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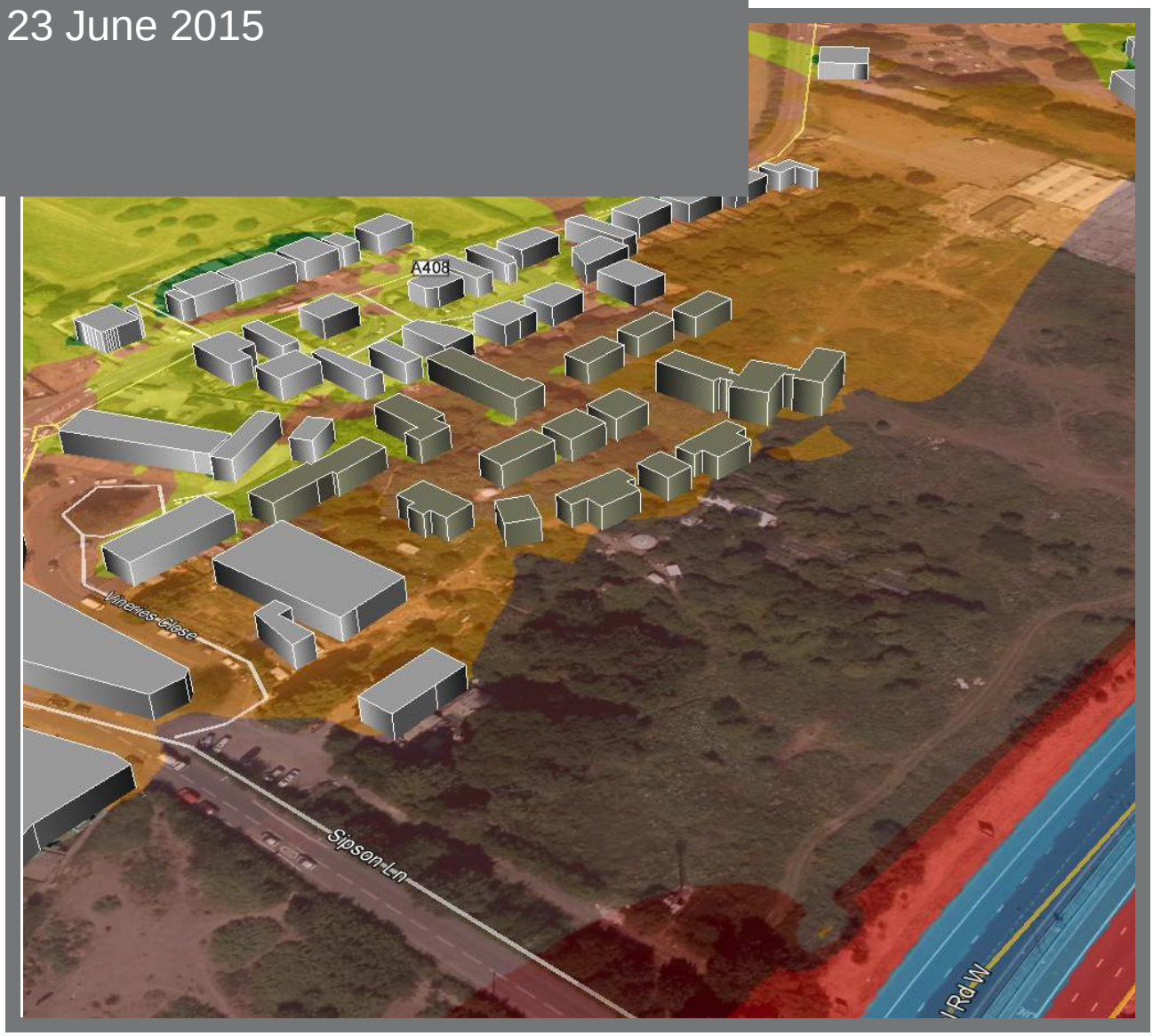
Sipson Garden Centre

Noise Impact Assessment - Option A
23 June 2015



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1. Introduction

A residential development is proposed on land formerly in use as Sipson Garden Centre, Heathrow.

This report has been prepared to assess the existing noise environment at the proposed development site and appraise the implications for the proposed development.

