Haweswater Aqueduct Resilience Programme – Proposed Bowland Section

Environmental Statement

Volume 4

Appendix 17.3: Baseline Sound Level Report

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Haweswater Aqueduct Resilience Programme - Proposed Bowland Section

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Contents

1. Baseline Sound Level Review Report

1) This appendix reports the existing sound levels at sensitive locations adjacent to the Haweswater Aqueduct Resilience Programme (HARP), hereafter referred to as the Proposed Programme of Works. These baseline sound levels have been determined using several different methods due to the constraints introduced on survey work because of the COVID-19 pandemic. The survey across the route of the Programme of Works initially comprised 65 proposed monitoring locations along the length of the route, which were identified at the scoping assessment stage. The original intention was to undertake baseline sound measurements at all of the proposed monitoring locations; however, due to the COVID-19 pandemic, this has not been possible. As such, an alternative approach has been developed which has enabled suitable baseline conditions to be determined, as identified below. The appendix discusses the baseline sound level monitoring method adopted along the length of the Proposed Programme of Works but presents just those locations in the vicinity of the Proposed Bowland Section.

2) Measurements were undertaken at 20 locations before restrictions on movements were implemented. The baseline sound was determined using the methods described in steps b) to d) below for a number of other locations in the vicinity of the Proposed Programme of Works . As the airborne construction noise assessment progressed and the Proposed Programme of Works design developed, it has been possible to omit eight of the previously identified monitoring locations as they are no longer located close to the Proposed Programme of Works. A total of three locations in the vicinity of the Proposed Bowland Section are presented in this Appendix.

3) The order of priority for the determination of baseline sound is as follows:

   a) Measured baseline sound levels are used, where available. Baseline sound measurement surveys were undertaken by Jacobs from November 2019 to January 2020. These are considered to be the primary source for baseline information

   b) Measured baseline sound levels undertaken by 3rd parties. In April 2020 a review of previous local surveys has been conducted and, where publicly available, have been used where appropriate. A search of planning applications within approximately 1 km of the proposed construction compounds identified no useable sound level data that would be helpful in the determination of baseline sound levels

   c) Where measured levels were unavailable, a review of online sources has been made to identify indicative sound levels (e.g. road and rail noise: www.extrium.co.uk) that are considered representative of the monitoring locations

   d) Where measured levels are unavailable and online sources do not provide indicative levels, conservative assumptions have been made. These have typically resulted in low noise thresholds being adopted for construction noise assessment, i.e. the 65, 55, 45 dB $L_{Aeq,T}$ day, evening and night thresholds presented within BS 5228-1[1], table E1.

4) The baseline sound levels provide a basis for the assessment of noise effects which may arise during the construction of the Proposed Programme of Works. As detailed in Chapter 17, the noise levels associated with the Proposed Programme of Works have been compared to the baseline sound levels at the assessment locations. This has enabled potential construction noise effects to be predicted and, where necessary, appropriate control measures incorporated into the Construction Code of Practice (CCoP). An overview is provided in the following paragraphs of the baseline locations, the methodologies adopted to characterise the baseline sound, and the relevant guidance.

1.1 Monitoring Locations

5) The baseline sound level monitoring locations selected for inclusion within the baseline study were identified initially through a desktop review of the route. Locations were selected based on their distance to the route, proximity of other sensitive properties, their suitability as proxies for other nearby sensitive

[1] BSI (2014). British Standard 5228 part 1 (BS 5228-1:2009+A1:2014), Code of practice for noise and vibration control on construction and open sites, Part 1: Noise. London, the British Standards Institution.

locations, and their suitability as monitoring locations (e.g. secure monitoring locations). The sound climate at each selected monitoring location was considered representative of surrounding properties and locations, unless stated otherwise within the individual monitoring summary sheets (Section 1.4).

6) A technical working group was established. The working group comprised representatives of United Utilities and Jacobs, and officers from each of the Local Authorities. This working group was established to ensure that a consistent approach for the assessment of noise and vibration could be established across the Proposed Programme of Works.

7) Local Authorities were informed of the proposed baseline sound level monitoring locations in October 2019 (Hyndburn Borough Council (HBC), Lancaster County Council (LCC), Ribble Valley Borough Council (RVBC), Rossendale Borough Council (RBC) and South Lakeland District Council (SLDC) and December 2019 (Bury Council (BC)) and invited to comment on the suitability of the selected locations. The Environmental Health Officer at RBC responded to confirm they had no objections to the locations identified. No responses were received from the other Local Authorities. As such, officers from the remaining local authorities were invited to telephone conference calls to discuss the matter. During these calls the proposed monitoring strategy and locations were discussed. These meetings took place in December 2019 and January 2020 and were attended by representatives from RBC and BC.

