PARSONS BRINCKERHOFF

June 2015

FIVE MILE LANE - BASELINE NOISE REPORT

Welsh Assembly Government

3512646D-HHC

Final

Five Mile Lane - Baseline Noise Report

3512646D-HHC

Prepared for
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1.0	June 2015		
2.0	Jan 2016	Various	Further details on the role of the noise survey report in the EIA

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1 INTRODUCTION

1.1 Background

1.1.1 Parsons Brinckerhoff was commissioned by the Welsh Assembly Government to undertake measurements of the existing noise climate along the proposed road improvement scheme at A2446 Five Mile Lane, west of Cardiff and north-west of Barry, between Weycock Cross and Sycamore Cross.

1.1.2 The results of this noise report provide baseline noise information, which will be used for the noise prediction and subsequent noise assessment for the proposed Five Mile Lane project operation and construction scenarios.

1.1.3 A glossary of acoustics terminology is provided in Annex A.

1.2 Site Description

1.2.1 The Five Mile Lane site is along the A2446, to the north-west of Barry. Figure 1 (located in section 2.2 of this report) shows the proposed site boundary along the route.

1.2.2 The southernmost section of the site is Waycock Cross. This area is suburban and consists of a mixture of residential, commercial and light industrial receptors. North of Waycock Cross, the rest the scheme is rural and includes Noise Sensitive Receptor (NSRs) at varying distances from the alignment.

1.3 Published Guidance

1.3.1 The Calculation of Road Traffic Noise CRTN [1] issued by the Department of Traffic Welsh Office, defines the methods used to predict and measure noise levels from road traffic in England and Wales.

1.3.2 This standard uses the statistical parameter L_{A10} to assess noise impact from existing or proposed roads. L_{A10} is the A-weighted sound pressure level that is exceeded for 10% of the measurement period. The measured L_{A10} is the arithmetic mean of the eighteen one-hourly measurements representative of the daytime period.

1.3.3 However, CRTN allows measurements in shorter periods, and for the purposes of this survey the shortened three hour procedure as described in paragraph 43 of CRTN was used. The CRTN measurements will be used to validate the road traffic noise model, traffic flows for which will be produced by the transport team.

1.3.4 BS5228:2009;A1-2014 'Code of practice for noise and vibration control on construction and open sites' [2] gives recommendations on noise control relating to construction activities. The standard provides advice on prediction methods, noise measurements and assessment for the associated impact.

1.3.5 Construction noise levels are predicted as a 'free field' equivalent continuous noise level averaged over a one-hour period ($L_{Aeq,1h}$), and then subsequently averaged over a twelve hour working day to give the $L_{Aeq,12h}$.

1.3.6 Construction noise limits are specific to each scheme, and are agreed in consultation with the local authority. These limits take many factors into account, including the nature of the works, the times and durations of the activities, and the sensitivities of the closest receptors. The limits are expressed as an average level for a period of time (usually averaged over the working day), and thus it is possible that peak levels are in excess of the average levels.

1.3.7 The significance of construction noise impacts can be assessed using a significance criteria based on the 'ABC' method described in Annex E of BS5288. The level of significance will relate to the degree of exceedance of the values presented in Table 1.

Table 1 - BS5228 'ABC' significance criteria

Evaluation Period	Assessment Category (dB L_{Aeq})		
	A	B	C
Night-time (23:00-07:00)	45	50	55
Evening and Weekends*	55	60	65
Daytime (07:00-19:00)	65	70	75

* 19:00-23:00 weekdays, 13:00-23:00 Saturdays and 07:00-23:00 Sundays.

Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.

Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as Category A values.

Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than Category A values.

The Category (A, B or C) is to be determined separately for each time period and the lowest noise category is then used throughout the 24-hour cycle, e.g. a site which is category A by day and category B or C in the evening and night will be treated as category A for day, evening and night.

1.3.8 BS 7445 defines and prescribes best practice during the recording and reporting of environmental noise. This report details the methodology and approach of the noise survey, and presents the full set of recorded measurements. The methodology detailed in British Standard (BS) 7445-1:2003[3] and BS 7445-3:1991[4], was also followed during the surveys undertaken.

