

# HS2

November 2019

## **Construction noise and vibration Monthly Report – October 2019**

**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 (LBC) during the month of October 2019.

A number of worksites were active during the reporting month in the LBC area. Works at Network Rail worksites G and H included works at platforms, installation of base ballast, overhead line works and removal of signals. Ancillary activities and materials processing was undertaken at the DB Cargo and former Addison Lee worksite (ref. S001-WS01). Scaffolding and demolition were underway at the Regent's Park Estate worksite (ref. S001-WS07). Archaeological excavations and earthworks were underway at St James's Garden worksite (ref. S003-WS01). Removal of fixtures and fittings, scaffolding and demolition was undertaken at the Wolfson House, Walkden House, 67-75 & 77-79 Euston Rd, worksite (ref. S003-WS03). Demolition, propping and backfilling was undertaken at the Thistle Hotel worksite (ref. S003-WS04). Processing of arisings was carried out at the Ibis Hotel, 3 Cardington Street & 1-3 Cobourg Street worksite (ref. S003-WS05). Deliveries were carried out at the former National Temperance Hospital, 110-122 Hampstead Road worksite (ref. S003-WS06). Propping and backfilling were undertaken at 93-103 Drummond Street, 11-15 Melton Street, 54-64 Euston Street, 69 Cobourg Street worksite (ref. S003-WS07). Demolition and scaffolding were undertaken at One Euston Square, 40 Melton Street, Grant Thornton House, 22 Melton Street worksite (ref. S003-WS09). Shaft fitout works were carried out at Park Village East / London Zoo Compound and open cut trenches, pipe installation and backfilling / reinstatement were carried out at Albany Street, Robert Street, Redhill Street and Onsaburgh Street.

Noise monitoring was undertaken in the vicinity of Network Rail worksites B, C, D, E, F and G; in the vicinity of the DB Cargo worksite (ref. S001-WS01), 132 and 140 Hampstead Road and Petrol Station worksite (ref. S001-WS02), Regent's Park Estate worksite (ref. S001-WS07), St James's Gardens worksite (ref. S003-WS01), Wolfson House, Walkden House, 67-75 & 77-79 Euston Rd worksite (ref. S003-WS03), the Ibis Hotel, 3 Cardington Street & 1-3 Cobourg Street worksite (ref. S003-WS05), former National Temperance Hospital, 110-122 Hampstead Road worksite (ref. S003-WS06), Drummond Street / Euston Street worksites (ref. S003-WS07), Ibis Hotel, Euston Square Gardens (west) worksite (ref. S003-WS08) and the Thistle Hotel (ref. S003-WS04). Further noise monitoring was also undertaken in the vicinity of Regents Park Lorry Holding Area.

Vibration monitoring was undertaken in the vicinity of the Regent's Park Estate worksite (ref. S001-WS07), the Walkden House, 67-75 & 77-79 Euston Road worksite (ref. S003-WS03), the Ibis Hotel, 3 Cardington Street & 1-3 Cobourg Street worksite (ref. S003-WS05) and the Ibis Hotel, Euston Square Gardens (west) worksite (ref. S003-WS08). A new vibration monitor (V043) became active in October to record vibration levels at Cubitt Court on Park Village East.

Two exceedances of the SOAEL were measured in the LBC area due to HS2 construction during October 2019, at one location where construction activities were being undertaken in close proximity to the noise monitor. Six complaints were received during the monitoring period. Description of complaints, results of investigations and any actions taken are detailed in this report.

# Abbreviations and descriptions

The abbreviations, descriptions and project terminology used within this report can be found in the Project Dictionary (HS2-HS2-PM-GDE-000-000002).

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.                                                                                                                                                                                                                                                                                                                                                                                           |
| Equivalent continuous sound pressure level, or $L_{pAeq,T}$ | 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.                                                                                                                                                             |
| 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.                                                                                                                                                                                                                                                                                                                           |
| 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 <sup>1.75</sup> .         |

# 1 Introduction

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

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

Monitoring data and interpretive reports are to be provided to each relevant local authority on a monthly basis and shall include a summary of the construction activities occurring, the data recorded over the monitoring period, any complaints received, any periods in exceedance of agreed trigger levels, the results of any investigations and any actions taken or mitigation measures implemented. This report provides noise data, and interpretation thereof, for monitoring carried out by HS2 within the London Borough of Camden (LBC) for the period 1<sup>st</sup> to 31<sup>st</sup> October 2019.

1.1.2 Active construction sites in the local authority area during this period include:

- Network Rail on-networks HS2 preparatory works: worksites ref. G and H (see plans 1 to 3 in Appendix A)
  - Works included works at platforms (including unload top ballast from auto ballasters, positioning of buffer, installation of plain line panels and insulated block joint panels (IBJ), removal of existing IBJ, installation of closure, inline cabling works and installation of cable management system), installation of base ballast, overhead line works and removal of signals).
- DB Cargo shed and adjacent land on Granby Terrace, worksite ref. S001-WS01 (see plan 2 in Appendix A)
  - Works included materials processing and ancillary activities.
- Regent's Park Estate, worksite ref. S001-WS07 (see plan 2 and 3 in Appendix A)
  - Works activities included scaffolding and demolition.
- St James's Gardens, worksite ref. S003-WS01 (see plan 2 in Appendix A)
  - Works activities included archaeological excavations and backfilling.
- Wolfson House, Walkden House, 67-75 & 77-79 Euston Rd, worksite ref. S003-WS03 (see plan 3 in Appendix A)

- Works activities included removal of fixtures and fittings, scaffolding and demolition.
- Thistle Hotel, Cardington Street, worksite ref. S003-WS04 (see plan 3 in Appendix A)
  - Works activities include demolition, propping and backfilling.
- Ibis Hotel, 3 Cardington Street, worksite ref. S003-WS05 (see plan 3 in Appendix A)
  - Work activities included processing of arisings.
- Former National Temperance Hospital, 110 Hampstead Road, worksite ref. S003-WS06 (see plan 3 in Appendix A)
  - Site activities included deliveries.
- 93-103 Drummond Street, 11-15 Melton Street, 54-64 Euston Street, 69 Cobourg Street, worksite ref. S003-WS07 (see plan 3 in Appendix A)
  - Works activities included propping and backfilling.
- One Euston Square, 40 Melton Street, Grant Thornton House, 22 Melton Street, worksite ref. S003-WS09 (see plan 3 in Appendix A)
  - Works activities included demolition and scaffolding.

Further works were also undertaken as part of the Granby Terrace Bridge utilities diversion (GTB Utilities) on Stanhope Street. Shaft fitout works were carried out at Park Village East / London Zoo Compound and open cut trenches, pipe installation and backfilling / reinstatement were carried out at Albany Street, Robert Street, Redhill Street and Onsaburgh Street.

- 1.1.3 Please refer to Appendix A for plan identifying active worksites within the London Borough of Camden.
- 1.1.4 The applicable standards, guidance, and monitoring methodology is outlined in the construction noise and vibration monitoring methodology report which can be found at the following location <https://www.gov.uk/government/collections/monitoring-the-environmental-effects-of-hs2>. Noise and vibration monitoring reports for previous months can also be found at this location. Noise and vibration reports prior to 2018 can be found at the following location [www.gov.uk/government/publications/monitoring-noise-and-vibration-on-the-hs2-phase-one-route](http://www.gov.uk/government/publications/monitoring-noise-and-vibration-on-the-hs2-phase-one-route).

## **1.2 Measurement locations**

- 1.2.1 Table 2 summarises the position of noise and vibration monitoring installations within the LBC area in October 2019.
- 1.2.2 A new vibration monitor (V043) became active in October to record vibration levels at Cubitt Court on Park Village East.

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

Table 2: Monitoring locations.

| <b>Worksite Reference</b> | <b>Measurement Reference</b> | <b>Address</b>                                                                                      |
|---------------------------|------------------------------|-----------------------------------------------------------------------------------------------------|
| B                         | CC                           | Whittlebury Mews West                                                                               |
|                           | JC                           | Juniper Crescent                                                                                    |
| C                         | MT2                          | Lamppost opposite to 49 Mornington Terrace                                                          |
|                           | N022                         | External to 34 Mornington Terrace                                                                   |
|                           | N024                         | External to Park Village Studios, Park Village East                                                 |
| D                         | N004                         | Mornington Terrace, lamppost #7 (junction of Mornington Terrace, Mornington Place and Clarkson Row) |
| E                         | N005                         | 5A Granby Terrace                                                                                   |
| F                         | BS                           | Roof of Stockbeck House, Barnby Street                                                              |
|                           | N023                         | Lamppost #21 on Hampstead Road                                                                      |
| G                         | HH                           | Euston Station Parcel Deck, Barnby Street                                                           |
| S001-WS01                 | 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)                                           |
| S001-WS02                 | N018                         | Outside replacement housing, Hampstead Road                                                         |
|                           | N019                         | Outside Cartmel, Hampstead Road                                                                     |
| S001-WS07                 | 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                                                                     |
| S003-WS01                 | N016                         | Margaret Centre roof                                                                                |
| S003-WS03                 | N006                         | Royal College of General Practitioners roof level                                                   |
|                           | N008                         | Stephenson's Way lamppost (external to RCGP)                                                        |
|                           | N010                         | Wesley Hotel                                                                                        |
|                           | N011                         | Euston Street, lamppost #4 (external to 82 Euston Street)                                           |
|                           | V002                         | Royal College of General Practitioners basement boiler room by Stephenson Way                       |
|                           | V037                         | Magic Circle, basement                                                                              |
|                           | V038                         | Wesley Hotel, basement lightwell, Euston Street                                                     |

| Worksite Reference | Measurement Reference | Address                                                                |
|--------------------|-----------------------|------------------------------------------------------------------------|
| S003-WS05          | N014                  | Starcross Street lamppost (external to Exmouth Arms)                   |
|                    | V021                  | 42-44 Cobourg Street                                                   |
| S003-WS06          | N017                  | Hampstead Road, lamppost #48                                           |
| S003-WS07          | N012                  | Drummond Street, lamppost #14 (opposite to 92-94 Drummond Street)      |
| S003-WS08          | N007                  | Royal College of General Practitioners, Melton Street                  |
|                    | V003                  | Royal College of General Practitioners basement vaults under Melton St |
| Not near worksite  | N025                  | External to 3 Prince Albert Road                                       |
| Not near worksite  | N026                  | Thames Water Compound                                                  |

## 2 Summary of results

### 2.1 Exceedances of SOAEL

- 2.1.1 The significant observed adverse effect levels (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."
- 2.1.2 Where construction noise levels exceed the SOAEL, relevant periods will be identified and summary statistics provided in order to evaluate ongoing qualification for noise insulation and temporary rehousing.
- 2.1.3 Table 3 presents a summary of recorded exceedances of the SOAEL due to HS2 related construction noise at each measurement location over the reporting period, including the number of exceedances during each time period.

Table 3: Summary of exceedances of SOAEL.

| Worksite Reference | Measurement Reference | Monitor Address                            | Day (Weekday, Saturday, Sunday, Night) | Time period | Number of exceedances of SOAEL |
|--------------------|-----------------------|--------------------------------------------|----------------------------------------|-------------|--------------------------------|
| B                  | CC                    | Whittlebury Mews West                      | All days                               | All periods | No exceedance                  |
|                    | JC                    | Juniper Crescent                           | All days                               | All periods | No exceedance                  |
| C                  | MT2                   | Lamppost opposite to 49 Mornington Terrace | All days                               | All periods | No exceedance                  |

| Worksite Reference | Measurement Reference | Monitor Address                                      | Day (Weekday, Saturday, Sunday, Night) | Time period | Number of exceedances of SOAEL |
|--------------------|-----------------------|------------------------------------------------------|----------------------------------------|-------------|--------------------------------|
|                    | N022                  | External to 34 Mornington Terrace                    | All days                               | All periods | No exceedance                  |
|                    | N024                  | External to Park Village Studios, Park Village East  | All days                               | All periods | No exceedance                  |
| D                  | N004                  | Mornington Terrace, lamppost #7                      | All days                               | All periods | No exceedance                  |
| E                  | N005                  | 5A Granby Terrace                                    | All days                               | All periods | No exceedance                  |
| F                  | BS                    | Barnby Street                                        | All days                               | All periods | No exceedance                  |
|                    | N023                  | Ampthill Estate, lamppost #21, Hampstead Road        | All days                               | All periods | No exceedance                  |
| G                  | HH                    | Euston Station Parcel Deck, Barnby Street            | All days                               | All periods | No exceedance                  |
| S001-WS01          | N001                  | DB Cargo shed and adjacent land on Granby Terrace    | All days                               | All periods | No exceedance                  |
|                    | N002                  | DB Cargo shed and adjacent land on Granby Terrace    | All days                               | All periods | No exceedance                  |
|                    | N003                  | DB Cargo shed and adjacent land on Granby Terrace    | All days                               | All periods | No exceedance                  |
| S001-WS02          | N018                  | 132 and 140 Hampstead Road and Petrol Station        | All days                               | All periods | No exceedance                  |
|                    | N019                  | 132 and 140 Hampstead Road and Petrol Station        | All days                               | All periods | No exceedance                  |
| S001-WS07          | N020                  | Mackworth Street, lamppost #1                        | All days                               | All periods | No exceedance                  |
|                    | N021                  | Stanhope Street, lamppost #2                         | All days                               | All periods | No exceedance                  |
|                    | N044                  | Regents Park Estate west, near Langdale              | All days                               | All periods | No exceedance                  |
|                    | N045                  | Regents Park Estate south, external to Coniston      | All days                               | All periods | No exceedance                  |
| S003-WS01          | N016                  | Margarete Centre roof                                | All days                               | All periods | No exceedance                  |
| S003-WS03          | N006                  | Royal College of General Practitioners Roof level    | All days                               | All periods | No exceedance                  |
|                    | N008                  | Walkden House, 67-75 & 77-79 Euston Rd               | All days                               | All periods | No exceedance                  |
|                    | N010                  | Wesley Hotel                                         | All days                               | All periods | No exceedance                  |
|                    | N011                  | Walkden House, 67-75 & 77-79 Euston Rd               | Weekday                                | 0800-1800   | 2                              |
| S003-WS05          | N014                  | Ibis Hotel, 3 Cardington Street & 1-3 Cobourg Street | All days                               | All periods | No exceedance                  |
| S003-WS06          | N017                  | Hampstead Road, lamppost #48                         | All days                               | All periods | No exceedance                  |

| Worksite Reference | Measurement Reference | Monitor Address                                                                     | Day (Weekday, Saturday, Sunday, Night) | Time period | Number of exceedances of SOAEL |
|--------------------|-----------------------|-------------------------------------------------------------------------------------|----------------------------------------|-------------|--------------------------------|
| S003-WS07          | N012                  | 93-103 Drummond Street, 11-15 Melton Street, 54-64 Euston Street, 69 Cobourg Street | All days                               | All periods | No exceedance                  |
| S003-WS08          | N007                  | Euston Square Gardens (west)                                                        | All days                               | All periods | No exceedance                  |
| Not near worksite  | N025                  | External to 3 Prince Albert Road                                                    | All days                               | All periods | No exceedance                  |
| Not near worksite  | N026                  | Thames Water Compound                                                               | All days                               | All periods | No exceedance                  |

- 2.1.4 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 4 and may be lower than the total sum of individual exceedances reported in Table 3 for each location.

Table 4: Summary of total exceedances of SOAEL.

| Worksite Reference | Measurement Reference | Monitor Address                        | Total of SOAEL exceedances in the month |
|--------------------|-----------------------|----------------------------------------|-----------------------------------------|
| S003-WS03          | N011                  | Walkden House, 67-75 & 77-79 Euston Rd | 2                                       |

- 2.1.5 Construction and demolition works taking place at worksites S001-WS07, S003-WS03, S003-WS04, S003-WS07 and S003-WS09 were ongoing for the majority of the period and are likely to have given rise to noise which would have been audible beyond the site boundary and, at times, in excess of the LOAEL at sensitive receptors.
- 2.1.6 Activities taking place at other worksites were either intermittent or not considered to give rise to substantial levels of HS2 related construction noise during this period, with the measured noise levels largely dominated by the underlying ambient noise, acknowledging that intermittent HS2 works may on occasion be taking place within the area.
- 2.1.7 Monitoring of vibration peak particle velocity (PPV) was undertaken with the purpose of ensuring that construction generated vibration are not of such a magnitude to damage adjacent buildings, in accordance with Annex 1: Code of Construction Practice of the High Speed Rail (London-West Midlands) Environmental Minimum Requirements. No exceedances of the Code of Construction Practice criteria due to vibration caused by HS2

vibration were measured. There are no LOAEL and SOAEL criteria based on PPV applicable to HS2 construction vibration.

## **2.2 Summary of measured noise and vibration levels**

- 2.2.1 Table 5 presents a summary of the measured noise levels at each monitoring location over the reporting period. The  $L_{Aeq,T}$  is presented for each of the relevant time periods averaged over the calendar month, along with the highest single period  $L_{Aeq,T}$  that was found to occur within the month.
- 2.2.2 Noise monitoring in the vicinity of worksites G, H, S001-WS07, S003-WS03, S003-WS04, S003-WS07 and S003-WS09 is considered representative of HS2 works in LBC during periods of construction works. Other worksites were not considered to be giving rise to substantial levels of HS2 related construction noise, with the measured noise levels largely dominated by the underlying ambient noise, acknowledging that intermittent HS2 works may on occasion be taking place within the area.

Table 5: Summary of measured dB L<sub>Aeq</sub> data over the monitoring period.

| Worksite Reference | Measurement Reference | Monitor Address                                     | Free-field or Façade measurement | Weekday Average L <sub>Aeq,T</sub><br>(highest day L <sub>Aeq,T</sub> ) |                |                |                | Saturday Average L <sub>Aeq,T</sub><br>(highest day L <sub>Aeq,T</sub> ) |                |                |                | Sunday / Public Holiday Average L <sub>Aeq,T</sub><br>(highest day L <sub>Aeq,T</sub> ) |                |                |                |
|--------------------|-----------------------|-----------------------------------------------------|----------------------------------|-------------------------------------------------------------------------|----------------|----------------|----------------|--------------------------------------------------------------------------|----------------|----------------|----------------|-----------------------------------------------------------------------------------------|----------------|----------------|----------------|
|                    |                       |                                                     |                                  | 0700 - 0800                                                             | 0800 - 1800    | 1800 - 1900    | 1900 - 2200    | 2200 - 0700                                                              | 0700 - 0800    | 0800 - 1300    | 1300 - 1400    | 1400 - 2200                                                                             | 2200 - 0700    | 0700 - 2200    | 2200 - 0700    |
| B                  | CC                    | Whittlebury Mews West                               | Free-field                       | 60.9<br>(63.3)                                                          | 59.4<br>(61.3) | 63.1<br>(65.8) | 62.0<br>(66.2) | 56.1<br>(63.2)                                                           | 59.0<br>(62.5) | 63.1<br>(65.8) | 62.5<br>(63.3) | 61.4<br>(64.3)                                                                          | 54.4<br>(61.0) | 61.5<br>(68.0) | 56.2<br>(61.3) |
|                    | JC                    | Juniper Crescent                                    | Free-field                       | 59.2<br>(66.8)                                                          | 60.3<br>(63.1) | 60.0<br>(62.9) | 59.6<br>(62.3) | 56.0<br>(62.6)                                                           | 59.7<br>(60.5) | 60.0<br>(62.2) | 59.8<br>(60.3) | 58.5<br>(61.8)                                                                          | 54.8<br>(58.8) | 58.3<br>(62.0) | 54.8<br>(58.3) |
| C                  | MT2                   | Lamppost opposite to 49 Mornington Terrace          | Free field                       | 62.5<br>(65.3)                                                          | 62.7<br>(64.2) | 63.6<br>(66.5) | 62.4<br>(64.9) | 58.2<br>(64.0)                                                           | 61.8<br>(64.0) | 62.5<br>(64.0) | 61.6<br>(62.9) | 61.7<br>(65.7)                                                                          | 57.6<br>(61.6) | 61.4<br>(64.8) | 57.8<br>(62.5) |
|                    | N022                  | 52A Mornington Terrace                              | Free-field                       | 59.9<br>(61.1)                                                          | 61.0<br>(62.7) | 61.1<br>(62.9) | 59.8<br>(62.0) | 55.6<br>(62.3)                                                           | 59.1<br>(60.1) | 60.0<br>(61.4) | 60.2<br>(61.2) | 59.3<br>(60.6)                                                                          | 55.8<br>(59.4) | 59.8<br>(66.9) | 55.3<br>(59.5) |
|                    | N024                  | External to Park Village Studios, Park Village East | Free-field                       | 56.6<br>(67.5)                                                          | 59.8<br>(66.6) | 59.0<br>(66.3) | 56.9<br>(71.2) | 51.3<br>(60.6)                                                           | 52.5<br>(54.1) | 56.1<br>(58.0) | 54.2<br>(54.7) | 54.9<br>(60.0)                                                                          | 51.3<br>(54.2) | 55.2<br>(61.1) | 51.0<br>(54.1) |
| D                  | N004                  | Mornington Terrace, lamppost #7                     | Free-field                       | 62.9<br>(64.2)                                                          | 63.8<br>(66.8) | 63.1<br>(65.4) | 62.5<br>(66.0) | 58.6<br>(66.1)                                                           | 62.1<br>(63.1) | 62.3<br>(63.1) | 62.9<br>(63.4) | 66.1<br>(76.3)                                                                          | 57.0<br>(63.5) | 63.6<br>(71.6) | 58.7<br>(63.1) |
| E                  | N005                  | 5A Granby Terrace                                   | Free-field                       | 65.7<br>(67.0)                                                          | 67.1<br>(68.3) | 66.0<br>(67.6) | 65.2<br>(66.4) | 63.3<br>(67.5)                                                           | 64.4<br>(64.9) | 65.7<br>(66.7) | 65.9<br>(66.0) | 65.2<br>(66.2)                                                                          | 63.8<br>(65.0) | 64.9<br>(67.2) | 63.0<br>(67.4) |
| F                  | BS                    | Roof of Stockbeck House, Barnby Street              | Free-field                       | 61.0<br>(63.3)                                                          | 62.9<br>(64.5) | 62.1<br>(64.1) | 61.0<br>(63.5) | 58.1<br>(71.0)                                                           | 61.5<br>(62.0) | 62.1<br>(63.3) | 61.5<br>(61.9) | 60.9<br>(63.8)                                                                          | 60.1<br>(71.5) | 61.5<br>(64.7) | 57.2<br>(60.4) |
|                    | N023                  | Ampthill Estate, Hampstead Road                     | Free-field                       | 72.3<br>(74.8)                                                          | 71.3<br>(73.0) | 70.8<br>(72.4) | 70.4<br>(73.7) | 68.7<br>(73.3)                                                           | 69.6<br>(71.1) | 70.8<br>(71.8) | 71.1<br>(72.3) | 70.8<br>(73.2)                                                                          | 70.1<br>(73.2) | 70.3<br>(73.2) | 67.7<br>(71.4) |

| Worksite Reference | Measurement Reference | Monitor Address                                 | Free-field or Façade measurement | Weekday Average L <sub>Aeq,T</sub><br>(highest day L <sub>Aeq,T</sub> ) |                |                |                | Saturday Average L <sub>Aeq,T</sub><br>(highest day L <sub>Aeq,T</sub> ) |                |                |                | Sunday / Public Holiday Average L <sub>Aeq,T</sub><br>(highest day L <sub>Aeq,T</sub> ) |                |                |                |
|--------------------|-----------------------|-------------------------------------------------|----------------------------------|-------------------------------------------------------------------------|----------------|----------------|----------------|--------------------------------------------------------------------------|----------------|----------------|----------------|-----------------------------------------------------------------------------------------|----------------|----------------|----------------|
|                    |                       |                                                 |                                  | 0700 - 0800                                                             | 0800 - 1800    | 1800 - 1900    | 1900 - 2200    | 2200 - 0700                                                              | 0700 - 0800    | 0800 - 1300    | 1300 - 1400    | 1400 - 2200                                                                             | 2200 - 0700    | 0700 - 2200    | 2200 - 0700    |
| G                  | HH                    | Euston Station Parcel Deck, Barnby Street       | Free-field                       | 62.3<br>(65.2)                                                          | 67.0<br>(70.9) | 65.8<br>(76.3) | 62.7<br>(69.5) | 59.7<br>(72.3)                                                           | 60.9<br>(65.1) | 64.4<br>(65.1) | 62.6<br>(63.0) | 64.1<br>(70.4)                                                                          | 59.8<br>(64.9) | 61.8<br>(66.7) | 59.4<br>(66.2) |
| S001-WS01          | N001                  | External to Cubitt Court, 100 Park Village East | Façade                           | 57.4<br>(60.1)                                                          | 66.9<br>(70.0) | 58.1<br>(61.8) | 57.0<br>(66.7) | 52.3<br>(61.7)                                                           | 55.0<br>(56.4) | 58.7<br>(62.5) | 56.1<br>(56.1) | 56.2<br>(58.2)                                                                          | 52.1<br>(54.8) | 56.8<br>(61.3) | 52.0<br>(55.0) |
|                    | N002                  | Richmond Court, Park Village East               | Free-field                       | 58.4<br>(60.3)                                                          | 61.1<br>(62.3) | 60.7<br>(62.3) | 59.0<br>(67.7) | 53.7<br>(61.2)                                                           | 55.2<br>(56.8) | 58.1<br>(59.0) | 58.4<br>(58.8) | 59.6<br>(61.8)                                                                          | 54.8<br>(60.3) | 58.9<br>(66.1) | 53.9<br>(57.4) |
|                    | N003                  | Silsoe House, Park Village East                 | Free-field                       | 58.6<br>(61.6)                                                          | 61.4<br>(65.7) | 61.1<br>(65.4) | 59.2<br>(62.2) | 53.9<br>(68.0)                                                           | 55.3<br>(56.2) | 58.2<br>(58.5) | 58.2<br>(58.9) | 60.7<br>(67.1)                                                                          | 55.2<br>(59.7) | 58.4<br>(64.6) | 53.7<br>(56.8) |
| S001-WS02          | N018                  | Outside replacement housing, Hampstead Road     | Free-field                       | 72.4<br>(76.8)                                                          | 73.4<br>(74.4) | 73.0<br>(75.0) | 73.3<br>(75.9) | 71.6<br>(77.8)                                                           | 71.6<br>(72.6) | 72.5<br>(72.8) | 73.5<br>(73.9) | 73.5<br>(75.2)                                                                          | 73.5<br>(76.8) | 72.5<br>(75.6) | 70.5<br>(74.5) |
|                    | N019                  | Outside Cartmel, Hampstead Road                 | Free-field                       | 71.4<br>(74.0)                                                          | 72.4<br>(74.2) | 71.6<br>(73.2) | 71.7<br>(74.4) | 70.4<br>(75.4)                                                           | 70.0<br>(70.5) | 71.1<br>(71.9) | 71.7<br>(72.2) | 72.8<br>(76.3)                                                                          | 71.9<br>(75.0) | 71.5<br>(75.4) | 69.8<br>(74.9) |
| S001-WS07          | N020                  | Mackworth Street                                | Free-field                       | 54.0<br>(60.0)                                                          | 64.4<br>(70.2) | 53.3<br>(59.1) | 55.6<br>(79.0) | 50.4<br>(63.3)                                                           | 52.1<br>(53.1) | 59.6<br>(66.2) | 57.9<br>(62.0) | 53.7<br>(59.9)                                                                          | 50.5<br>(55.0) | 53.1<br>(62.1) | 49.2<br>(53.4) |
|                    | N021                  | Stanhope Street, lamppost #2                    | Free-field                       | 53.1<br>(61.1)                                                          | 63.5<br>(65.6) | 53.1<br>(59.0) | 53.6<br>(78.3) | 48.5<br>(61.4)                                                           | 53.0<br>(57.8) | 58.9<br>(65.1) | 50.5<br>(51.3) | 52.2<br>(55.5)                                                                          | 48.6<br>(52.8) | 53.2<br>(63.6) | 47.2<br>(50.2) |
|                    | N044                  | Regents Park Estate west                        | Free field                       | 51.5<br>(54.5)                                                          | 62.2<br>(65.9) | 51.4<br>(53.8) | 51.4<br>(65.1) | 48.8<br>(56.3)                                                           | 50.8<br>(52.6) | 60.9<br>(67.3) | 50.6<br>(51.8) | 51.1<br>(55.6)                                                                          | 49.4<br>(51.8) | 52.2<br>(62.0) | 48.1<br>(50.6) |
|                    | N045                  | Regents Park Estate south, external to Coniston | Free field                       | 56.4<br>(59.2)                                                          | 66.9<br>(72.3) | 56.3<br>(58.7) | 56.4<br>(61.5) | 54.2<br>(59.7)                                                           | 58.0<br>(64.5) | 64.4<br>(69.9) | 56.4<br>(57.9) | 56.9<br>(59.9)                                                                          | 56.5<br>(59.6) | 56.3<br>(62.9) | 53.2<br>(57.4) |

| Worksite Reference | Measurement Reference | Monitor Address                  | Free-field or Façade measurement | Weekday Average L <sub>Aeq,T</sub><br>(highest day L <sub>Aeq,T</sub> ) |                |                |                | Saturday Average L <sub>Aeq,T</sub><br>(highest day L <sub>Aeq,T</sub> ) |                |                |                | Sunday / Public Holiday Average L <sub>Aeq,T</sub><br>(highest day L <sub>Aeq,T</sub> ) |                |                |                |
|--------------------|-----------------------|----------------------------------|----------------------------------|-------------------------------------------------------------------------|----------------|----------------|----------------|--------------------------------------------------------------------------|----------------|----------------|----------------|-----------------------------------------------------------------------------------------|----------------|----------------|----------------|
|                    |                       |                                  |                                  | 0700 - 0800                                                             | 0800 - 1800    | 1800 - 1900    | 1900 - 2200    | 2200 - 0700                                                              | 0700 - 0800    | 0800 - 1300    | 1300 - 1400    | 1400 - 2200                                                                             | 2200 - 0700    | 0700 - 2200    | 2200 - 0700    |
| S003-WS03          | N006                  | RCGP Roof level                  | Free-field                       | 55.4<br>(57.7)                                                          | 66.4<br>(72.5) | 54.2<br>(55.8) | 53.9<br>(55.7) | 53.6<br>(57.8)                                                           | 55.1<br>(56.6) | 60.1<br>(64.8) | 53.7<br>(54.3) | 54.0<br>(56.1)                                                                          | 53.6<br>(55.4) | 55.0<br>(64.1) | 52.7<br>(54.8) |
|                    | N008                  | RCGP Stephenson Way              | Façade                           | 63.3<br>(66.6)                                                          | 66.1<br>(69.8) | 57.0<br>(63.7) | 55.2<br>(60.0) | 58.6<br>(72.3)                                                           | 57.9<br>(58.7) | 61.6<br>(66.0) | 59.0<br>(63.0) | 55.1<br>(56.3)                                                                          | 54.3<br>(56.9) | 56.3<br>(65.3) | 58.4<br>(71.6) |
|                    | N010                  | Wesley Hotel                     | Façade                           | 66.9<br>(67.6)                                                          | 68.5<br>(71.6) | 65.7<br>(67.0) | 66.1<br>(66.7) | 61.3<br>(67.7)                                                           | 66.7<br>(67.0) | 66.8<br>(67.9) | 66.2<br>(66.3) | 66.2<br>(66.6)                                                                          | 63.2<br>(66.8) | 66.4<br>(68.8) | 58.3<br>(66.9) |
|                    | N011                  | Outside 82 Euston Street         | Free-field                       | 59.4<br>(67.7)                                                          | 65.4<br>(83.1) | 57.5<br>(63.6) | 55.8<br>(61.8) | 54.5<br>(62.3)                                                           | 56.3<br>(57.1) | 60.0<br>(65.9) | 54.6<br>(55.0) | 55.1<br>(57.5)                                                                          | 52.4<br>(55.2) | 58.4<br>(75.4) | 53.4<br>(60.1) |
| S003-WS05          | N014                  | Starcross Street                 | Free-field                       | 56.0<br>(60.7)                                                          | 62.4<br>(64.2) | 59.5<br>(66.0) | 58.3<br>(65.8) | 53.0<br>(62.9)                                                           | 55.0<br>(59.6) | 60.0<br>(63.8) | 54.3<br>(54.9) | 55.4<br>(57.4)                                                                          | 52.4<br>(56.3) | 55.0<br>(59.7) | 51.3<br>(57.1) |
| S003-WS01          | N016                  | Margaret Centre roof             | Free-field                       | 57.2<br>(61.7)                                                          | 61.4<br>(65.5) | 56.6<br>(58.2) | 56.3<br>(58.9) | 55.1<br>(59.3)                                                           | 56.0<br>(56.4) | 61.5<br>(65.5) | 55.6<br>(56.5) | 56.4<br>(58.2)                                                                          | 55.5<br>(57.3) | 56.6<br>(63.7) | 54.6<br>(58.2) |
| S003-WS06          | N017                  | Hampstead Road, lamppost #48     | Free-field                       | 71.7<br>(73.8)                                                          | 72.9<br>(74.4) | 71.6<br>(73.3) | 71.9<br>(74.9) | 70.2<br>(74.7)                                                           | 70.5<br>(71.9) | 71.6<br>(71.9) | 72.0<br>(72.5) | 72.7<br>(76.4)                                                                          | 72.0<br>(75.7) | 71.2<br>(74.6) | 69.5<br>(73.7) |
| S003-WS07          | N012                  | Opposite 92-94 Drummond Street   | Free-field                       | 59.1<br>(63.0)                                                          | 63.5<br>(65.7) | 59.7<br>(62.0) | 60.0<br>(66.1) | 57.4<br>(64.2)                                                           | 58.9<br>(59.7) | 62.3<br>(63.4) | 58.6<br>(58.6) | 62.2<br>(75.2)                                                                          | 57.1<br>(59.8) | 60.0<br>(68.8) | 55.7<br>(58.8) |
| S003-WS08          | N007                  | RCGP, Melton Street              | Free-field                       | 66.3<br>(69.3)                                                          | 70.3<br>(74.6) | 65.5<br>(67.1) | 65.2<br>(68.8) | 64.1<br>(68.6)                                                           | 66.3<br>(68.7) | 70.6<br>(74.6) | 66.3<br>(67.2) | 64.8<br>(66.0)                                                                          | 64.5<br>(68.3) | 65.6<br>(76.3) | 63.3<br>(66.1) |
| Not near worksite  | N025                  | External to 3 Prince Albert Road | Free-field                       | 68.7<br>(71.1)                                                          | 69.6<br>(72.8) | 68.2<br>(74.6) | 67.5<br>(72.1) | 65.4<br>(70.4)                                                           | 67.5<br>(69.7) | 67.6<br>(68.6) | 67.9<br>(69.3) | 68.3<br>(70.1)                                                                          | 66.8<br>(71.6) | 66.8<br>(70.7) | 65.0<br>(70.1) |
| Not near worksite  | N026                  | Thames Water Compound            | Free-field                       | 59.0<br>(60.2)                                                          | 62.9<br>(65.8) | 58.4<br>(62.3) | 57.3<br>(61.0) | 53.4<br>(59.6)                                                           | 55.9<br>(57.8) | 57.8<br>(59.3) | 57.4<br>(58.1) | 57.5<br>(59.3)                                                                          | 54.8<br>(58.4) | 56.9<br>(60.0) | 53.0<br>(56.4) |

2.2.3 Table 6 presents a summary of the measured vibration levels at monitoring locations V002, V003, V021, V037, V038 and V039 over the reporting period. During the monitoring high values of PPV were measured at V021, V038 and V039 which were due to local disturbance of the vibration monitors and are not representative of HS2 construction works. These have been greyed out in the charts alongside other periods of local disturbance of the monitor as shown in Appendix B, and have been excluded to calculate values in Table 6. The highest PPV measured during the monitoring along any axis is presented in the table.

Table 6: Summary of measured PPV data over the monitoring period.

| <b>Worksite Reference</b> | <b>Measurement Reference</b> | <b>Monitor Address</b>                          | <b>Highest PPV measured in any axis, mm/s</b> |
|---------------------------|------------------------------|-------------------------------------------------|-----------------------------------------------|
| S001-WS07                 | V039                         | Coniston, Regents Park Estate                   | 2.49 (Y-axis)                                 |
|                           | V043                         | Cubitt Court, Park Village East                 | 1.94 (X-axis)                                 |
| S003-WS03                 | V002                         | RCGP. basement boiler room. 305 Euston Road     | 1.16 (Z-axis)                                 |
|                           | V037                         | Magic Circle, basement                          | 1.30 (Z-axis)                                 |
|                           | V038                         | Wesley Hotel, basement lightwell, Euston Street | 1.93 (Z-axis)                                 |
| S003-WS05                 | V021                         | 42-44 Cobourg Street (floor)                    | 0.82 (Z-axis)                                 |
| S003-WS09                 | V003                         | RCGP. basement vaults, 305 Euston Road          | 0.51 (Y-axis)                                 |

2.2.4 Appendix C presents graphs of 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>.

## 2.3 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 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 |
|--------------------------------------------|--------------------|----------------------|-------------------|---------------------------------------------------------------|---------------|
| -                                          | -                  | -                    | -                 | -                                                             | -             |

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

## 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.

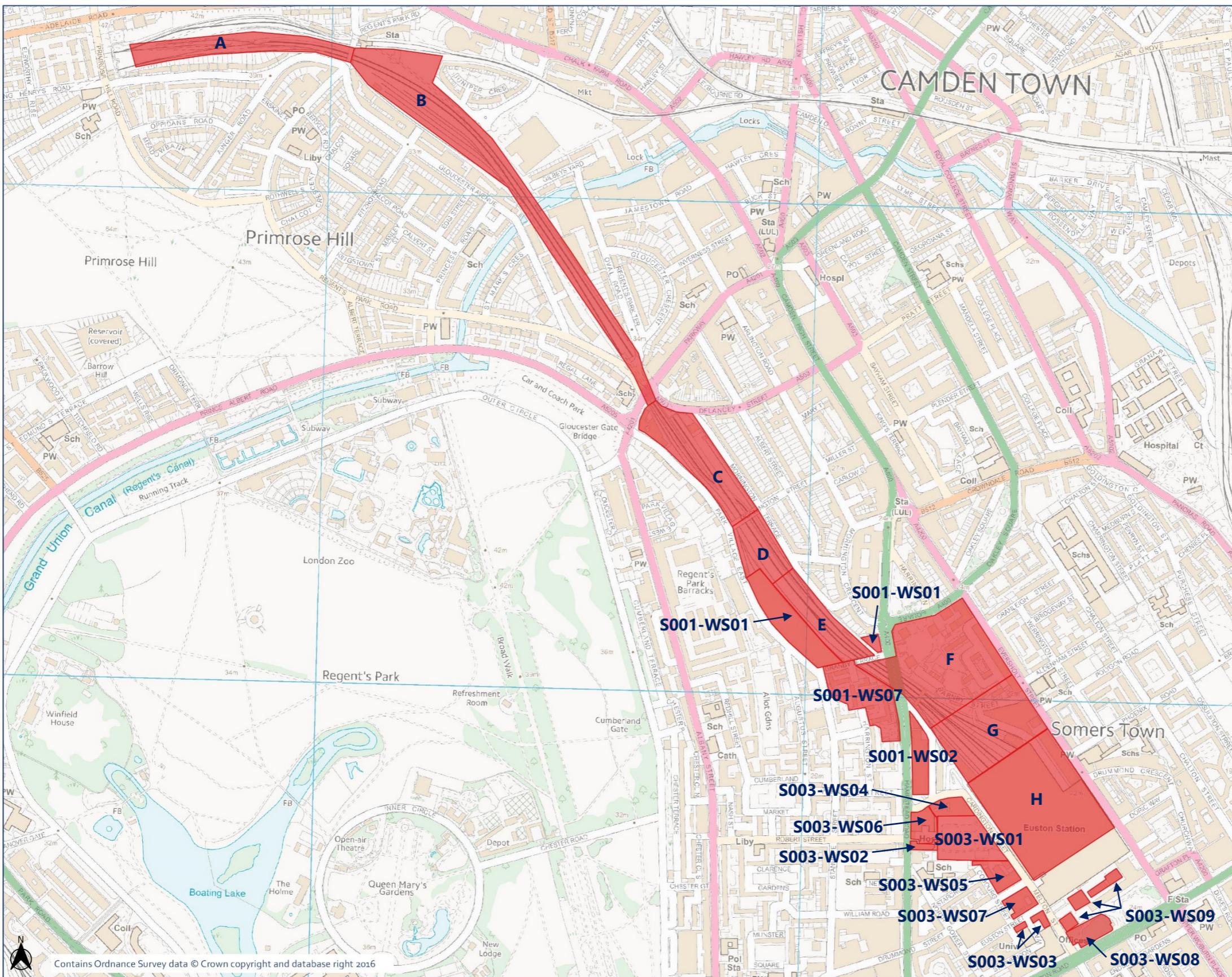
Table 8: Summary of complaints.

| Complaint reference number                         | Worksite reference | Description of complaint                                                                                                                                                       | Results of investigation                                                                                                                                                                                                                                                                                                                           | Actions taken                                                                                                         |
|----------------------------------------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| HS2-19-10158-C                                     | S003-WS09          | Complaint received from non-residential property on Stephenson Way regarding noise and vibration from a single, isolated event, presumed to arise from the adjoining worksite. | Source of impact not certain, however likely to be demolition/collapse of column. Ongoing monitoring at complainant premises indicates that level of vibration from the event is likely to have been clearly perceptible within the premises, however significantly below that at which any potential cosmetic building damage is likely to occur. | Complainant was contacted and information provided.                                                                   |
| HS2-19-10490-C<br>HS2-19-10493-C<br>HS2-19-10704-C | S001-WS07          | Complaint from a residential property at Langdale, Stanhope Street regarding perceptible vibration within the house.                                                           | Contractors confirmed that there were no vibration generating activities being undertaken at the time of the complaint.                                                                                                                                                                                                                            | Complainant was contacted by the contractor and informed that the construction vibration was not associated with HS2. |

| <b>Complaint reference number</b> | <b>Worksite reference</b> | <b>Description of complaint</b>                                                                                               | <b>Results of investigation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Actions taken</b>                                                                                                                                                                      |
|-----------------------------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HS2-19-10766-C                    | S001-WS07                 | Complaint from a residential property at Cubitt Court, Park Village East regarding perceptible vibration within the dwelling. | Investigation of the complaint is ongoing.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Investigation is in progress.                                                                                                                                                             |
| HS2-19-10493-C                    | S001-WS04                 | Complaint from Regent's Park Estate regarding perceptible vibration within the property during both daytime and night time.   | No works taking place outside of daytime hours. Long reach demolition of Eskdale was underway. Vibration monitoring data at adjacent properties closer to demolition shows that vibration may be perceptible, however below levels at which any potential cosmetic building damage is likely to occur. At complainant premises the vibration from demolition works is expected to be lower. Utility diversion works also taking place adjacent to premises on Stanhope St. Specific source of vibration could not be established. | Further communication provided to residents regarding works and ongoing monitoring, including advice that vibration levels do not pose any risk of potential cosmetic damage to building. |

