

Meadow High School Hillingdon

Environmental Noise Survey and Outline BB93 Strategy Report

23714/ENS1

28 November 2016

For:
Mace Limited
155 Moorgate
London
EC2M 6XB



Hann Tucker Associates
Consultants in Acoustics Noise & Vibration

Head Office: Duke House, 1-2 Duke Street, Woking, Surrey, GU21 5BA (t) +44 (0) 1483 770 595
Manchester Office: First Floor, 346 Deansgate, Manchester, M3 4LY (t) +44 (0) 161 832 7041
(w) hanntucker.co.uk (e) enquiries@hanntucker.co.uk



Environmental Noise Survey and Outline BB93 Strategy Report 23714/ENS1

Document Control

Rev	Date	Comment	Prepared by	Authorised by
0	28/11/2016	-	Ryan Fernandez	
			Ryan Fernandez	Andrew Fermer Director BSc(Hons), MIOA



Environmental Noise Survey and Outline BB93 Strategy Report 23714/ENS1

Contents	Page
1.0 Introduction	1
2.0 Objectives	1
3.0 Site Description	2
4.0 Acoustic Terminology	3
5.0 Methodology	3
6.0 Results	7
7.0 Discussion Of Noise Climate	8
8.0 Plant Noise Emission Criteria	9
9.0 BB93: Internal Ambient Noise Level (IANL)	10
10.0 Conclusions	17

Attachments

Appendix A – Acoustic Terminology



1.0 Introduction

Hann Tucker Associates have been appointed to undertake both, manned and unmanned noise monitoring at Meadow High School, Hillingdon. In order to identify existing environmental noise levels around the site.

Existing background noise levels were measured and will be used to determine noise emission criteria for replacement of existing plant machinery in agreement with the planning requirements of the Local Authority.

This report presents the methodology and findings of our noise survey and outline BB93 strategy assessment.

2.0 Objectives

To inspect the site to familiarise ourselves with its layout and surroundings in order to identify suitable accessible locations for environmental noise measurements.

To establish by means of a detailed 24 hour survey the existing L_{A10} , L_{A90} , L_{Aeq} and L_{Amax} environmental road, rail and air traffic noise levels at up to two (2) “secure” and accessible on-site positions, using fully computerised unmanned monitoring equipment.

To undertake supplementary attended measurements.

To present the above sets of environmental noise data in a combined report, with recommendations made for daytime and night-time plant noise emission limits (in line with BS4142 2014), following liaison with the Local Authority. The survey will also capture incident traffic noise levels suitable to be used in all subsequent analysis to establish sound performance specifications for the external building fabric elements (in line with BB93).

Based upon interpretation of the results of the noise survey, the internal noise criteria of BB93 and external plant criteria of BS4142 the report will include guidance on the likely impact the ambient noise levels will have on the architectural/engineering design.



3.0 Site Description

3.1 Location

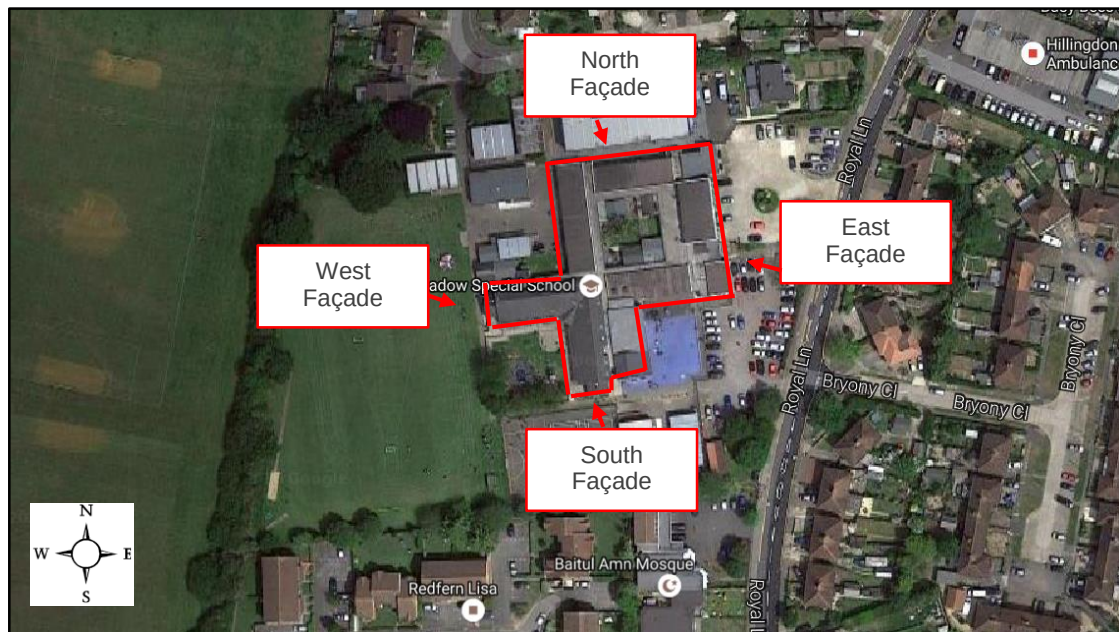
The site is located at Meadow High School, Hillingdon and falls within the London Borough of Hillingdon Council's jurisdiction. See Location Map below.



Location Map (Map Data © 2016 Google)

3.2 Description

The Site, Meadow High School is bound to Royal Lane to its east. Benson Close is to the north and Baitul Amn Mosque is located to the south of the school. The building to be demolished and rebuilt and the building to be refurbished are of a Timber and brick construction with timber cladding design. The dominant noise source were the pupils in school and the traffic from the surrounding road network.



Site Plan (Imagery©2016 Bluesky, DigitalGlobe, Getmapping plc, Infoterra Ltd & Bluesky, The GeoInformation Group, Map data ©2016 Google)

4.0 Acoustic Terminology

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.

5.0 Methodology

The survey was undertaken by Ryan Fernandez.

5.1 Unmanned Survey

5.1.1 Procedure

Fully automated environmental noise monitoring was undertaken from approximately 14:15 hours on Monday 14 November to 14:15 hours on Tuesday 15 November.

