AGAR GROVE

NOISE AND VIBRATION REPORT

DECEMBER 2013

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Agar Grove

Noise and Vibration Assessment

On behalf of **Camden Council**

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Executive Summary

Peter Brett Associates LLP (PBA) has been commissioned to undertake a noise and vibration assessment to support a planning application by the London Borough of Camden ("the applicant") for the redevelopment of the Agar Grove Estate in Camden.

The purpose of this report is to describe the existing noise climate at the proposed development site to determine its suitability for the residential development that is the subject of the current application, having regard to local planning policy and national guidance documents relating to environmental noise. Noise mitigation measures are recommended where necessary.

A meeting took place on 9 September 2013 with the Environmental Health team at Camden Council to agree the survey and assessment methodologies.

Noise surveys were undertaken between 29 and 30 August, on 25 September and on 4 October 2013 to determine the current climate at the site and validate the noise model.

Calculations were undertaken to determine the mitigation required to meet the BS 8233 good internal noise criteria.

The assessment demonstrates that all external noise levels would meet the council's limits. Noise levels at amenity spaces would meet the BS 8233 external noise levels of 55 dB.

With the advised glazing, the internal noise criteria would also be met.

The assessment also shows that the vibration levels on site would be well below the Council's limit.

It is therefore considered that the proposed development meets the policy requirements and the site is considered suitable for the proposed development.

1 Introduction

1.1 Context

1.1.1 Peter Brett Associates LLP (PBA) has been commissioned by Camden Council to undertake a noise and vibration assessment to support a planning application by the London Borough of Camden ("the applicant") for the redevelopment of the Agar Grove Estate in Camden.

1.1.2 This report assesses the current noise climate at the site and considers the suitability of the site for residential development in accordance with the National Planning Policy Framework (NPPF) and the Noise Policy Statement for England (NPSE).

1.2 Site Location and Development Description

1.2.1 Agar Grove Estate was constructed by the London Borough of Camden in the 1960s and comprises 249 residential units; two small retail units; and community facilities. The Estate consists of a series of low / medium rise blocks of flats and an 18 storey tower (Lulworth House) along with areas of open space and surface car-parking.

1.2.2 The site is centrally located in the Borough to the east of Camden town centre in a predominantly residential area which comprises a mix of period housing; post-war municipal estates; 20th century in-fill; and some remnants of light-industrial activity.

1.2.3 The Estate is bordered to the north by Agar Grove beyond which sits an area of mid-to-late 19th century high-quality terraces and villas focused around Camden Square.

1.2.4 To the east lies Camley Street which is occupied by low rise light-industrial units. Beyond Camley Street lies the mainline railway into St Pancras and then the 1960s Benson and Forsyth Maiden Lane Estate which is also undergoing refurbishment as part of the Council's estate programme. Further to the south-east is the Kings Cross development area.

1.2.5 To the south is the London Overground railway line beyond which sits a pocket of low rise late 20th century housing. To the west is a predominantly residential area heading back towards Camden town.

1.2.6 The Agar Estate Regeneration project forms part of Camden's 'Community Investment Programme' (CIP) which aims to generate investment, deliver new homes and regenerate neighbourhoods. A detailed description of the application proposals is provided in the Design and Access Statement which, in broad terms, comprises:

- Demolition of the existing low-rise blocks (with the exception of the children's centre) and comprehensive refurbishment of Lulworth House
- Creation of 493 new homes [net increase of 244 units] including a mix of social rent, shared-ownership and private units designed to meet current housing needs and space standards (including a single decant for the majority of existing tenants)
- Replacement community and retail facilities along with new small-scale business space; and
- Landscaped open and amenity spaces to support the development and contribute towards the creation of a high-quality environment.

1.3 Scope of Assessment

1.3.1 The purpose of this report is to describe the existing noise climate at the proposed development site to determine its suitability for the residential development that is the subject of the current application, having regard to local planning policy and national guidance documents relating to environmental noise. Noise mitigation measures are recommended where necessary.

1.3.2 Whilst every effort has been made to ensure that this report is easy to understand, it is technical in nature. To assist the reader, an introduction to noise and an explanation of the terminology used in this report is contained in **Appendix A**.

2 Legislation, Planning and Guidance

2.1 National Policy

The National Planning Policy Framework (NPPF)

2.1.1 The NPPF was published in March 2012. In respect of noise, the document states that:

"The planning system should contribute to and enhance the natural and local environment by … preventing both new and existing development from contributing to or being put at unacceptable risk from or being adversely affected by unacceptable levels of … noise pollution."

2.1.2 The NPPF goes on to advise that:

"Planning policies and decisions should aim to:

- *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;*
- *Recognise that development will often create some noise and existing business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- *Identify and protect areas of tranquility which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

2.1.3 The NPPF indicates that the Noise Policy Statement for England (NPSE) should be used to define the "significant adverse impacts". A summary of the NPSE is provided below, and it is understood that the DEFRA is currently undertaking research to quantify the "significant observed effect levels of noise", although no formal guidance on this has been published at the time of writing.

Noise Policy Statement for England (NPSE)

2.1.4 The Noise Policy Statement for England was published in March 2010. The document seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. It also sets out the long term vision of Government noise policy:

"to promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development"

2.1.5 The NPSE clarifies that noise should not be considered in isolation of the wider benefits of a scheme or development, and that the intention is to minimise noise and noise effects as far as is reasonably practicable having regard to the underlying principles of sustainable development.

2.2 Local Policy

2.2.1 Camden's Core Strategy sets out the key elements of the council's planning vision and strategy for the borough. It is the central part in the Local Development Framework.

2.2.2 Development Policy 28 states:

"The Council will only grant planning permission for development sensitive to noise in locations that experience noise pollution, and for development likely to generate noise pollution, if appropriate attenuation measures are taken, such as double-glazing. Planning permission will not be granted for development sensitive to noise in locations that have unacceptable levels of noise.

2.2.3 It also states:

"In assessing applications, we will have regard to the Noise and Vibration Thresholds, set out below."

