

Construction noise and vibration Monthly Report – April 2021

London Borough of Camden

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Non-Technical Summary

This Noise and Vibration Monitoring Report fulfils HS2 Limited's commitment detailed in the Environmental Minimum Requirements (EMRs), Annex 1, Code of Construction Practice, to present the results of noise and vibration monitoring carried out within the London Borough of Camden during the month of April 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, installation of new sliding gates, installation of security cameras and closed-circuit television systems, asbestos removal and retraining wall investigations were underway.
- Noise monitoring was undertaken in the vicinity of Euston Throat Retained Cut and Granby Terrace Bridge worksite (ref.: ETRC & GTB) where guide wall construction, polymer silo installation and grouting, excavations, piling, groundworks and preparations for the removal of Granby Terrace bridge and parapets were underway.
- Noise monitoring was undertaken in the vicinity of Euston Scissor Cut worksite (ref.: ESC) where piling, removal of waste materials, pile mat and guide wall installation, installation of access ramp, survey and haul road maintenance were underway. A rail line blockade started on 2nd April and was ongoing throughout the month allowing the installation of piles during the daytime adjacent to the rail line. Night-time works during the blockade did not have any piling or concrete related activity, with minimal amount of plant used (crane and hand tools).
- Noise and vibration monitoring was undertaken in the vicinity of the Hampstead Road Bridge worksite (ref.: HRB) where installation of hauling, installation of haul road access and installation of traffic management systems were underway.
- Noise and vibration monitoring was undertaken in the vicinity of the Euston Cavern worksite (ref.: ECAV), where testing and installation of ground anchors, wall coring, hoarding works and piling.
- Noise monitoring was undertaken in the vicinity of On-Network worksites (ref.: B, C, D, E, F, G and H), where:
 - permanent earthing section, mileage post and bulk timber installation (worksites C, D and E);
 - cabling works (worksite E);
 - signalhead installation (worksite G); and
 - mechanical, electrical and plumbing assets installation (worksite H) were underway.
- Noise monitoring was undertaken in the vicinity of the 140 Hampstead Road and Power Signal Box worksite (ref.: S001-WS02), where groundworks and demolition were 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), hoarding works, installation of slope measurement gauges, drilling of boreholes and site maintenance were underway.
- Noise monitoring was undertaken in the vicinity of the Euston Towers Demolition worksite (ref.: ETD), where investigations of existing piles and installation of basement propping were underway.
- Noise monitoring was undertaken in the vicinity of the Vehicle Holding Area worksite (ref.: VHA), where concrete slab construction and site setup were underway.
- Noise monitoring was undertaken in the vicinity of the Traction Substation worksite (ref.: TSS) where deliveries were underway.
- Noise monitoring was undertaken in the vicinity of the Interim Taxi Rank worksite (ref.: ITR), where hoarding works, roadworks, installation of concrete blockwork and installation of railing protection boxes were underway.

Further works were also undertaken at:

- Stephenson Way, Regnart Buildings, Drummond Street, Gower Street and Harrington Street where utilities works were underway.
- Euston Road, where borehole drilling as part of ground investigation 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 on twelve (12) occasions due to HS2 works in the Local Authority Area during April 2021.

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

Ten (10) 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 1st to 30th April 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;
 - installation of new sliding gates;
 - installation of security cameras and closed-circuit television systems
 - asbestos removal; and
 - retaining wall investigations.
- Euston Throat Retained Cut and Granby Terrace Bridge worksite ref.: ETRC & GTB (see plan 2 in Appendix A), where work activities included:
 - guide wall construction;
 - polymer silo installation and grouting;
 - excavations;
 - continuous flight auger (CFA) piling and sheet piling;
 - groundworks to provide ramp access utilising a roller; and
 - preparations for the removal of Granby Terrace bridge and parapets.

- Euston Scissor Cut worksite ref.: ESC (see plan 2 in Appendix A), where work activities included:
 - CFA and sheet piling;
 - removal of waste materials from site;
 - pile mat installation;
 - installation of access ramp;
 - track surveys;
 - haul road maintenance; and
 - activities undertaken during a rail line blockage (piling during the daytime and light works using a crane and hand tools during the night-time).
- Hampstead Road Bridge worksite ref.: HRB (see plan 3 in Appendix A), where work activities included:
 - installation of hoarding;
 - installation of haul road access; and
 - installation of traffic management systems.
- Euston Cavern worksite ref.: ECAV (see plan 3 in Appendix A), where work activities included:
 - testing of ground anchors;
 - wall coring and ground anchor installation;
 - bridge investigations;
 - hoarding works; and
 - steel sheet piling.
- On-Network worksites ref.: C, D, E, F, G and H (see plan 3 in Appendix A), where work activities included:
 - permanent earthing section, mileage post and bulk timber installation (worksites C, D and E);
 - cabling works (worksite E);
 - signalhead installation (worksite G);
 - mechanical, electrical and plumbing assets installation (worksite H);
- 140 Hampstead Road and Power Signal Box worksite ref.: S001-WS02 (see plan 2 in Appendix A), where work activities included:
 - groundworks (ground remediation); and
 - superstructure 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:
 - hoarding works;
 - installation of inclinometers;
 - drilling of ground investigation boreholes; and
 - site maintenance.
- Euston Towers Demolition worksite ref.: ETD (see plan 3 in Appendix A), where work activities included:
 - investigations of existing piles; and
 - installation of basement propping.
- Vehicle Holding Area worksite ref.: VHA (see plan 1 in Appendix A), where work activities included:
 - steel fixing of concrete slabs;
 - concrete pouring; and
 - site setup.
- Traction Substation worksite ref.: TSS (see plan 3 in Appendix A), where work activities included:
 - deliveries.
- Interim Taxi Rank worksite ref.: ITR (see plan 3 in Appendix A), where work activities included:
 - hoarding works;
 - roadworks (excavation of haul road, laying and compaction of aggregates);
 - installation of concrete blockwork; and
 - installation of railing protection boxes.

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

- Stephenson Way, Regnart Buildings, Drummond Street, Gower Street and Harrington Street where utilities works were undertaken; and
- Euston Road, where borehole drilling as part of ground investigation 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 nine (9) vibration monitoring installations were active across fifteen (15) worksites in April in the LBC area. Table 2 summarises the position of noise and vibration monitoring installations within the LBC area in April 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 |
| 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 |

| Worksite Reference | Measurement Reference | Address |
|---------------------|-----------------------|---|
| G | HH | Euston Station Parcel Deck, Barnby Street |
| | BS | Roof of Stockbeck House, Barnby Street |
| 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 | 66.9 (68.3) | 68.0 (69.6) | 67.7 (73.0) | 68.1 (74.9) | 64.2 (73.0) | 65.2 (65.9) | 66.8 (67.1) | 69.2 (71.1) | 67.7 (70.7) | 64.5 (69.0) | 67.9 (75.8) | 64.2 (73.0) |
| | N052 | Adelaide Road-Beaumont Walk | Free-field | 65.7 (68.1) | 67.9 (70.7) | 66.6 (70.3) | 67.5 (75.6) | 62.9 (74.7) | 65.4 (70.0) | 66.3 (68.7) | 69.0 (73.3) | 66.7 (69.8) | 62.6 (67.6) | 65.7 (71.4) | 62.9 (70.0) |
| B | JC | Juniper Crescent | Free-field | 56.1 (59.4) | 55.9 (57.4) | 55.2 (58.4) | 56.8 (60.7) | 54.5 (64.7) | 54.9 (56.0) | 55.4 (56.9) | 54.9 (56.9) | 54.4 (55.9) | 50.0 (55.8) | 54.4 (57.8) | 54.1 (62.0) |
| ESC | N024 | External to Park Village Studios, Park Village East | Free-field | 59.1 (62.4) | 61.4 (72.1) | 60.5 (67.4) | 58.4 (69.5) | 54.7 (76.6) | 55.2 (56.5) | 60.3 (69.2) | 61.4 (70.9) | 60.2 (70.7) | 52.9 (57.5) | 59.1 (70.5) | 53.6 (60.3) |
| | N047 | Park Village East/Mornington Street bridge, lamppost #13 | Free-field | 59.1 (63.4) | 62.1 (65.3) | 60.5 (62.8) | 58.6 (63.1) | 53.6 (63.0) | 56.7 (57.7) | 60.1 (62.4) | 59.2 (60.0) | 59.3 (62.4) | 52.9 (57.4) | 57.7 (61.2) | 53.2 (57.6) |
| ESC, C | N022 | External to 34 Mornington Terrace | Free-field | 58.5 (59.8) | 62.4 (68.5) | 58.8 (60.4) | 57.3 (59.3) | 53.5 (61.8) | 56.7 (57.3) | 59.1 (59.8) | 58.5 (60.8) | 57.6 (59.8) | 51.6 (56.6) | 56.8 (60.9) | 53.9 (61.5) |
| | N046 | Mornington Terrace near The Edinboro Castle pub, lamppost #18 | Free-field | 62.0 (64.0) | 63.9 (69.7) | 61.7 (63.7) | 59.9 (62.7) | 57.6 (69.6) | 60.3 (61.1) | 62.2 (63.1) | 62.6 (65.0) | 60.4 (63.5) | 55.8 (63.4) | 60.1 (64.8) | 56.4 (62.5) |
| ETRC & GTB | N001 | External to Cubitt Court, 100 Park Village East | Free-field | 59.2 (63.6) | 66.1 (68.6) | 60.5 (64.0) | 58.4 (62.0) | 53.0 (60.3) | 56.5 (56.9) | 64.8 (69.5) | 59.3 (61.4) | 58.8 (62.2) | 52.6 (57.6) | 58.6 (69.6) | 52.6 (56.4) |
| | N002 | Richmond Court, Park Village East | Free-field | 58.9 (63.3) | 63.6 (67.5) | 61.3 (62.8) | 58.8 (61.8) | 53.6 (63.9) | 56.3 (57.3) | 60.9 (61.7) | 60.0 (61.0) | 59.4 (62.0) | 53.0 (57.9) | 57.9 (61.0) | 53.1 (59.4) |

| 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 |
| | N003 | Silsoe House, Park Village East | Façade | 58.5 (60.2) | 62.9 (68.2) | 61.6 (63.2) | 59.2 (62.0) | 53.8 (63.5) | 56.9 (57.1) | 60.0 (60.5) | 60.2 (61.0) | 59.7 (62.1) | 53.4 (58.2) | 58.0 (61.1) | 53.5 (57.4) |
| ETRC & GTB, D | N004 | Mornington Terrace, lamppost #7 | Free-field | 64.7 (68.7) | 68.4 (73.6) | 65.9 (71.4) | 63.6 (72.3) | 62.1 (70.8) | 66.0 (70.1) | 66.5 (69.8) | 65.8 (70.3) | 66.7 (73.0) | 62.6 (71.6) | 65.3 (72.9) | 63.5 (70.8) |
| ETRC & GTB, E | N005 | 5A Granby Terrace | Free-field | 64.5 (66.9) | 67.5 (70.8) | 63.5 (65.5) | 62.7 (67.2) | 60.9 (65.7) | 63.5 (64.4) | 64.8 (65.3) | 62.7 (64.3) | 62.0 (65.8) | 60.5 (62.8) | 62.1 (66.6) | 60.0 (63.0) |
| ETRC & GTB, F | N023 | Lamppost #21 on Hampstead Road | Free-field | 69.4 (71.0) | 70.1 (71.2) | 68.9 (72.8) | 68.5 (74.6) | 65.8 (75.9) | 67.8 (70.0) | 68.0 (68.9) | 69.1 (70.6) | 68.2 (72.3) | 65.2 (68.3) | 68.5 (75.0) | 65.3 (70.9) |
| HRB | N020 | Mackworth Street, lamppost #1 | Free-field | 55.6 (58.5) | 64.5 (68.2) | 54.7 (62.1) | 52.2 (58.9) | 50.1 (63.9) | 52.6 (53.8) | 59.8 (61.9) | 53.9 (57.7) | 52.2 (54.0) | 49.4 (53.1) | 53.2 (60.6) | 53.9 (74.5) |
| | N021 | Stanhope Street, lamppost #2 | Free-field | 58.3 (62.1) | 64.5 (69.3) | 59.3 (61.7) | 56.6 (60.3) | 52.2 (62.7) | 54.7 (55.2) | 62.8 (70.0) | 58.4 (60.2) | 57.6 (61.5) | 51.5 (55.6) | 57.8 (71.5) | 51.3 (56.1) |
| | N044 | Regents Park Estate west, near Langdale | Free-field | 55.7 (64.2) | 70.7 (75.7) | 56.7 (68.2) | 52.7 (67.3) | 48.9 (62.7) | 54.3 (58.8) | 67.7 (76.7) | 55.6 (61.2) | 52.6 (55.0) | 48.9 (53.1) | 53.8 (68.7) | 48.3 (53.9) |
| | N045 | Regents Park Estate south, external to Coniston | Free-field | 57.9 (61.9) | 68.2 (72.5) | 58.9 (70.9) | 56.4 (68.9) | 53.1 (60.3) | 58.0 (60.8) | 66.7 (68.0) | 58.1 (59.8) | 57.2 (59.6) | 53.1 (57.1) | 59.2 (72.4) | 53.2 (58.3) |
| G | HH | Euston Station Parcel Deck, Barnby Street | Free-field | 58.9 (67.3) | 59.7 (62.7) | 60.8 (66.6) | 60.3 (70.4) | 56.6 (72.9) | 57.6 (60.6) | 58.9 (62.0) | 57.6 (58.5) | 59.8 (68.9) | 55.1 (60.0) | 58.6 (68.3) | 55.8 (60.3) |
| | BS | Roof of Stockbeck House, Barnby Street | Free-field | 61.9 (64.2) | 61.4 (62.9) | 60.5 (62.4) | 61.0 (63.9) | 56.9 (61.8) | 60.6 (62.3) | 60.8 (61.0) | 59.7 (60.9) | 60.0 (61.9) | 55.6 (62.6) | 60.4 (64.3) | 57.4 (61.6) |
| S001-WS02 | N018 | Outside replacement housing, Hampstead Road | Free-field | 69.0 (70.0) | 71.0 (73.1) | 69.9 (74.0) | 69.8 (76.5) | 66.6 (73.8) | 67.2 (68.8) | 69.0 (70.5) | 69.9 (71.6) | 69.3 (73.1) | 66.6 (71.4) | 69.4 (75.3) | 65.8 (71.7) |

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| 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 |
| | N019 | Outside Cartmel, Hampstead Road | Free-field | 57.6 (58.9) | 63.2 (71.7) | 57.9 (65.2) | 56.8 (62.9) | 54.5 (62.2) | 56.7 (57.8) | 60.4 (61.5) | 57.7 (59.3) | 57.2 (60.8) | 54.3 (56.8) | 57.0 (65.7) | 54.3 (58.0) |
| S003-WS03, ETD, TSS | N006 | Royal College of General Practitioners roof level | Free-field | 58.7 (65.1) | 66.3 (71.7) | 55.5 (62.5) | 54.9 (57.0) | 54.7 (64.4) | 57.0 (58.2) | 61.9 (66.9) | 54.4 (55.9) | 54.7 (56.2) | 54.8 (57.2) | 54.8 (57.1) | 53.7 (56.7) |
| S003-WS03, TSS | N008 | Stephenson's Way lamppost (external to RCGP) | Façade | 60.8 (70.4) | 70.5 (76.8) | 54.6 (64.0) | 53.7 (55.6) | 54.4 (70.1) | 58.5 (59.8) | 68.8 (74.8) | 57.2 (61.8) | 56.7 (72.6) | 53.2 (55.3) | 54.2 (57.9) | 53.7 (59.1) |
| | N010 | Wesley Hotel | Façade | 59.3 (67.5) | 66.9 (72.1) | 55.0 (66.5) | 54.9 (66.7) | 54.0 (66.8) | 58.1 (67.1) | 65.2 (71.0) | 59.5 (66.2) | 56.2 (66.0) | 51.1 (52.7) | 52.1 (54.5) | 55.4 (65.9) |
| | N011 | Outside 82 Euston Street | Free-field | 56.6 (60.2) | 60.1 (62.7) | 57.4 (63.9) | 55.2 (60.0) | 53.1 (62.6) | 53.7 (54.0) | 58.0 (59.3) | 55.8 (56.9) | 57.1 (69.8) | 51.4 (54.7) | 55.2 (61.8) | 52.6 (61.2) |
| S003-WS03, ETD | N007 | Royal College of General Practitioners, Melton Street | Free-field | 63.8 (66.6) | 65.5 (67.9) | 62.8 (65.9) | 62.5 (66.3) | 61.2 (67.6) | 61.9 (62.4) | 62.3 (63.5) | 61.7 (63.5) | 62.9 (68.9) | 60.1 (63.8) | 61.5 (65.3) | 60.5 (64.5) |
| VHA | N025 | External to 3 Prince Albert Road | Free-field | 67.8 (72.9) | 67.6 (69.6) | 67.0 (69.8) | 66.0 (69.9) | 63.0 (69.0) | 65.8 (67.7) | 66.2 (67.8) | 65.7 (66.2) | 66.2 (71.5) | 63.1 (68.2) | 66.2 (75.6) | 62.9 (69.3) |
| | N026 | Thames Water Compound | Free-field | 57.1 (61.2) | 62.3 (67.2) | 56.5 (58.8) | 55.1 (62.7) | 52.4 (64.8) | 54.2 (54.6) | 56.0 (56.9) | 55.8 (56.4) | 56.2 (60.5) | 51.9 (56.3) | 54.9 (59.8) | 51.4 (56.6) |

| 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 | 58.1 (62.5) | 66.0 (72.6) | 58.1 (64.1) | 57.8 (59.7) | 56.4 (59.1) | 57.1 (58.7) | 61.3 (68.0) | 58.6 (59.2) | 58.2 (59.3) | 56.7 (58.2) | 58.6 (68.4) | 54.6 (57.7) |
| NTH-EN | N014 | Starcross Street lamppost (external to Exmouth Arms) | Free-field | 55.1 (57.7) | 59.4 (63.1) | 61.1 (66.8) | 59.5 (68.4) | 54.1 (67.3) | 52.8 (55.0) | 57.0 (59.4) | 58.1 (62.4) | 57.4 (62.8) | 51.1 (58.5) | 56.3 (64.7) | 52.7 (60.4) |
| | N016 | Margaret Centre roof | Free-field | 56.0 (60.7) | 58.4 (63.1) | 54.7 (58.8) | 53.7 (60.3) | 52.2 (61.0) | 55.7 (57.6) | 55.4 (56.9) | 54.6 (55.0) | 54.0 (57.6) | 51.1 (53.9) | 54.0 (57.8) | 52.5 (62.1) |
| | N017 | Hampstead Road, lamppost #48 | Free-field | 69.6 (72.3) | 71.0 (73.6) | 70.4 (73.3) | 70.1 (77.0) | 67.0 (74.6) | 68.2 (71.7) | 69.0 (70.8) | 70.2 (71.9) | 68.8 (71.8) | 66.9 (74.3) | 69.0 (75.9) | 66.4 (71.6) |

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 |
|--------------------|-----------------------|---|--|
| HRB | V039 | Coniston, Regents Park Estate | 2.36 (Z-Axis) |
| | V043 | Cubitt Court, Park Village East | 2.67 (Y-Axis) |
| S003-WS03 | V002 | RCGP basement boiler room, 305 Euston Road | 2.03 (Z-axis) |
| | V003 | RCGP basement vaults, 305 Euston Road | 0.46 (Z-axis) |
| | V037 | Magic Circle, basement | 6.03 (Z-axis) |
| | V038 | Wesley Hotel, basement lightwell, Euston Street | 2.89 (Z-axis) |
| NTH-EN | V021 | 42-44 Cobourg Street (floor) | 0.60 (Z-axis) |
| ESC | PVS-V1 | Park Village Studios | 2.65 (Y-axis) |
| ETRC & GTB | SH-V1 | Silsoe House | 0.78 (Z-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 | All days | All periods | No exceedance |
| | 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 | Sunday | 0700-2200 | 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 | Weekday | 1900-2200 | 3 |
| | | | Weekday | 0800-1800 | 1 |
| ETRC & GTB, E | N005 | 5A Granby Terrace | All days | All periods | No exceedance |
| 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 | Weekday | 0800-1800 | 7 |
| | | | Saturday | 0800-1300 | 1 |
| N045 | Regents Park Estate south, external to Coniston | All days | All periods | No exceedance | |

| Worksite Reference | Measurement Reference | Site Address | Day (Weekday, Saturday, Sunday, Night) | Time period | Number of exceedances of SOAEL |
|---------------------|-----------------------|--|--|-------------|--------------------------------|
| G | HH | Euston Station Parcel Deck, Barnby Street | All days | All periods | No exceedance |
| | 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 |
| NTH-EN | N012 | Opposite 92-94 Drummond Street | Night | 2200-0700 | 1 |
| | 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 | 1 |
| ETRC & GTB, D | N004 | Mornington Terrace, lamppost #7 | 2 |
| HRB | N044 | Regents Park Estate west, near Langdale | 8 |
| NTH-EN | N012 | Opposite 92-94 Drummond Street | 1 |

2.2.6 12 exceedances of the SOAEL were recorded due to HS2 construction works during April 2021. The exceedances occurred at:

- Monitoring location N001 during a Sunday daytime period due to groundworks (excavations);
- Monitoring location N004 during a weekday evening due to use of a concrete pump and during a weekday due the cumulative effect of multiple site activities (borehole drilling, offloading of reinforcement cages and sheet piling);
- Monitoring location N044 during 7 weekday periods and 1 Saturday period due to the cumulative effect of multiple site activities (welfare foundation installation, drainage installation, pile installation, steel fixing and shuttering installation); and
- Monitoring location N012 during a night-time period due to the operation of a site generator which failed to automatically switch off.

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

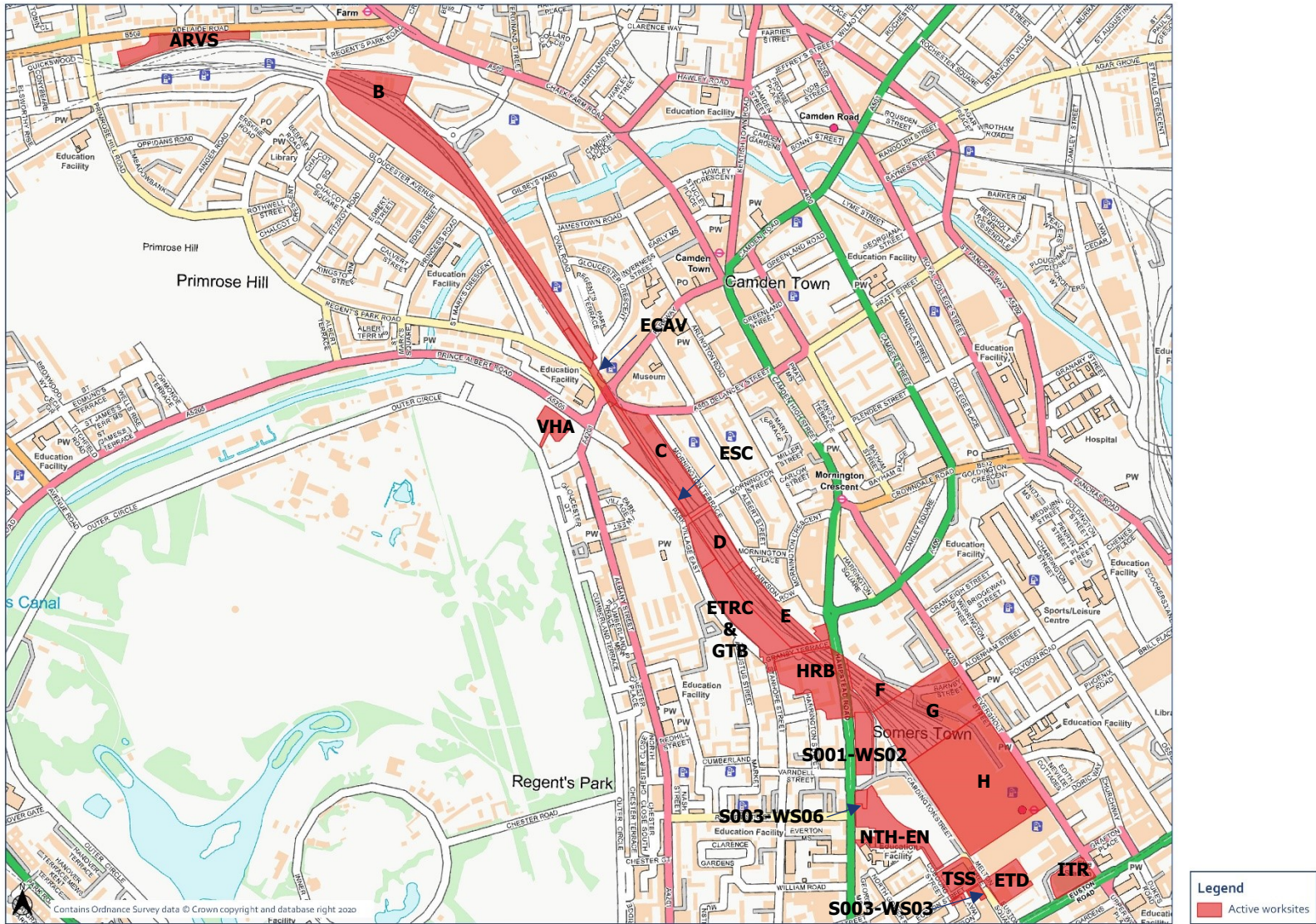
2.4.1 Table 8 provides a summary of complaint information related to noise and vibration received during the reporting period, along with the findings of any investigation.

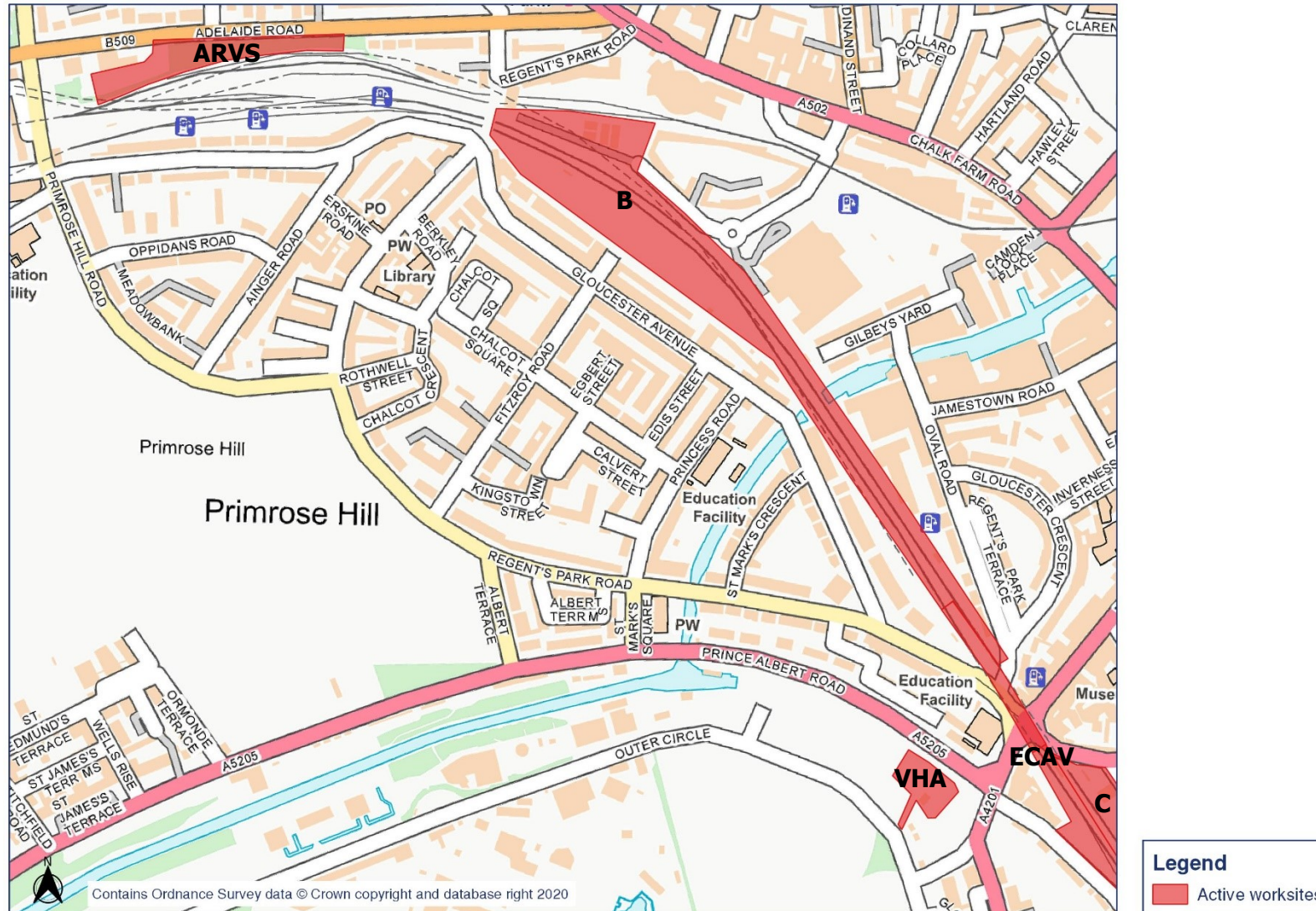
Table 8: Summary of Complaints

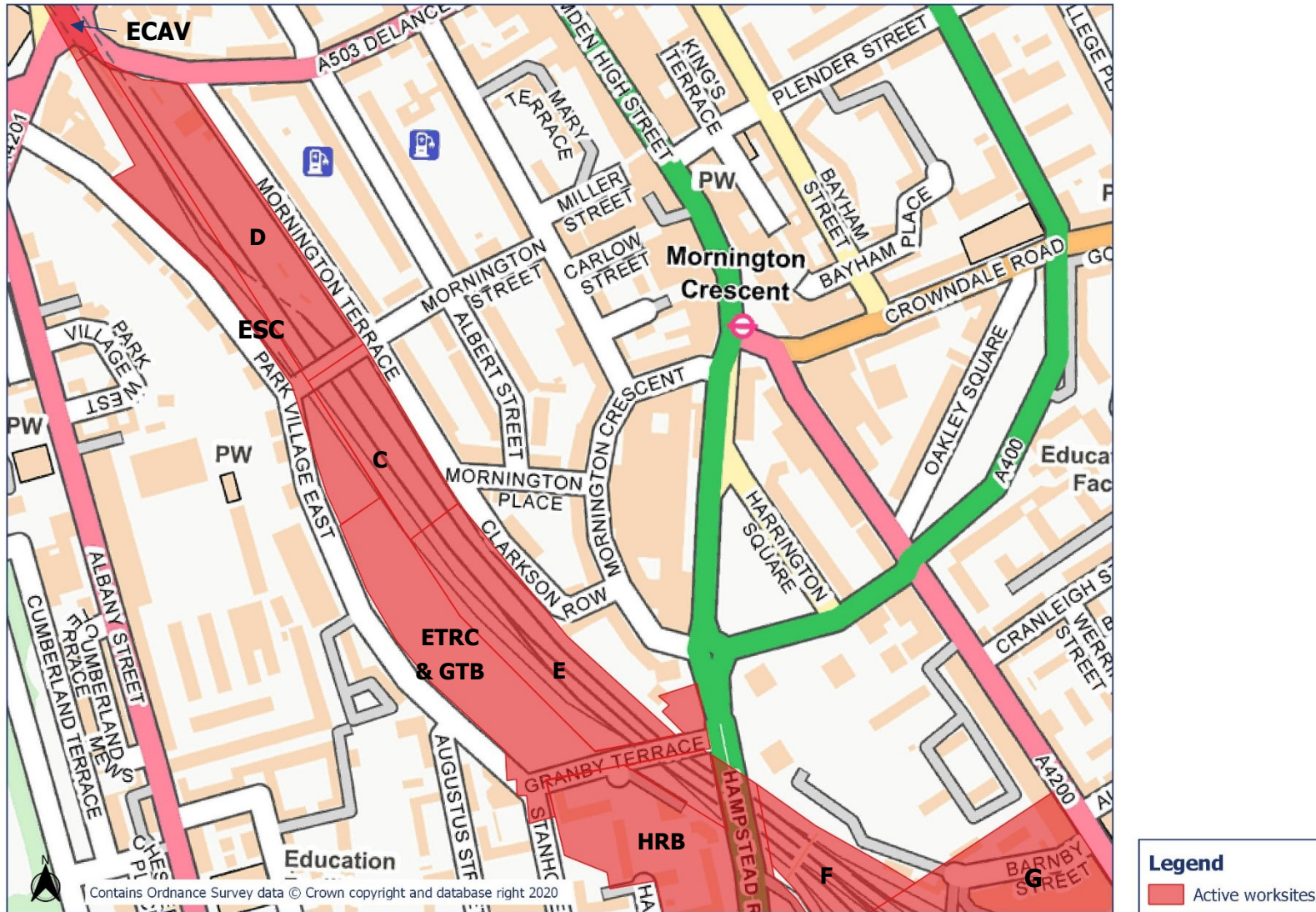
| Complaint Reference Number | Worksite Reference | Description of Complaint | Results of Investigation | Actions Taken |
|----------------------------|--------------------|---|---|--|
| HS2-21-41816-C | NTH-EN | Complaint regarding noise from generator during a single night-time period. | Timer limiting operation of the generator had been set incorrectly and failed to switch off generator. | Error corrected on the generator and generator also to be replaced by hybrid version. |
| HS2-21-41749-C | N/A | General complaint regarding construction noise. | The noise reported was not associated with HS2 construction works. | Information was provided to the Stakeholder via telephone and joint letter from the associated contractor and rail operator. Information was also provided on how to apply for further assistance as a special case. |
| HS2-21-41777-C | ESC | Complaint regarding vibration due to piling works. | The piling was associated with HS2 construction works. Monitoring data demonstrates compliance with Section 61 requirements. | Information was provided to the Stakeholder and it was confirmed that piling works were scheduled to be complete at the associated location on 30 th April. |
| HS2-21-41780-C | ESC, C | Complaint regarding construction noise and lack of notification of works. | Notification of the works had been provided via the HS2 works notification website and via the HS2 works newsletter. | Information was provided to the Stakeholder. |
| HS2-21-41802-C | ARVS | General complaint regarding construction noise. | Although the noise was associated with HS2 construction works, monitoring data demonstrates compliance with Section 61 requirements. | Information was provided to the Stakeholder outlining the methods used to limit construction noise wherever possible. |
| HS2-21-41809-C | HRB / ETRC & GTB | Complaint regarding construction noise on a Sunday. | The noise was associated with the installation of a water connection to a HS2 construction site. Prior notification was made available on the HS2 works notification website. | Information was provided to the Stakeholder. |

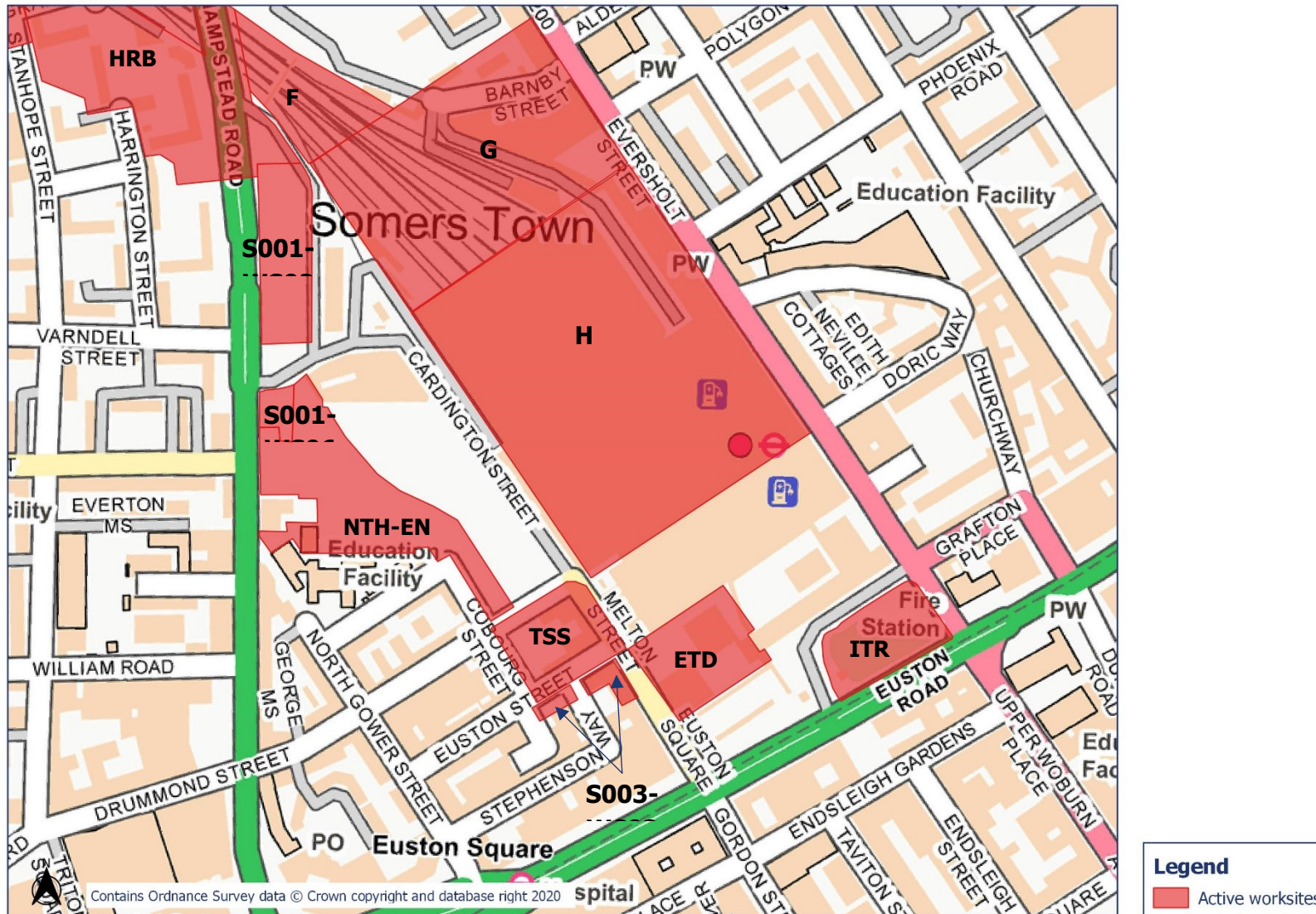
| Complaint Reference Number | Worksite Reference | Description of Complaint | Results of Investigation | Actions Taken |
|-----------------------------------|---------------------------|---|--|---|
| HS2-21-41812-C HS2-21-41859-C | ESC, C | General complaint regarding construction noise. | Although the noise was associated with HS2 construction works, monitoring data demonstrates compliance with Section 61 requirements. | Information was provided to the Stakeholder concerning special cases panel and information on how to take forward should the stakeholder wish to be considered. |
| HS2-21-41835-C | ESC | Complaint regarding vibration felt within the Stakeholder's property. | The vibration was caused by use of a vibratory roller. Monitoring data demonstrates compliance with Section 61 requirements. | Works methodology has been changed to use a rolling method which does results in lower levels of vibration. |
| HS2-21-41869-C | ESC | General complaint regarding construction noise. | Although the noise was associated with HS2 construction works, monitoring data demonstrates compliance with Section 61 requirements. | Information was provided to the Stakeholder confirming that noise and vibration levels will continue to be monitored. |

Appendix A Site Locations

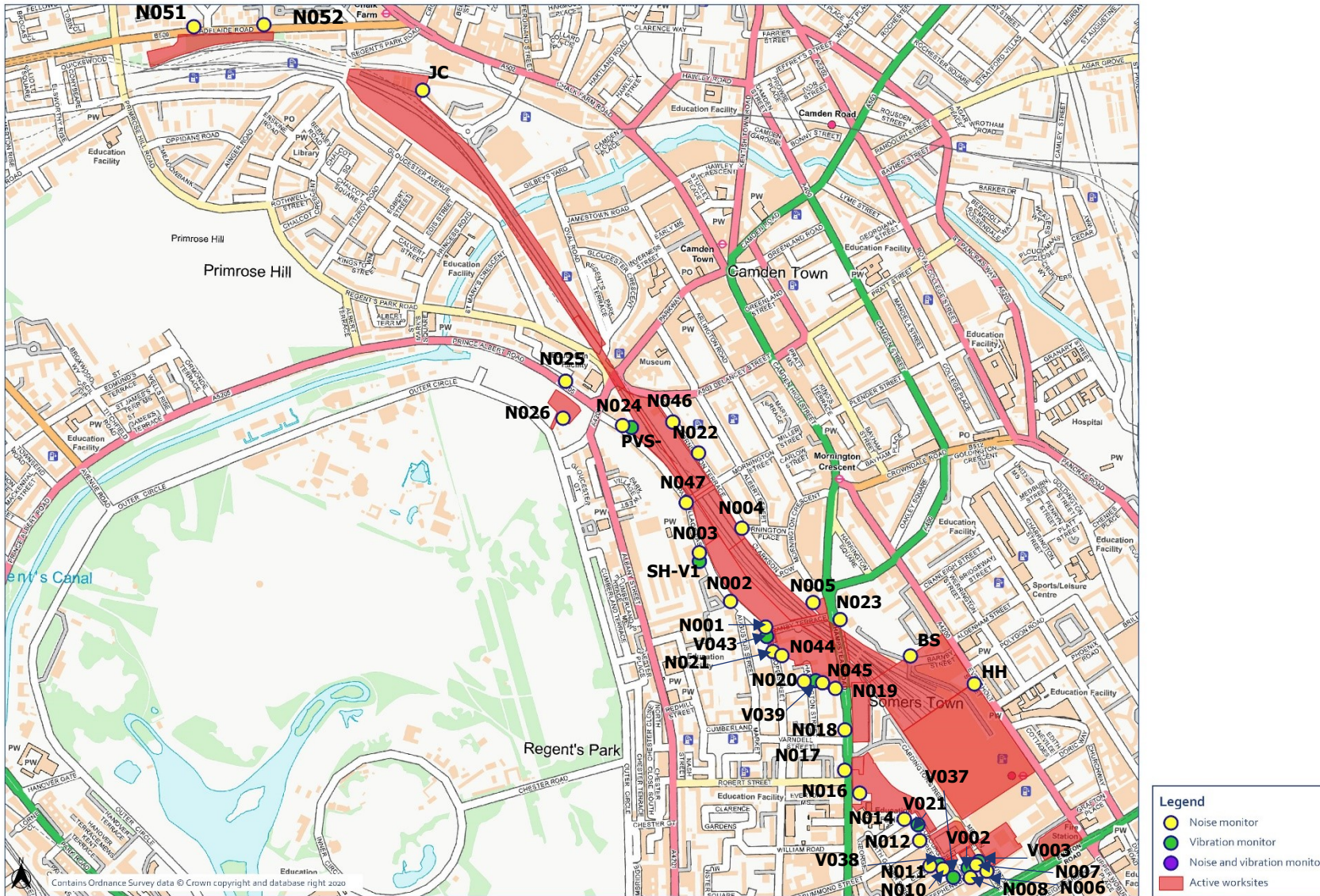


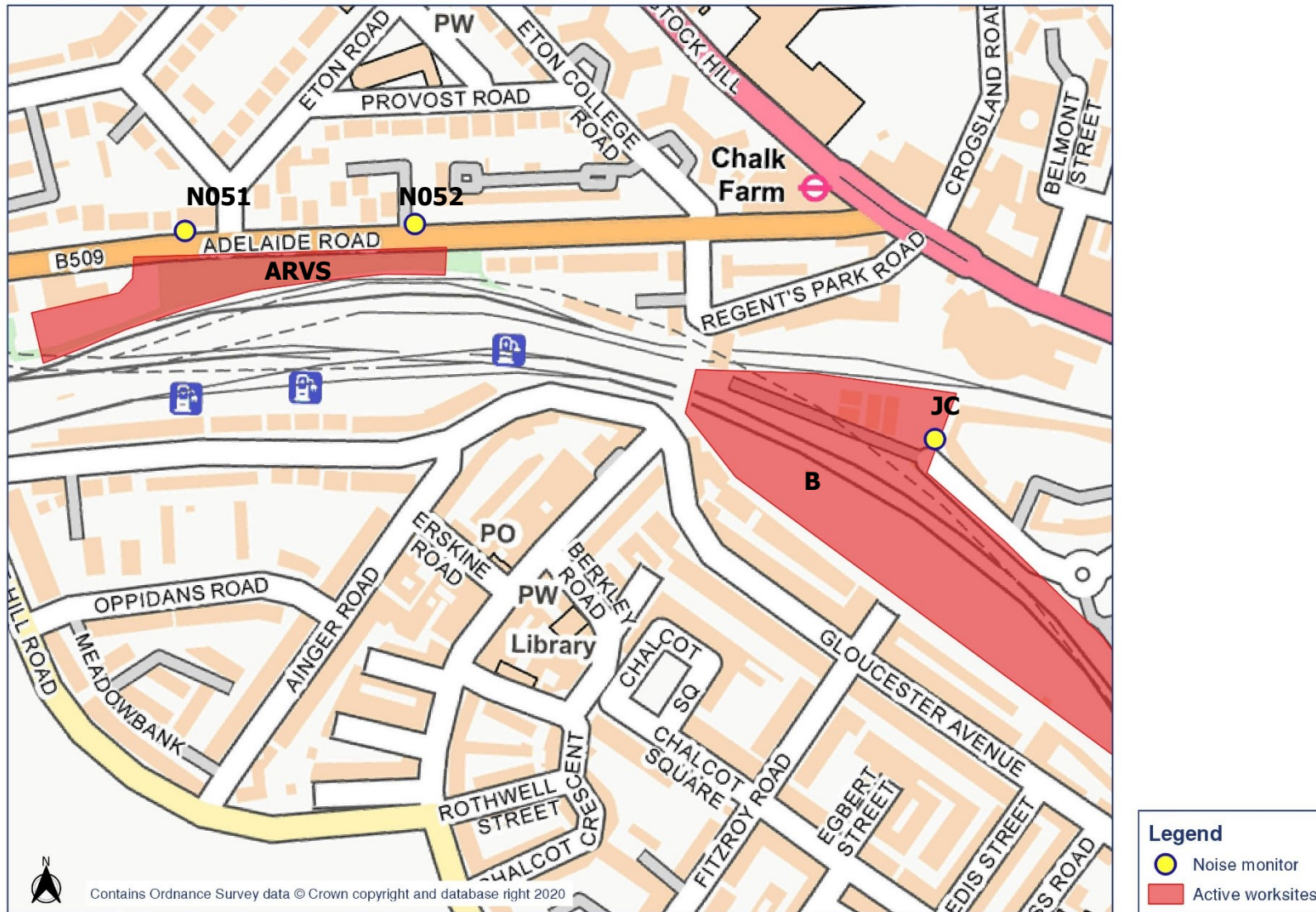


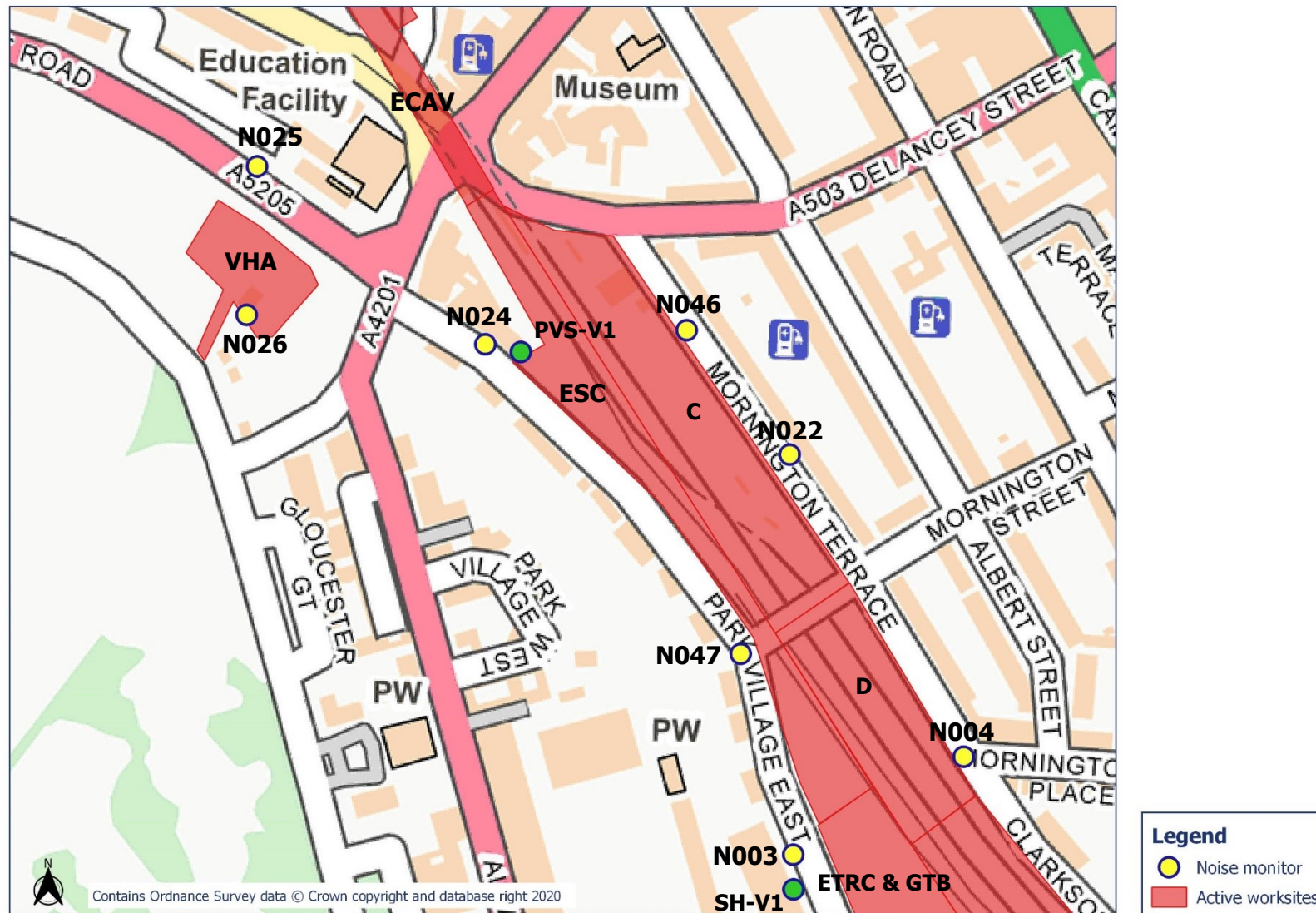




Appendix B Monitoring Locations

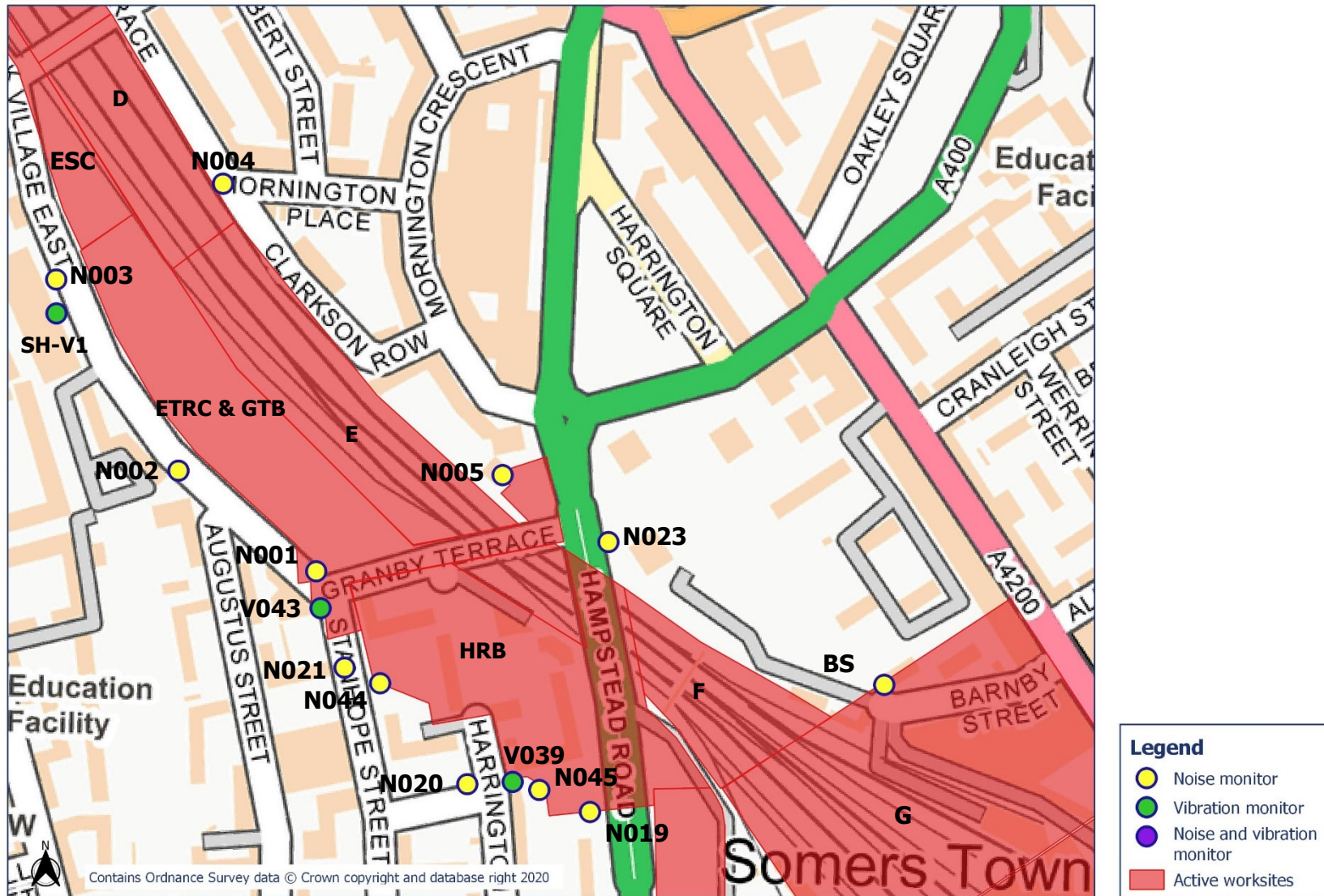


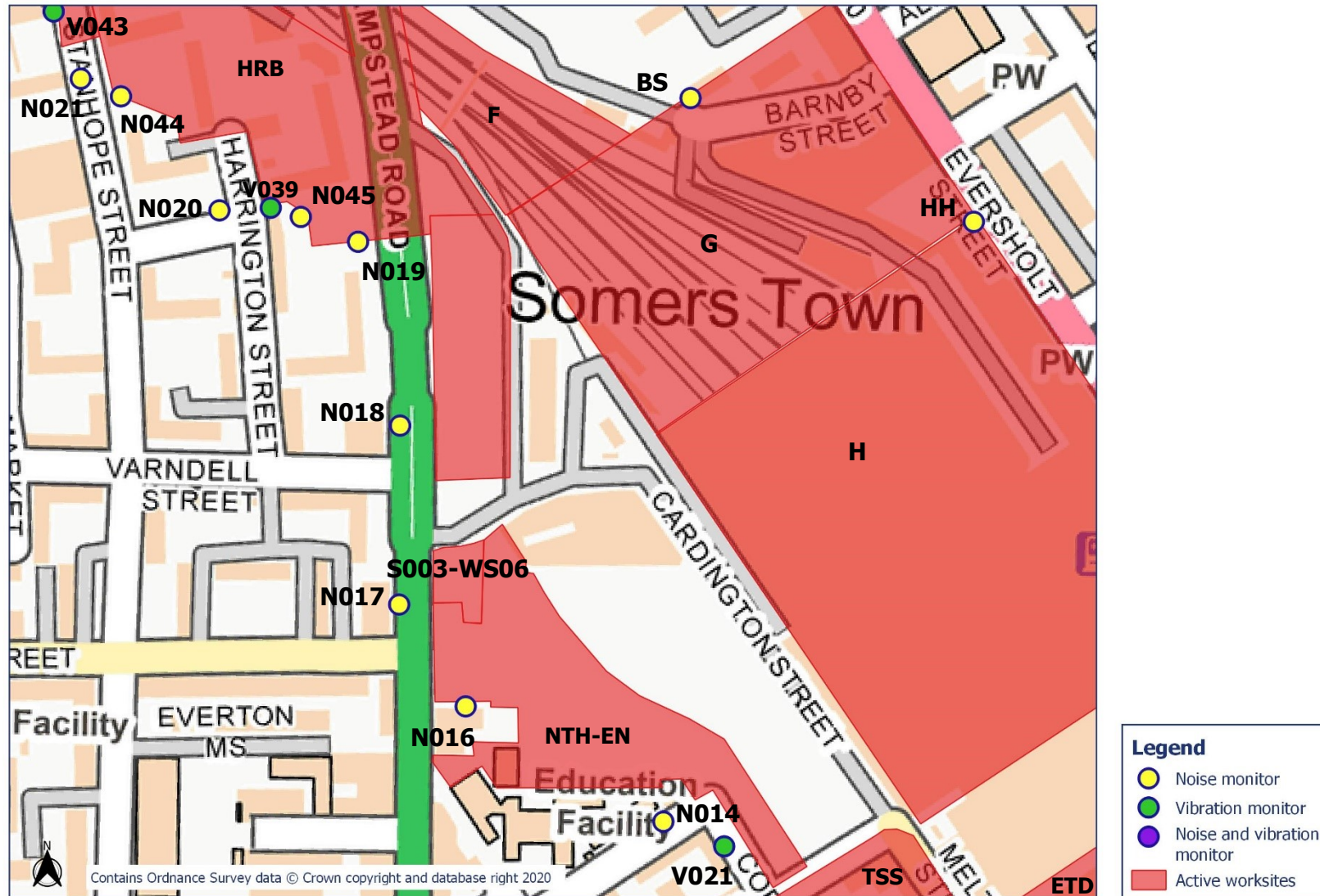




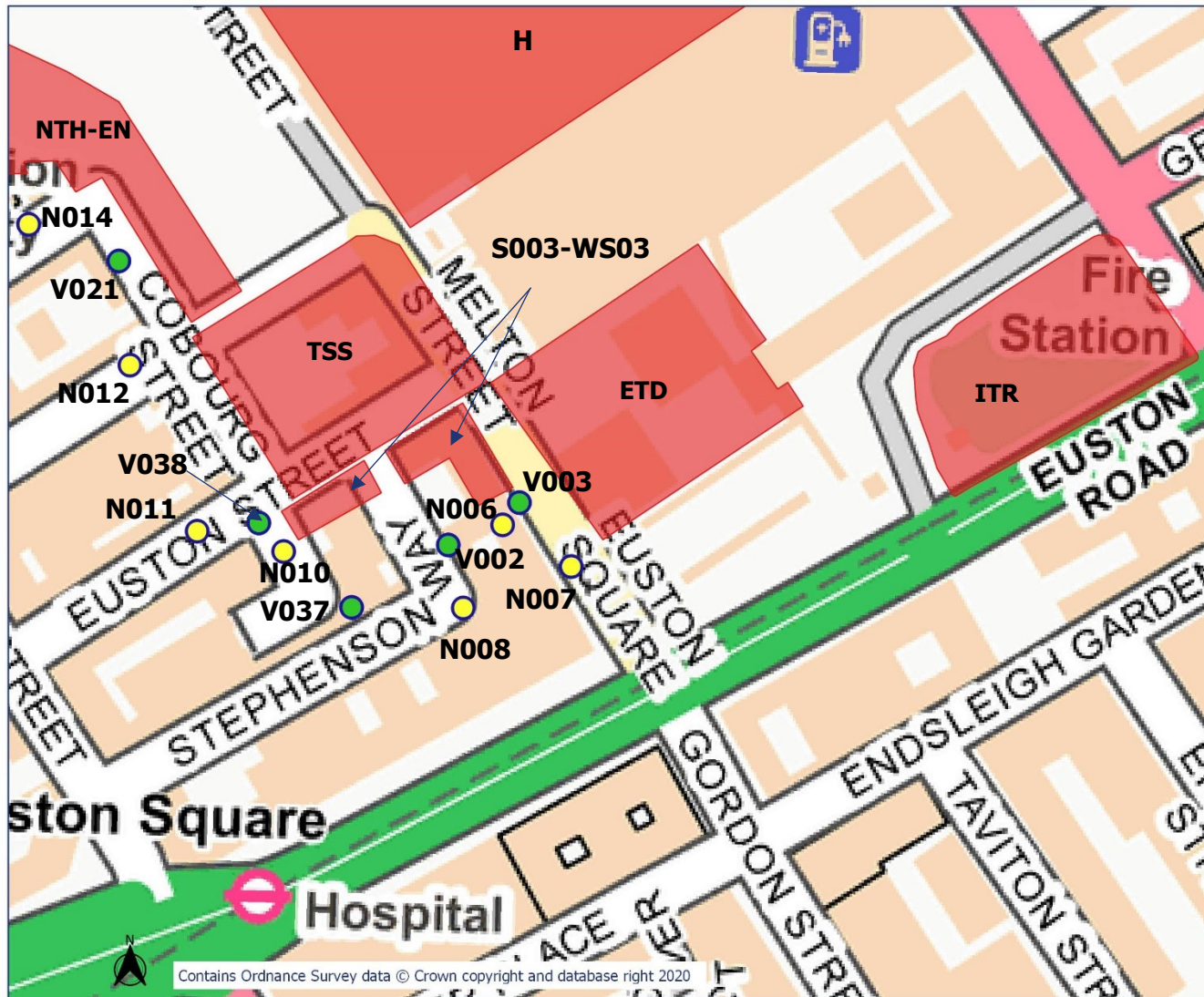
HS2

Noise and vibration monitoring plan - 3





HS2 Noise and vibration monitoring plan - 5



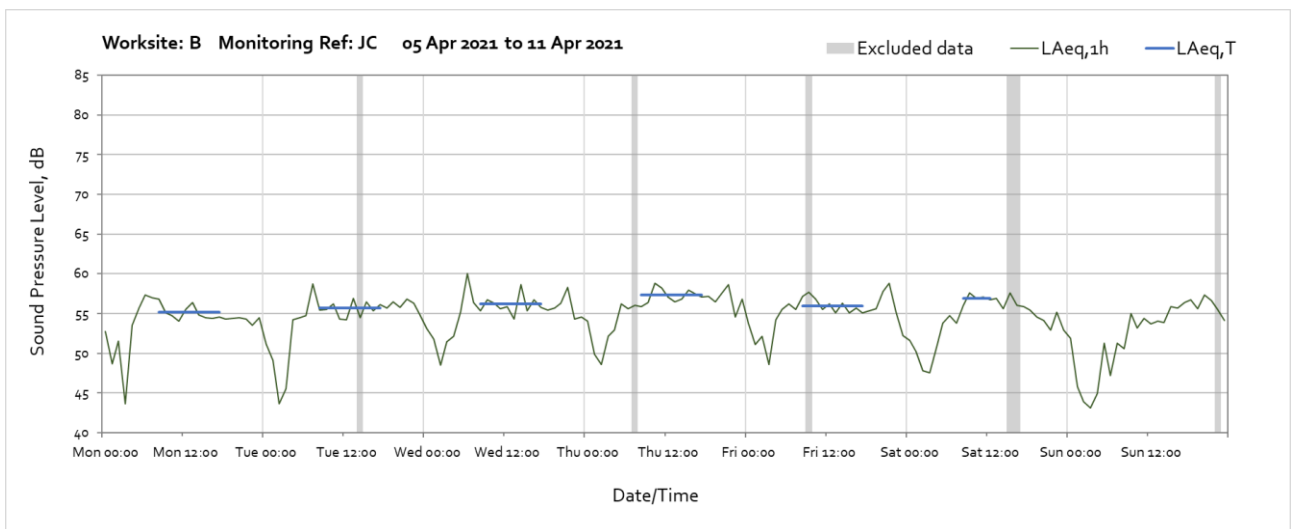
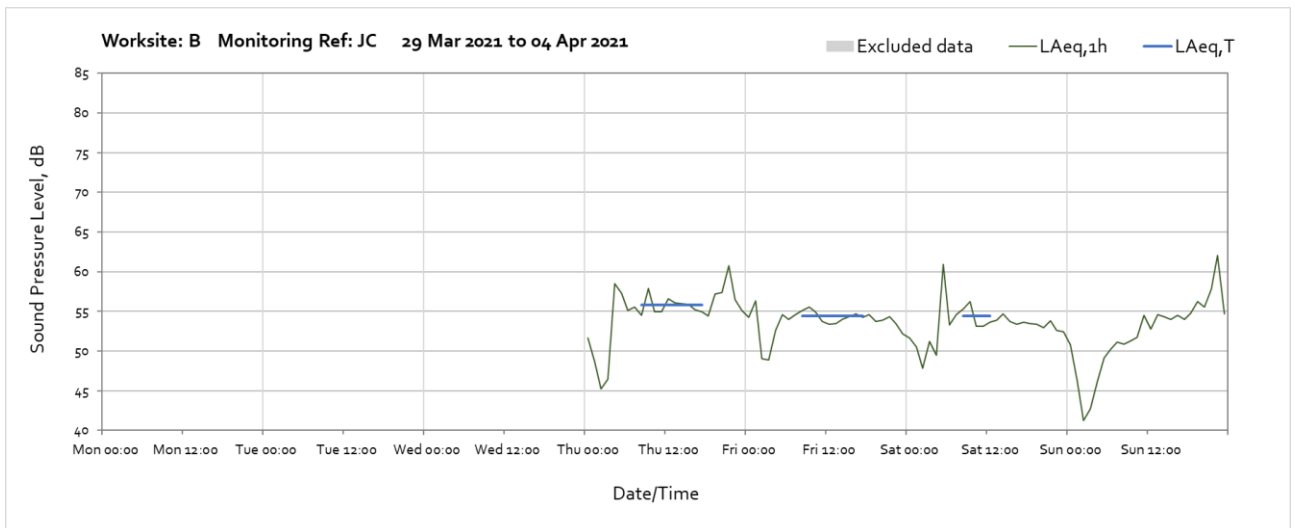
OFFICIAL