Existing noise levels which affect the site have been quantified though a noise measurement survey which has subsequently been used to predict the noise levels at the proposed facades of the dwellings using environmental noise modelling software.

The results of the calculations have been compared to relevant national guidance, World Health Organisation recommendations and requirements discussed with the London Borough of Hillingdon (LBH) Environmental Protection Department. Recommendations for typical mitigation measures which may be required to achieve an acceptable internal noise climate are provided.

The site location is close to London Heathrow Airport and the M4, A408 and M4 spur. These are the principle noise sources that affect the development. The future expansion of the Airport is also currently a possibly and the noise effects of the potential development have been considered in this assessment.

A glossary of acoustic terms can be found in Appendix A.

1.1 Site description

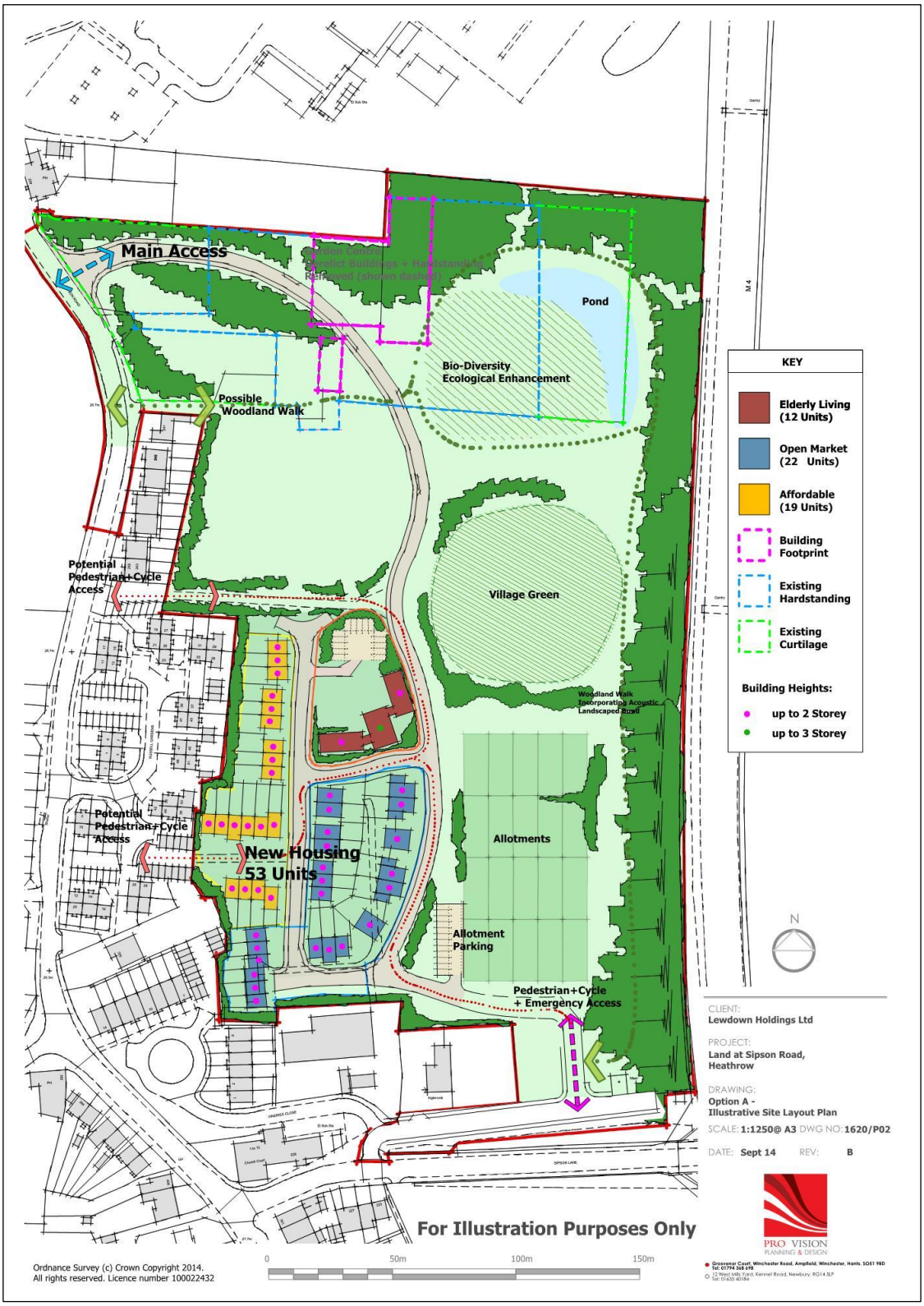
The site is to be located on the former Heathrow Garden Centre and is accessed from the A408. The site is bounded to the east by the M4 spur, Tunnel Road, to the north by the Holiday Inn Hotel Heathrow, with the M4 running east to west approximately 250 metres north of the site (see Figure 1). To the west and south, the site is bounded by housing lining Sipson Road, Sipson Lane, Russell Gardens and Vineries Close. Heathrow Airport is situated approximately 1 km south of the site with the runways running east to west. Figure 1 illustrates the location of the proposed development area.

