



# BEAR Scotland

## M80 DBFO – Year 10 Noise Assessment

10752555/rmg/R1/v3

15<sup>th</sup> February 2022



*Move Forward with Confidence*

## Document Control Sheet

Identification	
<b>Client</b>	BEAR Scotland
<b>Document Title</b>	M80 DBFO – Year 10 Noise Assessment
<b>Client Reference</b>	10752555/rmg/R1

Contact Details		
<b>Company Name</b>	Bureau Veritas UK Limited	BEAR Scotland
<b>Contact Name</b>	[REDACTED]	[REDACTED]
<b>Position</b>	[REDACTED]	[REDACTED]
<b>Address</b>	Suite 4/3 Cadell House 27 Waterloo Street Glasgow G2 6BZ	Chryston Works Auchengeich Road Chryston G69 0JL
<b>Telephone</b>	[REDACTED]	[REDACTED]
<b>e-mail</b>	[REDACTED]	[REDACTED]

Configuration				
Version	Date	Author	Reason for Issue/Summary of Changes	Status
v1	25/06/21	[REDACTED]		Superseded
v2	20/12/21	[REDACTED]	Draft report amended after minor comments received by BEAR Scotland.	Superseded
V3	15/02/22	[REDACTED]	Added appendix for additional monitoring on Kilsyth Road	Final

	Name	Job Title	Signature
<b>Prepared By</b>	[REDACTED]	[REDACTED]	
<b>Approved By</b>	[REDACTED]	[REDACTED]	

Commercial In Confidence  
© Bureau Veritas UK Limited

The copyright in this work is vested in Bureau Veritas UK Limited, and the information contained herein is confidential. This work, either in whole or in part, may not be reproduced or disclosed to others or used for any purpose, other than for internal client evaluation, without Bureau Veritas' prior written approval.

Bureau Veritas UK Limited, Registered in England & Wales, Company Number: 01758622  
Registered Office: Suite 206, Fort Dunlop, Fort Parkway, Birmingham, B24 9FD

## **Contents**

- 1. Introduction**
- 2. Criteria for Noise Assessment**
- 3. Road Traffic Noise Survey**
- 4. Noise Model**
- 5. Discussion**
- 6. Conclusions**

### **Appendices**

- Appendix A - Glossary of Acoustic Terminology
- Appendix B – Schedule of Monitoring Equipment
- Appendix C – Measurement Locations
- Appendix D – Noise Survey Sheets
- Appendix E – Year 10 Noise Monitoring: 63 Kilsyth Road, Haggs

## 1. Introduction

- 1.1 Bureau Veritas was instructed by BEAR Scotland to undertake the Year 10 noise assessment for the M80 motorway between Stepps and Hags.
- 1.2 As part of the O&M works requirements under the DBFO contract, BEAR Scotland has a duty to undertake a noise assessment every five years for the M80 (until year 15).
- 1.3 The noise assessment is required to determine if any properties along the route of the M80 between Stepps and Hags are subject to noise levels that would potentially qualify them for improved sound insulation under the Noise Insulation (Scotland) Regulations 1975 (NISR).
- 1.4 The scope of works was previously agreed with all parties prior to the commencement of the Year 5 work i.e. with HMG (represented by WSP Parsons Brinckerhoff) and Scottish Ministers (represented by Jacobs). It was agreed that the Year 10 work should follow the same scope. This included the following work;
  - Update the Year 1 noise model with traffic flows for Year 10;
  - Identify properties that may qualify under NISR and compare with pre-construction noise model;
  - Undertake noise monitoring at selected locations along the M80 in order to verify the Year 10 noise model;
  - Where, if any, properties are identified as potentially meeting the qualification criteria under NISR, undertake further noise monitoring / perform hand calculations as per, the statutory method for determining entitlement to sound insulation which is contained in the Memorandum of Advice and Instruction (Noise Insulation (Scotland) Regulations, 1975.
- 1.5 In addition to the 8 monitoring locations carried out for the Year 5 study, a 9<sup>th</sup> location was chosen on the northbound carriage close to the J5 on slip following dialogue with Transport Scotland. The location was chosen to verify that the noise model accurately reflects actual noise levels in the vicinity.
- 1.6 The Year 1 (2012) noise model was prepared by WSP Parsons Brinckerhoff and this was provided to Bureau Veritas by BEAR Scotland. The Year 1 model contains the entire M80 scheme from Stepps to Hags and has been developed using the CadnaA noise modelling software.
- 1.7 Traffic flow data for May 2021 was provided by Traffic Scotland. Subsequently, the Year 1 model was updated with the Year 10 traffic data and processed in order to obtain noise levels at properties within 300m of the carriageway.
- 1.8 A total of 3686 buildings have been included in the noise model and all residential dwellings have been assessed for their eligibility under the NI(S)R 1975. It should be noted that the majority of these buildings are single dwellings comprising of two floor levels. For multi storey buildings receptor locations include for higher floors.

## 2. Criteria for Noise Assessment

### Noise Insulation (Scotland) Regulations 1975

- 2.1 The NI(S)R 1975 defines the legislative duty and additional discretionary powers to carry out sound insulation or to make grants when the use of a new or altered highway and any other highway in the vicinity causes or is expected to cause a noise level ('specified noise level') not less than  $L_{A10,18h}$  68 dB at the façade of an eligible residential building.
- 2.2 In addition, the noise level caused or expected to be caused by the altered or new highway together with other traffic in the vicinity ('relevant noise level') should be at least 1 dB higher than the 'prevailing noise level' defined as the noise level immediately before the construction of the works began.
- 2.3 Eligible properties must be within 300m from the nearest point of the carriageway and have clear line of sight to the new or altered road. The point of this assessment corresponds to the most exposed windows or doors on a façade from which a straight line can be drawn to the new or altered road without passing through another building.
- 2.4 The requirement of the NI(S)R 1975 is to assess the noise level in relation to an eligible building within the first 12 months of opening the scheme and then to reassess at subsequent intervals at 5, 10 and 15 years. This report addresses the year 10 requirements.

### Memorandum of Advice & Instruction (Noise Insulation (Scotland) Regulations 1975) No. 1/74

- 2.5 This memorandum describes the methodology to quantify the road traffic noise at a given distance from a highway. It is a technical document that supports the Noise Insulation (Scotland) Regulations 1975.
- 2.6 It has been agreed with HMG that the CRTN method would be used for the purposes of the modelling, using a lower  $L_{A10,18h}$  65 dB as a proxy trigger, following which, eligible facades that are above the proxy trigger and are predicted to have a noise increase of 1 dB or more would be assessed using the NI(S)R 1975 Memorandum method.

### Calculation of Road Traffic Noise (CRTN) 1988

- 2.7 This memorandum describes the methodology to calculate the road traffic noise at a given distance from the highway. This method is more robust than the above Memorandum method in predicting road traffic noise levels.
- 2.8 The methodology takes into account the intervening ground cover, road configuration and road layout. The calculation assumes a typical traffic and noise propagation conditions. Noise levels are presented in terms of the noise descriptor  $L_{A10,18h}$  which is the arithmetic average of the noise level exceeded for 10% of the time each hour between 06:00 and 24:00 hours.
- 2.9 The variables used in the calculation of the traffic noise level are:
  - The annual average week day traffic flow (AAWT) for the 18-hour period from 06:00 to 24:00 hours;
  - Mean traffic speed;
  - Percentage of heavy vehicles;
  - Road gradient;
  - Type of road surface;
  - Distance of the receptor from the road;
  - Nature of the ground cover between the road and the receptor;
  - Screening and reflections.