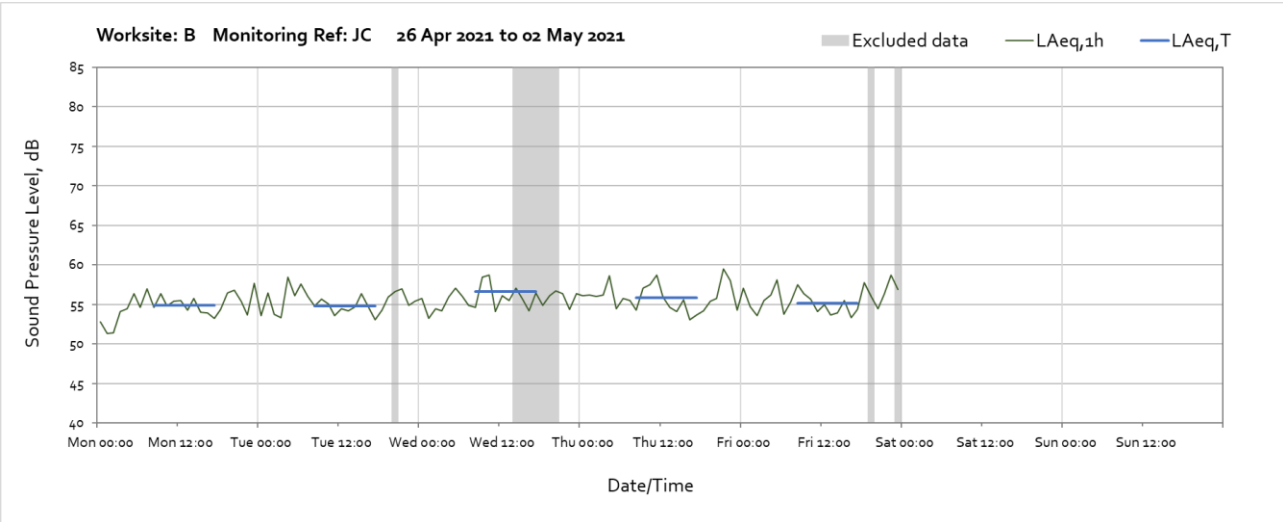
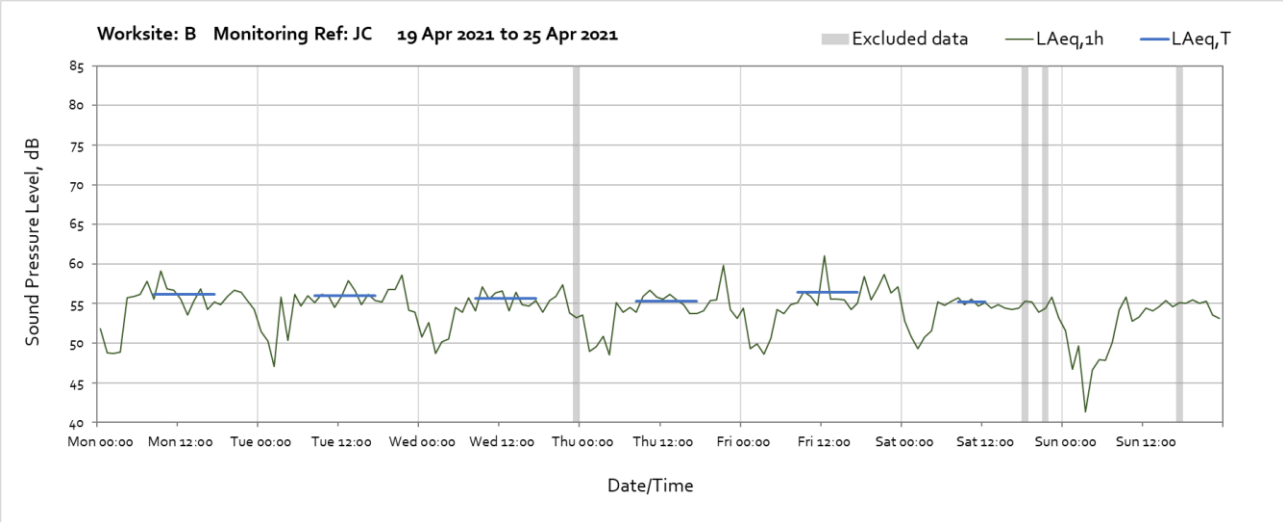
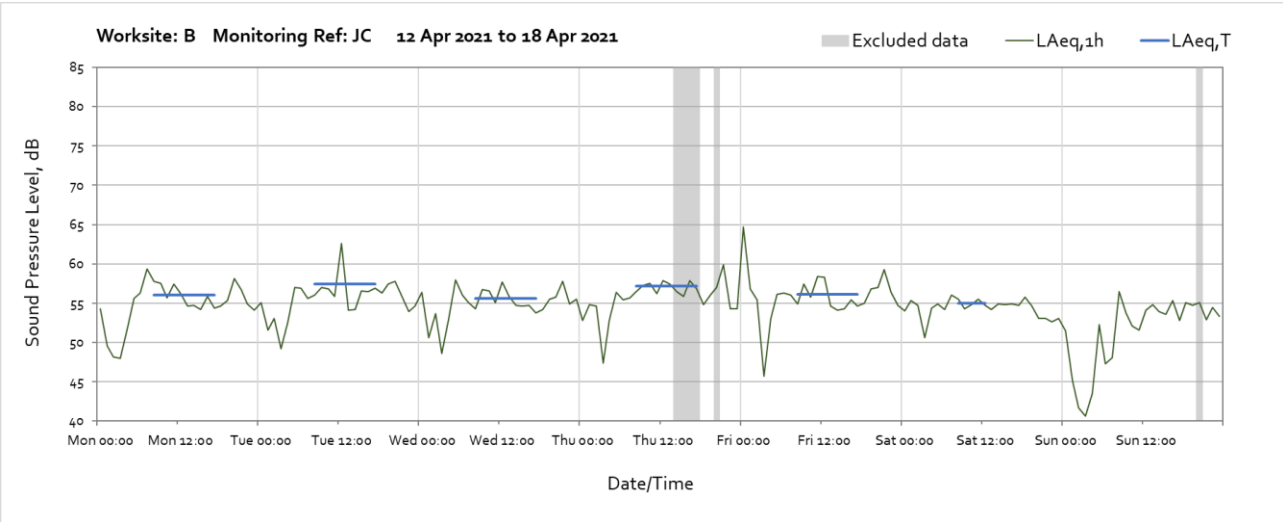
Appendix C Data

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.

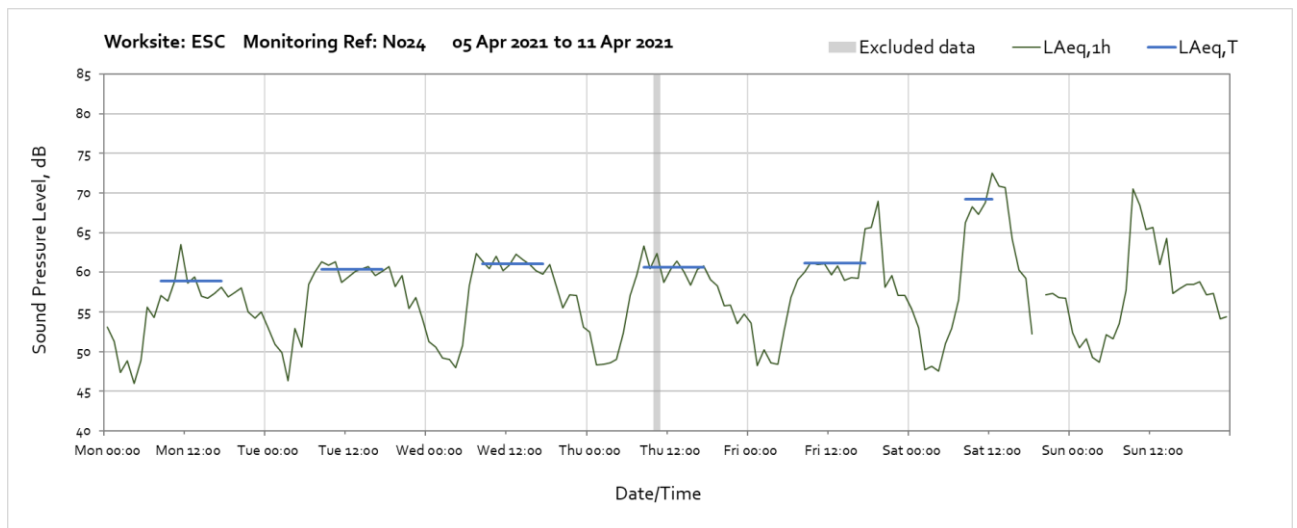
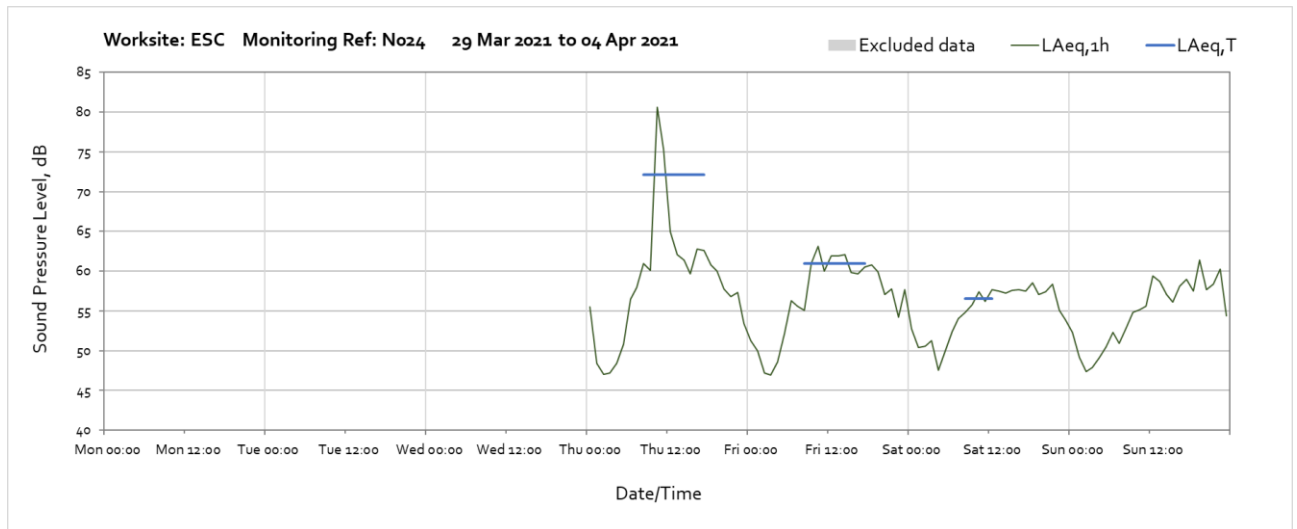
Noise

Worksite: B – Monitoring Ref: JC

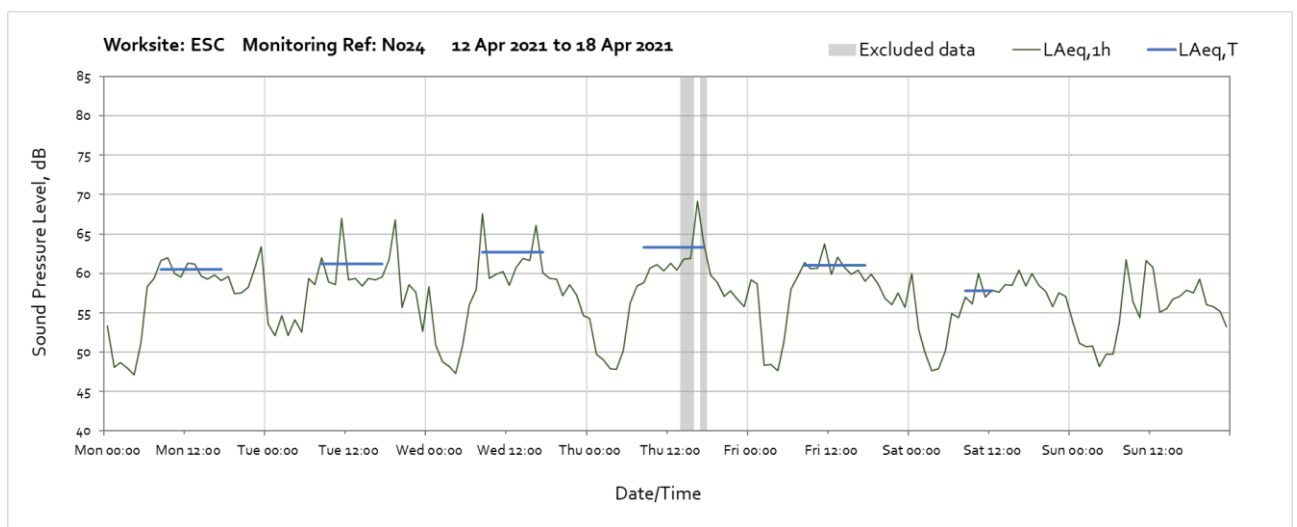


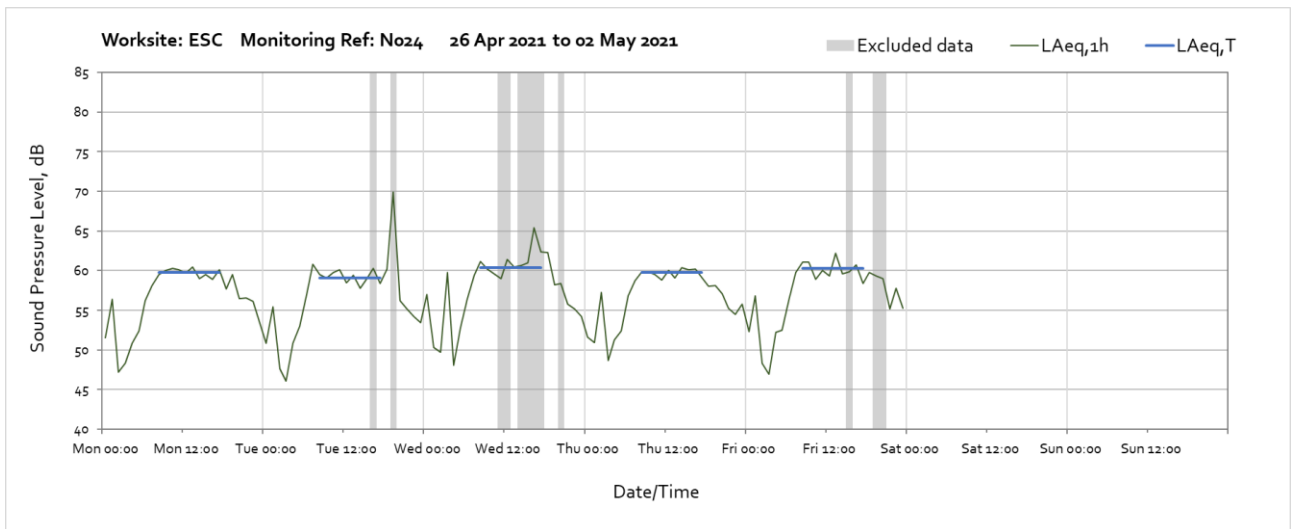
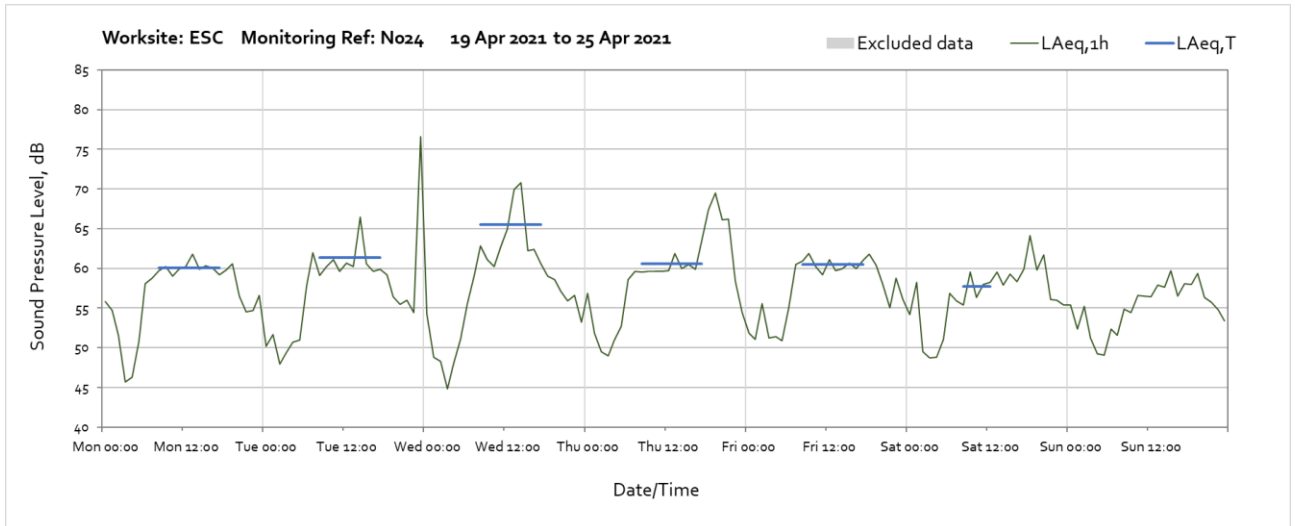


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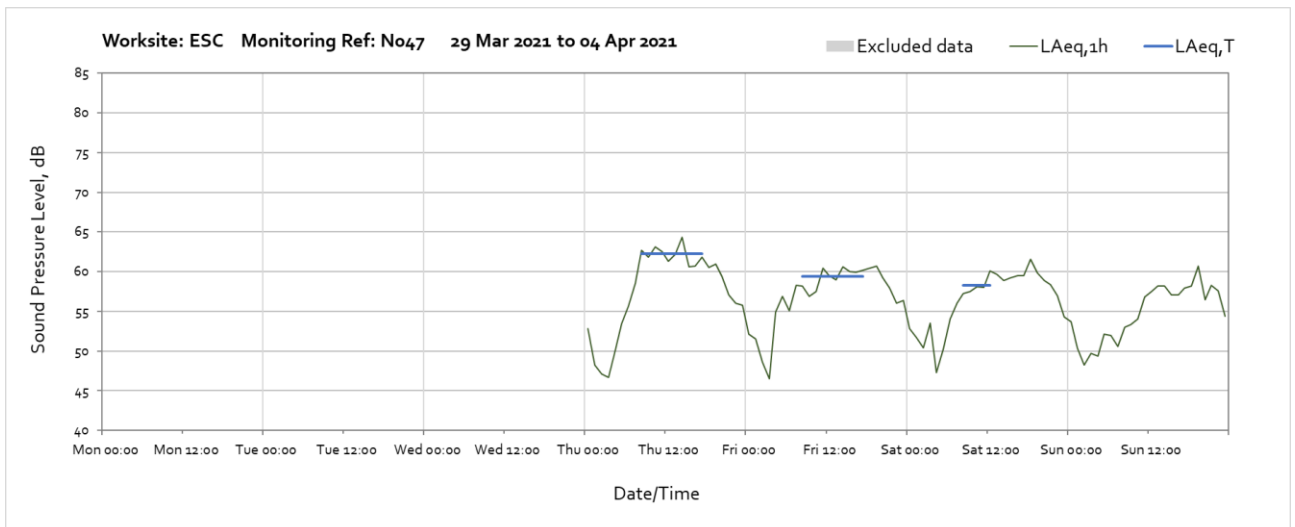


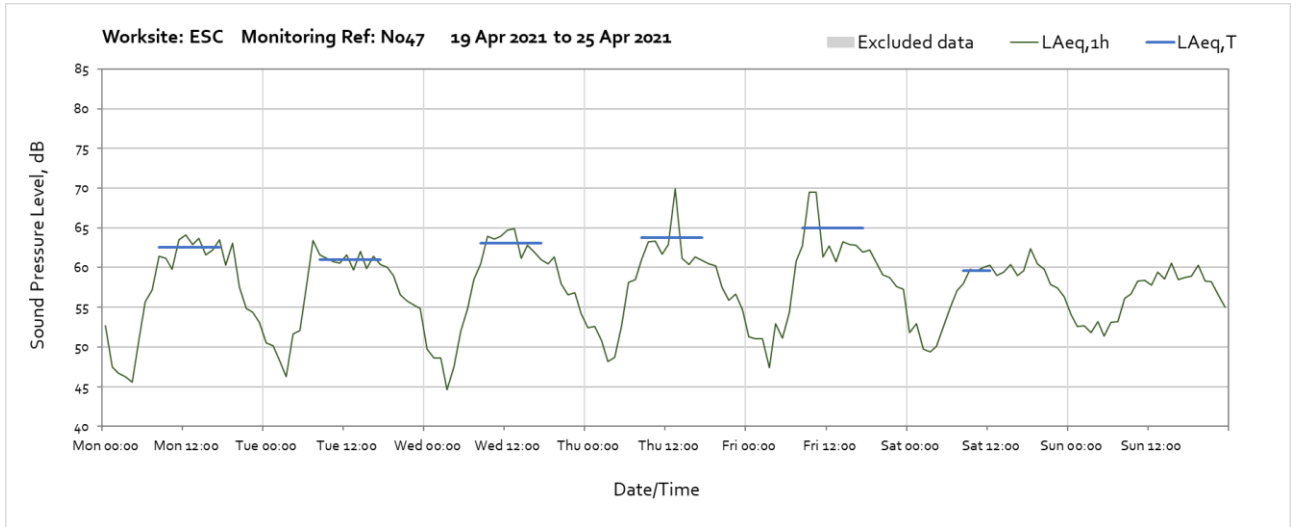
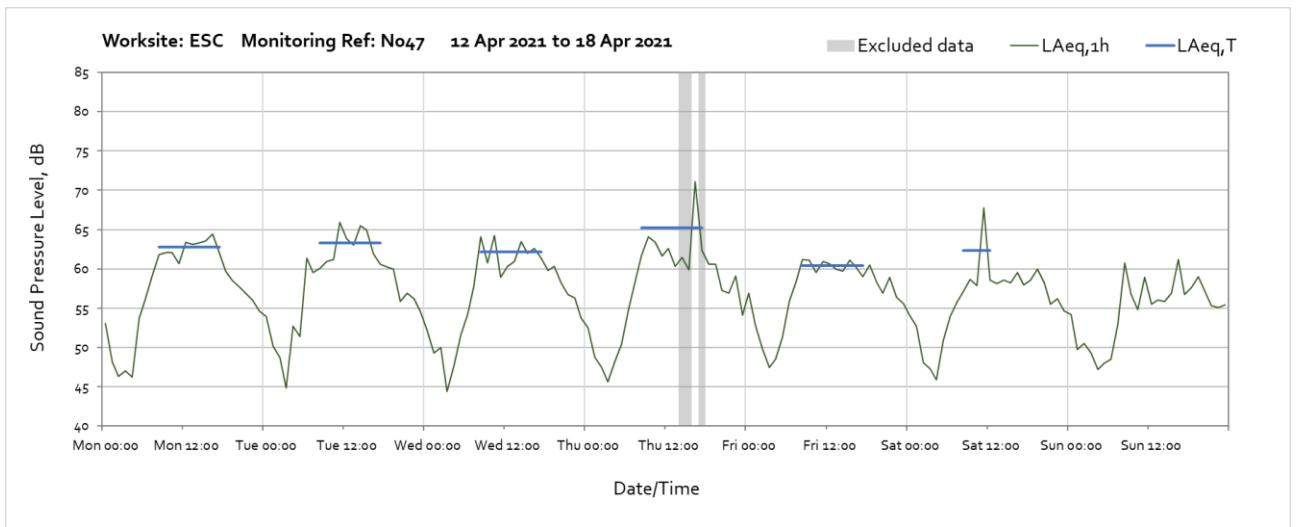
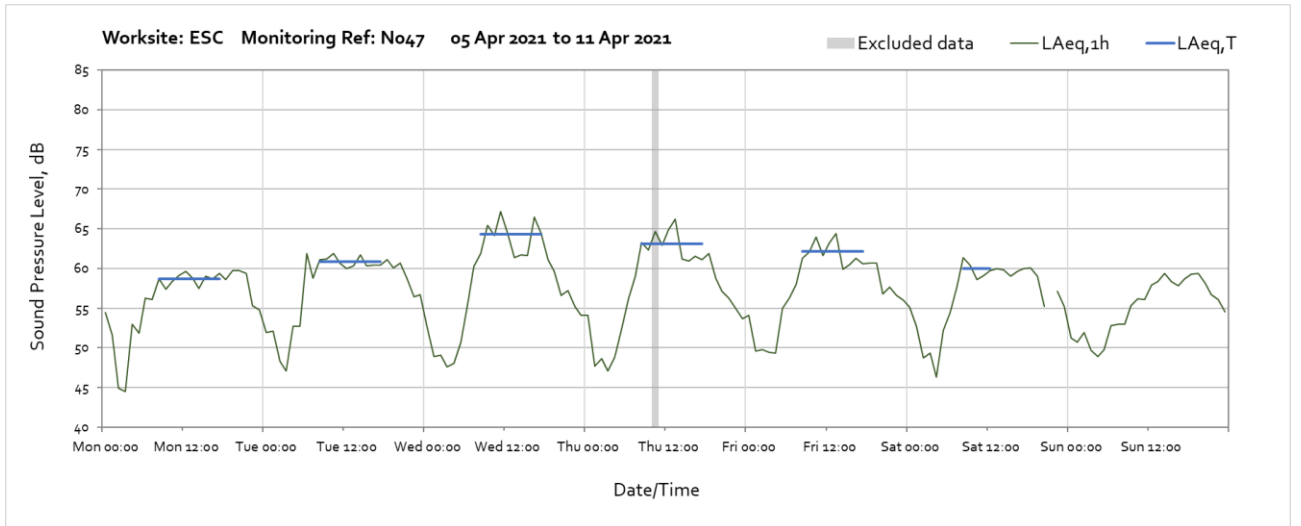
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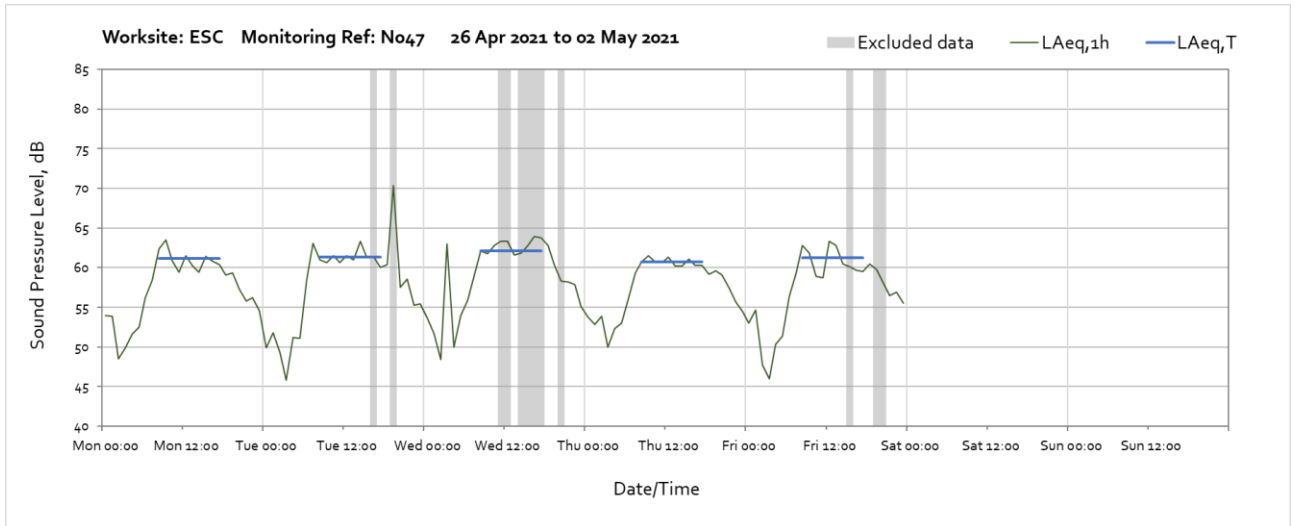




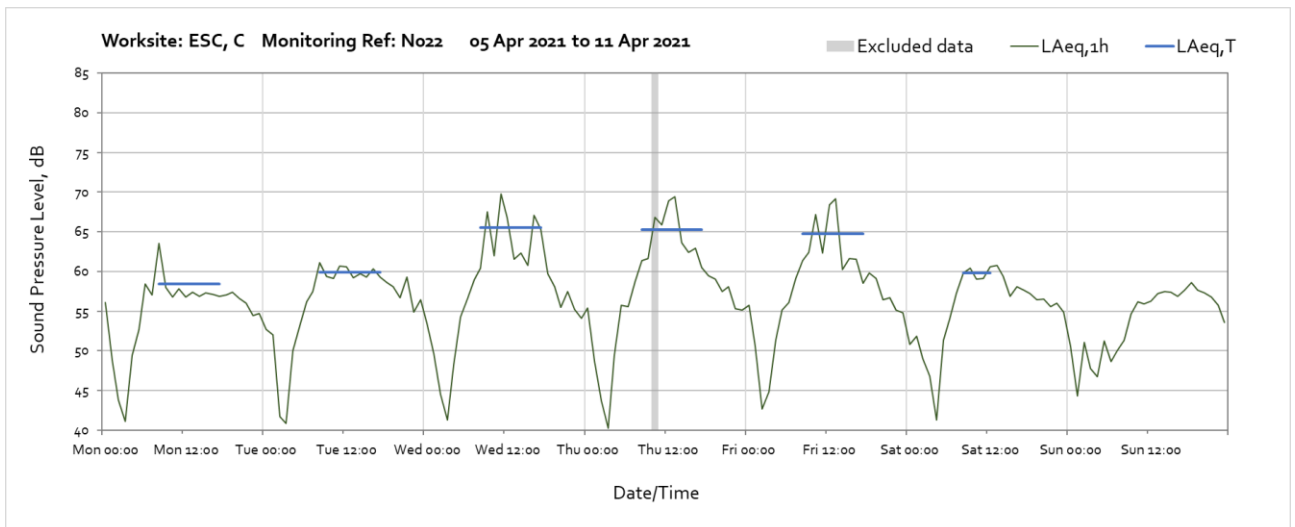
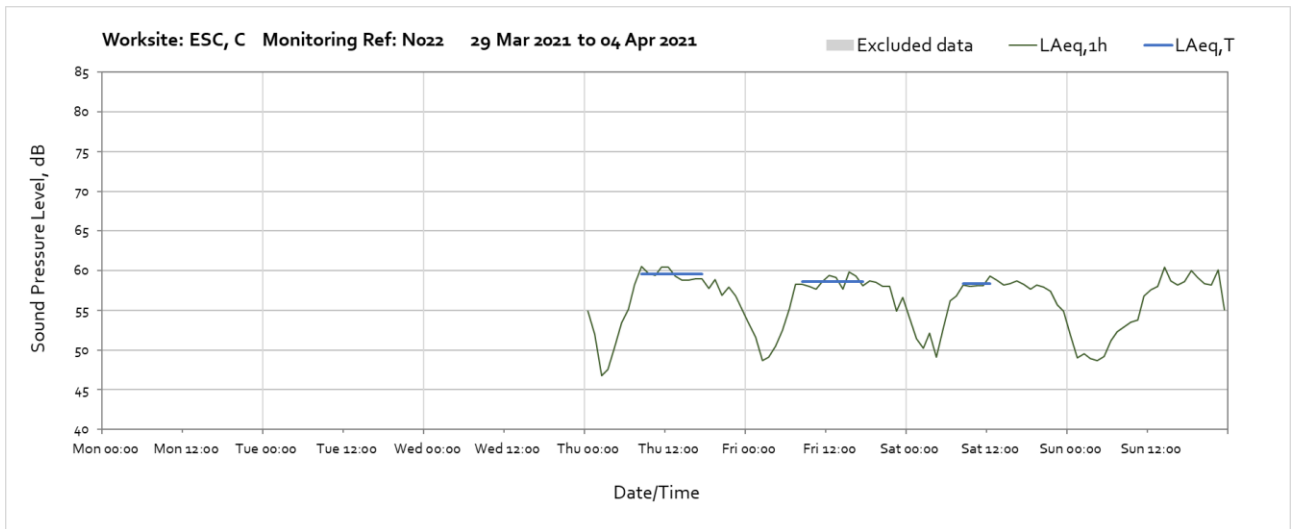
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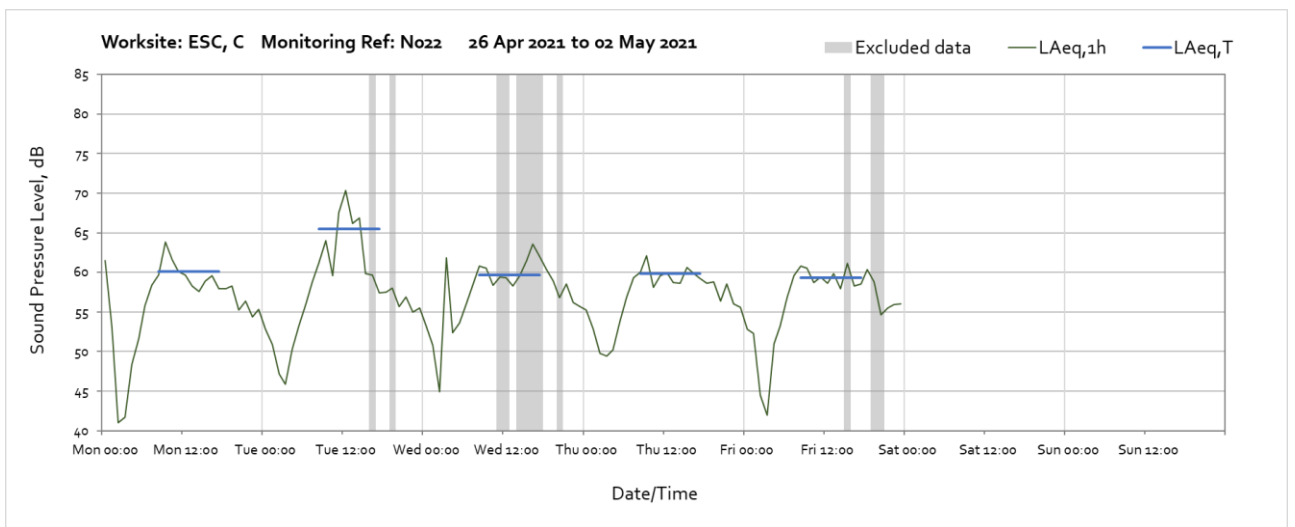
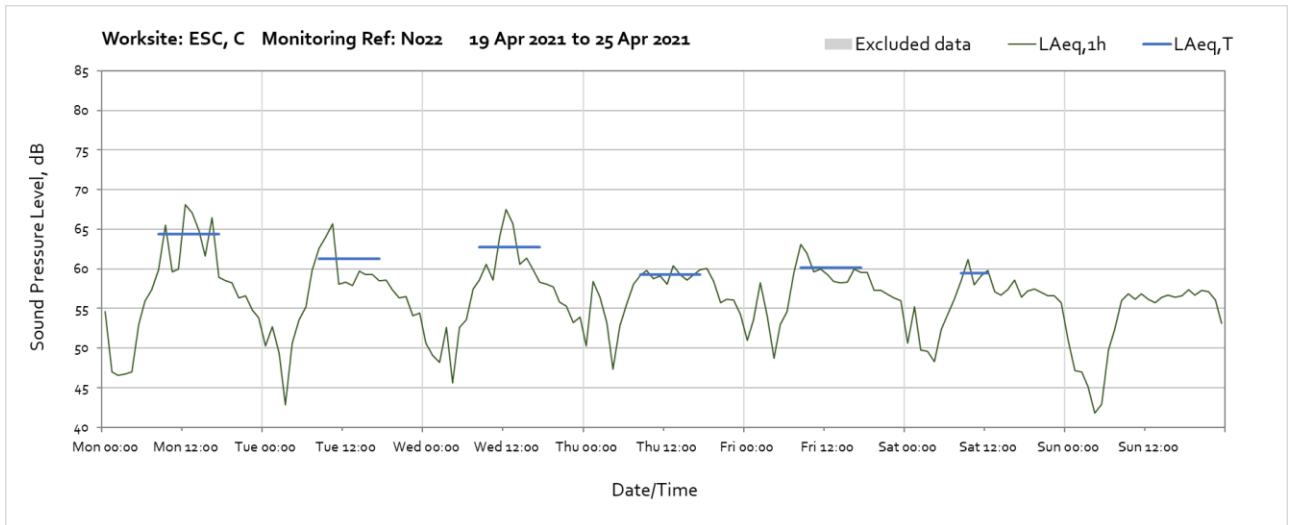
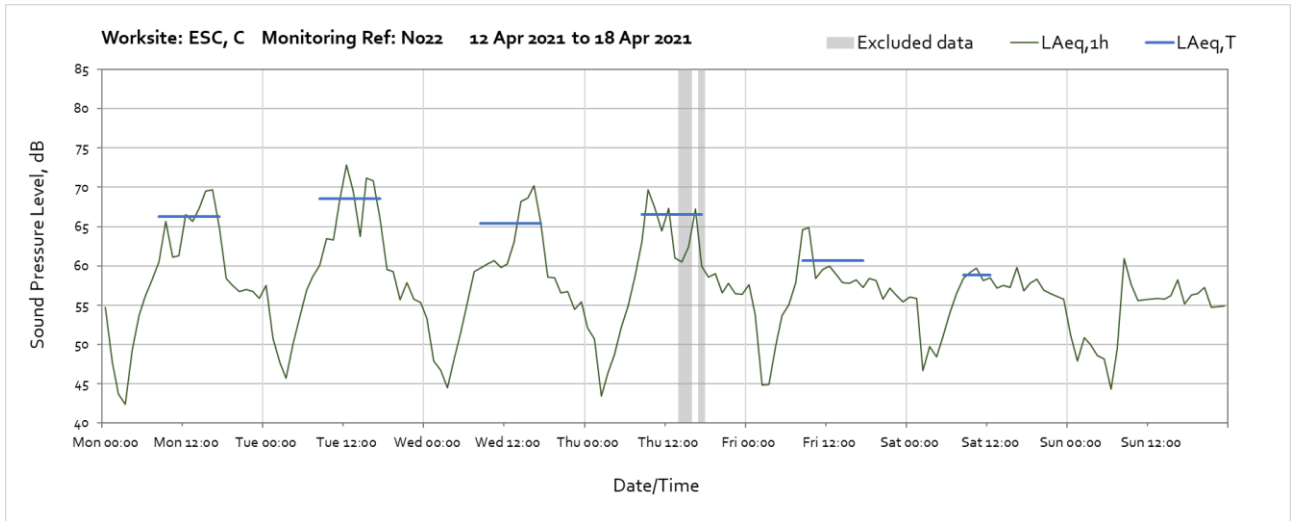




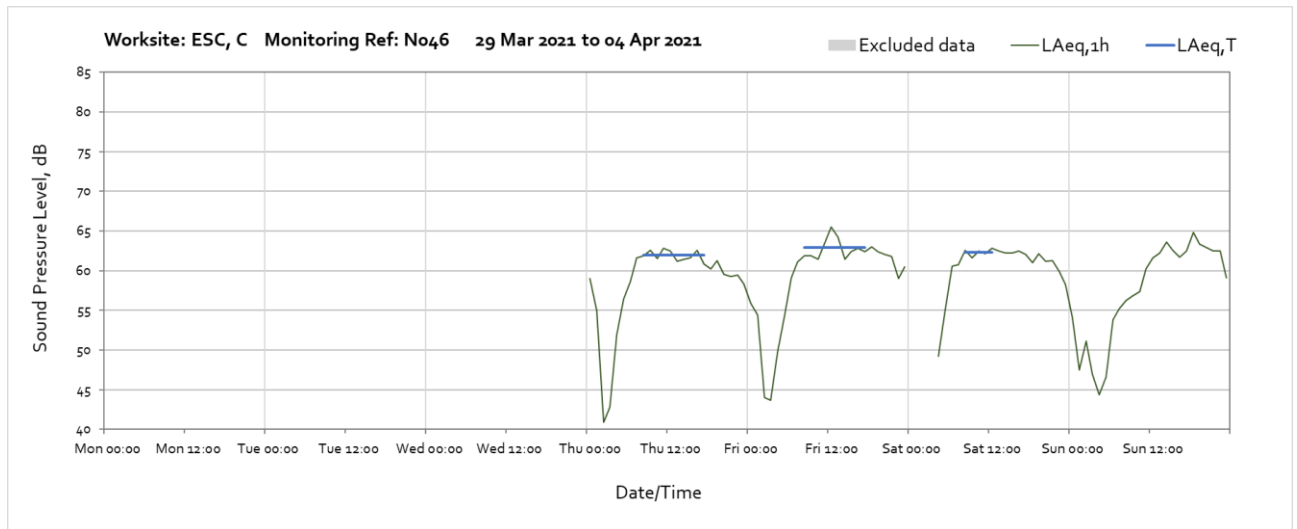


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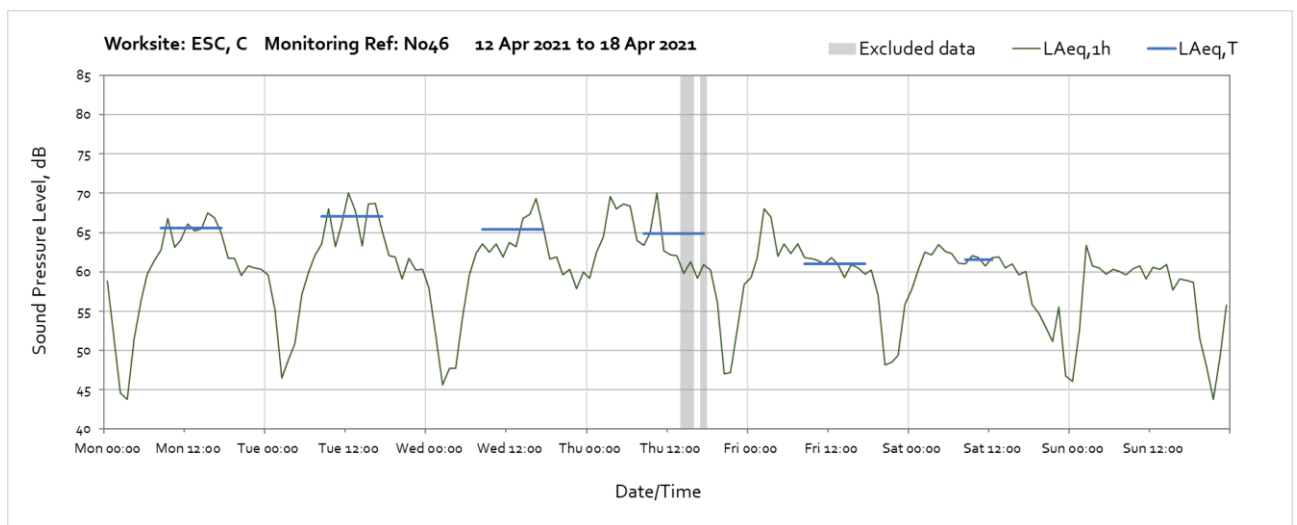
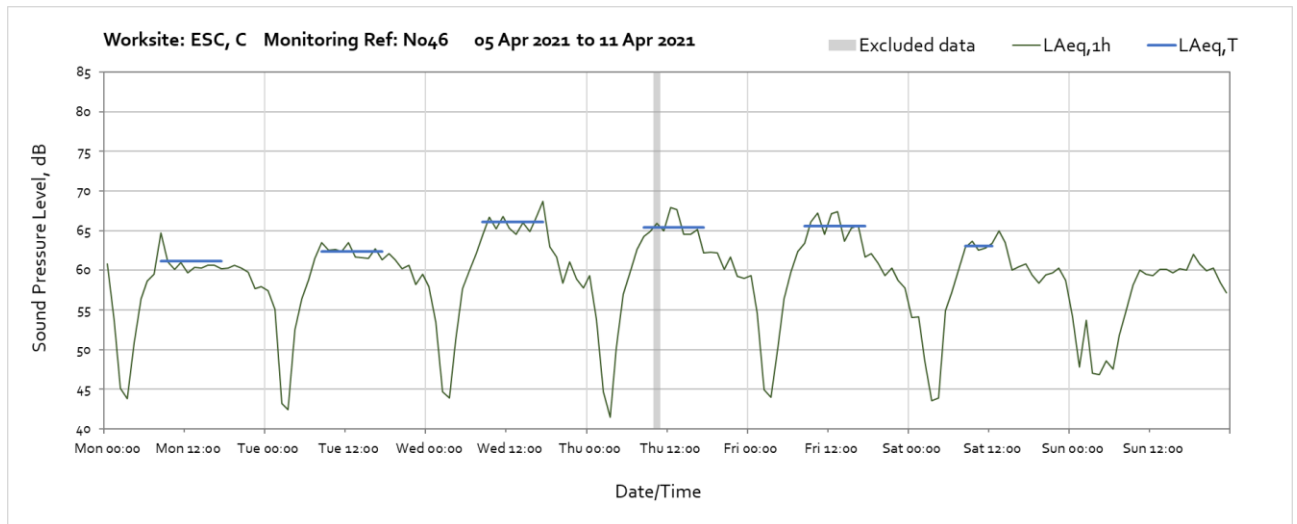


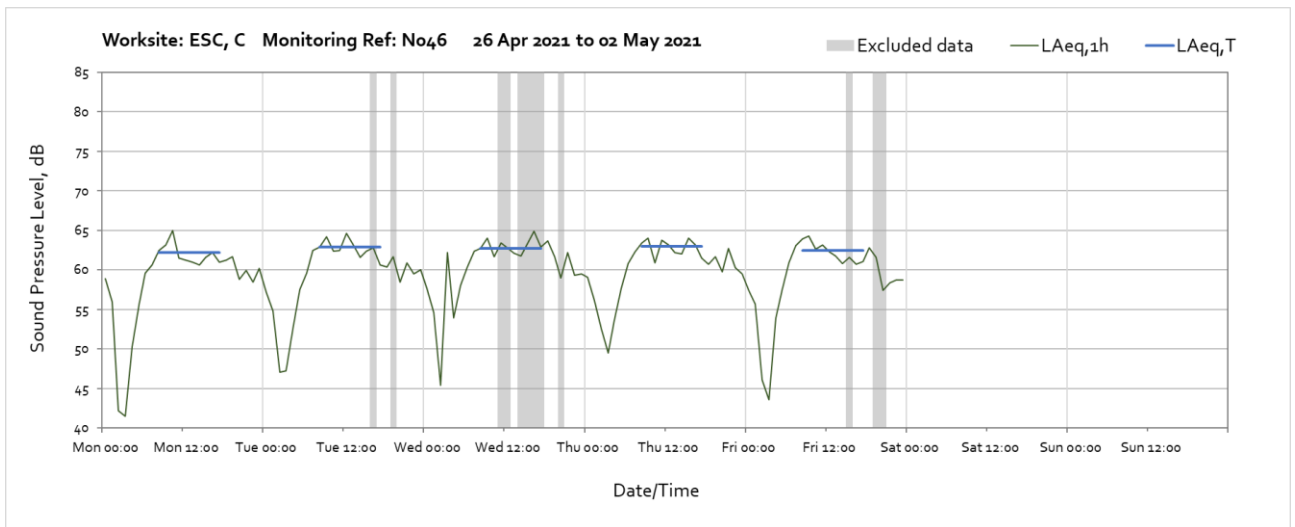
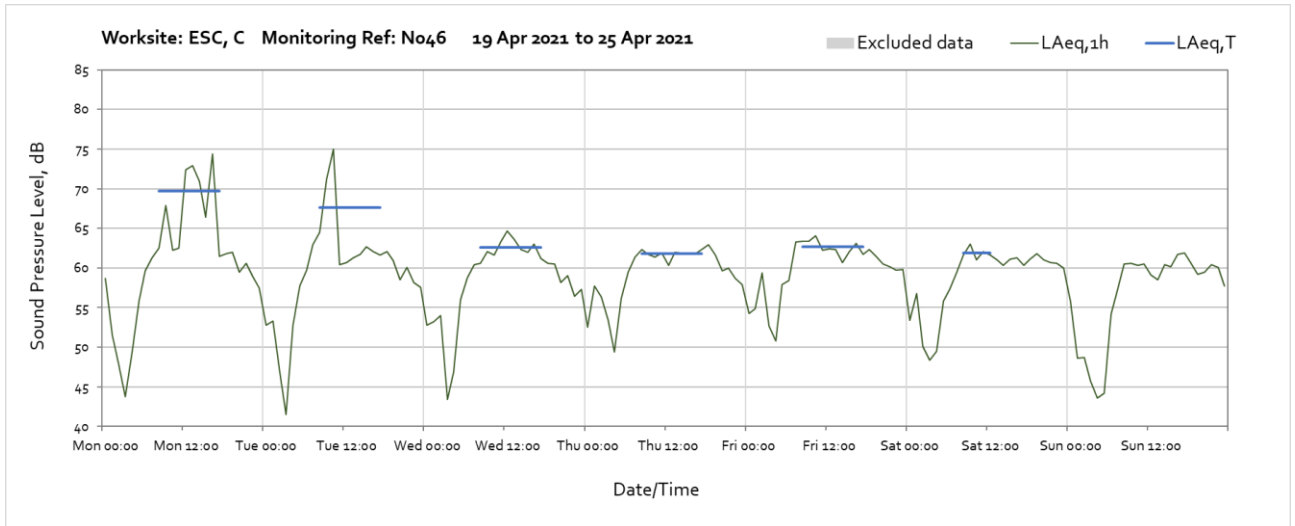


Worksite: ESC, C – Monitoring Ref: N046

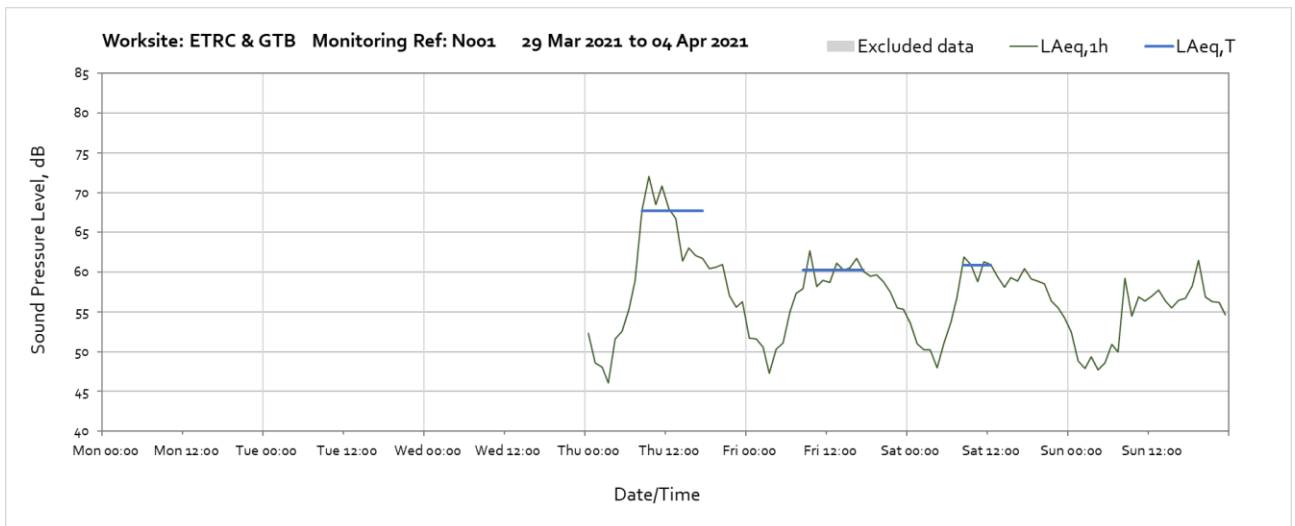


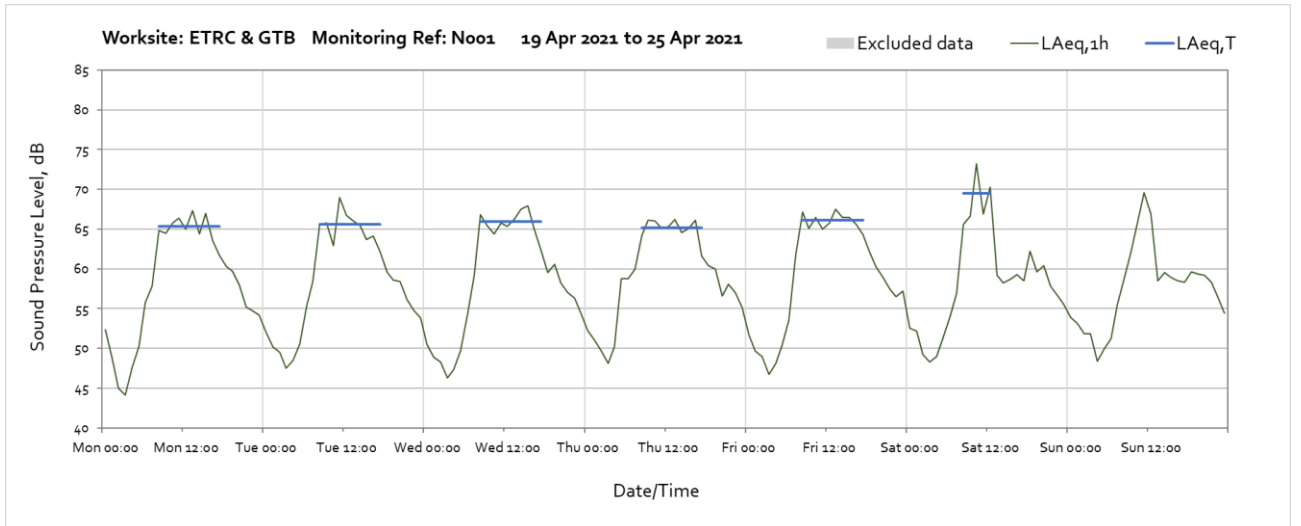
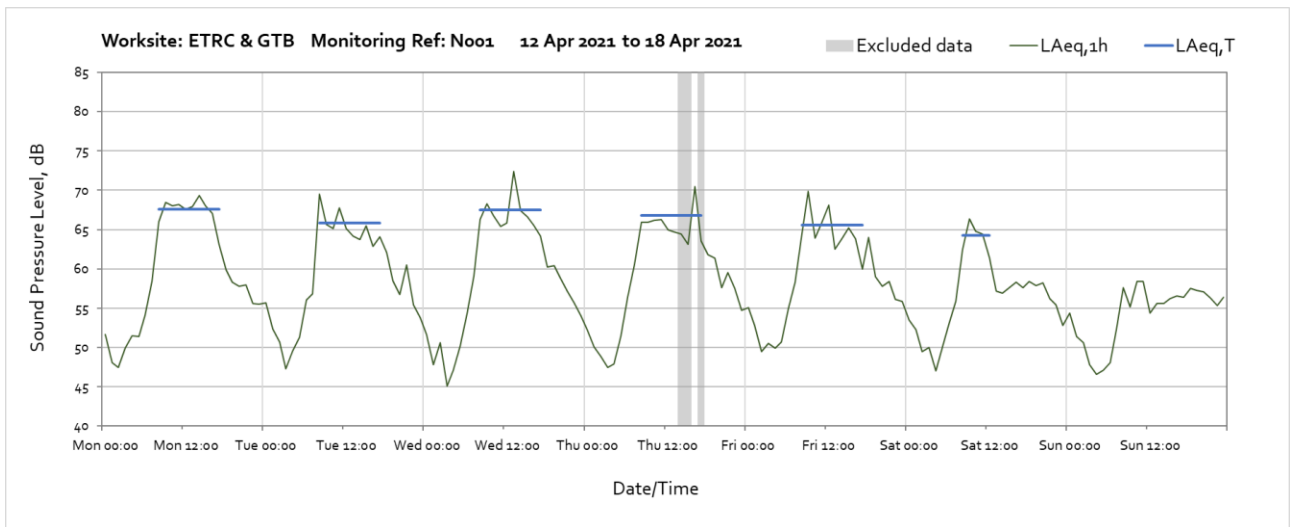
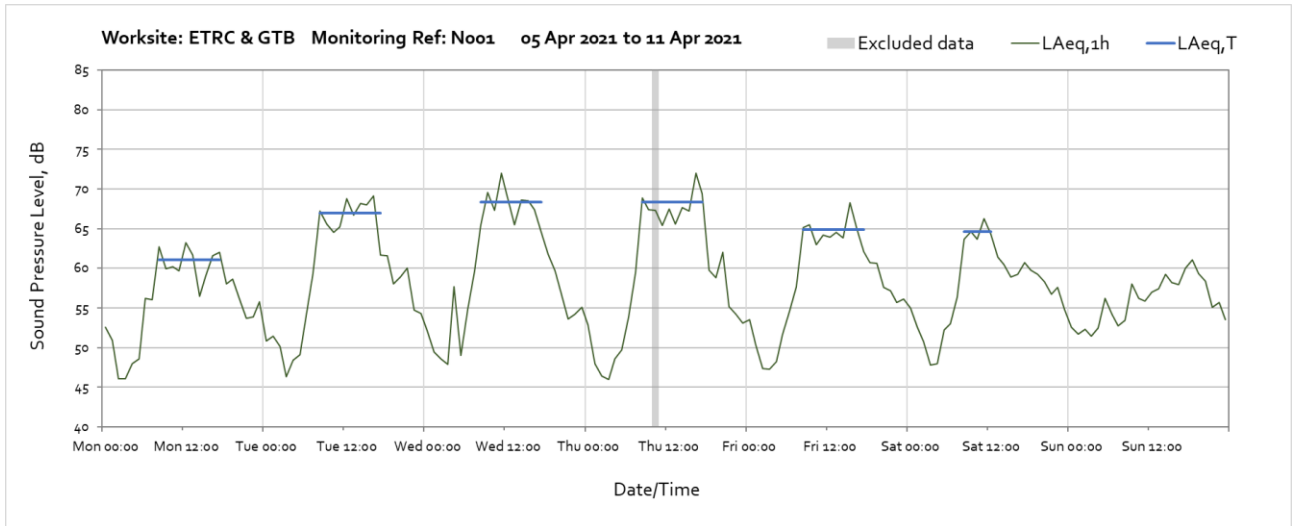
Note: Missing data between 00:00-04:00 on Saturday 3rd April was due to a memory card fault.