Proposals are to construct 53 new housing units on the site, including 12 Elderly Living units, with external garden areas, allotments and a bio-diversity area. There is a landscaped bund proposed along the eastern boundary with the M4 spur road. Figure 2 overleaf illustrates the development proposals.

Figure 1: Location of the proposed development

Source: OS Opendata

Figure 2: Layout of the proposed development



2. Assessment criteria

The following relevant guidance documents have been considered whilst undertaking this assessment.

2.1 National Policy Guidance

2.1.1 National Planning Policy Framework (2012)

The National Planning Policy Framework (NPPF) was introduced in March 2012. The document sets out the Government's planning policies for England and how these are expected to be applied. The NPPF provides for the production of distinctive local and neighbourhood plans by Councils, in consultation with local people, which should be developed to reflect the needs and priorities of their communities. The paragraphs from the NPPF relating to noise are set out below:

- Paragraph 109: 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 soil, air, water or noise pollution or land instability.
- Paragraph 123: 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 businesses wanting to develop in continuance of their 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 tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.
- Paragraph 143: In preparing Local Plans, local planning authorities should:
  - Set out environmental criteria, in line with the policies in this Framework, against which planning applications will be assessed so as to ensure that permitted operations do not have unacceptable adverse impacts on the natural and historic environment or human health, including from noise, dust, visual intrusion, traffic, tip- and quarry-slope stability, differential settlement of quarry backfill, mining subsidence, increased flood risk, impacts on the flow and quantity of surface and groundwater and migration of contamination from the site; and take into account the cumulative effects of multiple impacts from individual sites and/or a number of sites in a locality; and
  - When developing noise limits, recognise that some noisy short-term activities, which may otherwise be regarded as unacceptable, are unavoidable to facilitate minerals extraction.

Paragraph 144: When determining planning applications, local planning authorities should:

- Ensure that any unavoidable noise, dust and particle emissions and any blasting

vibrations are controlled, mitigated or removed at source, and establish appropriate noise limits for extraction in proximity to noise sensitive properties.

Applications for planning permission must be determined in accordance with the Development Plan (which includes any local plan or neighbourhood plans which have been adopted for the area), unless material considerations indicate otherwise. The NPPF must be taken into account in the preparation of local and neighbourhood plans, and is a material consideration in the determination of planning applications. Planning policies and decision must reflect, and where appropriate, promote relevant EU obligations and statutory requirements. The planning system is required to contribute to and enhance the natural and local environment.

Consequently, the aim is to prevent both new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by unacceptable levels of noise pollution or vibration.

Therefore planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse effects on health and quality of life as a result of new development;
- Mitigate and reduce to a minimum other adverse effects on quality of life arising from noise from new development (including through the use of conditions);
- Recognise that development will often create some noise, and balance the requirement to restrict the effects of the operational noise against the need for the development; and
- Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

2.1.2 Noise Policy Statement for England (NPSE)

This document was published by DEFRA in 2010 and states three policy aims:

> *"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*
>
> - *Avoid significant adverse impacts on health and quality of life;*
> - *Mitigate and minimise adverse impacts on health and quality of life; and*
> - *Where possible, contribute to the improvement of health and quality of life."*

The first two points require that significant adverse impact should not occur and that, where a noise level falls between a level which represents the lowest observable adverse effect and a level which represents a significant observed adverse effect:

> *"… all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur."*

2.1.3 Planning Policy Guidance Note 24 'Planning and Noise'

PPG24 provided guidance on planning and noise, and contained the criteria which were most widely used in the UK when determining the suitability of sites for development. In addition to introducing Noise Exposure Categories (NEC), PPG24 outlined the considerations to be taken into account in determining planning applications both for noise sensitive development and

for those activities that generate noise, and advised on the use of conditions to minimise the effect.