### 3. Road Traffic Noise Survey

- 3.1 The level of road traffic noise has been determined using the measurement and prediction methodology set out in, “*Calculation of Road Traffic Noise 1988*,” (CRTN 88). Noise measurements were made in accordance with the shortened measurement procedure during three consecutive hours between 10:00 and 17:00 hours.
- 3.2 Road traffic noise measurements were undertaken on the 11<sup>th</sup>, 13<sup>th</sup> and 19<sup>th</sup> May 2021 and the results of these surveys have been used to validate the CadnaA noise model.
- 3.3 The noise monitoring equipment was calibrated at the beginning and end of the assessment period using an acoustic calibrator, which had itself been calibrated against a reference set traceable to National and International Standards. No significant shift in calibration level was observed, i.e. <0.5dB. All measurements were undertaken with Class 1 sound level meters and the details of these can be found in Appendix B.
- 3.4 Measurements were made in a free-field location, at a height of approximately 1.5m above local ground level. The sound level meters were set to record hourly interval values for the measurement period, for the  $L_{A10}$ ,  $L_{A90}$ ,  $L_{Aeq}$  and  $L_{Amax}$  indices.
- 3.5 Meteorological conditions during the noise survey period were dry, still and predominantly sunny and hence considered to be generally conducive to carrying out road traffic sound level measurements.
- 3.6 The results from the noise measurements are given in Table 3.1 below. An arithmetic average of the three  $L_{A10,1h}$  measurements at each location has been derived in accordance with CRTN to give a  $L_{A10,3h}$  dB. The  $L_{A10, 18h}$  dB (06:00 – 24:00) has subsequently been calculated in accordance with CRTN by subtracting 1 dB from the  $L_{A10,3h}$ .

**Table 3.1:** Road Traffic Noise Survey Data

Measurement Location	Description	Distance from Road (m)	$L_{A10, 3h}$ dB(A)	$L_{A10, 18h}$ dB(A)
1	Drumsack Farm	15	78.1	77.1
2	West of Auchengeich Road	6	80.7	79.7
3	East of Auchengeich Road	3	82.6	81.6
4	West of J4 Slip	6	79.0	78.0
5	Glenview Ave, Banknock	9	79.1	78.1
6	Castlecary Road	8	82.4	81.4
7	Carrick Road	5	83.6	82.6
8	M77 Off Slip	3	79.2	78.2
9	North of J5 nr. Southfield Drive	4	81.1	80.1

- 3.7 The dominant noise source at all the measurement positions was found to be from road traffic on the M80. Measurement locations can be seen in Appendix B and noise survey sheets with additional information can be found in Appendix C.

## 4. Noise Model

- 4.1 A road traffic noise model for the entire M80 scheme from Stepps to Haggs was prepared using CadnaA by WSP Parsons Brinkerhoff. Noise predictions were undertaken following the methodology described in CRTN. The WSP Parsons Brinkerhoff report dated December 2014 ref; 3513048C Issue 2 contains full details of the assumptions and methodologies used to build the model.
- 4.2 Bureau Veritas obtained the Year 1 (2012) noise model prepared by WSP Parsons Brinkerhoff and road traffic data for May 2016 from Traffic Scotland.
- 4.3 Bureau Veritas has subsequently updated the Year 1 model with Year 10 traffic data in order to obtain noise levels at properties within 300m of the carriageway.
- 4.4 The results in the table below show the difference between the measured road traffic noise levels undertaken by Bureau Veritas in May 2021 with the predicted model data using the traffic flows provided by Transport Scotland.

**Table 4.1:** Comparison between Noise Modelling and Noise Survey Results

Measurement Location	Noise Modelling Results $L_{A10,18h}$ dB(A)	Noise Survey Results $L_{A10,18h}$ dB(A)	Difference dB
1 - Drumsack Farm	78.6	77.1	-1.5
2 - West of Auchengeich Rd	79.8	79.7	-0.1
3 - East of Auchengeich Rd	80.4	81.6	1.2
4 - West of J4 Slip	78.1	78.0	-0.1
5 - Glenview Ave, Banknock	78.2	78.1	-0.1
6 - Castlecary Road	78.6	81.4	2.8
7 - Carrick Road	81.2	82.6	1.4
8 - M77 Off Slip	76.7	78.2	1.5
9 - North of J5 nr. Southfield Dr.	79.8	80.1	0.3

- 4.5 It can be seen from the table above that the difference between the noise model and survey results are generally within ~1.5 dB for all locations much like the Year 5 study. Generally however, the difference between the results is closer than the Year 5 study but once again, with the exception of Location 6 – Castlecary Road, which was found to differ by 2.8 dB.
- 4.6 It is considered that variances can be accounted for given the noise survey was only a 3-hour ‘snapshot’ of a typical weekday between the hours of 10:00 and 17:00, whereas the noise modelling results were averaged over an entire month, included data from 06:00 to 24:00 and accounts for a larger variation in traffic flows. Up-to-date traffic count information was supplied by Traffic Scotland and was incorporated within the noise model.
- 4.7 It is Bureau Veritas’ opinion that the differences calculated between the noise surveys and noise model is an acceptable tolerance for the purpose of validating the noise model. For many locations the difference between measured and modelled results was within 0.5 dB, which is considered very accurate. Variances of ~1.5 dB between the measured and modelled noise levels are considered reasonable and therefore the noise model is considered to be validated.

## 5. Discussion

- 5.1 The 2016 (Year 5) and 2021 (Year 10) models have been compared to establish consistency. Traffic flows were found to be broadly similar, but were at times, slightly lower than the previous study and the predicted noise levels for Year 10 were generally similar to the Year 5 assessment, often within  $\pm 1.5$  dB.
- 5.2 Comparison of the results against the NI(S)R indicated that once again one dwelling has potentially met the criteria and this is discussed in further detail below. Although 361 dwellings were found to be exposed to a noise level greater than  $L_{A10,18h}$  65 dB(A), either the noise levels have not increased by at least 1 dB or they have not met the other specifications such as; the dwelling does not have a direct line of sight to the motorway or is within 300m of the motorway.
- 5.3 As an example, if the road traffic noise level at the façade of an eligible building was  $L_{A10,18h}$  63 dB before the construction began and  $L_{A10,18h}$  64 dB after, then the property does not qualify under the regulations. Conversely, if the prevailing noise level was  $L_{A10,18h}$  64 dB and the noise level at the facade of the same property is measured to be  $L_{A10,18h}$  65 dB with the new road in operation, then the property may qualify for sound insulation under NI(S)R. It is also possible to find properties which are above  $L_{A10,18h}$  65 dB both before and after the scheme opens, but do not experience a 1 dB increase. These would not be eligible.
- 5.4 The table below shows the number of receptor points that meet the requirements. It must be noted that several receptor points account for first and second floors for one building.

**Table 5.1:** Number of receptor points meeting the criteria

Criteria	No of receptor points
Are noise levels in 2021 greater than 2003?	361
Are noise levels greater than $L_{A10,18h}$ 65 dB?	78
Is the difference greater than or equal to 1 dB?	51
Dwellings within the 300m of motorway?	51
Direct Line of Sight?	1

- 5.5 51 receptors were identified as being exposed to noise levels greater than 65 dB  $L_{A10,18h}$  and having increased by a minimum of 1 dB since 2003. Furthermore, all are located within 300m of the motorway.
- 5.6 Interrogating the noise model further and viewing a cross section of each of the receptors confirmed that 50 of the properties do not have a clear, direct line of sight to the M80 and therefore do not satisfy the NI(S)R requirements wholly. However, 1 property was found to possibly have line of sight and required further review, that being 63 Kilsyth Road, Bonnybridge.
- 5.7 The property at 63 Kilsyth Road, Bonnybridge is the same property that was identified during the Year 5 study. Longer term noise monitoring was carried out at the property in 2016 in order to verify the results of the noise model. It was found that the noise model was over-predicting noise levels such that even the proxy trigger of  $L_{A10,18h}$  65 dB was not being exceeded, thus, the property did not qualify under the NI(S)R. It was also found during the site visit, that the direct line of site to the M80 was dubious, however, the monitoring was taken nonetheless.