Due to the nature of the survey, i.e. unmanned, it is not possible to accurately comment on the weather conditions throughout the entire survey period. However at the beginning and end of the survey period the wind conditions were calm. The sky was generally clear. We understand that generally throughout the survey period the weather conditions were similar to this and these conditions are considered suitable for obtaining representative measurement results.



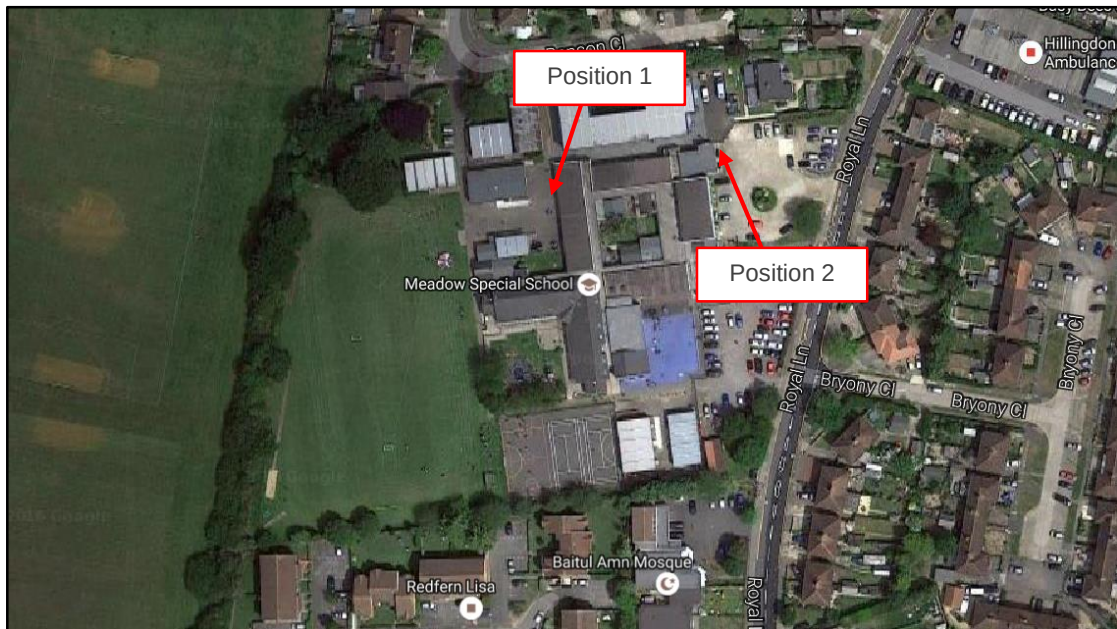
Measurements were taken continuously of the A-weighted (dBA) L_{90} , L_{eq} and L_{max} sound pressure levels over 15 minute periods.

5.1.2 Measurement Positions

The noise level measurements were undertaken at 2 positions around the development site. The measurement positions are described in the table below.

Position No	Description
1	Attached to a drainpipe in the playground at a height of approximately 2 meters.
2	Attached to a fence separating the school from the carpark, at a height of approximately 2 meters.

The Measurement positions are shown on the plan below.



Plan Showing Unmanned Measurement Positions (Imagery©2016 Bluesky, DigitalGlobe, Getmapping plc, Infoterra Ltd & Bluesky, Map data ©2016 Google)



5.1.3 Instrumentation

The instrumentation used during the survey is presented in the table below:

Description	Manufacturer	Type	Serial Number	Calibration
Position 1 Type 1 Data Logging Sound Level Meter	Larson Davis	824	3802	HT calibration on 11/07/2016
Position 1 Type 1 ½" Condenser Microphone	PCB	377B02	107040	HT calibration on 11/07/2016
Position 2 Type 1 Data Logging Sound Level Meter	Larson Davis	824	3699	HT calibration on 12/04/2016
Position 2 Type 1 ½" Condenser Microphone	Larson Davis	2541	104946	HT calibration on 12/04/2016
Type 1 Calibrator	Larson Davis	CAL200	3082	LD calibration on 09/06/2016

Each sound level meter, including the extension cable, was calibrated prior to and on completion of the surveys. No significant changes were found to have occurred (no more than 0.1 dB).

Each sound level meter was located in an environmental case with the microphone connected to the sound level meter via an extension cable. Each microphone was fitted with a Larson Davis windshield.

5.2 Manned Survey

5.2.1 Procedure

Fully manned environmental noise monitoring was undertaken between approximately 14:15 hours and 14:30 hours on Monday 14 November, 14:30 hours and 14:45 hours on Monday 14 November.

During the survey period there was a light wind blowing in a north-westerly direction. The sky was generally clear. There was no rainfall between approximately 13:45 hours and 15:00 hours on Monday 14 November during the survey. Road surfaces were dry throughout the majority of the survey period.

