

KR05583

Viveash Close

Noise Impact Assessment...

Standard: British Standard 8233: 2014

Site: Viveash Close

Address: 3 Viveash Close

Hayes

Middlesex

Postcode: UB3 4RY

Customer: General Food Trading Co Ltd

Address: 3 Viveash Close

Hayes

Middlesex

Postcode: UB3 4RY

Issue: V1.6

Date: 13th December 2017

Status: Full Report

KR Associates (UK) Ltd

Quietly confident...



Revisions...

KR05583		Project	Viveash Close		
		Title	Noise Impact Assessment		
		Standard	British Standard 8233: 2014		
Issue	Date	Details of Revision			
v1.5	13/12/2017	Description	Issue of report for submission to Local Authority		
		Roles	Prepared by	Checked by	Issued by
		Signature			
		Name	Miss I. Samphier	Miss N. Truman	Mr. R Scrivener
		Position	Consultant	Project Manager	Technical Director

Disclaimer...

This document is strictly confidential and is designed to meet the requirements of the customer. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party. No Liability is accepted outside the scope of this report in strict accordance with the standard terms and conditions.

KR Associates...

KR Associates (UK) Ltd (Company No. 04813349) registered office at 56 Bassett Green Road, Southampton. SO16 3DX.

London: 0203 77 11 368 Manchester: 0161 30 20 593 Southampton: 02380 55 04 55

Table of Contents...

1	Executive Summary.....	6
1.1	Instruction	6
1.2	Outline of Proposal.....	6
1.3	Scope of Report.....	6
1.4	Vibration.....	6
1.5	Outline of Methodology.....	6
1.6	Executive Summary	7
1.6.1	Summary of Criterion.....	7
1.6.2	Measurements	7
1.6.3	External Façade Levels	7
1.6.4	Mitigation Measures	7
1.7	Conclusions	7
1.7.1	British Standard 8233:2014.....	7
1.7.2	National Planning Policy Framework.....	8
1.7.3	British Standard 7385:1993.....	8
1.7.4	Ventillation	8
2	Site Location.....	9
2.1	Local Area	9
2.2	Existing Site Plan	10
2.3	Proposed Layout Plans	10
3	Background Measurements.....	11
3.1	Measurement Detail.....	11
3.1.1	Location of Measurements.....	11
3.1.2	Measurement Equipment	11
3.1.3	Measurement Period	11
3.1.4	Context of the Site	12
3.2	Weather Conditions.....	13
3.2.1	Temperature and dew Point	13
3.2.2	Barometric Pressure.....	13
3.2.3	Wind Speed and Wind Gust	13
3.2.4	Wind Direction	13
3.3	Measurement Results.....	14
3.3.1	Background Noise Profile	14
3.4	3D Background Noise Maps.....	15
3.4.1	Day Time (07:00 – 23:00).....	15
3.4.2	Night Time (23:00- 07:00).....	16
4	Assessments.....	17
4.1	British Standard 8233:2014.....	17
4.1.1	Calculation Procedure.....	17

4.2	Transmission Loss Data	18
4.2.1	Ventilation (D_{ne}).....	18
4.2.2	Glazing (R_{wi})	18
4.2.3	Walls (R_{ew}).....	18
4.2.4	Ceiling (R_{rr}).....	18
4.3	Day Time (07:00 to 23:00) Internal Noise Levels	19
4.3.1	3D Noise Maps.....	19
4.4	Night Time (23:00 to 07:00) Internal Noise Levels	20
4.4.1	3D Noise Maps.....	20
4.5	L _{Aeq} Assessment	21
4.5.1	British Standard 8233: 2014 Day Time Assessment	21
4.5.2	British Standard 8233: 2014 Night Time Assessment.....	22
4.6	L _{Max} Assessment.....	23
4.6.1	British Standard 8233: 2014 Day Time Assessment	23
4.6.2	British Standard 8233: 2014 Night Time Assessment.....	24
5	Methodology and Criterion.....	25
5.1	British Standard 8233: 2014 (“BS8233”).....	25
5.1.1	Internal Ambient Noise Levels for dwellings.....	25
5.1.2	Maximum Noise Levels	25
5.2	National Planning Policy Framework: 2012(“NPPF”)	26
5.2.1	Scope of Document.....	26
5.2.2	Paragraph 14 -Requirement of Grant Planning Permission	26
5.2.3	Paragraph 123 -Aim of Planning Decisions with respect to Noise.....	26
6	Vibration	27
6.1.1	Displacement Time Trace (Z Axis)	27
6.1.2	Velocity Time Trace (Z Axis).....	27
6.1.3	Acceleration Time Trace (Z Axis).....	27
6.1.4	Frequency Time Trace (Z Axis).....	28
7	Vibration Criterion and Discussions.....	29
7.1	British Standard 7385-2:1993 (“BS7385”).....	29
7.1.1	Scope of Document.....	29
7.1.2	Transient Vibration Guide Values for Cosmetic Damage	29
7.2	British Standard ISO 2631-1:1997 (“BS2631”).....	29
7.2.1	Scope of Document.....	29
7.2.2	Comfort reactions to Vibration Environments.....	29
7.3	British Standard 6472-1:2008 (“BS6472”).....	29
7.3.1	Scope of Document.....	30
7.3.2	Vibration Dose Value Ranges for Adverse Comment	30
7.3.3	Estimated Vibration Dose Value	30
7.4	Assessing vibration - A Technical Guideline: 2006 (“DEC”)	30

7.4.1	Scope of Document.....	30
7.4.2	Acceptable Values for Continuous or Impulsive Vibration	30
7.4.3	Acceptable Vibration Does Values for Intermittent Vibration.....	31
7.4.4	Vibration Criteria Presented in Different Units.....	31
7.5	Assessment Criterion	31
8	Conclusion	32
8.1	British Standard 8233:2014.....	32
8.1.1	Summary of Criterion.....	32
8.1.2	Measurements	32
8.1.3	External Façade Levels	32
8.1.4	Mitigation Measures.....	32
8.2	Conclusions	33
8.2.1	British Standard 8233: 2014	33
8.2.2	National Planning Policy Framework.....	33
8.2.3	Vibration	33
8.2.4	Ventillation	33

1 Executive Summary...

1.1 Instruction

KR Associates have been instructed by General Food Trading Co Ltd to undertake a noise impact assessment at Viveash Close in Middlesex to determine if the noise from the existing noise and vibration sources will have an acceptable impact on the proposed residential development.

1.2 Outline of Proposal

It is proposed to develop a mixed-use regeneration scheme (including B1 and C3) from the existing light industrial use area. The area south of Nestles Avenue is predominantly residential and the current site itself is made up of industrial units, educational buildings, self-storage, car rental and car repair. The aim of this report is to determine the effect of the existing and proposed noise sources on the proposed residential development (see plan in section 2.2)

1.3 Scope of Report

Full Planning Permission will be sought under the Town and Country Planning Act for the development of 68 residential units on the upper floors and commercial floorspace on the ground, mezzanine and first floor levels.

This report is prepared in accordance with British Standard 8233:2014. The aim is to determine the existing background noise and then create a 3D noise map of the site and surrounding area which will generate the noise levels likely to arise at the new development.

1.4 Vibration

The report will also establish the existing Groundbourne Vibration levels within the existing site to ensure that the vibration from the surrounding railway lines and local roads will not have a significant or adverse effect on the proposed residential development.

1.5 Outline of Methodology

Background noise levels are measured at an appropriate position and used along with spot measurements on site to create a 3D-Noise map of the existing site to predict the free-field levels impacting on the façade of the proposed development. Calculations are then undertaken in accordance with British Standard 8233: 2014 with the windows closed in accordance with Approved Document F: 2000 to determine the mitigation measures required to meet the required internal noise levels specified within British Standard 8233: 2014. Calculations are also undertaken to determine the noise levels within an external amenity spaces

1.6 Executive Summary

1.6.1 Summary of Criterion

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	L _{Aeq} , 16 hour 35 dB	--
Dining	Dining Room	L _{Aeq} , 16 hour 40 dB	--
Sleeping (Daytime Resting)	Bedroom	L _{Aeq} , 16 hour 35 dB	L _{Aeq} , 8 hour 30 dB

1.6.2 Measurements

Background noise measurements were undertaken between Friday 6th January 2017 to Monday 9th January 2017 with the meter located opposite the site.

Measurement Index	Day Time (07:00 to 23:00)	Night Time (23:00 to 07:00)
Position 1	L _{Aeq} , 16 hour 63 dB	L _{Aeq} , 8 hours 58 dB.

1.6.3 External Façade Levels

A 3D-Noise map was created using the continuous background noise measurements and spot measurements taken around site to determine the free-field façade noise levels that are likely to impact on the residential façade.

Measurement Index	Day Time (07:00 to 23:00)	Night Time (23:00 to 07:00)
Average Levels (BS8233:2014)	L _{Aeq,ff} 16 hour 66 dB	L _{Aeq,ff} 8 hour 58 dB
L _{AMax} Levels	L _{AMax} , 16 hour 71 dB	L _{AMax} , 8 hours 63 dB.

1.6.4 Mitigation Measures

It has been recommended that in order to meet the criterion defined within British Standard 8233: 2014 consideration be given to the following mitigation measures.

Mitigation measures	Maximum Free Field Levels Impacting on a Residential Facade
Glazing	Triple Glazing (4 - 12 - 6 - 50 - 6)
Trickle Vents	MVHR System
Upper Floor Ceiling	2 Layers of 15mm Soundbloc Plasterboard

1.7 Conclusions

1.7.1 British Standard 8233:2014

The assessments undertaken in accordance with British Standard 8233:2014 indicate that if the proposed mitigation measures are adhered to then the required internal noise levels will be met.

1.7.2 National Planning Policy Framework

The assessments indicate that the existing noise sources will not have a significant adverse impact on the internal or external living conditions of the residents of the proposed residential dwellings. It would therefore be recommended planning permission is granted in accordance with paragraph 14 of the National Planning Policy Framework as the benefits of the development are likely to outweigh any significant adverse impact in terms of noise.

1.7.3 British Standard 7385:1993

The measurements undertaken indicate that the existing vibration levels will not have an adverse effect on the development or the future residing residents.