## 6. Conclusion

- 6.1 Bureau Veritas have undertaken the Year 10 noise impact assessment to review the noise levels generated from the M80 Motorway as part of the O&M works requirements under the DBFO contract. The requirements state that a noise assessment must be undertaken every 5 years for the M80 (until year 15).
- 6.2 A noise model was developed using the CadnaA modelling software in Year 1 of the completion of the M80 by WSP Parsons Brinckerhoff and contained the entire M80 scheme from Stepps to Haggs. As part of the Year 10 assessment the model was updated with the latest traffic flows to determine the impact on 3686 buildings or 7676 receptor points.
- 6.3 The traffic flow data for the entire month of May 2021 was provided by Traffic Scotland and used to calculate the  $L_{A10,18h}$  which is the arithmetic average of the noise level exceeded for 10% of the time each hour between 06:00 and 24:00 hours.
- 6.4 The 2021 traffic data was input to the updated noise model and compared with the attended measurements locations to confirm its accuracy. The comparison showed that many monitoring locations were within 0.5 dB of the modelling results which is considered to be very accurate. Generally, results were within 1.5 dB which is considered reasonable when accounting for variables between noise monitoring and noise modelling. As discussed in Section 4 however, there was a slightly higher difference at monitoring location 6 – Castlecary Road, where the difference between measured and modelling results was 2.8 dB. This was very similar to the assessment undertaken for Year 5 and the difference could be attributed to various specific local conditions such as higher traffic speeds, the road surface, acoustic reflections etc.
- 6.5 Comparisons between the 2016 and 2021 model were also made to establish consistency. Generally, traffic flows were found to be similar to the Year 5 study or slightly lower. Also, predicted noise levels for 2021 were generally similar to the 2016 assessment i.e. most receptor noise levels were found to be within  $\pm 1.5$  dB.
- 6.6 The results of the noise model were considered against The Noise Insulation (Scotland) Regulations 1975 and 1 property was found to be potentially entitled to sound insulation or a grant. It was established that 51 receptor points increased by a minimum of 1 dB, are exposed to noise levels of more than  $L_{A10,18h}$  65 dB at the façade and are within 300m from the nearest point of the carriageway. Further interrogation of the noise model and viewing a cross section of each of the receptors confirmed that 50 of the properties do not have a clear, direct line of sight to the M80 and therefore do not satisfy the NI(S)R requirements wholly.
- 6.7 The one potential property that meets the NI(S)R qualifying criteria is located at 63 Kilsyth Road, Bonnybridge. Please note this is the same property that was identified in the Year 5 study.
- 6.8 Longer term noise monitoring was previously carried out at this property in 2016 in order to verify the results of the Year 5 noise model. The results of the noise monitoring found that the façade noise level was  $L_{A10,18h}$  59.1 dB, therefore, it was established that the level was below the 68 dB trigger criterion stipulated in the NISR and hence the dwelling would not be eligible for a grant or improved sound insulation. Nevertheless, the same exercise was repeated in 2021 to verify the Year 10 model and the results of the assessment can be found in Appendix E.

## Appendix A

### Glossary of Acoustic Terminology

<b>"A" Weighting (dB(A))</b>	The human ear does not respond uniformly to different frequencies. "A" weighting is commonly used to simulate the frequency response of the ear. It is used in the assessment of the risk of damage to hearing due to noise.
<b>Decibel (dB)</b>	The range of audible sound pressures is approximately $2 \times 10^{-5}$ Pa to 200 Pa. Using decibel notation presents this range in a more manageable form, 0 dB to 140 dB. Mathematically: Sound Pressure Level (dB) = $20 \log \{p(t) / P_0\}$ where $P_0 = 2 \times 10^{-5}$ Pa
<b>Frequency (Hz)</b>	The number of cycles per second, for sound this is subjectively perceived as pitch.
<b>Frequency Spectrum</b>	Analysis of the relative contributions of different frequencies that make up a noise.
<b><math>L_{eq}(T)</math></b>	The equivalent continuous sound level. It is that steady sound level which would produce the same energy over a given time period T as a specified time varying sound.
<b><math>L_{Amax}(T)</math></b>	The maximum RMS A-weighted sound pressure level occurring within a specified time period.
<b><math>L_{AE}</math> or SEL</b>	A measure of A-weighted sound energy used to describe noise events such as the passing of a train or aircraft; it is the A-weighted sound pressure level which, if occurring over a period of one second, would contain the same amount of A-weighted sound energy as the event. The relationship between $L_{Aeq,(T)}$ and SEL is as follows:  $L_{Aeq,(T)} = 10 \log [\text{antilog } SEL_1/10 + \text{antilog } SEL_2/10 + \dots]$ Total time period in seconds where $SEL_n$ is the measured single event level for a given event
<b><math>L_{A10,T}</math></b>	Road traffic noise level. The A-weighted sound pressure level of the residual noise in decibels exceeded for 10% of a given time interval.
<b><math>L_{A90,T}</math></b>	Background noise level. The A-weighted sound pressure level of the residual noise in decibels exceeded for 90% of a given time interval.
<b>Noise</b>	Unwanted sound.
<b>Octave Band</b>	A range of frequencies defined by an upper limit which is twice the lower limit. Octave bands are identified by their centre frequency.

<b><math>R_{TRA}</math> (dB)</b>	The Traffic Noise Reduction Sound Insulation is derived by taking into account a typical spectrum of road traffic in town and city centres
<b><math>R_W</math> (dB)</b>	The weighted sound reduction incorporates a correction for the ear's response and has been derived in accordance with BS 5821:1984.
<b>Specific Noise</b>	The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval.
<b>Rating Level, <math>L_{Ar,T}</math></b>	The specific noise level plus any adjustment for the character of the noise.
<b>Ambient Noise</b>	Totally encompassing sound in a given situation at any given time composed of noise from many sources, near and far.
<b>Residual Noise</b>	The ambient noise remaining at a given position in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise.