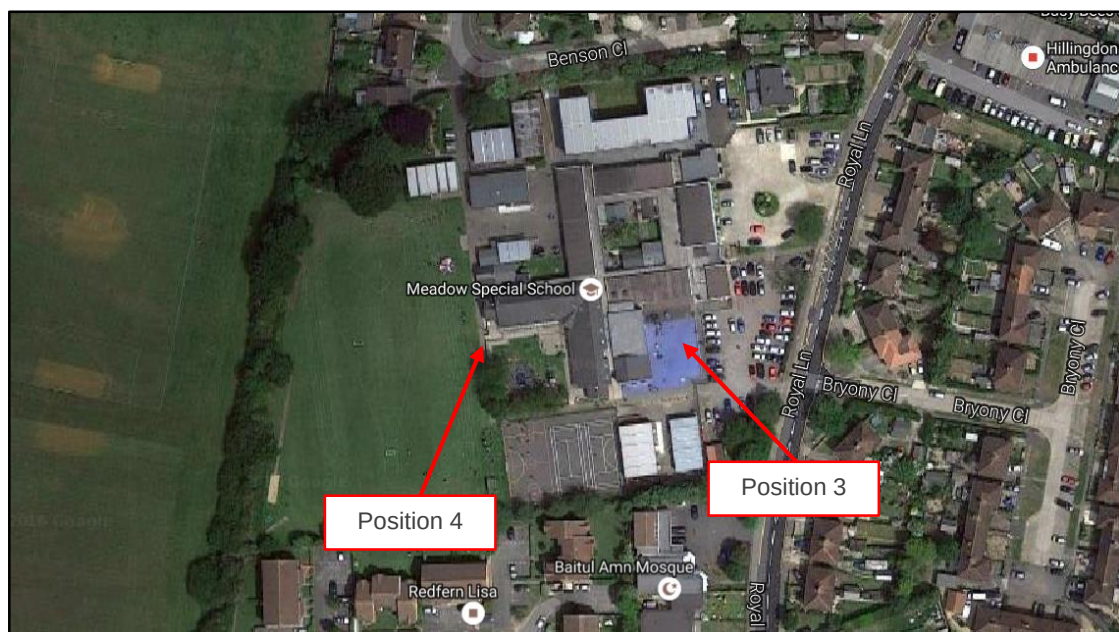


Measurements were taken of the A-weighted (dBA) L_{90} , L_{eq} and L_{max} sound pressure levels over periods of not less than 15 minutes in each hour. Atypical noises were excluded as far as reasonably possible. The noise levels measured are therefore assumed to be representative of the noise climate during the hour in which the measurements were taken.

In addition, at each position typical L_{eq} octave band spectra (from 63Hz to 8kHz) were taken for daytime period in order to gain a more detailed description of the prevailing noise climate.

5.2.2 Measurement Positions

The noise level measurements were undertaken at position 3 and position 4. The measurement positions were at ground level by the entrance to the school and on the field behind the playground. As shown below.



Plan Showing Manned Measurement Positions (Imagery©2016 Bluesky, DigitalGlobe, Getmapping plc, Infoterra Ltd & Bluesky, Map data ©2016 Google)

5.2.3 Instrumentation

The instrumentation used during the manned survey is presented in the table below:

Description	Manufacturer	Type	Serial Number	Calibration
Type 1 Precision Sound Level Meter	Brüel and Kjær	2250	3007292	27/11/2015
Type 1 Calibrator	Larson Davis	CAL200	3082	LD calibration on 09/06/2016



The sound level meter, was calibrated prior to and on completion of the surveys. No significant changes was found to have occurred (no more than 0.1 dB).

6.0 Results

6.1 Results of Unmanned survey

6.1.1 L_{A90} Noise Levels

The results have been plotted on Time History Graphs 23714/TH1.1 to 23714/TH2.1 enclosed presenting the 15 minute A-weighted (dBA) L_{90} , L_{eq} and L_{max} levels at each measurement position throughout the duration of the survey.

The following table presents the lowest measured L_{A90} background noise levels during the survey:

Position	Lowest Measured L_{A90} Background Noise Level (dB re 2×10^{-5} Pa)		
	Daytime (07:00 – 19:00) Hours	Evening (19:00 – 23:00) Hours	Night-Time (23:00 – 07:00) Hours
1	45	47	43
2	41	41	37

The following table presents the modal average of the measured L_{A90} background noise levels during the survey:

Position	Modal Average Measured L_{A90} Background Noise Level (dB re 2×10^{-5} Pa)		
	Daytime (07:00 – 19:00) Hours	Evening (19:00 – 23:00) Hours	Night-Time (23:00 – 07:00) Hours
1	50	50	46
2	46	44	40

6.1.2 L_{eq} Noise Levels

In order to compare the results of our survey with suitable guidelines it is necessary to convert the measured $L_{Aeq(15 \text{ minute})}$ noise levels into single figure daytime $L_{Aeq(12\text{-hour})}$ (07:00-19:00 hours), evening $L_{Aeq(4\text{-hour})}$ (19:00-23:00 hours), and night-time $L_{Aeq(8\text{-hour})}$ (23:00-07:00 hours) levels.

The daytime $L_{Aeq(12\text{-hour})}$, evening $L_{Aeq(4\text{-hour})}$ and night-time $L_{Aeq(8\text{-hour})}$ noise levels for each position are presented in the tables below.

Position	Daytime $L_{Aeq(12\text{-hour})}$	Daytime $L_{Aeq(4\text{-hour})}$	Night-Time $L_{Aeq(8\text{-hour})}$
1	61	51	50
2	56	49	48



6.1.3 Representative Noise Levels

The noise levels shown are increased drastically when the pupils are on break time. The following table presents our interpretation of the noise levels in the absence of noise from the school occupants for use in subsequent assessments.

Position	Daytime (07:00 – 19:00) Hours L_{Aeq}	Evening Hours (19:00 – 23:00) L_{Aeq}	Night-Time (23:00 – 07:00) Hours L_{Aeq}
1	55	51	50
2	54	49	48

6.2 Results of Manned survey

The results have been plotted on Time History Graphs 23714/G1 to 23714/G2 enclosed presenting the 15 minute A-weighted (dBA) L_{90} , L_{eq} and L_{max} levels at the measurement position throughout the duration of the survey.

The measured daytime data is presented in the table below.

Position	$L_{Aeq,15min}$	$L_{1,15min}$
3	49	56
4	51	56

7.0 Discussion Of Noise Climate

7.1 Unmanned Survey

Due to the nature of the survey, i.e. unmanned, it is not possible to accurately describe the dominant noise sources, or specific noise events throughout the entire survey period. However at the beginning and end of the survey period the dominant noise sources were noted to be the school pupils moving around and talking and traffic from the surrounding road network.

7.2 Manned Survey

During the survey period the dominant noise sources were noted to be the noise from pupils in class and road traffic from Noahs Arc Road at Position 3 or road traffic from Astor Avenue at Positions 4 and 5.



8.0 Plant Noise Emission Criteria

The Site lies within the London Borough of Hillingdon Council's jurisdiction. The Borough of Hillingdon's Council have produced a supplementary planning document for noise which states:

"British Standard 4142:1997 gives advice on measuring and assessing the noise from machinery or plant, and is relevant if surrounding residential areas might be affected. Developments with a BS4142 assessment of marginal significance or above would not ordinarily be permitted. Consequently, the development should be controlled such that the rating level of the noise from the proposed development determined according to BS4142 is at least 5 dB below the background noise level LA_{90,T}. Ideally, the assessment of noise should give a positive indication that complaints are unlikely."