8) In March 2020 (with a follow up email sent in July 2020) all of the Local Authorities were contacted regarding the change to the proposed approach to determining baseline sound levels. The approach was detailed within an email to the technical working group, outlining the revised approach and the guidance published by the Institute of Acoustics (IOA) and Association of Noise Consultants (ANC)[2]. In August 2020 the Environmental Health Officer (EHO) for LCC responded with a number of questions. These were answered in two emails, which included a link to the scoping report, a link to the modified assessment approach and details of the baseline monitoring undertaken in the LCC area. In October 2020 the EHO at HBC responded to say that baseline data gathering approach is reasonable. No responses were received from the other Local Authorities.

9) Due to design changes between the commencement of the baseline sound level monitoring surveys and the final design assessed in the ES, eight of the 20 survey locations were no longer required due to proximity to above ground construction activities.

10) The baseline sound level survey locations that are listed in Table 1 and illustrated in Figure 17.1. The locations were surveyed to establish the prevailing levels of ambient sound. During each group of sound monitoring surveys, a weather station was deployed to record the corresponding weather conditions. Periods of adverse weather were omitted from the sound level dataset before averages were calculated and reported. Where it has not been possible to undertake sound monitoring surveys, the baseline sound level has been characterised following the order of priorities, as described above (Paragraph 3).

Table 1: Baseline Sound Level Survey Locations

HARP Section	Location ID	Monitoring Location Address	Data Source
Proposed Bowland Section	B08	Botton Hall Farm, Wray	Monitoring survey
	B09	Leyland Farm, Wray	Monitoring survey
	B10	Fober Farm, Dunsop Road, Newton-in-Bowland	Monitoring survey

[2] Association of Noise Consultants (ANC) and Institute of Acoustics (IOA). *Joint Guidance on the Impact of COVID-19 on the Practicality and Reliability of Baseline Sound Level Surveying and the Provision of Sound & Noise Impact Assessments.*

1.2 Survey Methodology

11) Sound level measurements and meteorological measurements were conducted at the locations where 'Jacobs survey' is identified as the data source in Table 1. Observations were recorded at each location to describe the sound environment and any significant characteristics of the survey location.

12) The sound level measurements were conducted over a minimum period of seven days, to characterise both weekday and weekend periods, in addition to daytime and night-time diurnal patterns. To minimise uncertainty of the measured values, surveys were conducted outside of holiday periods. In addition, periods of adverse weather conditions were omitted from the reported datasets.

13) The sound level measurements were conducted considering the measurement procedures outlined in the following British Standards:

- BS 4142:2014+A1 Methods for rating and assessing industrial and commercial sound [3]
- BS 7445-1:2003. Description and measurement of environmental noise. Guide to quantities and procedures [4]
- BS 7445-2:1991. Description and measurement of environmental noise. Guide to the acquisition of data pertinent to land use [5]
- BS 5228-1:2009+A1:2014. Code of practice for noise and vibration control on construction and open sites. Noise [6].

14) All measurements were conducted in free field conditions, 3.5 m away from any acoustically reflective surface other than the ground. The microphone was placed at a height of 1.2 m above the ground and calibration checks were made at the start and end of each monitoring period.

1.2.1 Instrumentation

15) All sound level measurements were conducted with Class 1 Sound Level Meters (SLMs) complying with the requirements of BS EN 61672-1[7]. The calibration of all SLMs and calibrators has been undertaken at the required intervals at a testing laboratory traceable to UKAS standards.

16) The sound level measurements were synchronised to 5-minute intervals, at a resolution of 1 second. Sound level data were measured in whole octave frequency bands and broadband single figures. A range of statistical data were measured which included the following indices:

- $L_{Aeq,T}$ – the equivalent continuous sound pressure level over the measurement period (T). This parameter was standardised as pertinent for land use within BS7445-2 [8]
- $L_{Amax,T}$ – the maximum sound pressure level occurring within the defined measurement period (T)
- $L_{A90,T}$ – the sound pressure level exceeded for 90% of the measurement period (T) and is indicative of the background noise level
- $L_{A10,T}$ – the sound pressure level exceeded for 10% of the measurement period (T). The L_{A10} index is used within the Calculation of Road Traffic Noise [9] (CRTN) as an appropriate descriptor of traffic noise.

17) Broadband $L_{Aeq,T}$ and $L_{A90,T}$ sound levels are presented in this technical appendix. $L_{A10,T}$ and $L_{Amax,T}$ indices were used when reviewing the measurement data to identify potential atypical noise events.