Table A: Noise levels on residential sites adjoining railways and roads at and above which planning permission will not be granted:

Noise description and location of measurement	Period	Time	Sites adjoining railways	Sites adjoining roads
Noise at 1 metre external to a sensitive façade	Day	0700-1900	74 dB $L_{Aeq,12h}$	72 dB $L_{Aeq,12h}$
Noise at 1 metre external to a sensitive façade	Evening	1900-2300	74 dB $L_{Aeq,4h}$	72 dB $L_{Aeq,4h}$
Noise at 1 metre external to a sensitive façade	Night	2300-0700	66 dB $L_{Aeq,8h}$	66 dB $L_{Aeq,8h}$

Table B: Noise levels on residential streets adjoining railways and roads at and above which attenuation measures will be required:

Noise description and location of measurement	Period	Time	Sites adjoining railways	Sites adjoining roads
Noise at 1 metre external to a sensitive façade	Day	0700-1900	65 dB $L_{Aeq,12h}$	62 dB $L_{Aeq,12h}$
Noise at 1 metre external to a sensitive façade	Evening	1900-2300	60 dB $L_{Aeq,4h}$	57 dB $L_{Aeq,4h}$
Noise at 1 metre external to a sensitive façade	Night	2300-0700	55 dB $L_{Aeq,8h}$	52 dB $L_{Aeq,8h}$
Individual noise events several times an hour	Night	2300-0700	>82 dB L_{Amax} (S time weighting)	>82 dB L_{Amax} (S time weighting)

Table C: Vibration levels on residential sites adjoining railways and roads at and above which planning permission will not be granted:

Noise description and location of measurement	Period	Time	Vibration levels
Vibration inside critical areas such as hospital operating theatre	Day, evening and night	0000-2400	0.1 VDV ms-1.75
Vibration inside dwellings	Day and Evening	0070-2300	0.2 to 0.4 VDV ms-1.75
Vibration inside dwellings	Night	2300-0700	0.13 VDV ms-1.75
Vibration inside offices	Day and Evening	0000-2400	0.4 VDV ms-1.75
Vibration inside workshops	Day and Evening	0000-2400	0.8 VDV ms-1.75

Where dwellings may be affected by ground-borne regenerated noise internally from, for example, railways or underground trains within tunnels, noise levels within the rooms should not be greater than 35 dB(A)max

2.3 Noise Guidance

British Standard 8233: 1999 Sound Insulation and Noise Reduction for Buildings – Code of Practice

2.3.1 British Standard 8233 sets out recommended indoor noise levels in habitable rooms for dwellings, such as living room and bedrooms, when they are unoccupied. These recommended levels are given in **Table 2.1**.

Table 2.1: Recommended Internal Ambient Noise Levels

Criterion	Typical Situation	Design Range $L_{Aeq.T}$ dB	
		Good	Reasonable
Reasonable resting/sleeping conditions	Living rooms	30	40
	Bedrooms[1]	30	35
[1] For a reasonable standard in bedrooms at night, individual noise events (measured with F time-weighting) should not normally exceed 45 dB L_{Amax}.			

2.3.2 BS 8233 also recommends design criteria for intrusive external noise. In gardens and balconies it is desirable that the steady noise level does not exceed 50 dB LAeq,T and 55 dB LAeq,T should be regarded as the upper limit.

2.3.3 This standard has been included to assess the proposed residential elements of the development.

World Health Organisation – Guidelines for Community Noise, 1999

2.3.4 This document is a review of the medical and scientific knowledge on health impacts of community noise, and provides guidance to health authorities and professionals dealing with the effect of noise in non-industrial environments.

2.3.5 It presents, in Table 1, the guideline values for community noise in specific environments. In dwellings, the effect of noise is typically sleep disturbance, annoyance and speech interference.

2.3.6 It identifies that to protect the majority of the people from being seriously annoyed during the daytime, the outdoor noise level from steady, continuous noise should not exceed 55 dB L_{Aeq} on balconies, terraces and outdoor living areas. To protect people from being moderately annoyed during daytime, the noise level should not exceed 50 dB L_{Aeq}.

Calculation of Road Traffic Noise (CRTN): 1998

2.3.7 CRTN is a Department for Transport (DfT) memorandum that describes the procedure to calculate the road traffic noise at a given receptor location.

2.3.8 Section III (The Measurement Method) describes the shortened measurement procedure to be undertaken within 3 consecutive hours between 10.00 and 17.00hrs. A formula is presented to calculate the noise level in dB $L_{A10,18h}$ based on these measurements.

Method for Converting the UK Road Traffic Noise Index $L_{A10,18h}$ to the EU Noise Indices for Road Noise Mapping: 2006

2.3.9 This report was prepared by the Transport Research Laboratory and Casella Stanger on behalf of the Department for Environment, Food and Rural Affairs (Defra) in January 2006.

2.3.10 It presents a methodology to convert the noise index for traffic noise derived from CRTN, $L_{A10,18h}$, into the noise indicators required by the Environmental Noise Directive (EU Noise Indices) L_{den} and L_{night}. For road traffic noise, supplementary noise indicators are also presented $L_{Aeq,12h}$ (07:00-19:00), known as L_{day}, $L_{Aeq,4h}$ (19:00-23:00), known as $L_{evening}$ and $L_{Aeq,16h}$ (07:00-23:00).

British Standard 7445: 2003 Description and measurement of environment noise – Part 1: Guide to quantities and procedures

2.3.11 BS 7445-1 describes methods and procedures for measuring noise from all sources which contribute to the total noise climate of a community environment, individually and in combination. The results are expressed as equivalent continuous A-weighted sound pressure levels, $L_{Aeq,T}$.

2.3.12 BS 7445-1 states that sound level meters that are used should conform to Type 1 (or Type 2 as a minimum) as described in BS EN 61672:2003 Electroacoustics. Sound Level Meters should be calibrated according to the instructions of the manufacturer and field calibration should be undertaken at least before and after each series of measurements.

3 Methodology

3.1 Consultation

3.1.1 A meeting took place on 9 September 2013 with Mario Houska and Helen Materson of the Environmental Health team at Camden Council to agree the survey and assessment methodologies. A summary of the agreed approach is presented below:

- The assessment will be based on a noise model.
- Baseline noise monitoring will be undertaken to establish existing noise levels at the site. The results of this monitoring will be incorporated within the noise modelling and subsequent assessment.
- Noise measurements need to cover both nearby railway lines and the nearby road.
- Noise modelling will be carried out using the computer software SoundPLAN v7.2. The model will be validated using the baseline measurements taken.
- Vibration monitoring will be undertaken by the London Overground line to assess vibration levels on site.
- Assessment to be based on BS 8233:1999 and WHO guidance.