On the basis of the above, and the results of the environmental noise survey, we propose that the following future plant noise emission criteria to be achieved at 1m from the nearest noise sensitive residential window.

Plant Noise Emission Criteria (dB re 2x10 ⁻⁵ Pa)		
Daytime (07:00 – 23:00 hours)	Evening (07:00 – 23:00 hours)	Night-Time (23:00 – 07:00 hours)
36	36	32

It should be noted that the above criteria are subject to final approval by Hillingdon Borough Council.



9.0 BB93: Internal Ambient Noise Level (IANL)

9.1 Upper Limit for Internal Ambient Noise Levels

The table below is extracted from Table 1 of BB93;

Type of Room	Upper Limit for the Indoor Ambient Noise Level $L_{Aeq,30mins}$ dB	
	New Build	Refurbishment
Secondary school: Classroom, general teaching area, seminar room, tutorial room, language laboratory	35	40
Open plan: (See also section 1.8) Teaching area, resource/breakout area	40	45
Secondary music classroom 1, small and large practice/group 1, performance/recital room 1	35	40
Ensemble room 1, recording studio 1	30	35
Control room – for recording 1, control room – not for recording	35	40
Lecture room	35	40
Teaching space intended specifically for students with special hearing and communication needs ²	30	35
SEN calming room	35	35
Study room (individual study, withdrawal, remedial work, teacher preparation)	40	45
Libraries: Quiet study area Resource area	40	45
Science laboratory	40	45
Design and technology: Resistant materials, CAD/CAM area, electronics/control, textiles, food, graphics, design/resource area, ICT room, art	40	45
Drama studio, assembly hall, multi-purpose hall (drama, PE, audio/visual presentations, assembly, occasional music)	35	40
Atrium, circulation space not intended for teaching and learning	45	50
Sports hall, dance studio, gymnasium/activity studio	40	45
Swimming pool	50	55
Meeting room, interviewing/counselling room, video conference room	40	45
Dining room	45	50
Administration and ancillary spaces:		
Kitchen	50	55
Office, medical room, staff room	40	45
Corridor, stairwell, coats and Locker area	45	55
Changing area	50	55
Toilet	50	55

In order to protect students from regular discrete noise events, e.g., aircraft or trains, indoor ambient noise levels should not exceed 60 dB $LA_{1, 30mins}$. This is achieved by default for spaces with IANLs up to 40 dB $L_{Aeq, 30min}$, but requires assessment in spaces with higher IANL limits, e.g., 45 and 50 dB.



9.2 Building Services and Indoor Ambient Noise Levels

The table below is extracted from Table 2 of BB93;

Condition	Condition	Noise Level Limit
Normal – ventilation for normal teaching and learning activities	Mechanical ¹	Table 1 value
	Natural ²	Table 1 value + 5dB ⁴
	Hybrid ²	Mechanical system noise: Table 1 value
		Total noise level: Table 1 value + 5dB ⁴
Summertime ⁵ – ventilation under local control of teacher to prevent overheating – allowable during the hottest 200hrs of the year	Mechanical	Table 1 value + 5 dB ⁴
	Natural or Hybrid	≤ 55 dB
Intermittent boost ⁶ – ventilation under local control of teacher for dilution of fumes during Practical activities as in practical spaces for science, art, food technology and design and technology	Mechanical	Table 1 value + 5 dB ⁴
	Natural	≤ 55 dB
Process ³ – extract can be automatic ventilation for safety and/or under local control of teacher	Mechanical and/or natural	See IoA/ANC guide for operational noise levels

Notes

¹ The normal condition for a ventilation system with purely mechanical air supply is defined as when the system is operating to limit the daily average carbon dioxide concentration to no more than 1,000ppm with the maximum concentration not exceeding 1,500ppm for more than 20 consecutive minutes on any day during normal school operating hours. This would normally equate to a minimum ventilation rate of approximately 8l/s per person. Mechanical ventilation in this context refers to systems (or parts of systems) that use mechanical fans to mix or drive the air including those in mechanical, hybrid, mixed mode and natural ventilation systems and in fan convactor heaters.

² The normal condition for a ventilation system in natural or hybrid mode is defined as when the system is operating to limit the daily average carbon dioxide concentration to no more than 1,500ppm with the maximum concentration not exceeding 2,000ppm for more than 20 consecutive minutes on any day. This would normally equate to a minimum ventilation rate of approximately 5l/s per person. For hybrid systems, the mechanical noise excluding external noise break in, should meet the IANL figure in table 1. The mid-season design condition can be used in simple ventilation calculations and is defined as an outside temperature of 11 °C and an internal air temperature of 20 °C with no external wind effect. Where external ambient free field noise levels at the facade expressed as the $L_{Aeq,30mins}$, do not exceed the IANL figures given in Table 1 by more than 16 dB for single sided ventilated spaces and 20 dB for cross ventilated or roof ventilated spaces, the criteria for natural ventilation can usually be achieved. However, the ventilation



strategy still requires appropriate design of façade openings, height differences between low and high level openings, corridor transfer vents/stacks, etc.', to limit the required façade open areas appropriately. Where there is a hybrid system, any mechanical system components should meet the IANL limits from table 1. The total noise level including external noise ingress may exceed the IANL limit from table 1 by up to 5 dB.

³ Process extract includes the operational noise from local exhaust ventilation systems and boost ventilation under the local control of the teacher as required for fume and dust extract in design and technology, odour and steam from cookers in food technology, fume cupboard extract and similar process extract systems. See guidance on specification and measurement of operational noise levels in 'Acoustics of Schools: a design guide' Ref.1. For example, for new fume cupboards the maximum noise level should not exceed 50 dB(A), measured at a height of 1,500 mm above the floor and 1,500 mm from the face of the fume cupboard, with the sash set at a height of 200 mm.

⁴ The +5 dB does not apply to teaching and learning spaces where the Table 1 IANL is greater than or equal to 45 dB.