[3] BSI (2014). British Standard 4142 (BS 4142-1:2014+A1:2019), *Methods for rating and assessing industrial and commercial sound*. London, the British Standards Institution.
[4] BSI (2003). British Standard 7445-1 (BS 7445-1:2003) *Description and measurement of environmental noise. Guide to quantities and procedures*. London, the British Standards Institution.
[5] BSI (1991) British Standard 7445-2 (BS 7445-2:1991) *Description and measurement of environmental noise. Guide to the acquisition of data pertinent to land use*. London, the British Standards Institution.
[6] BSI (BS 5228-1), *op. cit.*
[7] BSI (2003). British Standard 61672-1 (BS EN 61672-1:2003), *Electroacoustics. Sound level meters. Specifications*. London, the British Standards Institution.
[8] BSI (BS 7445-2), *op. cit.*
[9] HMSO (1988). *Calculation of Road Traffic Noise (CRTN)*. Department for Transport and the Welsh Office. Cardiff: National Assembly for Wales. Her Majesty's Stationary Office.

18) Sound measurements were taken with an A-weighting (denoted by a subscript 'A') to approximate the frequency response of the human ear. The time constant of the SLMs was set to 'Fast' during all measurements. This corresponds to an integration time of 125 $m.s^{-1}$ and is commonly used to approximate the temporal response of the human ear, or the human ear's integration time for a fluctuating noise level.

19) Weather data were collected for the duration of the surveys using meteorological equipment which recorded temperature, humidity, rainfall, wind speed, and wind direction. The information recorded was used in the data analysis to remove unfavourable periods of weather. These are defined as average wind speeds greater than 5 m/s and more than 0.1 mm of rainfall (which is the lowest level detected / reported by the weather station).

1.2.2 Observations

20) Observations were made regarding the features of the acoustic environment at each survey location during the deployment and collection of equipment.

1.2.3 Data processing

21) The sound level data were processed into the time periods which are relevant for each of the different assessment periods. The periods of adverse weather were first removed from the sound level dataset. This entailed removing sound level data for each corresponding 5-minute interval where average wind speeds were measured above 5 m/s and periods of rainfall occurred. Further, due to surface water which may lie on roads and elevate sound levels, the 60-minute period following rainfall was also typically omitted; although professional judgement was used to determine if this period was adjusted through consideration of noise level variation. This excluded periods that do not typify the usual sound environment under normal conditions.

22) Summary sheets for each of the measurement locations are provided in Section 1.4.

1.2.4 Uncertainty of measured values

23) A qualitative estimate has been made to assess the uncertainty of the measured sound levels based on the procedure described in BS 4142[10]. The factors which may suggest some uncertainty in the measured values, and provisions made to minimise this, are as follows:

- Selected measurement location: The measurement equipment was positioned in free field conditions, 1.2 m above the ground, 3.5 m away from any acoustically reflecting surfaces other than the ground. The locations were selected to represent the most exposed noise sensitive façade (subject to access permission) that may be affected by noise generated by the HARP programme of works
- Calibration drift: The calibration of the sound level meters was checked at the start and end of the measurement period using Class 1 field calibrators. The calibration drift was generally found to be within the tolerances suggested in BS 4142[11] for long term monitoring. However, the following observations were made:
  - A drift in calibration of 0.7 dB was recorded at Leyland Farm, Wray. The SLM had been deployed 11 days prior to collection. Interrogation of the data and SLM does not suggest any error in the equipment or measurement data. The drift in calibration is less than 1 dB and is considered to be the result of an extended unattended survey. The data are considered suitable to define prevailing sound levels at the property and for use in the construction noise assessment.
- Equipment measurement range: The noise floor of the SLMs used for these surveys is in the order of 17 dBA. The noise floor is well below the lower noise limit thresholds typically used for construction noise assessments and will not affect the assessment outcomes.
- Weather affected data: The periods affected by wind speeds higher than 5 m/s and rainfall have been highlighted in the measurement results presented in Section 1.4 and omitted from the statistical

[10] BS (BS 4142), *op. cit.*
[11] BS (BS 4142), *op. cit.*

analysis. The amount of data removed from each measurement due to unfavourable weather conditions has been determined to indicate the percentage of usable data captured over the measurement period. This process has ensured that only representative sound level data were used for the characterisation of prevailing sound levels

- Atypical or seasonal sound sources: The first survey (4 locations) took place on and around the 5 November 2019. The evening of 5 November was excluded, as were large parts of the surrounding days where high noise events were observed as these were assumed (in all cases, on a precautionary basis) to be firework noises. The survey was extended to ensure adequate data capture following filtering to remove high noise events. There were no known road closures or diversions in the vicinity of the monitoring locations during the survey periods; therefore, road generated noise is considered to be representative of typical conditions.

24) Qualitative estimates of uncertainty are presented in the summary results in Section 1.4.

1.3 Defra Strategic Noise Mapping

25) Baseline sound information has been sourced from Defra Strategic Noise Mapping (2017) for the remaining locations. The Strategic Noise Mapping is part of the Environmental Noise Directive (END) (Directive 2002/49/EC) undertaken every 5 years and is transposed into English law by the Environmental Noise (England) Regulations 2006 (as amended).