PPG24 guidance has been superseded by the NPPF. The NPPF makes general reference to noise and amenity but does not contain any methodology for the assessment of noise nor does its technical appendices. Therefore, the NPPF places impetus on the local authority to produce their local planning policy and make reference to guidance that should be followed. The PPG24 methodology remains a valid method when referenced in local planning policy for assessing noise effects from new developments.

PPG24 is referenced in the Hillingdon Local Development Framework Supplementary Planning Guidance (SPD) on Noise. It is therefore used in this assessment as it is widely understood and a reliable benchmark for residential developments. It contains Noise Exposure Categories (NECs) for the classification of residential development sites. The Noise Exposure Categories from PPG 24 are set out in Table 1 below.

Table 1: PPG 24 Noise Exposure Categories

Noise Source	Time period	Noise Exposure Category *(dB L_{Aeq})*			
		A	B	C	D
Road Traffic	(07:00-23:00 hrs)	<55	55-63	63-72	>72
	(23:00-07:00 hrs)*	<45	45-57	57-66	>66
Rail Traffic	(07:00-23:00 hrs)	<55	55-66	63-74	>74
	(23:00-07:00 hrs)*	<45	45-59	59-66	>66
Air Traffic	(07:00-23:00 hrs)	<57	57-66	66-72	>72
	(23:00-07:00 hrs)*	<48	48-57	57-66	>66
Mixed Sources	(07:00-23:00 hrs)	<55	55-63	63-72	>72
	(23:00-07:00 hrs)*	<45	45-57	57-66	>66

[* sites where noise events regularly exceed 82 dB L_{Amax} several times in any hour at night should be treated as being in Category C]

Category A: Noise need not be considered as a determining factor in granting planning permission

Category B: Noise should be taken into account and steps taken to ensure an adequate level of protection against noise

Category C: Planning permission should not normally be granted. Where development is permitted, steps should be taken to ensure a commensurate level of protection against noise

Category D: Planning permission should normally be refused.

2.2 Additional guidance documents

2.2.1 World Health Organisation - Guidelines for Community Noise

The WHO document *Guidelines for Community Noise*[1] recommends the following limits when assessed in or near to a dwelling:

Table 2: WHO guideline values for community noise in specific environments

Specific environment	Critical Health effect(s)	L_{Aeq} *(dB)*	Time base *(hours)*	L_{Amax} *(dB)*
Outdoor living areas	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	
Inside bedrooms	Sleep disturbance, night-time	30	8	45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

2.2.2 British Standard 8233: 2014

BS8233 provides guidance on internal ambient levels that should be achieved within different spaces, of dwellings for day and night-time. These largely agree with the noise levels recommended by the WHO above. An extract from BS8233 is provided in Table 3.

Table 3: BS8233:2014 – Indoor ambient noise levels for dwellings

Activity	Location	Day time *07:00 to 23:00*	Night-time *23:00 to 07:00*
Resting	Living room	35 dB $L_{Aeq,16h}$	-
Dining	Dining Room / area	40 dB $L_{Aeq,16h}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,8h}$

For traditional amenity areas such as gardens and patios, it is desirable that the external noise level does not exceed 50dB L_{Aeq}, with an upper guideline value of 55dB L_{Aeq} which would be acceptable in noisier environments. BS 8233:2014 also states that:

> *'it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited'*

2.3 Local Policy Guidance

The London Borough of Hillingdon's Local Development Framework Supplementary Planning Guidance Document (SPD) on Noise, and Policies OE3 and OE5 of the Hillingdon Local Plan,

[1] Berglund et al. (1999) - *Guidelines for Community Noise*. Geneva, World Health Organisation (WHO)

Part 2 are the most relevant Local Guidance applicable to this development. The SPD requires the assessment to consider the guidance in Planning Policy Guidance Note 24 *Planning and Noise* and provides noise criteria for various proposed uses.