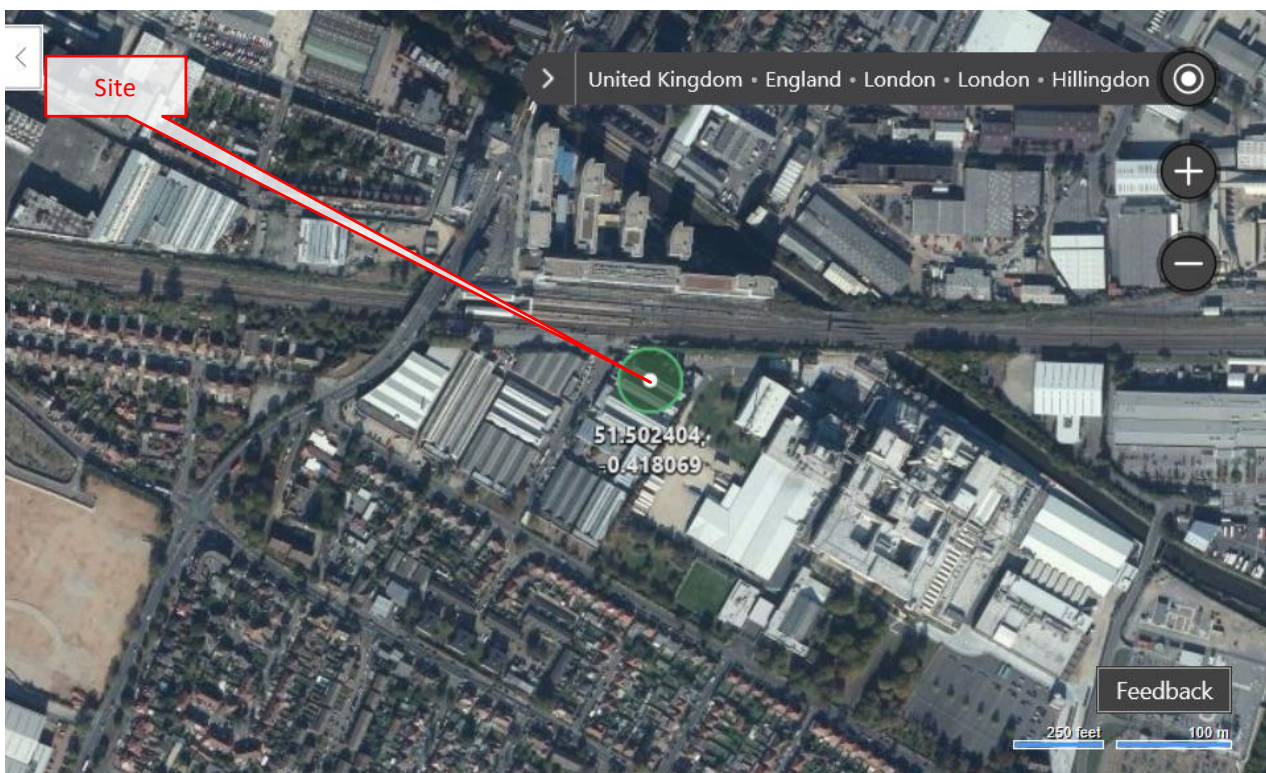
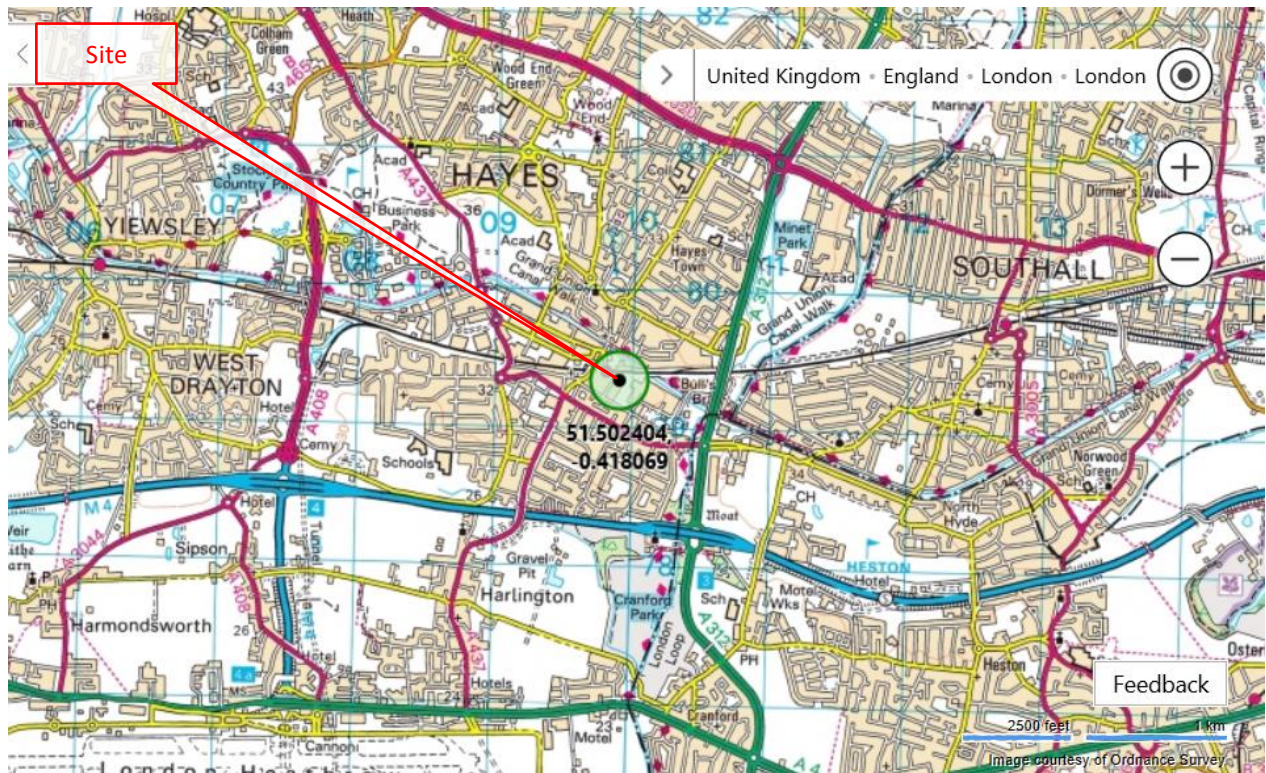
1.7.4 Ventillation

For the purpose of ventilation, a MVHR System is to be incorporated into this scheme to eliminate the requirement to open all windows which should allow for the use of non-openable windows on the facades facing the railway line.

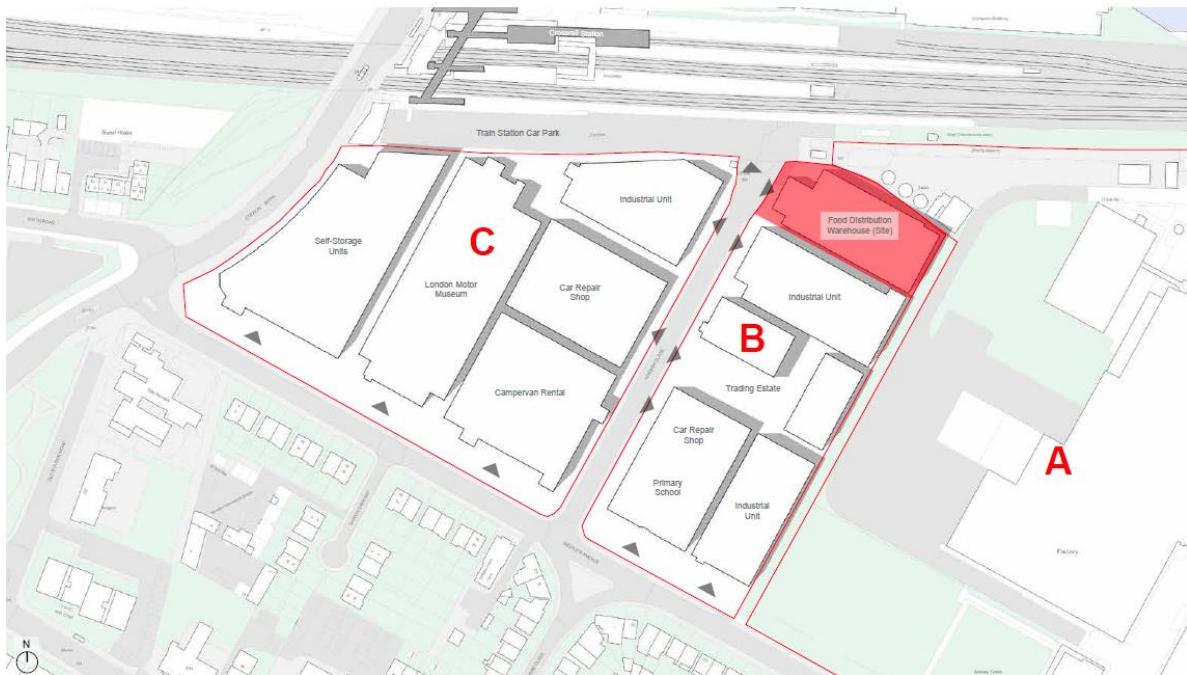
2 Site Location...

2.1 Local Area

The site is located to the south of Hayes town centre and adjacent to Harlington train station and the approved Crossrail station. The train station is on one of the major commuter routes into central London, providing a direct connection to Heathrow and links to the South West. The plot is located at the north end of Viveash Close and is part of a light industrial area.