3.2 Noise Survey

3.2.1 Noise surveys were undertaken between 29 and 30 August, on 25 September and on 4 October 2013 to determine the current climate at the site and validate the noise model.

3.2.2 Long term noise and vibration measurements were taken on the south boundary of the site by the overground railway for 24 hours between 29 and 30 August 2013.

3.2.3 Short term noise measurements were taken on the east boundary of the site on the same days to measure the noise from the main railway.

3.2.4 A 3 hr CRTN measurement was taken along Agar Grove to the north of the site to measure the road traffic noise.

3.2.5 Short term measurements were also taken on the roof of Lulworth Tower on 25 September to determine the general noise climate at that level.

3.2.6 The noise survey locations are described in **Table 3.1** and presented in **Figure 1**.

Table 3.1: Survey Locations Description

Location	Description	Measurement Period
1	Located on the southern site boundary by the overground railway line. The microphone was mounted on a pole 5 m from the local ground level to be close to track level. Main source of noise affecting this location was railway noise.	24 hours
2	Located on the eastern site boundary by the main railway line. Main sources of noise affecting this location were railway noise and noise from workshops/ garages.	3 hours

3	Located on the northern boundary along Agar Grove. A 3 hr CRTN was undertaken 9 m from the road. The main source of noise was road traffic.	3 hours
4	Located on the roof of Lulworth tower. Main sources of noise affecting this location were construction noise from nearby sites, activity noise from cement works and railway noise.	3 hours

3.2.7 Weather conditions remained warm, sunny and dry. The temperature during all survey periods was around 20 ^{o}C during the daytime with maximum wind speeds of 0.5 m/s. The weather conditions were considered acceptable for the noise surveys.

Instrumentation

3.2.8 Type 1 sound level meters were used for the survey. The meter used for the long term measurements by the overground railway to the south was mounted at 5 m from the local ground level to have it level with the track. Others were mounted at 1.5 m above local ground. All were at a minimum of 3 m from any reflective surface.

3.2.9 The noise instrumentation has valid laboratory certification, which is available upon request. Field calibrations were performed before and after the measurements with no significant fluctuation recorded. The instrumentation used in the noise monitoring is listed in **Table 3.2**.

Table 3.2: Noise Instrumentation used in the Survey

Item	Type	Manufacturer	Serial Number	Laboratory Calibration Date
Sound Calibrator	4231	Bruel & Kjaer	2619373	21/01/2013
Hand-Held Analyzer	2250	Bruel & Kjaer	2626230	20/01/2012
Hand-Held Analyzer	2250	Bruel & Kjaer	2626231	20/01/2012
Prepolarized free-field ½ " Microphone	4189	Bruel & Kjaer	2621208	20/01/2012
Prepolarized free-field ½ " Microphone	4189	Bruel & Kjaer	2621209	20/01/2012

3.3 Vibration Survey

3.3.1 A vibration survey was undertaken on the south boundary of the site by the overground railway for 24 hours between 29 and 30 August 2013 to assess the levels of vibration caused by the nearby London Overground Line. The vibration meter was mounted on a DIN plate placed on hard ground about 10 m from the railway line in the Children's Centre playground.

3.3.2 The vibration survey location is presented as Location 1 in **Figure 1**.

Instrumentation

3.3.3 **Table 3.3** provides the details of the equipment used for the survey.

Table 3.3: Noise Instrumentation used in the Survey

Item	Type	Manufacturer	Serial Number	Laboratory Calibration Date
Vibration Meter	VM-54	Rion	00750083	20/03/2013
Tri-axial Accelerometer	PV-83CW	Rion	41287	20/03/2013

3.3.4 The vibration instrumentation has valid laboratory certification, which is available upon request.

3.4 Assumptions/Limitations

Railway Characteristics

3.4.1 It is considered that the railway traffic on both the London Overground line and Midland mainline was representative of a typical day.

Road Traffic Characteristics

3.4.2 It is considered that the road traffic on nearby roads was representative of a typical traffic flow for the area and there were no abnormal incidents or roadworks nearby which may have affected the flows.

3.5 Noise Model

3.5.1 The noise survey results established the noise climate of the site at the specific time and locations of the survey. A noise model was prepared to complement the baseline studies and to predict the likely noise impact arising from the operation of the proposed development. The noise model was also used to determine any areas that require mitigation and to test and demonstrate the efficacy of any proposed mitigation measures.

3.5.2 Noise modelling has been undertaken using SoundPLAN v7.2 and includes road traffic and railway traffic. The site topography and existing buildings have been included within the model and so corrections for these factors are included within the calculations.

3.5.3 The following scenarios have been modelled:

- Baseline 2013;
- Year of completion with Proposed Development;

3.5.4 Discussions were undertaken with road traffic and railway expert to determine the impact of the flows on the proposed development.

3.5.5 The worst case future road and railway traffic flows were used for the ‘with proposed development’ scenario, taking into account the increase in traffic on both the roads and the railway lines.

3.5.6 The model has been setup having regard to the masterplan drawing 131107_ROL_Masterplan and to the elevation drawings 1423_DWG_PlotA_00_250-251 and 1423_DWG_PlotB_00_250-251.

3.5.7 Noise levels measured during the survey have been used to validate the baseline model.

3.6 Mitigation

3.6.1 The acoustic performance required for the glazing of habitable rooms for the proposed residential units, has been calculated. The mitigation advice is based on the worst affected floor of each façade.

4 Baseline

4.1 Noise Survey Results

4.1.1 A summary of the noise survey results is presented in **Table 4.1 – 4.2**. A complete set of results is presented in **Appendix B**.

