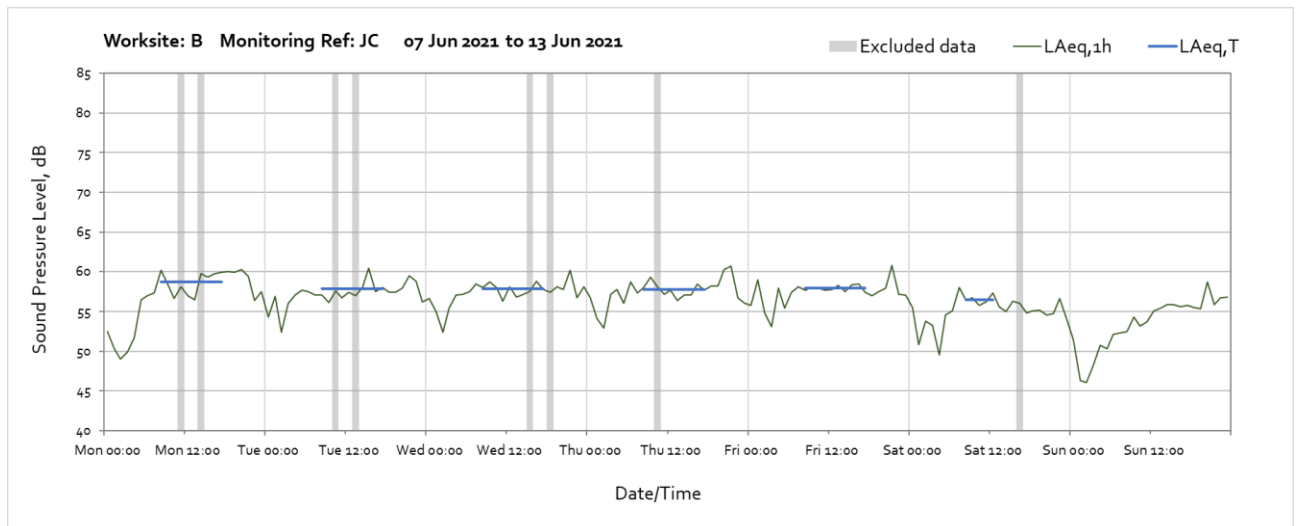
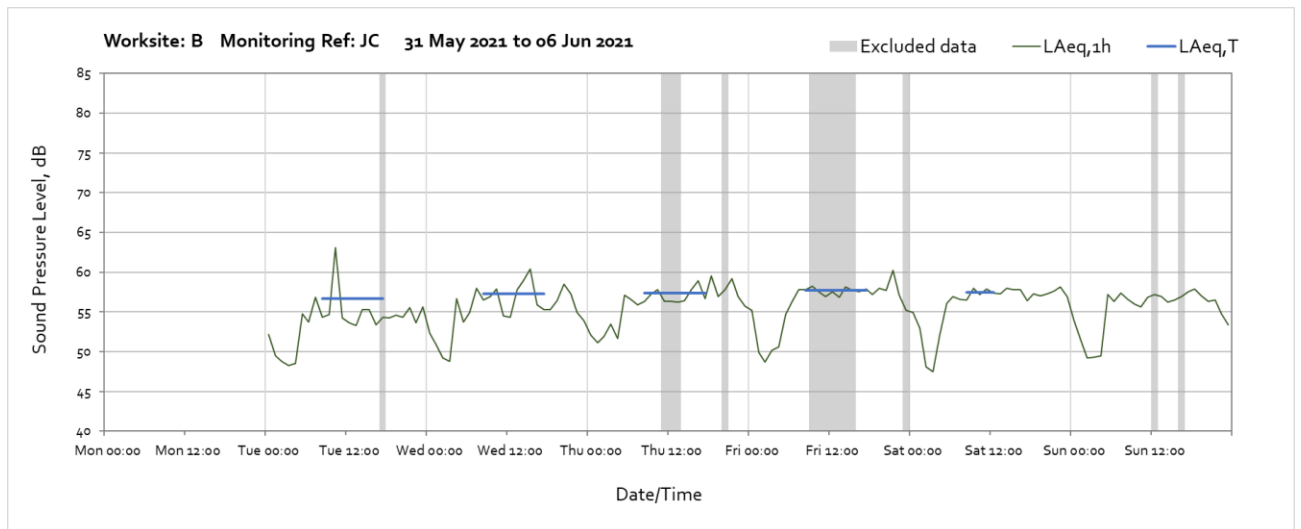
OFFICIAL

# Appendix C Data

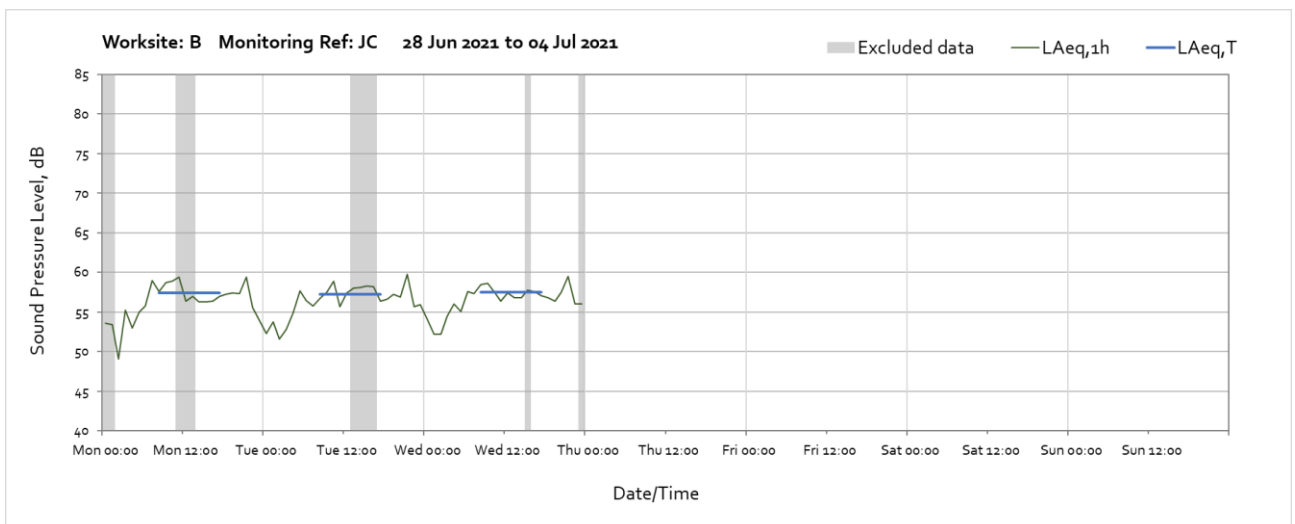
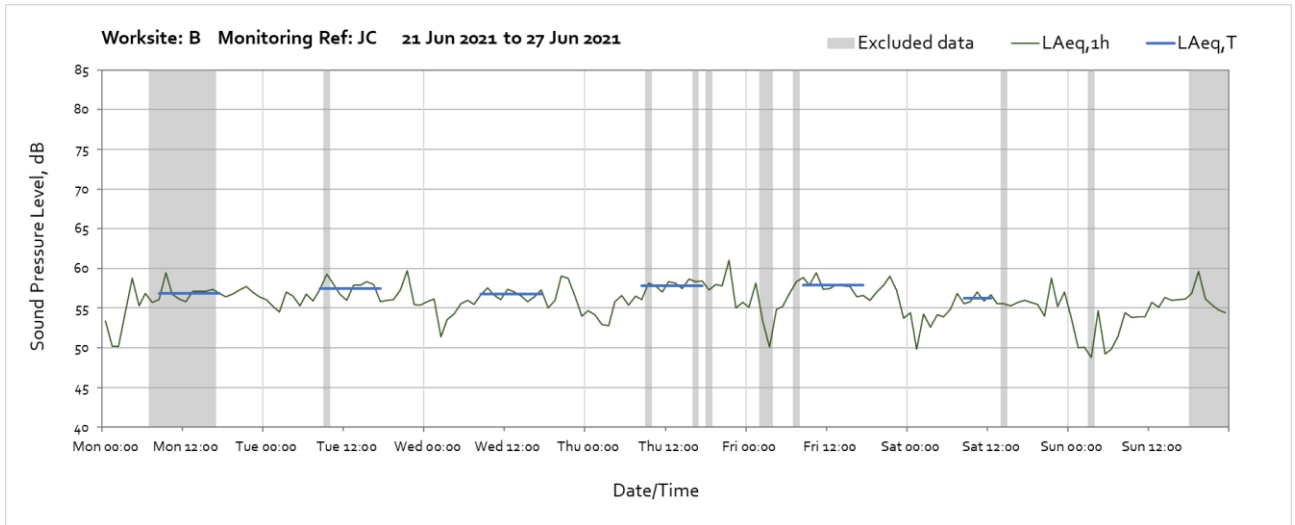
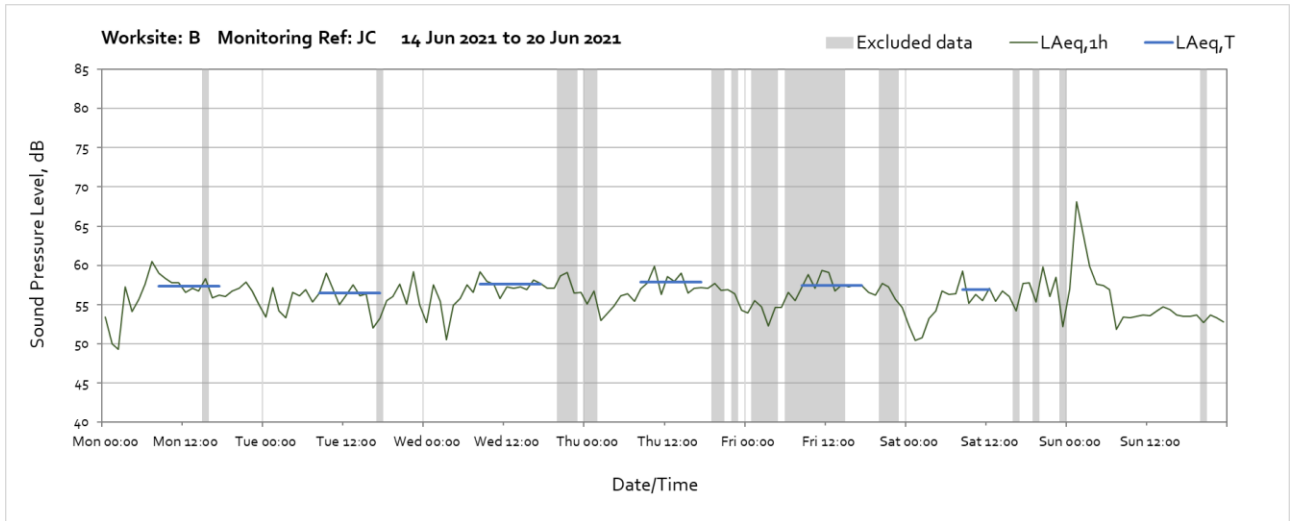
The following graphs show the hourly measured ambient noise level  $L_{Aeq,1h}$  and, where relevant, the averaged noise level  $L_{Aeq,T}$  values, where the time period T is as specified in Table 1 of HS2 Information Paper E23. Periods with adversely weather affected noise levels are greyed out and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

## Noise

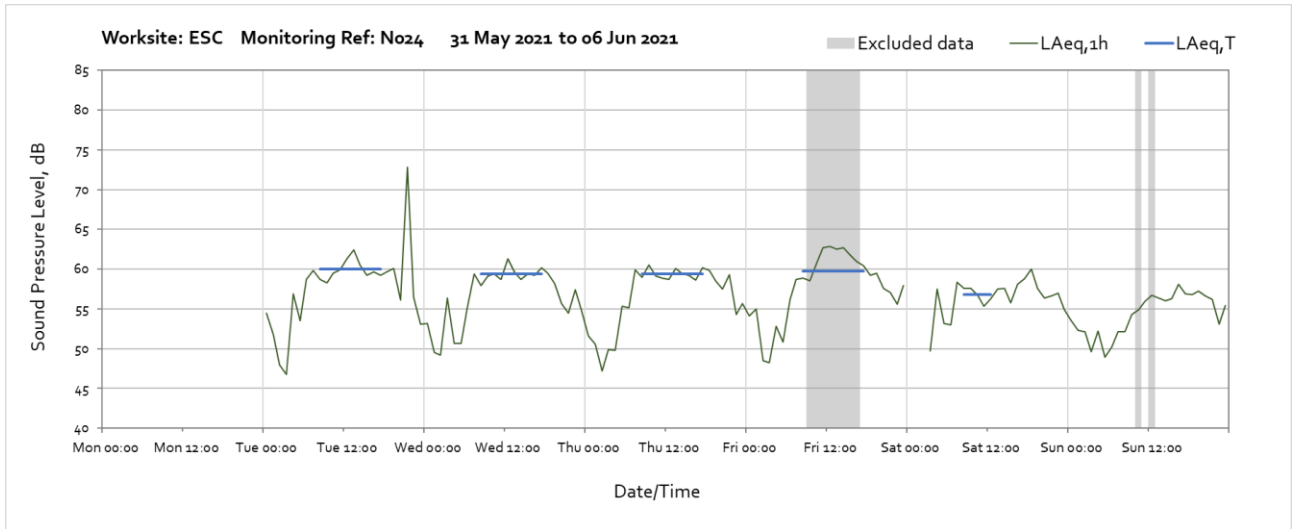
### Worksite: B – Monitoring Ref: JC



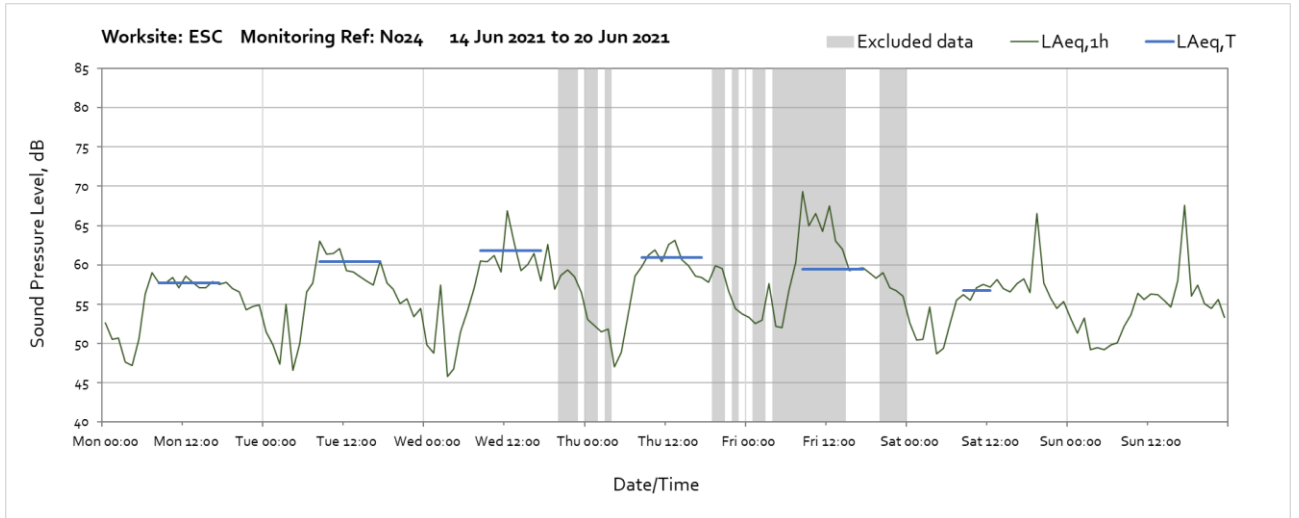
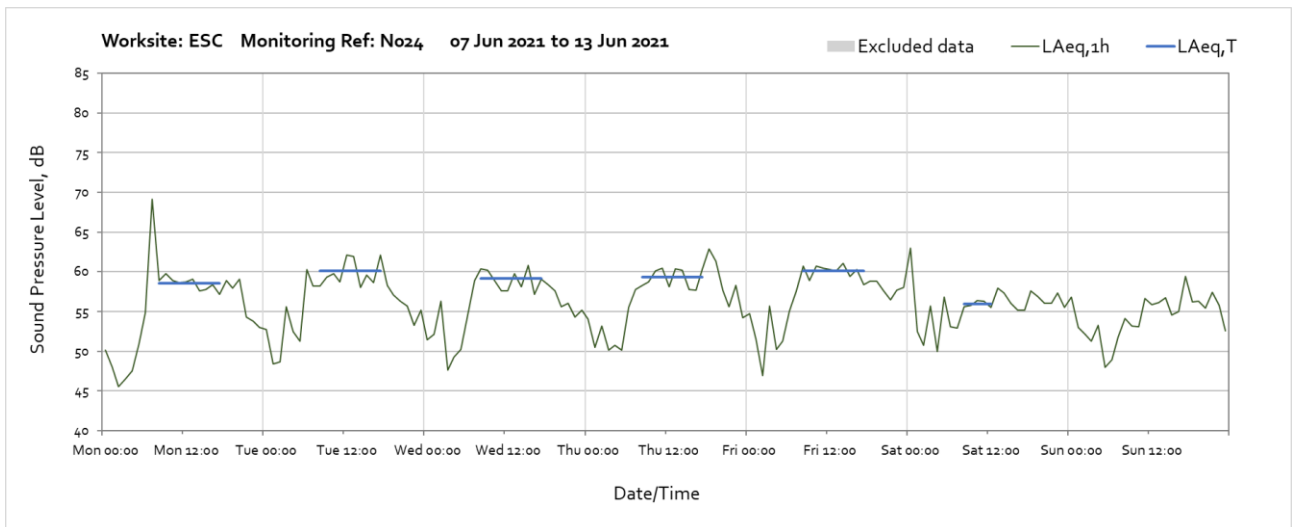


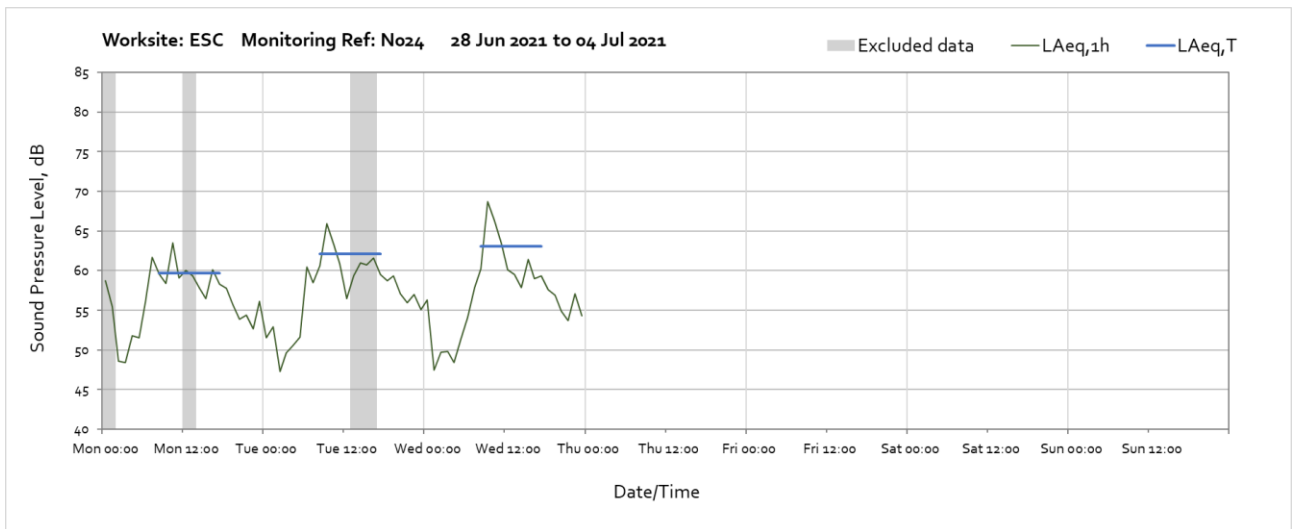
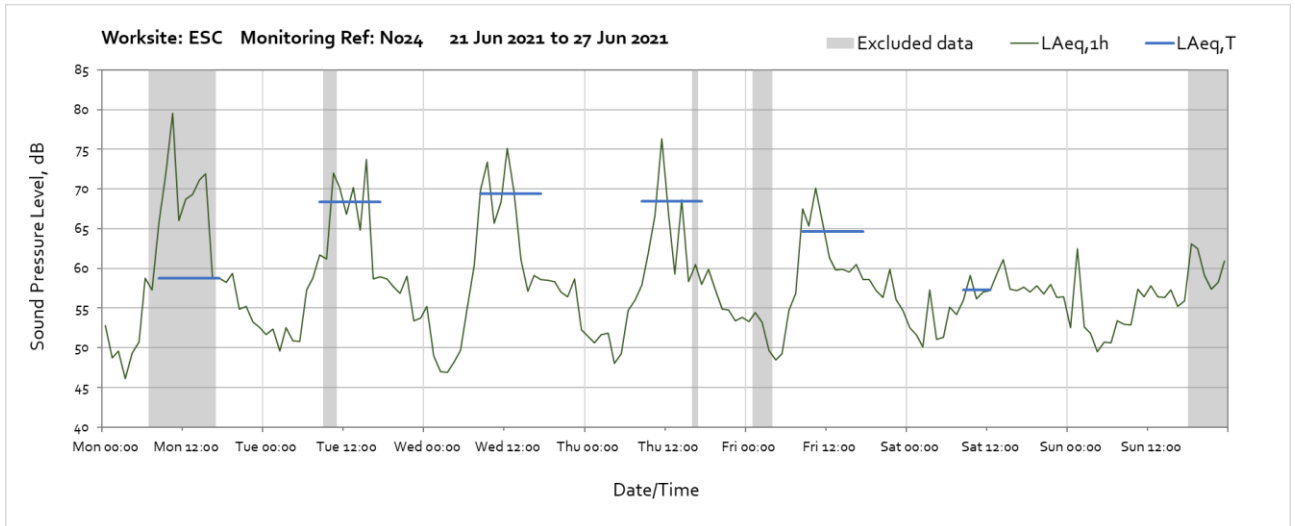


## Worksite: ESC - Monitoring Ref: N024

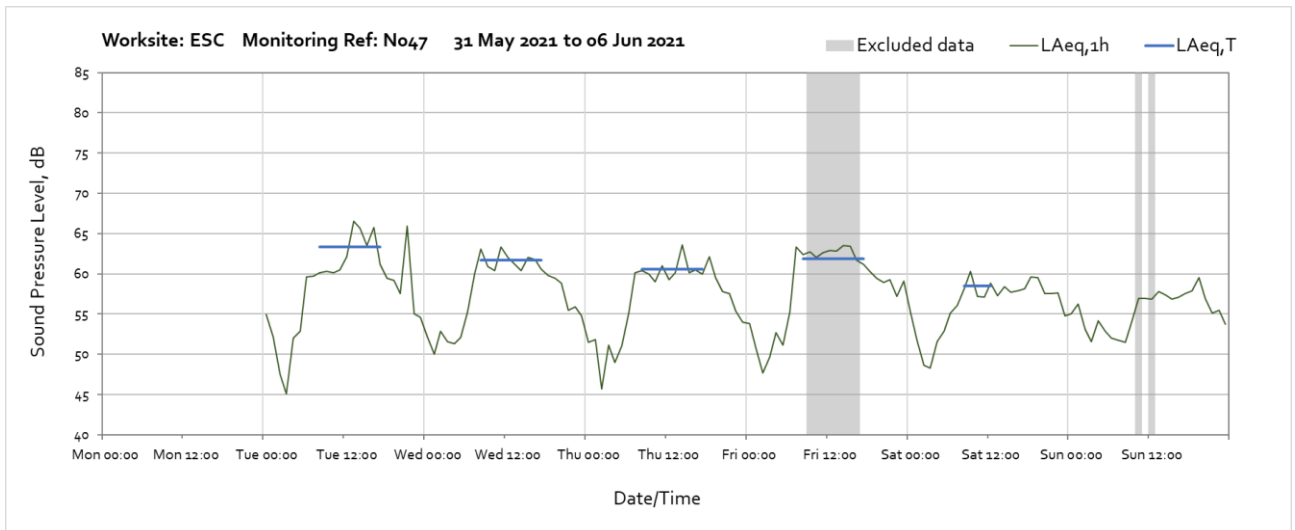


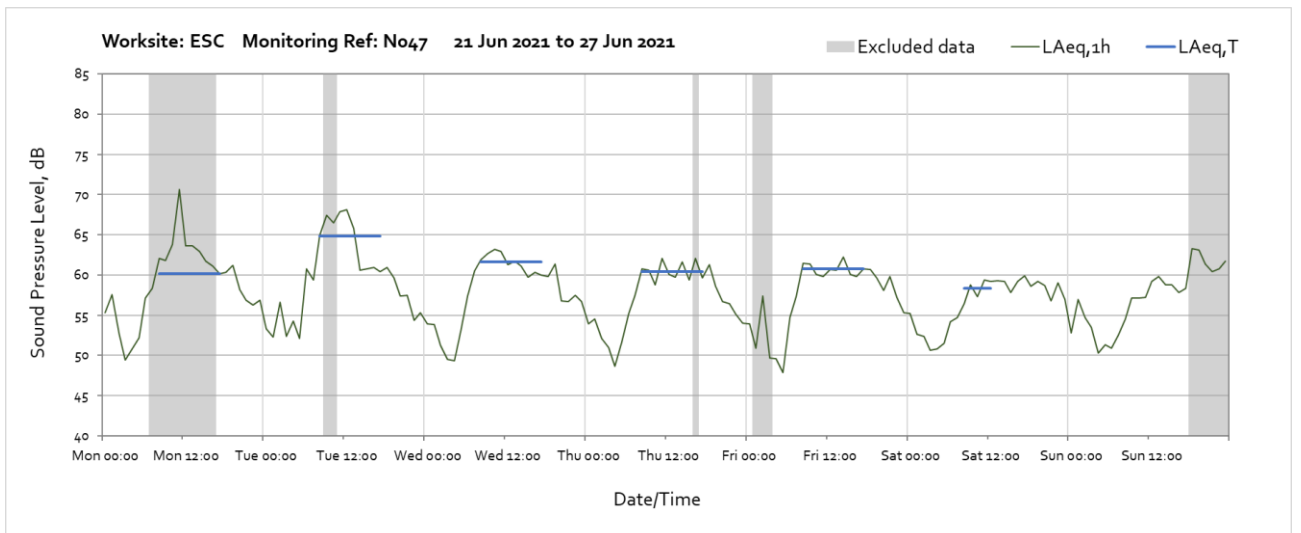
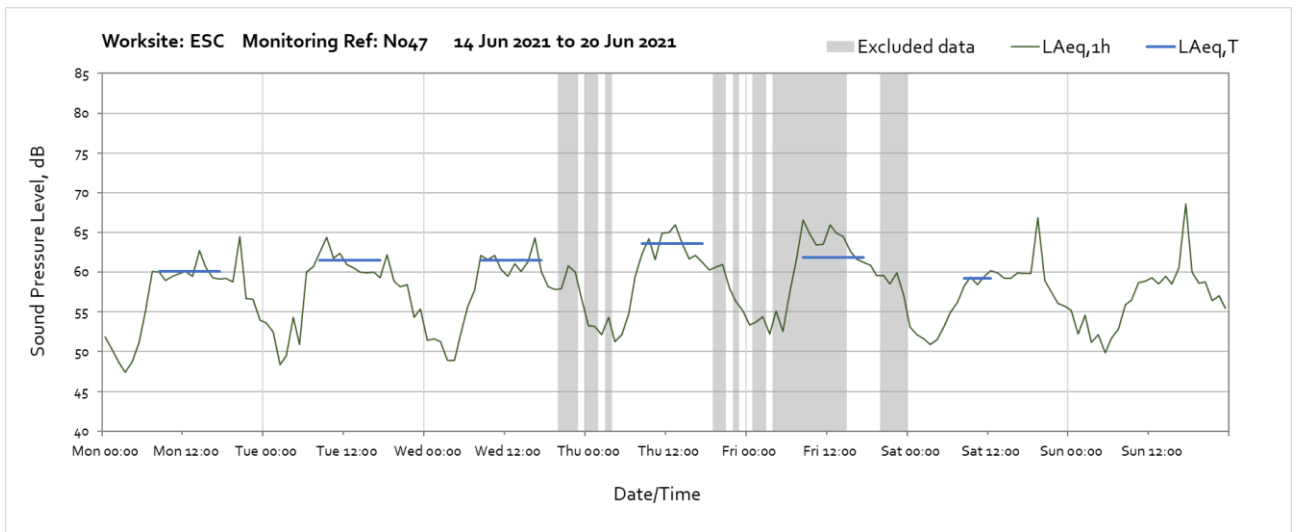
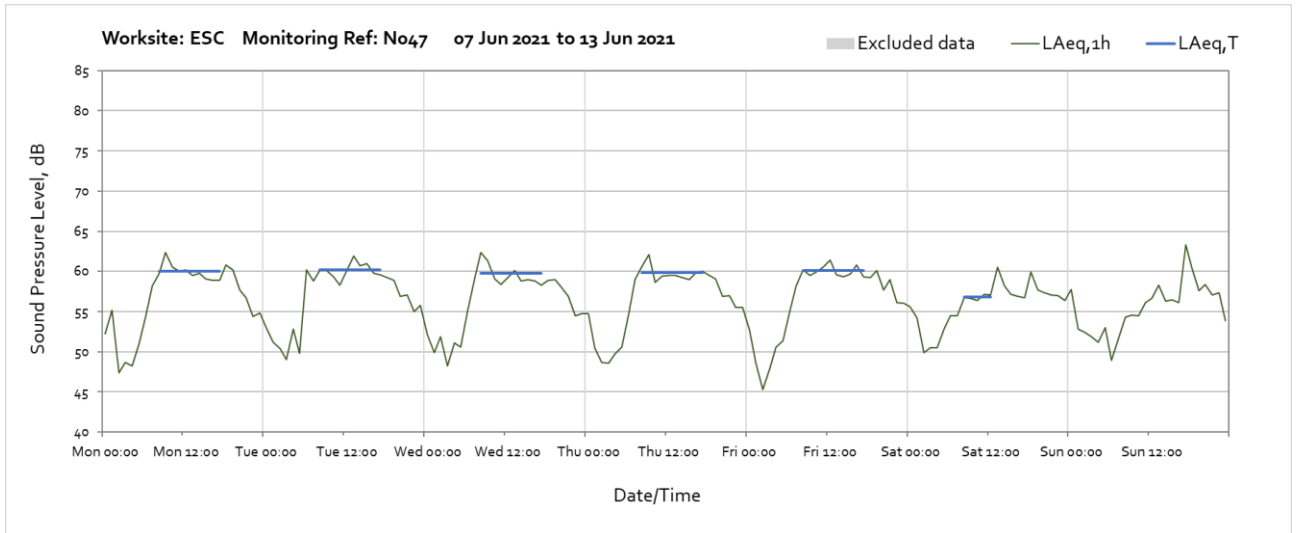
Note: Missing data from 00:00 until 03:00 on Saturday 5<sup>th</sup> June was due to a monitoring station network connection error.

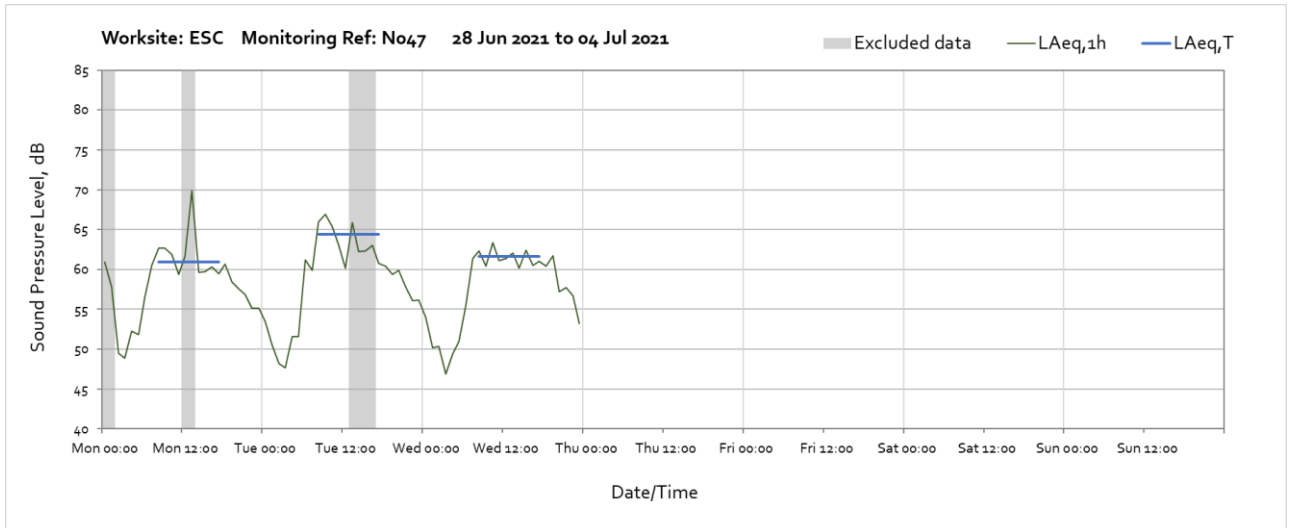




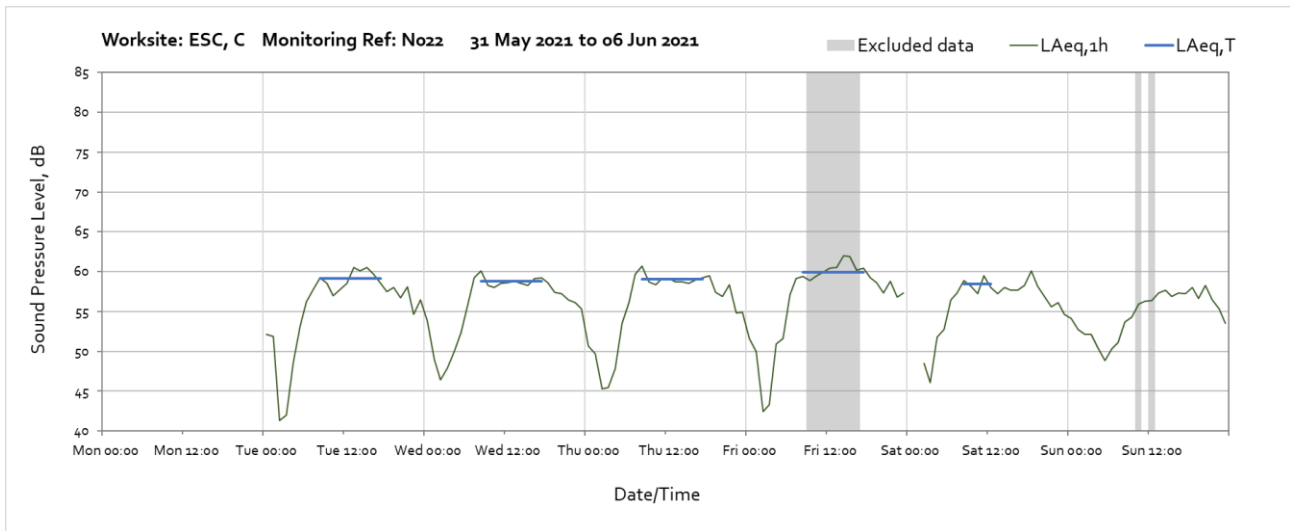
### Worksite: ESC - Monitoring Ref: N047



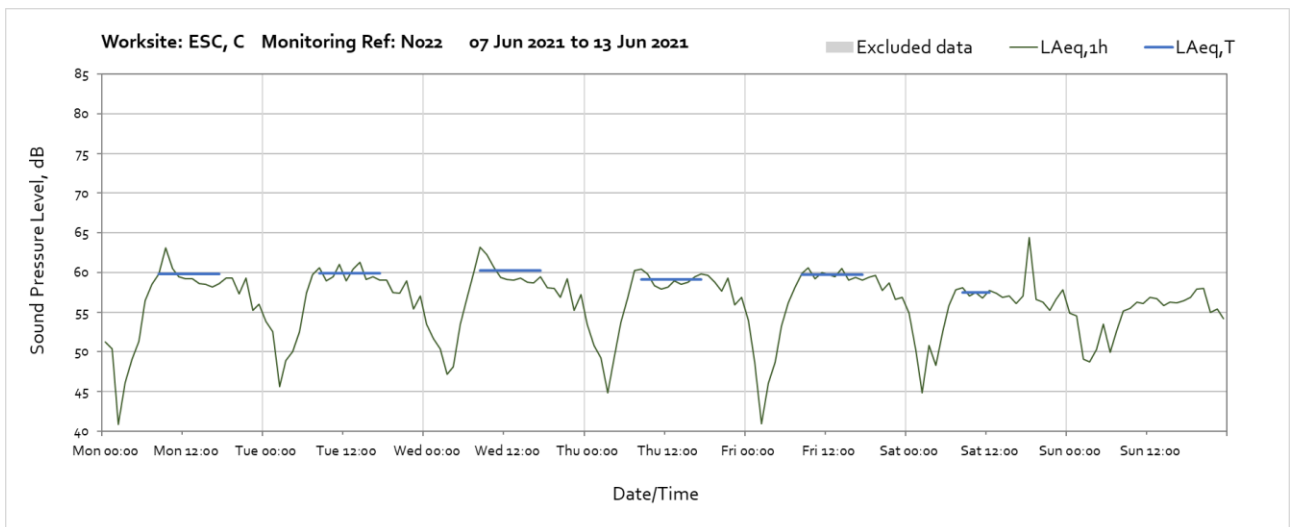


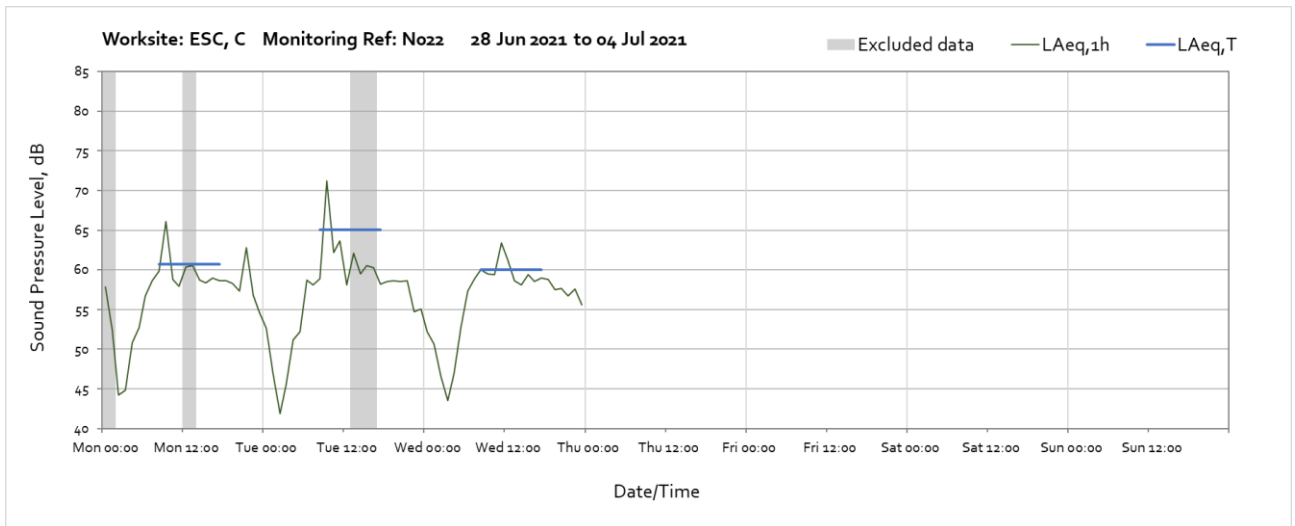
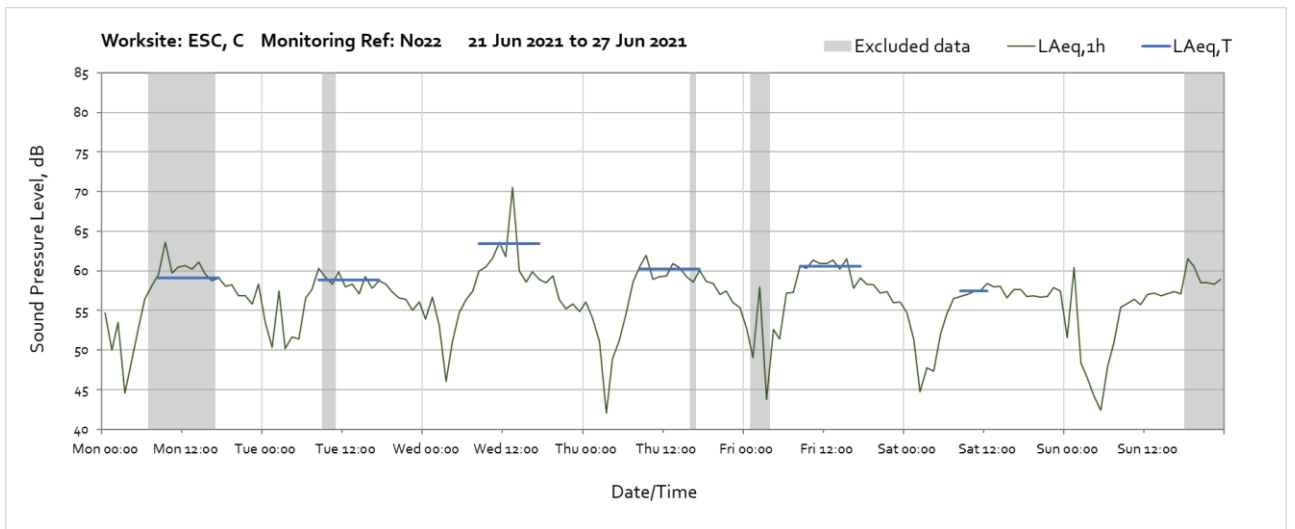
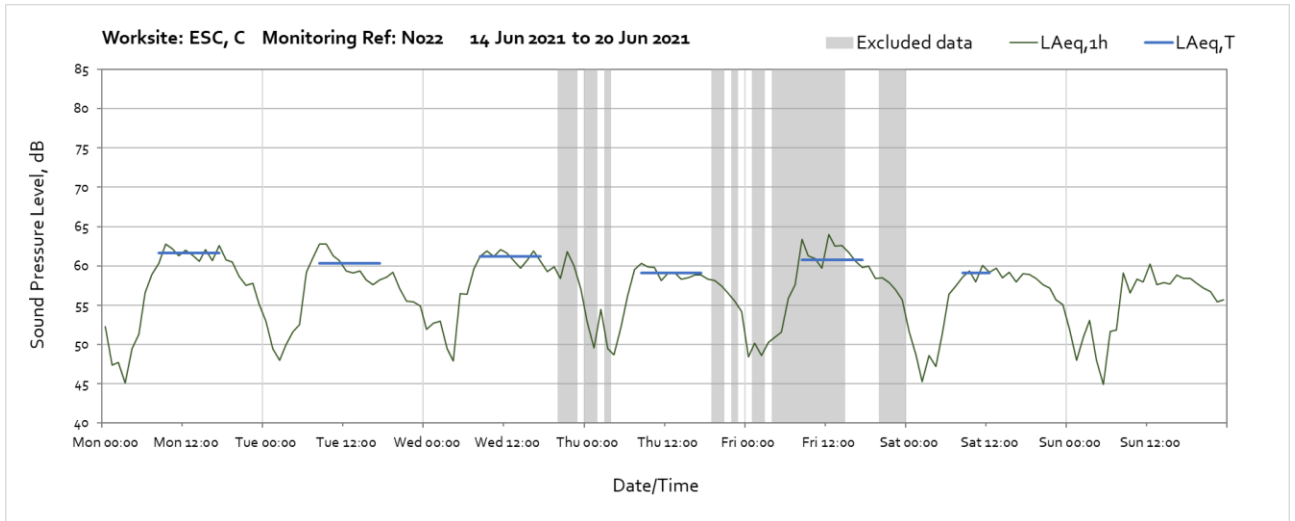


**Worksite: ESC, C – Monitoring Ref: N022**



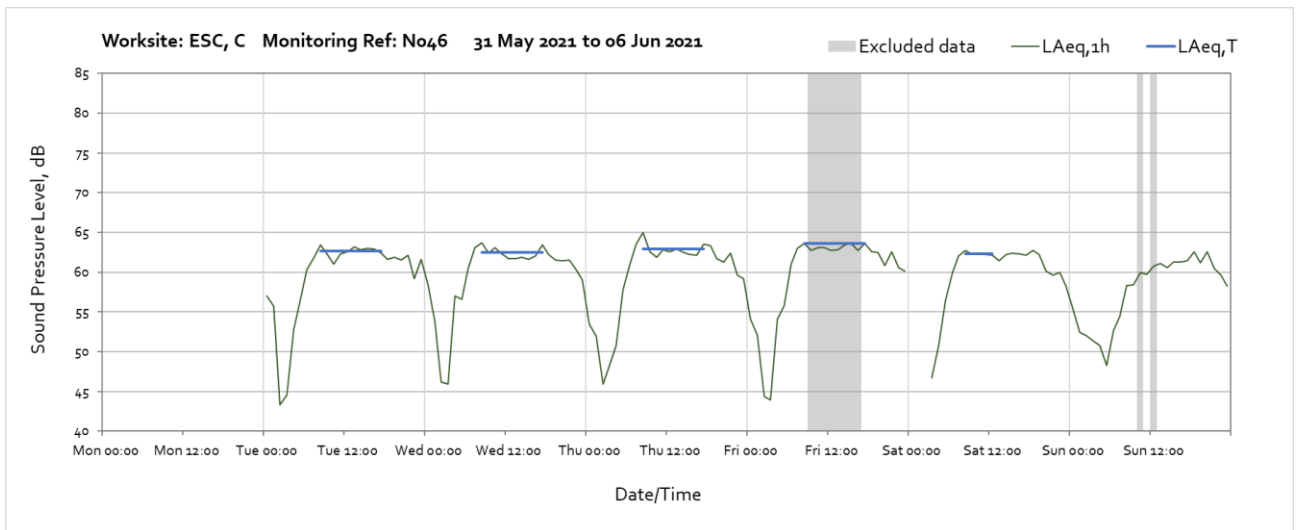
Note: Missing data from 00:00 until 02:00 on Saturday 5<sup>th</sup> June a monitoring station network connection error.



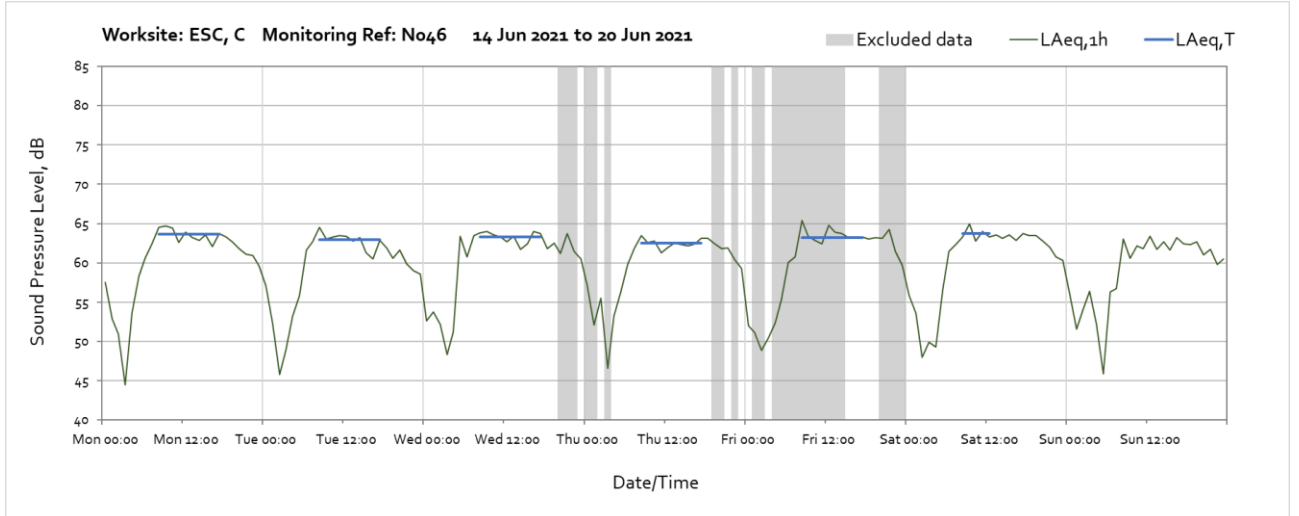
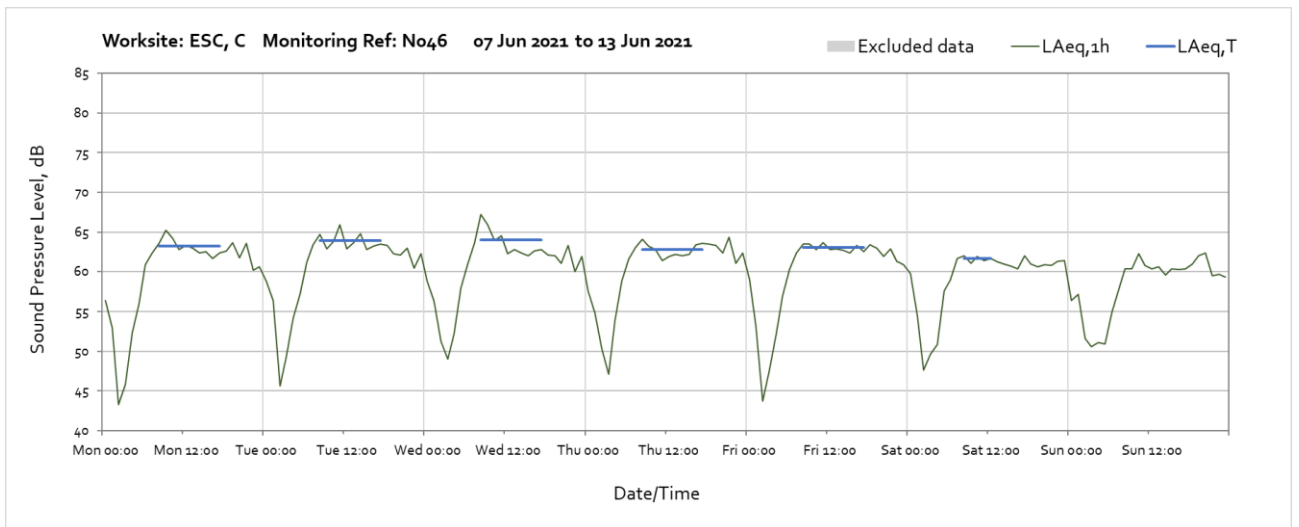


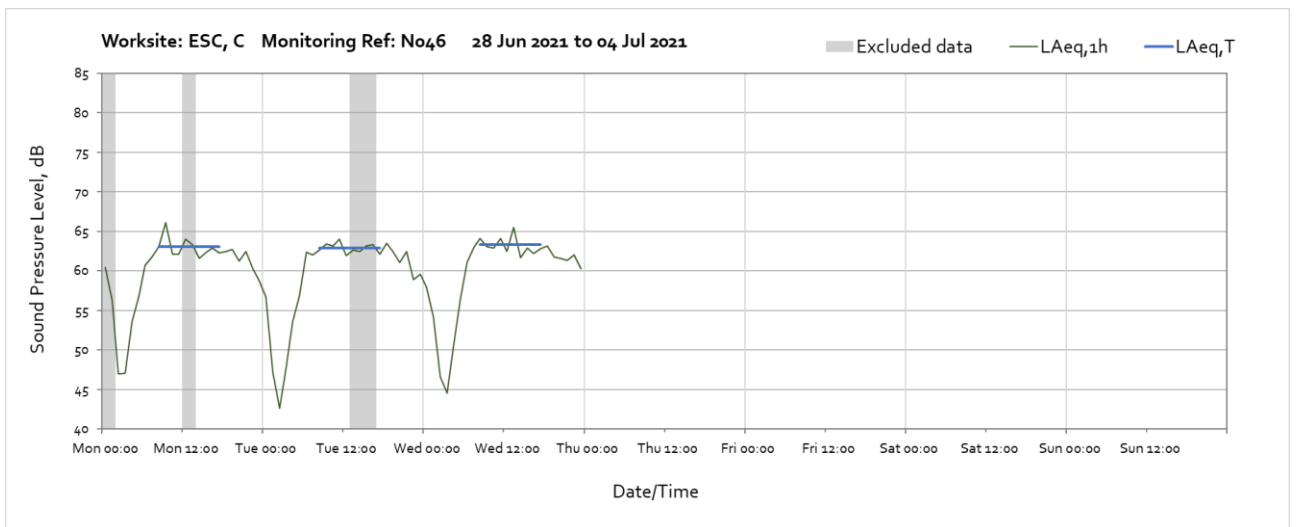
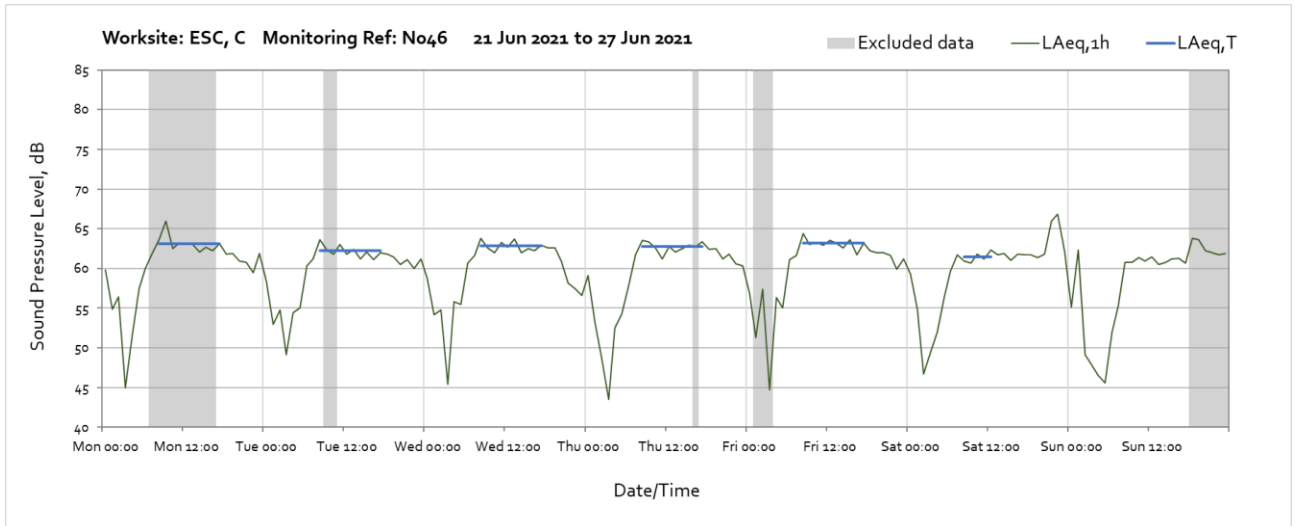


## Worksite: ESC, C – Monitoring Ref: N046

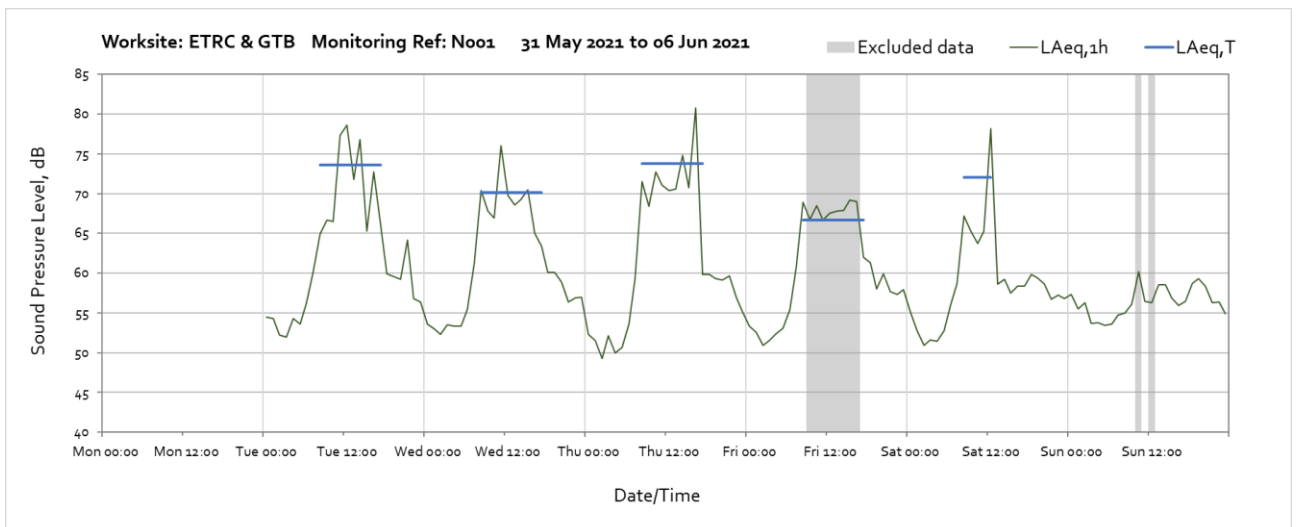


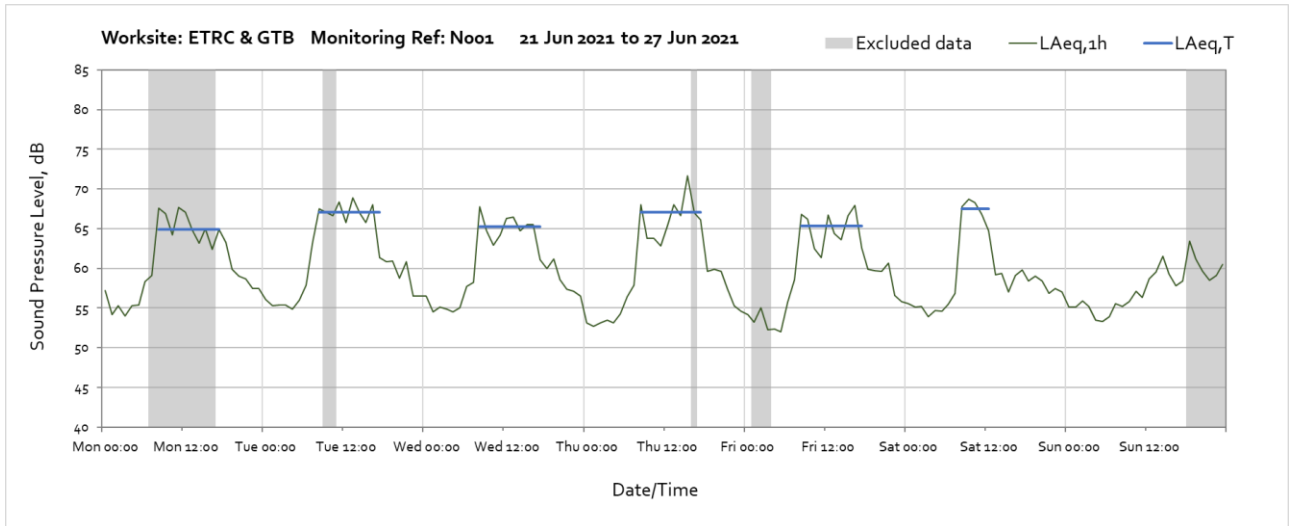
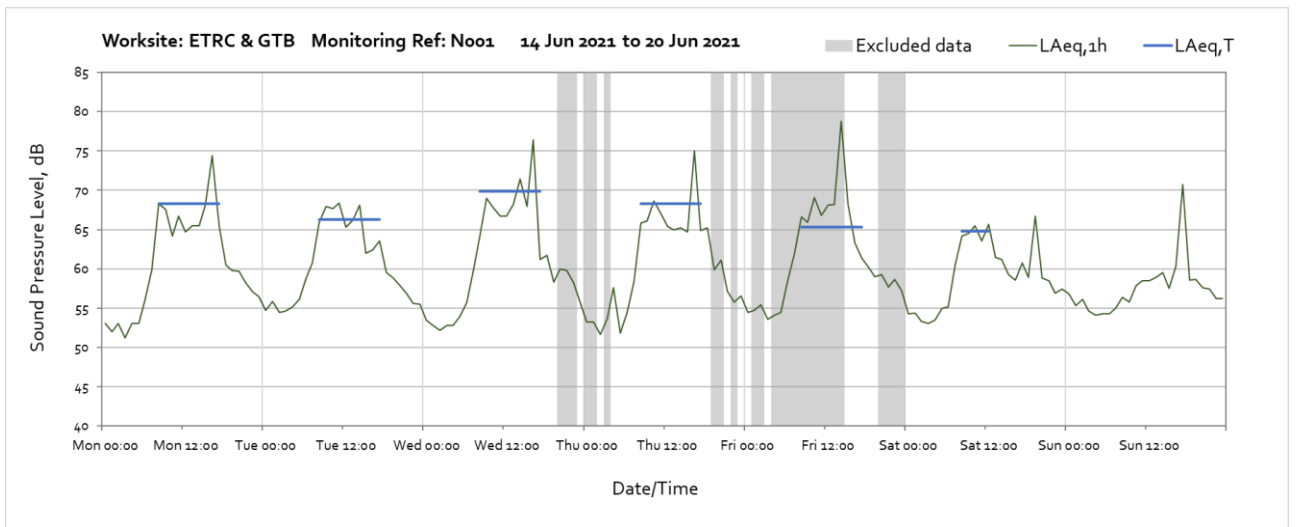
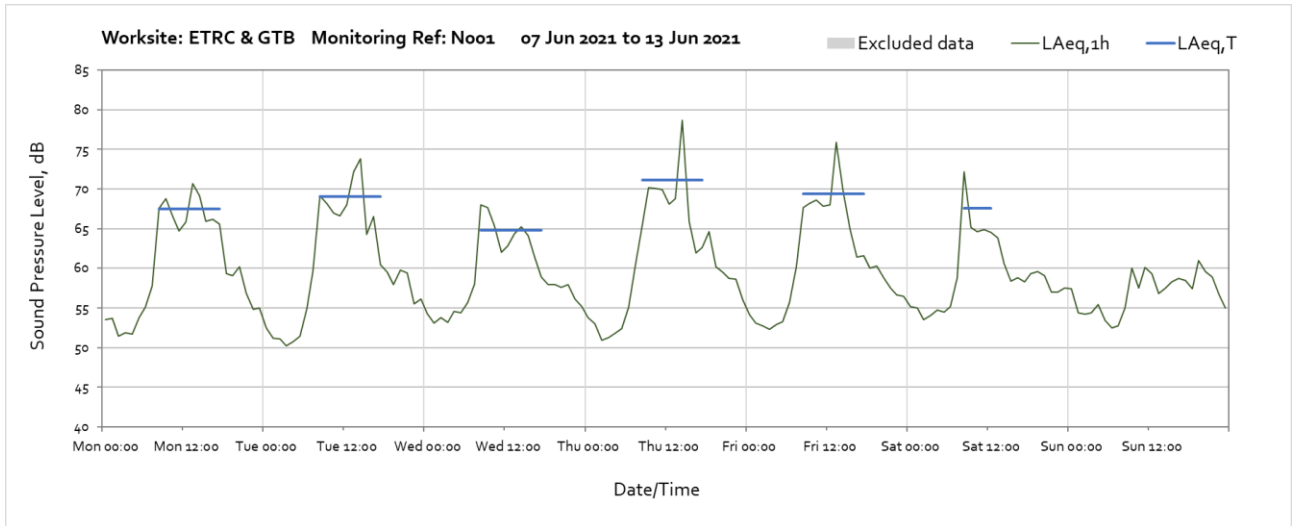
Note: Missing data from 00:00 until 03:00 on Saturday 5<sup>th</sup> June a monitoring station network connection error.