⁵ Natural, mechanical or hybrid ventilation systems may be used to improve thermal comfort in summer at the expense of higher indoor ambient noise levels. The normal ventilation IANL can be exceeded during the hottest 200 hours in peak summertime conditions and the design should show that IANLs, defined in table 3 can be met under these conditions as well as under normal operation. The ventilation must be under the local control of the teacher so that the noise level can be reduced to normal levels when needed. This does not apply to classrooms intended specifically for students with special hearing and communication needs, or to speech therapy rooms.

9.3 Proposed Ventilation Strategy & Achievable IANL

The tables below shows the likelihood of BB93 IANL criteria being met under natural ventilation conditions, for different room types and different facades. This should allow the appropriate façade design approach to be selected. This is based on subtracting 15dB loss (from a partially open window) from the expected external $L_{Aeq\ 30mins}$ façade levels for comparison to the required IANL.

For block being extended we are treating as a new build for the purpose of this assessment. This is so that the indoor ambient noise levels can be estimated for variable locations of where the school may be built. The L_{Aeq} for each façade corresponds to the adapted L_{Aeq} from the closest measurement position. As shown in the table below.



9.3.1 North Façade

Type of Room	New Build
Secondary school: Classroom, general teaching area, seminar room, tutorial room, language laboratory	Suitable for natural ventilation
Open plan: (See also section 1.8) Teaching area, resource/breakout area	Suitable for natural ventilation
Secondary music classroom 1, small and large practice/group 1, performance/recital room 1	Suitable for natural ventilation
Ensemble room 1, recording studio 1	Not suitable for natural ventilation without further attenuation measures. Conventional double glazing with mechanical ventilation or attenuated façade ventilation system likely to be acceptable
Control room – for recording 1, control room – not for recording	Suitable for natural ventilation
Lecture room	Suitable for natural ventilation
Teaching space intended specifically for students with special hearing and communication needs ²	Not suitable for natural ventilation without further attenuation measures. Conventional double glazing with mechanical ventilation or attenuated façade ventilation system likely to be acceptable
SEN calming room	Not suitable for natural ventilation without further attenuation measures. Conventional double glazing with mechanical ventilation or attenuated façade ventilation system likely to be acceptable
Study room (individual study, withdrawal, remedial work, teacher preparation)	Suitable for natural ventilation
Libraries: Quiet study area Resource area	Suitable for natural ventilation
Science laboratory	Suitable for natural ventilation
Design and technology: Resistant materials, CAD/CAM area, electronics/control, textiles, food, graphics, design/resource area, ICT room, art	Suitable for natural ventilation
Drama studio, assembly hall, multi-purpose hall (drama, PE, audio/visual presentations, assembly, occasional music)	Suitable for natural ventilation
Atrium, circulation space not intended for teaching and learning	Suitable for natural ventilation
Sports hall, dance studio, gymnasium/activity studio	Suitable for natural ventilation
Swimming pool	Suitable for natural ventilation
Meeting room, interviewing/counselling room, video conference room	Suitable for natural ventilation
Dining room	Suitable for natural ventilation
Administration and ancillary spaces:	
Kitchen	Suitable for natural ventilation
Office, medical room, staff room	Suitable for natural ventilation
Corridor, stairwell, coats and Locker area	Suitable for natural ventilation
Changing area	Suitable for natural ventilation
Toilet	Suitable for natural ventilation



9.3.2 East Façade

Type of Room	New Build
Secondary school: Classroom, general teaching area, seminar room, tutorial room, language laboratory	Suitable for natural ventilation
Open plan: (See also section 1.8) Teaching area, resource/breakout area	Suitable for natural ventilation
Secondary music classroom 1, small and large practice/group 1, performance/recital room 1	Suitable for natural ventilation
Ensemble room 1, recording studio 1	Not suitable for natural ventilation without further attenuation measures. Conventional double glazing with mechanical ventilation or attenuated façade ventilation system likely to be acceptable.
Control room – for recording 1, control room – not for recording	Suitable for natural ventilation
Lecture room	Suitable for natural ventilation
Teaching space intended specifically for students with special hearing and communication needs ²	Not suitable for natural ventilation without further attenuation measures. Conventional double glazing with mechanical ventilation or attenuated façade ventilation system likely to be acceptable.
SEN calming room	Not suitable for natural ventilation without further attenuation measures. Conventional double glazing with mechanical ventilation or attenuated façade ventilation system likely to be acceptable
Study room (individual study, withdrawal, remedial work, teacher preparation)	Suitable for natural ventilation
Libraries: Quiet study area Resource area	Suitable for natural ventilation
Science laboratory	Suitable for natural ventilation
Design and technology: Resistant materials, CAD/CAM area, electronics/control, textiles, food, graphics, design/resource area, ICT room, art	Suitable for natural ventilation
Drama studio, assembly hall, multi-purpose hall (drama, PE, audio/visual presentations, assembly, occasional music)	Suitable for natural ventilation
Atrium, circulation space not intended for teaching and learning	Suitable for natural ventilation
Sports hall, dance studio, gymnasium/activity studio	Suitable for natural ventilation
Swimming pool	Suitable for natural ventilation
Meeting room, interviewing/counselling room, video conference room	Suitable for natural ventilation
Dining room	Suitable for natural ventilation
Administration and ancillary spaces:	
Kitchen	Suitable for natural ventilation
Office, medical room, staff room	Suitable for natural ventilation
Corridor, stairwell, coats and Locker area	Suitable for natural ventilation
Changing area	Suitable for natural ventilation
Toilet	Suitable for natural ventilation