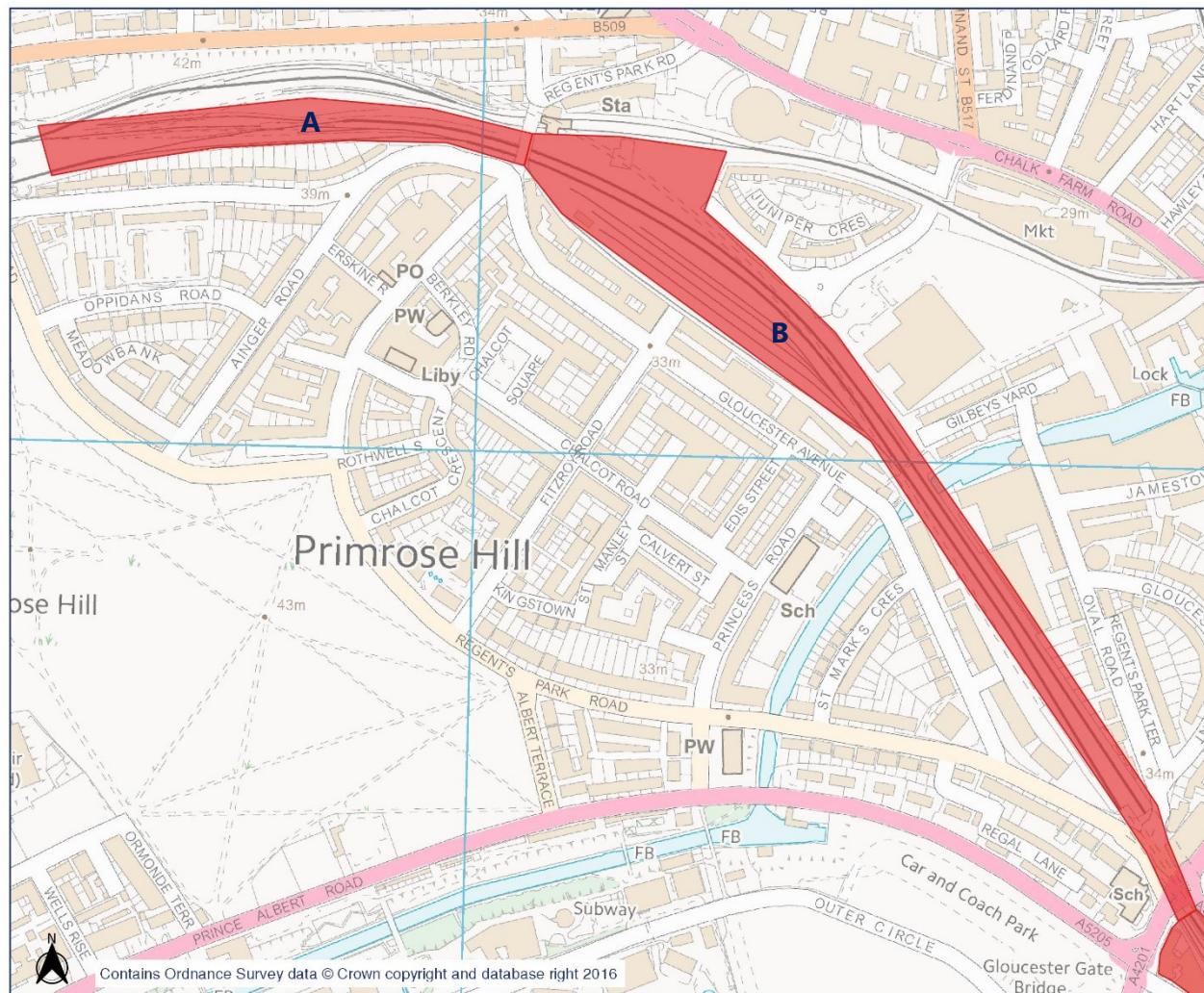
# **Appendix A Site Locations**

## Worksite identification plan - Overview



# HS2

## Worksite identification plan - 1

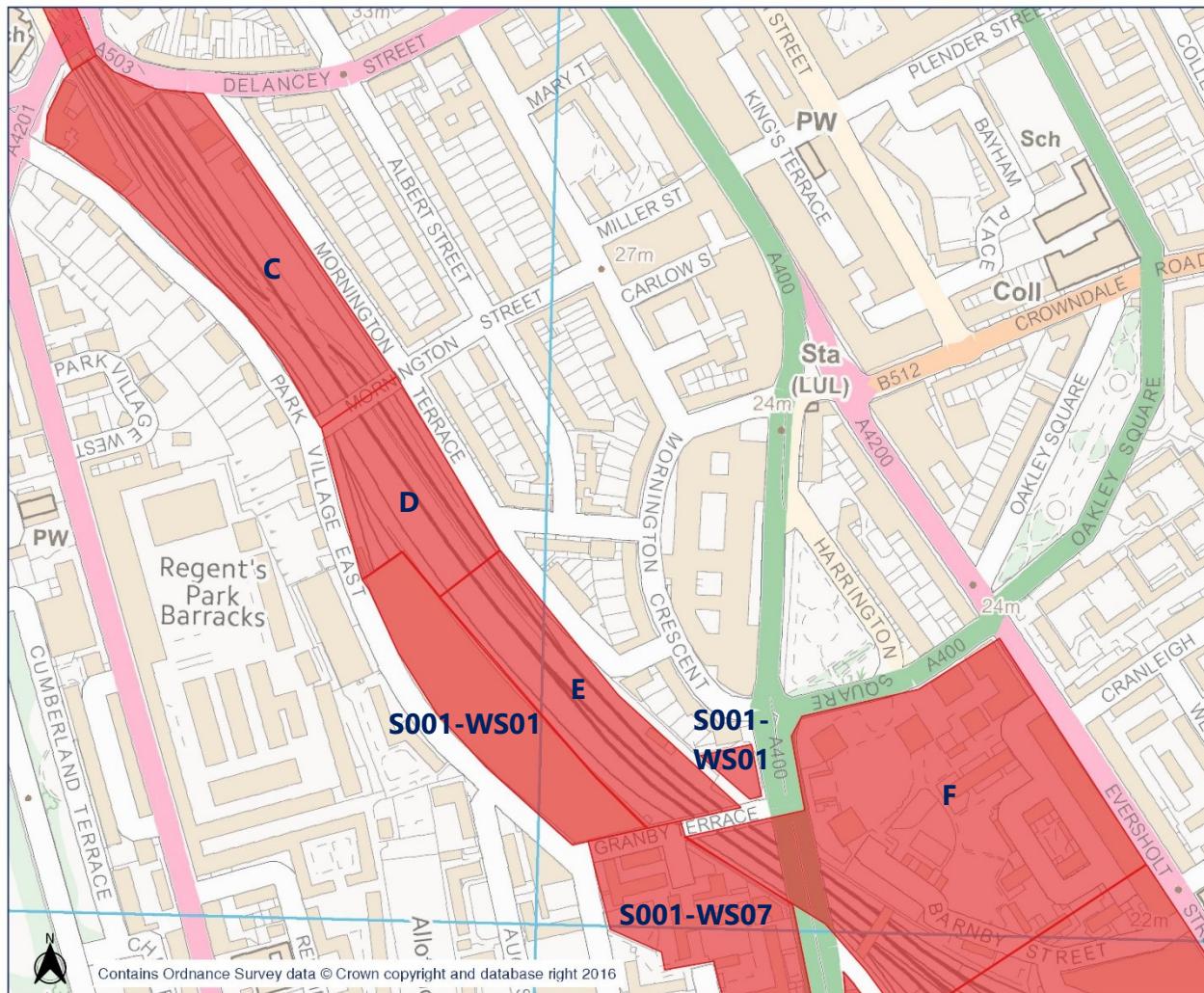


**Legend**

Active worksites

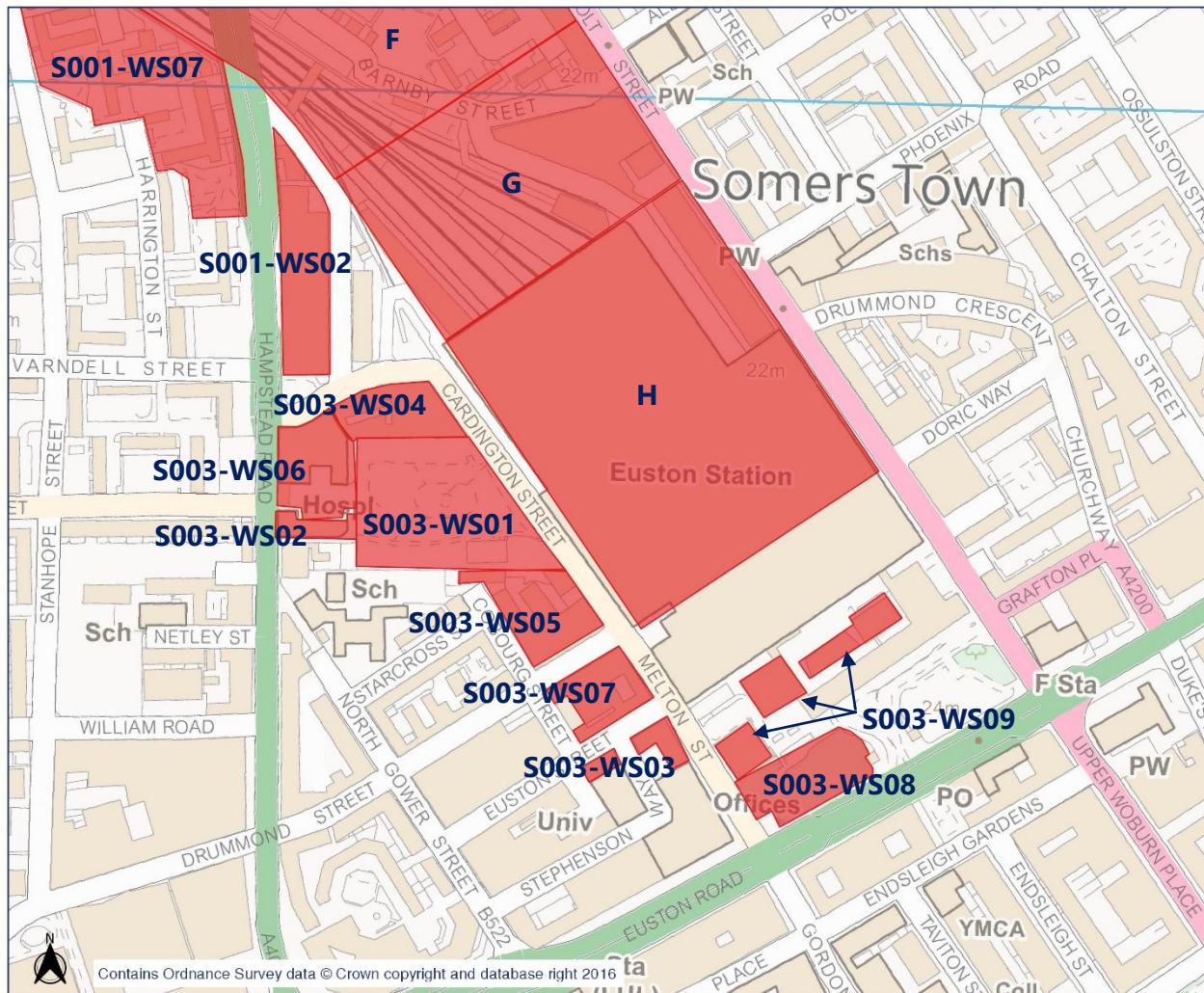
# HS2

## Worksite identification plan - 2



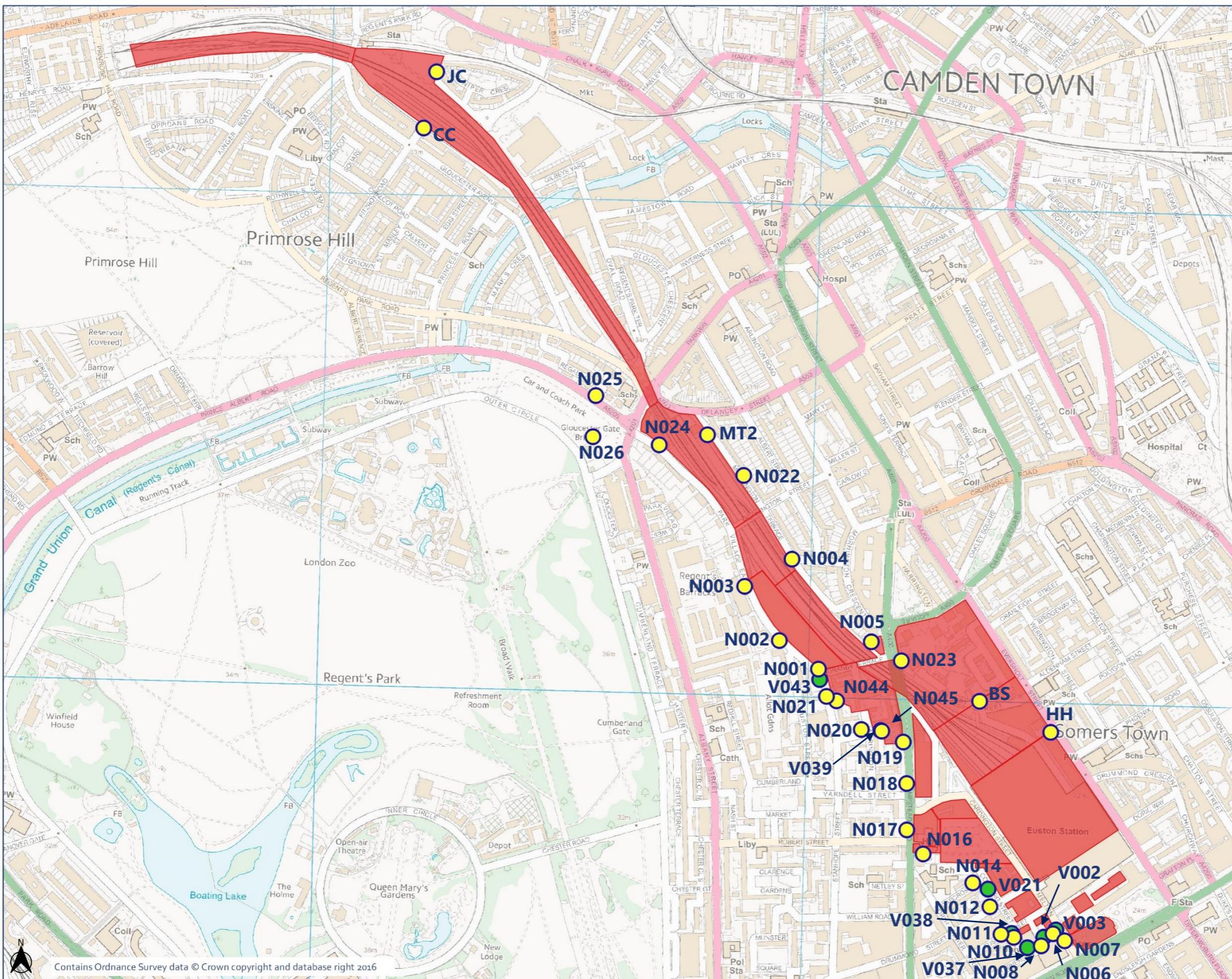
# HS2

## Worksite identification plan - 3



## **Appendix B Monitoring Locations**

## Noise monitoring plan - Overview

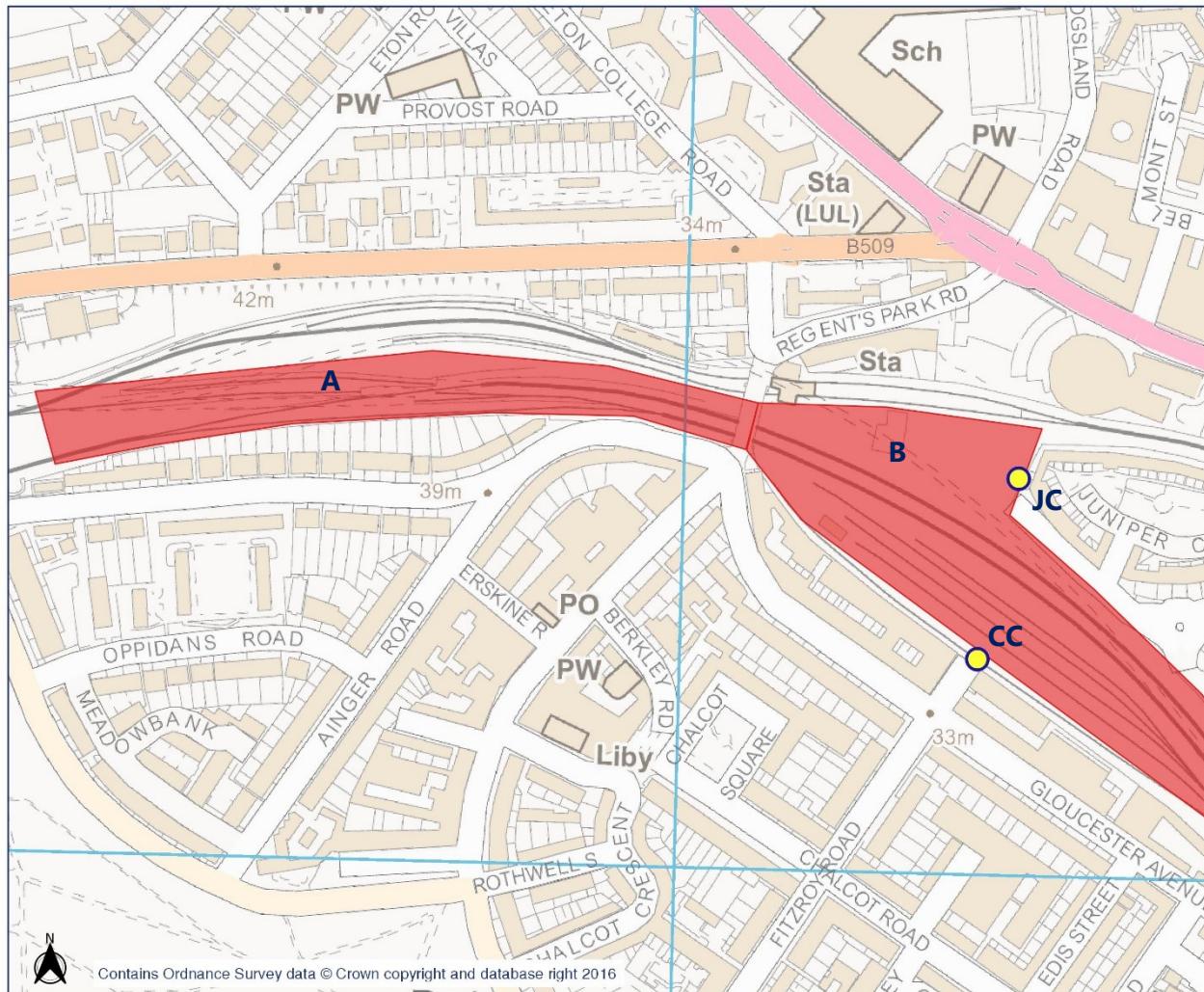


**Legend**

- Yellow circle: Noise monitor
- Green circle: Vibration monitor
- Red shaded area: Active worksites

# HS2

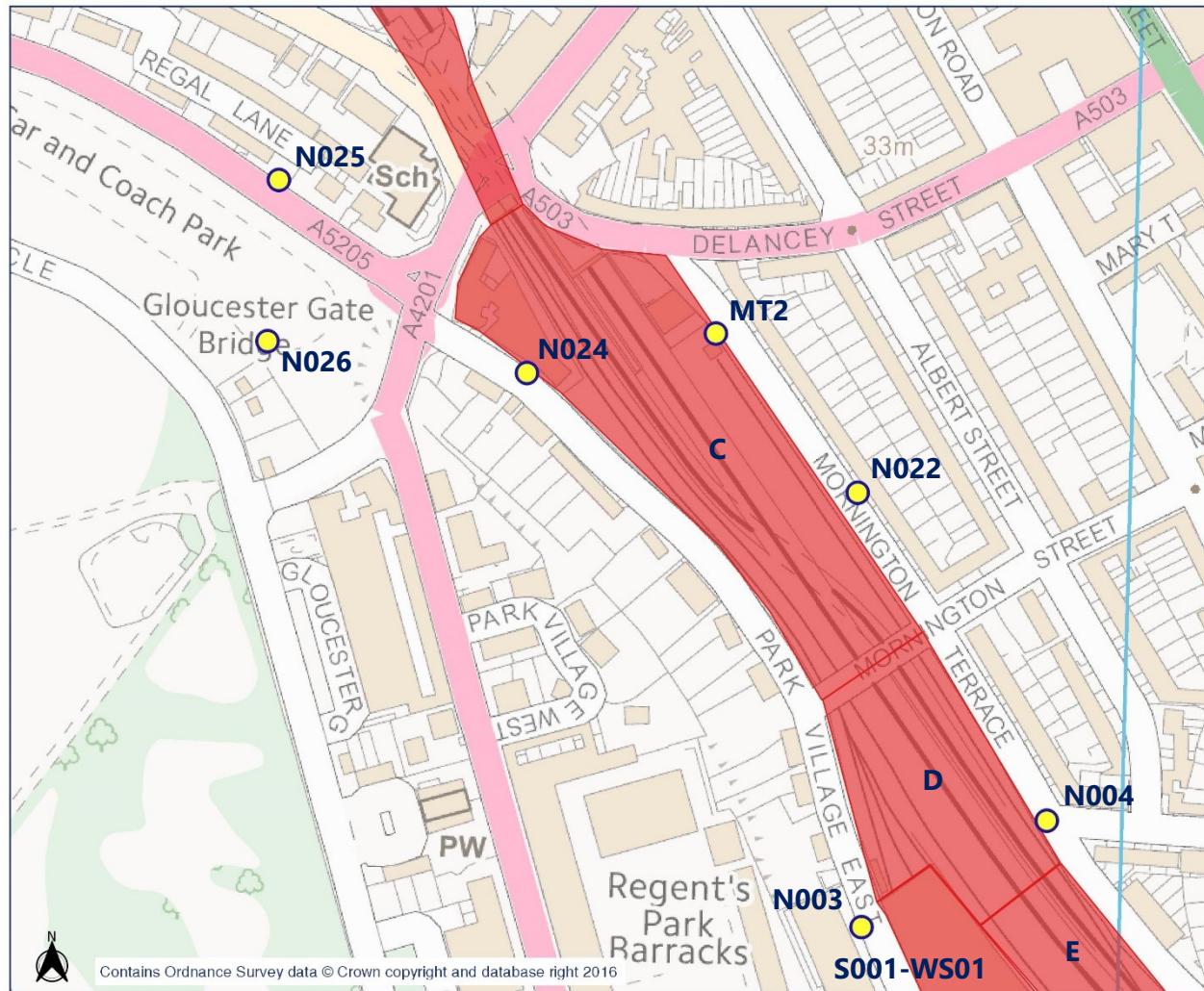
## Noise monitoring plan - 1



**Legend**  
Yellow circle: Noise monitor  
Red shaded area: Active worksites

# HS2

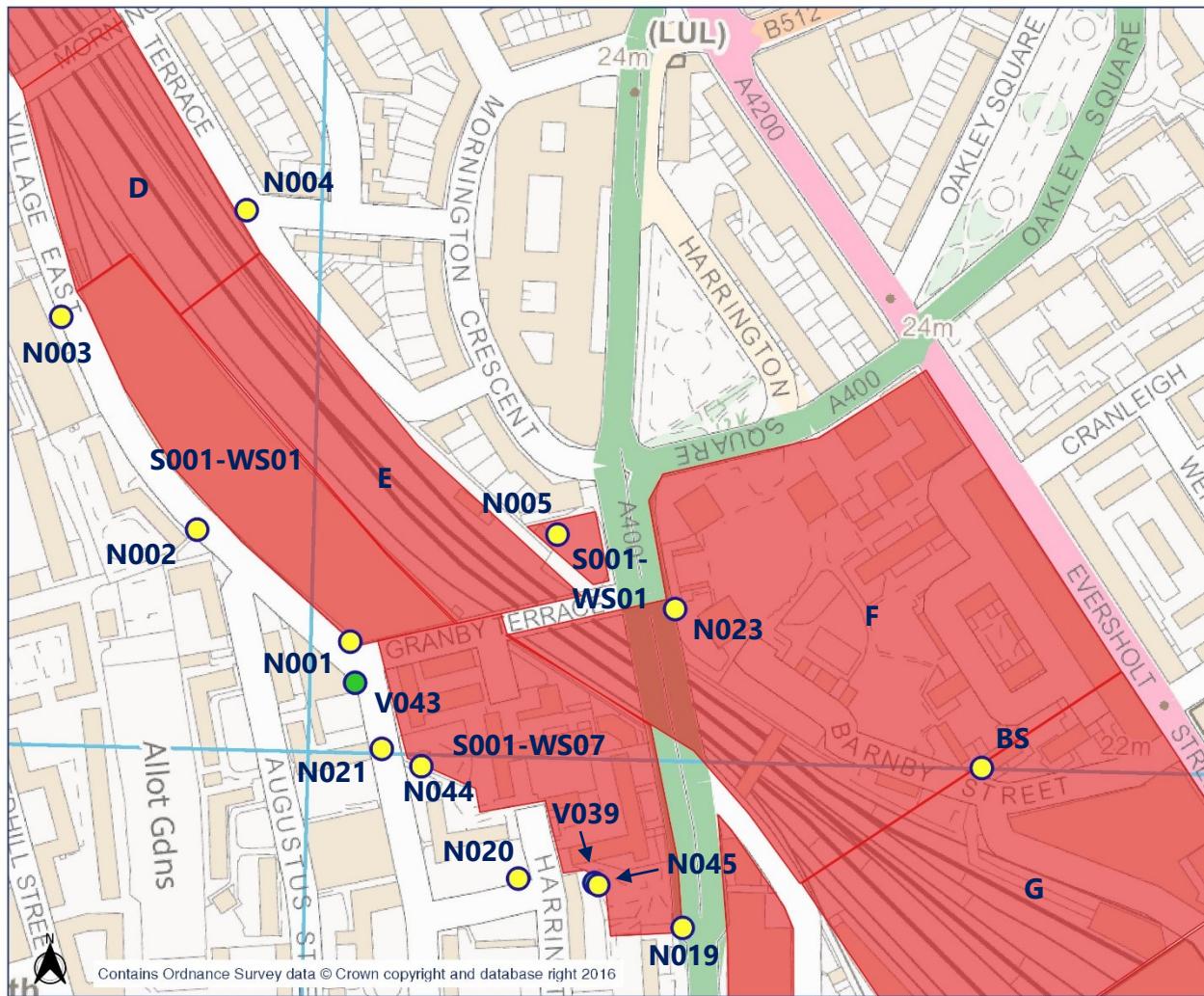
## Noise monitoring plan - 2



**Legend**  
Yellow circle: Noise monitor  
Red shaded area: Active worksites

# HS2

## Noise monitoring plan - 3

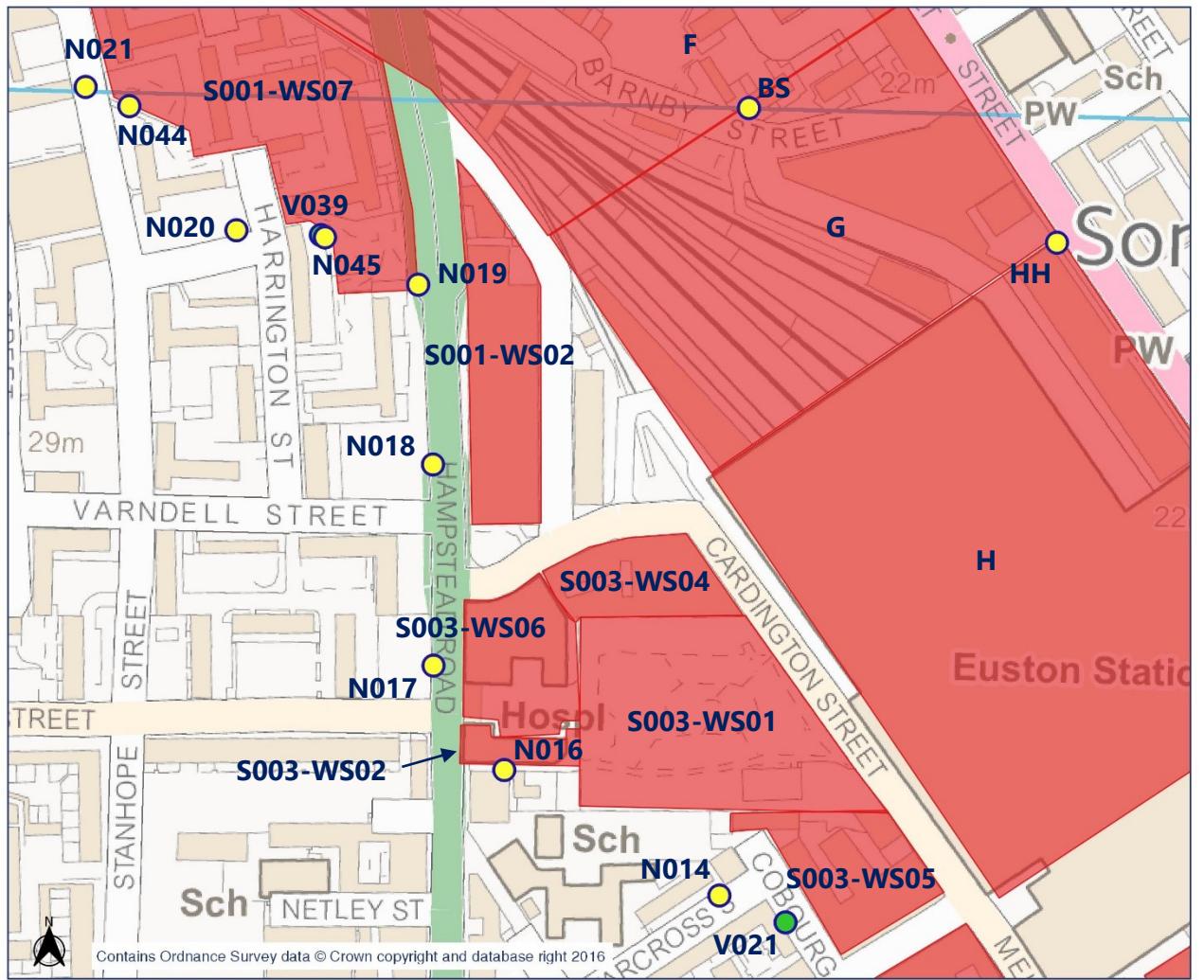


**Legend**

- Noise monitor
- Vibration monitor
- Active worksites

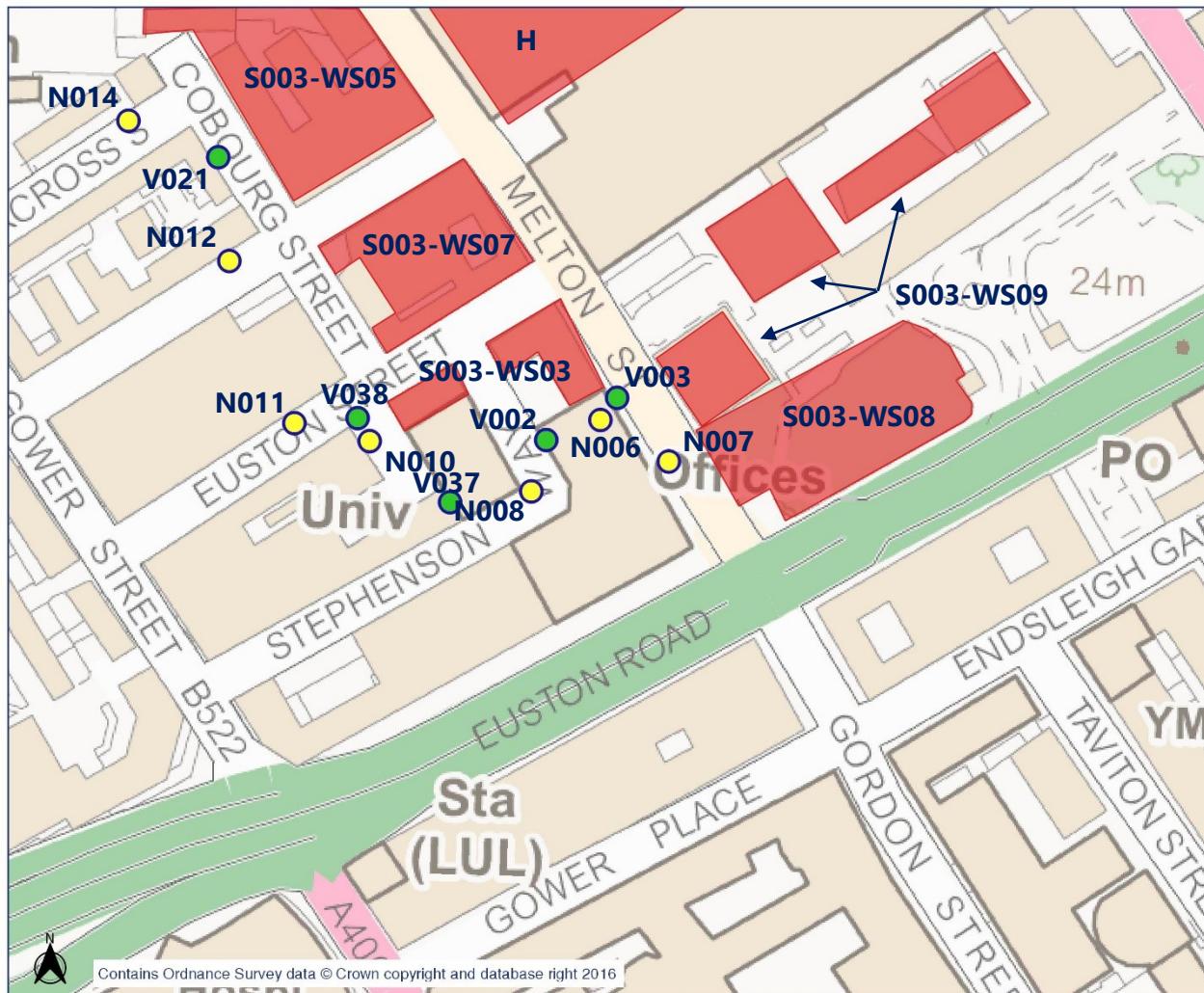
# HS2

## Noise monitoring plan - 4



# HS2

## Noise monitoring plan - 5

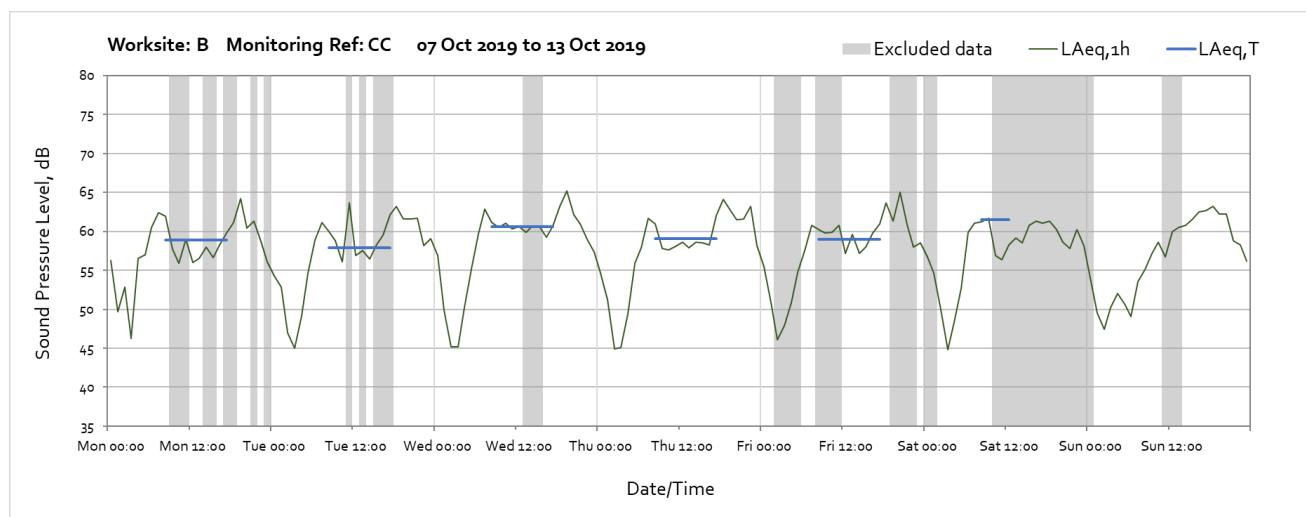
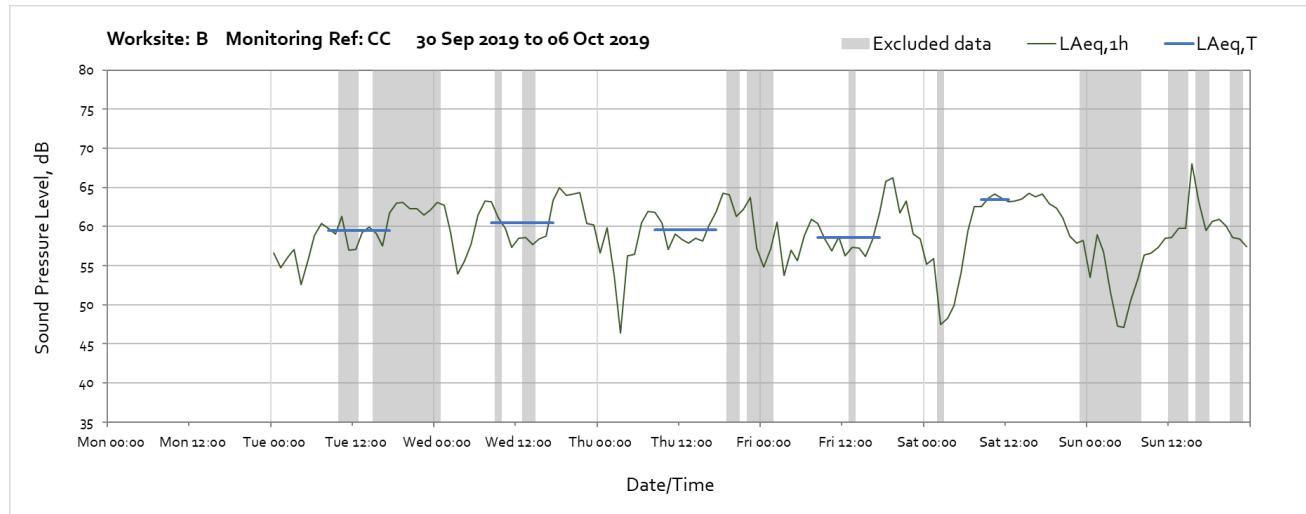


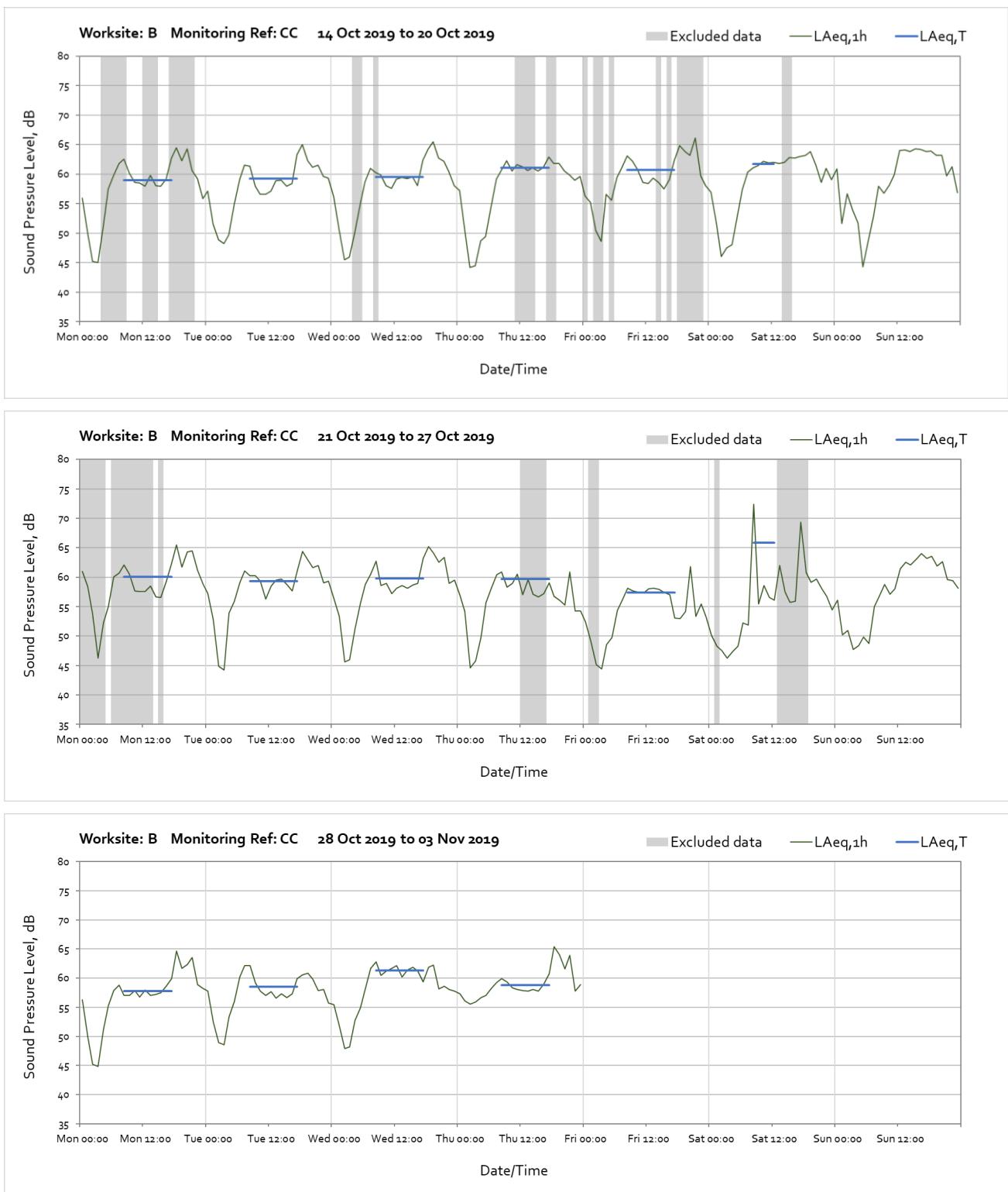
# Appendix C Data

## Noise

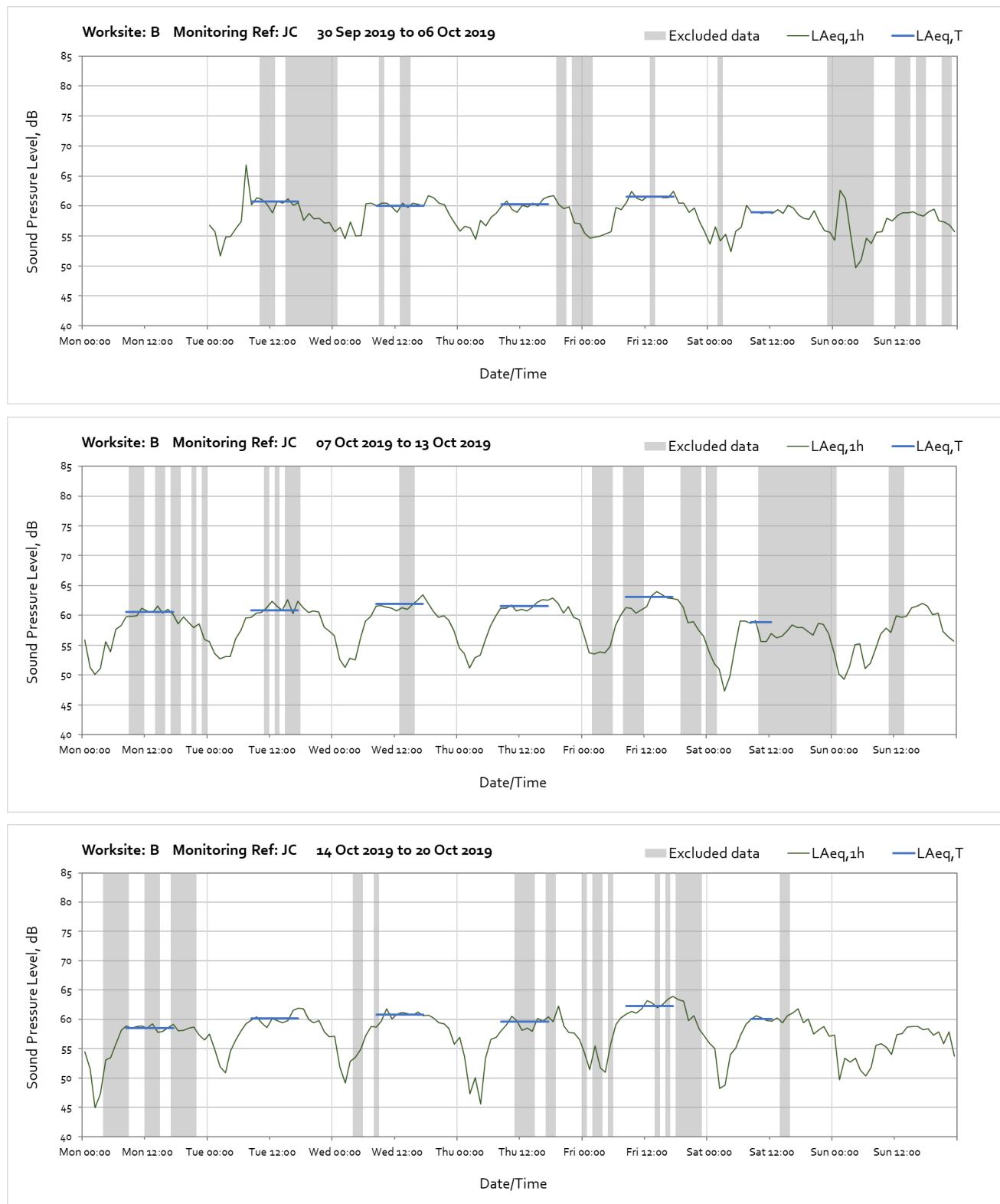
The following graphs show the hourly measured ambient noise level  $L_{Aeq,1h}$  and, where relevant, the averaged noise level  $L_{Aeq,T}$  values, where the time period T is as specified in Table 1 of HS2 Information Paper E23. Periods with adversely weather affected noise levels are greyed out and have been excluded from the calculation of the  $L_{Aeq,T}$  values in Table 5.