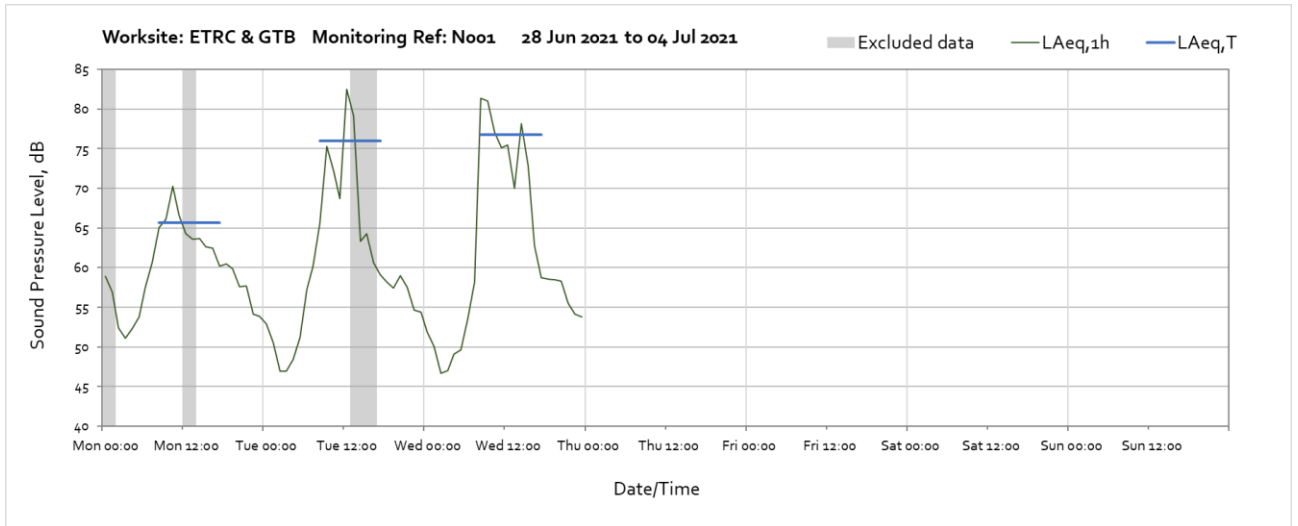




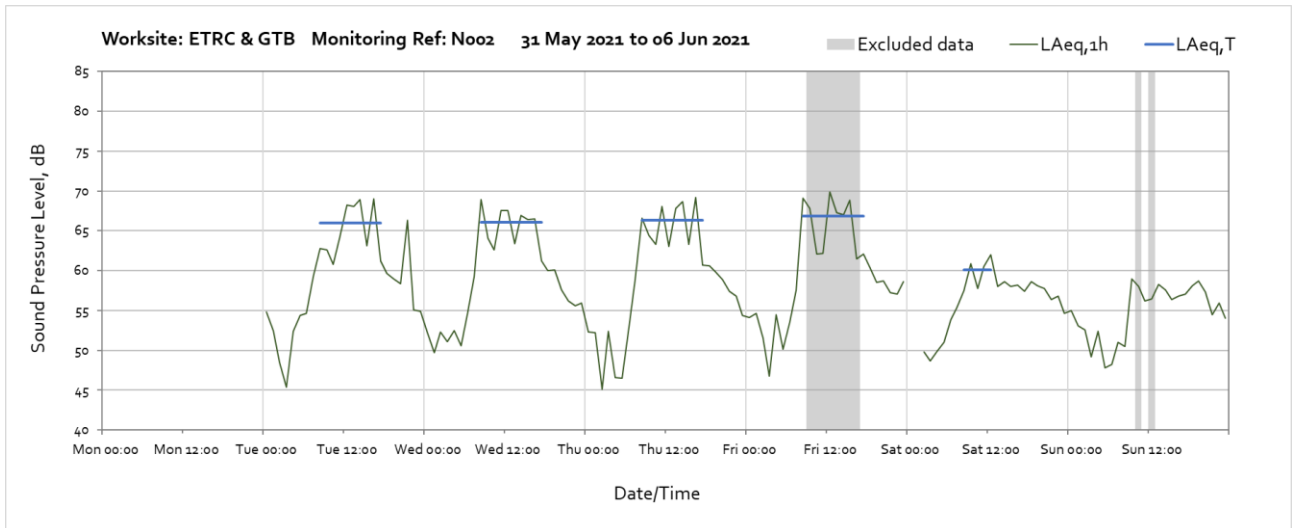
**Worksite: ETRC & GTB - Monitoring Ref: N001**



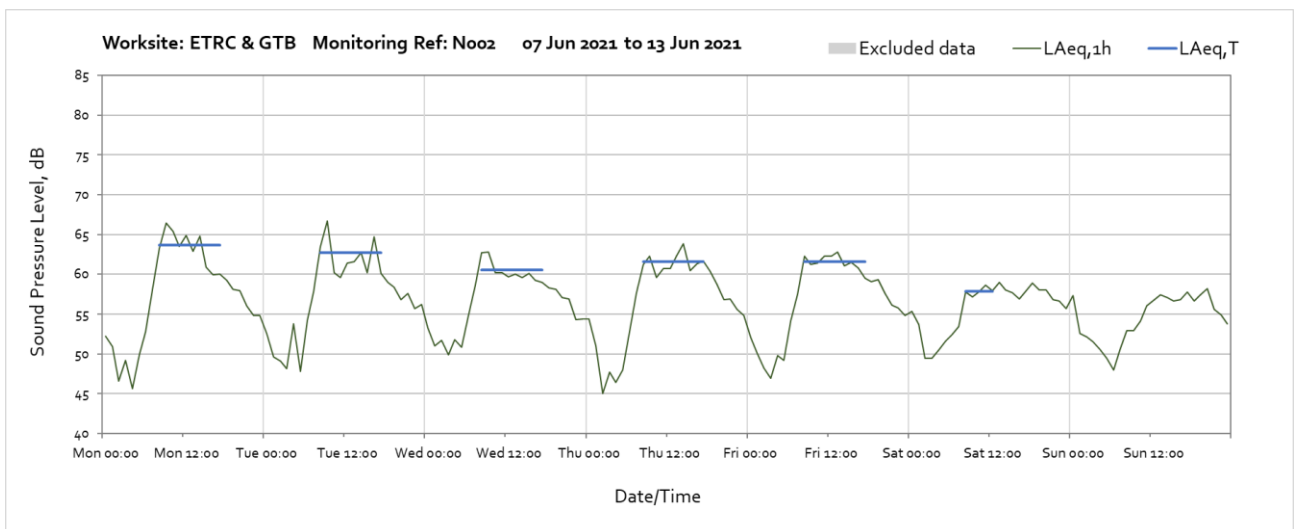


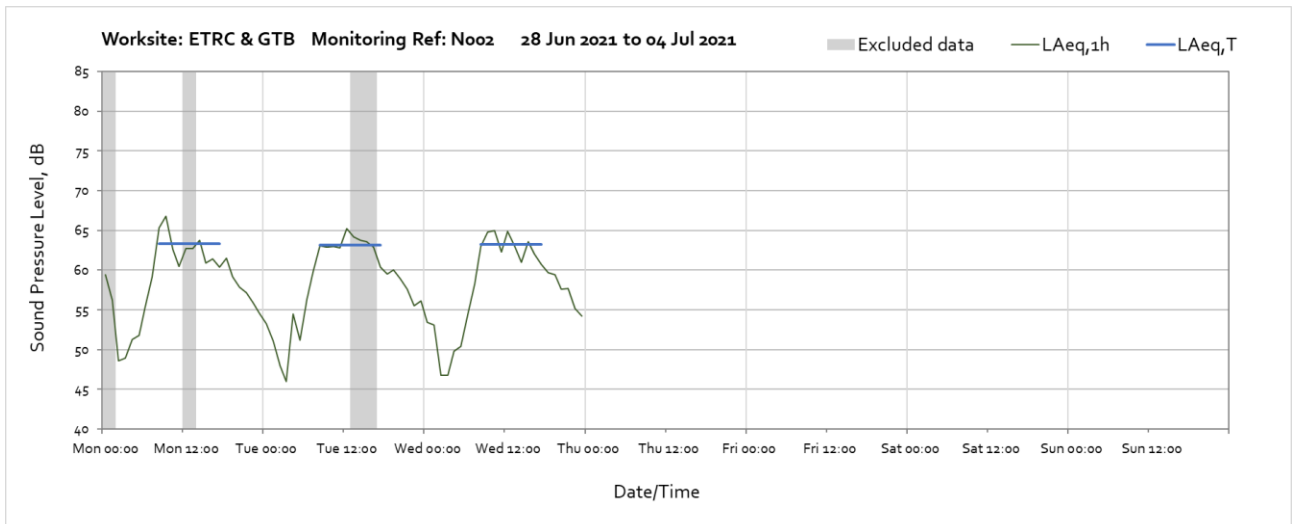
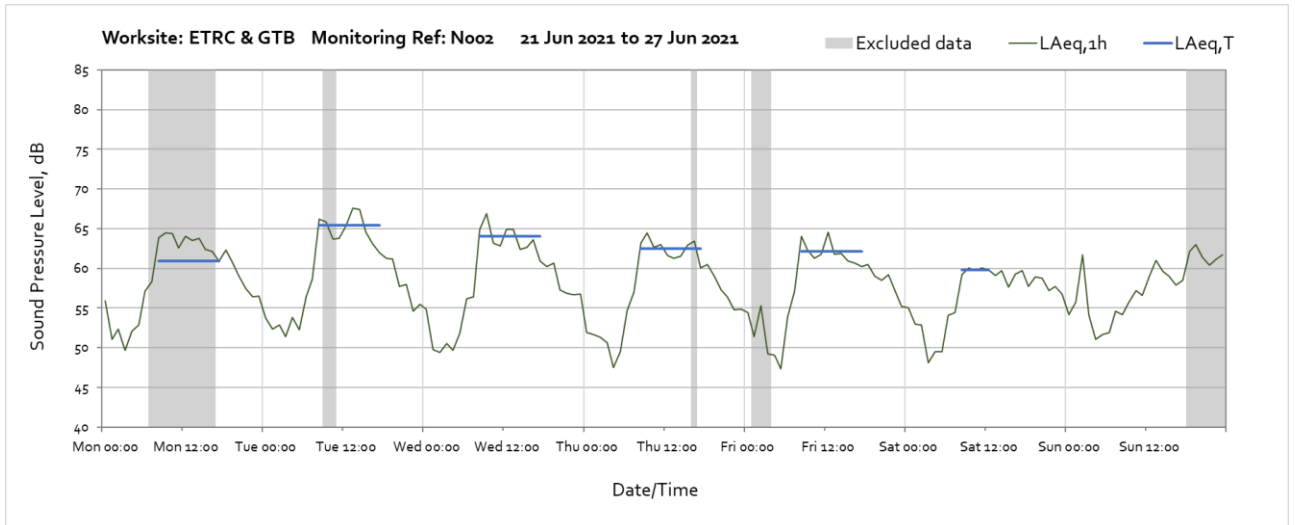
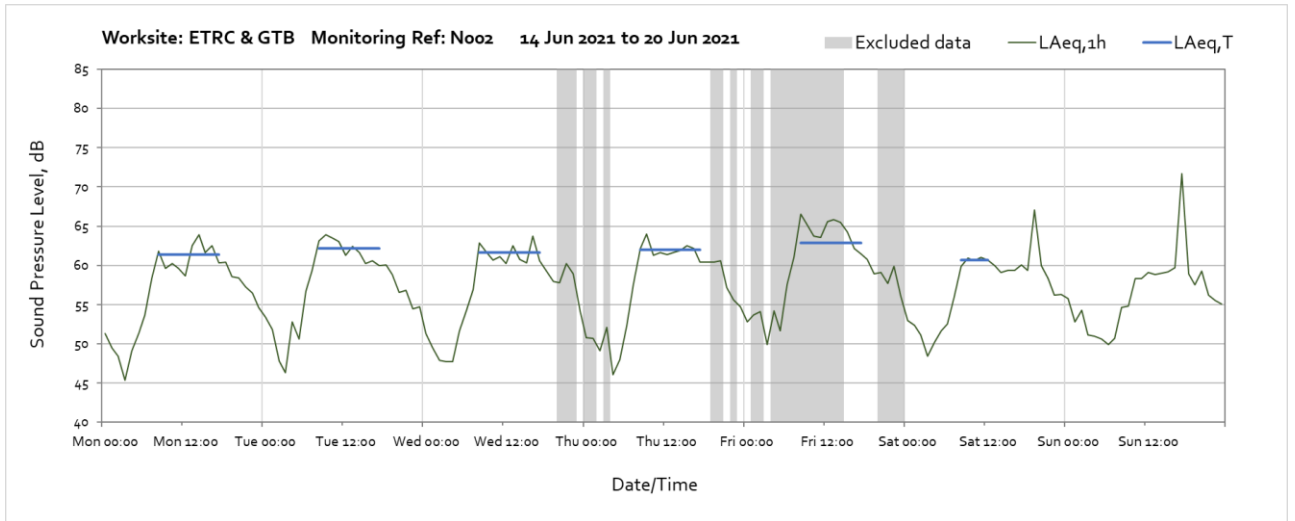


**Worksite: ETRC & GTB – Monitoring Ref: N002**

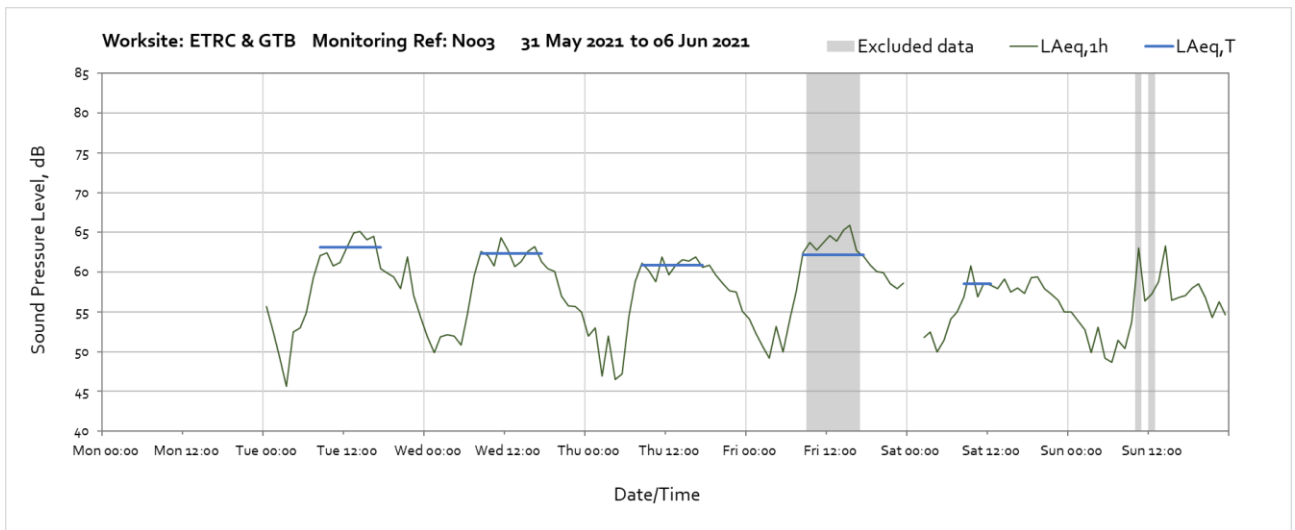


Note: Missing data from 00:00 until 02:00 on Saturday 5<sup>th</sup> June a monitoring station network connection error.

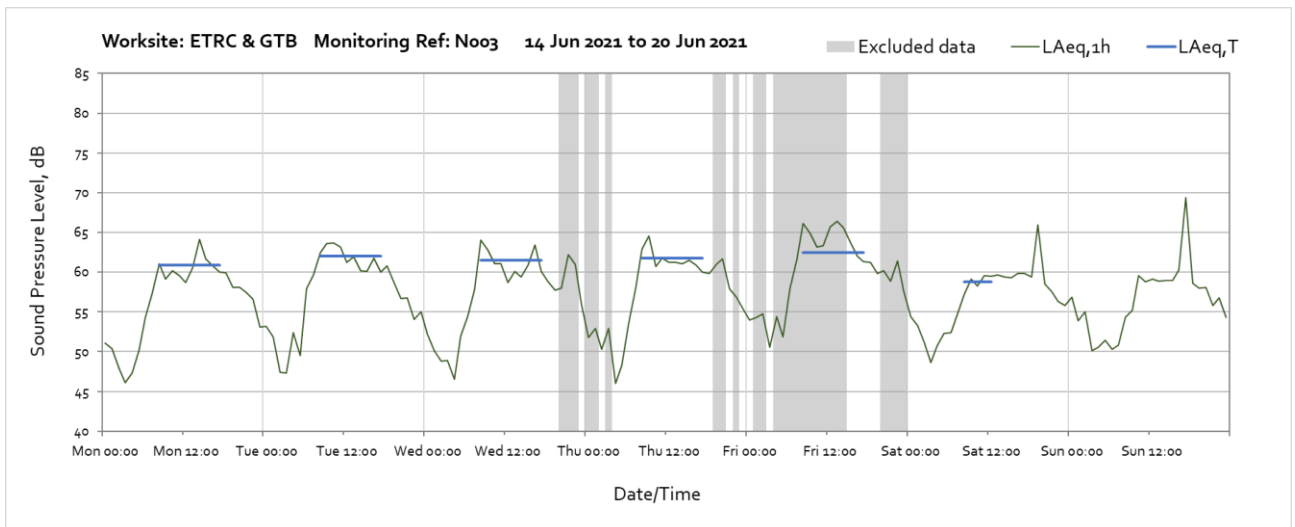
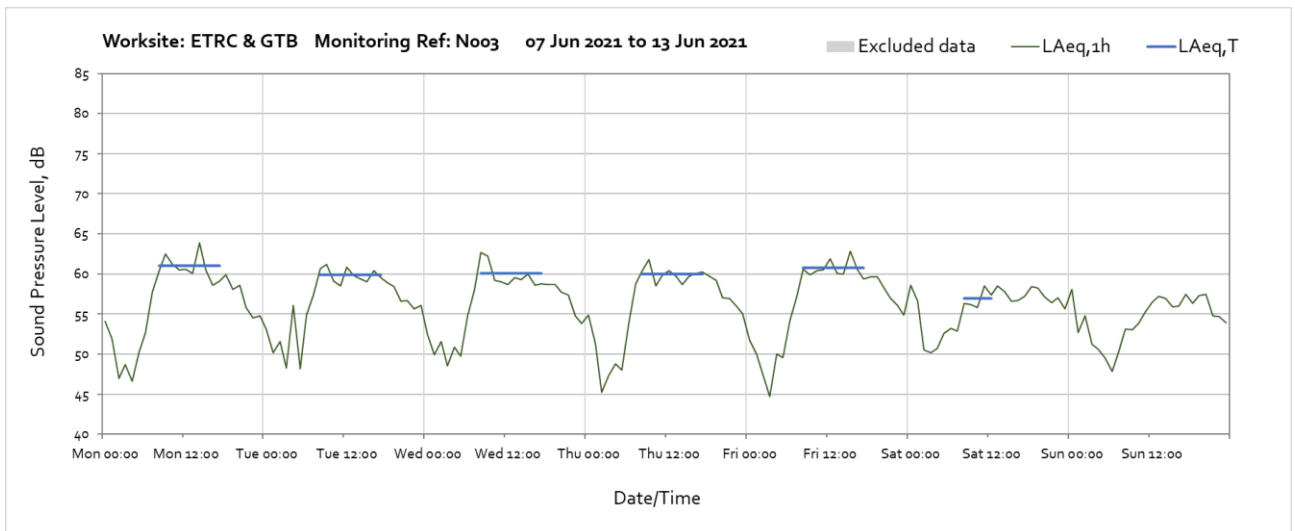




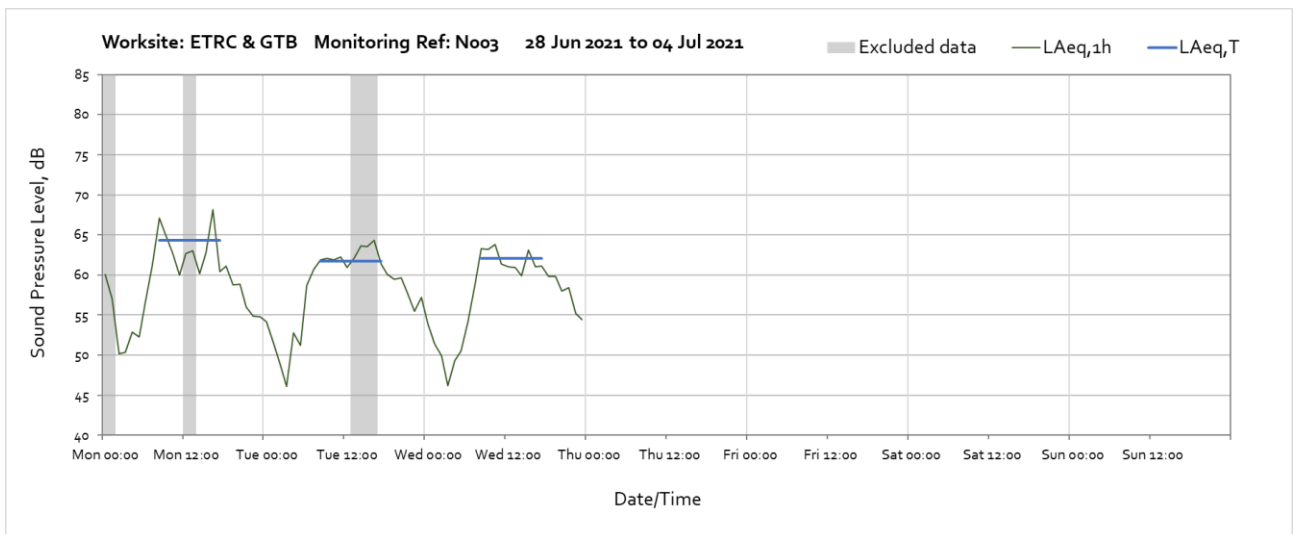
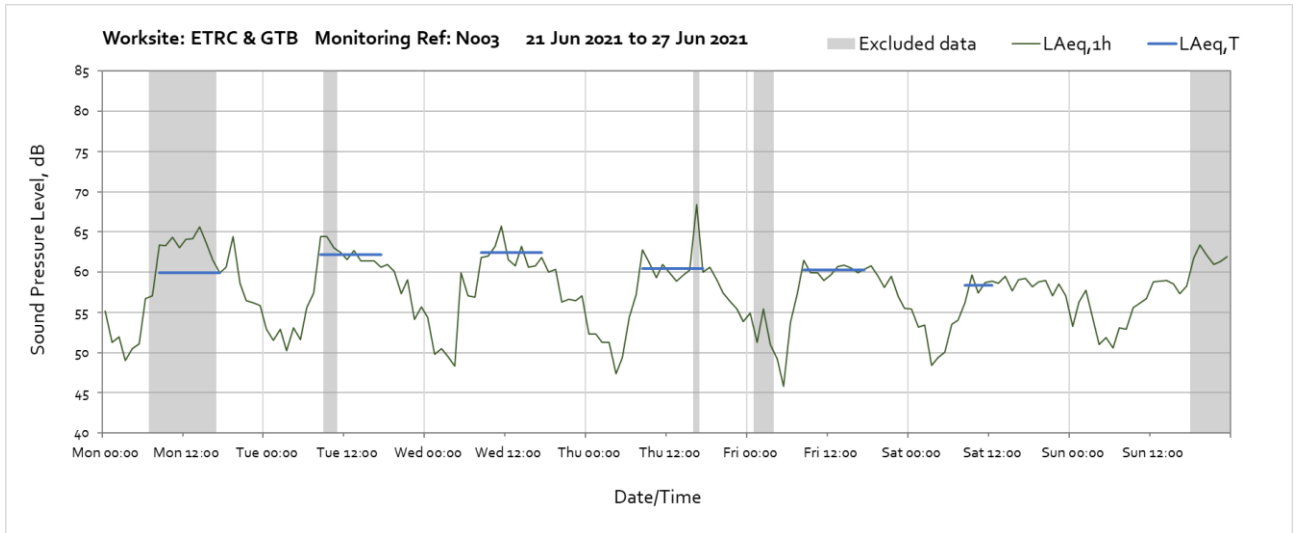
## Worksite: ETRC & GTB – Monitoring Ref: N003



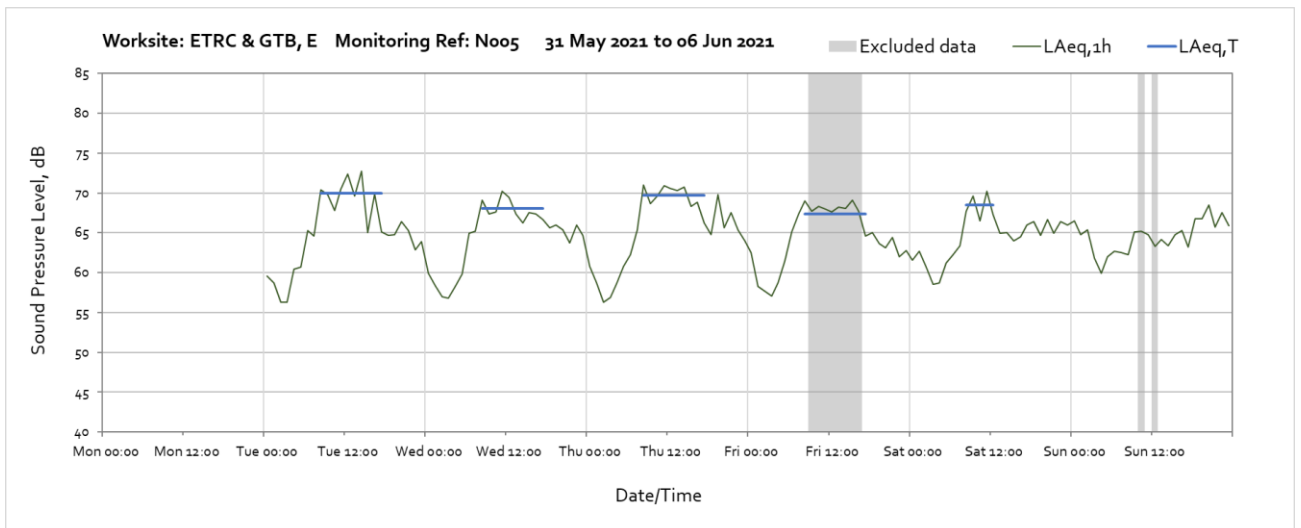
Note: Missing data from 00:00 until 02:00 on Saturday 5<sup>th</sup> June a monitoring station network connection error.

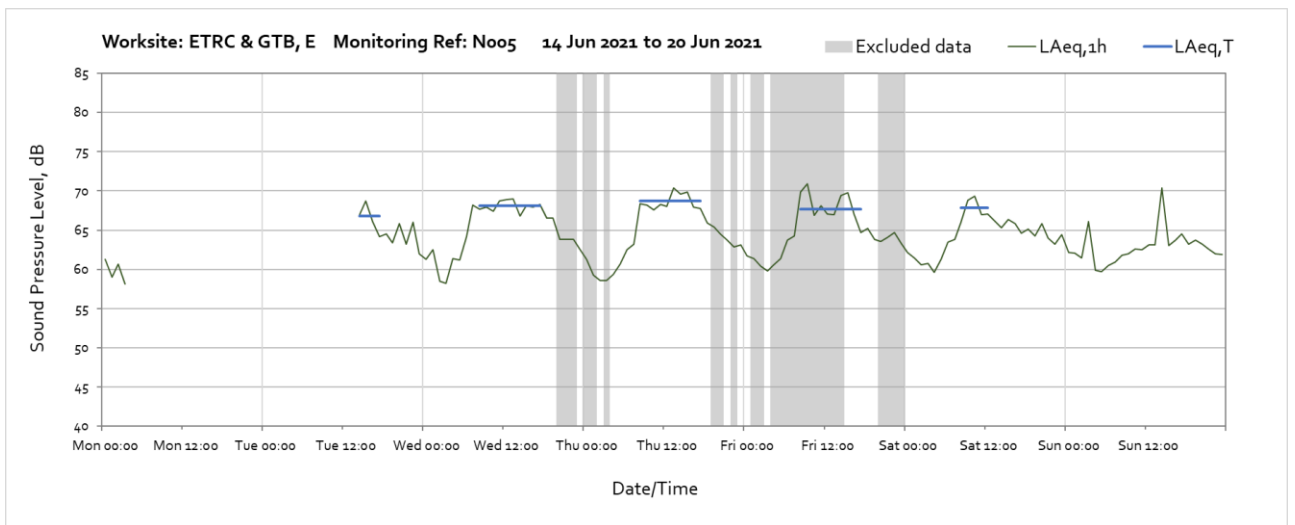
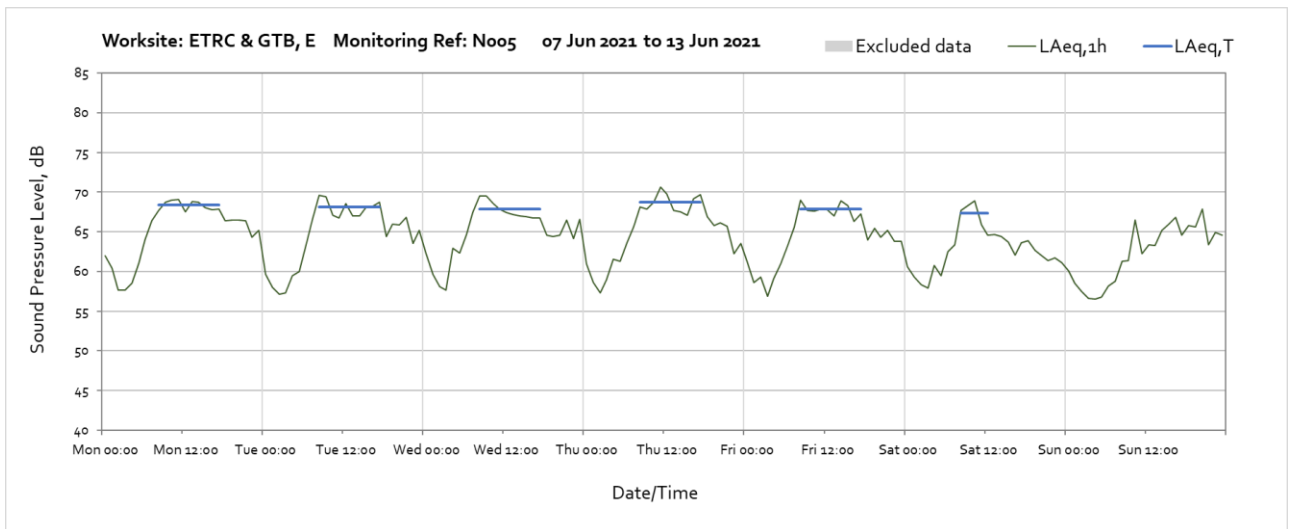




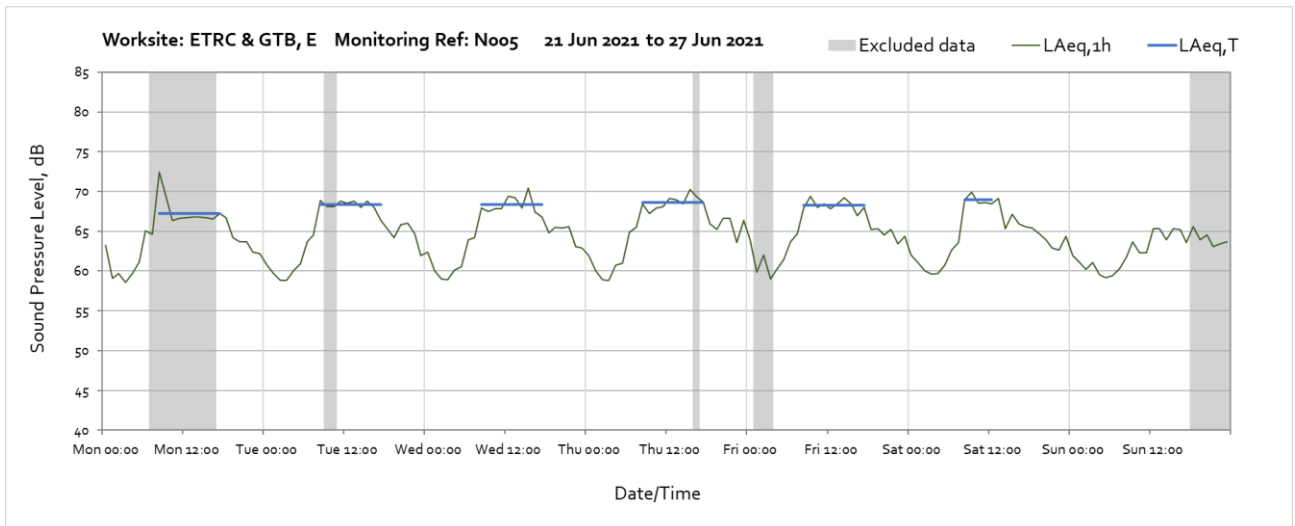


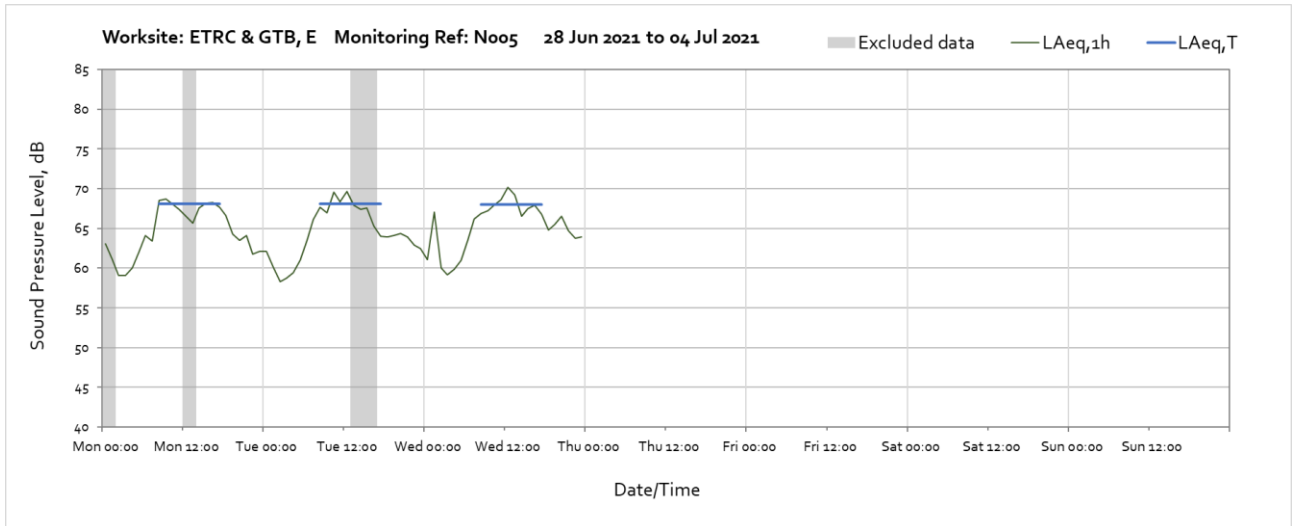
**Worksite: ETRC & GTB, E - Monitoring Ref: N005**



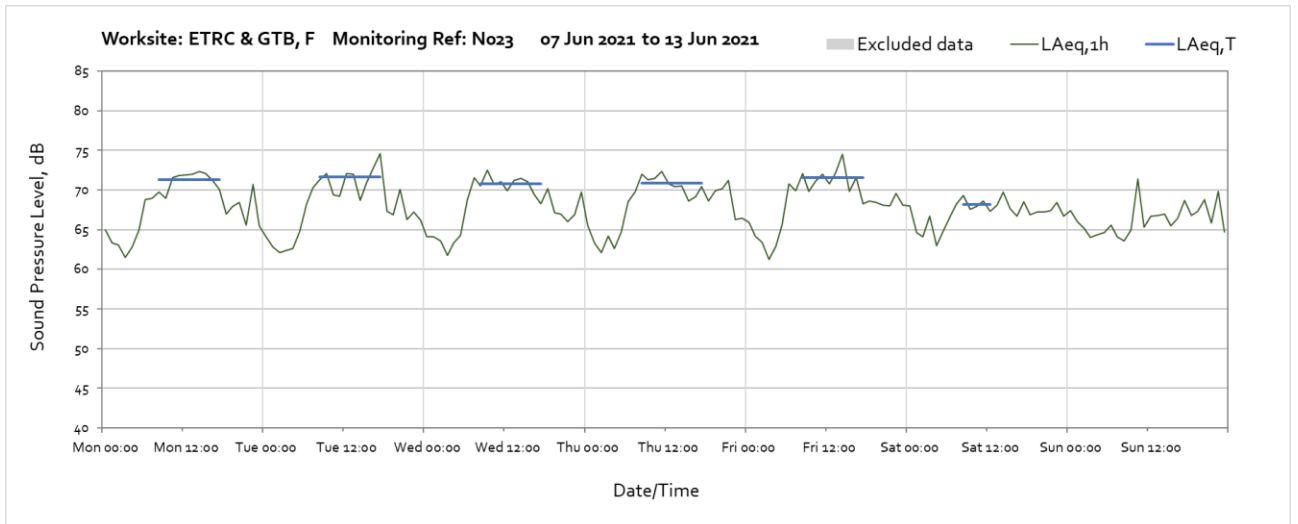
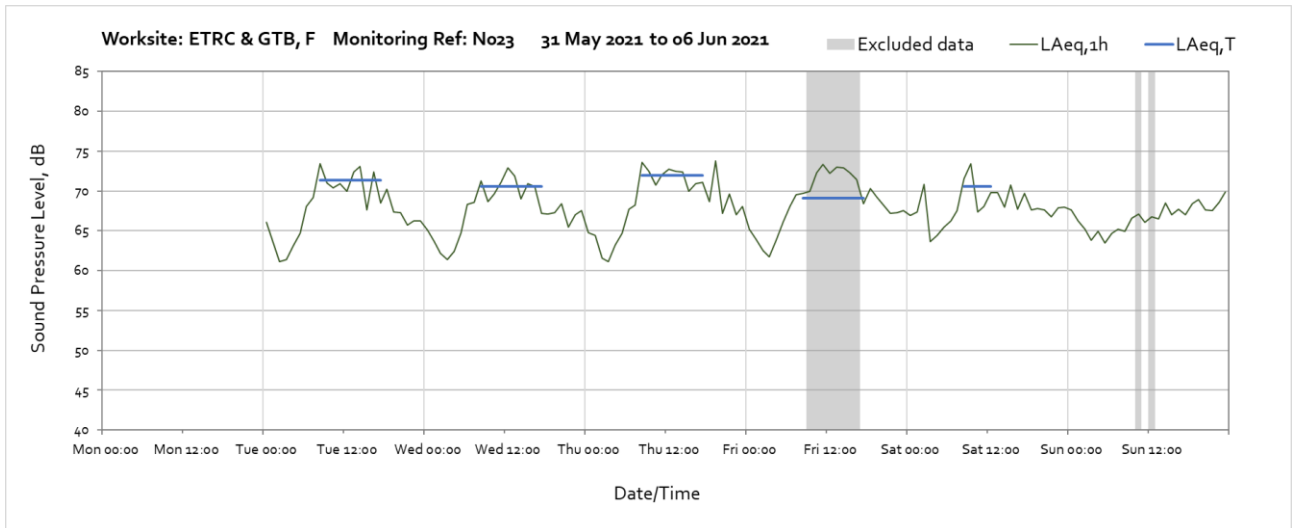


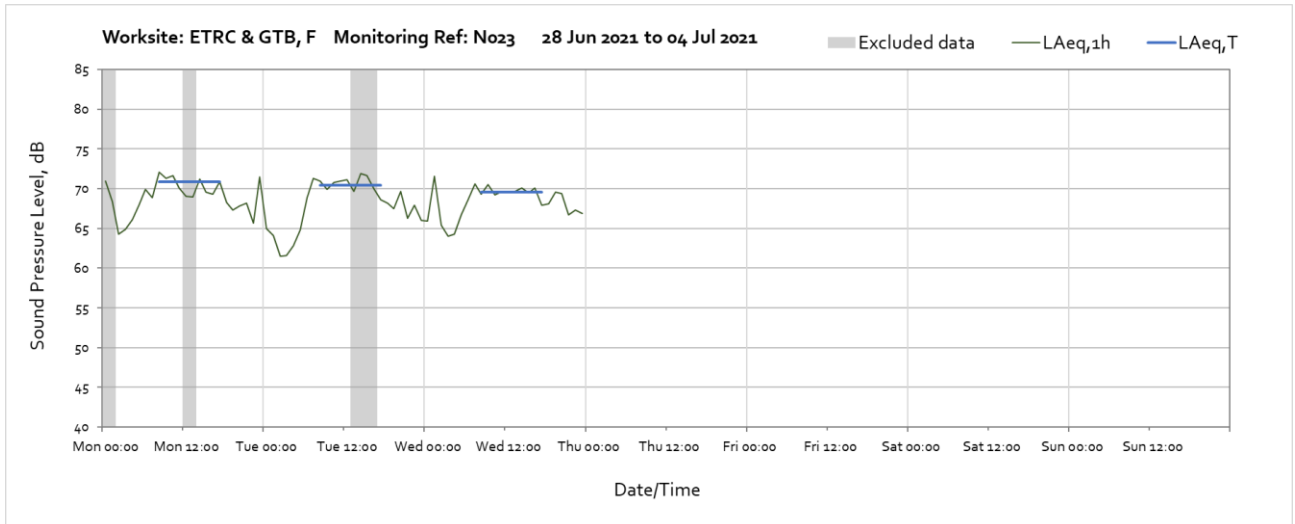
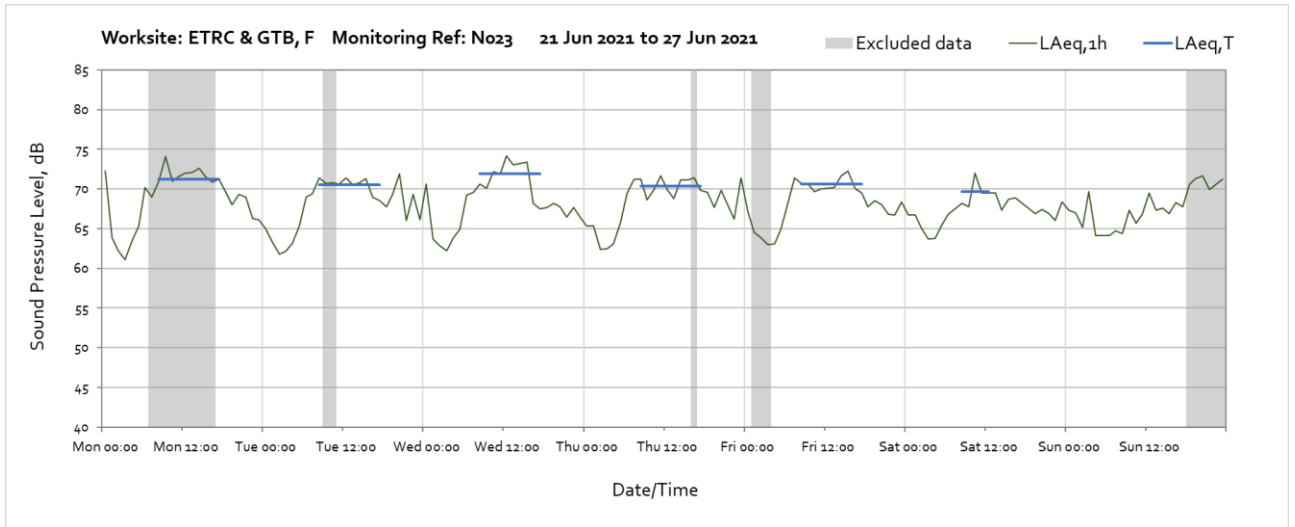
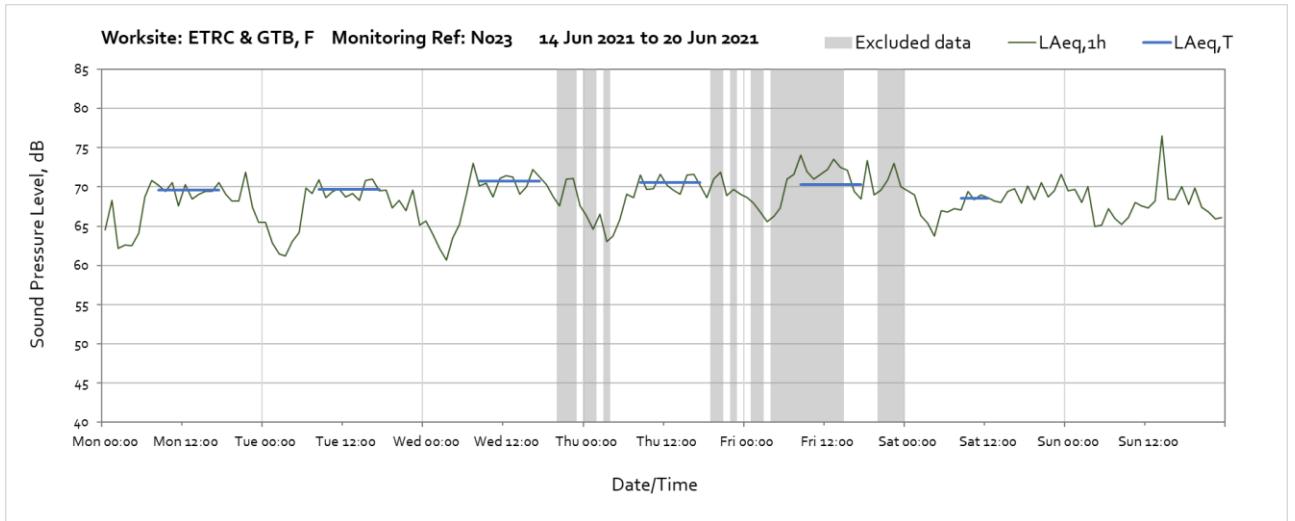
Note: Missing data from 04:00 on Monday 14<sup>th</sup> June until 14:00 on Tuesday 15<sup>th</sup> June was due to a loss of power to the monitoring station.