26) This publicly available collection of information provides an indication of the noise levels generated by major road or rail sources for the whole of England and Wales. Major roads are defined under the END as regional or national sections of road which have a bi-directional flow of 3 million vehicle passages or more per year and major railways are defined under the END as those sections of rail route above a flow threshold of 30,000 vehicle passages per year. The dataset provides an indication of the daytime ($L_{Aeq,16h}$) and night-time noise levels (L_{night}) as well as the weighted 24 hour average annual noise level, L_{DEN}..

27) The noise level data yielded from the strategic noise mapping were used to identify the construction noise limits for the impact assessment presented in Shapter 17. Where the strategic noise mapping has been used, only the weekday daytime and night-time noise levels are available. It is not possible to distinguish between weekday, weekend or evening sound levels therefore it has been assumed that the daytime and evening noise level is equivalent to the $L_{Aeq,16h}$ sound level and the night-time noise level equivalent to L_{night}. For the weekend periods, in absence of any other data, it is assumed that these are equivalent to the sound levels during the weekday.

28) Table 2 summarises the main advantages and disadvantages in using the strategic noise mapping data for the purpose of defining baseline sound levels for the HARP construction noise assessment.

Table 2: Advantages and Disadvantages of Defra Strategic Noise Mapping

Advantages	Disadvantages
The data are accessible for immediate use, without waiting for COVID-19 movement restrictions to be lifted.	The data only accounts for major road and rail noise sources.
It provides an indication of the annual average noise levels, without being affected by seasonal variations or adverse weather conditions.	The noise levels are provided in 5 dB steps; therefore judgement must be applied to use the upper or lower bound noise level.
A thoroughly checked and verified methodology, utilising well researched calculation algorithms from Calculation of Road Traffic Noise[12] and Calculation of Rail Noise[13].	Only the daytime and night-time noise levels are available. Therefore, assumptions were made for the evening and weekend noise levels.

[12] HMSO (CRTN 1988), *op. cit.*
[13] HMSO (1995). *Calculation of Rail Noise (CRN)*, Department of Transport, Her Majesty's Stationary Office.

Advantages	Disadvantages
	The lower boundaries are 55 dB for daytime and 45 dB at night. Where locations are beyond these limits an assumption of <55 dB or <45 dB for day and night-time respectively has been made, resulting in the lowest possible effect noise level threshold (Category A) in the BS 5228[14] assessment mythology.

1.3.1 Results Summary

29) Site specific data and observations for each location are presented in summary in Section 1.4, this contains the following information:

- The measurement location, including coordinates and a map of the site
- Photos of the site and monitoring equipment (surveyed locations only)
- A table of the baseline data showing relevant sound and metrological metrics over the measurement period
- A description of the weather conditions during the measurement period (surveyed locations only)
- A table showing the processed hourly $L_{A90,1h}$ and $L_{Aeq,1h}$ sound data over the measurement period
- Observations of the sound environment at each of the monitoring locations
- Observations and comments regarding the measurement uncertainty.

30) A baseline summary is presented in Table 3.

Table 3: Baseline Sound Level Results Summary

ID	Monitoring Location Address	Period	Sound Pressure Level (dB $L_{Aeq,1hr}$)			Comments / Observations
			Week	Sat	Sun	
Proposed Bowland Section						
B08	Botton Hall Farm, Wray *(Sound level monitoring)*	Day	46	46	42	~440 m south-east of Lower Houses Compound. This is a rural location 1.4 km west of Lowgill village. Natural sounds (including birdsong) and faint road traffic noise was observed during the survey.
		Eve	39	45	-	
		Night	39	39		
B09	Leyland Farm, Wray *(Sound level monitoring)*	Day	43	41	*36*	~800 m west of Lower Houses Compound. This is a rural location 2.6 km north-west of Lowgill village. Natural sounds (including birdsong) and faint road traffic noise was observed during the survey. * For assessment - baseline sound level adjustments made for assessment: (i) weekend night to match weekday = 43 dBA.
		Eve	39	44	-	
		Night	43	*48* 43*		
B10	Fober Farm, Dunsop Road,	Day	49	50 49*	52 49*	~100 m west of Newton-in-Bowland Compound.
		Eve	43	46	-	

[14] BSI (BS 5228-1), *op. cit.*

ID	Monitoring Location Address	Period	Sound Pressure Level (dB $L_{Aeq,1hr}$)			Comments / Observations
			Week	Sat	Sun	
	Newton-in-Bowland *(Sound level monitoring)*	Night	43	50 43*		This is a rural location 1.0 km west of Newton-in-Bowland village. Farm activities, animal sounds and road traffic noise were observed during the survey. * For assessment - baseline sound level adjustments made for assessment: (i) weekend daytime sound level to match weekday = 49 dBA, (ii) weekend night to match weekday = 43 dBA.