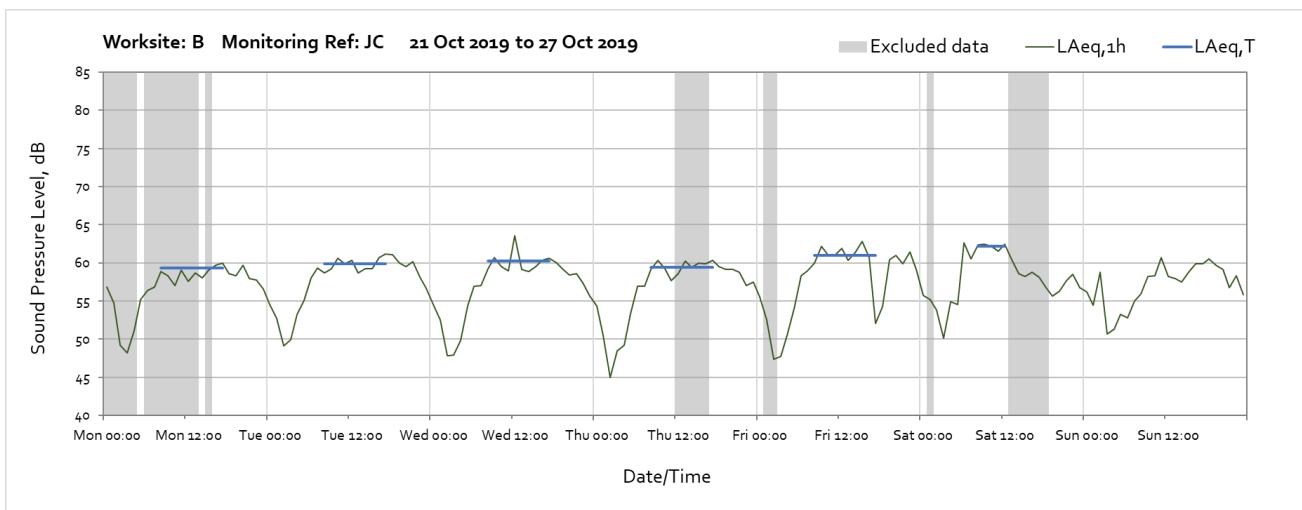
## Worksite: B – Monitoring Ref: CC



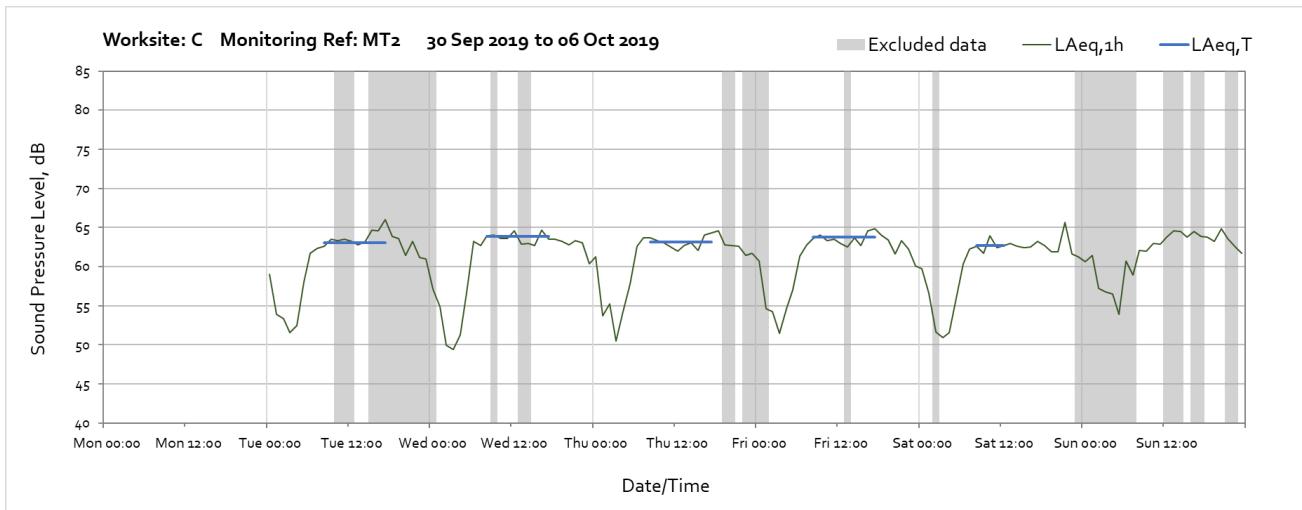


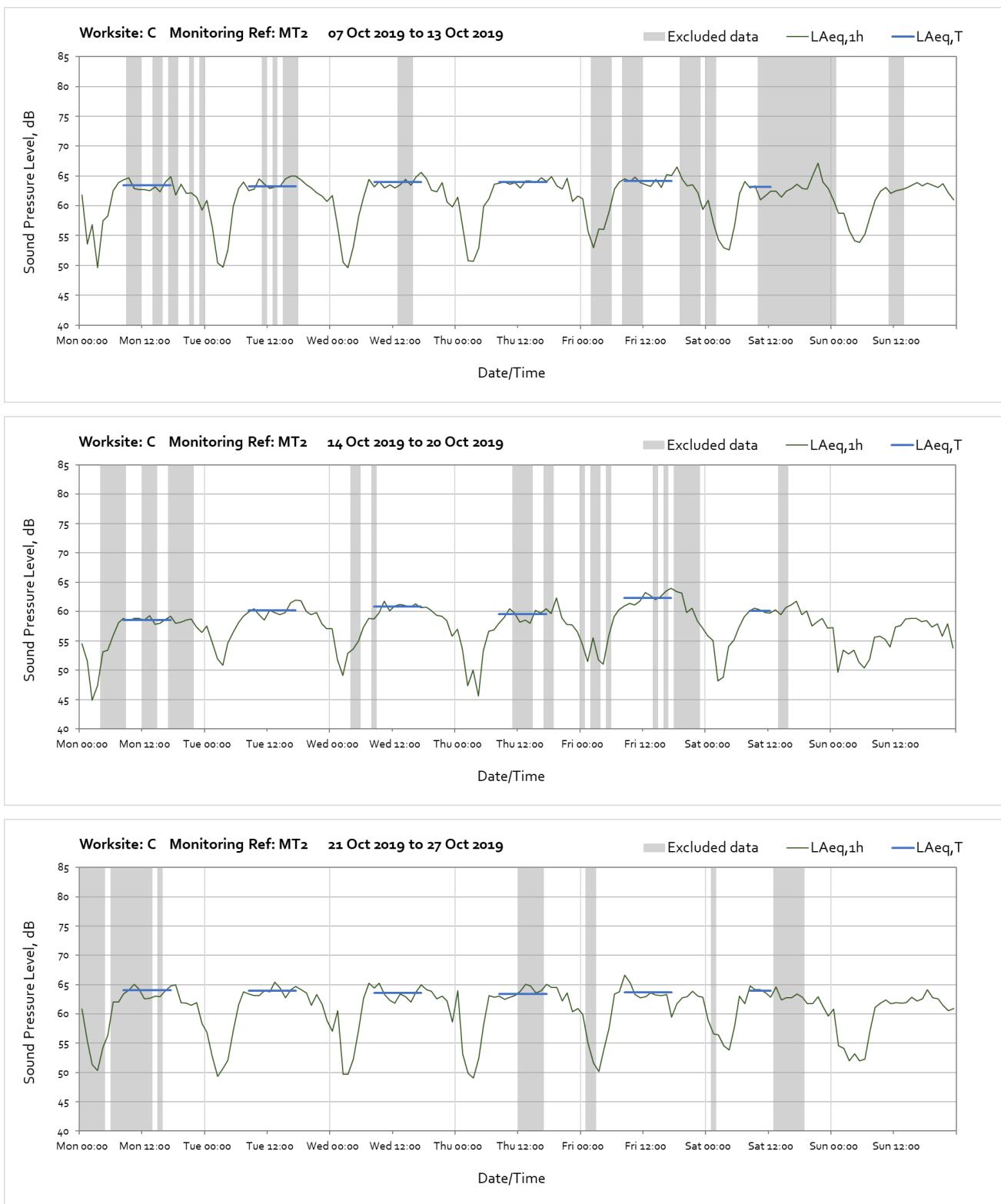
## Worksite: B – Monitoring Ref: JC

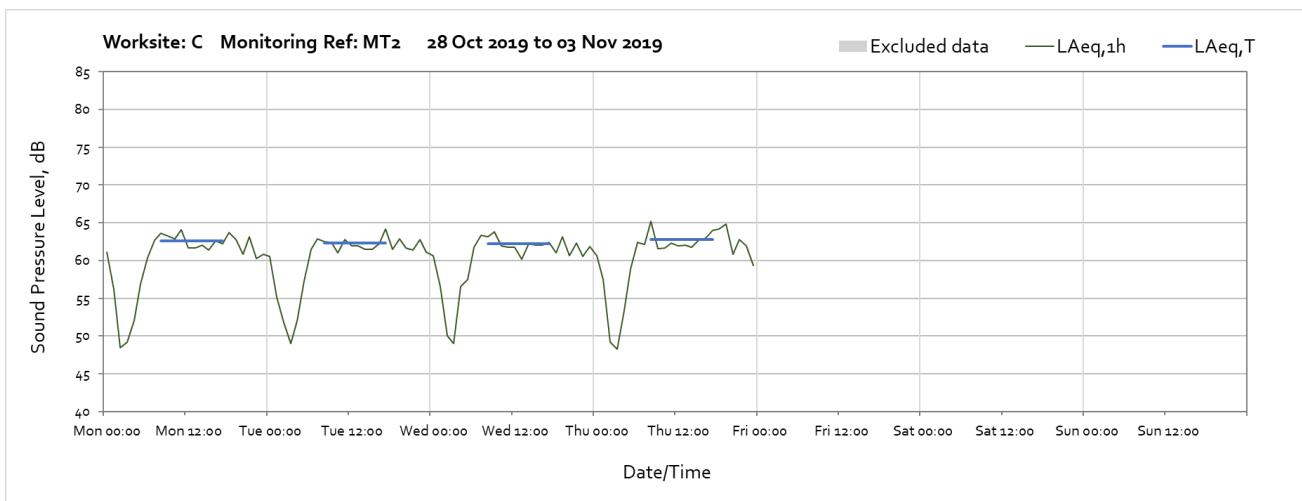




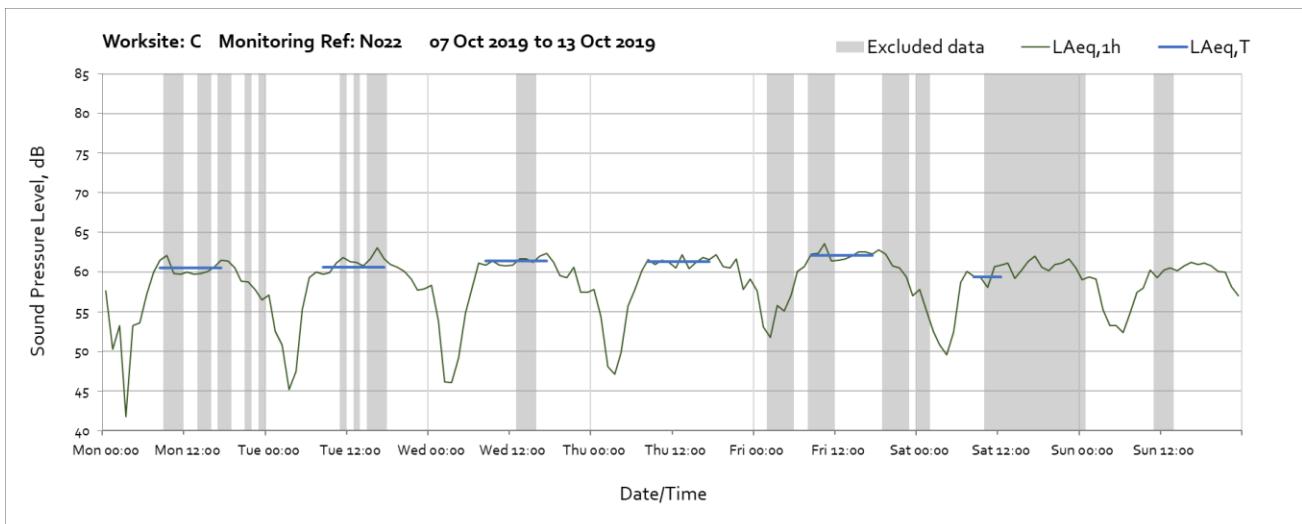
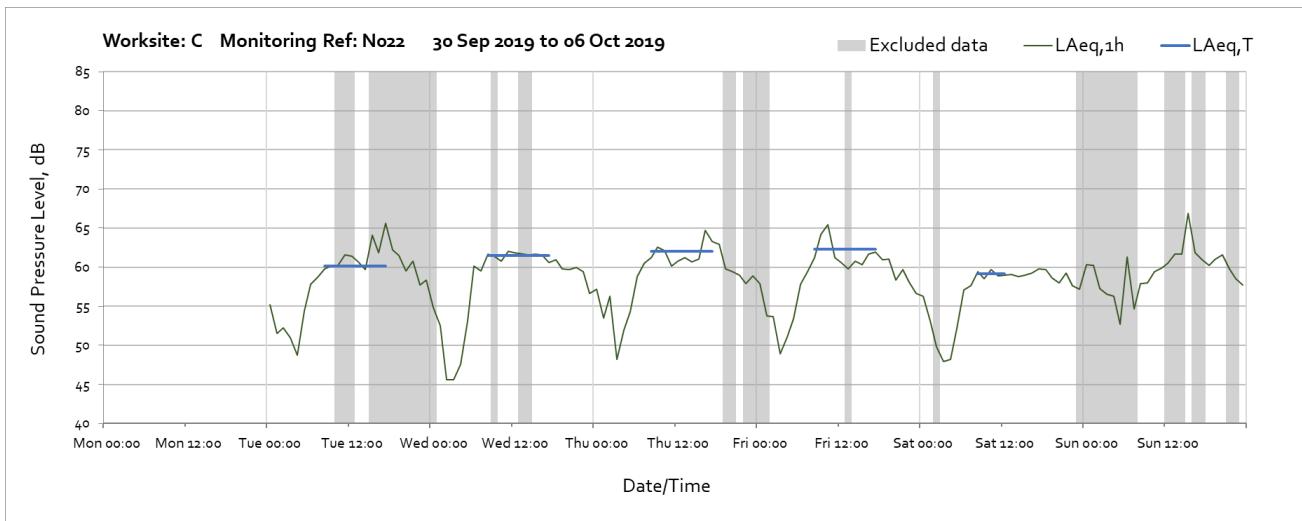
## Worksite: C – Monitoring Ref: MT2

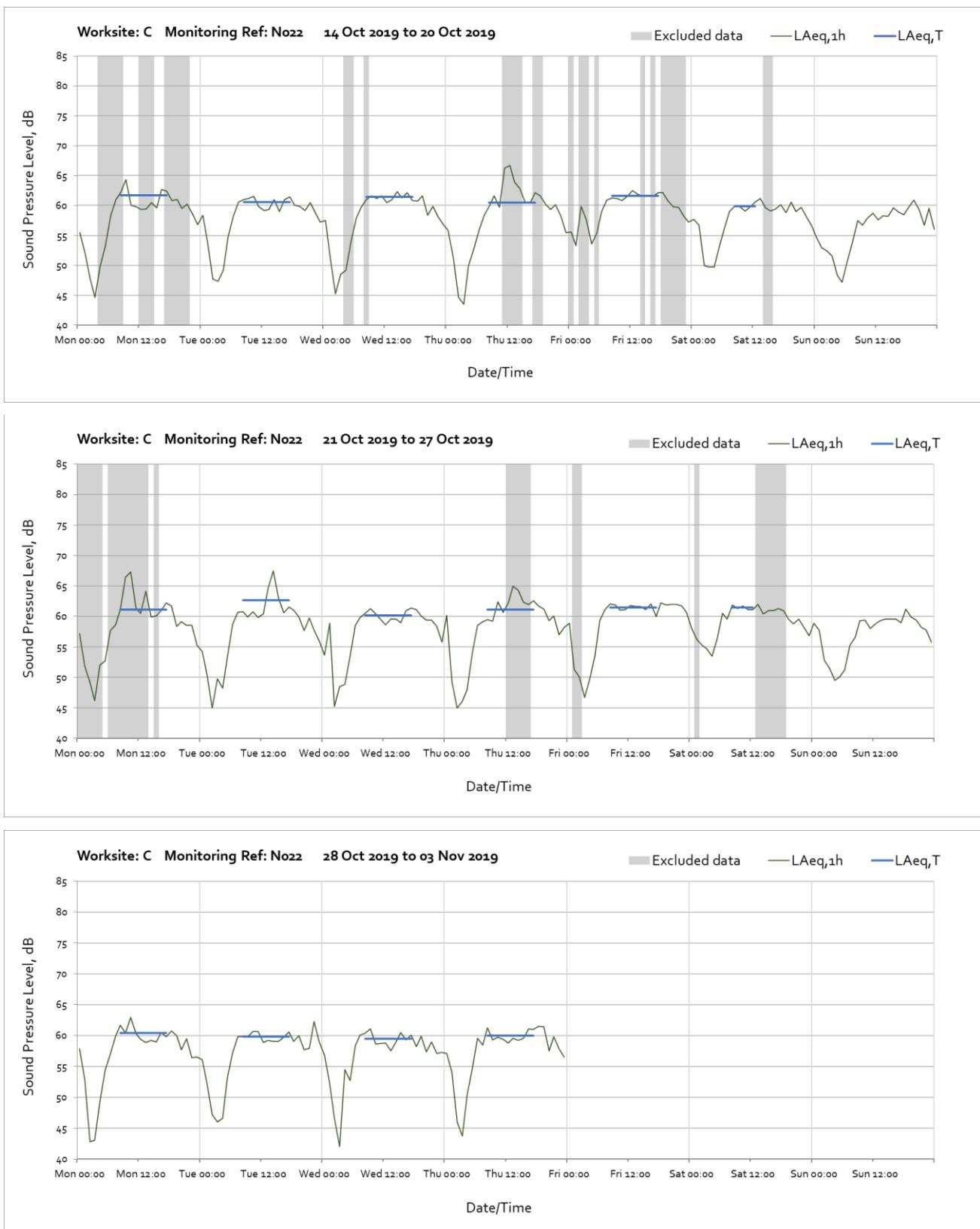




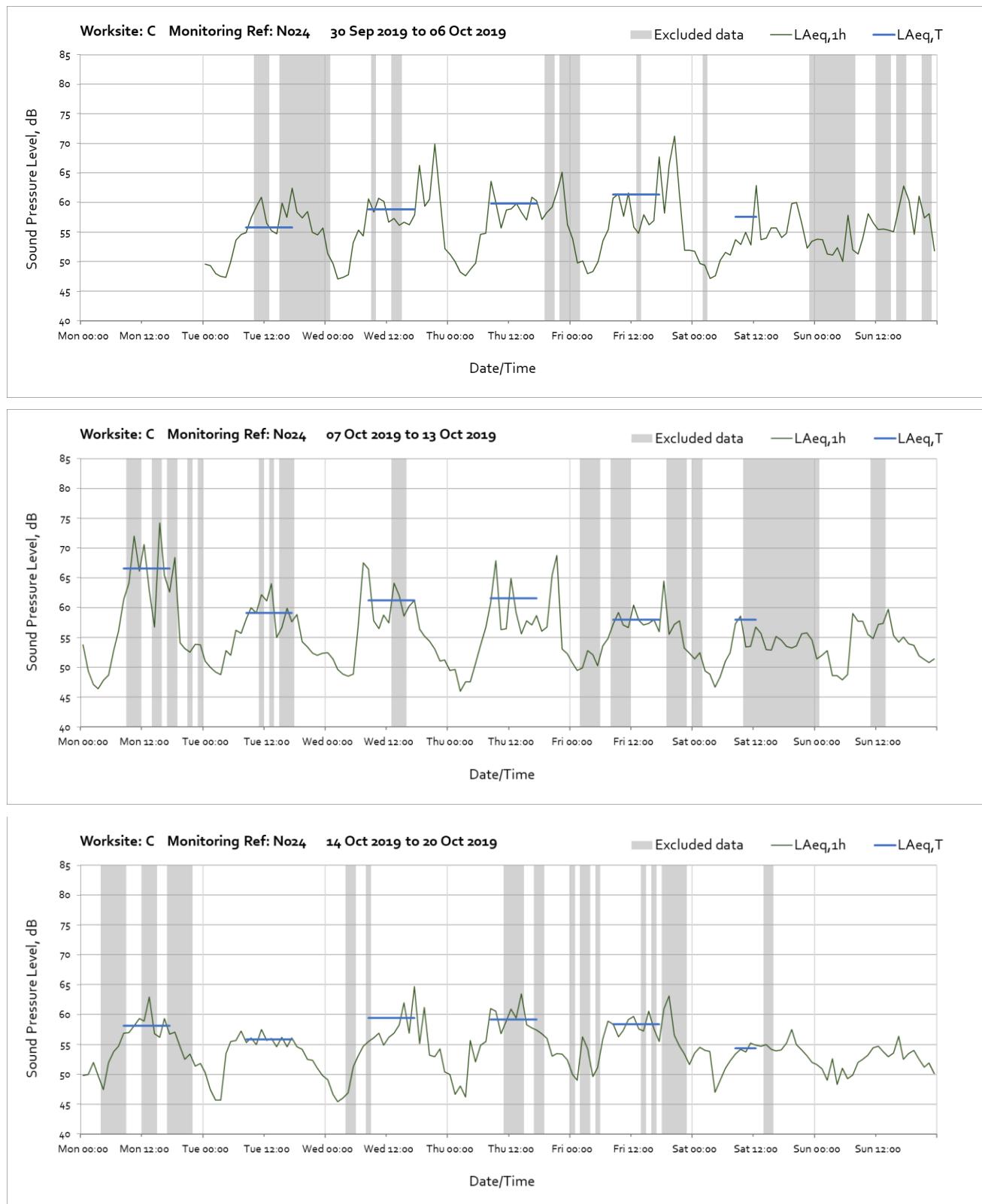


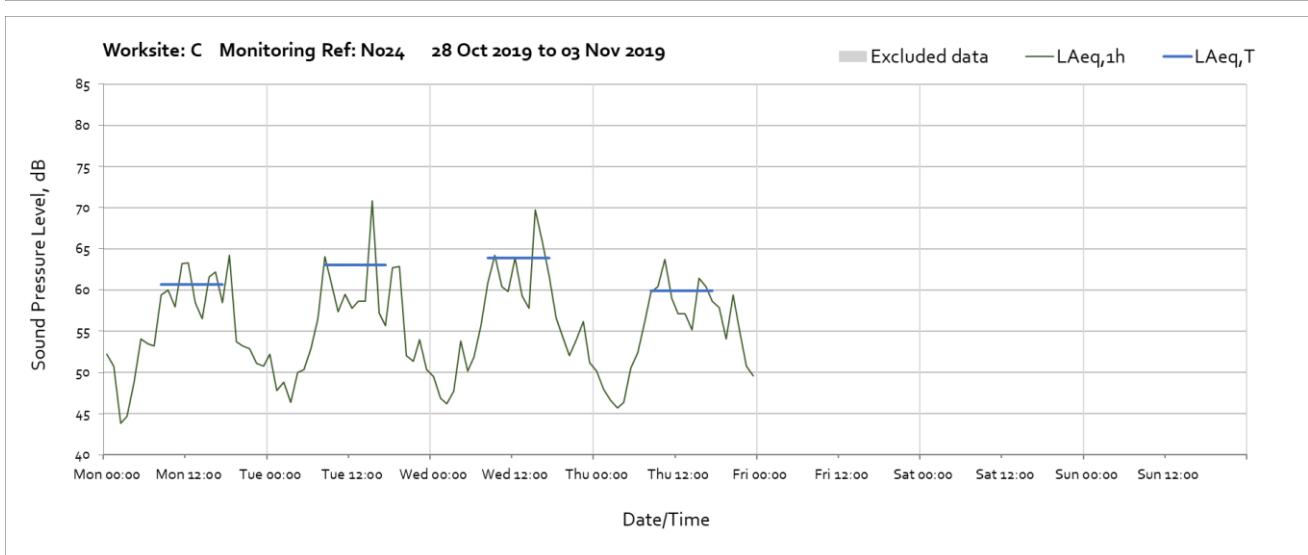
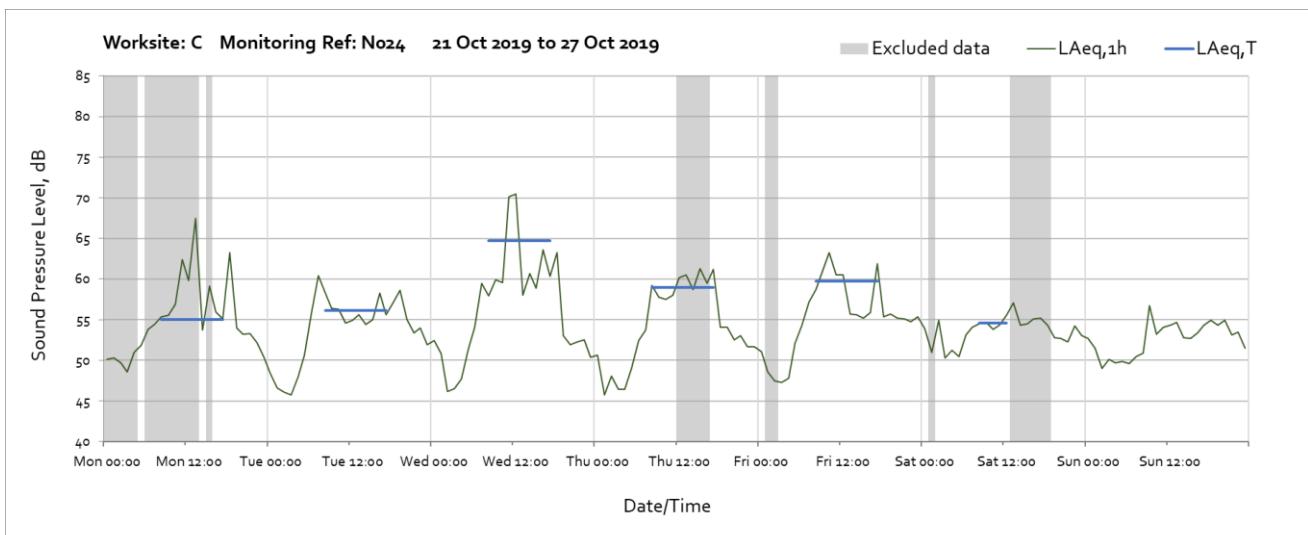
## Worksite: C – Monitoring Ref: N022



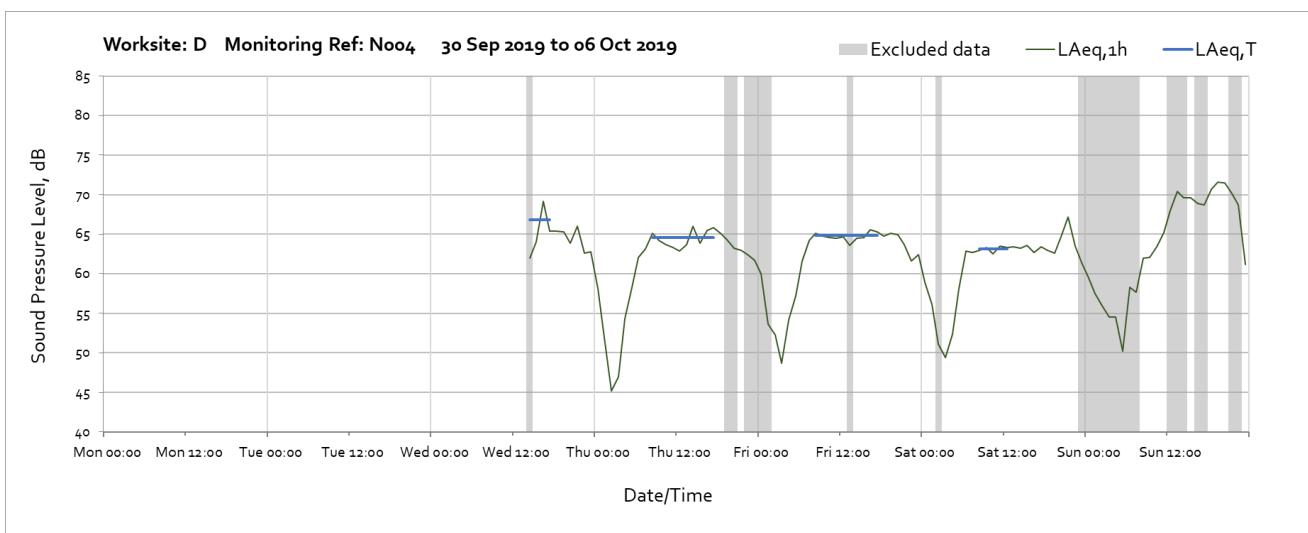


## Worksite: C – Monitoring Ref: N024

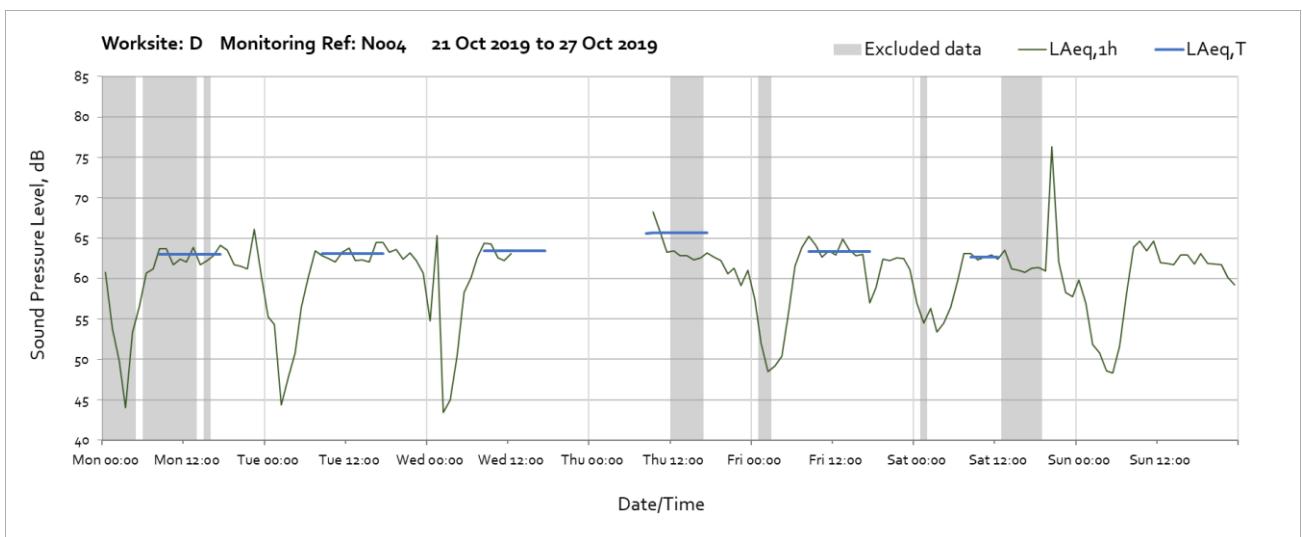
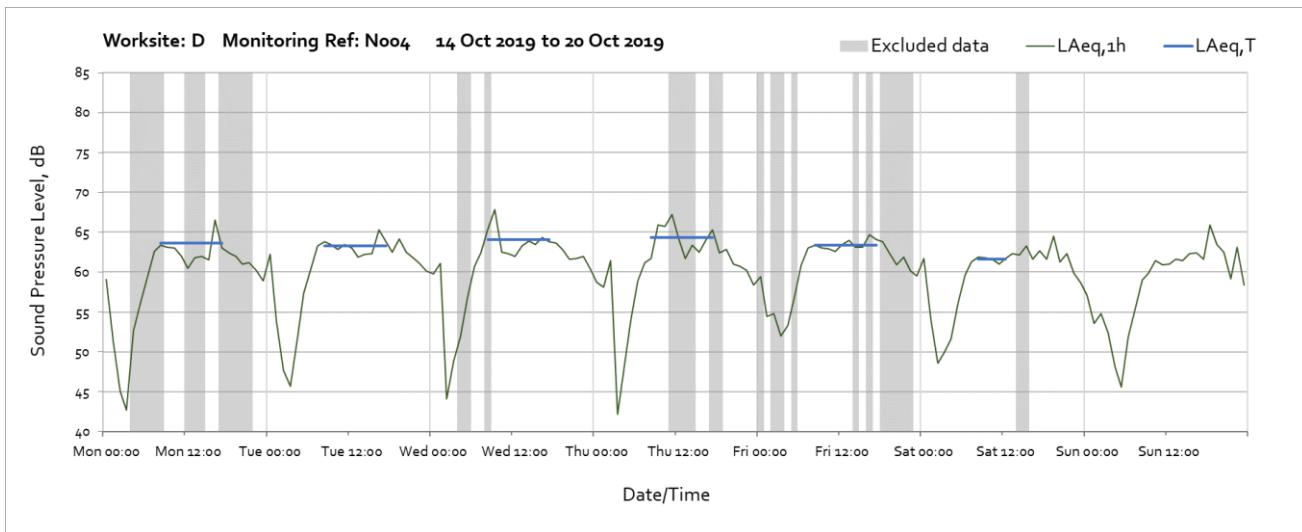
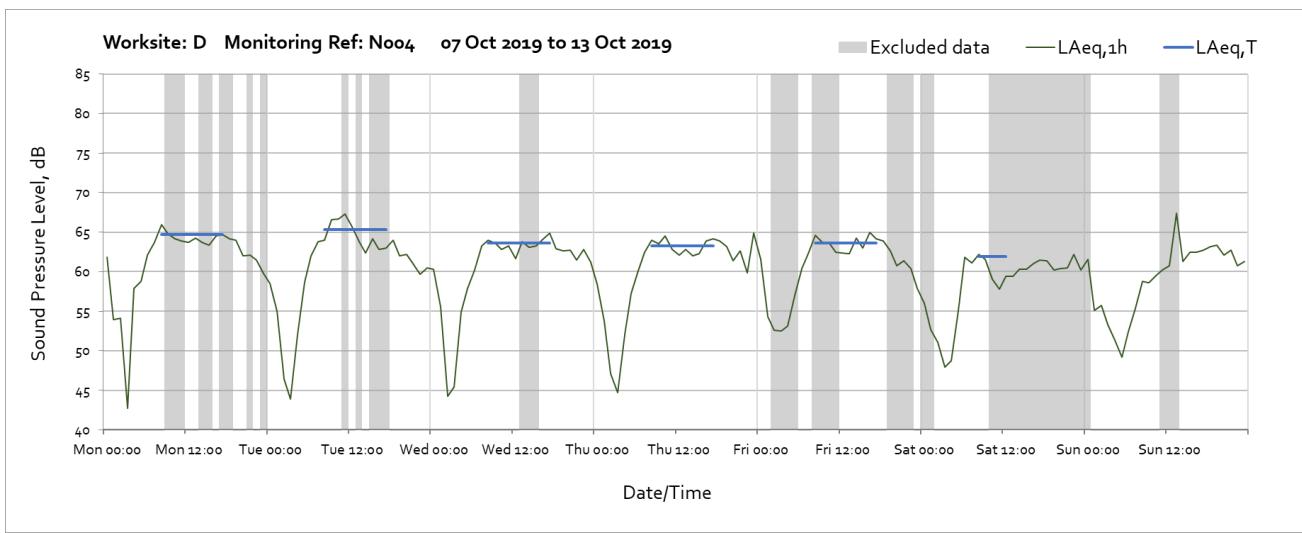




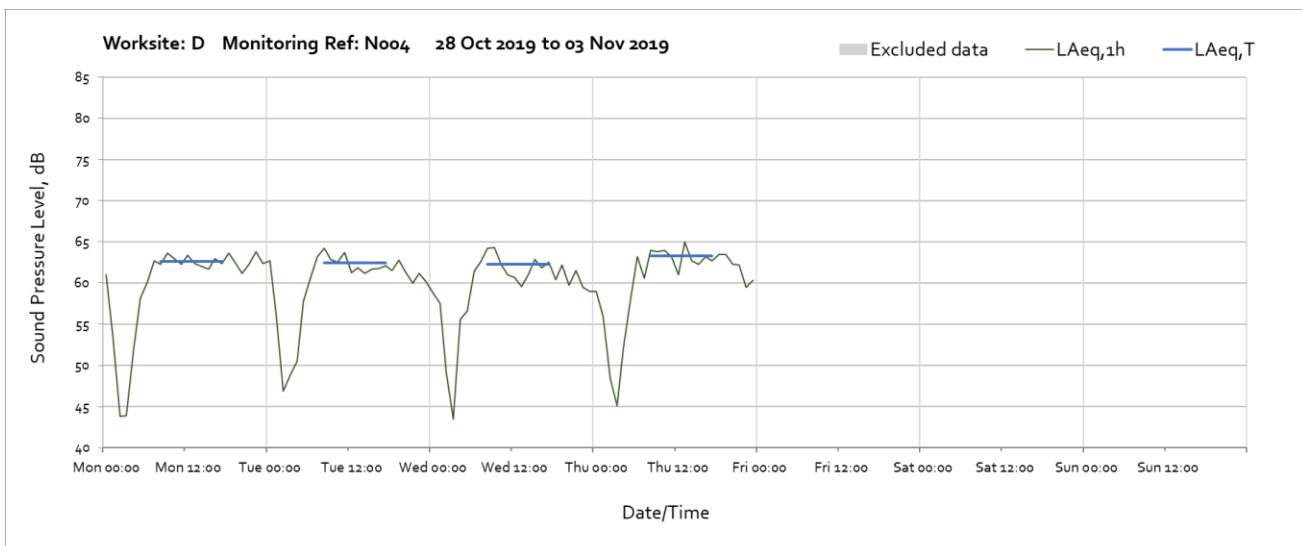
## Worksite: D – Monitoring Ref: N004



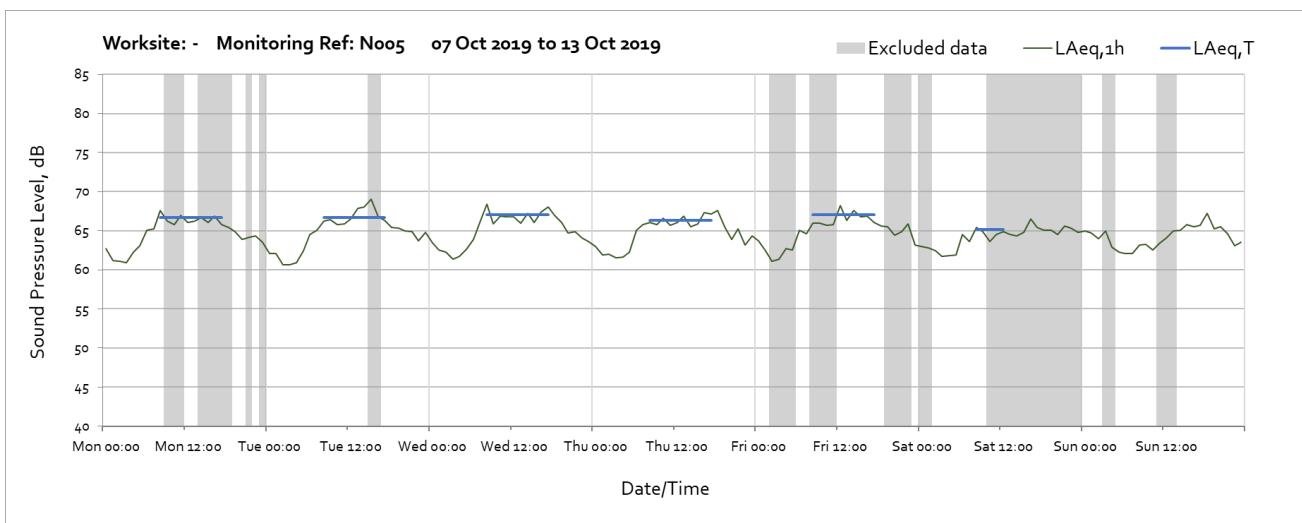
Note: Missing data between 00:00 on Tuesday 1<sup>st</sup> October and 14:00 on Wednesday 2<sup>nd</sup> October was due to a restart error following an update of the noise monitor firmware.



Note: Missing data between 13:00 on Wednesday 23<sup>rd</sup> and 08:00 on Thursday 24<sup>th</sup> October was due to a restart error following an update of the noise monitor firmware.