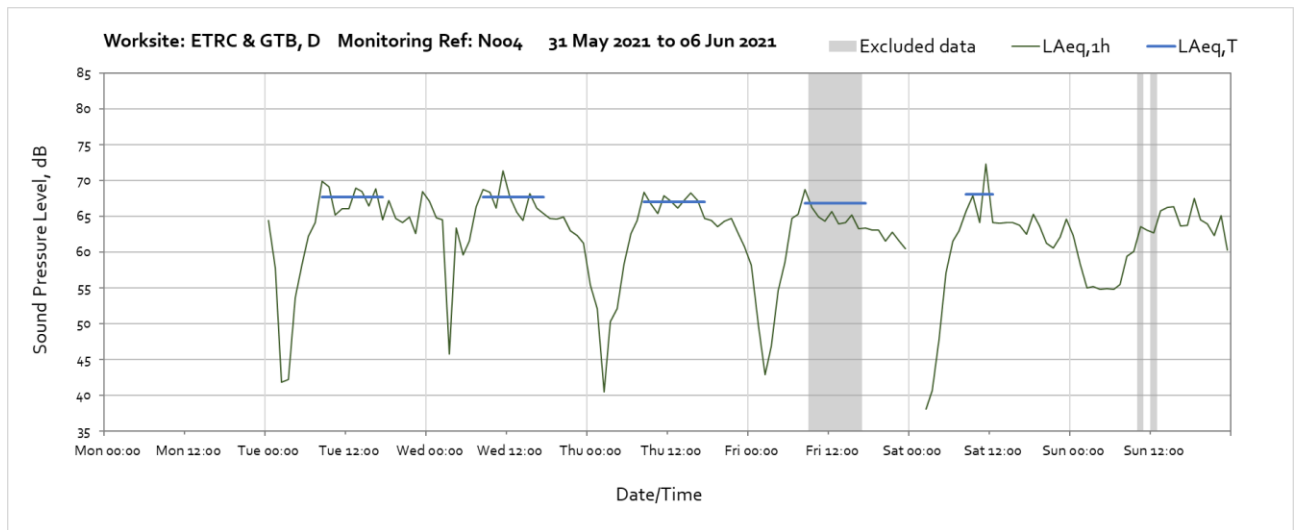


**Worksite: ETRC & GTB, F – Monitoring Ref: N023**

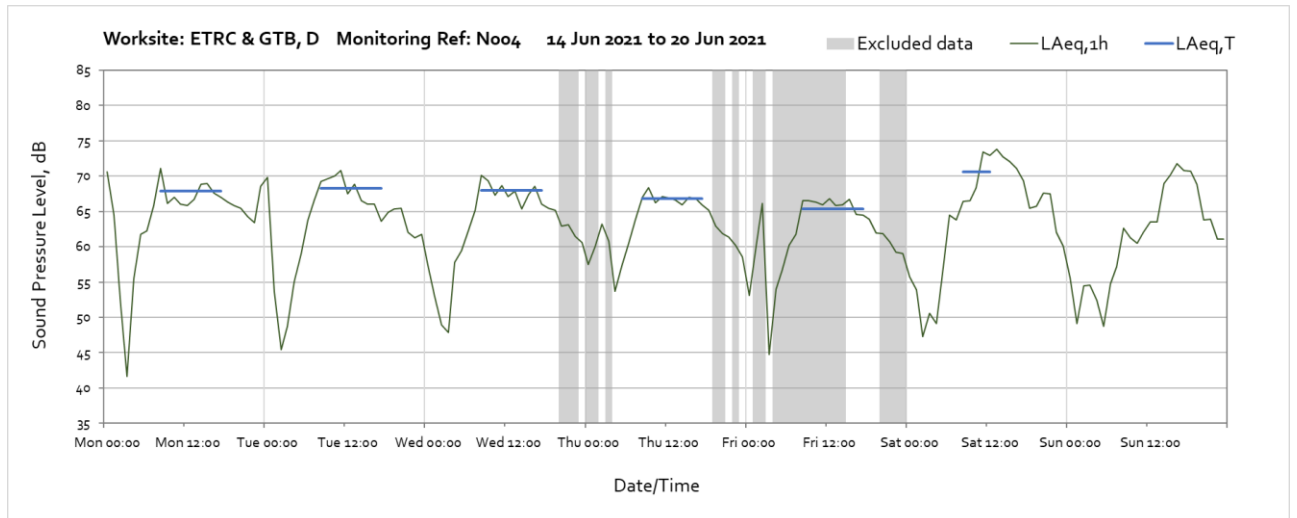
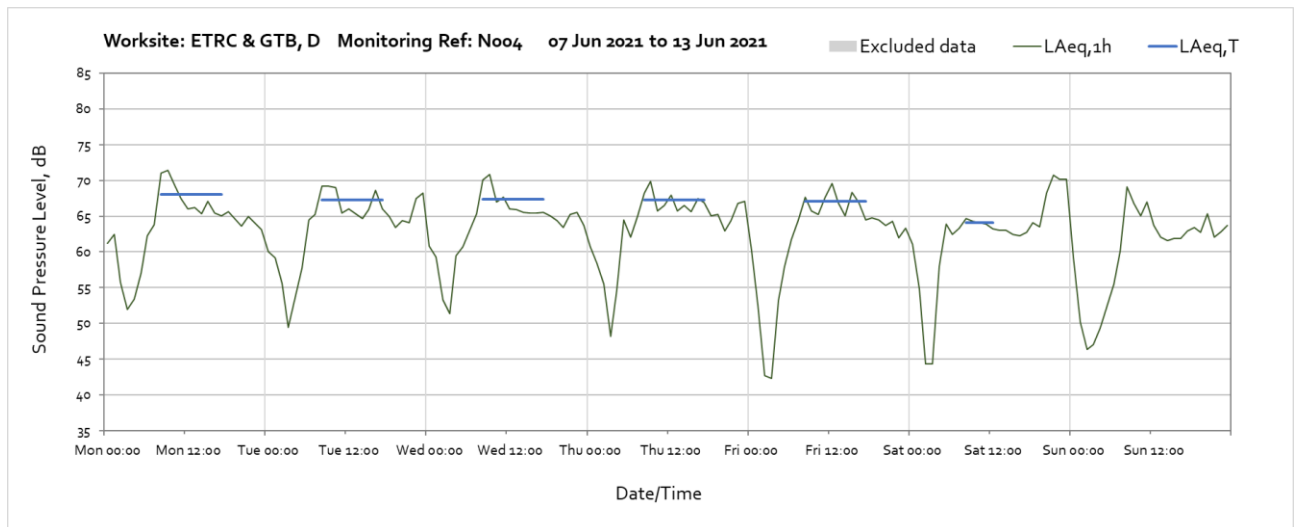




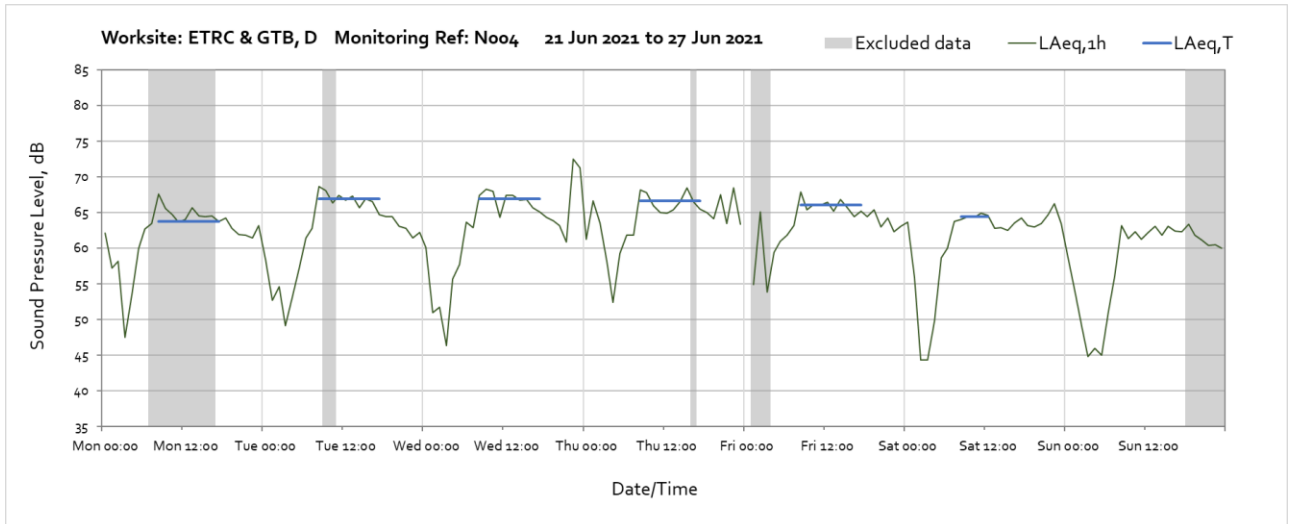
## Worksite: ETRC & GTB, D – Monitoring Ref: N004



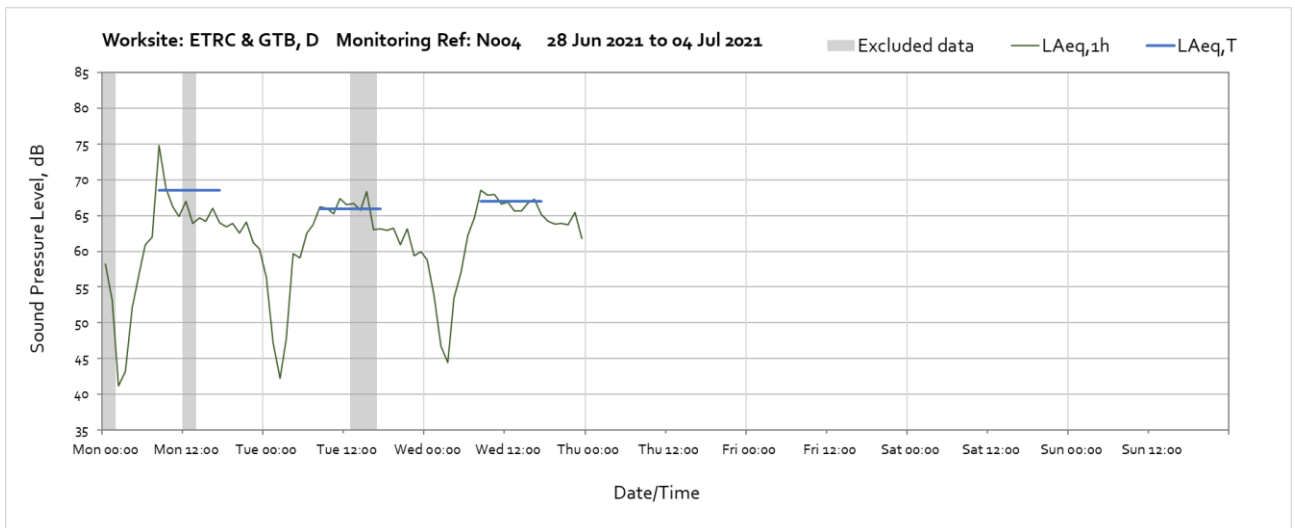
Note: Missing data from 00:00 until 02:00 on Saturday 5<sup>th</sup> June was due to a monitoring station network connection error.



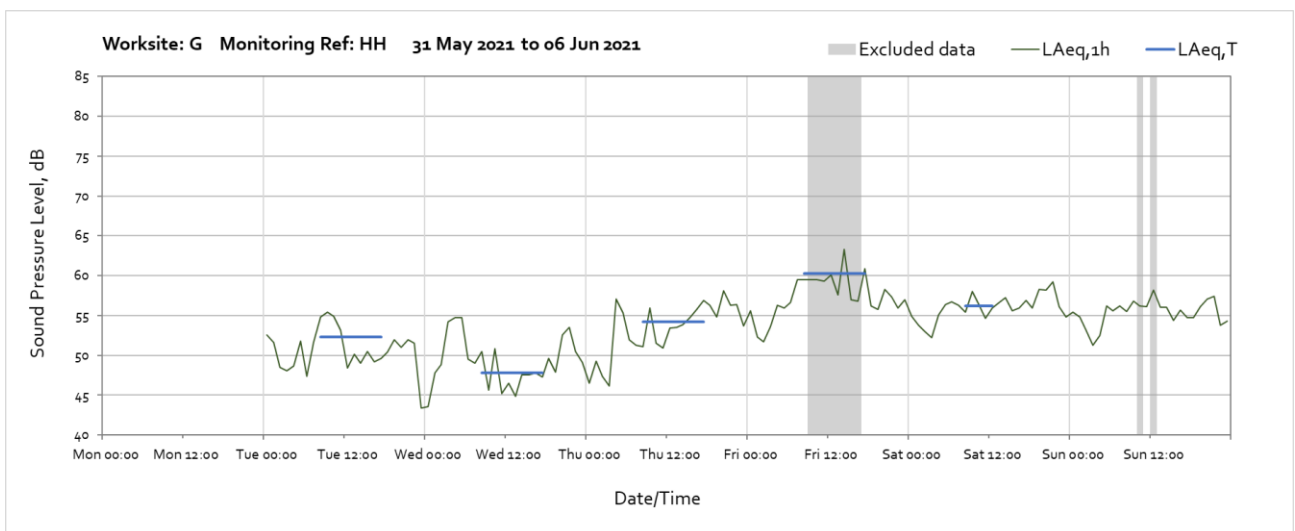


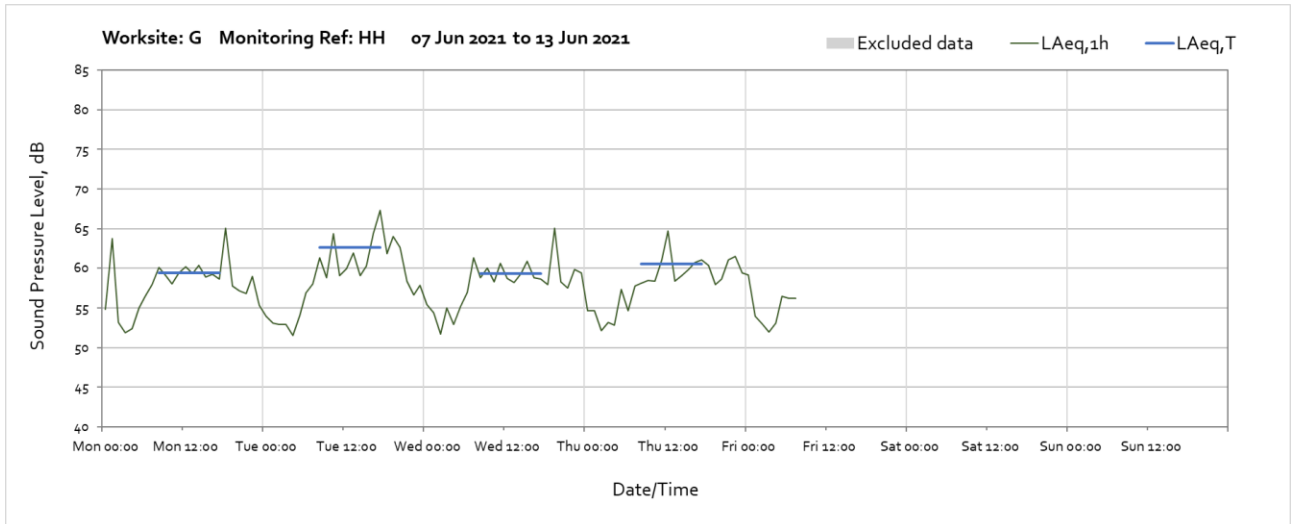


Note: Missing data from 00:00 until 01:00 on Friday 25<sup>th</sup> June was due to a monitoring station error.

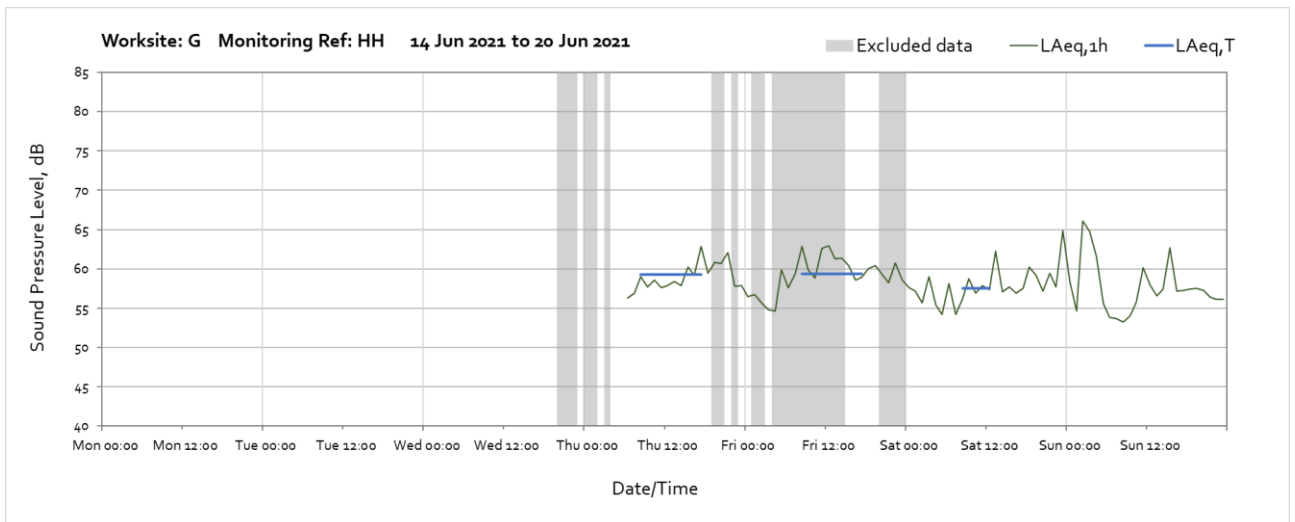


### Worksite: G - Monitoring Ref: HH

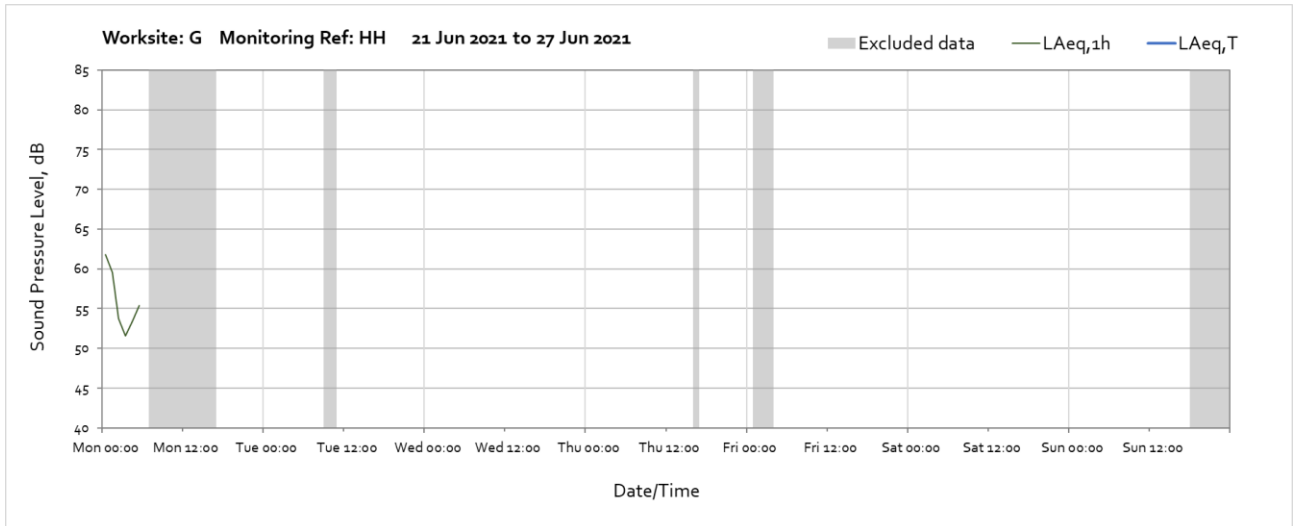




Note: Missing data from 08:00 on Friday 11<sup>th</sup> June until 06:00 on Thursday 17<sup>th</sup> June was due to loss of power to the monitoring station. The power issue has been followed up with the subcontracted site engineers and monitoring station offline alerts have been enabled with view of minimising further loss of data.

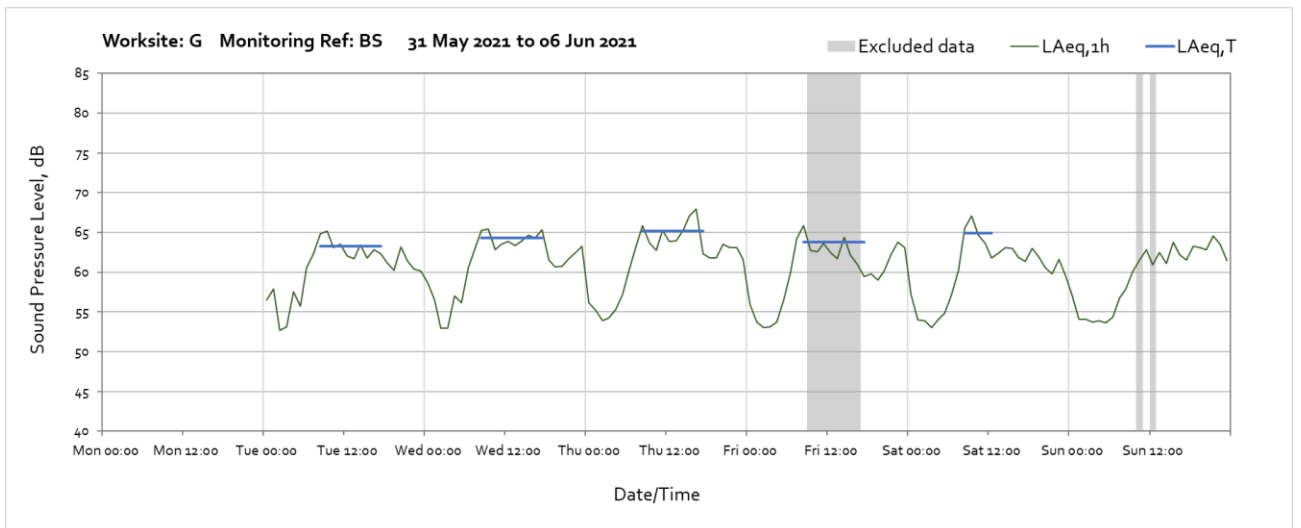


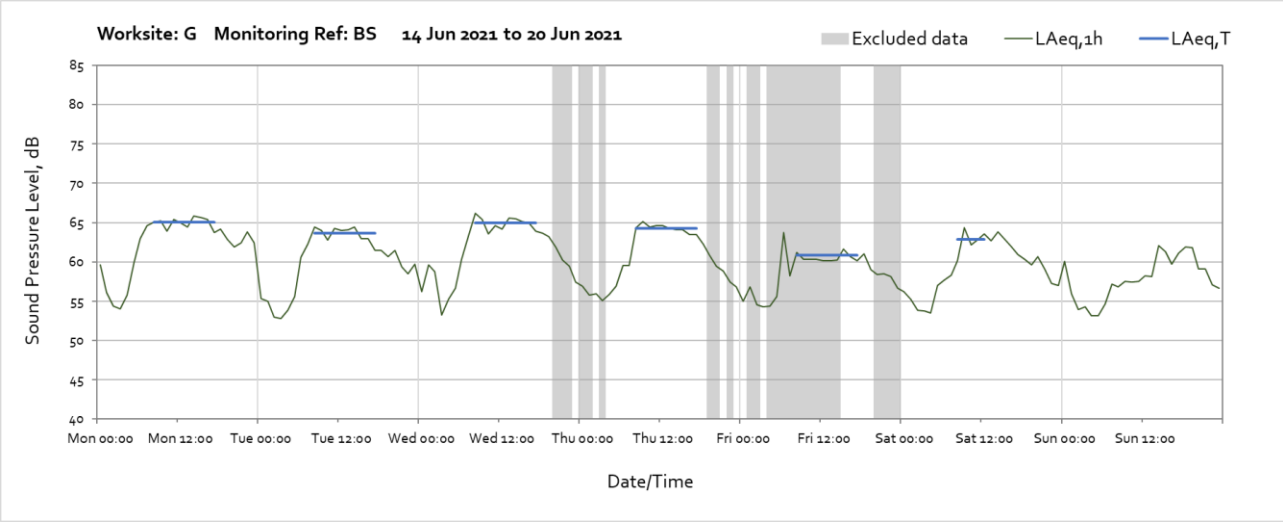
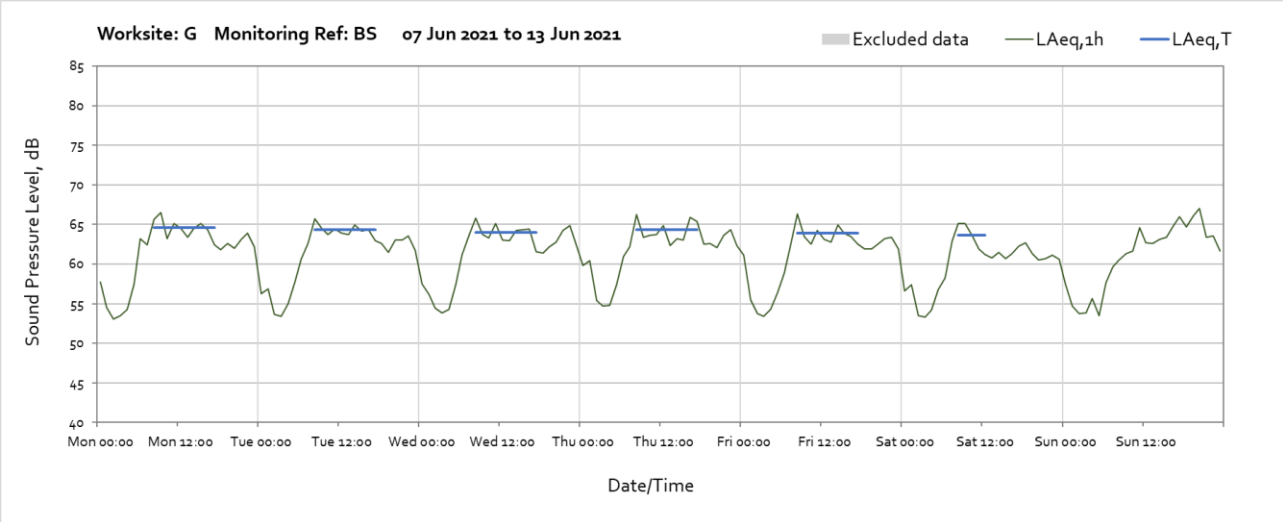
Note: Missing data from 08:00 on Friday 11<sup>th</sup> June until 06:00 on Thursday 17<sup>th</sup> June was due to loss of power to the monitoring station. The power issue has been followed up with the subcontracted site engineers and monitoring station offline alerts have been enabled with view of minimising further loss of data.

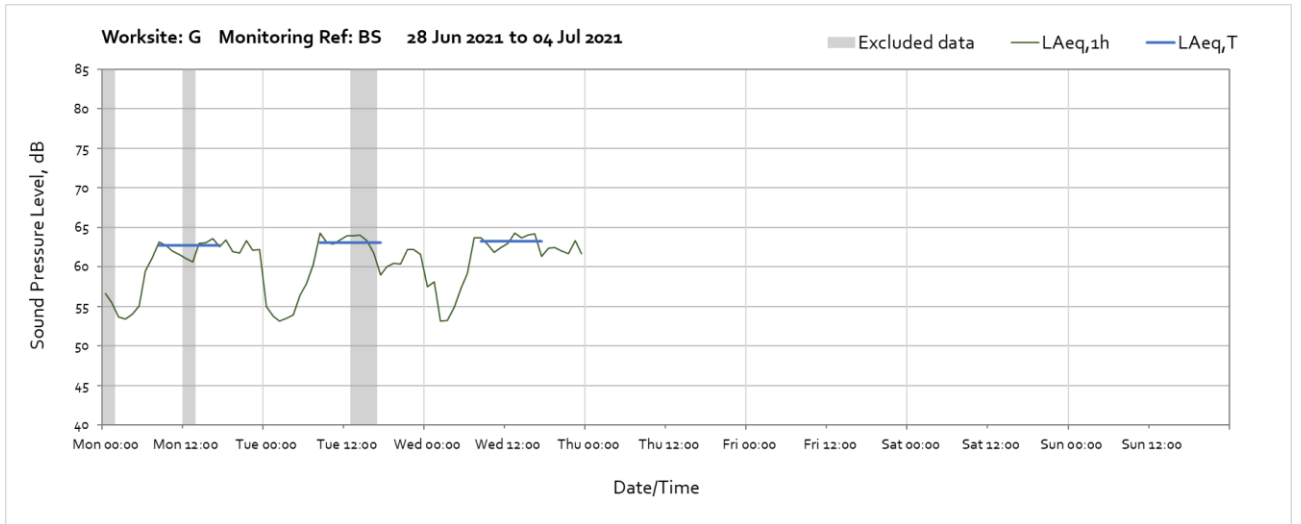


Note: Missing data from 06:00 on Monday 21<sup>st</sup> June until the end of the month was due to loss of power to the monitoring station. The power issue has been followed up with the subcontracted site engineers and monitoring station offline alerts have been enabled with view of minimising further loss of data. Power was restored to the monitoring station on Thursday 8<sup>th</sup> July.

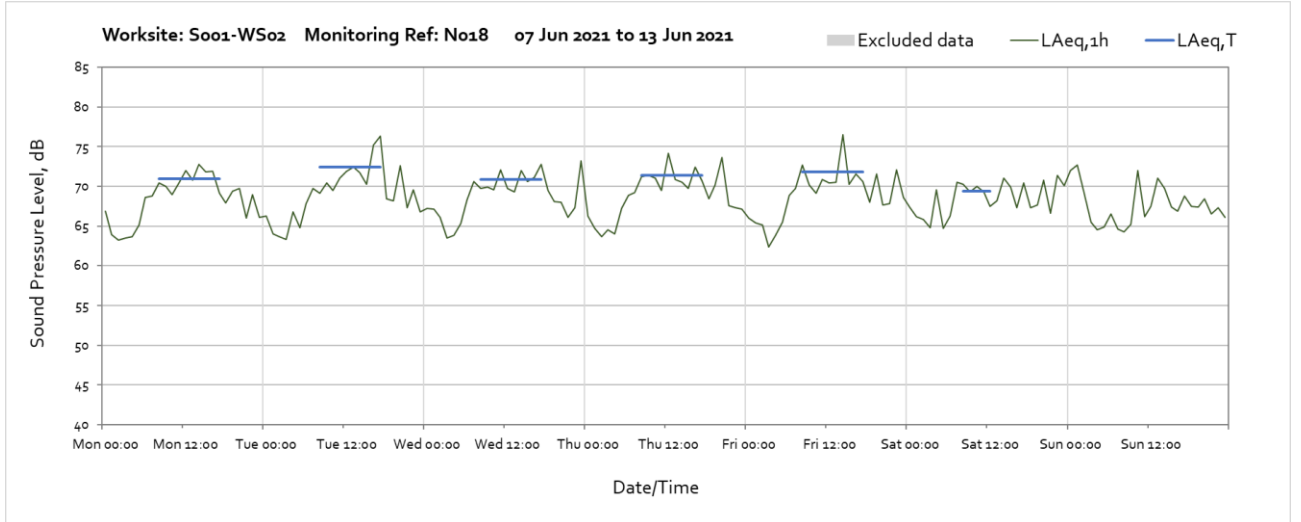
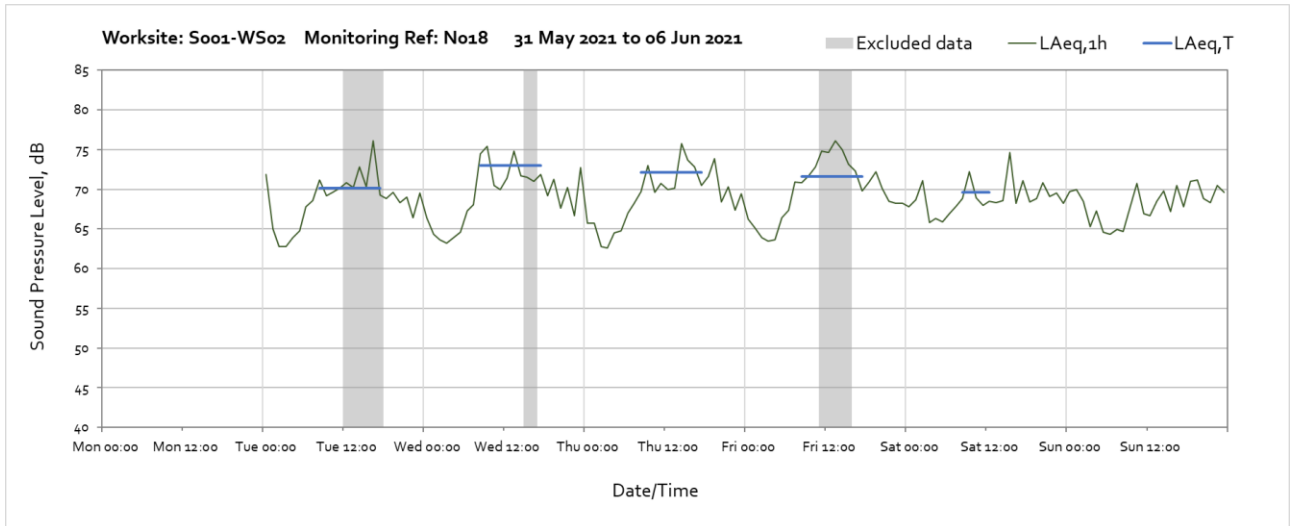
### Worksite: G - Monitoring Ref: BS



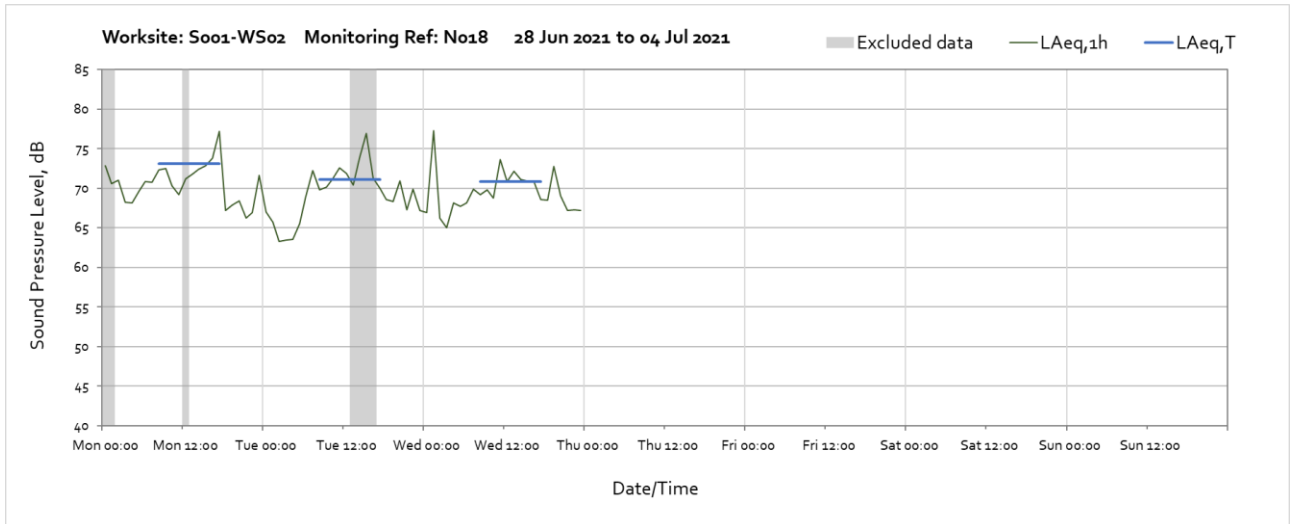
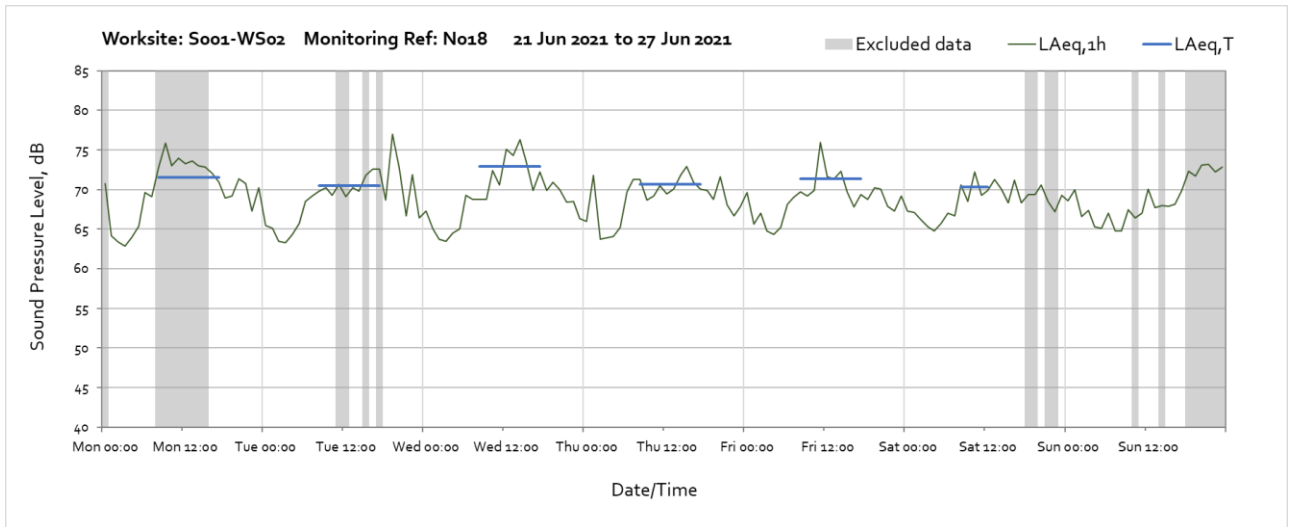
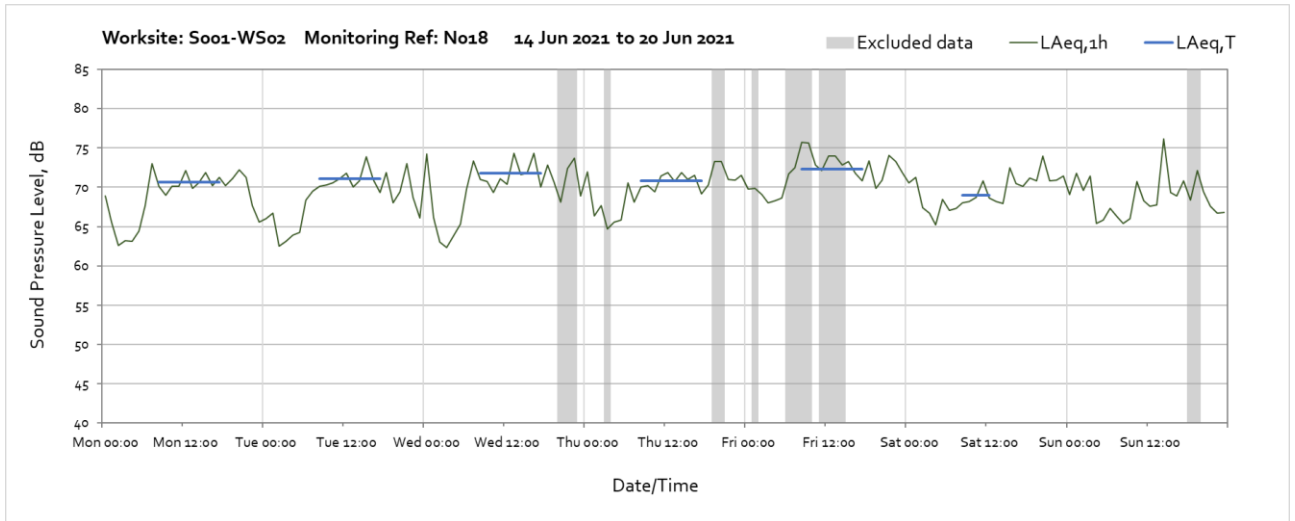




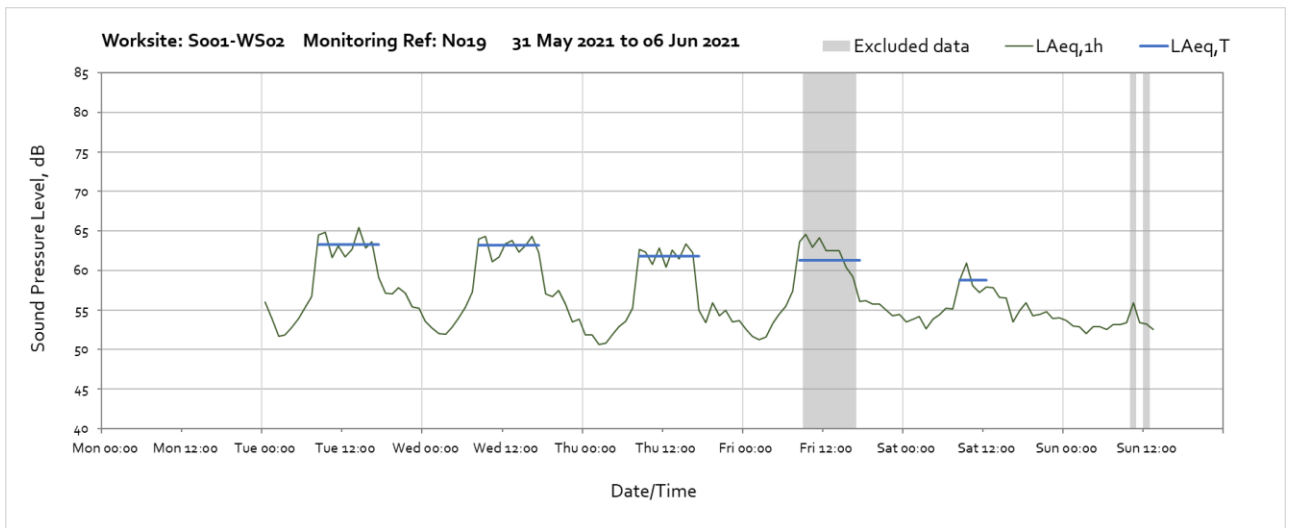
**Worksite: S001-WS02 – Monitoring Ref: N018**



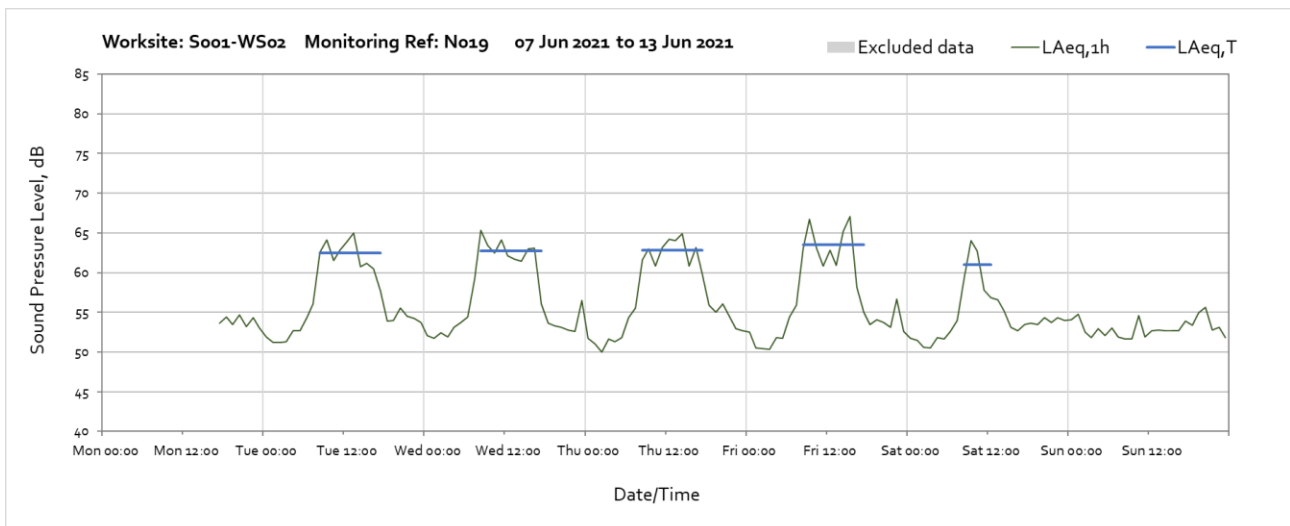




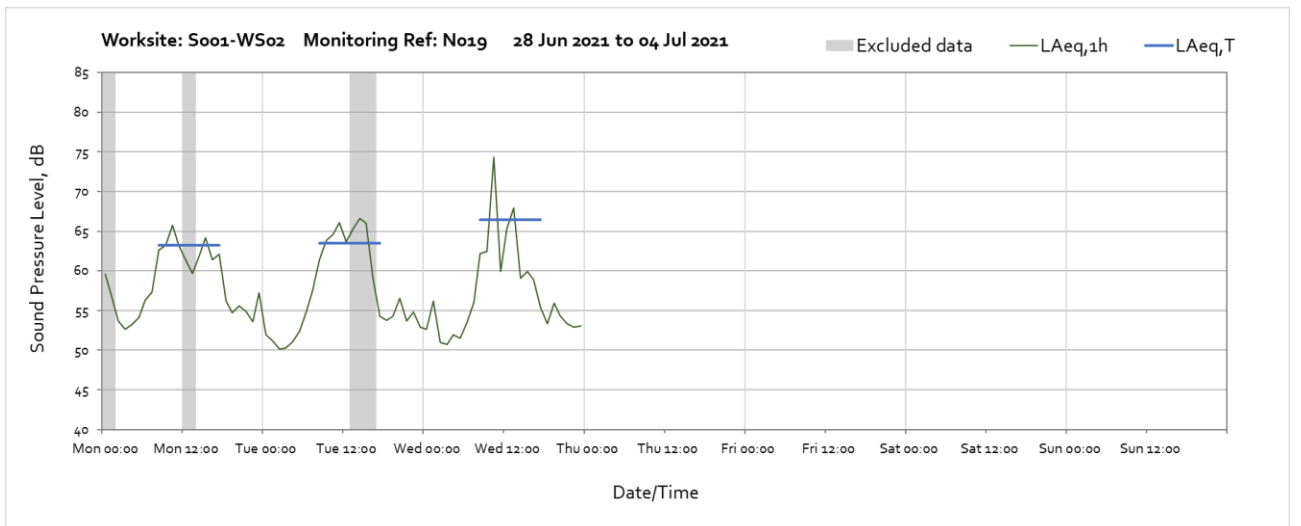
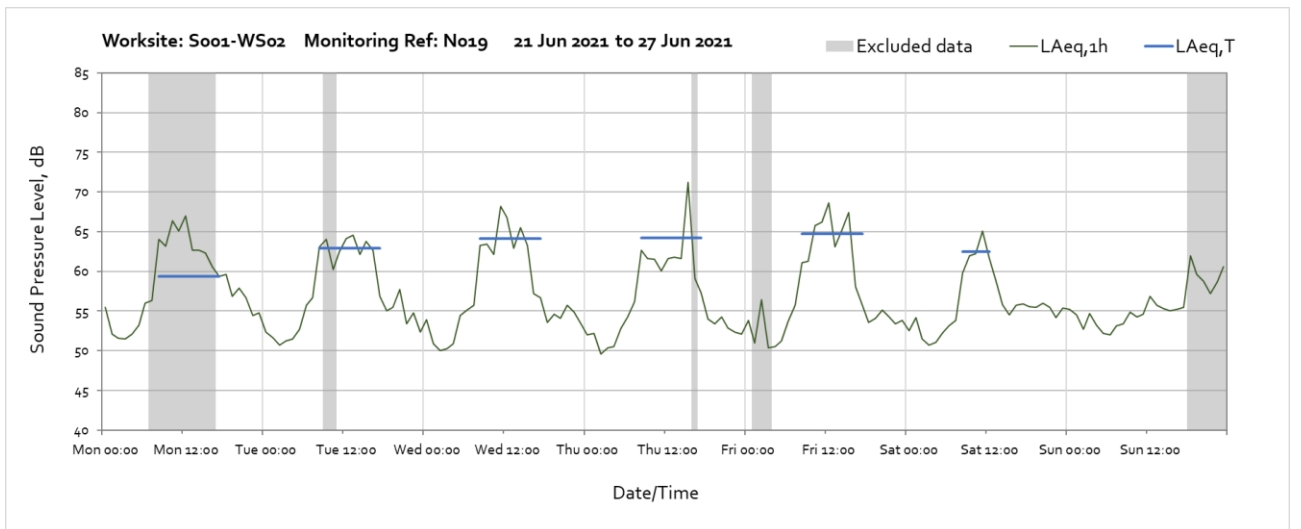
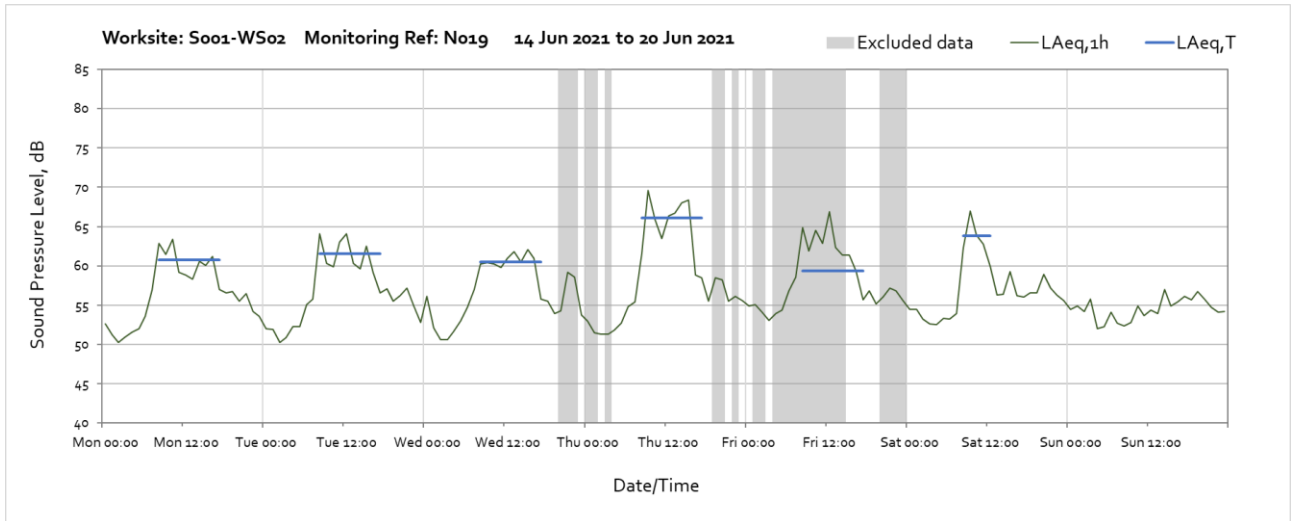
## Worksite: S001-WS02 – Monitoring Ref: N019



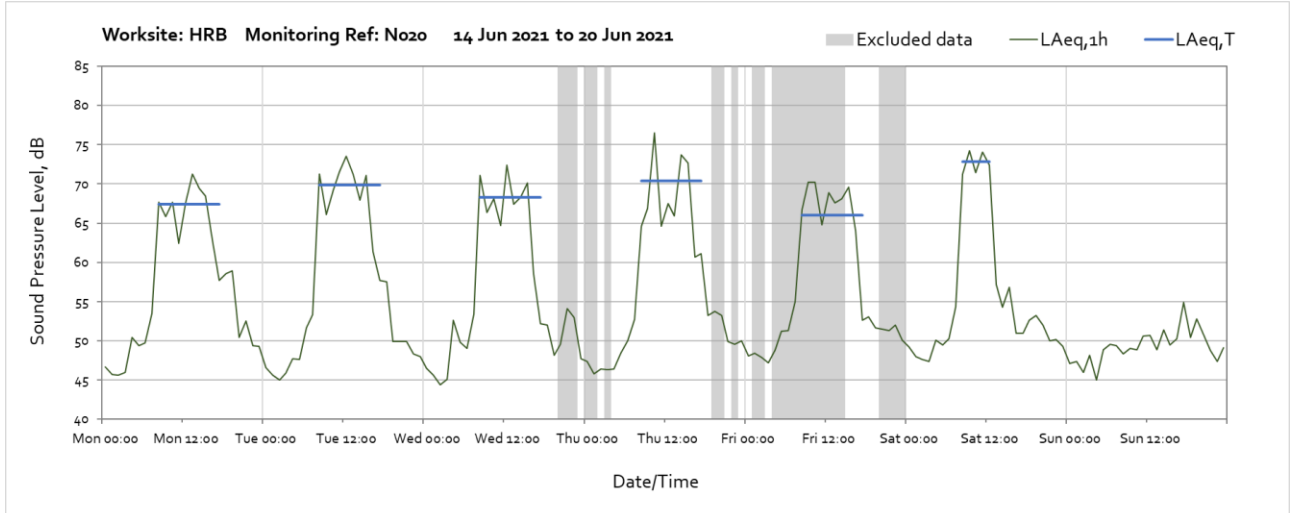
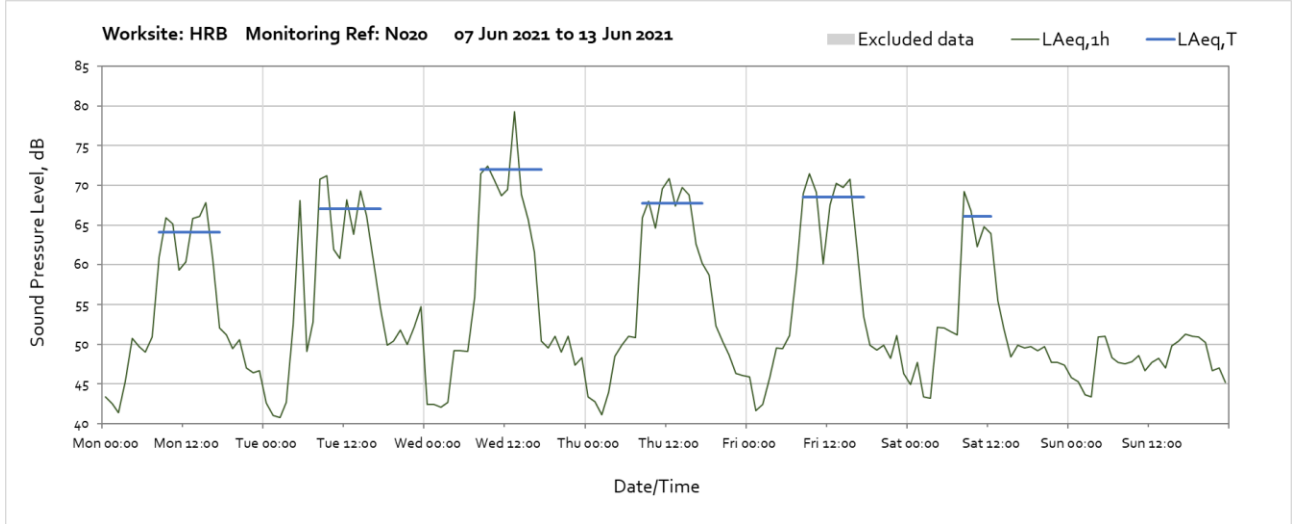
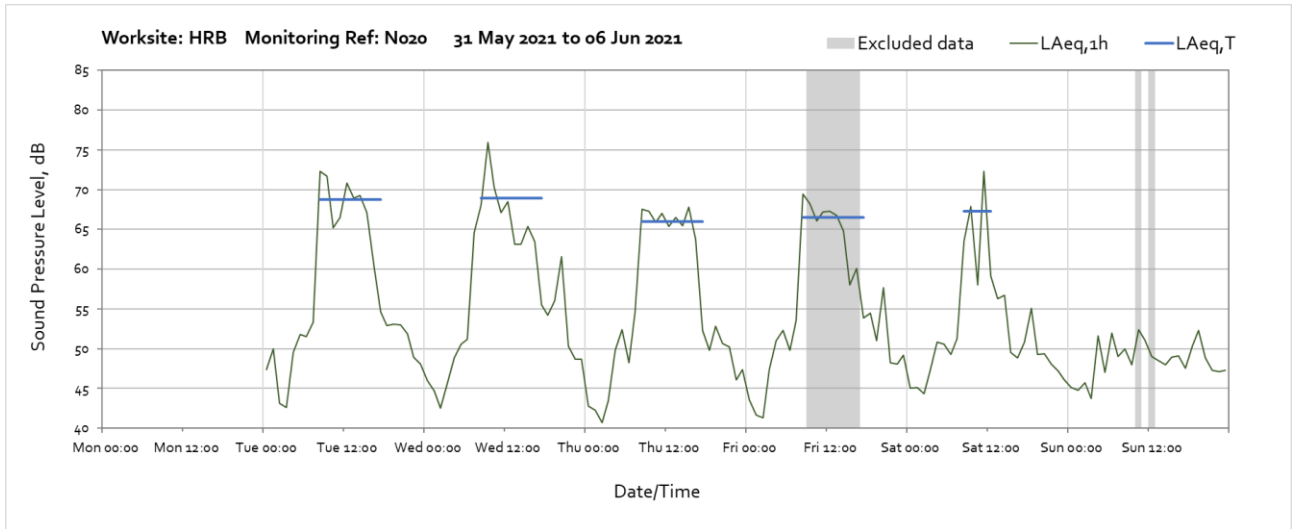
Note: Missing data from 13:00 on Sunday 6<sup>th</sup> June until 17:00 on Monday 7<sup>th</sup> June was due to loss of power to the monitoring station.



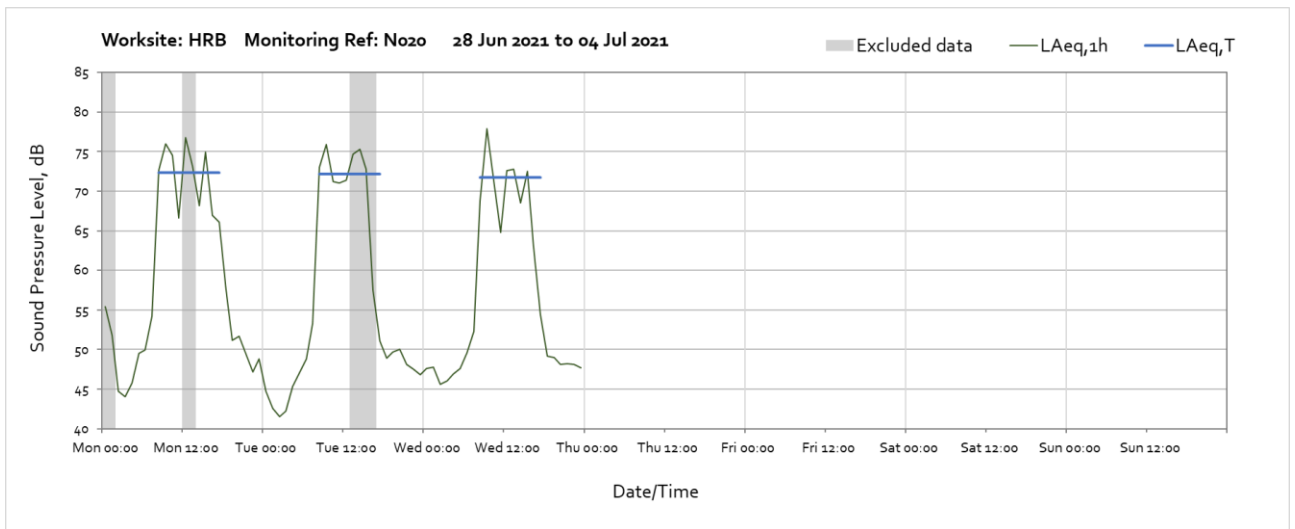
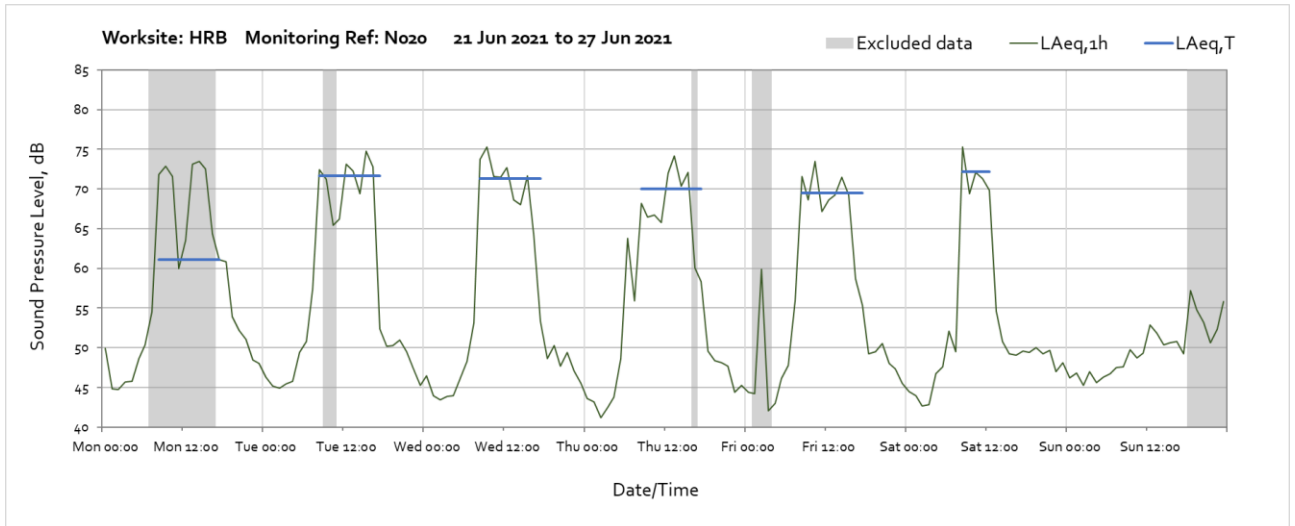
Note: Missing data from 13:00 on Sunday 6<sup>th</sup> June until 17:00 on Monday 7<sup>th</sup> June was due to loss of power to the monitoring station.