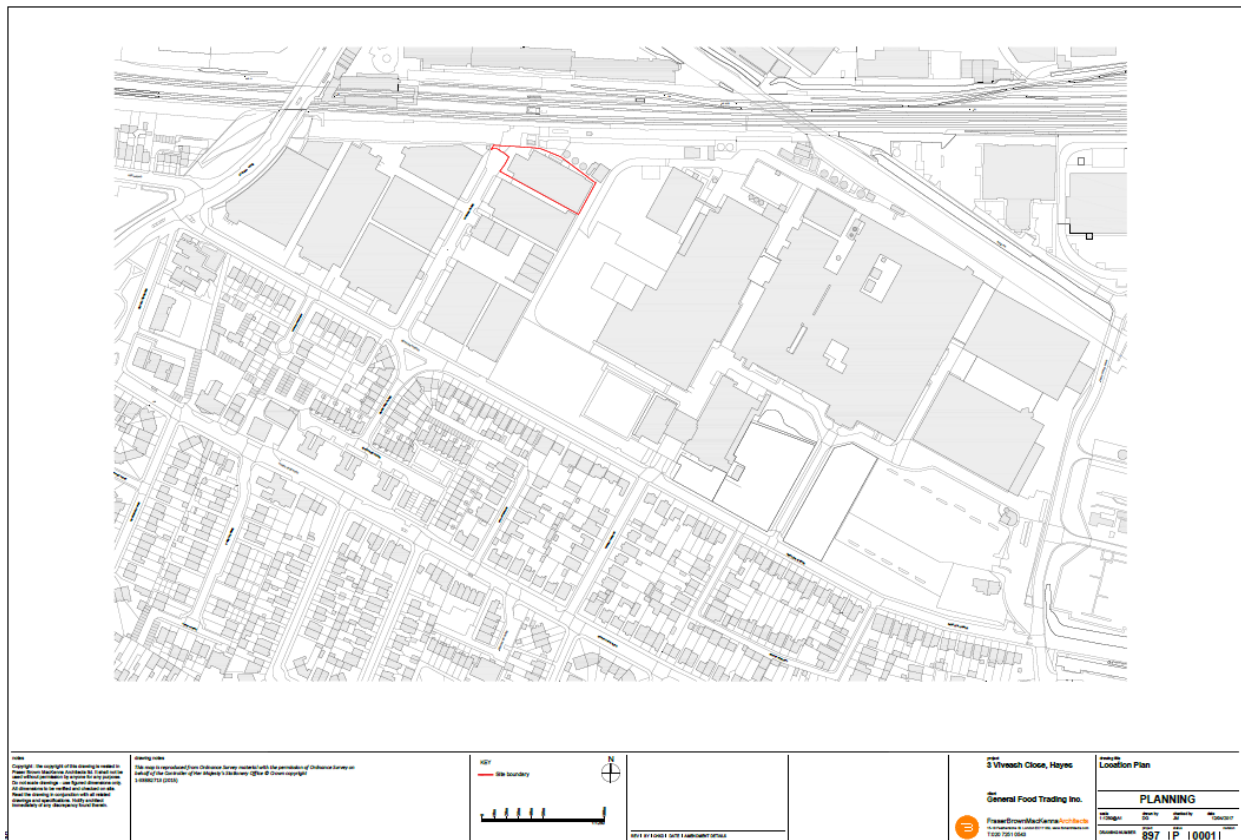


2.2 Existing Site Plan



2.3 Proposed Layout Plans

It is proposed to construct a mixed use residential and business development with 68 residential units located on the upper floors and commercial properties on the lower floors.

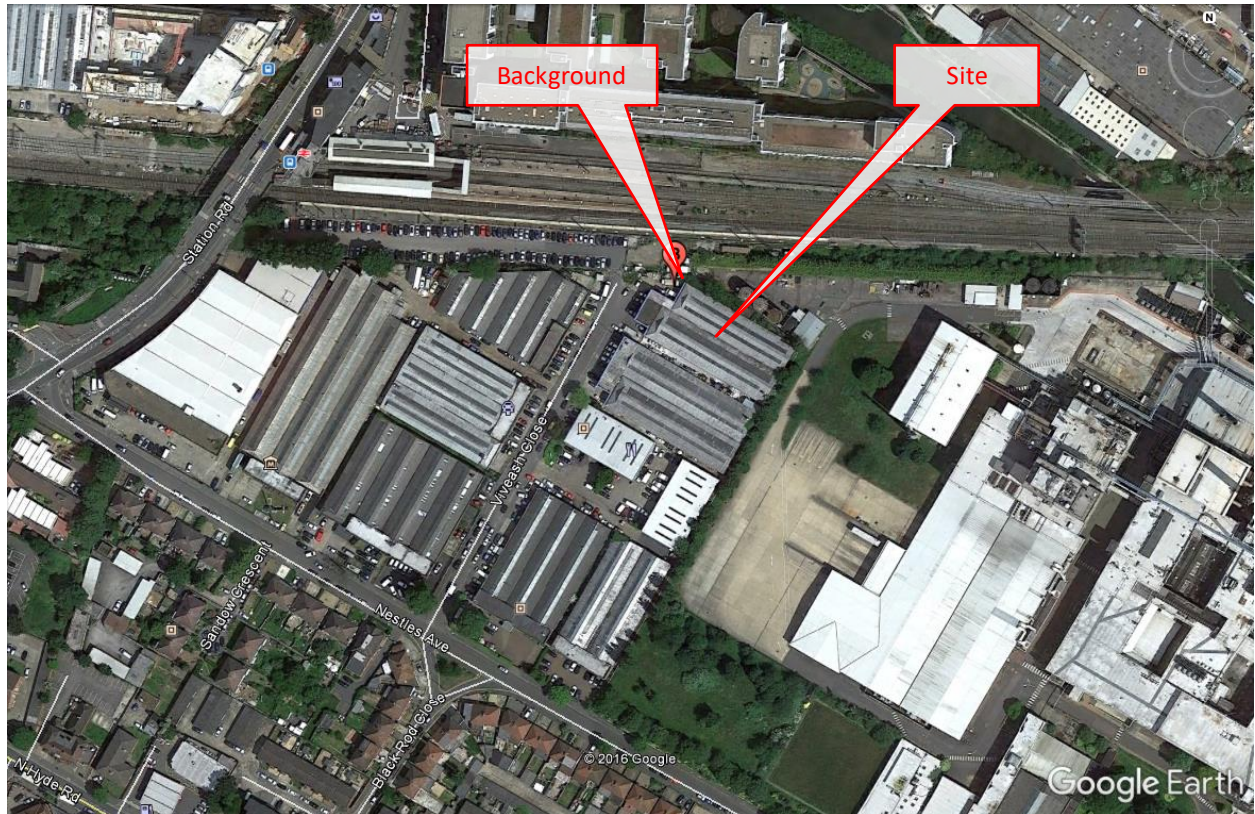


3 Background Measurements....

3.1 Measurement Detail

3.1.1 Location of Measurements

The background measurement position was determined at a location to the north of the site between Friday 6th January 2017 and Monday 9th January 2017. Particular consideration was given to the railway line running along the north of the site and the existing light industrial units.



Background Position	Latitude:	51.502576	Longitude:	-0.418333	Elevation:	1.0 m
---------------------	-----------	-----------	------------	-----------	------------	-------

3.1.2 Measurement Equipment

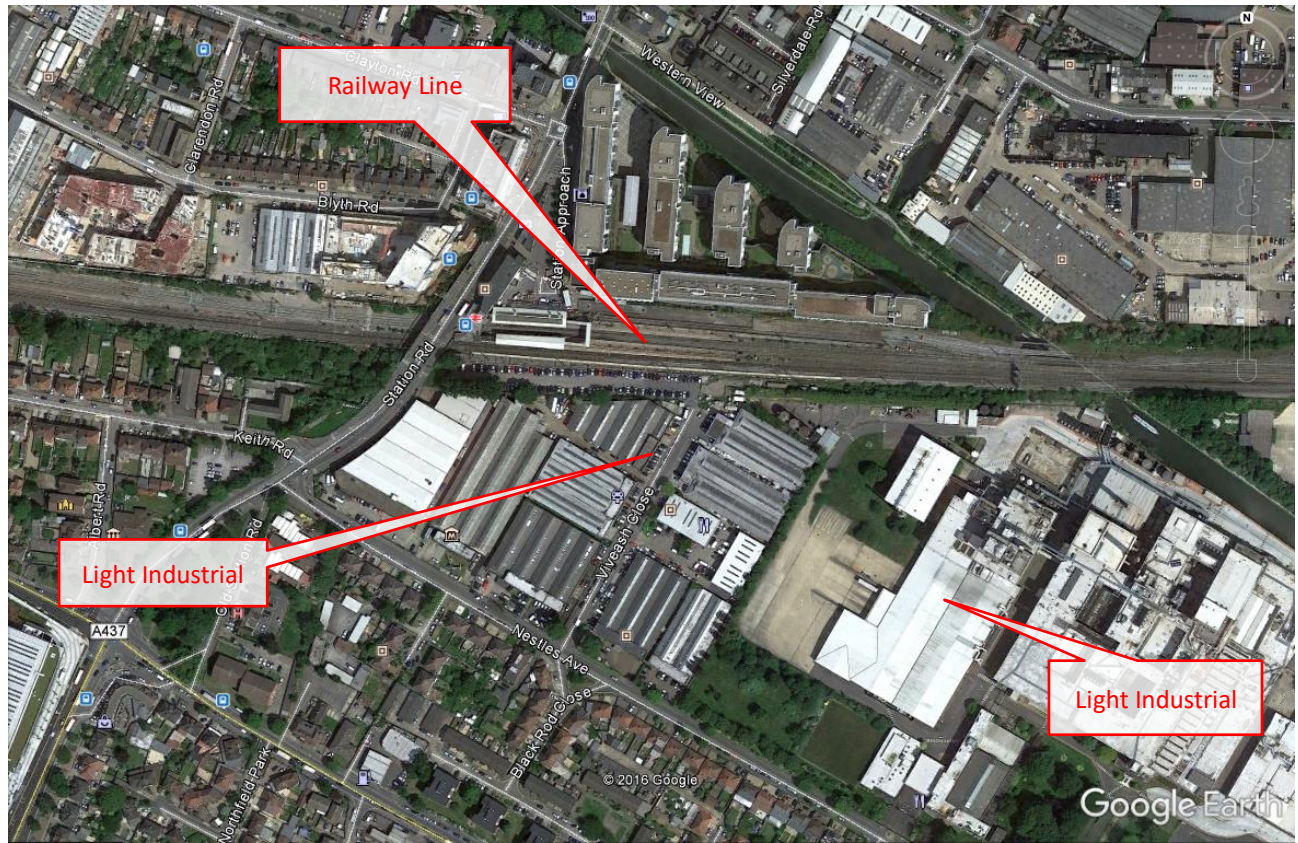
1)	Type	Sound Level Meter	Microphone	Calibrator
		KRE/027/01	KRE/027/02	KRE/027/03
2)	Manufacturer	Rion	Rion	Rion
3)	Serial Number	'00503252	320615	34304655
4)	Certificate Number	'UCRT14/1102	'U13136	7961
	Calibration Date	7 th May 2016	7 th May 2016	7 th May 2016

3.1.3 Measurement Period

Background noise measurements were undertaken between Friday 6th January 2017 to Monday 9th January 2017 with the meter located within the site boundary to the north. The background measurements were designed to capture a typical 24-hour measurement period.

3.1.4 Context of the Site

Spot measurements were taken in and around the site to determine the dominant noise sources that are likely to impact on the proposed development. The site is located within close proximity to a railway line which runs along the entire north side of the proposed site. The site is currently a unit situated amongst several other commercial and industrial type units.