## Appendix B

### Schedule of Monitoring Equipment

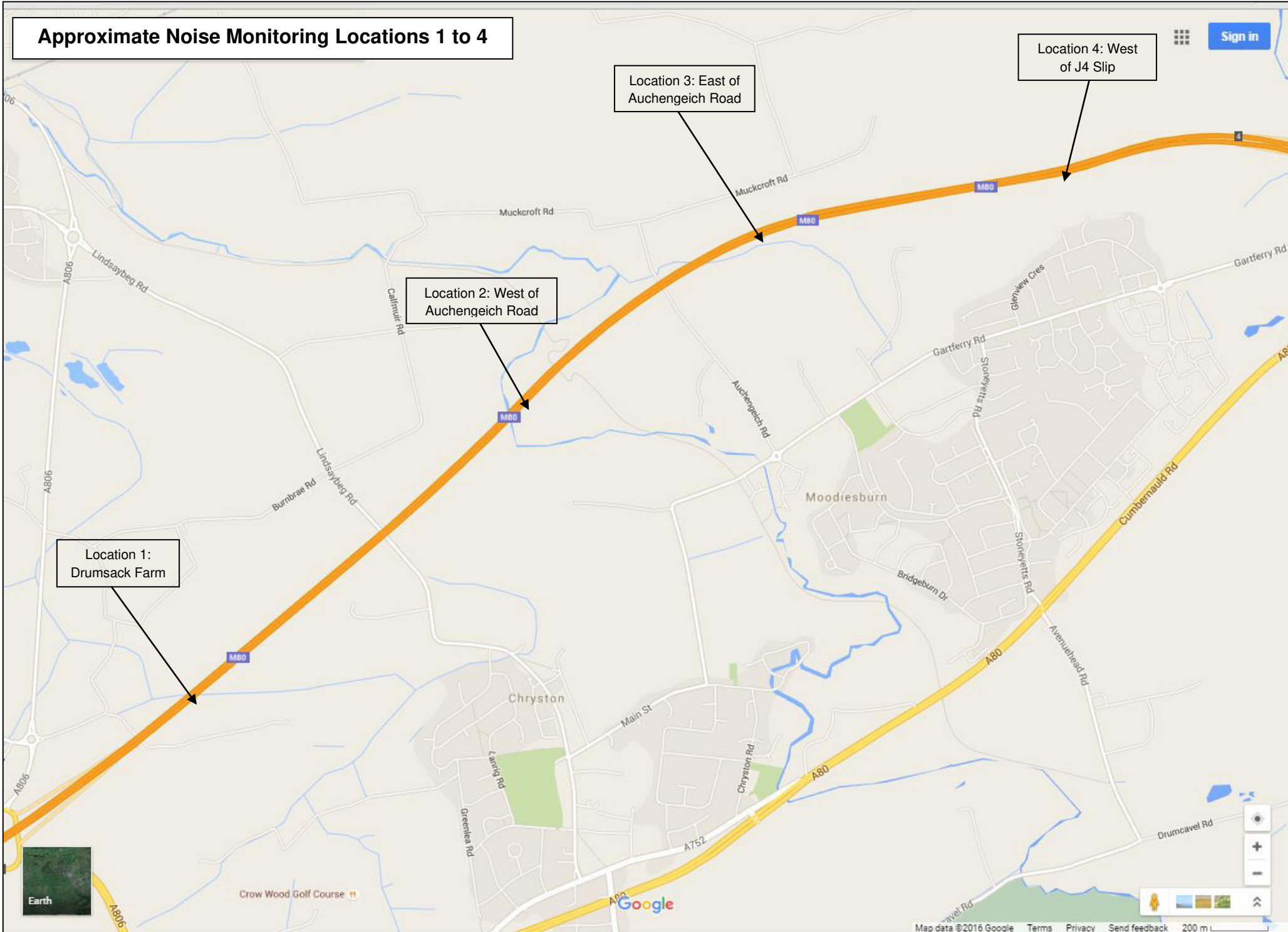
#### Noise Equipment

Brüel and Kjær Sound Analyser Type 2260	Serial Number 2520045
Brüel and Kjær Microphone Type 4189	Serial Number 2719881
Brüel and Kjær Sound Level Calibrator Type 4231	Serial Number 2229809
Brüel and Kjær Sound Analyser Type 2260	Serial Number 2124597
Brüel and Kjær Microphone Type 4189	Serial Number 2625098
Brüel and Kjær Sound Level Calibrator Type 4231	Serial Number 2229809
Brüel and Kjær Sound Analyser Type 2260	Serial Number 2443404
Brüel and Kjær Microphone Type 4189	Serial Number 2795597
Brüel and Kjær Sound Level Calibrator Type 4231	Serial Number 2229809
Rion Sound Level Meter Model NL-52	Serial Number 01054193
Rion Microphone Type UC-59	Serial Number 08576
Brüel and Kjær Sound Level Calibrator Type 4231	Serial Number 2229809
Brüel and Kjær Sound Analysis Software BZ 7202 (version 2)	