2 METHODOLOGY

2.1 General

2.1.1 Measurements were made using a Class 1 Integrating-Averaging Sound Level Meter (SLM) as defined in International Electrotechnical Commission (IEC) 61672:2003[5].

2.1.2 The measurements were designed for two purposes:

- CRTN to validate the road traffic noise model
- Baseline measurements to inform the construction noise assessment

2.1.3 The site engineer was James Wright (AMIOA).

CRTN Measurements

2.1.4 'Calculation of Road Traffic Noise' (CRTN) measurements were taken using three one hour measurements.

2.1.5 One attended sound level meter was setup at road side locations where free flowing traffic was present, on publicly accessible land at two locations along the A2446 within the scheme boundary.

Ambient Background Noise Measurements

2.1.6 A series of attended short term sample measurements were taken at four locations to quantify the ambient background noise at identified NSRs along the route.

2.2 Measurement Locations

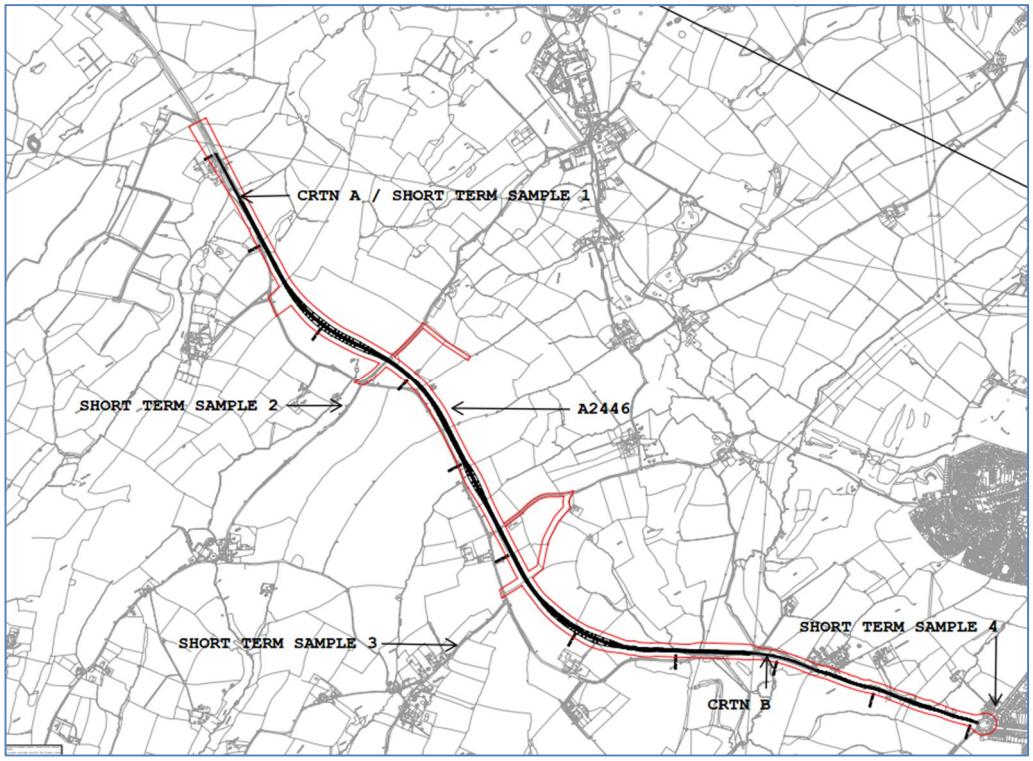


Figure 1 - Survey Measurement Locations and Site Boundary

2.2.1 Figure 1 shows the two CRTN and four short term sample measurements, along with the site boundary in red.

CRTN Measurements

2.2.2 The CRTN measurement locations were selected to represent free flowing traffic, away from junctions and areas where queues are likely. Two separate measurements were selected due to the length of the road and speed limit changes along the route. CRTN A was located on a stretch of road which had a 60 mph limit and CRTN B was located in a 40 mph zone.