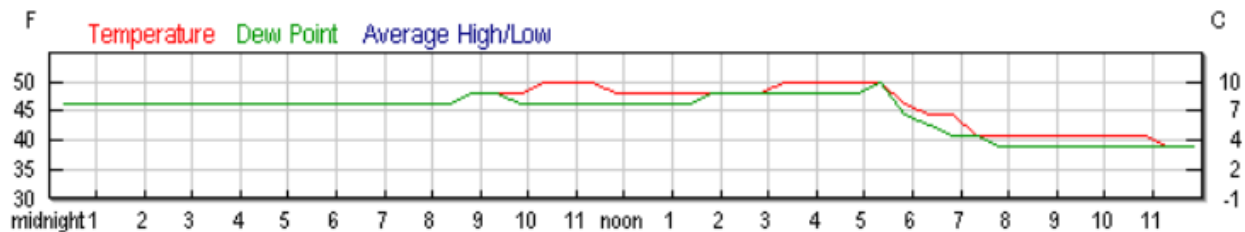


Railway line	Latitude:	51.502891	Longitude:	-0.418680	Elevation:	1m
Light Industrial	Latitude:	51.502166	Longitude:	-0.420495	Elevation:	4m
Light Industrial	Latitude:	51.501416	Longitude:	-0.416251	Elevation:	4m

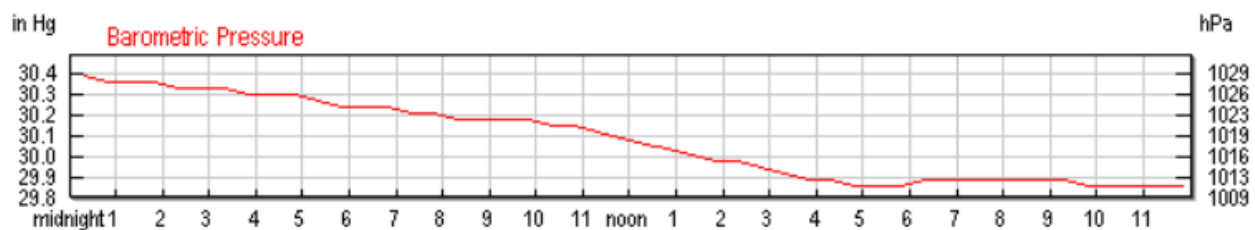
3.2 Weather Conditions

The following weather conditions were taken from a nearby weather station at Heathrow using the data supplied by the website www.wunderground.com. Observations on site indicate that the weather conditions were very similar to those at the nearby weather station.