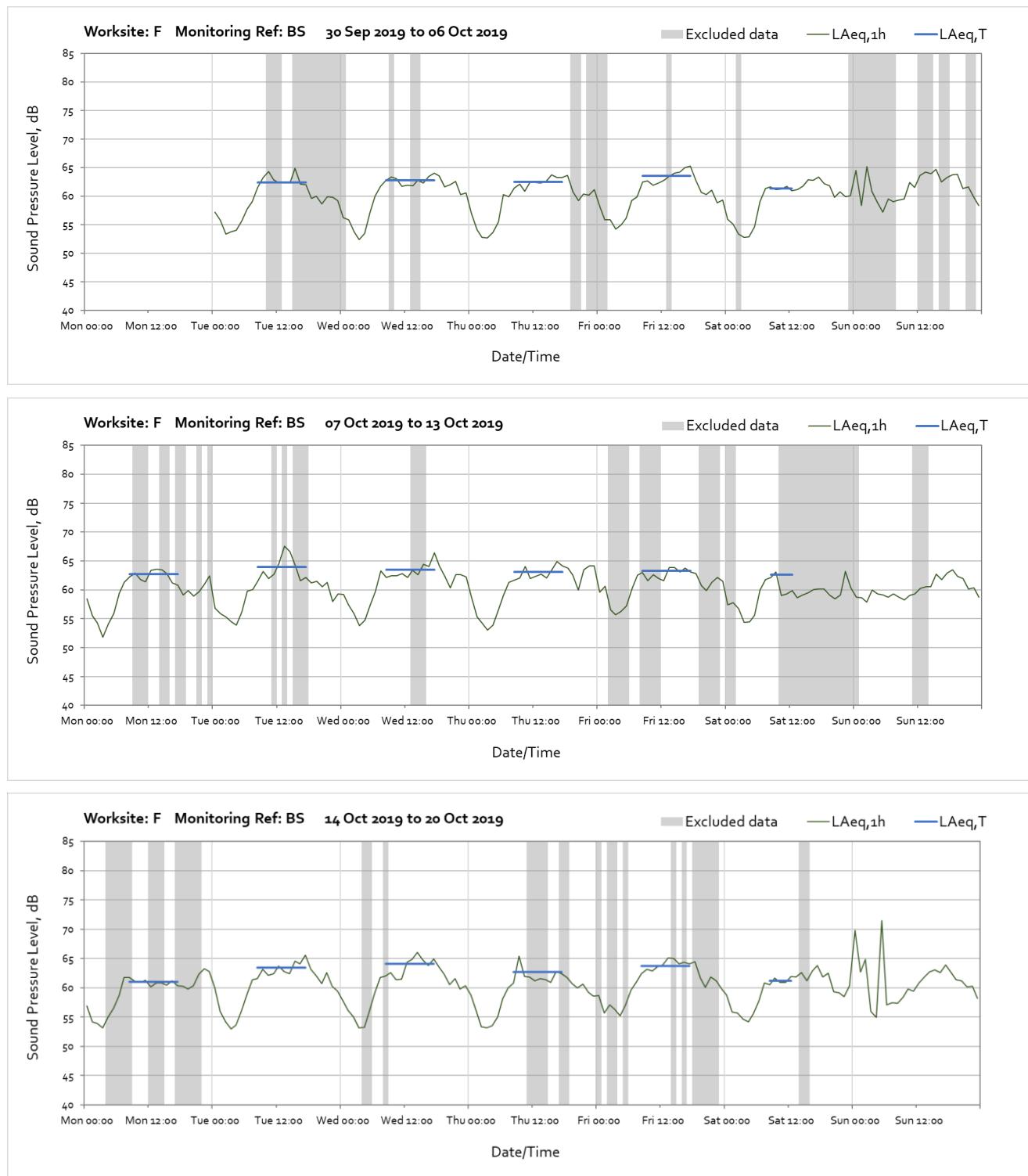


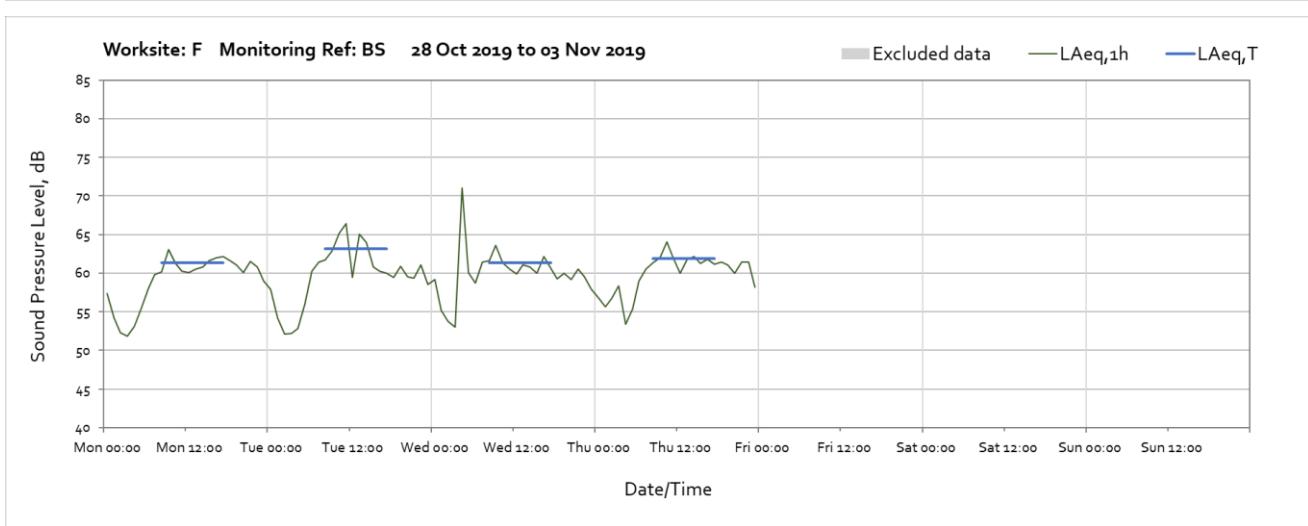
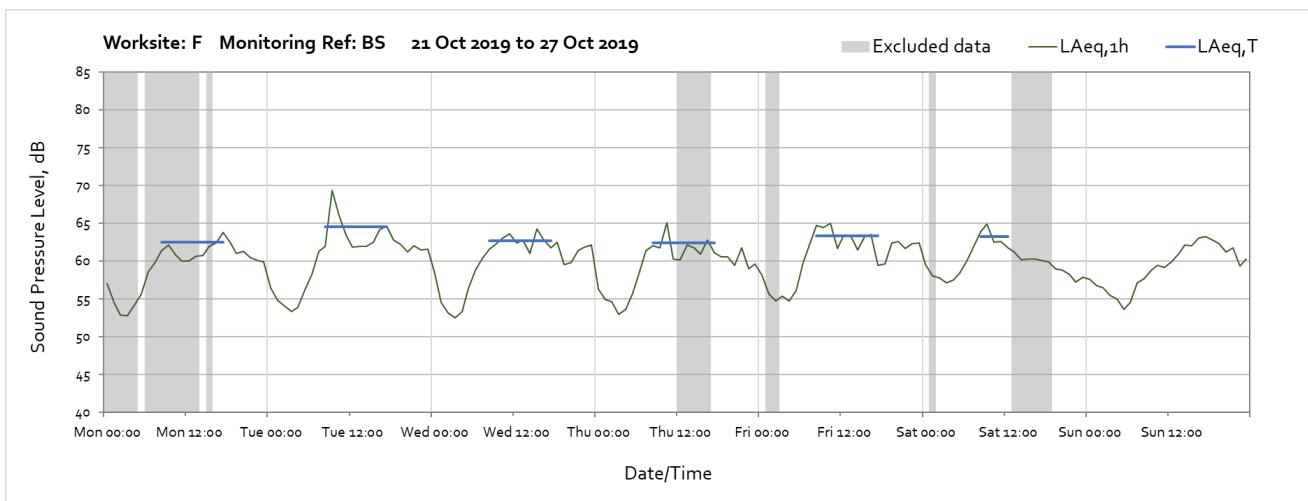
## Worksite: E – Monitoring Ref: N005



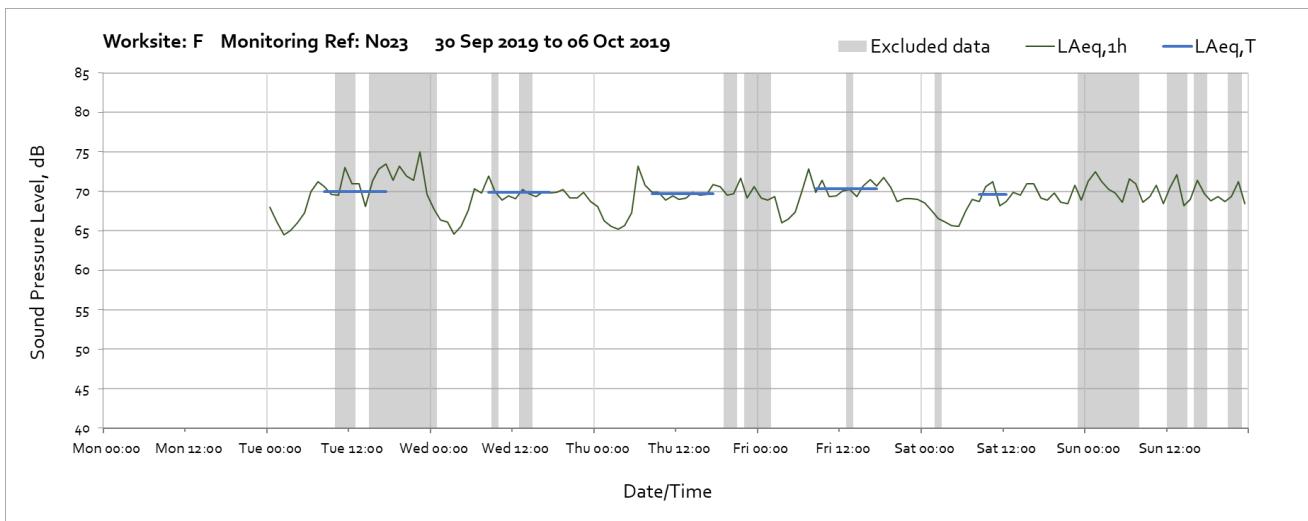


## Worksite: F – Monitoring Ref: BS





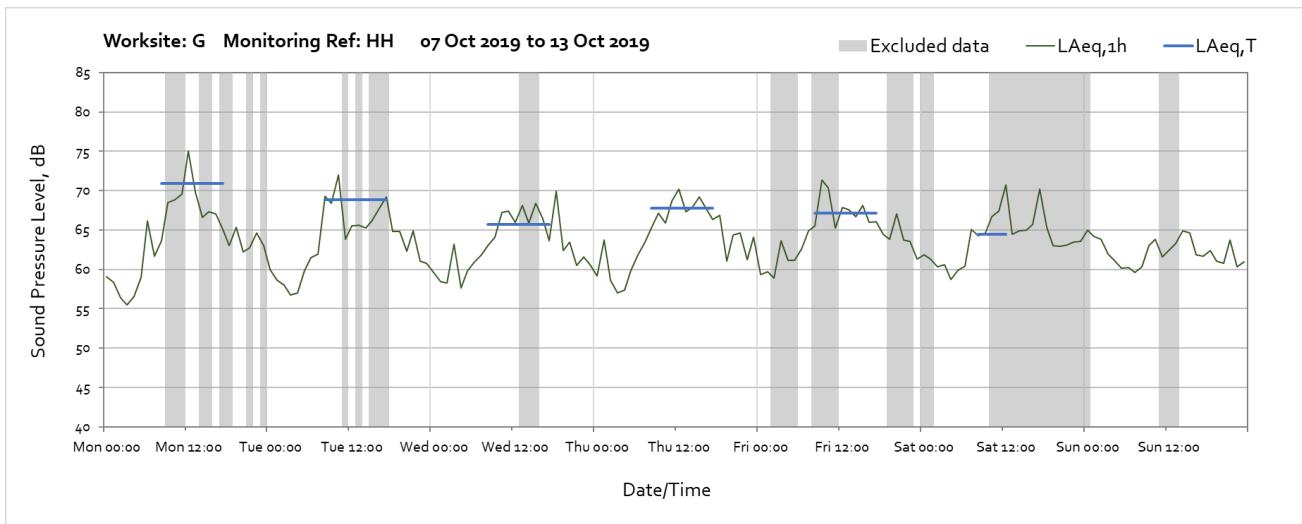
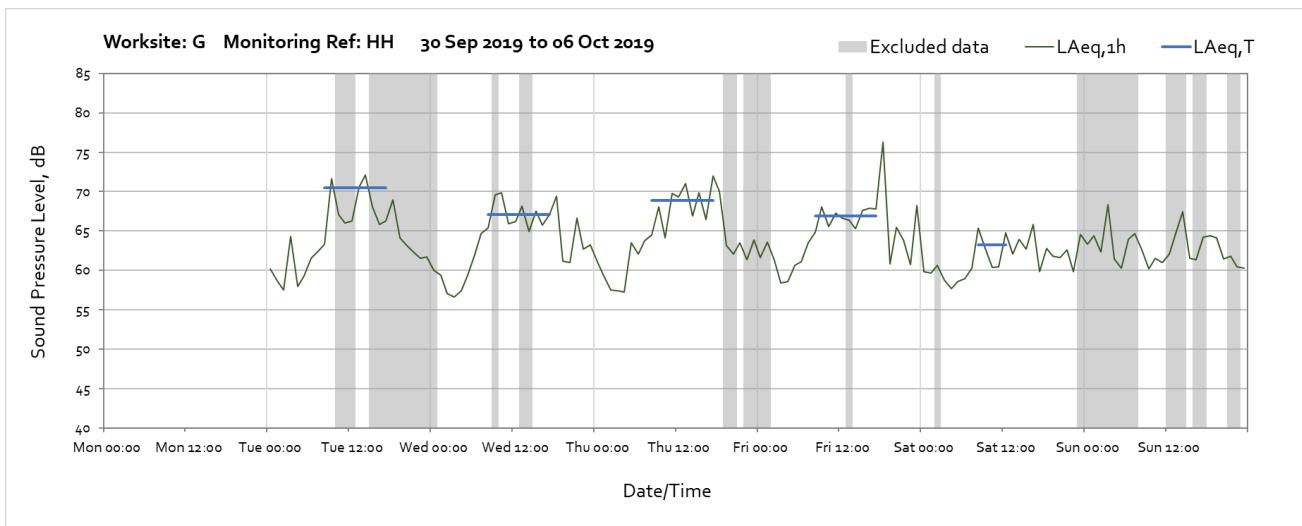
## Worksite: F – Monitoring Ref: N023

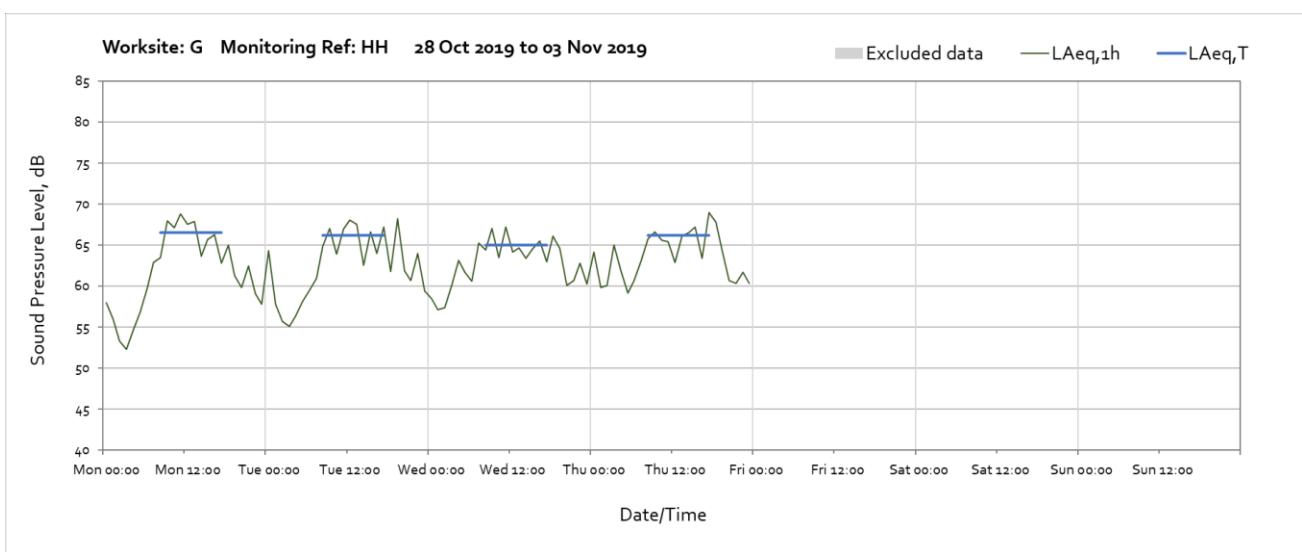
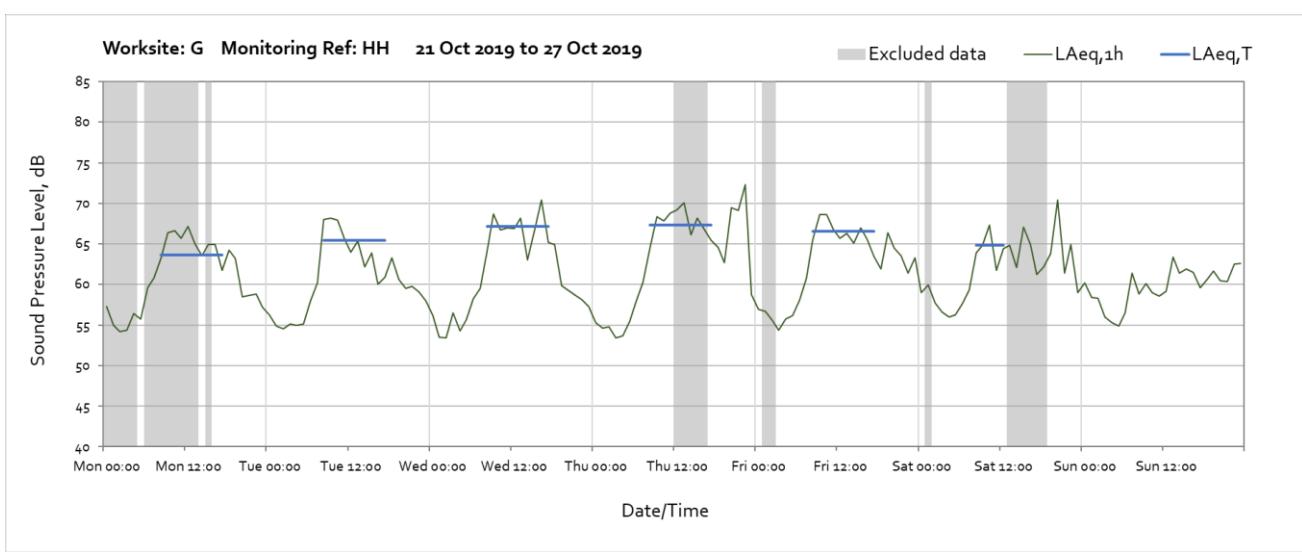
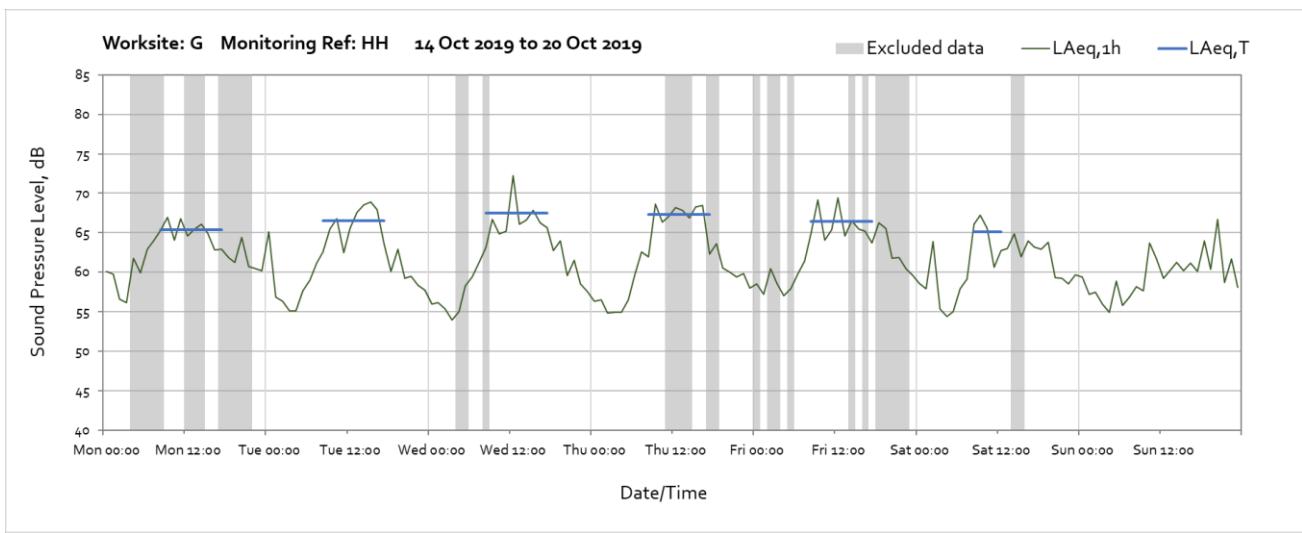




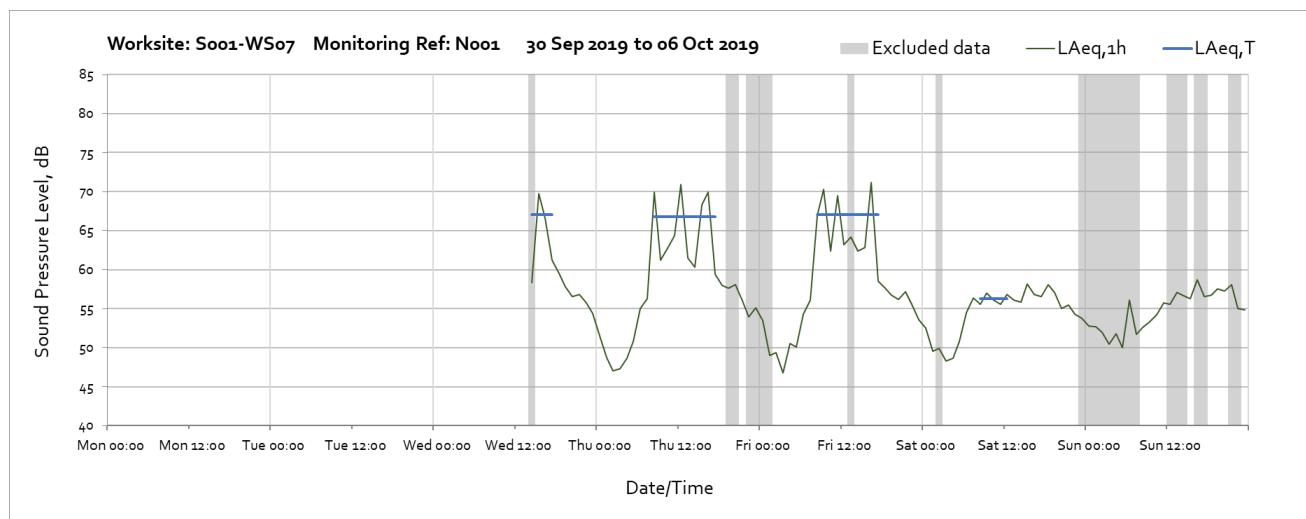


## Worksite: G – Monitoring Ref: HH

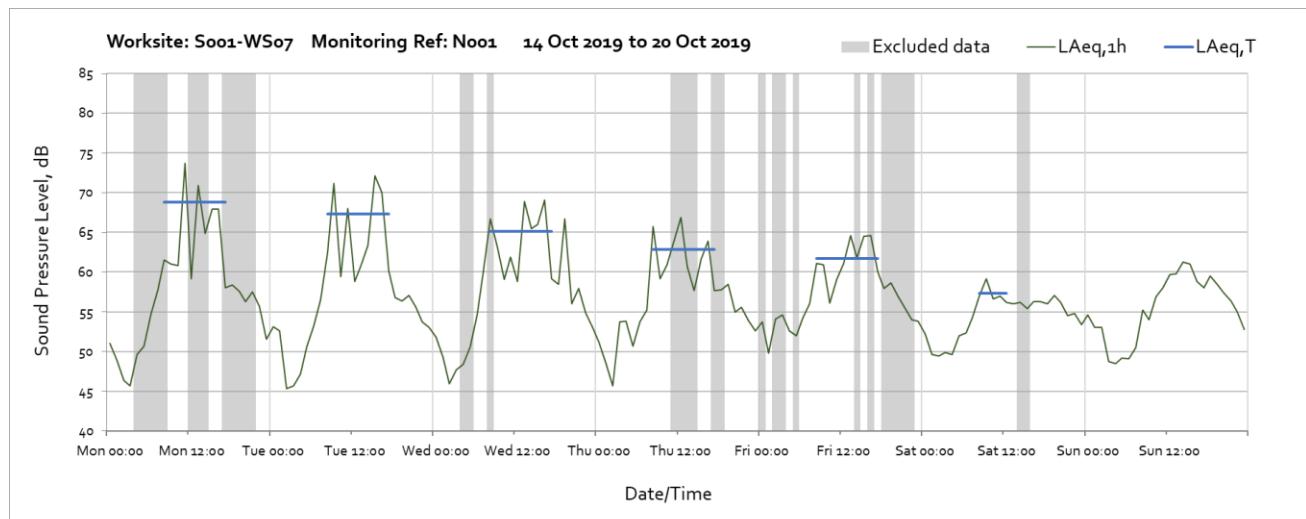
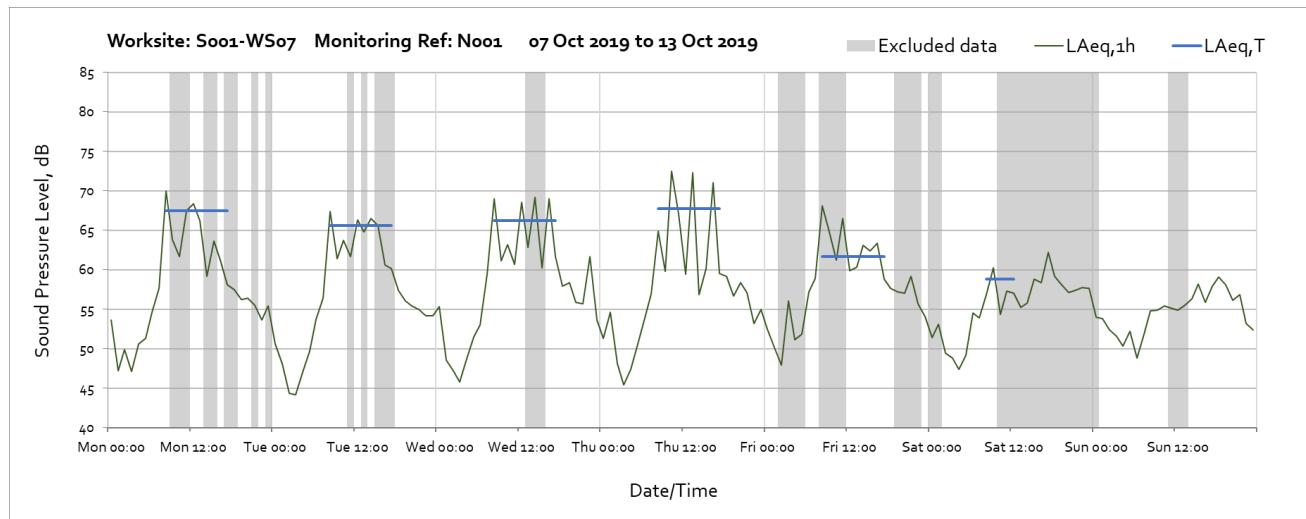


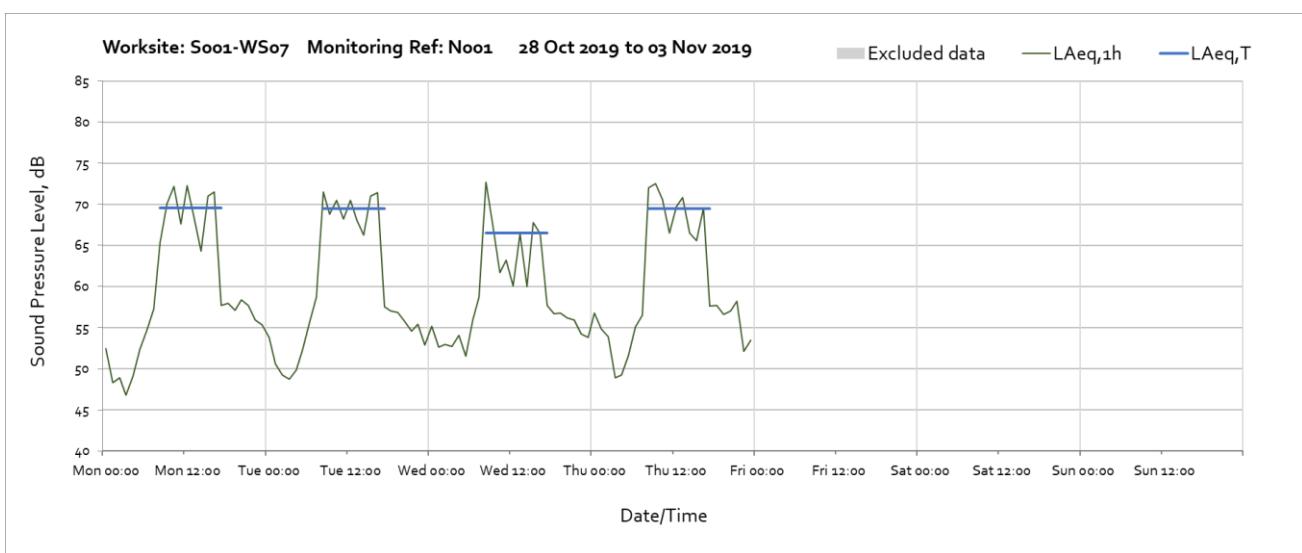
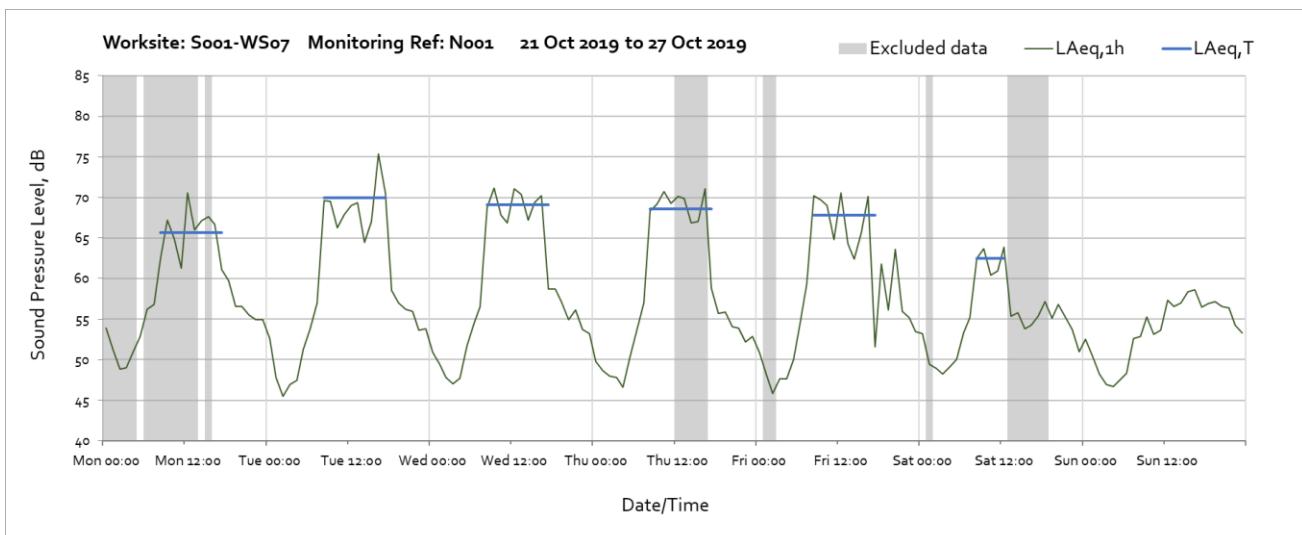


## Worksite: S001-WS01 – Monitoring Ref: N001

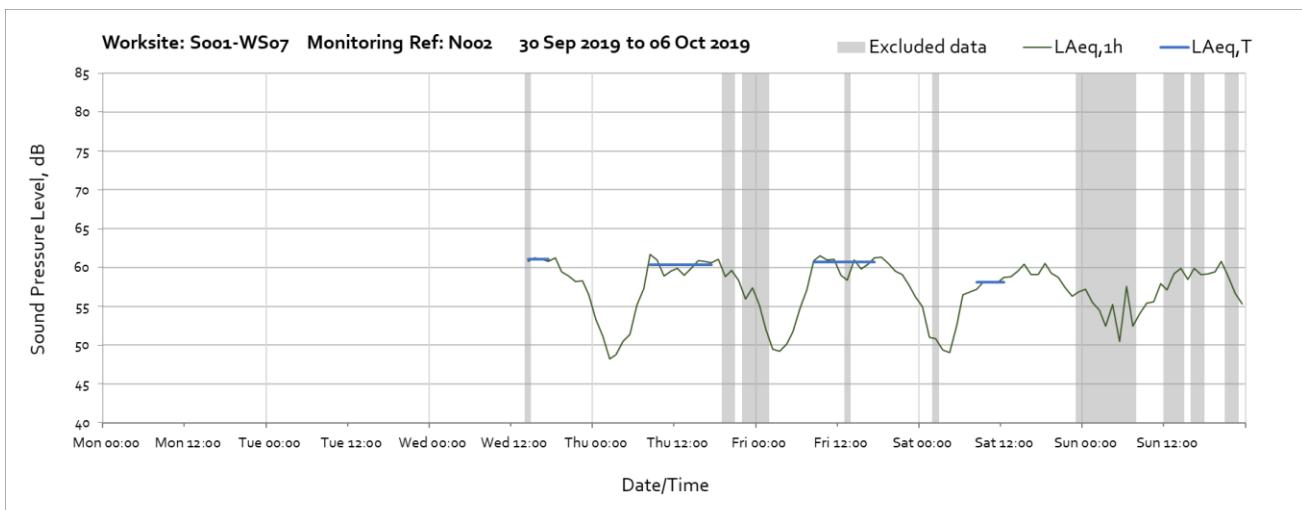


Note: Missing data between 00:00 on Tuesday 1<sup>st</sup> and 14:00 on Wednesday 2<sup>nd</sup> October was due to a restart error following an update of the noise monitor firmware.

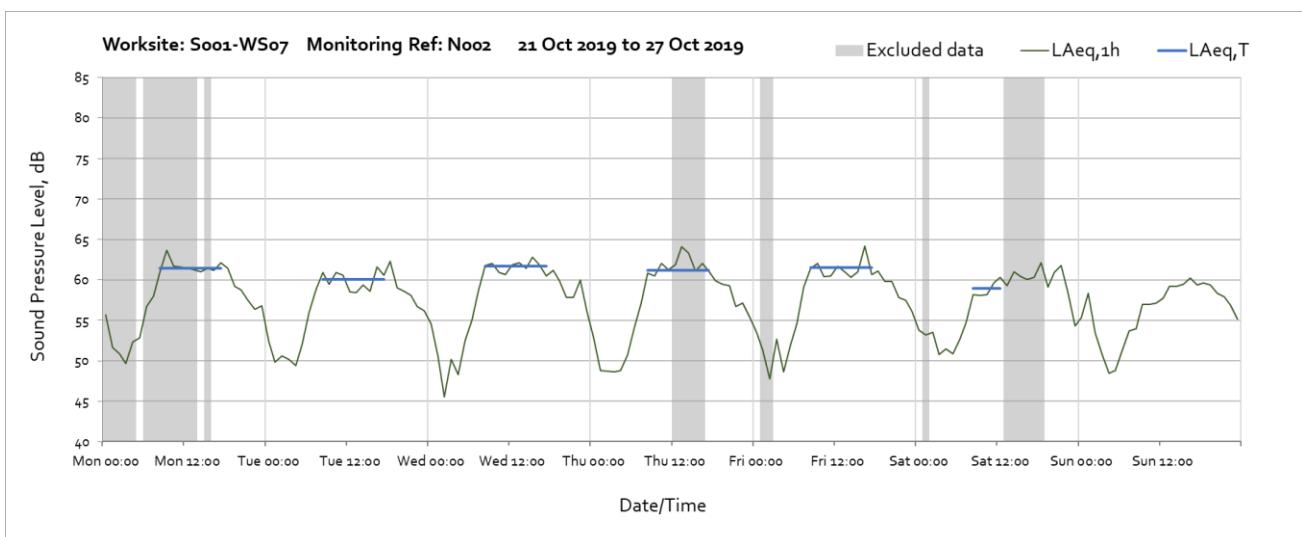
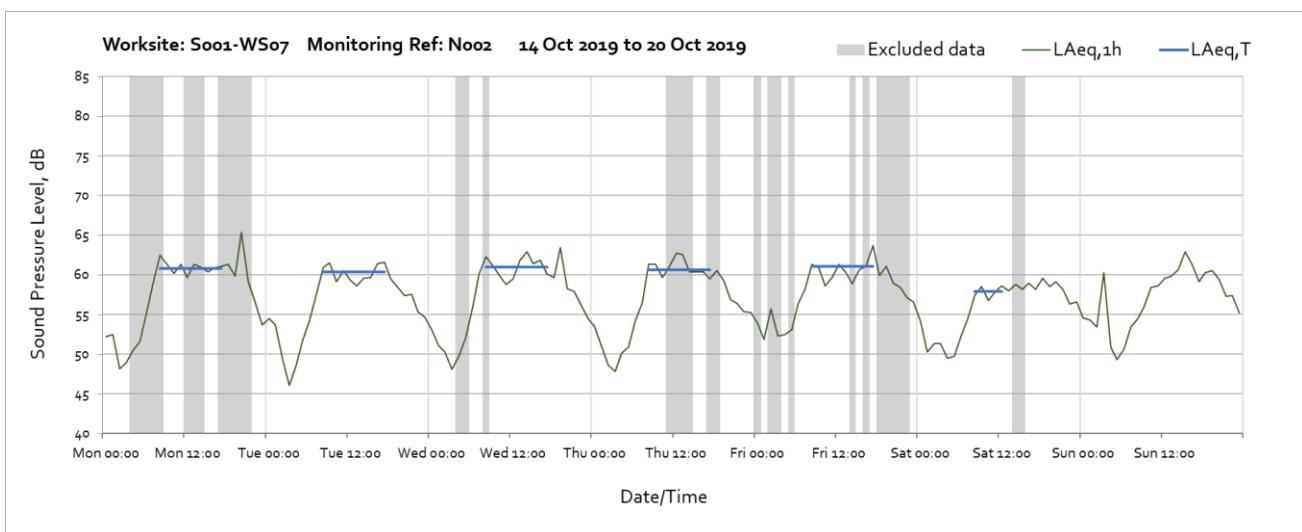
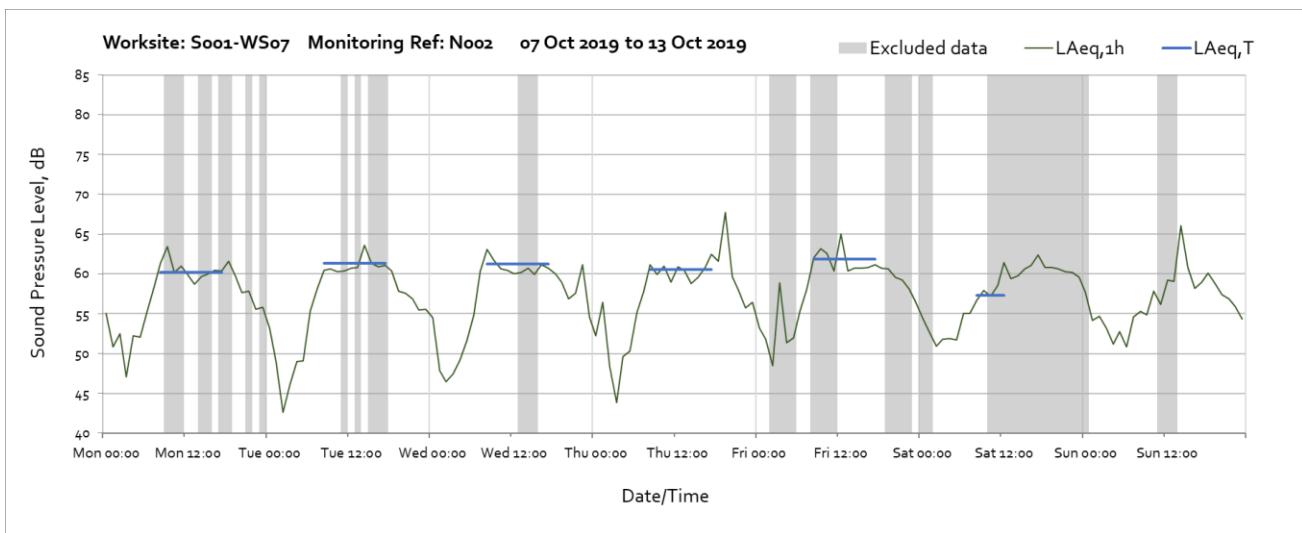


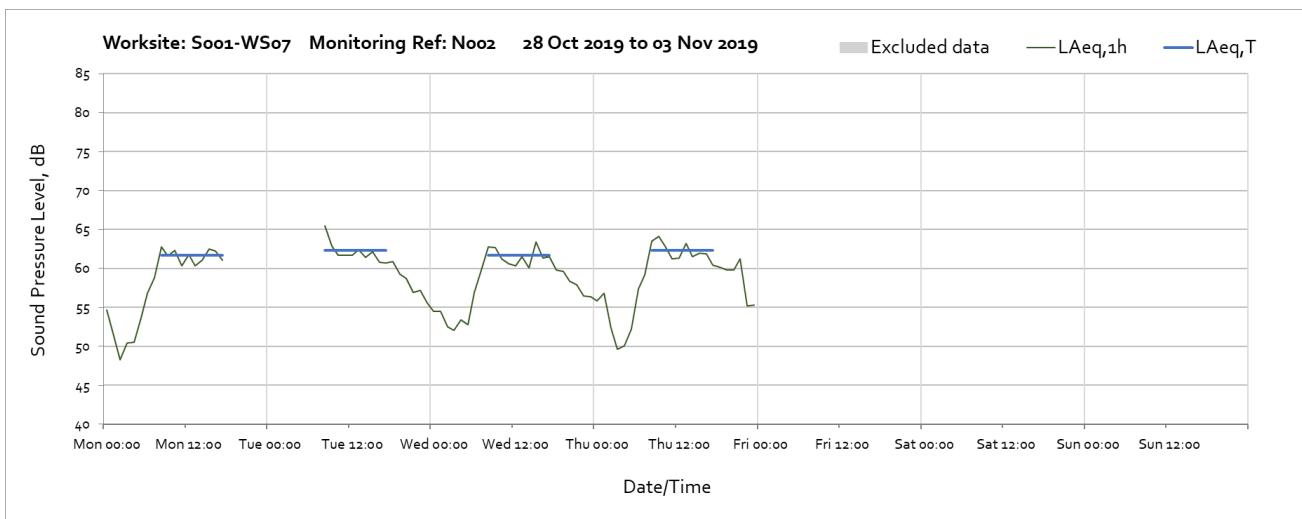


## Worksite: S001-WS01 – Monitoring Ref: N002



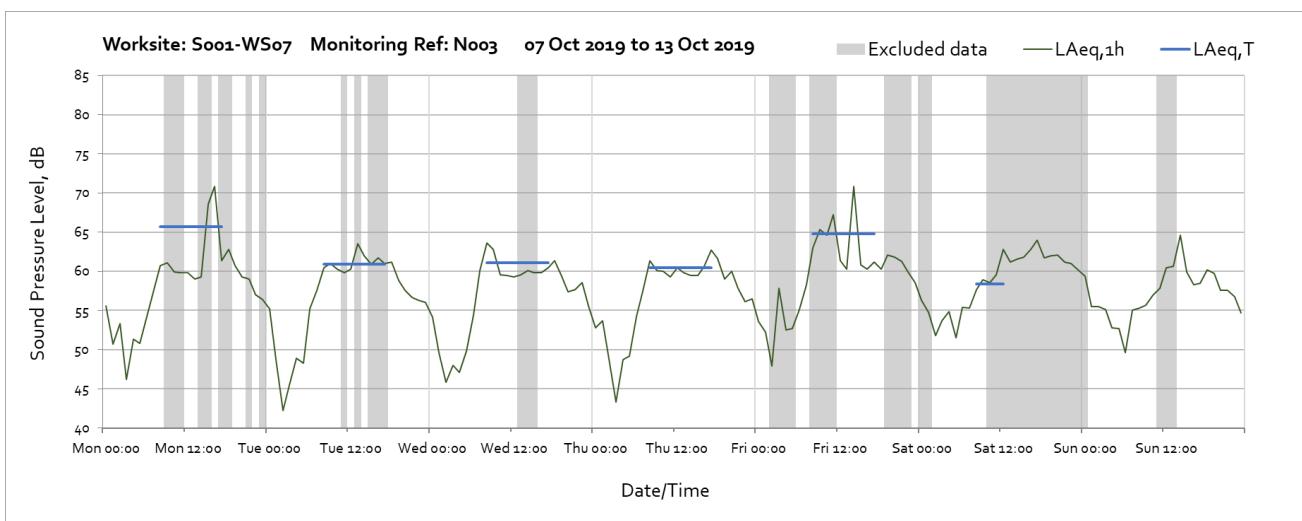
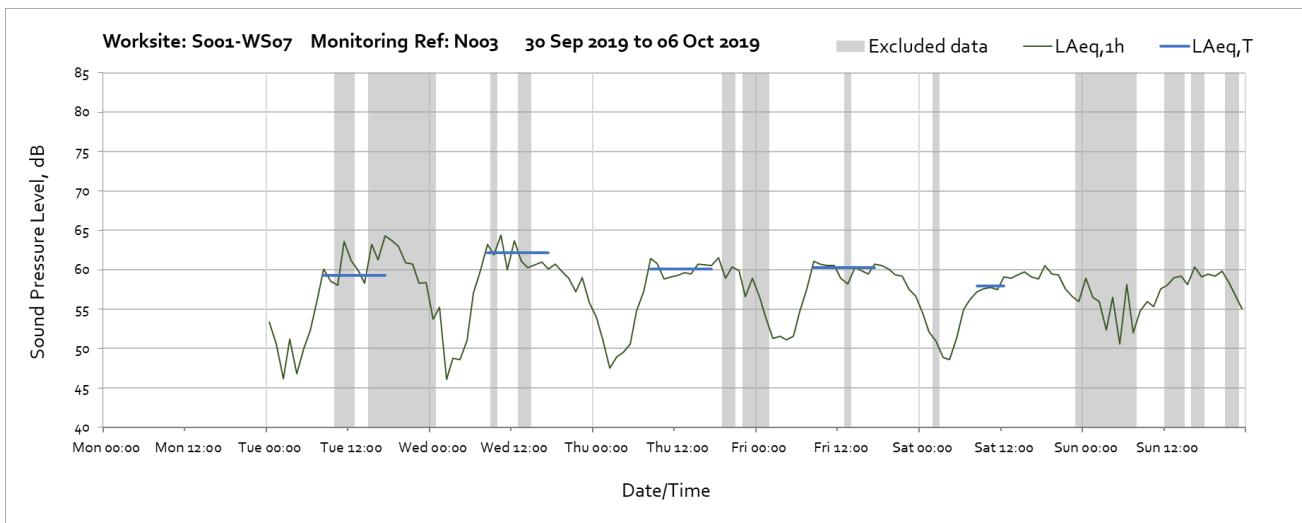
Note: Missing data between 00:00 on Tuesday 1<sup>st</sup> and 14:00 on Wednesday 2<sup>nd</sup> October was due to a restart error following an update of the noise monitor firmware.

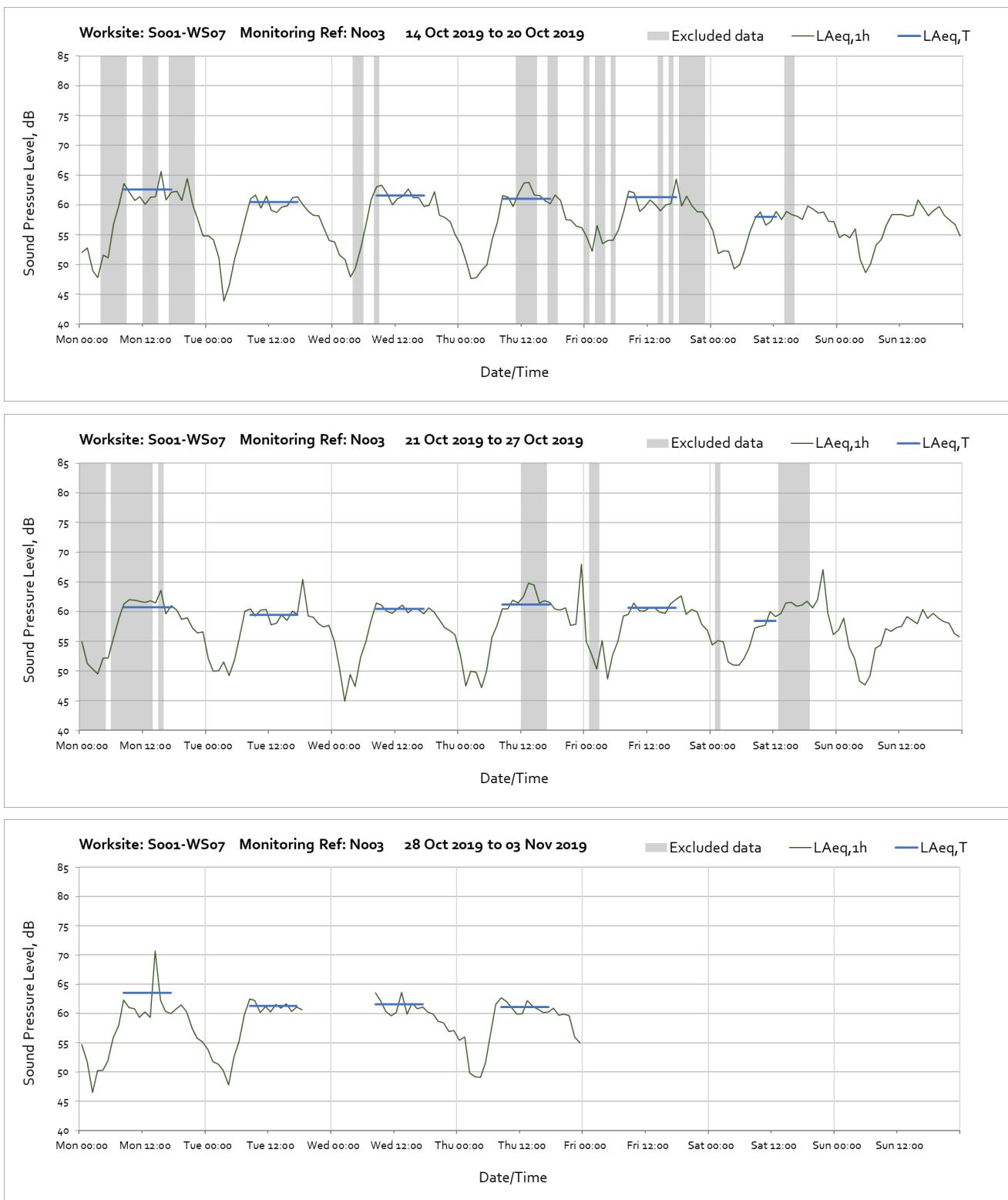




Note: Missing data between 18:00 on Monday 28<sup>th</sup> and 08:00 on Tuesday 29<sup>th</sup> October was due to a restart error following an update of the noise monitor firmware.

