

Construction noise and vibration Monthly Report – January 2020

Birmingham City Council

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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 vibration monitoring carried out within the Birmingham City Council (BCC) area during the month of January 2020.

This report presents vibration data from two monitoring installations at the Museum Collection Centre to collect baseline information ahead of construction activities in the area. No worksite was active during the month of January 2020 and no noise monitoring was carried out. The sensors measure Peak Particle Velocity (PPV).

No exceedances of the SOAEL and no exceedances of S61 trigger levels were measured due to HS2 related works during the monitoring period. No complaints were reported to HS2 for the BCC region during the January monitoring period.

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 $m/s^{1.75}$. |

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 baseline vibration data, and interpretation thereof, for monitoring carried out by HS2 within the Birmingham City Council (BCC) for the period 1st to 31st January 2020.

1.1.2 There were no active construction sites in the local authority area during this period.

1.1.3 The applicable standards, guidance, and monitoring methodology is outlined in the construction noise and vibration monitoring methodology report which can be found at the following location <https://www.gov.uk/government/collections/monitoring-the-environmental-effects-of-hs2>. Noise and vibration monitoring reports for previous months can also be found at this location.

1.2 Measurement locations

1.2.1 Table 2 summarises the position of the vibration monitoring installations within the BCC area in January 2020. Vibration monitors Vib 1 and Vib 2 were installed in September within the Museum Collection Centre to collect baseline information ahead of commencement of construction activities in the area.

1.2.2 Maps showing the locations of vibration monitoring installations are presented in Appendix B.

Table 2: Monitoring locations

| Worksite Reference | Measurement Reference | Address |
|--------------------------|-----------------------|--|
| Museum Collection Centre | Vib 1 | 25 Dolman Street, Birmingham, B7 4RQ (Top Floor) |
| | Vib 2 | 25 Dolman Street, Birmingham, B7 4RQ (Outside) |

2 Summary of results

2.1 Exceedances of SOAEL

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

2.1.2 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 Monitoring of vibration peak particle velocity (PPV) was undertaken with the purpose to ensure construction generated vibration levels were below those with potential to damage adjacent buildings, in accordance with Annex 1: Code of Construction Practice of the High Speed Rail (London-West Midlands) Environmental Minimum Requirements. This report presents baseline vibration levels whereby no HS2 construction activities were undertaken. 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 3 presents a summary of the vibration levels measured at monitors Vib 1 and Vib 2 over the reporting period.

2.2.2 Appendix C presents graphs of the vibration monitoring data over the month for each of the measurement locations. 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>.

Table 3: Summary of measured PPV data over the monitoring period.

| Worksite Reference | Measurement Reference | Site Address | Highest PPV measured in any axis, mm/s |
|--------------------------|-----------------------|--|--|
| Museum Collection Centre | Vib 1 ⁽¹⁾ | (Top Floor) 25 Dolman Street, Birmingham | 1.43 (Z axis) |
| | Vib 2 | (Outside) 25 Dolman Street, Birmingham | 0.14 (Z axis) |

⁽¹⁾ This monitoring location is exposed to local interference and the vibration levels measured are not representative of baseline noise levels further away from local sources of disturbance. Alternative locations for repositioning of this monitor are being considered.

2.2.3 No worksites were active in the area surrounding the Museum Collection Centre and measured vibration levels are considered representative of baseline conditions.

2.3 Exceedances of trigger level

2.3.1 Table 4 provides a summary of exceedances of the S61 trigger noise levels determined to be due to HS2 related construction noise and vibration measured during the reporting period, along with the findings of any investigation.

Table 4: 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 5 provides a summary of complaint information related to noise and vibration received during the reporting period, along with the findings of any investigation.