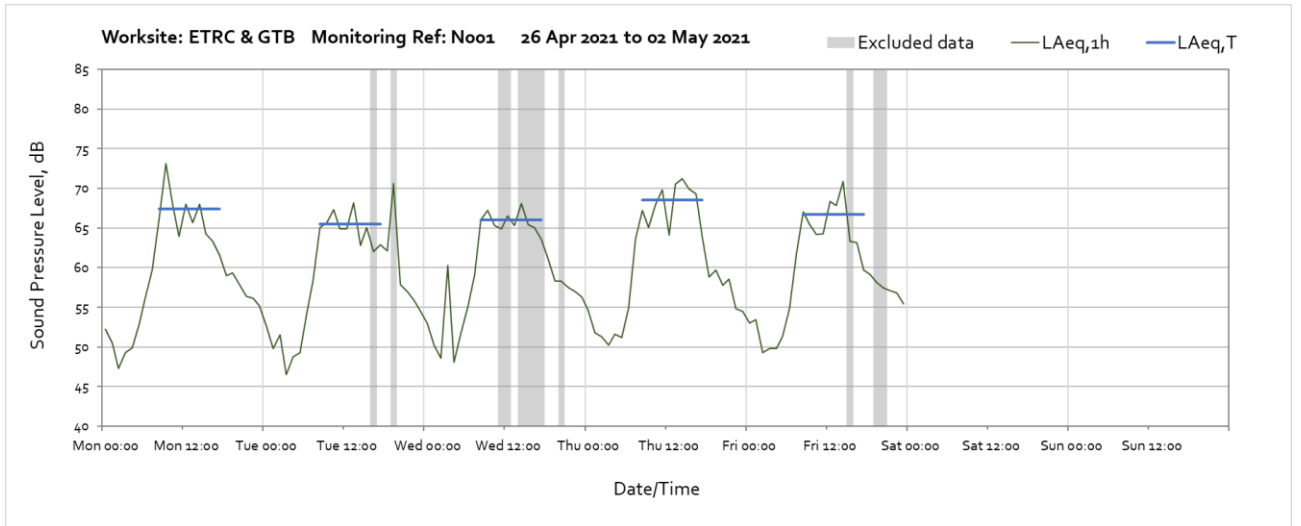




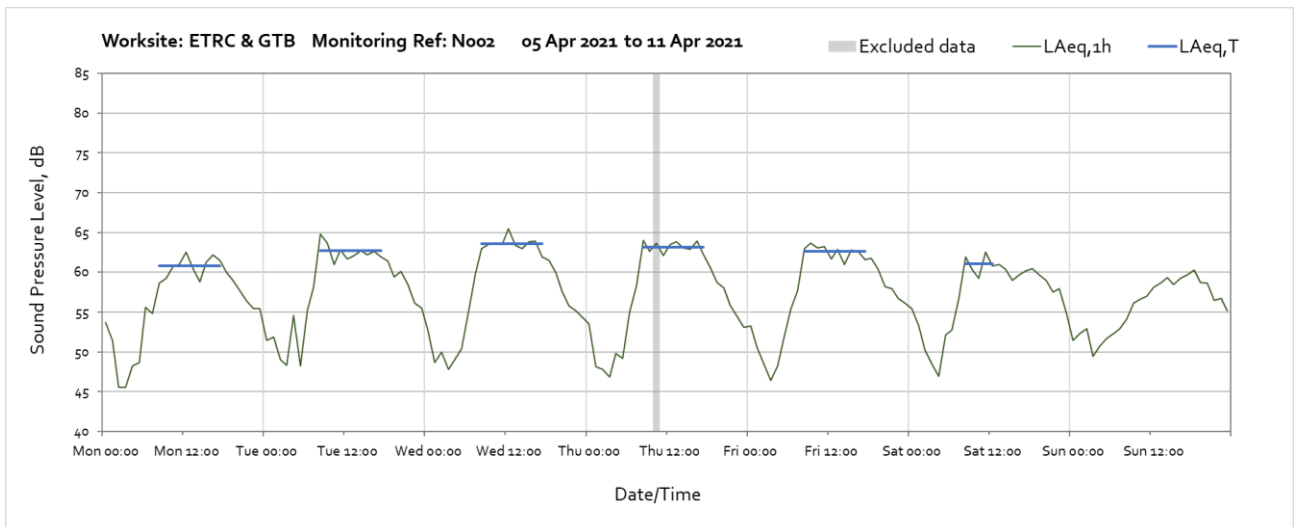
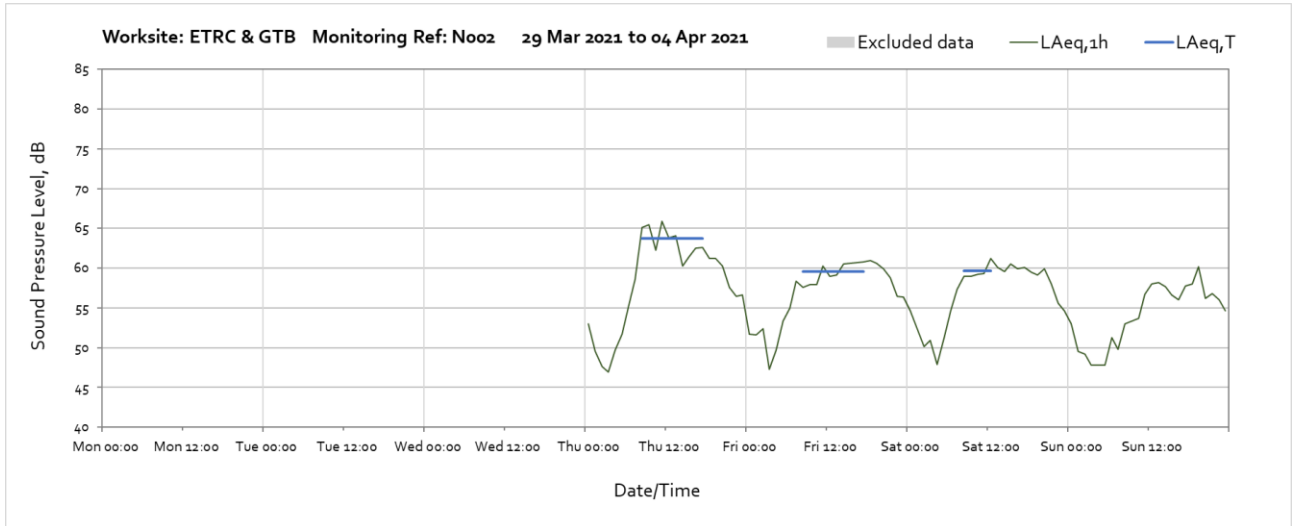
Worksite: ETRC & GTB – Monitoring Ref: N001

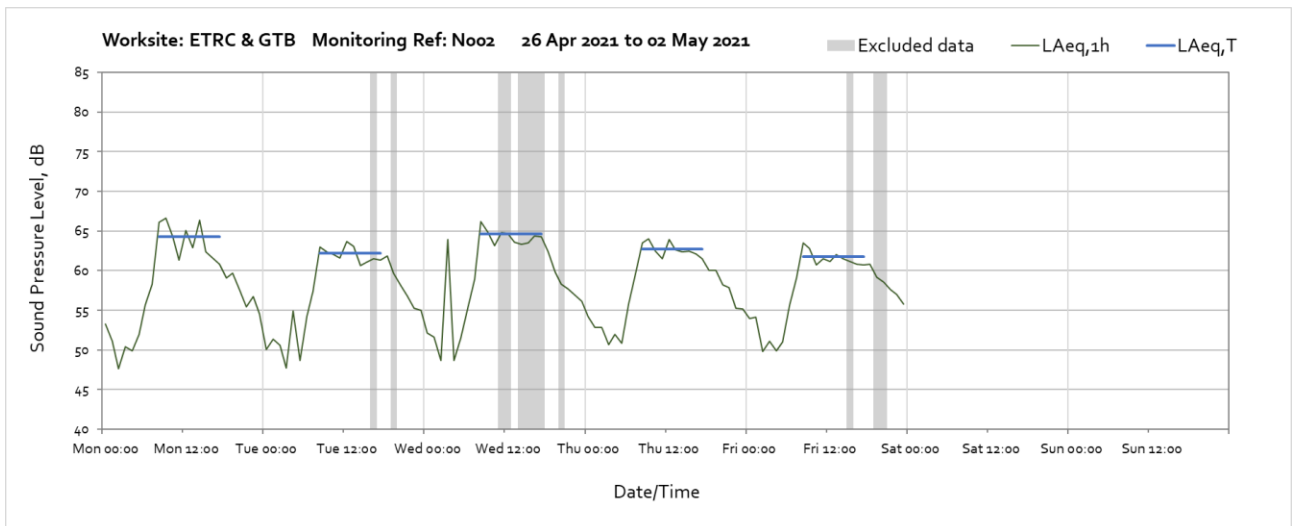
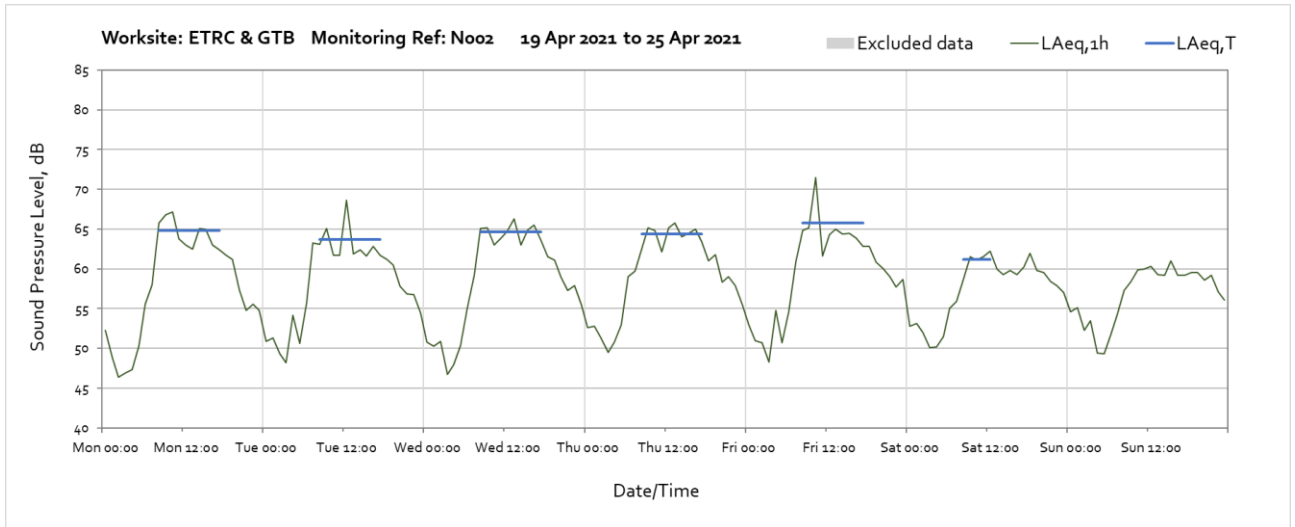
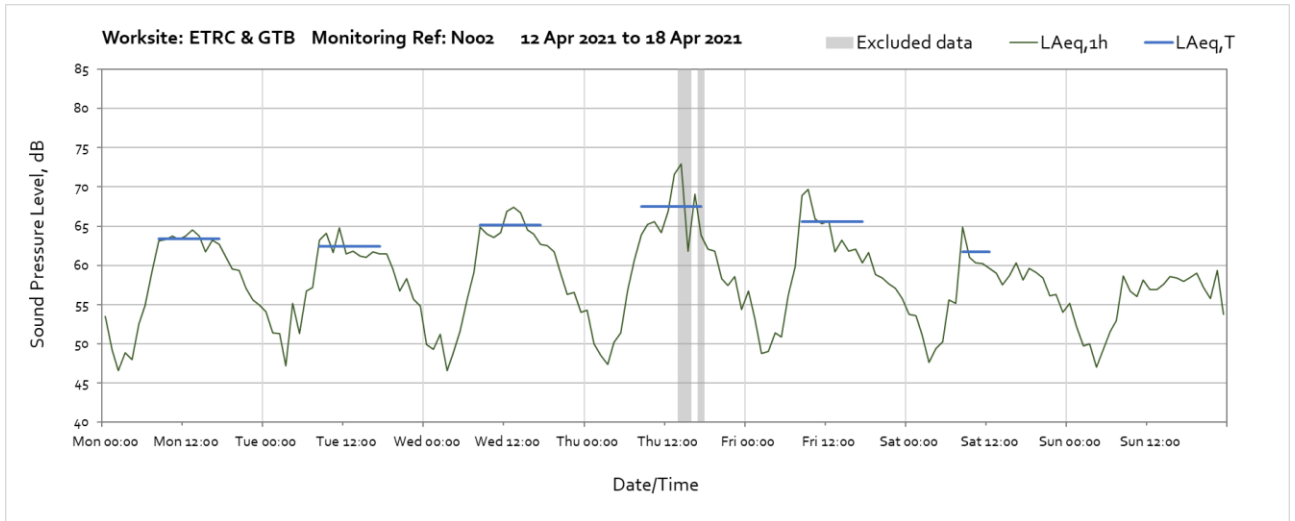




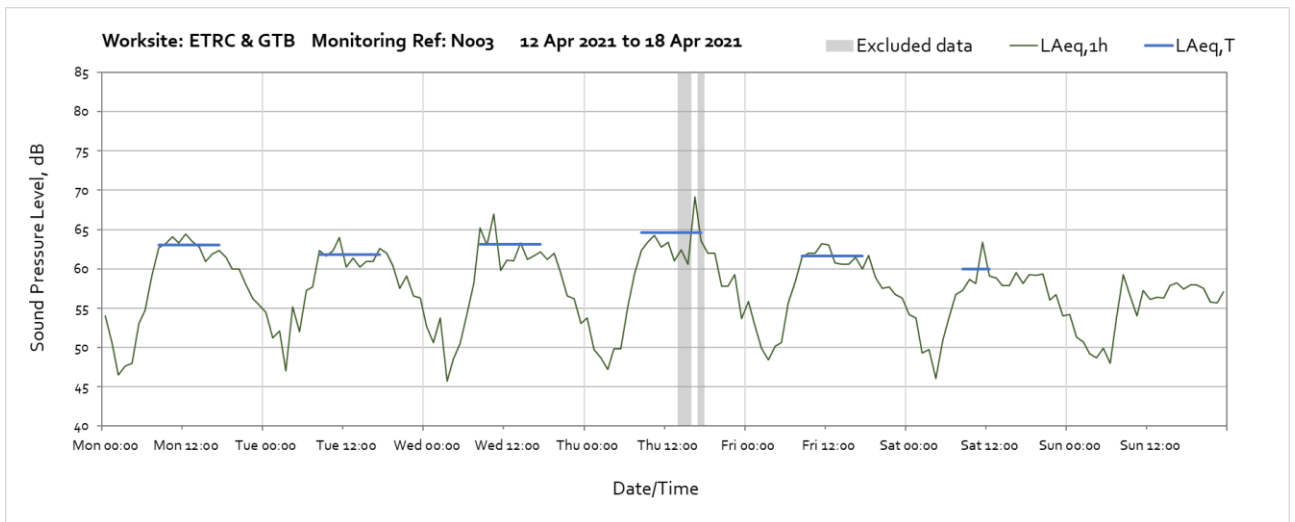
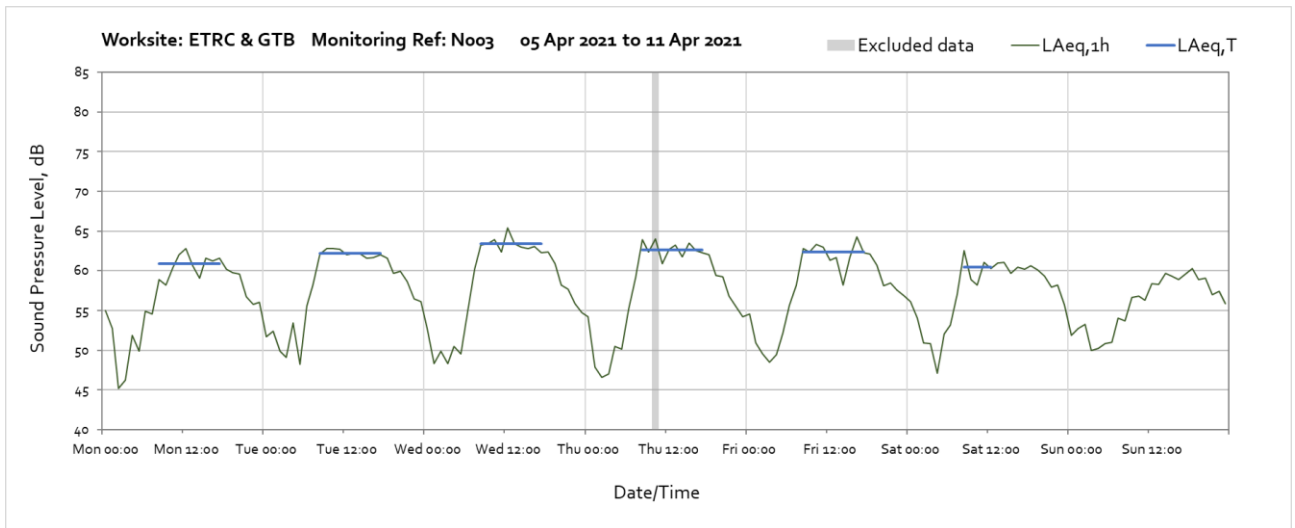
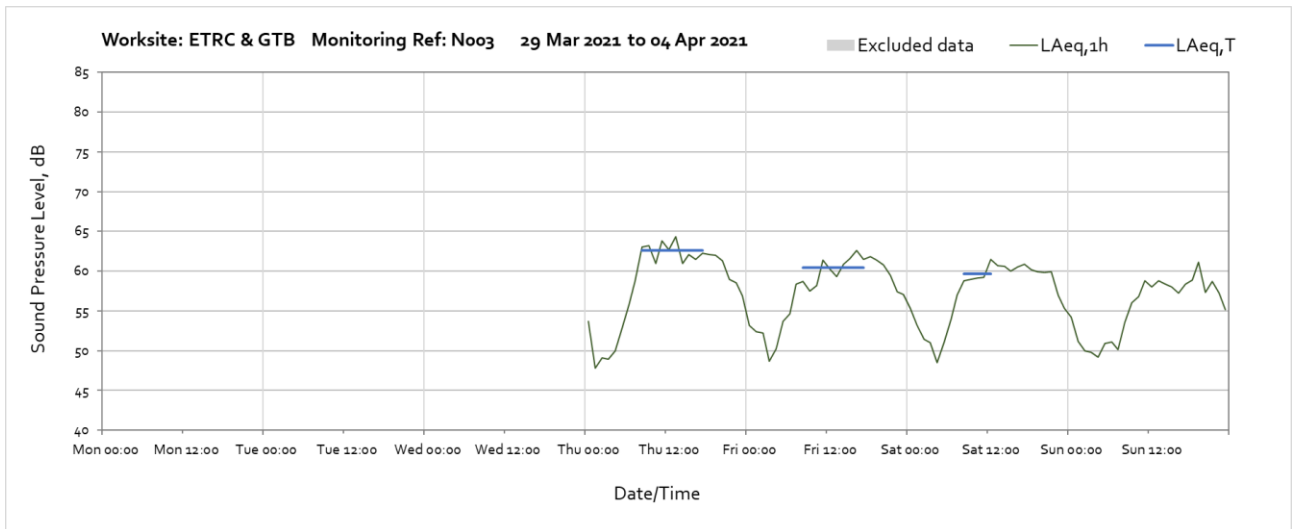


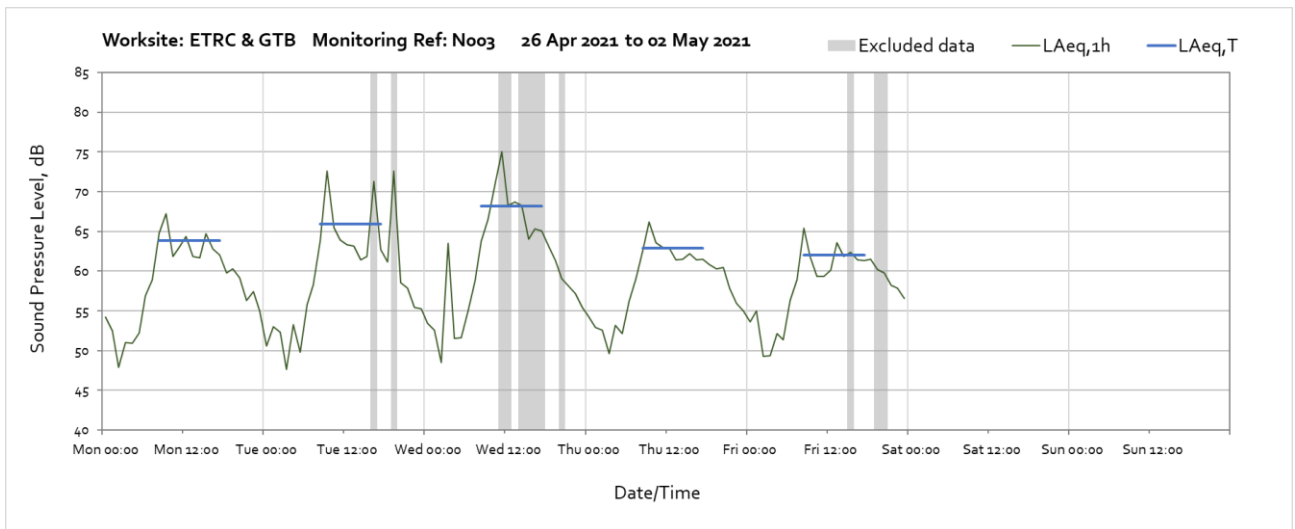
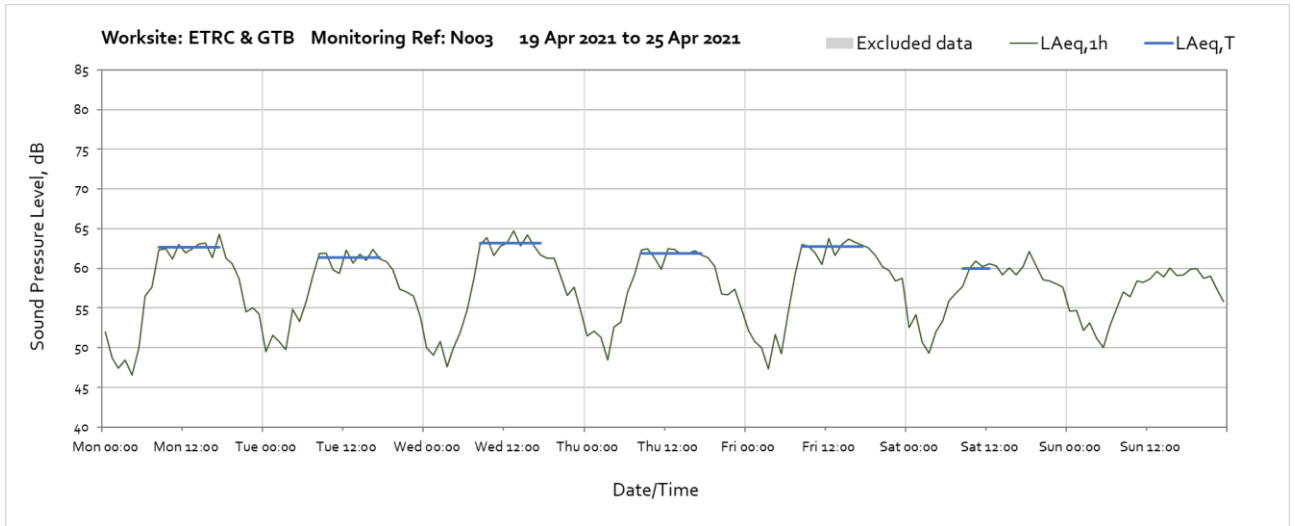
Worksite: ETRC & GTB – Monitoring Ref: N002



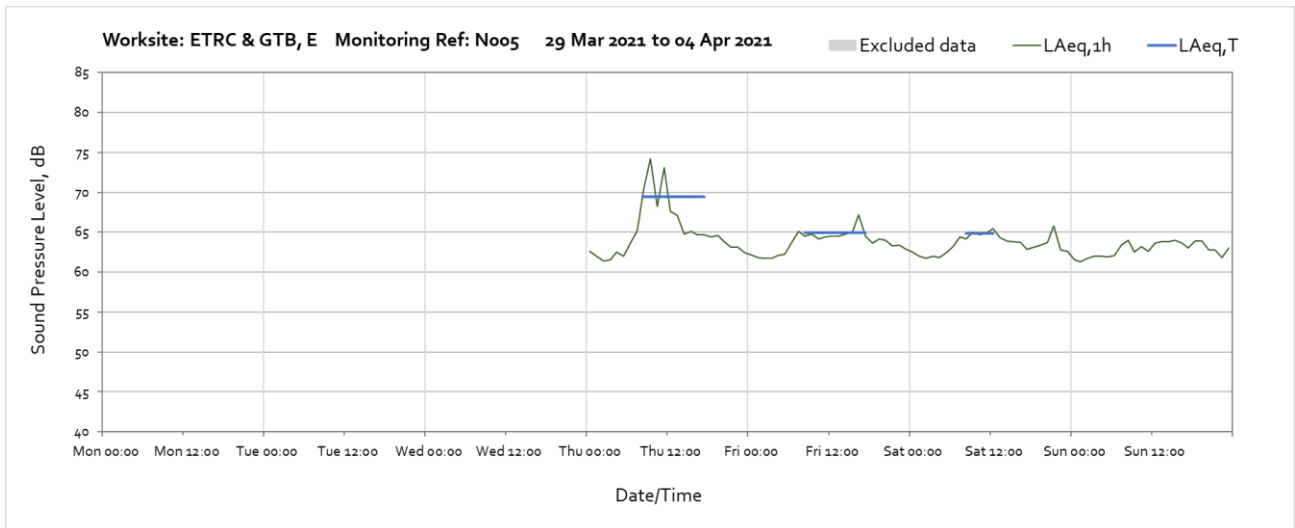


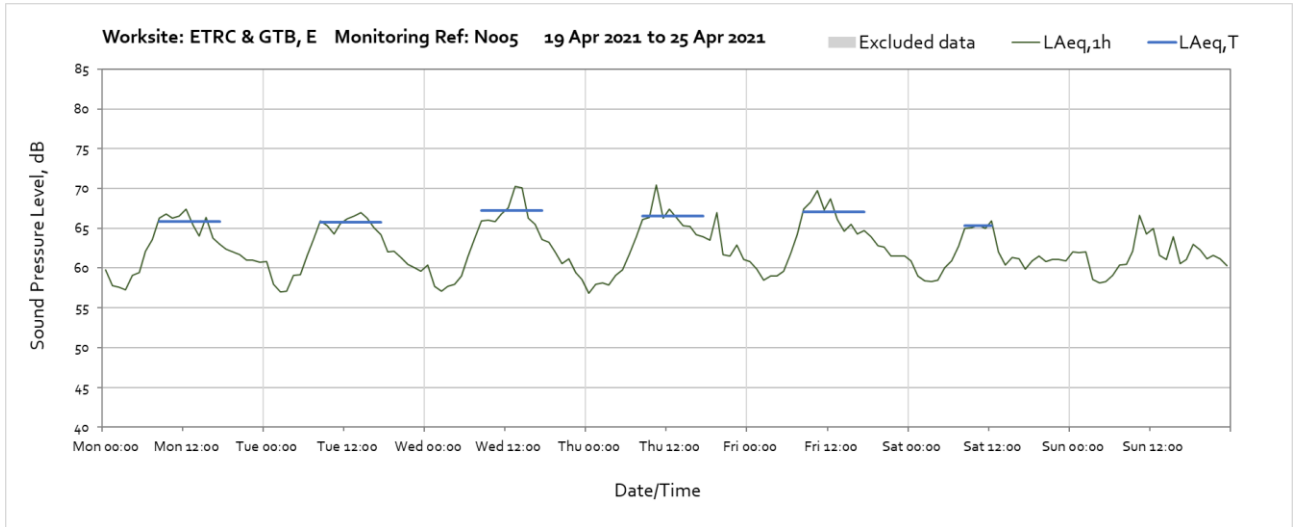
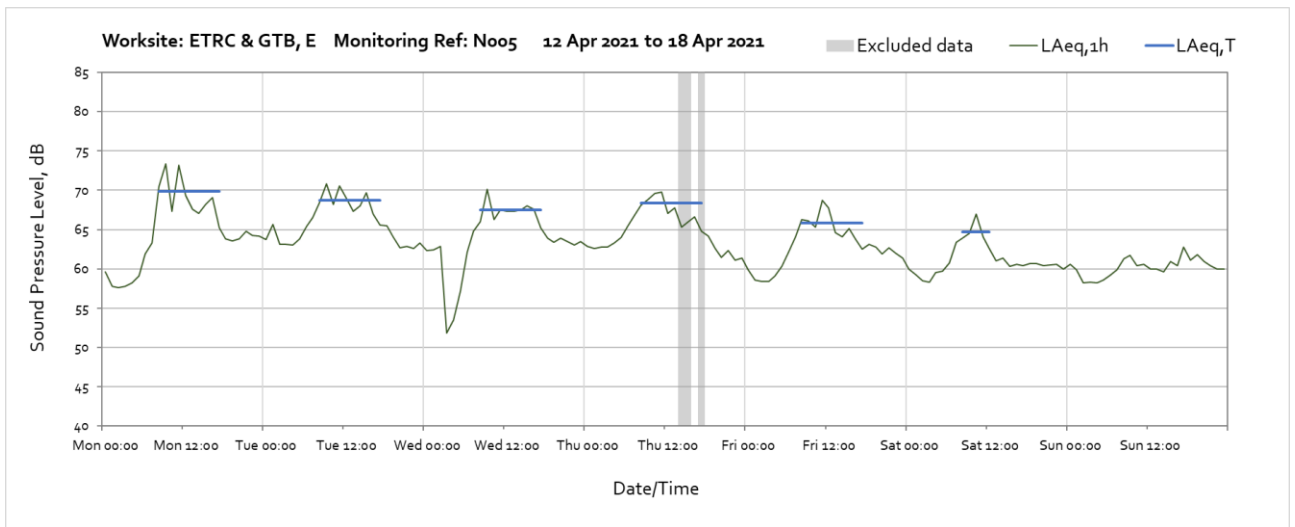
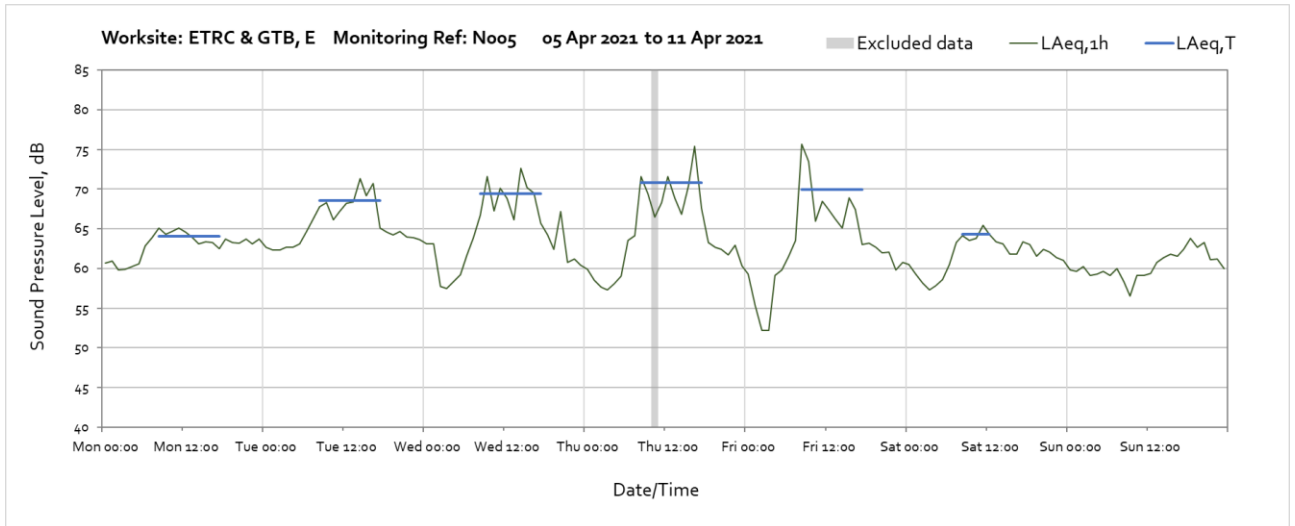
Worksite: ETRC & GTB – Monitoring Ref: N003

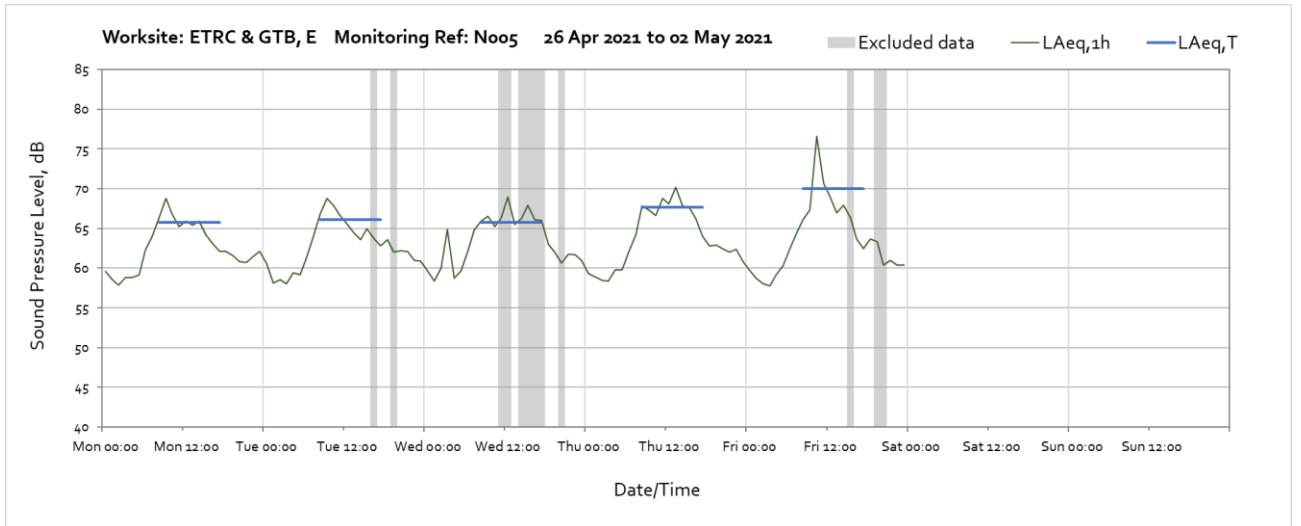




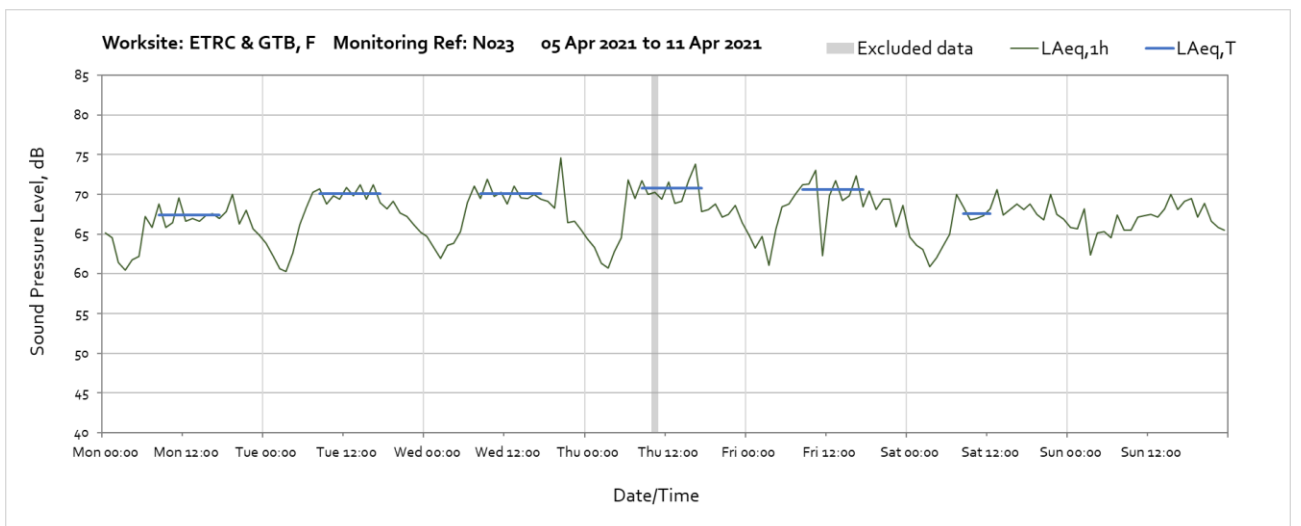
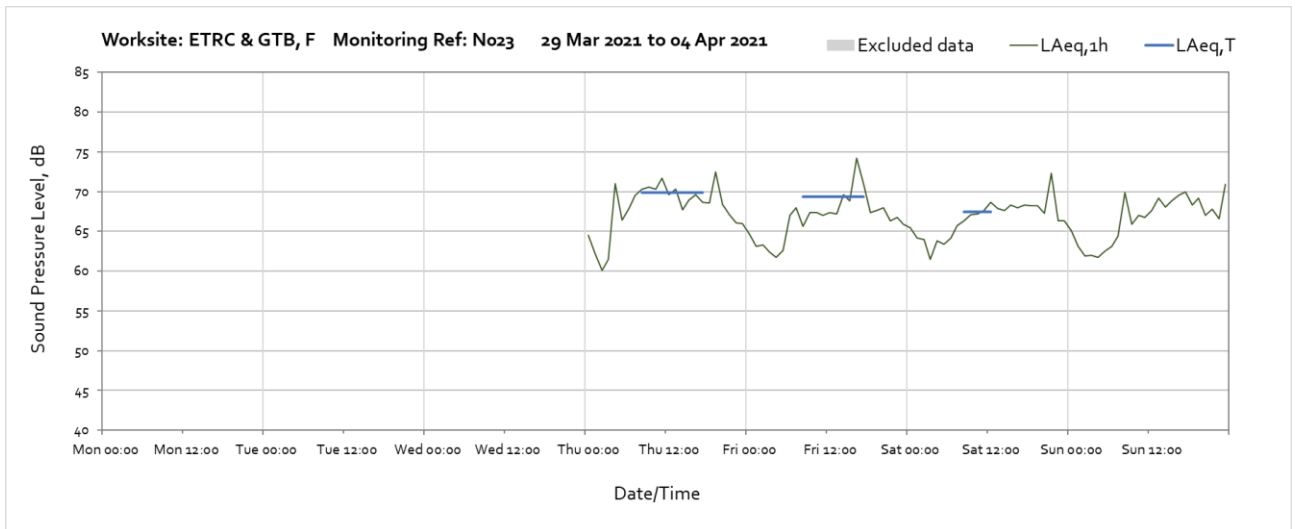
Worksite: ETRC & GTB, E – Monitoring Ref: N005

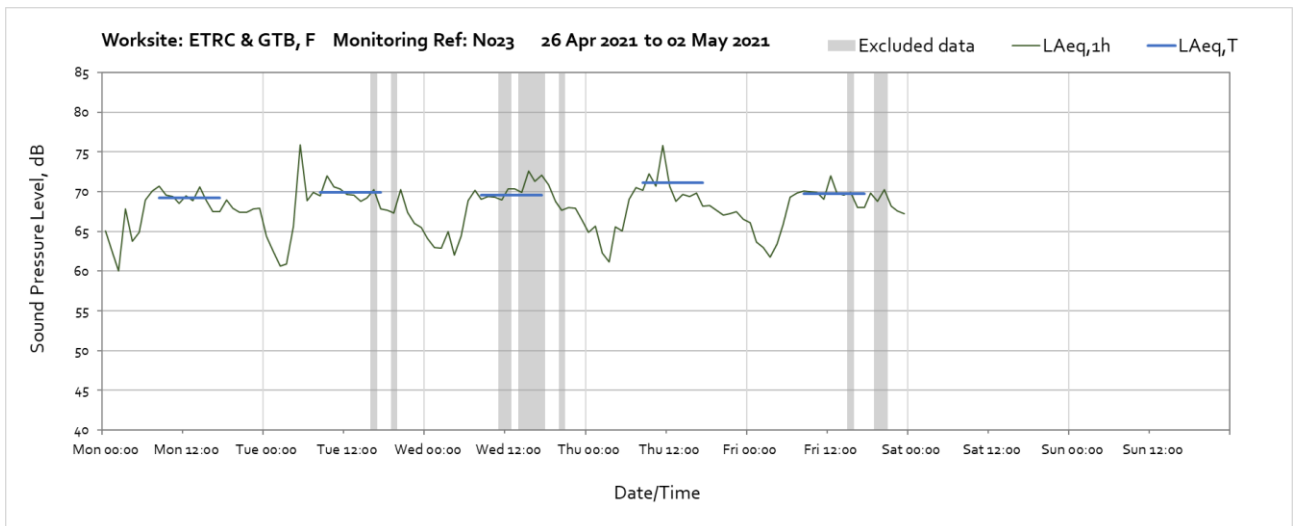
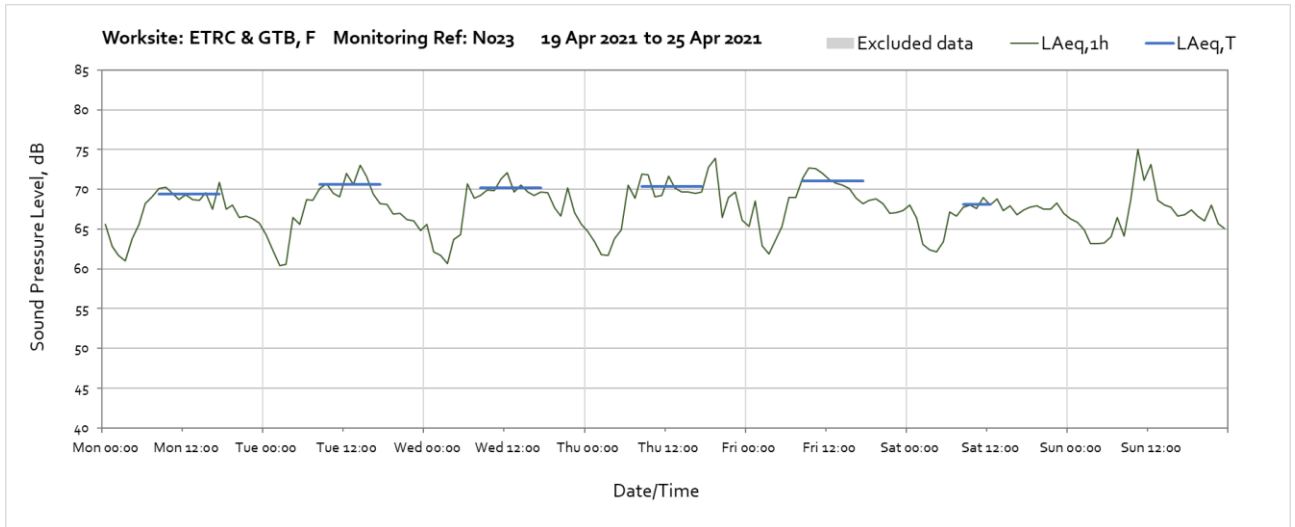
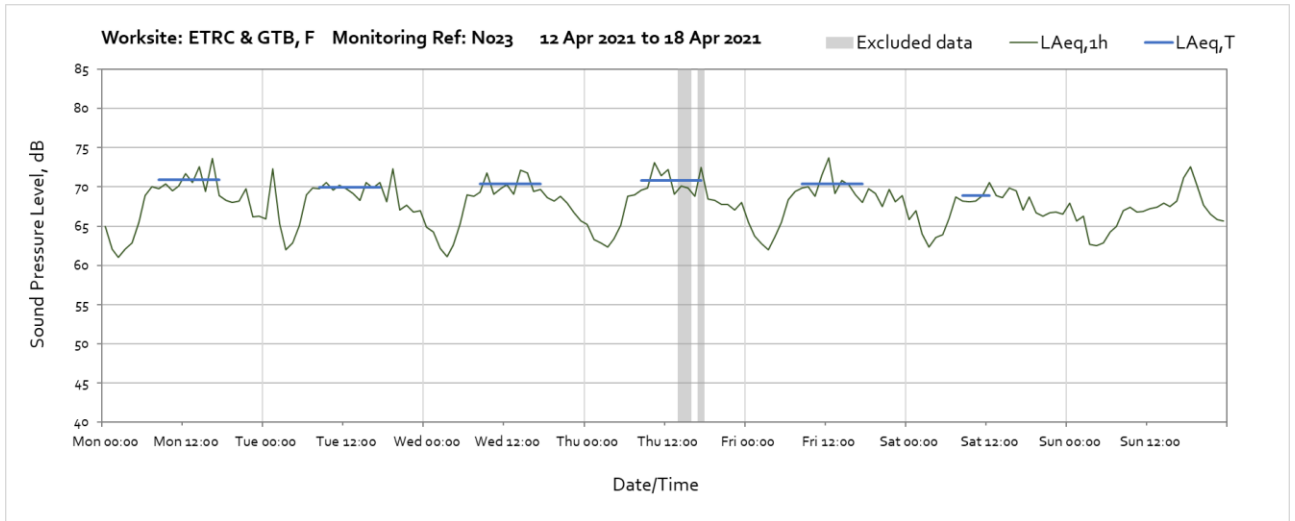




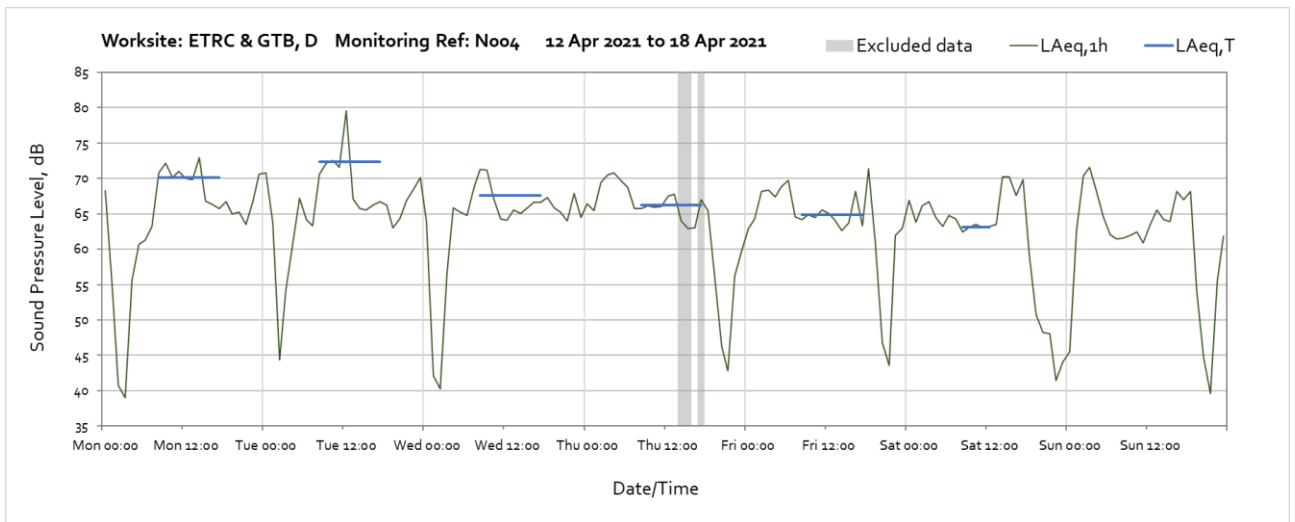
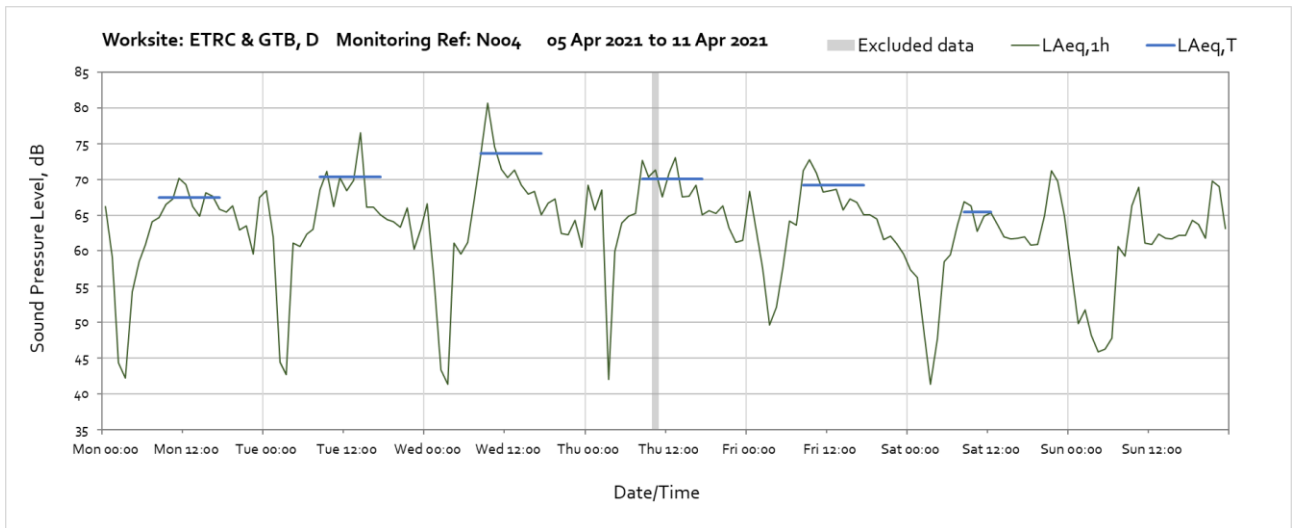
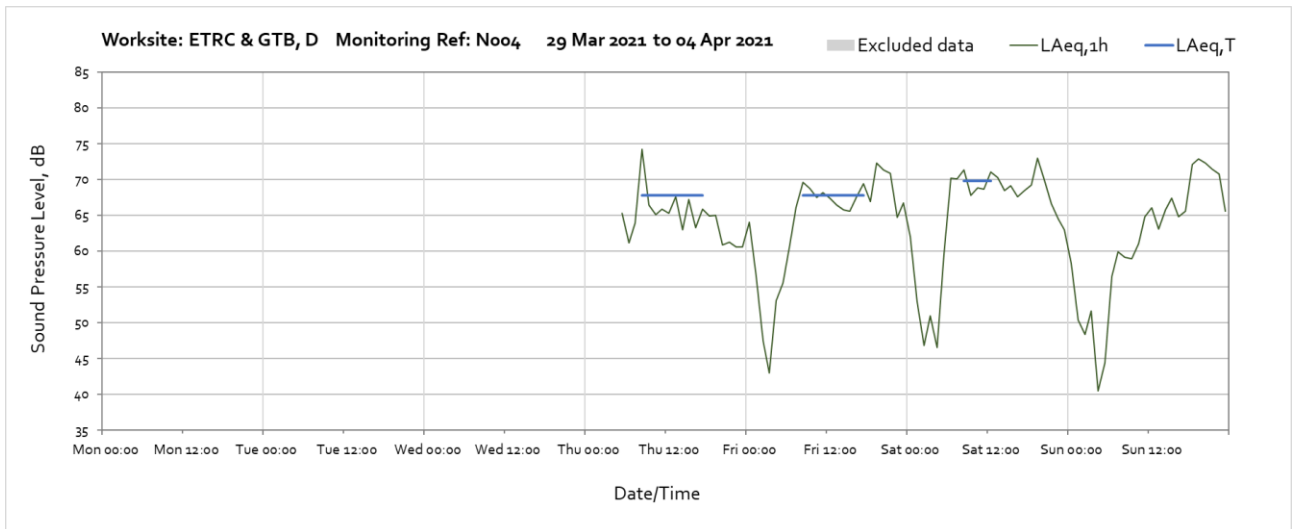


Worksite: ETRC – Monitoring Ref: N023

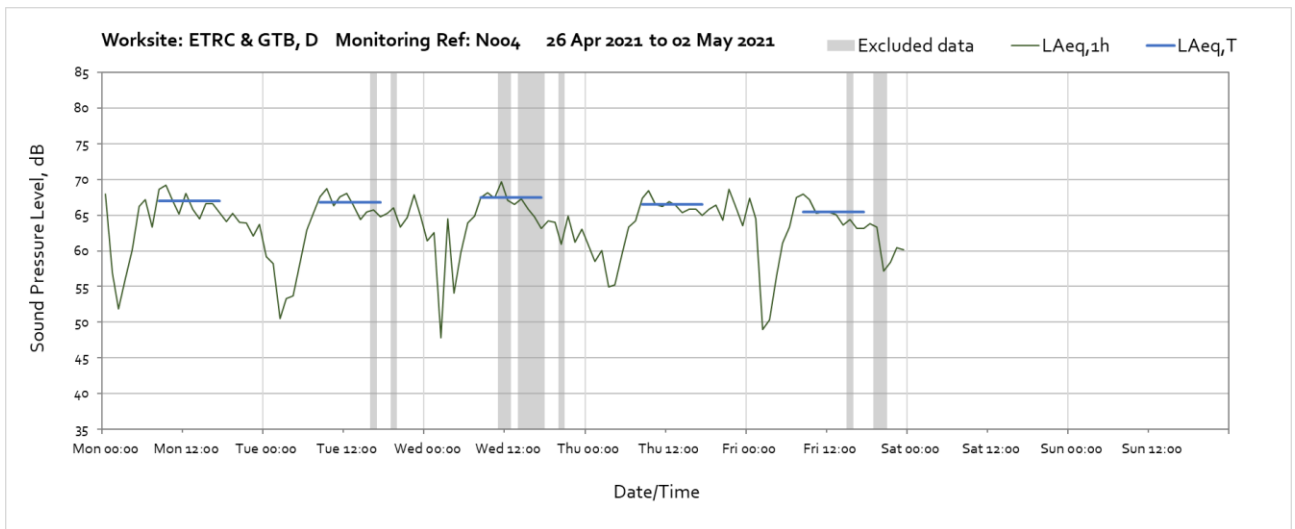
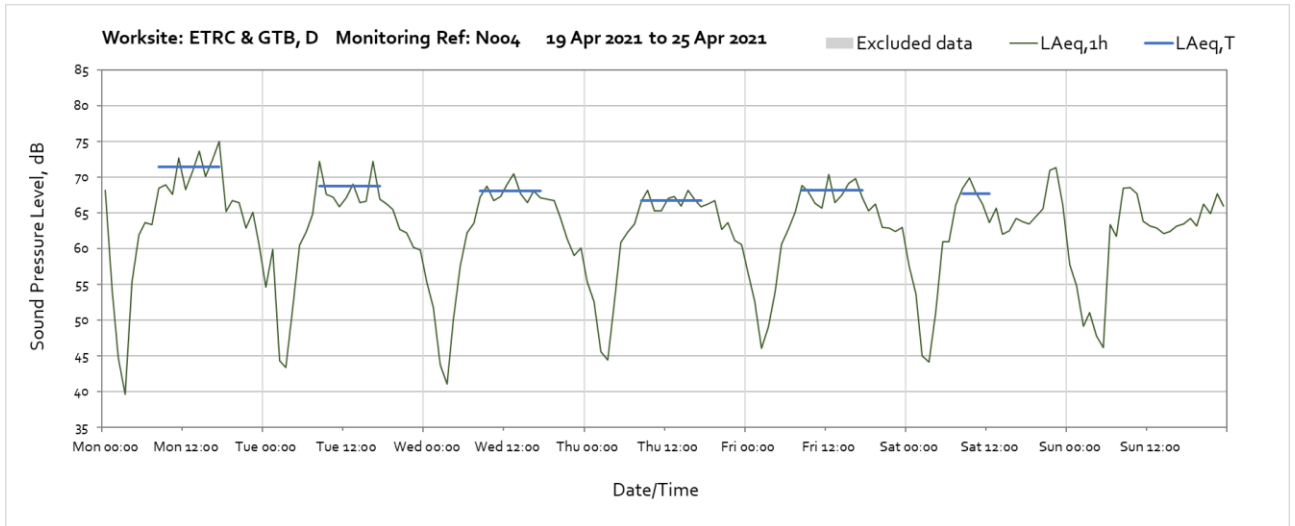




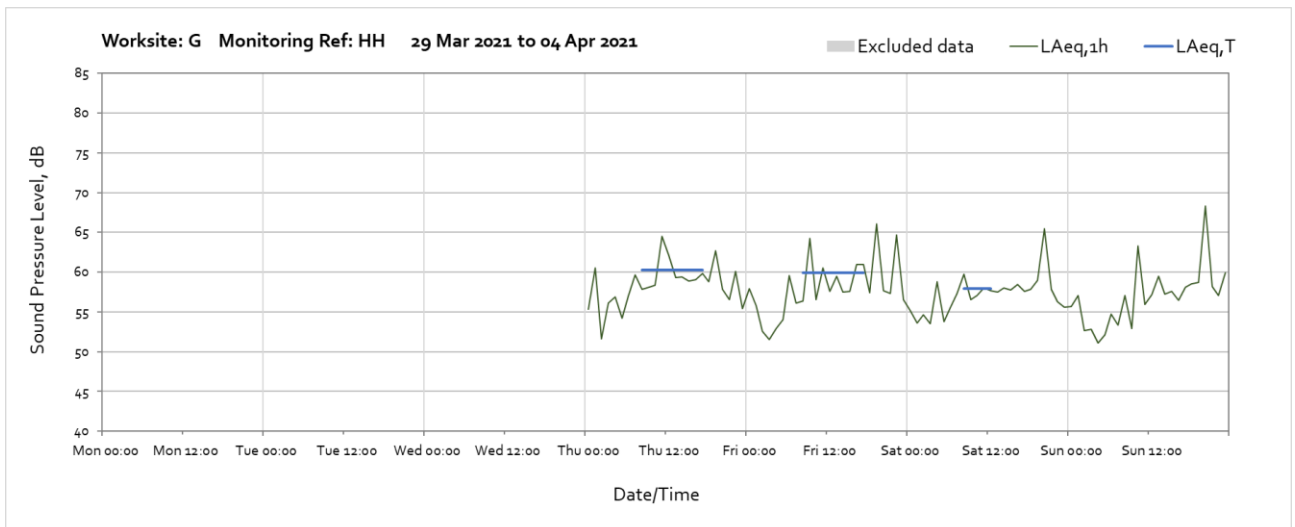
Worksite: ETRC & GTB, D – Monitoring Ref: N004

