HS2

May 2020

Construction noise and vibration Monthly Report – March 2020

London Borough of Hillingdon

gov.uk/hs2

List of tables

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 Hillingdon (LBH) during the month of March 2020.

This report presents data from noise monitor installations at, and in the vicinity of, the LTP #2 worksite located south of Dews Farm, the West Ruislip Portal worksite and the West Ruislip Northolt Corridor worksite. During the monitoring period site activities at the LTP #2 worksite included mobilisation of piling equipment, fencing repairs and removal of construction equipment. Works at the West Ruislip Northolt Corridor worksite included cable installation and testing, installation and removal of concrete troughing, material deliveries, works on heating strips on points, wiring in location cabinets and profiling ballast ready for tamping. Works at the adjacent West Ruislip Portal worksite included hoarding and fencing installation, site security, and aggregate deliveries via freight train.

Noise levels measured near the West Ruislip Northolt Corridor worksite were above guideline criteria for significant adverse effects due to construction activities on a number of days, due to night-time HS2 related works. No complaints were reported to HS2 for the LBH area during the March 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 $L_{pAeq,T}$	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.
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.
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.
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 noise data, and interpretation thereof, for monitoring carried out by HS2 within the London Borough of Hillingdon (LBH) for the period 1st to 31st March 2020.

1.1.2 Active construction sites potentially contributing to noise in the local authority area during this period include:

- LPT#2 worksite, where mobilisation of piling equipment, fencing repairs, removal of mobile crane, excavator, roller, small plant and the removal of piling rig parts were undertaken;

- West Ruislip Northolt Corridor worksite, where cable installation and testing, installation and removal of concrete troughing, material deliveries, works on heating strips on points, wiring in location cabinets and profiling ballast ready for tamping were undertaken. Works at the adjacent West Ruislip Portal worksite included hoarding and fencing installation, site security, and aggregate deliveries via freight train activities.

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 Noise monitoring was undertaken adjacent to the load test pile (LTP #2) worksite, at the boundary to the worksite (ref: NMP1) and at the Hillingdon Outdoor Activities Centre (Ref: NMP2), and at two locations adjacent to the West Ruislip Northolt Corridor worksite located on the opposite side of the tracks, installed on a concrete post approximately 80m northwest of Ickenham Road (ref: NMP3) and installed at a buffer stop approximately 370m northwest of Ickenham Road (ref: NMP4).

1.2.2 Table 2 presents the position of the noise monitoring installation within the LBH area in March 2020. A map showing the position of the noise monitoring installation is presented in Appendix B.

Table 2: Monitoring locations

Worksite Reference	Measurement Reference	Address
LTP #2	NMP1	Hillingdon Outdoor Activity Centre, Dews Lane, Harefield, Uxbridge
	NMP2	LTP #2 Worksite, Harvil Road, Harefield, Uxbridge
West Ruislip Portal/Northolt Corridor	NMP3	Down sidings, opposite worksite. Concrete post
	NMP4	Down sidings, opposite worksite. Buffer stop

2 Summary of results

2.1 Exceedances LOAEL of SOAEL

2.1.1 The lowest observed adverse effect level (LOAEL) is defined in the Planning Practice Guidance – Noise as the level above which "noise starts to cause small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life".

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

2.1.3 Table 3 presents a summary of recorded exceedances of the LOAEL and 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 LOAEL and SOAEL

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of LOAEL	Number of exceedances of SOAEL
LTP #2	NMP1	Hillingdon Outdoor Activity Centre, Dews Lane, Harefield, Uxbridge	All days	All periods	No exceedance	No exceedance
	NMP2	LTP #2 Worksite, Harvil Road, Harefield, Uxbridge	All days	All periods	No exceedance	No exceedance
West Ruislip Portal/Northolt Corridor	NMP3	Down sidings, opposite worksite. Concrete post	Weekday	0700-0800	24	No exceedance
			Weekday	1800-1900	30	No exceedance
			Saturday	0700-0800	6	No exceedance
			Saturday	1300-1400	6	No exceedance
			Sunday	0700-2200	3	No exceedance
			Night	2200-0700	22	7
	NMP4	Down sidings, opposite worksite. Buffer stop	Weekday	0700-0800	24	No exceedance
			Weekday	0800-1800	8	No exceedance
			Weekday	1800-1900	30	No exceedance
			Saturday	0700-0800	6	No exceedance
			Saturday	0800-1300	1	No exceedance
			Saturday	1300-1400	6	No exceedance
			Saturday	1400-2200	3	No exceedance
			Sunday	0700-2200	6	No exceedance
			Night	2200-0700	21	8

2.1.4 Exceedances of SOAEL occurred during overnight shifts for works including the installation of cables and cable troughing, works on points and material deliveries. The LOAEL was exceeded on a number of occasions during periods of works at monitoring locations near the West Ruislip/Northolt Corridor worksite. However, the monitoring locations are exposed to noise from the operational railway, engineering trains and

railway maintenance operations, and only a small number of LOAEL exceedances are believed to be attributable to HS2 construction works.

2.1.5 For the purpose of assessing eligibility for noise insulation or temporary rehousing, multiple exceedances of the SOAEL in a 24-hour period would be counted as a single exceedance during that day. Over the reporting period, the overall number of SOAEL exceedances at each measurement location is shown in Table 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
West Ruislip Northolt Corridor	NMP3	Down sidings, opposite worksite. Concrete post	6
	NMP4	Down sidings, opposite worksite. Buffer stop	8

2.2 Summary of measured noise 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 Ambient noise levels for monitoring location NMP1 in the locality of Hillingdon Outdoor Activity Centre are dominated by noise emanating from the activity centre and the use of the car park. Ambient noise levels for monitoring location NMP2 in the locality of LTP #2 are dominated by noise emanating from local road traffic on Harvil Road to the east.

2.2.3 Ambient noise levels for monitoring locations NMP3 and NMP4 adjacent to West Ruislip Northolt Corridor are dominated by road traffic from Ickenham Road bridge, there are also contribution from trains pass-bys and London Underground trains departing the nearby West Ruislip Station into the early hours.

Table 5: Summary of measured dB L_{Aeq} data over the monitoring period

Worksite Reference	Measurement Reference	Monitor Address	Free-field or Façade measurement	Weekday Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$)					Saturday Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$)					Sunday / Public Holiday Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$)	
				0700 - 0800	0800 - 1800	1800 - 1900	1900 - 2200	2200 - 0700	0700 - 0800	0800 - 1300	1300 - 1400	1400 - 2200	2200 - 0700	0700 - 2200	2200 - 0700
LTP #2	NMP1	Hillingdon Outdoor Activity Centre	Free-field	58.1	59.2	54.7	56.9	56.5	58.9	58.5	57.9	57.0	56.3	57.1	55.3
				(64.0)	(62.3)	(61.3)	(63.7)	(63.8)	(63.2)	(64.2)	(59.2)	(63.0)	(63.2)	(64.0)	(62.6)
	NMP2	LTP #2 Worksite	Free-field	52.9	54.6	51.0	49.0	47.0	51.0	53.1	51.5	49.8	45.7	50.3	45.8
				(57.5)	(57.8)	(54.9)	(54.5)	(56.9)	(53.6)	(55.4)	(53.5)	(52.2)	(51.0)	(53.0)	(52.9)
West Ruislip Portal/North olt Corridor	NMP3	Down sidings, opposite worksite. Concrete post	Free-field	67.3	69.9	70.4	69.9	64.5	60.5	65.5	65.5	65.5	58.6	65.4	60.2
				(68.7)	(71.7)	(73.6)	(73.4)	(72.9)	(64.3)	(70.0)	(70.5)	(71.1)	(69.2)	(72.7)	(70.6)
	NMP4	Down sidings, opposite worksite. Buffer stop	Free-field	68.6	71.9	72.2	71.8	66.6	61.5	66.3	66.0	65.9	59.4	66.2	61.8
				(71.3)	(73.9)	(75.6)	(75.6)	(76.5)	(66.2)	(71.9)	(71.9)	(72.8)	(71.1)	(75.2)	(72.1)

2.2.4 Appendix C presents graphs of the noise monitoring data over the month for the measurement location. Data presented includes 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). 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 6 provides a summary of exceedances of the Section 61 trigger noise levels determined to be due to HS2 related construction noise measured during the reporting period, along with the findings of any investigation.

Table 6: Summary of exceedances of trigger levels

Complaint Reference Number (if applicable)	Worksite Reference	Date and Time Period	Identified Source	Results of Investigation (including noise monitoring results)	Actions Taken
-	-	-	-	-	-

2.3.2 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 7 provides a summary of complaint information related to noise and vibration received during the reporting period, along with the findings of any investigation. No complaints were reported to HS2 for the LBH region during the March monitoring period.