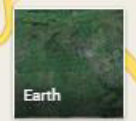
## Appendix C

### Measurement Locations

# Approximate Noise Monitoring Locations 1 to 4



Sign in

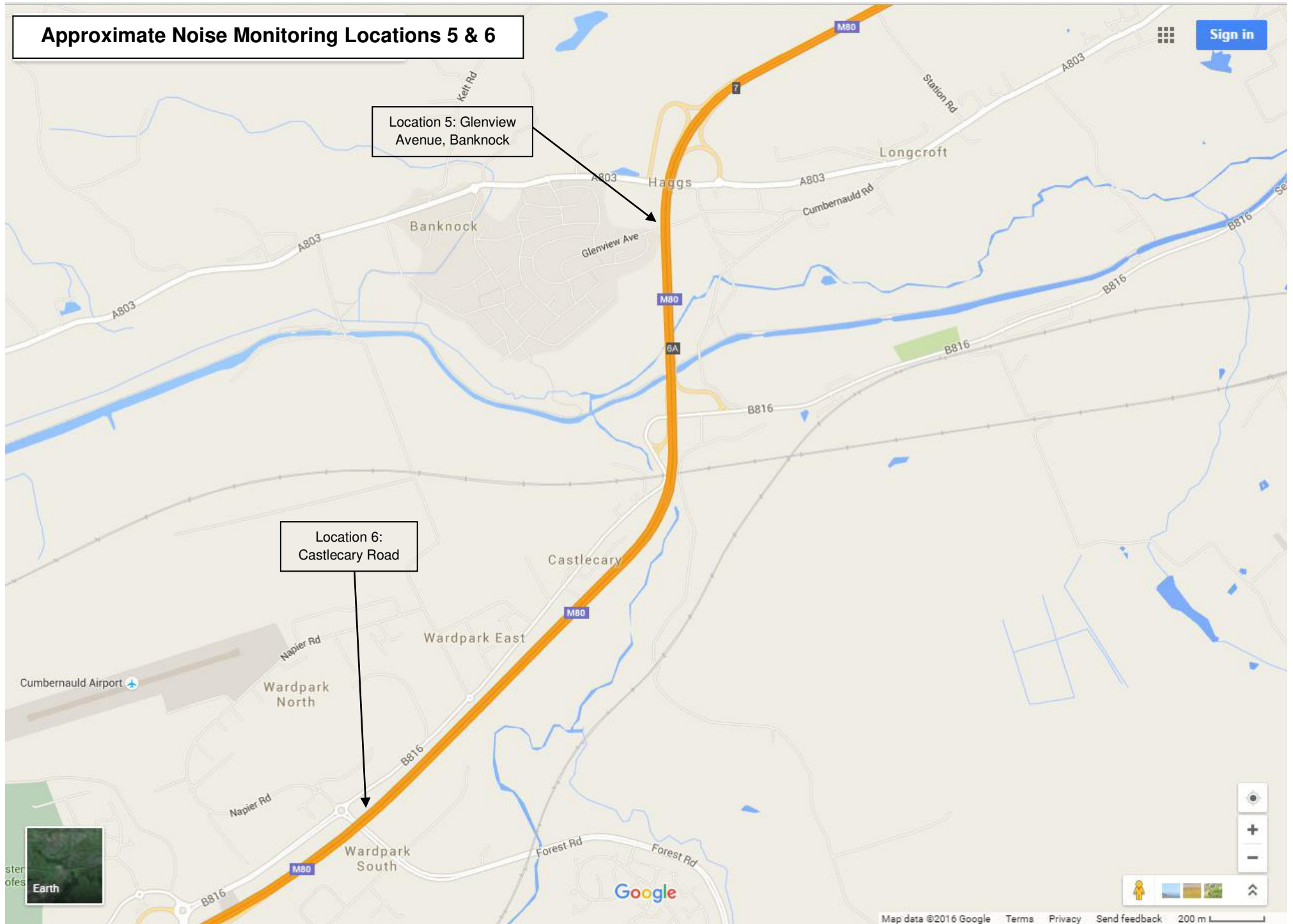




# Approximate Noise Monitoring Locations 5 & 6

Location 5:  
Glenview Avenue, Banknock

Location 6:  
Castlecary Road



# Approximate Noise Monitoring Locations 7 & 9

Location 7:  
Carrick Road

Location 9: North of J5  
nr. Southfield Drive

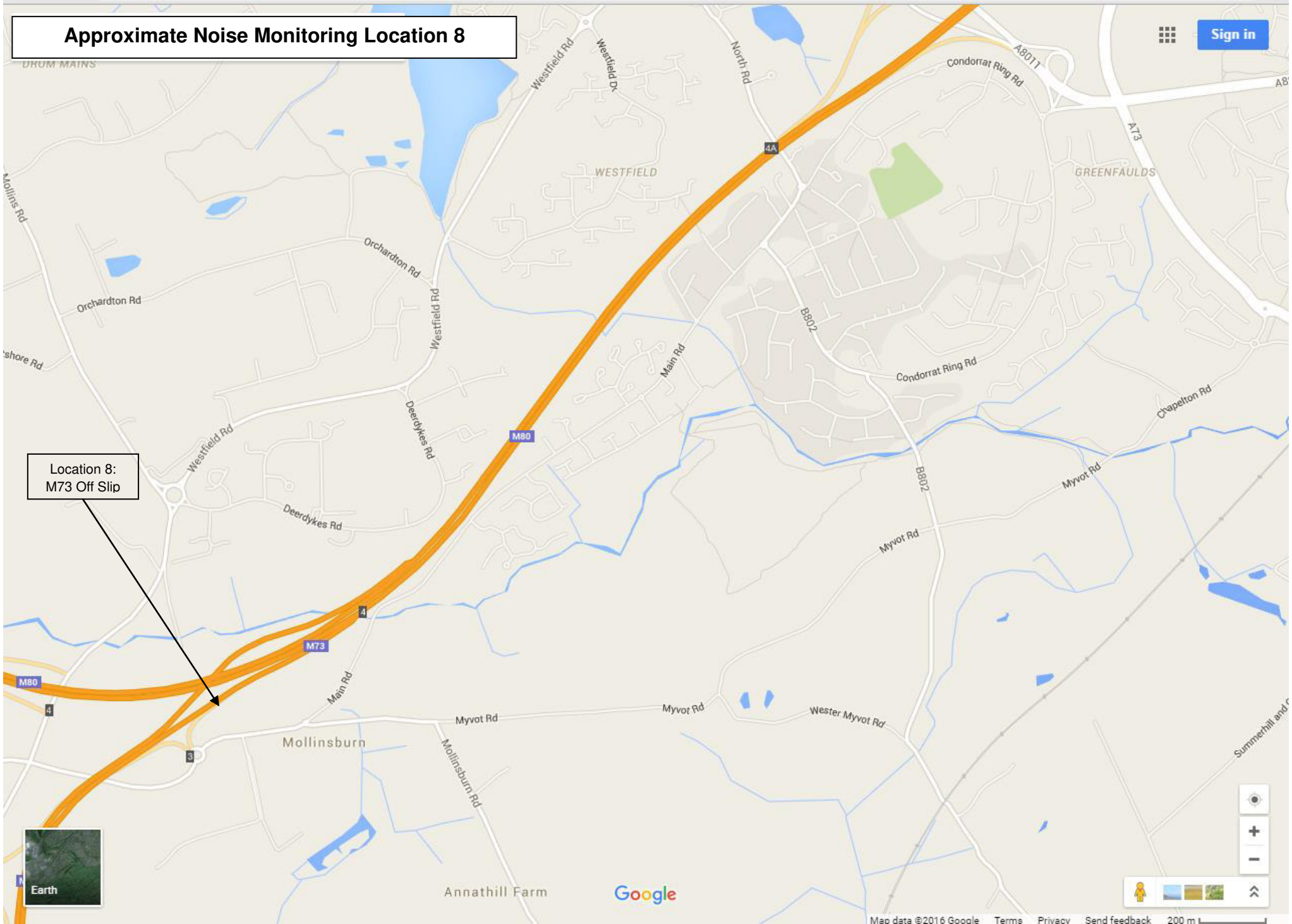




# Approximate Noise Monitoring Location 8

Sign in

Location 8:  
M73 Off Slip



## Appendix D

### Noise Survey Sheets

## NOISE SURVEY SHEET



MEASUREMENT LOCATION:	1	DATE:	19/05/21
Client:	BEAR Scotland	Equipment:	RION NL-52
Project:	M80 Year 5 Assessment	Serial No:	01054193
Job Number:	10752555	Responsible:	Rocco Giudice

### WEATHER CONDITIONS

Temperature (°C)	Wind Speed (mm/s)	Wind Direction	Humidity (%)	General Comments
15	1	W	49	Sunny and dry

### NOISE MEASUREMENTS (dB)

Start Time	Elapsed	31.5	63	125	250	500	1k	2k	4k	8k	A	L <sub>AMaxF</sub>	L <sub>AF10.0</sub>	L <sub>A90.0</sub>
10:29	1h	68.3	72.2	70.7	66.9	66.1	72.9	68.5	58.8	48.5	75.1	88.4	78.2	68.8
11:29	1h	68.5	72.7	69.8	65.4	65.9	73.1	68.7	58.8	48.5	75.2	86.1	78.2	69.3
12:29	1h	68.4	72.3	69.8	65.3	65.4	72.8	68.2	58.5	48.1	74.9	85.2	78	68.7

**Notes:** Road traffic noise dominant

### SOUND LEVEL METER MONITORING LOCATION PHOTOS



Looking westbound



Looking north



Looking eastbound



## NOISE SURVEY SHEET



MEASUREMENT LOCATION:	2	DATE:	13/05/21
Client:	BEAR Scotland	Equipment:	B&K 2260
Project:	M80 Year 10 Assessment	Serial No:	01054193
Job Number:	10752555	Responsible:	Rocco Giudice

### WEATHER CONDITIONS

Temperature (°C)	Wind Speed (mm/s)	Wind Direction	Humidity (%)	General Comments
9	3	ENE	58	Cloudy

### NOISE MEASUREMENTS (dB)

Start Time	Elapsed	31.5	63	125	250	500	1k	2k	4k	8k	A	L <sub>AMaxF</sub>	L <sub>AF10.0</sub>	L <sub>A90.0</sub>
10:40	1h	69.2	72.7	69.8	66.9	68.5	74.8	71.2	62.4	52.7	77.4	91.2	80.9	67.5
11:40	1h	68.6	72.5	70.3	66.7	68	74.8	71.2	62.4	52.8	77.3	90.8	80.9	67.4
12:40	1h	68.5	72.8	70.2	66.7	67.9	74.8	71.2	62.5	52.7	77.3	87.1	80.8	67

**Notes:** Road traffic noise dominant

### SOUND LEVEL METER MONITORING LOCATION PHOTOS



Looking westbound



Looking north



Looking eastbound

## NOISE SURVEY SHEET



**BUREAU  
VERITAS**

MEASUREMENT LOCATION:	3	DATE:	13/05/21
Client:	BEAR Scotland	Equipment:	B&K 2260
Project:	M80 Year 10 Assessment	Serial No:	2520445
Job Number:	10752555	Responsible:	Rocco Giudice

### WEATHER CONDITIONS

Temperature (°C)	Wind Speed (mm/s)	Wind Direction	Humidity (%)	General Comments
9	3	ENE	58	Cloudy

### NOISE MEASUREMENTS (dB)

Start Time	Elapsed	31.5	63	125	250	500	1k	2k	4k	8k	A	L <sub>AMaxF</sub>	L <sub>AF10.0</sub>	L <sub>A90.0</sub>
10:34	1h	68.4	72.1	69.3	68.1	71.8	76.7	71.7	60.9	51.4	78.9	89.5	82.6	68.2
11:34	1h	70.5	72	69.6	67.9	71.3	76.4	71.4	60.7	51.4	78.5	88.6	82.4	67.6
12:34	1h	69.5	72.3	69.7	68.5	71.6	76.8	71.9	62.6	55	79.0	98.9	82.8	67.8

**Notes:** Road traffic noise dominant

### SOUND LEVEL METER MONITORING LOCATION PHOTOS



Looking eastbound



Looking north



Looking westbound



## NOISE SURVEY SHEET



MEASUREMENT LOCATION:	4	DATE:	13/05/21
Client:	BEAR Scotland	Equipment:	B&K 2260
Project:	M80 Year 10 Assessment	Serial No:	2443404
Job Number:	10752555	Responsible:	Rocco Giudice

### WEATHER CONDITIONS

Temperature (°C)	Wind Speed (mm/s)	Wind Direction	Humidity (%)	General Comments
9	3	ENE	58	Cloudy

### NOISE MEASUREMENTS (dB)

Start Time	Elapsed	31.5	63	125	250	500	1k	2k	4k	8k	A	L <sub>AMaxF</sub>	L <sub>AF10.0</sub>	L <sub>A90.0</sub>
10:15	1h	71.7	71.9	69.4	65.9	65.8	71	68.2	57.4	46.3	73.9	83.6	79	67.4
11:15	1h	70.4	71.2	69	65.5	65.2	70.7	68.1	57.2	46	73.7	87.2	79.2	67
12:15	1h	69.6	71.7	68.9	65.5	64.8	70.6	68.3	57.4	46.2	73.7	87.1	78.8	66.8