Notes:

Weekday (Mon to Fri) Day = 07:00 to 19:00; Eve (evening) = 19:00 to 23:00; Night = 23:00 to 07:00

Saturday Day = 07:00 to 13:00; Eve (evening) = 13:00 to 23:00

Sunday Day = 07:00 to 23:00

Weekend (Sat and Sun) Night = 23:00 to 07:00

Sound level monitoring – Baseline measurements undertaken by Jacobs

1.4 Monitoring Summary Sheets

Baseline Location ID	B08 (Lower Houses Compound)
Address	Botton Hall Farm, Wray
Measurement Date	Monday 20 January to Thursday 30 January 2020
Monitoring location plan	
Photo of SLM at monitoring location	

Weather conditions during monitoring period (survey 3)

Wind: 5-min average wind speeds were generally below 5 m/s during the survey. However, periods of strong winds were observed, most notably on:

- Sun 26 from 05:30 to12:00,
- Mon 27 from 01:00 to 02:00,
- Tues 28 from 11:30 to 05:45 on Wed 29, and
- Wed 29 from13:00 to 01:30 on Thur 30.

Rain: Short periods of rain were observed during the survey. Prolonged periods of rain were observed on:

- Sun 26 from 11:50 to 12:45,
- Mon 27 from 21:00 to 22:40,
- Tues 28 from 09:30 to 10:40 and 12:20 to 13:20, and
- Wed 29 from 13:30 to 16:40.

Intermittent showers were observed on Tues 28 from 00:00 to 03:30

Measured Sound Pressure Levels dB LAeq,1hr *dB LA90,1hr* Shaded cells affected by adverse weather (including 60 minutes following a period of rain) or atypical noisy events.

Date	00:00	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Mon 20/01/19															44 *31*	42 *30*	46 *32*	49 *34*	41 *35*	39 *31*	38 *32*	36 *30*	36 *30*	36 *30*
Tue 21/01/19	35 *29*	36 *30*	34 *28*	29 *24*	28 *23*	30 *23*	46 *30*	50 *34*	49 *29*	46 *28*	43 *25*	39 *21*	40 *22*	38 *25*	46 *24*	46 *26*	49 *29*	46 *26*	44 *29*	42 *25*	41 *24*	46 *21*	29 *20*	26 *20*
Wed 22/01/19	25 *19*	23 *18*	29 *18*	28 *18*	23 *19*	30 *19*	42 *25*	44 *26*	46 *26*	43 *28*	45 *28*	44 *23*	44 *25*	42 *22*	52 *33*	48 *26*	46 *24*	46 *32*	42 *28*	36 *21*	34 *20*		31 *19*	25 *19*
Thu 23/01/19	25 *18*	28 *18*	23 *18*	26 *18*	21 *18*	34 *19*	44 *27*	41 *26*	42 *25*	38 *23*	43 *24*	43 *22*	47 *25*	47 *29*	45 *25*	44 *29*	49 *29*	46 *30*	49 *32*	37 *24*	34 *25*	35 *29*	35 *30*	33 *28*
Fri 24/01/19	33 *28*	31 *27*	34 *26*	29 *23*	26 *21*	34 *26*	44 *29*	45 *31*	42 *29*	45 *29*	46 *27*	36 *24*	34 *24*	42 *26*	44 *24*	48 *26*	47 *26*	46 *27*	43 *30*	38 *23*	36 *21*	32 *20*		30 *20*
Sat 25/01/19	29 *20*	27 *21*	27 *22*	28 *23*	27 *22*	27 *22*	47 *28*	43 *30*	47 *27*	49 *31*	41 *32*	48 *35*	47 *32*	43 *32*	49 *31*	55 *34*	48 *30*	45 *28*	40 *30*	38 *31*	38 *33*	36 *33*	37 *32*	34 *31*
Sun 26/01/19	34 *30*	38 *34*		32 *28*	34 *29*	40 *35*								43 *35*	41 *28*	48 *28*	50 *29*	39 *27*	40 *26*	37 *26*	37 *26*	27 *25*	35 *25*	29 *26*
Mon 27/01/19	40 *35*			41 *36*		45 *40*	45 *41*	49 *37*	54 *42*	50 *38*	46 *36*	52 *38*	51 *40*	47 *36*	51 *35*	44 *30*	41 *29*	42 *29*	50 *33*	43 *29*	40 *28*			43 *39*
Tue 28/01/19					43 *37*	41 *35*	45 *37*	49 *34*	47 *32*	46 *34*									50 *44*		50 *45*			
Wed 29/01/19				45 *40*	48 *42*	48 *42*	47 *42*	47 *40*	46 *39*	51 *41*	49 *44*	48 *42*	51 *45*											
Thu 30/01/19	54 *49*	49 *43*	48 *42*	43 *38*	34 *29*	45 *30*	49 *32*	47 *32*	45 *35*	47 *36*	51 *37*	49 *33*	48 *34*											

Observations and description of sound climate

This is a rural location 1.4 km west of Lowgill village. The observed noise sources at this location were faint traffic noise and natural sounds, such as birdsong.