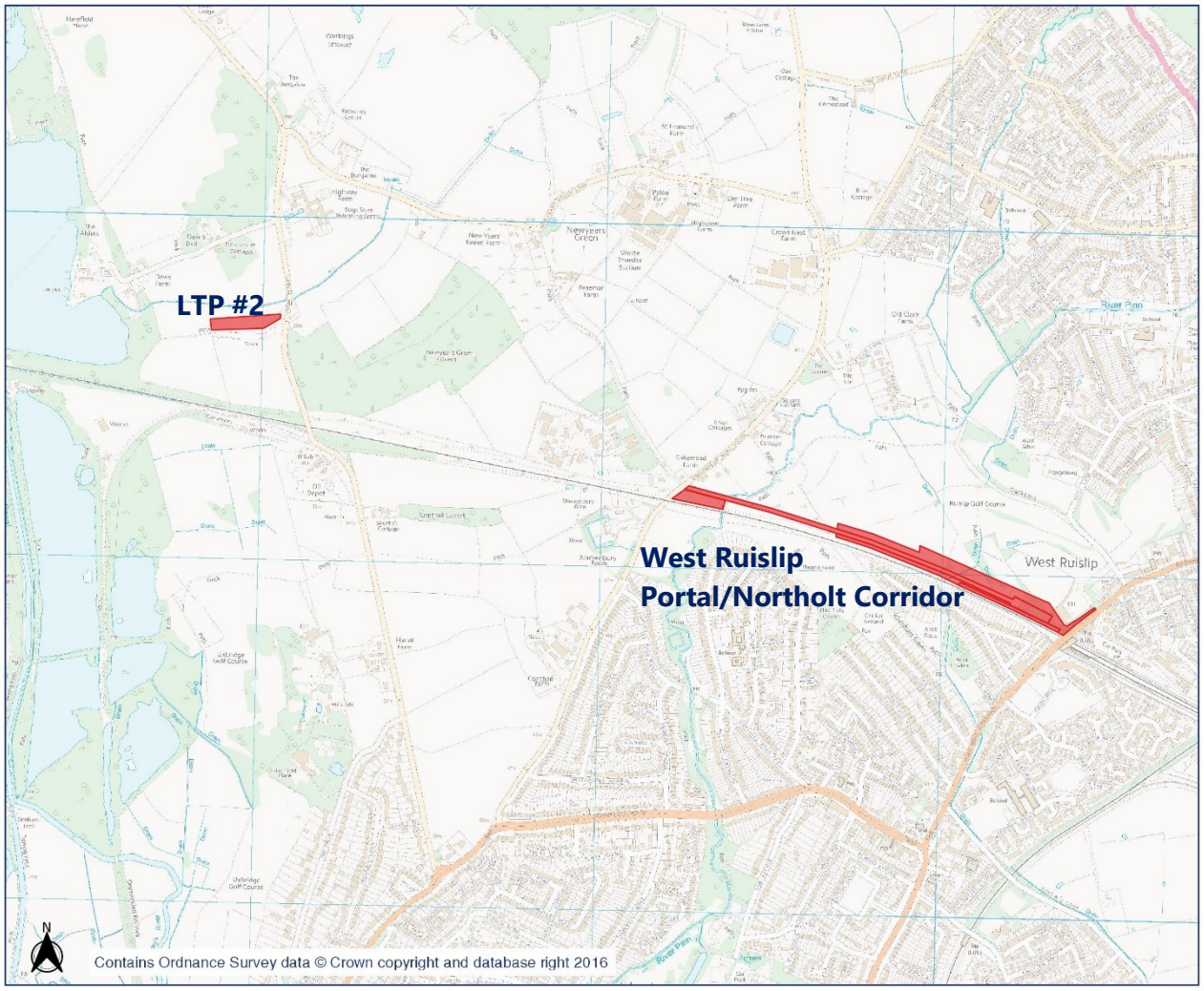
Table 7: Summary of complaints

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

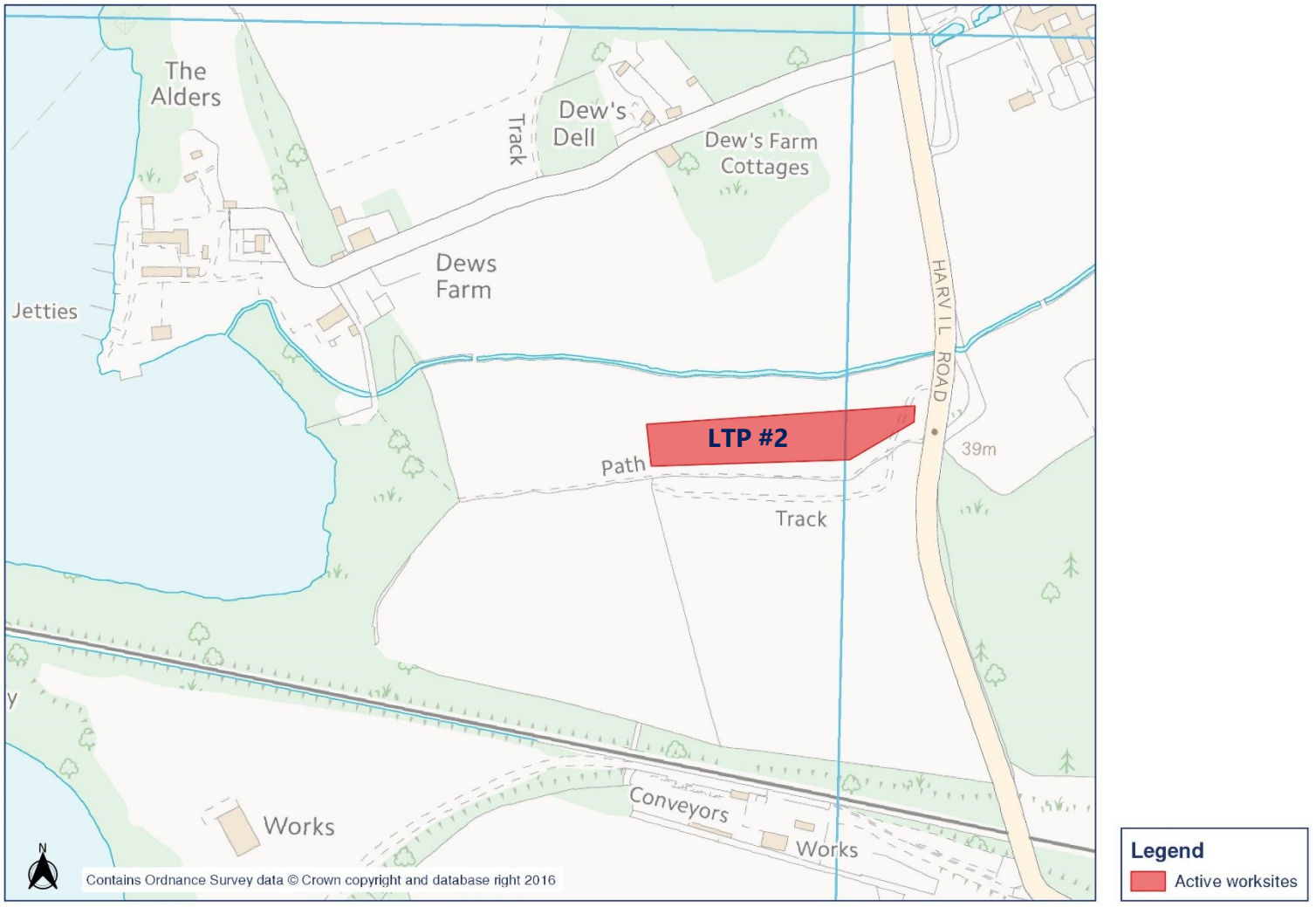
Appendix A Site Locations

HS2

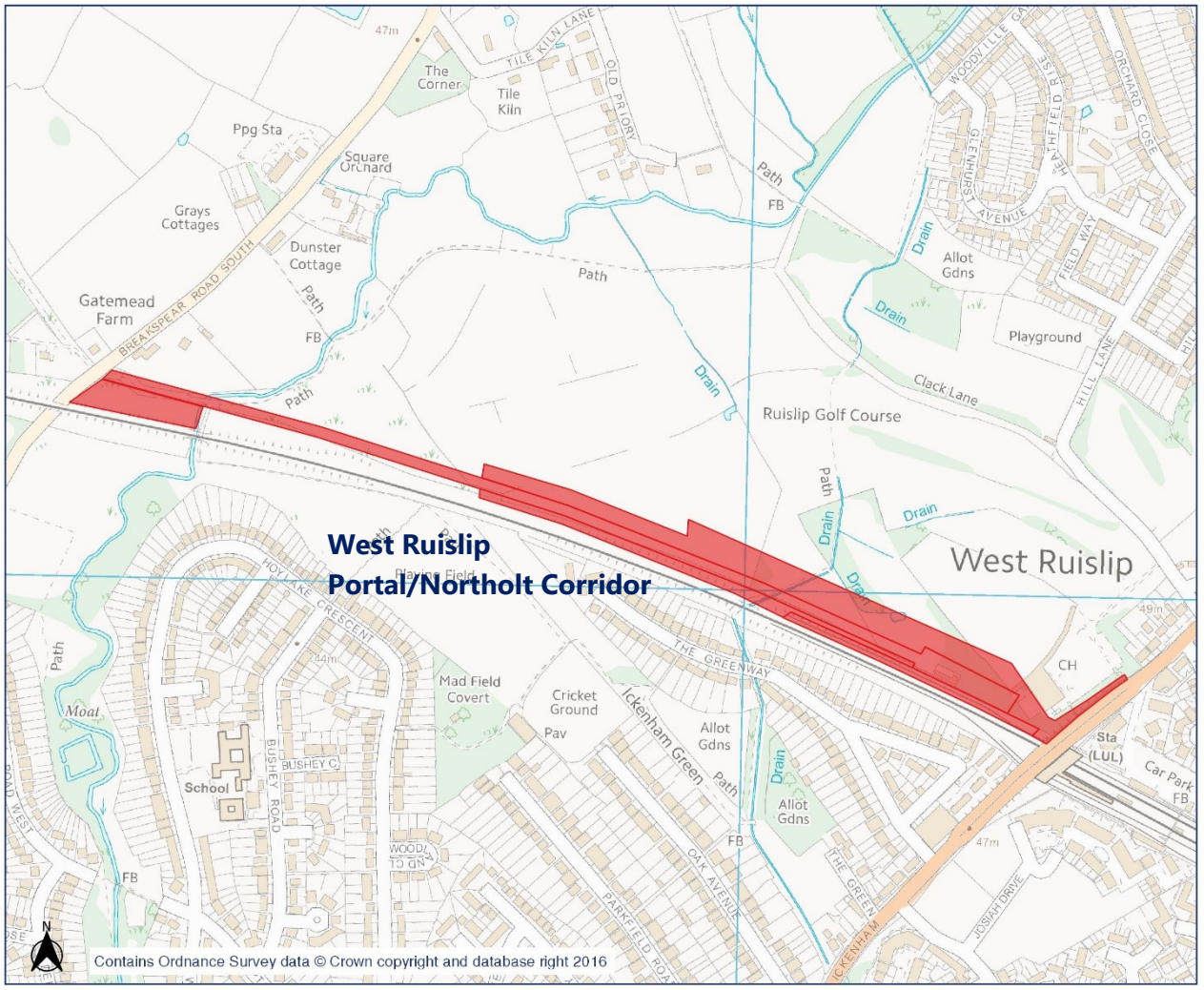
Worksite identification plan - 1



Worksite identification plan - 2



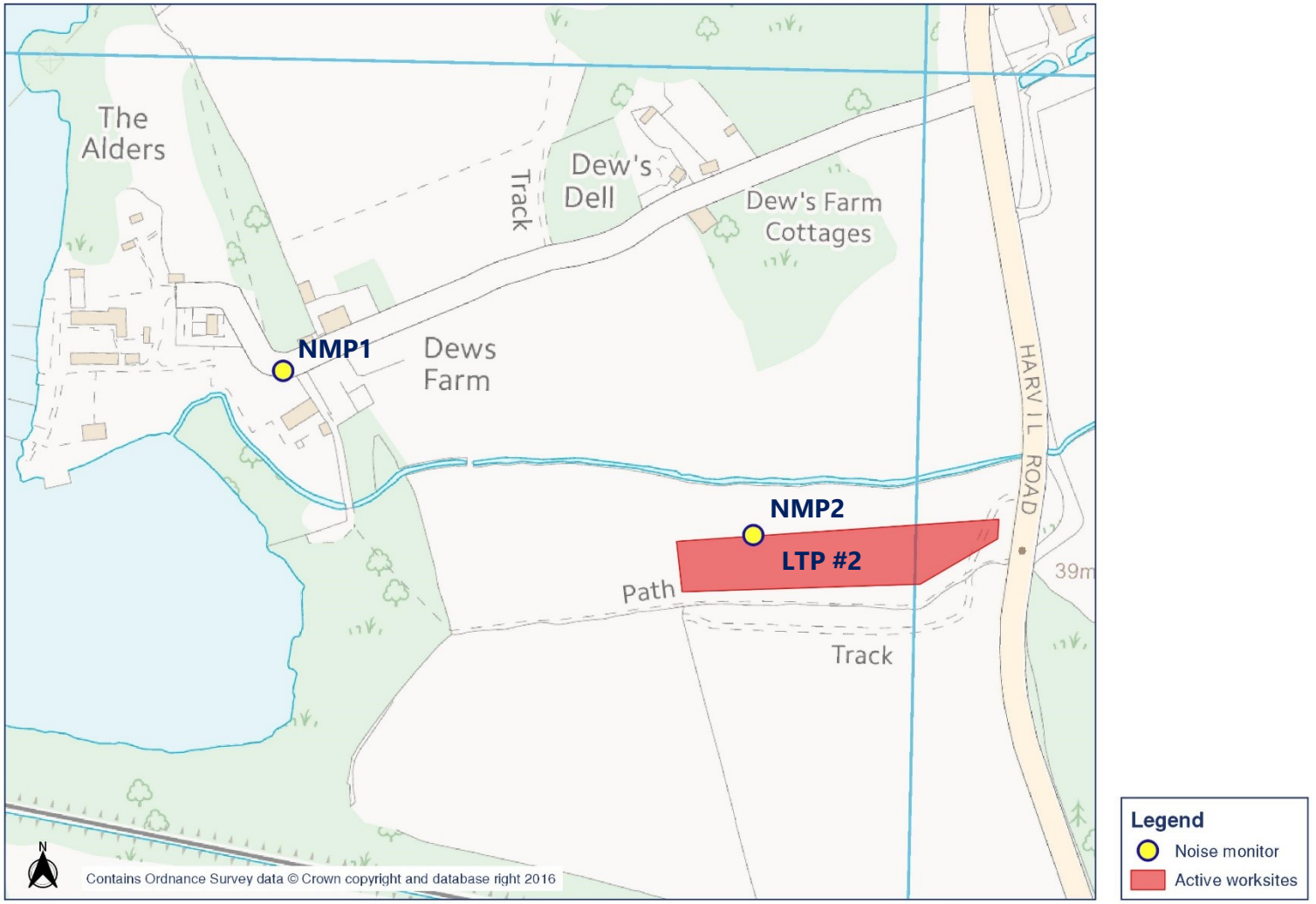
Worksite identification plan - 3



Appendix B Monitoring Locations

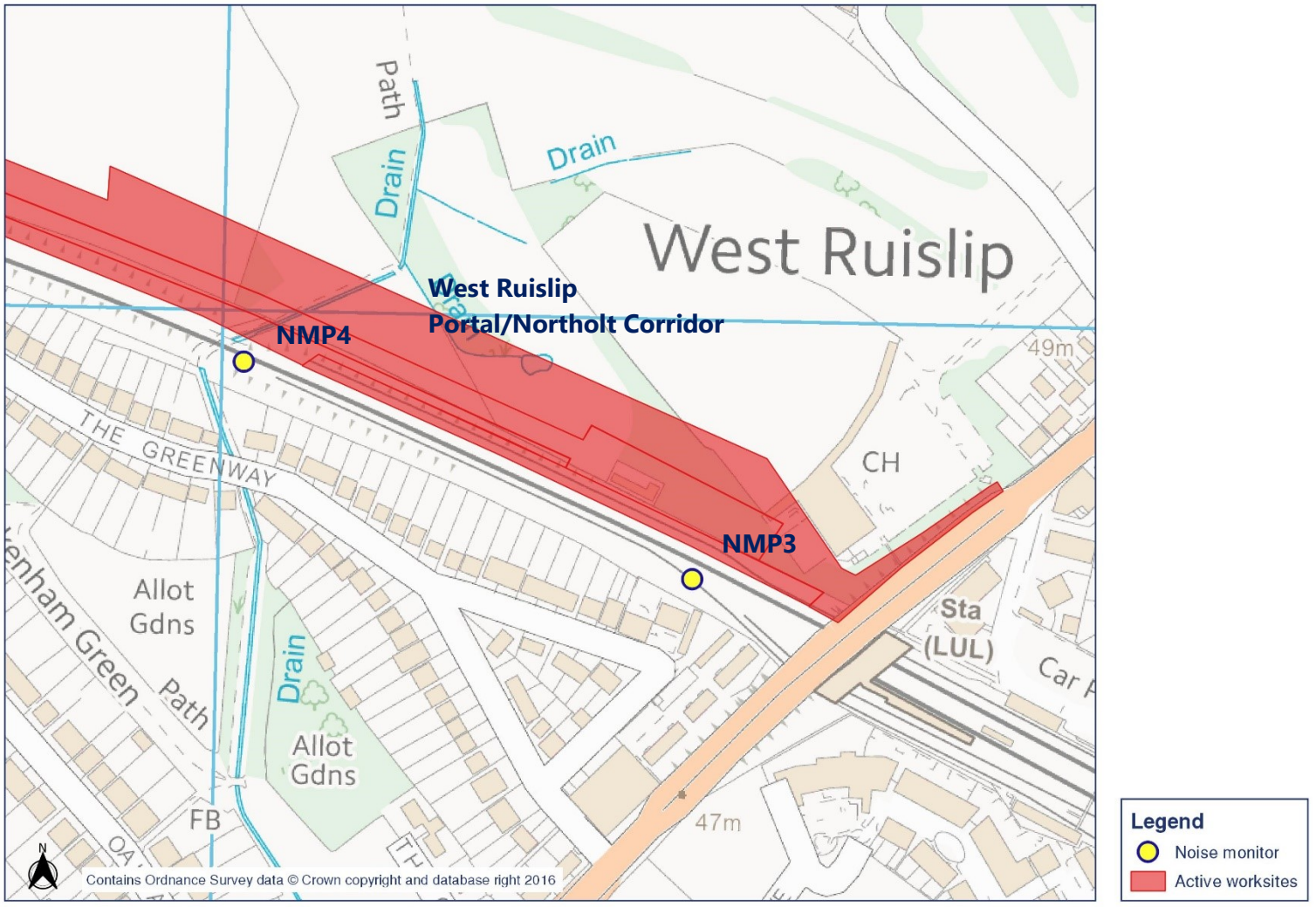
HS2

Noise monitoring plan - 1



HS2

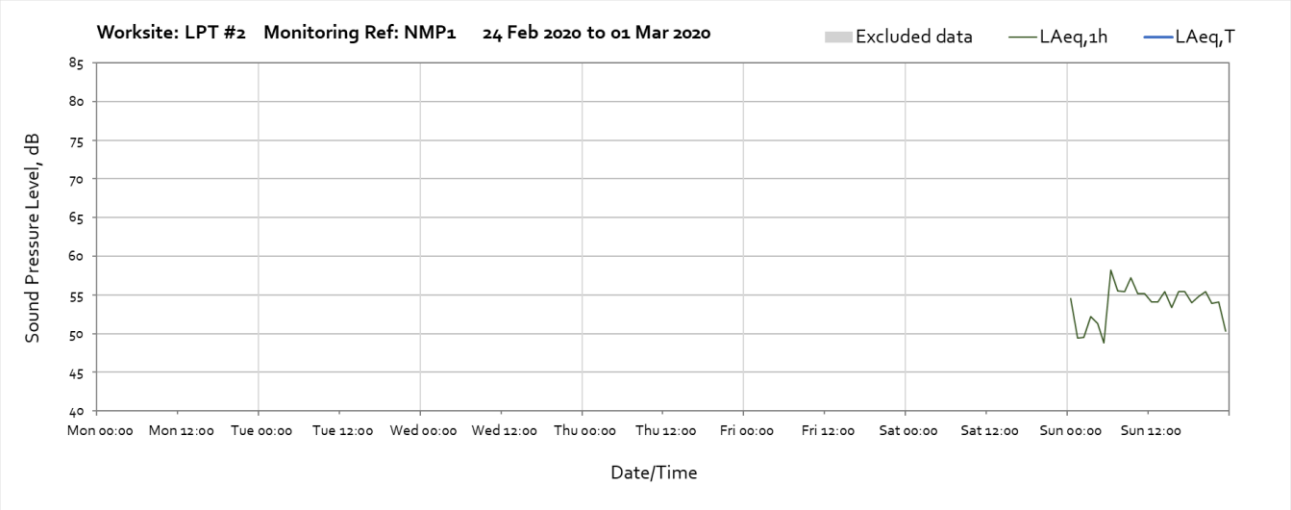