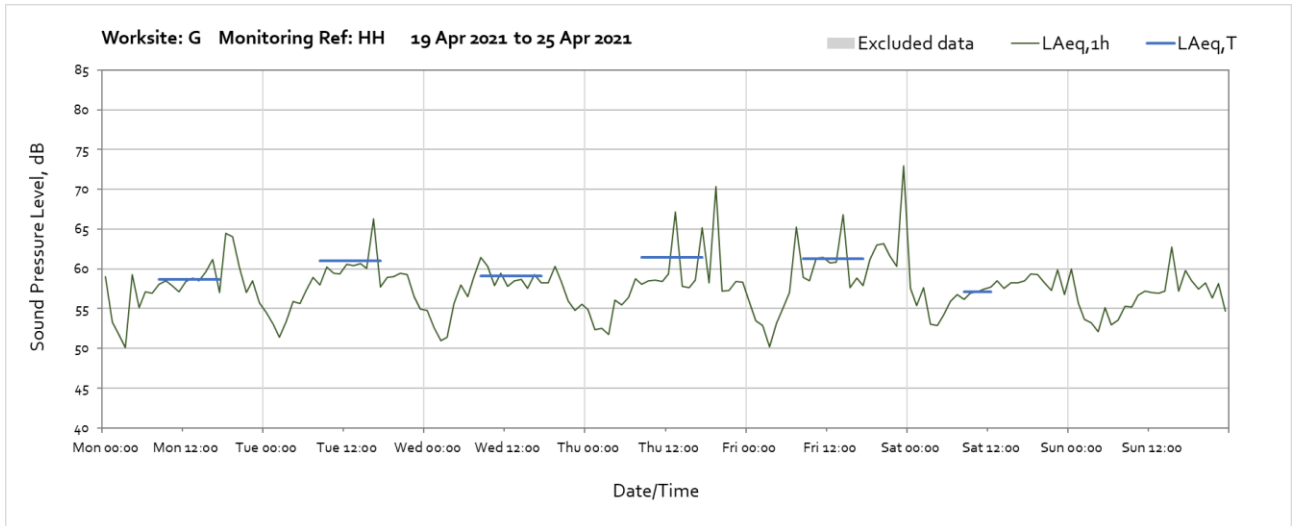
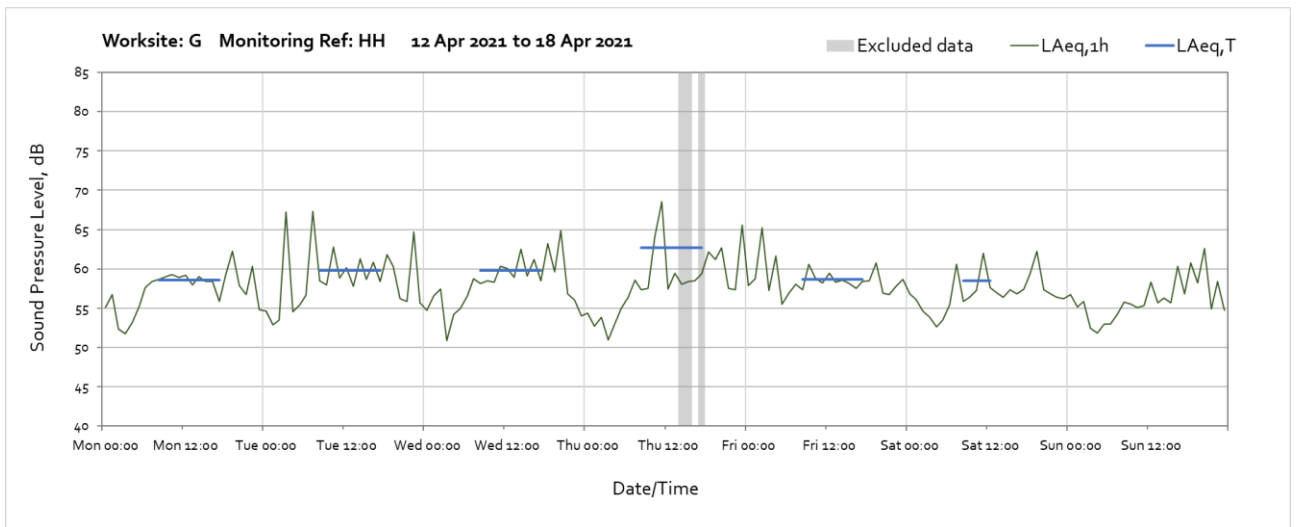
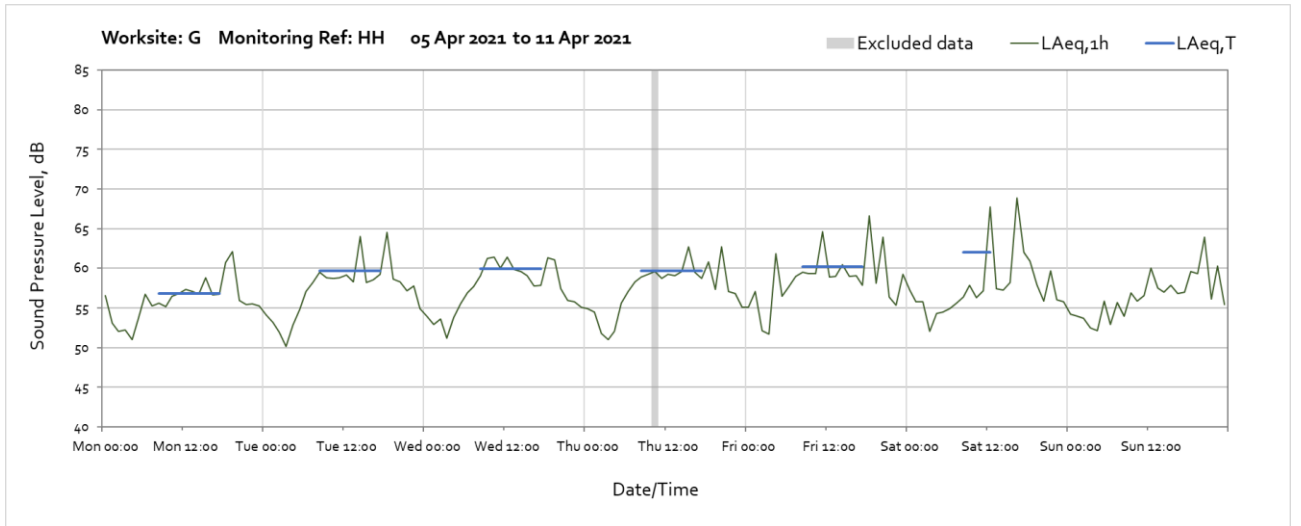


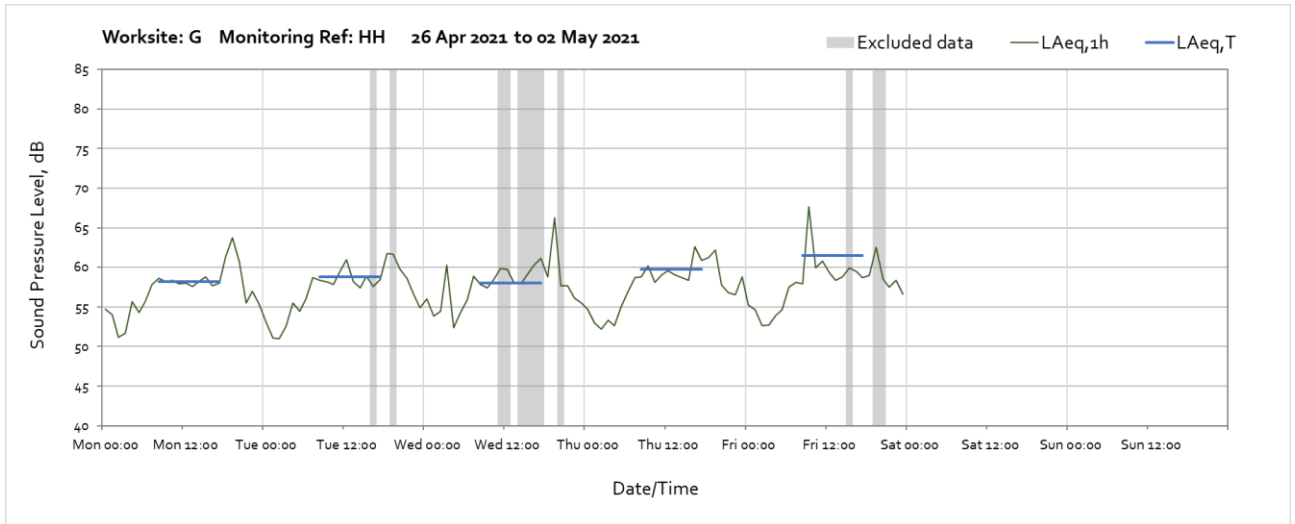
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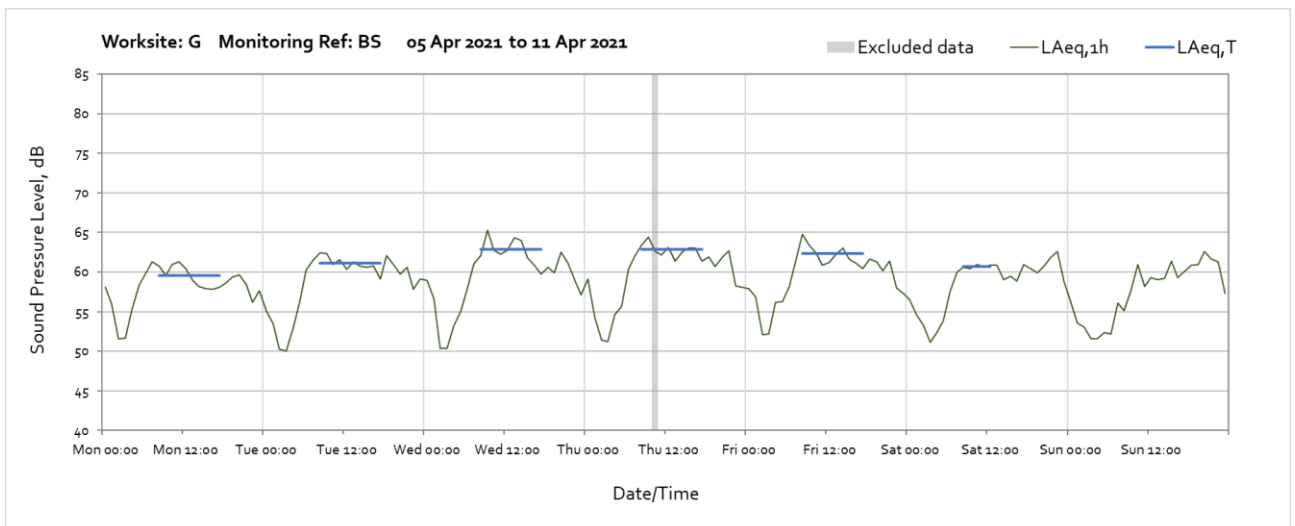
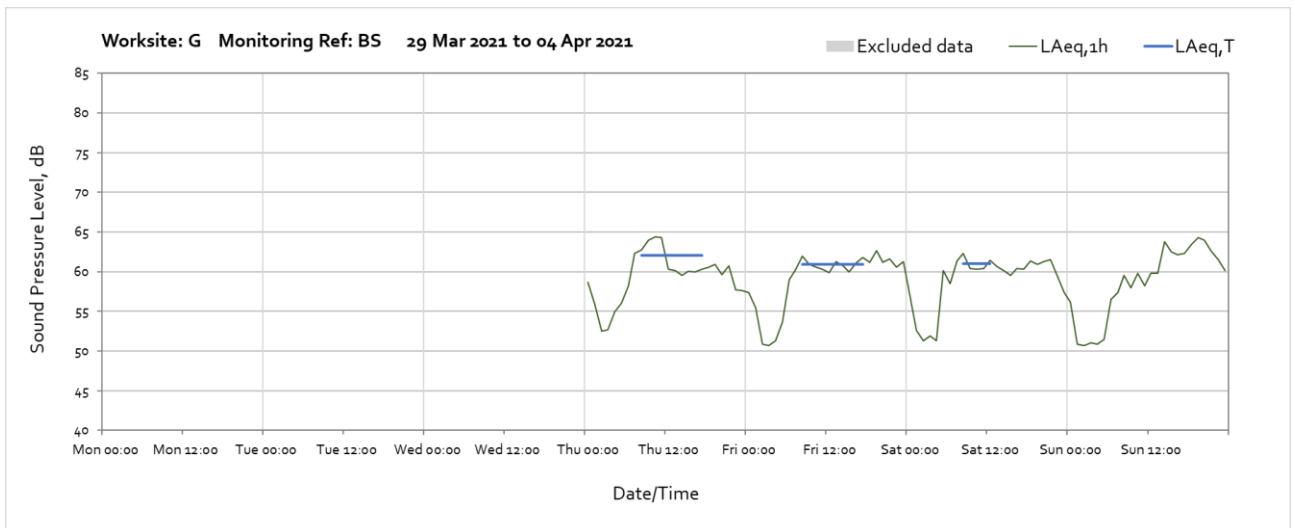
Worksite: G – Monitoring Ref: HH

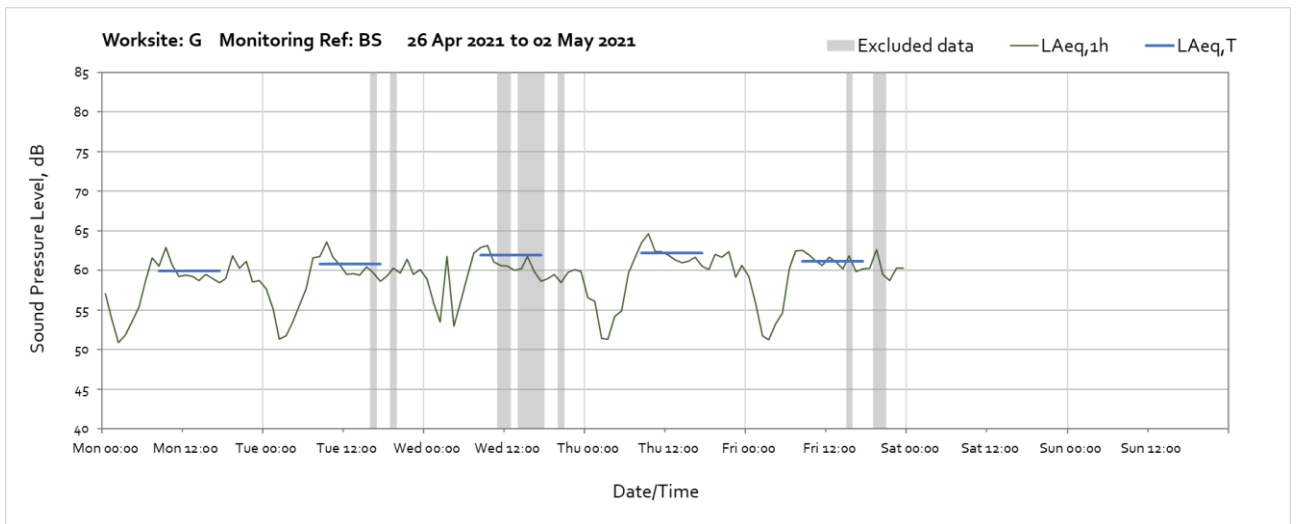
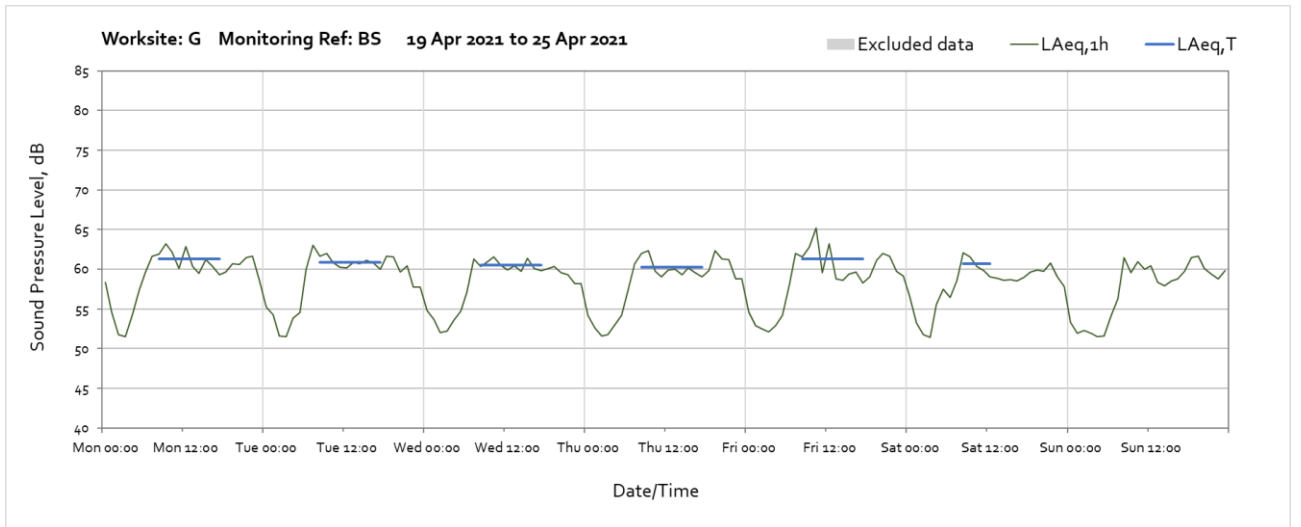
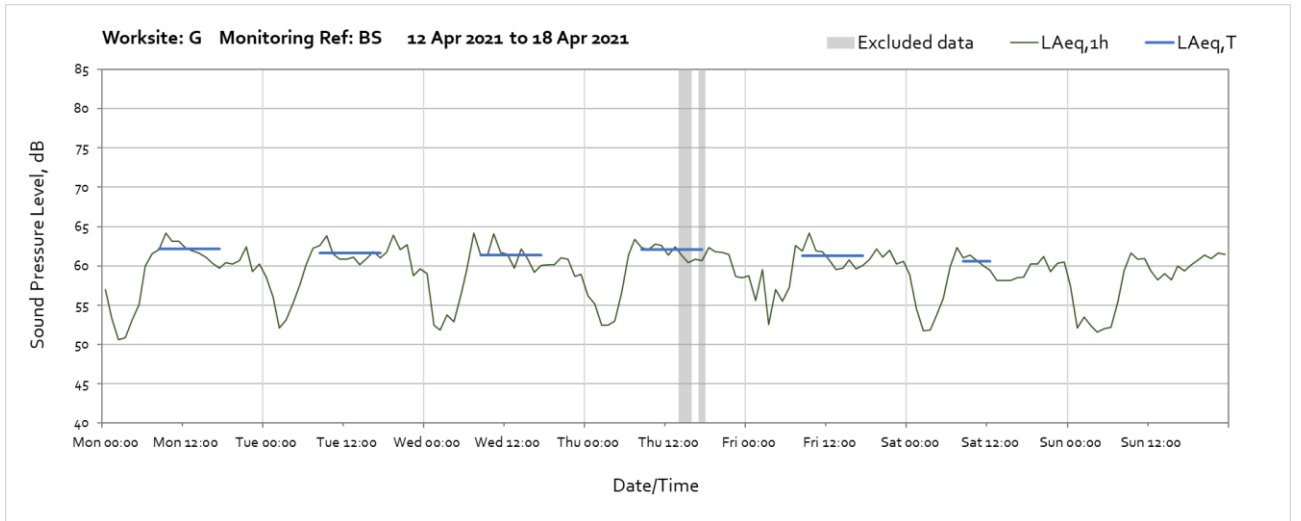




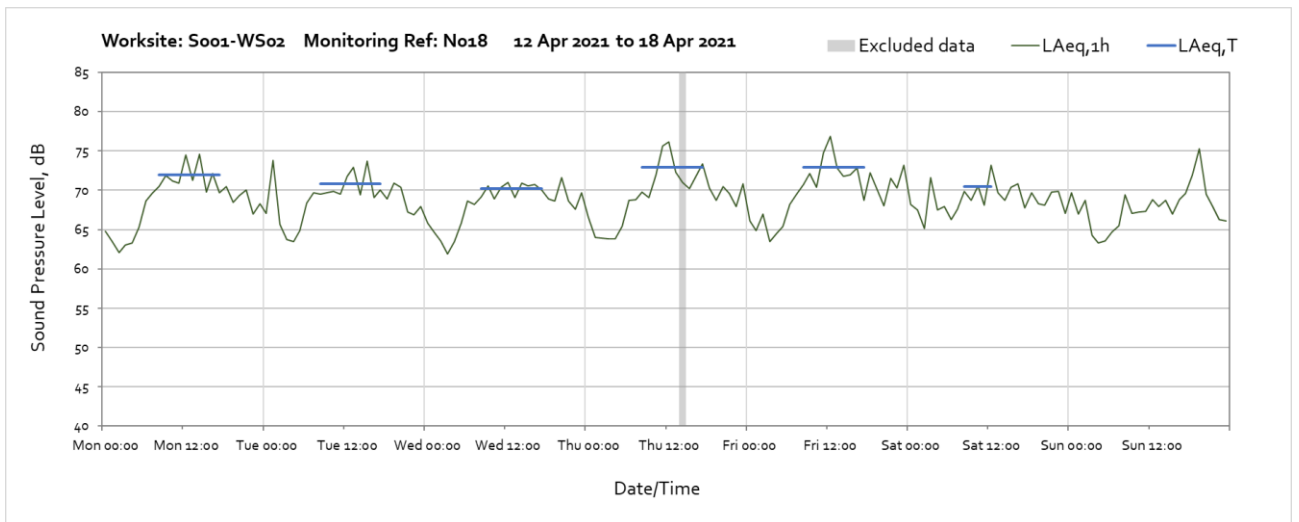
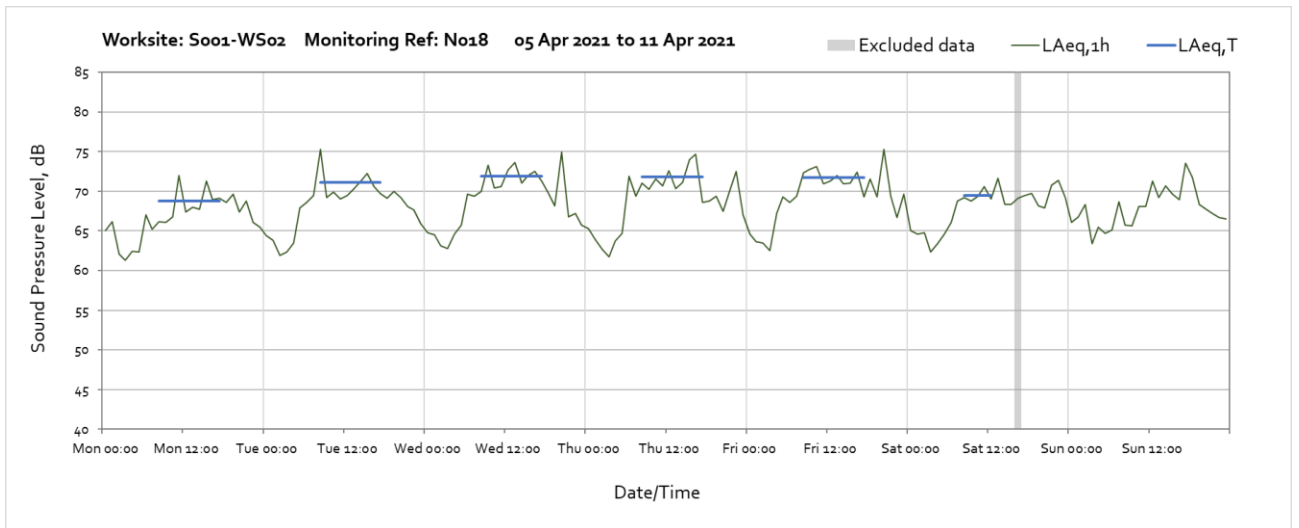
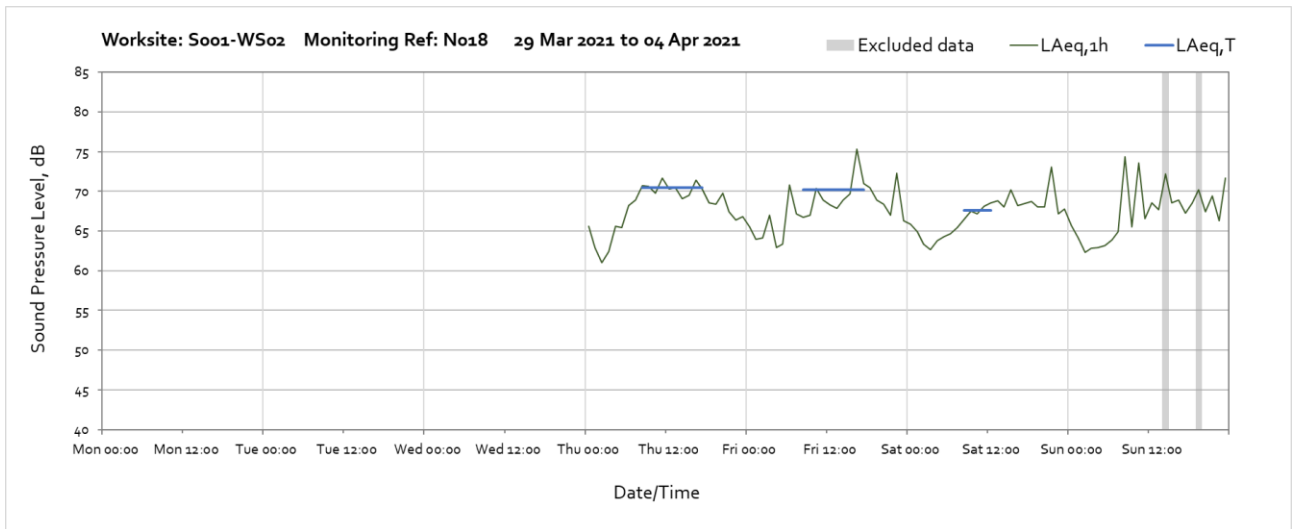


Worksite: G – Monitoring Ref: BS

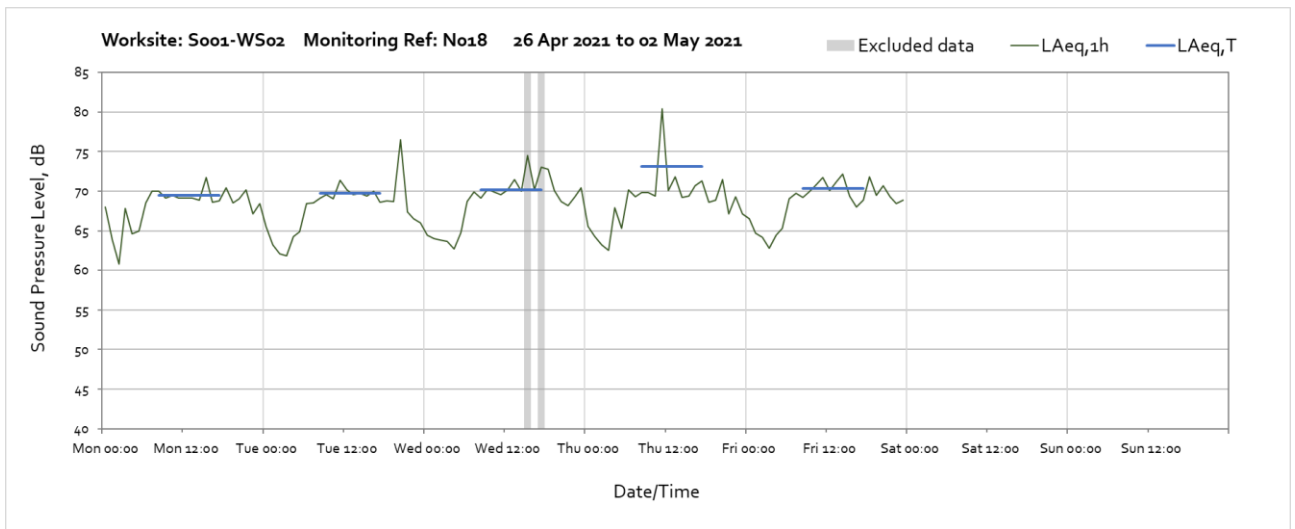
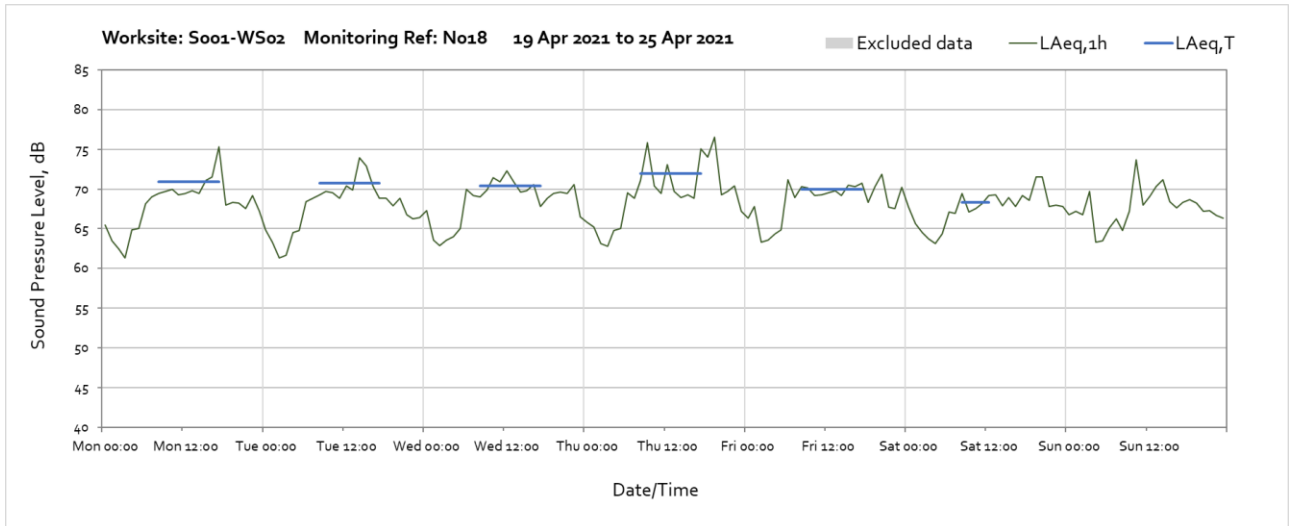




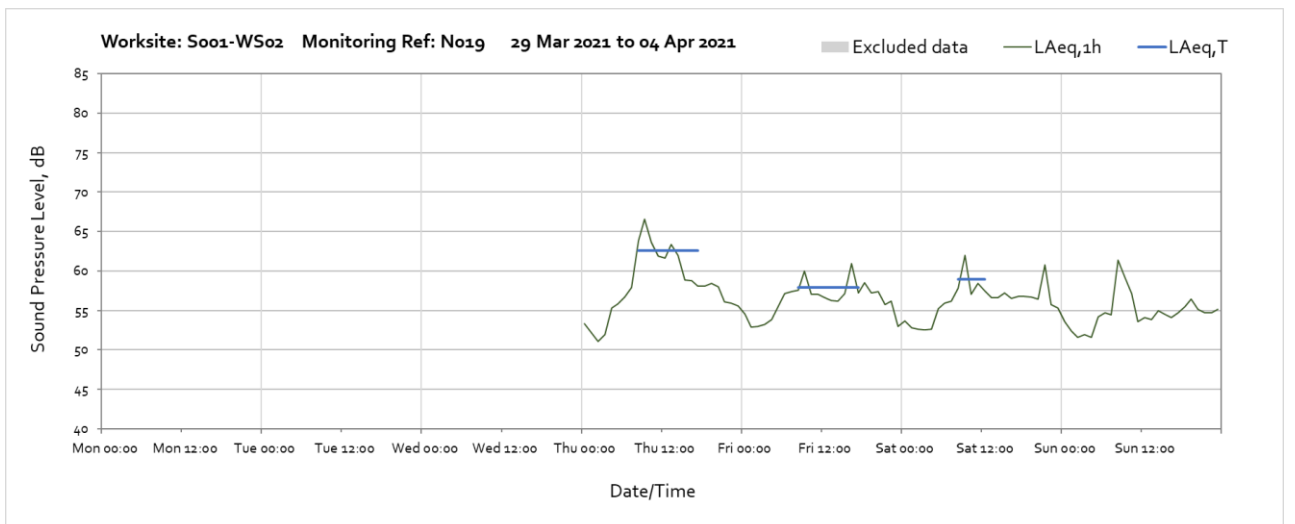
Worksite: S001-WS02 – Monitoring Ref: N018

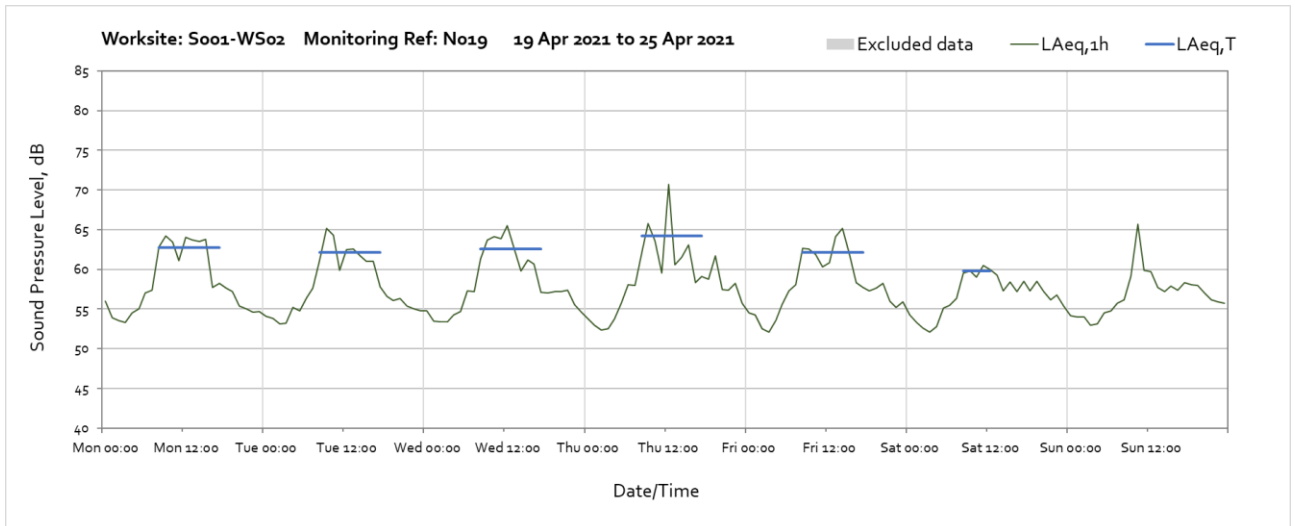
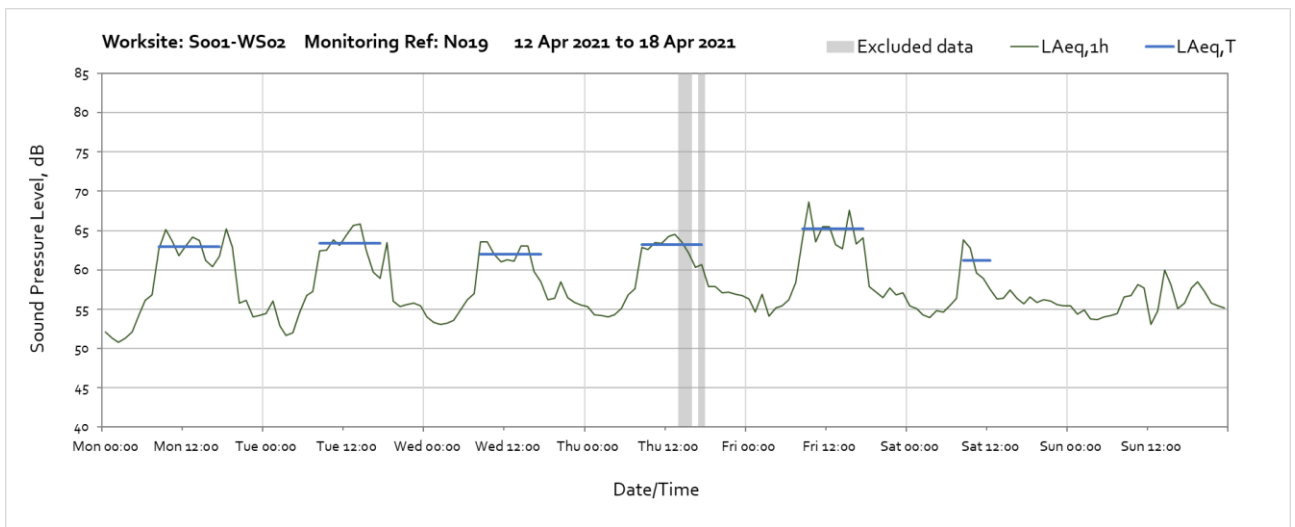
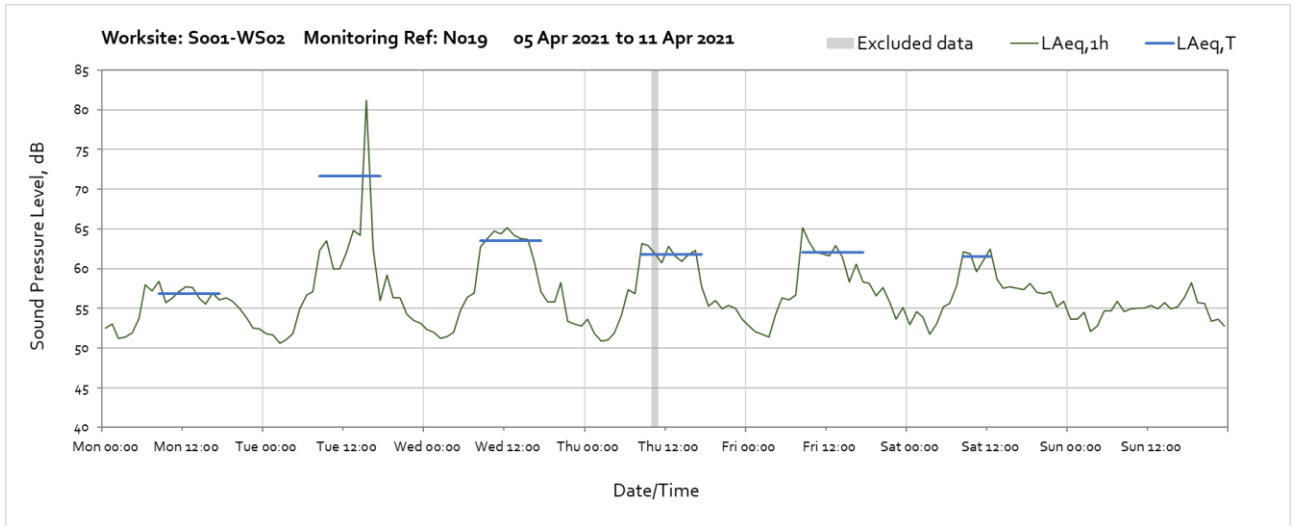


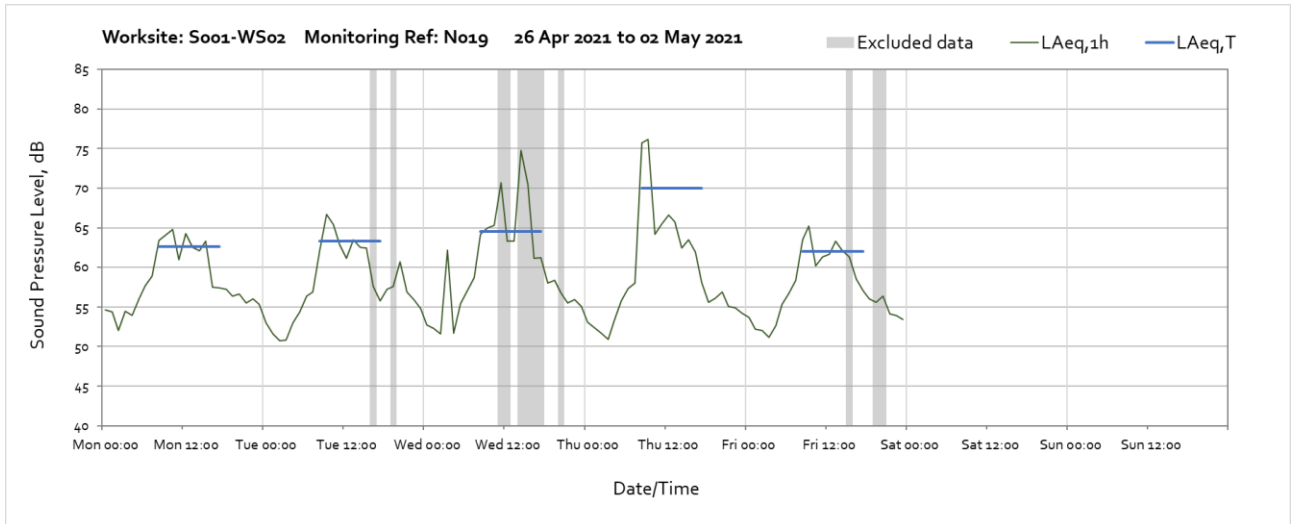
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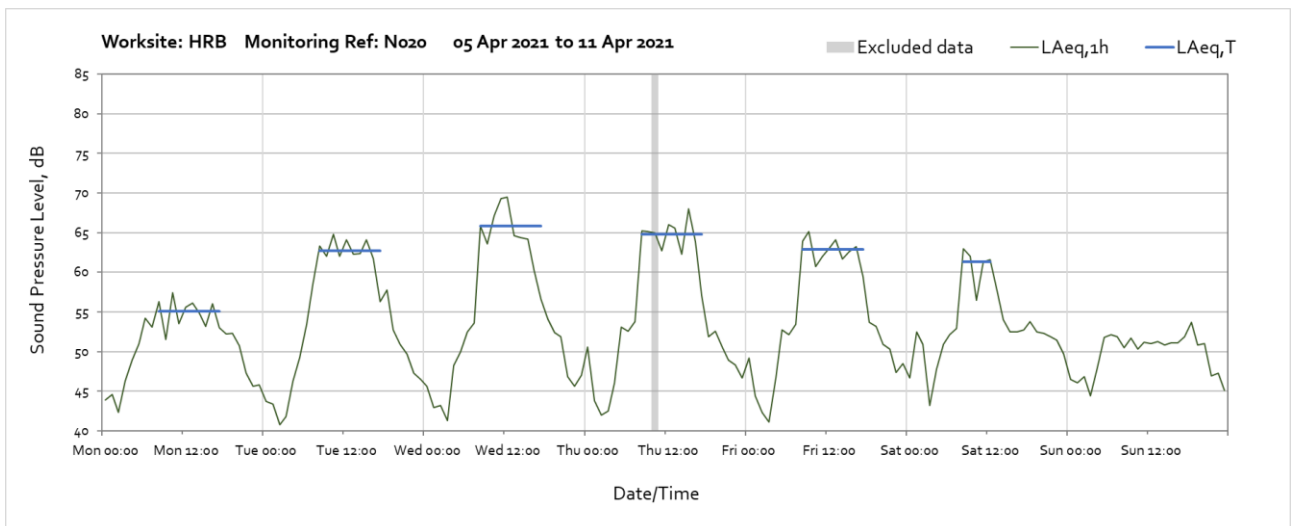
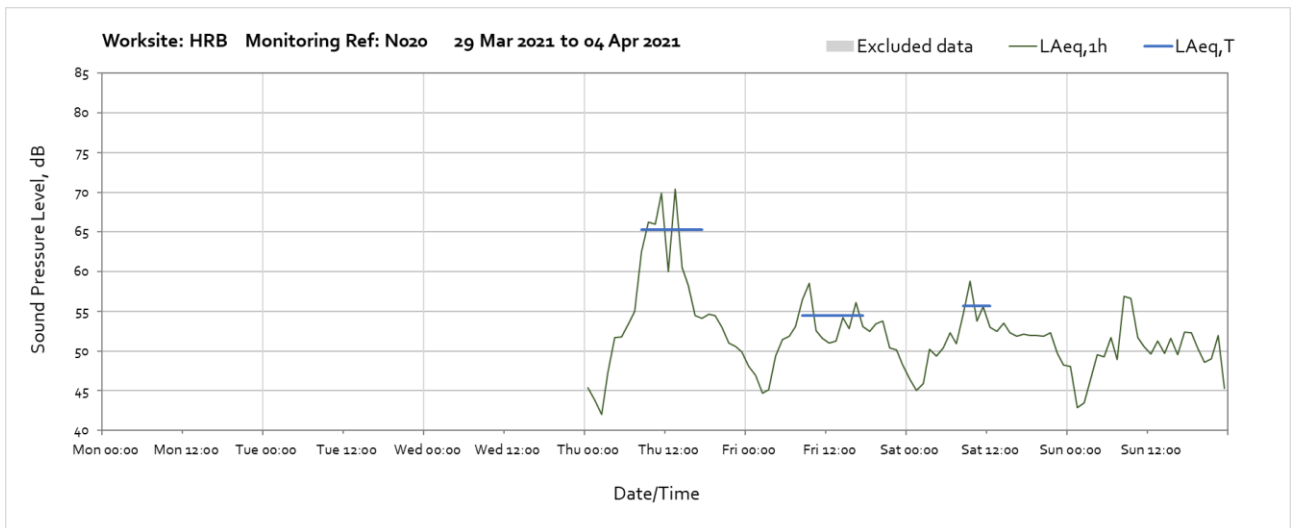
Worksite: S001-WS02 – Monitoring Ref: N019

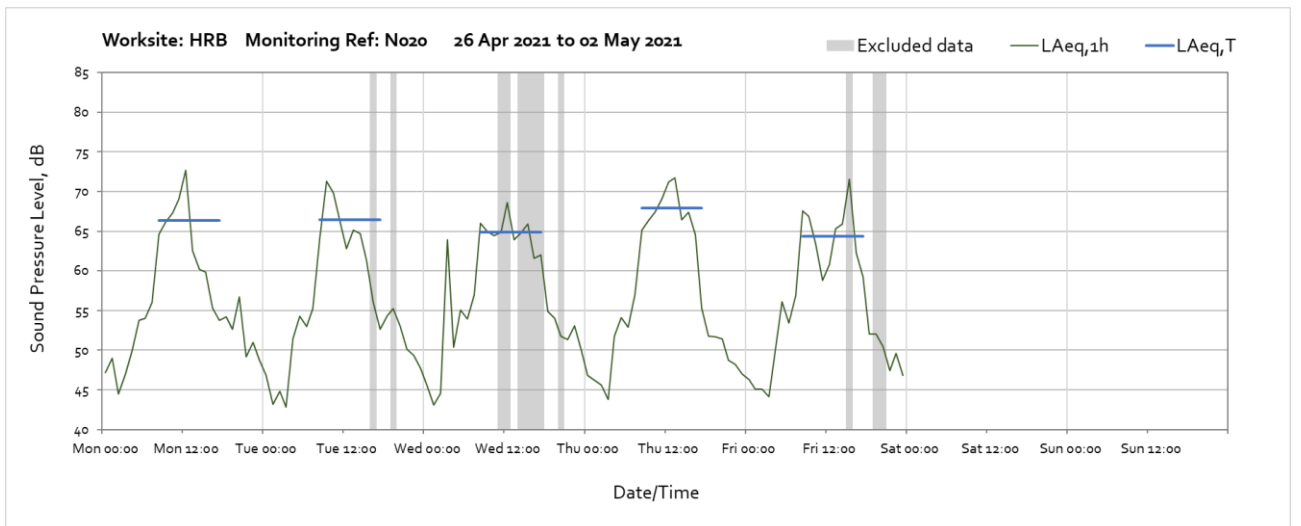
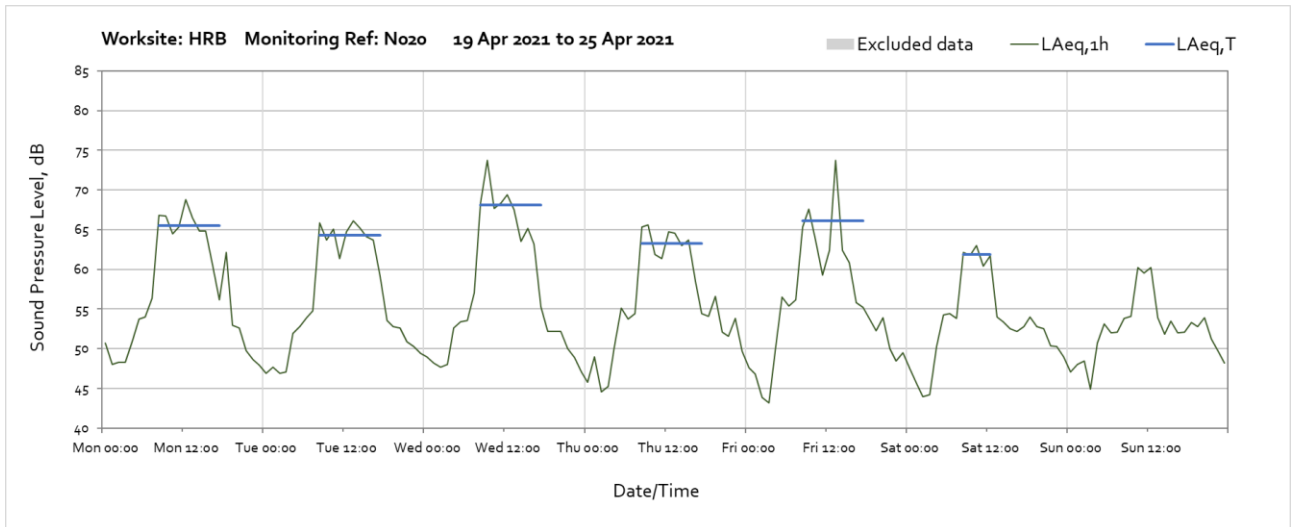
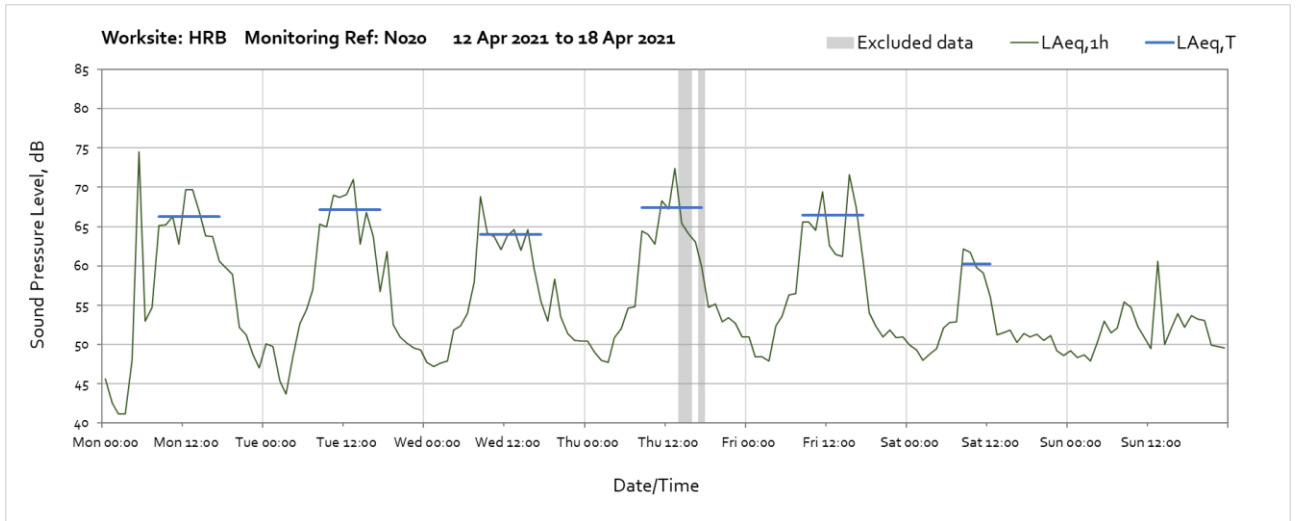




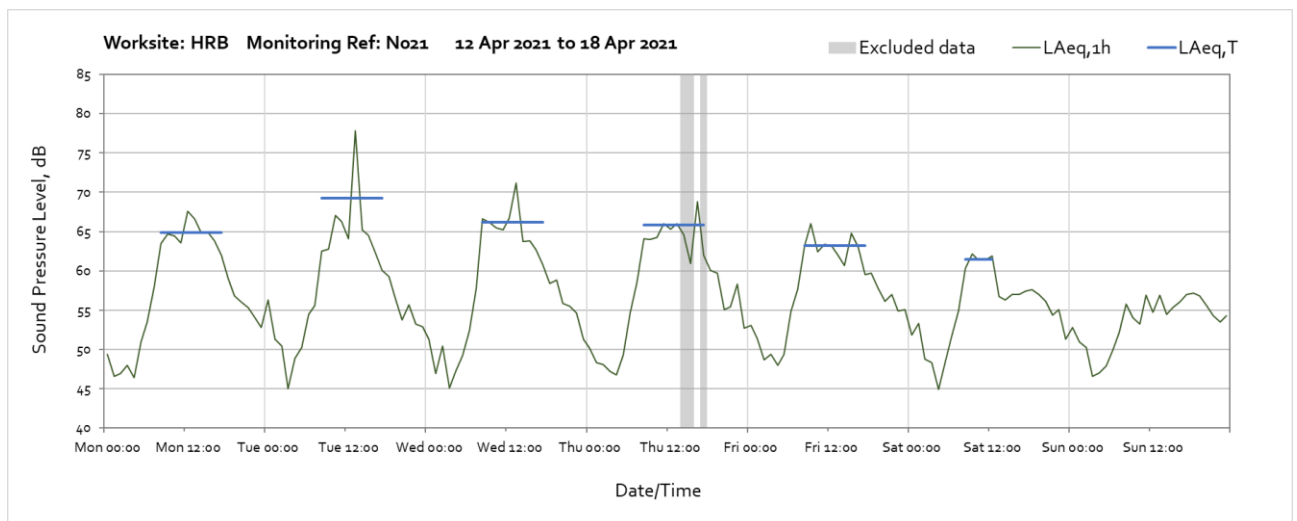
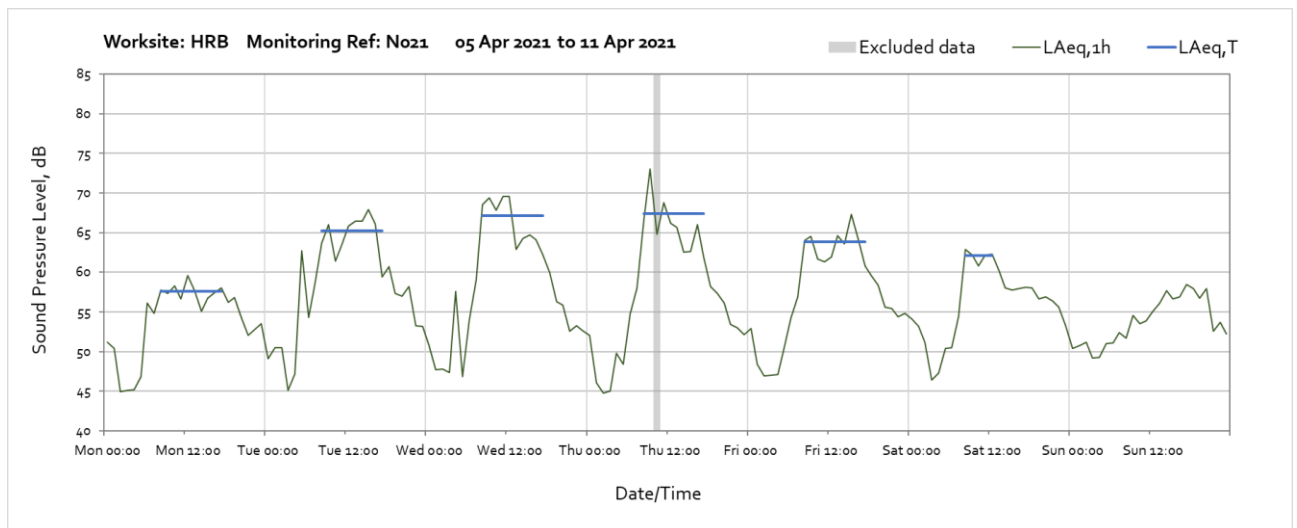
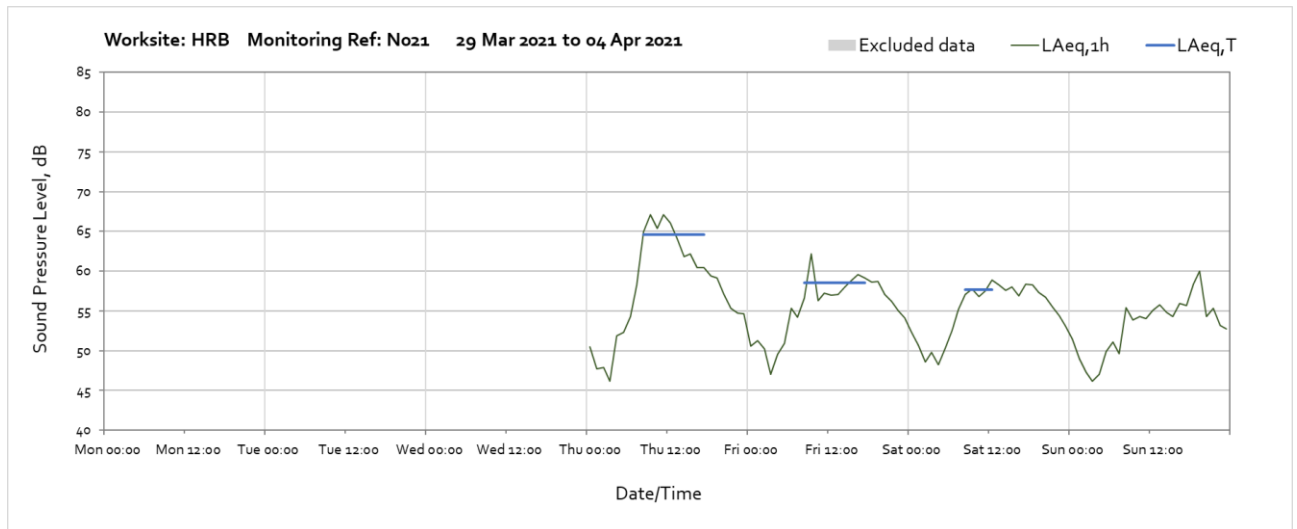


Worksite: HRB – Monitoring Ref: N020

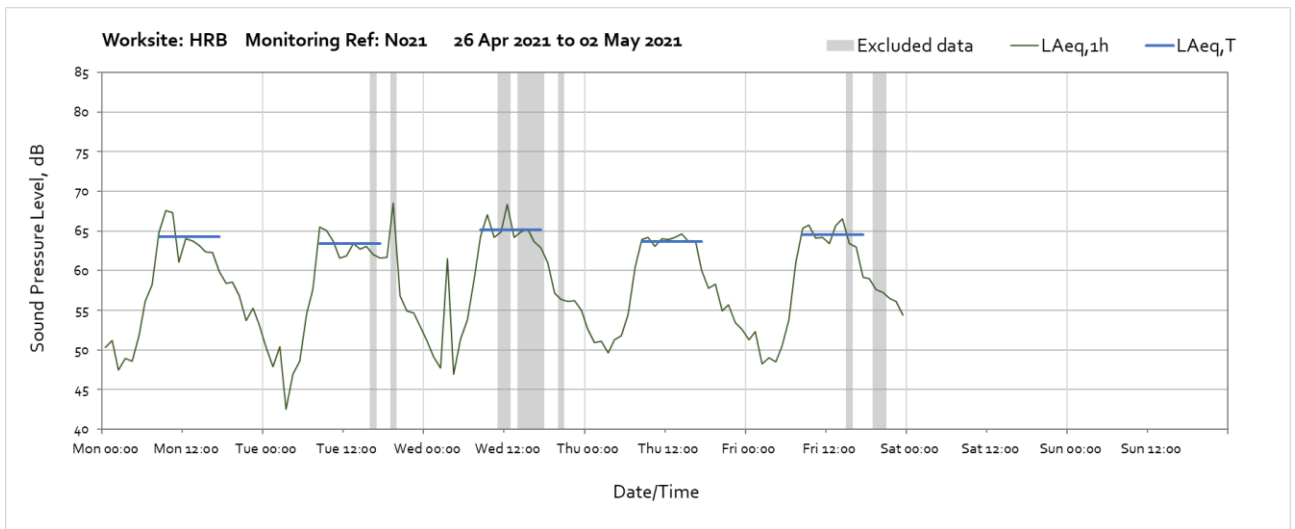
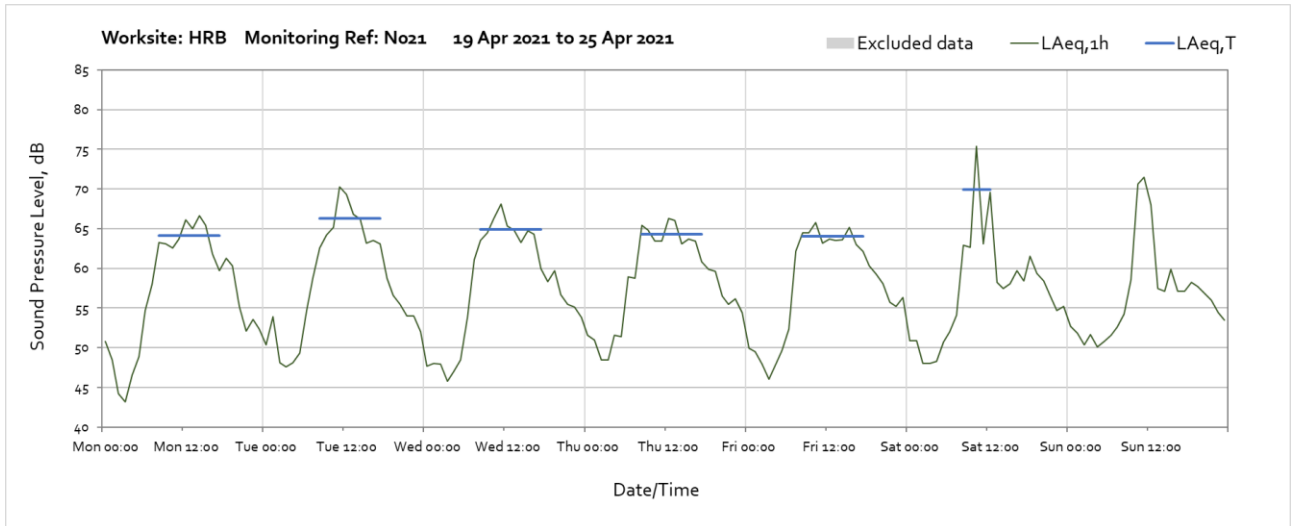