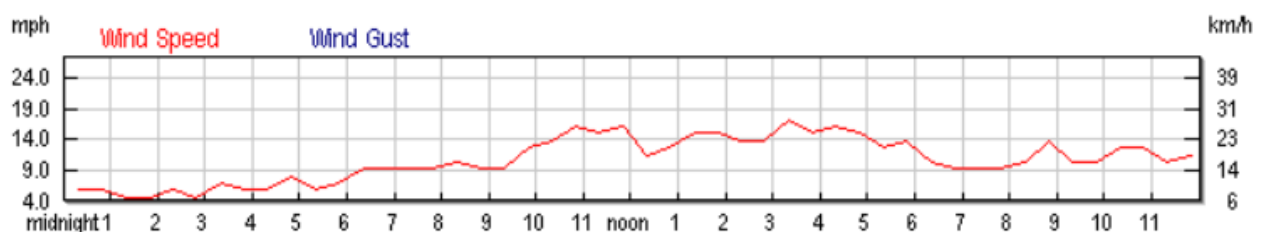
3.2.1 Temperature and dew Point



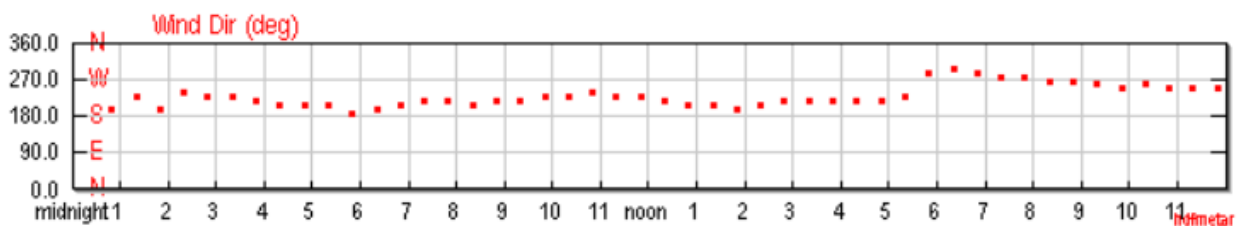
3.2.2 Barometric Pressure



3.2.3 Wind Speed and Wind Gust

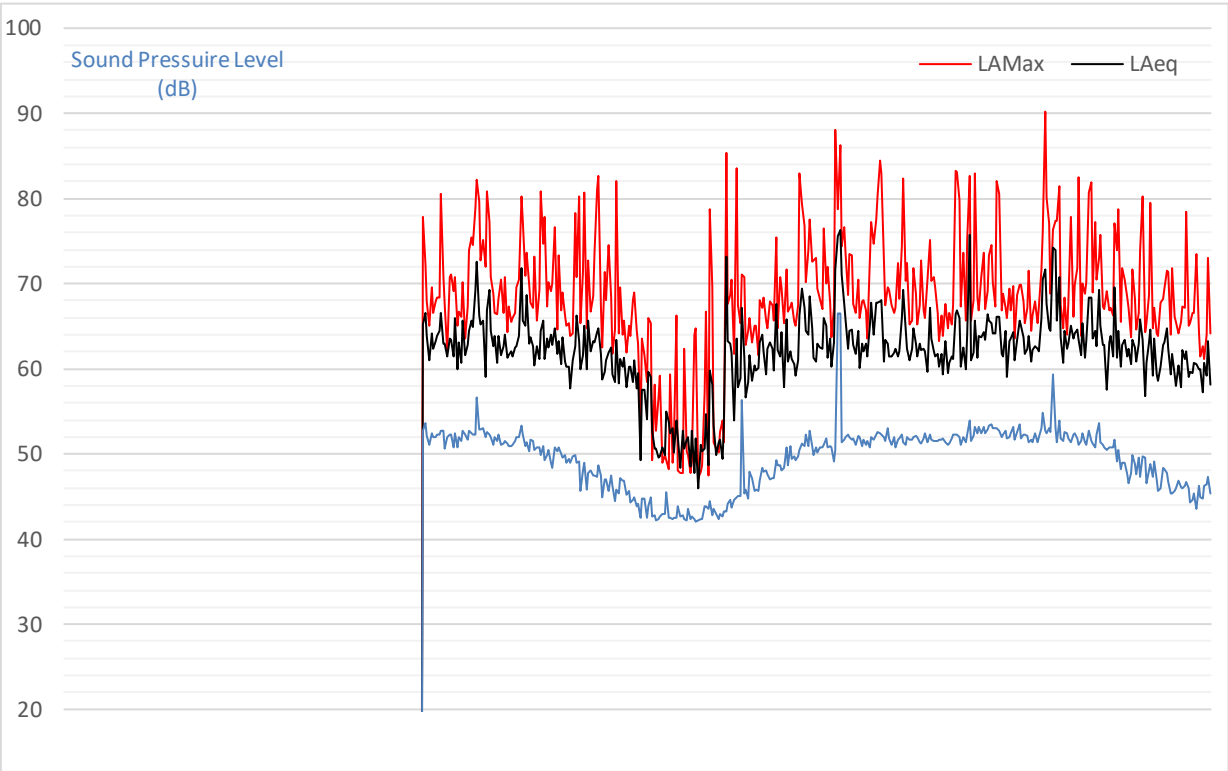


3.2.4 Wind Direction



3.3 Measurement Results

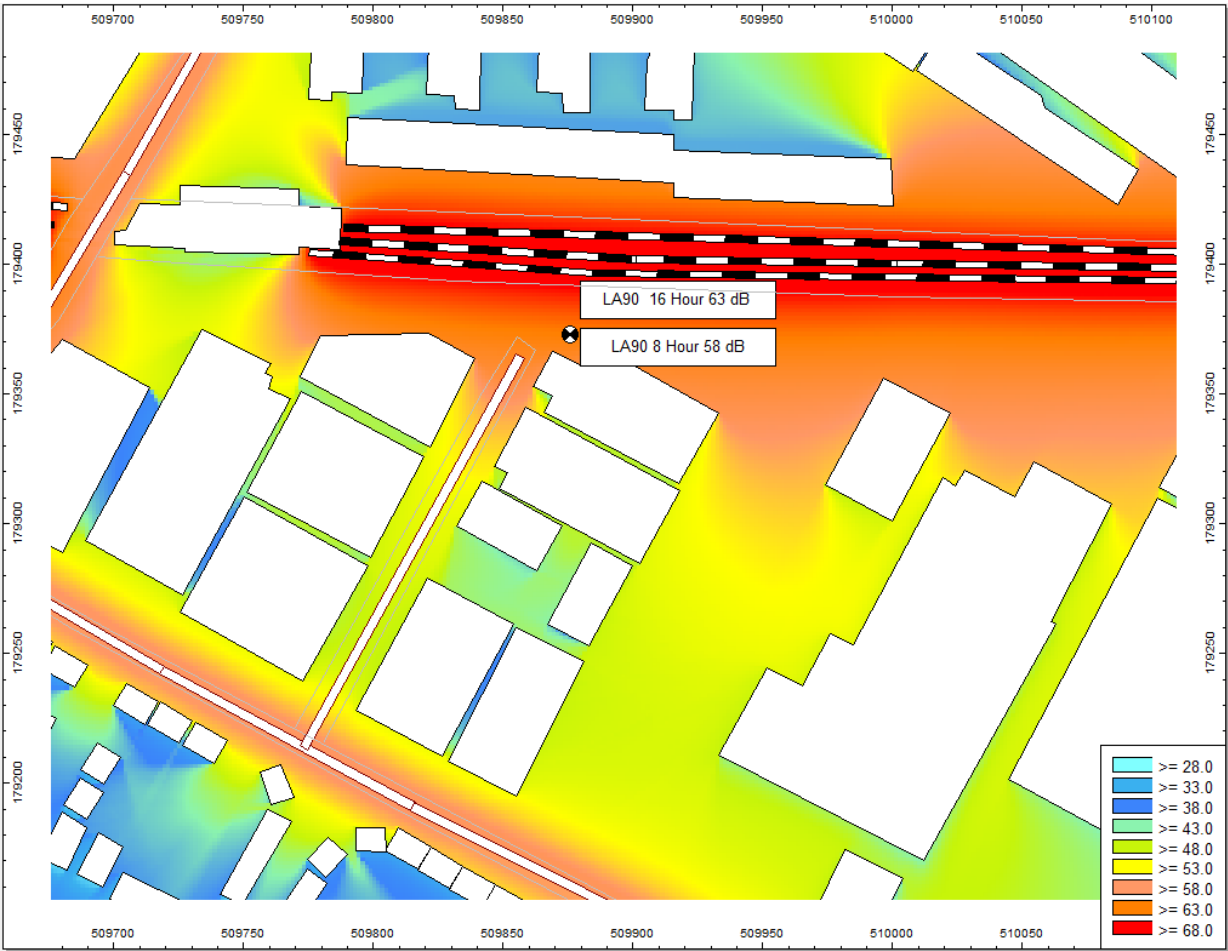
3.3.1 Background Noise Profile



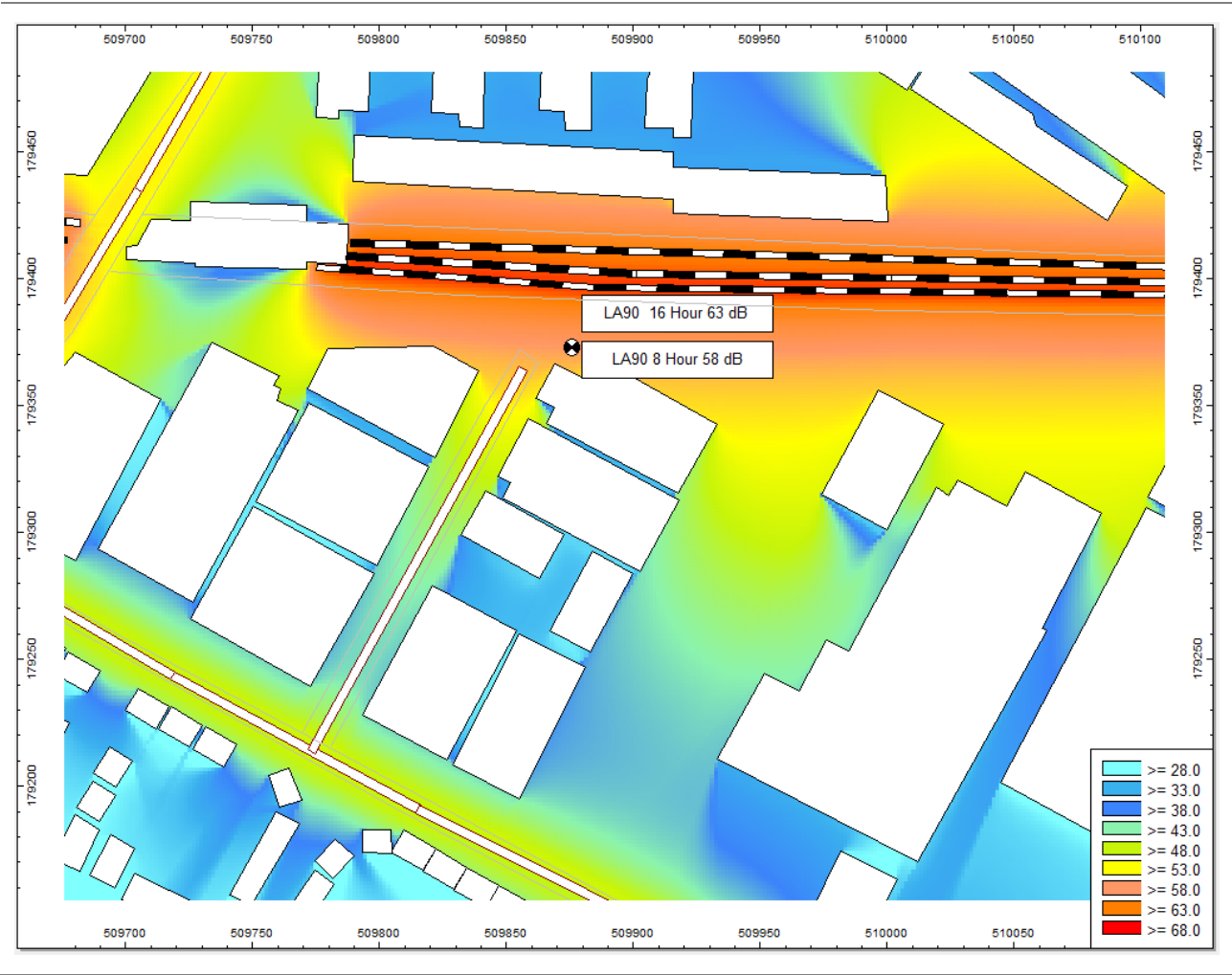
Day Time (07:00 to 19:00)			Evening Time (19:00 to 23:00)			Night Time (23:00 to 07:00)		
L _{AMax} , 1h	L _{Aeq} , 1h	L _{A90} , 1h	L _{AMax} , 1h	L _{Aeq} , 1h	L _{A90} , 1h	L _{AMax} 15 min	L _{Aeq} 15 min	L _{A90} 15 min
62-90	59-76	49-67	62-83	57-72	45-54	47-85	46-73	42-56

3.4 3D Background Noise Maps

3.4.1 Day Time (07:00 – 23:00)



3.4.2 Night Time (23:00- 07:00)



4 Assessments...

4.1 British Standard 8233:2014

4.1.1 Calculation Procedure

The calculation on the internal noise level within the proposed residential properties is based on the transmission loss or the difference between the sound power levels radiating onto the external surface of the façade and the sound power level radiating into the façade. The calculation formula is defined within equation G.1. of British Standard 8233: 2014 and is based on the calculation methodology of British Standard 12354 – Part 3: 2000 entitled “*Building acoustics – Estimation of acoustic performance of building from the performance of elements – Part 3: Airborne sound insulation against outdoor sound.*”

$$L_{eq,2} \approx L_{eq,ff} + 10 \cdot \log_{10} \left(\frac{A_0}{S} \cdot 10^{\frac{-D_{n,e}}{10}} + \frac{S_{wi}}{S} \cdot 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} \cdot 10^{\frac{-R_{ew}}{10}} + \frac{S_{rr}}{S} \cdot 10^{\frac{-R_{rr}}{10}} \right) + 10 \cdot \log_{10} \left(\frac{S}{A} \right) + 3$$

$L_{eq,2}$ = Equivalent sound pressure level internally within the room (dB) – reference $2 \times 10^{-5} \text{Nm}^{-2}$.

$L_{eq,ff}$ = Equivalent sound pressure level externally outside the room under consideration (dB) – reference $2 \times 10^{-5} \text{Nm}^{-2}$.

A_0 = Reference absorption area within room of 10m^2 and independent of frequency.

S_f = Total façade area of room in question (m^2).

S_{wi} = Area of windows or glazing within the room (m^2).

S_{ew} = Area of external wall within the room (m^2).

S_{rr} = Area of the ceiling within the room (m^2).

S = Total area of elements through which sound enters the room (m^2). i.e. $S = S_f + S_{rr}$

$D_{n,e}$ = Sound insulation of the trickle vent measured to British Standard 20140 – Part 10: 1992 (Withdrawn)

R_{wi} = Sound reduction index of the window (dB)

R_{ew} = Sound reduction index of the external wall (dB)

R_{rr} = Sound reduction index of the ceiling (dB)

A = Equivalent absorption of the room under consideration (m)

4.2 Transmission Loss Data

4.2.1 Ventilation (D_{ne})

Octave Band Frequency	63	125	250	500	1000	2000	4000
MVHR System	55	51	51.3	51.6	46.9	42	38

4.2.2 Glazing (R_{wi})

Octave Band Frequency	63	125	250	500	1000	2000	4000
Standard Glazing	21	25	25	38	39	40	45
Triple Glazing	24	29	38	44	48	49	53

4.2.3 Walls (R_{ew})

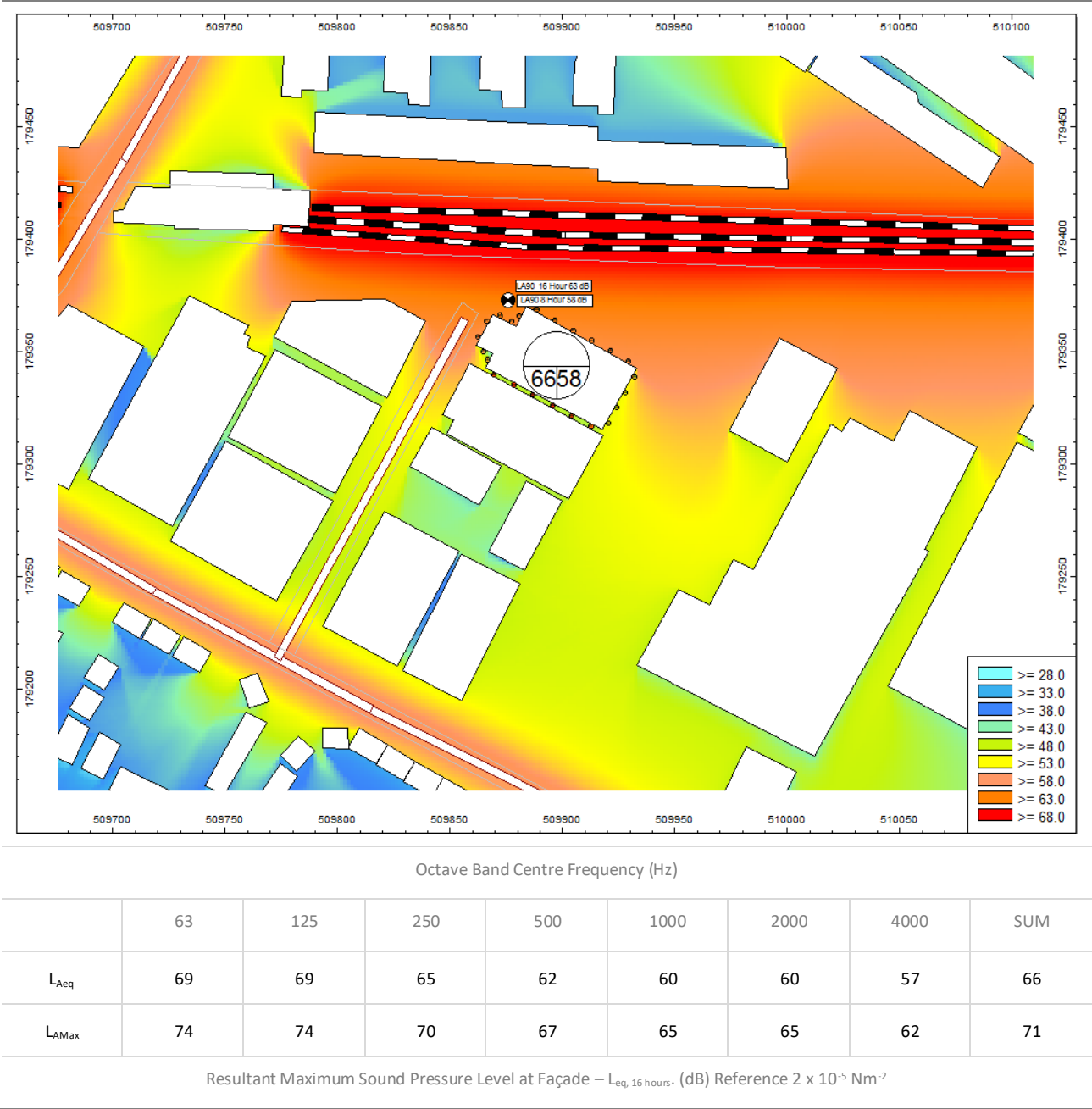
Octave Band Frequency	63	125	250	500	1000	2000	4000
Brick and Concrete Block	40	43	42	45	53	55	55