**Notes:** Road traffic noise dominant

### SOUND LEVEL METER MONITORING LOCATION PHOTOS



Looking eastbound



Looking north



Looking westbound

## NOISE SURVEY SHEET



**BUREAU  
VERITAS**

MEASUREMENT LOCATION:	5	DATE:	11/05/21
Client:	BEAR Scotland	Equipment:	B&K 2260
Project:	M80 Year 10 Assessment	Serial No:	2443404
Job Number:	10752555	Responsible:	Rocco Giudice

### WEATHER CONDITIONS

Temperature (°C)	Wind Speed (mm/s)	Wind Direction	Humidity (%)	General Comments
11	5	SSW	56	Partly cloudy with sunny spells

### NOISE MEASUREMENTS (dB)

Start Time	Elapsed	31.5	63	125	250	500	1k	2k	4k	8k	A	L <sub>AMaxF</sub>	L <sub>AF10.0</sub>	L <sub>A90.0</sub>
10:00	1h	70.5	74.6	70.7	66.1	69.2	74.3	68.8	57.7	46.1	76.3	85.7	79	70.8
11:00	1h	70.9	74.9	71.1	66.2	69.4	74.3	68.8	57.7	46.2	76.3	85.6	79	70.8
12:00	1h	70.8	74.7	71.3	66.5	69.6	74.5	69	57.9	46.2	76.6	91.8	79.2	71.4

**Notes:** Road traffic noise dominant

### SOUND LEVEL METER MONITORING LOCATION PHOTOS



Looking westbound



Looking south



Looking eastbound



## NOISE SURVEY SHEET



**BUREAU  
VERITAS**

MEASUREMENT LOCATION:	6	DATE:	11/05/21
Client:	BEAR Scotland	Equipment:	B&K 2260
Project:	M80 Year 10 Assessment	Serial No:	2520445
Job Number:	10752555	Responsible:	Rocco Giudice

### WEATHER CONDITIONS

Temperature (°C)	Wind Speed (mm/s)	Wind Direction	Humidity (%)	General Comments
12	4	SSW	56	Partly cloudy with sunny spells

### NOISE MEASUREMENTS (dB)

Start Time	Elapsed	31.5	63	125	250	500	1k	2k	4k	8k	A	L <sub>AMaxF</sub>	L <sub>AF10.0</sub>	L <sub>A90.0</sub>
10:21	1h	71.5	74.7	71.7	67.7	71.9	77.9	71	59.8	49	79.5	90.7	82.4	71.6
11:21	1h	71.8	75.1	72.8	68.5	71.8	78	71.1	59.8	49.1	79.6	90.3	82.4	72
12:21	1h	71.5	74.8	72	67.8	71.6	78.1	71.2	59.7	48.9	79.7	87.7	82.4	72.6

**Notes:** Road traffic noise dominant

### SOUND LEVEL METER MONITORING LOCATION PHOTOS



Looking westbound



Looking south



Looking eastbound



## NOISE SURVEY SHEET



MEASUREMENT LOCATION:	7	DATE:	11/05/21
Client:	BEAR Scotland	Equipment:	B&K 2260
Project:	M80 Year 10 Assessment	Serial No:	2124597
Job Number:	10752555	Responsible:	Rocco Giudice

### WEATHER CONDITIONS

Temperature (°C)	Wind Speed (mm/s)	Wind Direction	Humidity (%)	General Comments
11	5	SSW	58	Partly cloudy with sunny spells

### NOISE MEASUREMENTS (dB)

Start Time	Elapsed	31.5	63	125	250	500	1k	2k	4k	8k	A	L <sub>AMaxF</sub>	L <sub>AF10.0</sub>	L <sub>A90.0</sub>
10:44	1h	74.1	77.8	73.7	68.7	75.6	77.9	73	63	53.1	80.5	91	83.6	73.6
11:44	1h	74	78	73.4	68.3	75.8	78.2	73	63	53.3	80.7	92.4	83.6	74.2
12:44	1h	73.7	77.6	73.1	68	75.5	78.2	73	63	53.1	80.7	89.8	83.6	74.4

**Notes:** Road traffic noise dominant

### SOUND LEVEL METER MONITORING LOCATION PHOTOS



Looking westbound



Looking north



Looking eastbound

## NOISE SURVEY SHEET



**BUREAU  
VERITAS**

MEASUREMENT LOCATION:	8	DATE:	11/05/21
Client:	BEAR Scotland	Equipment:	RION NL-52
Project:	M80 Year 10 Assessment	Serial No:	01054193
Job Number:	10752555	Responsible:	Rocco Giudice

### WEATHER CONDITIONS

Temperature (°C)	Wind Speed (mm/s)	Wind Direction	Humidity (%)	General Comments
11	5	SSW	58	Partly cloudy with sunny spells

### NOISE MEASUREMENTS (dB)

Start Time	Elapsed	31.5	63	125	250	500	1k	2k	4k	8k	A	L <sub>AMaxF</sub>	L <sub>AF10.0</sub>	L <sub>A90.0</sub>
11:05	1h	70.4	74.2	70.8	67.7	71.4	72.8	67.2	58.8	48.6	75.4	85.6	79	64
12:05	1h	70.1	73.8	70.4	66.3	70.8	72.7	67.4	58.6	48.2	75.2	85.5	79.3	64.4
13:05	1h	70.4	73.9	70.5	66.6	71.1	72.8	67.3	58.5	48.1	75.3	85.9	79.4	64.9

**Notes:** Road traffic noise dominant

### SOUND LEVEL METER MONITORING LOCATION PHOTOS



Looking westbound



Looking north



Looking eastbound



## NOISE SURVEY SHEET



**BUREAU  
VERITAS**

MEASUREMENT LOCATION:

9

DATE:

14/05/21

Client:

BEAR Scotland

Equipment:

B&K 2260

Project:

M80 Year 10 Assessment

Serial No:

2124597

Job Number:

10752555

Responsible:

Rocco Giudice

### WEATHER CONDITIONS

Temperature (°C)	Wind Speed (mm/s)	Wind Direction	Humidity (%)	General Comments
10	3	ENE	56	Cloudy

### NOISE MEASUREMENTS (dB)

Start Time	Elapsed	31.5	63	125	250	500	1k	2k	4k	8k	A	L <sub>AMaxF</sub>	L <sub>AF10.0</sub>	L <sub>A90.0</sub>
11:03	1h	71.4	75.1	71.8	68	72.3	76.2	71.1	60.4	49.6	78.9	90.5	81.2	74
12:03	1h	72.2	75.9	72.6	68.8	73.1	77	71.9	61.2	50.4	78.8	86.7	81.2	74.4
13:03	1h	71.6	75.3	72	68.2	72.5	76.4	71.3	60.6	49.8	78.7	87.7	81	73.8

**Notes:**

Road traffic noise dominant

### SOUND LEVEL METER MONITORING LOCATION PHOTOS



Looking westbound



Looking south



Looking eastbound

## Appendix E

### Year 10 Noise Monitoring – 63 Kilsyth Road, Haggs



**BUREAU  
VERITAS**

Acoustics and Vibration Group

Our ref: 10752555/rmg/LR1  
20<sup>th</sup> August 2021

[REDACTED]  
BEAR Scotland  
Chryston Works  
Auchengeich Road  
Chryston  
G69 0JL