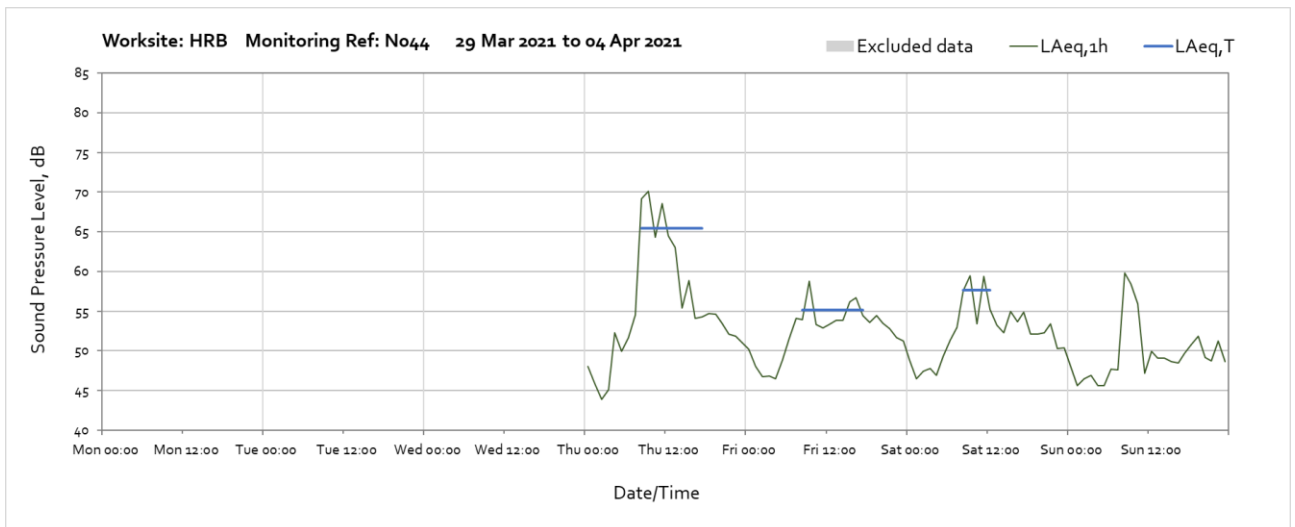
Worksite: HRB – Monitoring Ref: N021

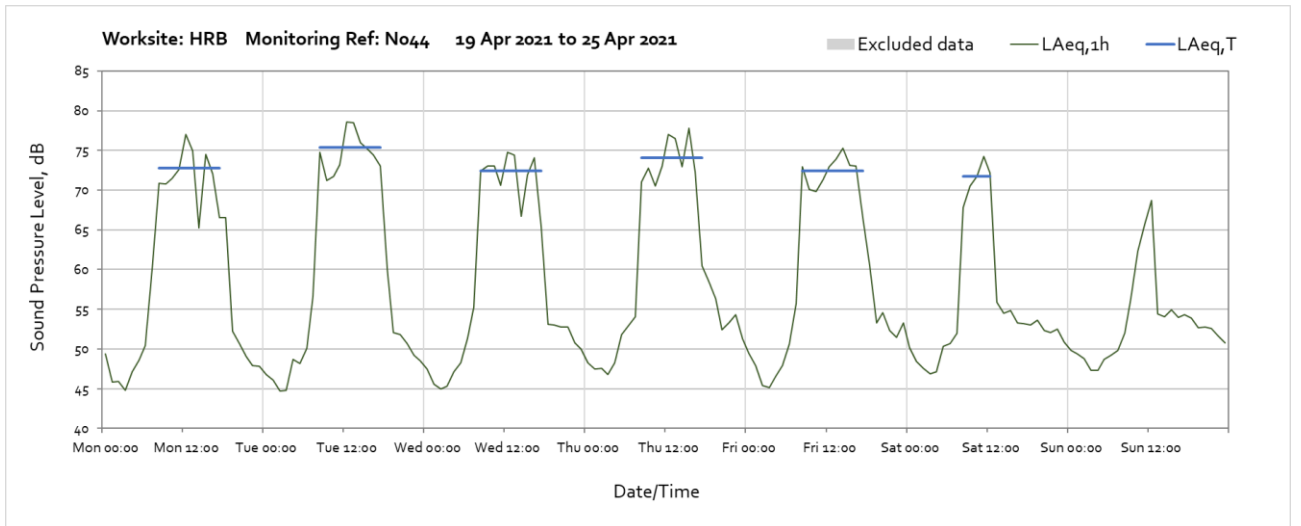
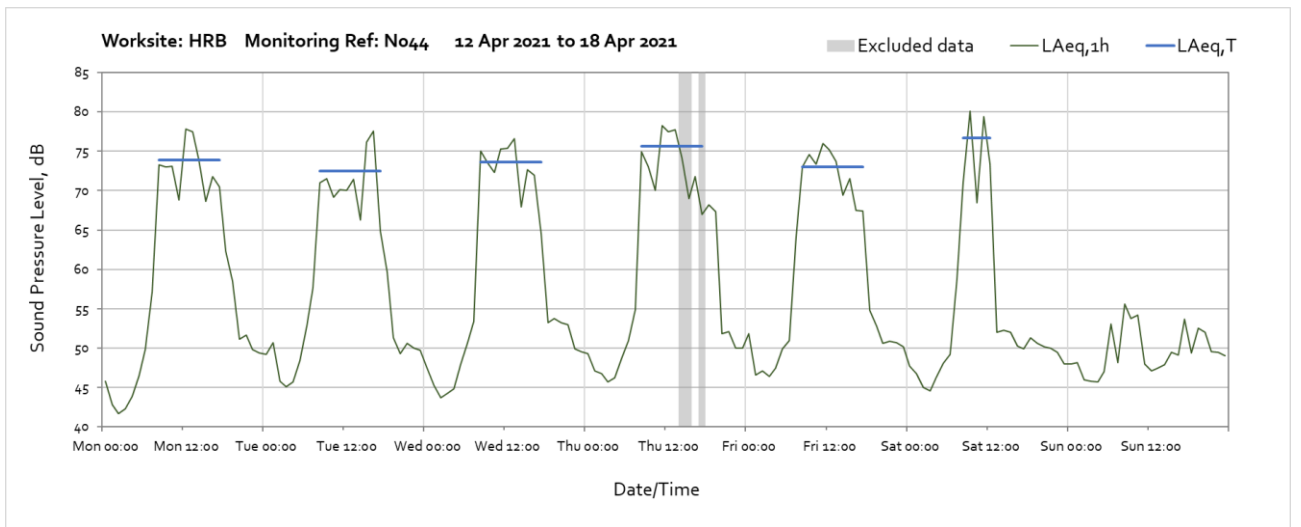
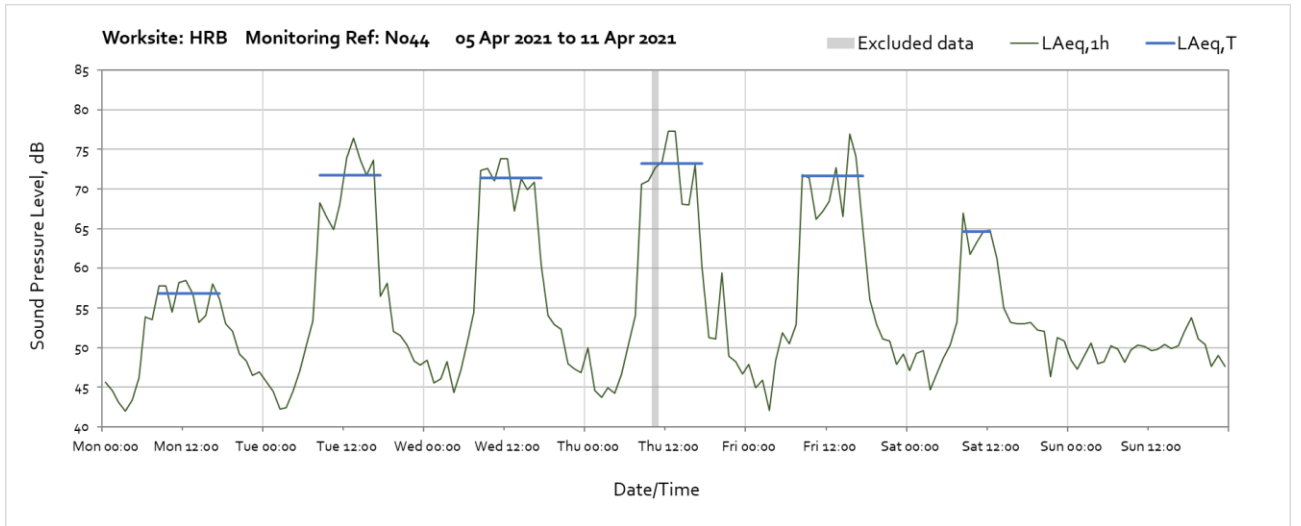


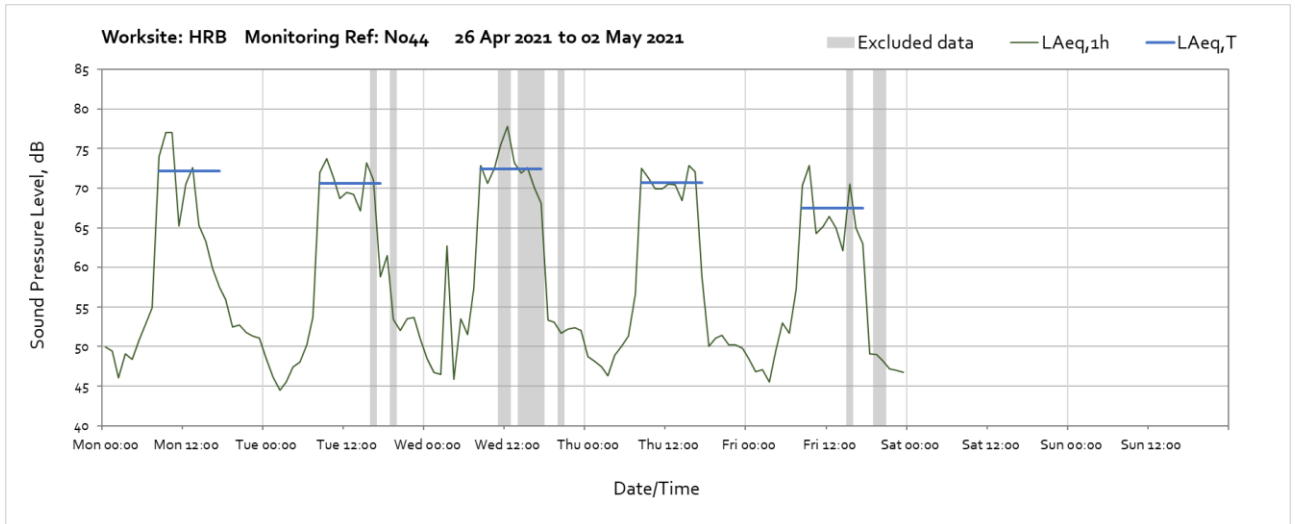
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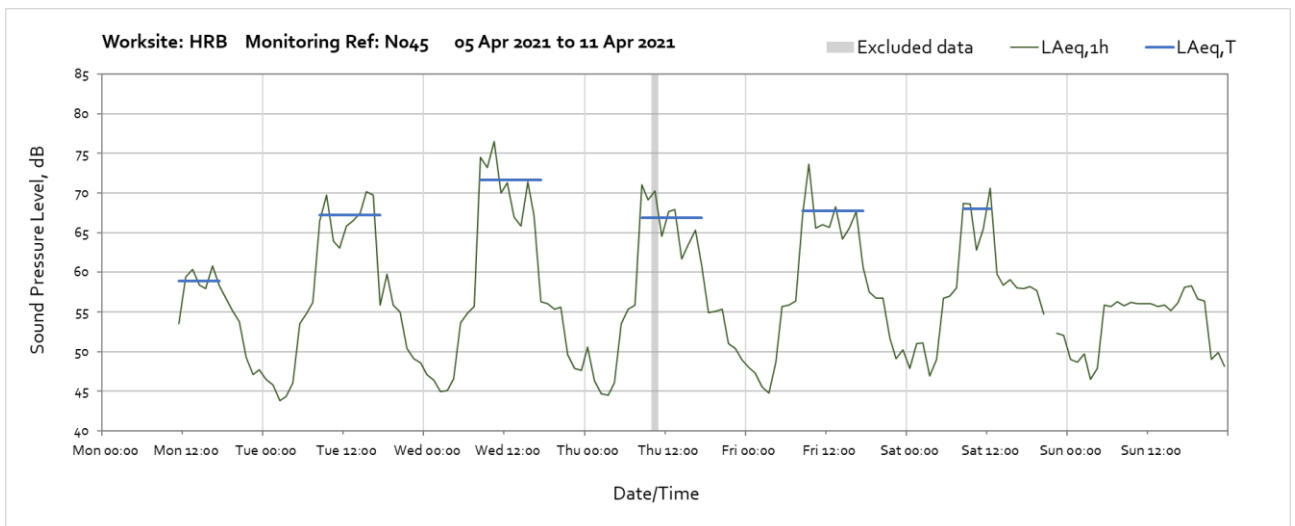
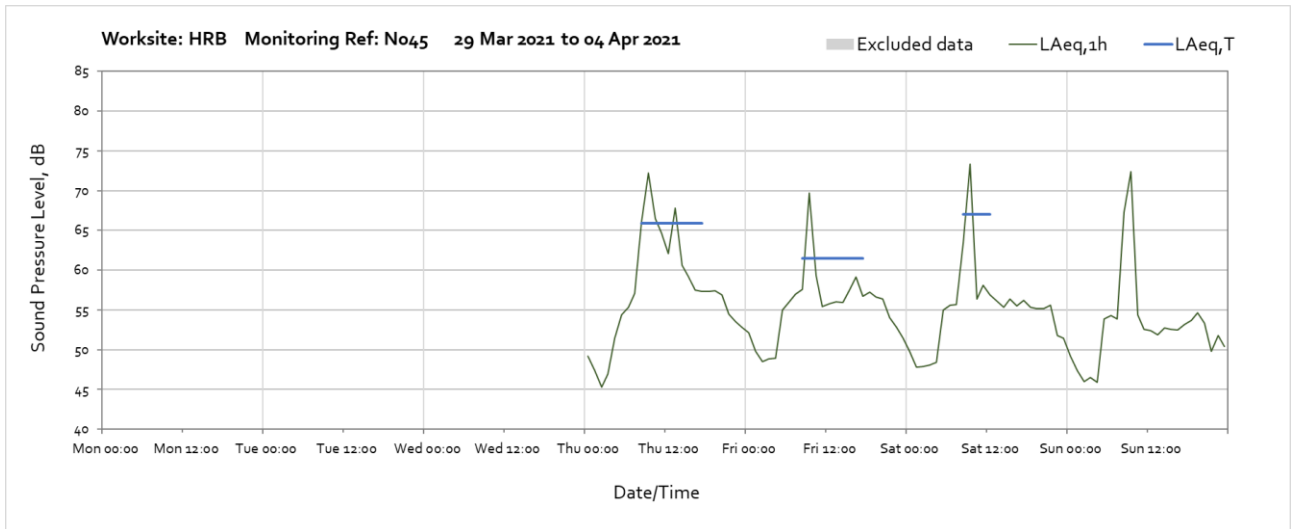
Worksite: HRB – Monitoring Ref: N044





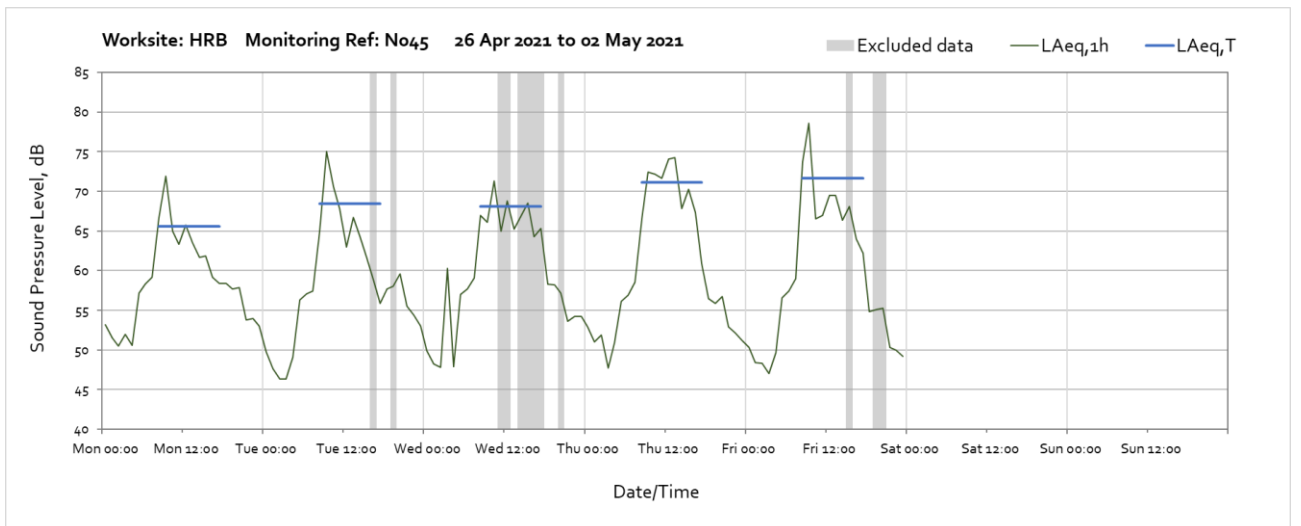
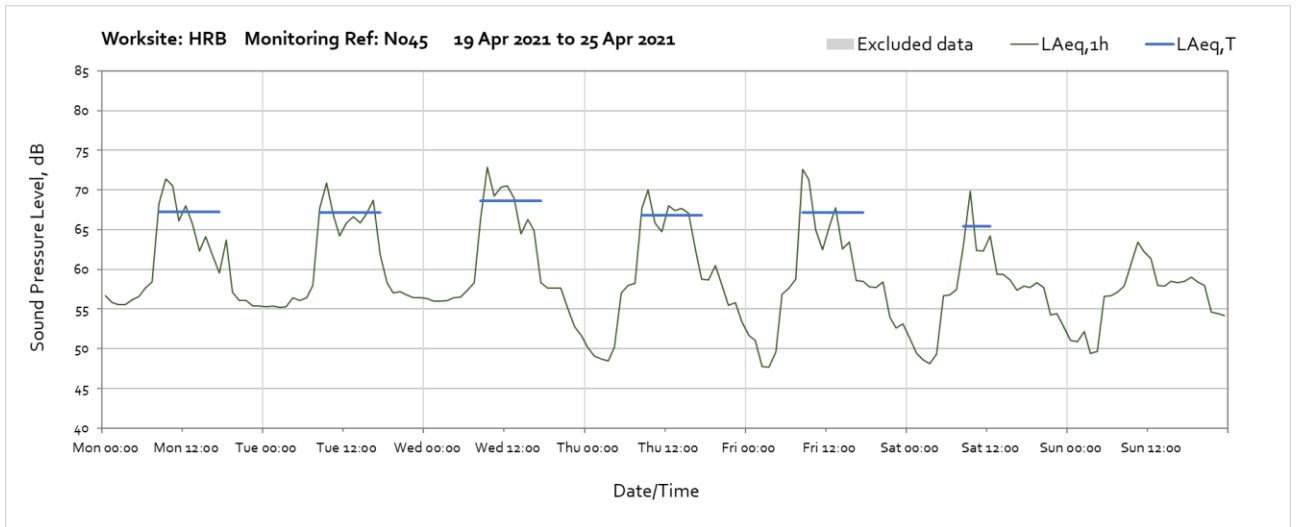
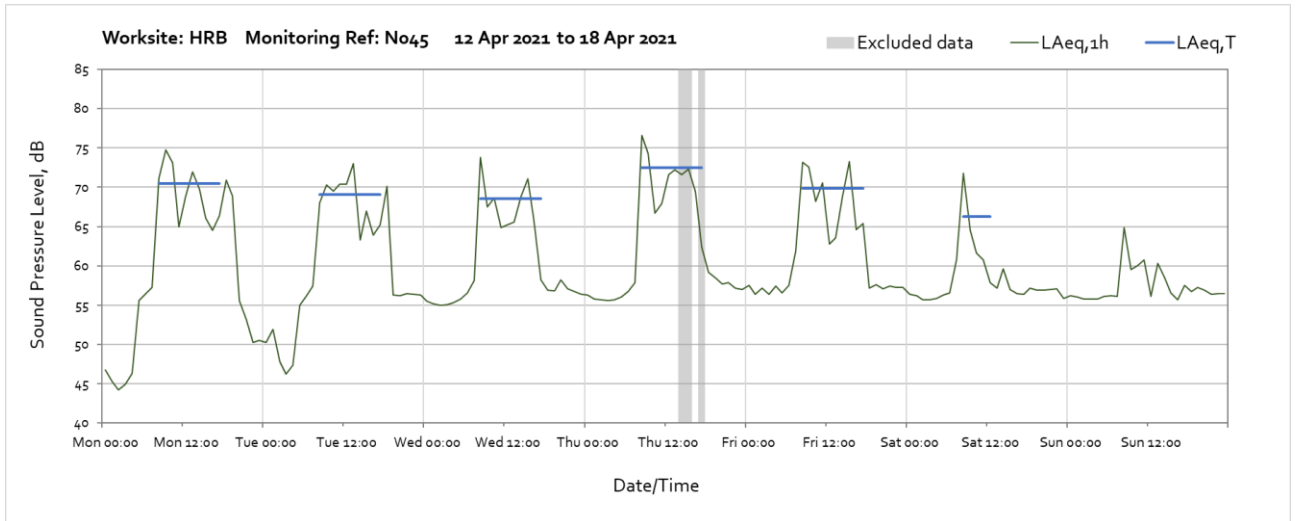


Worksite: HRB – Monitoring Ref: N045

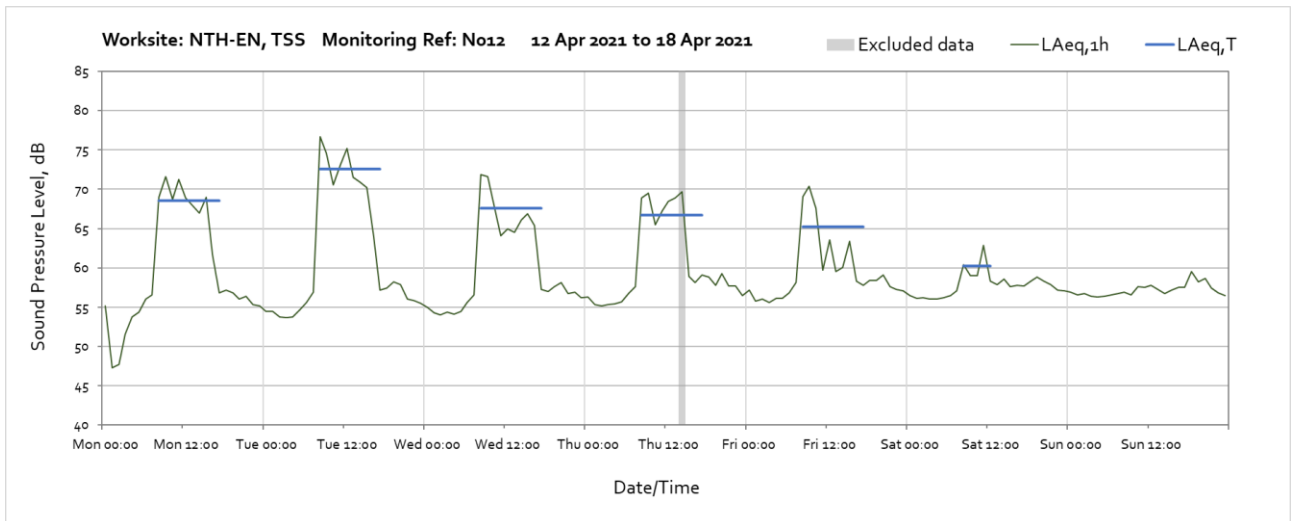
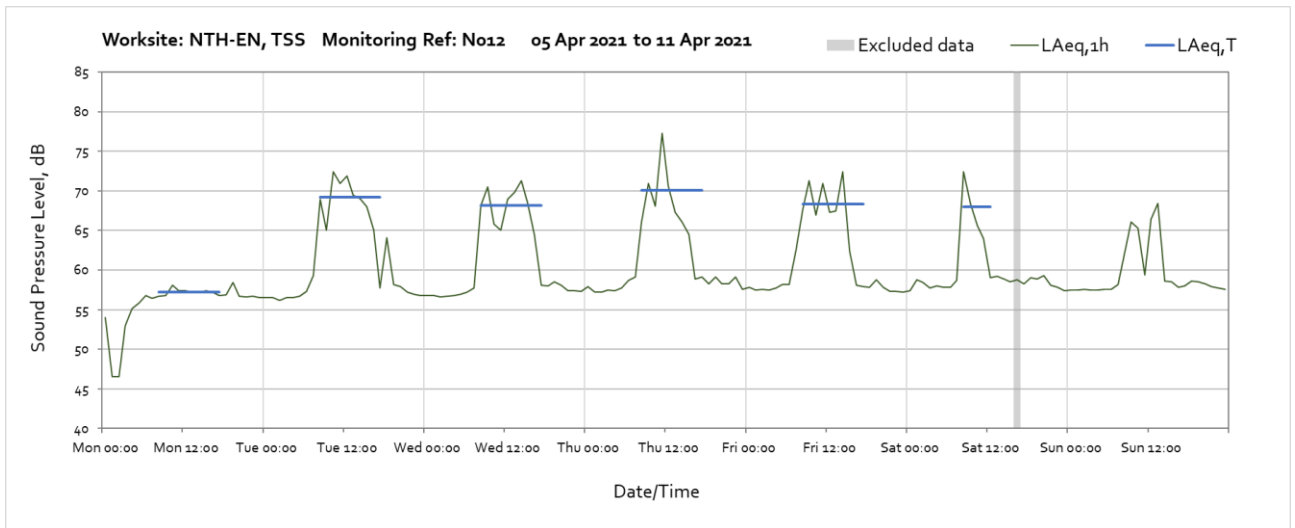
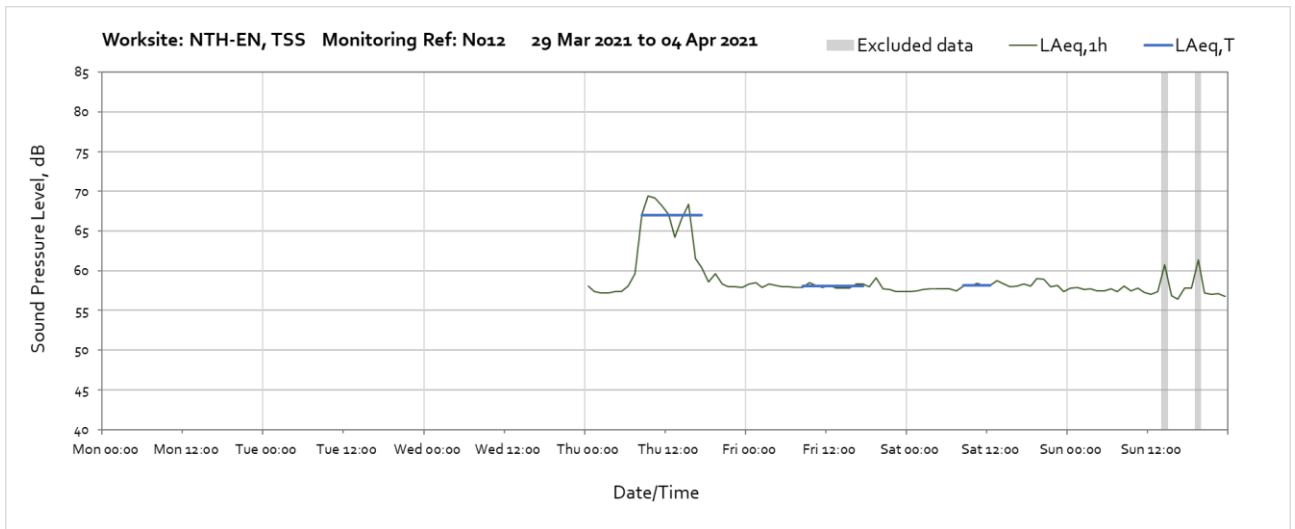


Note: Missing data between 00:00 and 11:00 on Monday 5th April and between 21:00 and 22:00 on Saturday 10th April was due to a memory card fault.

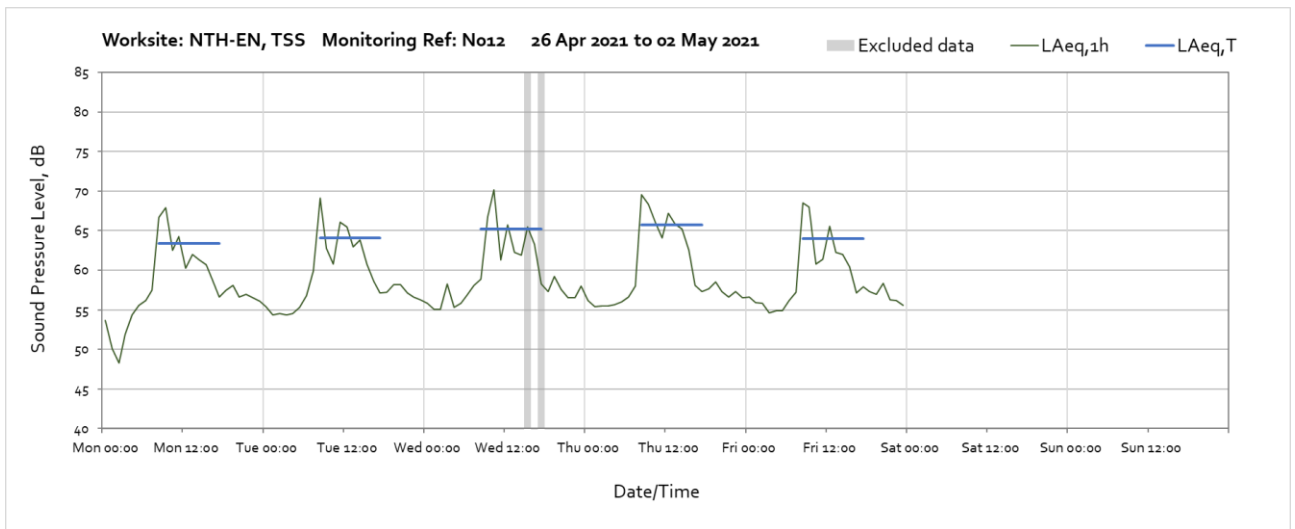
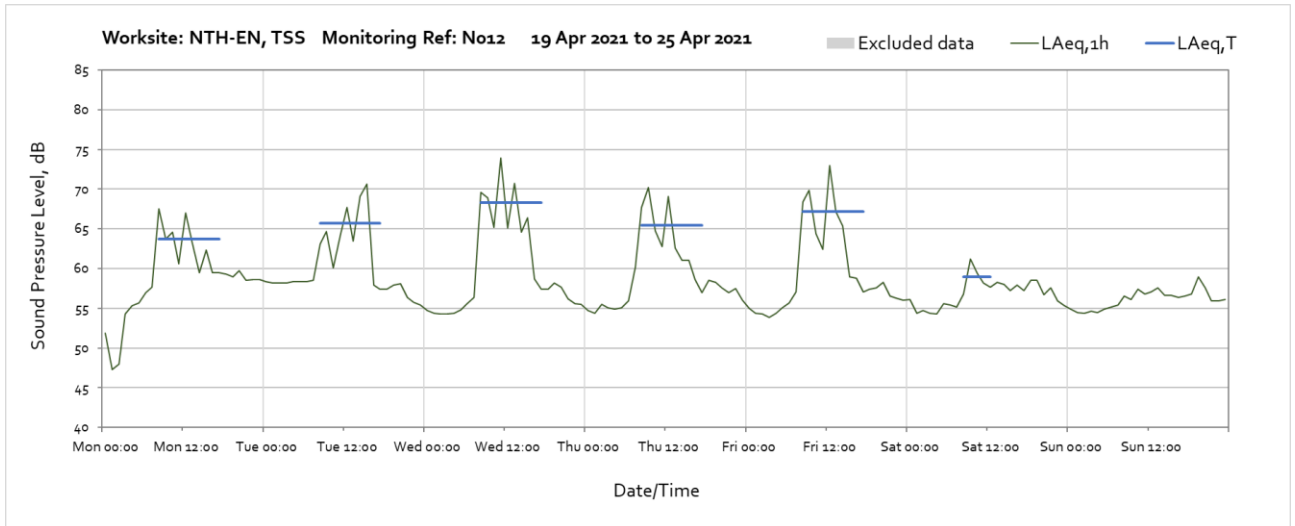
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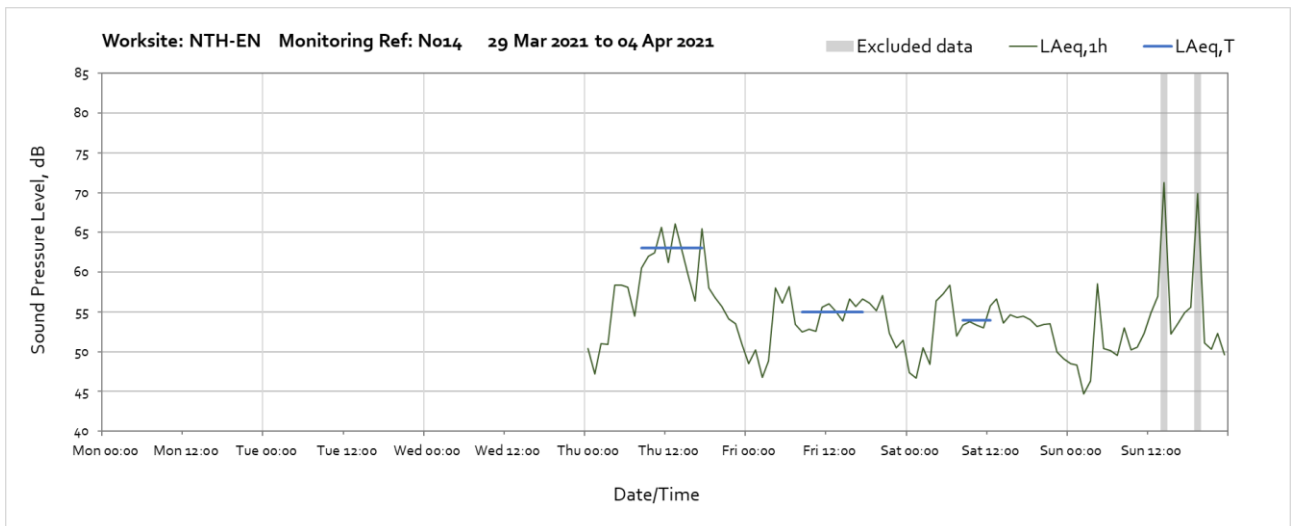
Worksite: NTH-EN, TSS – Monitoring Ref: N012

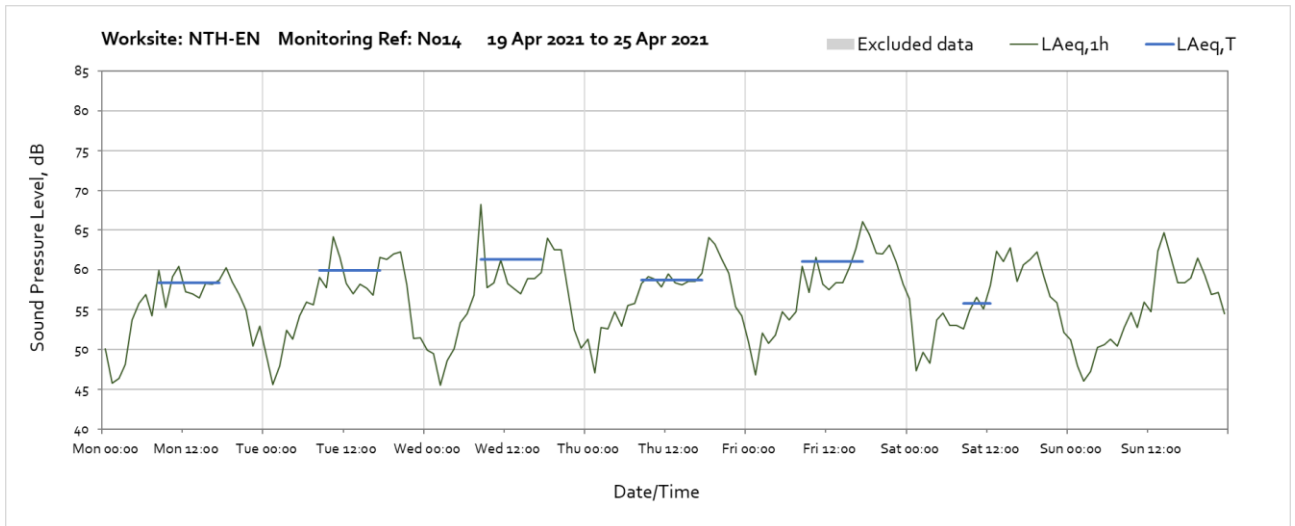
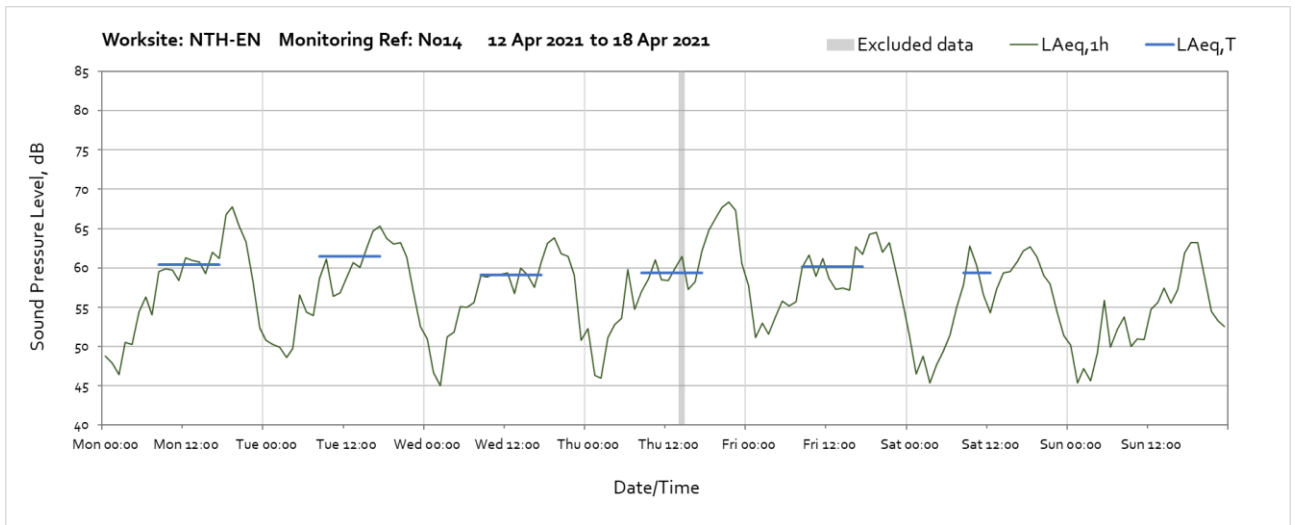
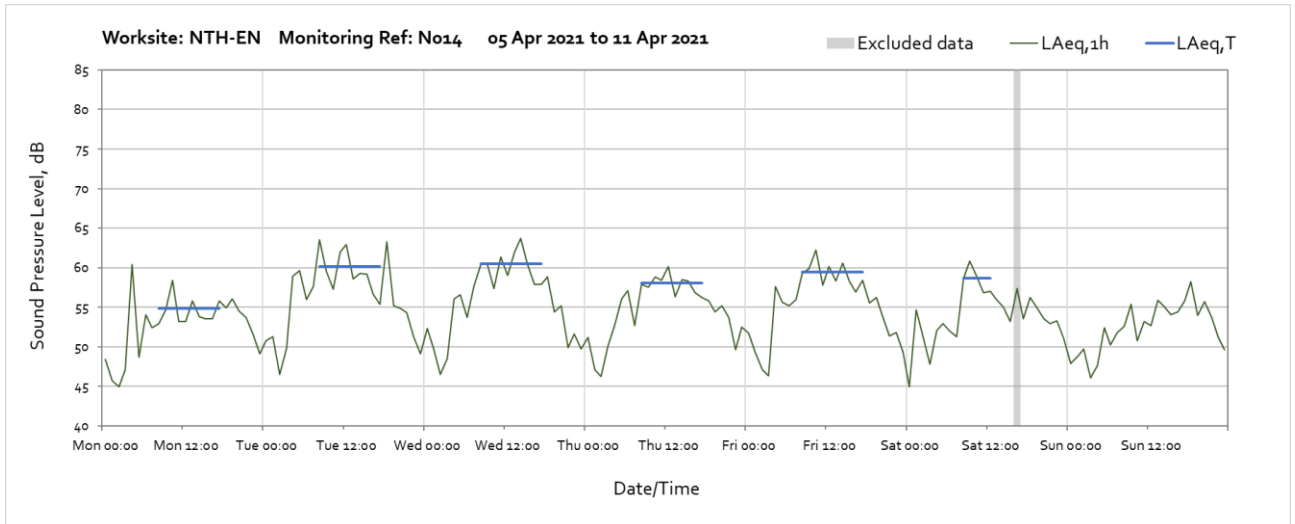


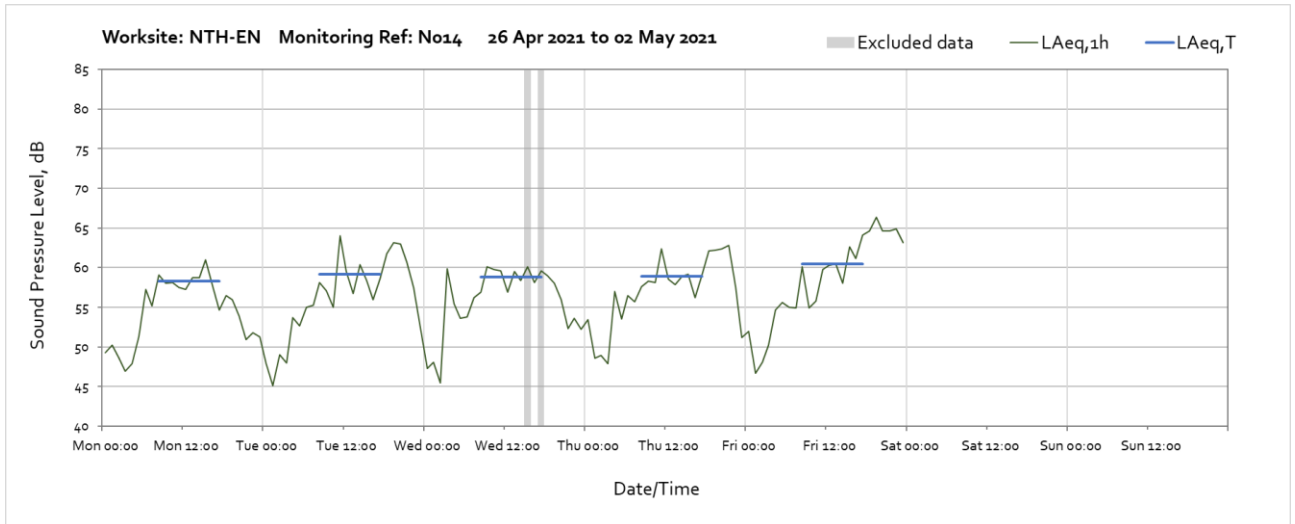
OFFICIAL



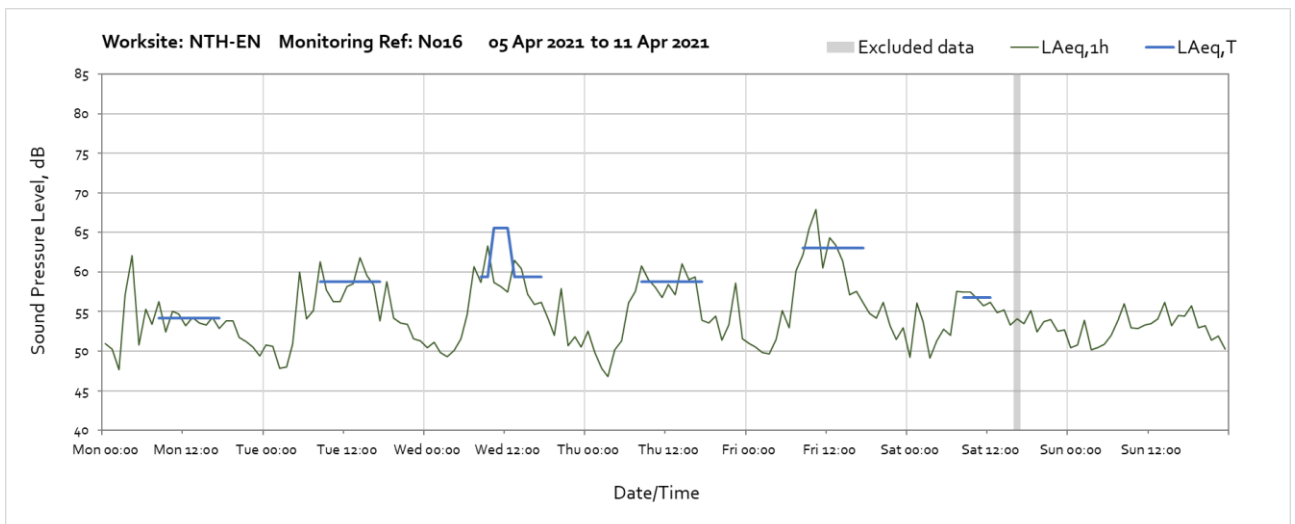
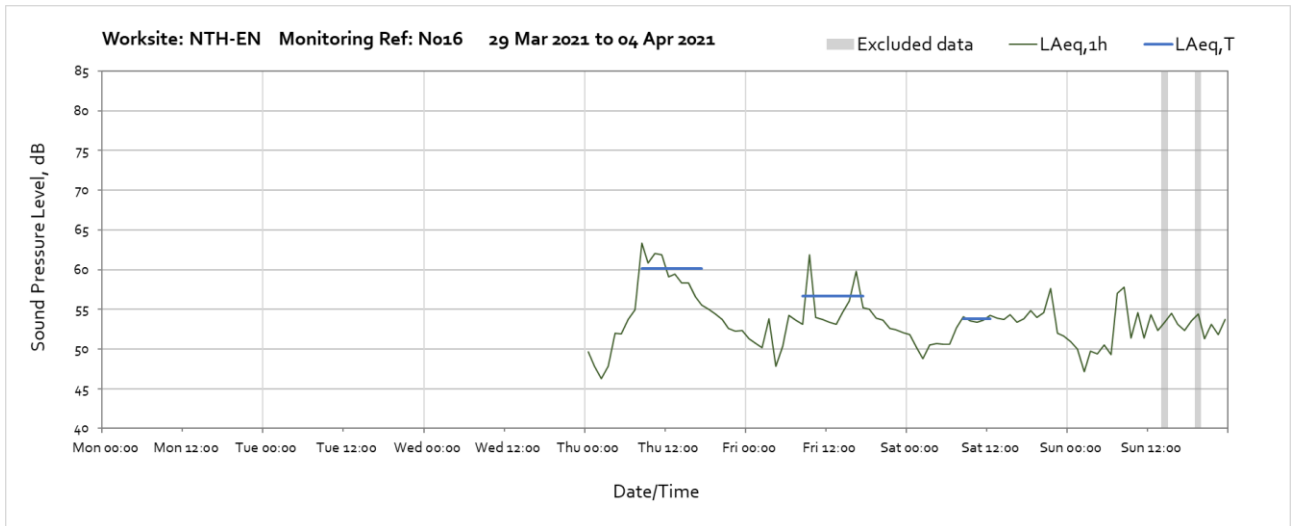
Worksite: NTH-EN – Monitoring Ref: N014

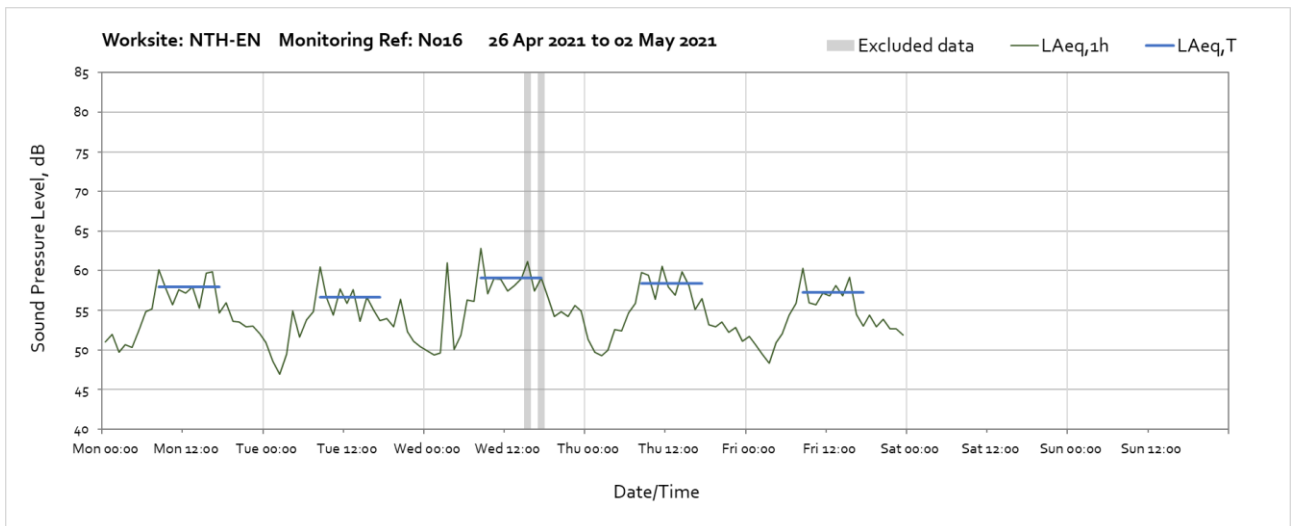
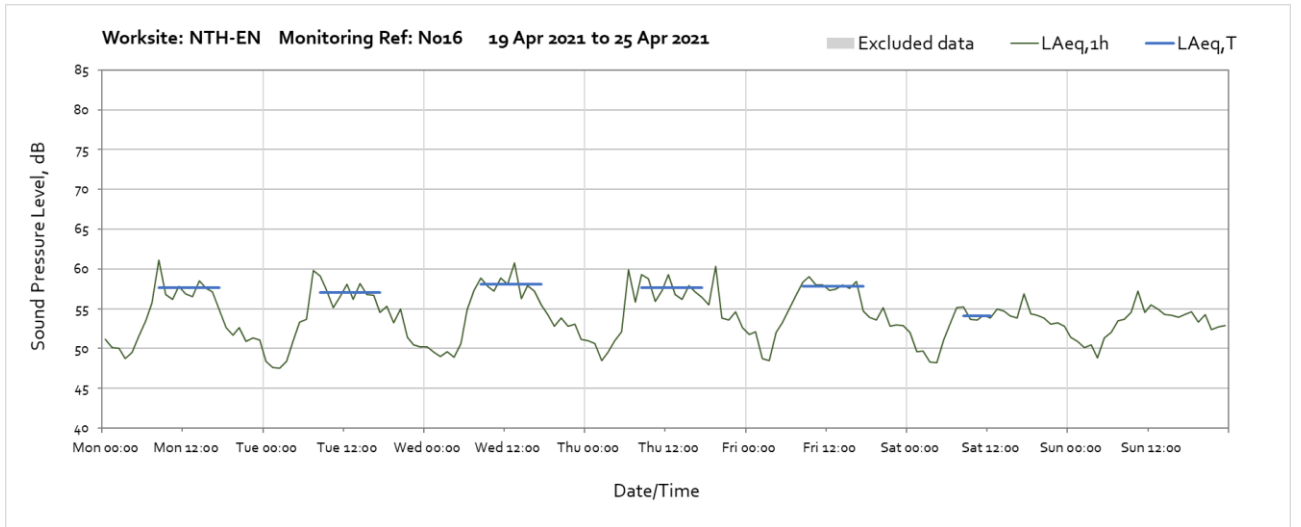
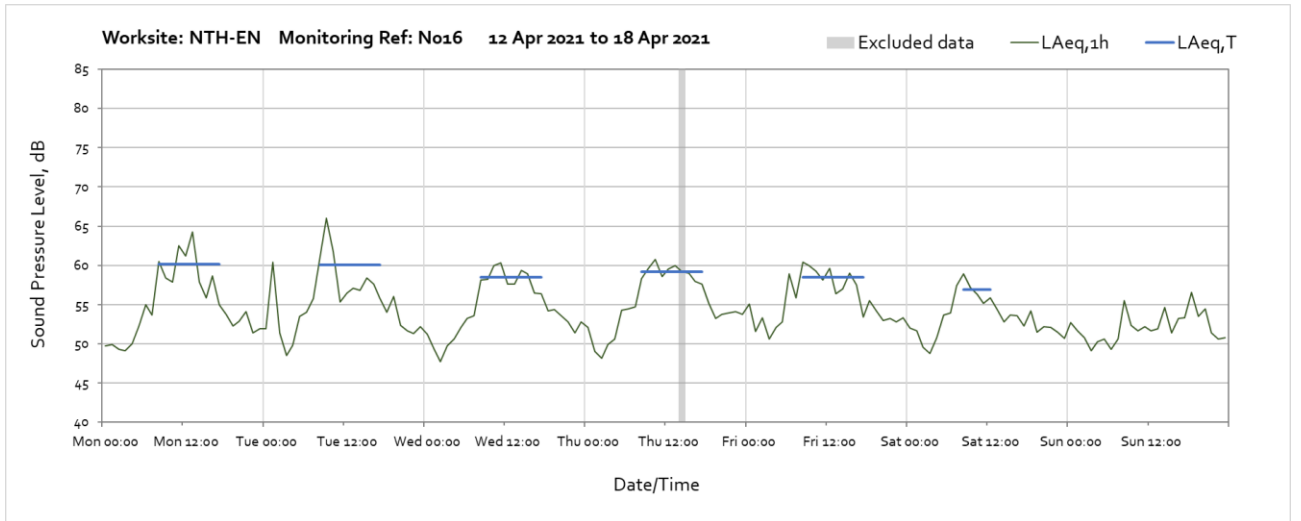




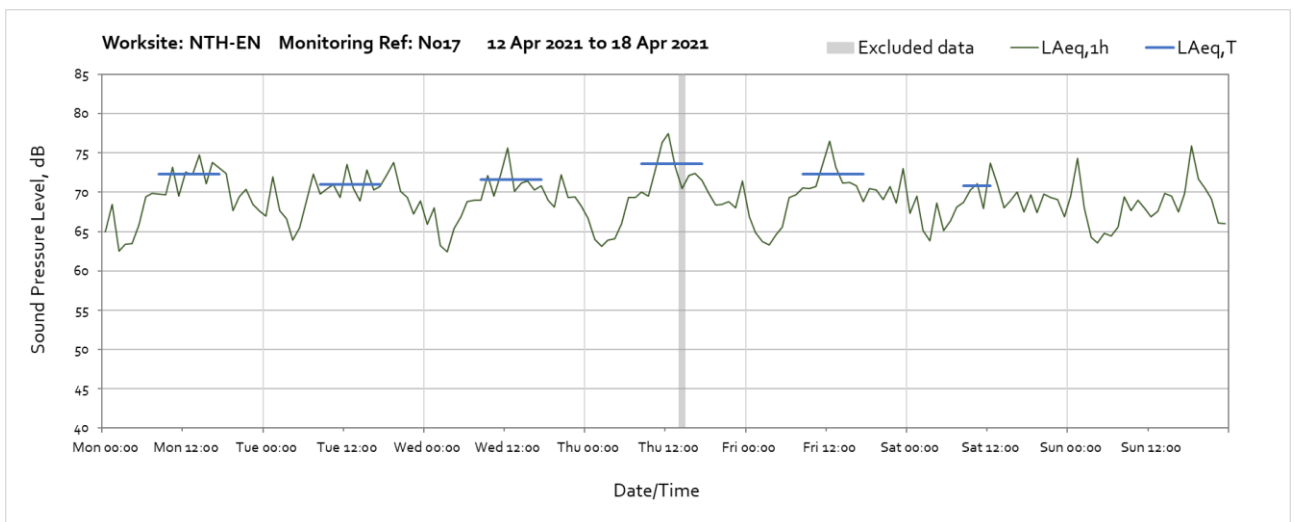
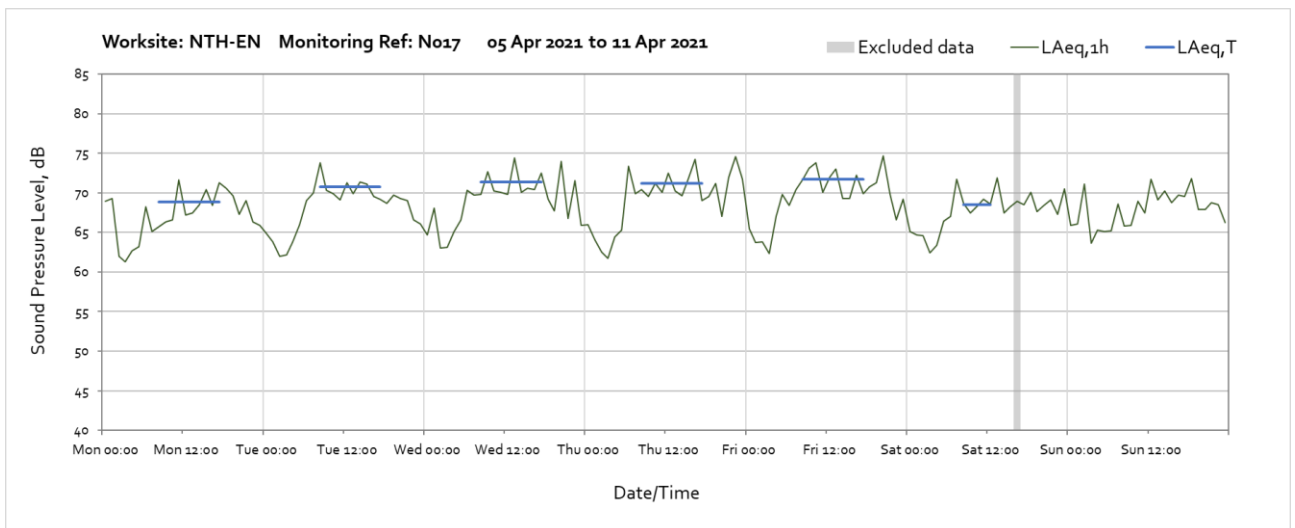
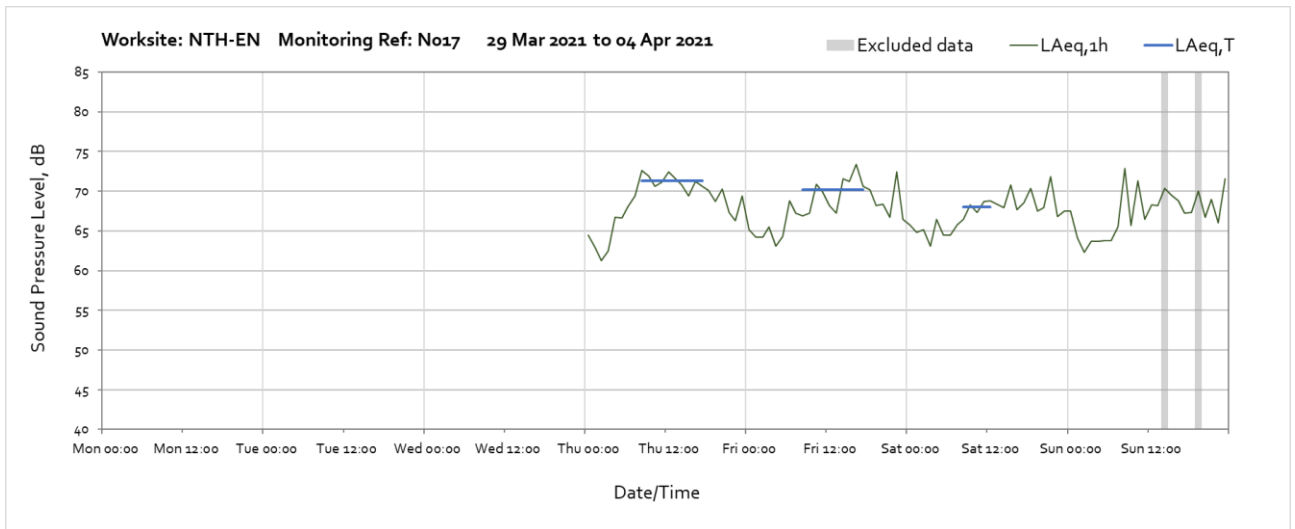


Worksite: NTH-EN – Monitoring Ref: N016

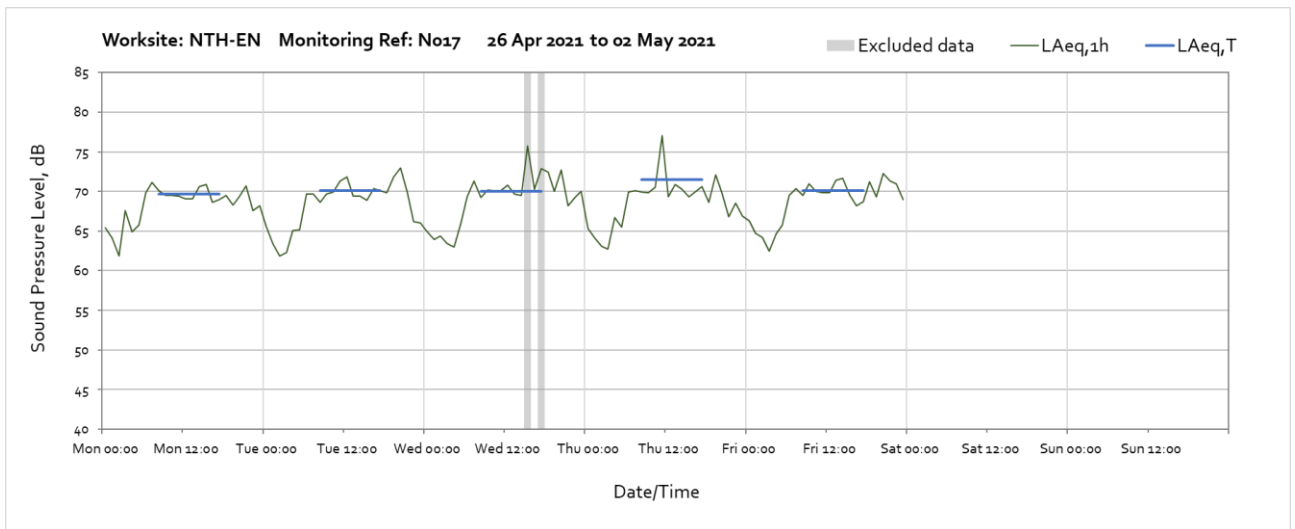
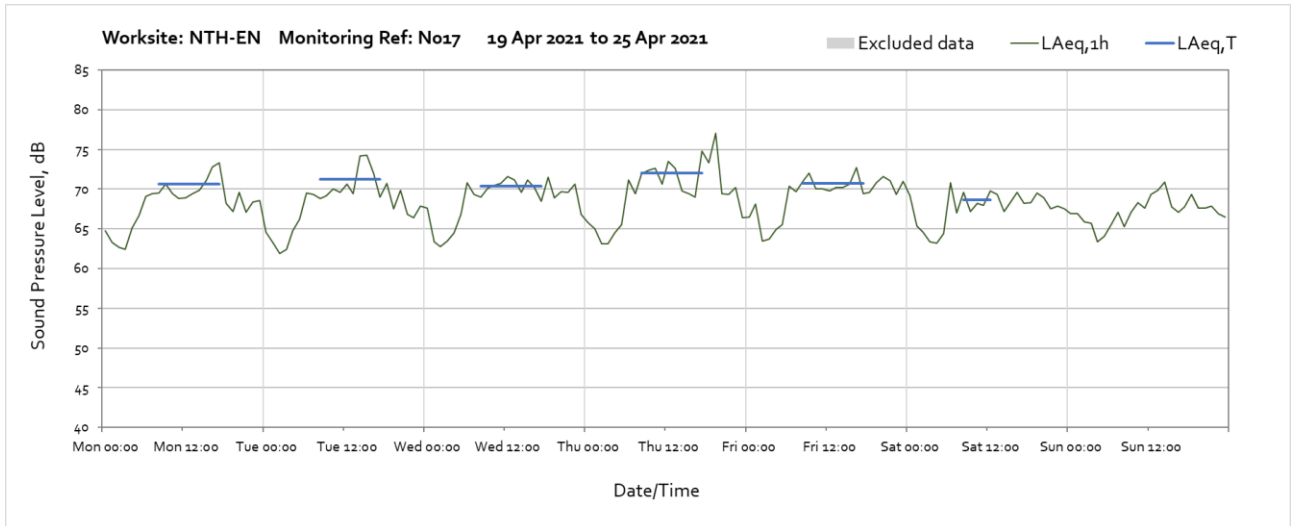