4.2.4 Ceiling (R_{rr})

Octave Band Frequency	63	125	250	500	1000	2000	4000
2 x 15mm Plasterboard	28	32	39	44	52	52	52

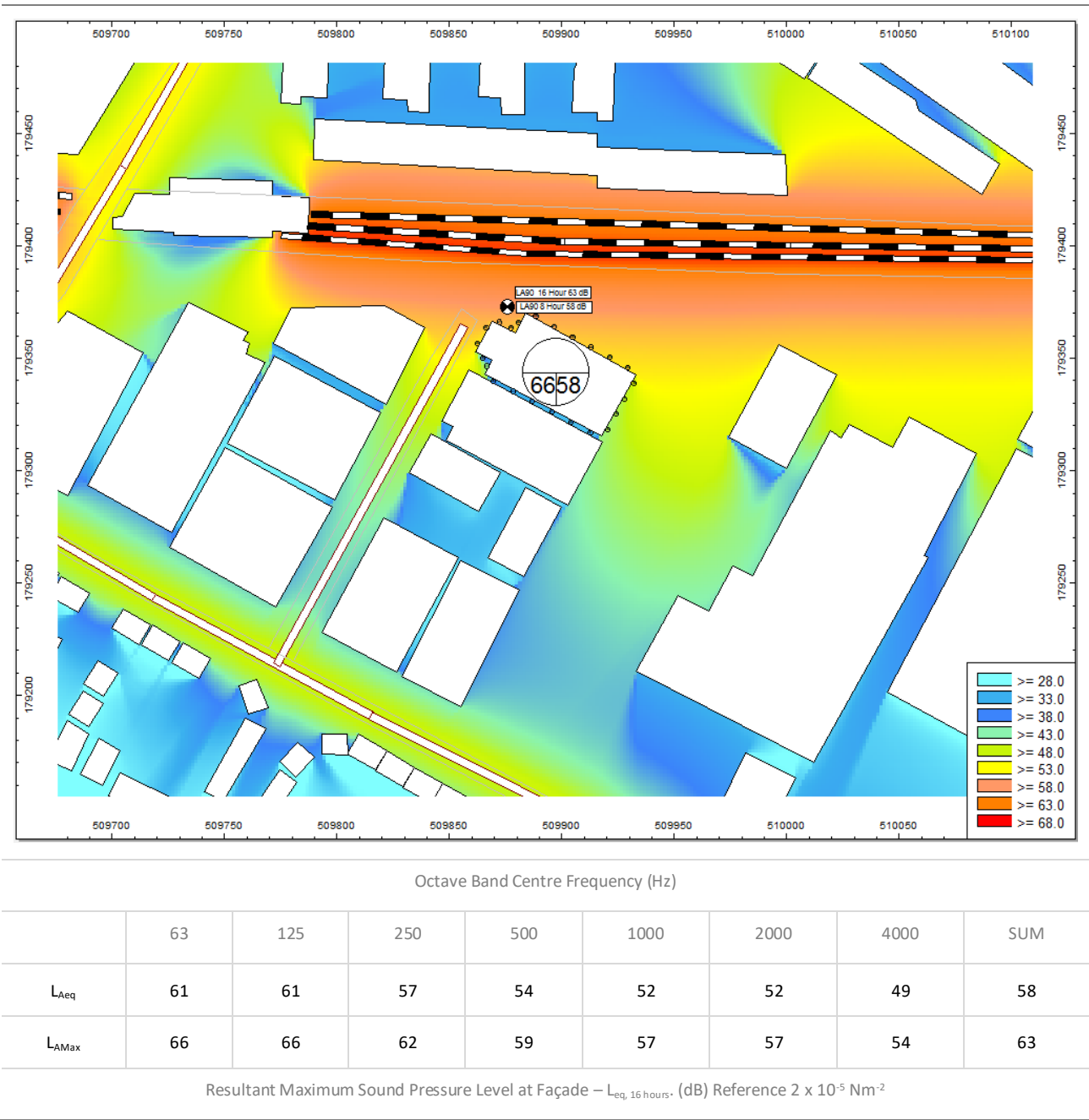
4.3 Day Time (07:00 to 23:00) Internal Noise Levels

4.3.1 3D Noise Maps



4.4 Night Time (23:00 to 07:00) Internal Noise Levels

4.4.1 3D Noise Maps



4.5 LAeq Assessment

4.5.1 British Standard 8233: 2014 Day Time Assessment

British Standard 8233: 2014 Assessment					 Quietly confident		
Day Time – 07:00 to 23:00 Hours							
Internal Noise Level from External Noise Sources							
Location of Measurements	First Floor						
Construction of Walls	Metsec Framing System clad in cement board						
Construction of Ceiling	2 layers of 15mm Soundbloc						
Construction of Windows	Standard Glazing (6 – 12 – 8)						
Construction of Trickle Vents	MVHR System						
Octave Band Frequency	63	125	250	500	1000	2000	4000
A = L_{eqff} ($L_{eq,1}$ + 2 dB)	69	69	65	62	60	60	57
B = Ventilation (D_{ne})	55	51	51.3	51.6	46.9	42	38
	0.00000	0.00000	0.00000	0.00000	0.00001	0.00002	0.00005
C = Window (R_{wi})	21	25	25	38	39	40	45
	0.00174	0.00069	0.00069	0.00003	0.00003	0.00002	0.00001
D = Walls (R_{ew})	56	56	52	49	47	47	44
	0.00003	0.00002	0.00002	0.00001	0.00000	0.00000	0.00000
E = Ceiling (R_r)	28	32	39	44	52	52	52
	0.00074	0.00030	0.00006	0.00002	0.00000	0.00000	0.00000
F = $10 \cdot \text{Log}_{10}$ (B + C + D + E)	-26.0	-30.0	-31.1	-41.8	-44.2	-43.4	-42.2
Absorption (A)	7	11	14	16	16	15	15
G = $10 \cdot \text{Log}_{10}$ (S/A)	6.6	4.6	3.6	3.0	3.0	3.3	3.3
Resultant Level	52.6	46.7	40.5	26.2	21.9	22.9	21.1
A-Weighting	-26	-16	-9	-3	0	1	1
A-Weighted	27	31	31	23	22	24	22
Resultant Internal Noise Level	L _{Aeq,16 hours} 35 dB						
British Standard 8233:2014	Sleeping (Daytime Resting) L _{Aeq,16 hours} 35 dB – Levels Meet the Requirements						

British Standard 8233: 2014 Assessment

Night Time – 23:00 to 07:00 Hours

Internal Noise Level from External Noise Sources



Quietly confident

Location of Measurements	First Floor						
Construction of Walls	Metsec Framing System clad in cement board						
Construction of Ceiling	2 layers of 15mm Soundbloc						
Construction of Windows	Standard Glazing (6 – 12 – 8)						
Construction of Trickle Vents	MVHR System						
Octave Band Frequency	63	125	250	500	1000	2000	4000
$A = L_{eqff} (L_{eq,1} + 2 \text{ dB})$	61	61	57	54	52	52	49
$B = \text{Ventilation } (D_{ne})$	55	51	51.3	51.6	46.9	42	38
	0.00000	0.00000	0.00000	0.00000	0.00001	0.00002	0.00005
$C = \text{Window } (R_{wi})$	21	25	25	38	39	40	45
	0.00174	0.00069	0.00069	0.00003	0.00003	0.00002	0.00001
$D = \text{Walls } (R_{ew})$	56	56	52	49	47	47	44
	0.00003	0.00002	0.00002	0.00001	0.00000	0.00000	0.00000
$E = \text{Ceiling } (R_{r})$	28	32	39	44	52	52	52
	0.00074	0.00030	0.00006	0.00002	0.00000	0.00000	0.00000
$F = 10 \cdot \text{Log}_{10} (B + C + D + E)$	-26.0	-30.0	-31.1	-41.8	-44.2	-43.4	-42.2
Absorption (A)	7	11	14	16	16	15	15
$G = 10 \cdot \text{Log}_{10} (S/A)$	6.6	4.6	3.6	3.0	3.0	3.3	3.3
Resultant Level	44.6	38.7	32.5	18.2	13.9	14.9	13.1
A-Weighting	-26	-16	-9	-3	0	1	1
A-Weighted	~~19~~	23	23	15	14	16	~~14~~
Resultant Internal Noise Level	$L_{Aeq,8 \text{ hours}}$ 27 dB						
British Standard 8233:2014	Sleeping (Daytime Resting) $L_{Aeq,8 \text{ hours}}$ 30 dB – Levels Meet the Requirements						

4.6 LMax Assessment

4.6.1 British Standard 8233: 2014 Day Time Assessment

British Standard 8233: 2014 Assessment					 Quietly confident		
Day Time – 07:00 to 23:00 Hours							
Internal Noise Level from External Noise Sources							
Location of Measurements	First Floor						
Construction of Walls	Metsec Framing System clad in cement board						
Construction of Ceiling	2 layers of 15mm Soundbloc						
Construction of Windows	Triple Glazing (4-12-6-50-6)						
Construction of Trickle Vents	MVHR System						
Octave Band Frequency	63	125	250	500	1000	2000	4000
A = L_{eqff} ($L_{eq,1}$ + 2 dB)	74	74	70	67	65	65	62
B = Ventilation (D_{ne})	55	51	51.3	51.6	46.9	42	38
	0.00000	0.00000	0.00000	0.00000	0.00001	0.00003	0.00006
C = Window (R_{wi})	24	29	38	44	48	49	53
	0.00096	0.00030	0.00004	0.00001	0.00000	0.00000	0.00000
D = Walls (R_{ew})	56	56	52	49	47	47	44
	0.00000	0.00000	0.00000	0.00000	0.00001	0.00001	0.00001
E = Ceiling (R_r)	28	32	39	44	52	52	52
	0.00076	0.00030	0.00006	0.00002	0.00000	0.00000	0.00000
F = $10 \cdot \text{Log}_{10}$ (B + C + D + E)	-27.6	-32.2	-39.9	-44.6	-46.9	-44.3	-41.0
Absorption (A)	7	11	14	16	16	15	15
G = $10 \cdot \text{Log}_{10}$ (S/A)	5.5	3.6	2.5	1.9	1.9	2.2	2.2
Resultant Level	54.9	48.4	35.7	27.4	23.1	25.9	26.2
A-Weighting	-26	-16	-9	-3	0	1	1
A-Weighted	29	32	27	24	23	27	27
Resultant Internal Noise Level	L _{Aeq,16 hours} 34 dB						
British Standard 8233:2014	Sleeping (Daytime Resting) L _{Aeq,16 hours} 35 dB – Levels Meet the Requirements						