A consultation was undertaken with Mr Muhammed Islam of the Environmental Protection Unit at London Borough of Hillingdon[2]. The following criteria were agreed as suitable for this development.

Description	Daytime *(07:00-23:00)*	Night time *(23:00-07:00)*	Source
Ambient noise level within bedrooms	≤ 35 dB $L_{Aeq,16h}$	≤ 30 dB $L_{Aeq,8h}$	BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings', Section 7.7.2 Hillingdon SPD *Noise*, Table 2
Maximum noise level within bedrooms	-	≤ 45 dB $L_{Amax,\ F}$	WHO Guidelines for Community Noise, Section 4.3.1 Hillingdon SPD *Noise*, Table 2
Ambient noise level for indoor living areas	≤ 35 dB $L_{Aeq,16h}$	-	BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings', Section 7.7.2 Hillingdon SPD *Noise*, Table 2
Ambient noise levels in outdoor living areas used for amenity space (e.g. gardens and patios)	≤ 50 dB $L_{Aeq,16h}$	-	Hillingdon SPD Noise, Table 2

It was also requested that the effects of the expansion of Heathrow Airport should be included in any noise assessments.

2.4 Criteria used within this assessment

2.4.1 External Noise Criteria

The external noise criteria from Hillingdon's SPD on Noise, Table 2, recommends an upper limit of 50 dB $L_{Aeq,16h}$ for outdoor living areas, although a compromise may be required due to the location of the site being close to the strategic transport network (M4) and London Heathrow Airport.

[2] Email correspondence: 30 October 2014

2.4.2 Internal Noise Criteria

Based on the consultation undertaken with LBH's Environmental Protection Department, the following table highlights the criteria used for this assessment:

Table 4: Internal Noise Criteria

Area	**Day time** *07:00 to 23:00 hours*	**Night-time** *23:00 to 07:00 hours*
Bedrooms	≤ 35 dB $L_{Aeq,16h}$	≤ 30 dB $L_{Aeq,8h}$ ≤ 45 dB $L_{Amax,\ F}$
Living Rooms / indoor living areas	≤ 35 dB $L_{Aeq,16h}$	-

3. Noise Survey

3.1 Survey Details

The existing levels of noise which affect the proposed development site were measured between the following periods:

- 13:00 hrs on 15 October and 02:00 hrs on 22 October 2014; and
- 18:00 hrs on 20 October and 19:30 hrs on 21 October 2014.

The noise measurement positions are illustrated in Figure 3 and described in Table 6. Appendix B details the full survey results. A summary of the measured noise levels is provided in Section 3.4.

Measurements were conducted using fully calibrated 'Type 1' equipment detailed in Table 5 and undertaken by members of the Institute of Acoustics. The calibration of the sound level meters was checked before and after the survey periods, with no significant change in sensitivity observed.

Table 5: Noise Survey Equipment

Item	Manufacturer	Model	Serial Number
Sound Level Meter (Position A)	Rion	NL-52	00821104
Sound Level Meter (Position 2, 15 Oct)	Rion	NL-52	00821130
Sound Level Meter (Positions 1-3, 24 Oct)	Rion	NL-52	00821129
Calibrator	Larson Davis	CAL200	3230

Intermittent periods of heavy wind were observed from 22:00 on 20 October to 02:00 on 22 October 2014; these periods have been omitted from our assessment. Weather conditions during the rest of the survey periods were cool and dry with a light breeze. We consider the conditions to be suitable to undertake reliable measurements, with the exception of those periods noted above.

The Heathrow Webtrak service shows that the predominant circulation pattern for the month of October comprised departures to the west and arrivals from the east. Supporting data can be found in Appendix E.

3.2 Description of noise climate

Noise levels across the site were mainly dominated by traffic on the M4 motorway spur running north-south (Tunnel Road East and Tunnel Road West), which borders the east of the site. The main M4 motorway and the M25 are further (north) from the site and screened by existing buildings including a large hotel. Traffic on these motorways could not be heard over traffic on the M4 spur.

Air traffic from Heathrow Airport was also regularly audible but did not dominate the overall noise climate.

It is considered that the average ambient noise levels (L_{Aeq}) affecting the site, are primarily influenced by road traffic noise, with intermittent peaks of noise (L_{Amax}) mostly generated from air traffic.