## Worksite: S001-WS01 – Monitoring Ref: N003

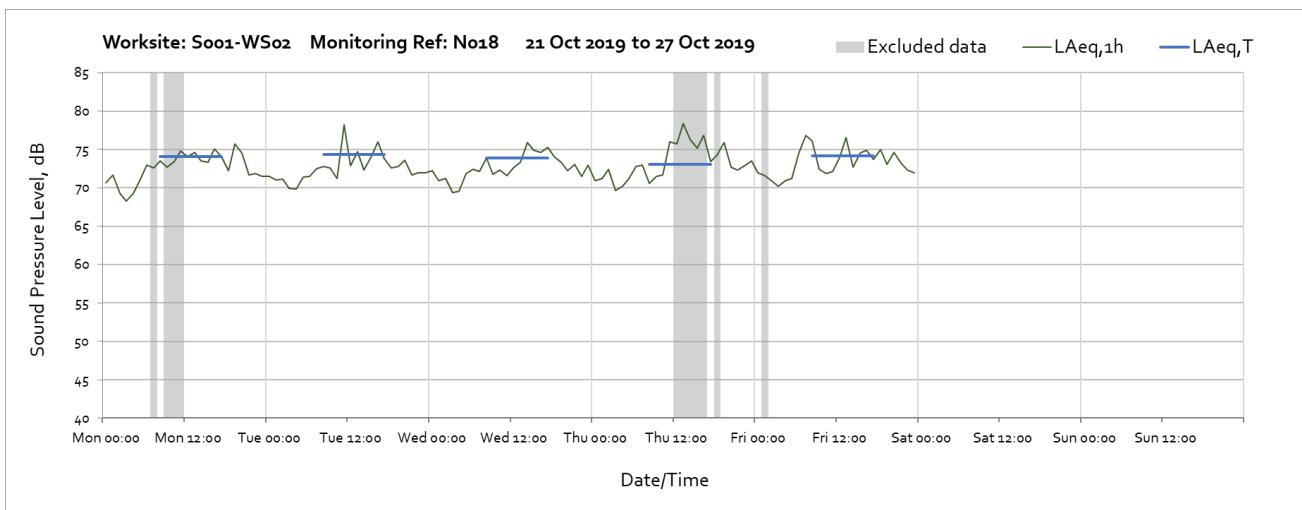




Note: Missing data between 19:00 on Tuesday 29<sup>th</sup> and 08:00 on Wednesday 30<sup>th</sup> October was due to a restart error following an update of the noise monitor firmware.

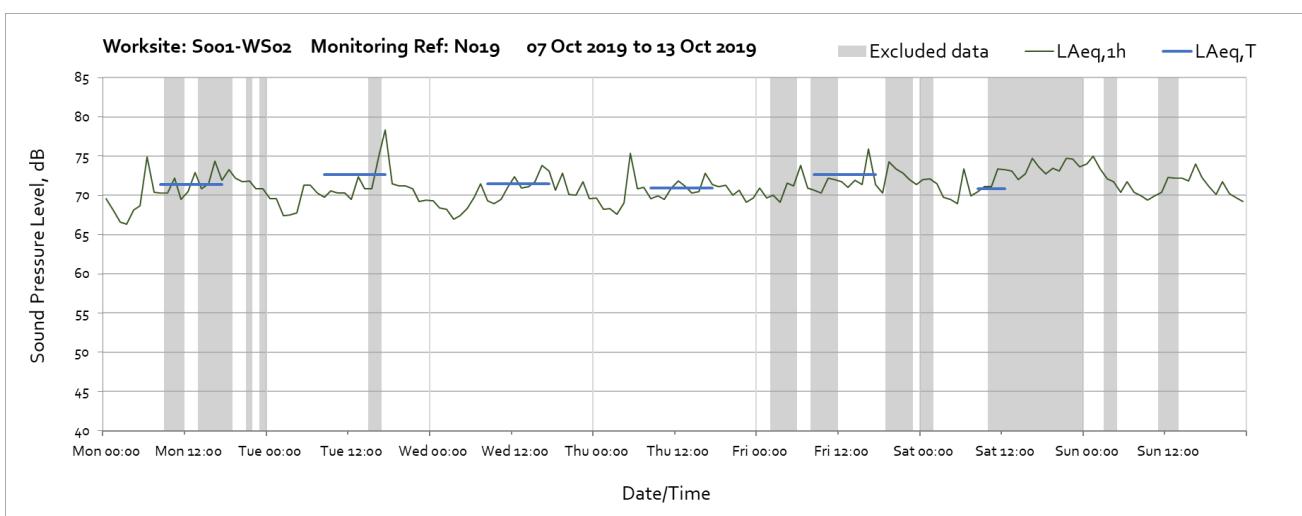
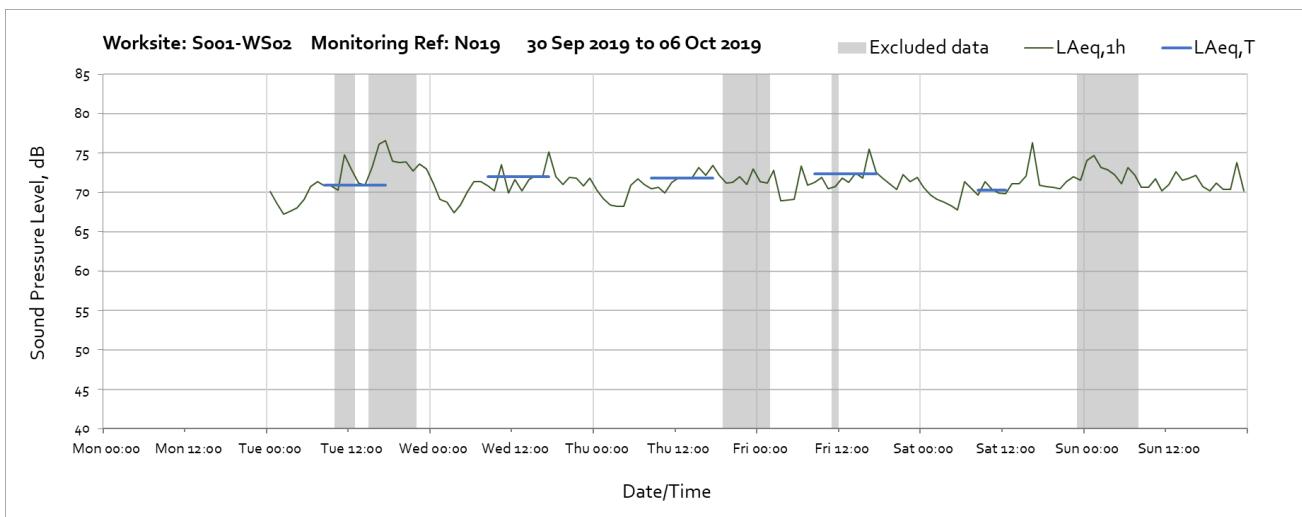
## Worksite: S001-WS02 – Monitoring Ref: N018





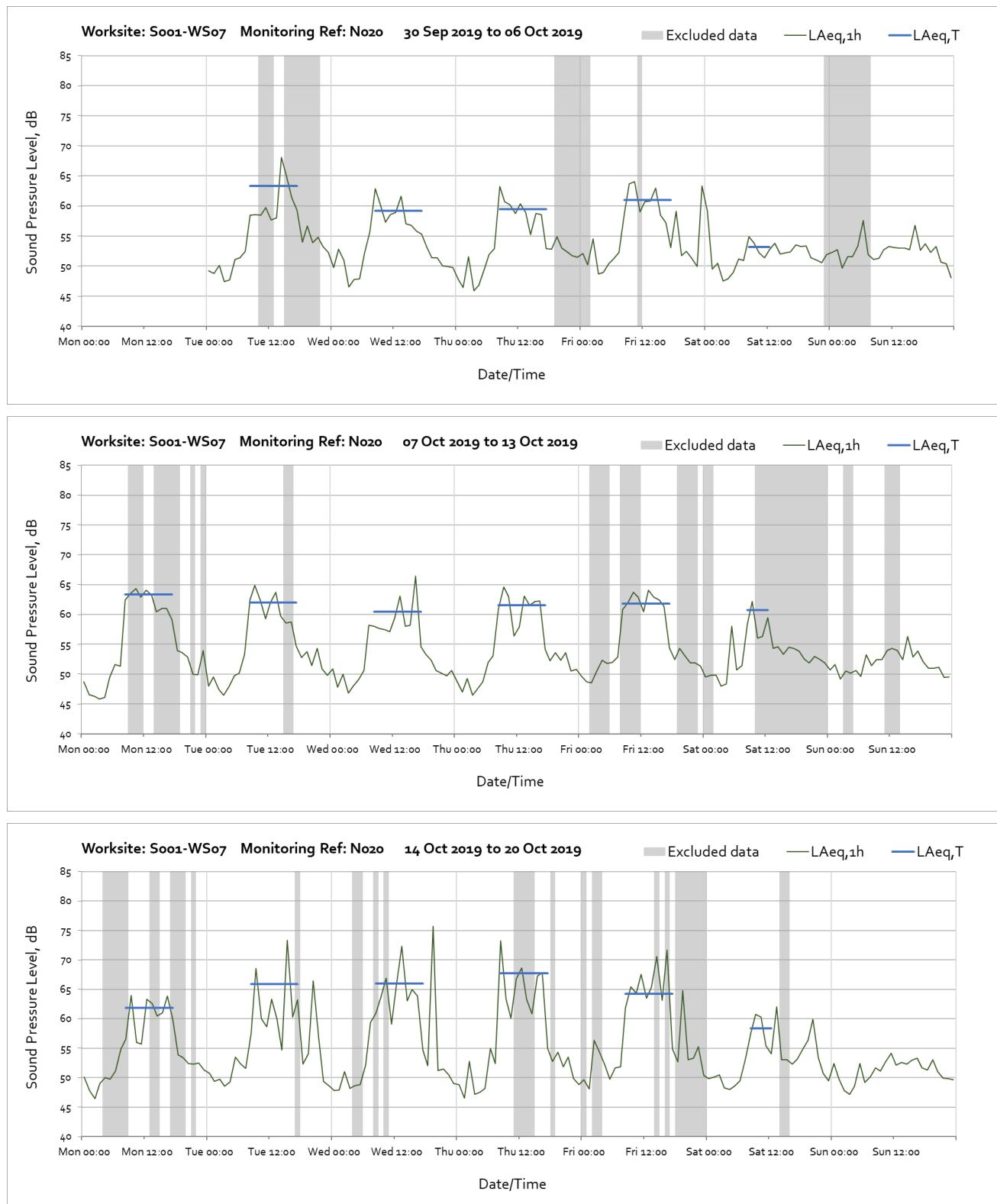
Note: Missing data from 00:00 on Saturday 26<sup>th</sup> October is due to loss of power at the monitoring station.

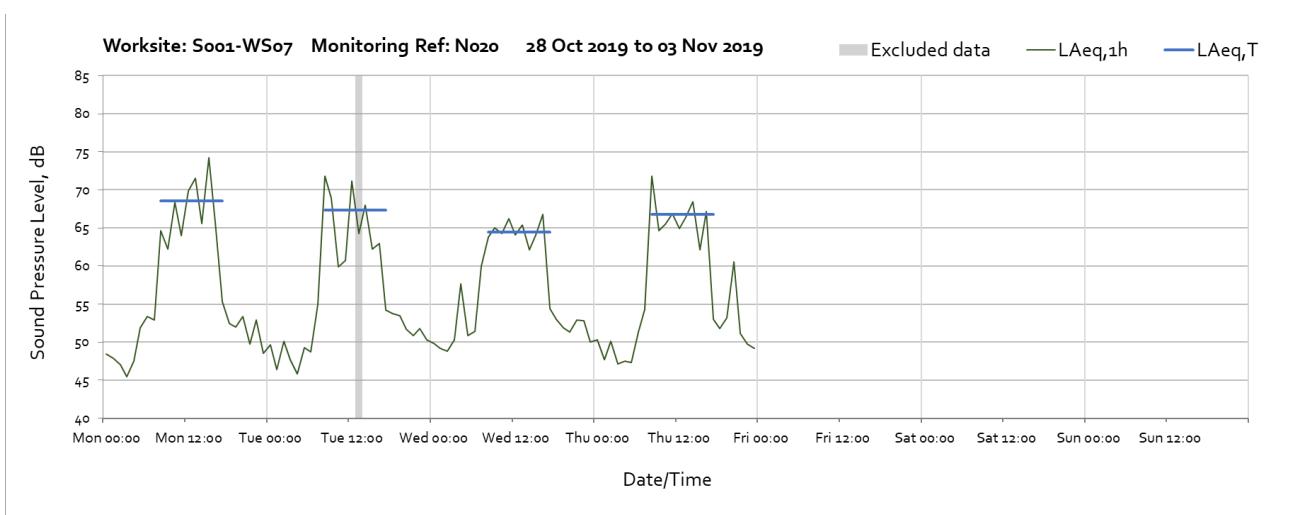
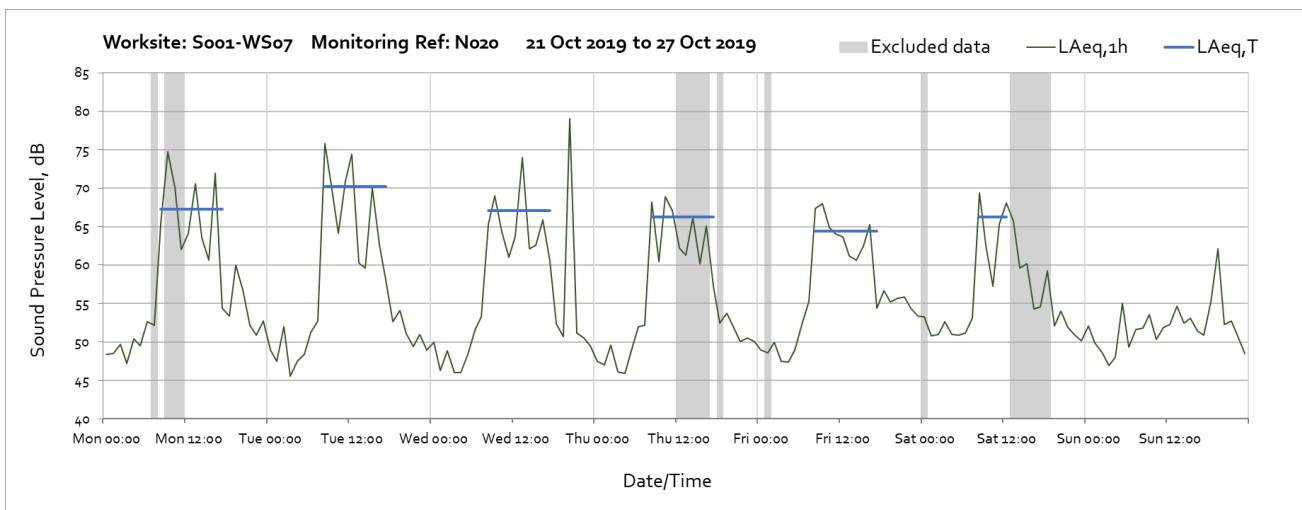
## Worksite: S001-WS02 – Monitoring Ref: N019



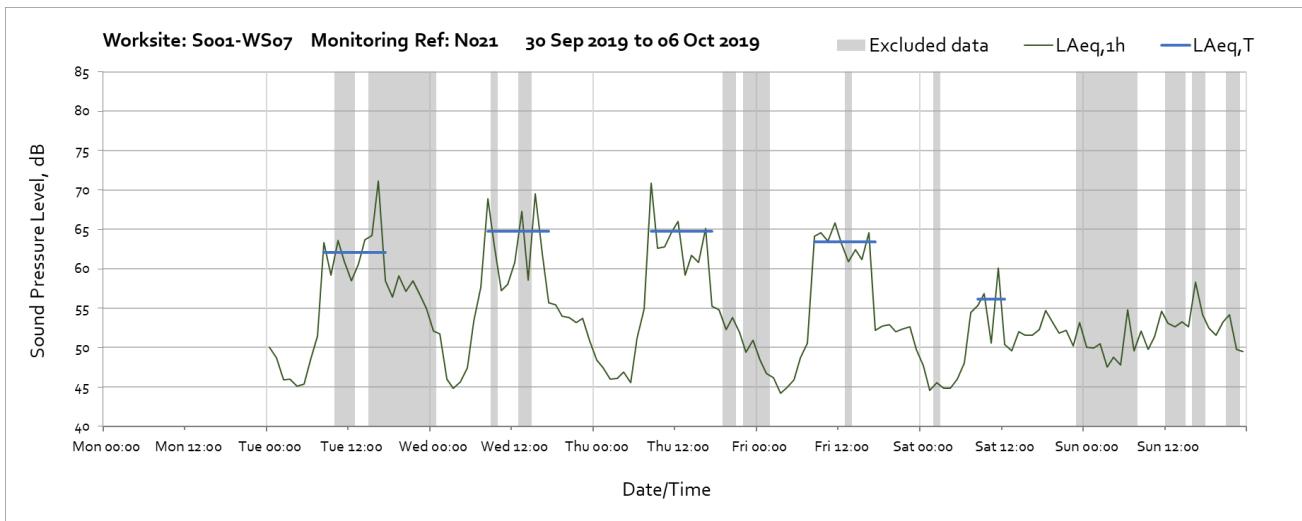


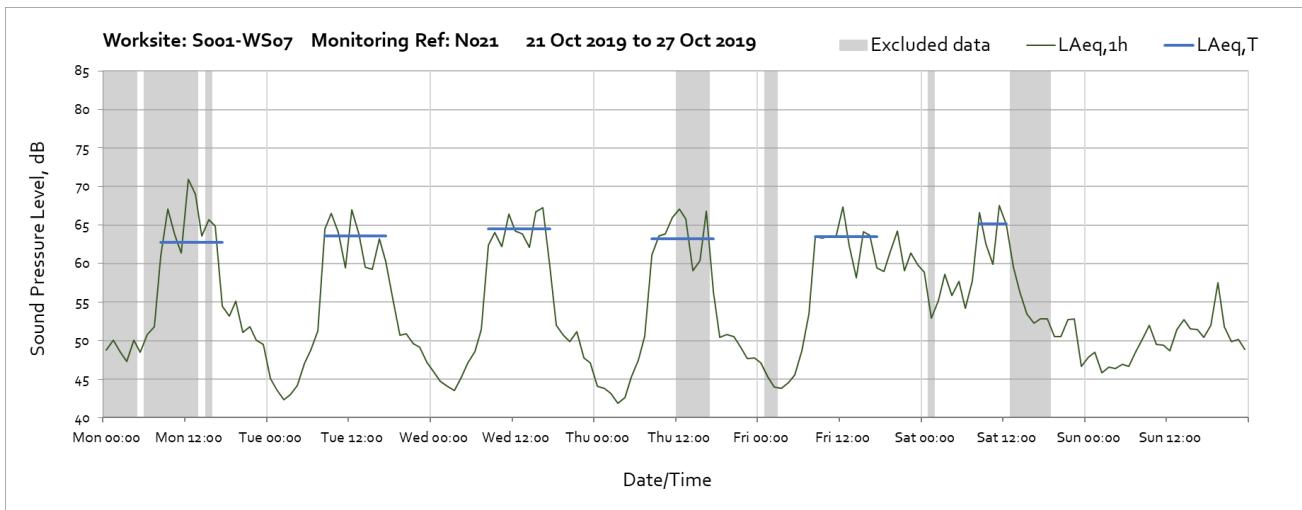
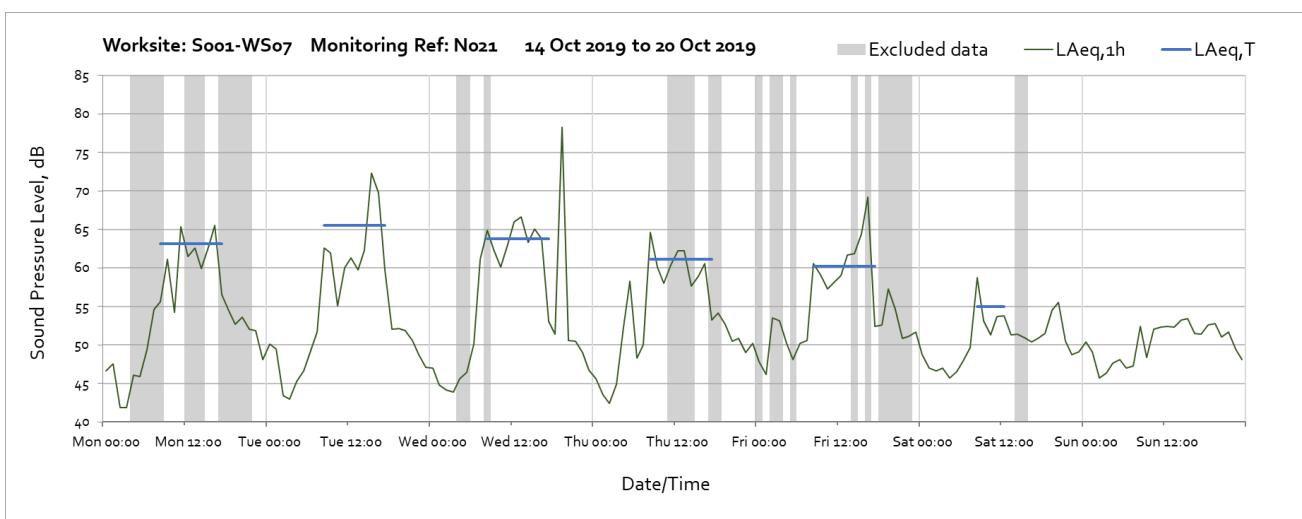
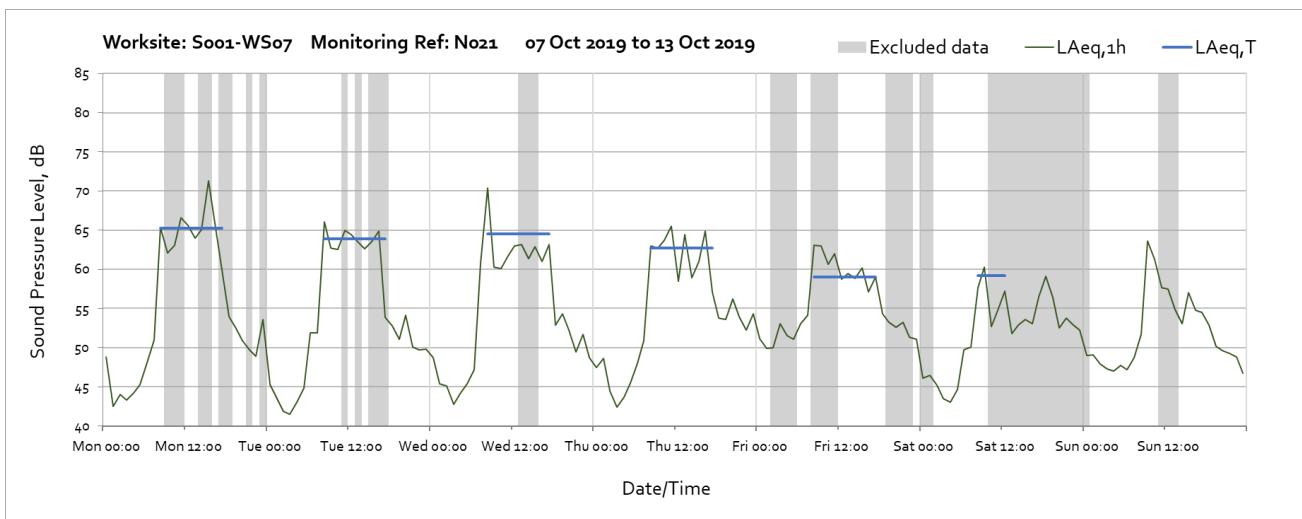
## Worksite: S001-WS07 – Monitoring Ref: N020

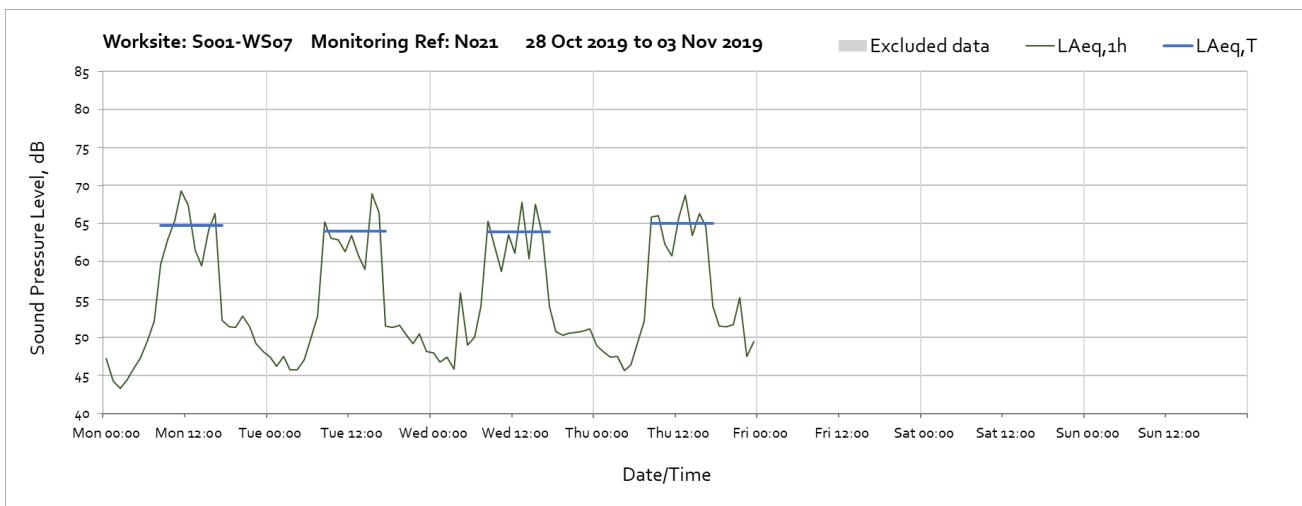




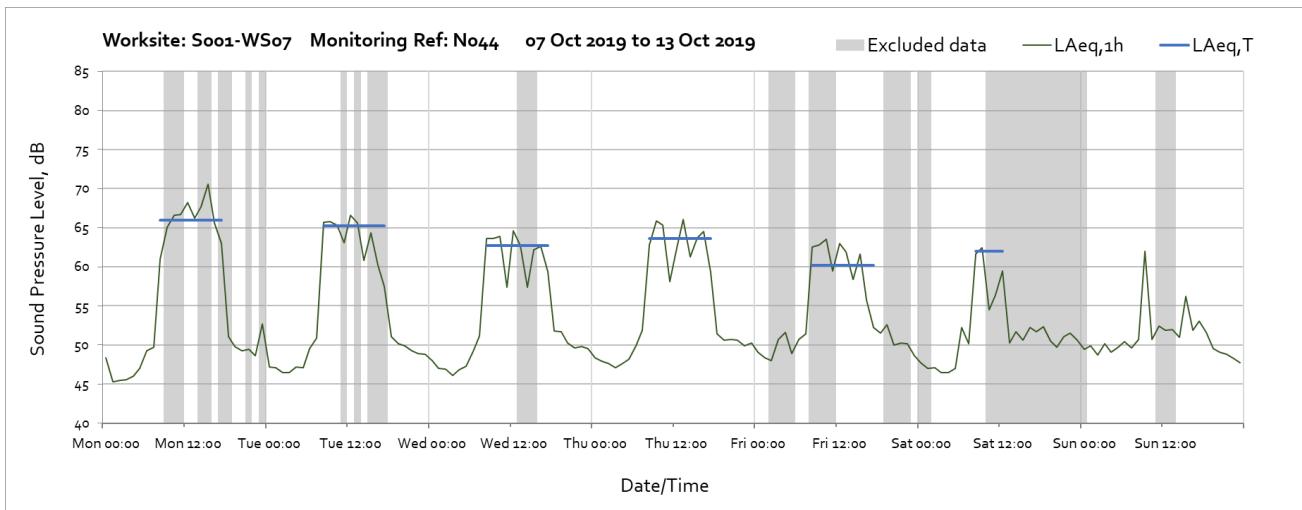
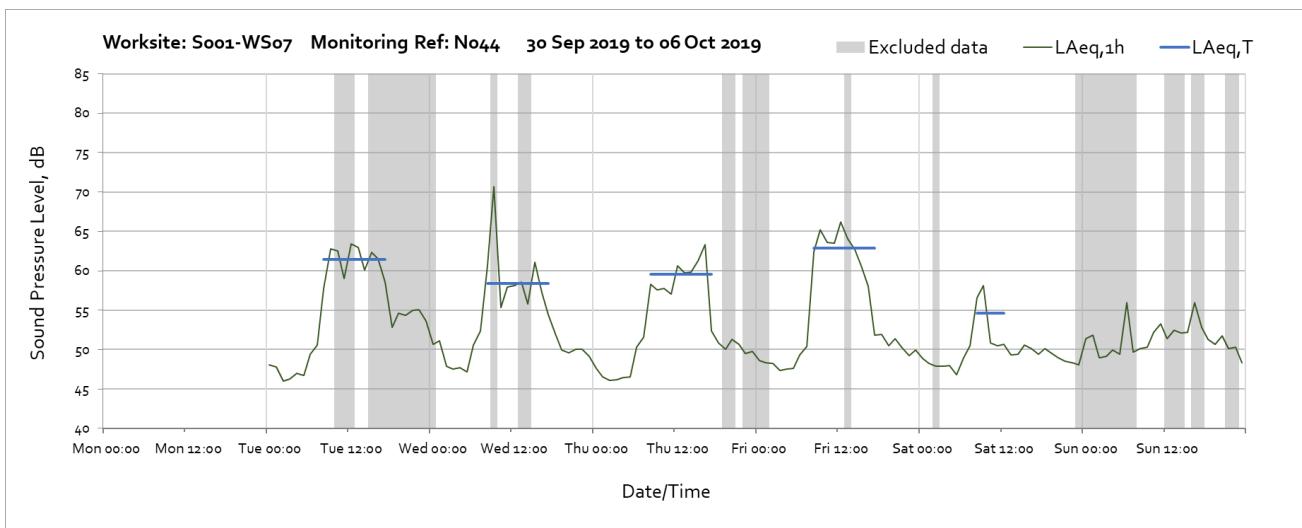
## Worksite: S001-WS07 – Monitoring Ref: N021







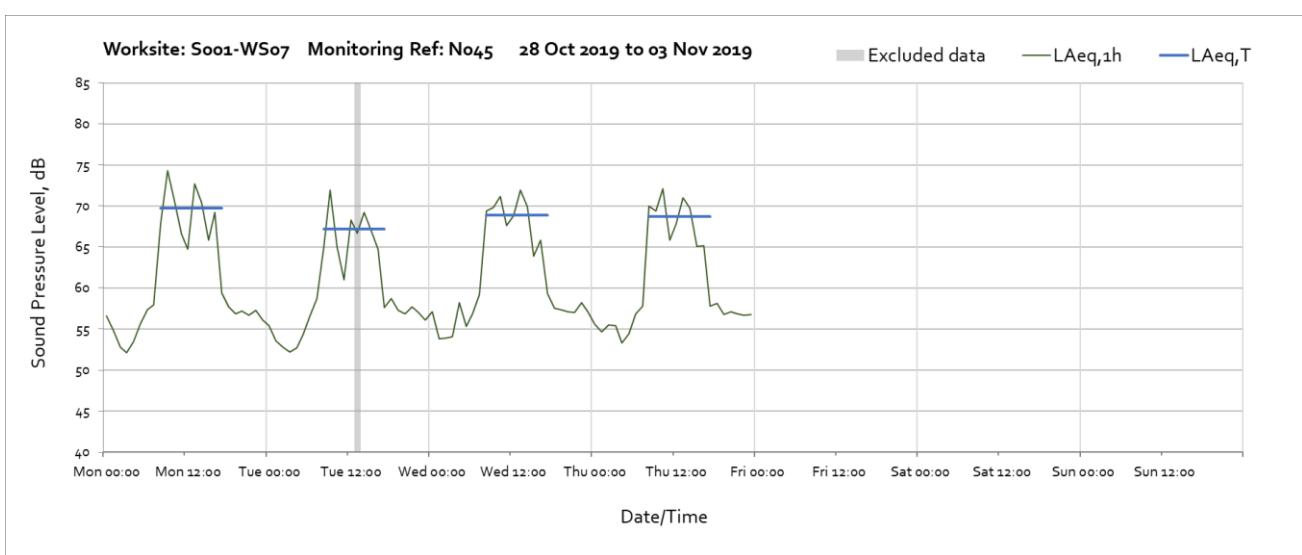
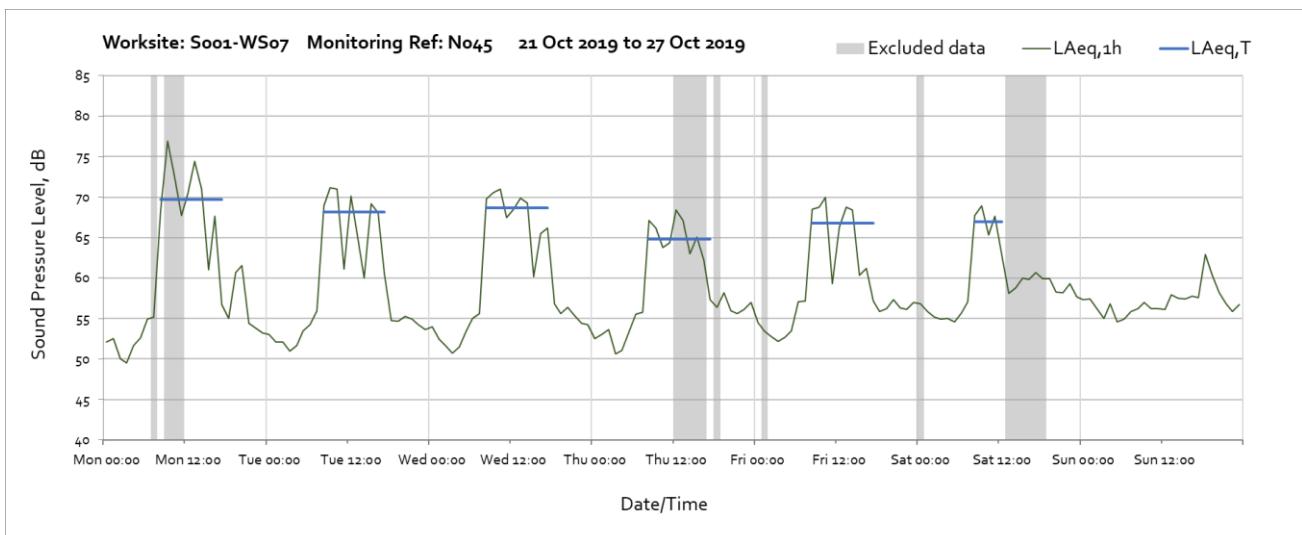
## Worksite: S001-WS07 – Monitoring Ref: N044



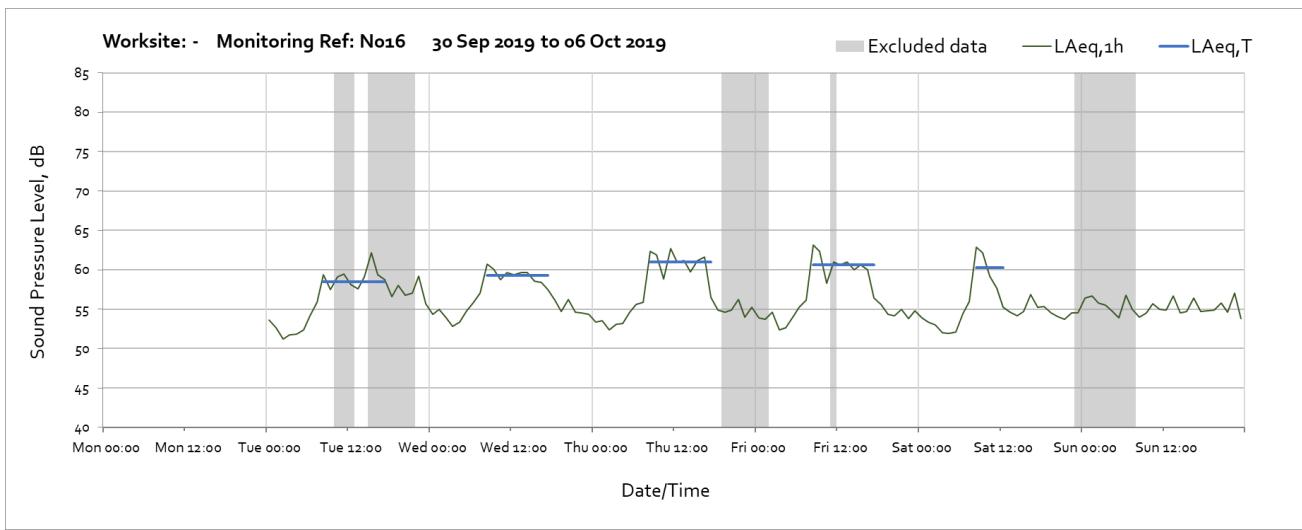


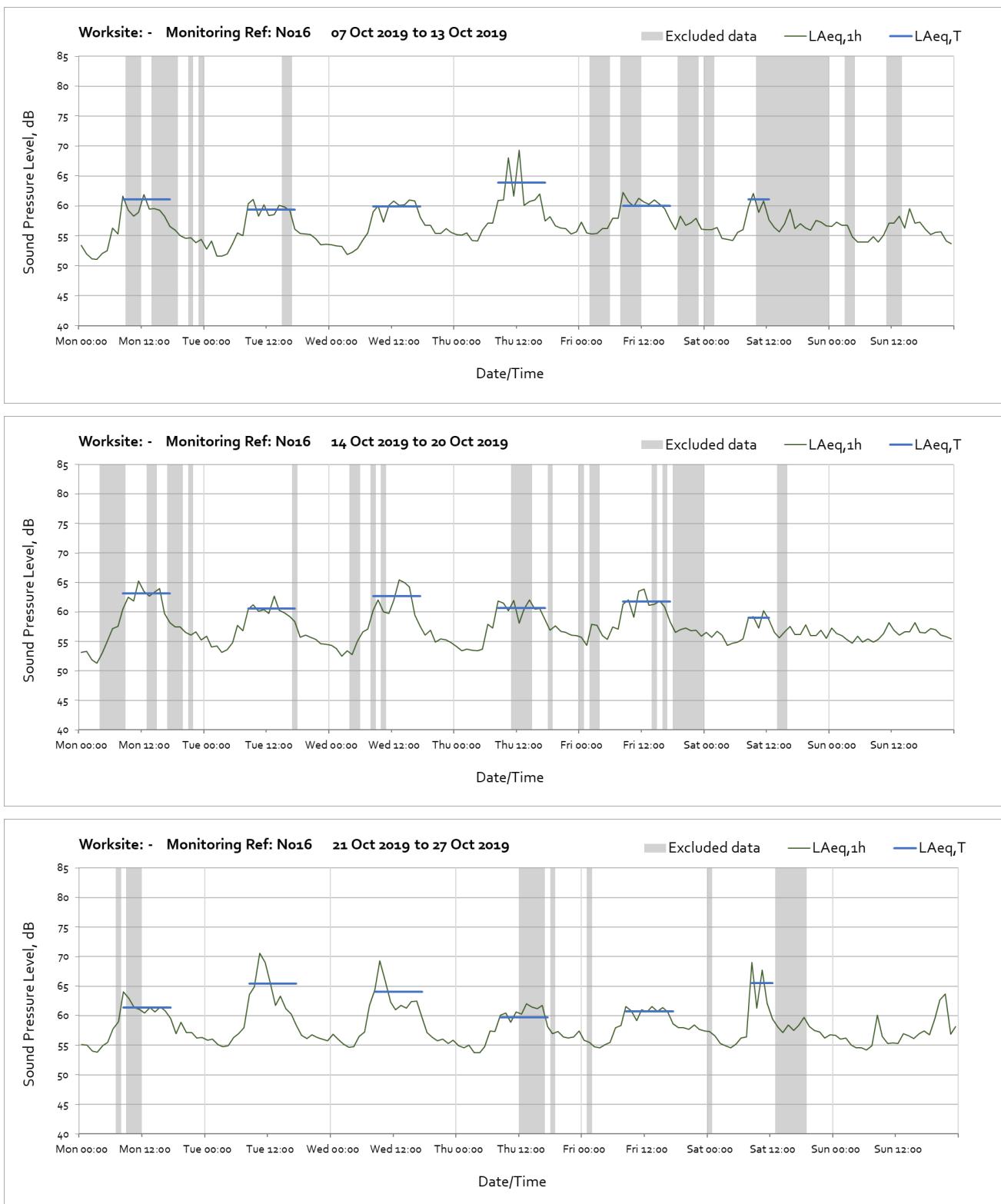
## Worksite: S001-WS07 – Monitoring Ref: N045

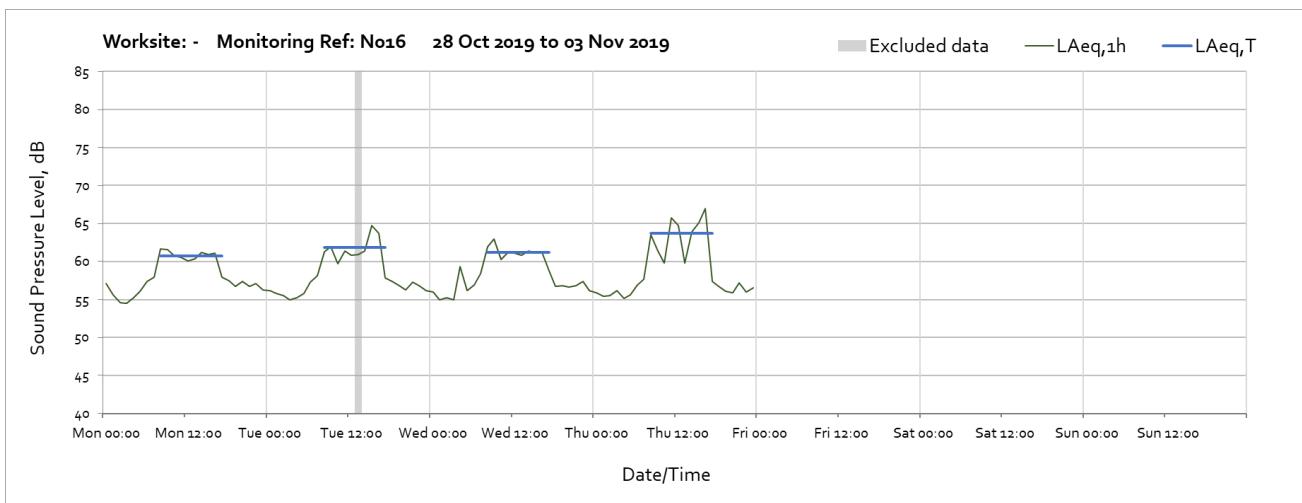




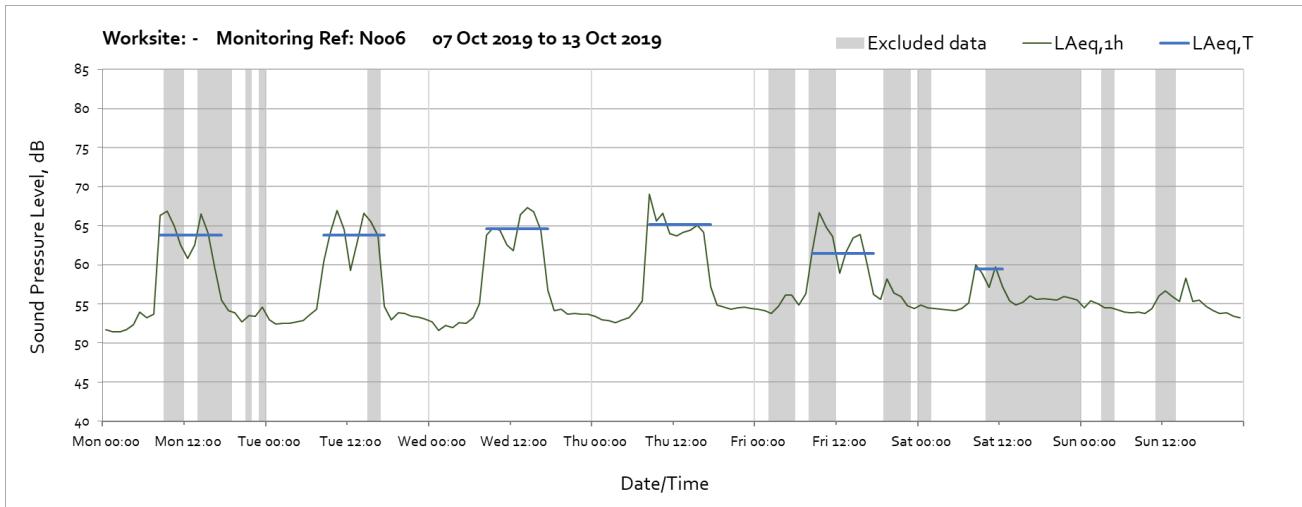
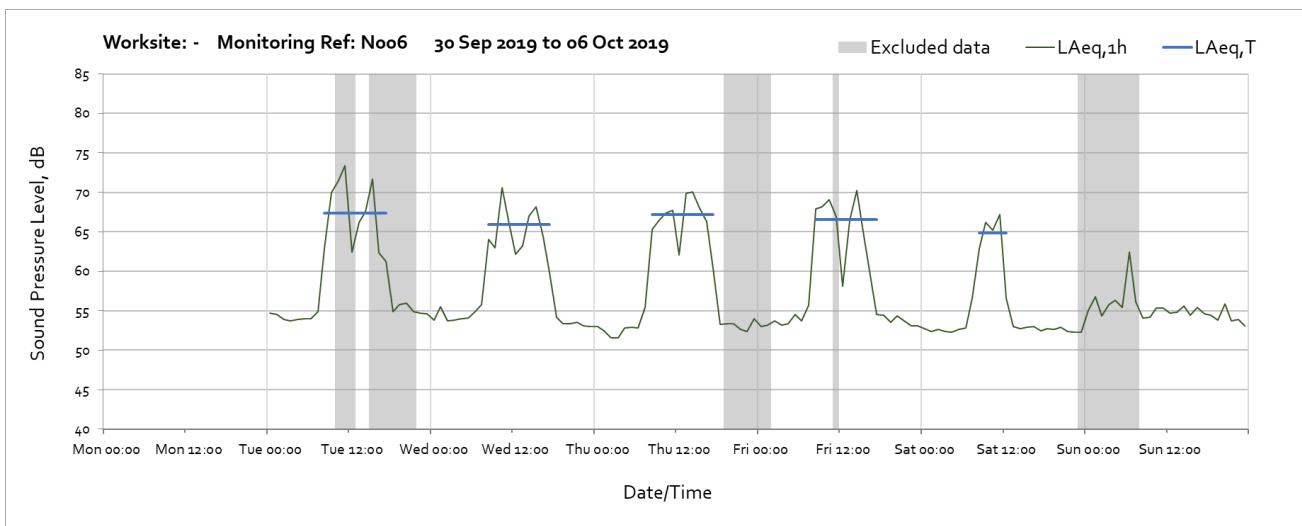
## Worksite: S003-WS01 – Monitoring Ref: N016