Table 5: Summary of complaints

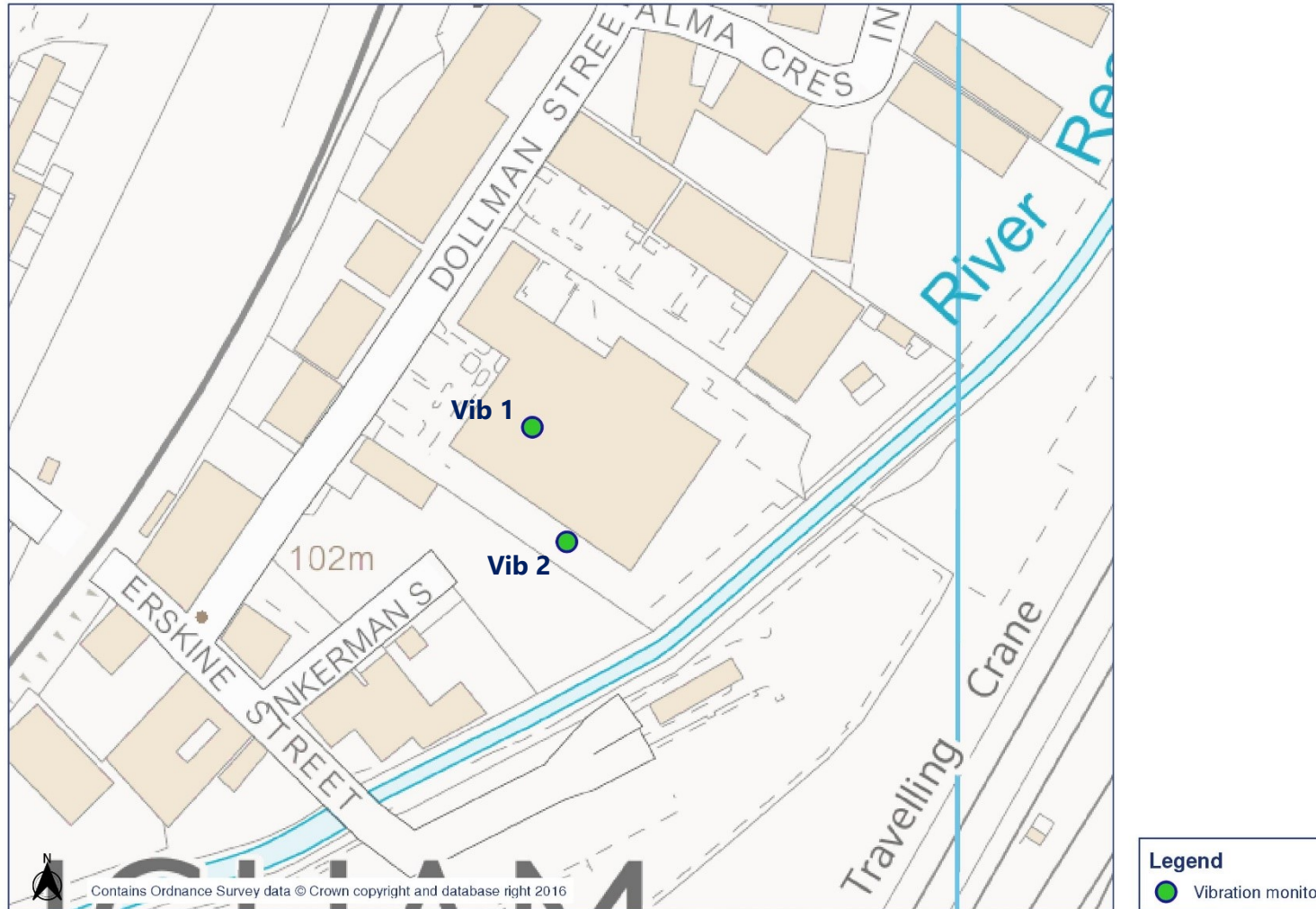
| Complaint Reference Number | Worksite Reference | Description of Complaint | Results of Investigation | Actions Taken |
|----------------------------|--------------------|--------------------------|--------------------------|---------------|
| - | - | - | - | - |

2.4.2 No complaint regarding HS2 related construction noise or vibration were received during the reporting period in the BCC area.