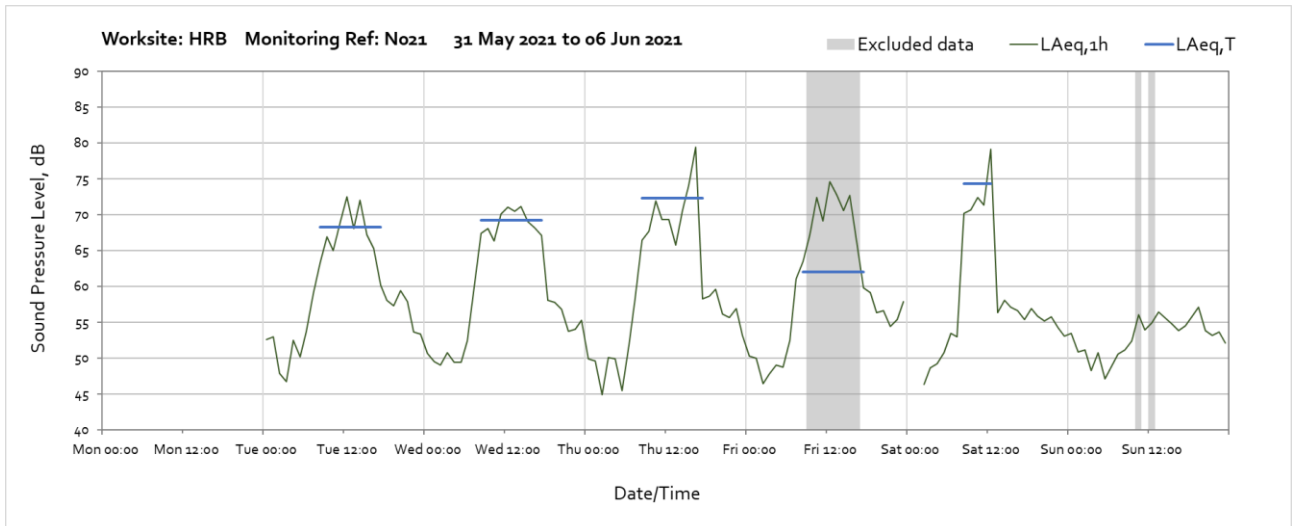
## Worksite: HRB – Monitoring Ref: N020



OFFICIAL



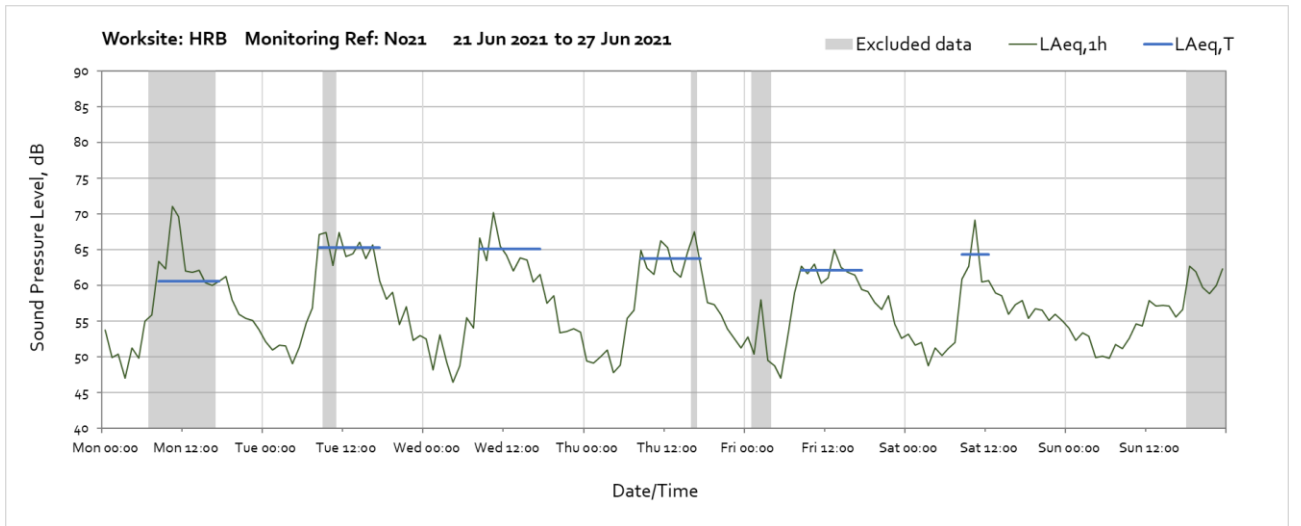
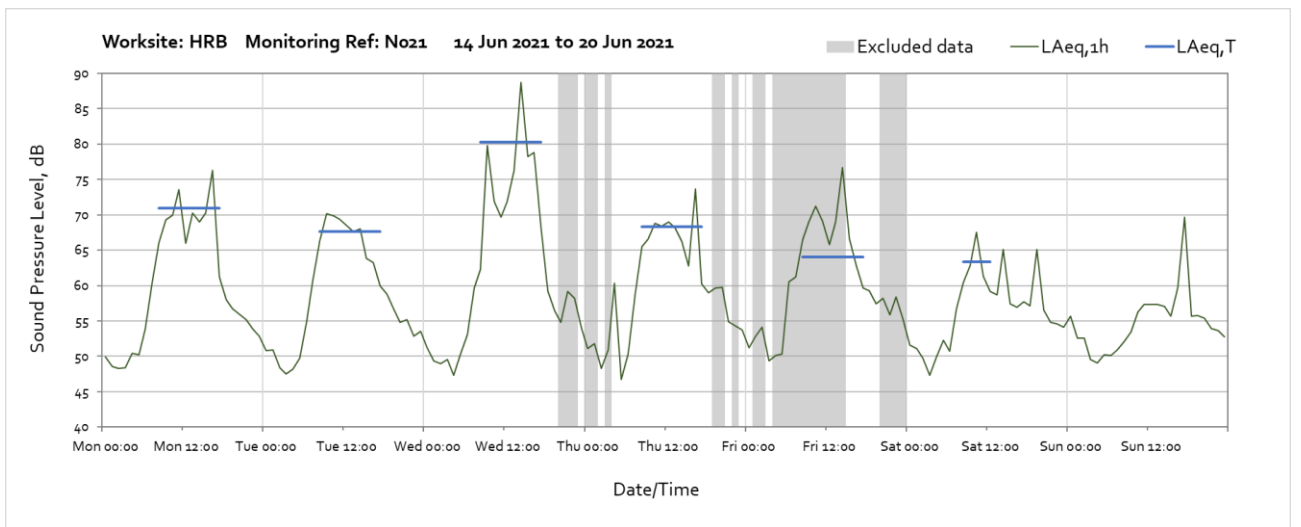
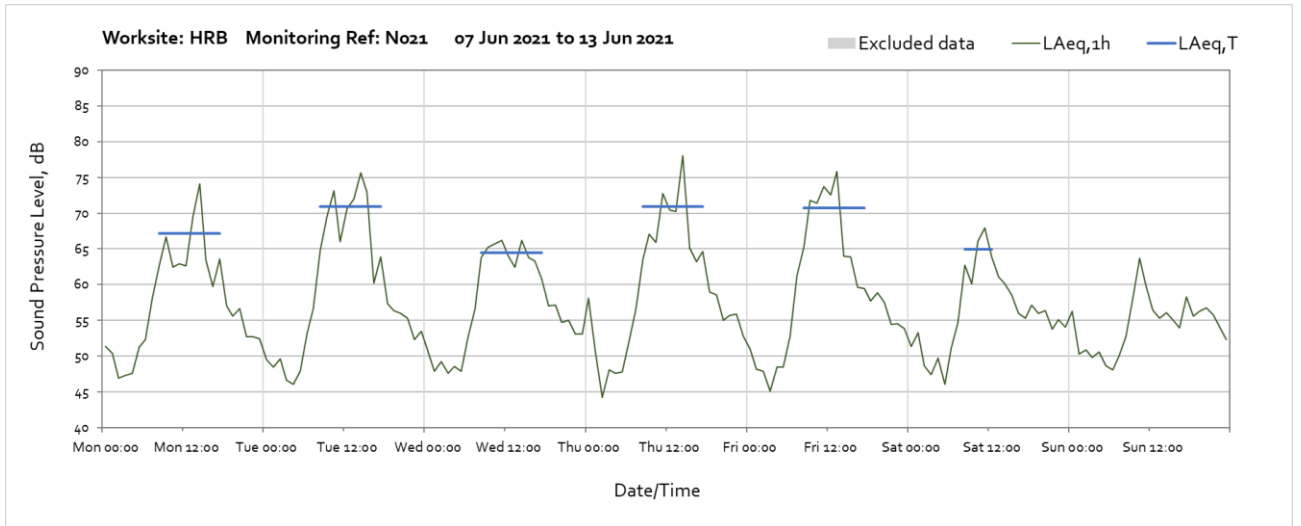
### Worksite: HRB - Monitoring Ref: N021

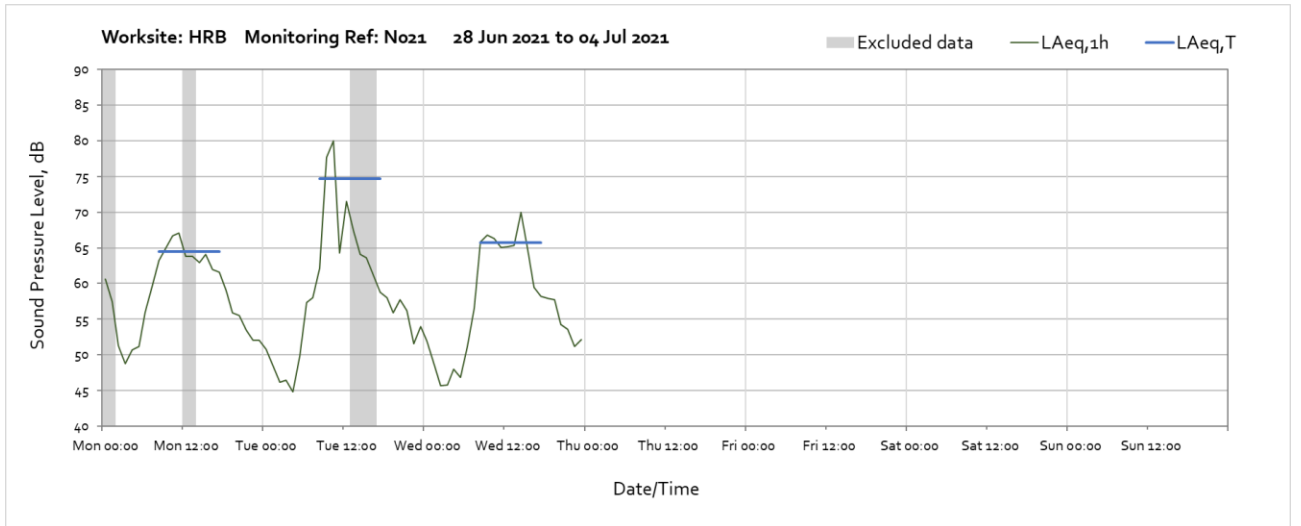


Note: Missing data from 00:00 until 02:00 on Saturday 5<sup>th</sup> June was due to a monitoring station network connection error.

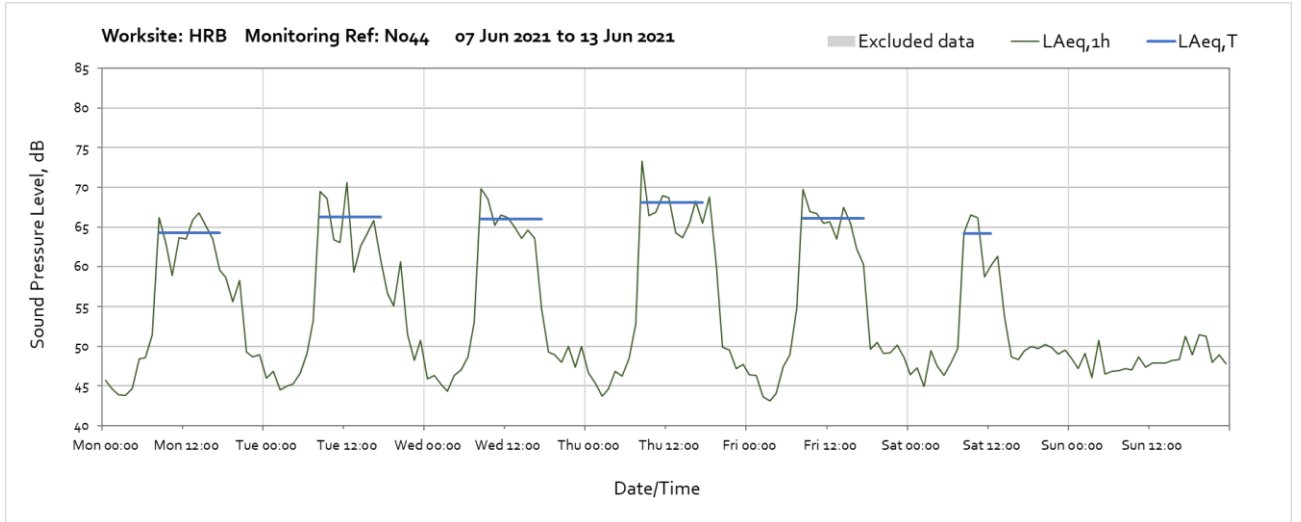
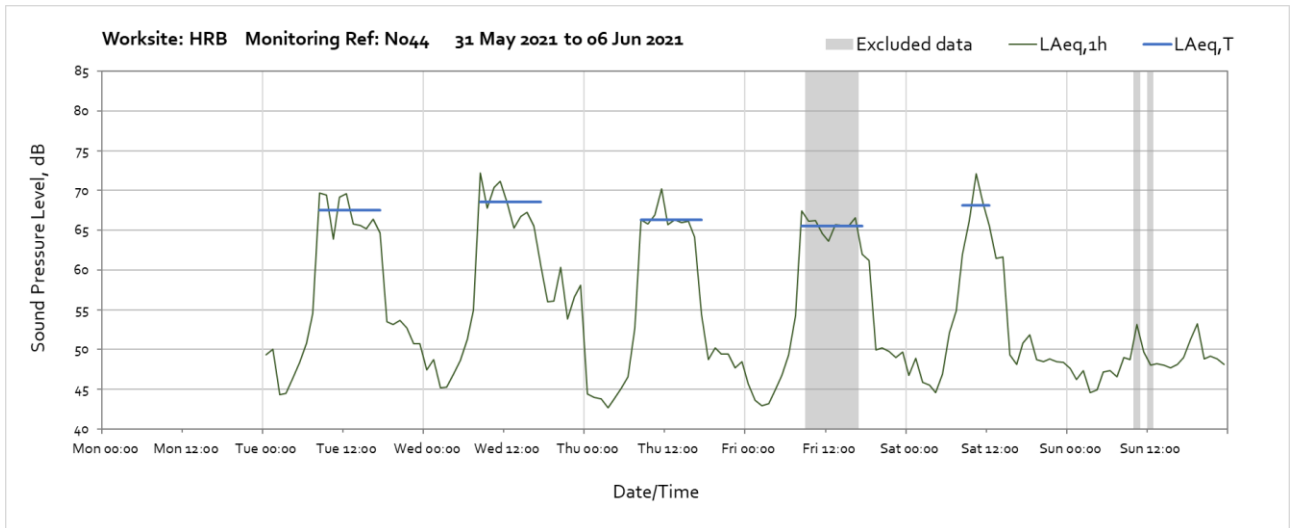
OFFICIAL

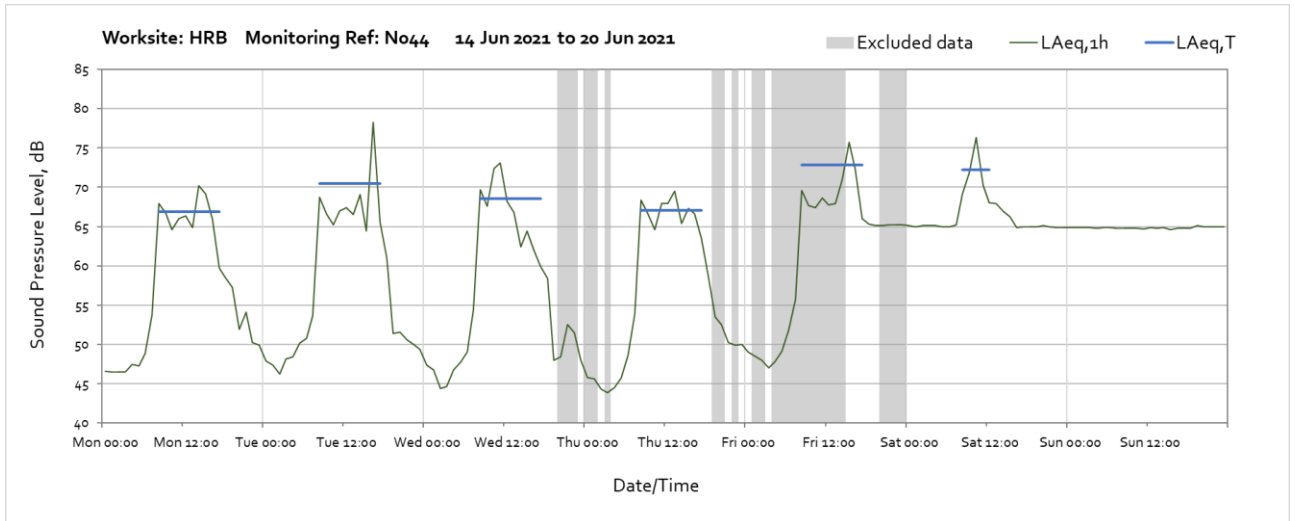




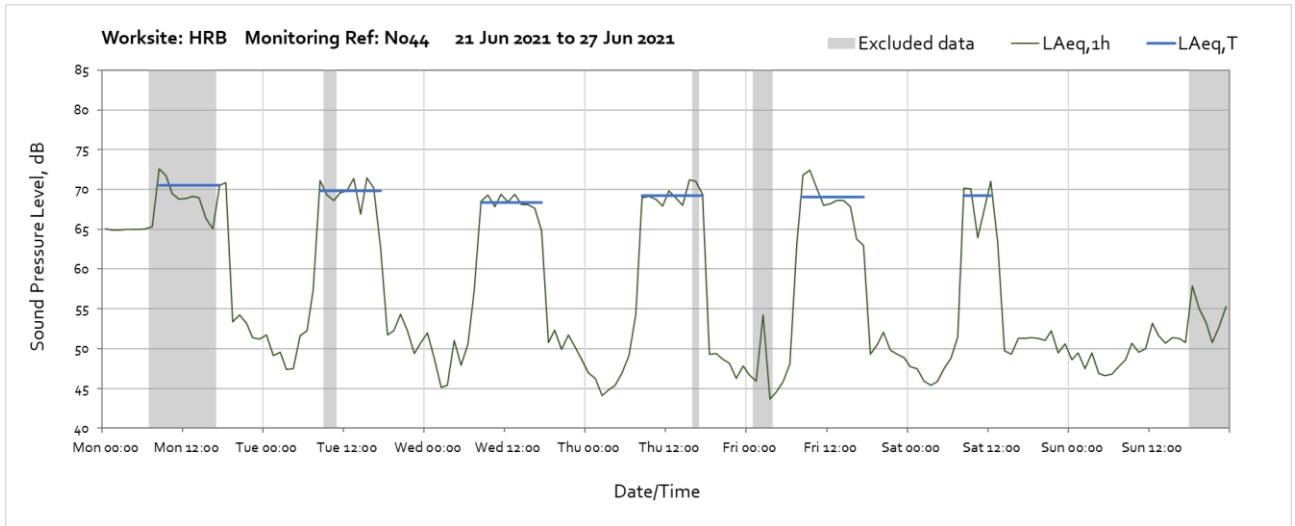


**Worksite: HRB – Monitoring Ref: N044**

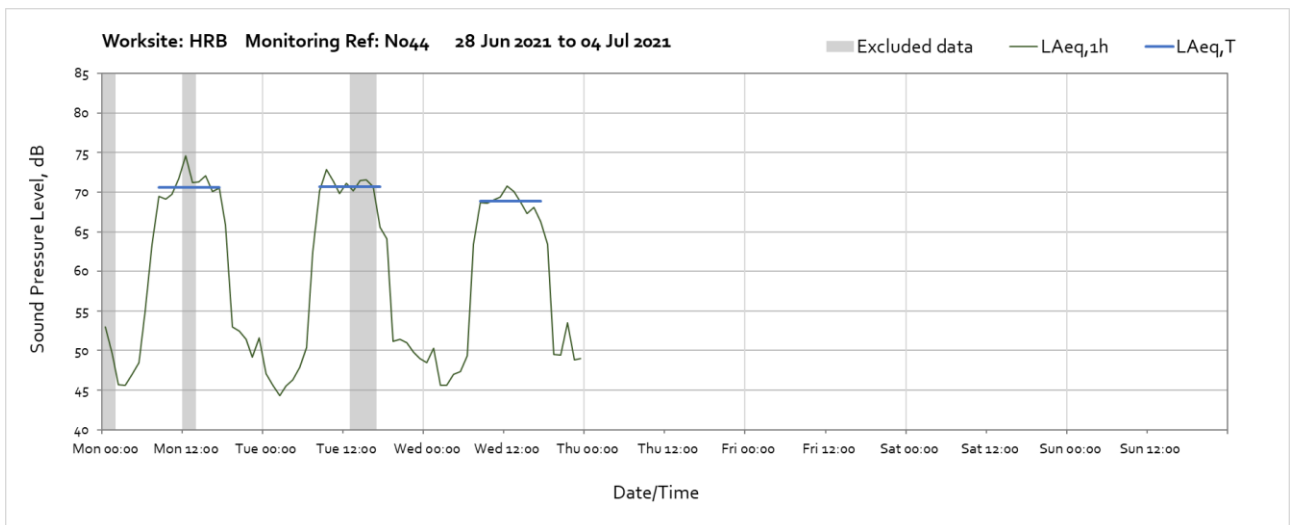




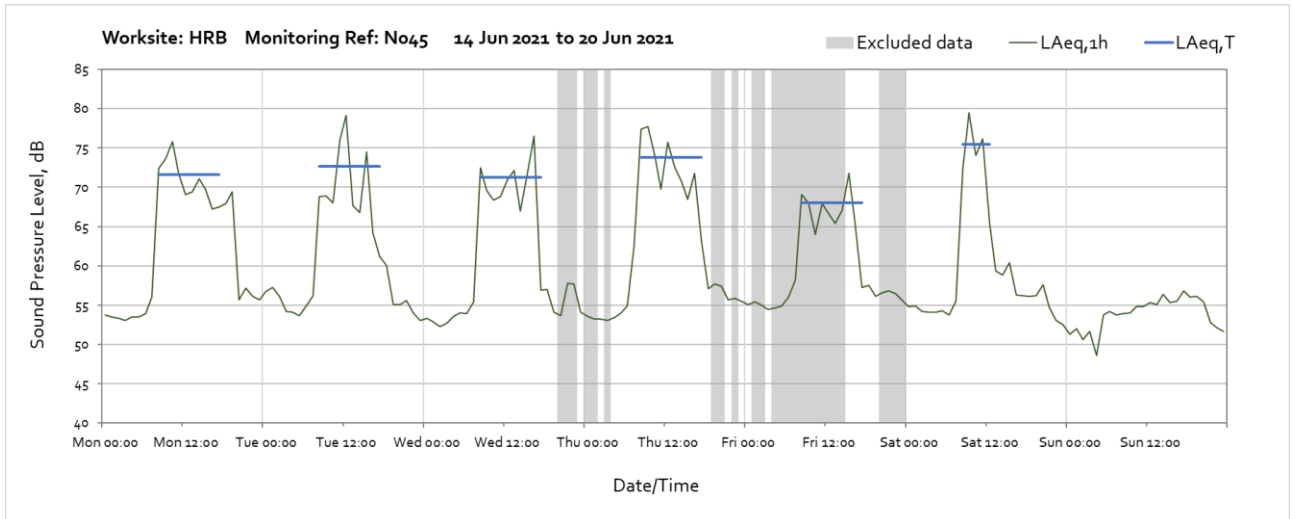
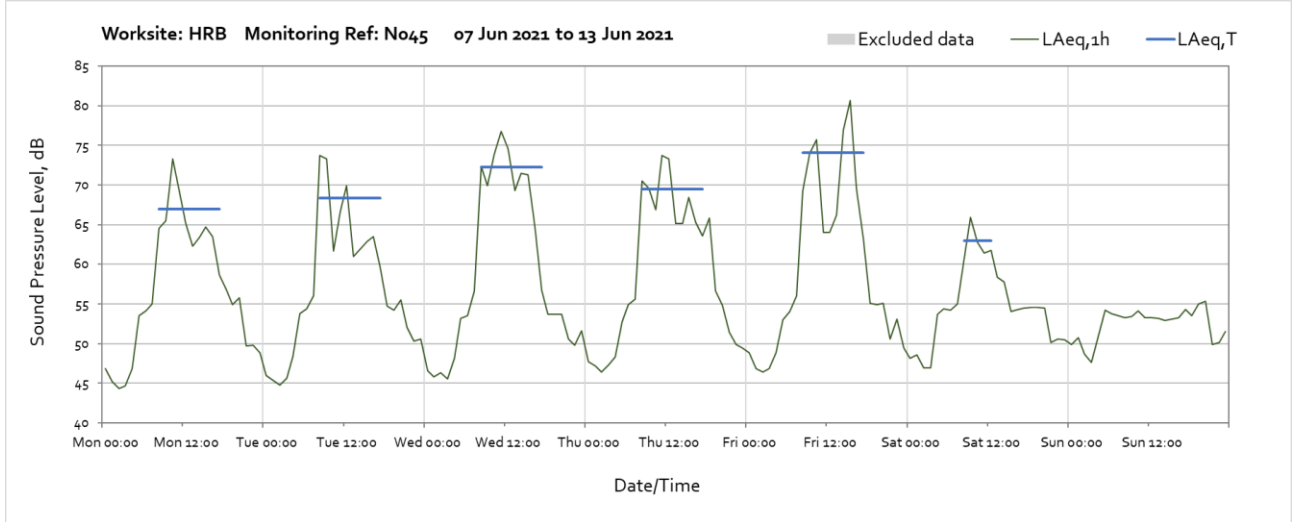
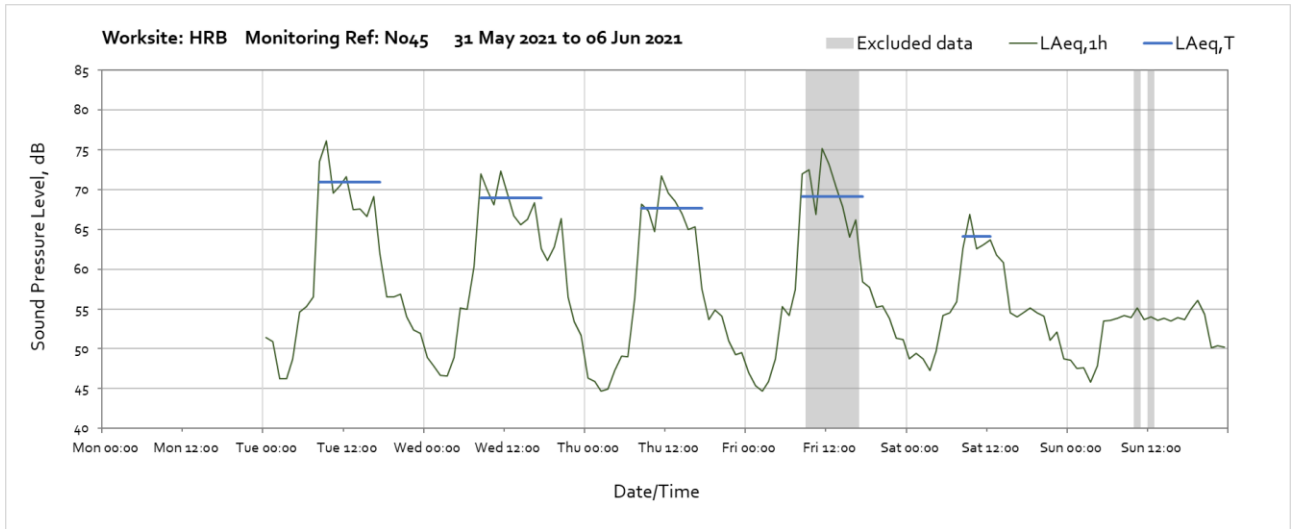
Note: Continuous noise levels from 18:00 on Friday 18<sup>th</sup> June until 07:00 on Monday 21<sup>st</sup> June were not caused by HS2 construction plant equipment.



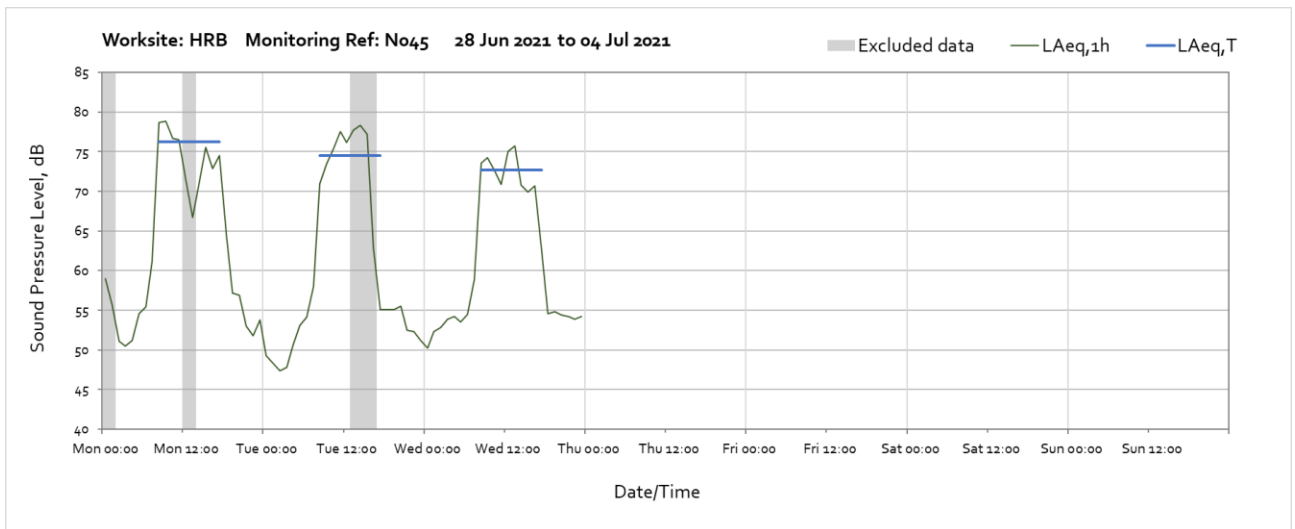
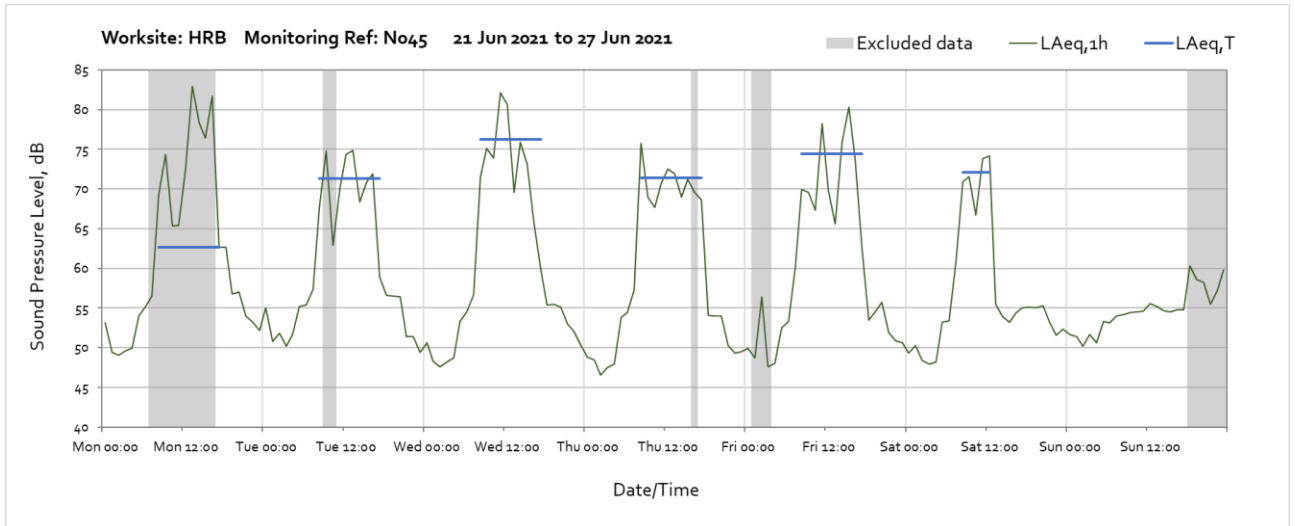
Note: Continuous noise levels from 18:00 on Friday 18<sup>th</sup> June until 07:00 on Monday 21<sup>st</sup> June were not caused by HS2 construction plant equipment.



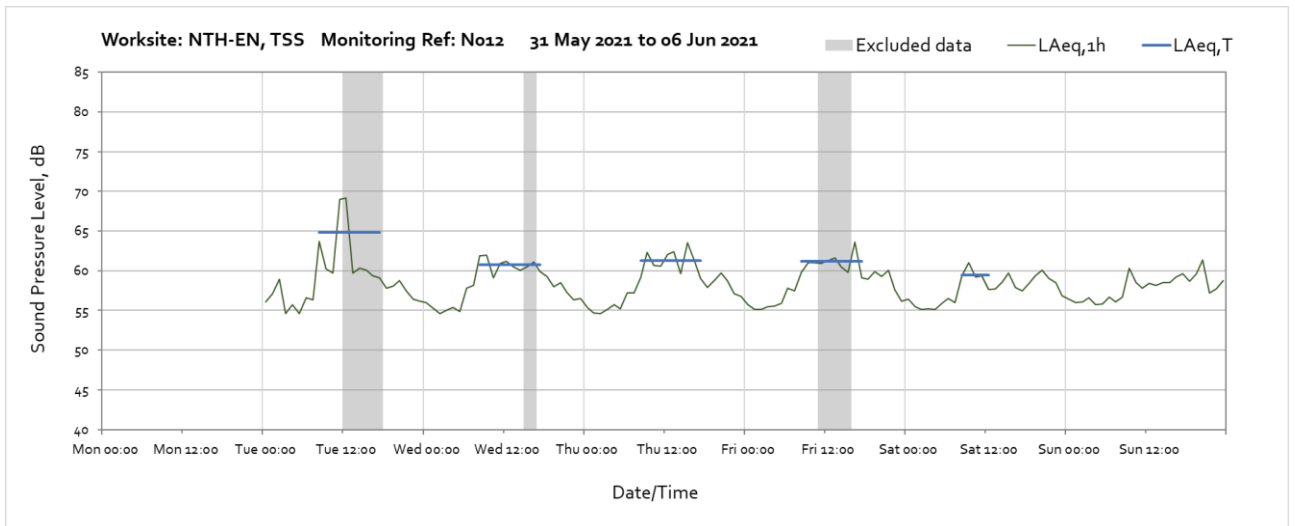
## Worksite: HRB – Monitoring Ref: N045



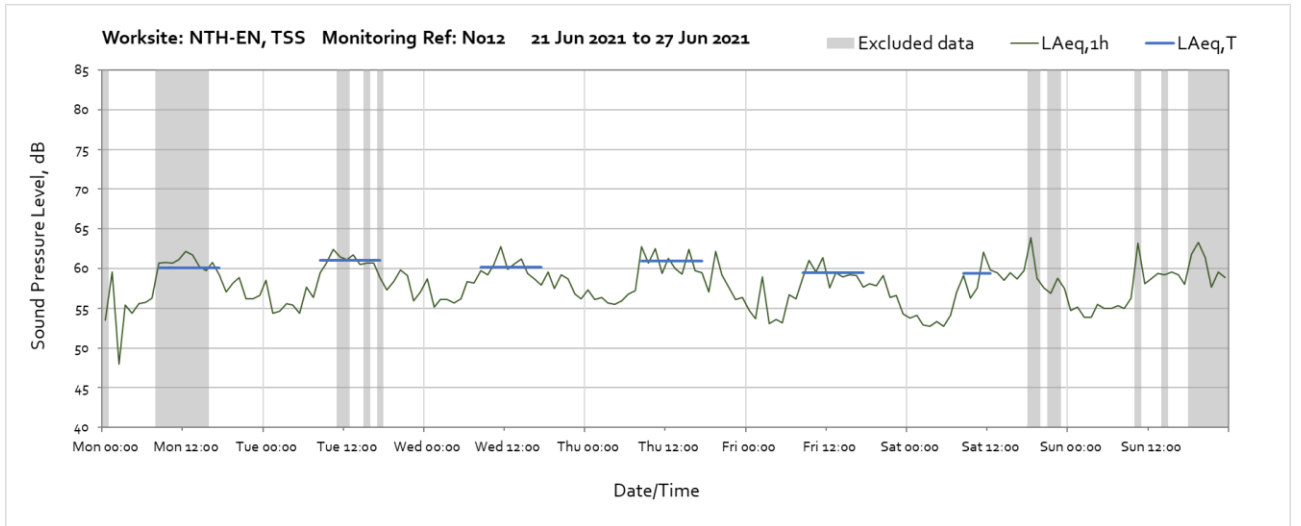
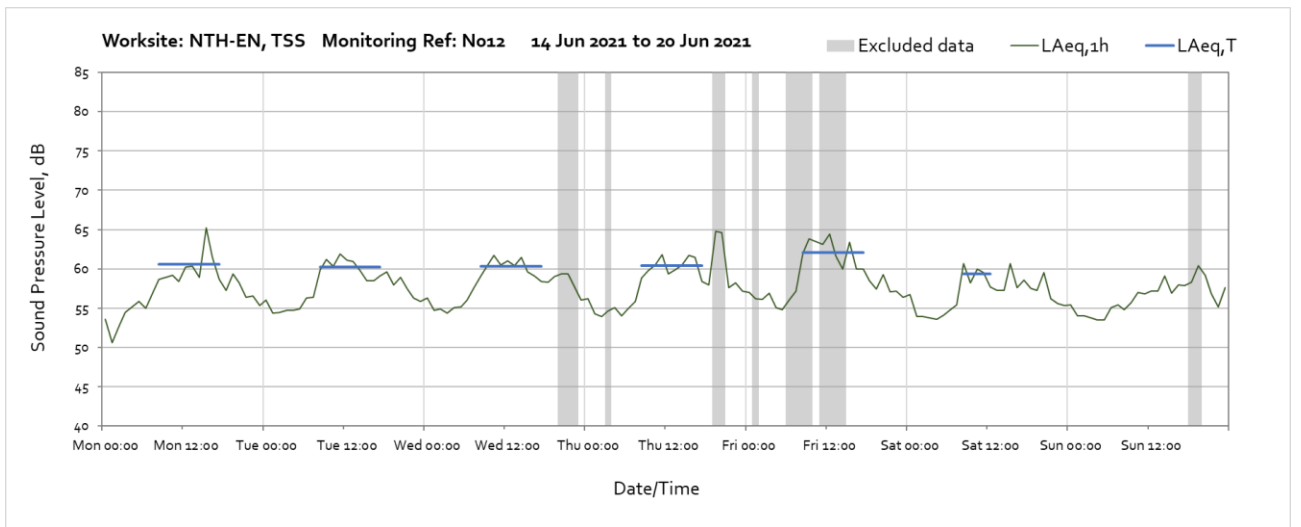
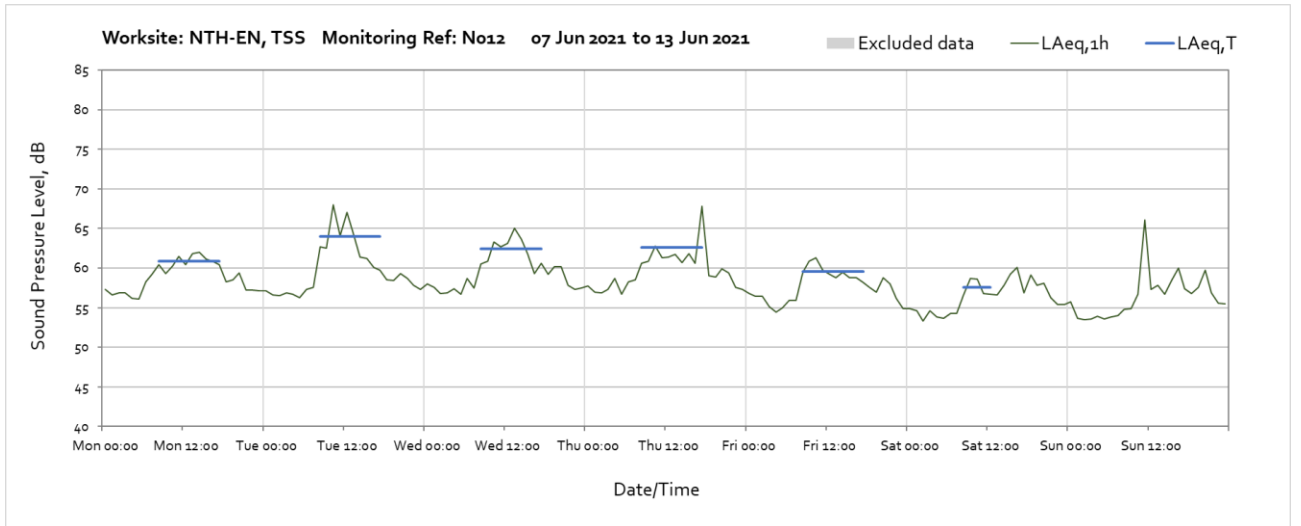
OFFICIAL

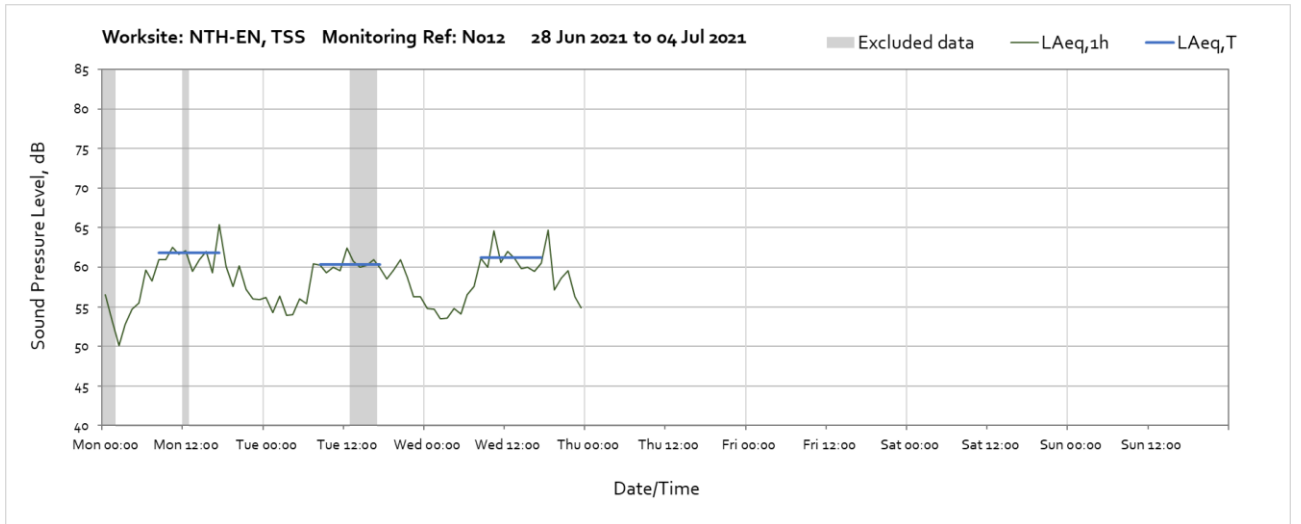


**Worksite: NTH-EN, TSS - Monitoring Ref: N012**

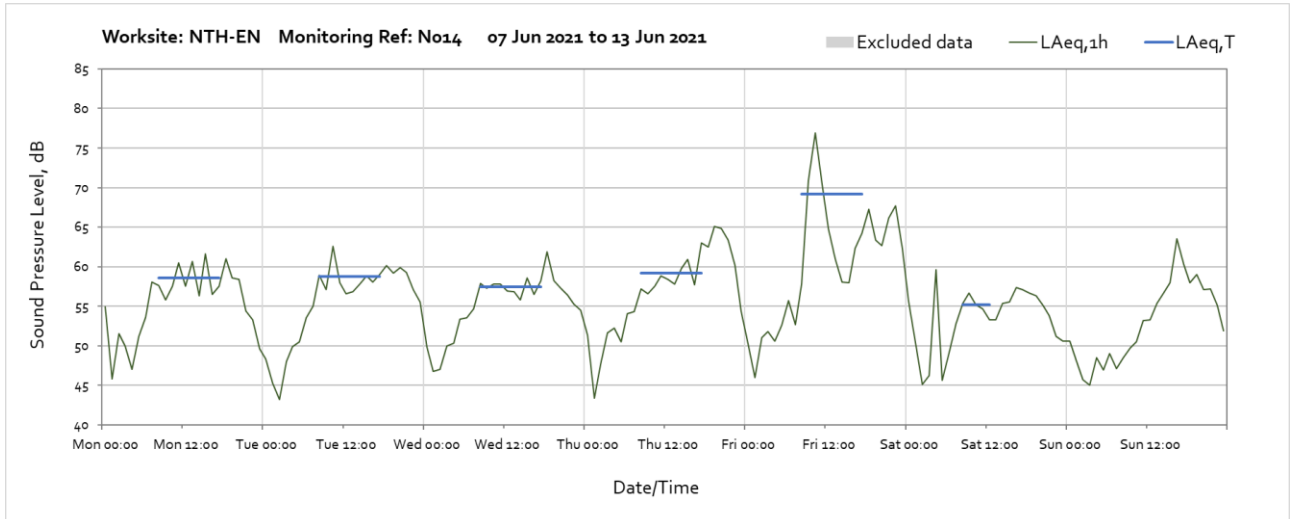
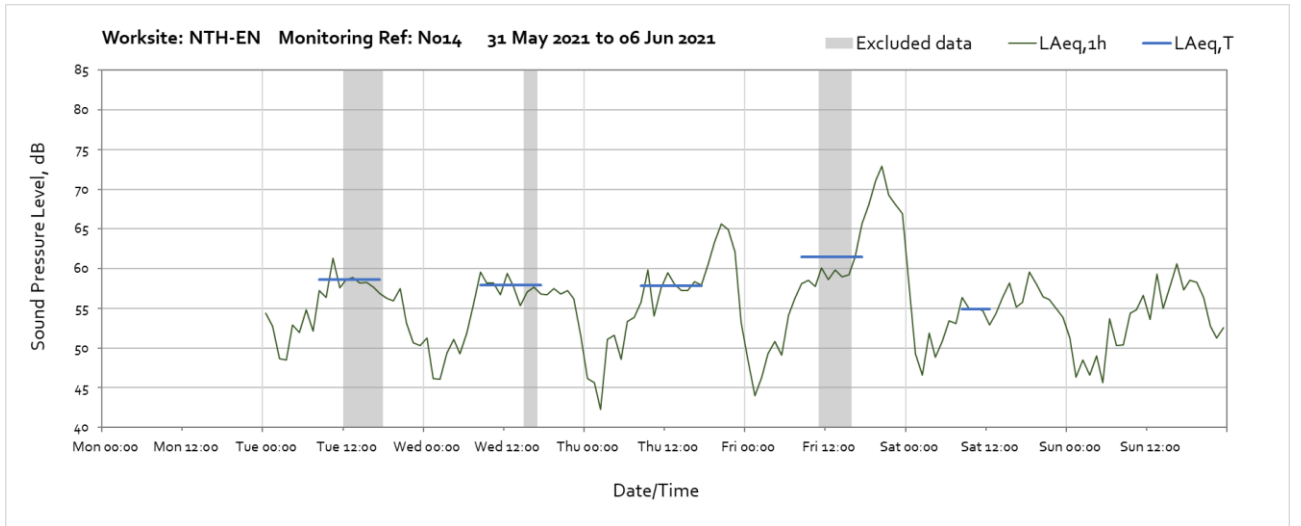


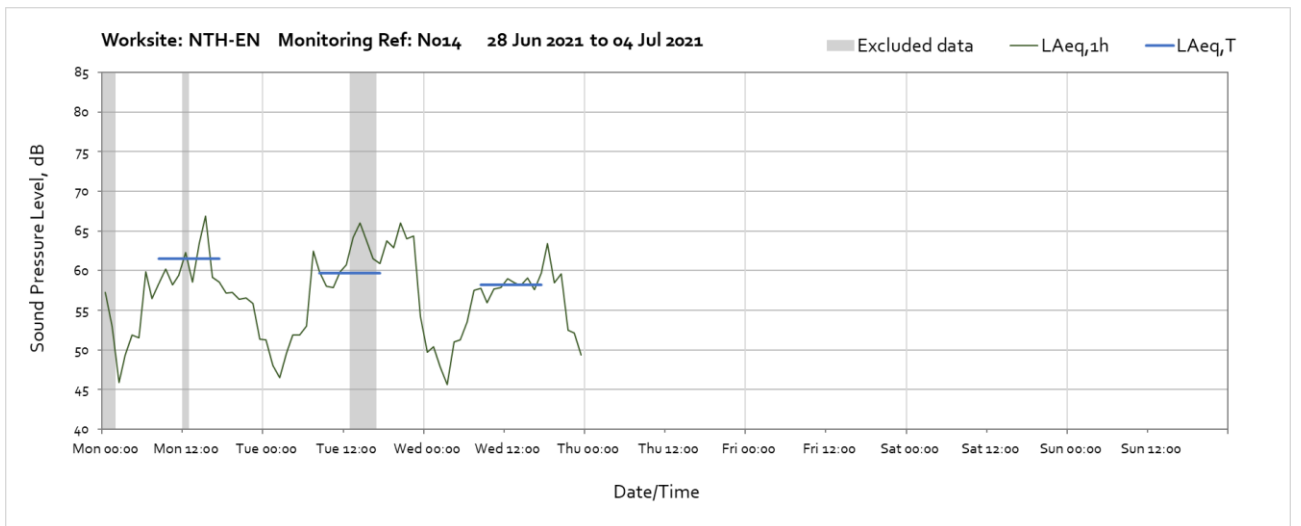
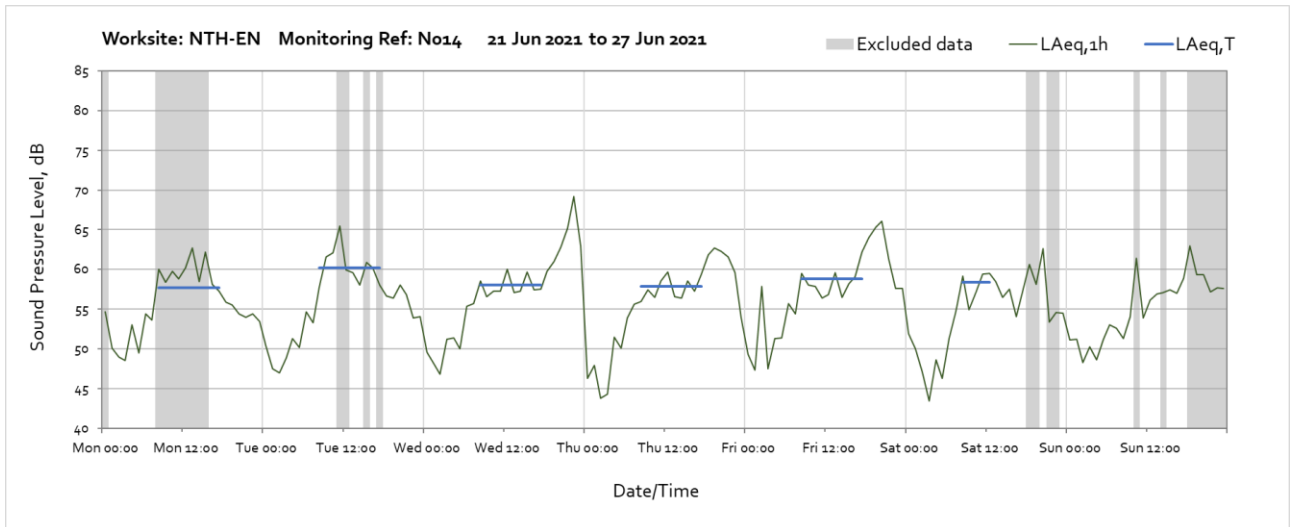
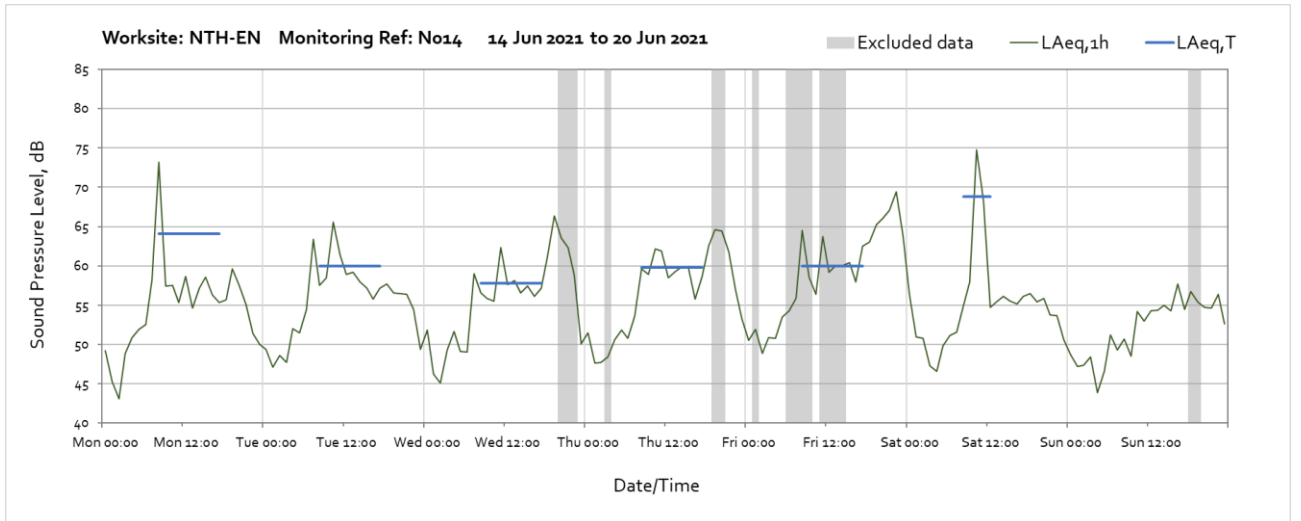