Noise monitoring plan - 2

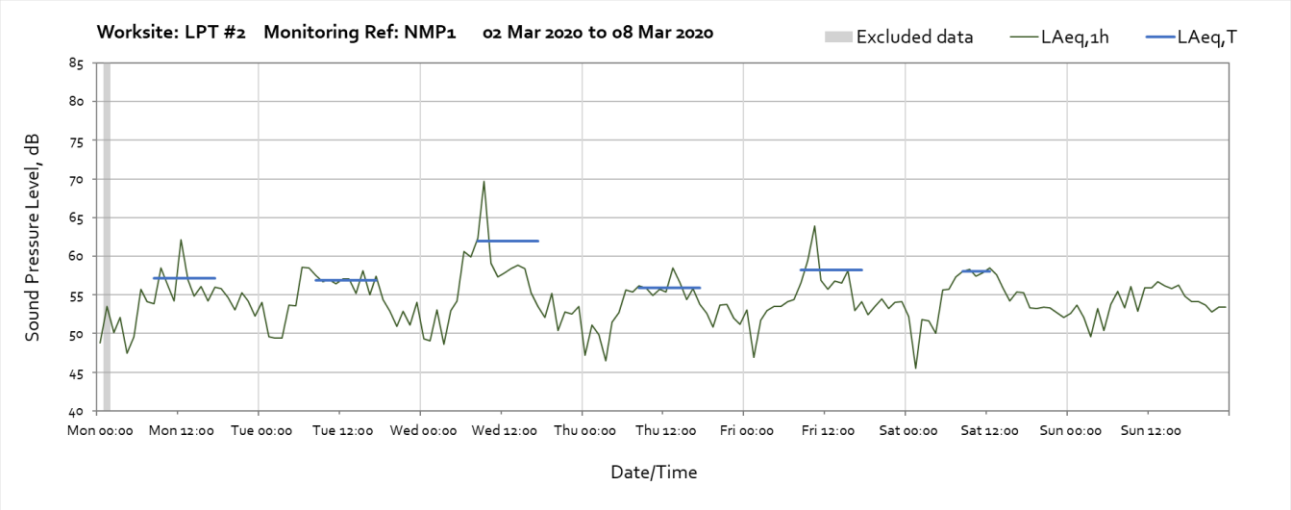


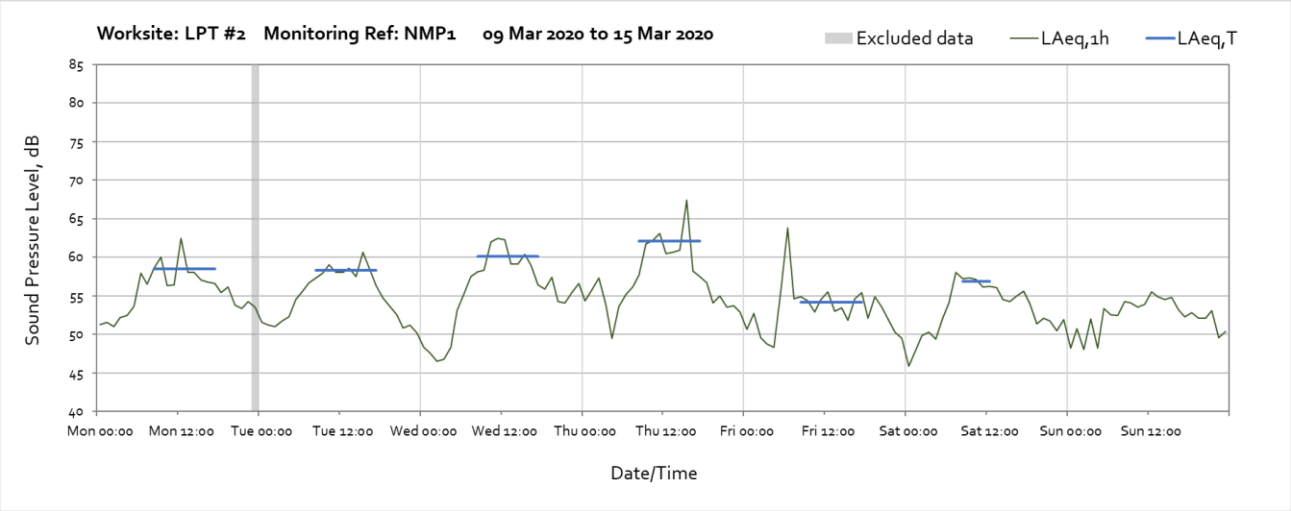
Appendix C Data

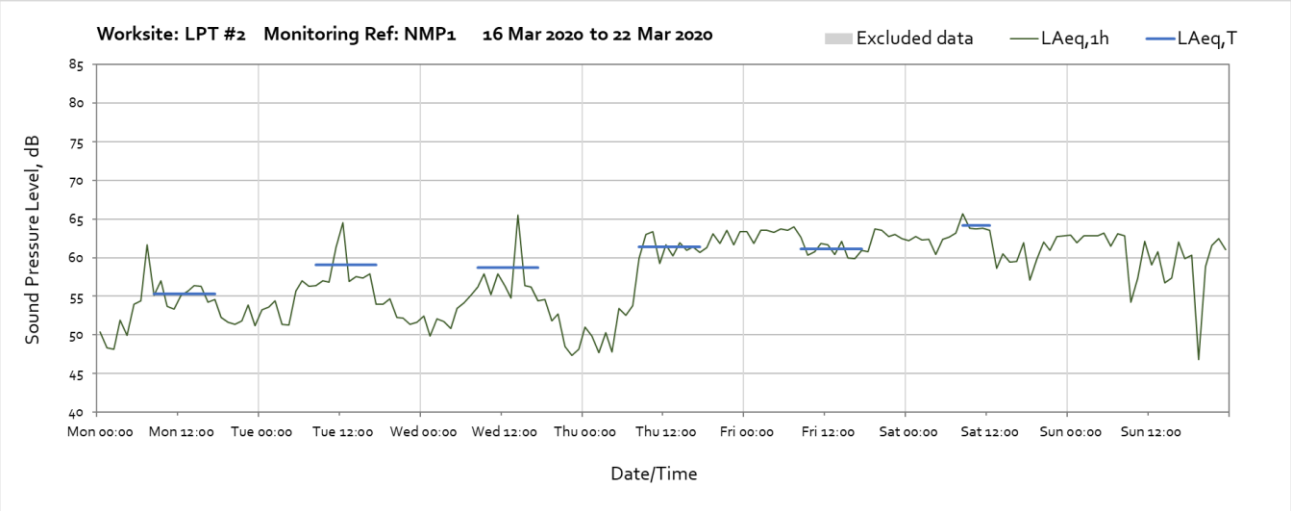
The following graphs show the hourly measured ambient noise level $L_{Aeq,1h}$ and, where relevant, the averaged noise level $L_{Aeq,T}$ values, where the time period T is as specified in Table 1 of HS2 Information Paper E23. Periods with adversely weather affected noise levels are greyed out and have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