Appendix A Monitoring Locations

HS2

Vibration monitoring plan

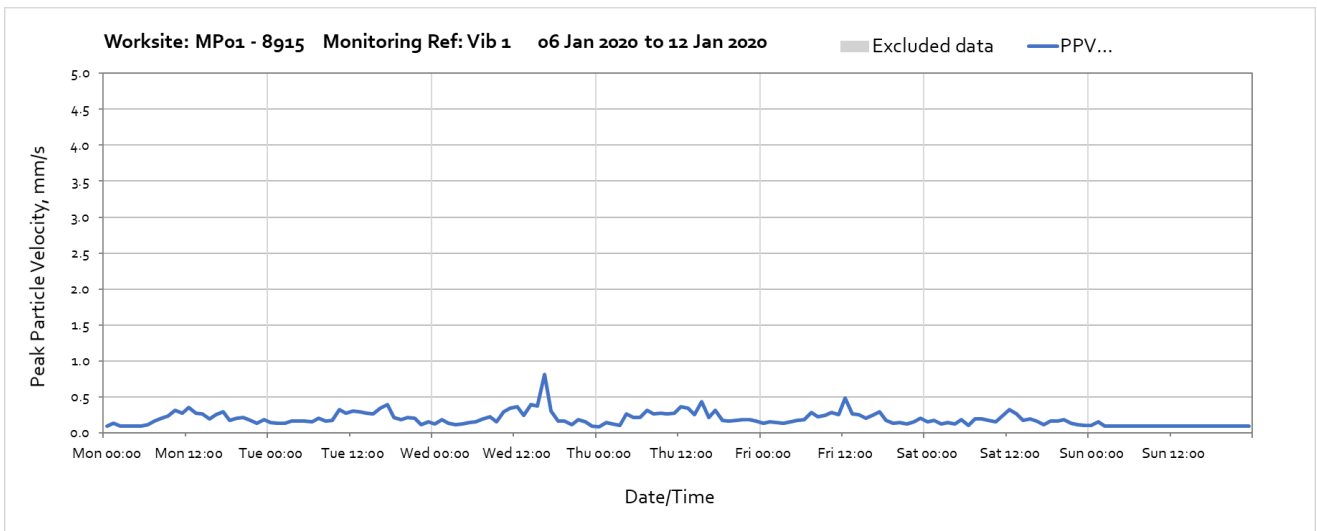
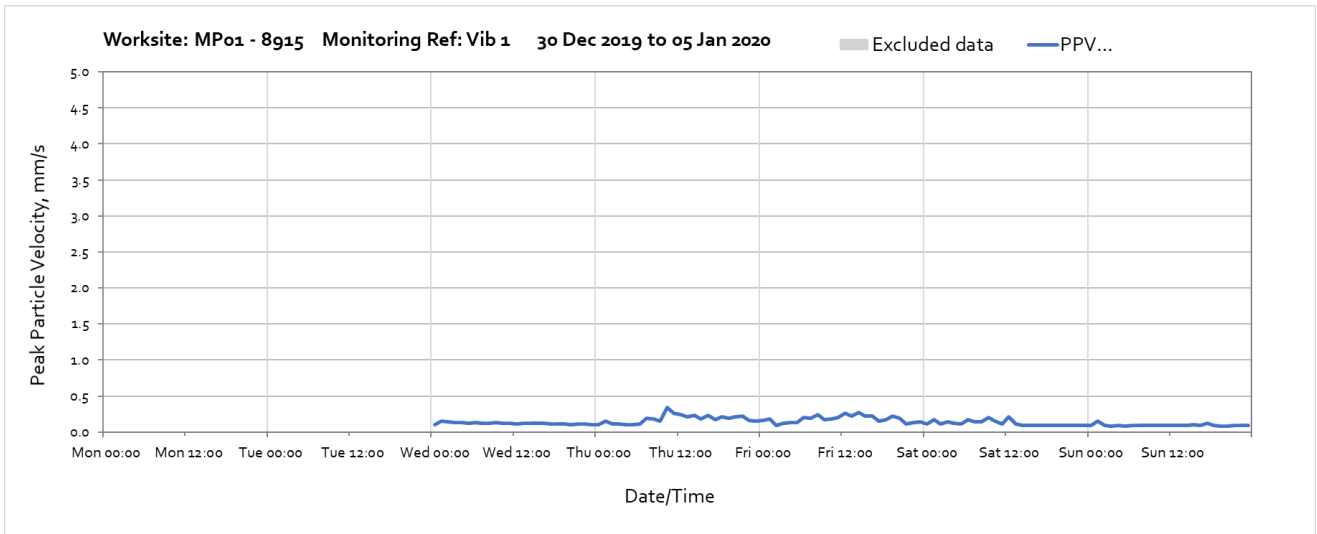