9.3.3 South Façade

Type of Room	New Build
Secondary school: Classroom, general teaching area, seminar room, tutorial room, language laboratory	Suitable for natural ventilation
Open plan: (See also section 1.8) Teaching area, resource/breakout area	Suitable for natural ventilation
Secondary music classroom 1, small and large practice/group 1, performance/recital room 1	Suitable for natural ventilation
Ensemble room 1, recording studio 1	Suitable for natural ventilation
Control room – for recording 1, control room – not for recording	Suitable for natural ventilation
Lecture room	Suitable for natural ventilation
Teaching space intended specifically for students with special hearing and communication needs ²	Suitable for natural ventilation
SEN calming room	Suitable for natural ventilation
Study room (individual study, withdrawal, remedial work, teacher preparation)	Suitable for natural ventilation
Libraries: Quiet study area Resource area	Suitable for natural ventilation
Science laboratory	Suitable for natural ventilation
Design and technology: Resistant materials, CAD/CAM area, electronics/control, textiles, food, graphics, design/resource area, ICT room, art	Suitable for natural ventilation
Drama studio, assembly hall, multi-purpose hall (drama, PE, audio/visual presentations, assembly, occasional music)	Suitable for natural ventilation
Atrium, circulation space not intended for teaching and learning	Suitable for natural ventilation
Sports hall, dance studio, gymnasium/activity studio	Suitable for natural ventilation
Swimming pool	Suitable for natural ventilation
Meeting room, interviewing/counselling room, video conference room	Suitable for natural ventilation
Dining room	Suitable for natural ventilation
Administration and ancillary spaces:	
Kitchen	Suitable for natural ventilation
Office, medical room, staff room	Suitable for natural ventilation
Corridor, stairwell, coats and Locker area	Suitable for natural ventilation
Changing area	Suitable for natural ventilation
Toilet	Suitable for natural ventilation



9.3.4 West Façade

Type of Room	New Build
Secondary school: Classroom, general teaching area, seminar room, tutorial room, language laboratory	Suitable for natural ventilation
Open plan: (See also section 1.8) Teaching area, resource/breakout area	Suitable for natural ventilation
Secondary music classroom 1, small and large practice/group 1, performance/recital room 1	Suitable for natural ventilation
Ensemble room 1, recording studio 1	Not suitable for natural ventilation without further attenuation measures. Conventional double glazing with mechanical ventilation or attenuated façade ventilation system likely to be acceptable
Control room – for recording 1, control room – not for recording	Suitable for natural ventilation
Lecture room	Suitable for natural ventilation
Teaching space intended specifically for students with special hearing and communication needs2	Not suitable for natural ventilation without further attenuation measures. Conventional double glazing with mechanical ventilation or attenuated façade ventilation system likely to be acceptable
SEN calming room	Not suitable for natural ventilation without further attenuation measures. Conventional double glazing with mechanical ventilation or attenuated façade ventilation system likely to be acceptable
Study room (individual study, withdrawal, remedial work, teacher preparation)	Suitable for natural ventilation
Libraries: Quiet study area Resource area	Suitable for natural ventilation
Science laboratory	Suitable for natural ventilation
Design and technology: Resistant materials, CAD/CAM area, electronics/control, textiles, food, graphics, design/resource area, ICT room, art	Suitable for natural ventilation
Drama studio, assembly hall, multi-purpose hall (drama, PE, audio/visual presentations, assembly, occasional music)	Suitable for natural ventilation
Atrium, circulation space not intended for teaching and learning	Suitable for natural ventilation
Sports hall, dance studio, gymnasium/activity studio	Suitable for natural ventilation
Swimming pool	Suitable for natural ventilation
Meeting room, interviewing/counselling room, video conference room	Suitable for natural ventilation
Dining room	Suitable for natural ventilation
Administration and ancillary spaces:	
Kitchen	Suitable for natural ventilation
Office, medical room, staff room	Suitable for natural ventilation
Corridor, stairwell, coats and Locker area	Suitable for natural ventilation
Changing area	Suitable for natural ventilation
Toilet	Suitable for natural ventilation



It can be seen from the above that for all rooms' natural ventilation should be considered a suitable strategy from an acoustic stand point. Except at north, east and west façades where we would recommend low level attenuation for the following rooms: ensemble rooms, recording studio and teaching space intended specifically for students with special hearing and communication needs and SEN calming rooms.

10.0 Conclusions

A detailed daytime fully manned environmental noise survey has been undertaken in order to establish the currently prevailing street level environmental noise climate around the site.

A detailed 24 hour daytime and night time fully automated environmental noise survey has been undertaken in order to establish the currently prevailing street level environmental noise climate around the site.

Plant noise emission criteria have been recommended based on the results of the noise survey and in conjunction with the Local Authority.

Internal noise levels have been presented in accordance with Table 1 of BB93.

We have assessed room uses on each facade and presented advice in relation to the likely required ventilation strategy.



Appendix A

The acoustic terms used in this report are defined as follows:

dB Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. 30dB + 30dB = 33dB, not 60dB).

dBA The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The _A subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted

It should be noted that levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.

L_{90,T} L₉₀ is the noise level exceeded for 90% of the period *T* (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.

L_{eq,T} L_{eq,T} is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time period, *T*.

L_{max} L_{max} is the maximum sound pressure level recorded over the period stated. L_{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L_{eq} noise level.

L_p Sound Pressure Level (SPL) is the sound pressure relative to a standard reference pressure of 2×10^{-5} Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).

L_w Sound Power Level (SWL) is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually 10^{-12} W).



L_{A1} If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for $n\%$ of the time, hence L_{A1} is the (A-weighted) level exceeded for 1% of the time and as such can be regarded as the 'maximum level'.

D_{nT,w} Weighted Standardised Level Difference (dB).

A single number quality characterising the on-site airborne sound insulation performance of a construction, including transmission of sound via flanking paths (e.g. adjoining floors/walls).

The higher the $D_{nT,w}$ of a construction, the better its airborne sound insulation performance; the higher the $D_{nT,w}$ requirement, the more stringent the criteria.

Since the level of reverberation in a "receive" room affects the difference in sound level across a wall or floor on site, $D_{nT,w}$ and $L'_{nT,w}$ include a correction for the "receive" room reverberation time (allowing comparison of values measured in various conditions).

RT, Reverberation Time (secs).

RT₆₀, The time, in seconds, for a sound to decay by 60dB.

T or T₆₀

T_{mf} Mid-Frequency Reverberation Time (secs).

The arithmetic average of the reverberation time in the 500Hz, 1kHz and 2kHz bands.