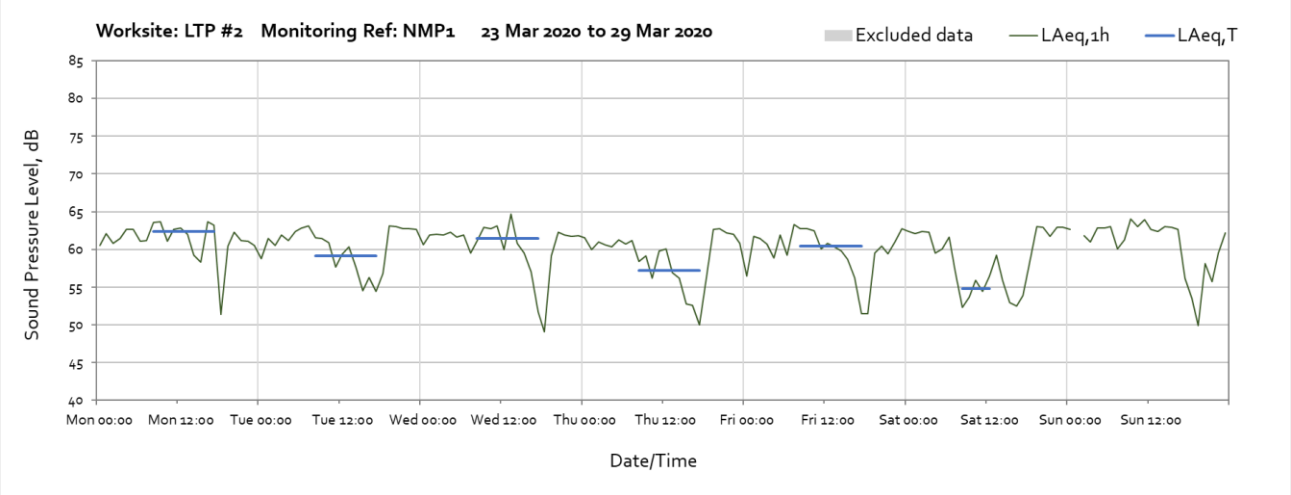
Worksite: LTP #2 – Monitoring Ref: NMP1



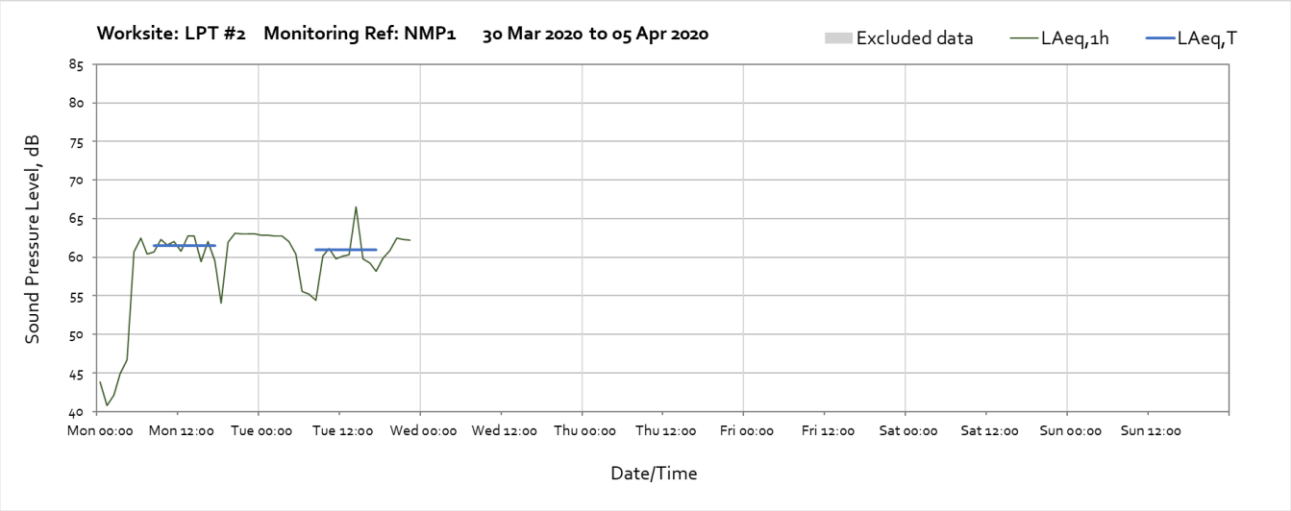




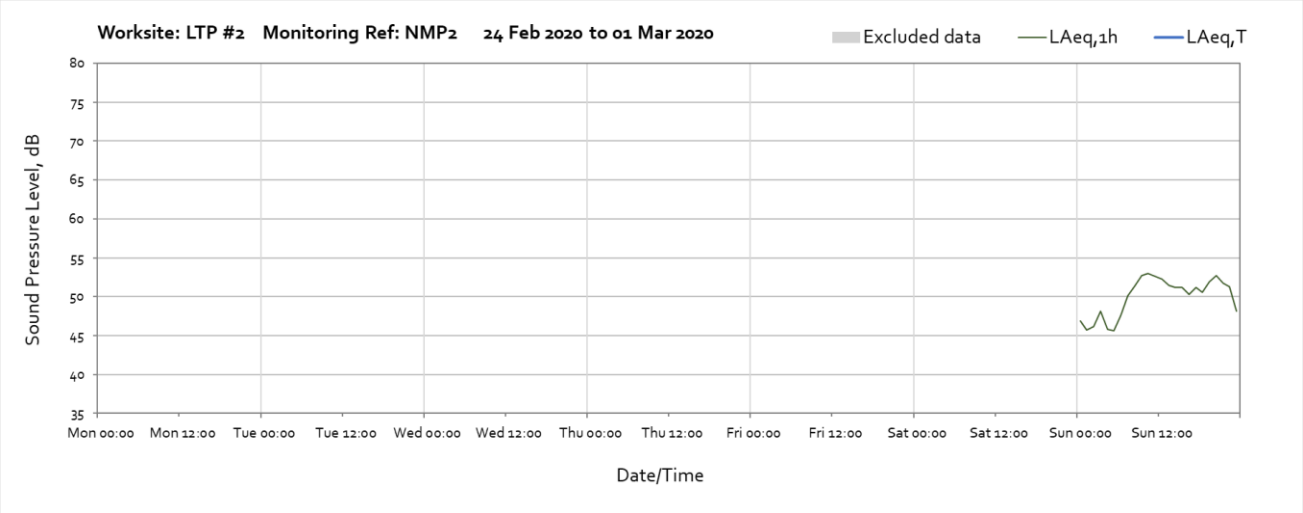


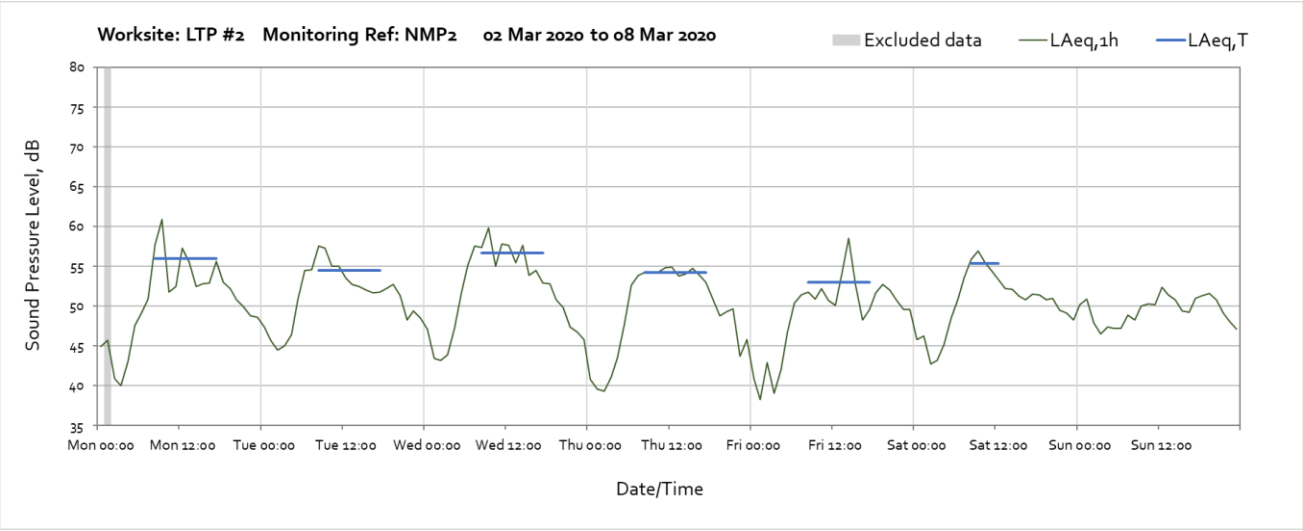


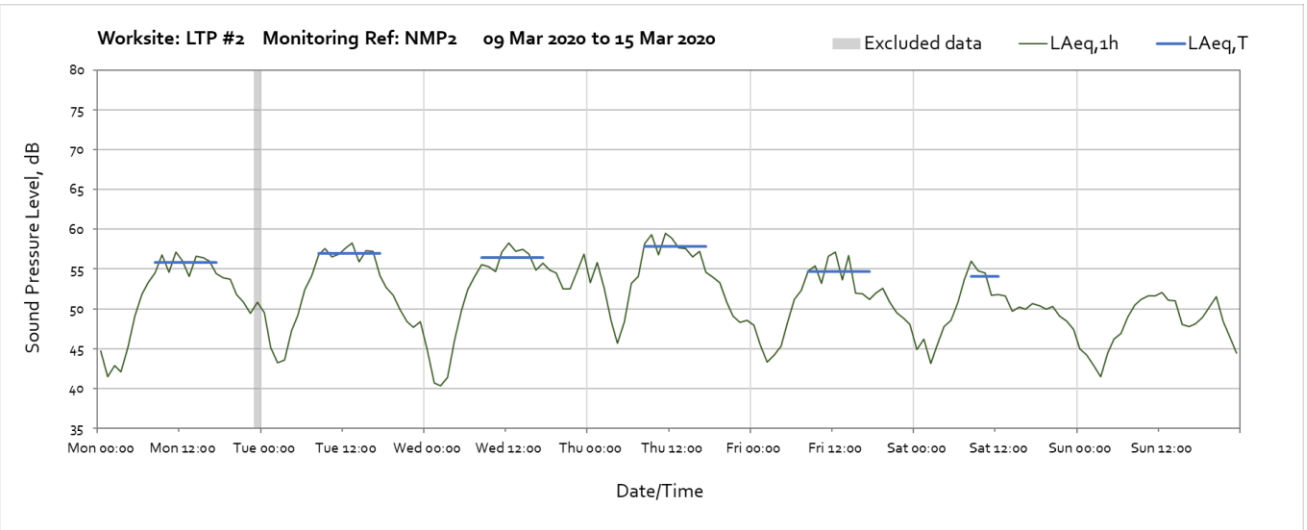
Note: Missing data at 01:00 on Sunday 29th March was due to the clocks going forward at the start of British Summertime.