2.2.3 Both CRTN measurement locations were positioned 10m from the nearest edge of the A2446 carriageway.

2.2.4 The measurements were taken during a typical weekday, on the 9th of July 2014.

Ambient Background Noise Measurement Locations

2.2.5 The measurement locations were selected to capture free-field day, evening and night-time data. They were sited away from facades at a minimum of 1.2m from the ground and were away from non-representative noise sources.

Ambient noise measurement durations:

- Day (0700 – 1900): 2 x 15 min
- Eve (1900 – 2300): 1 x 10 min
- Night (2300 – 0700): 2 x 5 min

2.2.6 The ambient measurements were taken over two typical weekdays, between the 9th and 10th of July 2014.

2.3 Instrumentation

2.3.1 A Class 1 Sound Level Meter was calibrated and checked before and after each measurement period, with no change in level noted.

2.3.2 The calibration certificate for the meter used is provided in Annex B, which also shows the serial number of the equipment used.

2.4 Weather Conditions

2.4.1 Weather conditions on all days were conducive to successful monitoring; with wind speeds between 0-3m/s. Roads were dry for the duration of the survey. The average ambient temperature was 22°C during the daytime, falling to 16°C during the night-time periods.

2.5 Traffic Conditions

2.5.1 Traffic conditions on all days were conducive to successful monitoring. However some atypical traffic flows were noted at CRTN location B. A topographical survey was occurring during the measurements, about 200m north along the A2446. The impact was temporary and although it resulted in a small short noise level change the average value was deemed representative.

3 BASELINE RESULTS

3.1 CRTN Noise Results

3.1.1 The measured $L_{A10,\ 1\ hr}$ (dB) levels at 10m for CRTN locations A and B are shown in Table 2.

Table 2 - CRTN Summary Table

Location	Start Time (hh:mm)	Measured $L_{A10, 1hr}$ dB	Calculated $L_{A10, 18hr}$ dB
CRTN A	12:26	68.1	67.2
	13:26	68.0	
	14:26	68.6	
CRTN B	09:17	63.6	62.5
	10:17	62.6	
	11:17	64.4	

3.1.2 Based on the $L_{A10,1hr}$ measurements, the $L_{A10,18hr}$ traffic noise level has been calculated at a distance of 10m from the road using the procedure detailed in CRTN. These values are obtained by taking the arithmetic average of the three one hour measurements and subtracting one dB. The results, rounded to the nearest integer value are presented in Table 3.

Table 3 - Calculated $L_{A10, 18hr}$ dB levels

Location	Calculated $L_{A10, 18hr}$ dB
CRTN A	67
CRTN B	63

3.1.3 The dominant noise source at each location was road traffic noise. Full details are provided in the noise monitoring forms in Annex C.

3.2 Ambient Background Noise Results

3.2.1 The lowest L_{Aeq} values for the short term sample locations, for the periods relevant to the BS5228 ABC significance criteria, are presented in Table 4.

Table 4 - L_{Aeq} Background Levels Summary

	Location	Lowest L_{Aeq} dB
Day (0700-1900)	Short Term 1	55
	Short Term 2	52
	Short Term 3	47
	Short Term 4	62
Evening (1900-2300)	Short Term 1	62
	Short Term 2	41
	Short Term 3	51
	Short Term 4	49
Night (2300-0700)	Short Term 1	38
	Short Term 2	29
	Short Term 3	26
	Short Term 4	44