Meadow High School

Position 1

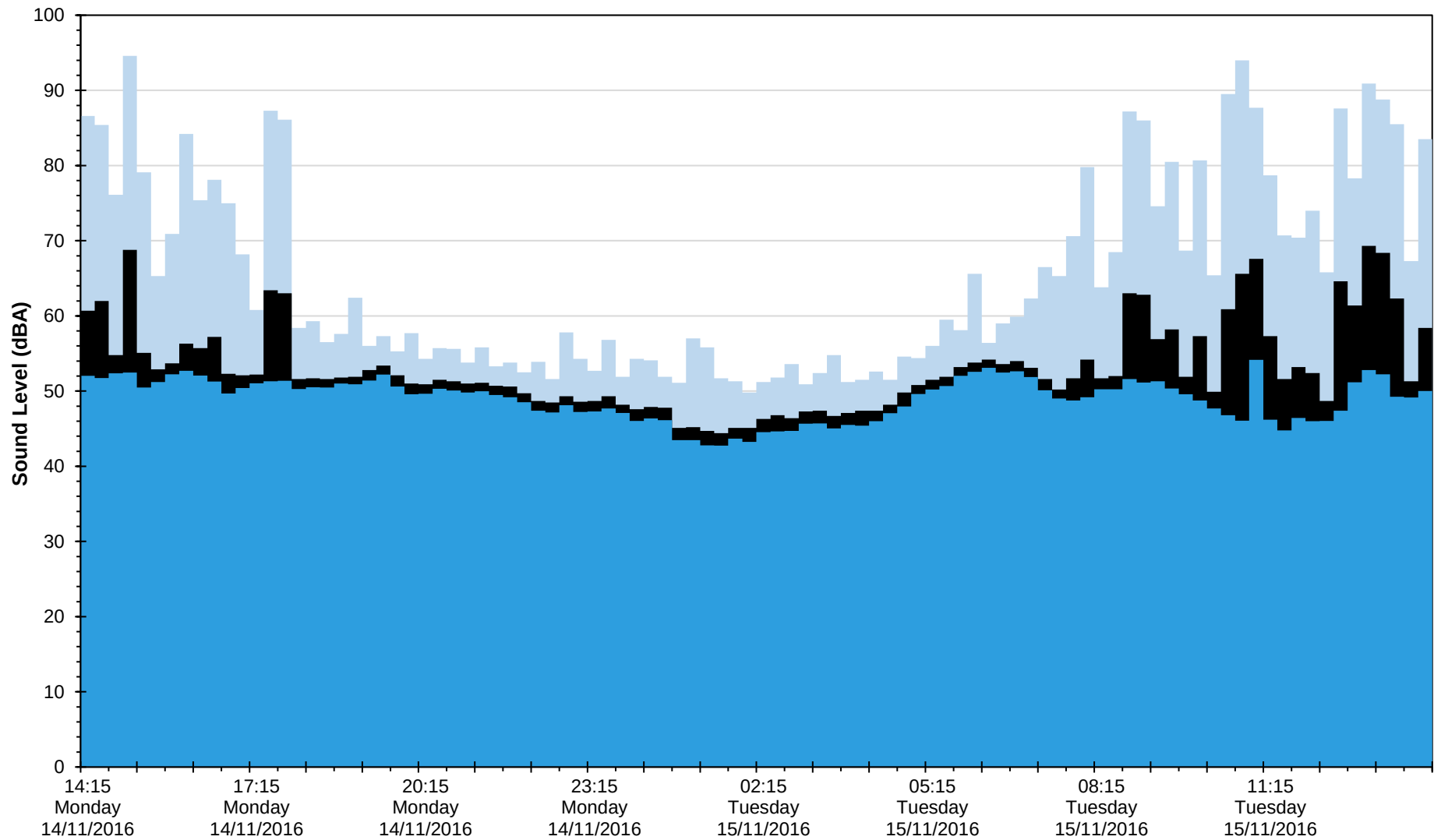
L_{Aeq} , L_{Amax} and L_{A90} Noise Levels

Monday 14 November 2016 to Tuesday 15 November 2016

■ L_{Amax}

■ L_{Aeq}

■ L_{A90}



Date and Time

23714/TH1

Meadow High School

Position 2

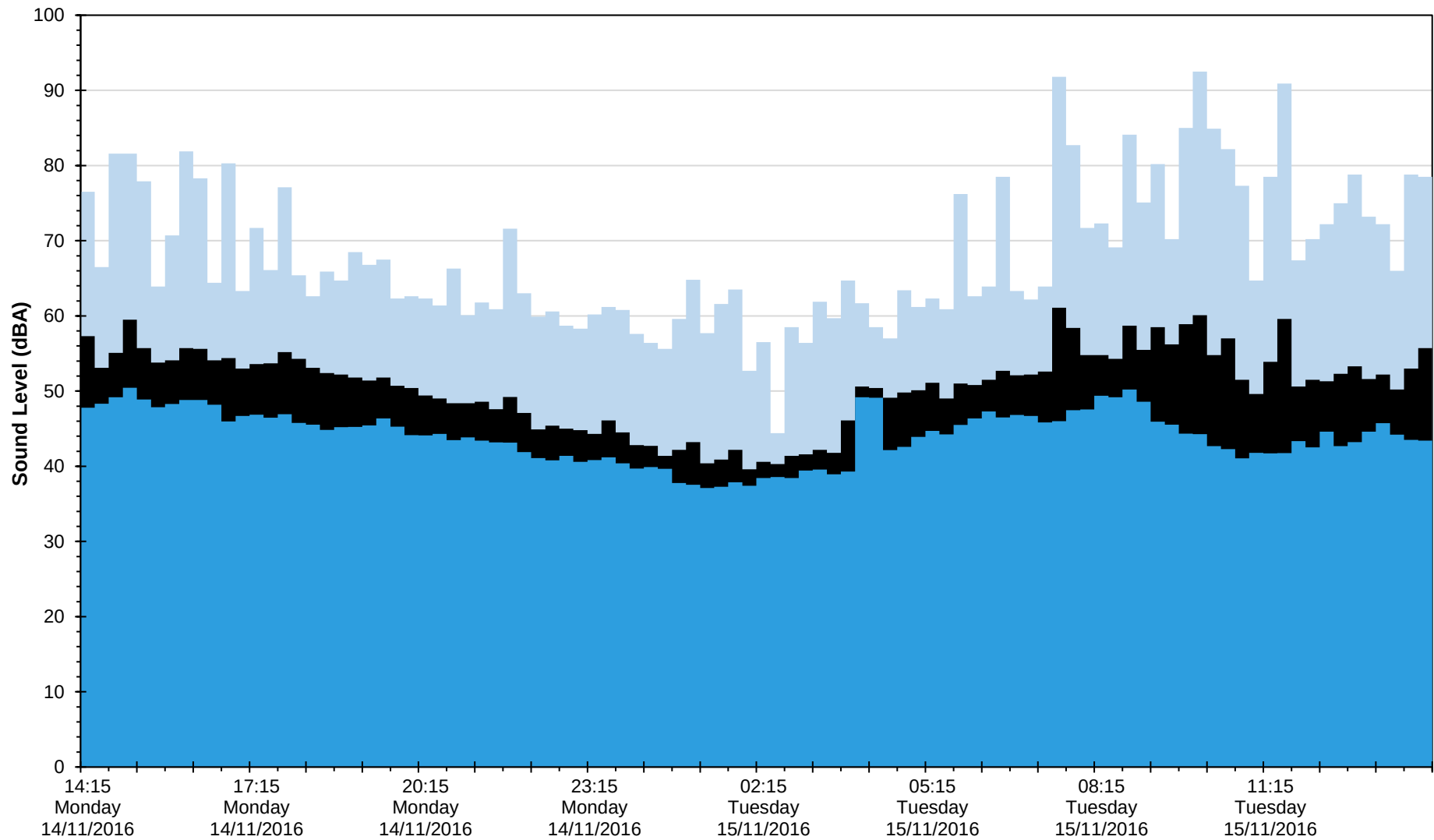
L_{Aeq} , L_{Amax} and L_{A90} Noise Levels