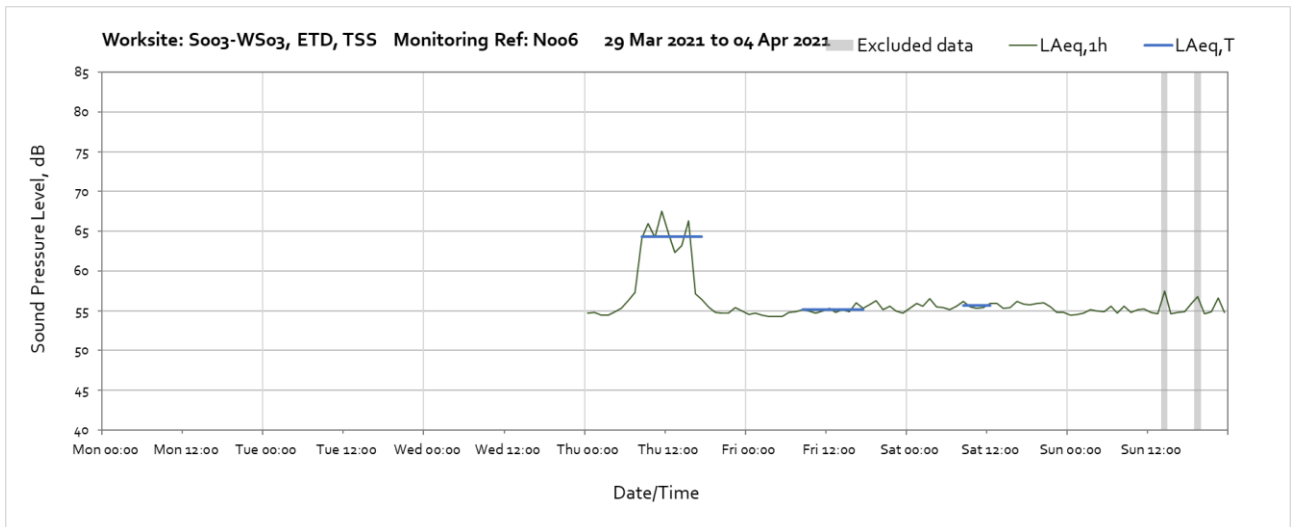
Worksite: NTH-EN – Monitoring Ref: N017

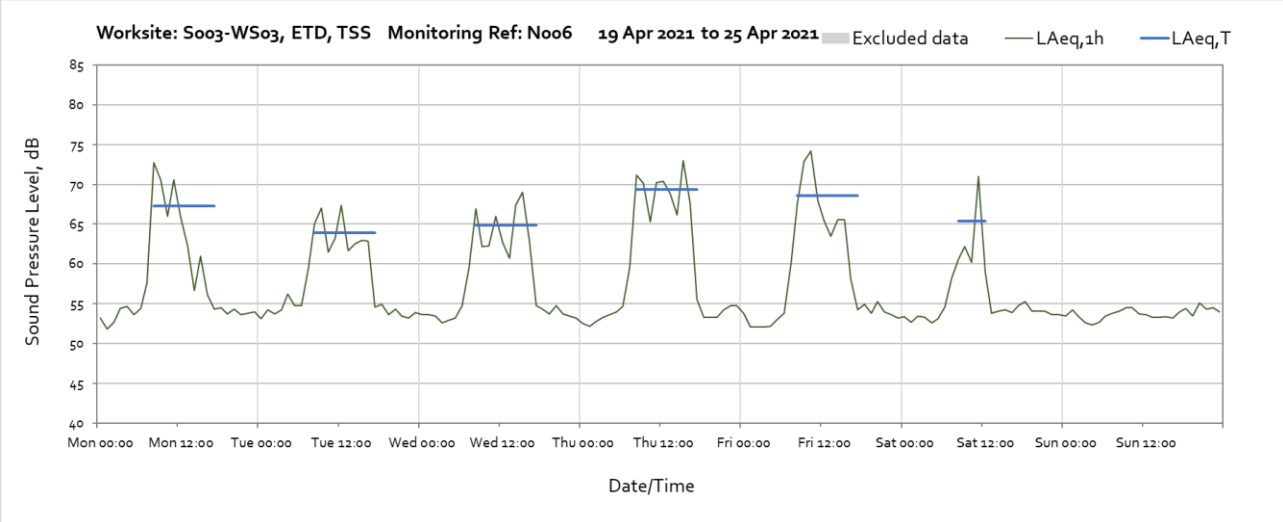
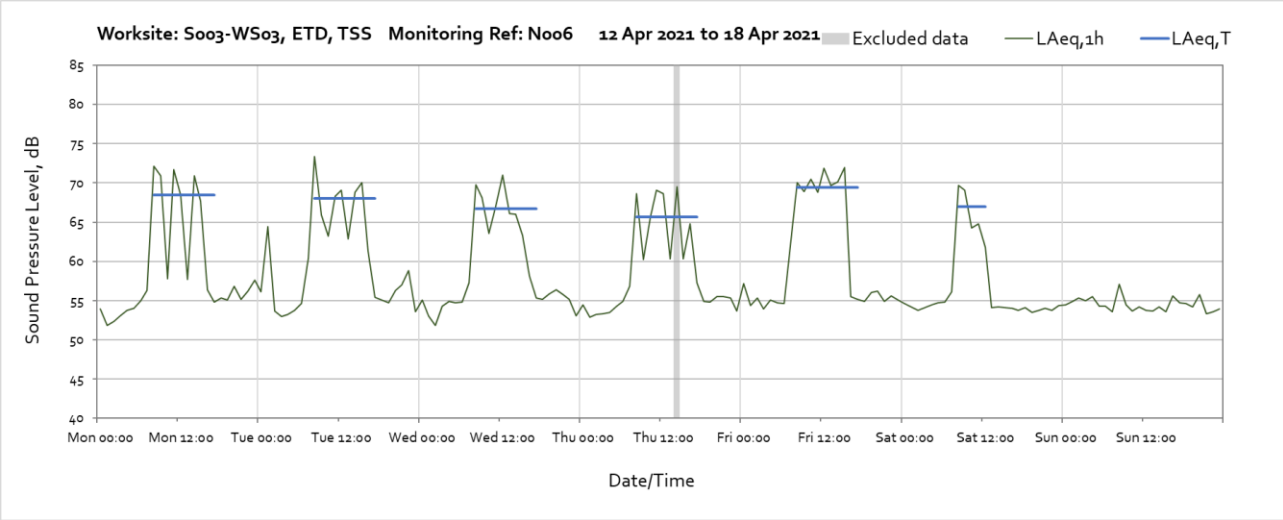
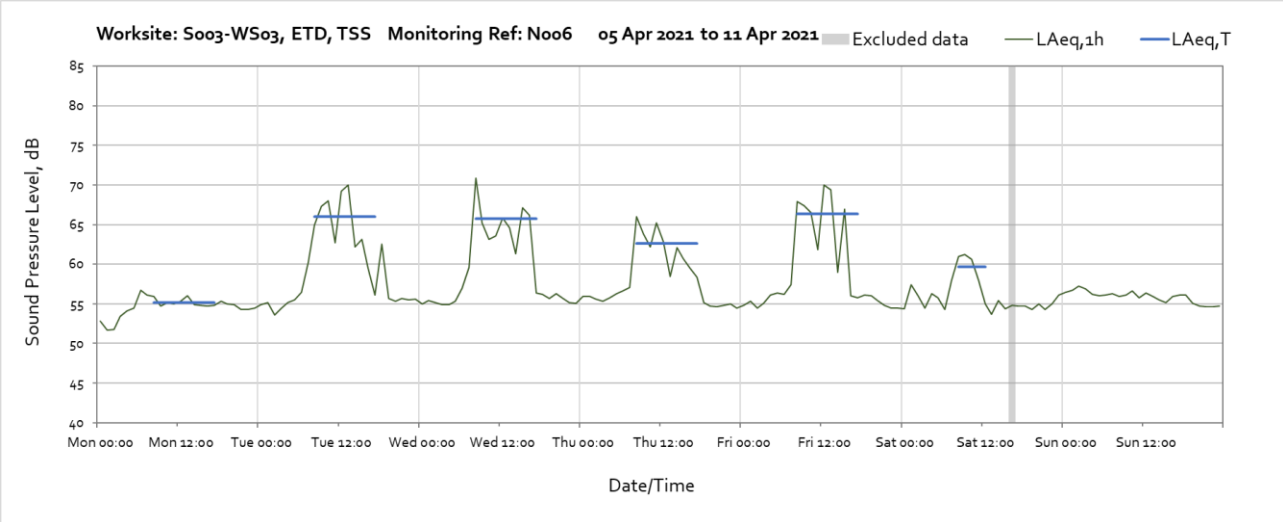


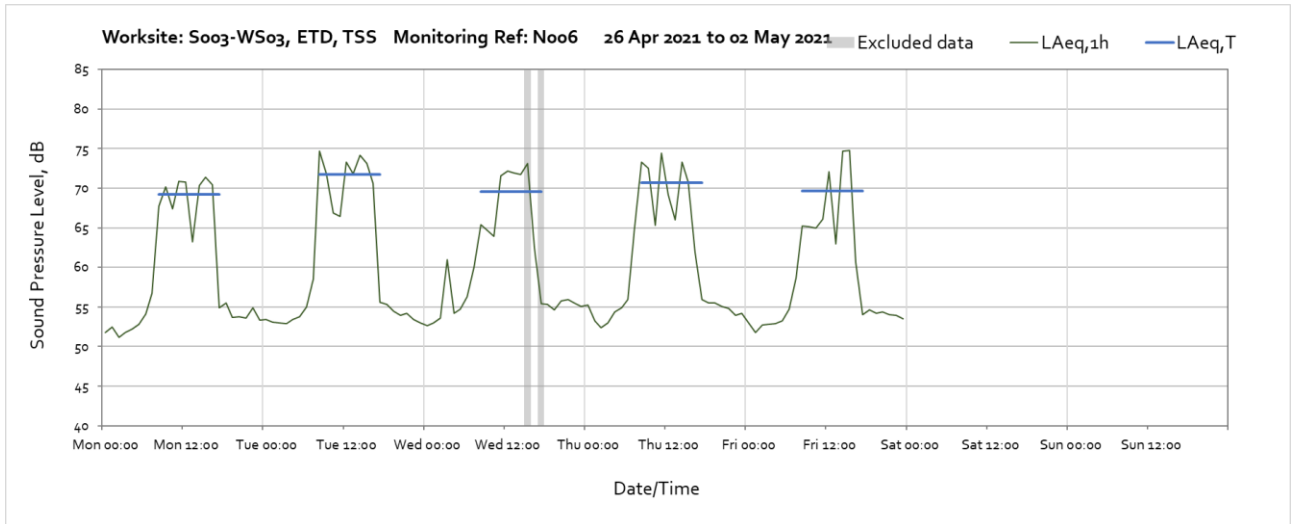
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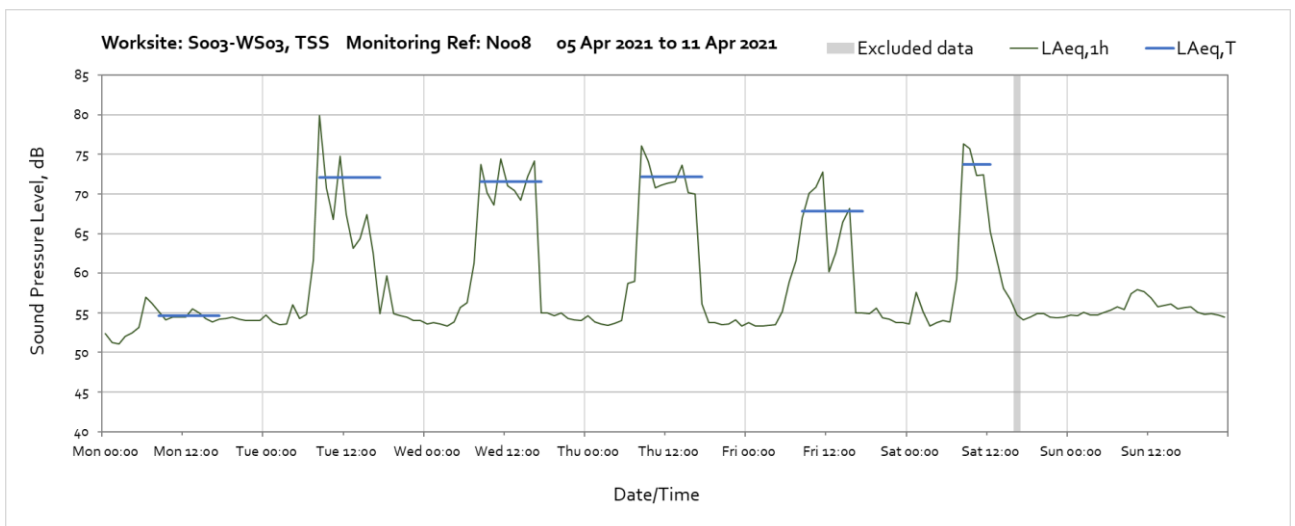
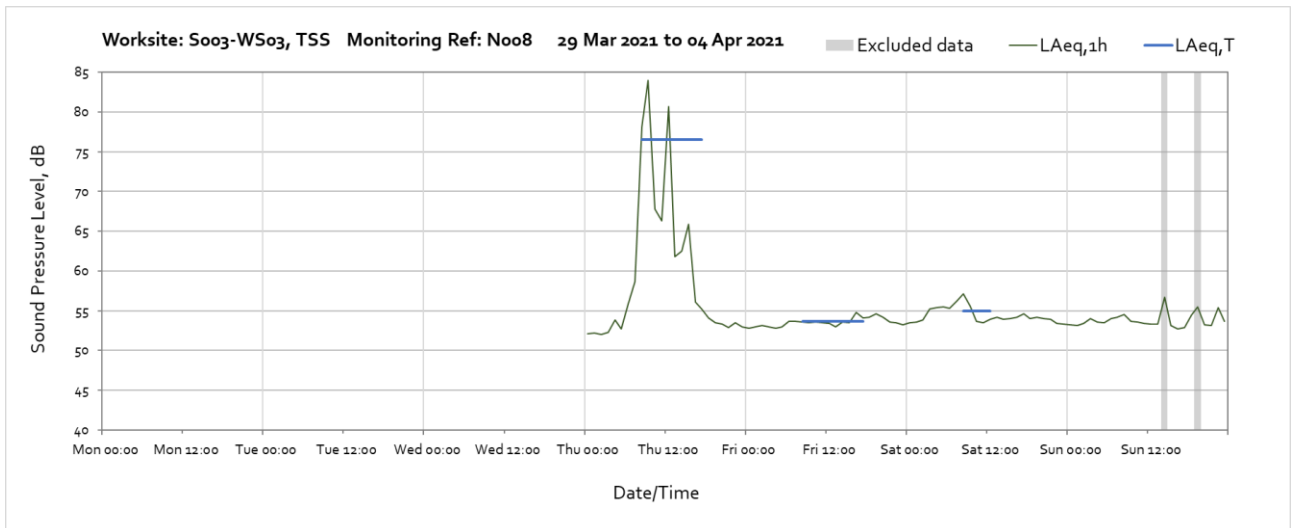
Worksite: S003-WS03, ETD, TSS – Monitoring Ref: N006

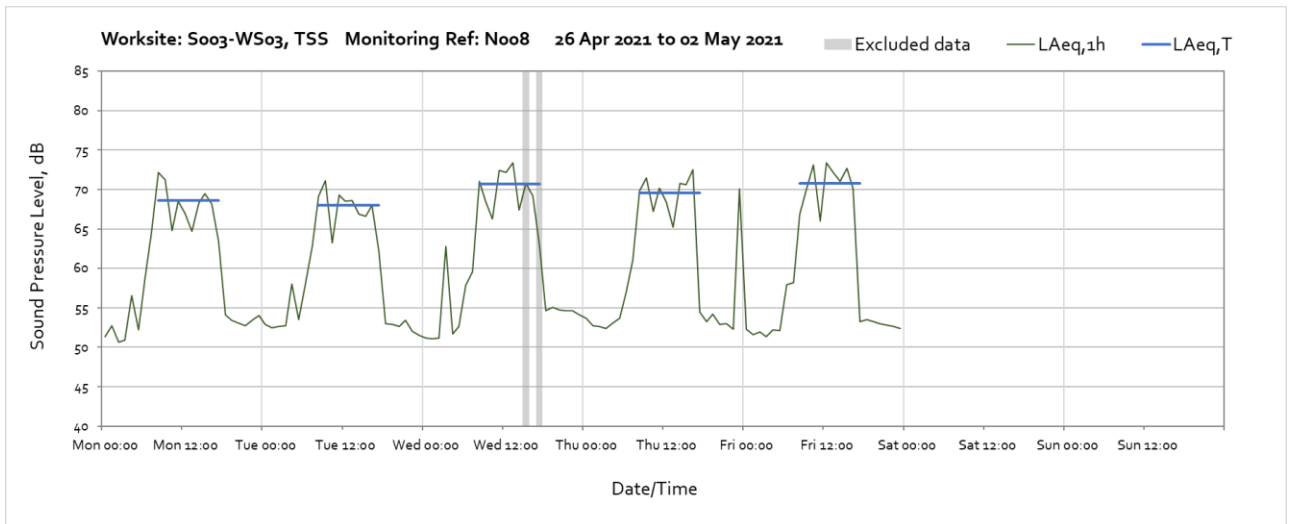
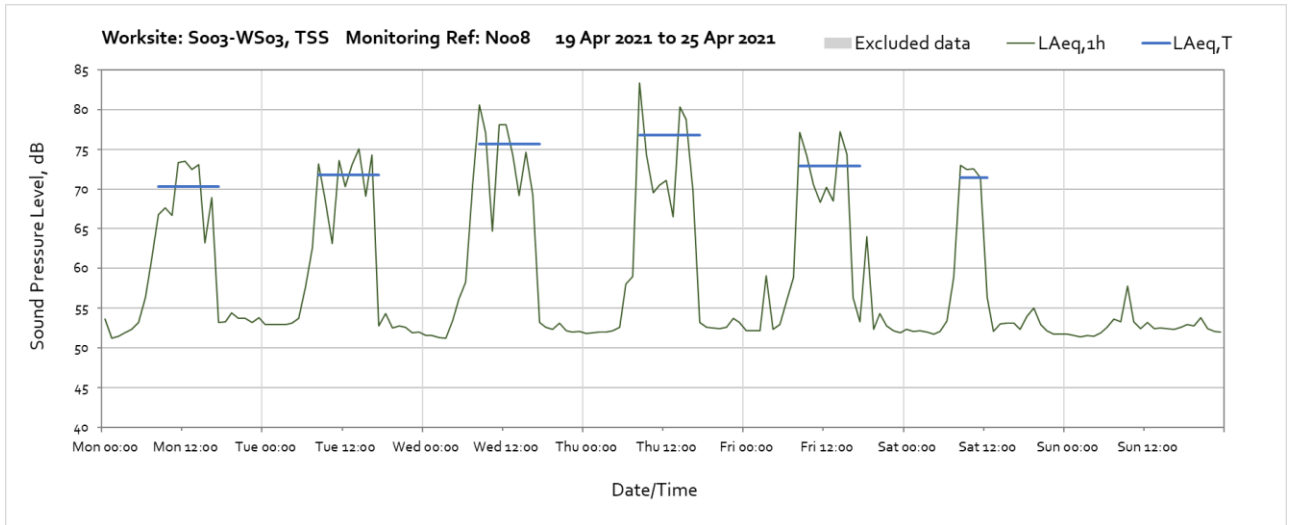
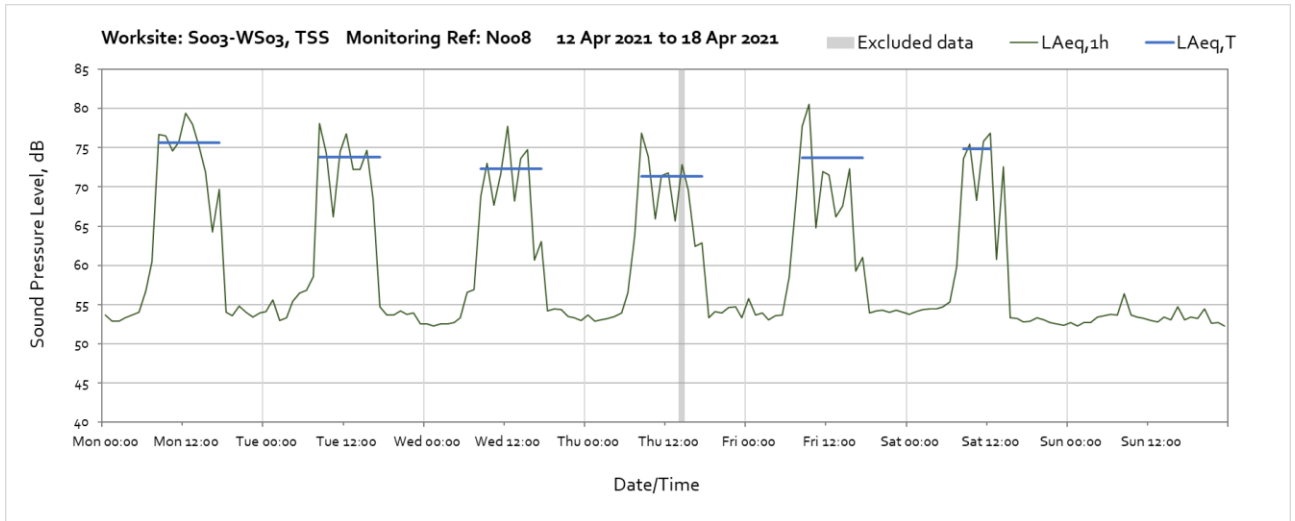




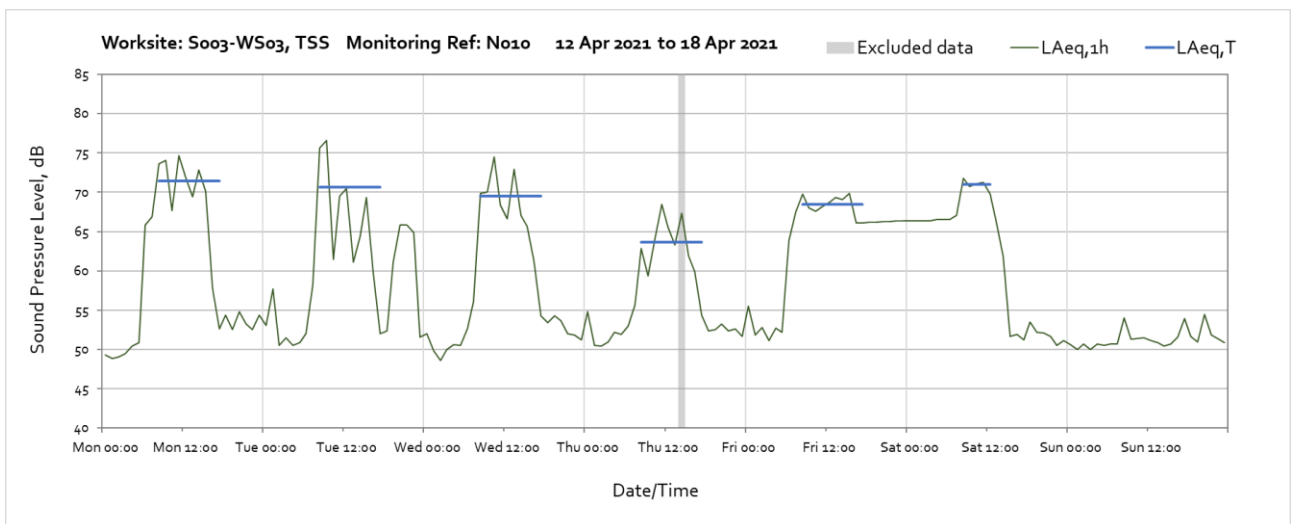
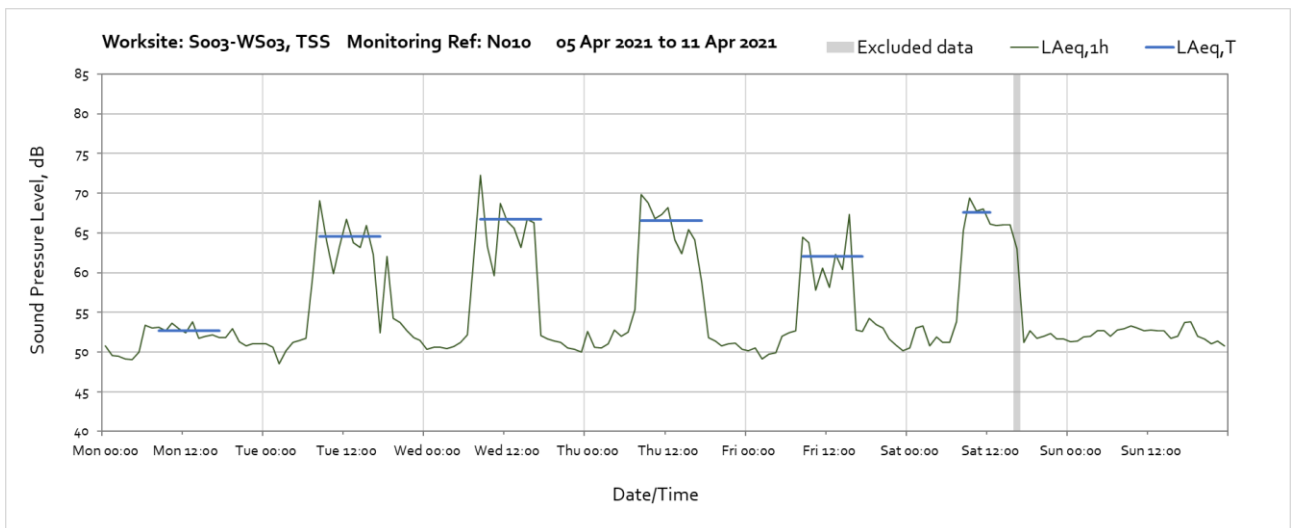
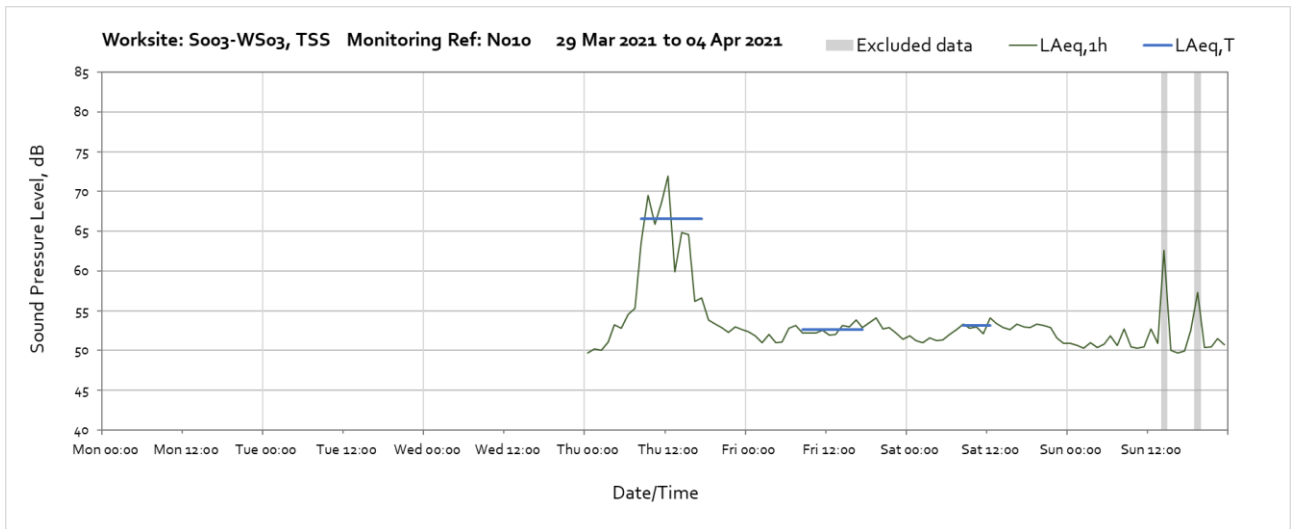


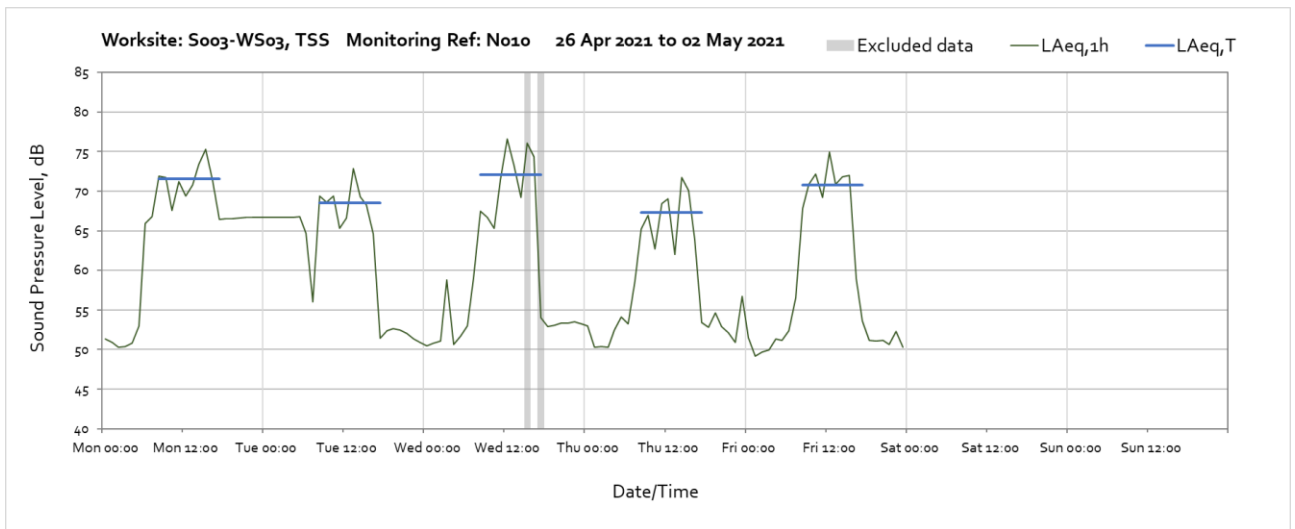
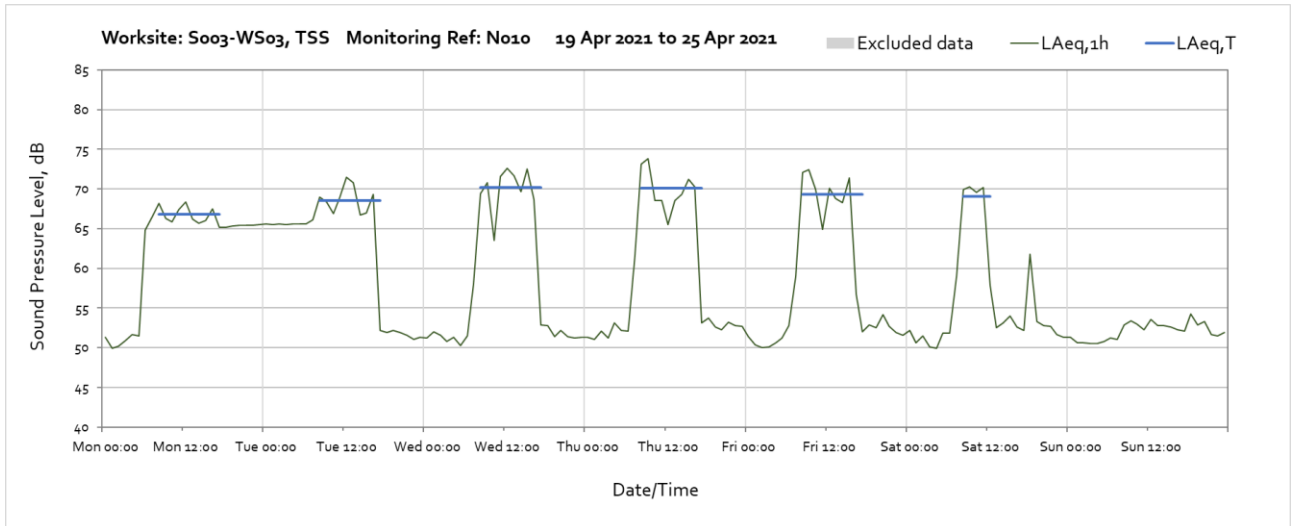
Worksite: S003-WS03, TSS – Monitoring Ref: N008



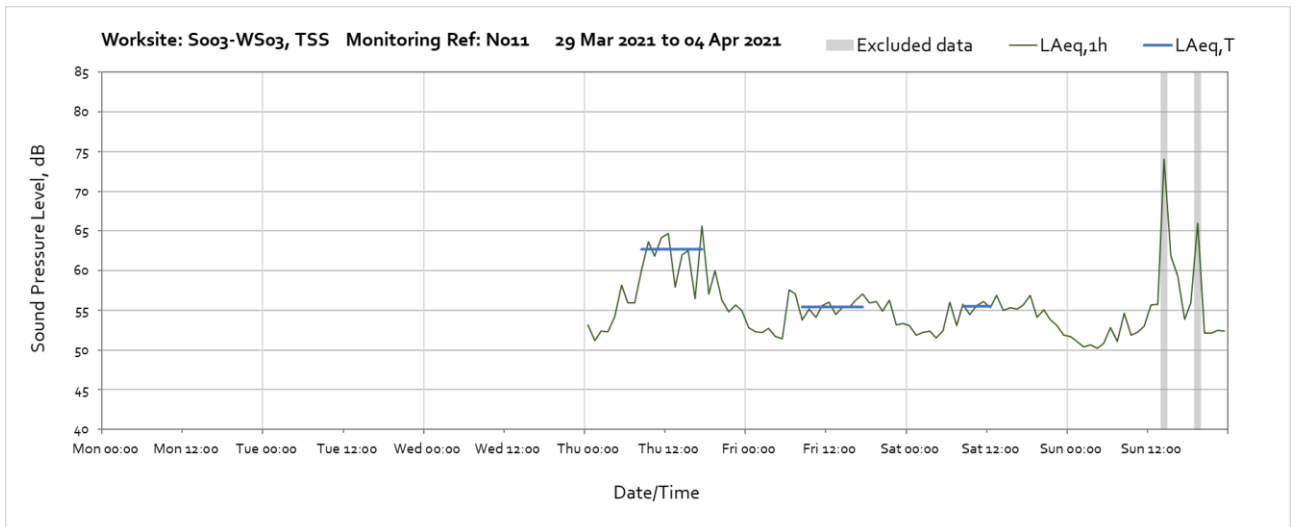


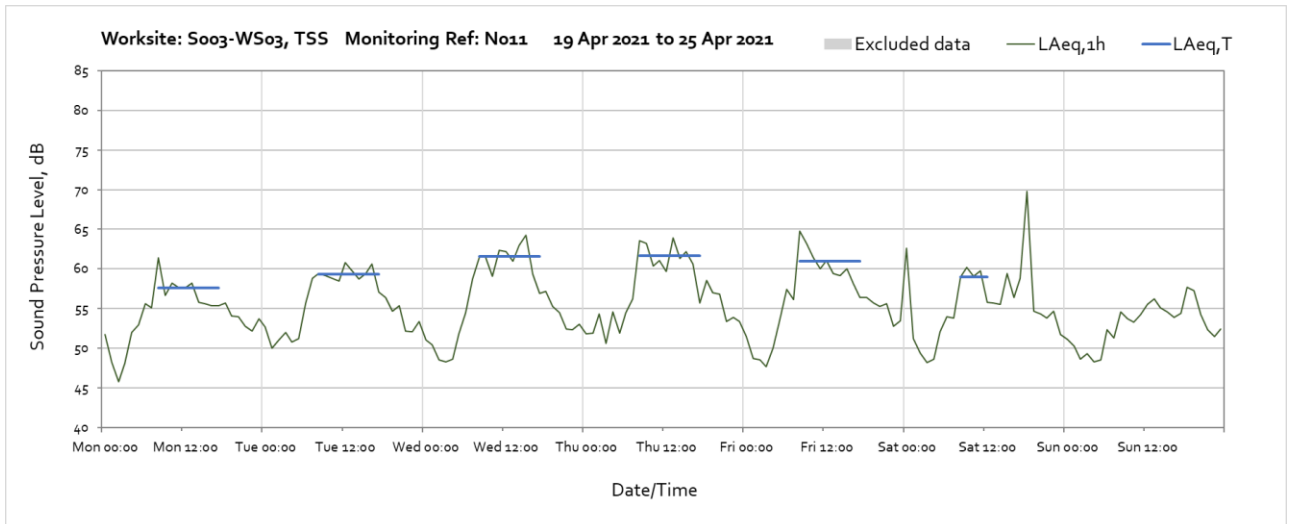
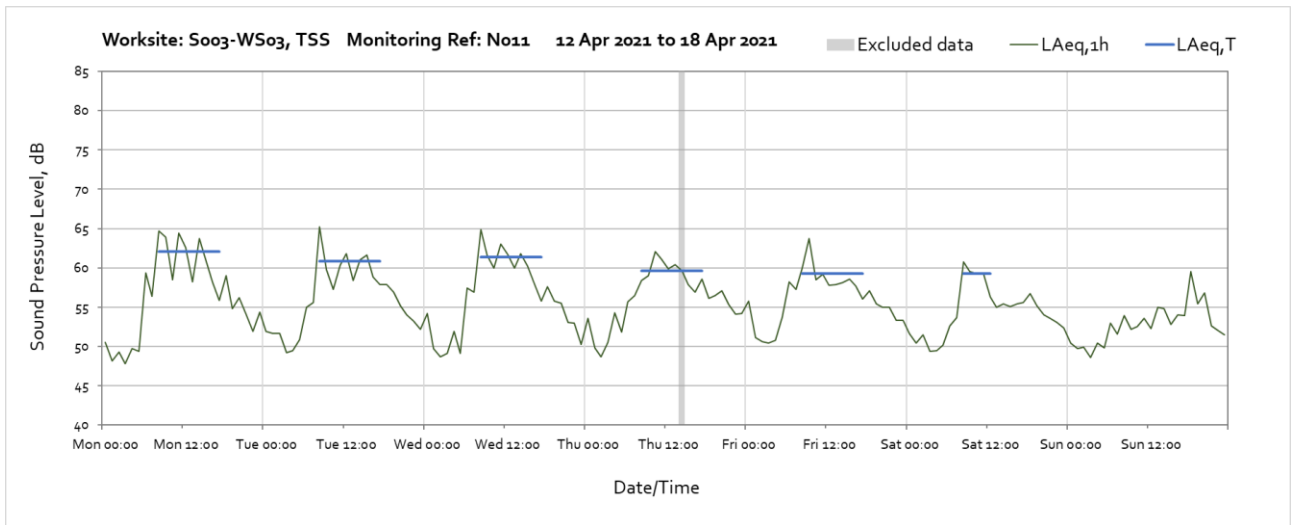
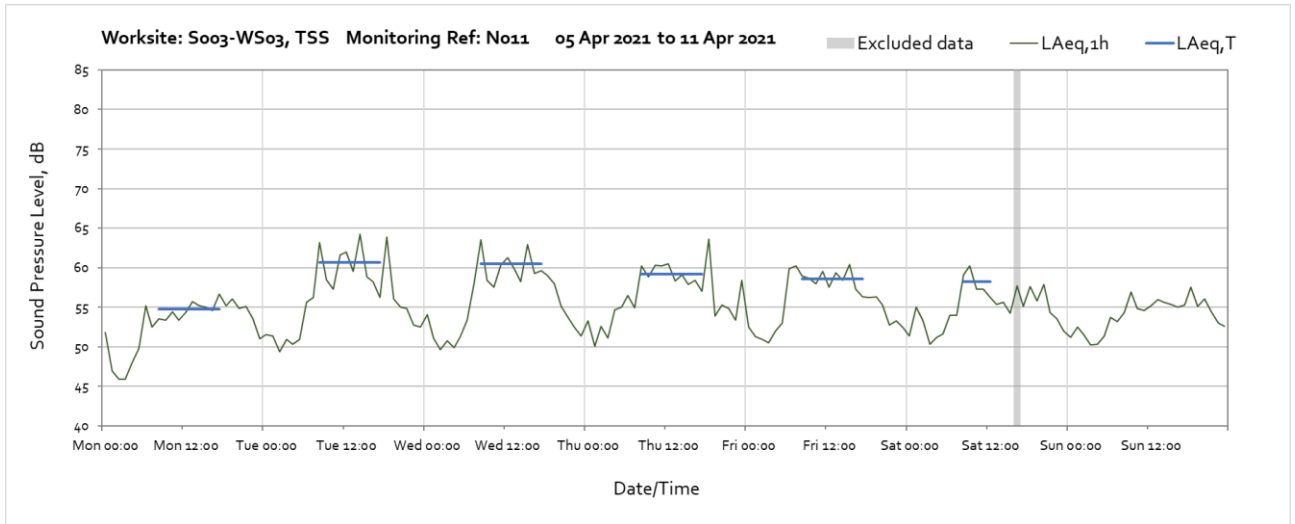
Worksite: S003-WS03, TSS – Monitoring Ref: N010

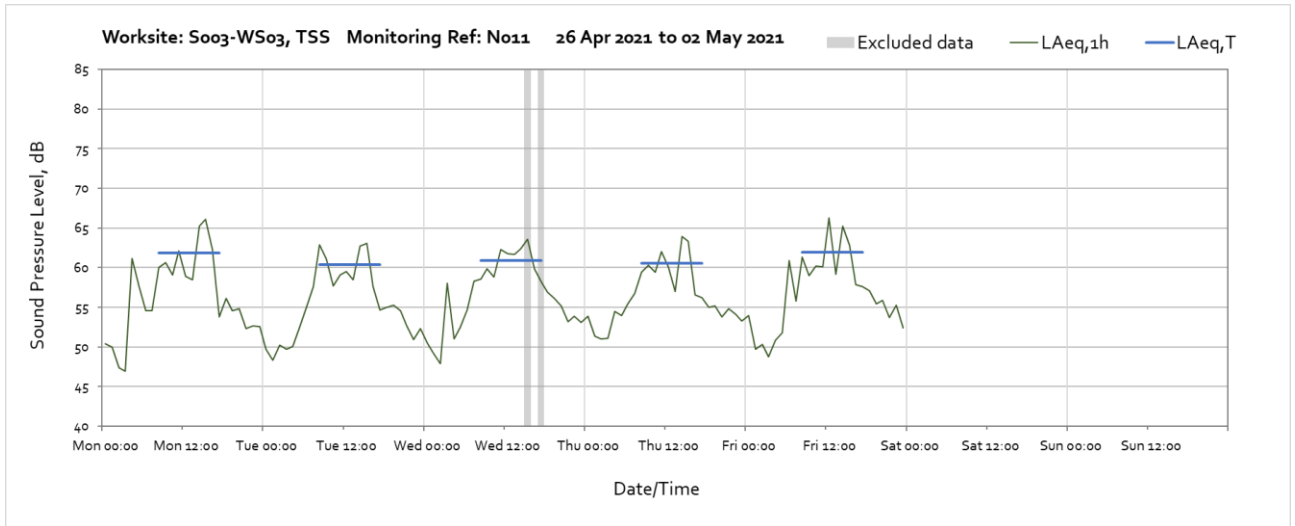




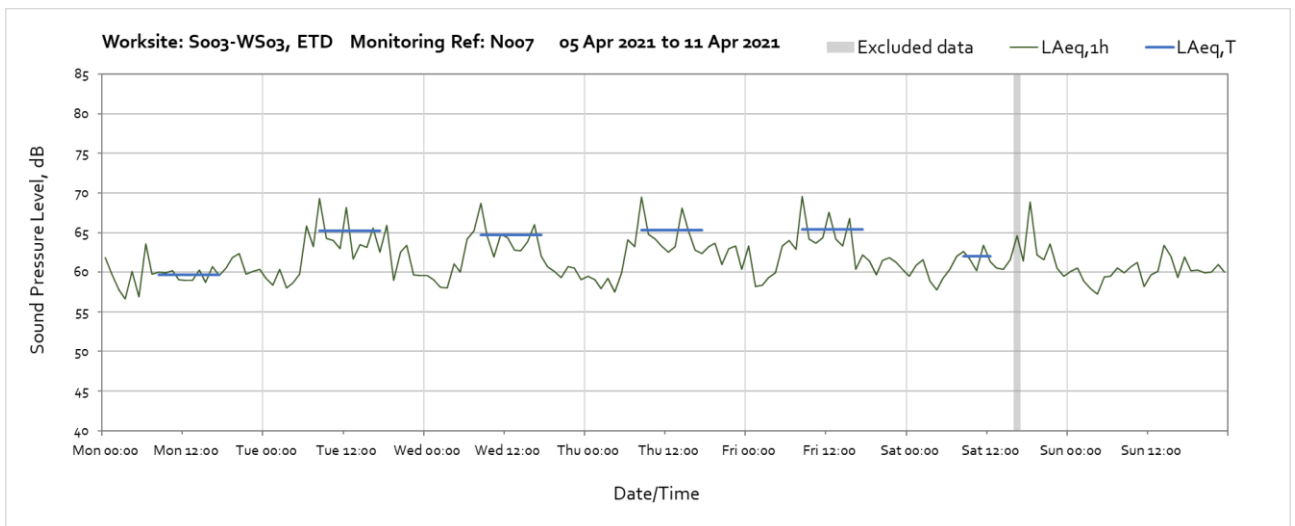
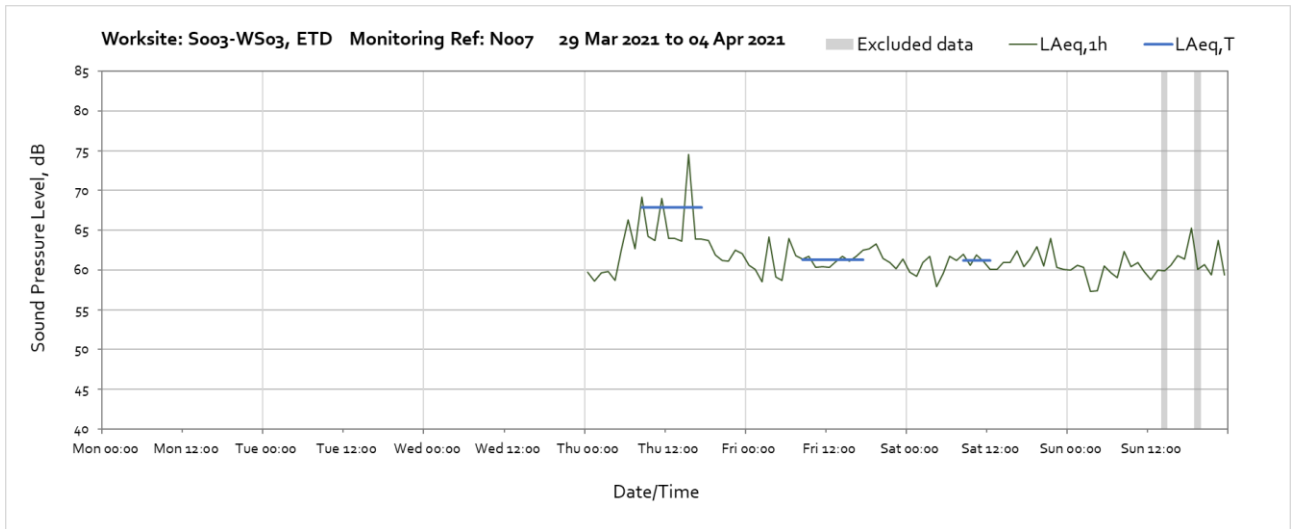
Worksite: S003-WS03 – Monitoring Ref: N011

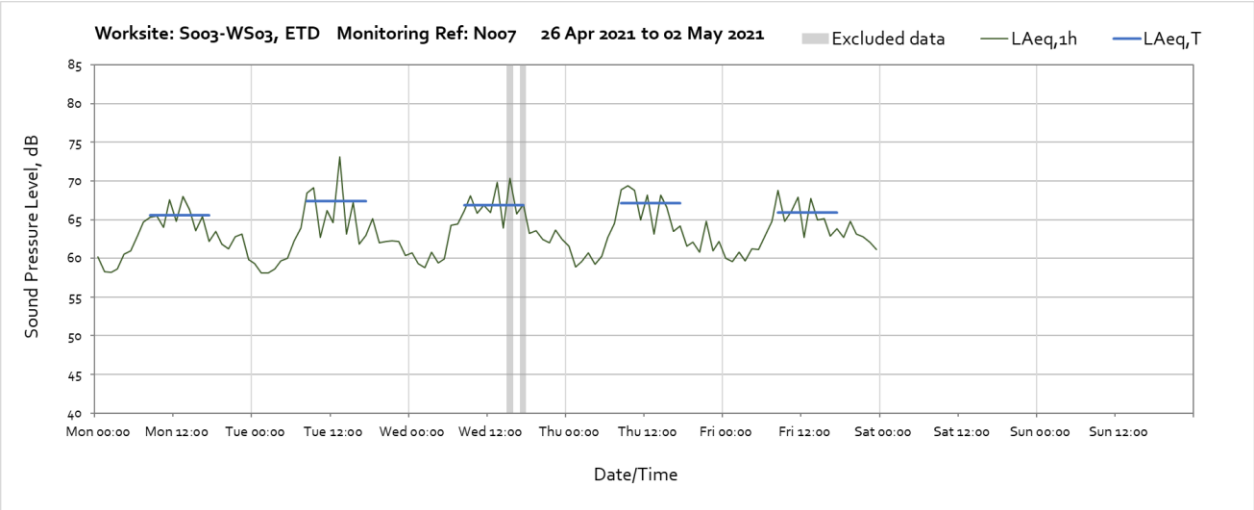
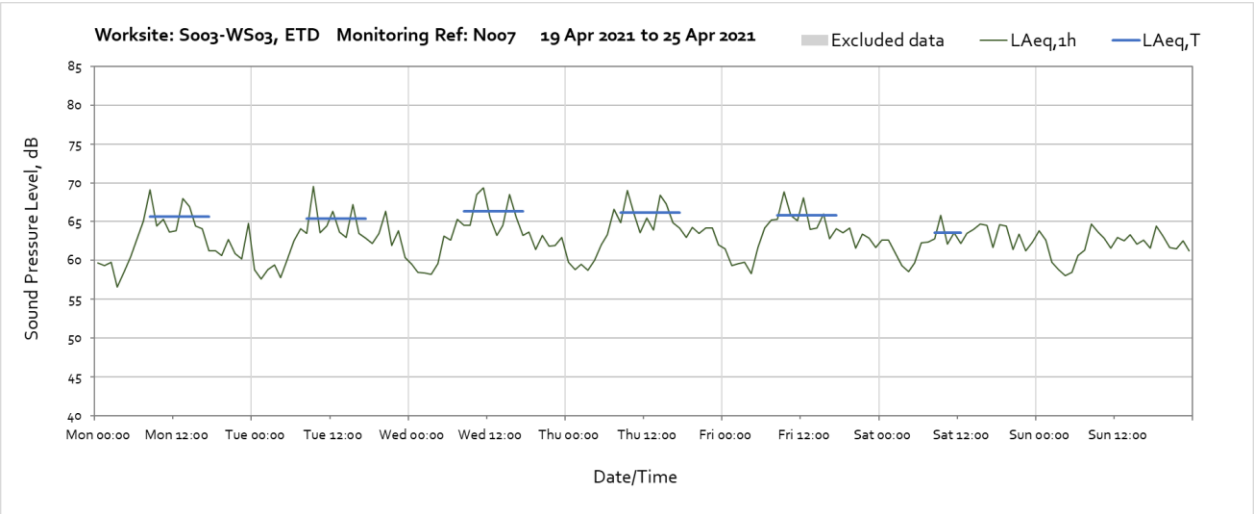
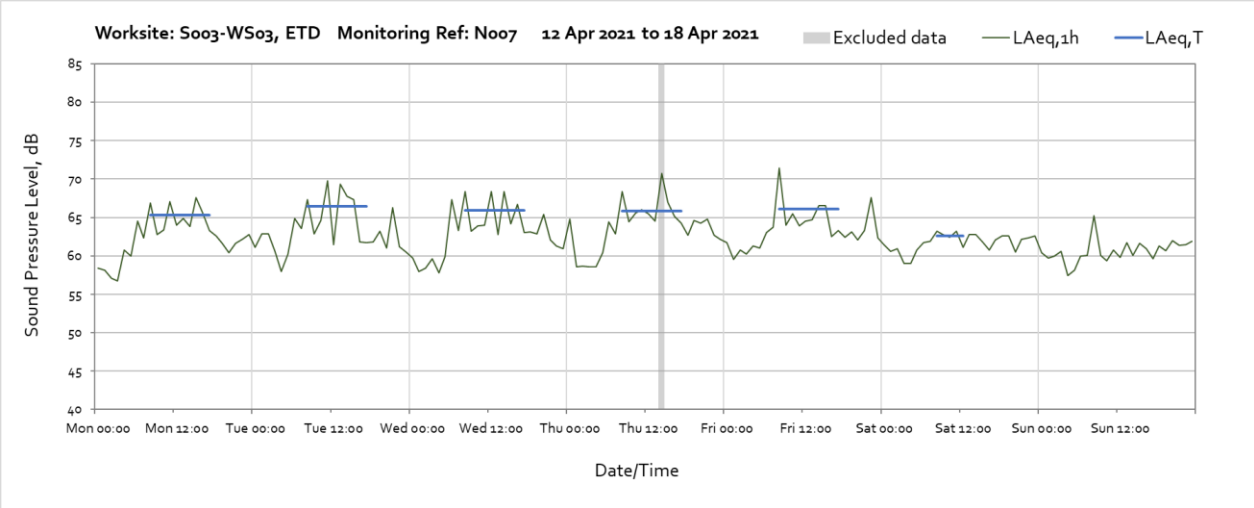




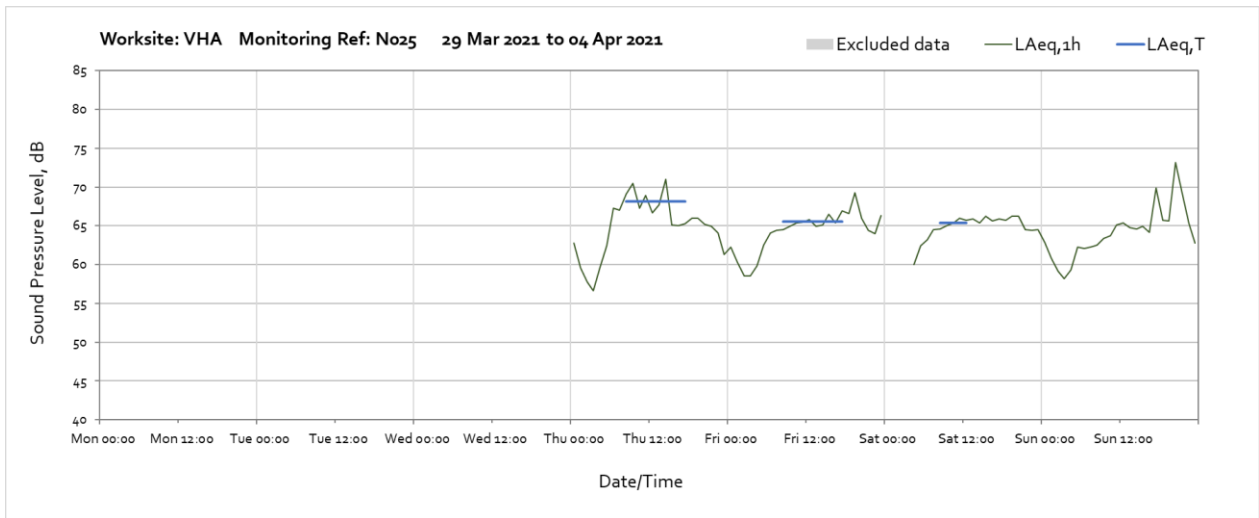


Worksite: S003-WS03, ETD – Monitoring Ref: N007

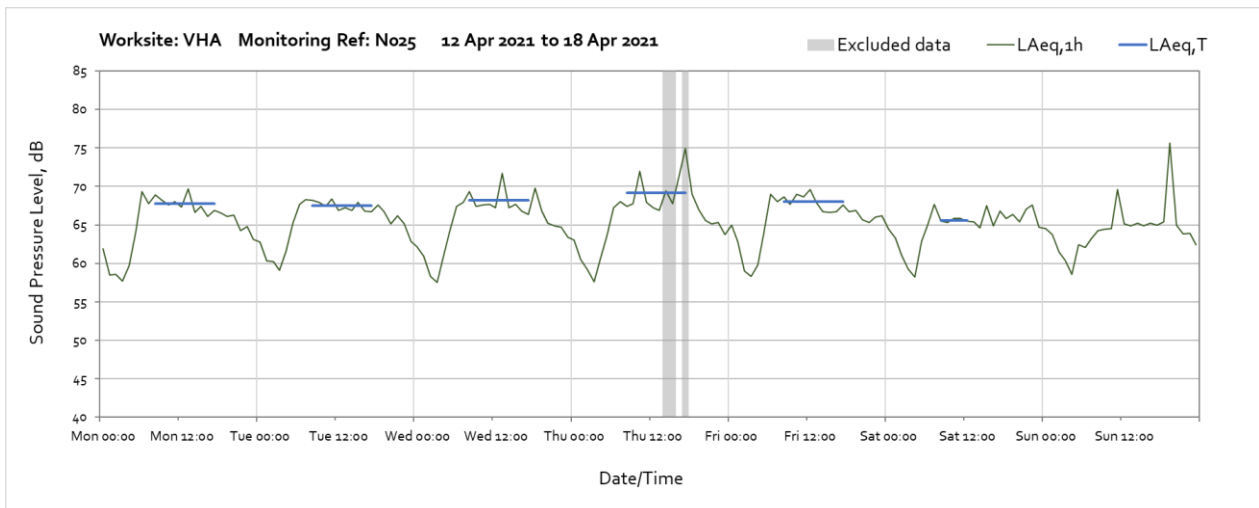
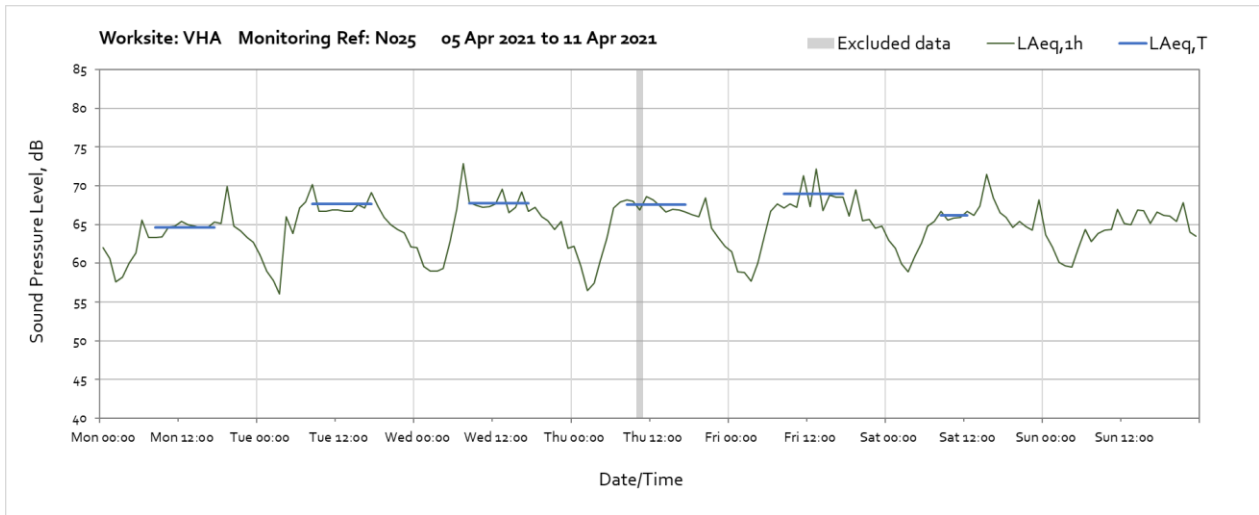


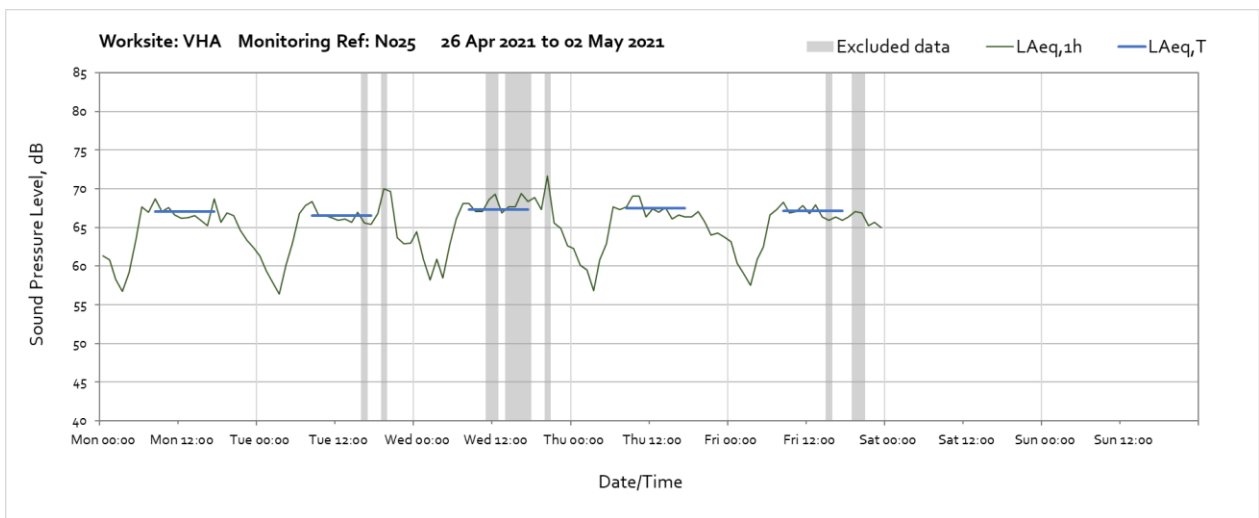
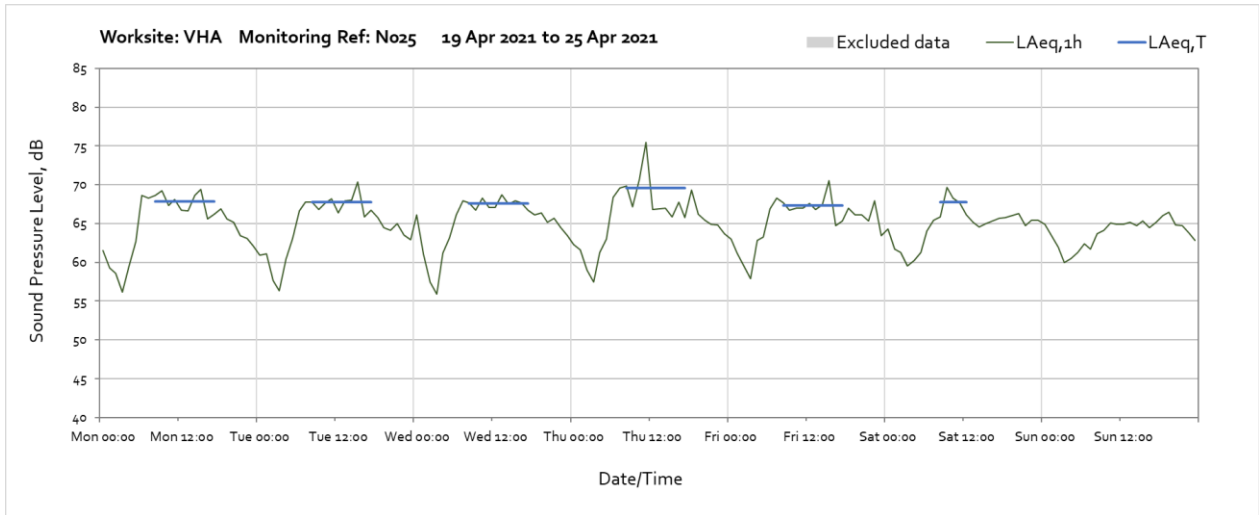


Vehicle Holding Area (VHA) – Monitoring Ref: N025

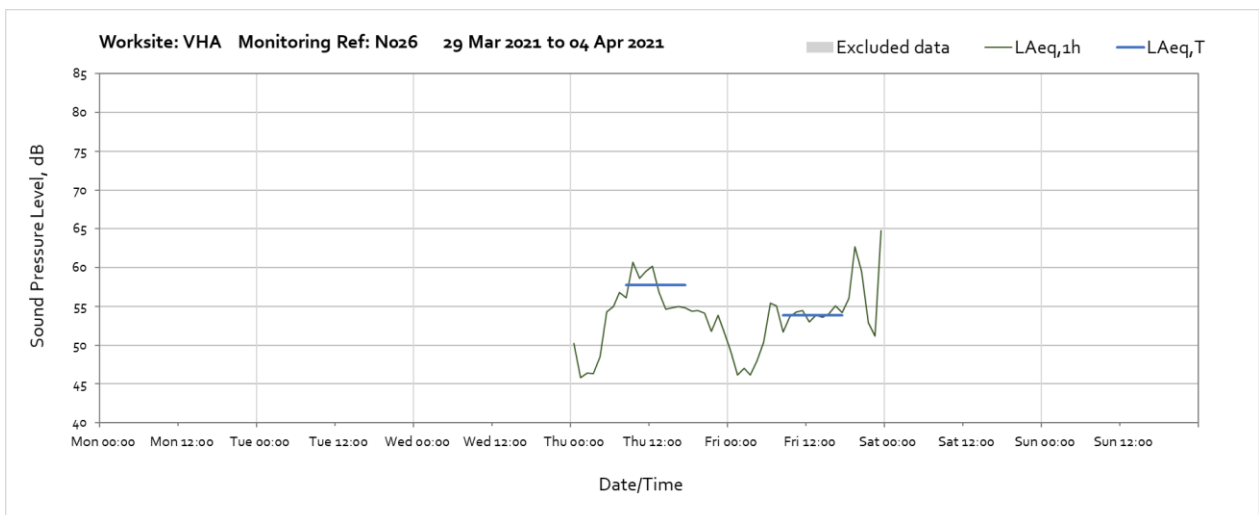


Note: Missing data between 00:00 and 04:00 was due to a memory card fault.