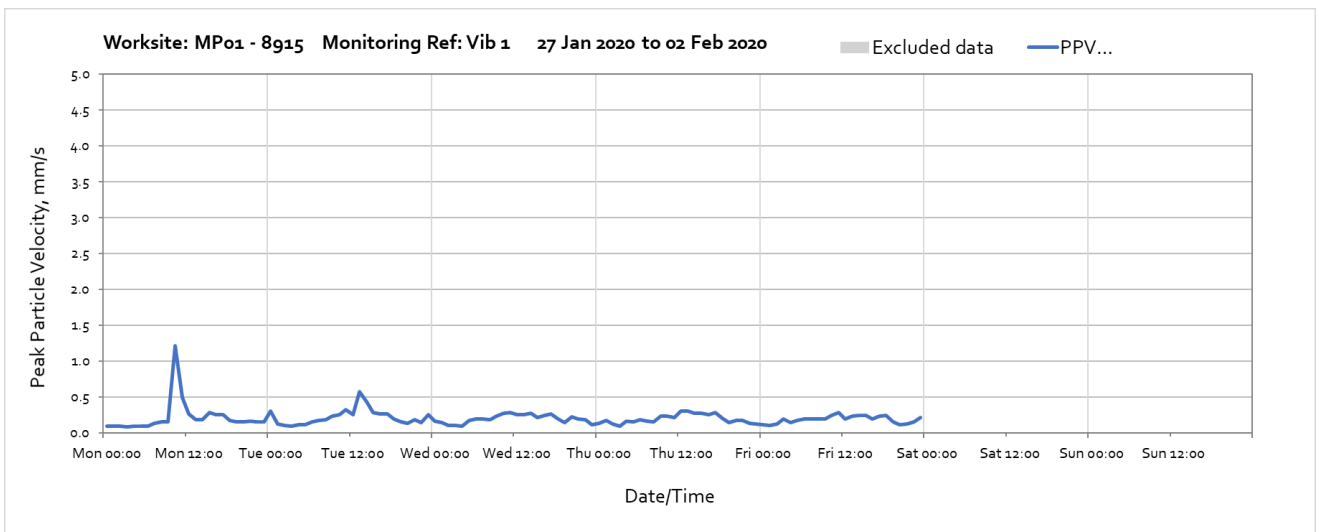
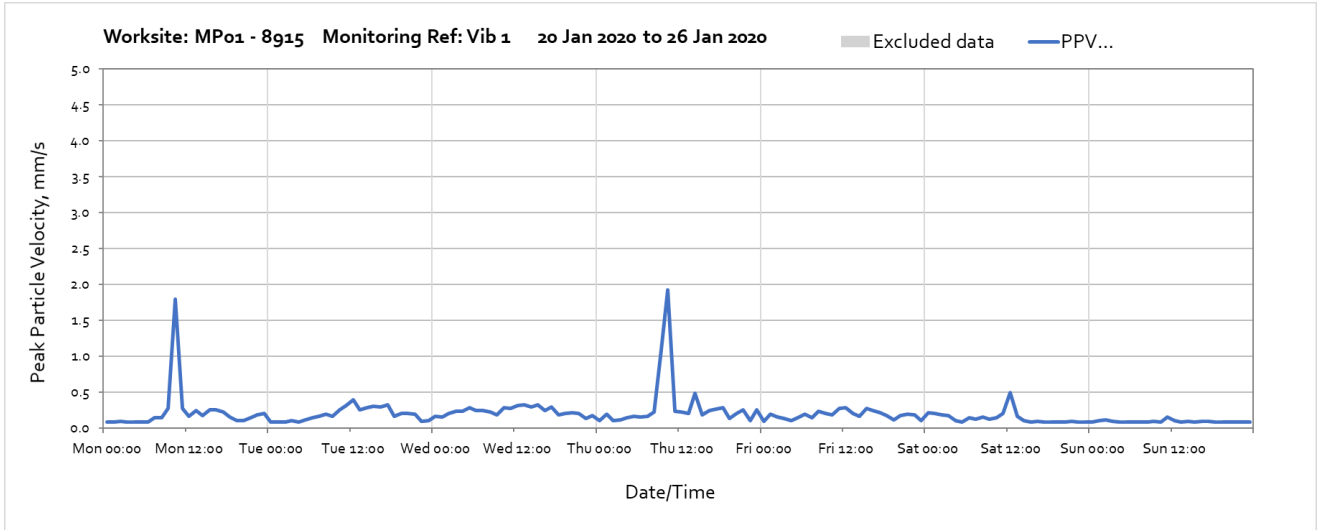
Appendix B Data

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.

Worksite: Museum Collection Centre – Monitoring Ref: Vib 1





Worksite: Museum Collection Centre – Monitoring Ref: Vib 2