4 REFERENCES

1. Calculation of Road Traffic Noise' (CRTN) – 1988 Department of Transport, HMSO

2. BS 5228-1:2009+A1:2014 "Code of practice for noise and vibration control on construction and open sites

3. BS 7445-1: 2003 "Description and Measurement of Environmental Noise: Guide to quantities and procedures", BSI

4. BS 7445-3: 1991 "Description and Measurement of Environmental Noise: Guide to application to noise limits ", BSI

5. IEC 61672:2003 "Electroacoustics - sound level meters", BSI

ANNEX A

GLOSSARY OF ACOUSTIC TERMINOLOGY

Decibel (dB)	The decibel scale is used in relation to sound because it is a logarithmic rather than a linear scale. The decibel scale compares the level of a sound relative to another. The human ear can detect a wide range of sound pressures, typically between $2x10^{-5}$ and 200 Pa, so the logarithmic scale is used to quantify these levels using a more manageable range of values.
Sound Pressure Level (SPL)	The Sound Pressure Level has units of decibels, and compares the level of a sound to the smallest sound pressure generally perceptible by the human ear, or the reference pressure. It is defined as follows: $SPL\ (dB) = 20\ Log_{10}(P/P_{ref})$ where P = Sound Pressure (in Pa), P_{ref} = Reference Pressure $2x10^{-5}$ Pa An SPL of 0dB suggests the Sound Pressure is equal to the reference pressure. This is known as the *threshold of hearing*. An SPL of 140dB represents the *threshold of pain*.
A-Weighting	The human ear can detect a wide range of frequencies, from 20Hz to 20kHz, but it is more sensitive to some frequencies than others. Generally, the ear is most sensitive to frequencies in the range 1 to 4 kHz. The A-weighting is a filter that can be applied to measured results at varying frequencies, to mimic the frequency response of the human ear, and therefore better represent the likely perceived loudness of the sound. SPL readings with the A-weighting applied are represented in dB(A).
L_{10} or L_{A10} and other percentile measures	This represents the SPL which is exceeded 10% of the time, expressed in dB or dB(A). L_{A10} is used to quantify road noise levels. Other percentiles exist and are used for various types of noise assessment. These include L_{01}, L_{50}, L_{90}, L_{99}.
Noise	A noise can be described as an unwanted sound. Noise can cause nuisance.
Noise Sensitive Receptors (NSR's)	Any identified receptor likely to be affected by noise. These are generally human receptors, which may include residential dwellings, work places, schools, hospitals, and recreational spaces.
RTN	Road Traffic Noise

ANNEX B

CALIBRATION CERTIFICATES

CERTIFICATE OF CALIBRATION

Date of Issue: 18 June 2014 **Certificate Number: TCRT14/1201**

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Approved Signatory

M. Breslin [ ] K. Mistry [✓]

Customer	Parsons Brinckerhoff Ltd Amber Court William Armstrong Drive Newcastle Business Park Newcastle upon Tyne NE4 7YQ
Order No.	83672
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification

Manufacturer	*Instrument*	*Type*	*Serial No. / Version*
Rion	Sound Level Meter	NA-28	00380778
Rion	Firmware		1.8
Rion	Pre Amplifier	NH-23	70703
Rion	Microphone	UC-59	00940
Rion	Calibrator	NC-74	35173440
	Calibrator adaptor type if applicable		NC-74-002

Performance Class	1		
Test Procedure	TP 2.SLM 61672-3 TPS-49		
	Procedures from IEC 61672-3:2006 were used to perform the periodic tests.		
Type Approved to IEC 61672-1:2002	Yes	Approval Number	21.21/07.01
	If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003		
Date Received	13 June 2014	ANV Job No.	TRAC14/06106
Date Calibrated	18 June 2014		

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	19 June 2012	TCRT12/1069	ANV Measurement Systems

ANNEX C

NOISE MONITORING FORMS

Noise Monitoring Form

PARSONS BRINCKERHOFF

Project:	Five Mile Lane	**Job Number:**	3512646D-HHC
Location:	CRTN A		

Equipment:	NA-28	**Engineer:**	James Wright
Pre-Calibration Level:	94.0 dB	**General Weather Description:**	Dry / Calm
Post-Calibration Level:	94.0 dB		

Measurement Period			Weather			Statistical Noise Levels / dB(A)					Description of Audible Noise
Date	Start Time	Elapsed Minutes	Wind Speed (m/s)	Wind Direction (from)	Temperature (°C)	L_{eq}	L_{max}	L_{min}	L_{10}	L_{90}	
09/07/2014	12:26	60	2-3	W	22	64.1	83.0	35.1	68.1	48.2	Dominated by road traffic noise. Flows were nottably higher than CRTN B, HGVs present and speeds increased.
09/07/2014	13:26	60	2-3	W	22	64.0	80.2	41.0	68.0	59.4	
09/07/2014	14:26	60	2-3	W	22	64.7	85.8	40.2	68.6	51.8	