Table 4.1: Summary of Long Term Measurements

Location	Period	Duration, T (hh:mm)	$L_{Aeq,T}$ dB	$L_{AFmax,T}$ dB	$L_{ASmax,T}$ dB	$L_{A90,T}$ dB
Location 1 –London Overground Line	Day	11:45	53.5	79.9	77.5	43.4
	Evening	04:00	55.7	83.3	81.7	40.6
	Night	08:00	53.9	78.7	78.0	35.9

Table 4.2: Summary of Short Term Measurements

Location	Start Time	Duration, T (hh:mm)	$L_{Aeq,T}$ dB	$L_{A90,T}$ dB	$L_{A10,T}$ dB
Location 2 - Midland Mainline	29/08/2013 13:56	02:00	57.4	46.1	58.4
	30/08/2013 11:29	01:13	56.3	46.9	56.9
Location 3 – CRTN Agar Grove	04/10/2013 10:18:20	3:00:00	63.6	52.4	66.7
Location 4 – Lulworth tower	25/09/2013 12:23	3:05	56.2	53.2	58.6

4.2 Vibration Survey Results

4.2.1 A summary of the vibration results is presented in **Table 4.3**. A complete set of results is presented in **Appendix B**.

Table 4.3: Summary of Vibration Measurements

Period	Duration	VDV,d X-axis in $m.s^{-1.75}$	VDV,d Y-axis in $m.s^{-1.75}$	VDV,b Z-axis in $m.s^{-1.75}$
Day	16 hrs	0.0034	0.0036	0.0074
Night	8 hrs	0.0026	0.0027	0.0056

5 Analysis

5.1 CRTN

5.1.1 Road traffic noise measured during the day at Location 3 was processed using CRTN. 1 dB has been subtracted from the arithmetic average of the three consecutive LA10,1hr measurements at these locations to provide the LA10,18hr.

5.1.2 The $L_{Aeq,16hr}$ and the $L_{Aeq,8hr}$ have been calculated using the $L_{A10,18hr}$ and the *Method for Converting the UK Road Traffic Noise Index $L_{A10,18hr}$ to the EU Noise Indices for Road Noise Mapping*, Defra: January 2006. This document provides equations to convert between the two noise parameters for both motorway and non-motorway roads. This assessment has used the formulae associated with non-motorway roads.

5.1.3 The daytime $L_{Aeq,16h}$ and night-time $L_{Aeq,8h}$ for Location 3, calculated using CRTN, are presented in **Table 5.1**.

Table 5.1: Location 3 – Calculated Daytime and Night-time Noise Levels

Location	Duration, T	Calculated $L_{Aeq,T}$ (dB)
Location 3	16 hours	64
	8 hours	56

5.2 External Noise Levels

5.2.1 The noise model has been used to calculate the external noise levels at all floors of all facades of the proposed development. The results are shown in **Figure 3** and **4**.

5.2.2 The levels have been used to assess the current noise climate at the site and compare it with the Camden Council's limits described in **Paragraph 2.2.3**.

5.2.3 Noise levels at ground level on parts of the site facing noise sources are shown in **Table 5.2**.

Table 5.2: External Noise Levels

Location	Noise Level at Ground Level Daytime, $L_{Aeq,16h}$ in dBA	Noise Level at Ground Level Night-time, $L_{Aeq,8h}$ in dBA
North of site – facing Agar Grove	Up to 66	Up to 58
East of site – facing the Midlands Mainline railway	Up to 62	Up to 54
South of site – facing the London Overground Line railway	Up to 58	Up to 56

5.2.4 All noise levels around the site are below the limits set out in Table A of Camden's DP28, 'Noise levels on residential streets adjoining railways and roads at which planning permission will not be granted'.

5.3 Vibration Levels

5.3.1 The external vibration levels measured during the survey along the London Overground Line have been compared with the Camden Council's limits described in **Paragraph 2.2.3**. All levels are below the limits set out in Table C, 'Vibration levels on residential sites adjoining railways and roads at which planning permission will not be granted'. This means no further mitigation will be needed on site in terms of vibration.

5.4 Internal Noise Levels

5.4.1 The noise model has been used to develop a mitigation strategy for the internal noise levels to comply with the good criteria in BS 8233:1999.

5.4.2 **Table 5.3 – 5.12** present the results of the break-in noise calculations for living rooms and bedrooms of the development. The tables present external noise levels at the worst affected floor of each façade of each building block and the Weighted Sound Reduction Index, R_w, needed to meet the internal noise levels from BS 8233. Mitigation is provided to meet both the L_{Aeq} levels during the day and the night and the L_{AMax} levels during the night. **Figure 2** presents the building blocks and façade mentioned in the tables.

Table 5.3: Façade Mitigation – Block A

Façade	Habitable Room	Period Assessed	External Façade Noise Levels, $L_{Aeq,T}$, dB	External Façade Noise Levels, L_{AMax}, dB	Glazing R_w to meet Internal Noise Levels, dB	Internal Noise Level achieved $L_{Aeq,T}$ dB
West	Living Room	Day	59	-	29	24
	Bedroom	Night	60	-	29	25
North	Living Room	Day	53	-	29	18
	Bedroom	Night	46	-	29	11
East	Living Room	Day	56	-	29	21
	Bedroom	Night	57	-	29	22
South	Living Room	Day	61	-	29	26
	Bedroom	Night	61	78	29	26; L_{AMax} = 43 dB

Table 5.4: Façade Mitigation – Block B

Façade	Habitable Room	Period Assessed	External Façade Noise Levels, $L_{Aeq,T}$, dB	External Façade Noise Levels, L_{AMax}, dB	Glazing R_w to meet Internal Noise Levels, dB	Internal Noise Level achieved $L_{Aeq,T}$ dB
West	Living Room	Day	58	-	29	23
	Bedroom	Night	58	-	29	23
North	Living Room	Day	65	-	29	30
	Bedroom	Night	55	-	29	20
East	Living Room	Day	66	-	30	30
	Bedroom	Night	59	-	29	24
South	Living Room	Day	59	-	29	24
	Bedroom	Night	60	78	29	25; L_{AMax} = 43 dB

Table 5.5: Façade Mitigation – Block CD

Façade	Habitable Room	Period Assessed	External Façade Noise Levels, $L_{Aeq,T}$, dB	Glazing R_w to meet Internal Noise Levels, dB	Internal Noise Level achieved $L_{Aeq,T}$ dB
West	Living Room	Day	53	29	18
	Bedroom	Night	47	29	12
North	Living Room	Day	58	29	23
	Bedroom	Night	47	29	12
East	Living Room	Day	59	29	24
	Bedroom	Night	52	29	17