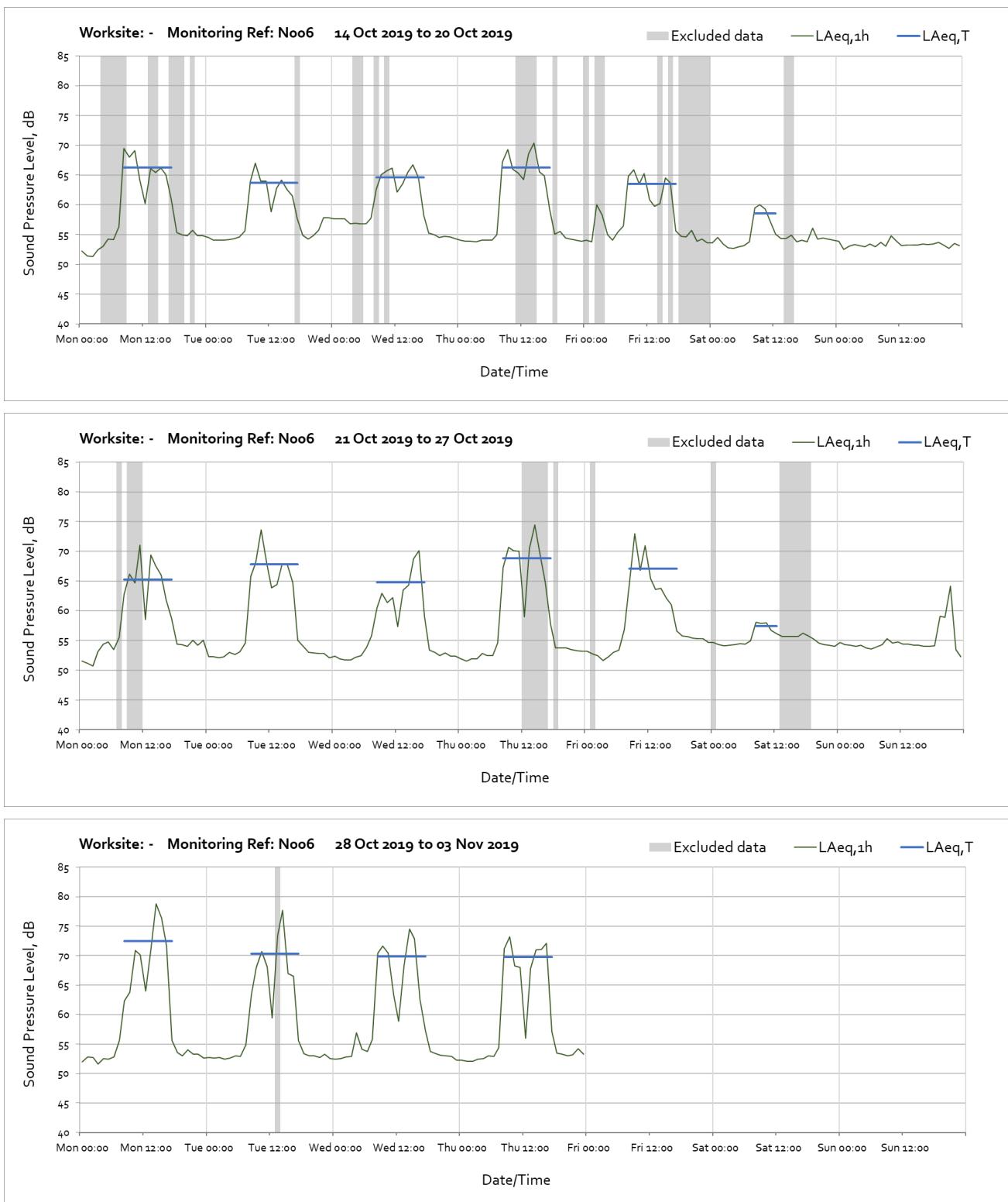




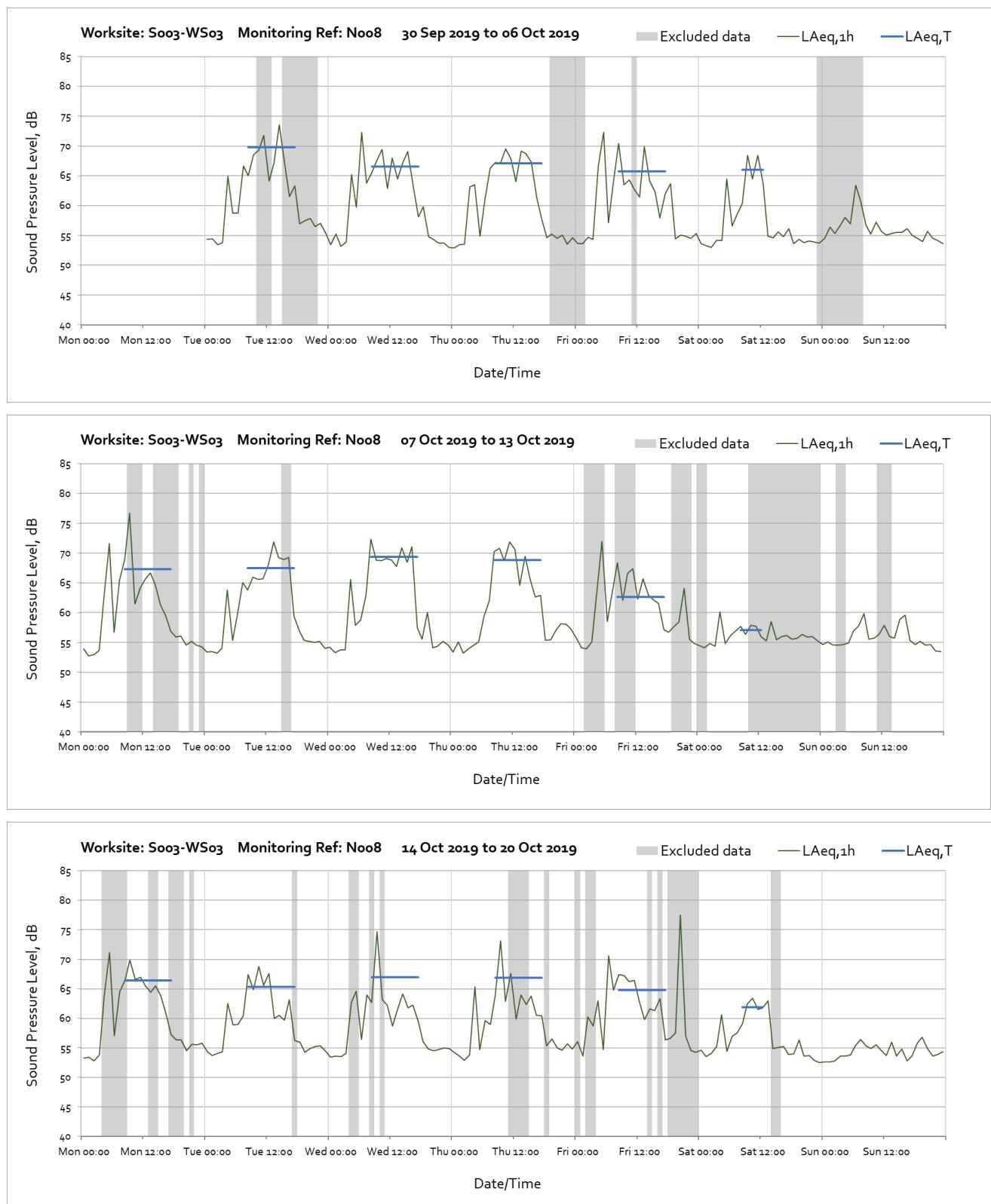


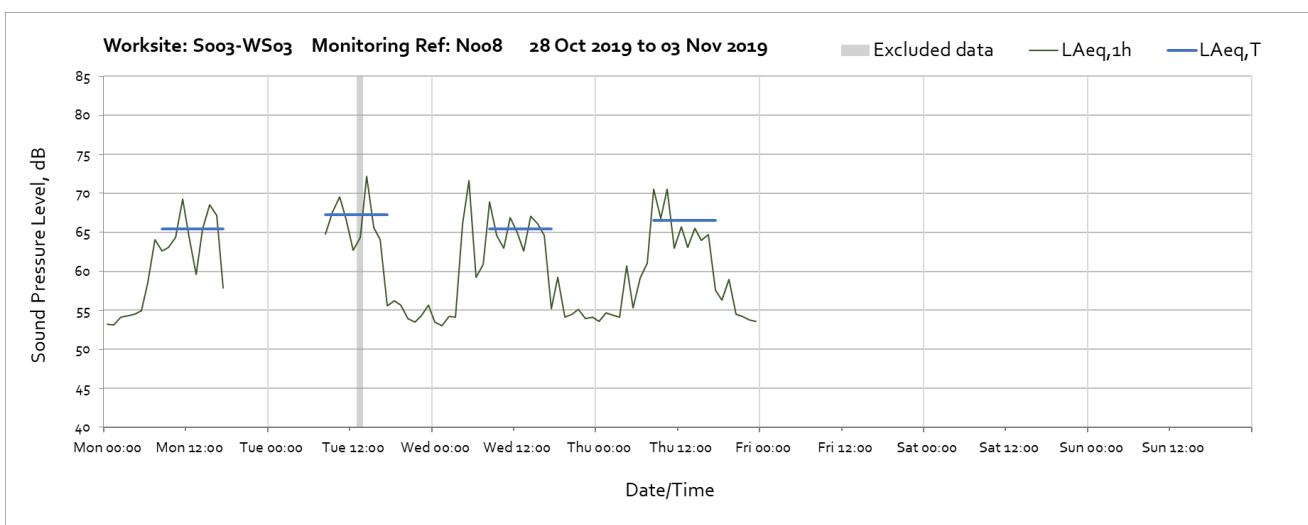
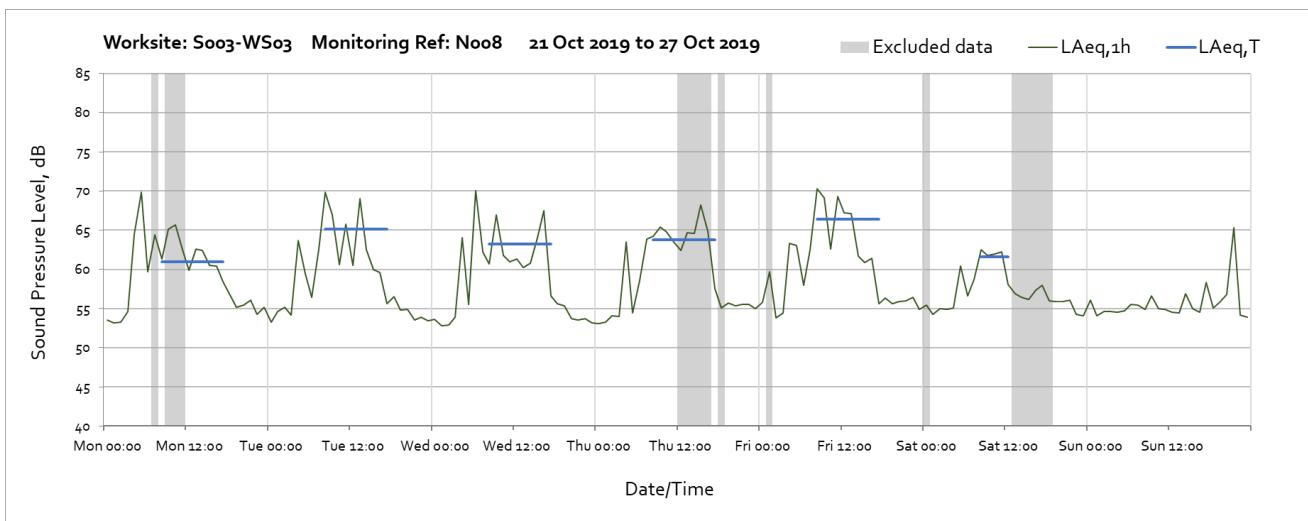
## Worksite: S003-WS03 – Monitoring Ref: N006





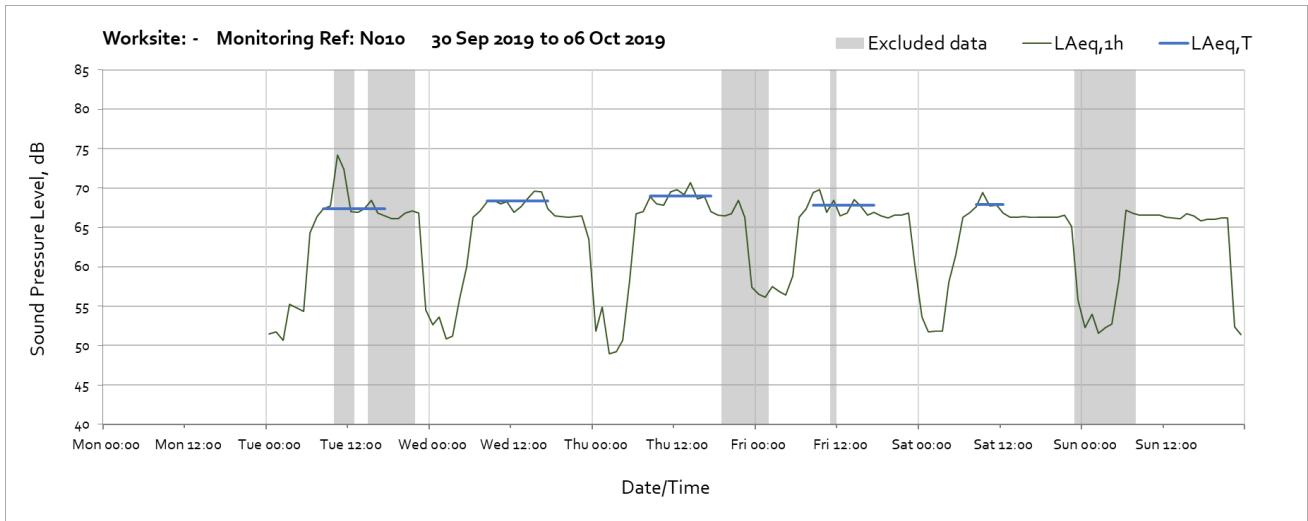
## Worksite: S003-WS03 – Monitoring Ref: N008

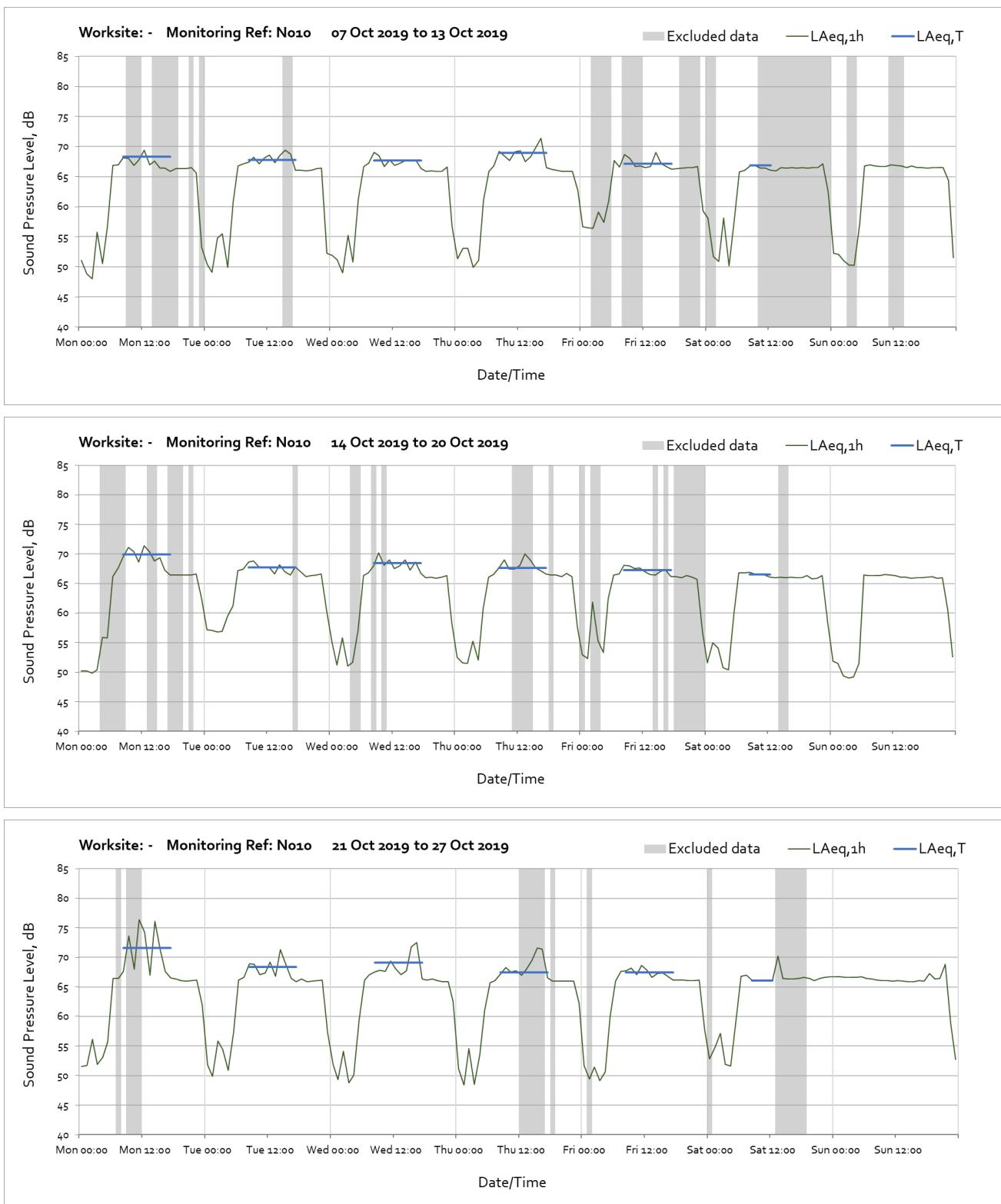


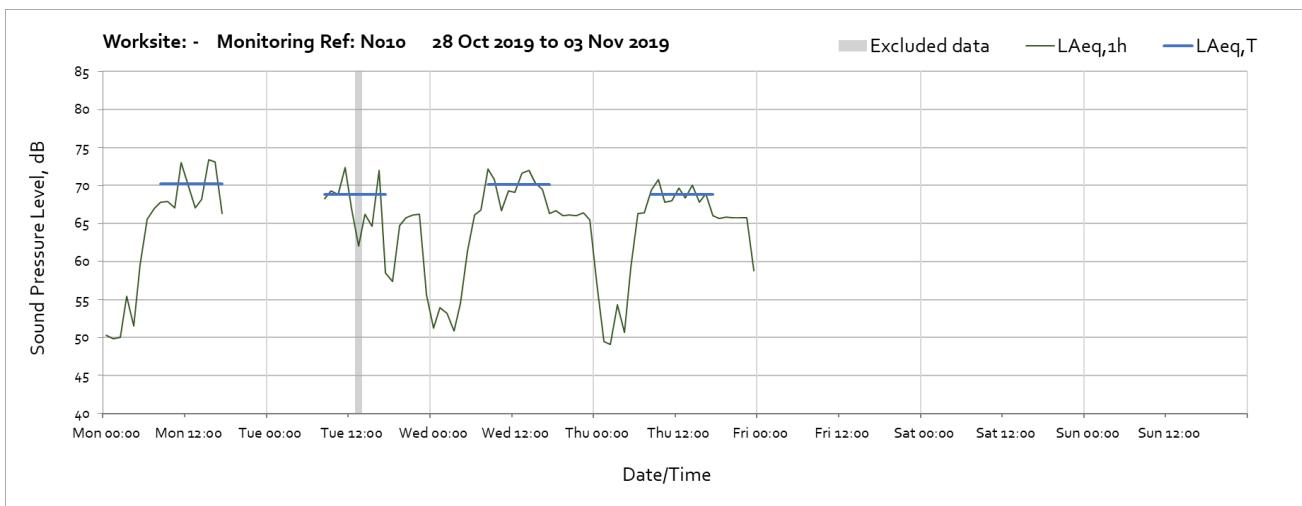


Note: Missing data between 18:00 on Monday 28<sup>th</sup> and 08:00 on Tuesday 29<sup>th</sup> October was due to a restart error following an update of the noise monitor firmware.

## Worksite: S003-WS03 – Monitoring Ref: N010

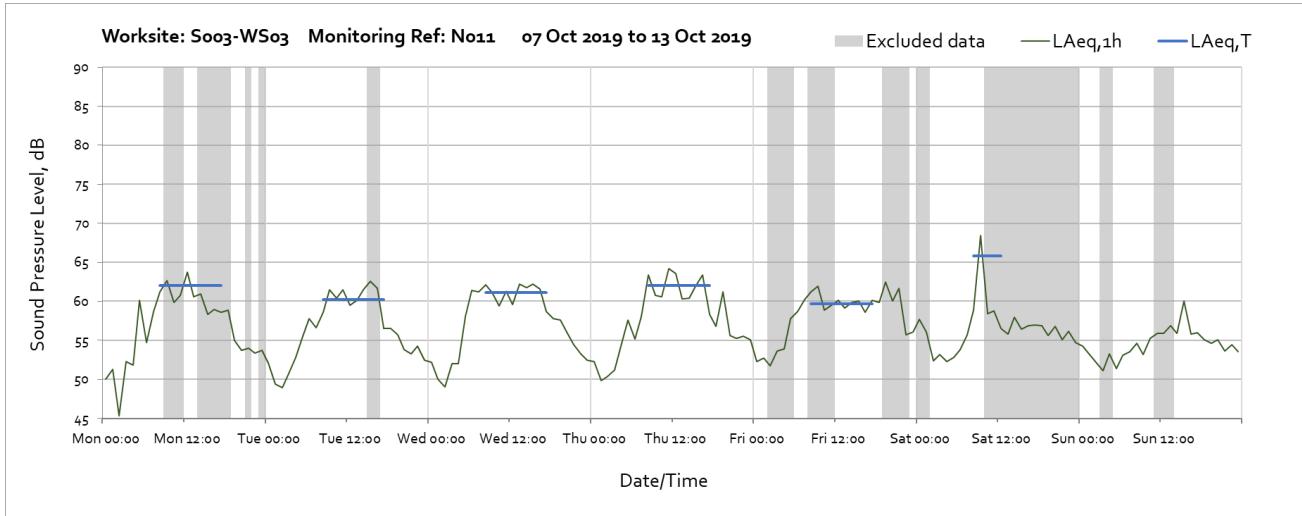
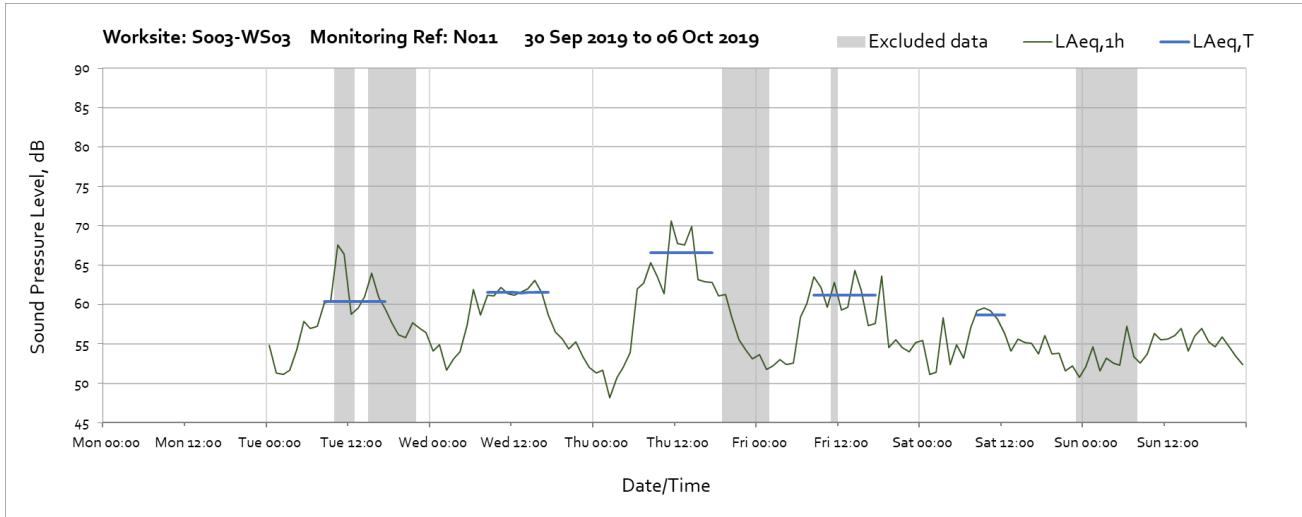


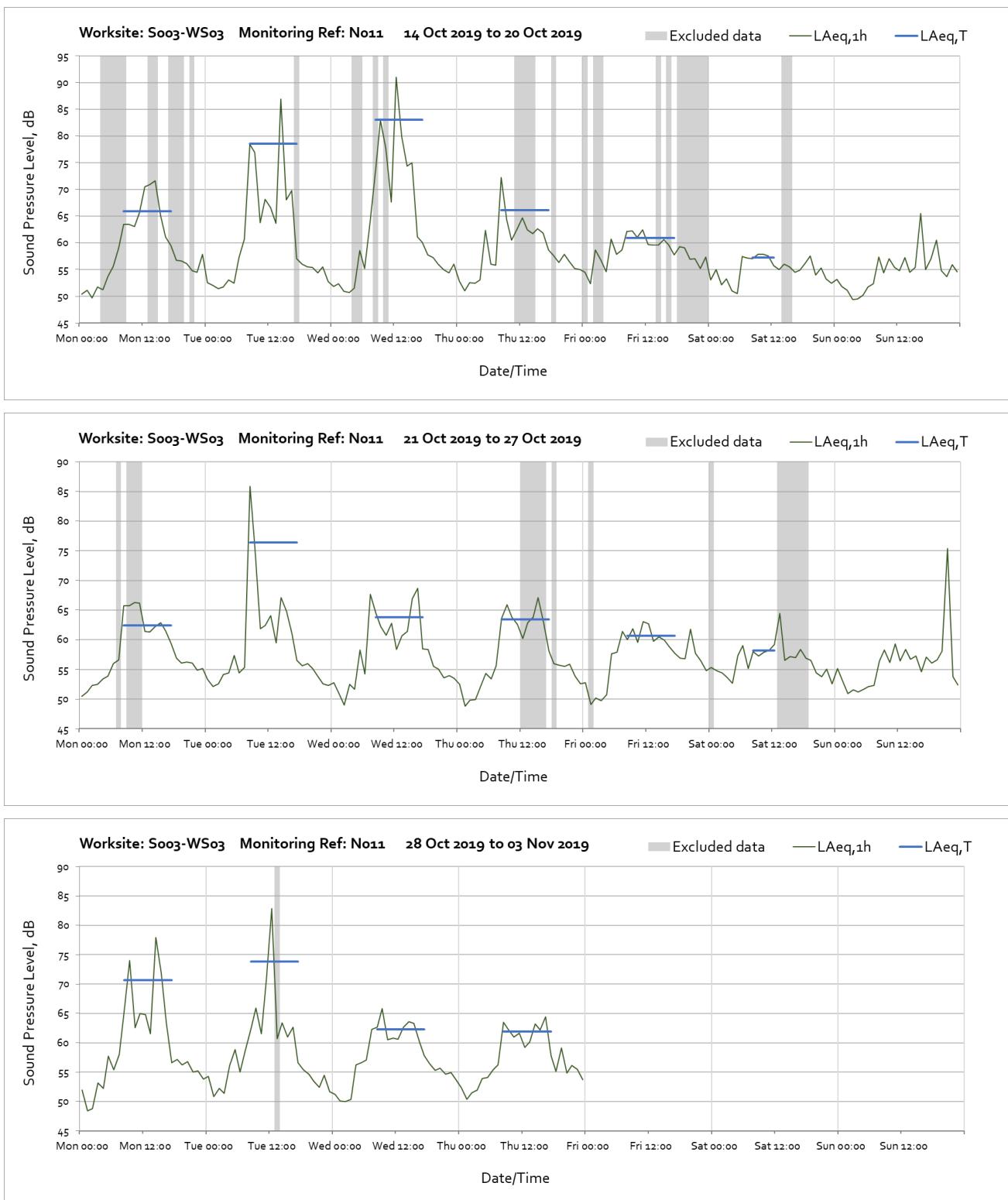




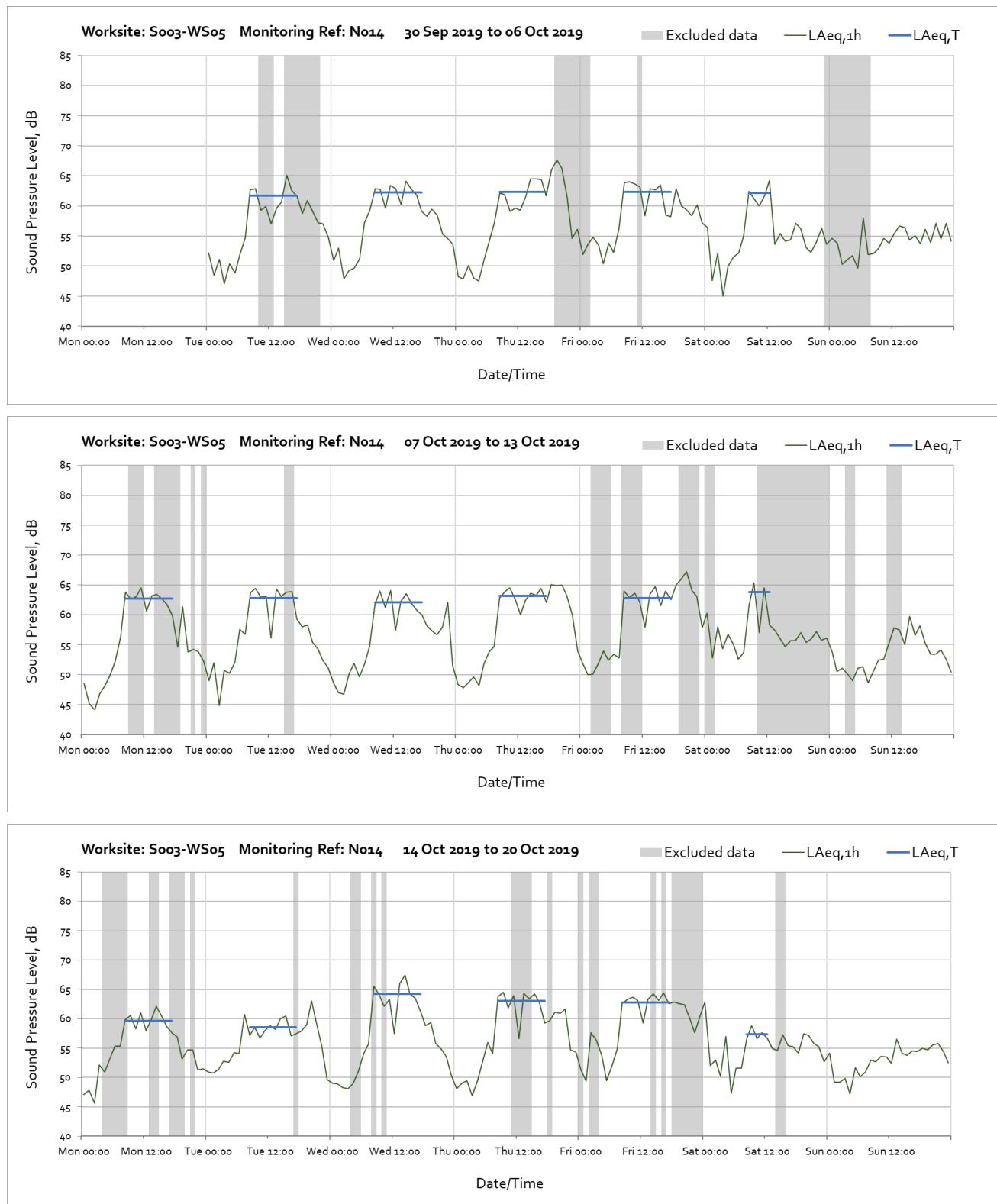
Note: Missing data between 18:00 on Monday 28<sup>th</sup> and 08:00 on Tuesday 29<sup>th</sup> October was due to a restart error following an update of the noise monitor firmware.

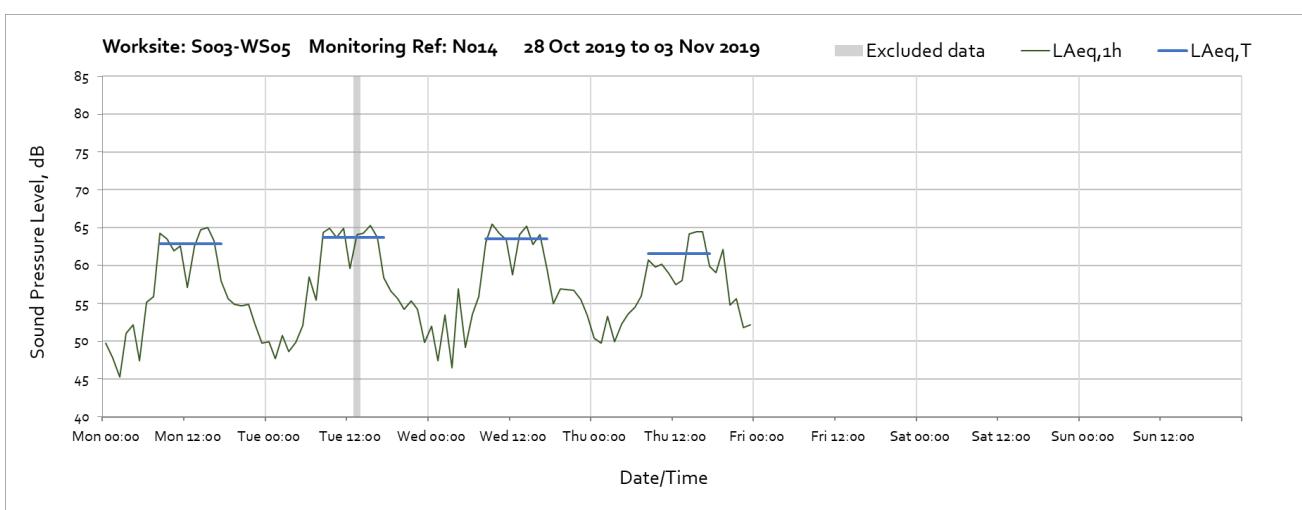
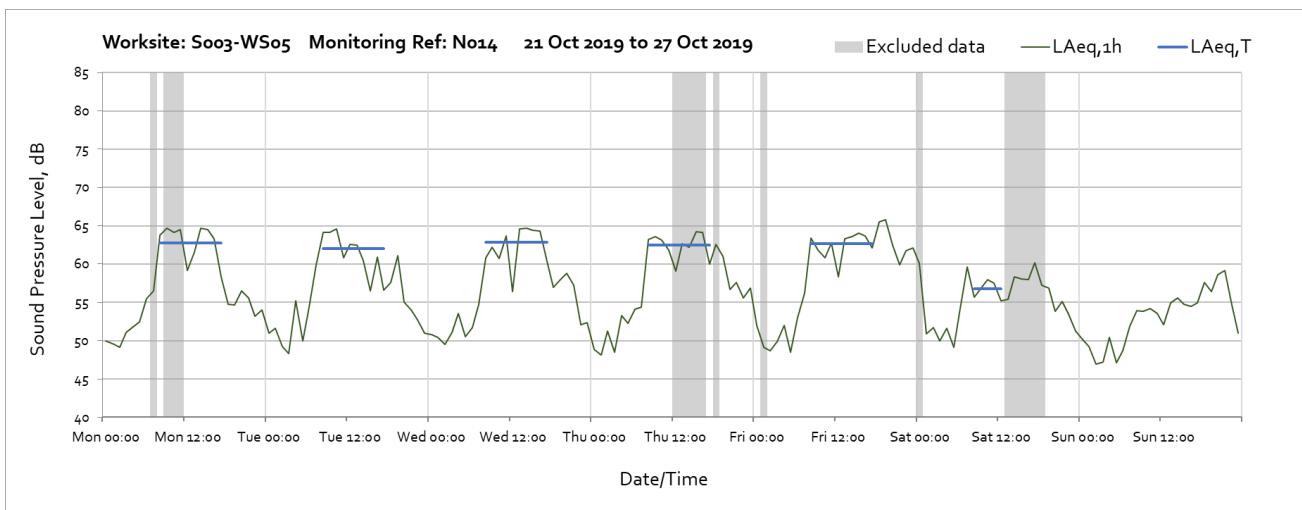
## Worksite: S003-WS03 – Monitoring Ref: N011



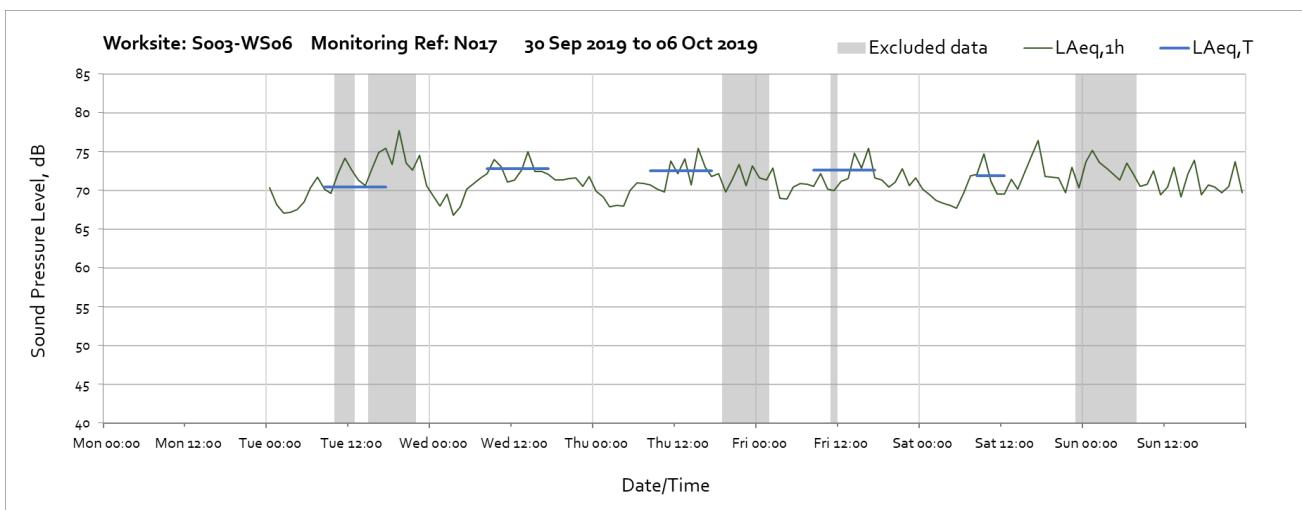


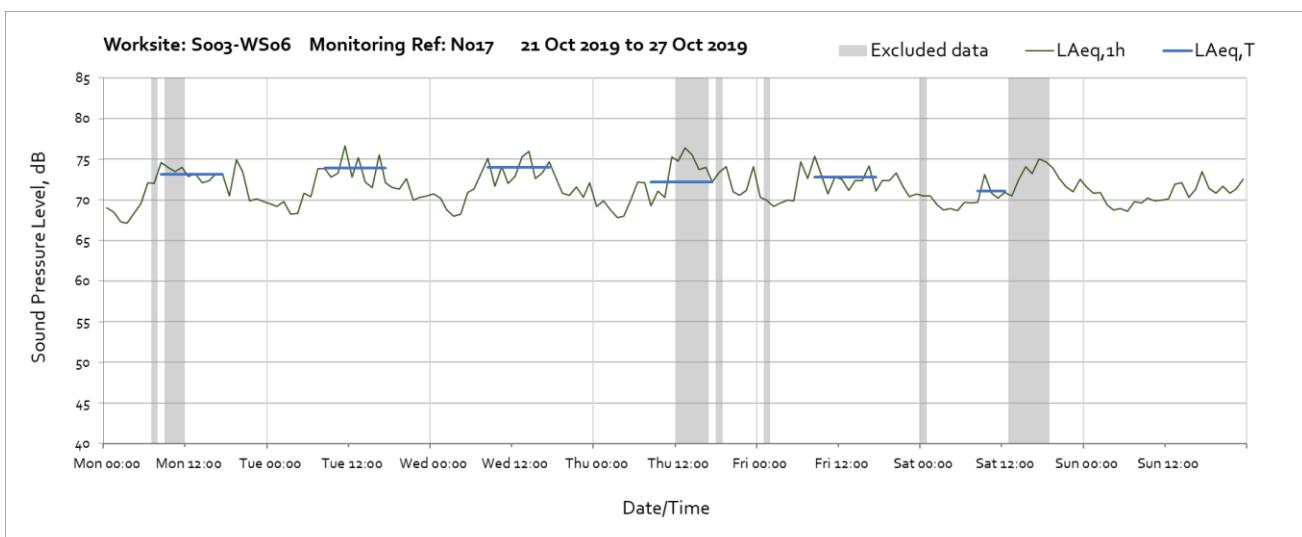
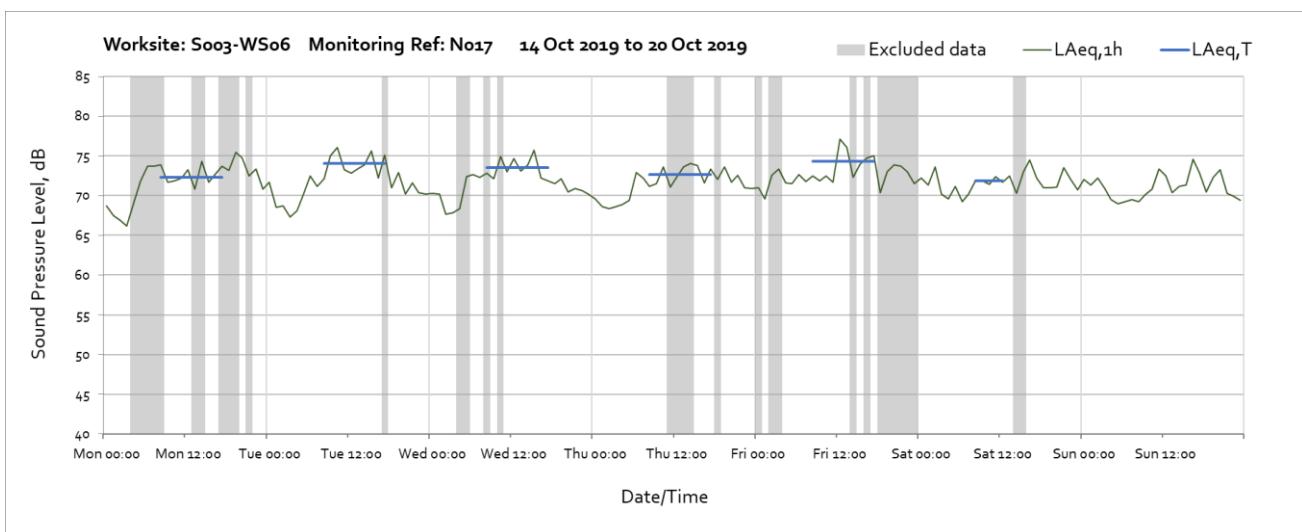
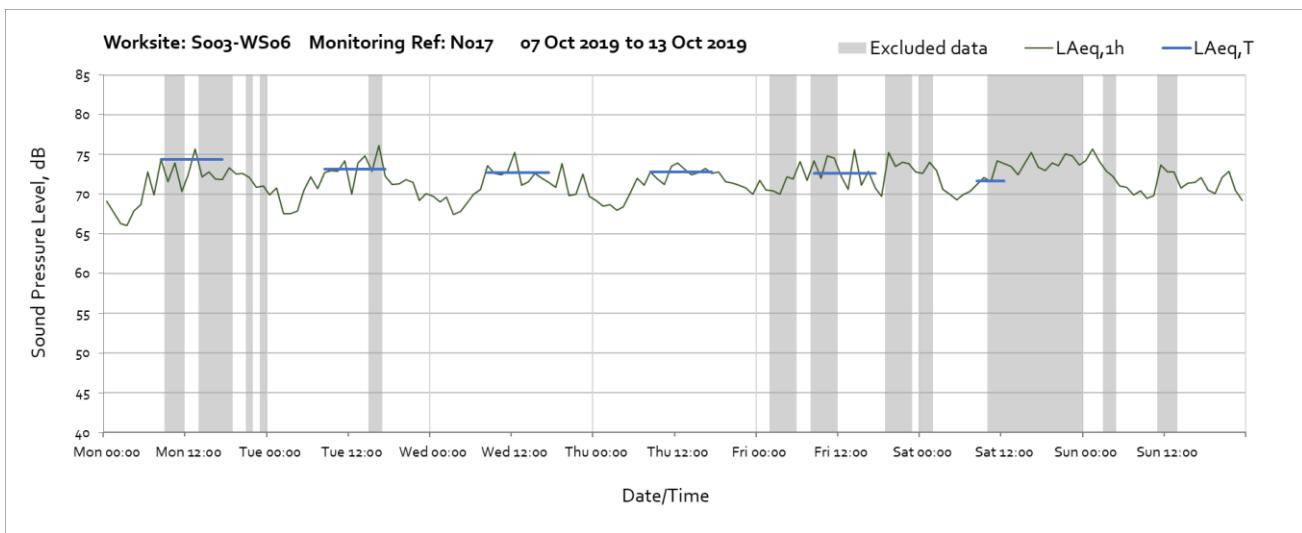
## Worksite: S003-WS05 – Monitoring Ref: N014