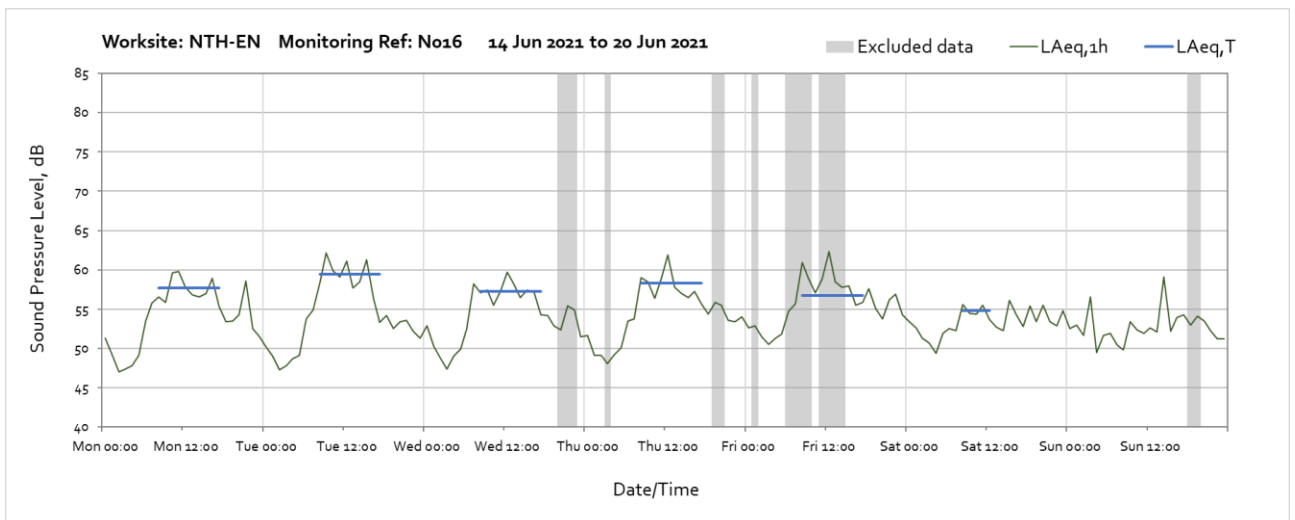
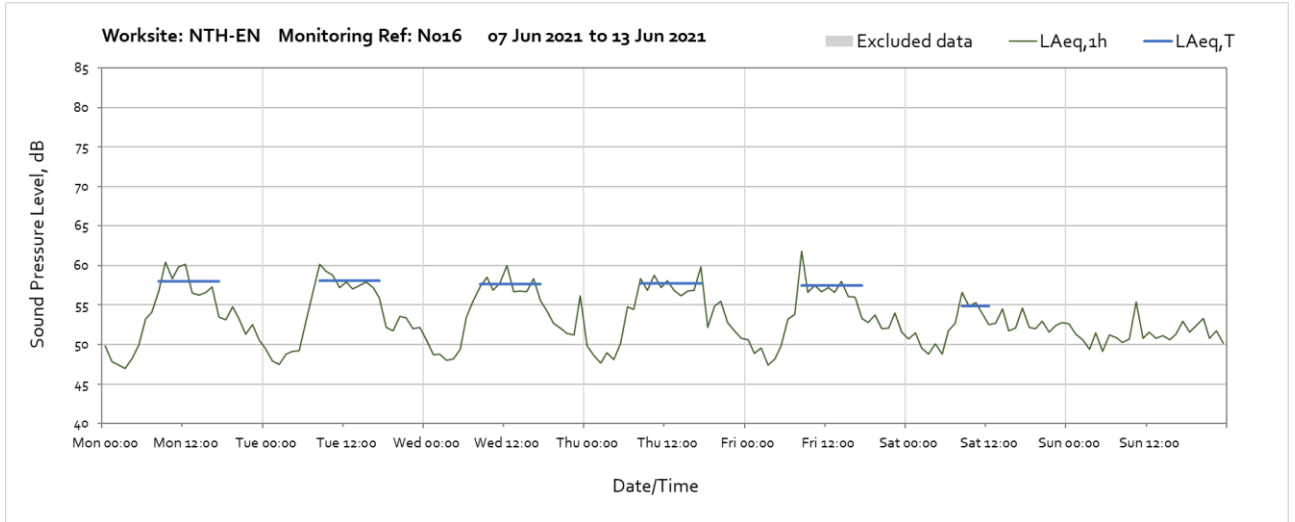
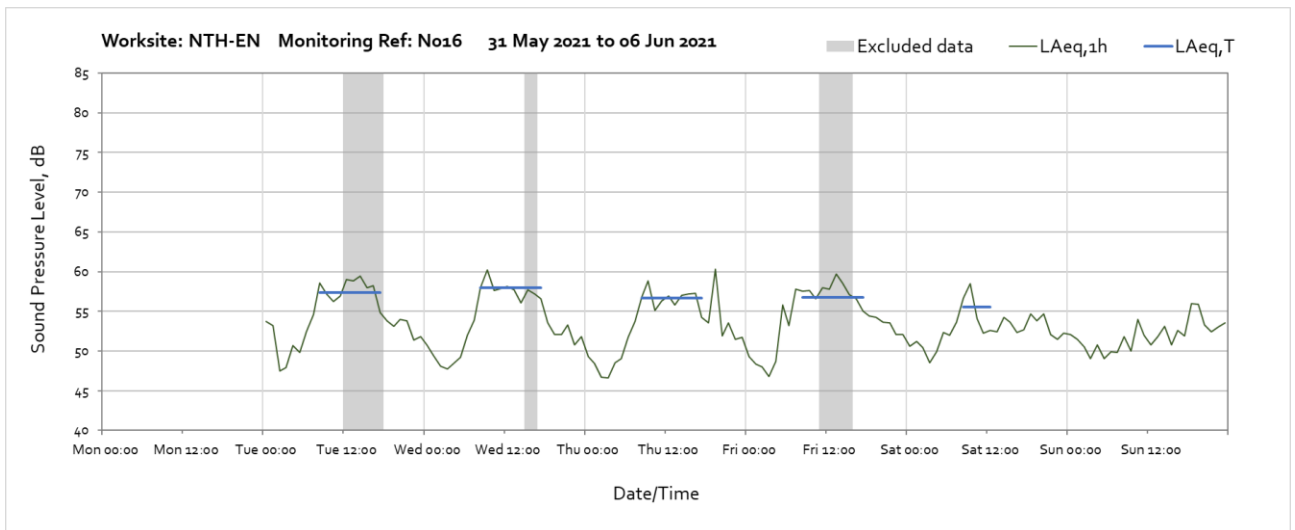


### Worksite: NTH-EN - Monitoring Ref: N014

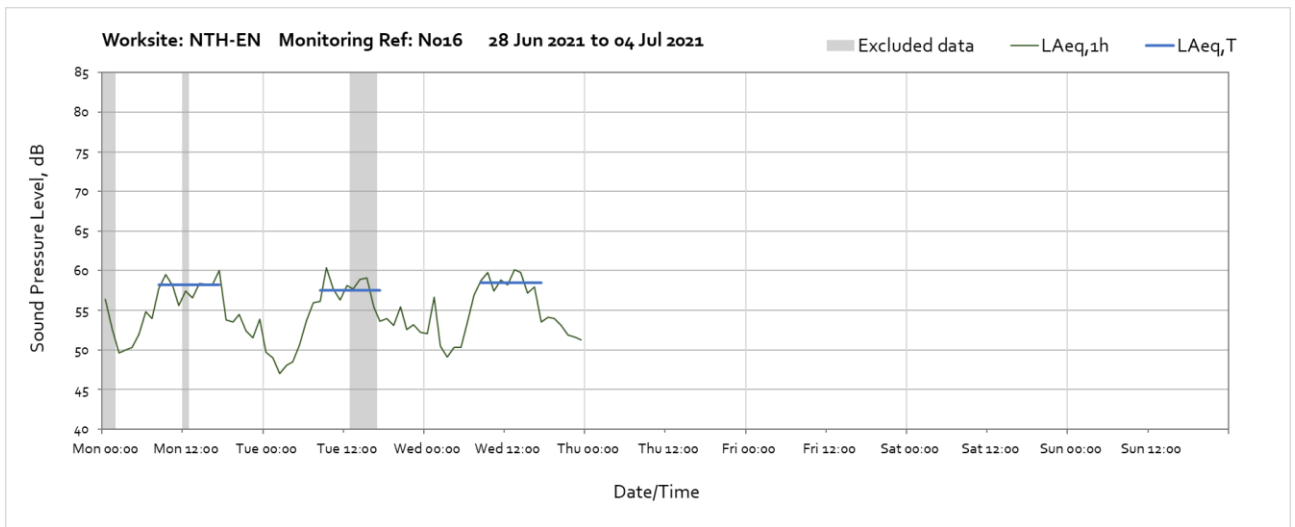
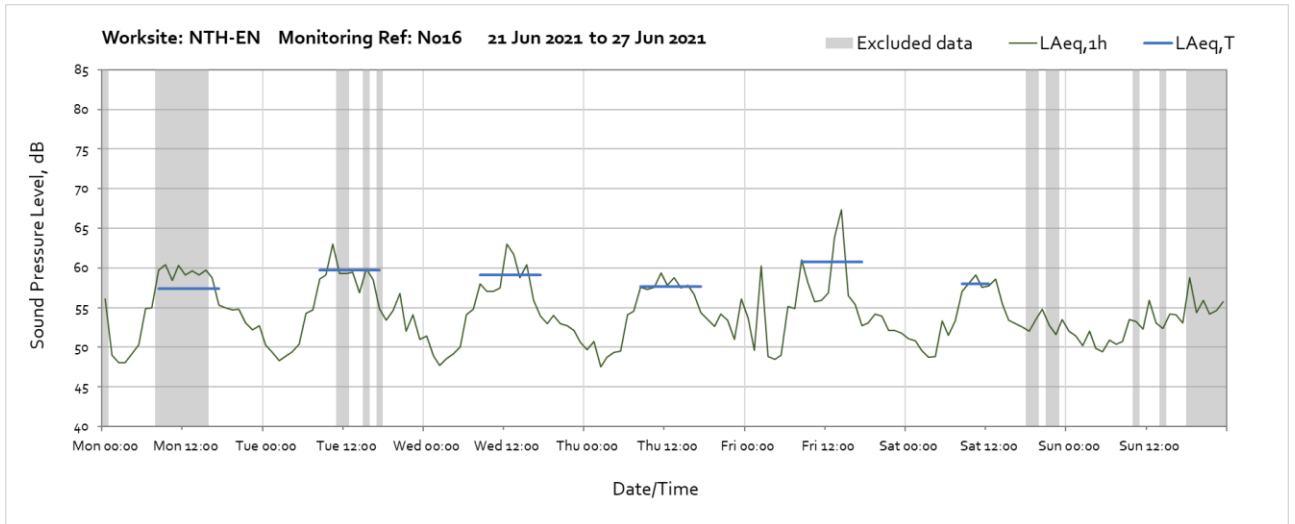




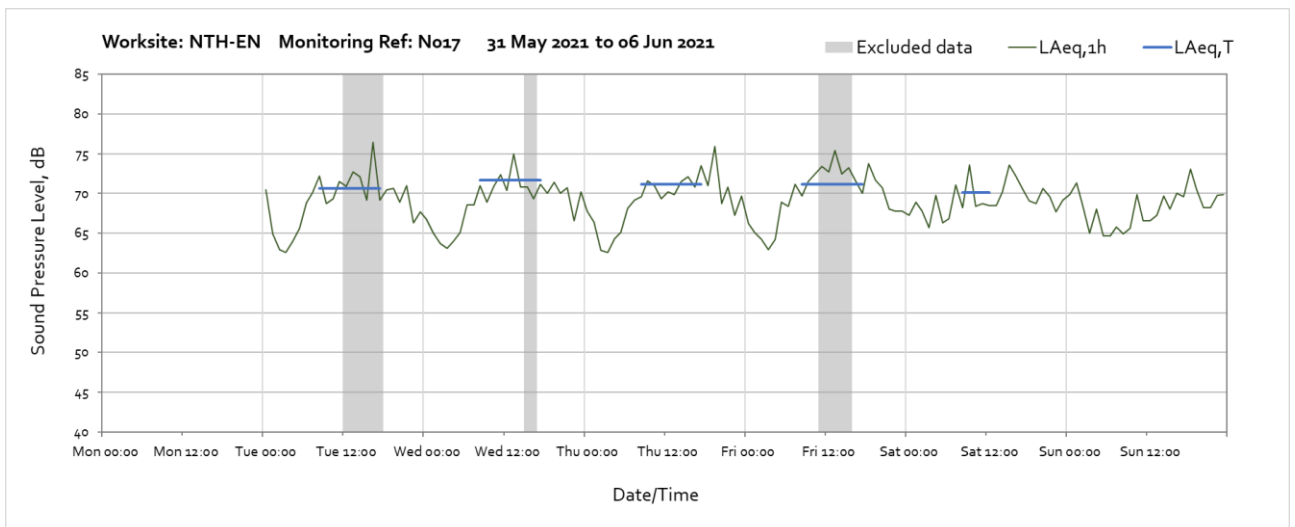
## Worksite: NTH-EN - Monitoring Ref: N016

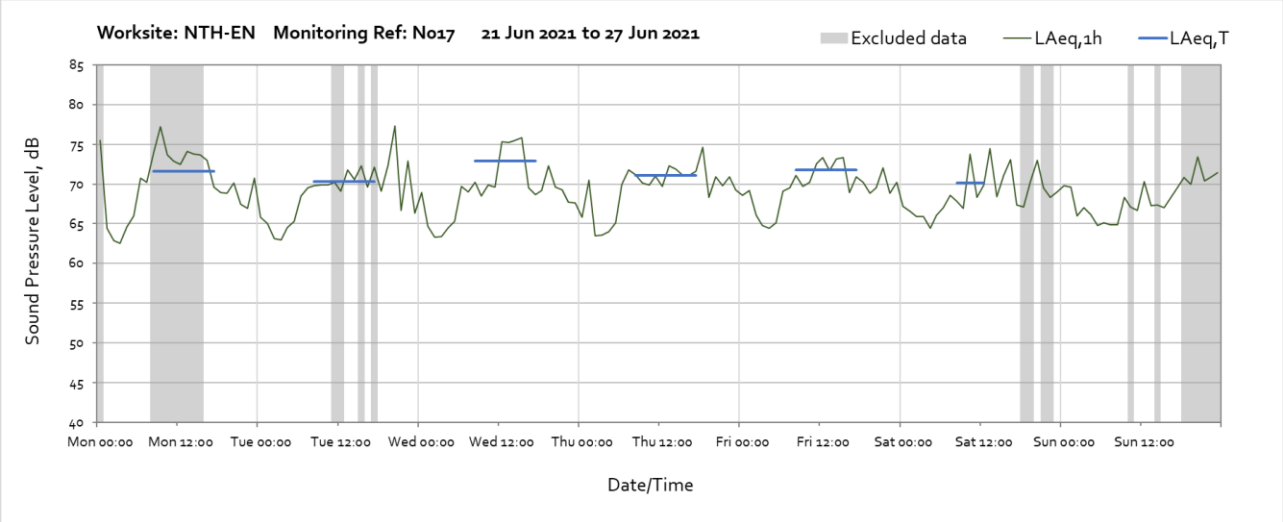
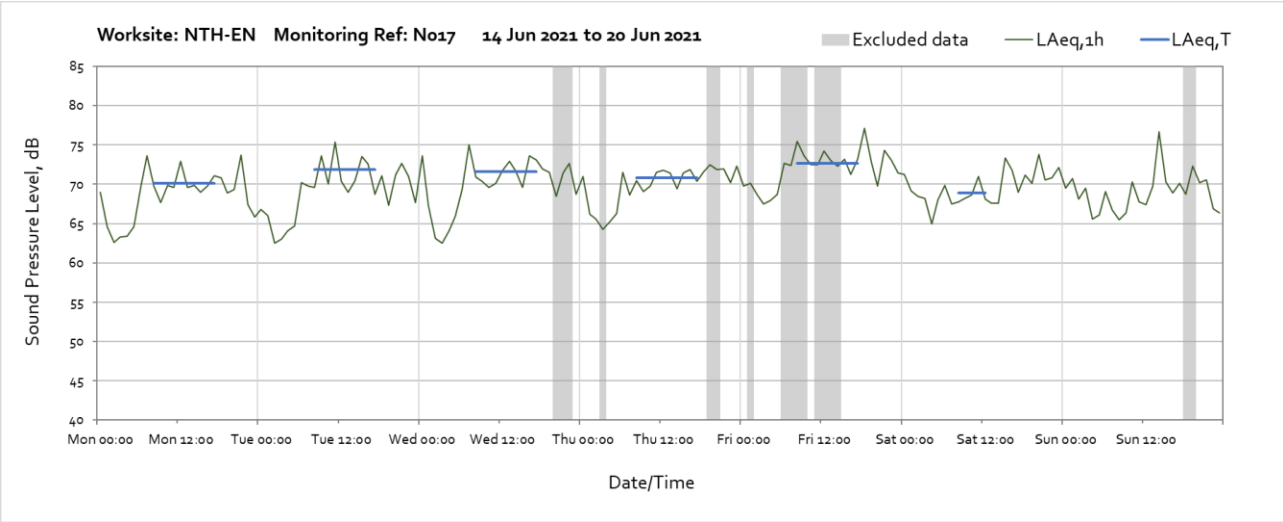
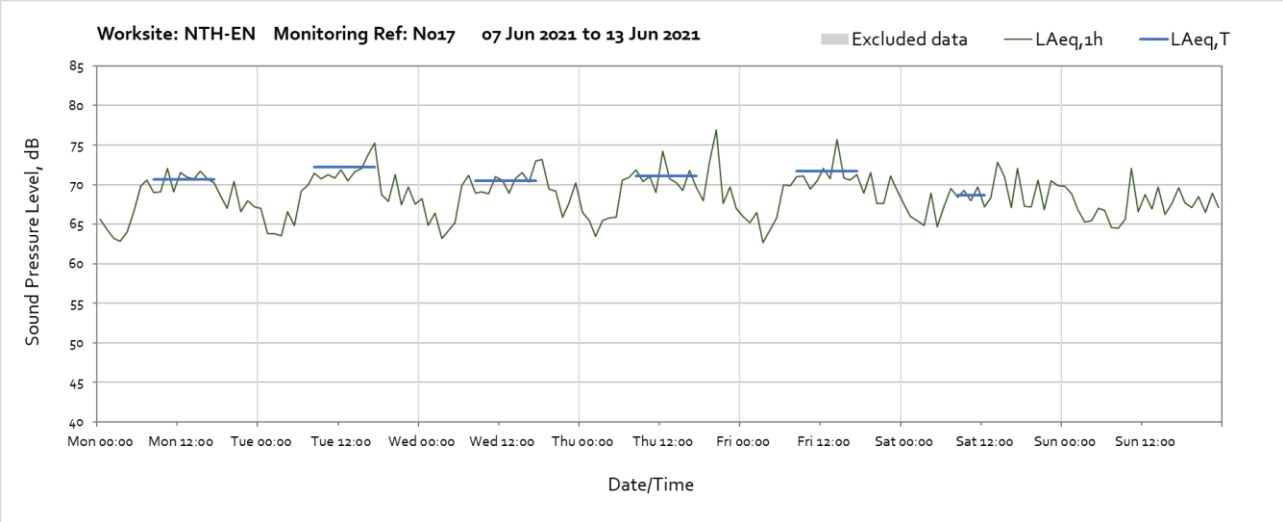


OFFICIAL

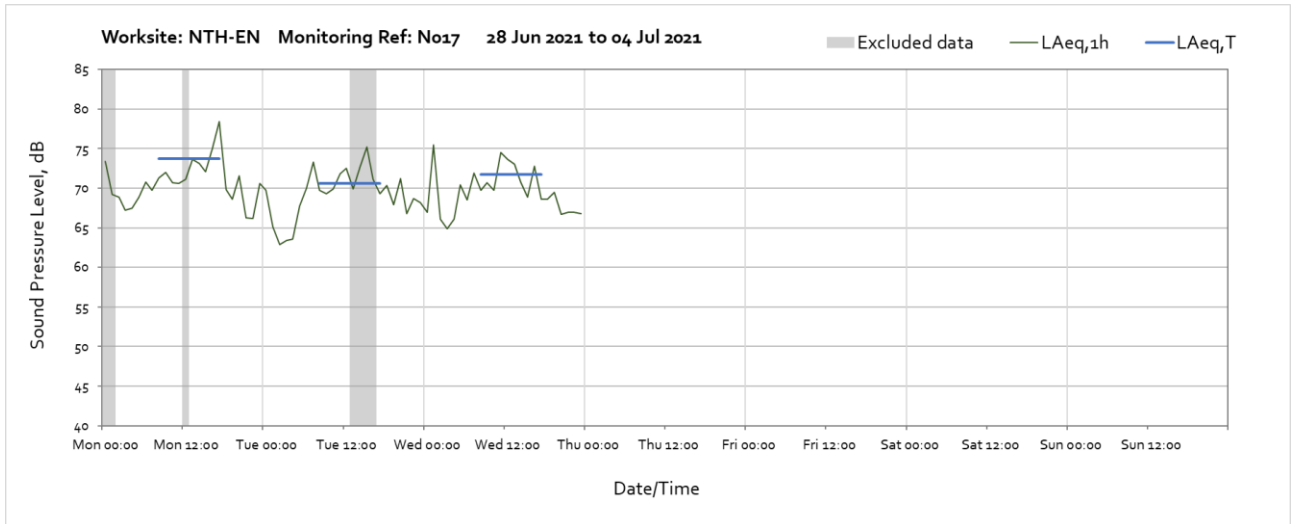


**Worksite: NTH-EN - Monitoring Ref: N017**

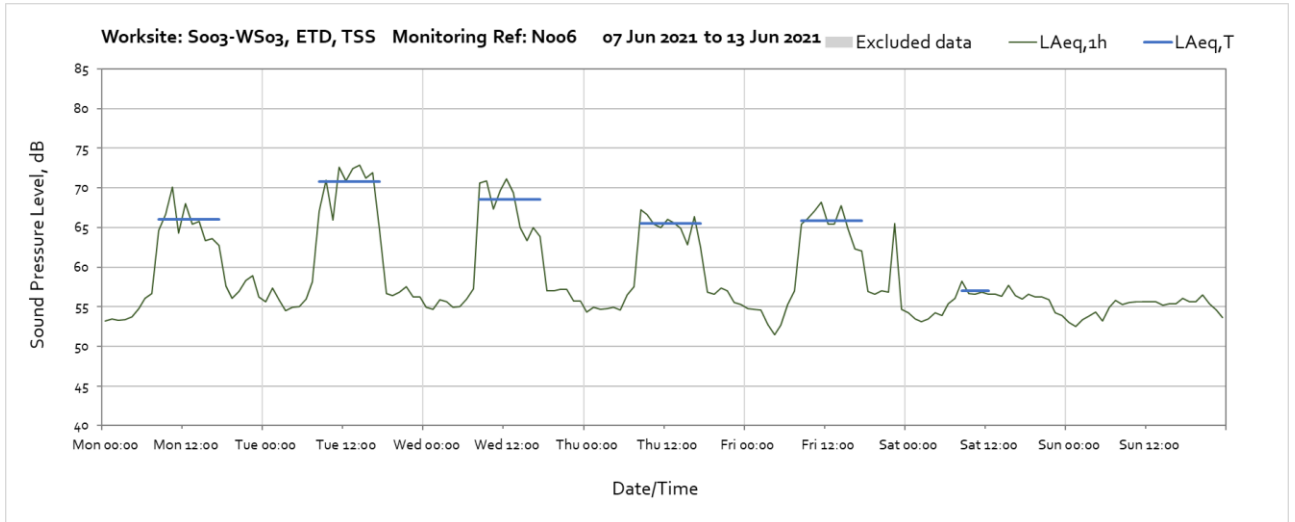
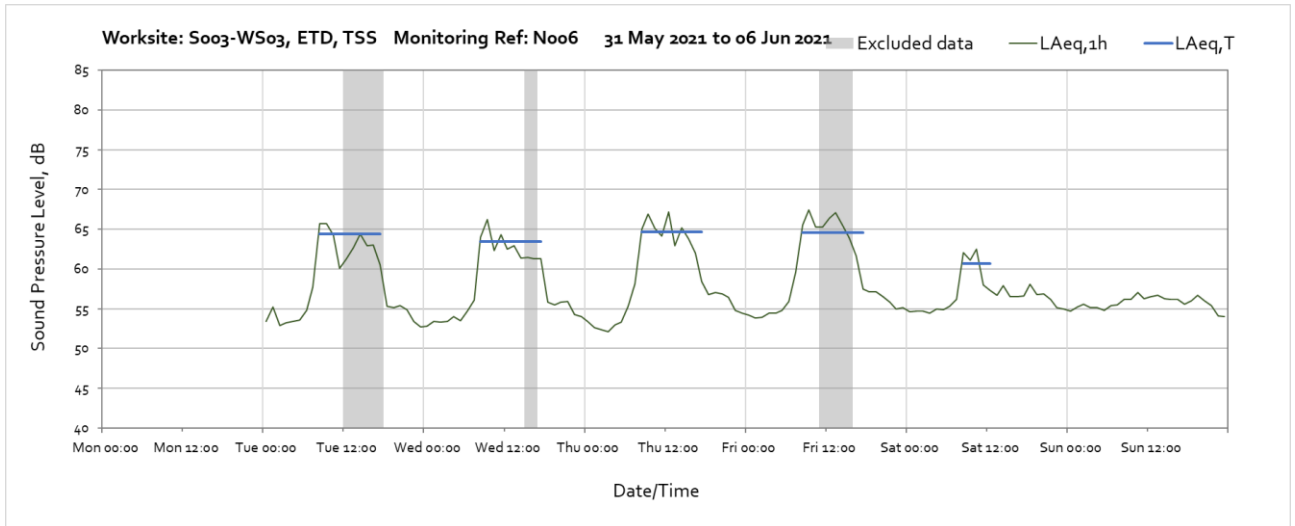


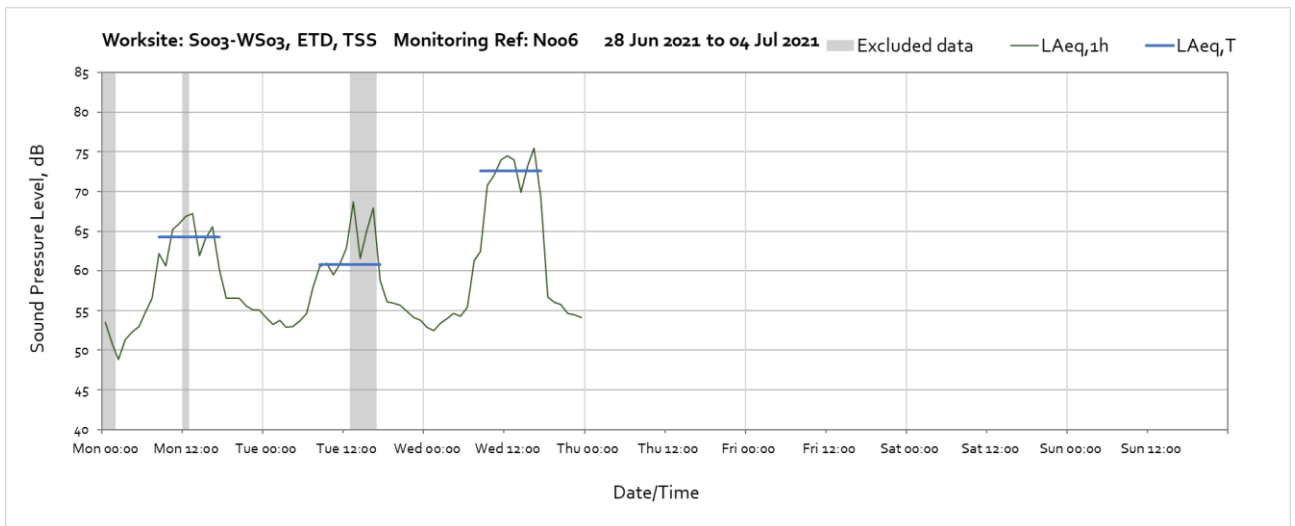
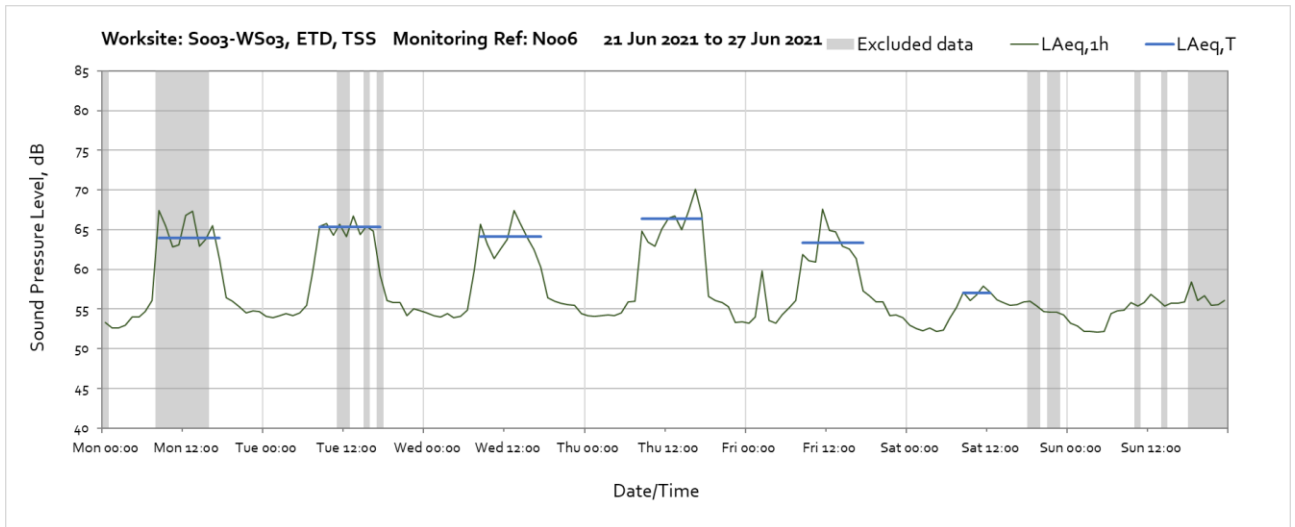
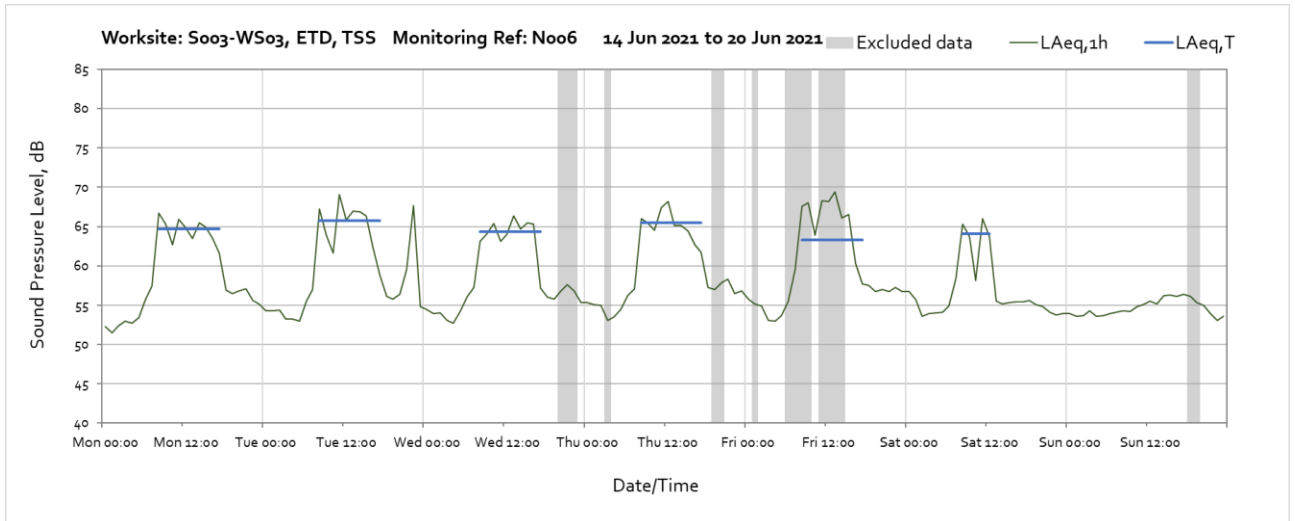




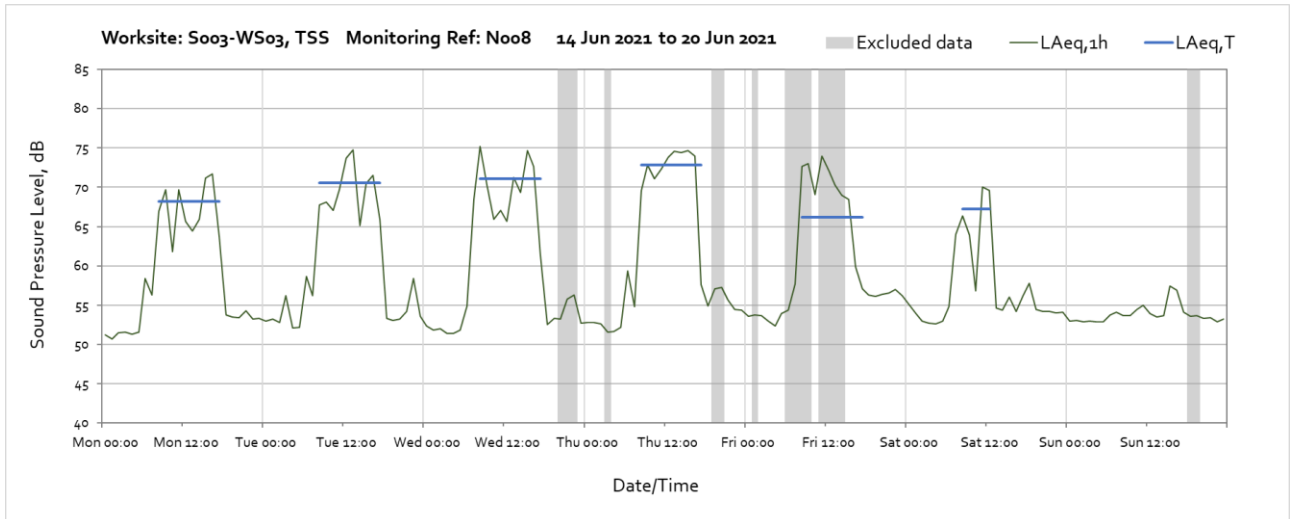
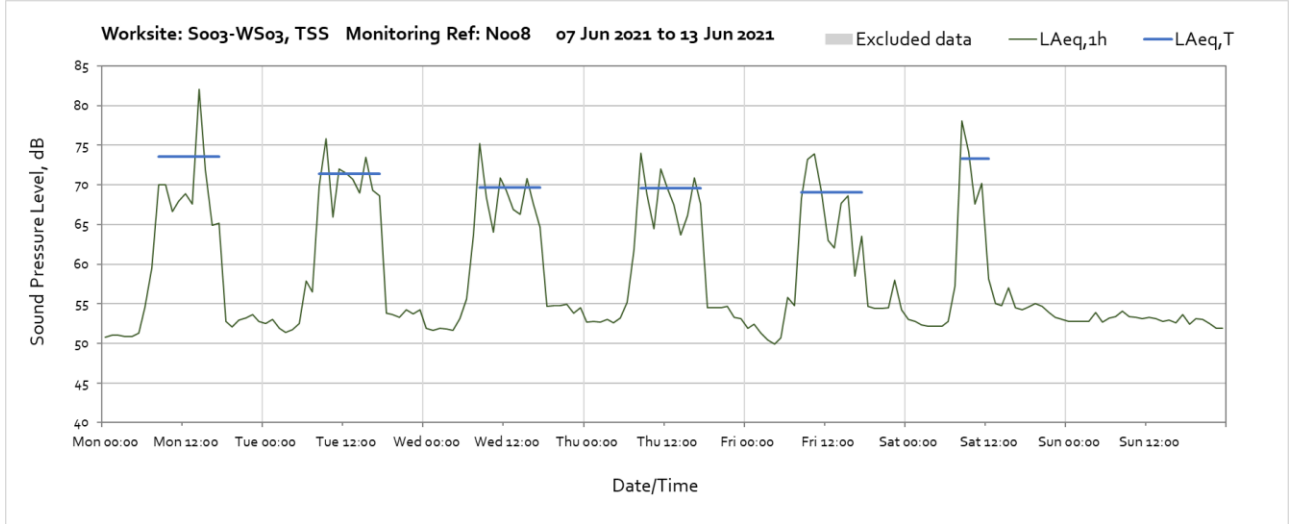
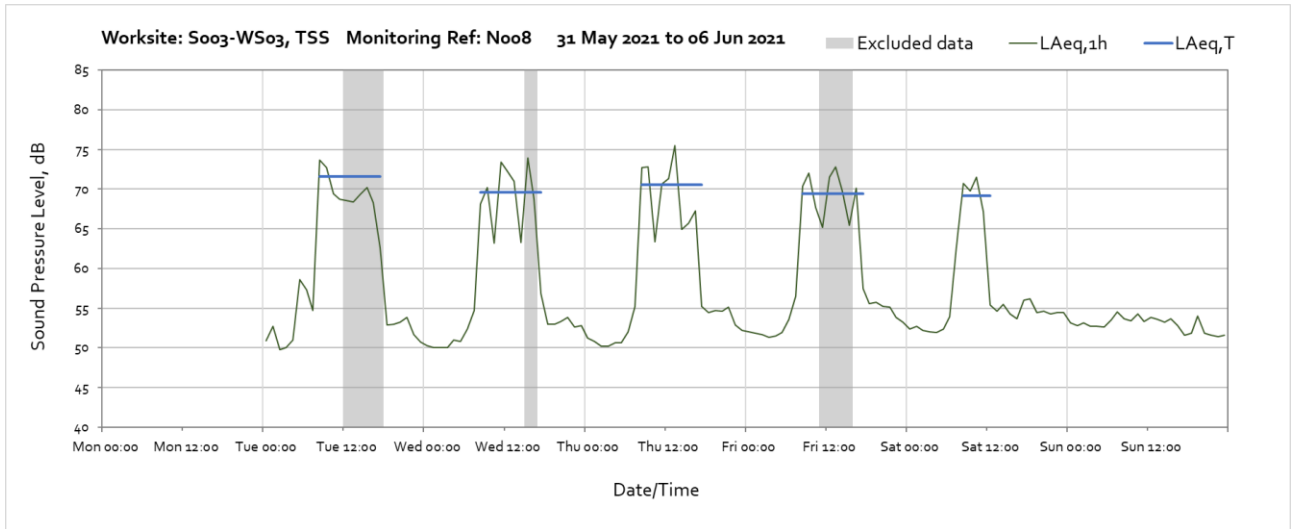


**Worksite: S003-WS03, ETD, TSS – Monitoring Ref: N006**

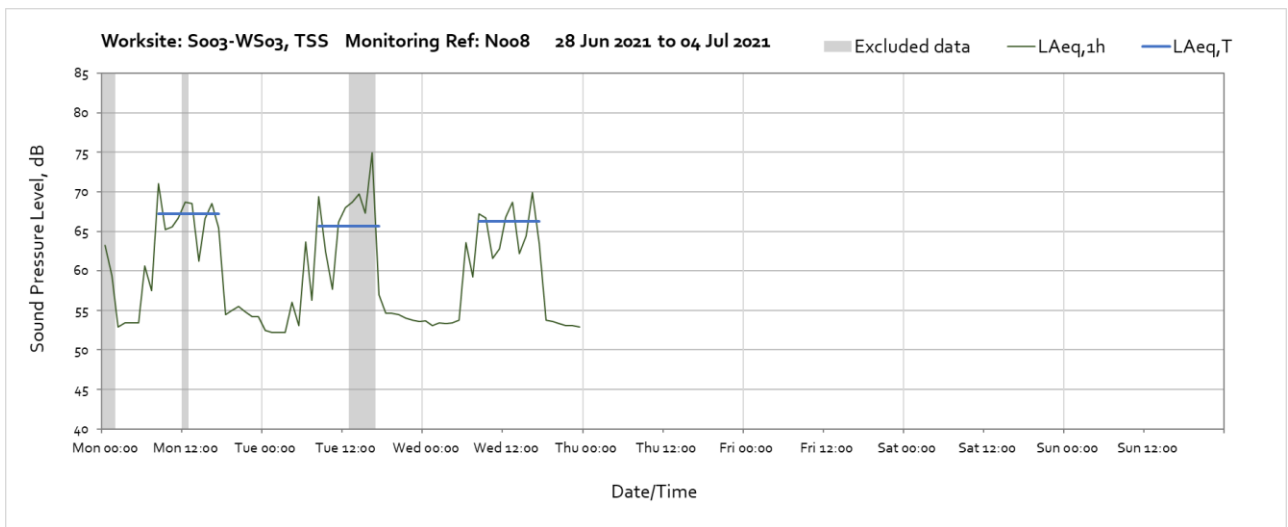
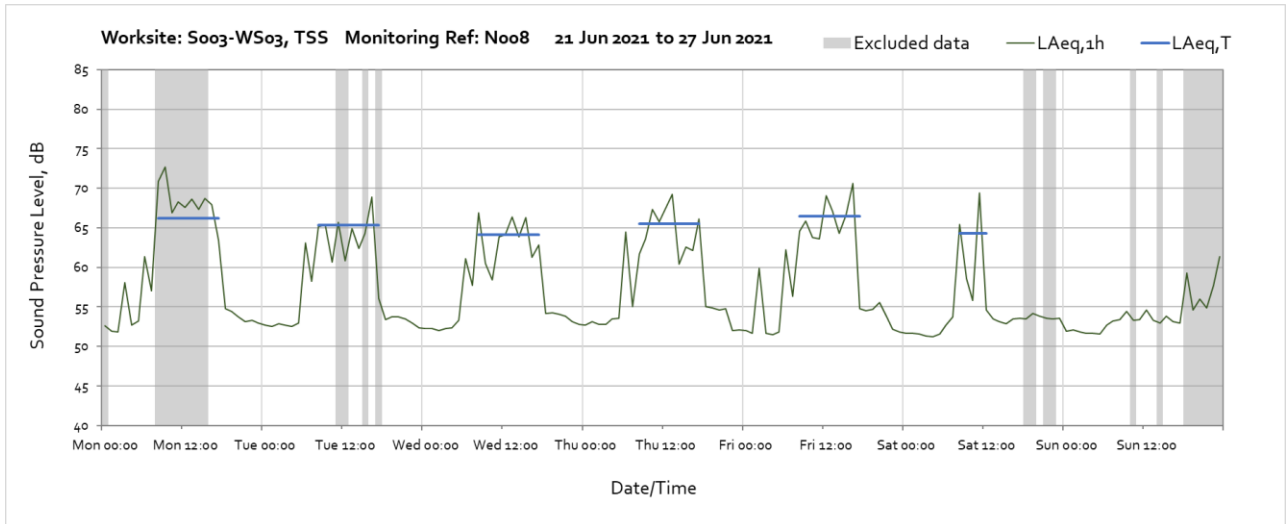




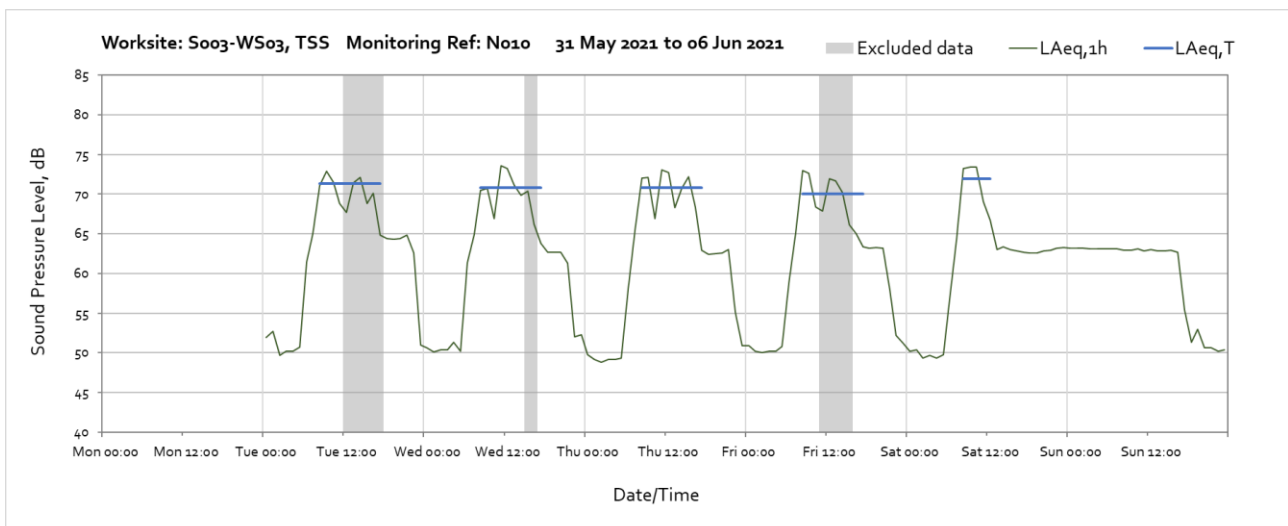
## Worksite: S003-WS03, TSS – Monitoring Ref: N008



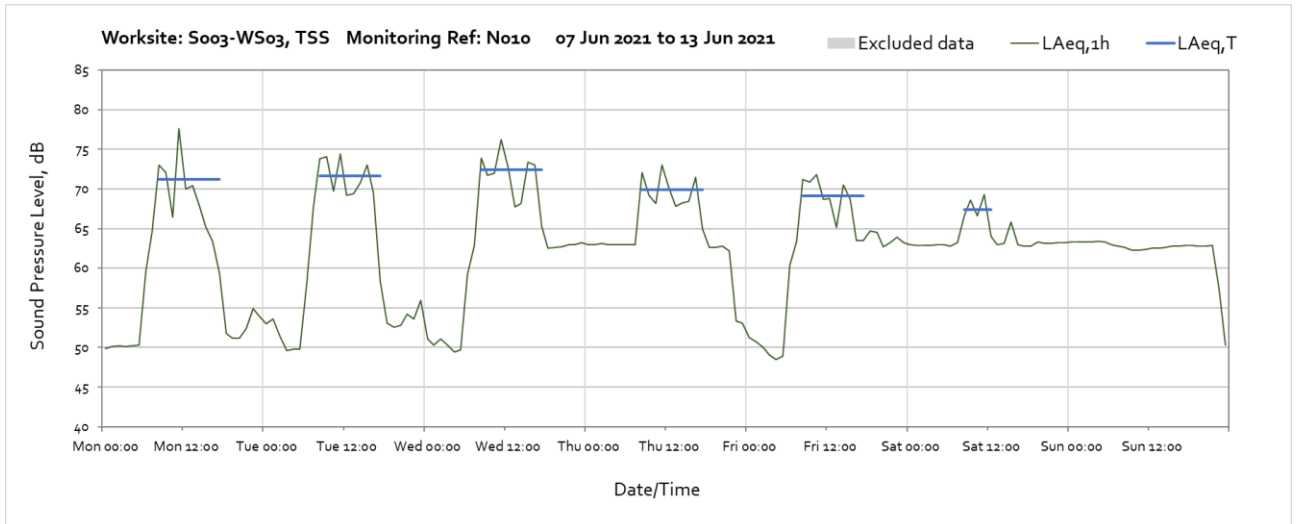
OFFICIAL



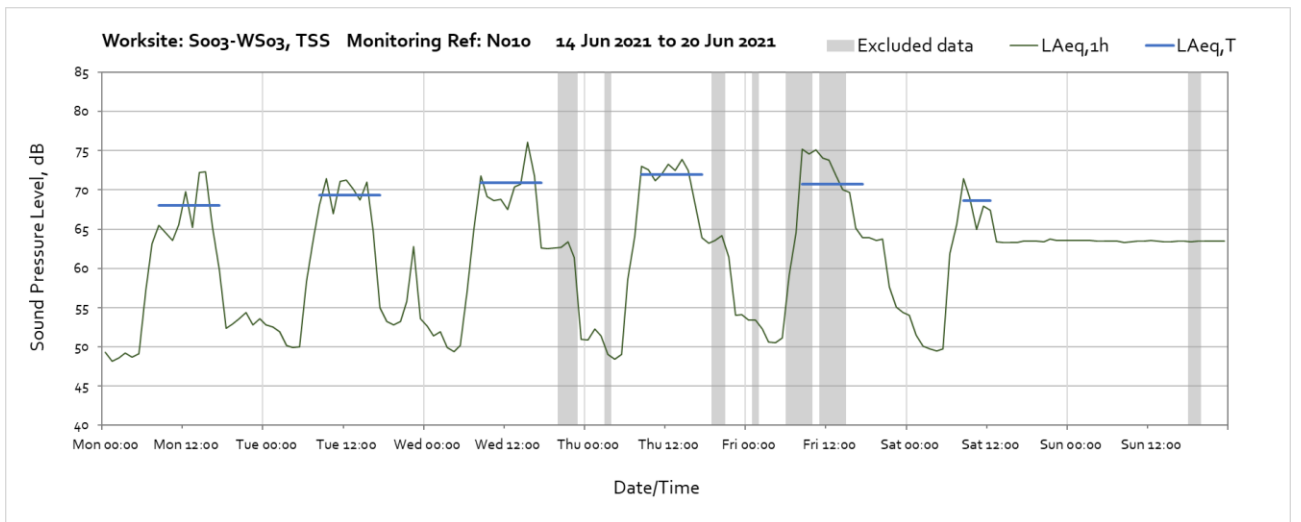
**Worksite: S003-WS03, TSS – Monitoring Ref: N010**



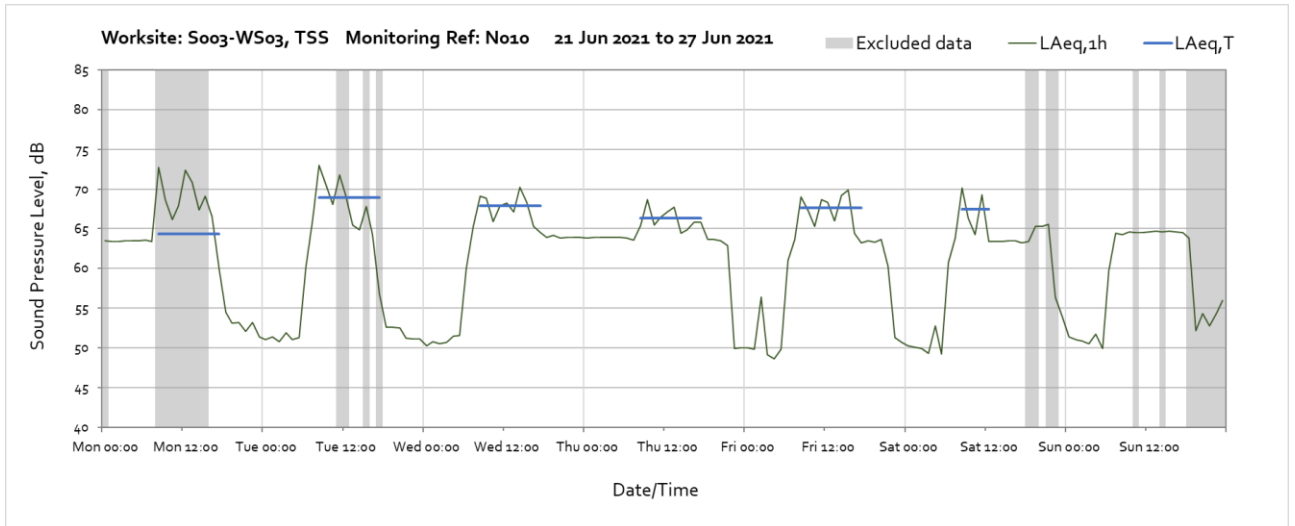
Note: Continuous noise levels measured outside of core construction hours were due to re Fridgeration plant equipment associated with a nearby hotel and is not associated with HS2 construction.



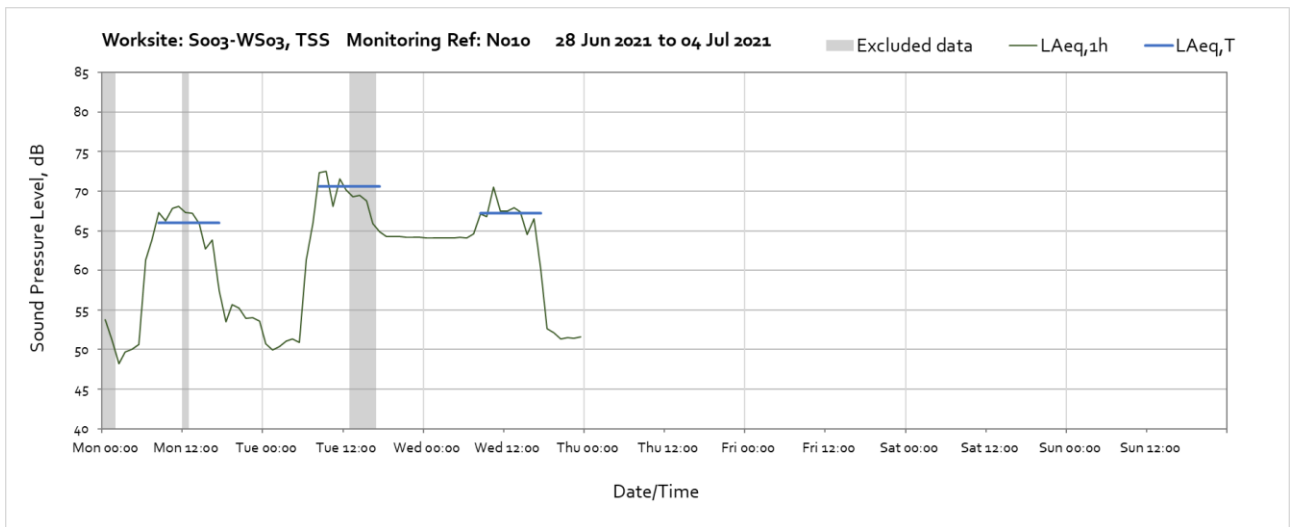
Note: Continuous noise levels measured outside of core construction hours were due to re Fridgeration plant equipment associated with a nearby hotel and is not associated with HS2 construction.



Note: Continuous noise levels measured outside of core construction hours were due to re Fridgeration plant equipment associated with a nearby hotel and is not associated with HS2 construction.