Table 5.6: Façade Mitigation – Block E

Façade	Habitable Room	Period Assessed	External Façade Noise Levels, $L_{Aeq,T}$, dB	Glazing R_w to meet Internal Noise Levels, dB	Internal Noise Level achieved $L_{Aeq,T}$ dB
West	Living Room	Day	54	29	19
	Bedroom	Night	53	29	18
East	Living Room	Day	59	29	24
	Bedroom	Night	49	29	14

Table 5.7: Façade Mitigation – Block F

Façade	Habitable Room	Period Assessed	External Façade Noise Levels, $L_{Aeq,T}$, dB	Glazing R_w to meet Internal Noise Levels, dB	Internal Noise Level achieved $L_{Aeq,T}$ dB
North	Living Room	Day	45	29	23
	Bedroom	Night	40	29	14
South	Living Room	Day	49	29	23
	Bedroom	Night	46	29	20

Table 5.8: Façade Mitigation – Block G

Façade	Habitable Room	Period Assessed	External Façade Noise Levels, $L_{Aeq,T}$, dB	Glazing R_w to meet Internal Noise Levels, dB	Internal Noise Level achieved $L_{Aeq,T}$ dB
West	Living Room	Day	59	32	30
	Bedroom	Night	53	29	27
North	Living Room	Day	67	41	30
	Bedroom	Night	59	36	30
East	Living Room	Day	52	29	26
	Bedroom	Night	46	29	20

Table 5.9: Façade Mitigation – Block H

Façade	Habitable Room	Period Assessed	External Façade Noise Levels, $L_{Aeq,T}$, dB	Glazing R_w to meet Internal Noise Levels, dB	Internal Noise Level achieved $L_{Aeq,T}$ dB
West	Living Room	Day	60	33	30
	Bedroom	Night	52	29	26
North	Living Room	Day	67	40	30
	Bedroom	Night	59	36	30
East	Living Room	Day	59	32	30
	Bedroom	Night	51	29	25
South	Living Room	Day	47	29	21
	Bedroom	Night	43	29	17

Table 5.10: Façade Mitigation – Block I

Façade	Habitable Room	Period Assessed	External Façade Noise Levels, $L_{Aeq,T}$, dB	Glazing R_w to meet Internal Noise Levels, dB	Internal Noise Level achieved $L_{Aeq,T}$ dB
West	Living Room	Day	52	29	26
	Bedroom	Night	44	29	18
North	Living Room	Day	69	42	30
	Bedroom	Night	61	36	30
East	Living Room	Day	51	29	25
	Bedroom	Night	46	29	20

Table 5.11: Façade Mitigation – Block JKL

Façade	Habitable Room	Period Assessed	External Façade Noise Levels, $L_{Aeq,T}$, dB	Glazing R_w to meet Internal Noise Levels, dB	Internal Noise Level achieved $L_{Aeq,T}$ dB
West	Living Room	Day	62	35	30
	Bedroom	Night	54	29	28
North	Living Room	Day	68	41	30
	Bedroom	Night	60	35	30
East	Living Room	Day	60	33	30
	Bedroom	Night	50	29	24
South	Living Room	Day	50	29	24
	Bedroom	Night	48	29	22

Table 5.12: Façade Mitigation – Lulworth Tower

Façade	Habitable Room	Period Assessed	External Façade Noise Levels, $L_{Aeq,T}$, dB	Glazing R_w to meet Internal Noise Levels, dB	Internal Noise Level achieved $L_{Aeq,T}$ dB
West	Living Room	Day	55	29	29
	Bedroom	Night	52	29	26
East	Living Room	Day	61	36	30
	Bedroom	Night	54	29	28

5.5 Railway maintenance and future changes

Railway maintenance

5.5.1 Modern track maintenance work is highly mechanised in order to produce a maximum of output in a minimum time. This keeps the period of disruption to regular traffic on each occasion to the shortest possible amount - and keeps the number of actual occasions to a minimum too.

5.5.2 It is unlikely that major work will be required on the two railway lines for some time. Routine, pre-planned engineering work does and will continue to take place near Agar Grove, on both lines, where rails need to be replaced every few years and the ballast needs to be cleaned, partly renewed and repacked every few years.

5.5.3 Maintenance works are temporary and periodic in nature and subject to their own noise management protocols to minimise disruption. The impact of maintenance on the dwellings in these locations will be no different to the occasional effect of maintenance of roads, rail and

underground tracks near to dwellings throughout London and does not therefore warrant special consideration.

Future changes

5.5.4 At present, the HS2 promoters plan to route trains past the Agar Grove site - using the existing tracks of the London Overground Line and an existing single-track connection from it. They also have plans to use the land along the Midlands Mainline as a depot site. Different proposals are currently being discussed however, it is very hard to know which option is most likely to become reality, and even if HS1 - HS2 link trains do pass the Agar Grove site, some time around 2026 then how many will do so per day and of what type they will be.

5.5.5 It is therefore currently impossible to assess if and how the site will be affected by HS2 and it is a matter for the Environmental Statements supporting the planning applications for these options to identify potential adverse effects and prescribe appropriate mitigation to address them adequately, particularly as the application site is currently in residential use.

6 Mitigation

6.1 External Noise Levels

6.1.1 Most gardens and external amenity areas are located to the rear of the building blocks and will be shielded from the three main sources of noise. Other amenity spaces are located along the Overground railway line. The modelling shows that all levels will be below the 55 dB criteria mentioned in BS 8233. Therefore no additional mitigation will be required.

6.2 Internal Noise Levels

6.2.1 Glazing with a Weighted Sound Reduction Index which meets the minimum 42 dB R_W set in **Tables 5.3 to 5.12** would ensure the good criteria in BS 8233 are met.

6.2.2 Triple glazing will be used which is likely to meet the glazing specifications of 42 dB R_W.

6.2.3 The calculated internal noise levels achieved have been based on the windows being closed. Opening windows will be used to allow for purge ventilation. The background ventilation will be supplied through mechanical ventilation.

7 Conclusion

7.1.1 Peter Brett Associates LLP (PBA) has been commissioned to undertake a noise and vibration assessment to support a planning application by the London Borough of Camden ("the applicant") for the redevelopment of the Agar Grove Estate in Camden.