3.3 Measurement positions

Figure 3: Measurement positions

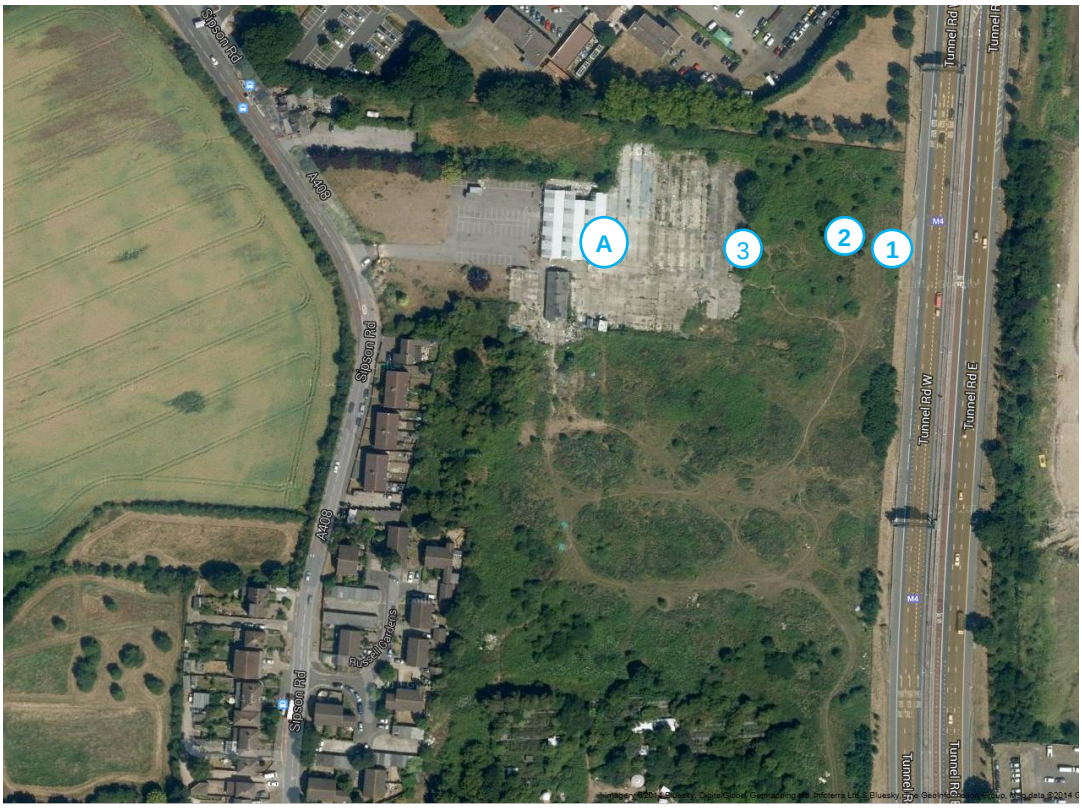


Table 6: Measurement positions

Position	Description
A	Mounted at outline of existing derelict garden centre, approximately 140 metres west of the closest lane of the M4 spur
1	At boundary fence, approximately 10 metres west of the M4 spur
2	On soft ground, approximately 20 metres west of the M4 spur
3	At edge of hardstanding, approximately 80 metres west of the M4 spur

3.4 Summary of measured noise levels

3.4.1 Long-term measurement position A

The following noise levels were measured, excluding periods of high winds.

Table 7: Summary of noise levels measured at Position A (in dB)

Date	Period	$L_{Aeq,T}$	L_{Amax}	$L_{A10,1h}$		$L_{A90,1h}$	
				Min	Max	Min	Max
Wed 15 Oct	Day (07:00-23:00)	62	72	62	65	58	62
Wed 15 Oct	Night (23:00-07:00)	59	79	51	67	47	52
Thu 16 Oct	Day (07:00-23:00)	60	85	59	63	56	60
Thu 16 Oct	Night (23:00-07:00)	57	78	54	63	46	60
Fri 17 Oct	Day (07:00-23:00)	62	85	61	65	57	61
Fri 17 Oct	Night (23:00-07:00)	59	77	55	64	47	59
Sat 18 Oct	Day (07:00-23:00)	62	77	61	65	57	61
Sat 18 Oct	Night (23:00-07:00)	55	71	51	63	45	59
Sun 19 Oct	Day (07:00-23:00)	61	76	60	65	57	60
Sun 19 Oct	Night (23:00-07:00)	55	69	52	60	47	56
Mon 20 Oct	Day (07:00-23:00)	59	74	59	62	56	58

Average daytime noise levels were measured between 59 dB and 62 dB $L_{Aeq,16h}$, with maxima of 72 dB to 85 dB L_{Amax}.