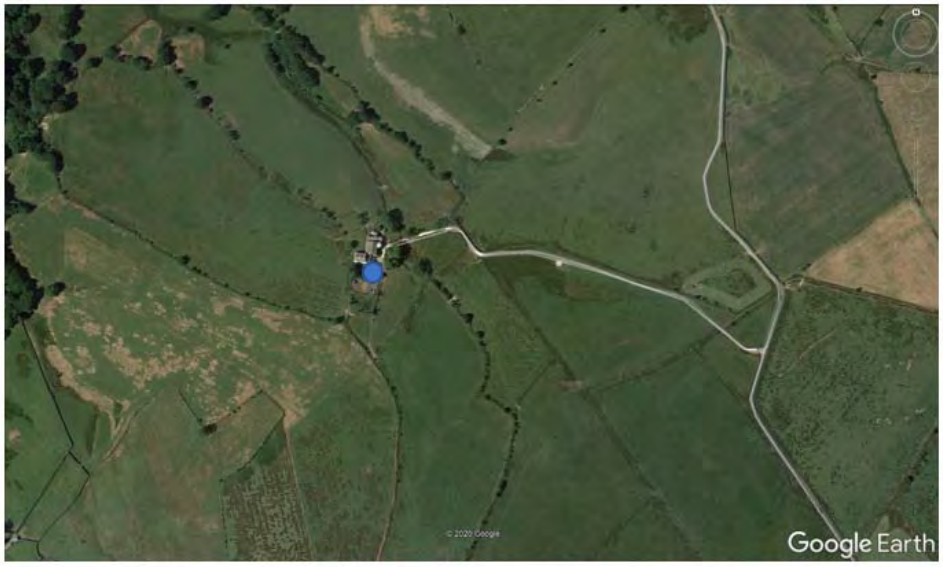
Elevated noise levels on equipment deployment and collection caused by surveyors have been omitted.

Measurement uncertainty

There were no known road closures or diversion in place during the monitoring period and no construction works were observed.

A reasonably precautionary approach has been adopted where unidentified high noise events have been omitted from the average baseline sound levels.

The overall data capture for the survey, with periods removed for unsuitable weather conditions, was 81% (equivalent to approximately eight days of data) . This level of data capture is considered sufficient to allow reliable baseline sound levels to be reported at this location, and was achieved through extending the survey to include 11 days of monitoring.

Baseline Location ID	B09 (Lower Houses Compound)
Address	Leyland Farm, Wray
Measurement Date	Monday 20 January to Thursday 30 January 2020
Monitoring location plan	
Photo of SLM at monitoring location	

Weather conditions during monitoring period (survey 3)

Wind: 5-min average wind speeds were generally below 5 m/s during the survey. However, periods of strong winds were observed, most notably on:

- Sun 26 from 05:30 to12:00,
- Mon 27 from 01:00 to 02:00,
- Tues 28 from 11:30 to 05:45 on Wed 29, and
- Wed 29 from13:00 to 01:30 on Thur 30.

Rain: Short periods of rain were observed during the survey. Prolonged periods of rain were observed on:

- Sun 26 from 11:50 to 12:45,
- Mon 27 from 21:00 to 22:40,
- Tues 28 from 09:30 to 10:40 and 12:20 to 13:20, and
- Wed 29 from 13:30 to 16:40.

Intermittent showers were observed on Tues 28 from 00:00 to 03:30

Measured Sound Pressure Levels	dB LAeq,1hr *dB LA90,1hr*	Shaded cells affected by adverse weather (including 60 minutes following a period of rain) or atypical noisy events.