Dear [REDACTED],

## Year 10 Noise Monitoring – 63 Kilsyth Road, Haggs

### 1. Introduction

- 1.1 Bureau Veritas was instructed by BEAR Scotland to undertake the year 10 noise assessment for the upgraded M80 motorway between Stepps and Haggs.
- 1.2 The noise assessment was required to determine if any properties along the route of the M80 between Stepps and Haggs were subject to noise levels that would potentially qualify them for compensation under the Noise Insulation (Scotland) Regulations 1975 (NISR).
- 1.3 A total of 3686 buildings were included in the noise model and all residential dwellings have been assessed for their eligibility under the NI(S)R 1975. It should be noted that the majority of these buildings are single dwellings comprising of two floor levels. For multi-storey buildings, receptor locations included higher floors.
- 1.4 It was agreed in the past, with HMG and the Scottish Ministers Site Representatives, during the year 5 study, that the CRTN methodology would be used for the purposes of the noise modelling. Furthermore, a lower proxy trigger of  $L_{A10,18h}$  65 dB (instead of 68 dB reference in the Regulations) would be used to identified potential eligible properties. Following this, eligible façades that are above the trigger and are predicted to have a noise increase of 1 dB or more would be assessed using the NI(S)R 1975 Memorandum method.
- 1.5 Comparison of the results against the criteria indicated that one dwelling at 63 Kilsyth Road had potentially qualified, in that free-field noise levels were calculated to be greater than  $L_{A10,18h}$  65 dB(A), the noise levels had increased by at least 1 dB, the property had a direction line of sight to the motorway and was within 300m of the motorway.
- 1.6 As per the agreed scope of work, the following was recommended on identification of any properties which may meet the qualifying criteria;
  - Noise monitoring to be undertaken to conform with NISR requirements to determine the  $L_{A10,18hr}$ . If it is found that measured noise levels are below the qualifying level, Bureau Veritas will report this and cease the study at that point;
  - Where the measured  $L_{A10,18hr}$  verifies that qualifying criteria can be met, detailed calculations as required by NISR will be carried out.
- 1.7 The NI(S)R recommends that road traffic noise monitoring should ideally be undertaken during the busiest months of the year, i.e. May or August. This assessment was undertaken in August 2021.

## 2. Road Traffic Noise Survey

- 2.1 The level of road traffic noise was measured using the principles set out in the Noise Insulation (Scotland) Regulations 1975.
- 2.2 Road traffic noise measurements were undertaken for a period of 72 hours between the 16<sup>th</sup> and 20<sup>th</sup> August 2021 within the back garden of 63 Kilsyth Road. Details of the noise equipment can be found in Appendix A while the site plan can be seen in Appendix B.
- 2.3 The noise monitoring equipment was calibrated at the beginning and end of the assessment period using an acoustic calibrator, which had itself been calibrated against a reference set traceable to National and International Standards. No significant shift in calibration level was observed, i.e. <0.5dB.
- 2.4 Façade measurements were made approximately 1m from the most exposed window, at a height of approximately 2m above local ground level. The sound level meter was set to record hourly interval values for the measurement period, for the  $L_{A10}$ ,  $L_{A90}$  and  $L_{Aeq}$  indices. A photo of the monitoring position can be seen in Figure 1.

**Figure 1:** Monitoring Location at 63 Kilsyth Road



- 2.5 Meteorological conditions during the noise survey period were dry, still and with many sunny spells on the 17<sup>th</sup> and 18<sup>th</sup> August but predominantly cloudy on the 19<sup>th</sup>. The weather conditions were considered conducive to carrying out road traffic sound level measurements and the weather experienced during the survey is shown below.

**Table 2.1:** Weather Conditions

Date	Wind Speed (m/s)	Wind Direction	Max. Temp. (°C)	Min. Temp. (°C)	Precipitation (mm)
17/08/21	5	WNW	23	12	0
18/08/21	6	W	23	13	0
19/08/21	3	SSW	17	13	0

- 2.6 The results from the noise measurements are given in Table 2.2 below. It should be noted that the  $L_{A10, 18hr}$  noise levels were calculated by arithmetically averaging the 1-hour noise levels. The full, hourly results can be found in Appendix C.

**Table 2.2:** Measured Façade Road Traffic Noise Levels

Date	Measurement Time	$L_{Aeq, 18h}$ dB(A)	$L_{A10, 18h}$ dB(A)	$L_{A90, 18h}$ dB(A)
17/08/21	06:00 – 24:00	57.2	57.8	52.4
18/08/21	06:00 – 24:00	56.6	58.1	52.2
19/08/21	06:00 – 24:00	56.4	58.1	52.2

- 2.7 It should be noted that the dominant noise source at the measurement position was found to be from road traffic on the M80 as well as local road traffic from Kilsyth Road.

### 3. Conclusions

- 3.1 Noise measurements at 63 Kilsyth Road were undertaken due to the dwelling potentially meeting the Noise Insulation (Scotland) Regulations (NISR) 1975 criteria for a grant or improved sound insulation with respect to road traffic noise.
- 3.2 The year 10 noise model predicted that the dwelling would exceed the  $L_{A10,18hr}$  65 dB proxy trigger, that noise levels had increased by more than 1 dB, that the house was within 300m of the M80 and that there was a clear line of site to the motorway.
- 3.3 In order to verify that noise levels at the property had exceeded the NI(S)R criterion of  $L_{A10,18hr}$  68 dB, noise monitoring was undertaken for a period of 3 days between the 16<sup>th</sup> and 19<sup>th</sup> August 2021.
- 3.4 The results of the noise monitoring found that the façade noise level did not exceed  $L_{A10,18hr}$  **58.1 dB**. It was therefore established that the façade level was below the  $L_{A10,18hr}$  68 dB criterion stipulated in the NI(S)R.
- 3.5 In light of this new evidence, the noise monitoring undertaken suggests that 63 Kilsyth Road would not be eligible for a grant or improved sound insulation with respect to road traffic noise as it does not meet all the applicable criteria of the NI(S)R.

We trust the above is clear and satisfactory, if you have any questions, please do not hesitate to contact us.

Yours sincerely,

[REDACTED]

Bureau Veritas UK Ltd.

[REDACTED]

## Appendix A

### Schedule of Monitoring Equipment

#### Noise Equipment

Rion NL-52 Sound Level Meter

Serial Number 01054193

Rion NH-25 Microphone

Serial Number 54266

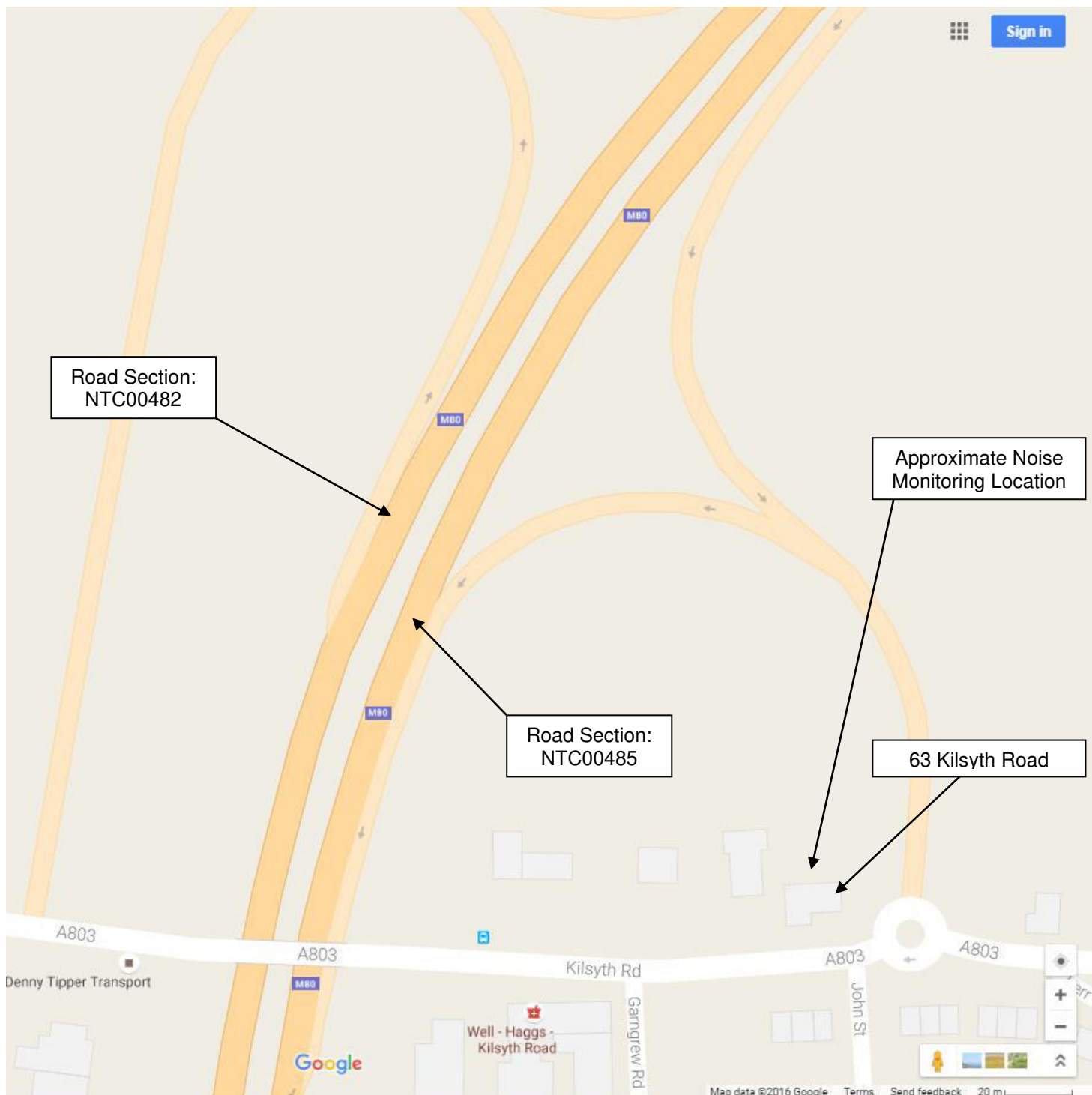
Brüel and Kjær Sound Level Calibrator Type 4231