British Standard 8233: 2014 Assessment

Night Time – 23:00 to 07:00 Hours

Internal Noise Level from External Noise Sources



Quietly confident

Location of Measurements	First Floor						
Construction of Walls	Metsec Framing System clad in cement board						
Construction of Ceiling	2 layers of 15mm Soundbloc						
Construction of Windows	Triple Glazing (4-12-6-50-6)						
Construction of Trickle Vents	MVHR System						
Octave Band Frequency	63	125	250	500	1000	2000	4000
$A = L_{eqff} (L_{eq,1} + 2 \text{ dB})$	66	66	62	59	57	57	54
$B = \text{Ventilation } (D_{ne})$	55	51	51.3	51.6	46.9	42	38
	0.00000	0.00000	0.00000	0.00000	0.00001	0.00003	0.00006
$C = \text{Window } (R_{wi})$	24	29	38	44	48	49	53
	0.00096	0.00030	0.00004	0.00001	0.00000	0.00000	0.00000
$D = \text{Walls } (R_{ew})$	56	56	52	49	47	47	44
	0.00000	0.00000	0.00000	0.00000	0.00001	0.00001	0.00001
$E = \text{Ceiling } (R_{ce})$	28	32	39	44	52	52	52
	0.00076	0.00030	0.00006	0.00002	0.00000	0.00000	0.00000
$F = 10 \cdot \text{Log}_{10} (B + C + D + E)$	-27.6	-32.2	-39.9	-44.6	-46.9	-44.3	-41.0
Absorption (A)	7	11	14	16	16	15	15
$G = 10 \cdot \text{Log}_{10} (S/A)$	5.5	3.6	2.5	1.9	1.9	2.2	2.2
Resultant Level	46.9	40.4	27.7	19.4	15.1	17.9	18.2
A-Weighting	-26	-16	-9	-3	0	1	1
A-Weighted	21	24	19	16	15	19	19
Resultant Internal Noise Level	$L_{Aeq,8 \text{ hours}}$ 27 dB						
British Standard 8233:2014	Sleeping (Daytime Resting) $L_{Aeq,8 \text{ hours}}$ 30 dB – Levels Meet the Requirements						

5 Methodology and Criterion...

5.1 British Standard 8233: 2014 ("BS8233")

British Standard 8233:2014 provides guidance on the sound insulation and the reduction of noise in and around buildings and replaced the original 1999 standard in February 2014.

"This British Standard provides guidance for the control of noise in and around buildings. It is applicable to the design of new buildings....."

The standard goes onto to provide details of the approach to be taken when assessing the design in terms of planning:

- "a) Assess the site, identify significant existing and potential noise sources, measure or estimate noise levels and evaluate layout options.*
- b) Determine design noise levels for spaces in and around the building (s).*
- c) Determine sound insulation of the building envelope, including the ventilation strategy.*
- d) Identify internal sound insulation requirements.*
- e) Identify and design appropriate noise control measures.*
- f) Establish quality control and ensure good workmanship."*

5.1.1 Internal Ambient Noise Levels for dwellings

British Standard 8233:2014 provides desirable internal ambient noise levels within different rooms and at different times for external noise sources that are considered steady within section 7.7.2.:

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	L _{Aeq} , 16 hour 35 dB	--
Dining	Dining Room	L _{Aeq} , 16 hour 40 dB	--
Sleeping (Daytime Resting)	Bedroom	L _{Aeq} , 16 hour 35 dB	L _{Aeq} , 8 hour 30 dB

5.1.2 Maximum Noise Levels

Unlike the previous version, BS 8233:2014 doesn't provide recommendations in relation to maximum noise levels in residential bedrooms at night from individual noise events such as vehicle pass-bys or aircraft movements. Instead, it advises that: "regular individual noise events...can cause sleep disturbance. A guideline value may be set in terms of SEL (Sound Exposure Level) or L_{Amax,F} depending on the character and number of events per night. Sporadic noise events could require separate values".

5.2 National Planning Policy Framework: 2012("NPPF")

5.2.1 Scope of Document

The National Planning Policy Framework ("NPPF") published in March 2012 sets out the Government's National Planning Policies for England and how these can be applied by local communities when developing their local plans or deciding planning application to best reflect the needs and priorities of the local communities. Current planning law requires Local Authorities to grant planning applications in accordance with the local development plan unless there are material considerations which require them to reach a different decision for sustainable developments.

5.2.2 Paragraph 14 -Requirement of Grant Planning Permission

This report therefore will determine if there is a significant adverse impact in terms of noise from the development and then allow the Local Authority to grant planning permission unless they can demonstrate that the significant adverse impact would outweigh the benefits of the development "At the heart of the National Planning Policy Framework is a presumption in favour of sustainable development, which should be seen as a golden thread running through both plan making and decision taking:

For decision-taking this means:

Approving development proposals that accord with the development plan without delay; and

Where the development plan is absent, silent or relevant policies are out-of-date, granting planning permission unless:

Any adverse impact of doing so would significantly and demonstrably outweigh the benefits, when assessed against policies in this Framework taken as a whole."

5.2.3 Paragraph 123 -Aim of Planning Decisions with respect to Noise

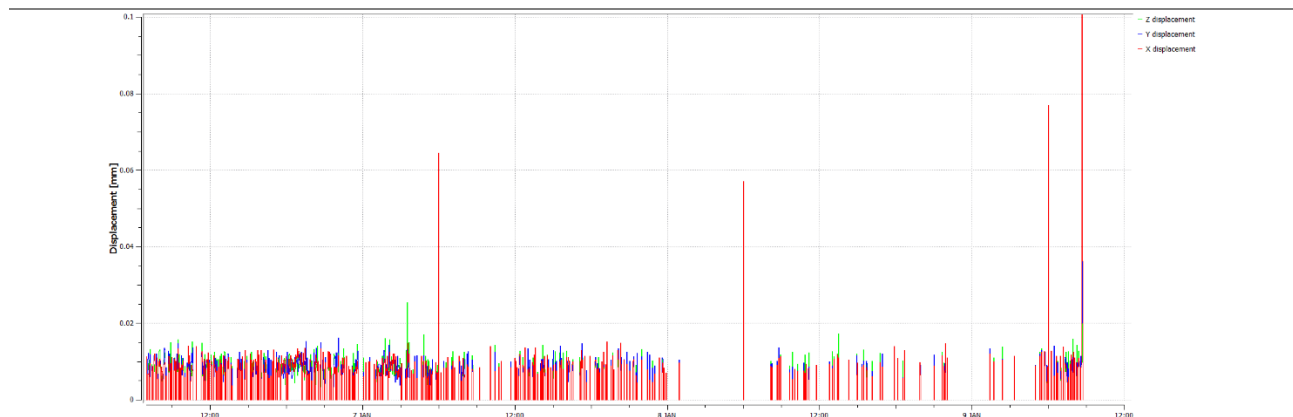
Paragraph 123 of the NPPF provides the overall aims in terms of noise when determining planning applications.

"Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;

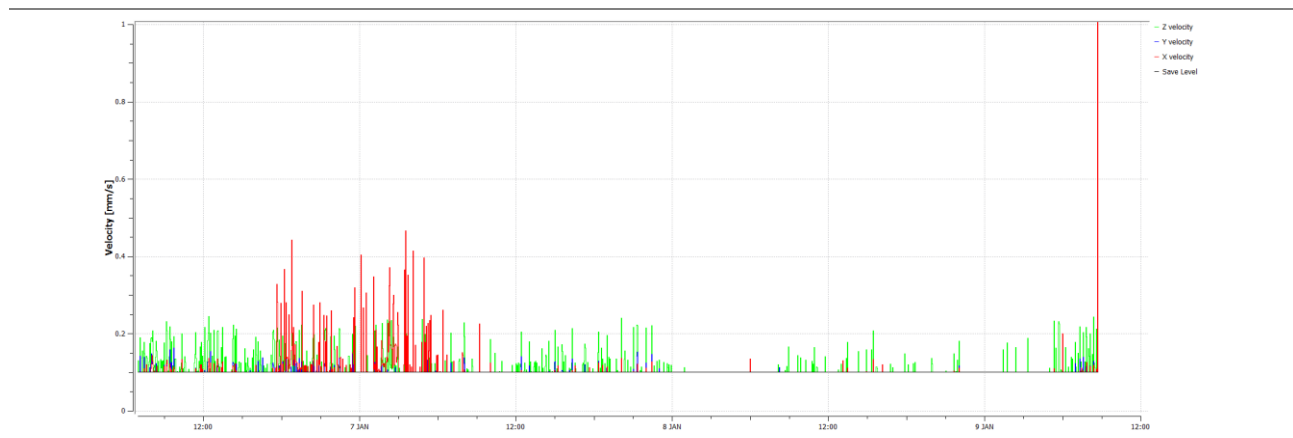
mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions..."

6 Vibration

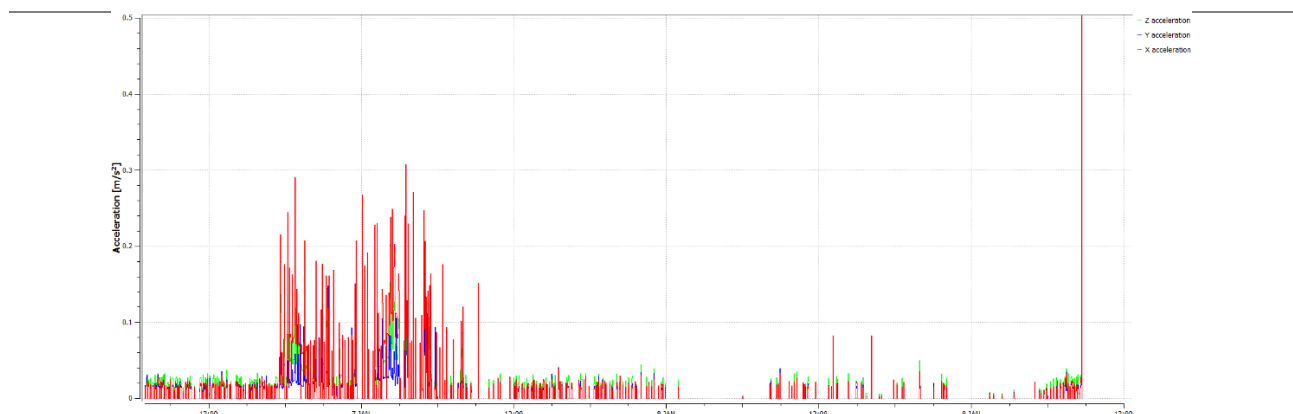
6.1.1 Displacement Time Trace (Z Axis)