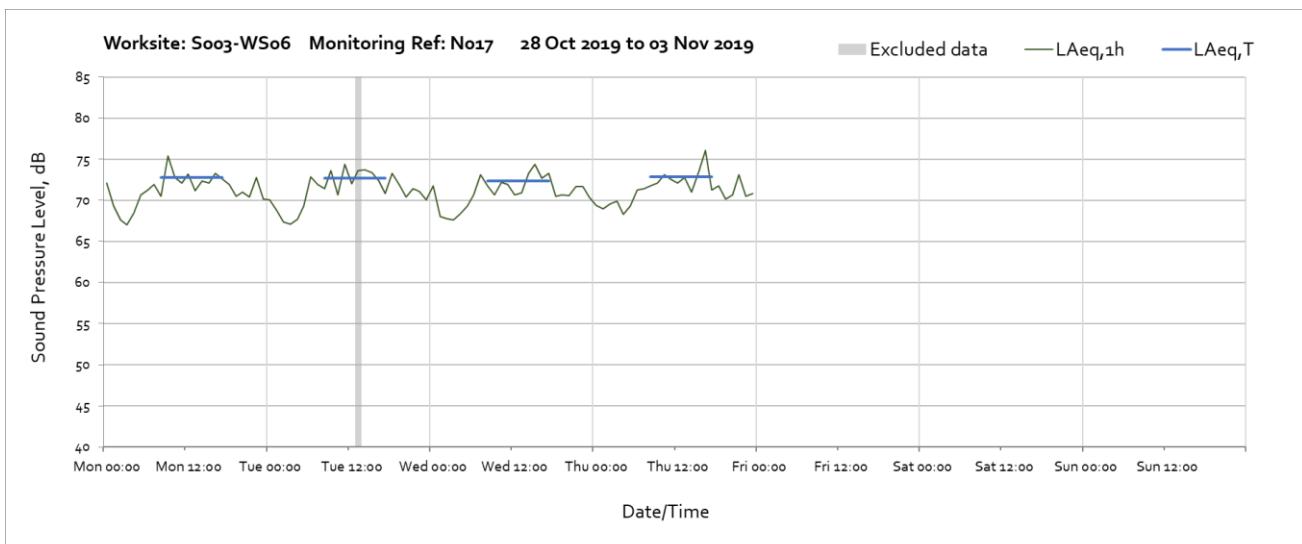




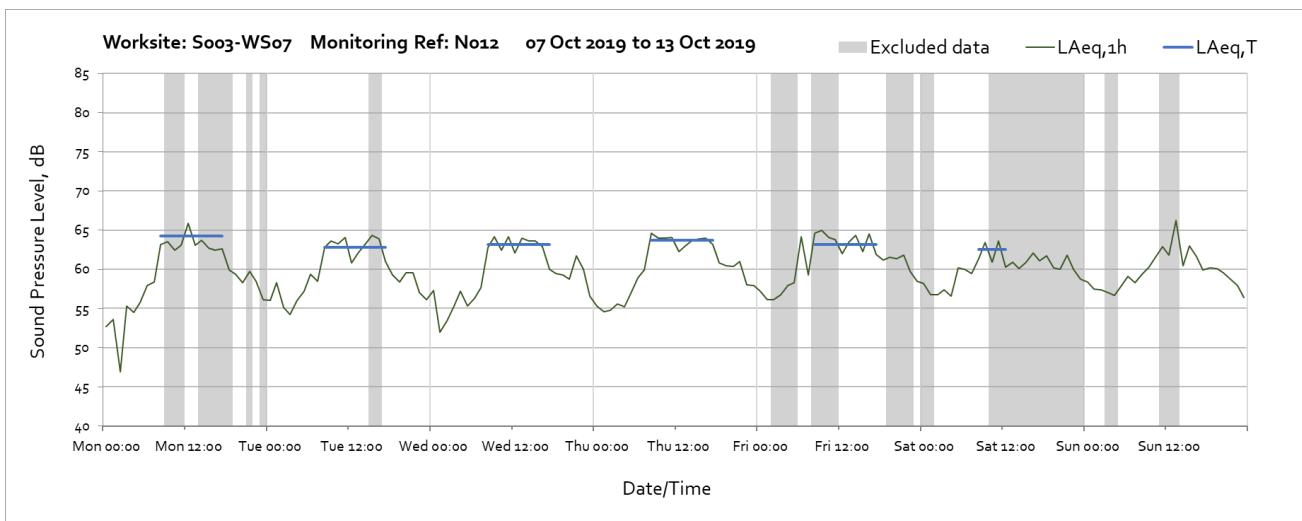
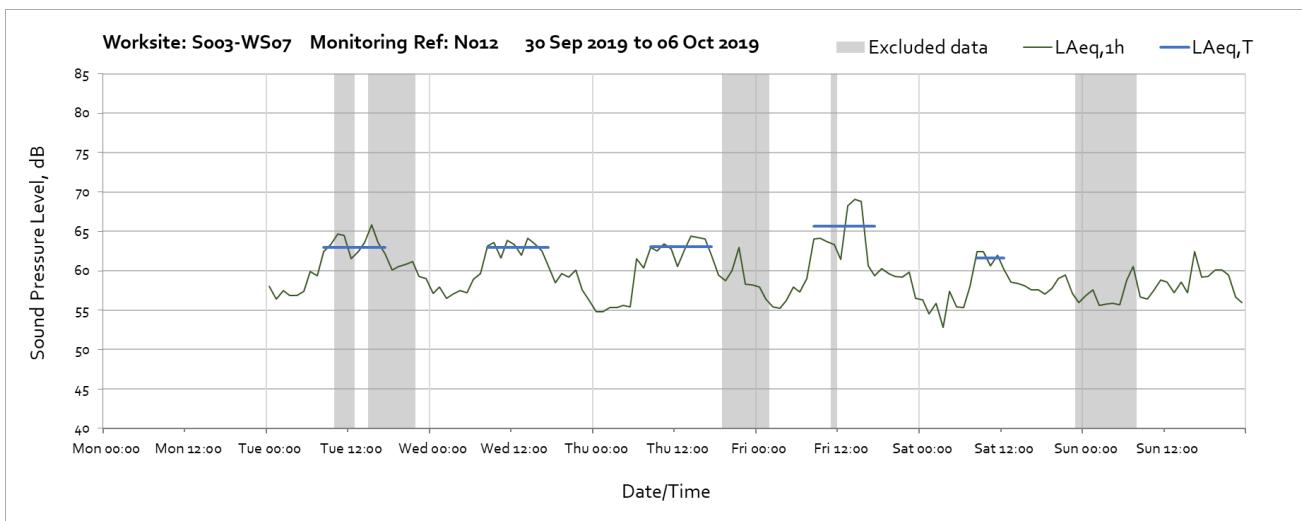
## Worksite: S003-WS06 – Monitoring Ref: N017







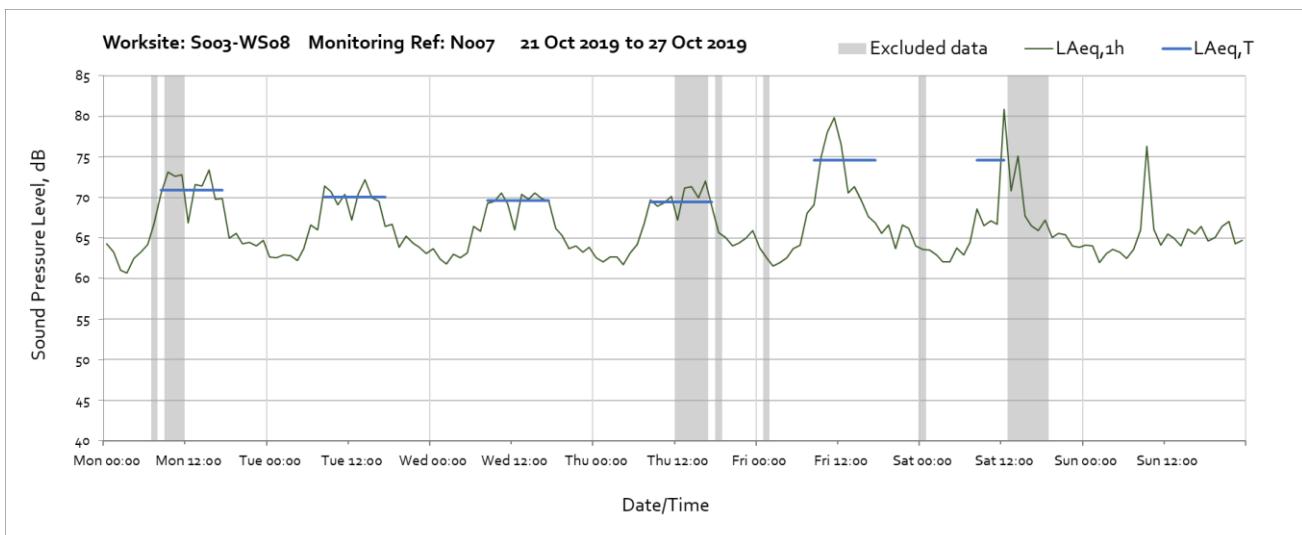
## Worksite: S003-WS07 – Monitoring Ref: N012



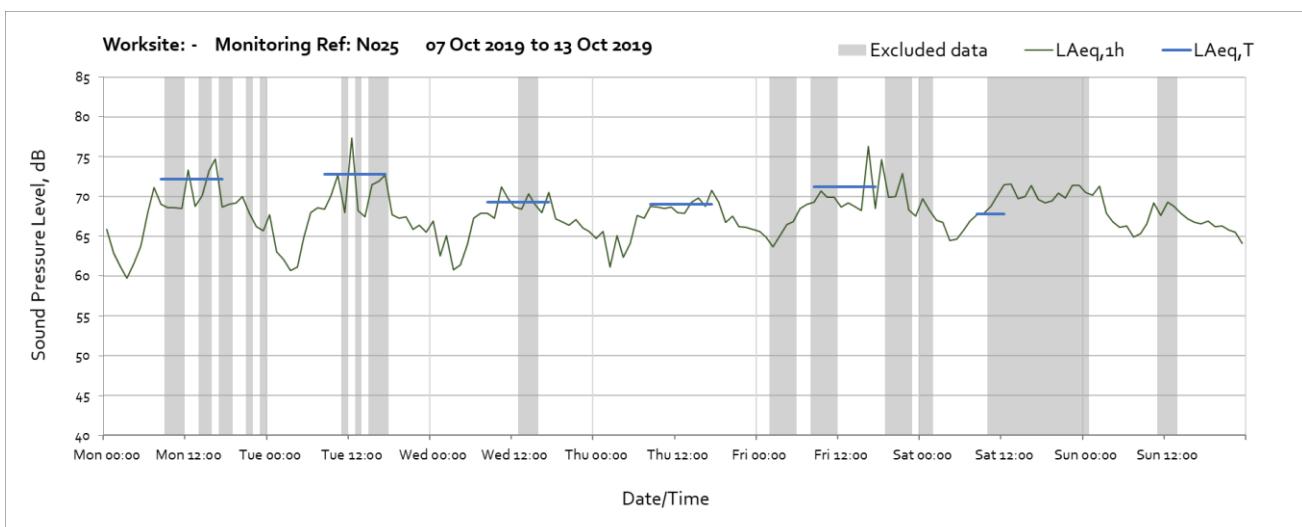
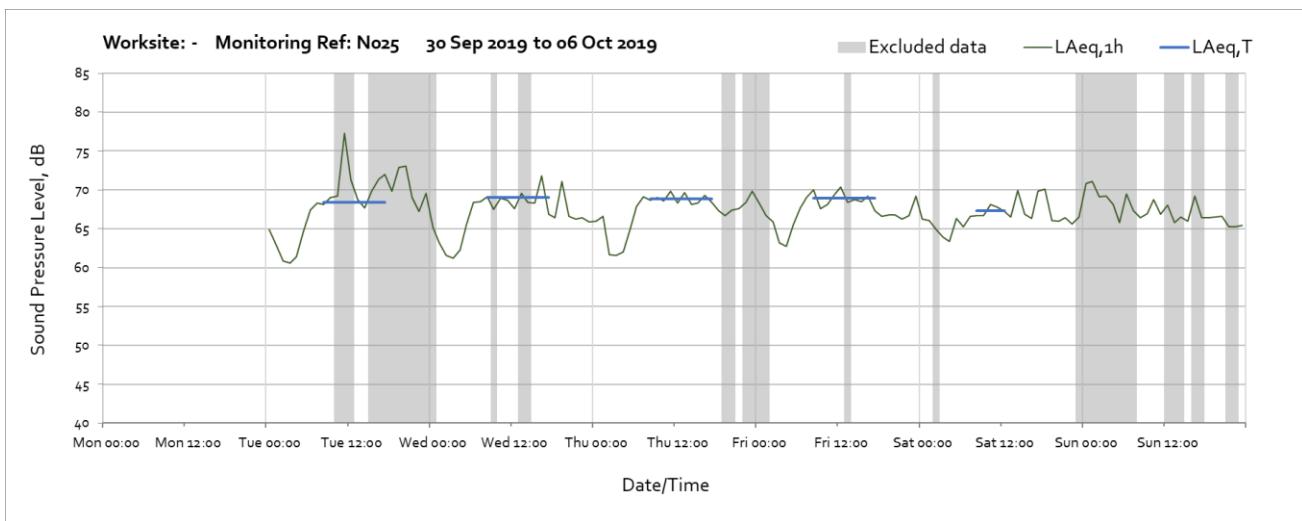


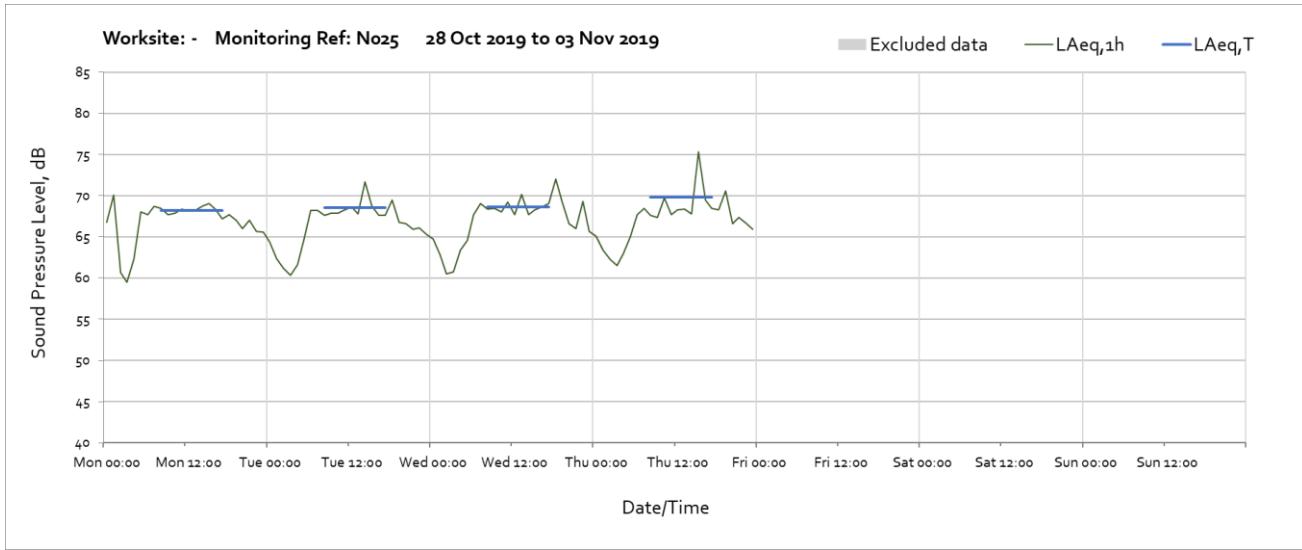
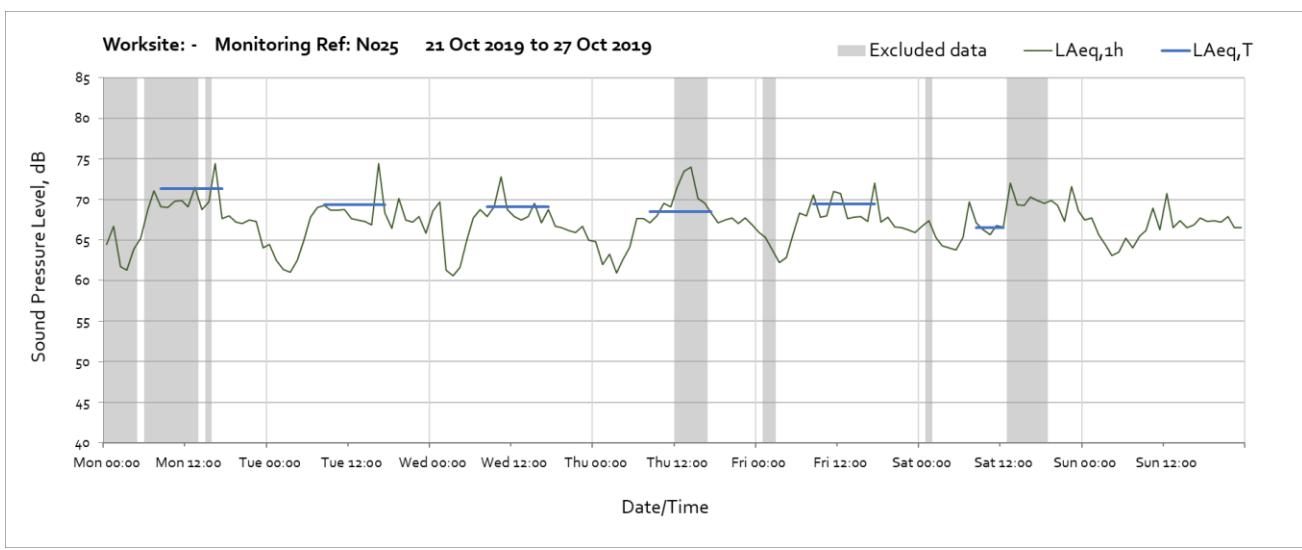
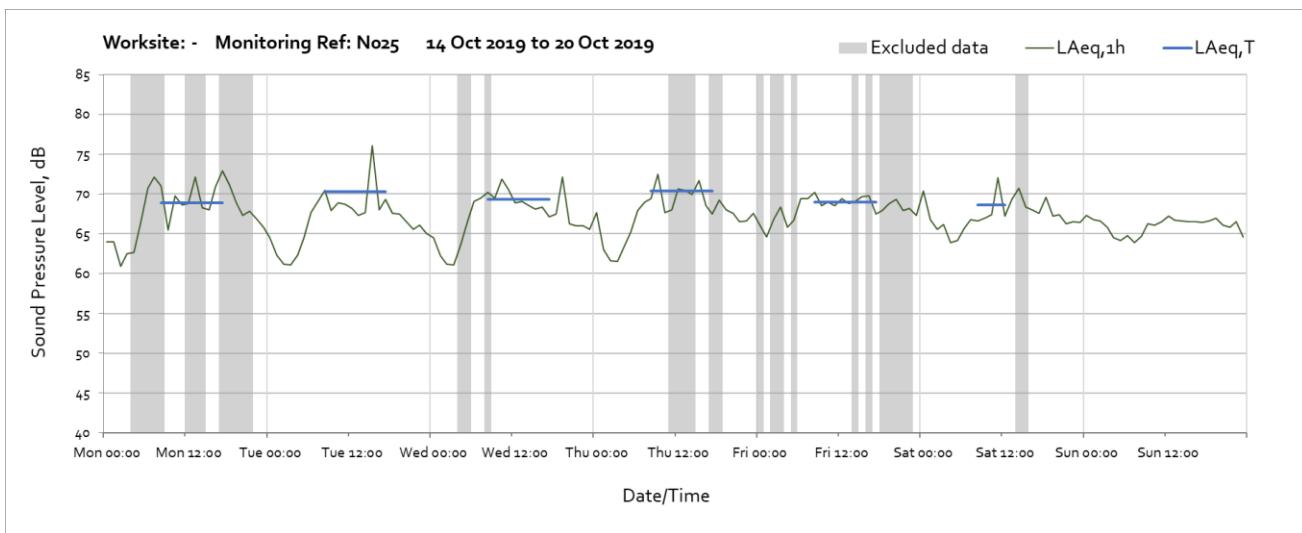
## Worksite: S003-WS08 – Monitoring Ref: N007



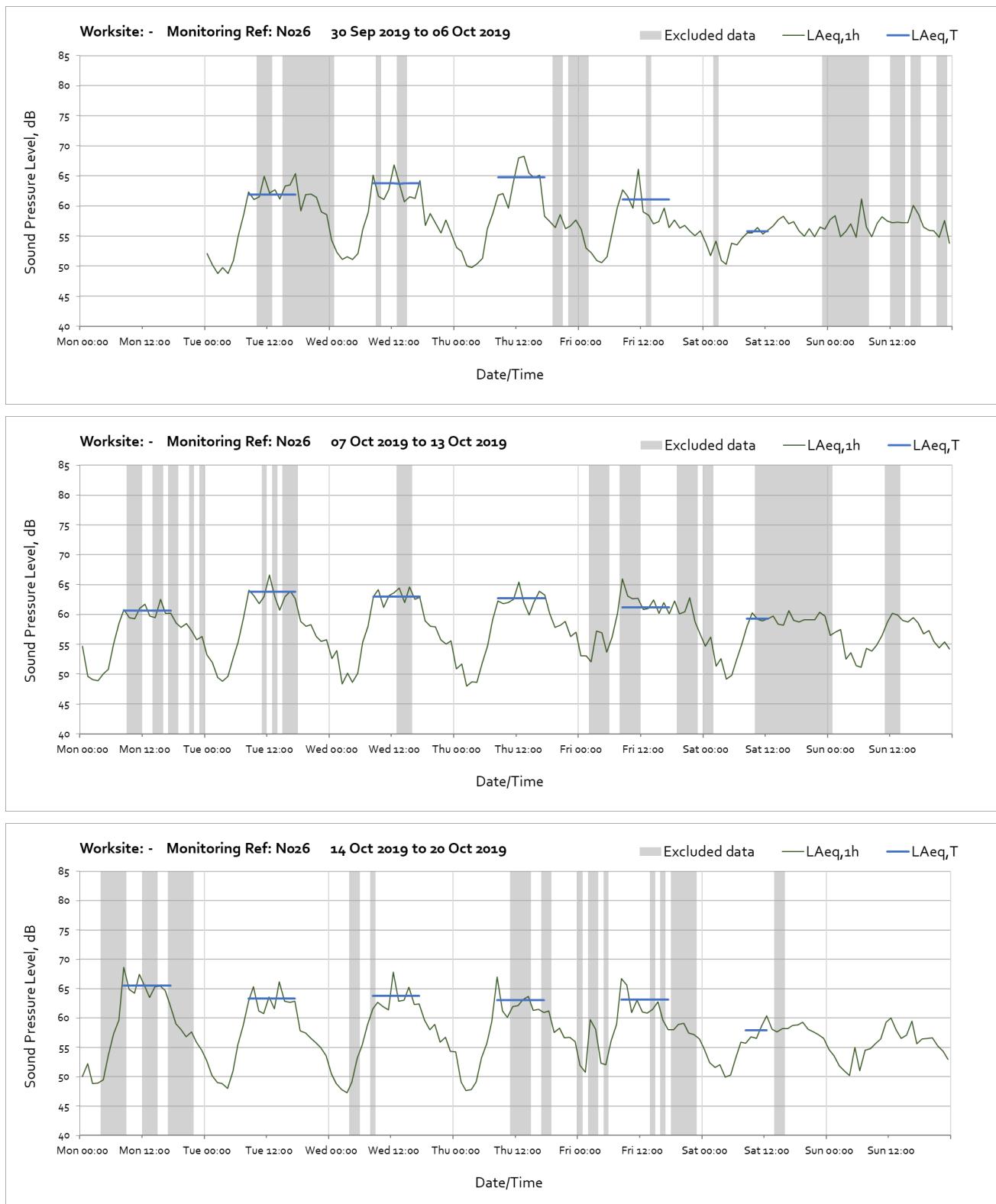


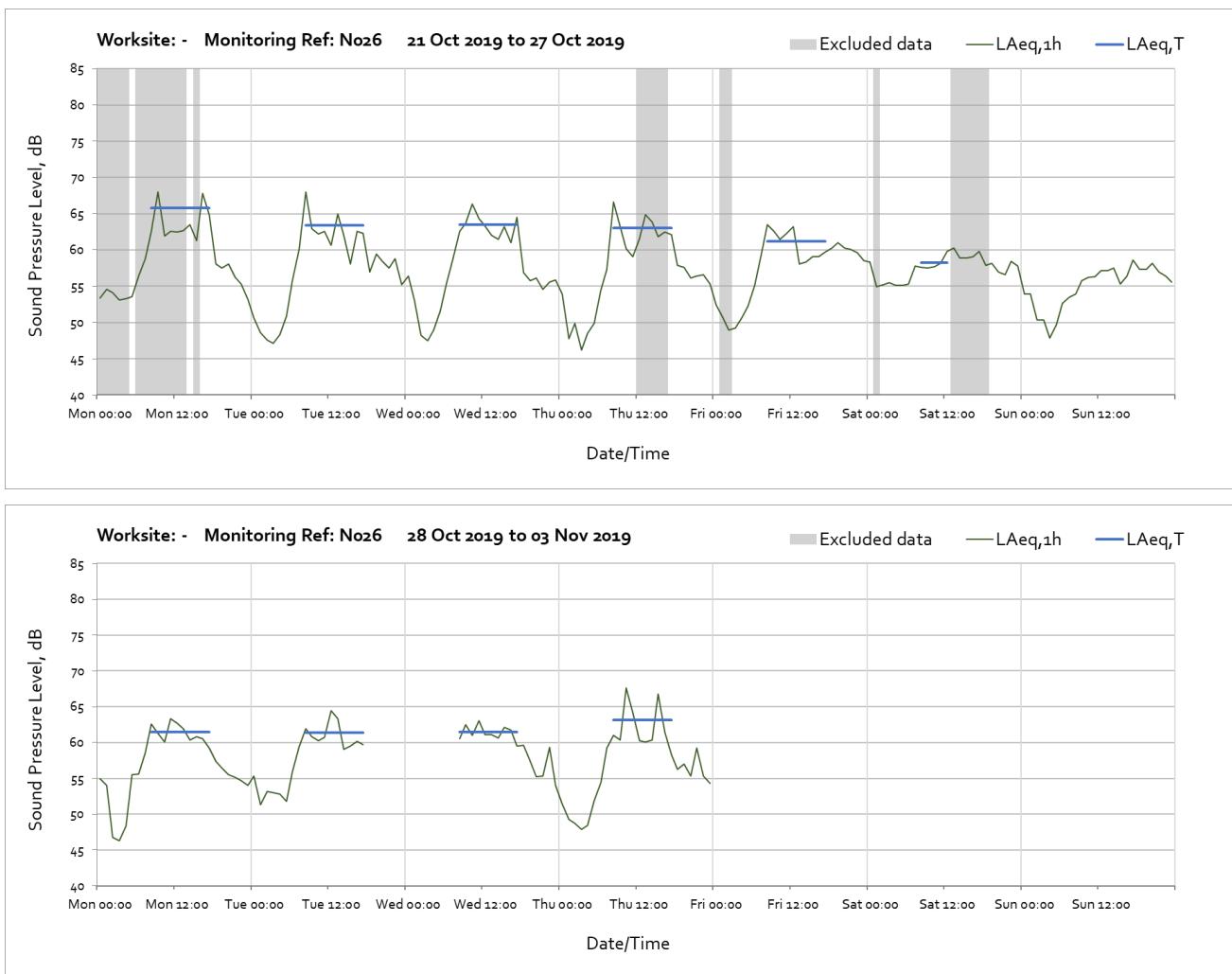
## Monitoring Ref: N025





## Monitoring Ref: N026



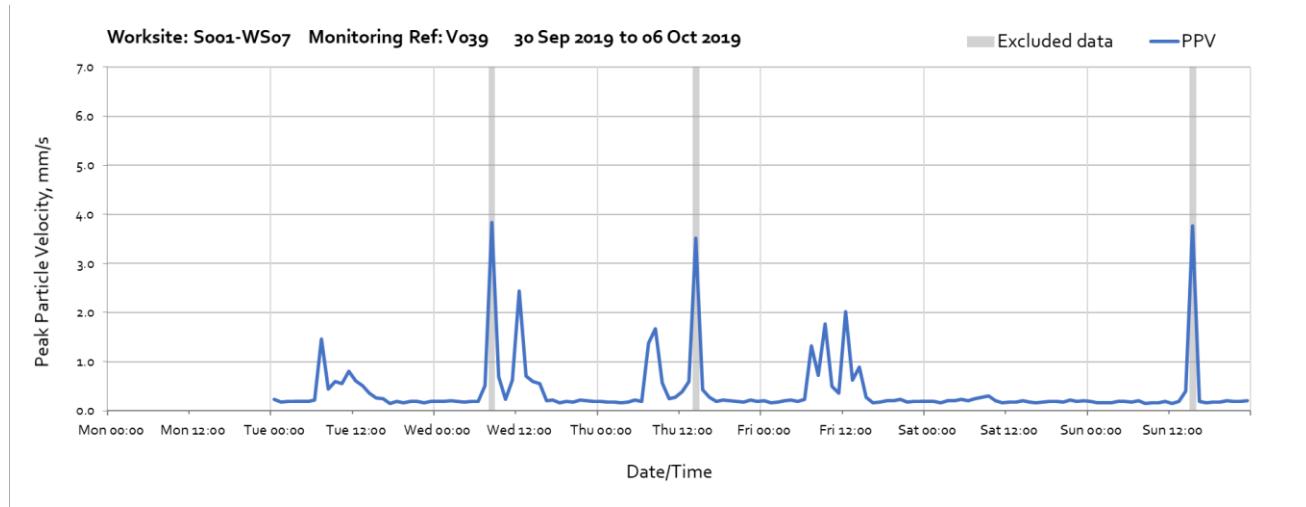


Note: Missing data between 18:00 on Tuesday 29<sup>th</sup> October and 08:00 on Wednesday 30<sup>th</sup> October was due to a restart error following an update of the noise monitor firmware.

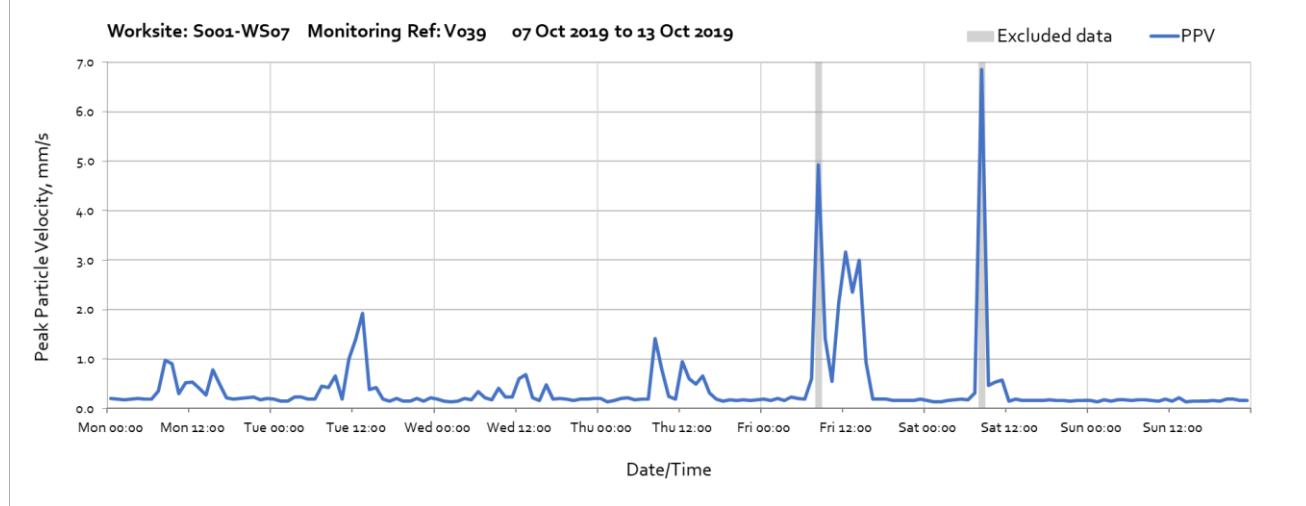
## Vibration

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. High values of PPV were measured on occasions at locations V021, V038 and V039. These were due to local interference with the vibration monitor and are not representative of HS2 construction works. These data entries have been greyed out in the following charts and have been excluded to calculate values in Table 6.

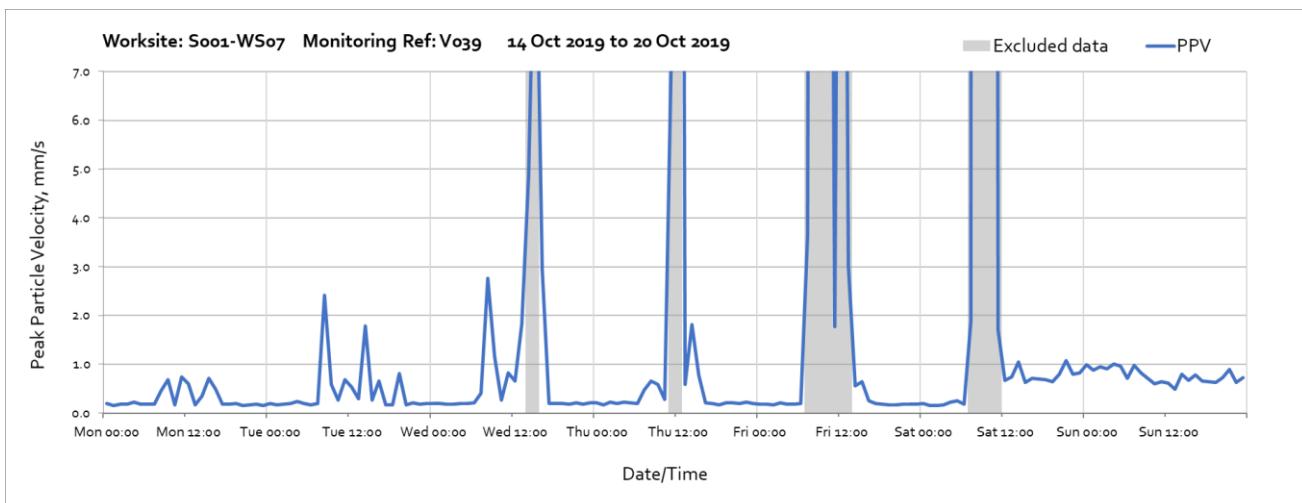
### Worksite: S001-WS07 – Monitoring Ref: V039



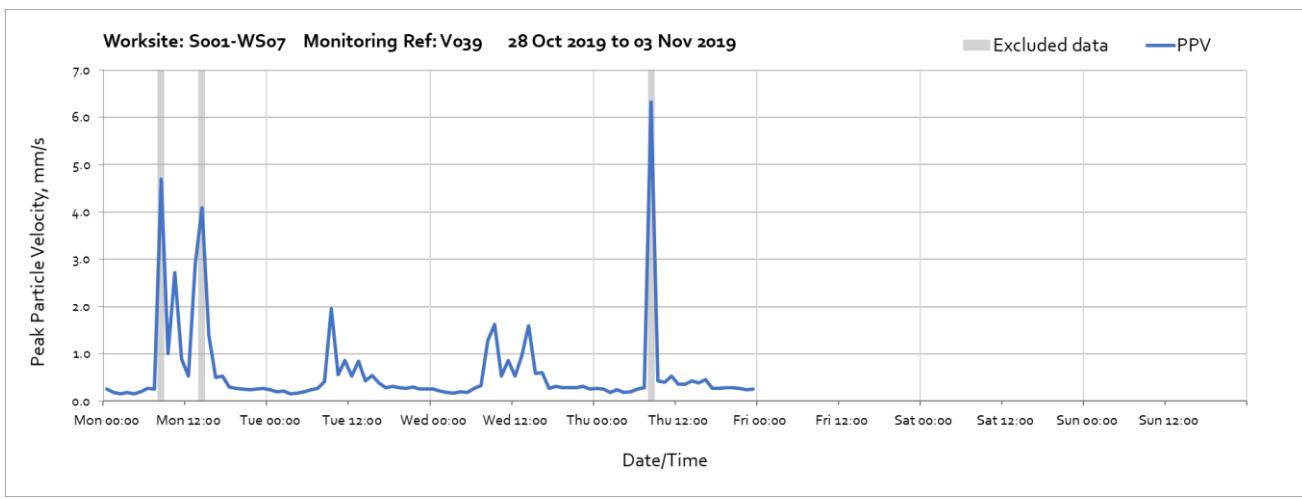
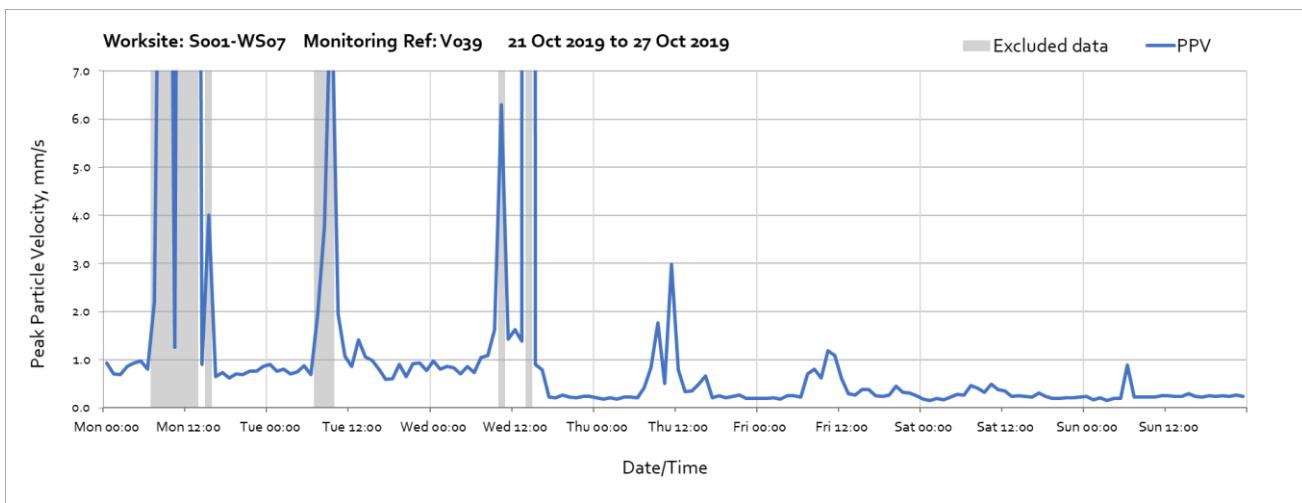
Note: High vibration levels throughout the week were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels.



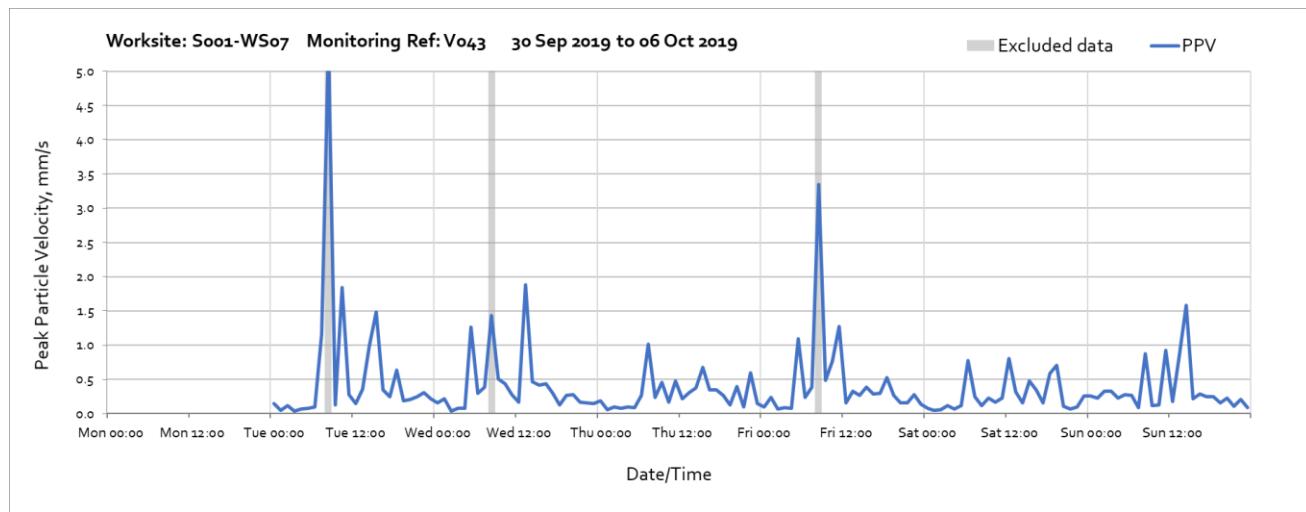
Note: High vibration levels throughout the week were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels.



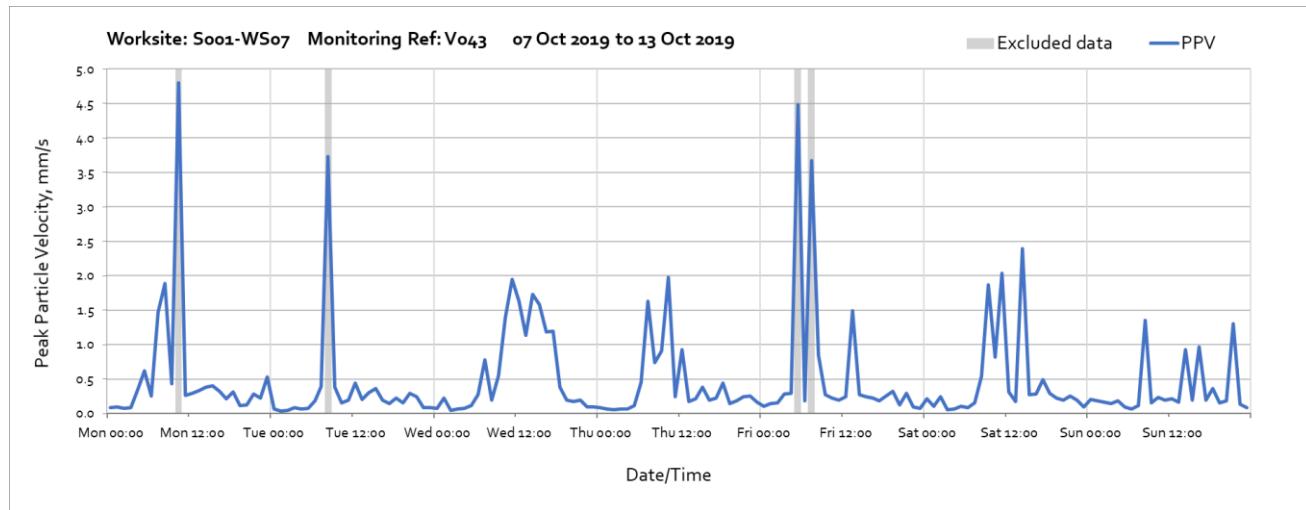
Note: High vibration levels throughout the week were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels.