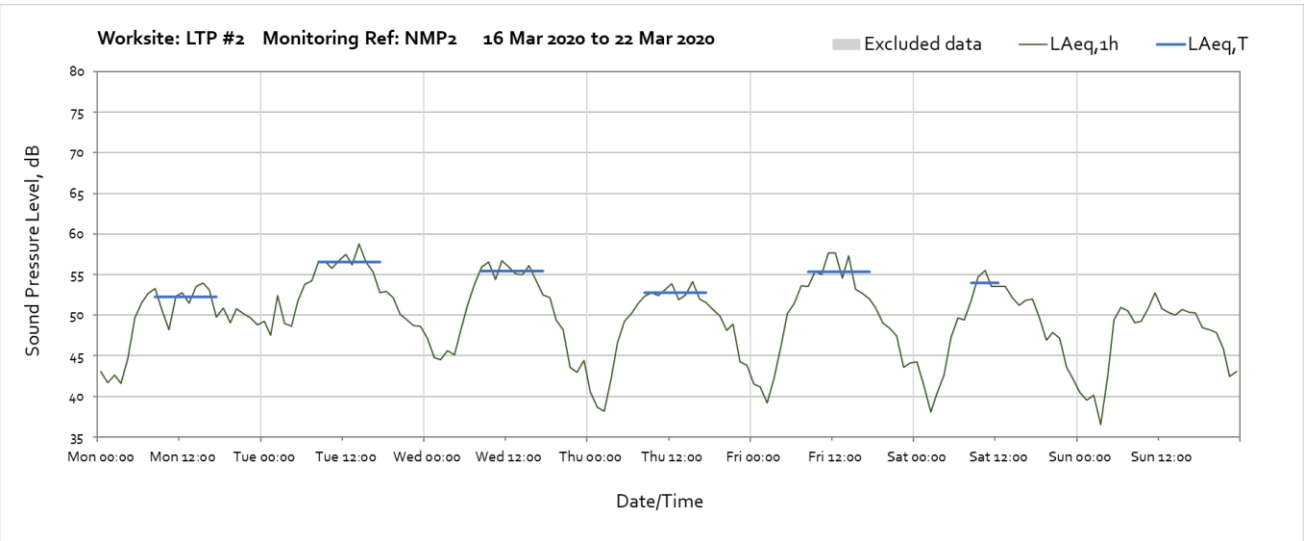


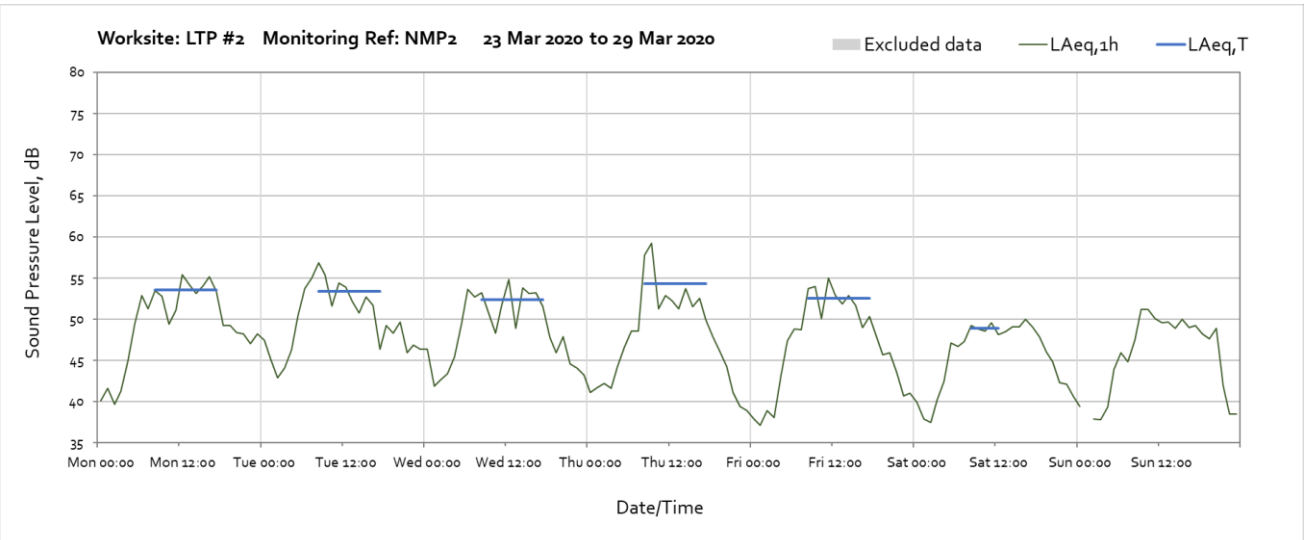
Worksite: LTP #2 – Monitoring Ref: NMP2











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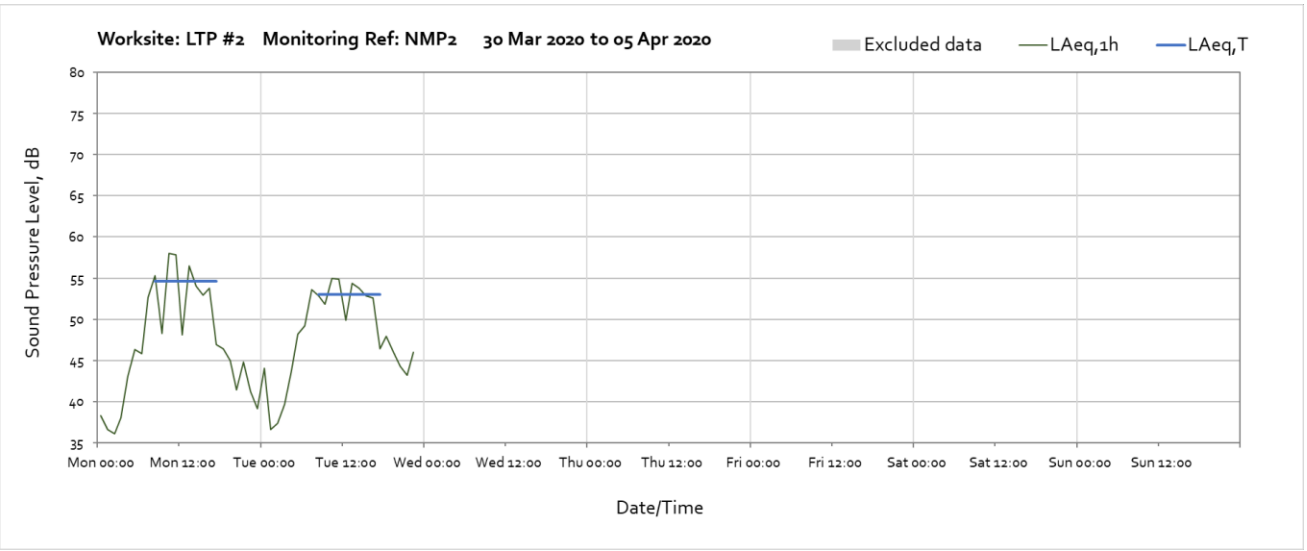

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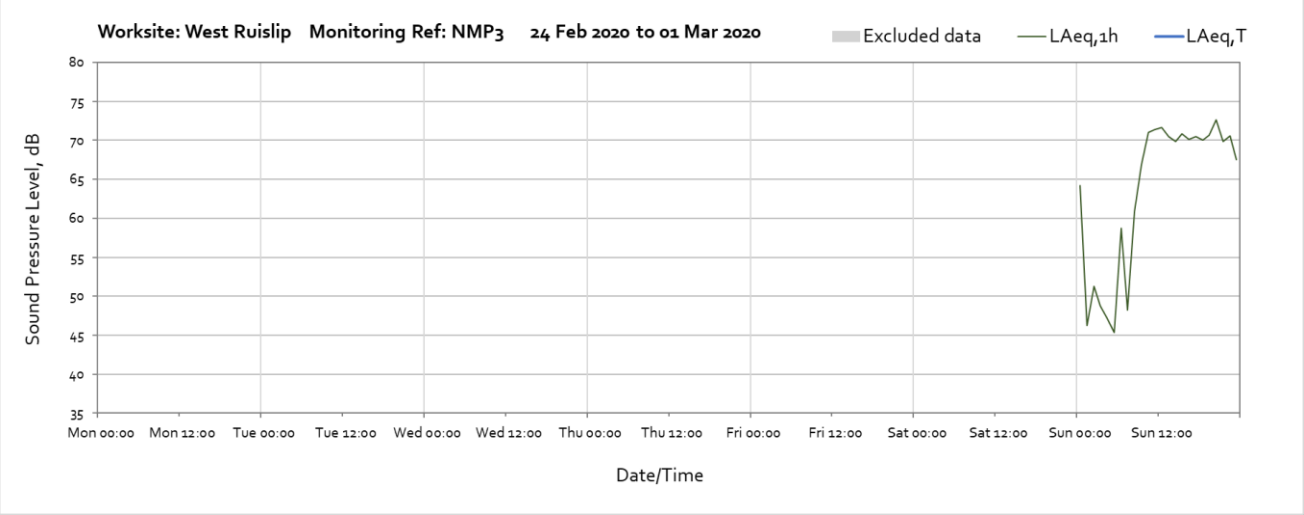