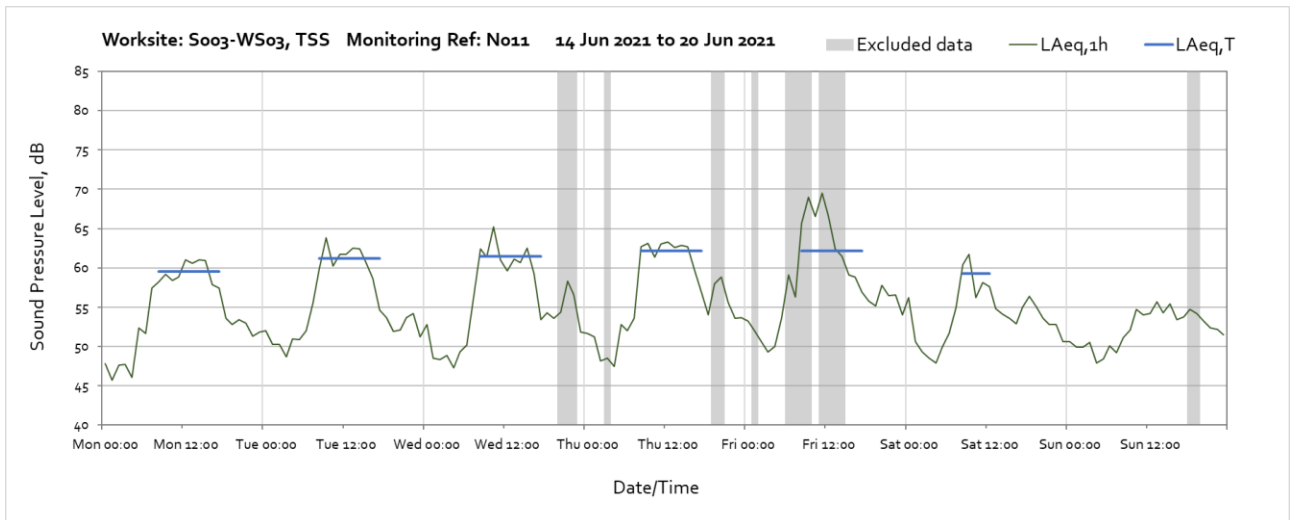
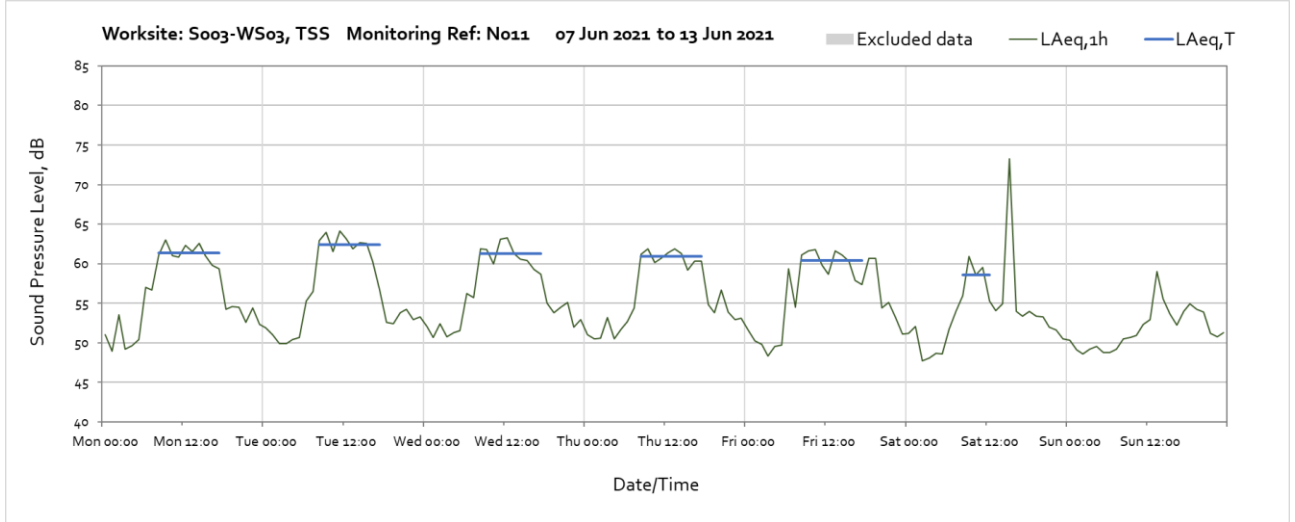
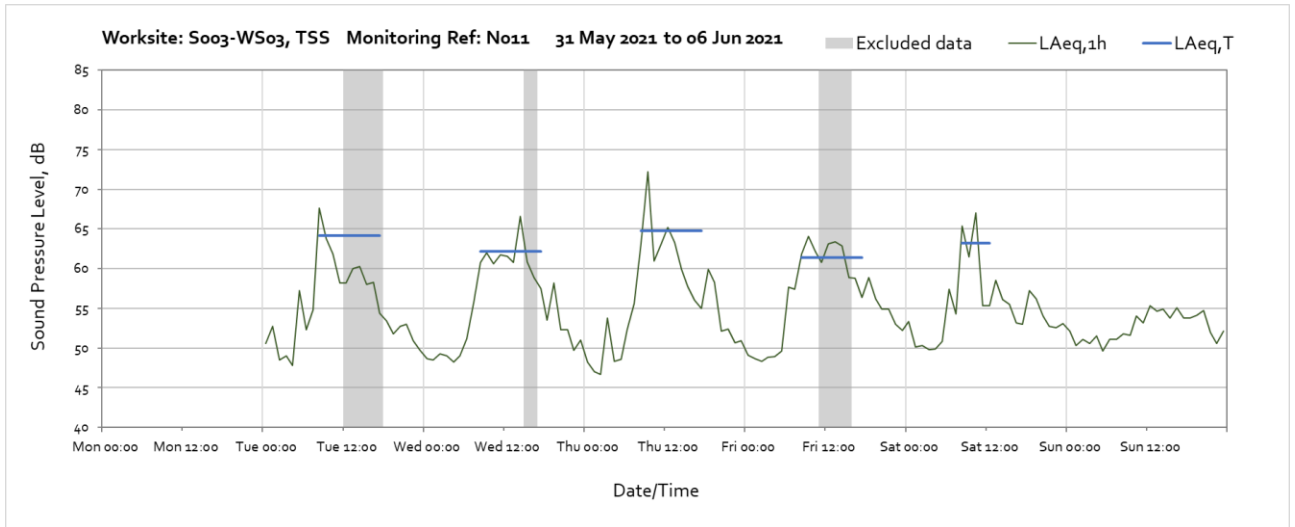


Note: Continuous noise levels measured outside of core construction hours were due to re Fridgeration plant equipment associated with a nearby hotel and is not associated with HS2 construction.



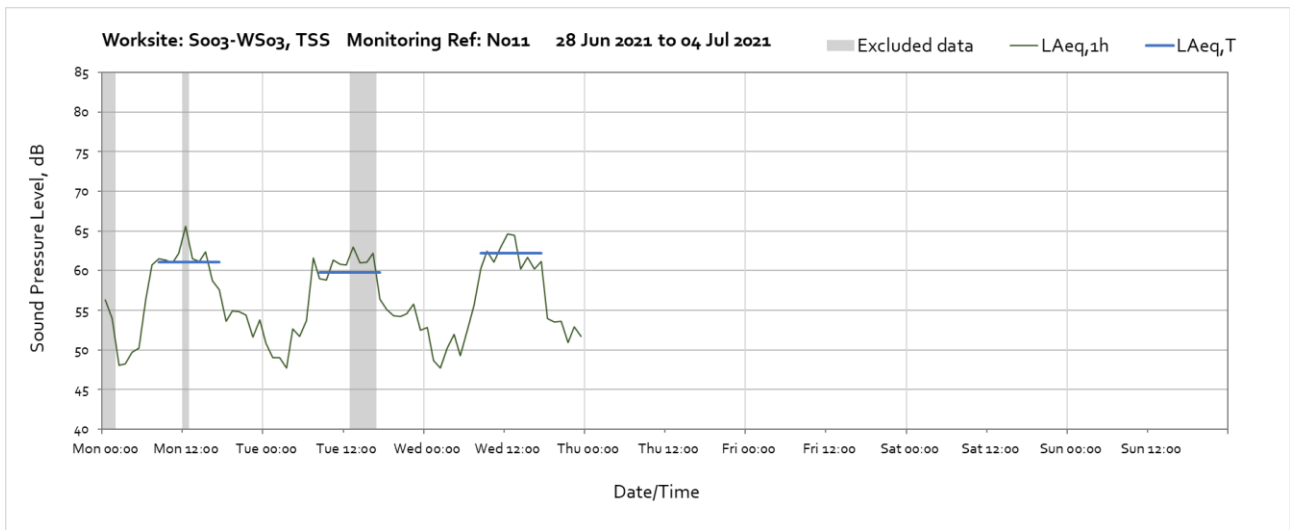
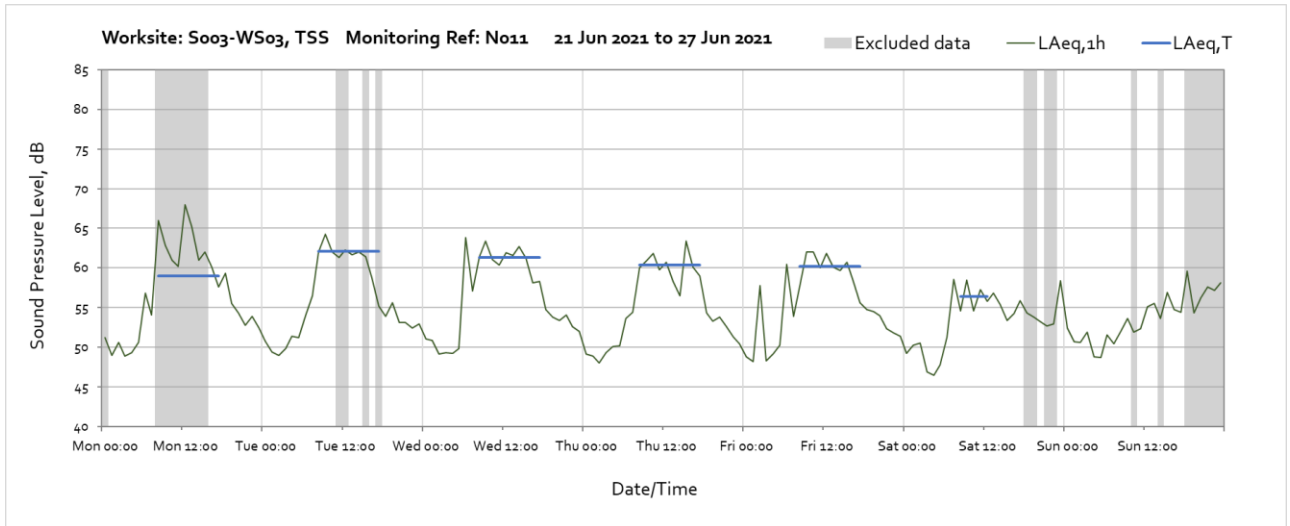
Note: Continuous noise levels measured outside of core construction hours were due to re Fridgeration plant equipment associated with a nearby hotel and is not associated with HS2 construction.

## Worksite: S003-WS03 – Monitoring Ref: N011

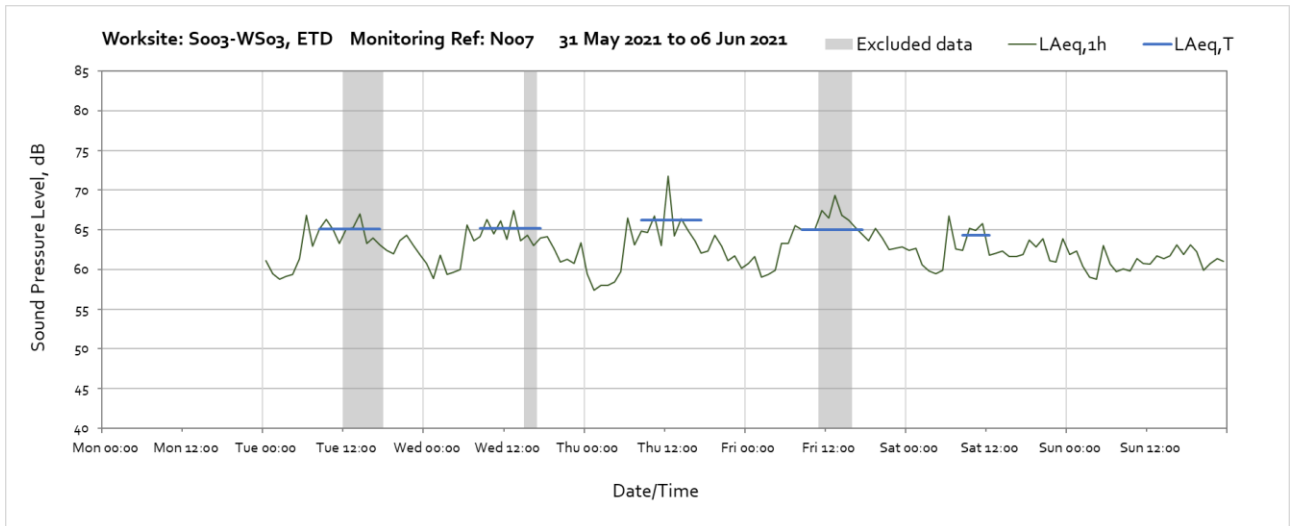


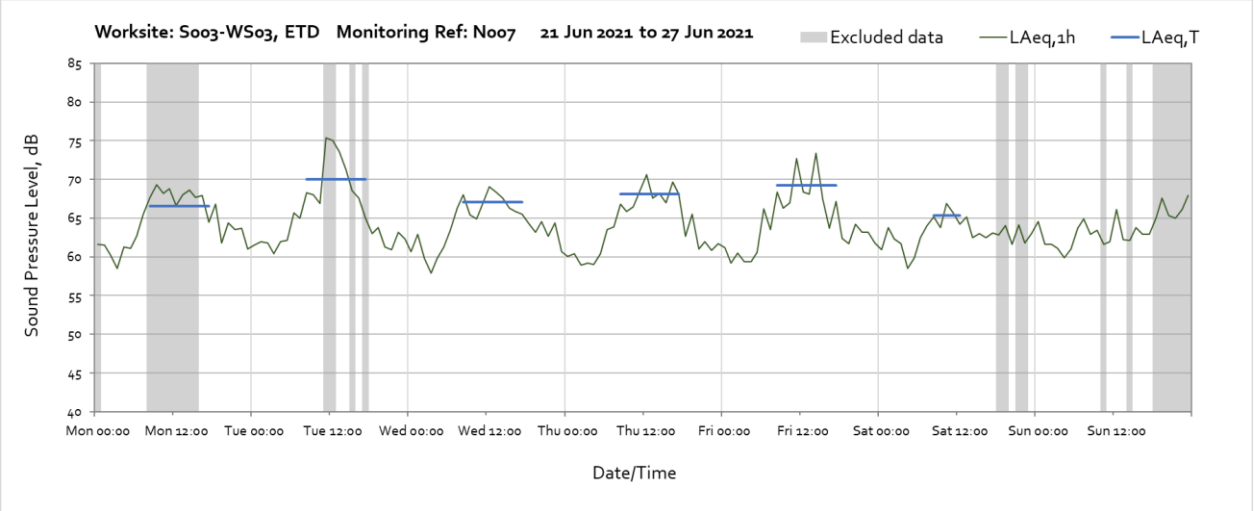
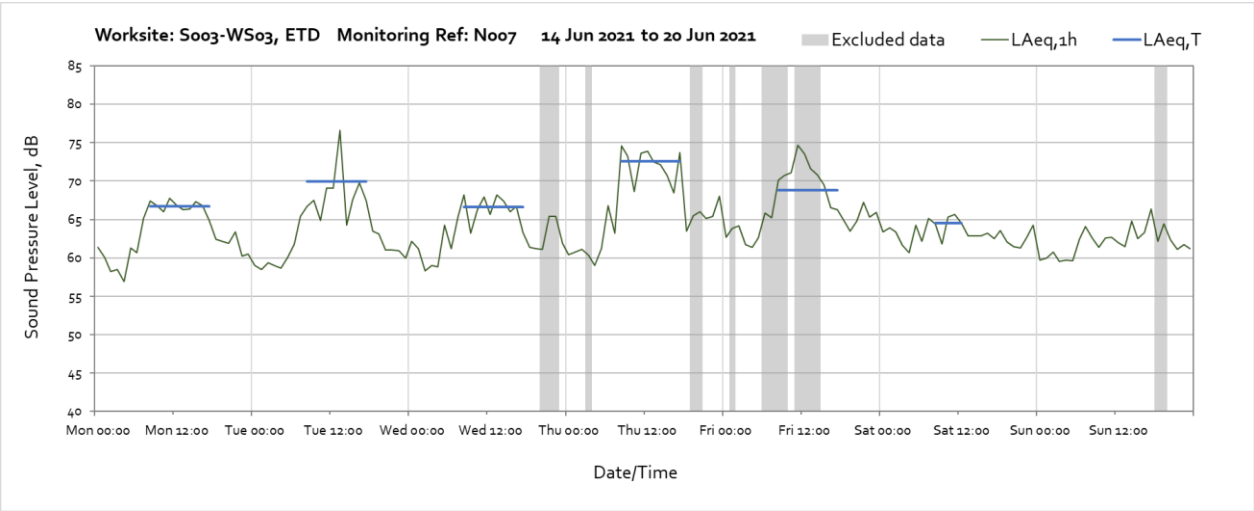
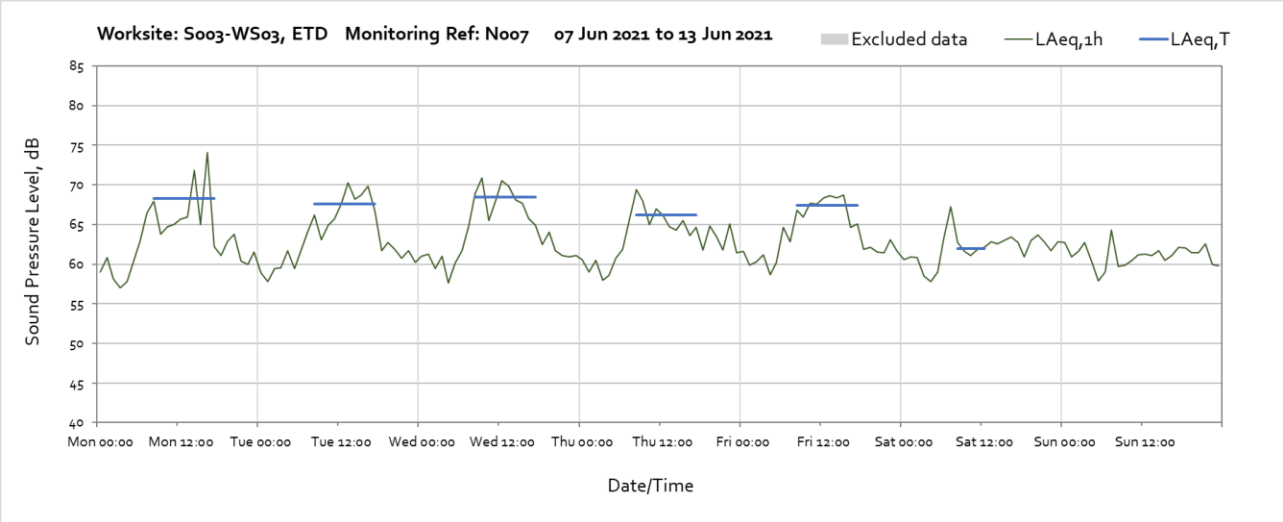
OFFICIAL

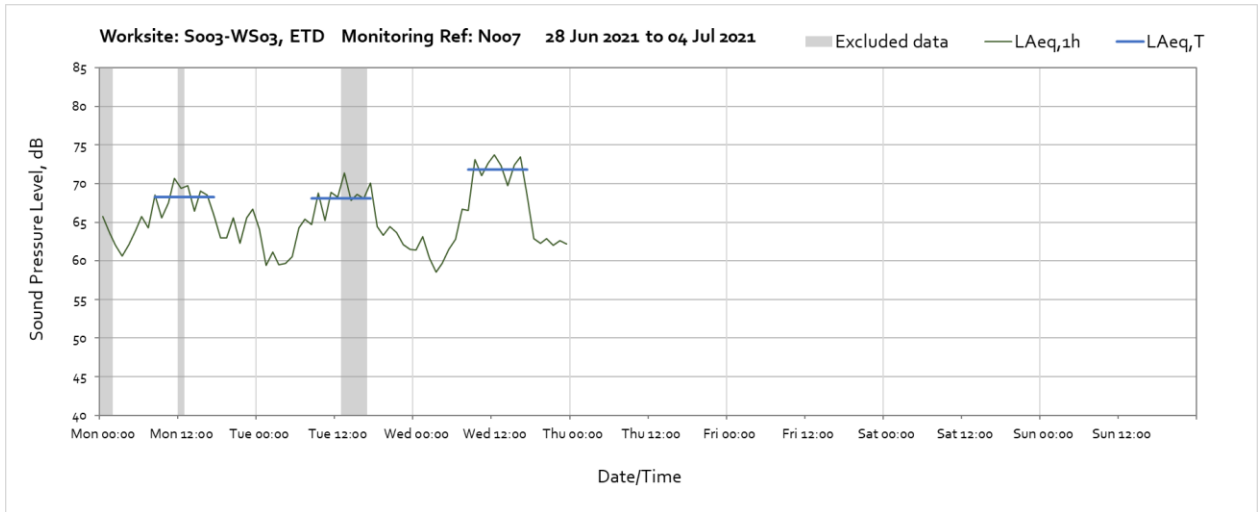




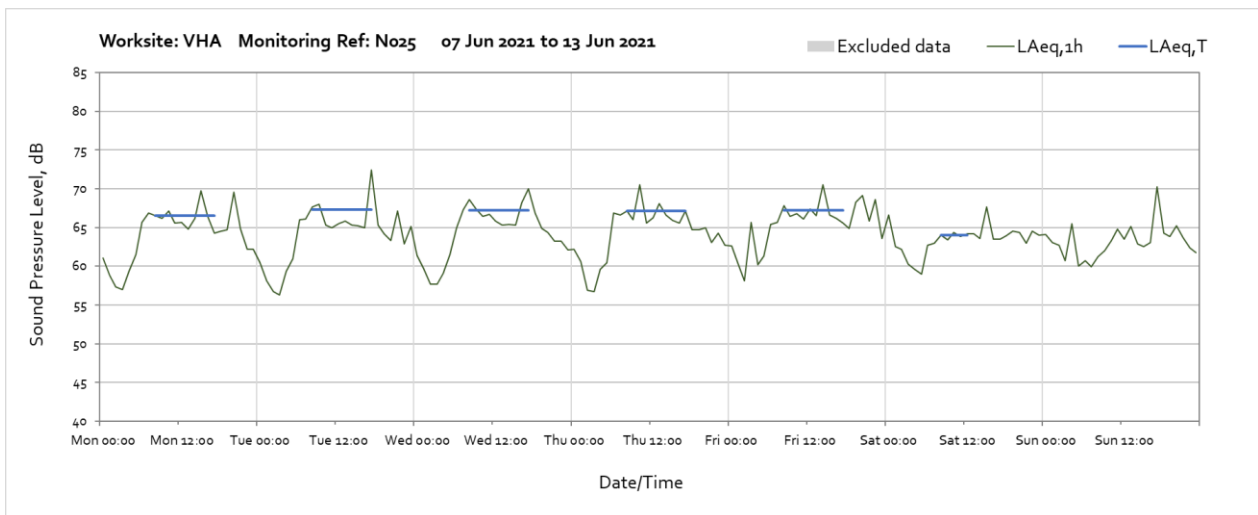
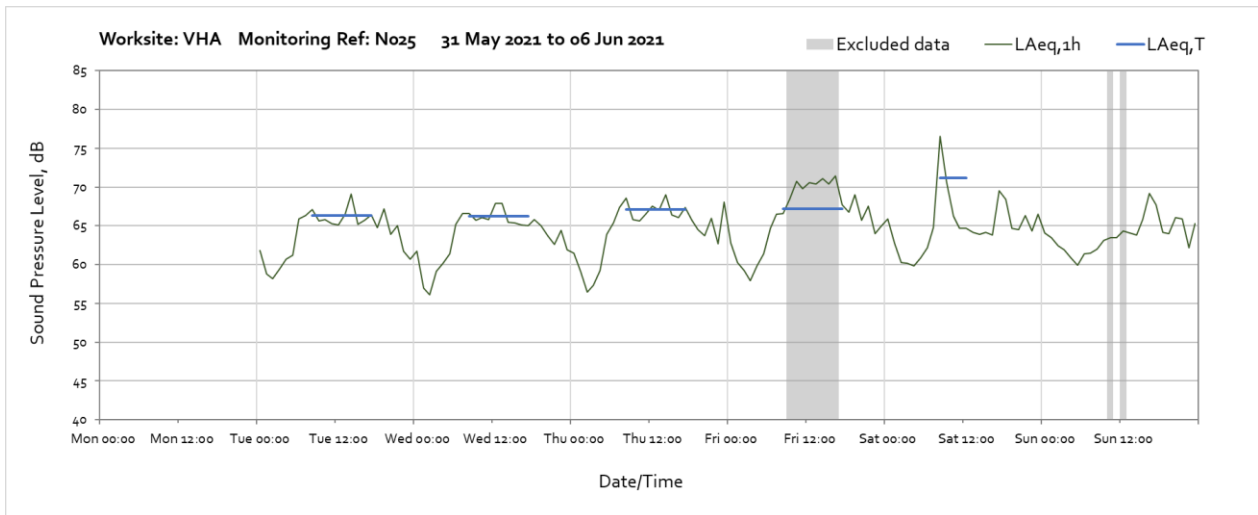
**Worksite: S003-WS03, ETD - Monitoring Ref: N007**

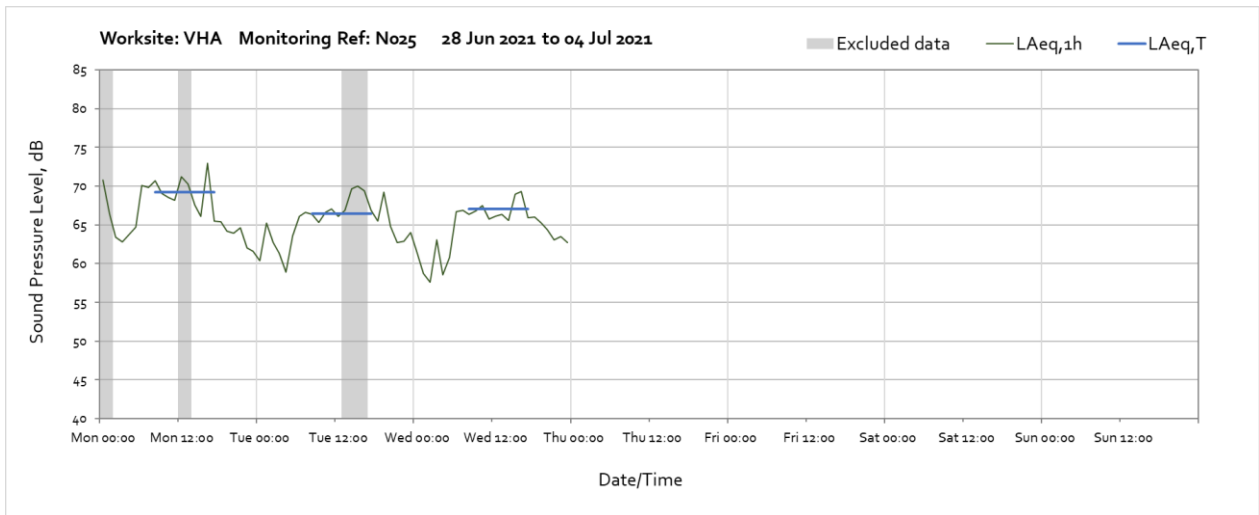
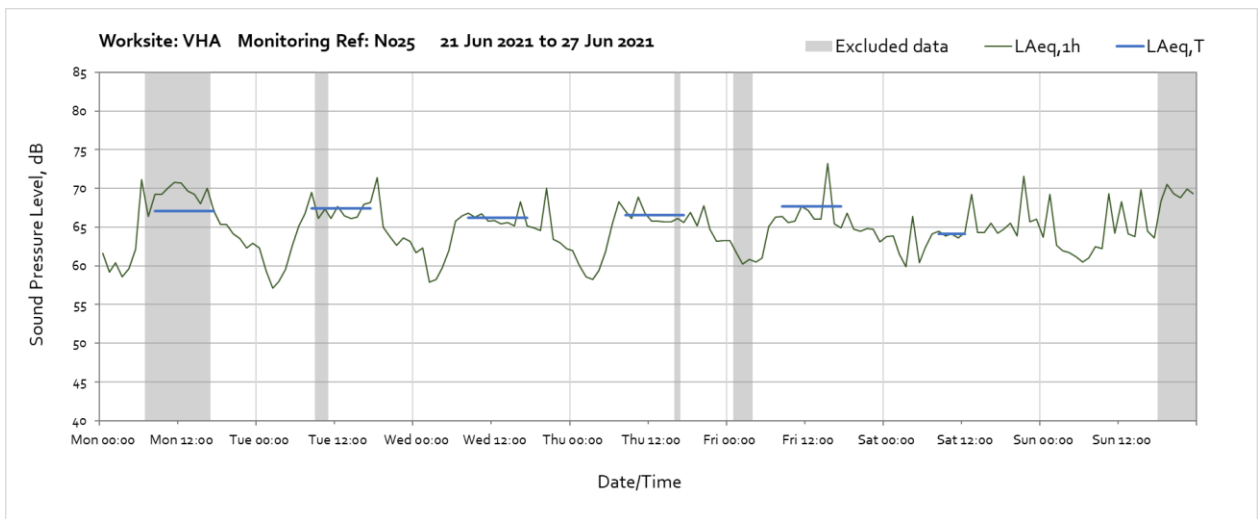
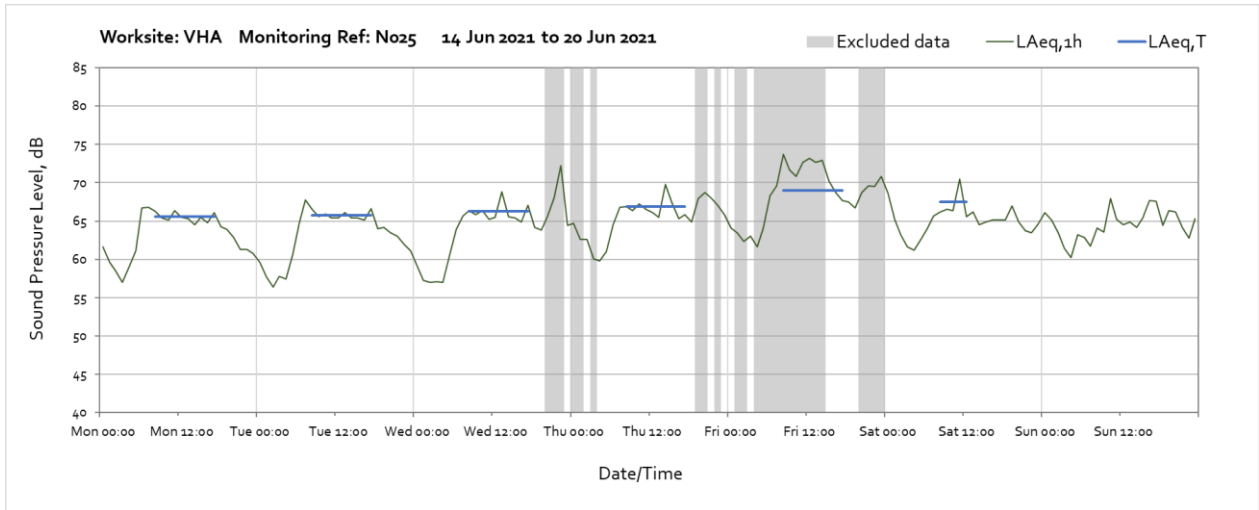




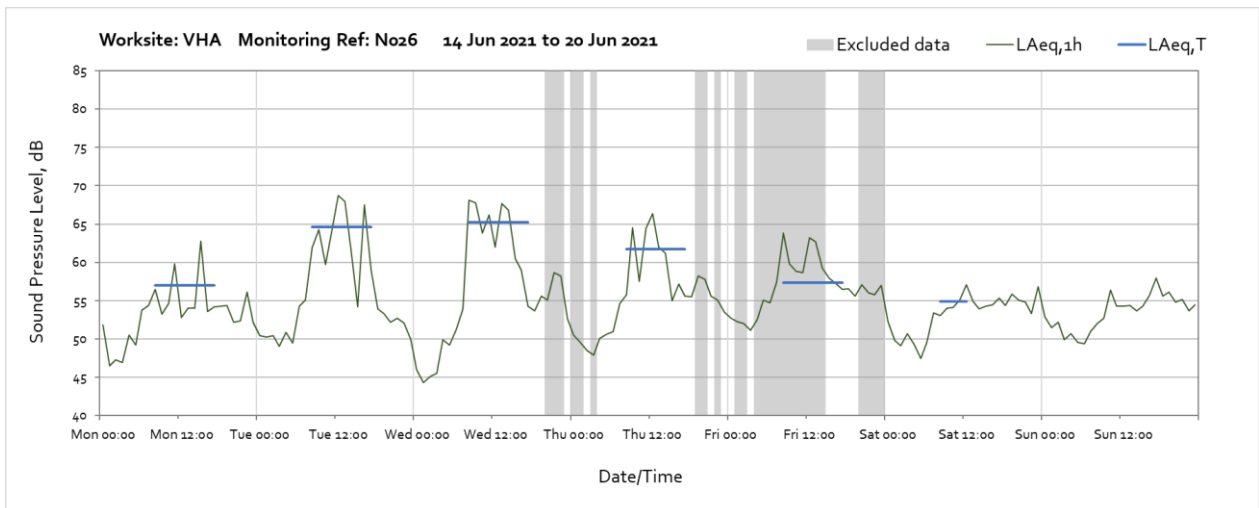
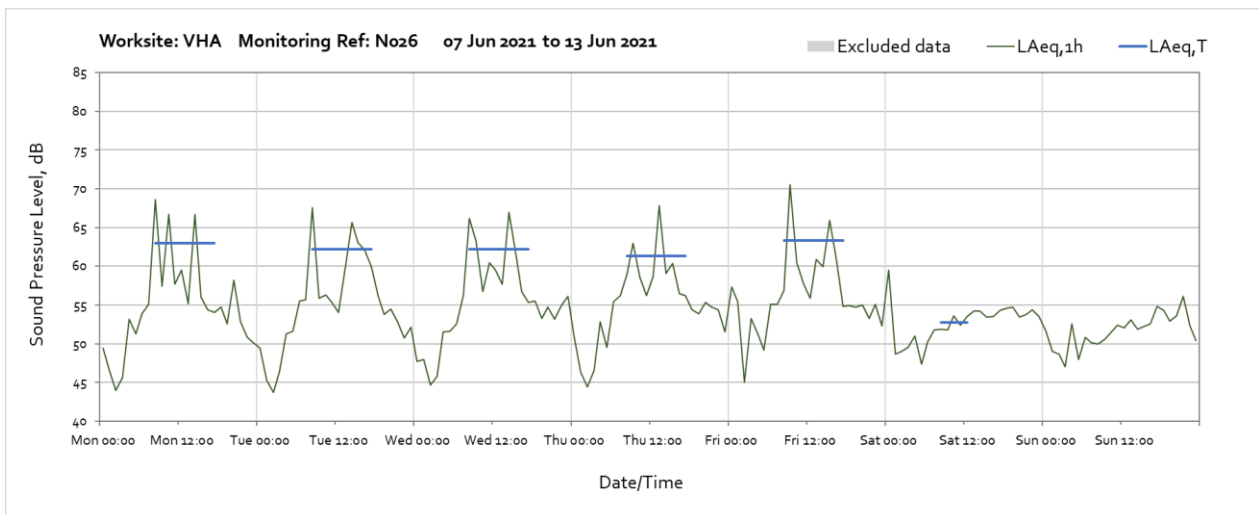
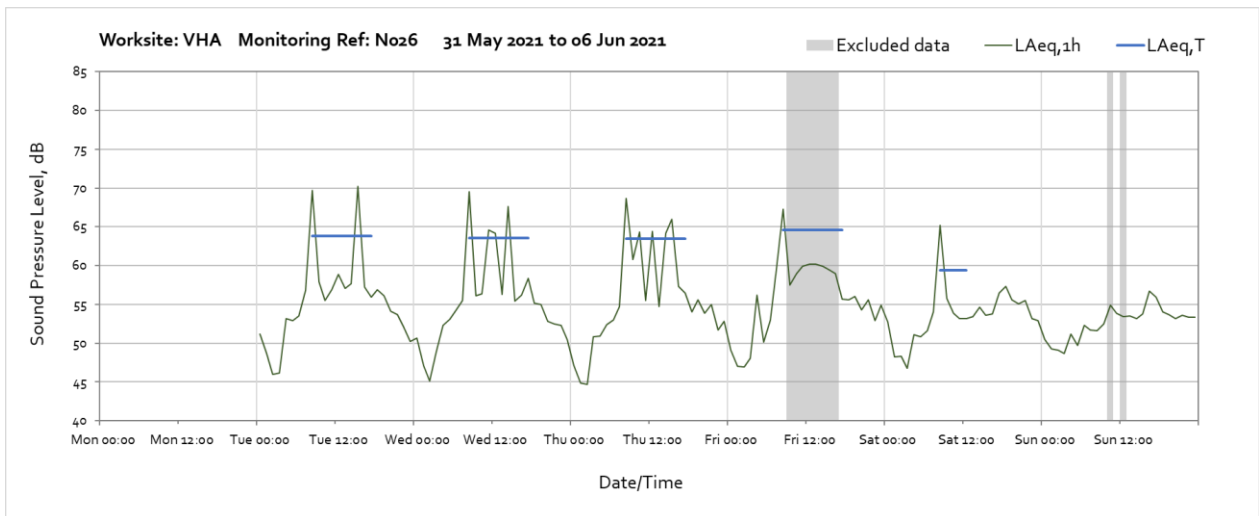


### Vehicle Holding Area (VHA) – Monitoring Ref: N025

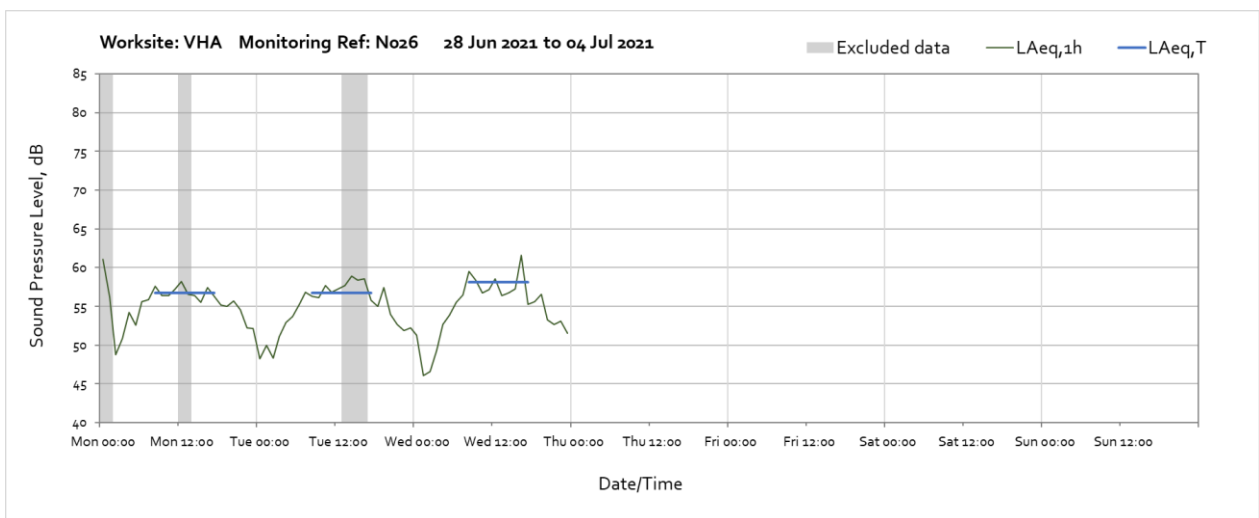
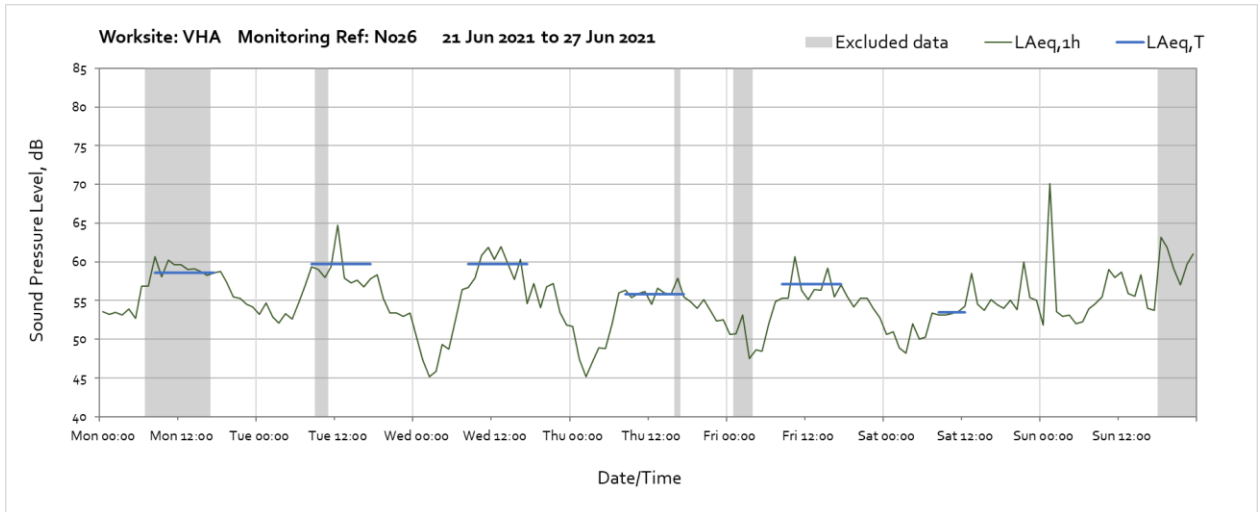




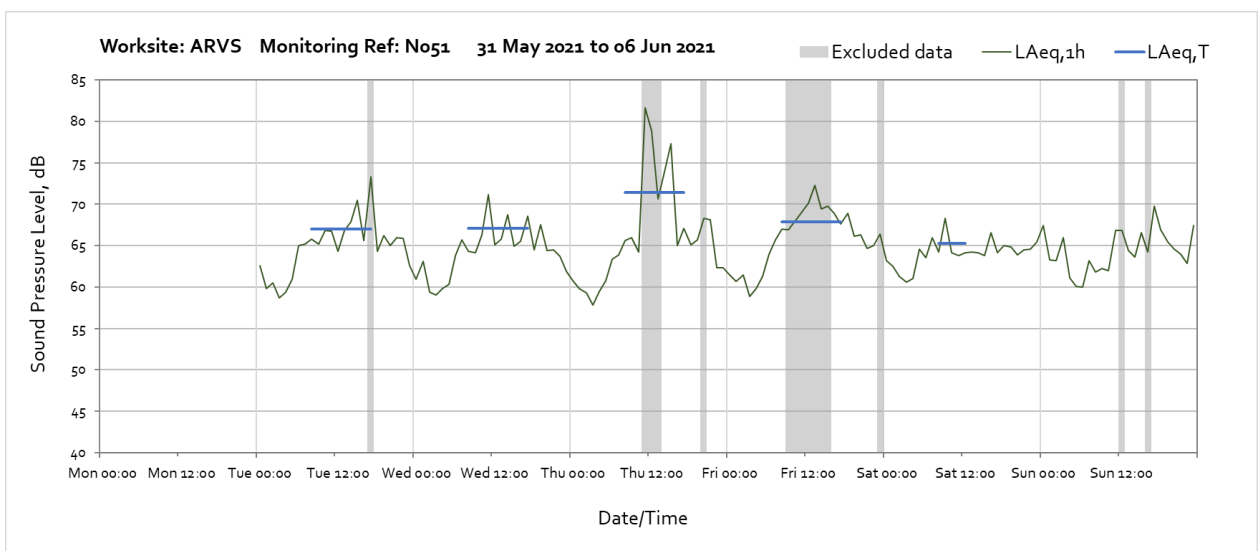
## Vehicle Holding Area (VHA) - Monitoring Ref: N026

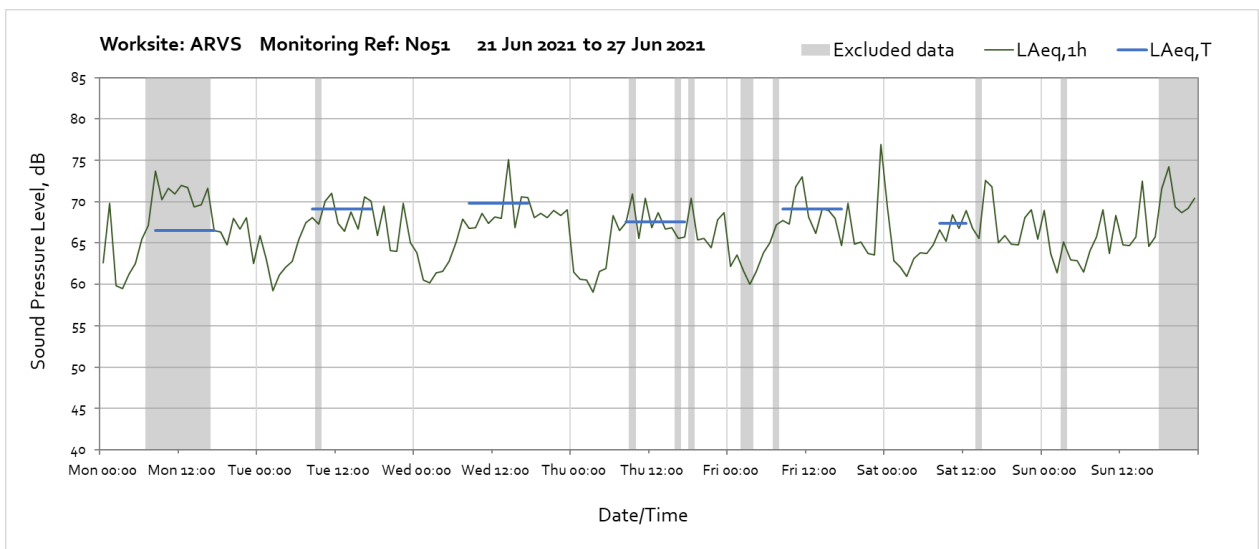
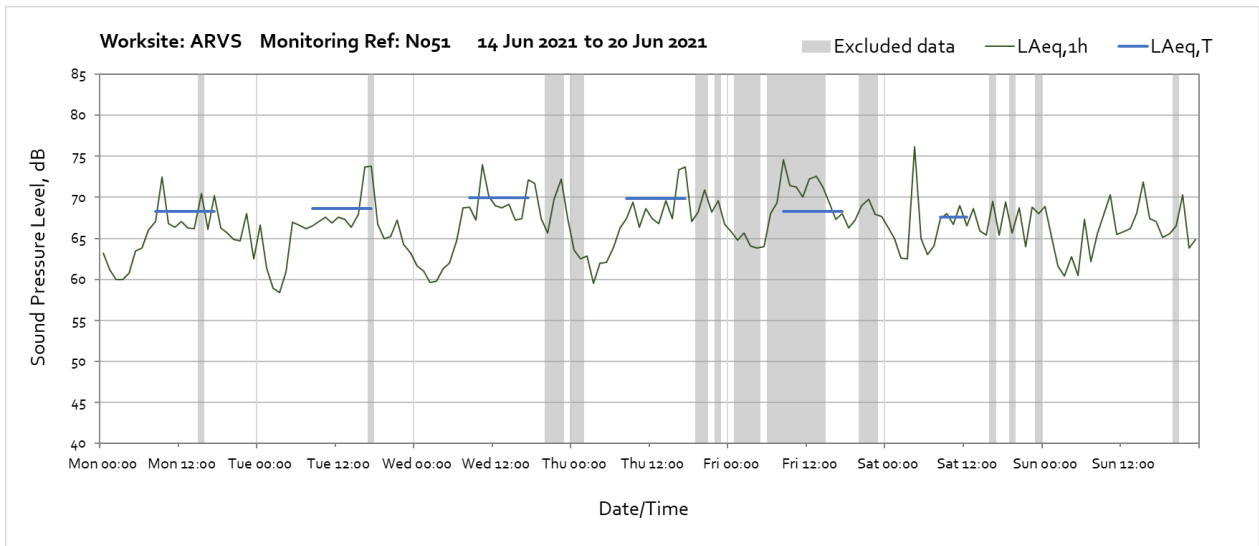
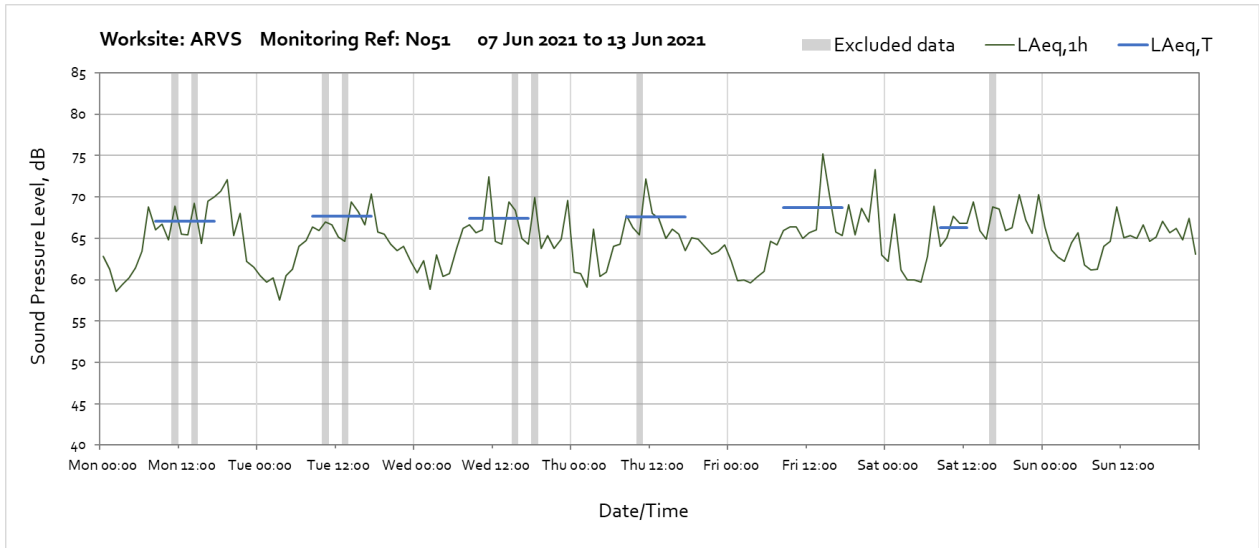


OFFICIAL

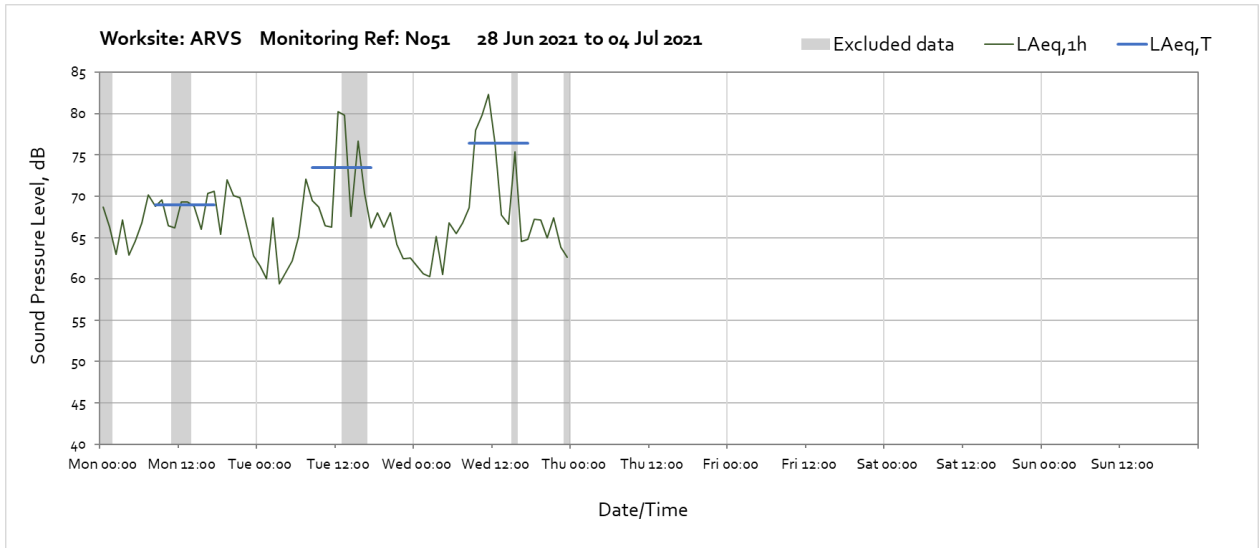


### Adelaide Road Ventilation Shaft (ARVS) – Monitoring Ref: N051

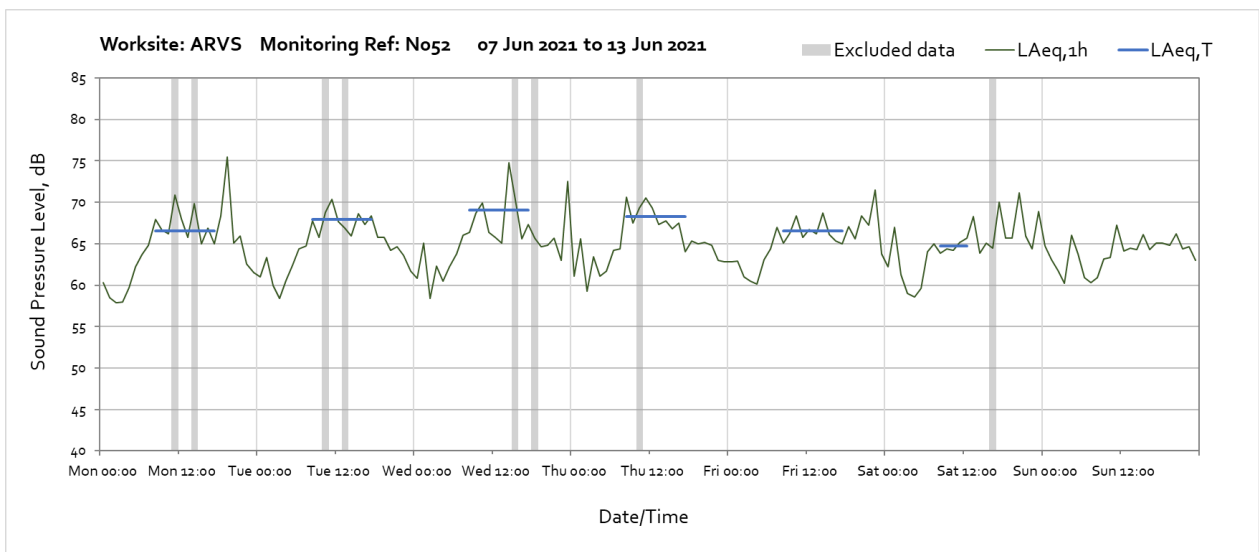
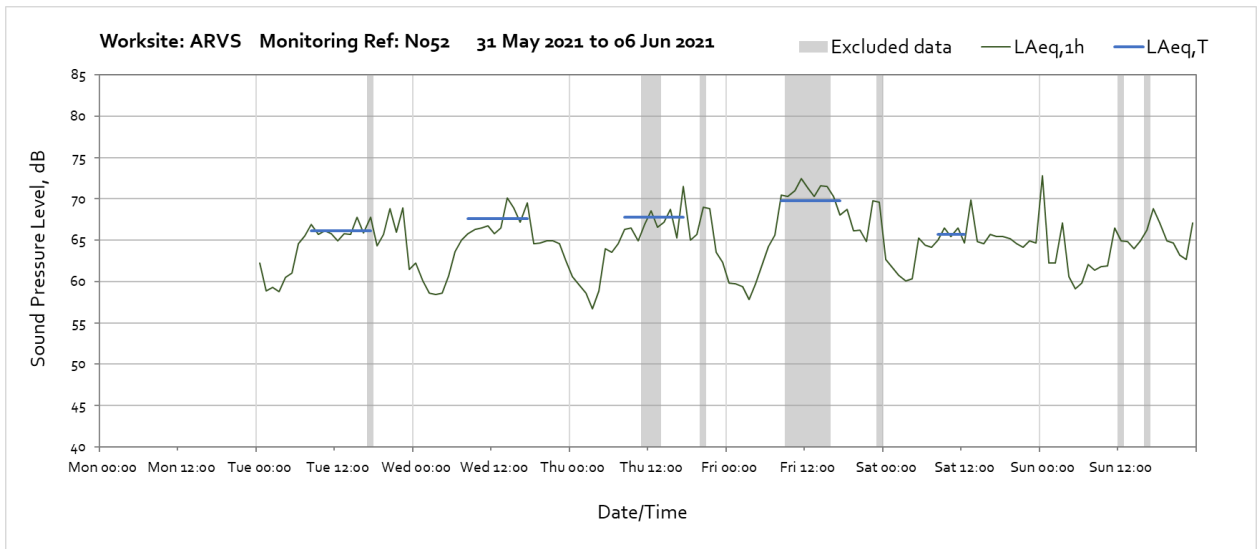