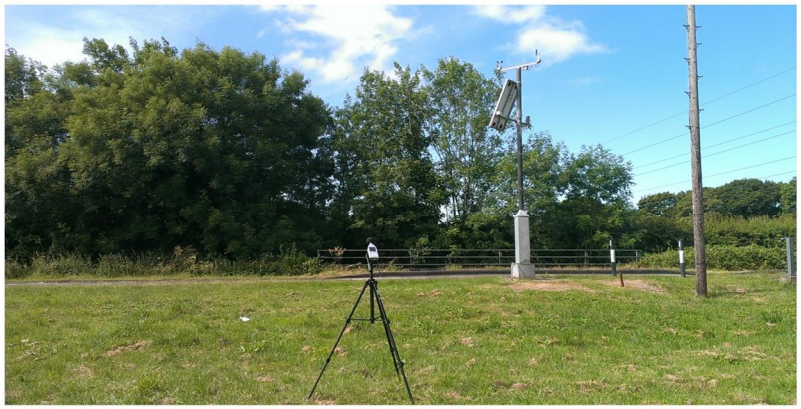
Noise Monitoring Form

PARSONS BRINCKERHOFF

Project:	Five Mile Lane	**Job Number:**	3512646D-HHC
Location:	CRTN B		

Equipment:	NA-28	**Engineer:**	James Wright
Pre-Calibration Level:	94.0 dB	**General Weather Description:**	Dry / Calm
Post-Calibration Level:	94.0 dB		

Measurement Period			Weather			Statistical Noise Levels / dB(A)					Description of Audible Noise
Date	Start Time	Elapsed Minutes	Wind Speed (m/s)	Wind Direction (from)	Temperature (°C)	L_{eq}	L_{max}	L_{min}	L_{10}	L_{90}	
09/07/2014	09:17	60	1-3	W	22	59.7	82.0	38.1	63.6	42.3	Dominated by road traffic noise. Flows were not notably high, HGVs present.
09/07/2014	10:17	60	1-3	W	22	58.8	81.0	36.6	62.6	43.0	
09/07/2014	11:17	60	1-3	W	22	60.4	80.2	37.7	64.4	45.3	



Noise Monitoring Form

PARSONS BRINCKERHOFF

Project:	Five Mile Lane	**Job Number:**	3512646D-HHC
Location:	ST1		

Equipment:	NA-28	**Engineer:**	James Wright
Pre-Calibration Level:	94.0 dB	**General Weather Description:**	Dry / Calm
Post-Calibration Level:	94.0 dB		

Measurement Period			Weather			Statistical Noise Levels / dB(A)					
Date	**Start Time**	**Elapsed Minutes**	**Wind Speed (m/s)**	**Wind Direction (from)**	**Temperature (°C)**	**L_{eq}**	**L_{max}**	**L_{min}**	**L_{10}**	**L_{90}**	**Description of Audible Noise**
09/07/2014	19:12	10	2-3	W	20	61.5	77.7	37.7	66.1	42.0	Road Traffic Noise from A2446
10/07/2014	01:54	5	1	W	18	39.8	56.2	24.0	41.9	26.9	Distant Road Traffic Noise (not A2446)
10/07/2014	02:52	5	1	W	18	38.1	54.0	25.0	39.8	27.3	
10/07/2014	12:36	15	2	W	22	55.0	70.4	43.5	57.9	50.0	Road Traffic Noise from A2446 and aircraft overhead
10/07/2014	14:04	15	2	W	22	59.2	88.0	46.5	58.5	50.8	

Noise Monitoring Form

PARSONS BRINCKERHOFF

Project:	Five Mile Lane	**Job Number:**	3512646D-HHC
Location:	ST2		

Equipment:	NA-28	**Engineer:**	James Wright
Pre-Calibration Level:	94.0 dB	**General Weather Description:**	Dry / Calm
Post-Calibration Level:	94.0 dB		