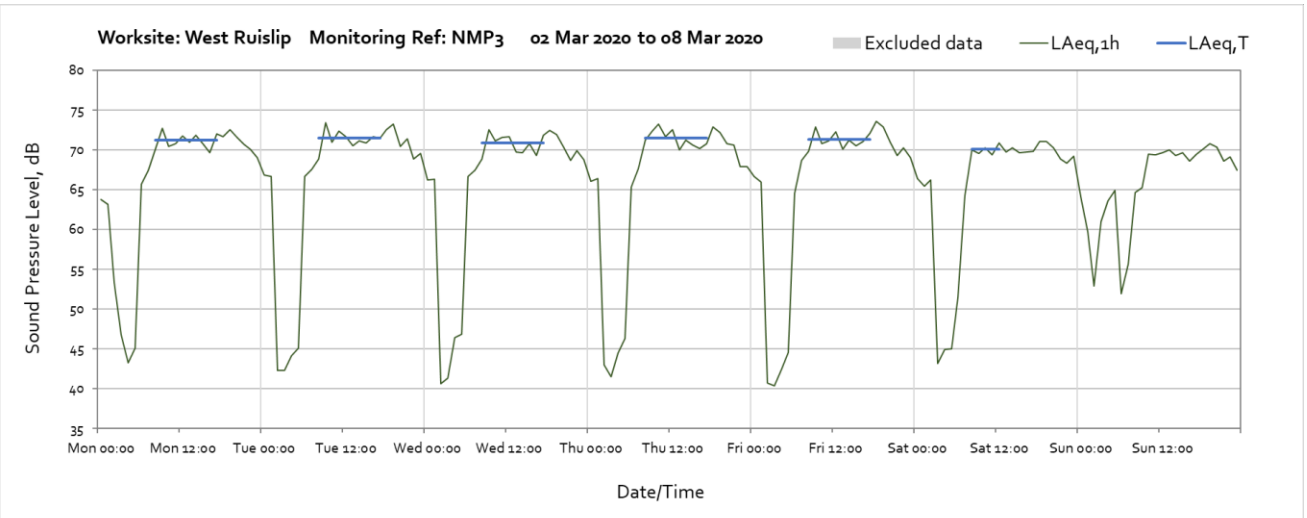

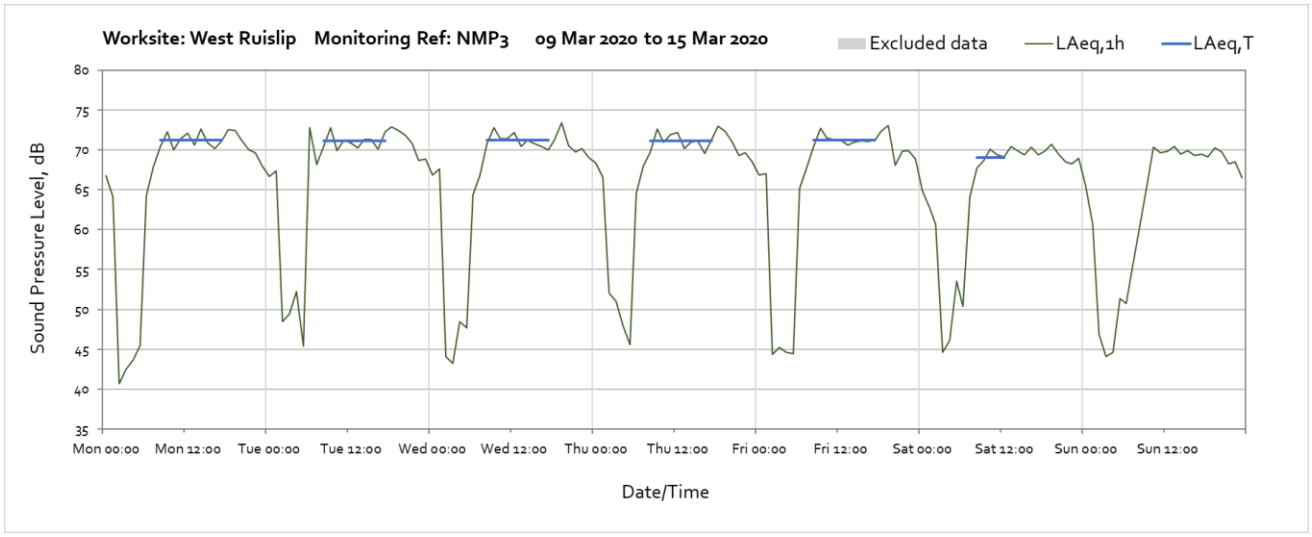
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LAeq,1h
LAeq,T
Sound Pressure Level, dB
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70
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55
50
45
40
35
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
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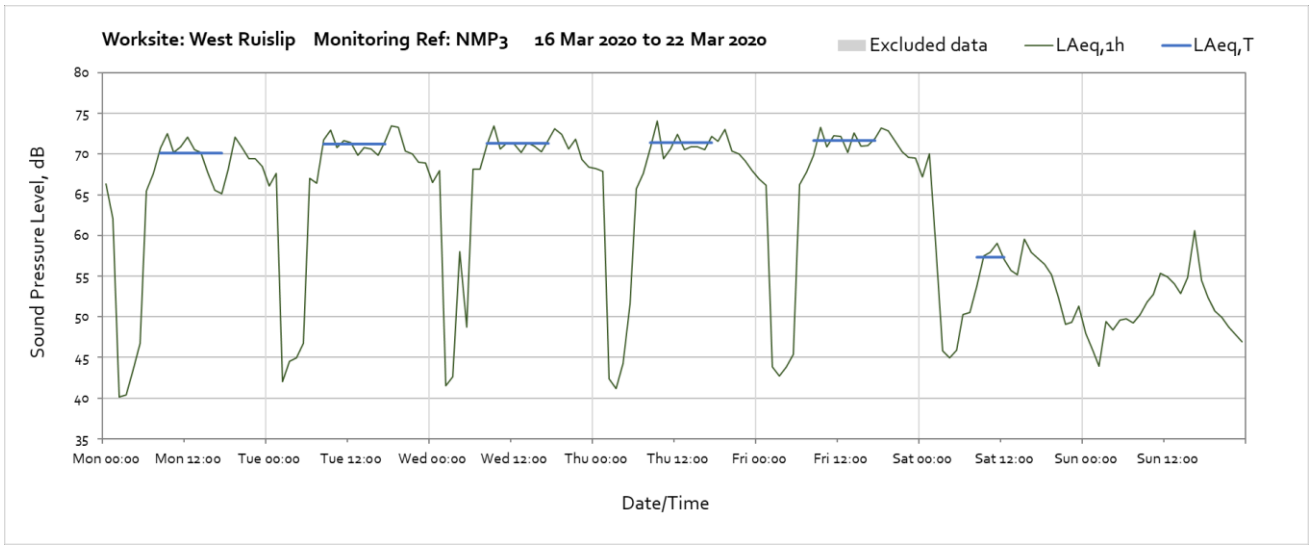
Date/Time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LAeq,T