At night average noise levels reduced by 3-4 dB, with average ambient noise levels measured between 55 dB and 59 dB $L_{Aeq,8h}$. Maxima were measured of 69 dB to 79 dB L_{Amax} during the night-time periods.

3.4.2 Attended measurements

Table 8: Summary of attended noise measurements (in dB)

Position	Start time	End time	$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A90,T}$	$L_{A10,T}$
1	24 Oct 17:46	18:16	70	79	63	74
	24 Oct 18:59	19:14	74	82	69	77
2	15 Oct 13:19	13:29	69	76	66	71
	24 Oct 19:15	19:30	68	72	65	69
3	24 Oct 18:18	18:48	61	69	59	62

The attended measurements were taken at different distances from the M4. This assisted in verification of the noise model used to calculate the noise levels at the locations of the proposed dwellings (Section 4).

The average ambient noise levels (L_{Aeq}) at Positions 1 to 3 reduce with increasing distance from the primary noise source, the M4 spur or Tunnel Road, which is as expected. However the maximum noise levels (L_{Amax}) are similar to those measured at Position A; ranging from 72 dB to 82 dB $L_{Amax.}$ This supports our observations that maximum or peak noise levels were generated mainly by overhead air traffic.

3.5 PPG 24 classification

The Hillingdon Local Development Framework Supplementary Planning Guidance (SPD) on Noise requires the site to be classified in accordance with the Noise Exposure Categories (NECs) of PPG 24.

It was observed that the site was affected by noise from Road and Air traffic and therefore the NEC has been classified from the Mixed Sources criteria in Table 1.

Table 9: PPG 24 classification

Period		L_{Aeq} *(dB)*	L_{Amax} *(dB)*	Noise Exposure Category
Day	(07:00-23:00)	62	85	B
Night	(23:00-07:00)	59	79	C

The corresponding guidance notes from PPG 24 are as follows:

Category B: Noise should be taken into account and steps taken to ensure an adequate level of protection against noise

Category C: Planning permission should not normally be granted. Where development is permitted, steps should be taken to ensure a commensurate level of protection against noise

Suitable mitigation measures are recommended in Section 6.

4. Noise modelling

The results of the noise measurement survey were used to construct a 3D noise model to determine the noise levels affecting the proposed dwellings on the development.

The noise modelling was undertaken using Datakustik's CadnaA noise propagation software which implements most common national and international acoustic calculation methods. The calculation algorithms described in International Standard (ISO) 9613 have been used in this assessment for calculating noise levels affecting the proposed development.

Figure 4: Noise model of the proposed development

4.1 Calculation results

4.1.1 Facade noise levels

The results of the noise modelling are illustrated as noise contour plots in Appendix D. The noise contours show the propagation of noise across the site and the noise levels at the facade locations of the proposed dwellings. The results of the calculations at each facade location are detailed in Table 16, Appendix C. A summary of the calculated noise levels is provided in Table 10. An illustration of the facade noise levels is provided in Figure 5 below.

Figure 5: Facade noise levels

The noise calculation results are summarised in Table 10 showing the noise level for each residential block at first floor level. The plots have been assigned numbers for ease of reference and are illustrated in Appendix C, Figure 7.