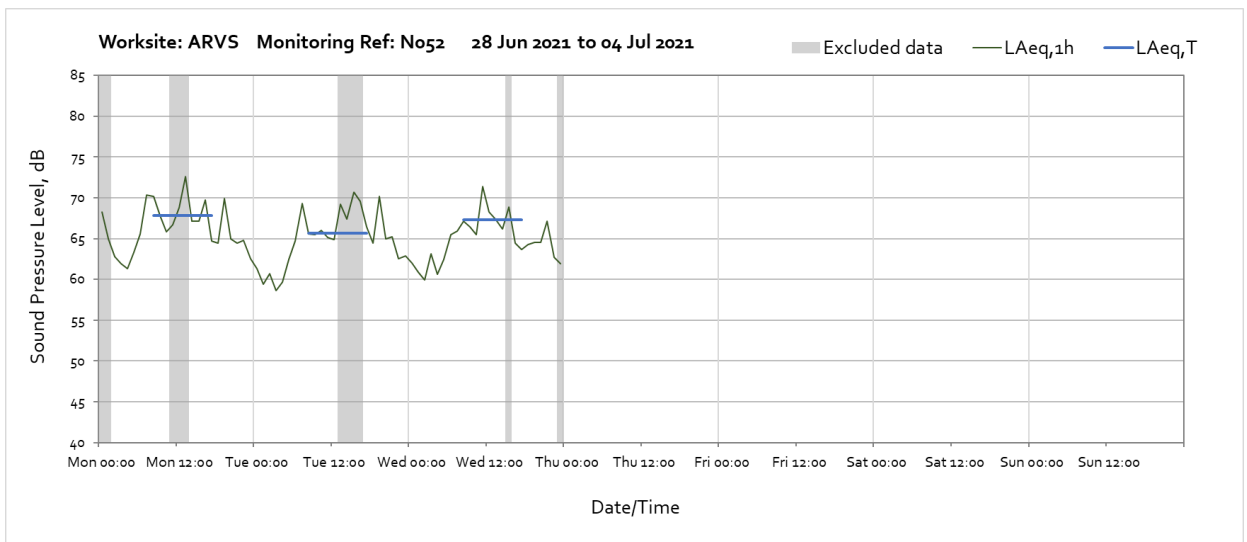
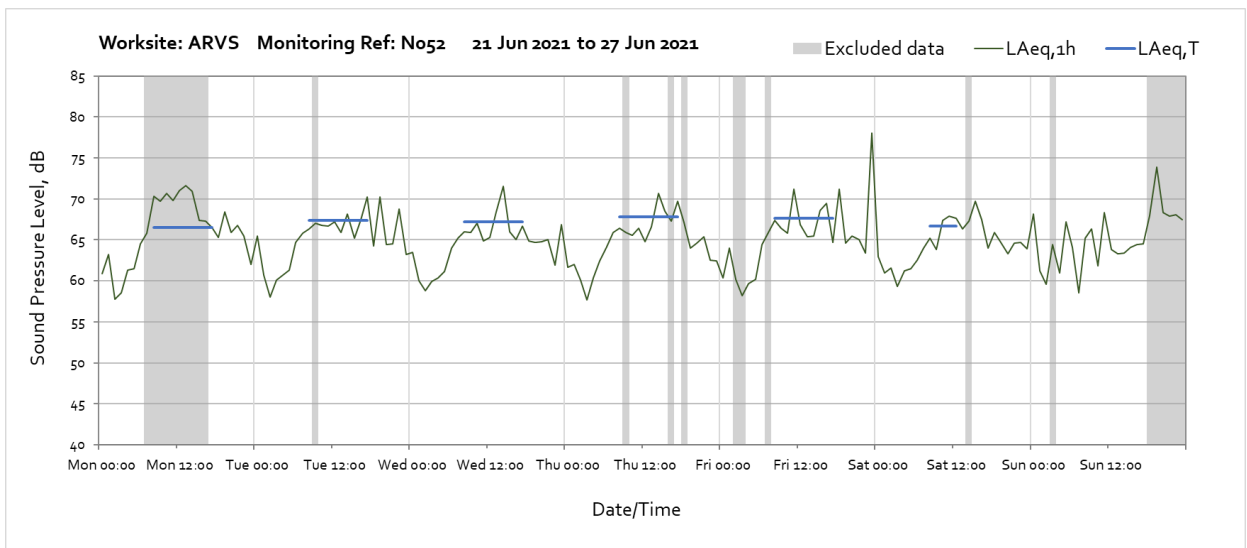
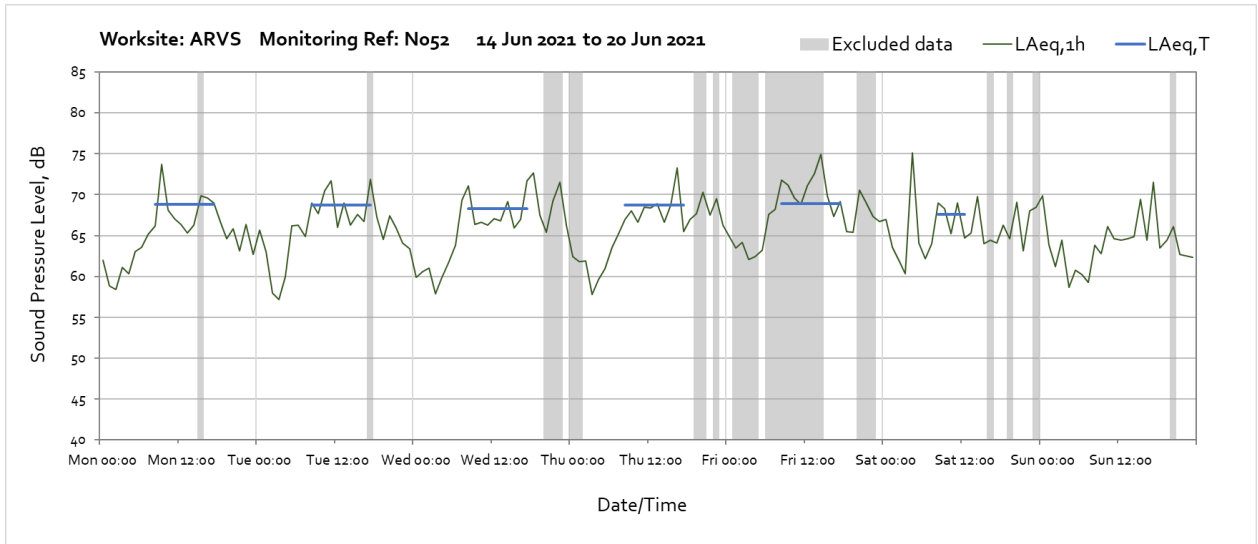






**Adelaide Road Ventilation Shaft (ARVS) – Monitoring Ref: N052**

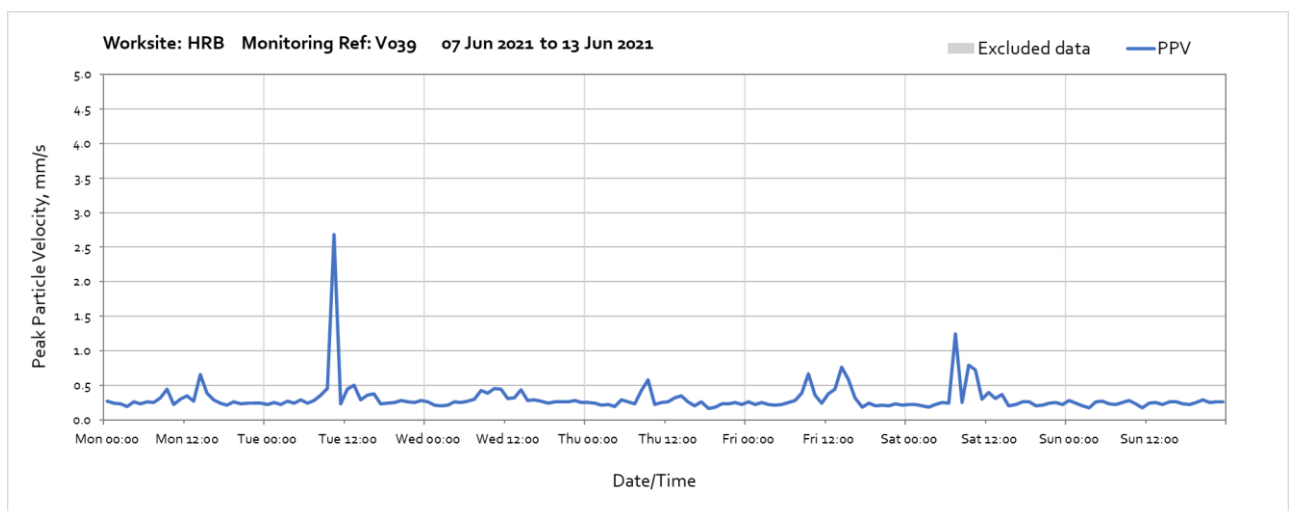
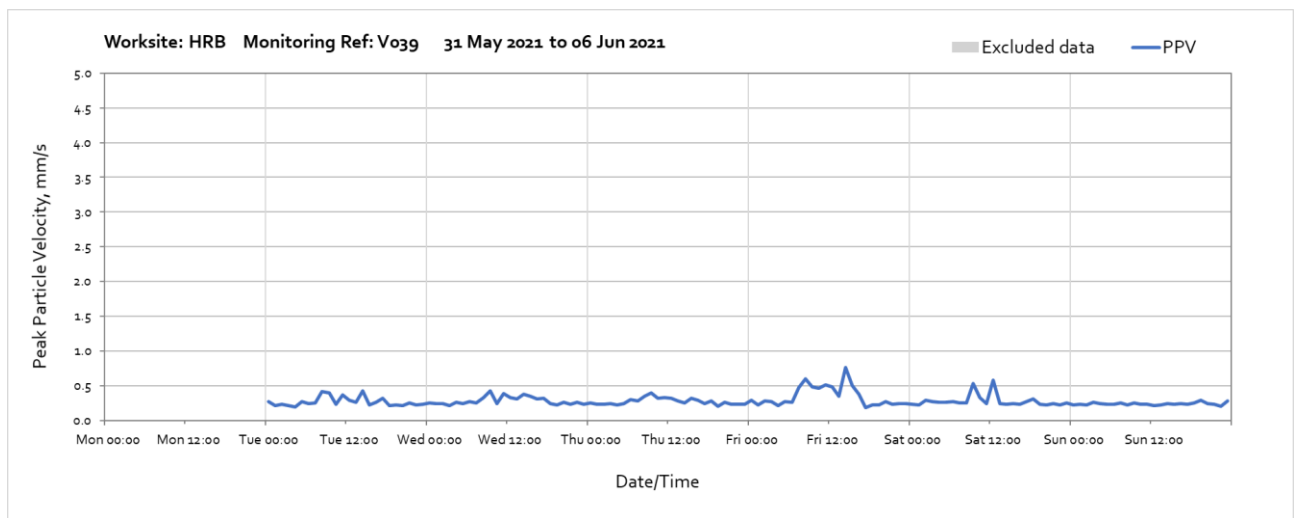


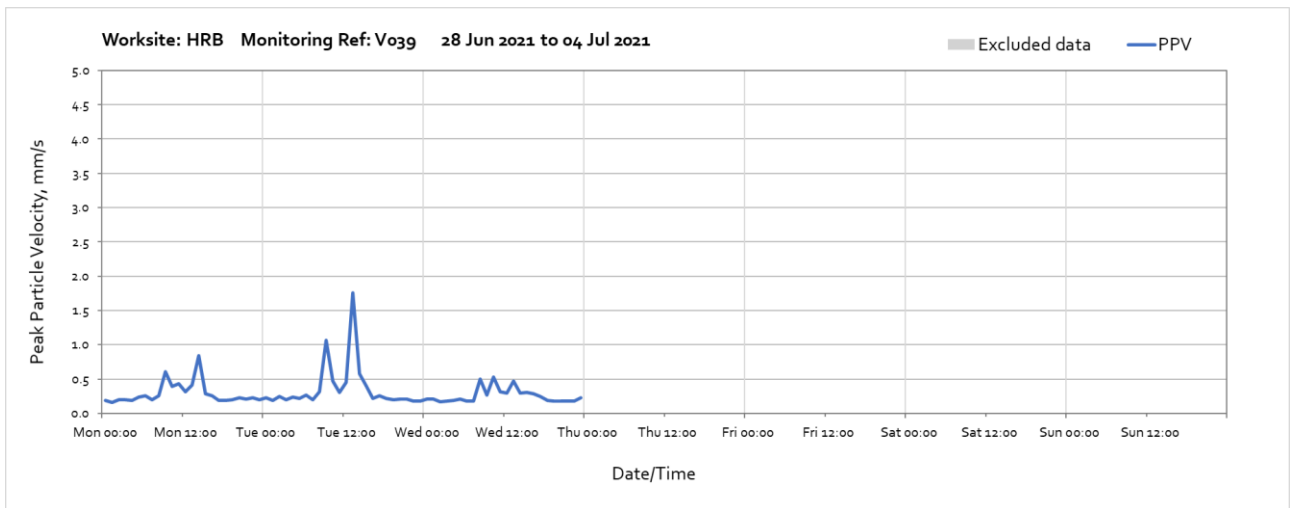
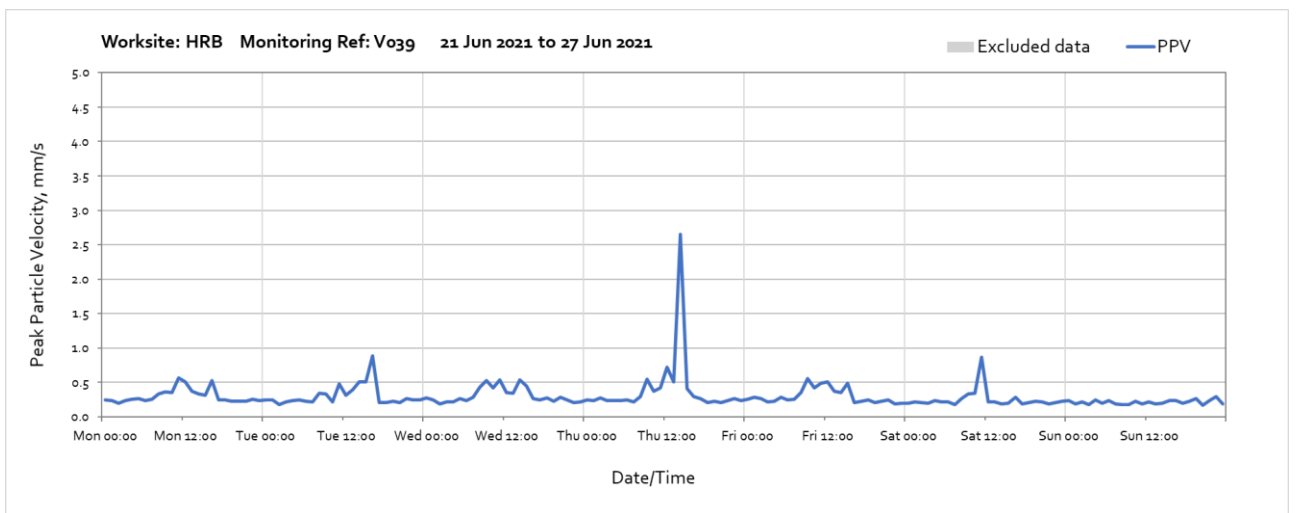
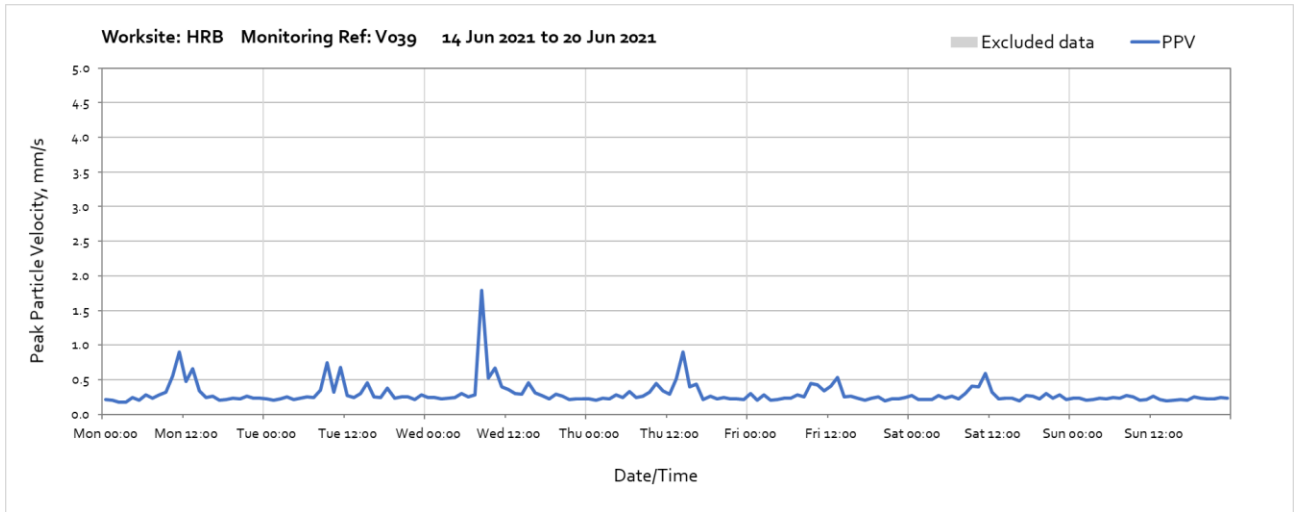


## Vibration

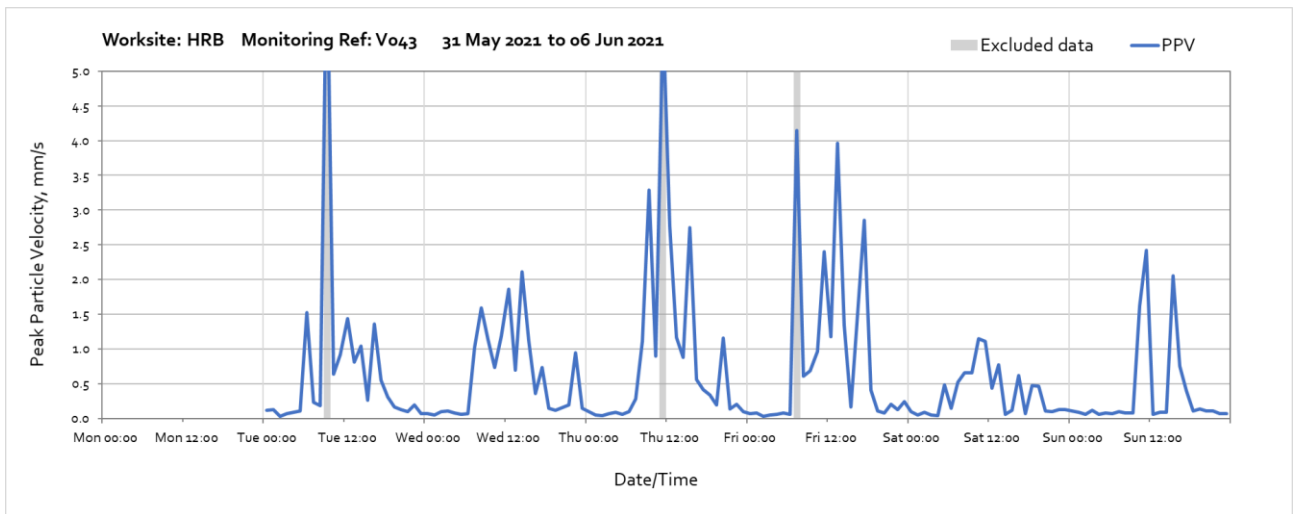
The following graphs show the hourly measured peak particle velocity PPV recorded during the monitoring period. The graphs show the resultant PPV due to vibration components on three orthogonal axes x, y and z. Where resultant PPV data is not available (monitors V039 and V043), the highest vibration 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: HRB – Monitoring Ref: V039

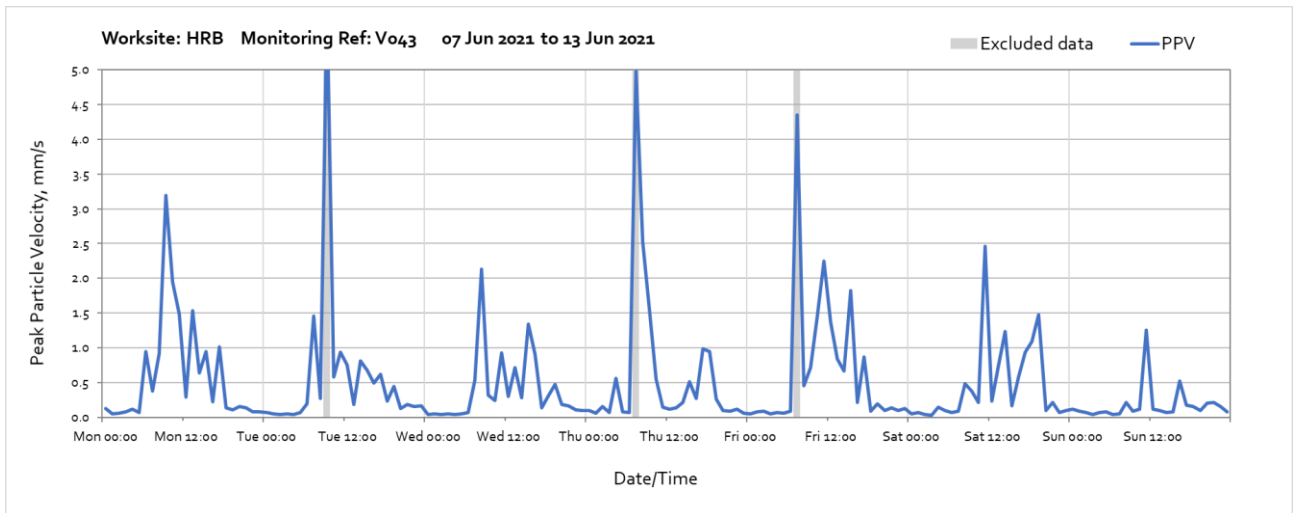




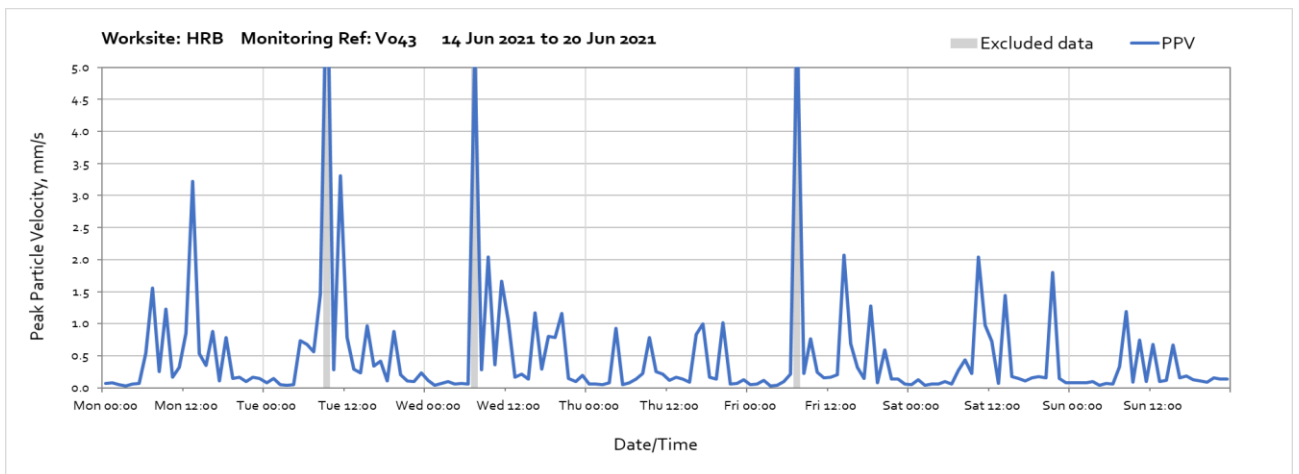
## Worksite: HRB – Monitoring Ref: V043



Note: High vibration levels measured throughout the weekend were due local interference of the monitor and are not representative of HS2 vibration levels.

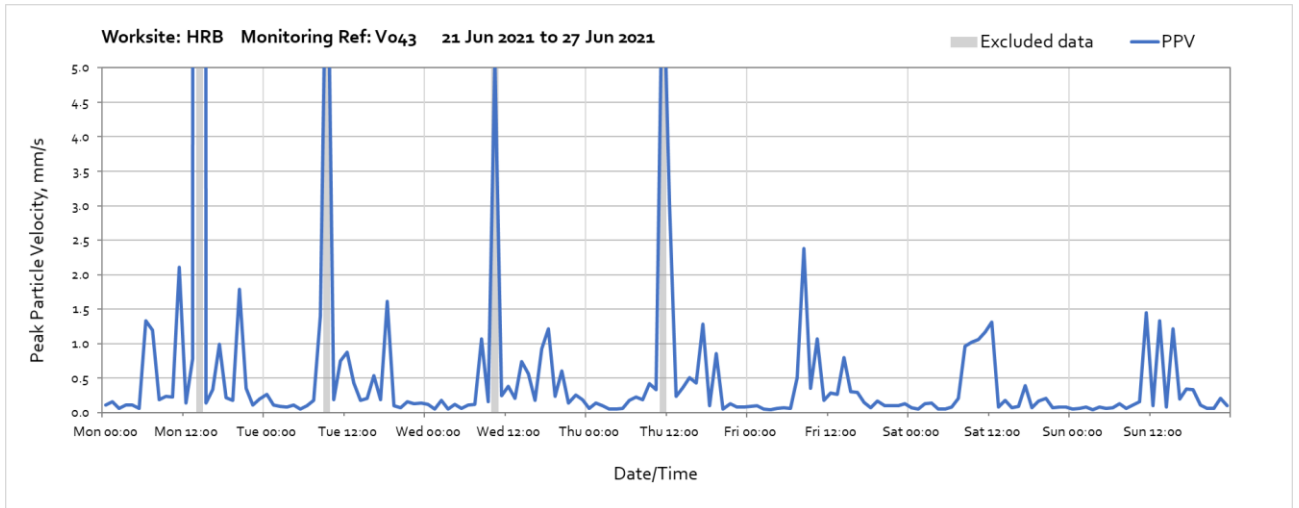


Note: High vibration levels measured throughout the week were due local interference of the monitor and are not representative of HS2 vibration levels.

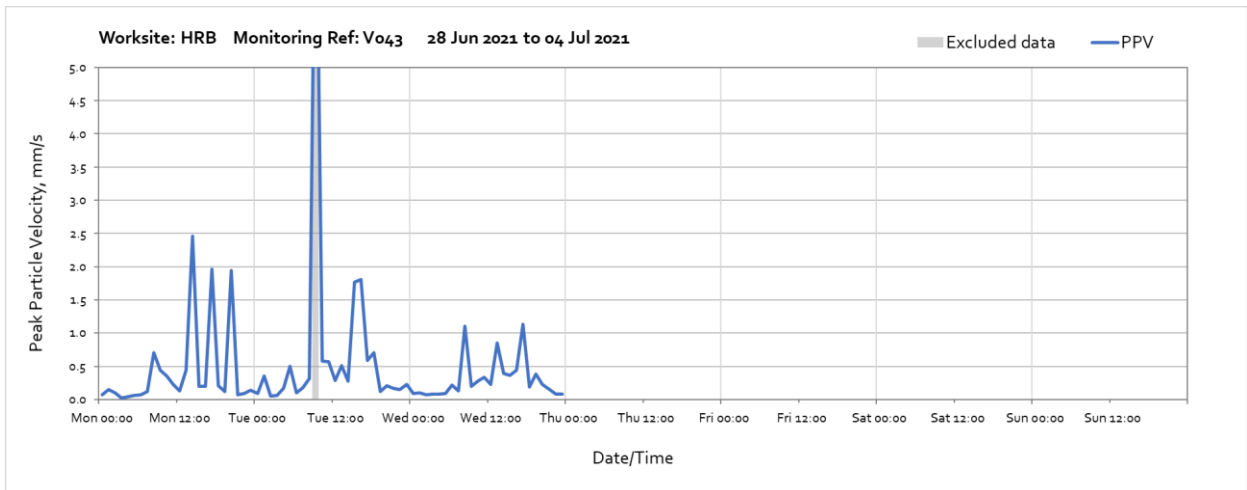


Note: High vibration levels measured throughout the week were due local interference of the monitor and are not representative of HS2 vibration levels.

OFFICIAL

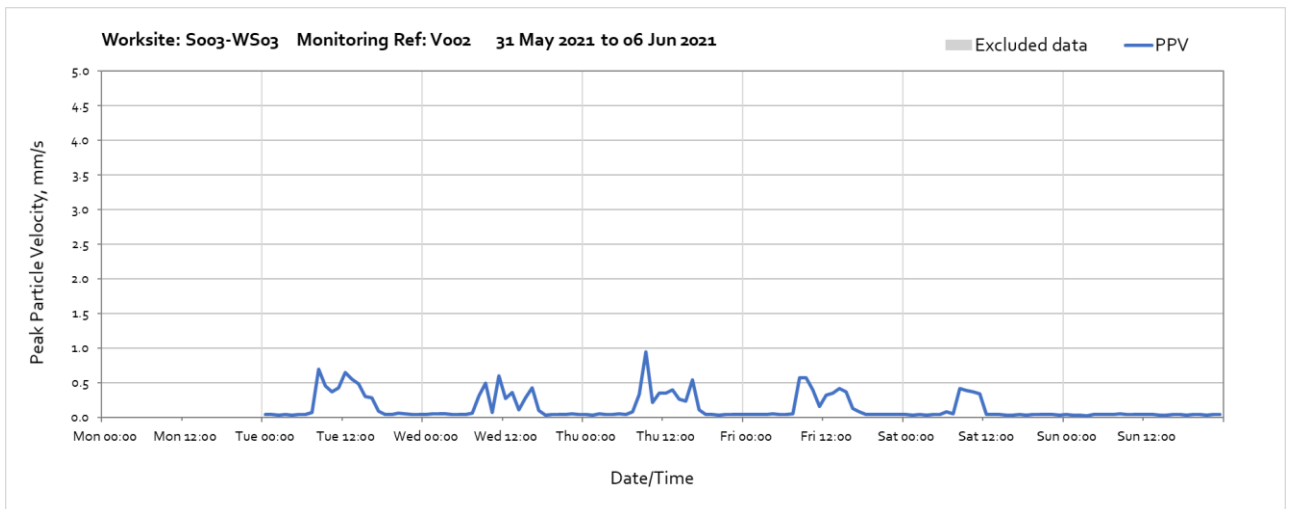


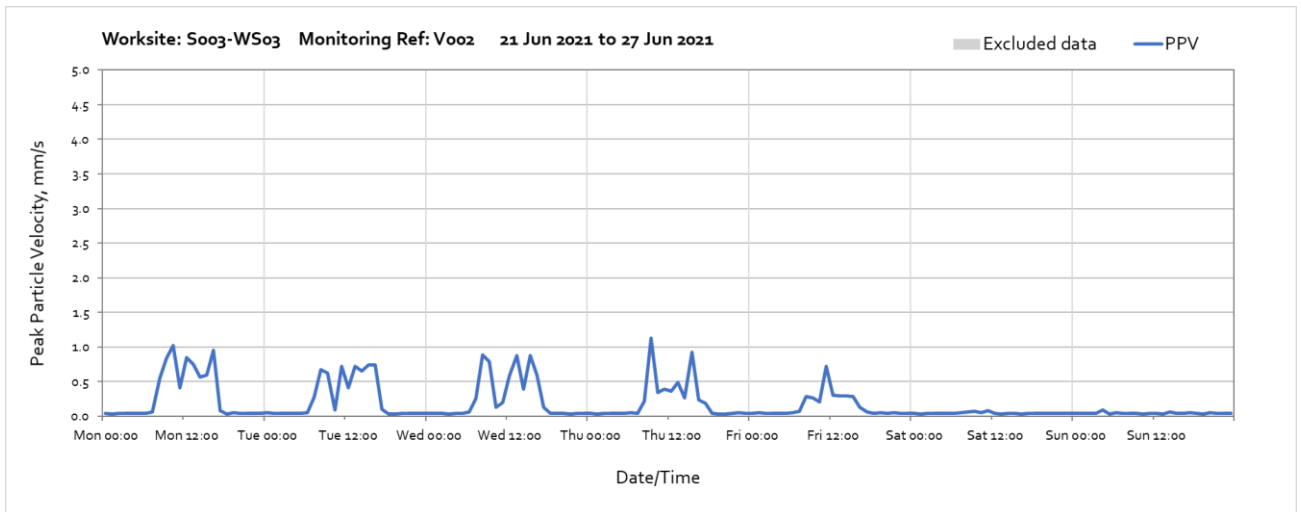
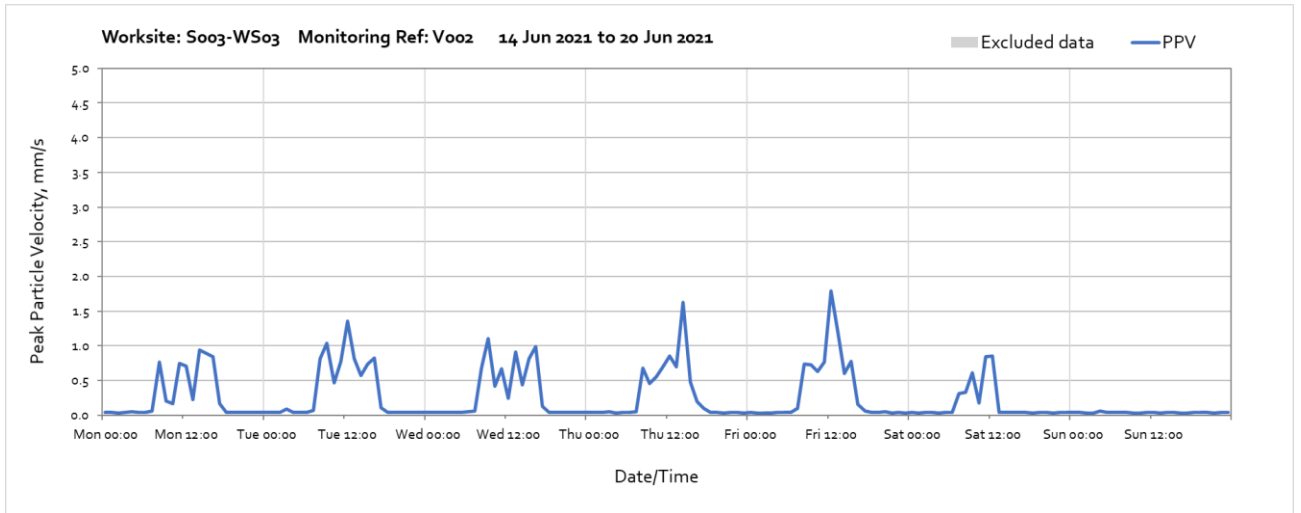
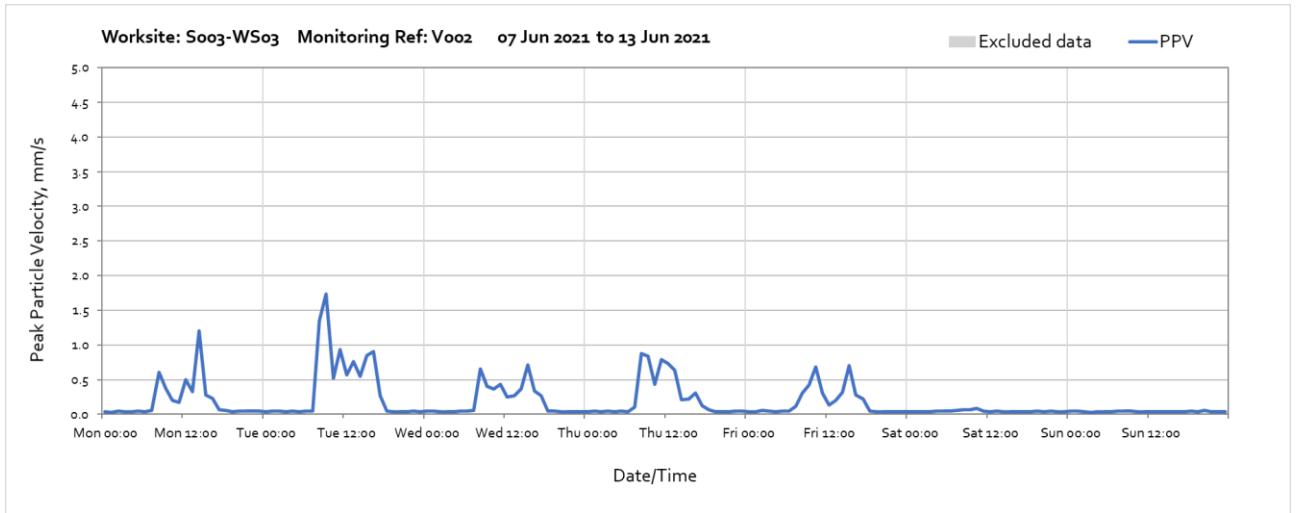
Note: High vibration levels measured throughout the week were due local intereference of the monitor and are not representative of HS2 vibration levels.



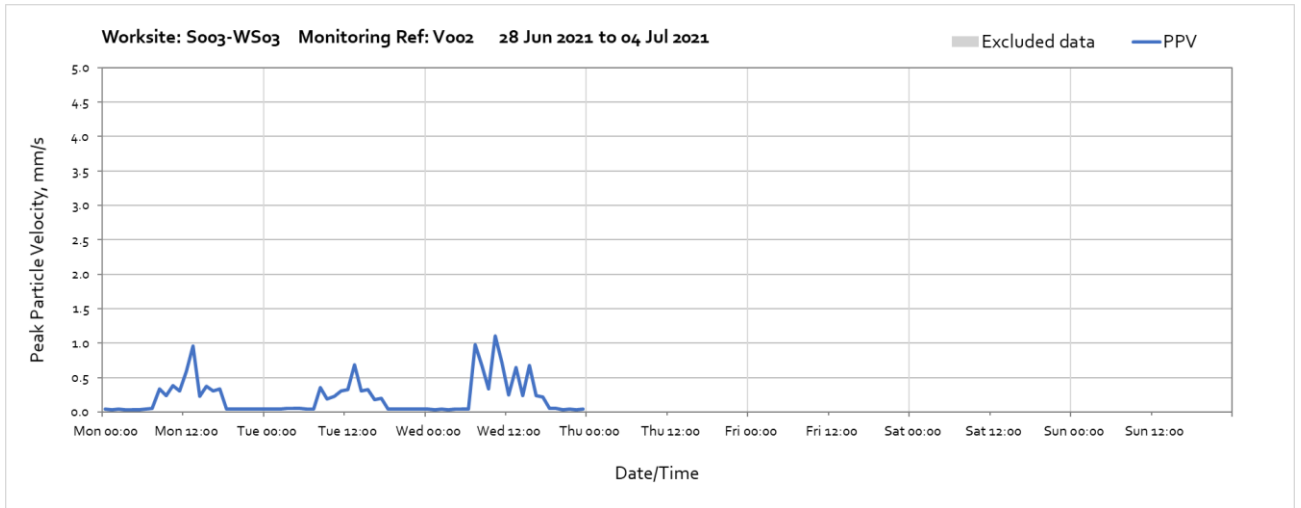
Note: High vibration levels measured from 09:00 until 10:00 on Tuesday 29<sup>th</sup> June were due local interference of the monitor and are not representative of HS2 vibration levels.

### Worksite: S003-WS03 – Monitoring Ref: V002

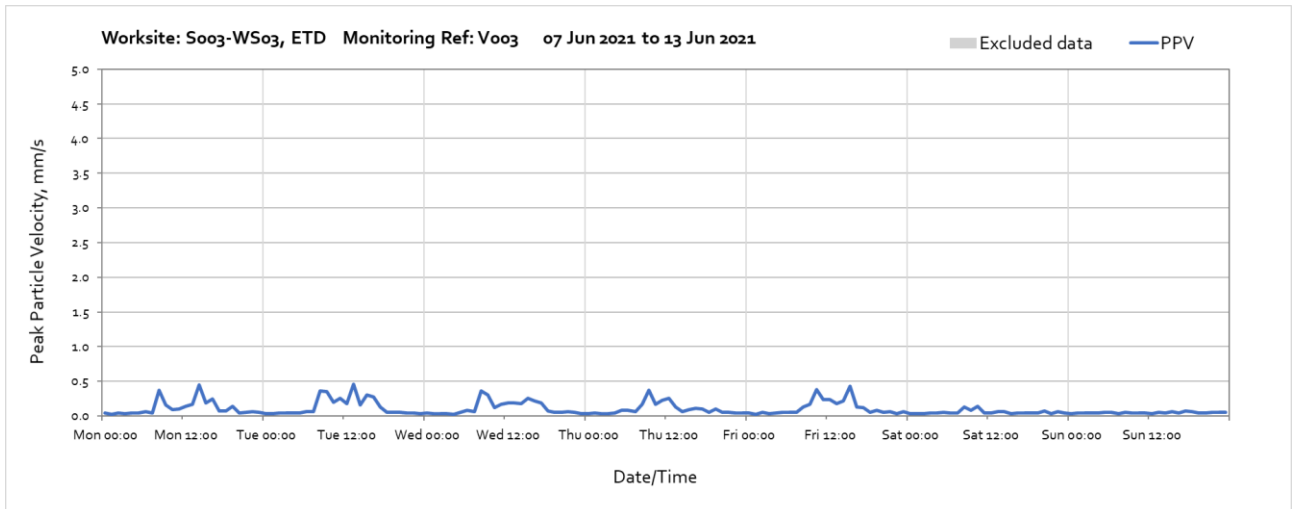
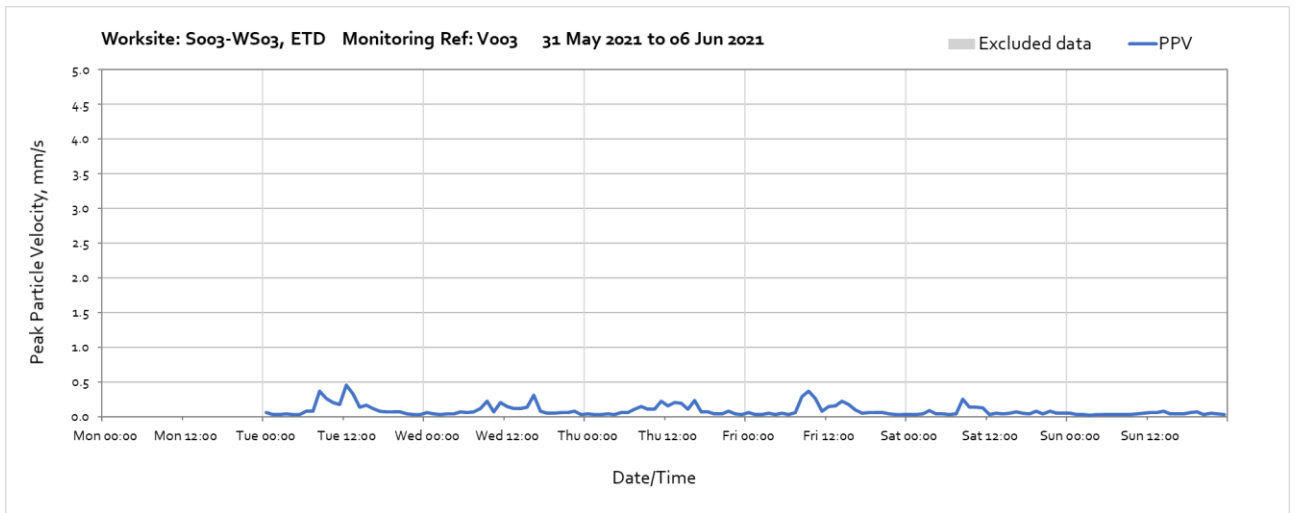


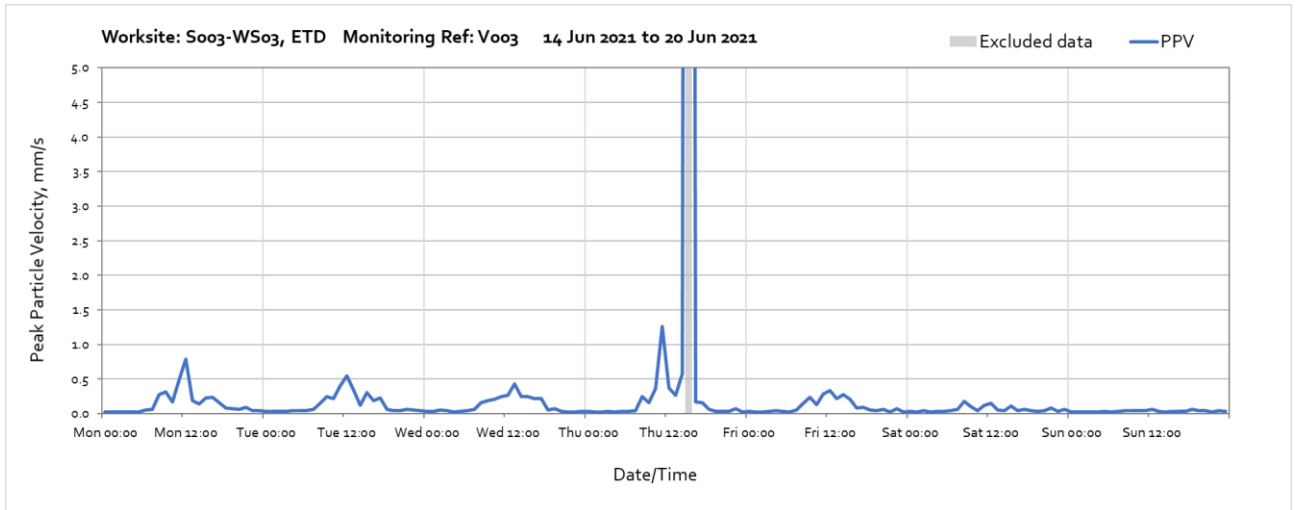




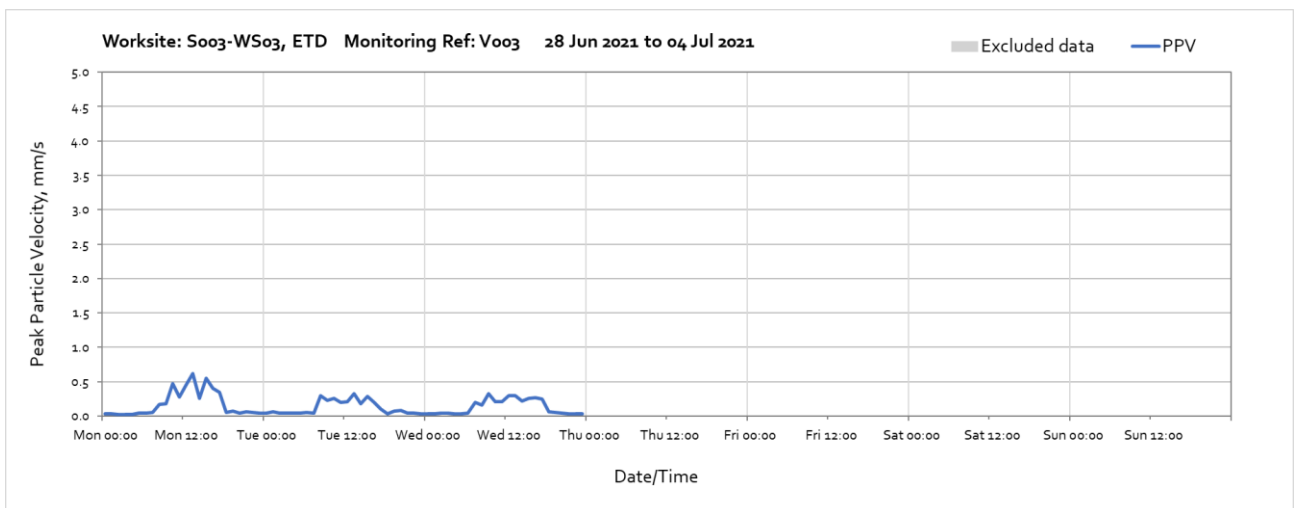
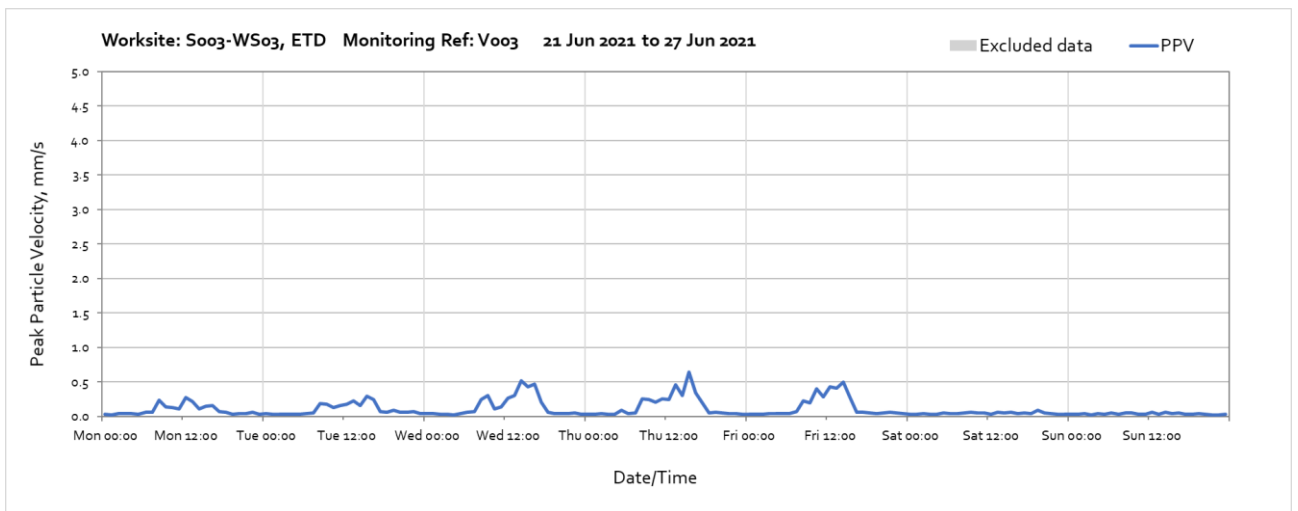


**Worksite: S003-WS03, ETD – Monitoring Ref: V003**

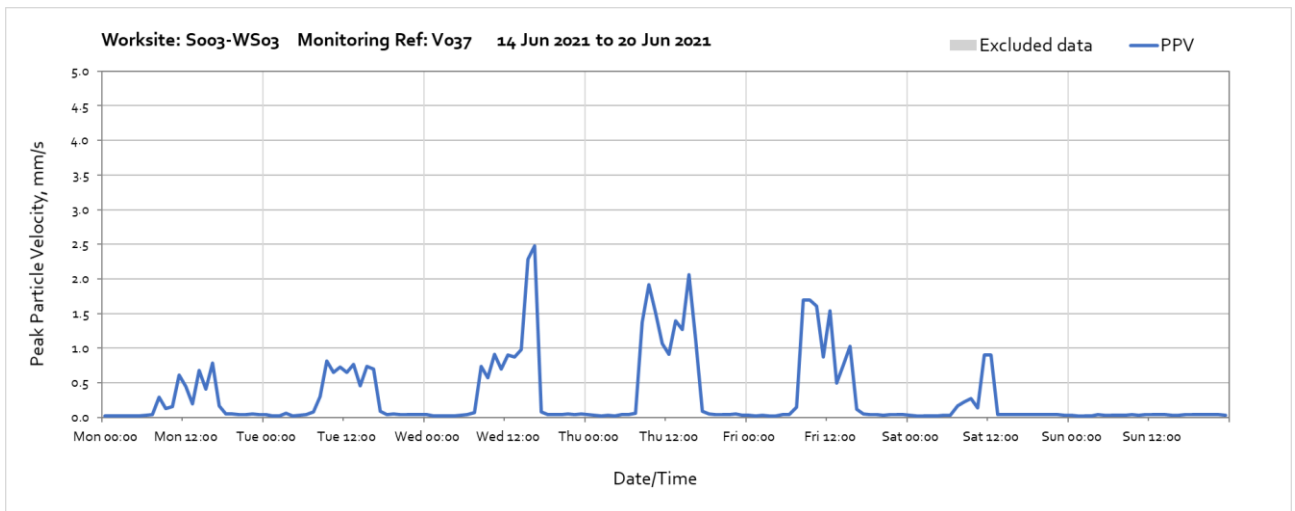
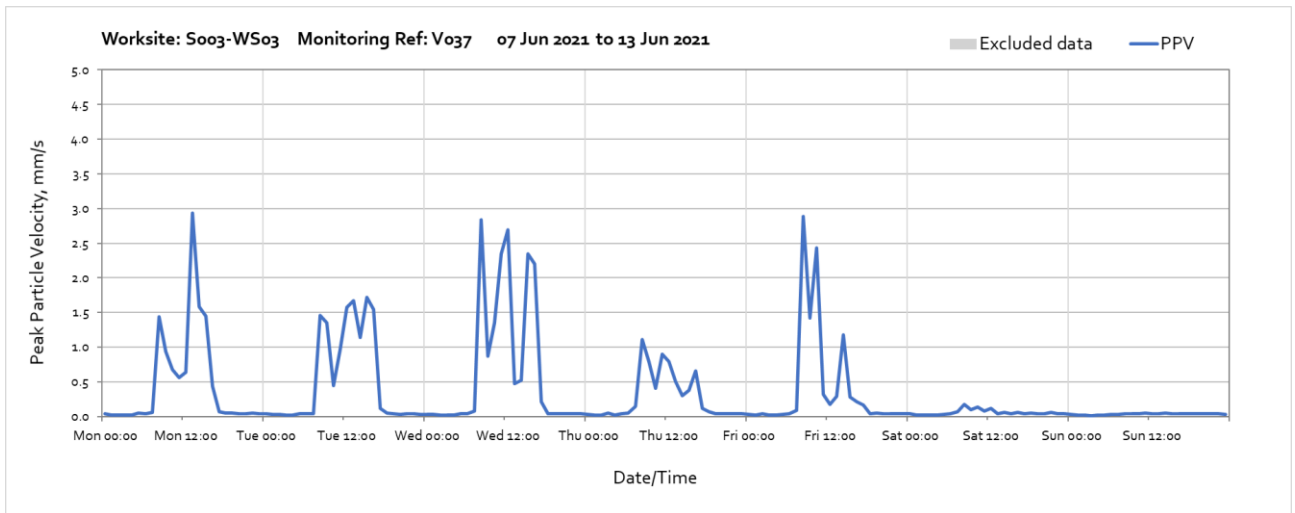
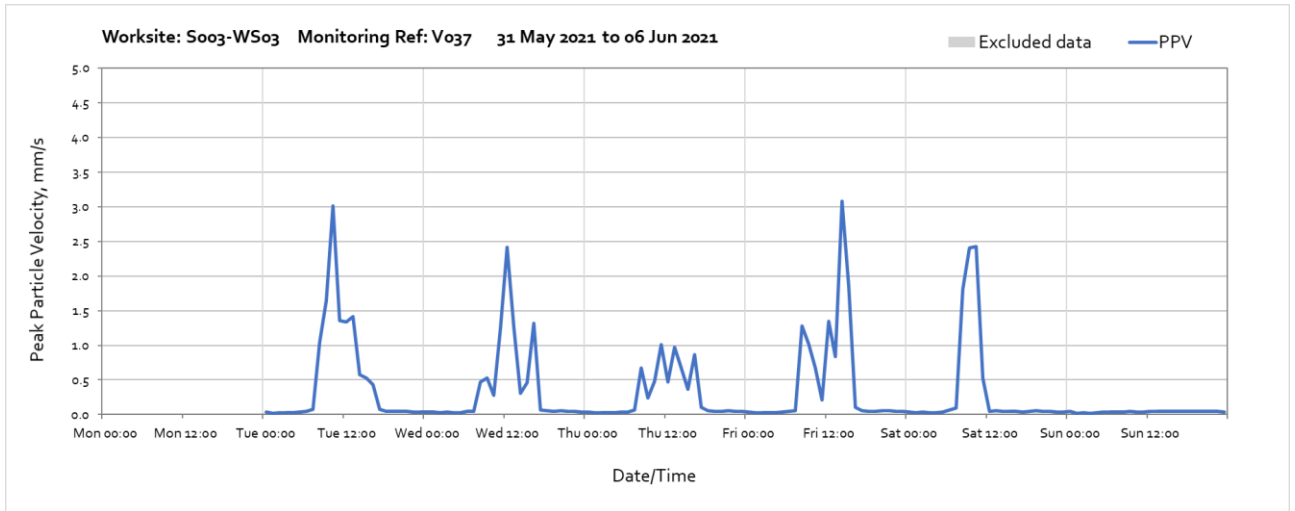


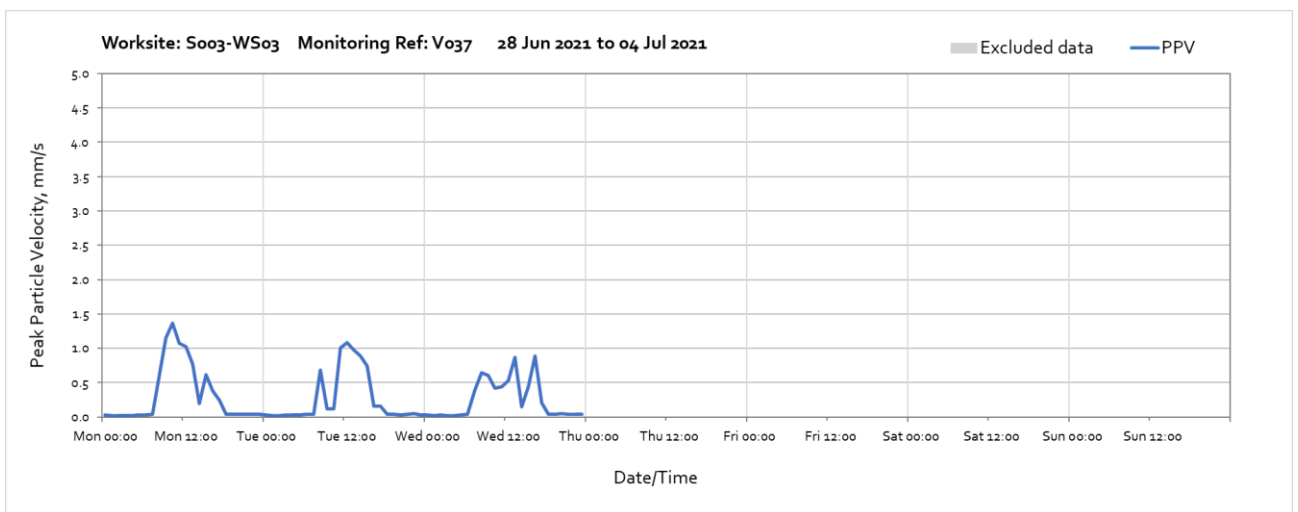
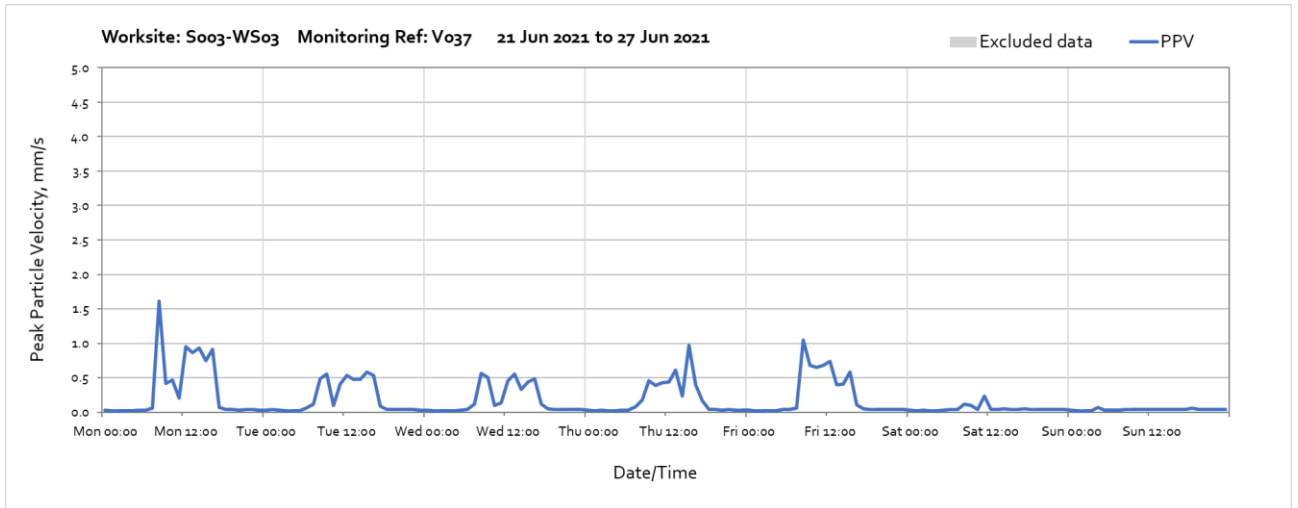


Note: High vibration levels measured from 15:00 until 16:00 on Thursday 17<sup>th</sup> June were due local interference of the monitor and are not representative of HS2 vibration levels.