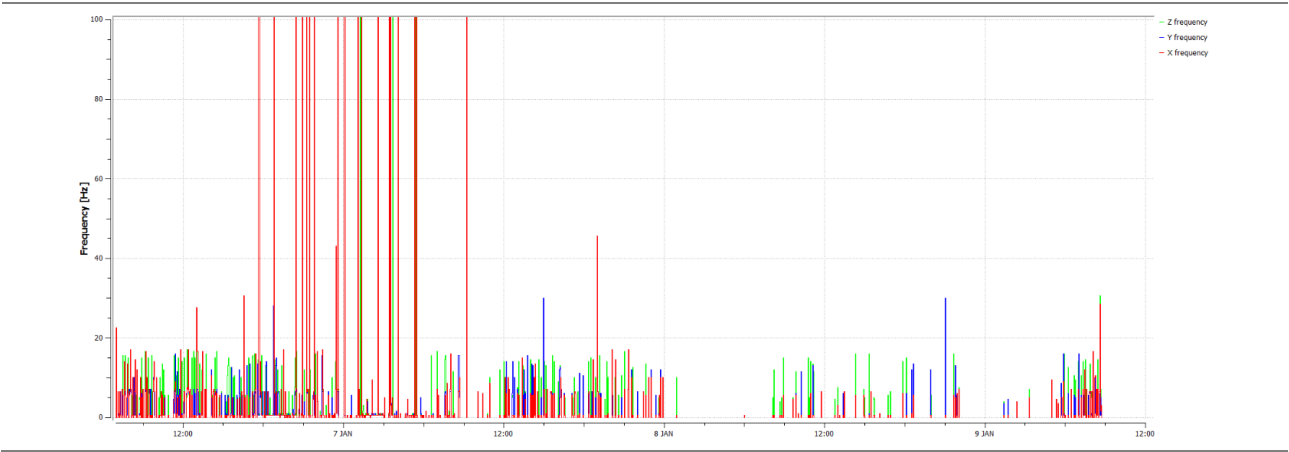
6.1.2 Velocity Time Trace (Z Axis)



6.1.3 Acceleration Time Trace (Z Axis)



6.1.4 Frequency Time Trace (Z Axis)



7 Vibration Criterion and Discussions

7.1 British Standard 7385-2:1993 ("BS7385")

Evaluation and measurement for vibration in buildings –
Part 2: Guide to damage levels from ground borne vibration.

7.1.1 Scope of Document

This document provides guidance on the levels of ground borne vibration that could give rise to damage in buildings. It identifies the factors which influence the vibration response of buildings and describes the basic procedure for carrying out a vibration survey.

7.1.2 Transient Vibration Guide Values for Cosmetic Damage

Line	Type of Building	Peak Component Particle Velocity (PPV)	
		4 to 15 Hz	15 Hz and Above
1	Reinforced framed structures Industrial and heavy buildings	50 mms ⁻¹ at 4 Hz and above	
2	Light framed structures Residential type buildings	15 mms ⁻¹ at 4Hz to 20 mms ⁻¹ at 15 Hz	20 mms ⁻¹ at 15 Hz 50 mms ⁻¹ at 40 Hz

7.2 British Standard ISO 2631-1:1997 ("BS2631")

Mechanical vibration and shock –
Evaluation of human exposure to whole body vibration – Part 1: General Requirements.

7.2.1 Scope of Document

This document defines the method for defining and measuring whole body vibration. More importantly, it defines between 0.5 and 80 Hz the level of vibration which is likely to be perceivable.

7.2.2 Comfort reactions to Vibration Environments

Acceleration (Peak) Wk Weighted	Perception of Whole Body Vibration (Sitting Down)
0.015 ms ⁻²	50 th Percentile of alert and fit persons can detect peak vibration at this magnitude
0.010 ms ⁻²	Median Perception of 0.15ms ⁻¹ lower interquartile range
0.020 ms ⁻²	Median Perception of 0.15ms ⁻¹ upper interquartile range

7.3 British Standard 6472-1:2008 ("BS6472")

Guide to evaluation of human exposure to vibration in buildings –
Part 1: Vibration source other than blasting.

7.3.1 Scope of Document

This document provides guidance on predicting the human response to vibration in buildings over the frequency range 0.5 Hz to 80 Hz. This part of the standard describes how to determine the vibration dose value, VDV from frequency-weighted vibration measurements.

7.3.2 Vibration Dose Value Ranges for Adverse Comment

Place and Time (Residential Buildings)	Adverse Comment		
	Low Probability	Possible	Probable
Day Time – 16 Hour (07:00 to 23:00)	0.2 to 0.4 ms ^{-1.75}	0.4 to 0.8 ms ^{-1.75}	0.8 to 1.6 ms ^{-1.75}
Night Time – 8 Hour (23:00 to 07:00)	0.1 to 0.2 ms ^{-1.75}	0.2 to 0.4 ms ^{-1.75}	0.4 to 0.8 ms ^{-1.75}

7.3.3 Estimated Vibration Dose Value

Both BS2631 and BS6472 provide a formula to determine the Vibration Dose Value from the weighted acceleration values assuming the weightings shown in figure 1 of BS6472, (W_b) which is commonly defined as fourth root of the time integral of the fourth power of the acceleration after it has been frequency weighted.

7.4 Assessing vibration - A Technical Guideline: 2006 ("DEC")

Department of Environment and Conservation's (DEC) - Australia

Assessing Vibration – A Technical Guideline.

7.4.1 Scope of Document

The Department of Environment and Conservation in Australia produced a very useful document entitled "Assessing Vibration – A Technical Guide" in which provide guidance to the interpretation and use of BS6472. The document provides useful guidance on acceptable levels of vibration in residential properties, and though it was published in Australia, it is based on BS6472 which is very relevant for sites within the UK.

7.4.2 Acceptable Values for Continuous or Impulsive Vibration

Location of Measurements	Assessment period	Preferred Values		Maximum Values	
		z-axis	x and y axis	z-axis	x and y axis
Residential Properties	Day Time (07:00 to 23:00)	0.010 ms ⁻²	0.0071 ms ⁻²	0.020 ms ⁻²	0.014 ms ⁻²
	Night Time (23:00 to 07:00)	0.007 ms ⁻²	0.005 ms ⁻²	0.014 ms ⁻²	0.010 ms ⁻²

7.4.3 Acceptable Vibration Does Values for Intermittent Vibration

Location of Measurements	Assessment period	Preferred Values	Maximum Values
		z-axis	z-axis
Residential Properties	Day Time (07:00 to 23:00)	0.20 ms ^{-1.75}	0.40 ms ^{-1.75}
	Night Time (23:00 to 07:00)	0.13 ms ^{-1.75}	0.26 ms ^{-1.75}

7.4.4 Vibration Criteria Presented in Different Units

Location of Measurements Residential Properties	Assessment period	Preferred Values	Maximum Values
		z-axis	z-axis
rms Acceleration	Day Time (07:00 to 23:00)	0.010 ms ⁻²	0.020 ms ⁻²
	Night Time (23:00 to 07:00)	0.007 ms ⁻²	0.014 ms ⁻²
rms Velocity	Day Time (07:00 to 23:00)	0.20 mms ⁻¹	0.40 mms ⁻¹
	Night Time (23:00 to 07:00)	0.14 mms ⁻¹	0.28 mms ⁻¹
Peak Velocity	Day Time (07:00 to 23:00)	0.28 mms ⁻¹	0.56 mms ⁻¹
	Night Time (23:00 to 07:00)	0.20 mms ⁻¹	0.40 mms ⁻¹

7.5 Assessment Criterion

It would be recommended that the vibration levels are below the following values to ensure there is no building damage and there is a low probability of future complaints from vibration.

- Day Time (07:00 to 23:00) VDV_b 0.2 ms^{-1.75}
- Night Time (23:00 to 07:00) VDV_b 0.2 ms^{-1.75}

8 Conclusion

8.1 British Standard 8233:2014

8.1.1 Summary of Criterion

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	L _{Aeq} , 16 hour 35 dB	--
Dining	Dining Room	L _{Aeq} , 16 hour 40 dB	--
Sleeping (Daytime Resting)	Bedroom	L _{Aeq} , 16 hour 35 dB	L _{Aeq} , 8 hour 30 dB

8.1.2 Measurements

Background noise measurements were undertaken between Friday 6th January 2017 to Monday 9th January 2017 with the meter located opposite the site.

Measurement Index	Day Time (07:00 to 23:00)	Night Time (23:00 to 07:00)
Position 1	L _{Aeq} , 16 hour 63dB	L _{Aeq} , 8 hours 58 dB.

8.1.3 External Façade Levels

A 3D-Noise map was created using the continuous background noise measurements and spot measurements taken around site to determine the free-field façade noise levels that are likely to impact on the residential façade.

Measurement Index	Day Time (07:00 to 23:00)	Night Time (23:00 to 07:00)
Average Levels (BS8233:2014)	L _{Aeq,ff} 16 hour 66 dB	L _{Aeq,ff} 8 hour 58 dB

8.1.4 Mitigation Measures

It has been recommended that in order to meet the criterion defined within British Standard 8233: 2014 consideration be given to the following mitigation measures.

Mitigation measures	Maximum Free Field Levels Impacting on a Residential Facade
Glazing	Standard Glazing (6– 12 – 8)
Trickle Vents	MVHR System
Upper Floor Ceiling	2 Layers of 15mm Soundbloc Plasterboard

8.2 Conclusions

8.2.1 British Standard 8233: 2014

The assessments undertaken in accordance with British Standard 8233:2014 indicate that if the proposed mitigation measures are adhered to then the required internal noise levels and external amenity noise levels will be met.

8.2.2 National Planning Policy Framework

The assessments indicate that the existing noise sources will not have a significant adverse impact on the internal or external living conditions of the residents of the proposed residential dwelling. It would therefore be recommended that planning permission is discharged in accordance with paragraph 14 of the National Planning Policy Framework as the benefits of the development are likely to outweigh any significant adverse impact in terms of noise.

8.2.3 Vibration

It would be recommended that the vibration levels are below the following values to ensure there is no building damage and there is a low probability of future complaints from vibration.

- Day Time (07:00 to 23:00) $VDV_b 0.2 \text{ ms}^{-1.75}$
- Night Time (23:00 to 07:00) $VDV_b 0.2 \text{ ms}^{-1.75}$

8.2.4 Ventillation

For the purpose of ventilation, a MVHR System is to be incorporated into this scheme to eliminate the requirement to open all windows which should allow for the use of non-openable windows on the facades facing the railway line.

KR Associates (UK) Ltd

Quietly **confident...**