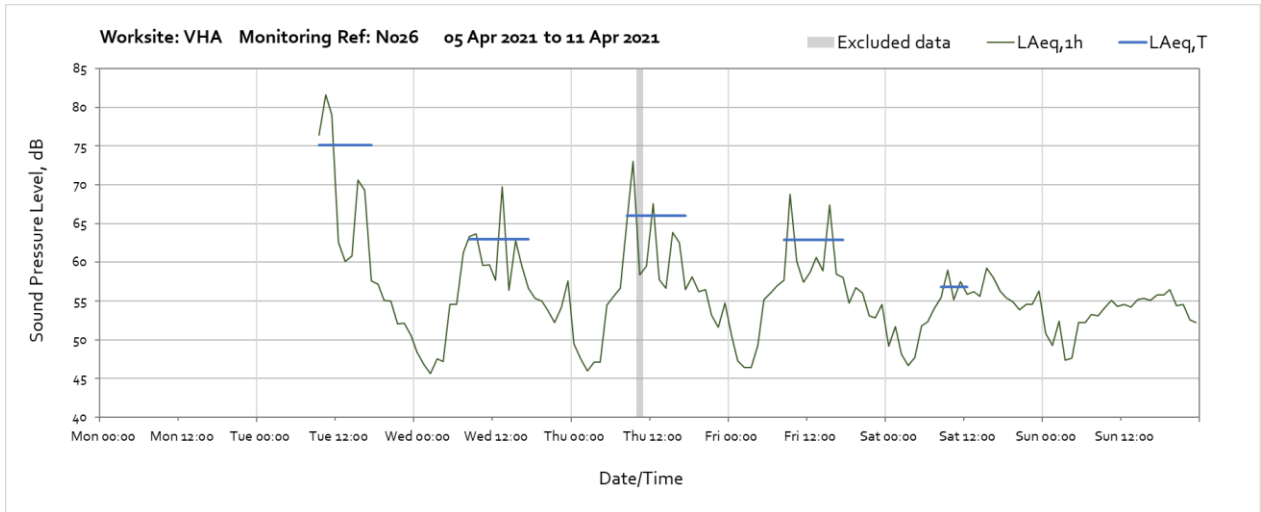


Vehicle Holding Area (VHA) – Monitoring Ref: N026

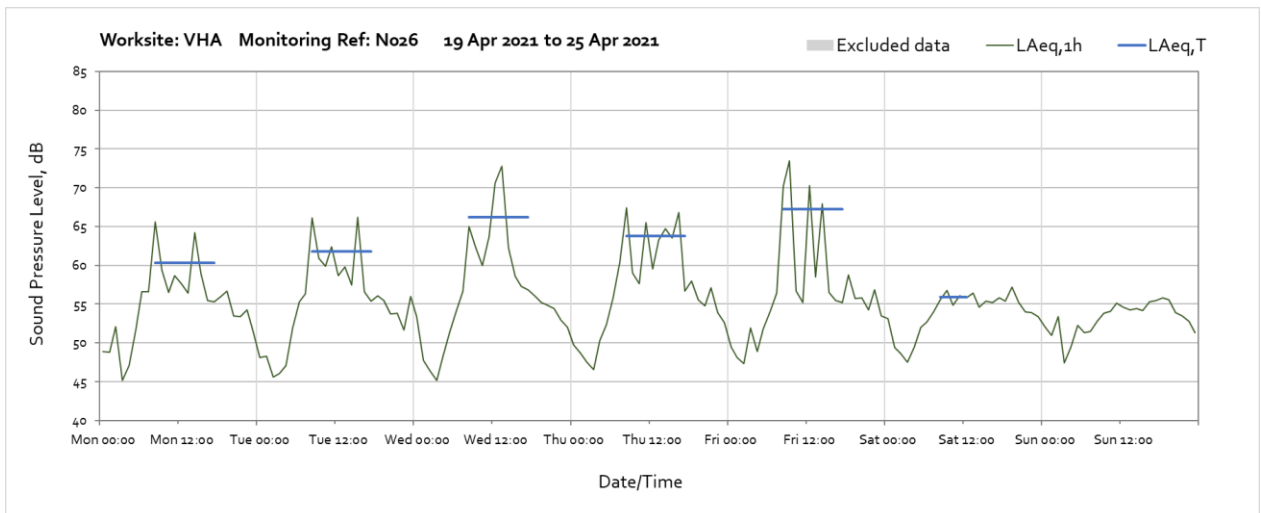
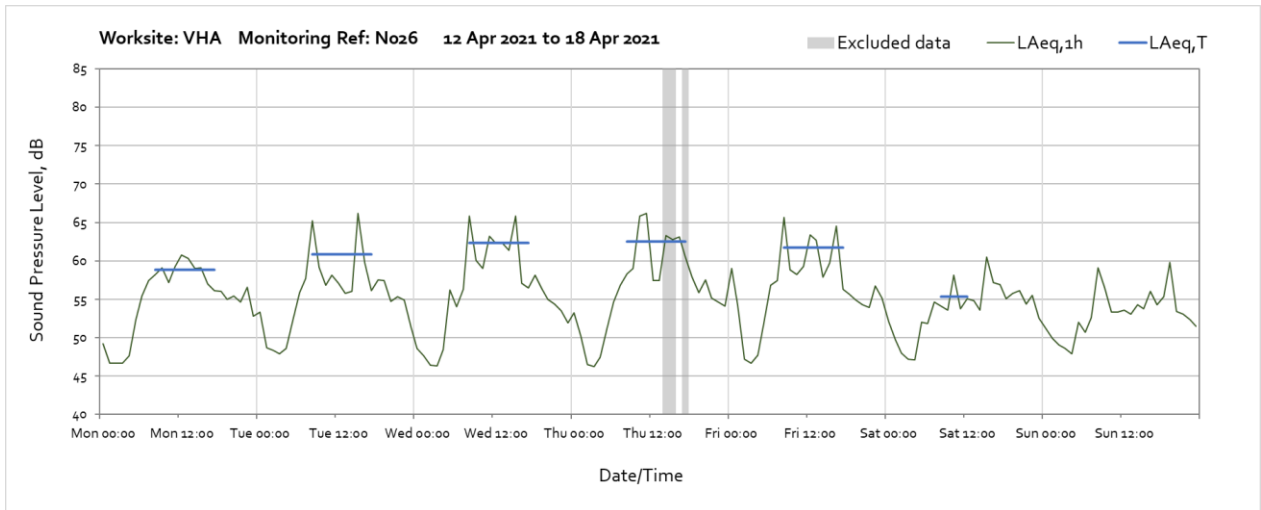


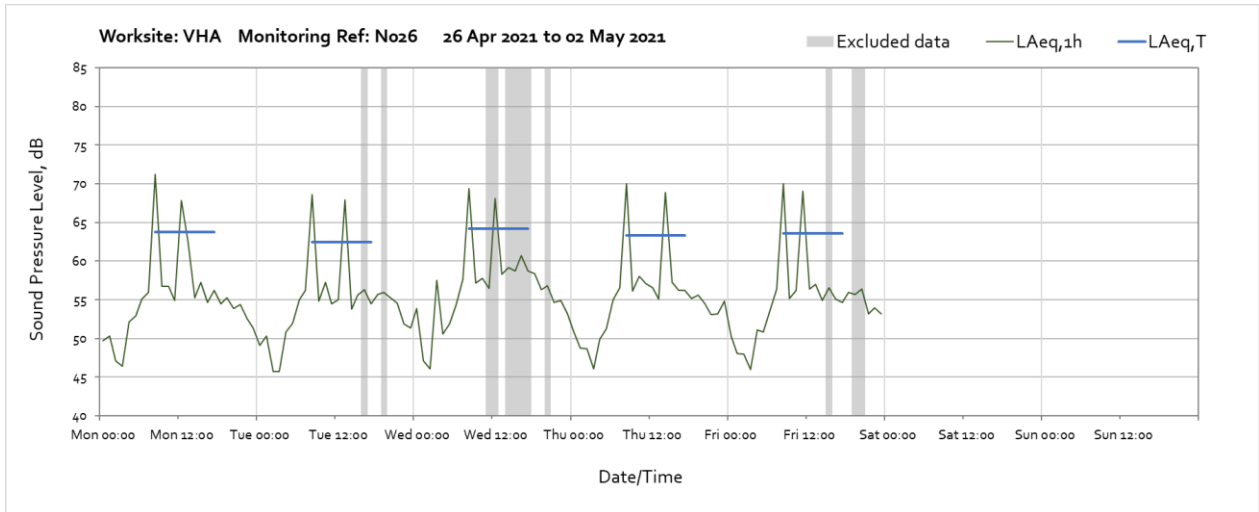
Note: Missing data between 00:00 on Saturday 3rd April and 09:00 on Tuesday 6th April was due to a loss of site power.

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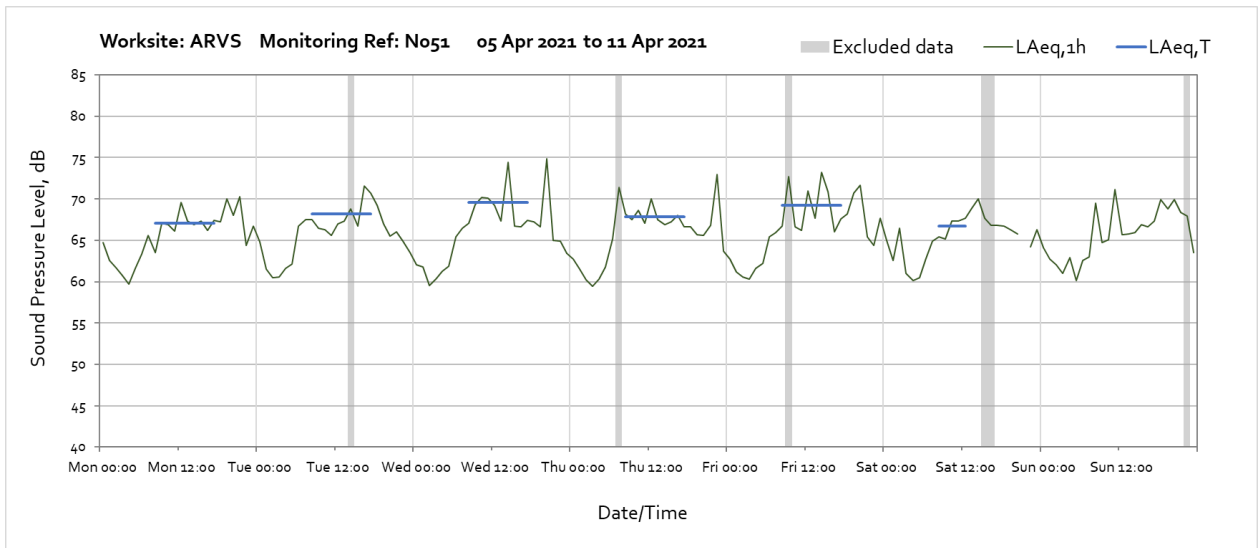
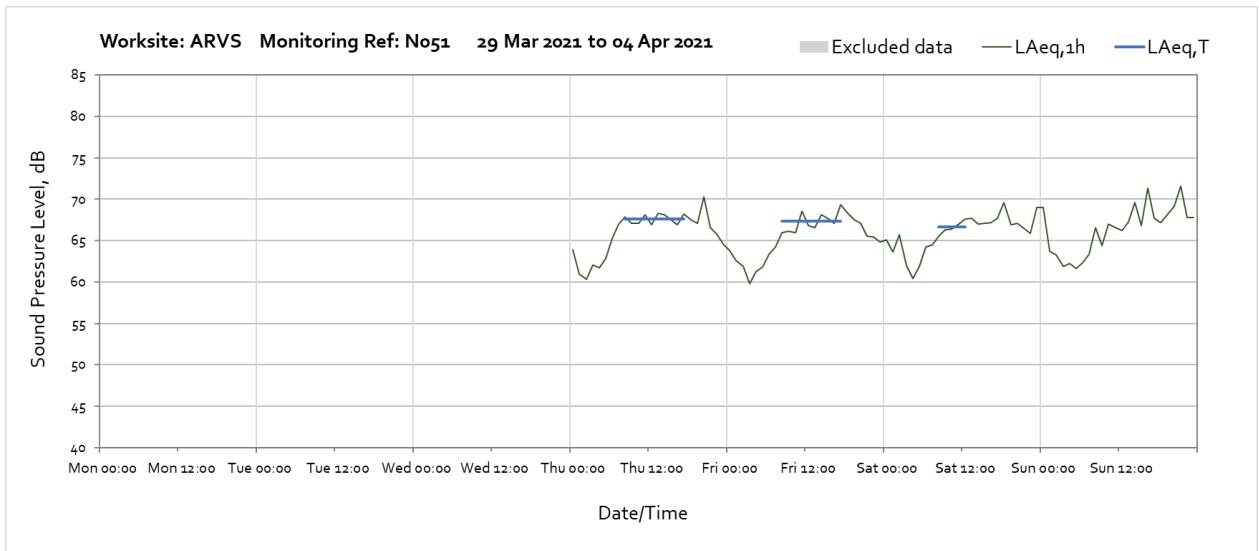


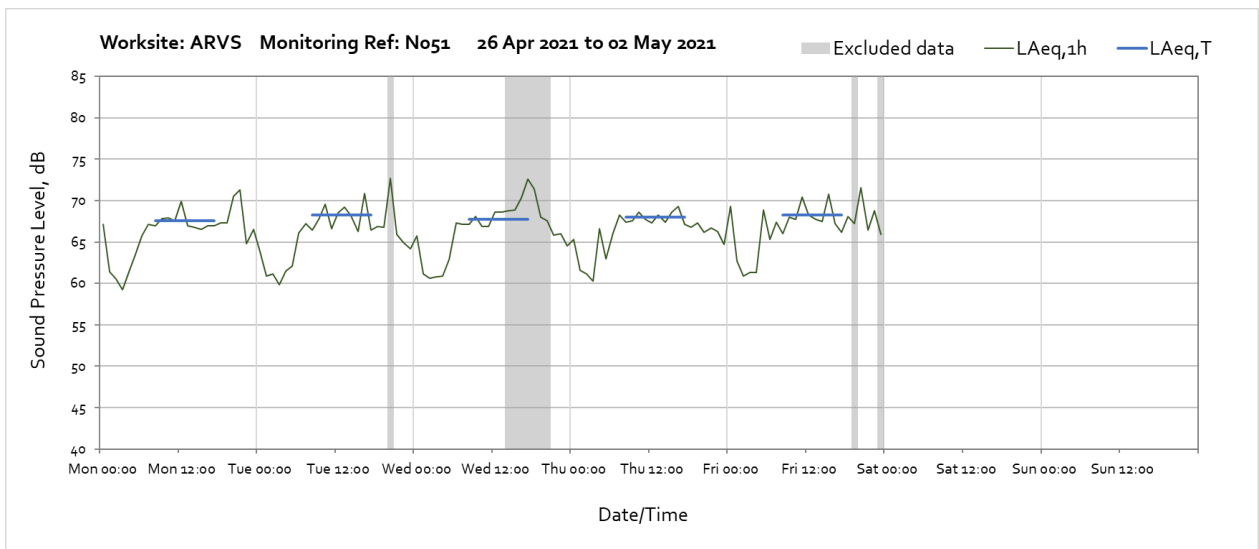
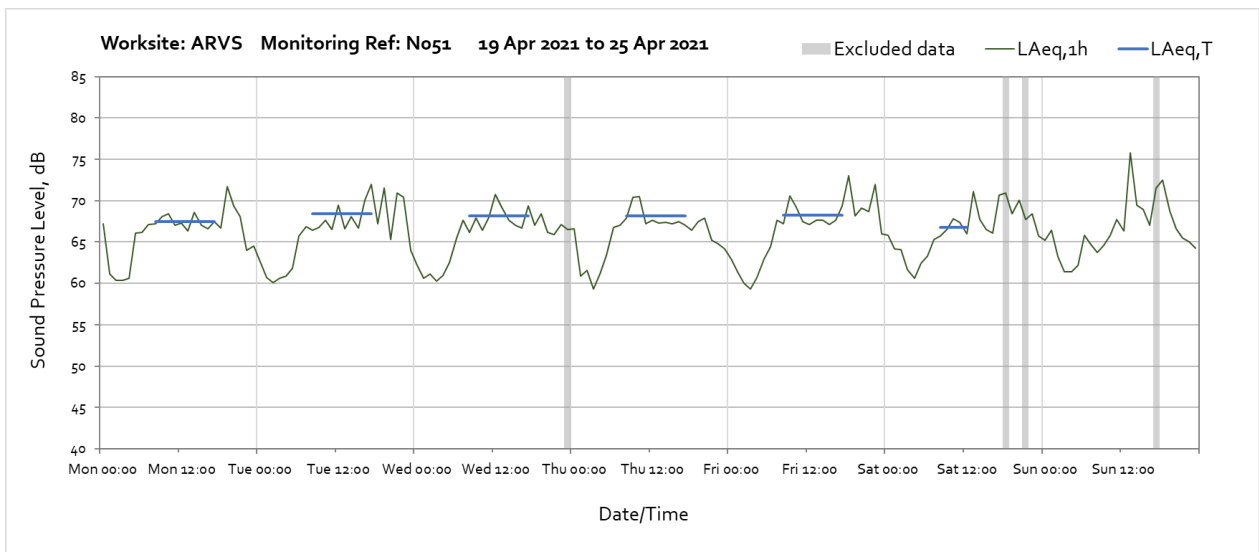
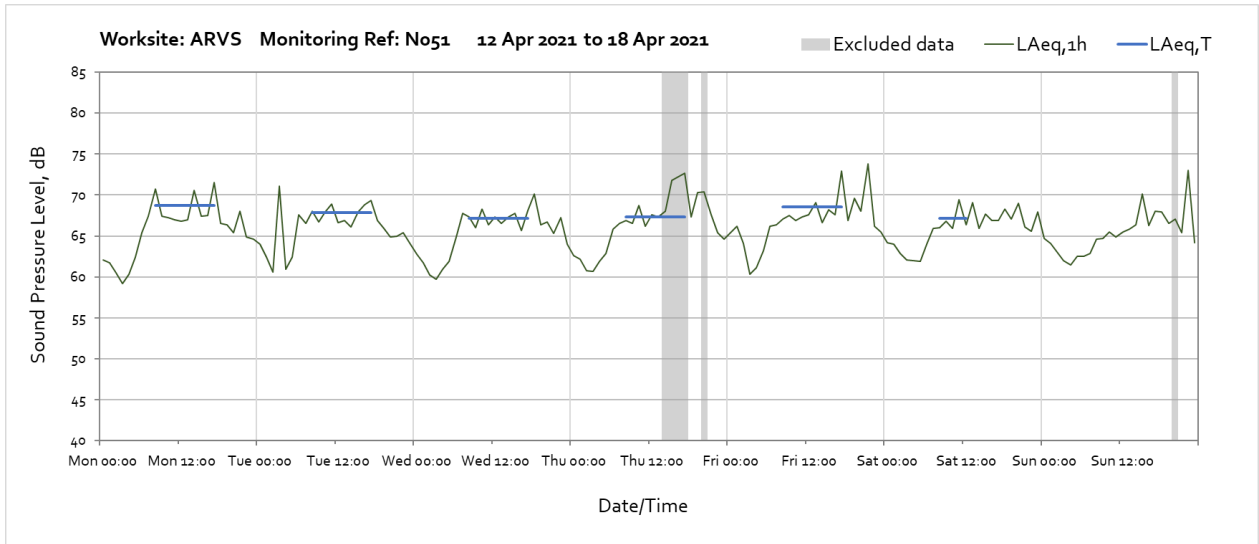
Note: Missing data between 00:00 on Saturday 3rd April and 09:00 on Tuesday 6th April was due to a loss of site power.



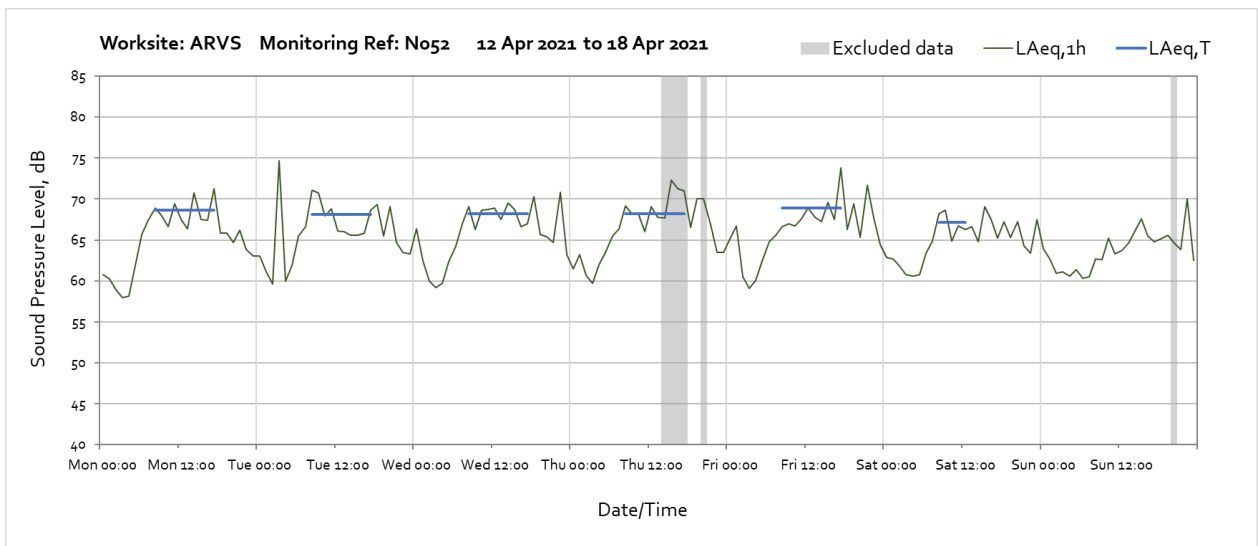
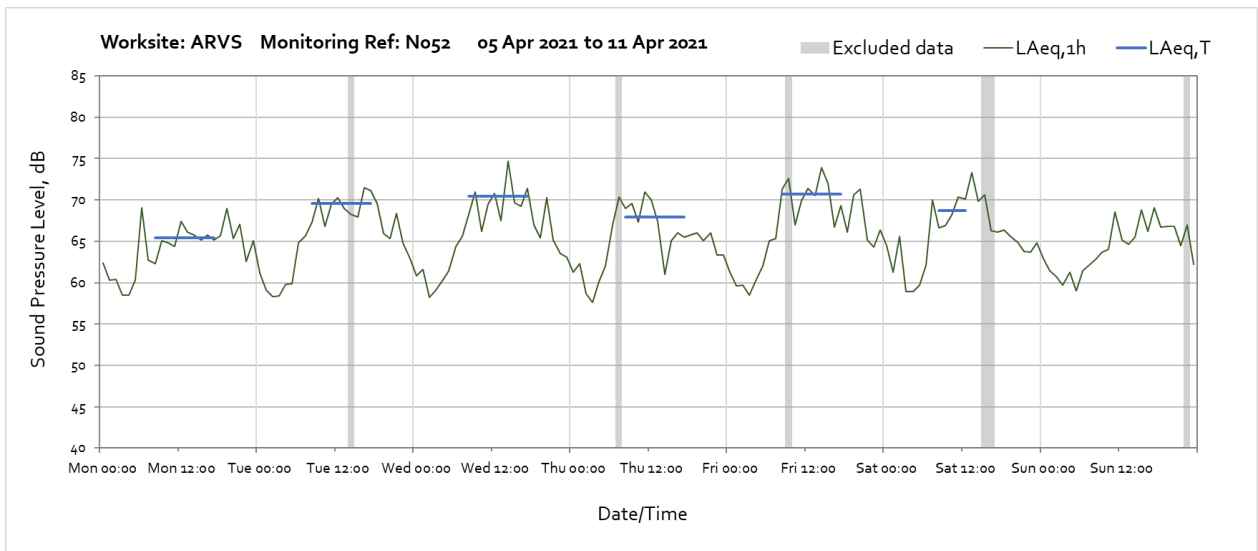
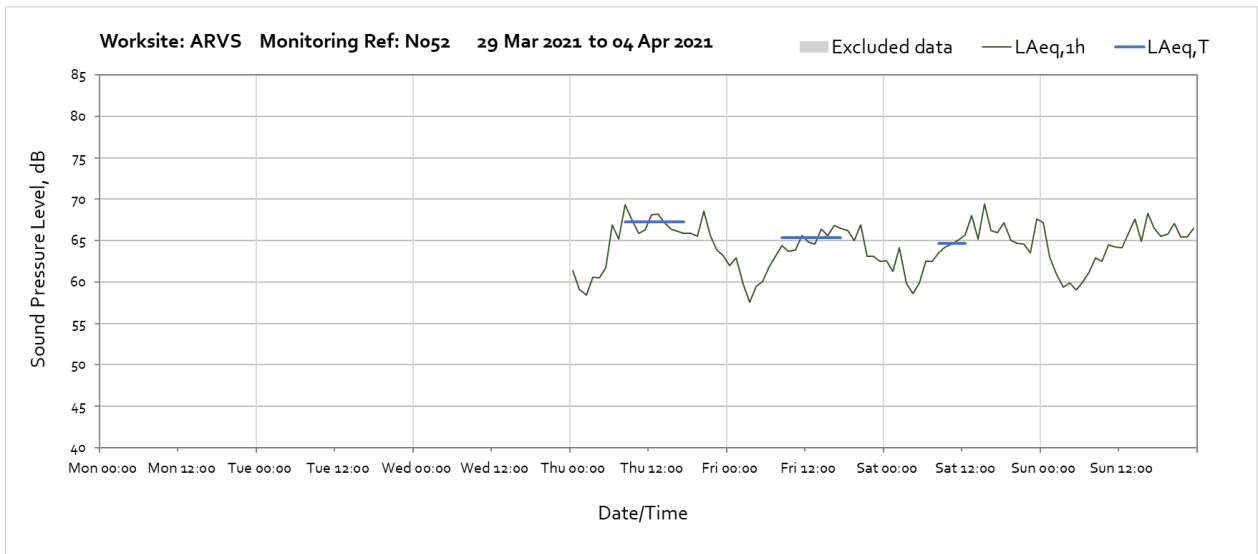


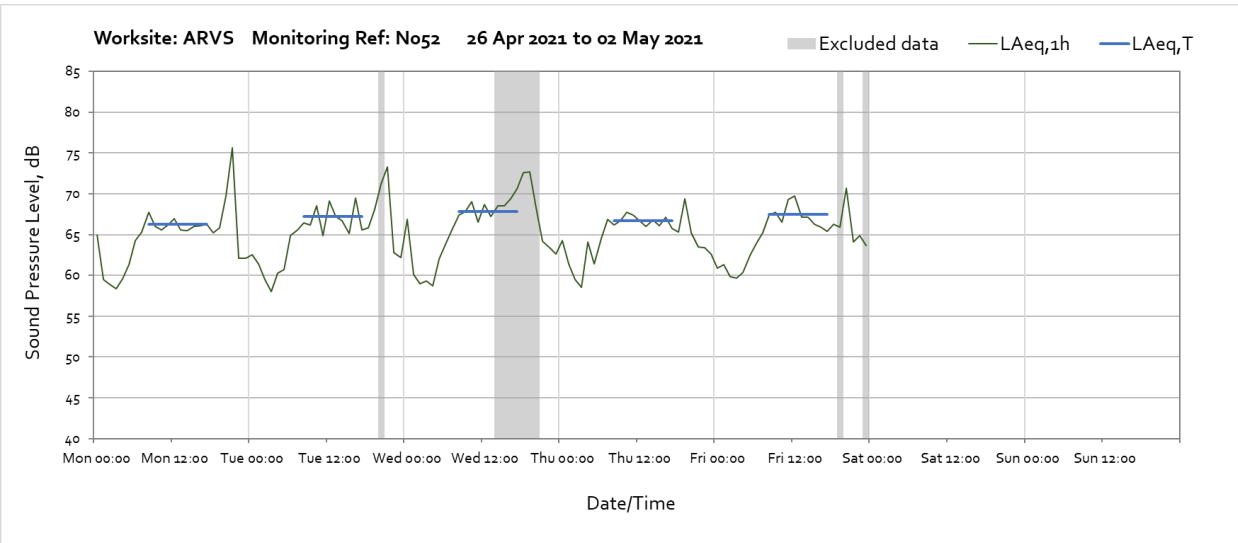
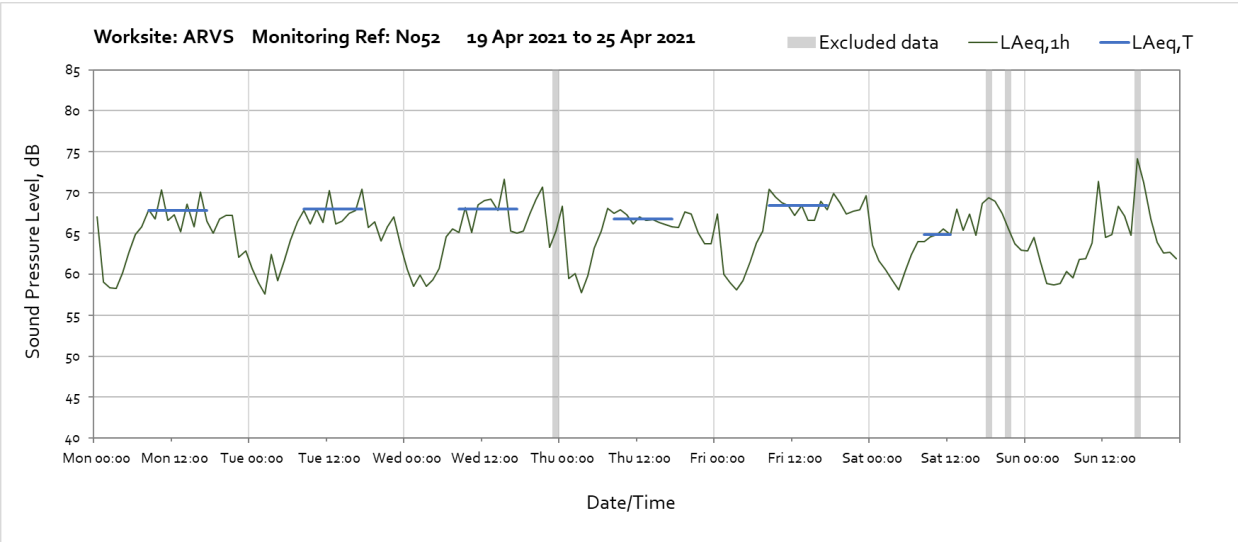
Adelaide Road Ventilation Shaft (ARVS) – Monitoring Ref: N051





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

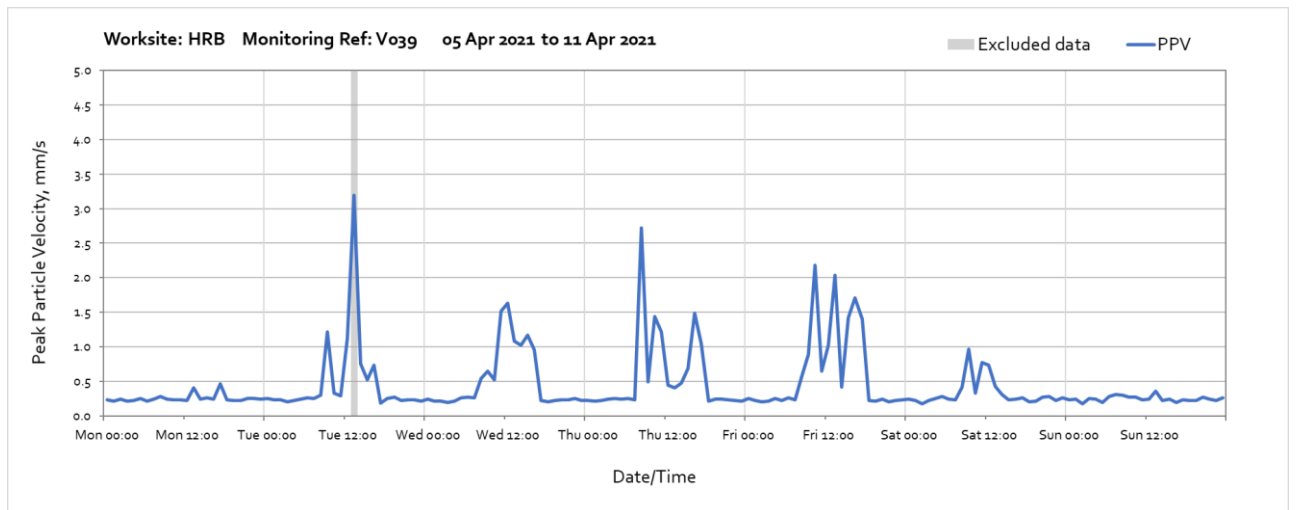
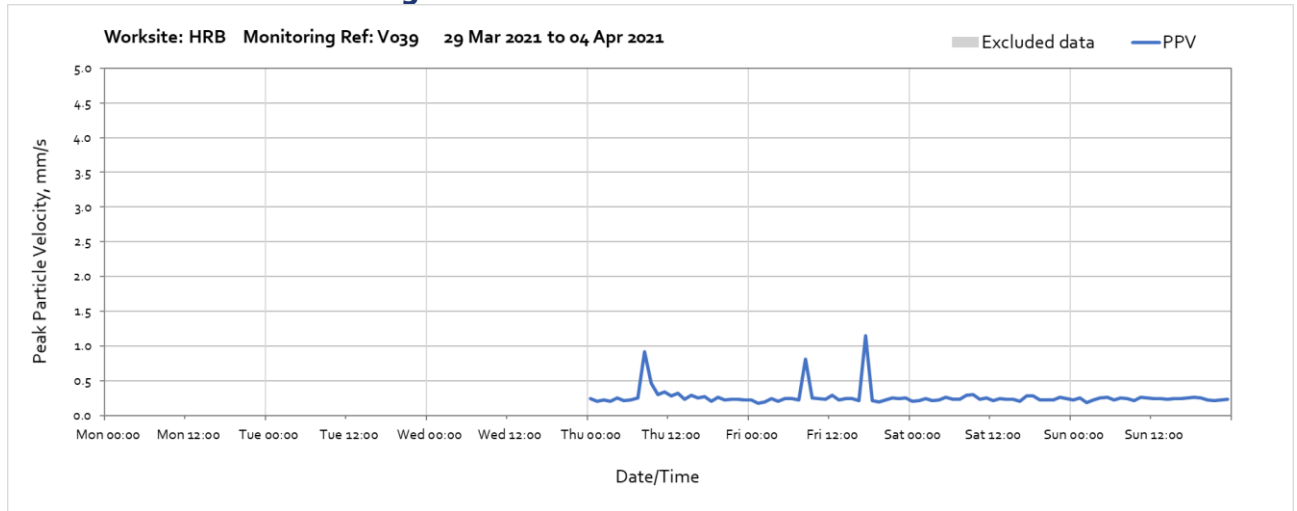




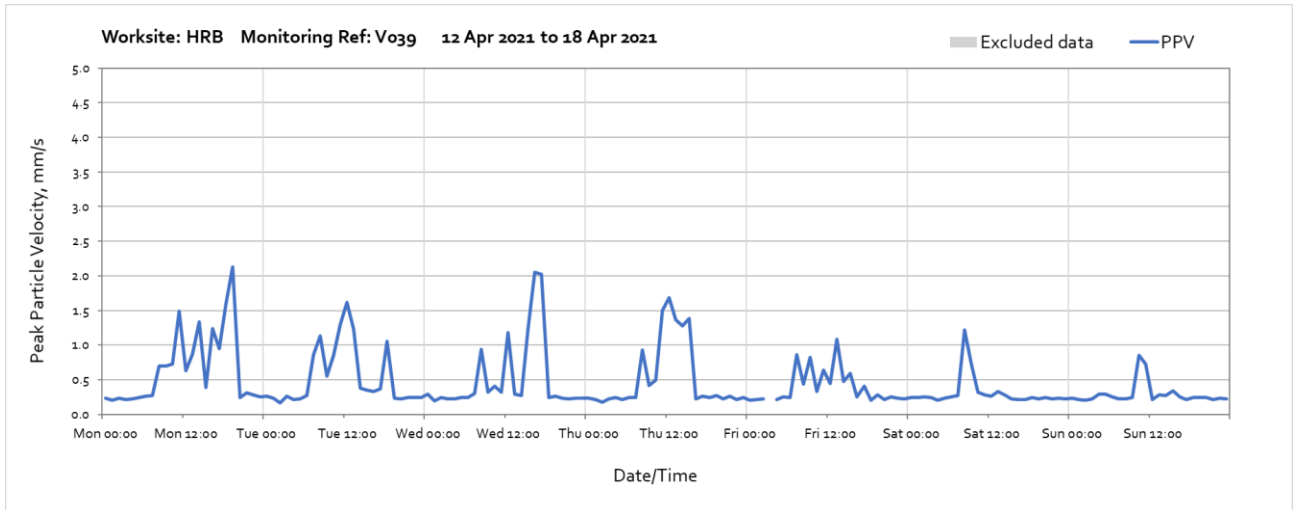
Vibration

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 axis x, y and z. Where high values of PPV were caused by local interference with the vibration monitor, which are not representative of HS2 construction works, these values have been greyed out in the following charts and have been excluded to calculate values in Table 4 of the main report.

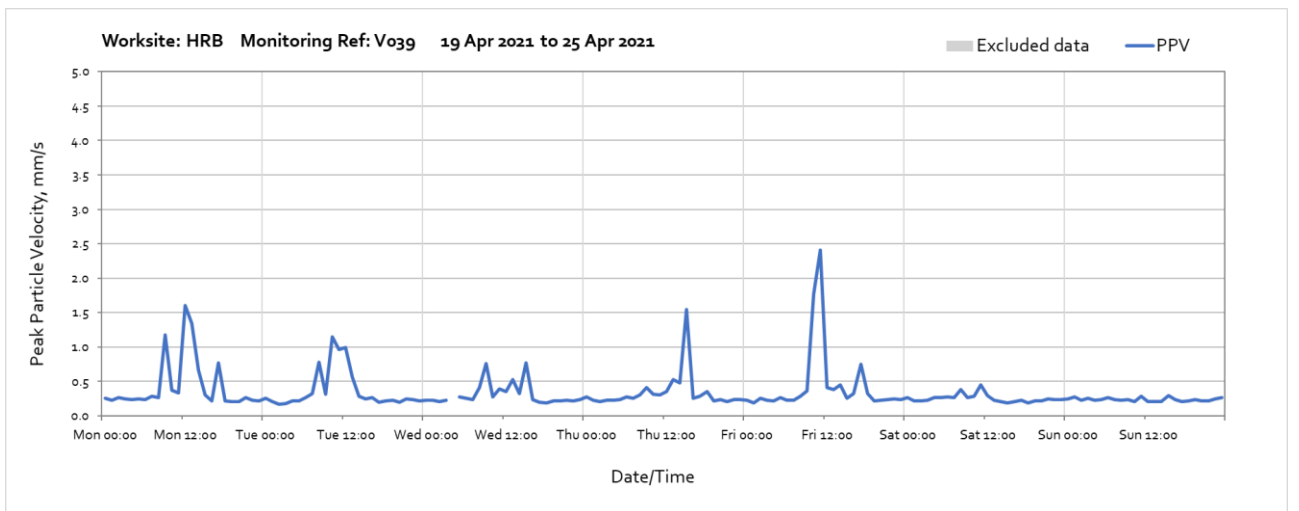
Worksite: HRB – Monitoring Ref: V039



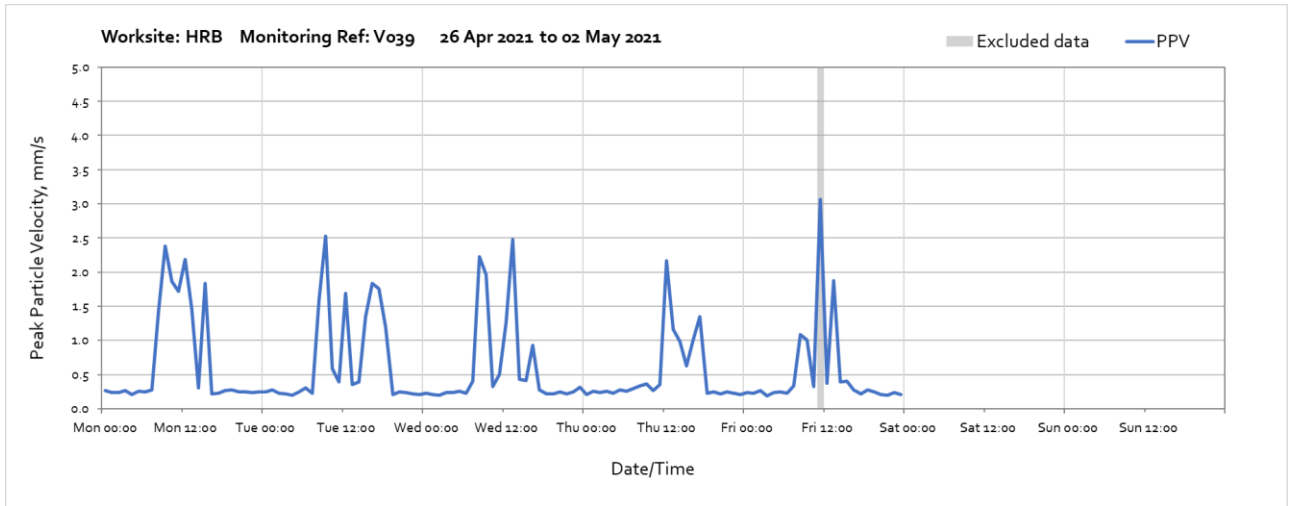
Note: High vibration levels measured between 13:00 – 14:00 on Tuesday 6th April were due to local interference of the monitor and are not representative of HS2 vibration levels.



Note: Missing data between 03:00 - 04:00 on Friday 16th April was due to a server connection dropout at the monitoring station. Investigation into the use of dual SIM cards is being undertaken with view of minimising further loss of data.

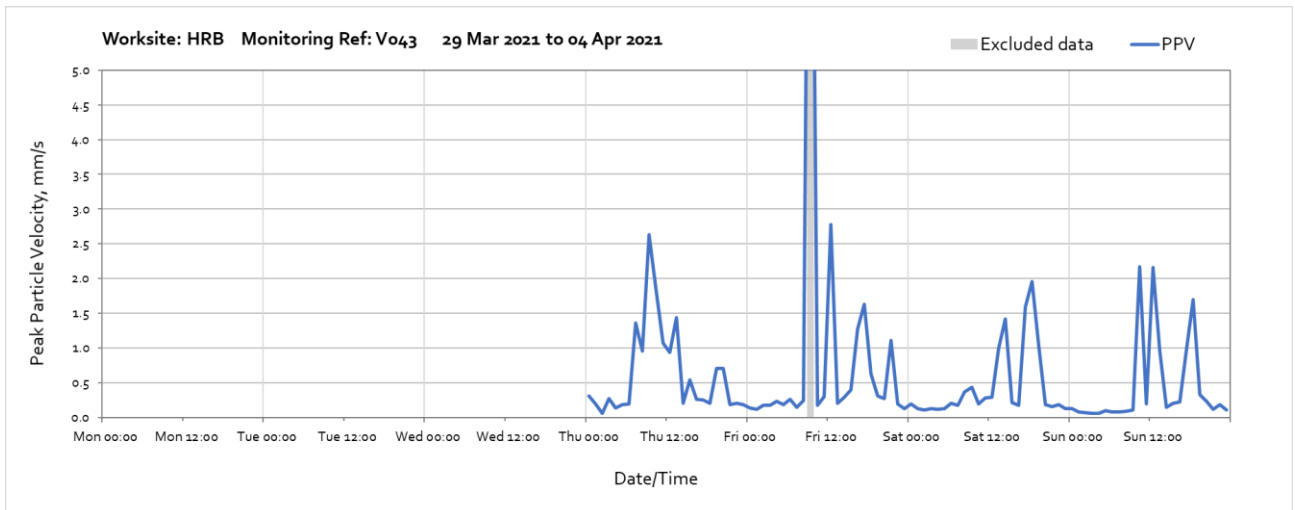


Note: Missing data between 04:00 - 05:00 on Wednesday 21st April was due to a server connection dropout at the monitoring station. Investigation into the use of dual SIM cards is being undertaken with view of minimising further loss of data.

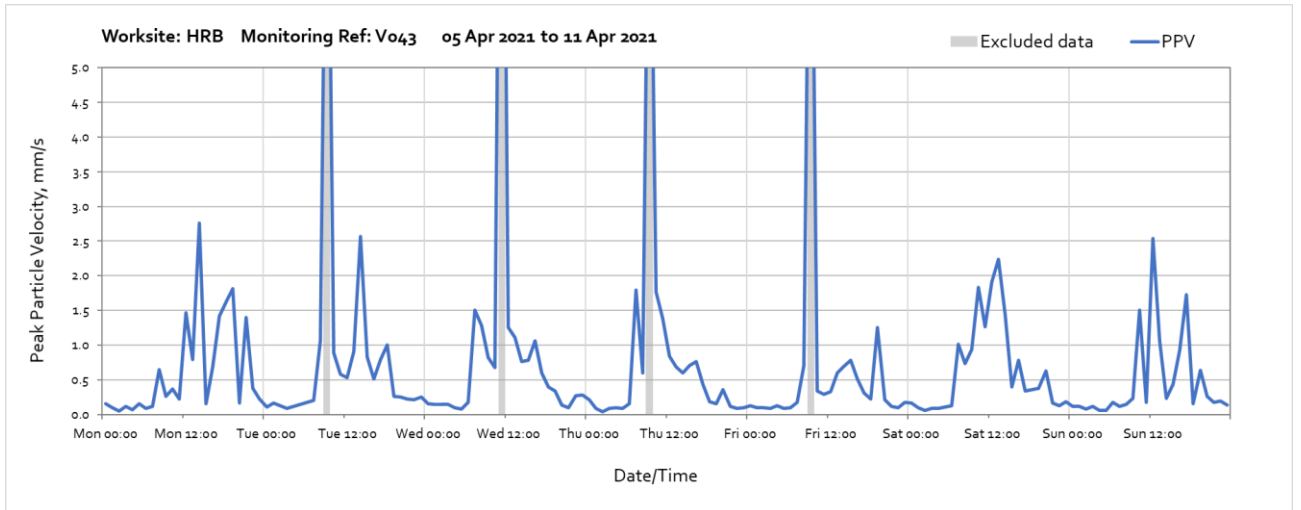


Note: High vibration levels measured between 13:00 – 14:00 on Tuesday 6th April were due to local interference of the monitor and are not representative of HS2 vibration levels.

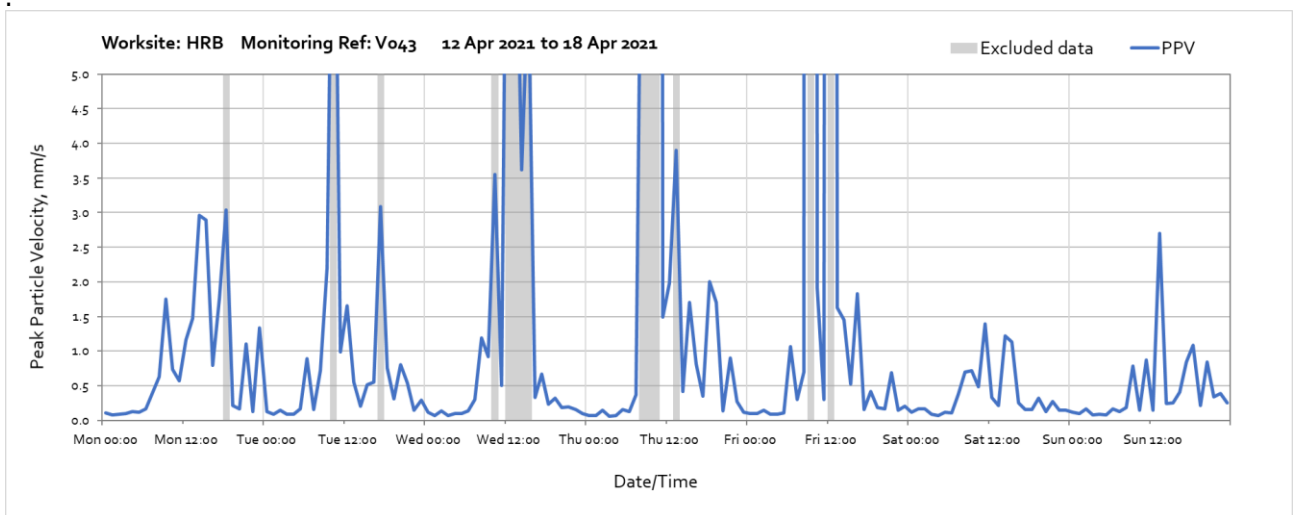
Worksite: HRB – Monitoring Ref: V043



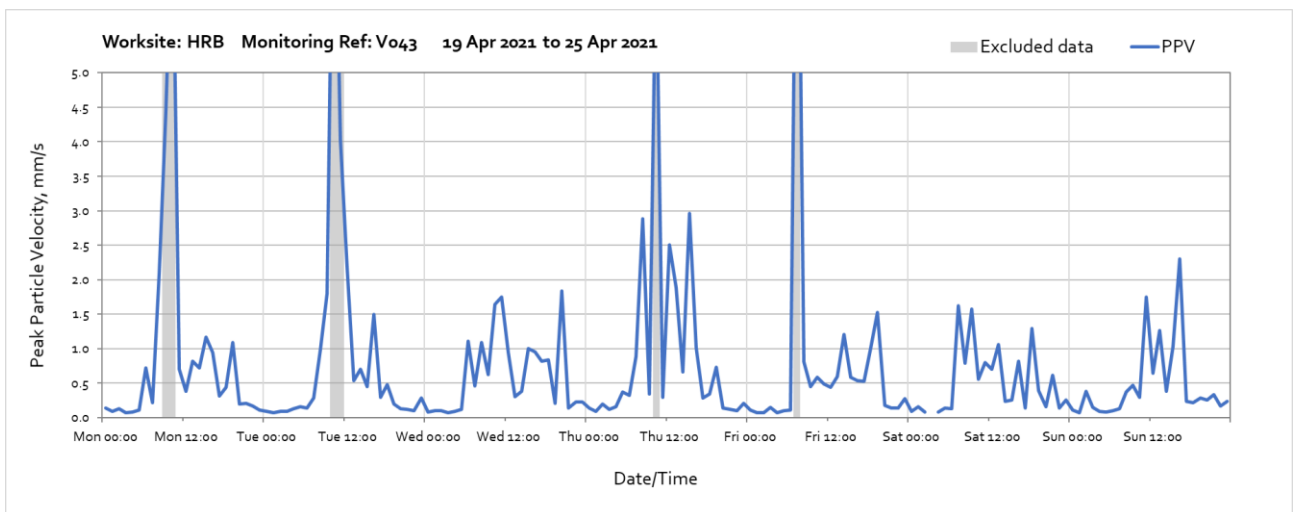
Note: High vibration levels measured between 09:00 – 10:00 on Friday 2nd April was due to the use of the nearby residential bin store and are not representative of HS2 vibration levels.



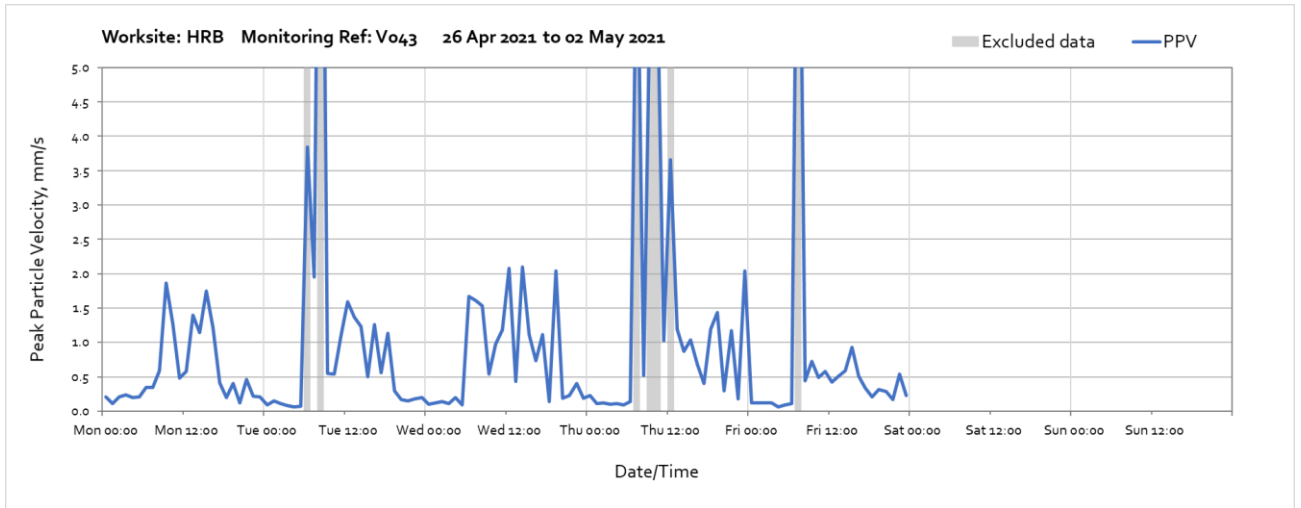
Note: High vibration levels measured throughout the week were due to the use of the neraby residential bin store and local interference of the monitor and are not representative of HS2 vibration levels.