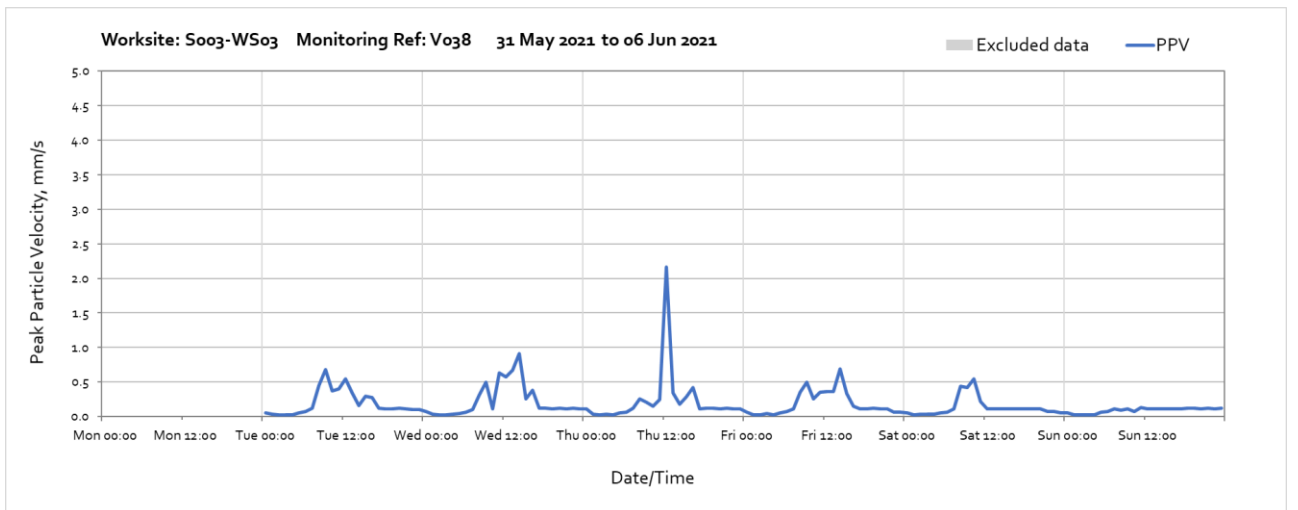


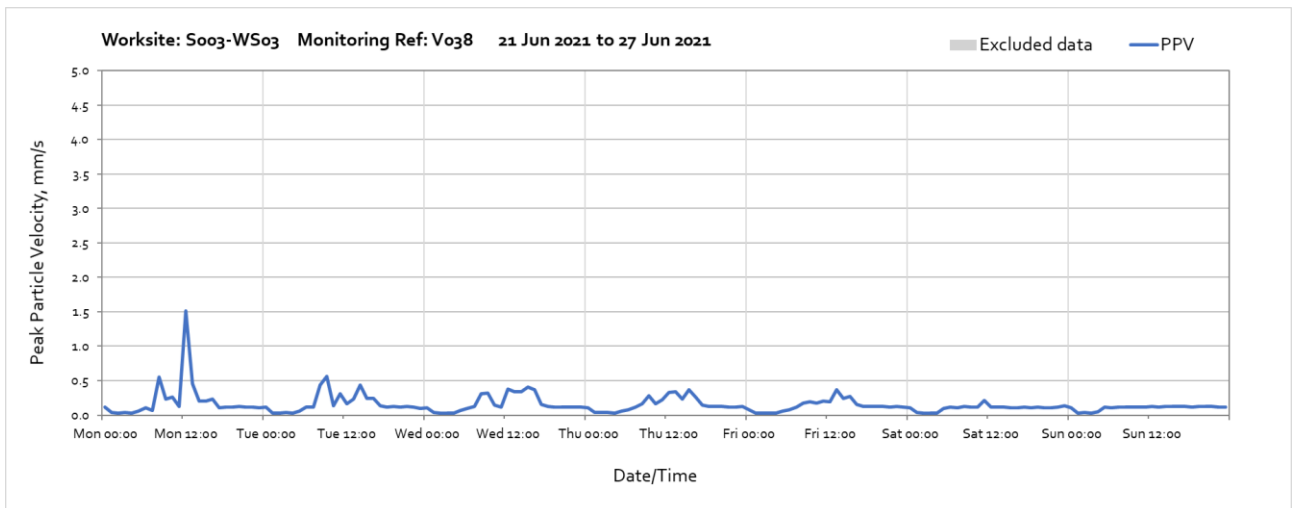
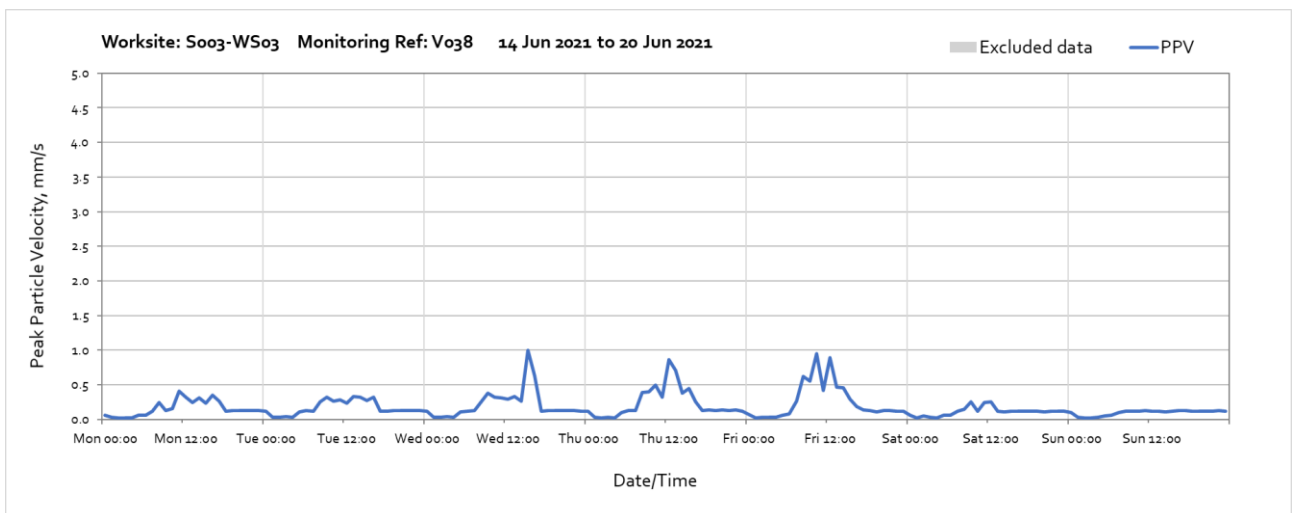
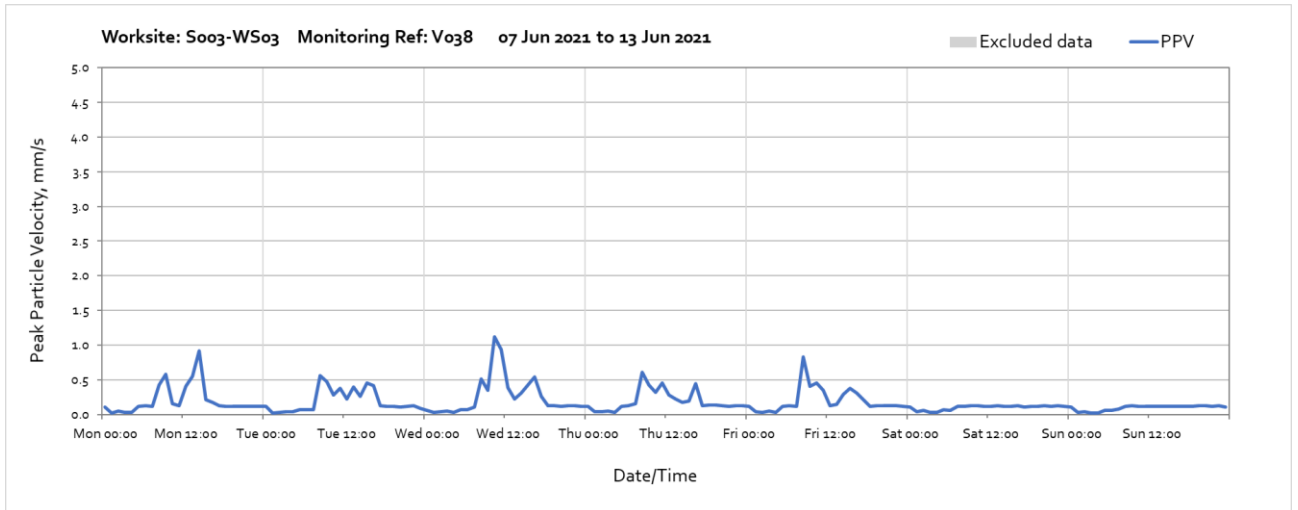
# Worksite: S003-WS03 – Monitoring Ref: V037

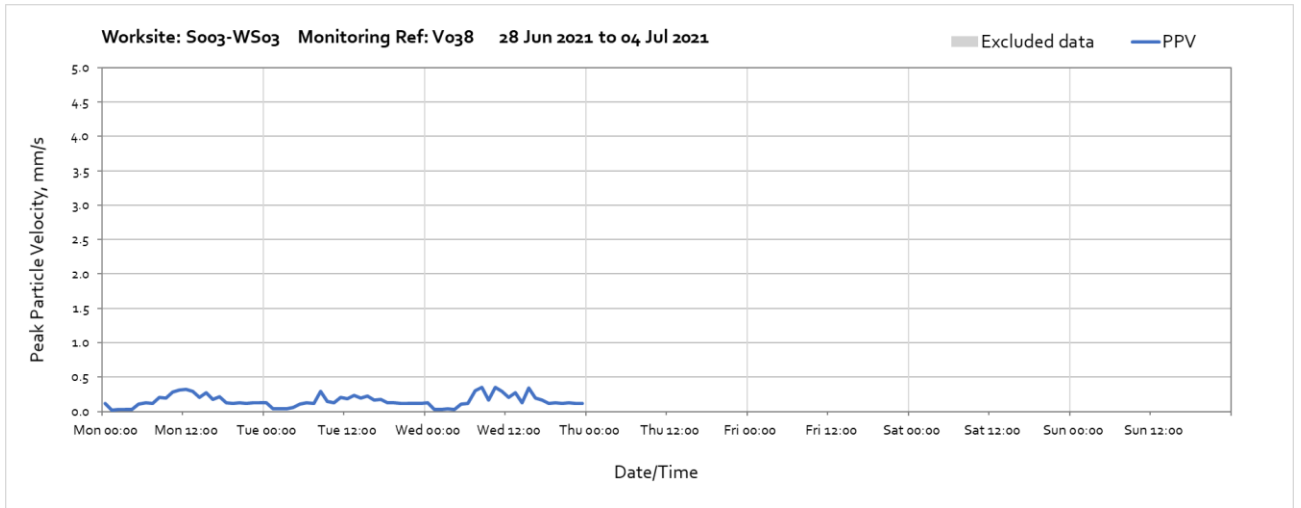




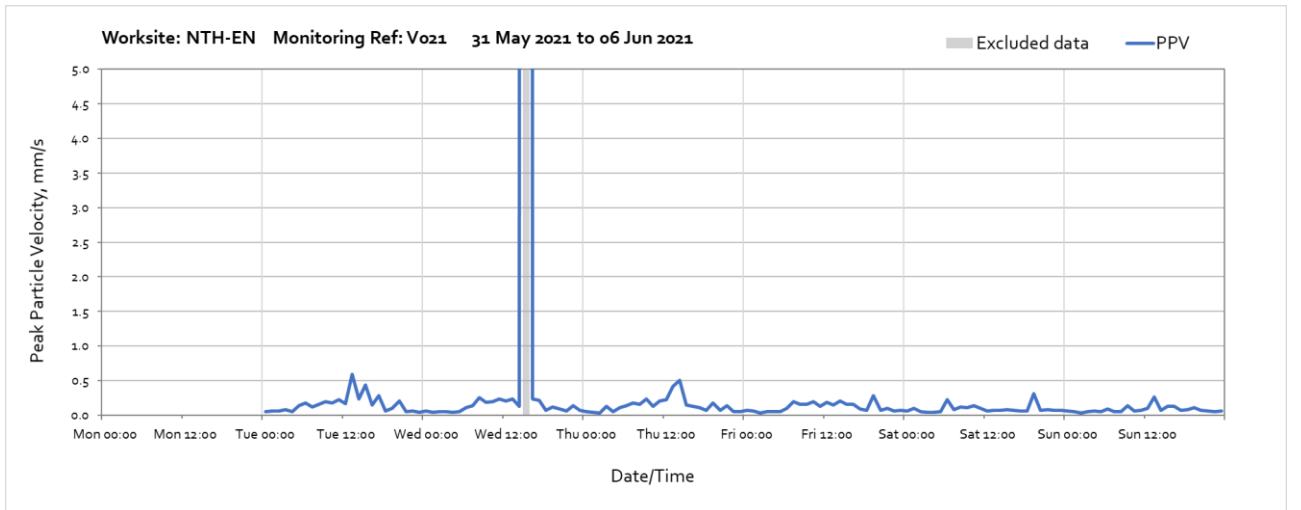
**Worksite: S003-WS03 – Monitoring Ref: V038**



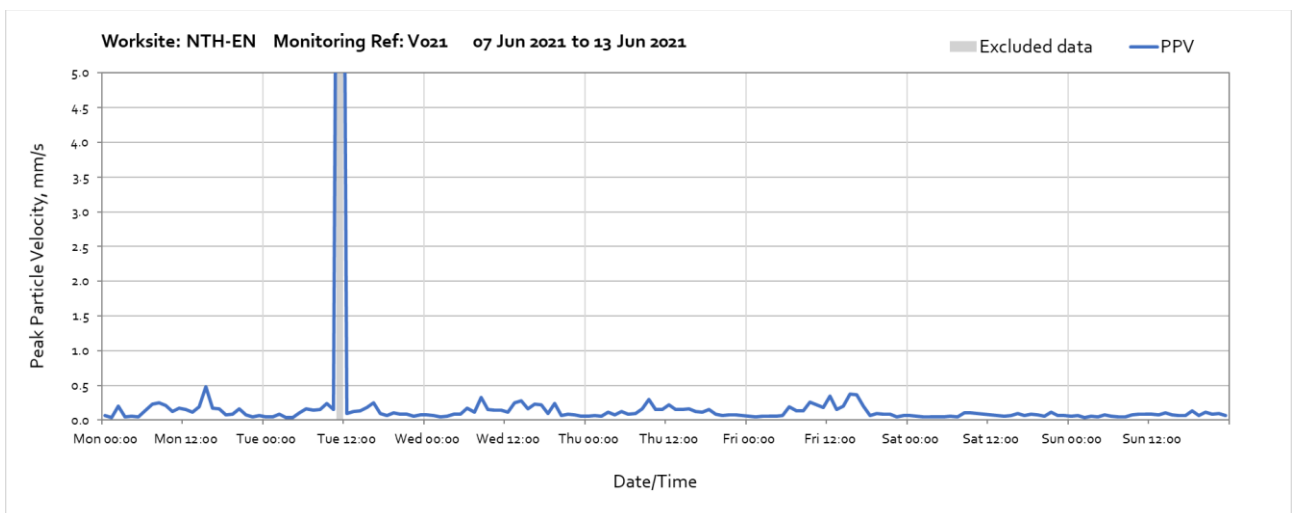




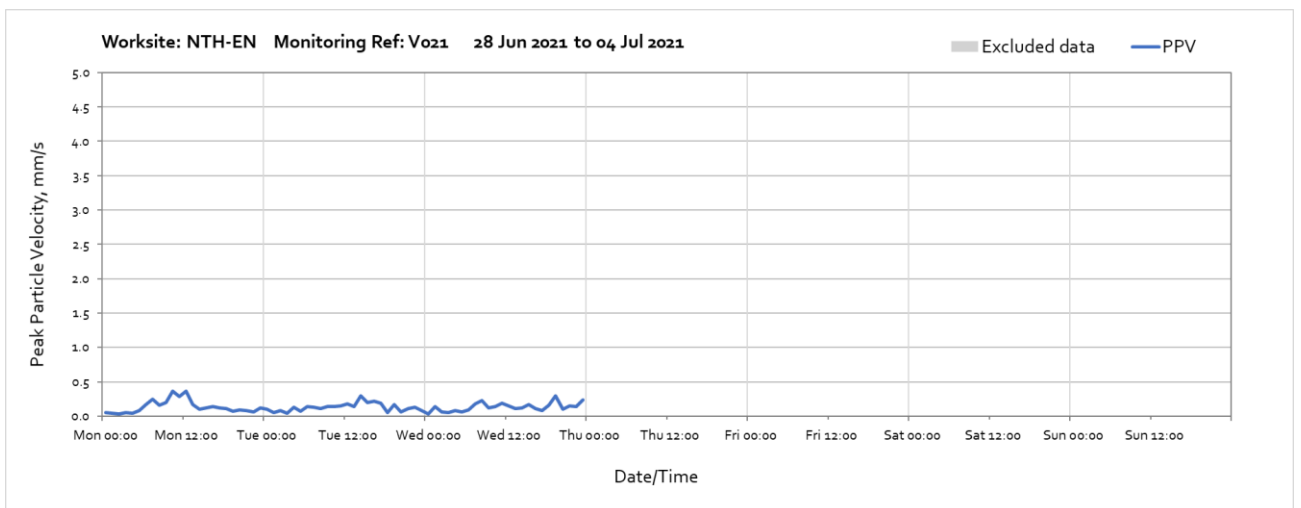
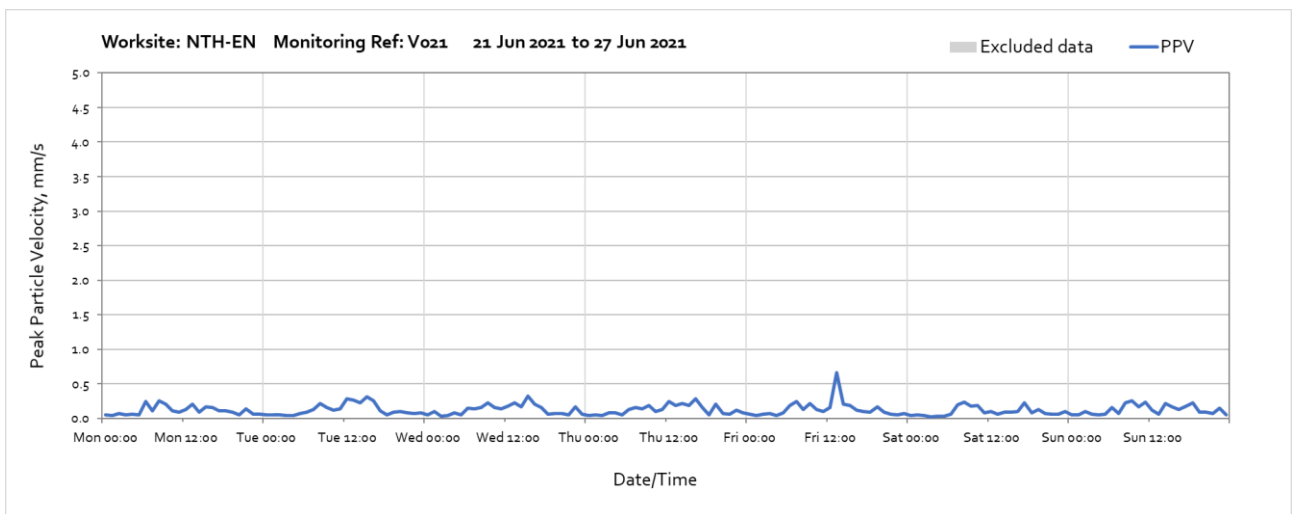
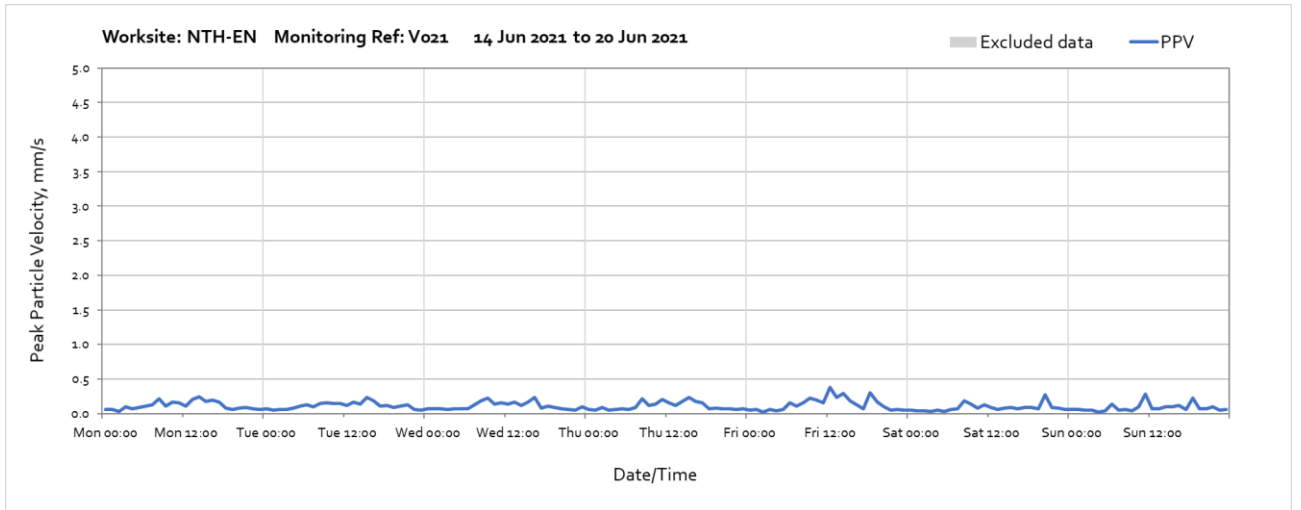
### Worksite: NTH-EN - Monitoring Ref: V021



Note: High vibration levels measured from 15:00 until 16:00 on Wednesday 2<sup>nd</sup> June were due local interference of the monitor and are not representative of HS2 vibration levels.

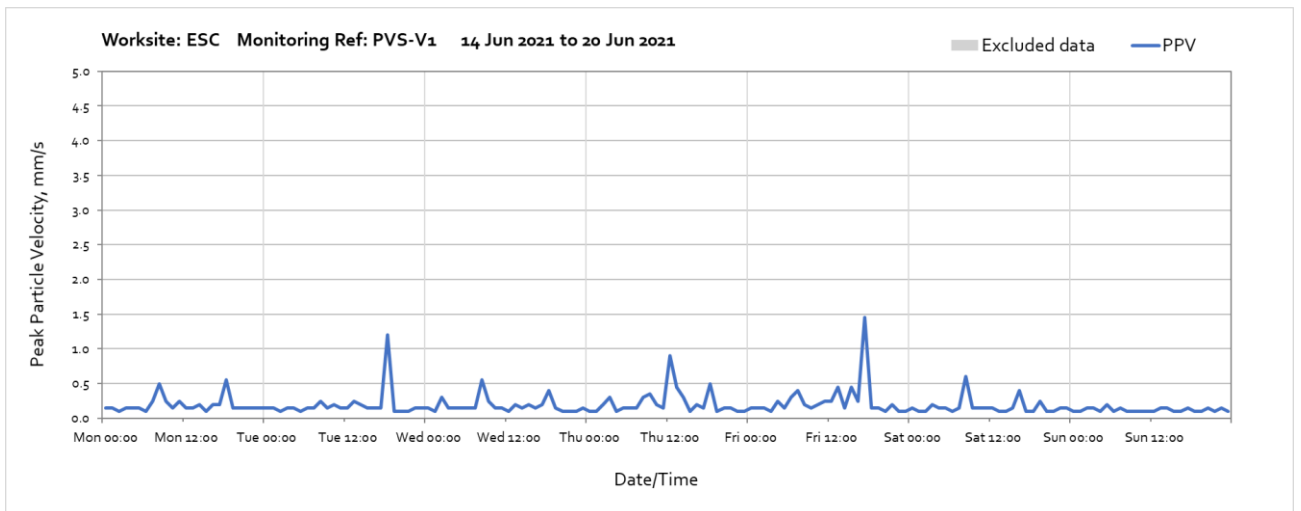
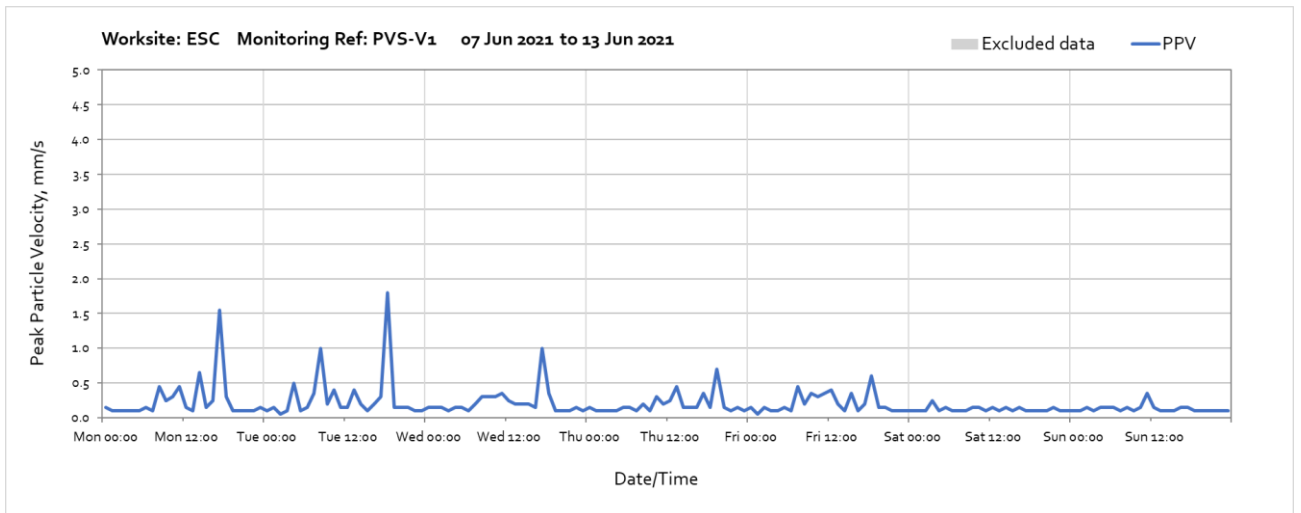
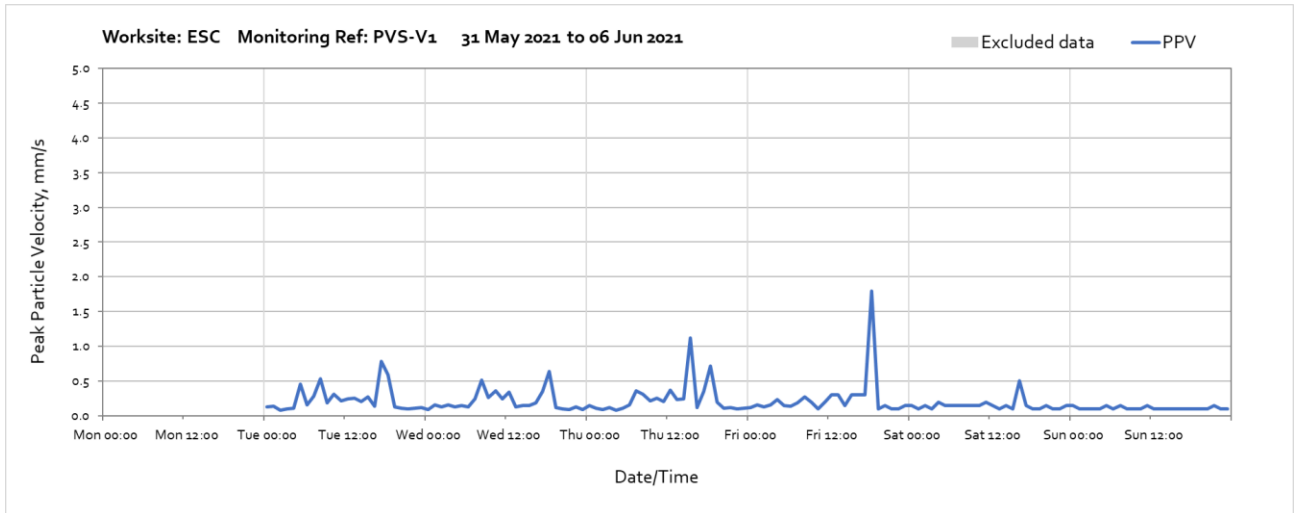


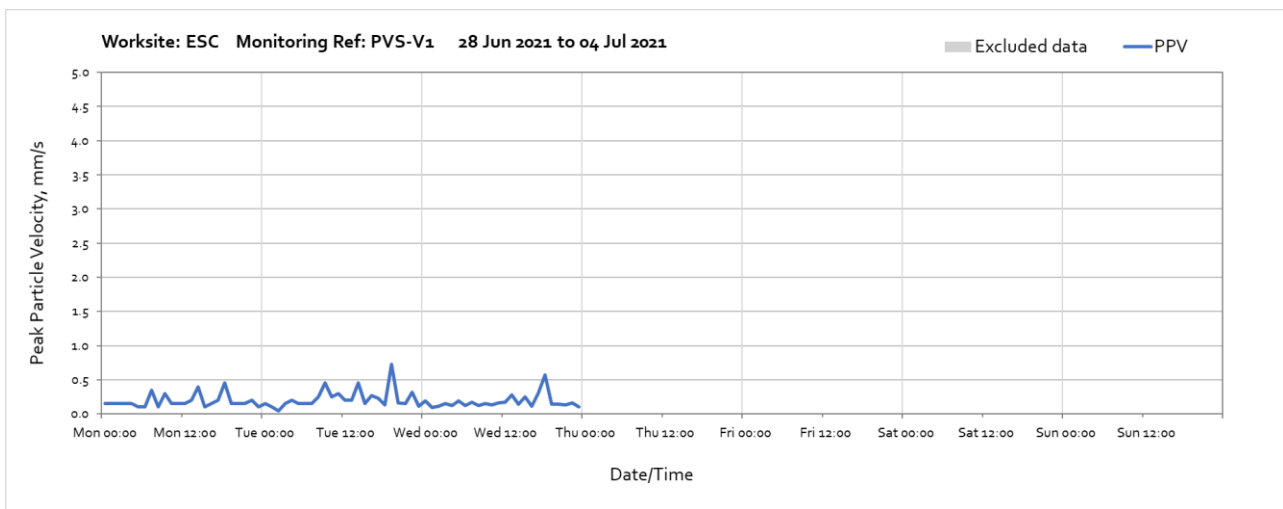
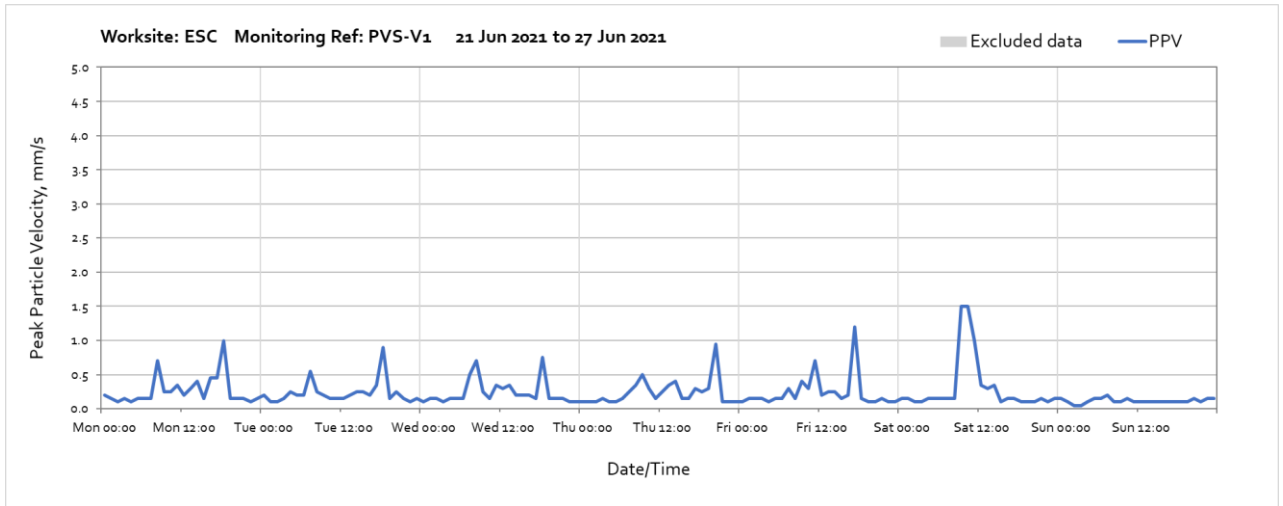
Note: High vibration levels measured from 11:00 until 12:00 on Tuesday 8<sup>th</sup> June were due local interference of the monitor and are not representative of HS2 vibration levels.



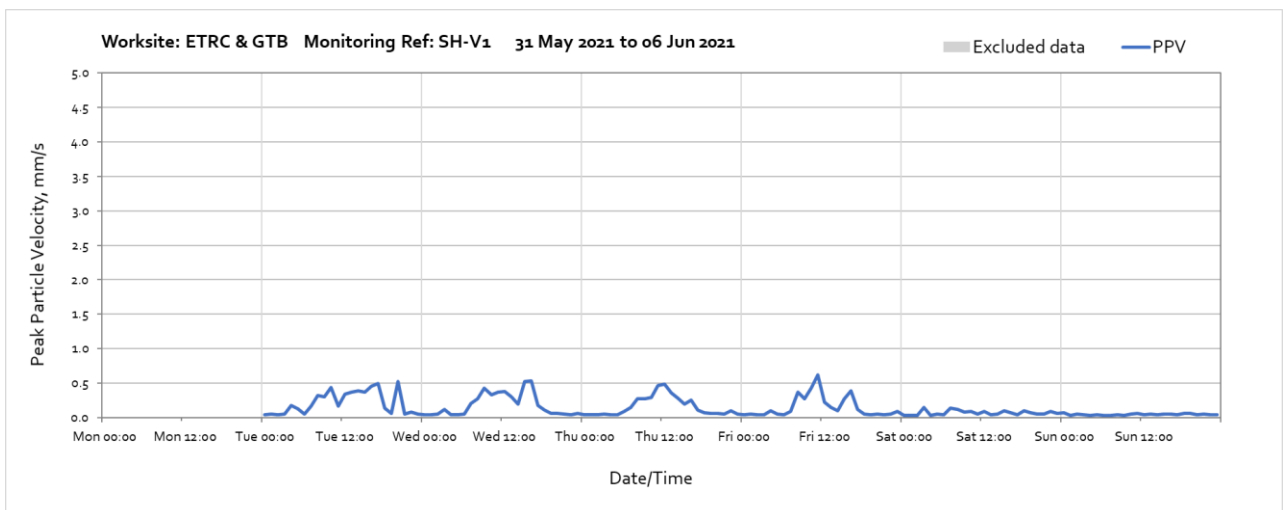


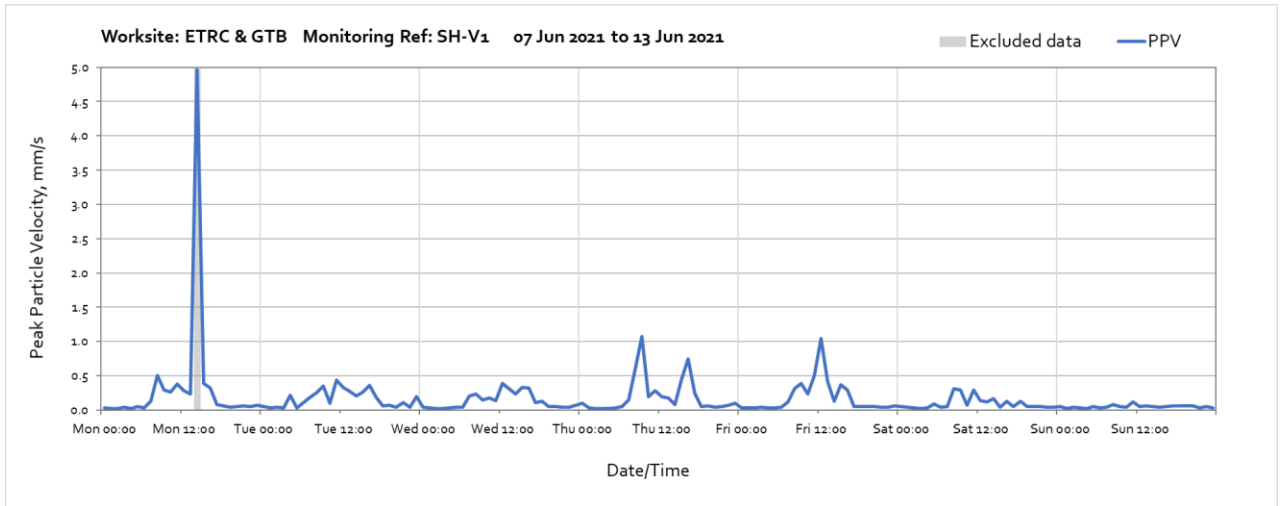
## Worksite: ESC – Monitoring Ref: PVS-V1



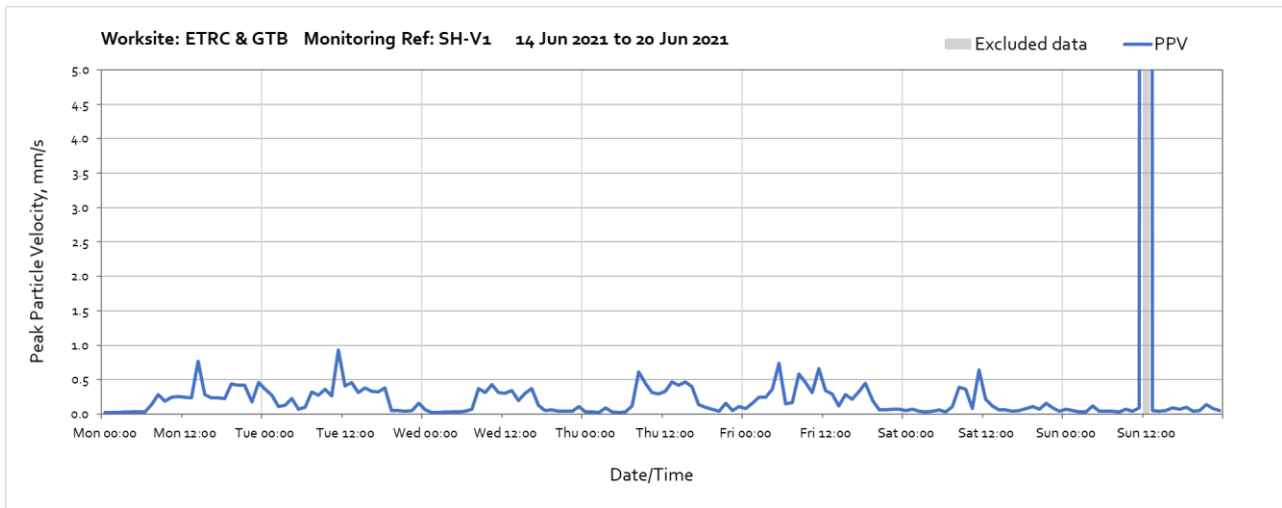


**Worksite: ETRC & GTB – Monitoring Ref: SH-V1**

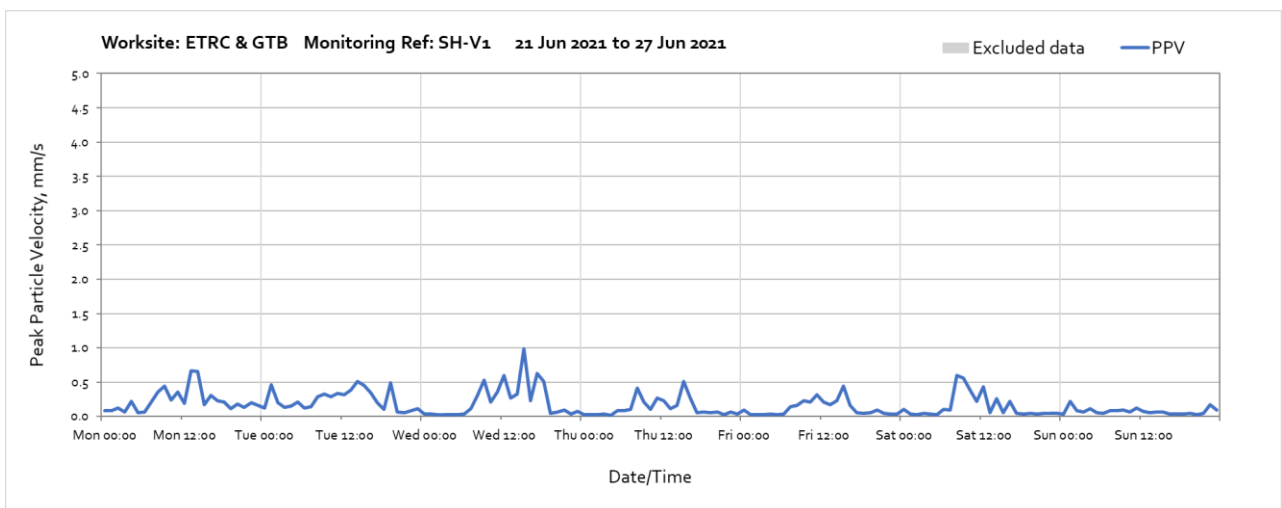


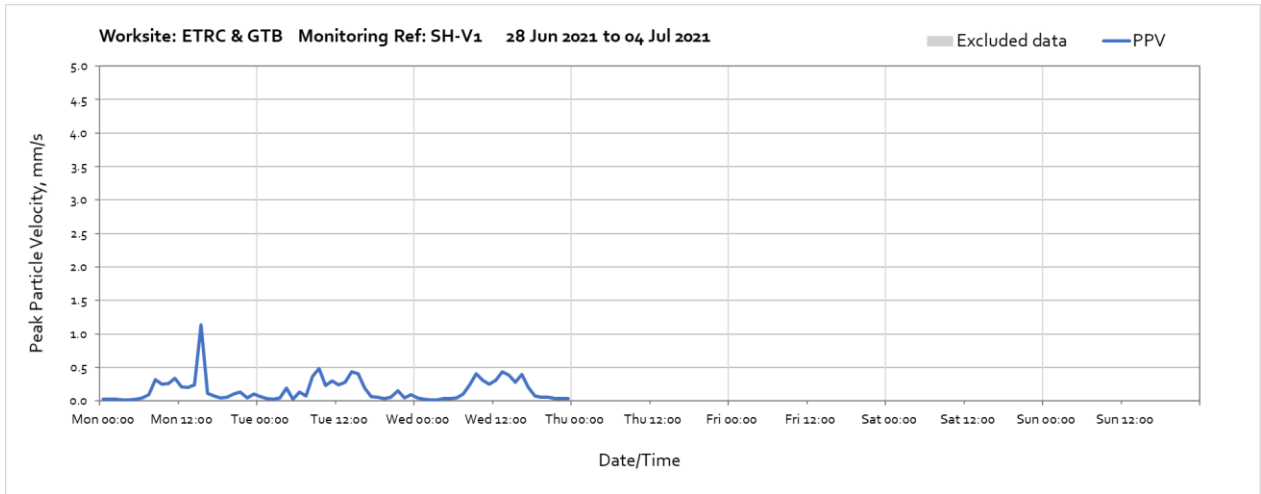


Note: High vibraton levels measured from 14:00 until 15:00 on Monday 7<sup>th</sup> June were due local intereference of the monitor and are not representative of HS2 vibration levels.

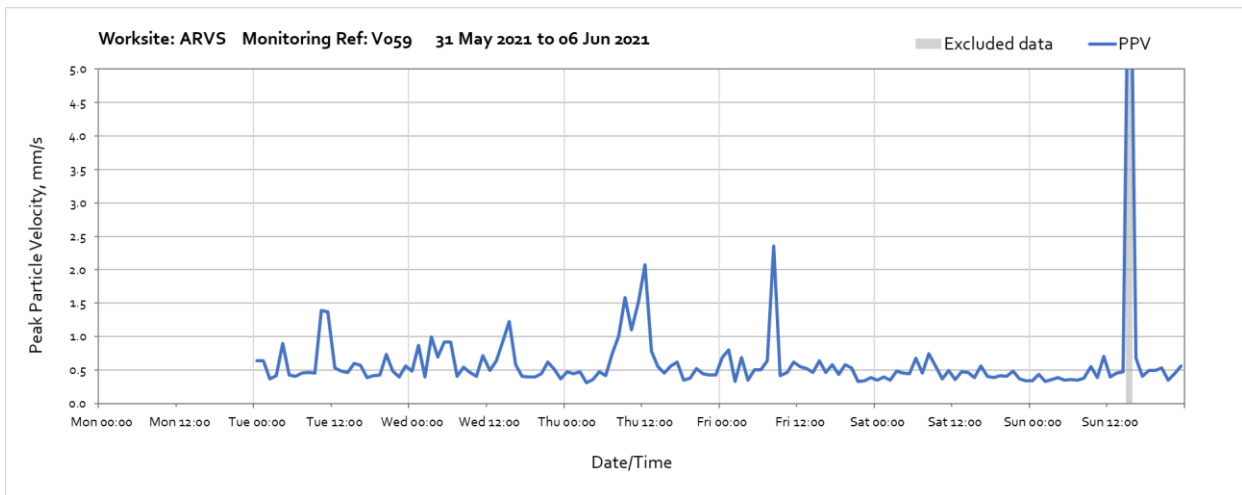


Note: High vibraton levels measured from 12:00 until 13:00 on Sunday 20<sup>th</sup> June were due local intereference of the monitor and are not representative of HS2 vibration levels.

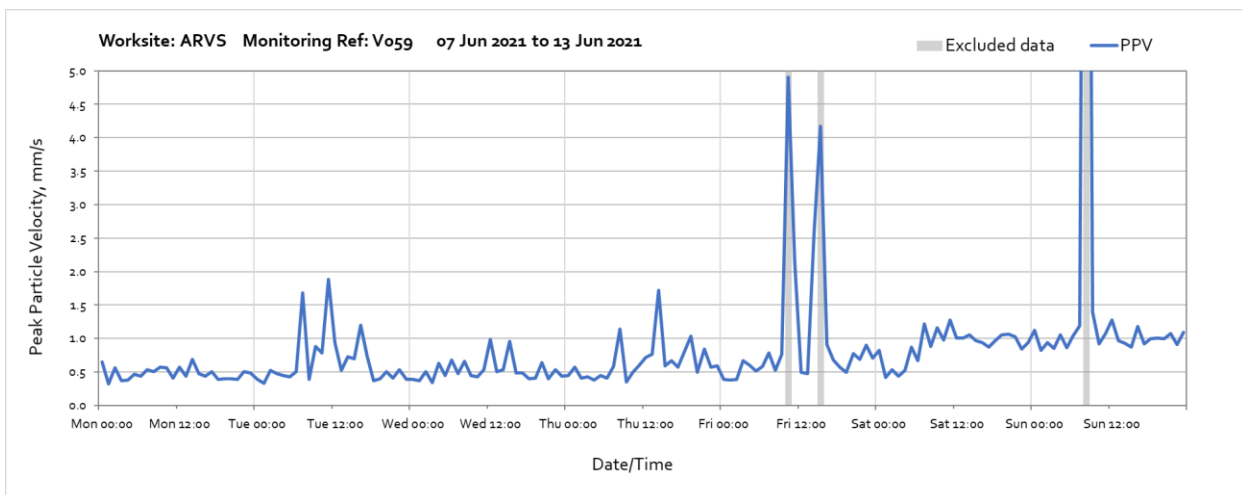




### Worksite: ARVS – Monitoring Ref: V059

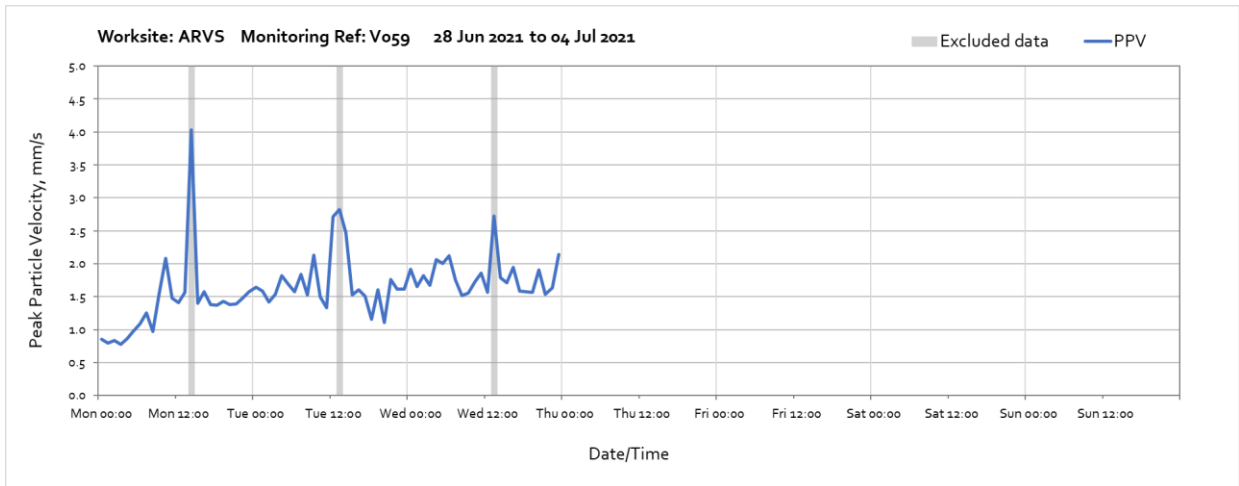
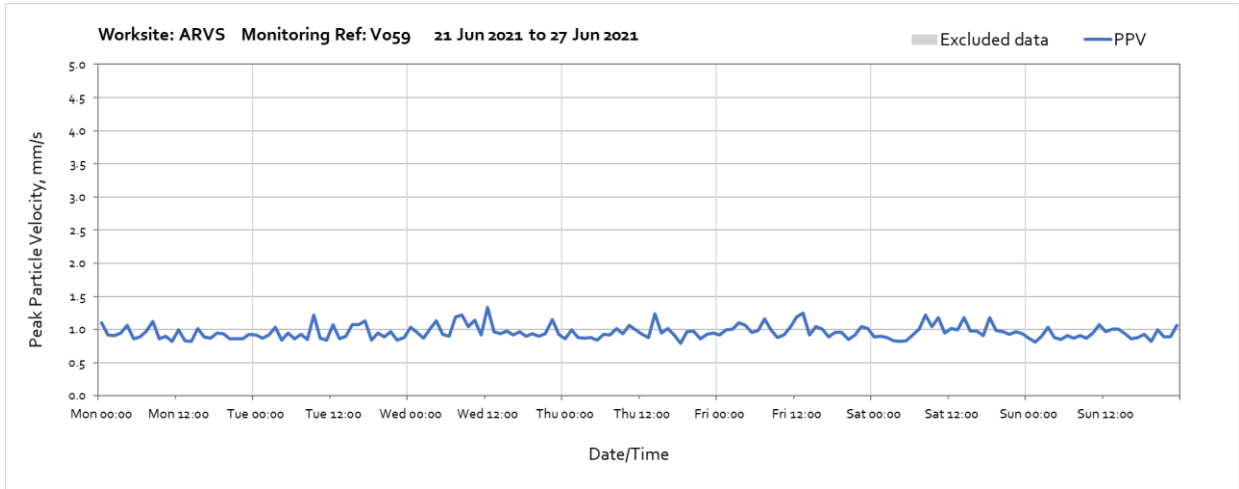
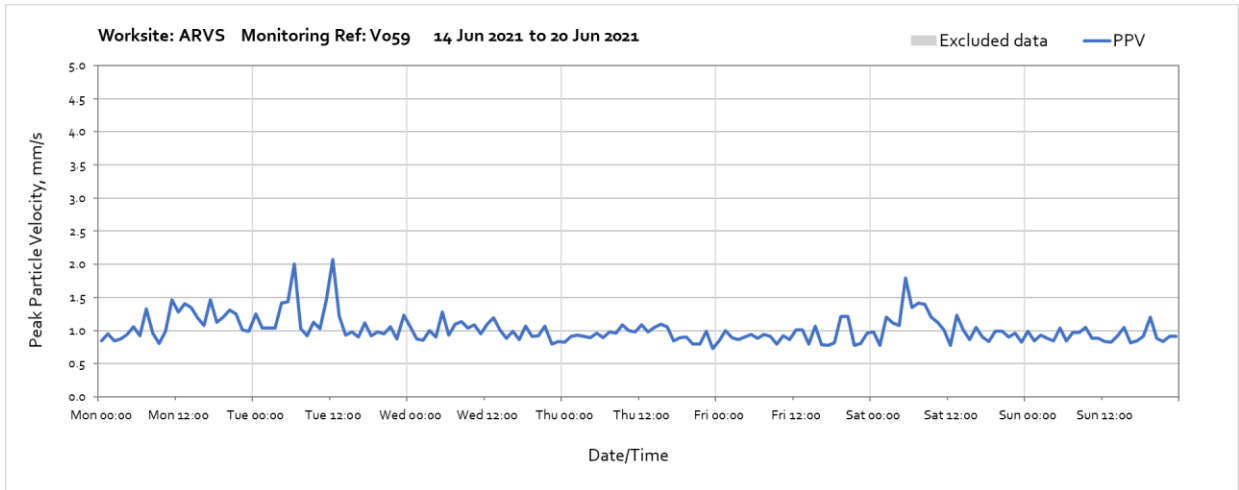


Note: High levels of vibration measured from 15:00 until 16:00 on Sunday 6<sup>th</sup> June were due to local interference of the monitor and are not representative of HS2 vibration levels.



Note: High vibration levels measured throughout the week were due to local interference of the monitor and are not representative of HS2 vibration levels.

OFFICIAL



Note: High vibration levels measured throughout the week were due to local interference of the monitor and are not representative of HS2 vibration levels.