Serial Number 2122928



## Appendix B

### Site Map (not to scale)



## Appendix C

### Measured Noise Data

Date	Start Time	End Time	$L_{Aeq}$ (dB)	$L_{A10}$ (dB)	$L_{A90}$ (dB)
16/08/2021	20:05	21:05	56.5	64.4	64.0
16/08/2021	21:05	22:05	52.5	63.8	63.3
16/08/2021	22:05	23:05	50.6	63.1	60.6
16/08/2021	23:05	00:05	49.3	61.6	58.1
17/08/2021	00:05	01:05	48.6	61.6	58.5
17/08/2021	01:05	02:05	48.7	61.7	57.8
17/08/2021	02:05	03:05	48.6	61.2	56.4
17/08/2021	03:05	04:05	49.4	62.5	58.8
17/08/2021	04:05	05:05	51.0	63.2	61.2
17/08/2021	05:05	06:05	55.0	66.3	63.9
17/08/2021	06:05	07:05	57.5	68.6	67.5
17/08/2021	07:05	08:05	58.2	69.3	68.4
17/08/2021	08:05	09:05	63.0	69.1	68.1
17/08/2021	09:05	10:05	56.8	69.4	67.3
17/08/2021	10:05	11:05	55.6	69.2	67.7
17/08/2021	11:05	12:05	56.3	69.5	68.5
17/08/2021	12:05	13:05	57.2	70.0	68.2
17/08/2021	13:05	14:05	57.3	69.7	68.1
17/08/2021	14:05	15:05	57.7	69.9	68.8
17/08/2021	15:05	16:05	58.6	70.0	68.9
17/08/2021	16:05	17:05	56.9	68.6	69.5
17/08/2021	17:05	18:05	57.1	69.4	70.5
17/08/2021	18:05	19:05	58.8	68.5	67.7
17/08/2021	19:05	20:05	56.7	65.3	65.1
17/08/2021	20:05	21:05	54.2	64.5	64.6
17/08/2021	21:05	22:05	52.9	63.7	63.8
17/08/2021	22:05	23:05	52.3	63.1	60.9
17/08/2021	23:05	00:05	48.9	61.9	58.8
18/08/2021	00:05	01:05	49.2	61.2	57.8
18/08/2021	01:05	02:05	47.0	63.3	57.5
18/08/2021	02:05	03:05	47.9	60.8	57.2
18/08/2021	03:05	04:05	49.2	61.8	58.6
18/08/2021	04:05	05:05	52.1	64.4	60.6
18/08/2021	05:05	06:05	53.3	66.8	64.2
18/08/2021	06:05	07:05	56.8	68.9	67.4
18/08/2021	07:05	08:05	58.0	69.9	69.7
18/08/2021	08:05	09:05	57.0	68.9	67.9
18/08/2021	09:05	10:05	56.5	69.3	67.7
18/08/2021	10:05	11:05	57.0	70.1	68.1
18/08/2021	11:05	12:05	57.4	70.5	68.0
18/08/2021	12:05	13:05	58.3	70.7	68.1
18/08/2021	13:05	14:05	58.1	70.2	68.2
18/08/2021	14:05	15:05	57.8	69.5	68.8
18/08/2021	15:05	16:05	57.8	69.7	69.2
18/08/2021	16:05	17:05	57.1	69.0	69.8
18/08/2021	17:05	18:05	57.6	68.5	70.2
18/08/2021	18:05	19:05	58.5	67.3	67.5

Date	Start Time	End Time	$L_{Aeq}$ (dB)	$L_{A10}$ (dB)	$L_{A90}$ (dB)
18/08/2021	19:05	20:05	55.0	65.6	65.0
18/08/2021	20:05	21:05	54.8	63.6	64.1
18/08/2021	21:05	22:05	54.3	63.1	63.5
18/08/2021	22:05	23:05	53.1	62.8	61.6
18/08/2021	23:05	00:05	50.5	61.7	59.4
19/08/2021	00:05	01:05	48.2	61.8	58.3
19/08/2021	01:05	02:05	47.1	60.2	57.5
19/08/2021	02:05	03:05	46.9	61.2	57.1
19/08/2021	03:05	04:05	48.2	62.0	58.1
19/08/2021	04:05	05:05	50.1	62.4	60.1
19/08/2021	05:05	06:05	54.3	66.7	63.8
19/08/2021	06:05	07:05	57.7	69.1	67.8
19/08/2021	07:05	08:05	57.9	69.5	69.2
19/08/2021	08:05	09:05	56.9	68.9	68.2
19/08/2021	09:05	10:05	56.9	69.1	67.6
19/08/2021	10:05	11:05	55.8	69.0	68.3
19/08/2021	11:05	12:05	57.1	68.9	68.1
19/08/2021	12:05	13:05	56.4	69.0	68.2
19/08/2021	13:05	14:05	55.3	69.2	68.5
19/08/2021	14:05	15:05	55.3	69.6	68.7
19/08/2021	15:05	16:05	55.5	68.8	68.5
19/08/2021	16:05	17:05	55.1	67.8	69.7
19/08/2021	17:05	18:05	56.3	68.0	70.1
19/08/2021	18:05	19:05	58.0	65.9	67.2
19/08/2021	19:05	20:05	57.5	65.4	65.6
19/08/2021	20:05	21:05	54.2	64.0	64.2
19/08/2021	21:05	22:05	57.5	62.6	63.1
19/08/2021	22:05	23:05	57.9	63.7	62.9
19/08/2021	23:05	00:05	54.4	63.1	60.0
20/08/2021	00:05	01:05	51.4	62.3	59.0
20/08/2021	01:05	02:05	49.7	60.6	57.1
20/08/2021	02:05	03:05	51.4	60.8	57.1
20/08/2021	03:05	04:05	48.9	62.6	59.3
20/08/2021	04:05	05:05	50.5	63.7	60.6
20/08/2021	05:05	06:05	54.4	66.6	64.3
20/08/2021	06:05	07:05	58.8	68.7	67.4
20/08/2021	07:05	08:05	60.8	69.1	69.1
20/08/2021	08:05	09:05	58.1	68.4	67.8
20/08/2021	09:05	10:05	60.3	70.3	69.0