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60
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50
45
40
35
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
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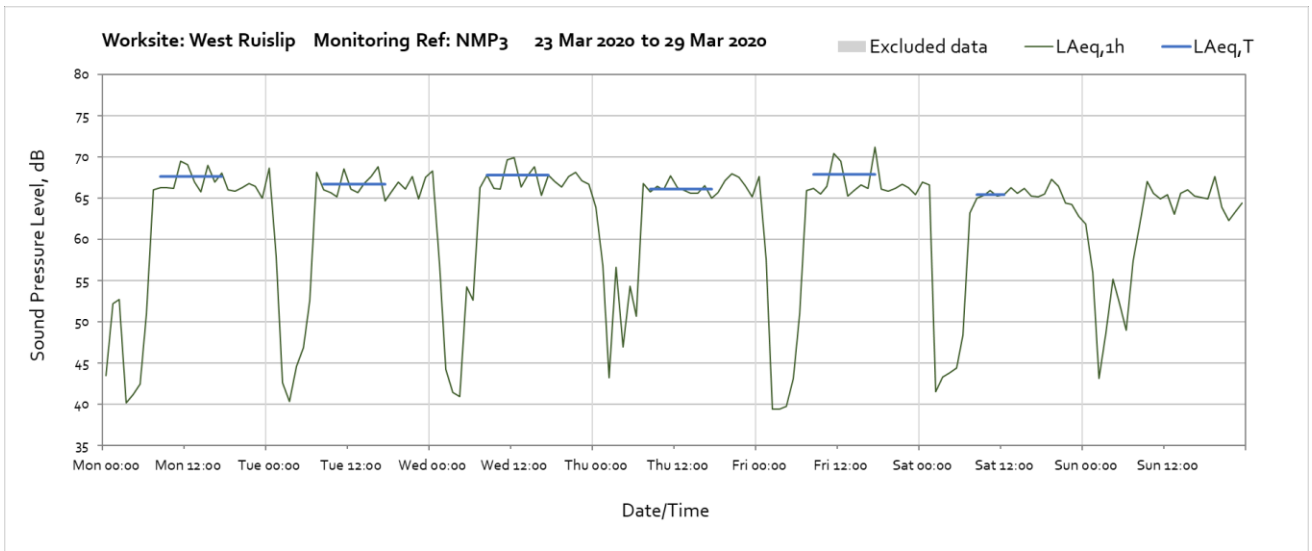
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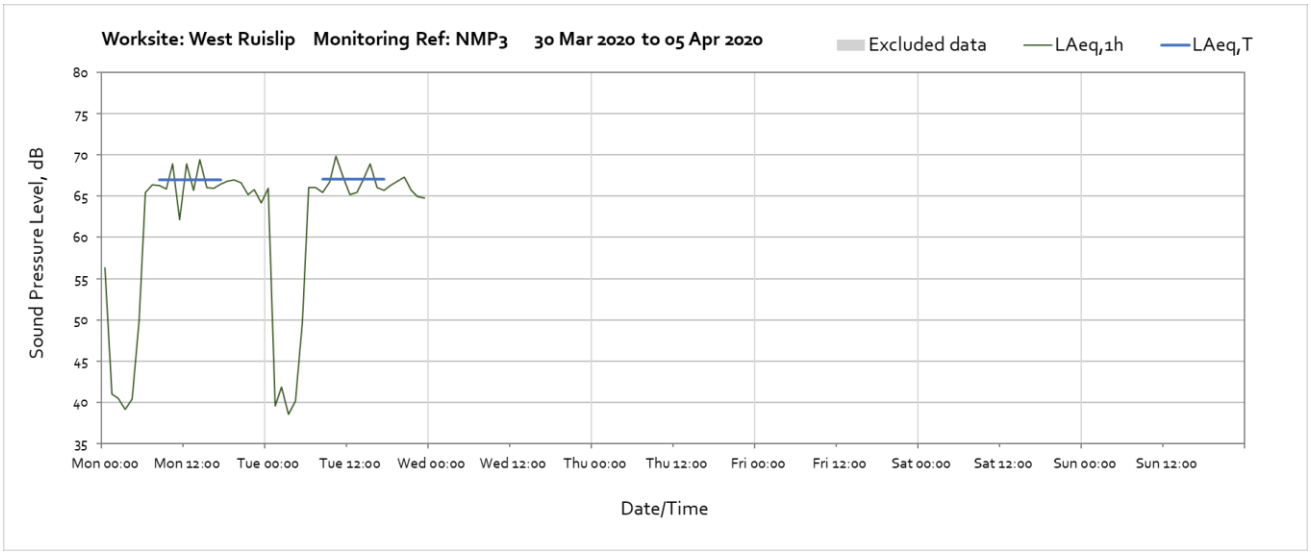
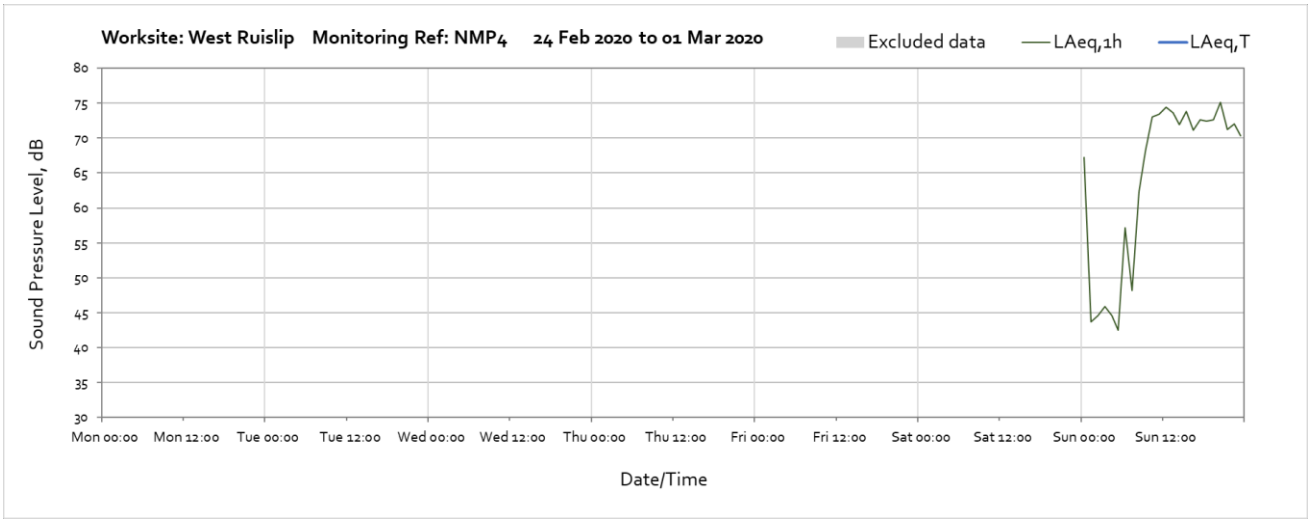
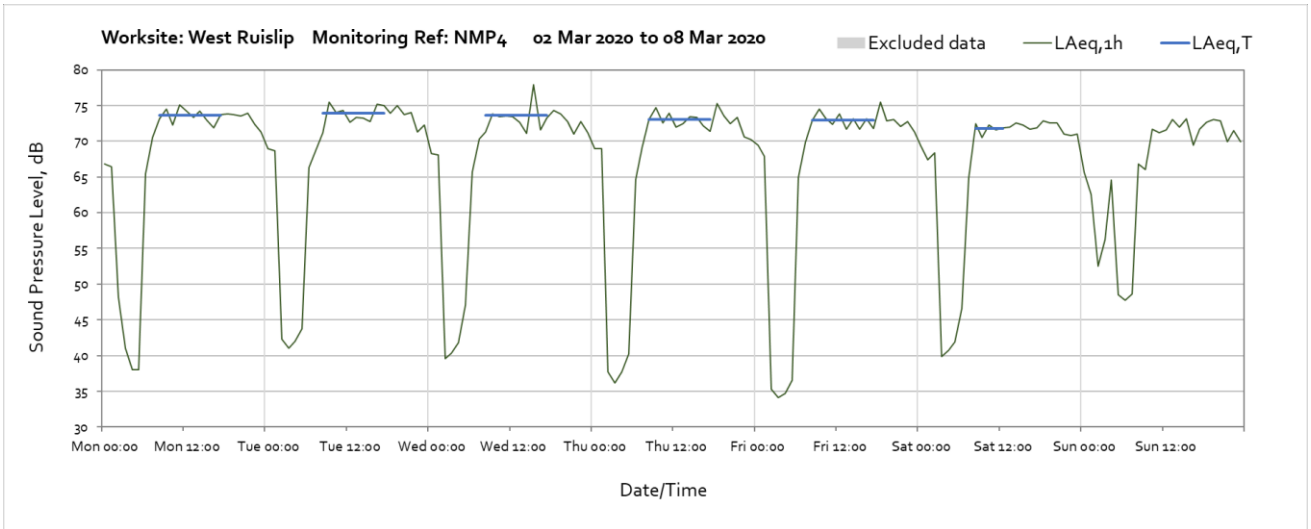
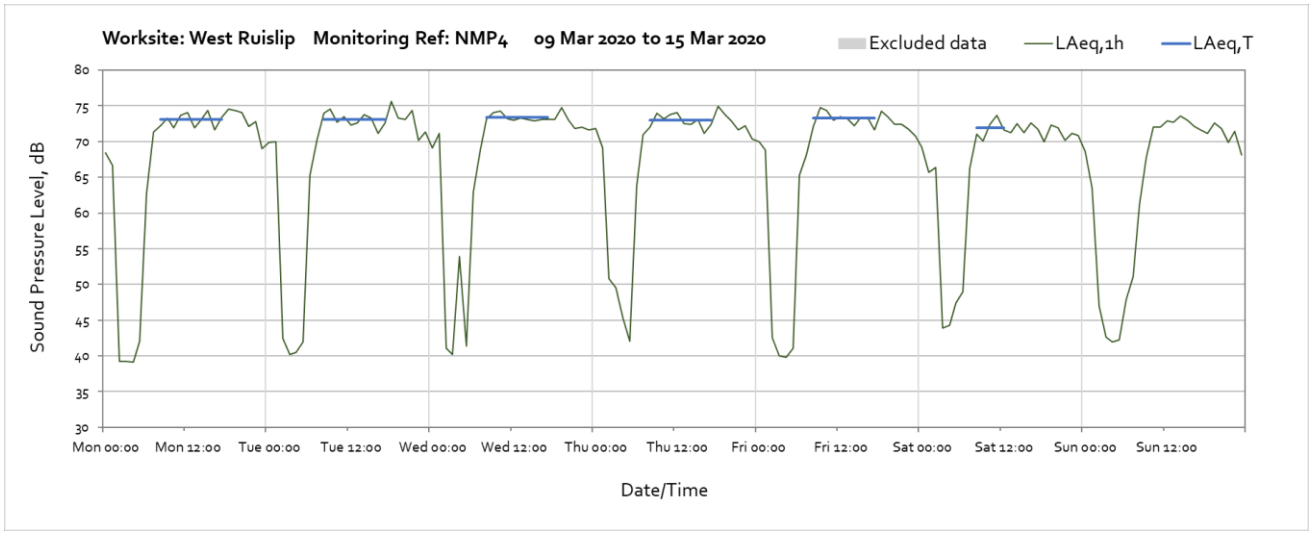
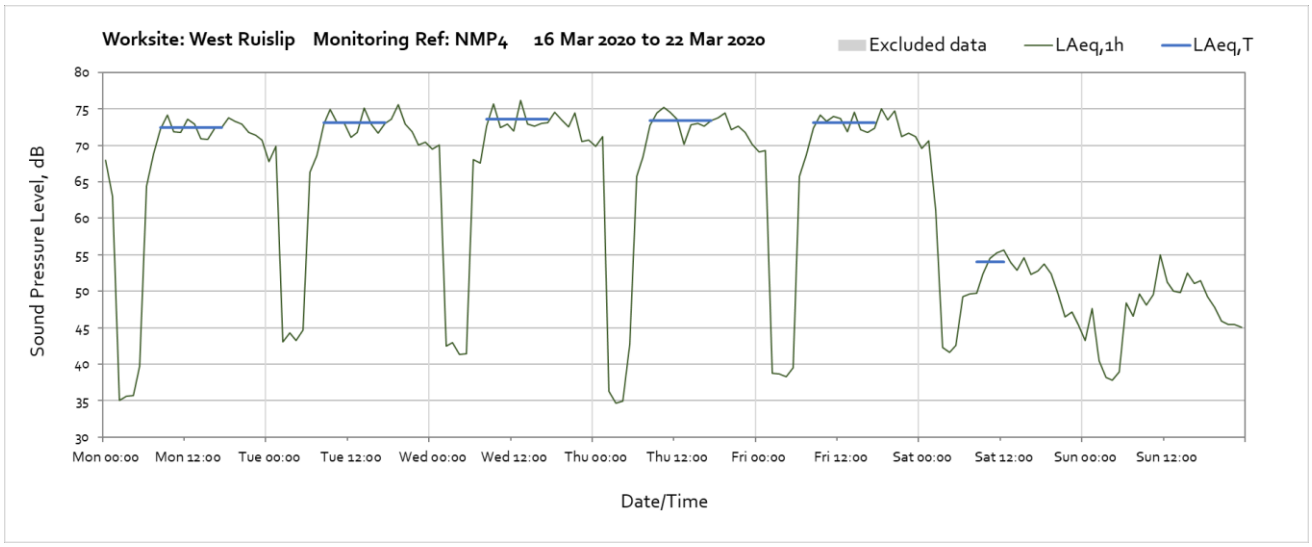