Monday 14 November 2016 to Tuesday 15 November 2016

■ L_{Amax}

■ L_{Aeq}

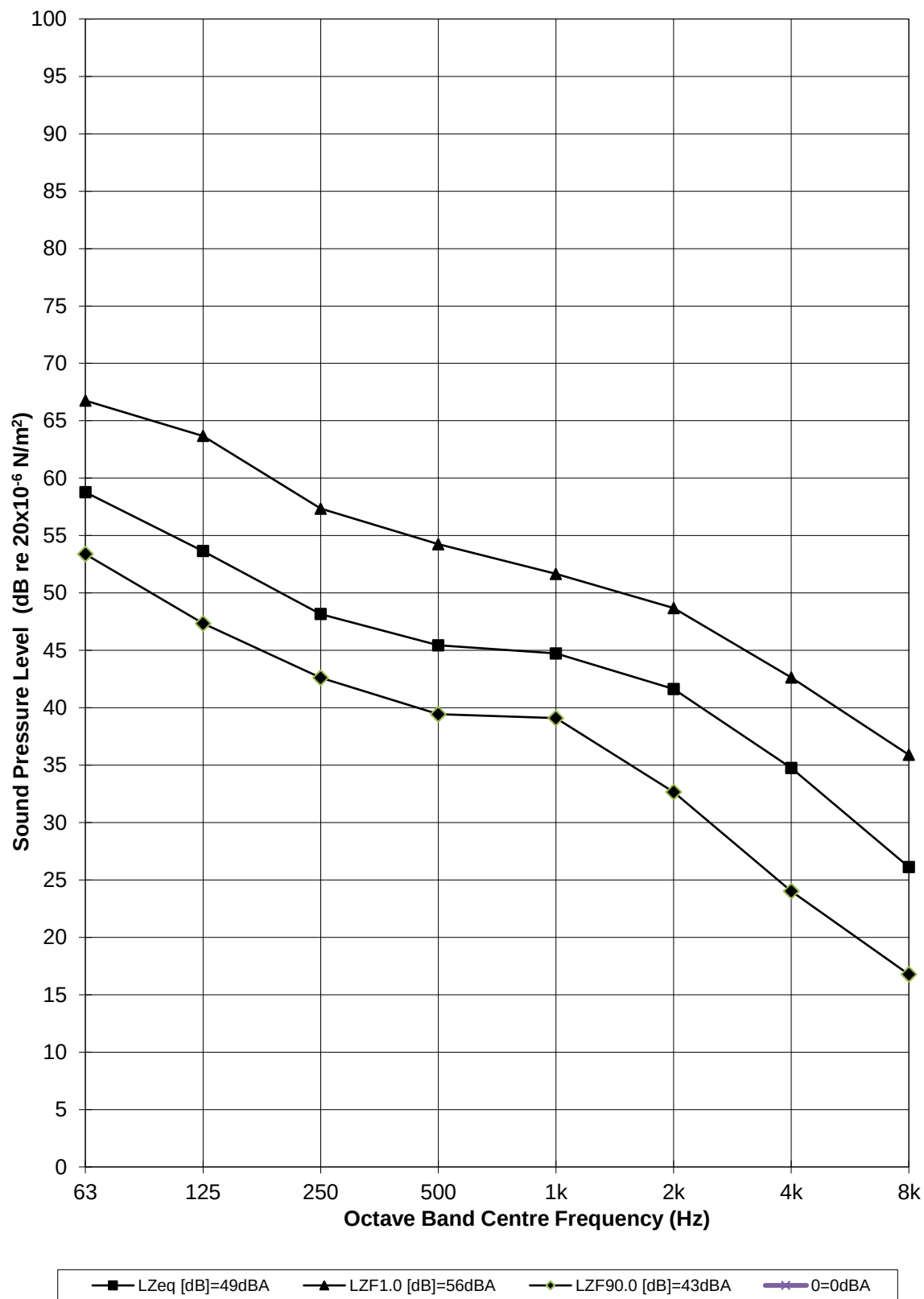
■ L_{A90}



Date and Time

23714/TH2

Meadow High School
Position 3
14:15 14 November 2016



Meadow High School
Position 4
14:30 14 November 2016