Date	00:00	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Mon 20/01/19															41 *34*	39 *35*	40 *34*	42 *37*	46 *38*	44 *38*	43 *38*	43 *37*	42 *37*	41 *36*
Tue 21/01/19	41 *36*	41 *35*	39 *33*	34 *29*	30 *26*	28 *26*	28 *26*	41 *28*	42 *29*	37 *30*	37 *27*	28 *23*	35 *25*	33 *28*	35 *27*	37 *27*	36 *28*	32 *26*	29 *25*	32 *27*	30 *24*	29 *23*	28 *23*	27 *21*
Wed 22/01/19	22 *20*	20 *19*	22 *20*	21 *20*	23 *21*	24 *22*	24 *21*	37 *23*	37 *25*	34 *28*	32 *27*	39 *25*	33 *24*	31 *23*	45 *27*	48 *32*	31 *23*	34 *27*	27 *24*	28 *22*	23 *21*		29 *20*	24 *20*
Thu 23/01/19	23 *19*	20 *19*	20 *19*	23 *21*	22 *21*	22 *21*	25 *22*	37 *23*	34 *23*	35 *23*	33 *25*	39 *24*	38 *26*	37 *27*	34 *28*	36 *28*	37 *30*	33 *30*	31 *28*	34 *28*	37 *32*	39 *34*	38 *33*	36 *31*
Fri 24/01/19	39 *33*	38 *32*	36 *31*	31 *26*	33 *28*	37 *30*	37 *31*	36 *30*	35 *29*	39 *29*	42 *27*	37 *27*	39 *27*	36 *28*	32 *25*	43 *27*	42 *25*	34 *24*	28 *23*	29 *22*	27 *21*	29 *21*		27 *23*
Sat 25/01/19	24 *21*	28 *24*	35 *30*	35 *28*	35 *29*	30 *25*	31 *26*	34 *29*	35 *28*	42 *33*	41 *36*	46 *38*	43 *39*	43 *38*	44 *39*	43 *39*	39 *35*	35 *30*	41 *37*	44 *39*	48 *40*	47 *41*	45 *40*	45 *40*
Sun 26/01/19	45 *39*	47 *43*		43 *37*	44 *39*	49 *44*								43 *38*	39 *34*	37 *31*	32 *27*	38 *29*	31 *25*	33 *31*	35 *31*	31 *29*	29 *26*	34 *28*
Mon 27/01/19	47 *42*			49 *43*		54 *48*	55 *49*	46 *42*	45 *41*	47 *43*	48 *42*	50 *43*	50 *45*	47 *42*	45 *39*	39 *32*	35 *30*	40 *34*	38 *32*	35 *29*	37 *30*			46 *42*
Tue 28/01/19					49 *44*	48 *43*	46 *41*	40 *36*	43 *35*	52 *40*									54 *50*		55 *50*			
Wed 29/01/19				55 *50*	55 *49*	52 *47*	53 *48*	51 *45*	51 *46*	53 *46*	53 *48*	53 *48*	55 *51*											
Thu 30/01/19	62 *56*	55 *49*	53 *47*	51 *44*	42 *34*	43 *35*	41 *34*	41 *35*	48 *41*	50 *45*	50 *45*	47 *40*												

Observations and description of sound climate

This is a rural location 2.6 km north-west of Lowgill village. The observed noise sources at this location were faint traffic noise and natural sounds, such as birdsong.

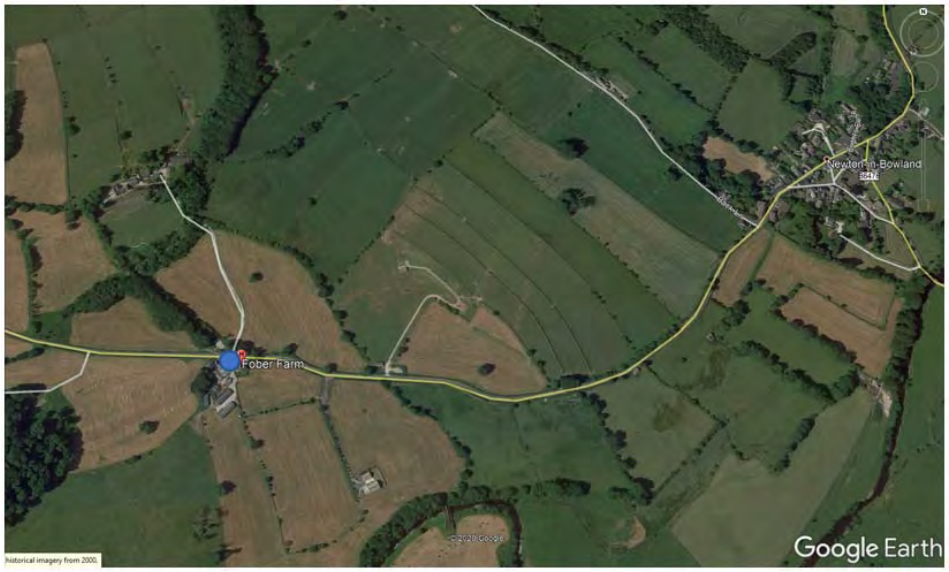
Elevated noise levels on equipment deployment and collection caused by surveyors have been omitted.

Measurement uncertainty

There were no known road closures or diversion in place during the monitoring period and no construction works were observed.

A reasonably precautionary approach has been adopted where unidentified high noise events have been omitted from the average baseline sound levels.

The overall data capture for the survey, with periods removed for unsuitable weather conditions, was 80% (equivalent to approximately eight days of data). This level of data capture is considered sufficient to allow reliable baseline sound levels to be reported at this location, and was achieved through extending the survey to include 11 days of monitoring.