7.1.2 Noise surveys were undertaken between 29 and 30 August, on 25 September and on 4 October 2013 to determine the current climate at the site and validate the noise model.

7.1.3 A vibration survey was undertaken between 29 and 30 August 2013.

7.1.4 The levels measured during the surveys at the different locations have been used to create a noise model and assess the current noise climate at the site and compare it with the Camden Council's limits.

7.1.5 All noise levels are below the limits set out in Camden noise criteria at which planning permission will not be granted during the day, the evening and the night-time.

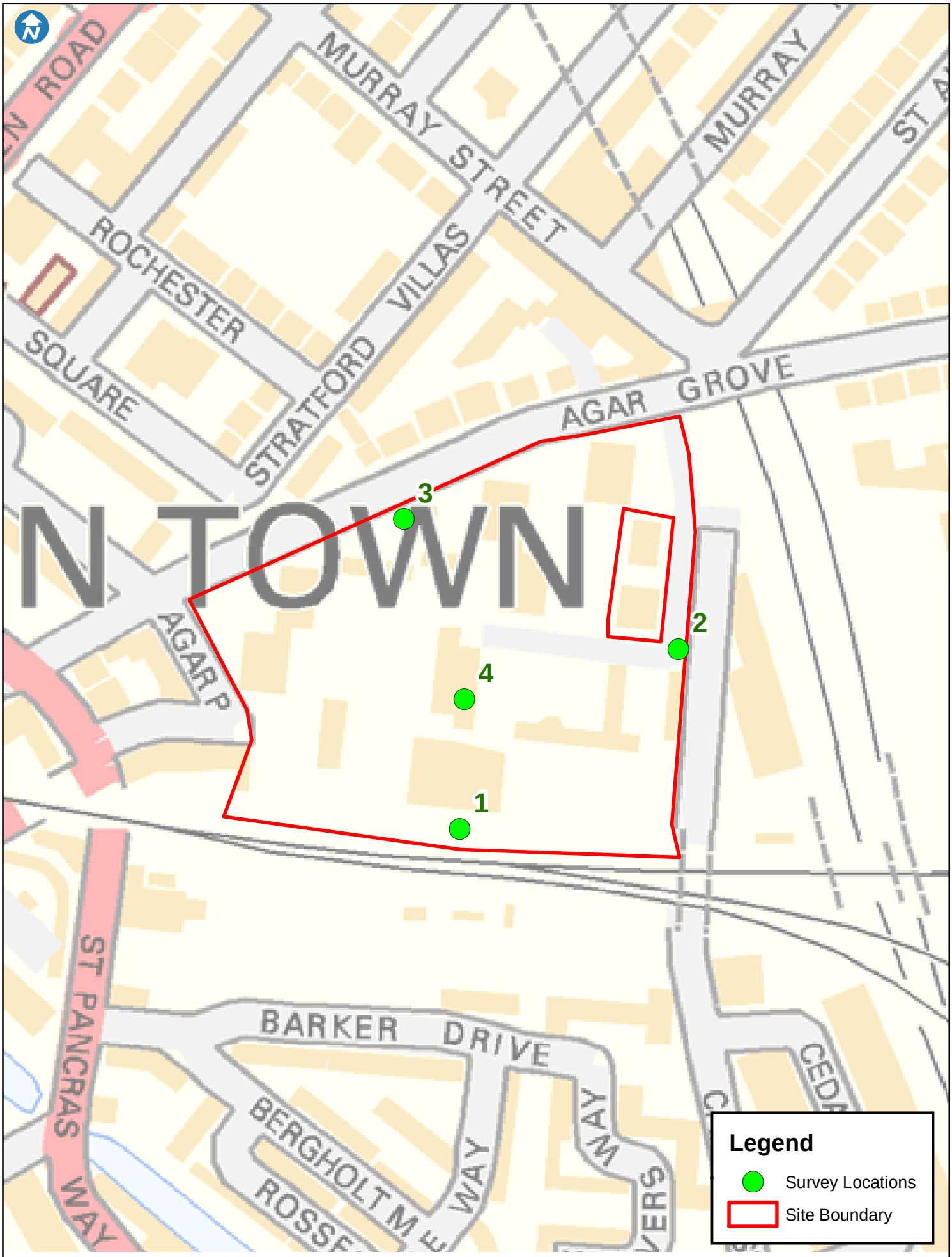
7.1.6 The external vibration levels measured during the survey along the London Overground line have been compared with the Camden Council's limits. All levels are below the limits set out in Camden vibration criteria at which planning permission will not be granted.

7.1.7 Based on the external noise levels calculated in the model, a mitigation strategy has been put in place to meet the good BS 8233 internal criteria. Glazing with a Weighted Sound Reduction Index which meets the minimum 42 dB R_W set in **Tables 5.3** to **5.12** would ensure the internal criteria are met.

7.1.8 Background ventilation will be provided through mechanical ventilation, although opening windows will still be provided to allow for purge ventilation.

7.1.9 It is considered that the proposed development meets the policy requirements and the site is considered suitable for the proposed development.