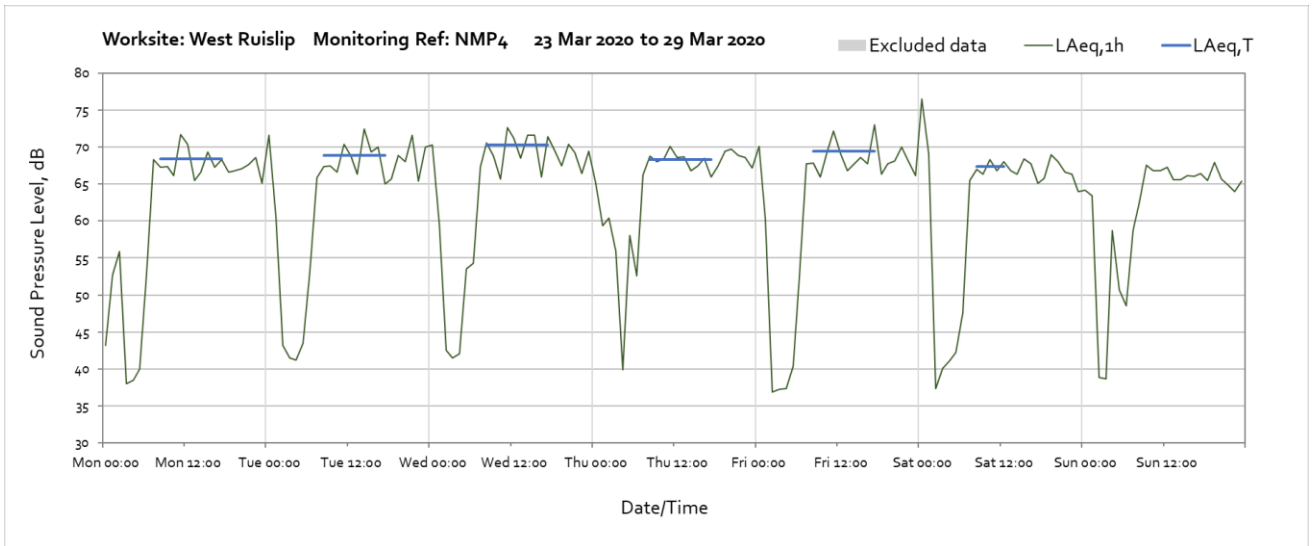
Worksite: West Ruislip – Monitoring Ref: NMP4

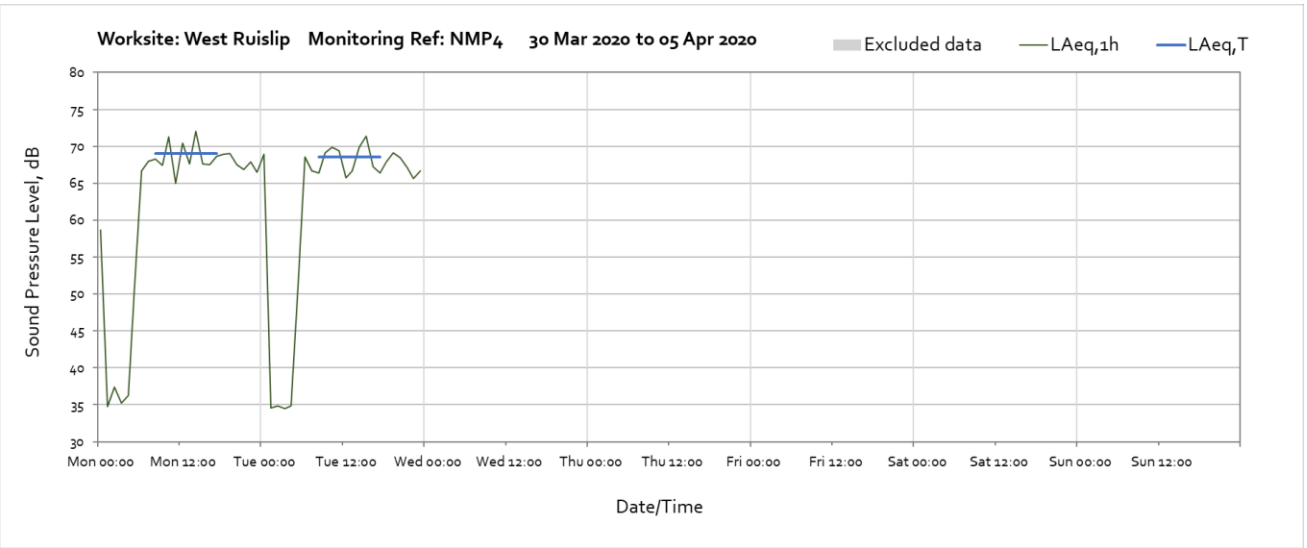





Worksite: West Ruislip Monitoring Ref: NMP4 09 Mar 2020 to 15 Mar 2020
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
80
75
70
65
60
55
50
45
40
35
30
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time


Worksite: West Ruislip Monitoring Ref: NMP4 16 Mar 2020 to 22 Mar 2020
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
80
75
70
65
60
55
50
45
40
35
30
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time


Worksite: West Ruislip Monitoring Ref: NMP4 23 Mar 2020 to 29 Mar 2020
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
80
75
70
65
60
55
50
45
40
35
30
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time


Worksite: West Ruislip Monitoring Ref: NMP4 30 Mar 2020 to 05 Apr 2020
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
80
75
70
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50
45
40
35
30
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time