Baseline Location ID	B10 (Newton-in-Bowland Compound)
Address	Fober Farm, Newton-in-Bowland
Measurement Date	Monday 2 December to Wednesday 11 December 2019
Monitoring location plan	
Photo of SLM at monitoring location	

Weather conditions during monitoring period (survey 2)

Wind: 5-min average wind speeds were below 5 m/s during the survey.

Rain: Short periods of rain were observed during the survey. Prolonged periods of rain were observed on:

- Thur 05 from 12:40 to 16:50 and from 19:00 to 20:00
- Fri 06 from 09:00 to 10:00 and from 13:30 to 14:30
- Sat 07 from 21:15 to 02:00 on Sun 08.
- Sun 08 from 21:15 to 22:15
- Tues 10 from 08:15 to 10:00 and from 14:25 to 18:45

Intermittent rain showers occurred during the survey, most notably on the afternoon of Sun 08.

Measured Sound Pressure Levels	dB LAeq,1hr *dB LA90,1hr*	Shaded cells affected by adverse weather (including 60 minutes following a period of rain) or atypical noisy events.

Date	00:00	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Mon 02/12/19																	53 *38*	49 *31*	42 *26*	39 *27*	35 *26*	38 *27*	38 *26*	32 *27*
Tue 03/12/19	30 *26*	28 *25*	31 *26*	31 *26*	29 *26*	32 *25*	54 *42*	48 *33*	51 *35*	43 *30*	40 *27*	42 *28*	42 *32*	42 *34*	41 *30*	50 *33*	53 *39*	45 *30*	40 *27*	40 *28*	37 *27*	41 *27*	36 *27*	30 *26*
Wed 04/12/19	30 *26*	28 *26*	29 *27*	28 *27*	30 *28*	35 *29*	55 *43*	51 *38*	56 *42*	53 *37*	47 *30*	52 *35*	48 *31*	42 *29*	44 *29*	50 *33*	53 *37*	41 *30*	40 *31*	36 *28*	34 *28*	34 *28*	35 *28*	32 *26*
Thu 05/12/19	30 *28*	31 *28*	34 *31*	34 *30*	34 *30*	39 *35*	54 *41*	51 *39*	46 *35*	46 *34*	45 *31*	41 *33*	46 *35*					48 *44*	47 *42*		50 *47*		52 *49*	51 *47*
Fri 06/12/19	49 *46*	49 *46*	49 *44*	47 *44*	48 *44*	44 *42*	56 *48*	51 *44*	52 *45*		50 *45*	49 *45*	50 *45*	53 *47*		58 *50*	50 *41*	49 *40*	41 *35*	41 *36*	41 *37*	38 *34*	38 *34*	36 *32*
Sat 07/12/19	35 *32*	41 *37*	42 *39*	42 *38*	37 *34*	39 *35*	42 *34*	52 *40*	52 *39*	56 *39*	46 *35*	44 *34*	42 *32*	46 *30*	43 *33*	48 *36*	56 *43*	47 *37*	39 *34*	40 *35*	41 *38*	43 *39*		
Sun 08/12/19				55 *49*		57 *50*	52 *47*	55 *49*	54 *47*	52 *47*	54 *43*	53 *48*			51 *45*	55 *47*	52 *44*	52 *47*	48 *44*	46 *43*		47 *45*		38 *35*
Mon 09/12/19	42 *37*		45 *39*	48 *41*	45 *39*	41 *34*	54 *39*	49 *37*	49 *37*	49 *36*	46 *35*	46 *36*	46 *33*	49 *33*	47 *29*	46 *33*	53 *37*	49 *36*	48 *33*	42 *32*	39 *32*	40 *33*	37 *32*	33 *31*
Tue 10/12/19	33 *31*	33 *32*	34 *33*	34 *33*	35 *34*	38 *35*	54 *43*		56 *49*			56 *48*	56 *48*							49 *46*	50 *46*	49 *45*	47 *42*	46 *42*
Wed 11/12/19	47 *43*	41 *37*	39 *36*		39 *37*	36 *34*	55 *41*	51 *39*	50 *42*	45 *37*	50 *36*	46 *35*												

Observations and description of sound climate

This is a rural location 1.0 km west of Newton-in-Bowland village. The observed noise sources at this location were traffic noise, farming machinery, human noise, farm animal noise (mainly cows) and dog barking. Loud farming machinery noise was heard upon deployment.

Elevated noise levels on equipment deployment and collection caused by surveyors have been omitted.

Measurement uncertainty

There were no known road closures or diversion in place during the monitoring period and no construction works were observed.

A reasonably precautionary approach has been adopted where Unidentified high noise events have been omitted from the average baseline sound levels.

The overall data capture for the survey, with periods removed for unsuitable weather conditions, was 86% (equivalent to approximately seven and a half days of data). This level of data capture is considered sufficient to allow reliable baseline sound levels to be reported at this location, and was achieved through extending the survey to include 10 days of monitoring.