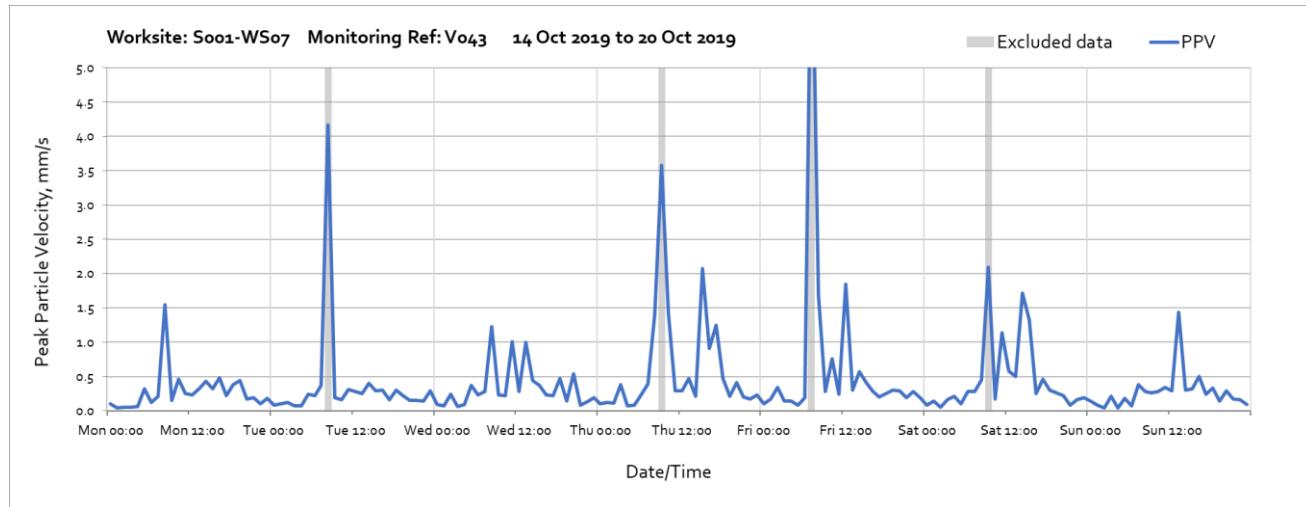
## Worksite: S001-WS07 – Monitoring Ref: V043



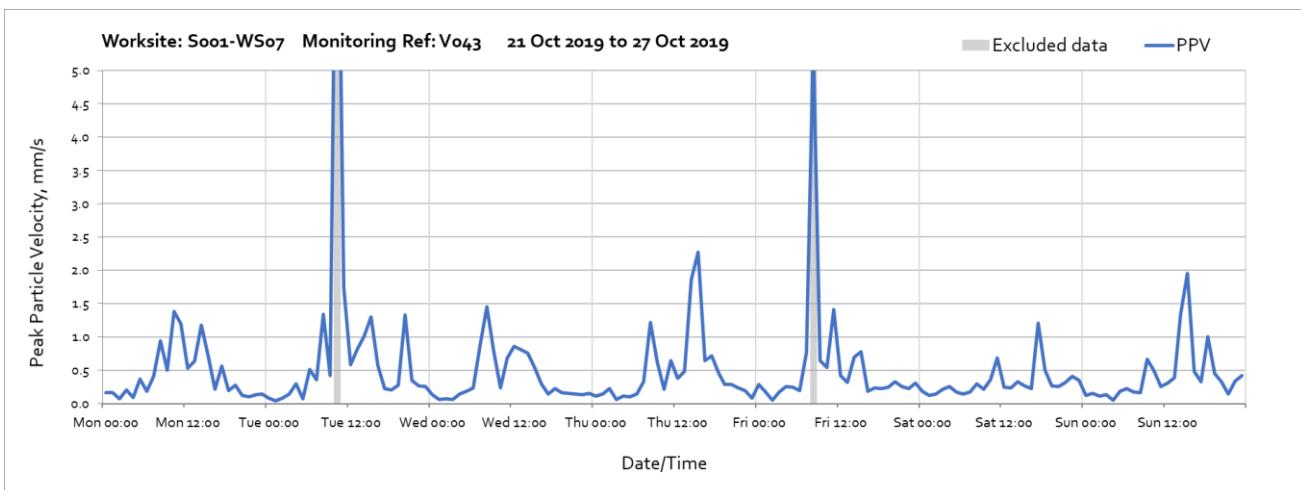
Note: High vibration levels throughout the week were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels.



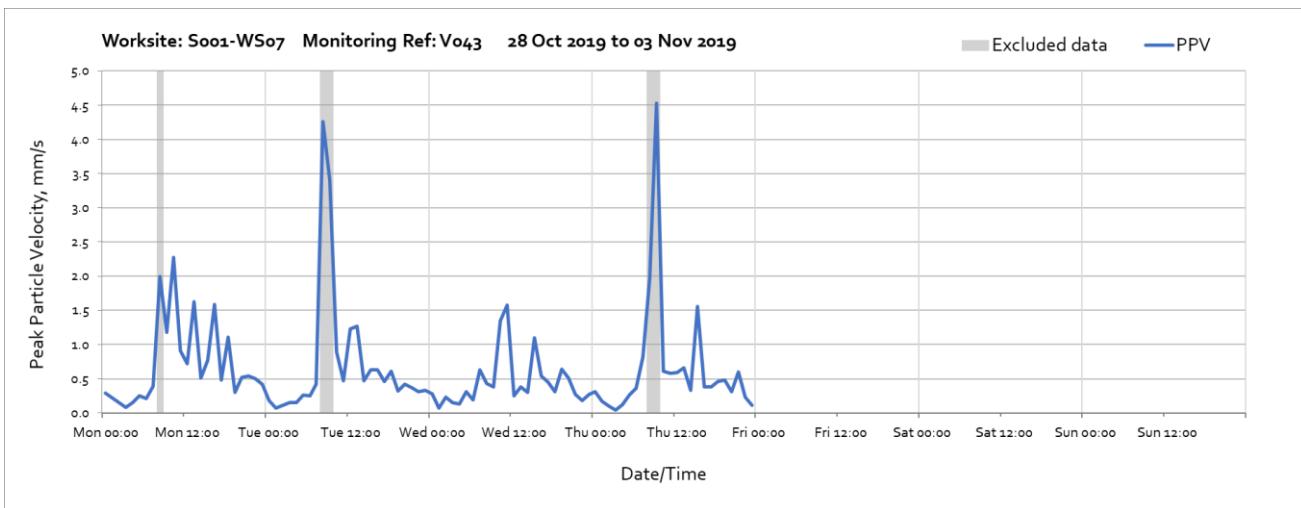
Note: High vibration levels throughout the week were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels.



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

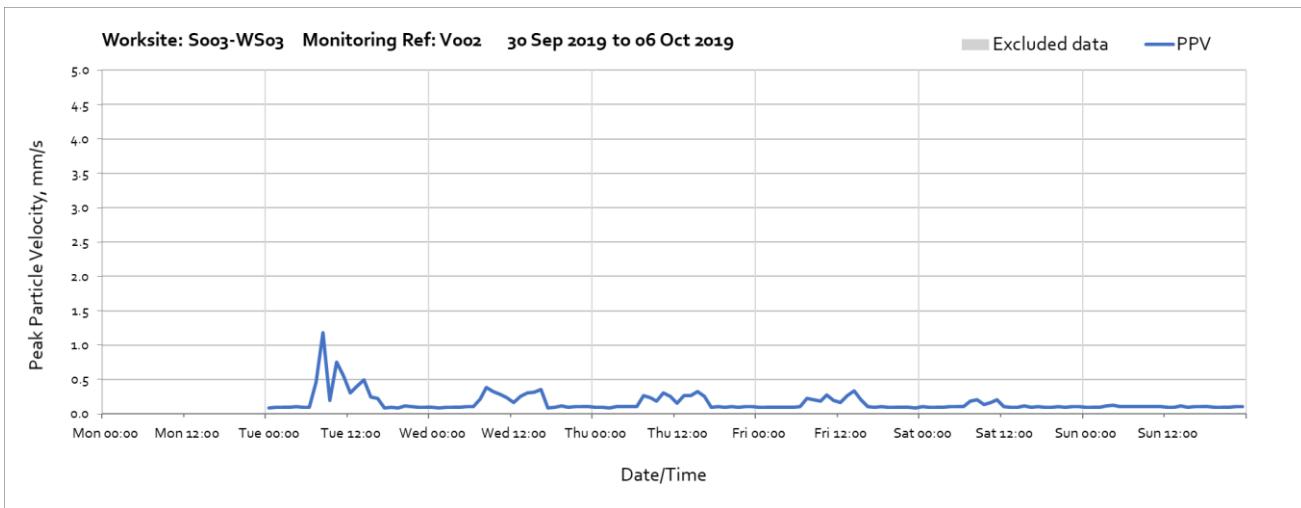


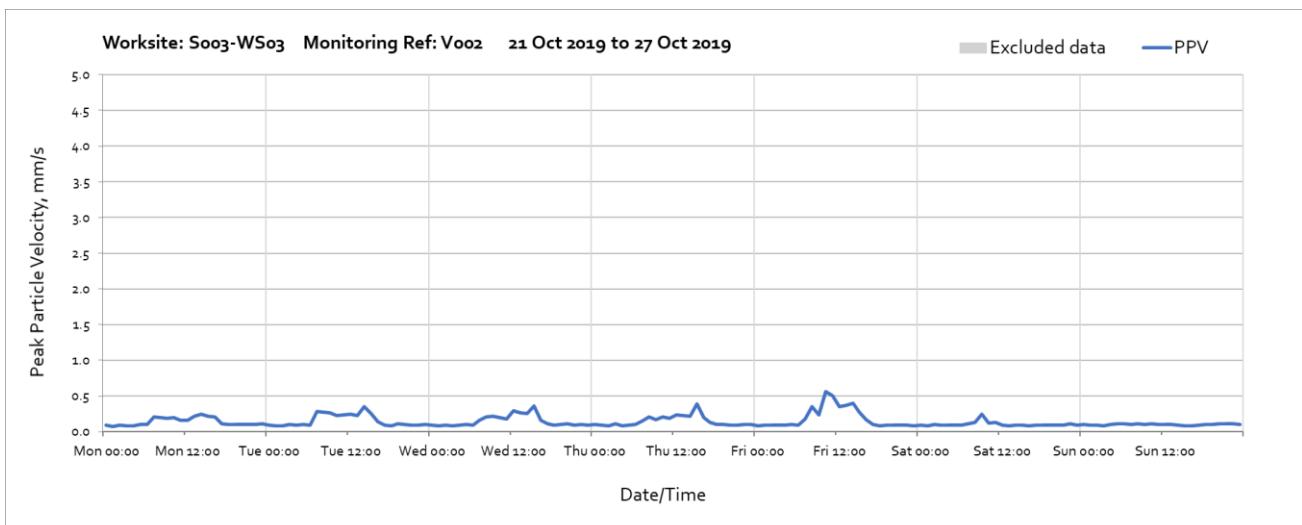
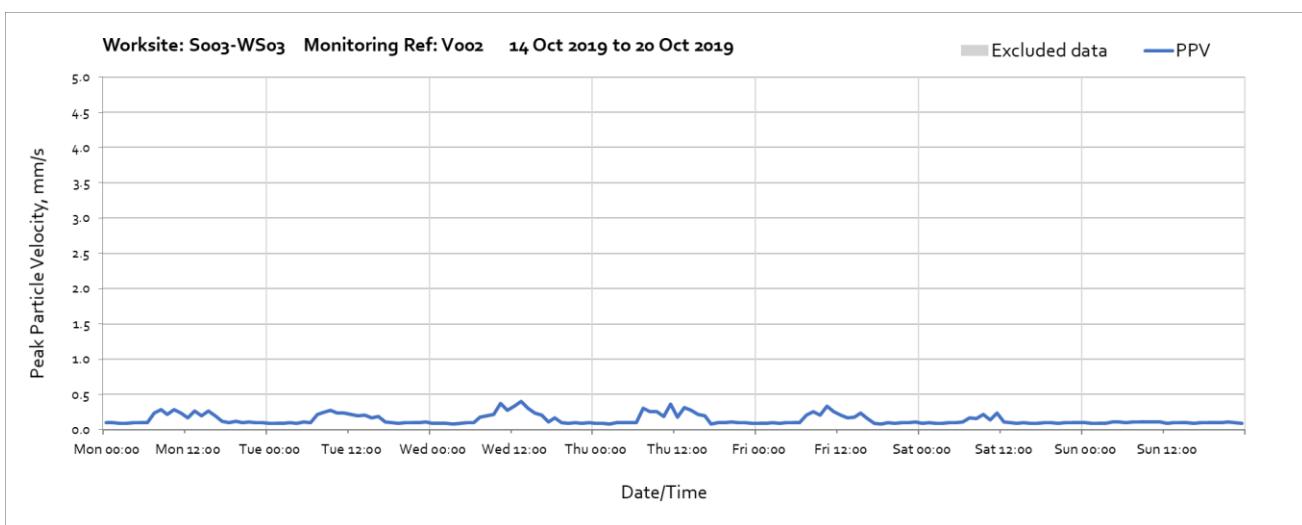
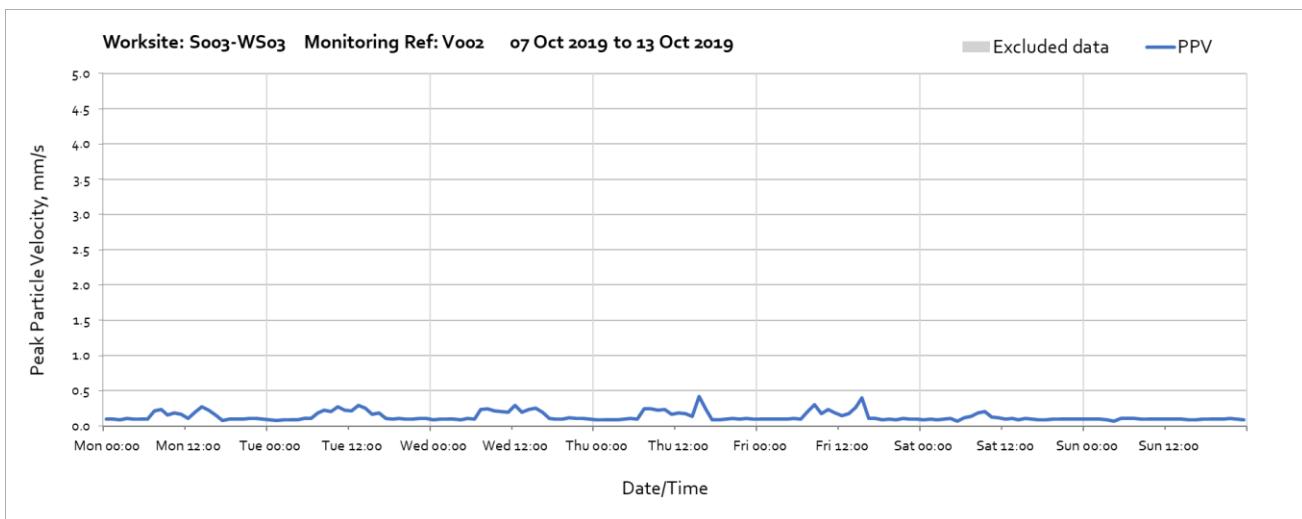
Note: High vibration levels throughout the week were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels.

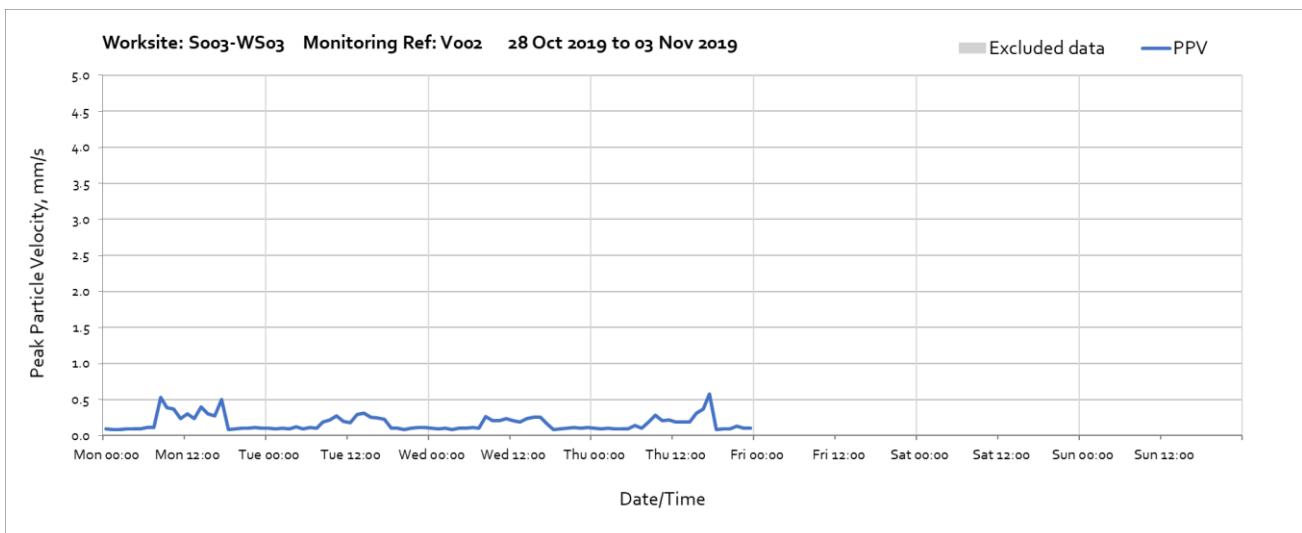


Note: High vibration levels throughout the week were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels.

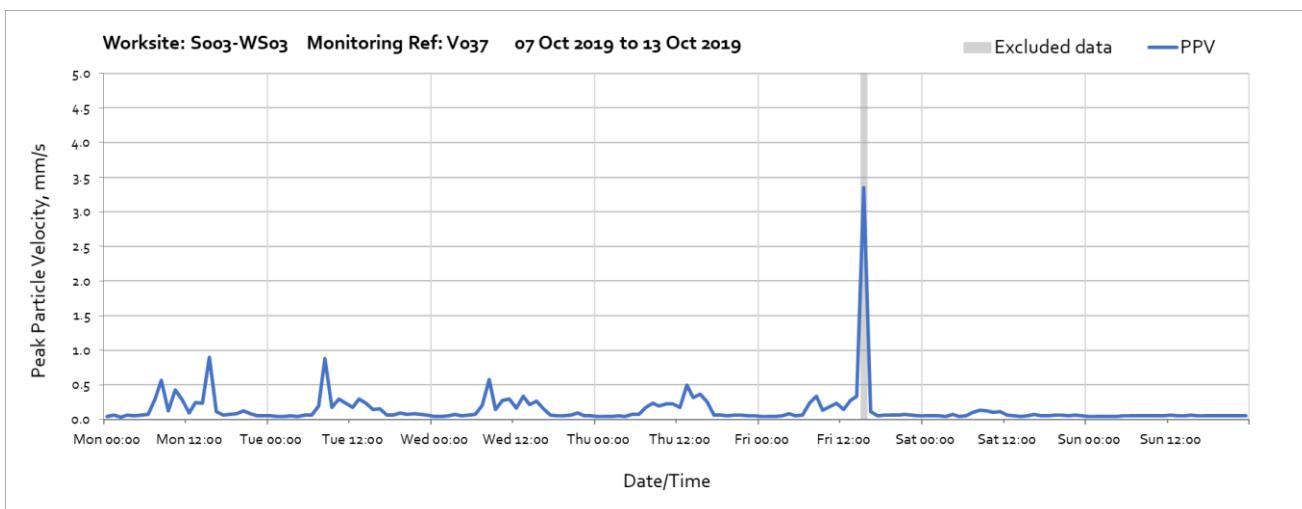
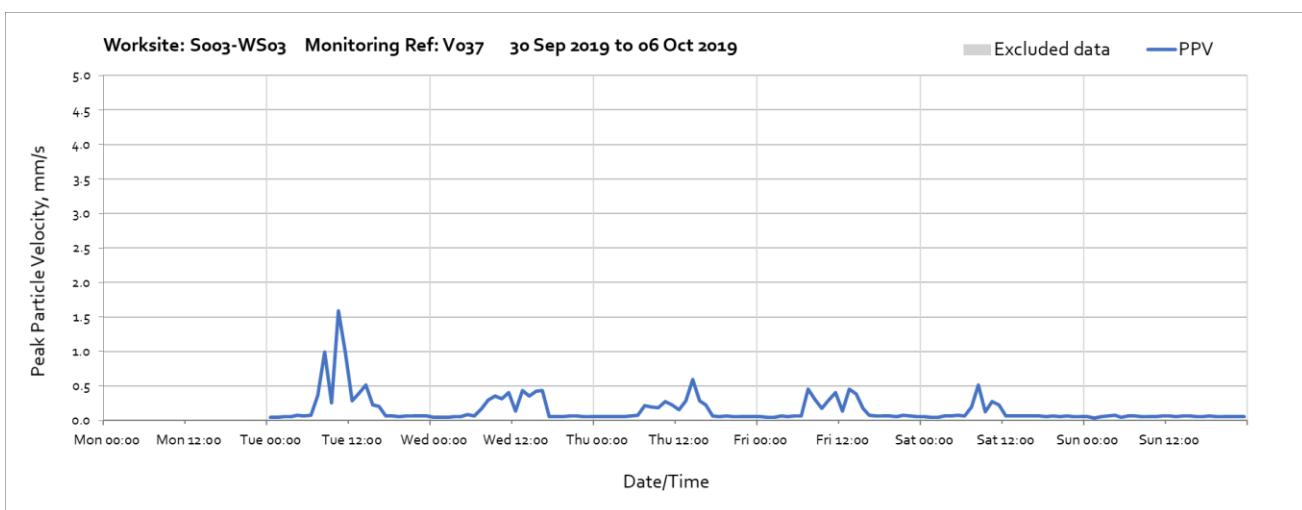
## Worksite: S003-WS03 – Monitoring Ref: V002



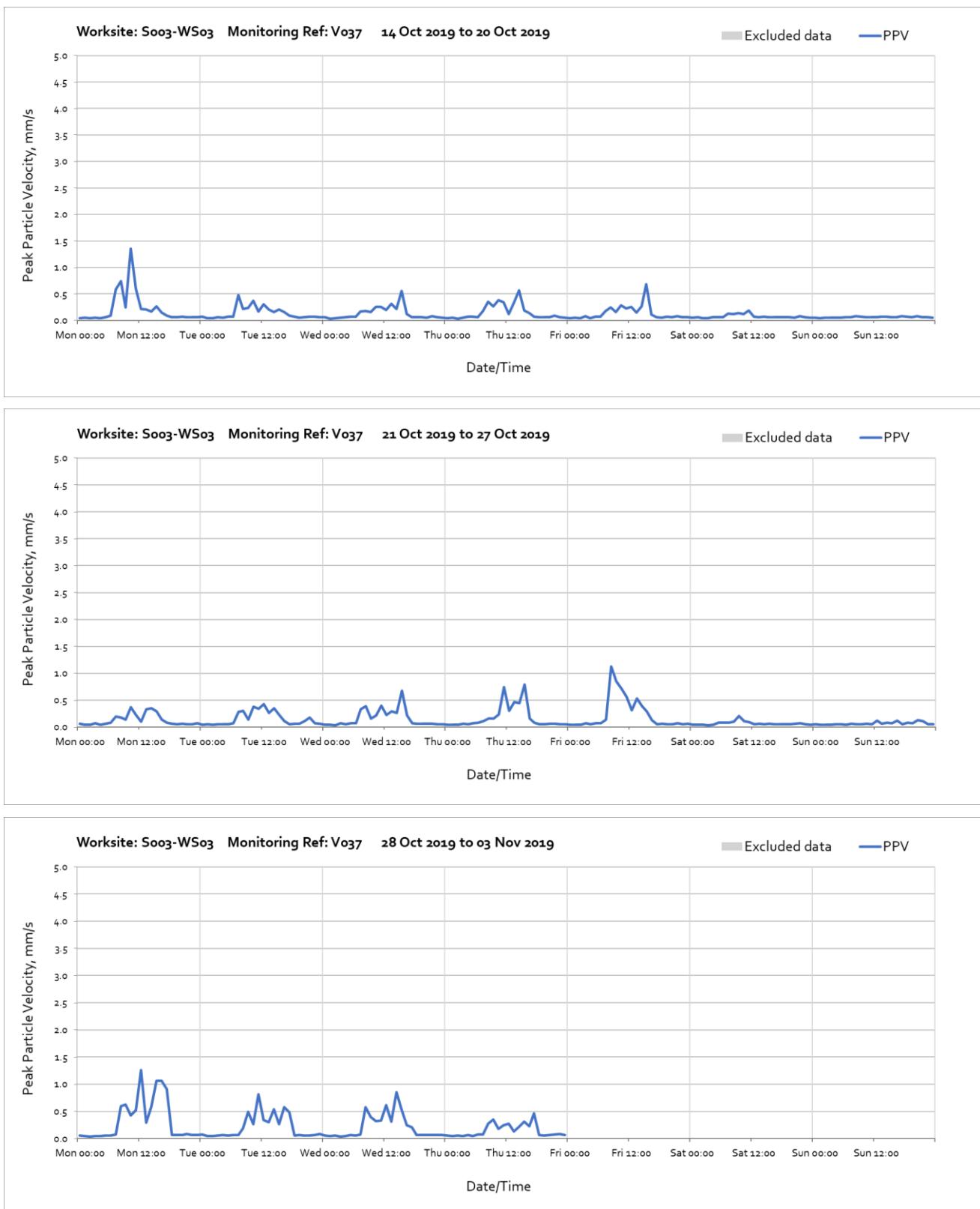




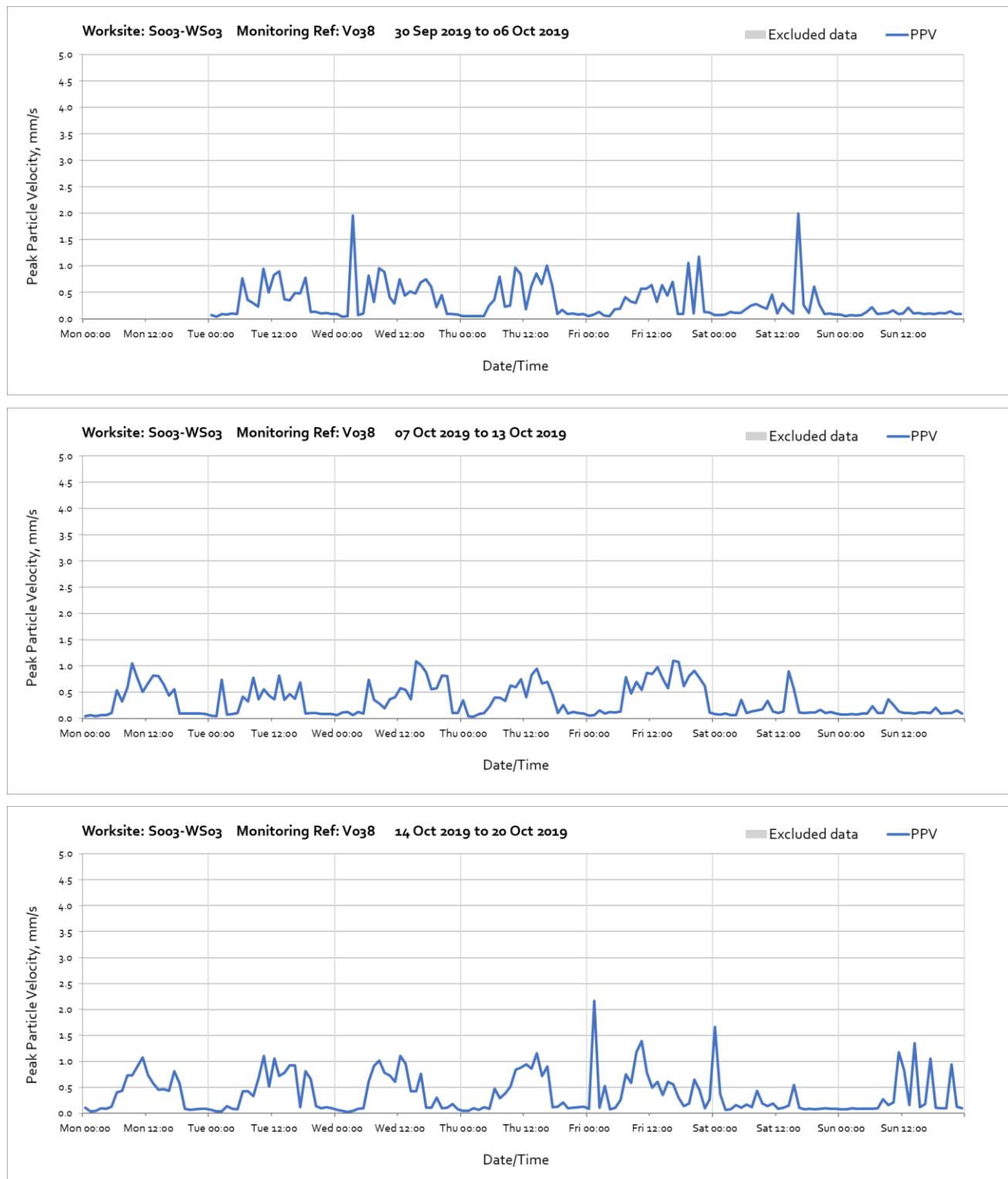
## Worksite: S003-WS03 – Monitoring Ref: V037

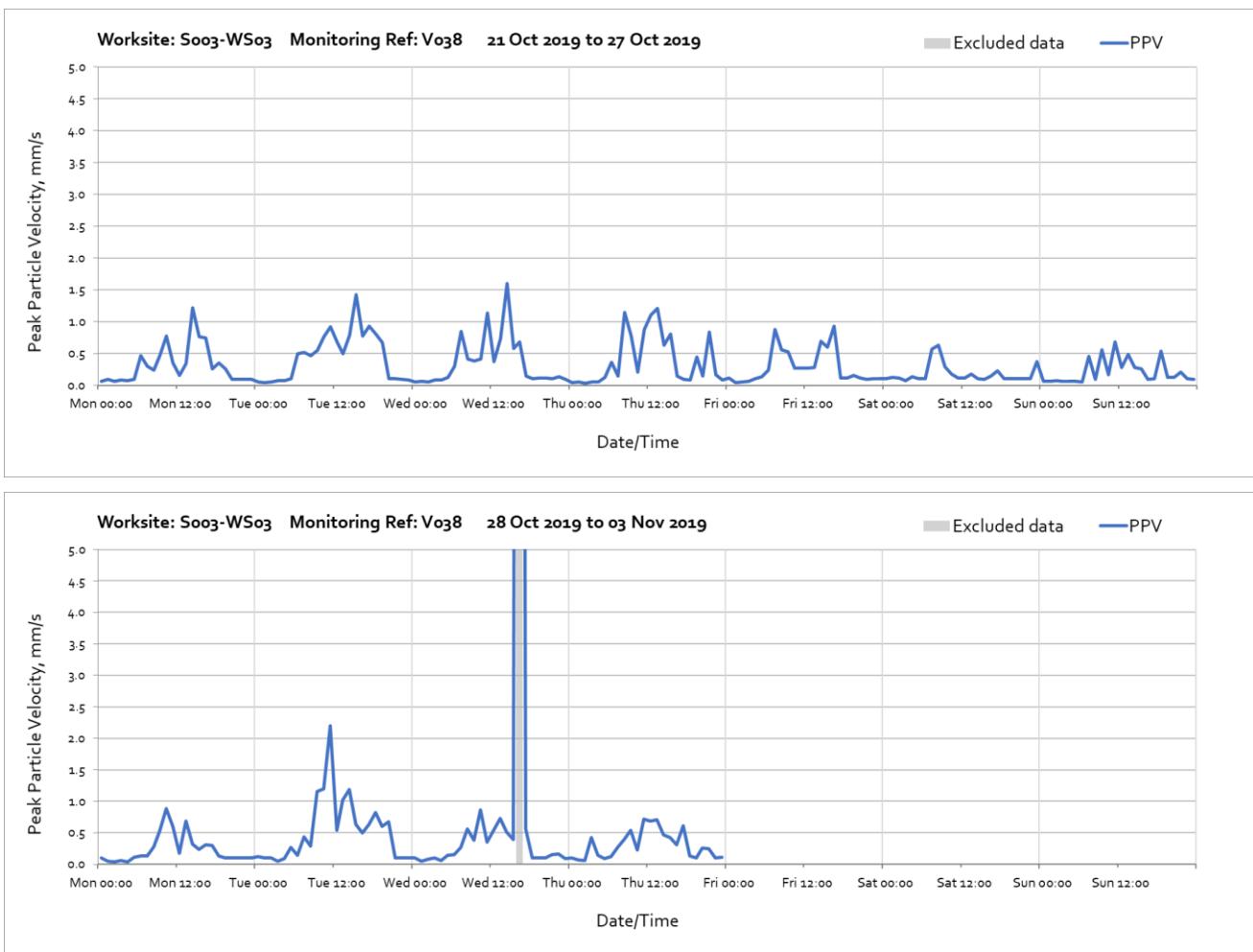


Note: High vibration levels at 15:00 on Wednesday 11<sup>th</sup> October were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels.



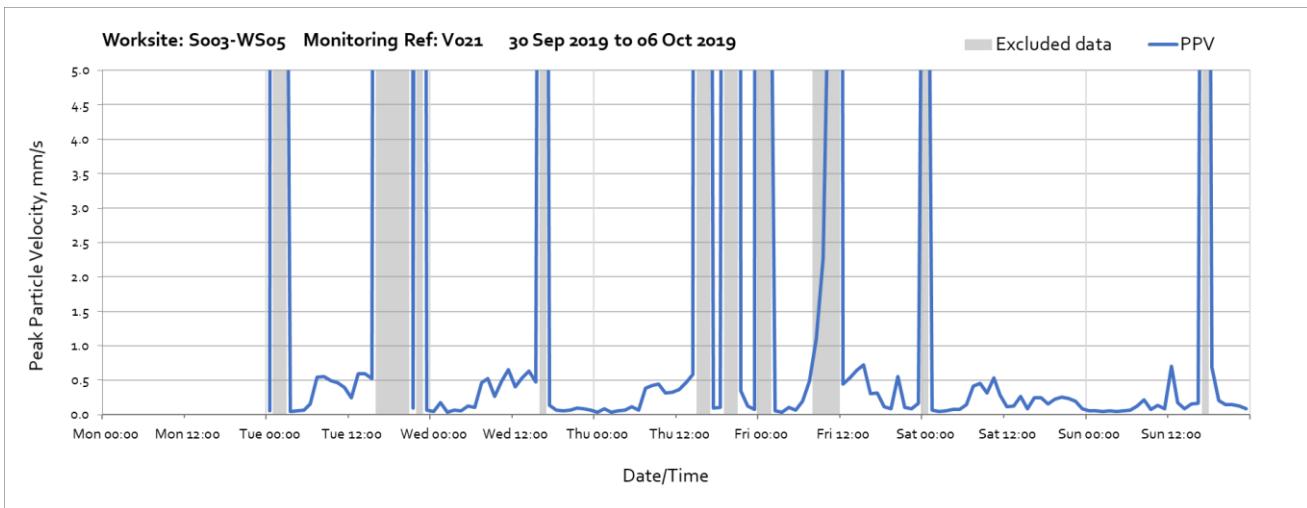
## Worksite: S003-WS03 – Monitoring Ref: V038



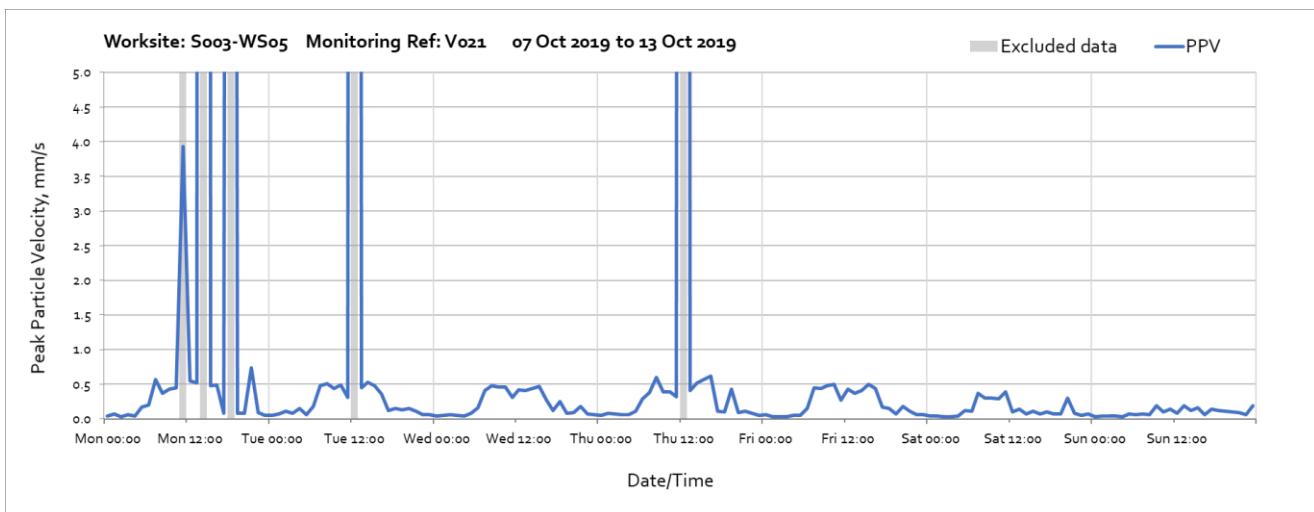


Note: High vibration levels at 16:00 Wednesday 30<sup>th</sup> October were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels.

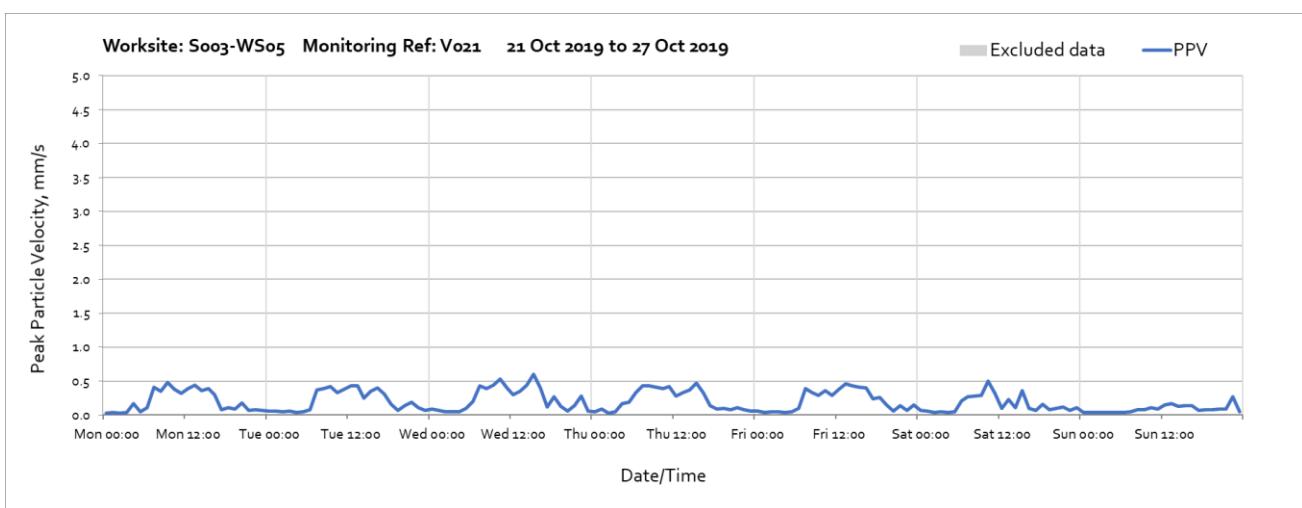
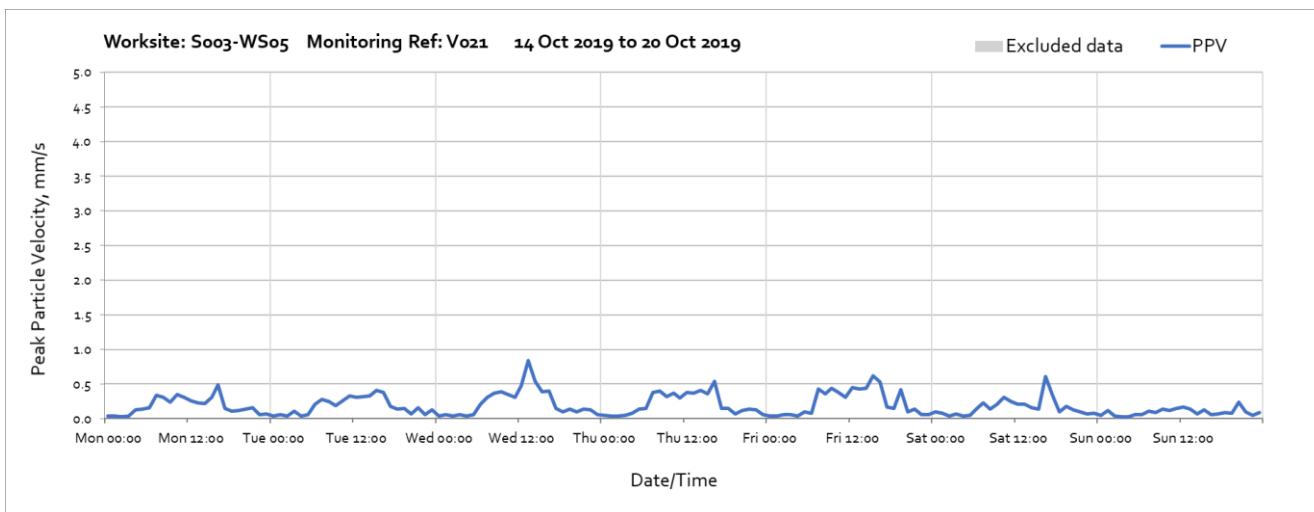
## Worksite: S003-WS05 – Monitoring Ref: V021

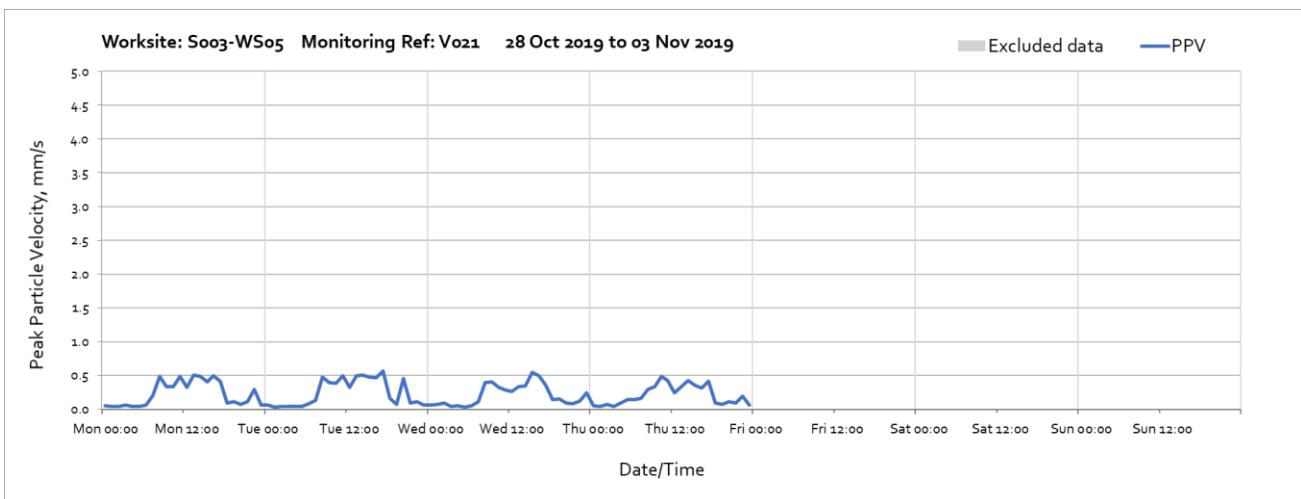


Note: High vibration levels throughout the week were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels.



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





## Worksite: S003-WS09 – Monitoring Ref: V003