Measurement Period			Weather			Statistical Noise Levels / dB(A)					
Date	**Start Time**	**Elapsed Minutes**	**Wind Speed (m/s)**	**Wind Direction (from)**	**Temperature (°C)**	**L_{eq}**	**L_{max}**	**L_{min}**	**L_{10}**	**L_{90}**	**Description of Audible Noise**
09/07/2014	19:27	10	2-3	W	20	41.1	62.3	31.4	43.3	34.5	Road Traffic Noise (A2446 and local)
10/07/2014	02:03	5	1	W	18	38.5	71.4	21.1	33.0	23.0	Distant Road Traffic Noise
10/07/2014	03:01	5	1	W	18	29.0	51.5	22.1	31.8	23.5	
10/07/2014	12:57	15	2	W	22	52.0	77.1	32.8	51.2	35.9	Road Traffic Noise (A2446 and local) and aircraft overhead
10/07/2014	14:25	15	2	W	22	51.7	73.6	33.9	49.7	37.2	

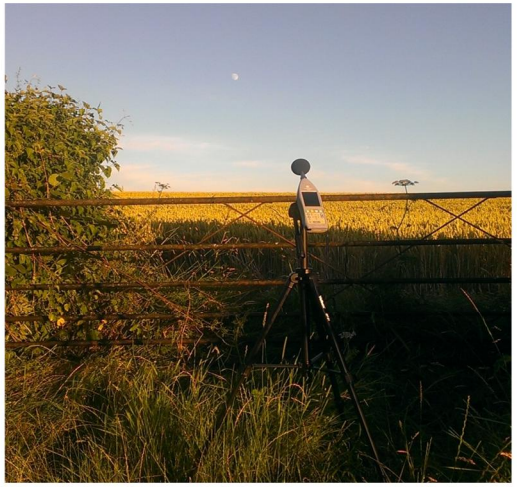
Noise Monitoring Form

PARSONS BRINCKERHOFF

Project:	Five Mile Lane	**Job Number:**	3512646D-HHC
Location:	ST3		

Equipment:	NA-28	**Engineer:**	James Wright
Pre-Calibration Level:	94.0 dB	**General Weather Description:**	Dry / Calm
Post-Calibration Level:	94.0 dB		

Measurement Period			Weather			Statistical Noise Levels / dB(A)					
Date	**Start Time**	**Elapsed Minutes**	**Wind Speed (m/s)**	**Wind Direction (from)**	**Temperature (°C)**	**L_{eq}**	**L_{max}**	**L_{min}**	**L_{10}**	**L_{90}**	**Description of Audible Noise**
09/07/2014	19:46	10	2-3	W	20	50.7	73.7	27.8	44.7	30.6	Road Traffic Noise (A2446 and local)
10/07/2014	02:14	5	1	W	18	25.9	38.3	18.3	30.4	19.5	Distant Road Traffic Noise
10/07/2014	03:11	5	1	W	18	26.9	52.2	20.4	28.5	22.2	
10/07/2014	13:22	15	2	W	22	64.3	95.3	34.6	48.8	38.0	Road Traffic Noise (A2446 and local) and aircraft overhead
10/07/2014	14:44	15	2	W	22	47.2	68.6	33.9	44.4	36.6	



Noise Monitoring Form

PARSONS BRINCKERHOFF

Project:	Five Mile Lane	**Job Number:**	3512646D-HHC
Location:	ST4		

Equipment:	NA-28	**Engineer:**	James Wright
Pre-Calibration Level:	94.0 dB	**General Weather Description:**	Dry / Calm
Post-Calibration Level:	94.0 dB		

Measurement Period			Weather			Statistical Noise Levels / dB(A)					Description of Audible Noise
Date	Start Time	Elapsed Minutes	Wind Speed (m/s)	Wind Direction (from)	Temperature (°C)	L_{eq}	L_{max}	L_{min}	L_{10}	L_{90}	
09/07/2014	20:03	10	2-3	W	20	49.3	60.7	41.9	51.9	45.1	Road Traffic Noise from Waycock Junction
10/07/2014	02:30	5	1	W	18	47.6	60.6	27.6	51.1	36.5	Road Traffic Noise from Waycock Junction
10/07/2014	03:22	5	1	W	18	43.7	56.2	31.8	47.9	35.5	
10/07/2014	13:40	15	2	W	22	61.6	78.7	37.6	65.7	43.9	Road Traffic Noise from Waycock Junction and petrol station activities
10/07/2014	15:04	15	2	W	22	63.3	76.9	39.4	67.7	44.9