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

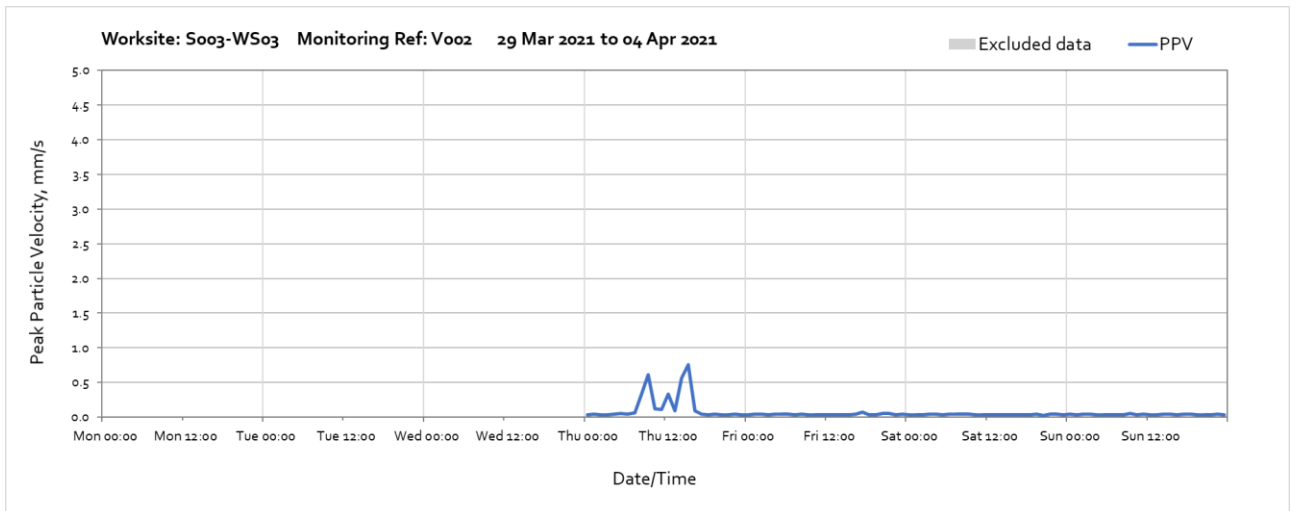


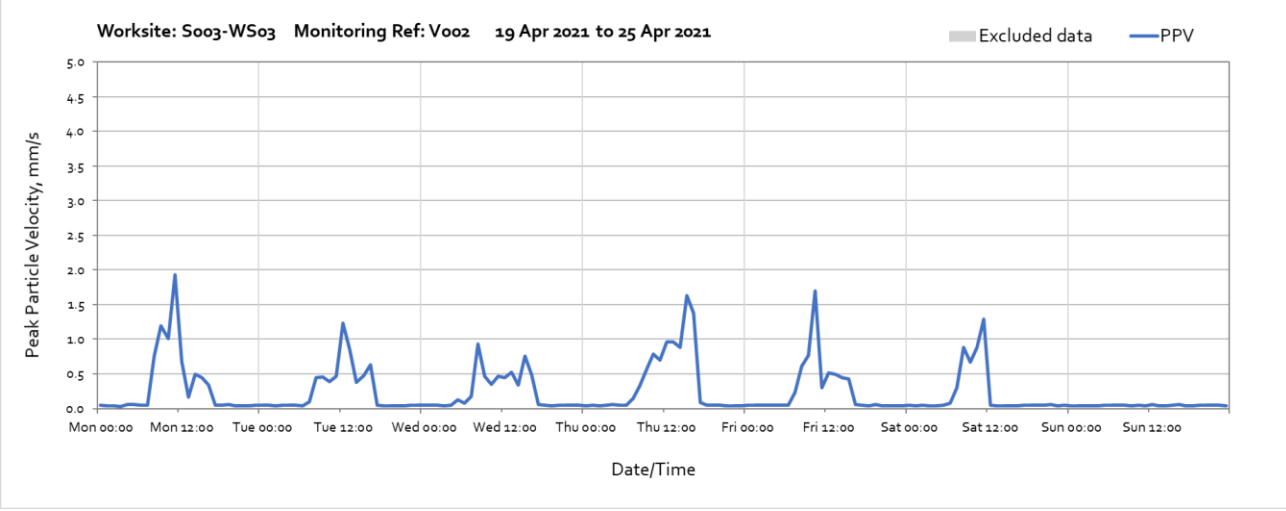
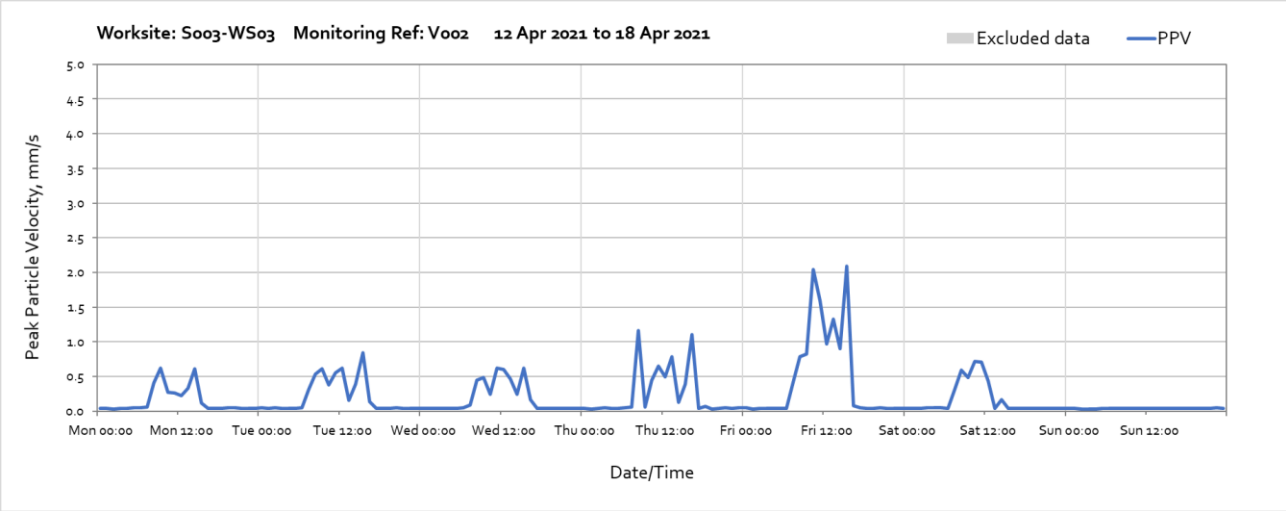
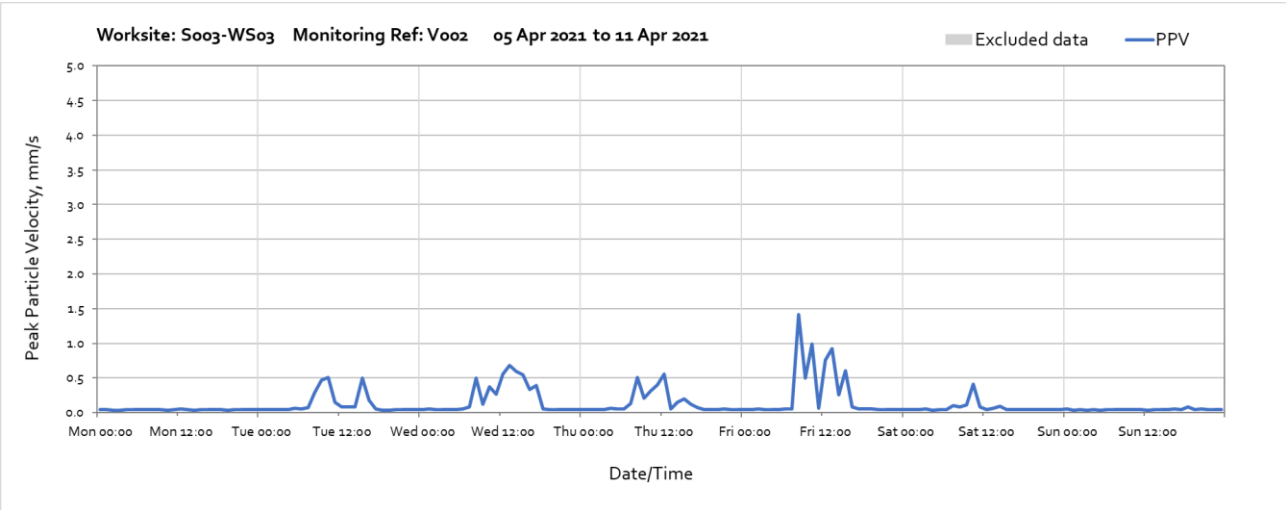
Note: High vibration levels measured throughout the week were due to the use of the nearby residential bin store and local interference of the monitor and are not representative of HS2 vibration levels. Missing data between 03:00 – 04:00 on Saturday 24th April was due to a server connection dropout at the monitoring station. Investigation into the use of dual SIM cards is being undertaken with view of minimising further loss of data.

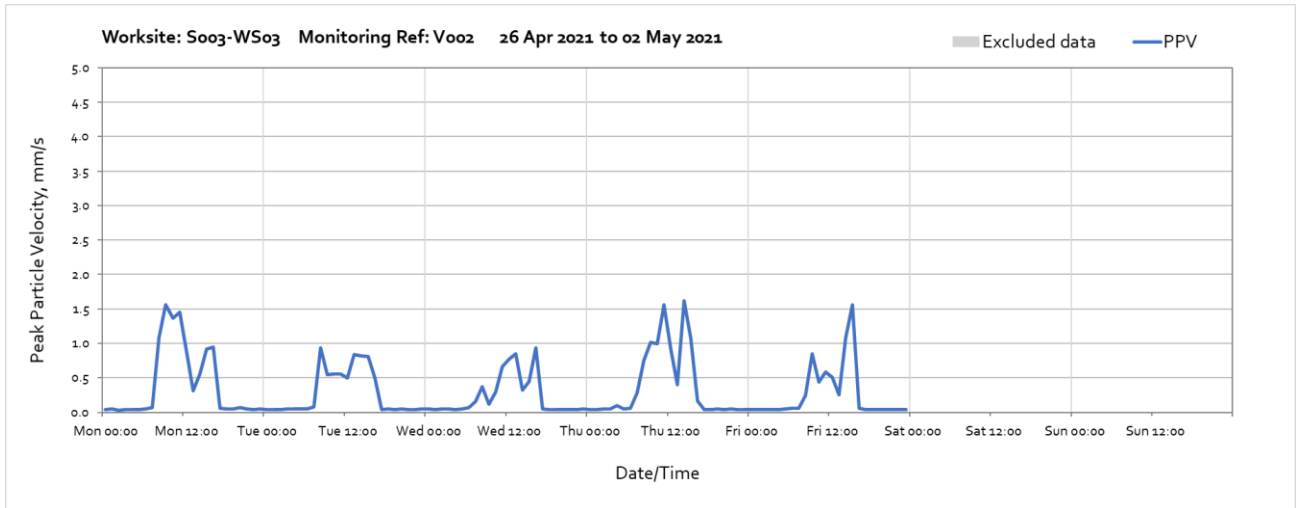


Note: High vibration levels measured throughout the week were due to the use of the nearby residential bin store and local interference of the monitor and are not representative of HS2 vibration levels.

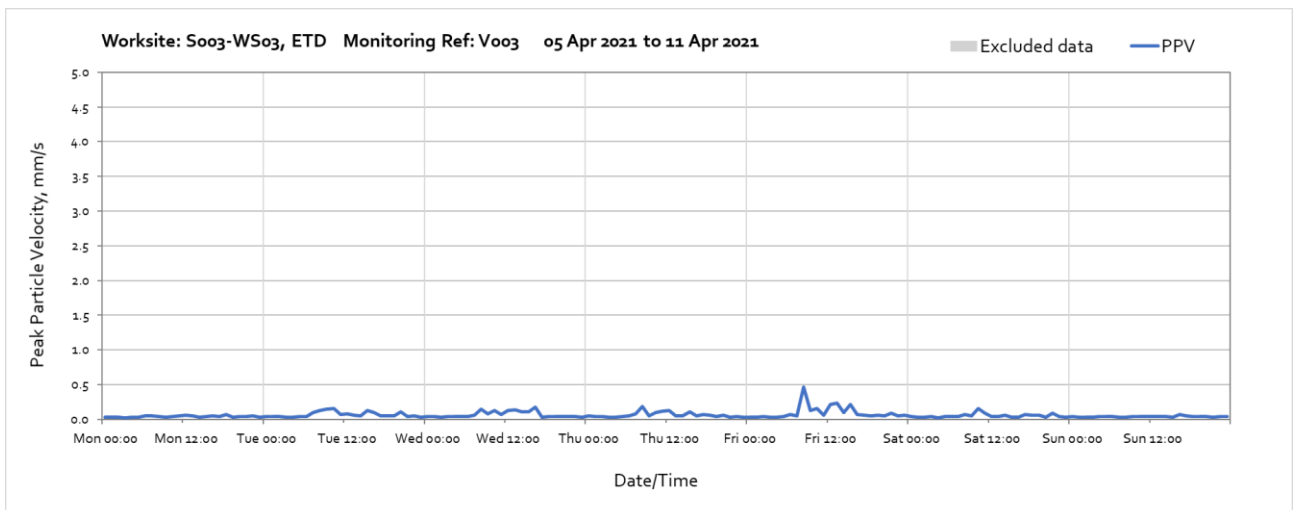
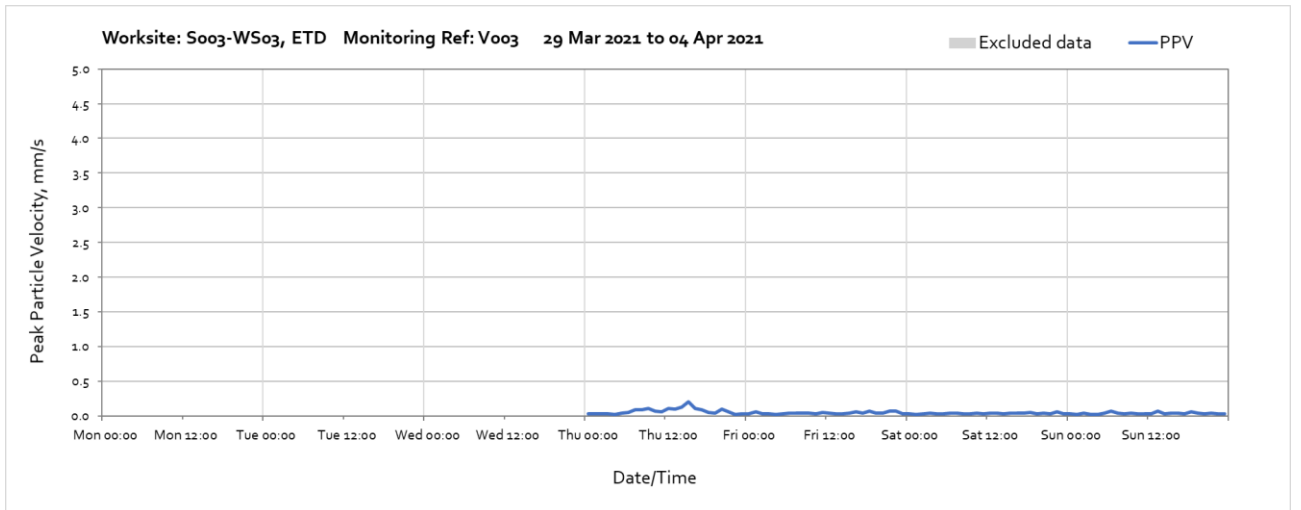
Worksite: S003-WS03 – Monitoring Ref: V002

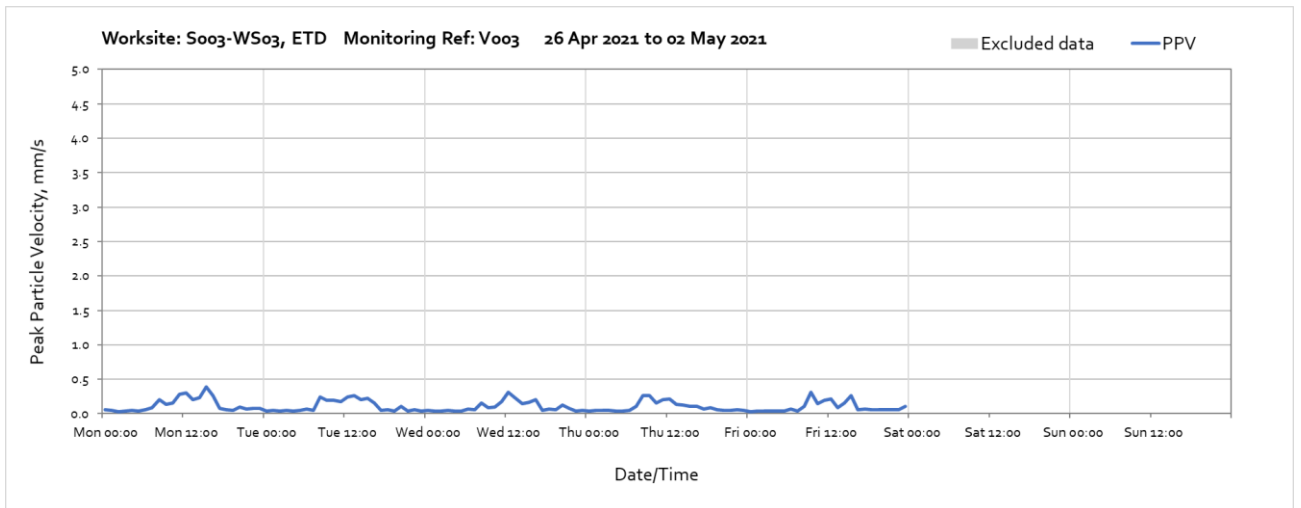
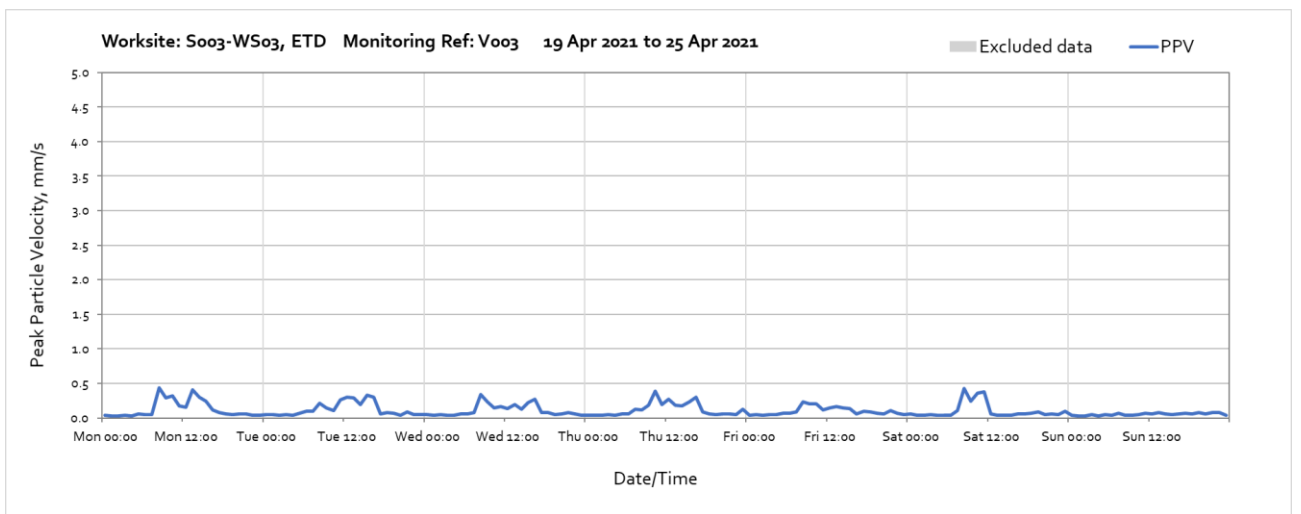
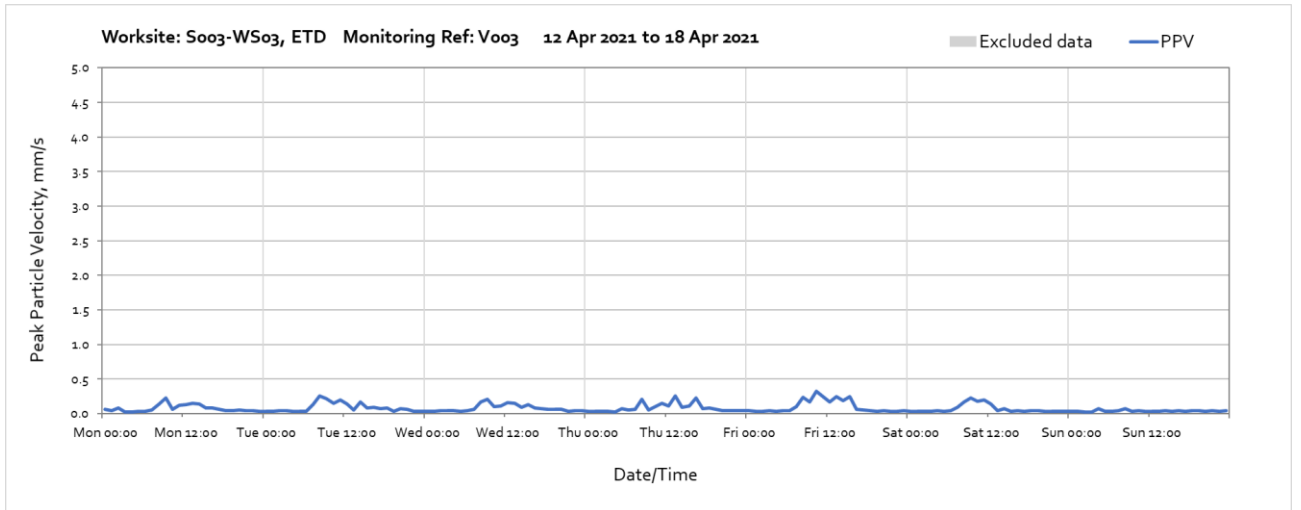




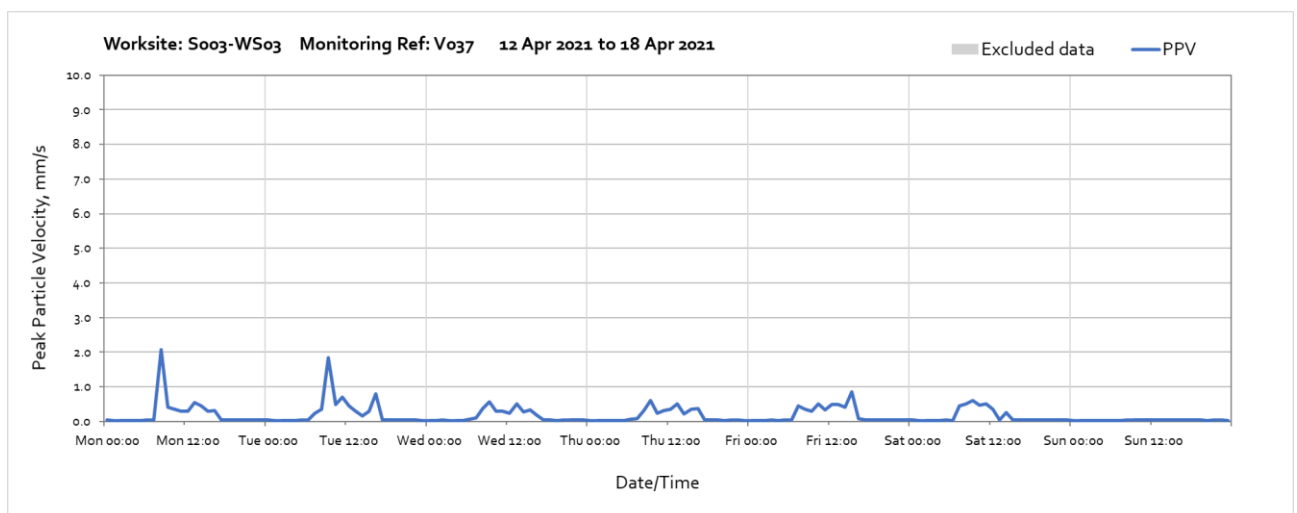
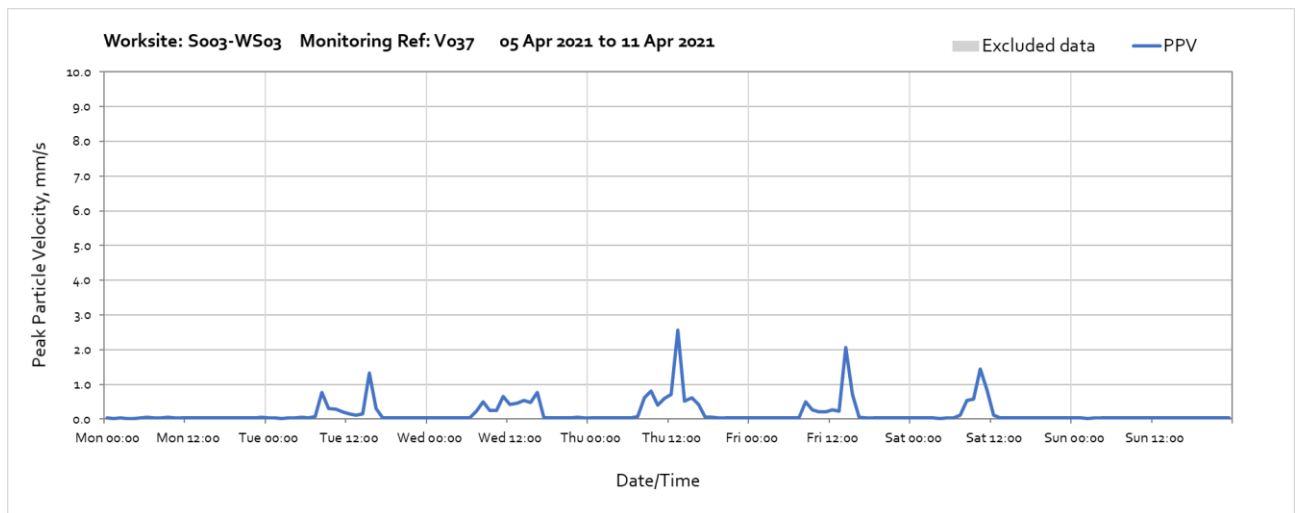
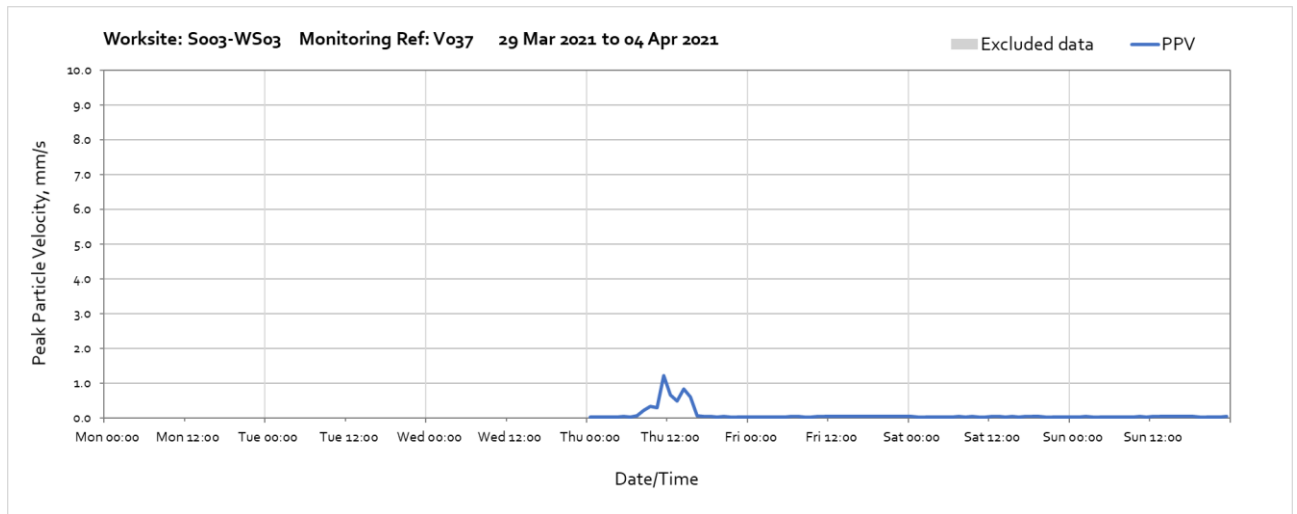


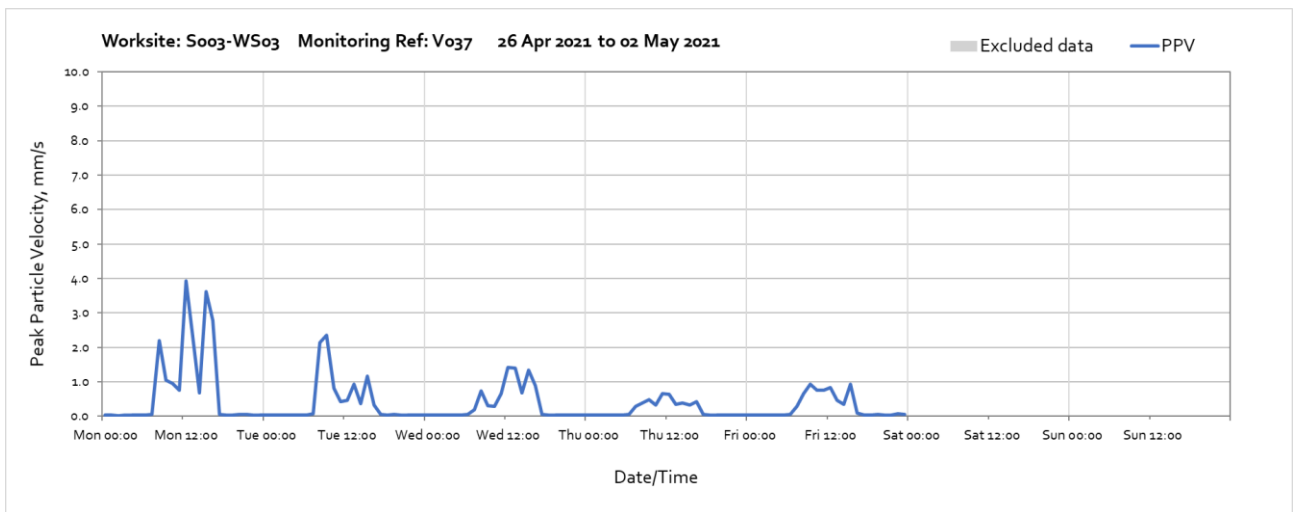
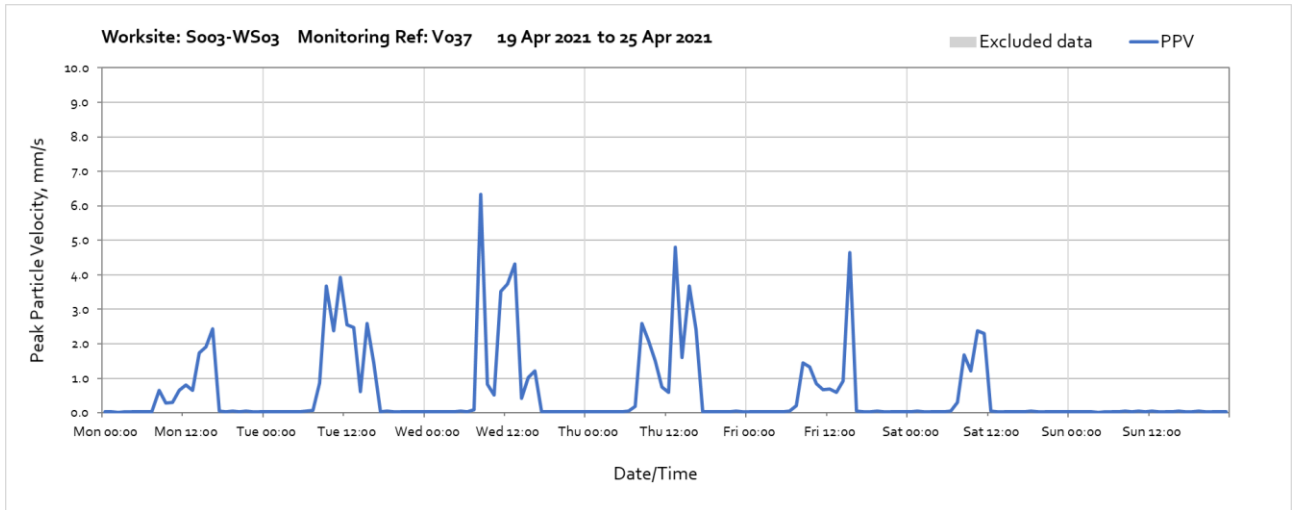
Worksite: S003-WS03, ETD – Monitoring Ref: V003



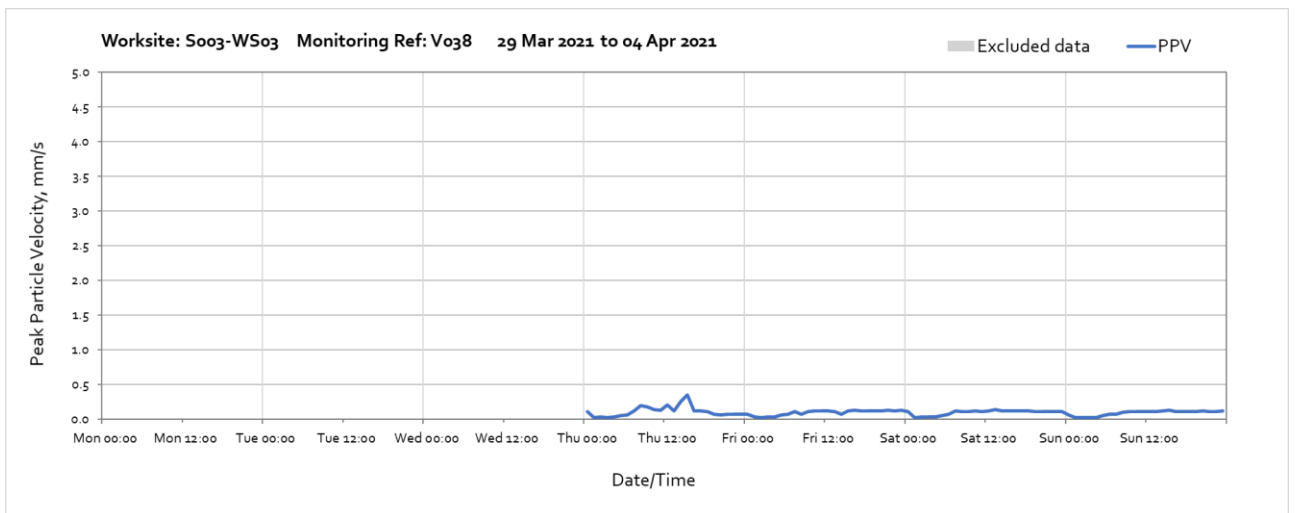


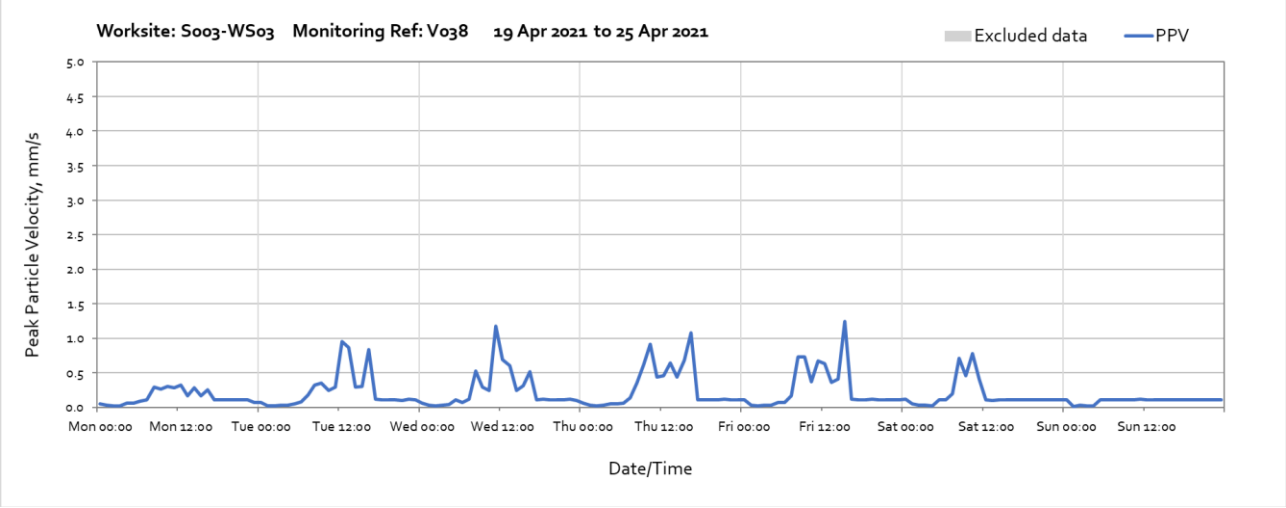
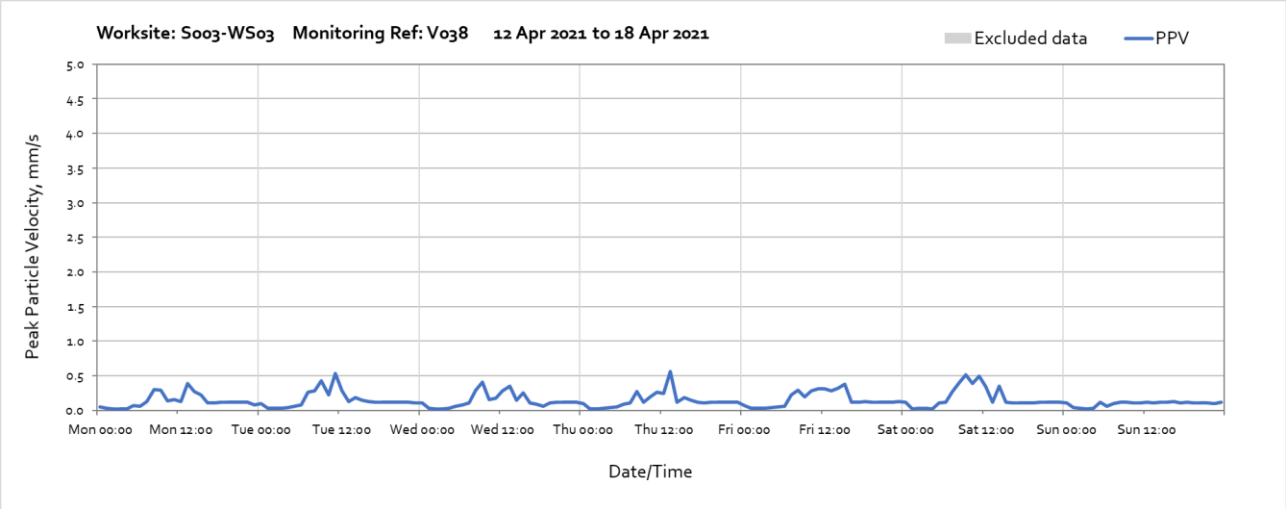
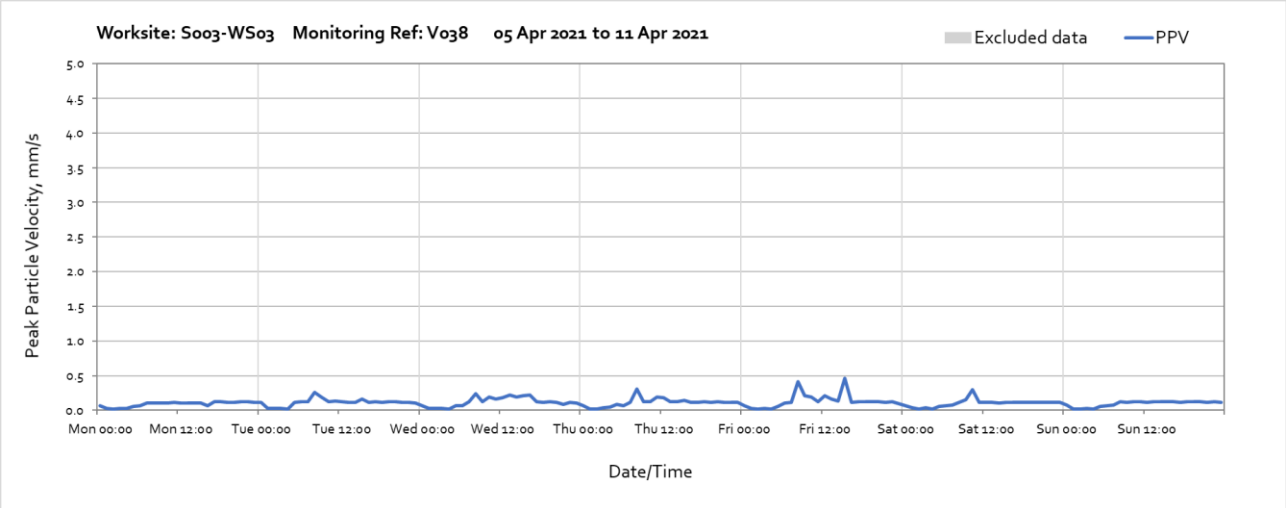
Worksite: S003-WS03 – Monitoring Ref: V037

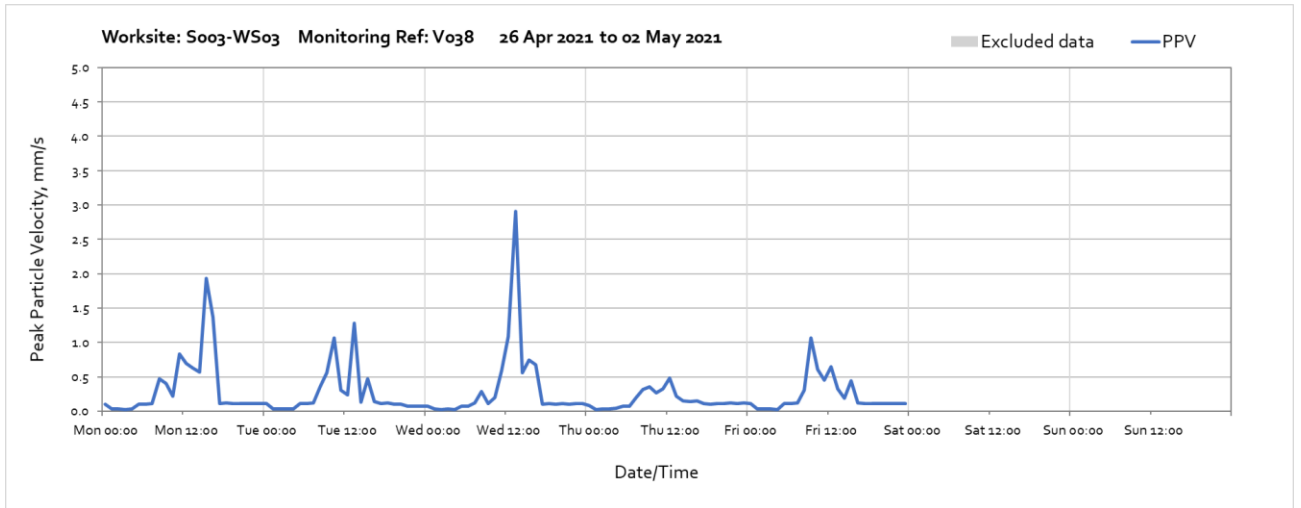




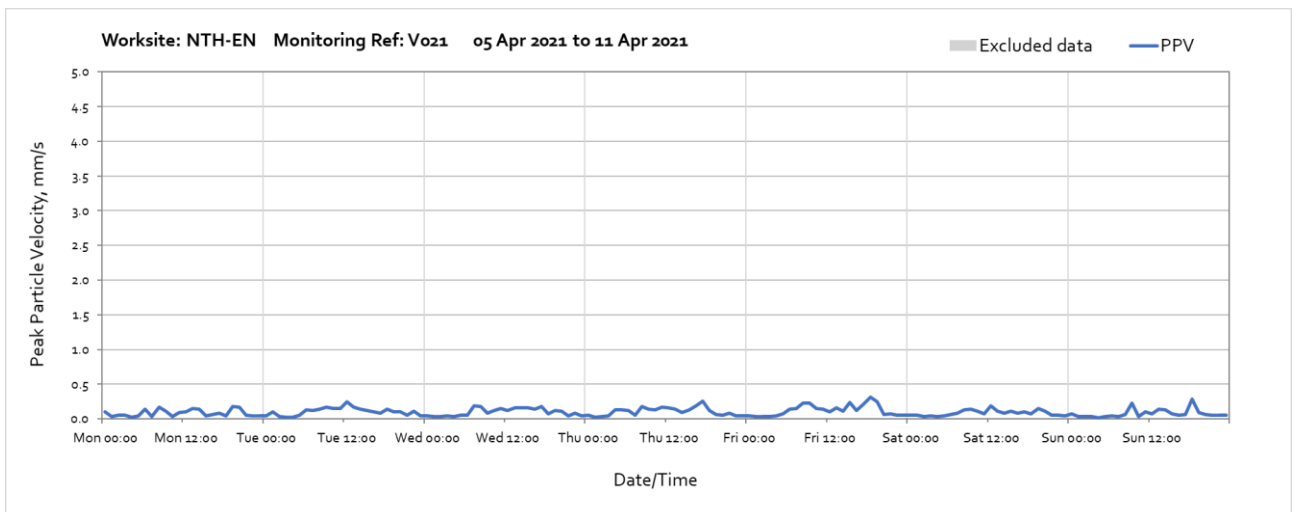
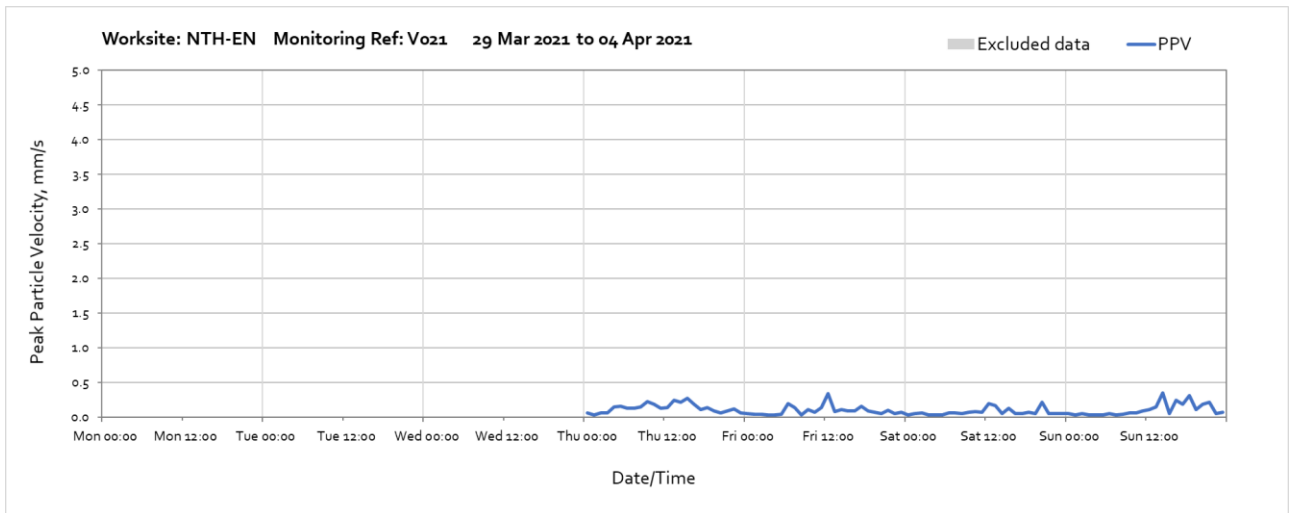
Worksite: S003-WS03 – Monitoring Ref: V038

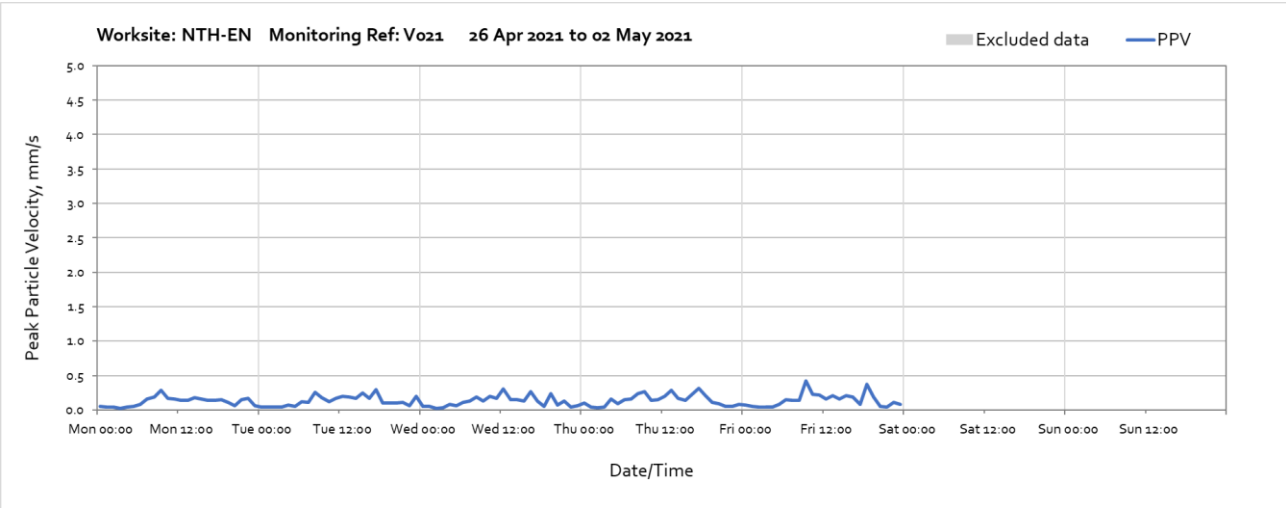
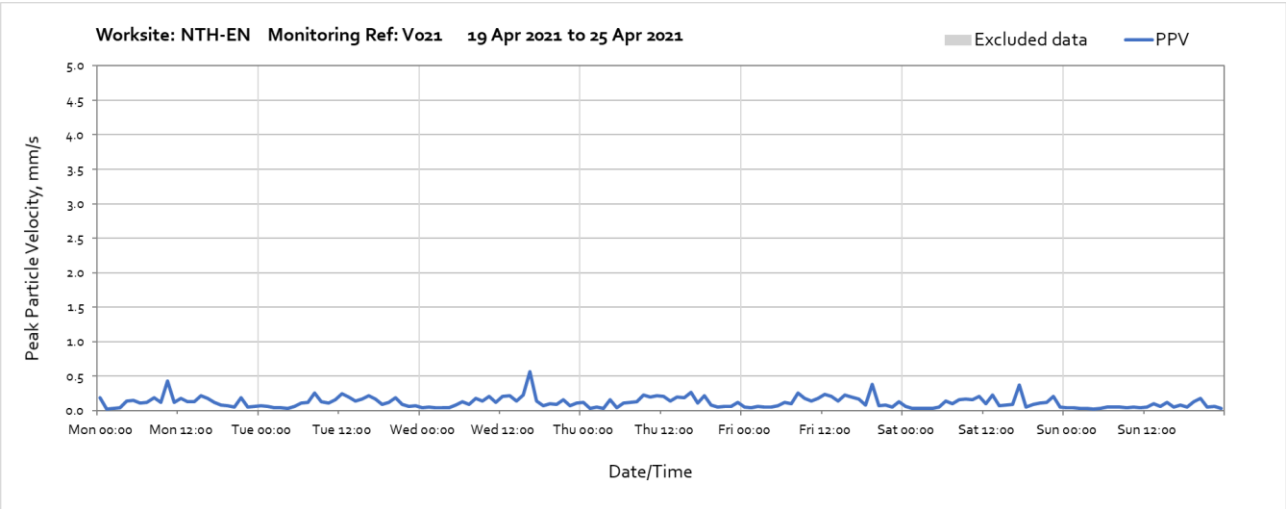
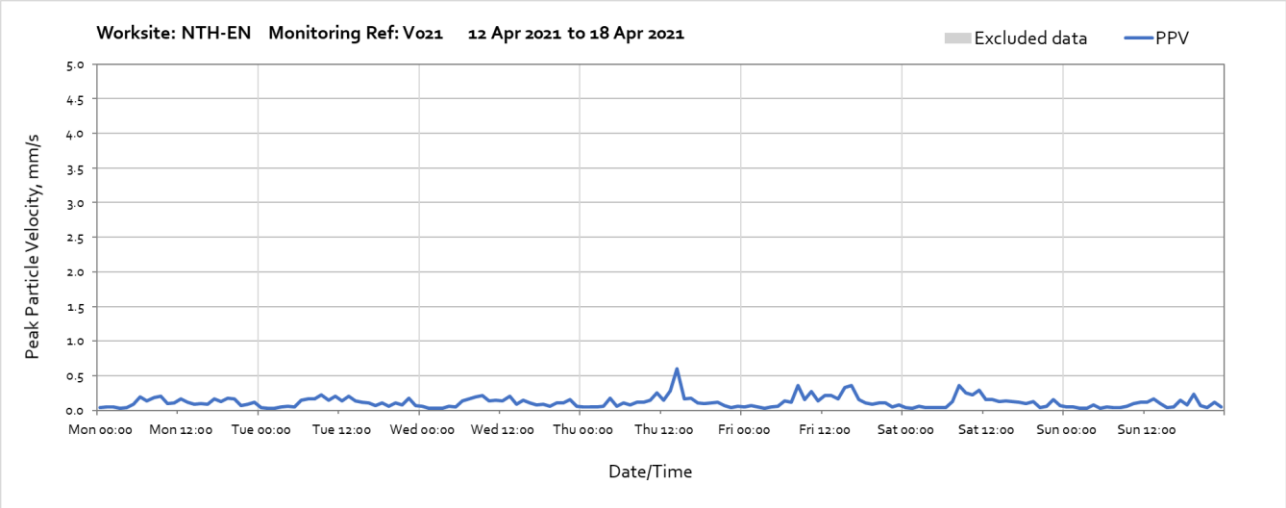




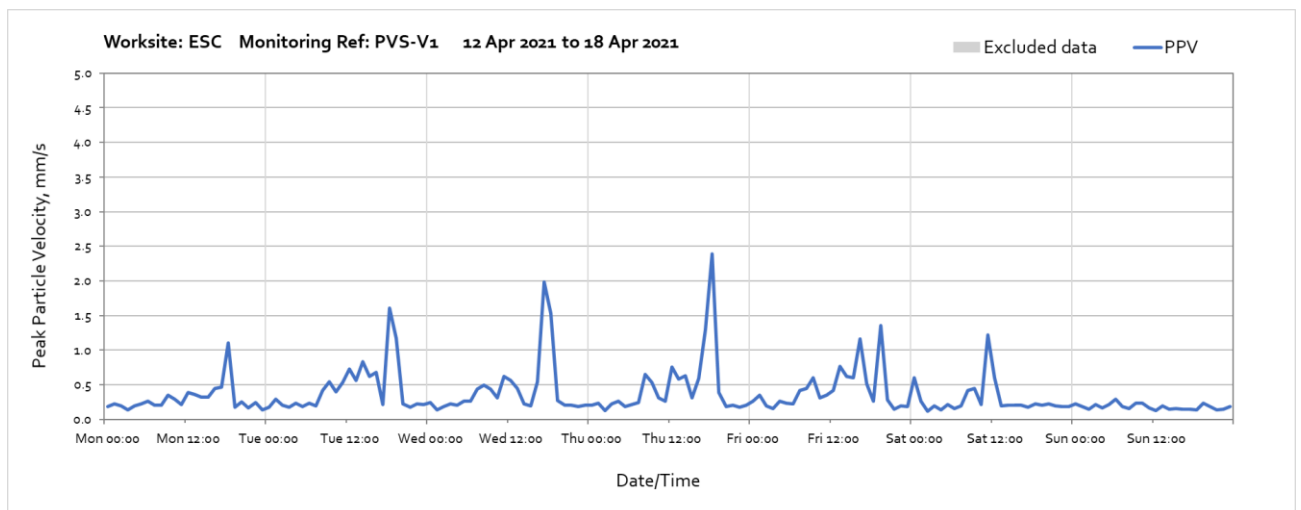
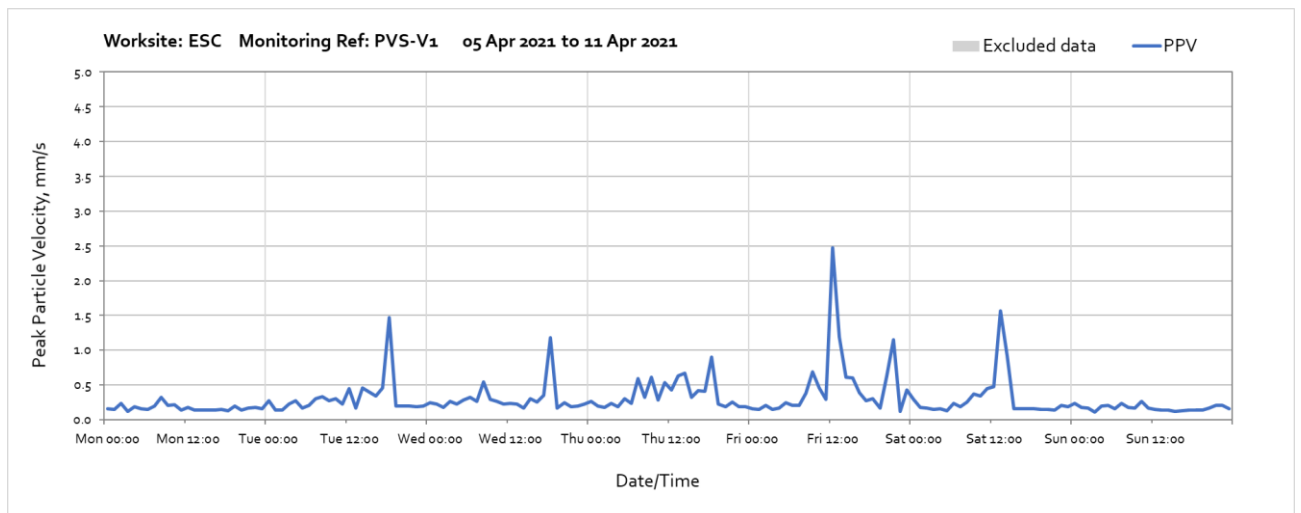
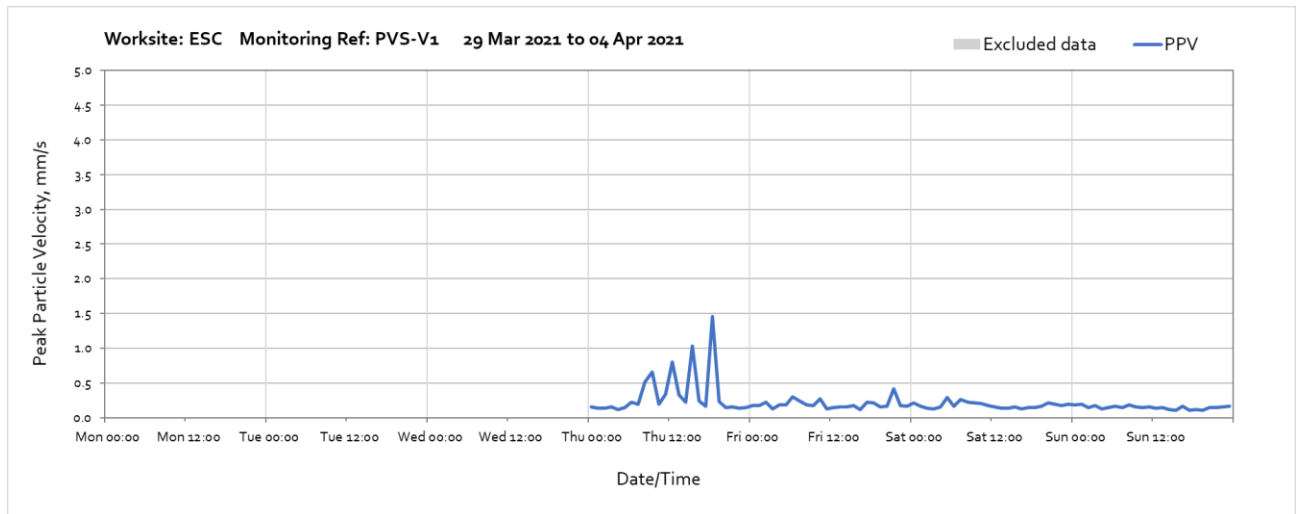


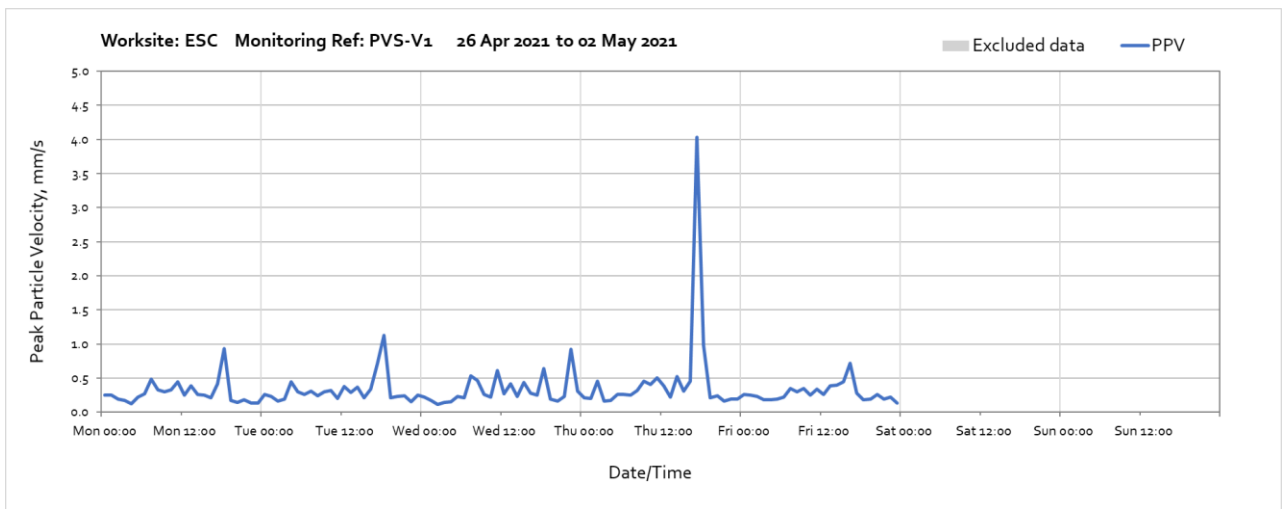
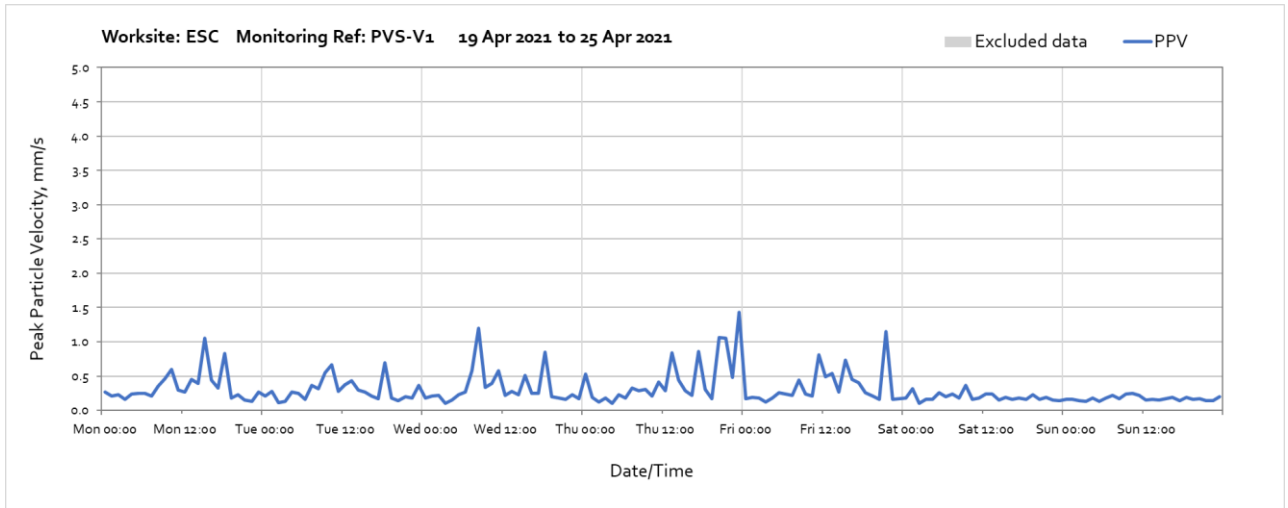
Worksite: NTH-EN – Monitoring Ref: V021





Worksite: ESC – Monitoring Ref: PVS-V1





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