Figure 1: Survey Locations



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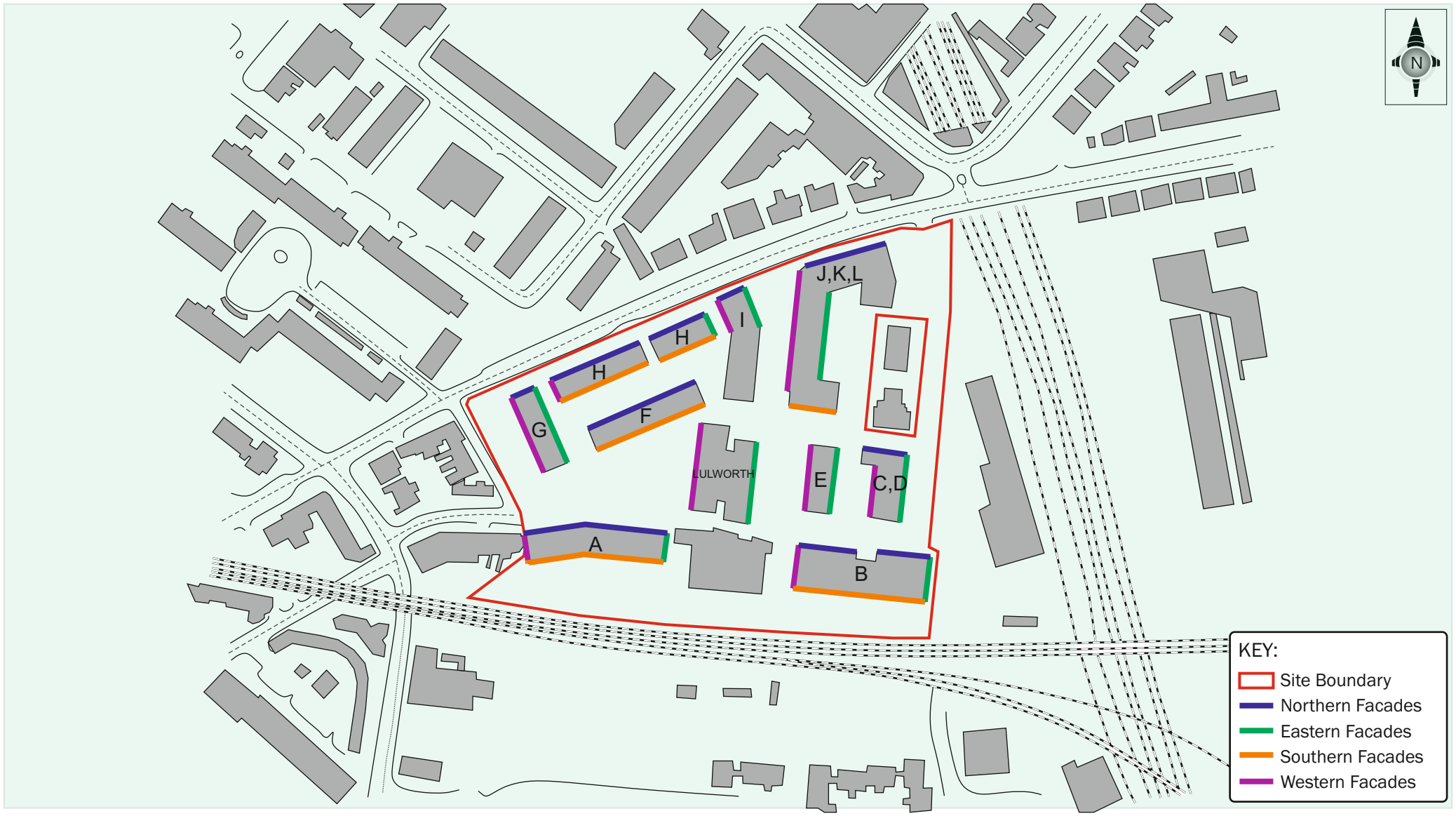
Client
Camden Council

Agar Grove, Camden

Noise Survey Locations

Date	30.09.2013
Scale	N.T.S.
Drawn By	ZB
Checked By	GT
Figure Number	**Figure 1**

Figure 2: Façade Description



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Agar Grove, Camden

Facade Descriptions

Date	15.11.2013
Scale	NTS
Drawn by	ZR
Checked by	GT
Revision	-

FIGURE 2

Figure 3: Daytime Noise Contours

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Future Daytime $LA_{eq,16hr}$ Noise Contours at Ground Level

Date	15.11.2013
Scale	NTS
Drawn by	ZR
Checked by	GT
Revision	-

FIGURE 3

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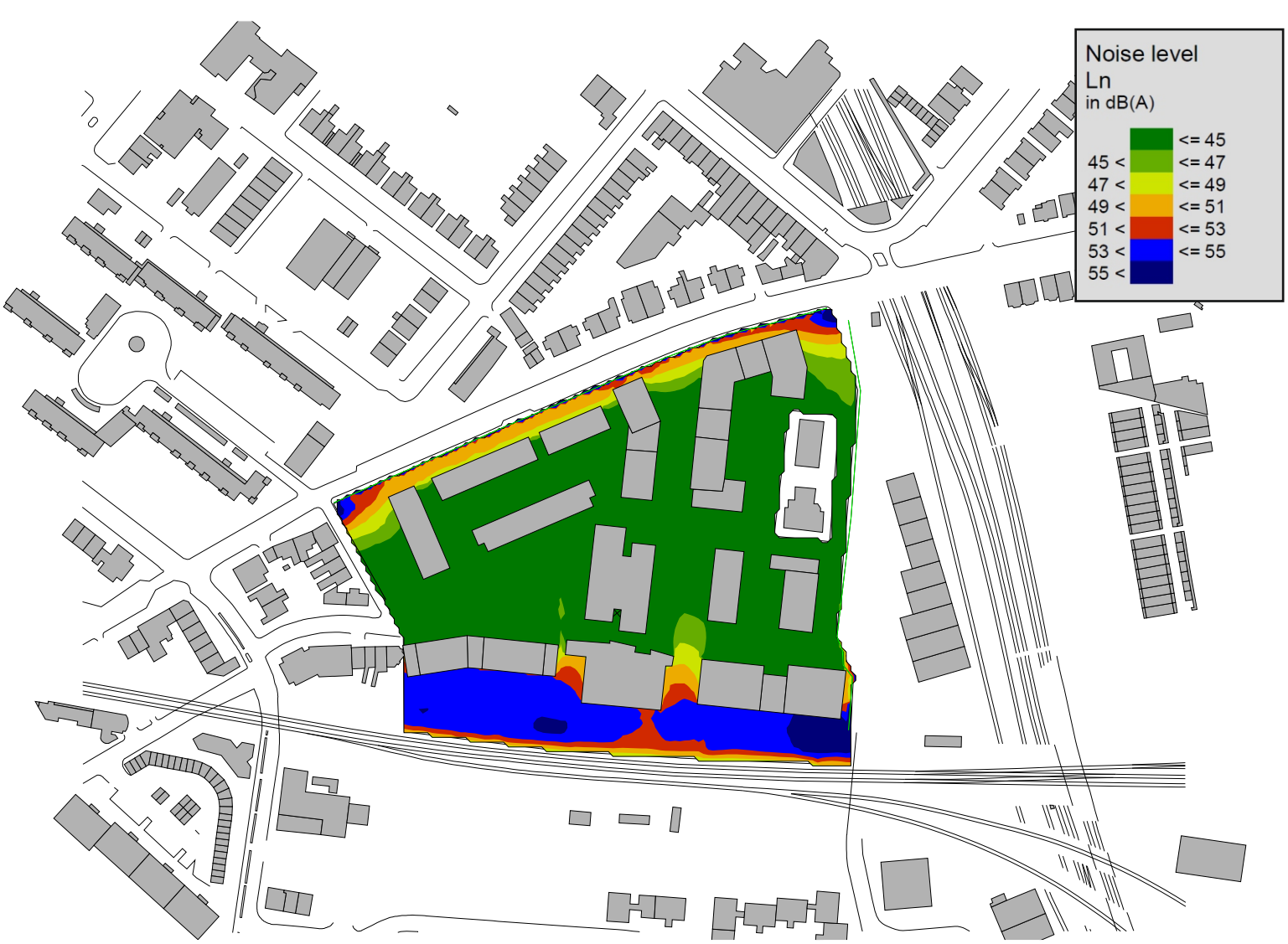
Figure 4: Night-time Noise Contours



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Future Night-time $LA_{eq,8hr}$ Noise Contours at Ground Level

Date	15.11.2013
Scale	NTS
Drawn by	ZR
Checked by	GT
Revision	-

FIGURE 4

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Appendix A Glossary of Acoustic Terminology

Decibel (dB)	A unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure levels the reference quantity is 20 uPa. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
$L_{A90,T}$	The A weighted noise level exceeded for 90% of the measurement period, T. ETSU-R-97 states that this descriptor should be used for both the background noise level and the wind farm noise.
$L_{A10,T}$	The A weighted noise level exceeded for 10% of the measurement period, T.
$L_{Aeq,,T}$	The equivalent continuous sound level – the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). $L_{Aeq,\ T}$ is used to describe many noises and can be measured directly with an integrating sound level meter.
Weighted sound reduction index R_w	Single number quantity which characterizes the airborne sound insulating properties of a material or building element over a range of frequencies.

Appendix B Survey Results

Table B.1: Noise Survey Results at Location 1

Start time	Duration	LAeq [dB]	LAFmax [dB]	LASmax [dB]	LA10 [dB]	LA90 [dB]
30/08/2013 07:00:00	1:00:00	50	70.1	67	50.7	41.8
30/08/2013 08:00:00	1:00:00	52.8	75	73.9	52.5	43.3
30/08/2013 09:00:00	1:00:00	50.5	68.3	66.1	51.5	43.3
30/08/2013 10:00:00	1:00:00	55.9	78.3	77.5	55.8	43.9
30/08/2013 11:00:00	1:00:00	54.1	73.9	72.5	56.5	44.4
30/08/2013 12:00:00	1:00:00	55.2	73.7	72.7	58.6	45.2
30/08/2013 13:00:00	0:44:48	57	79.9	75	59.5	43.7
29/08/2013 14:00:00	1:00:00	53.6	73.5	71.1	55	43.6
29/08/2013 15:00:00	1:00:00	52.8	74	71.3	53.3	43.8
29/08/2013 16:00:00	1:00:00	52.5	70.3	68	52.6	43.7
29/08/2013 17:00:00	1:00:00	51.5	68.2	66.1	53.4	44
29/08/2013 18:00:00	1:00:00	51.6	73.9	68.9	53.8	43.1
29/08/2013 19:00:00	1:00:00	53.4	74.6	72.8	55.8	43.4
29/08/2013 20:00:00	1:00:00	56.4	80.8	78.5	59	40.4
29/08/2013 21:00:00	1:00:00	56.7	83.3	81.7	57	41
29/08/2013 22:00:00	1:00:00	55.5	72.6	70.7	59.1	39.8
29/08/2013 23:00:00	1:00:00	54.1	73.2	71.8	53.3	38.9
30/08/2013	1:00:00	53.6	73.7	72.7	46.3	37.1

Start time	Duration	LAeq [dB]	LAFmax [dB]	LASmax [dB]	LA10 [dB]	LA90 [dB]
00:00:00						
30/08/2013 01:00:00	1:00:00	54.7	73.9	72.7	44.8	35.5
30/08/2013 02:00:00	1:00:00	52.2	76.8	76.2	38.9	35.3
30/08/2013 03:00:00	1:00:00	50.3	69.5	67.6	41	35.4
30/08/2013 04:00:00	1:00:00	57.7	78.7	78	58.2	36.9
30/08/2013 05:00:00	1:00:00	48.7	68.2	66.9	47.5	37.5
30/08/2013 06:00:00	1:00:00	54.1	77	75.5	55	40.1

Table B.2: Noise Survey Results at Location 2

Start time	Duration	LAeq [dB]	LAFmax [dB]	LA10 [dB]	LA90 [dB]
29/08/2013 13:56	02:00:00	57.4	85	58.4	46.1
30/08/2013 10:15	01:13:53	56.3	88	56.9	46.9

Table B.3: Noise Survey Results at Location 3

Start time	Duration	LAeq [dB]	LAFmax [dB]	LA10 [dB]	LA90 [dB]
04/10/2013 10:18:20	1:00:00	63.8	83.9	53.4	66.9
04/10/2013 11:18:20	1:00:00	63.3	85.4	52.3	66.6
04/10/2013 12:18:20	1:00:00	63.8	90.9	51.8	66.5

Table B.4: Noise Survey Results at Location 4

Start time	Duration	LAeq [dB]	LAFmax [dB]	LA10 [dB]	LA90 [dB]
25/09/2013 12:23:15	3:05:12	56.2	71.2	58.6	53.2

Table B.5: Vibration Survey Results at Location 1

Period	Duration	$VDV_{,d}$ X-axis in $m \cdot s^{-1.75}$	$VDV_{,d}$ Y-axis in $m \cdot s^{-1.75}$	$VDV_{,b}$ Z-axis in $m \cdot s^{-1.75}$
Day	16 hrs	0.0034	0.0036	0.0074
Night	8 hrs	0.0026	0.0027	0.0056