Table 10: Summary of noise calculation results

Name	Floor	Dir.	No Bund		2m bund	
			Day	Night	Day	Night
			(dBA)	*(dBA)*	*(dBA)*	*(dBA)*
Elderly Home N 1	1	N	55	52	54	51
Elderly Home W 1	1	W	53	50	50	47
Elderly E 1	1	E	62	59	59	56
Elderly S 1	1	S	57	54	54	51
Plot 10 - 15 E 1	1	E	55	52	54	51
Plot 10 - 15 N 1	1	N	54	51	52	49
Plot 10 - 15 S 1	1	S	54	51	53	50
Plot 1-3 E 1	1	E	58	55	56	53
Plot 1-3 W 1	1	W	51	48	49	46
Plot 16 - 19 E 1	1	E	57	54	55	52
Plot 16 - 19 N 1	1	N	53	50	52	49
Plot 16 - 19 S 1	1	S	54	51	52	49
Plot 20 - 25 E 1	1	E	57	54	56	53
Plot 20 - 25 E 1	1	E	58	55	55	52
Plot 20 - 25 W 1	1	W	49	46	49	46
Plot 26 - 28 N 1	1	N	55	52	53	50
Plot 26 - 28 S 1	1	S	59	56	58	55
Plot 29 - 31 E 1	1	E	58	55	56	53
Plot 29 - 31 W 1	1	W	52	49	51	48
Plot 32 - 33 E 1	1	E	58	55	56	53
Plot 32 - 33 W 1	1	W	50	47	48	45
Plot 34 - 35 E 1	1	E	58	55	56	53
Plot 34 - 35 W 1	1	W	53	50	52	49
Plot 36 - 37 E 1	1	E	62	59	60	57
Plot 36 - 37 W 1	1	W	55	52	54	51
Plot 38 E 1	1	E	62	59	59	56
Plot 38 W 1	1	W	55	52	54	51
Plot 39 - 40 E 1	1	E	62	59	59	56
Plot 39 - 40 W 1	1	W	55	52	53	50
Plot 4 - 6 E 1	1	E	56	53	55	52
Plot 4 - 6 W 1	1	W	52	49	51	48
Plot 41 E 1	1	E	61	58	59	56
Plot 41 W 1	1	W	54	51	53	50
Plot 7 - 9 E 1	1	E	57	54	55	52
Plot 7 - 9 W 1	1	W	50	47	49	46

The noise calculation results indicate levels of up to 62 dB L_{Aeq} during the daytime and 59 dB L_{Aeq} at night. With the inclusion of the proposed landscaped earth bund shown on Figure 1, these levels of noise reduce to 60 dB L_{Aeq} during the daytime and 57dB L_{Aeq} at night.

With the landscaped earth bund along the eastern boundary with the site, the noise levels at the most exposed plot are classified as NEC B for the daytime and NEC B/C at night.

Appropriate mitigation recommendations to control the level of noise breaking into the dwellings are provided in Section 6.

4.1.2 External noise climate in gardens and recreation areas

Table 11: Noise calculation results – Garden and recreation areas

Name	No Bund	2m Bund
	Day	Day
	(dBA)	*(dBA)*
Allotment	65	60
Plot 1 - 3 Garden	53	53
Plot 10 - 15 Garden	52	51
Plot 16 - 19 Garden	51	50
Plot 20 -25 Garden	48	47
Plot 26 - 28 Garden	55	54
Plot 29 - 31 Garden	55	54
Plot 32 Garden	56	54
Plot 34 Gardens	56	54
Plot 36 - 37 Garden	55	54
Plot 38 Garden	56	55
Plot 39 - 40 Garden	54	53
Plot 4 - 6 Garden	52	51
Plot 41 Garden	55	54
Plot 7 - 9 Garden	51	50
Village Green	60	58

The external noise levels at ground floor level were calculated to range from 44 dB to 55 dB L_{Aeq} in rear gardens during the daytime; benefitting from the natural screening provided by the dwellings. Generally it can be considered that the rear gardens of the proposed plots will exceed the preferred level of 50 dB L_{Aeq} in the Hillingdon SPD but achieve the upper limit of 55 dB L_{Aeq} for outdoor recreation areas recommended by the WHO and in BS 8233.

The noise levels calculated on the Allotment sites are up to 60 dB L_{Aeq} during the daytime, which exceeds the preferred level of 50 dB L_{Aeq} in the Hillingdon SPD and the upper limit of 55 dB L_{Aeq} for outdoor recreation areas recommended by the WHO and in BS 8233.

However, BS 8233 provides the following comment in relation to external noise levels.

'it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited'

These comments are similar in aim to those of the NPPF, insofar as external noise should be reduced as far as is practical without prohibiting development.

5. Airport expansion

London Heathrow airport is currently devising plans to increase throughput of the airport. These plans include the possible construction of a further runway. The possible expansion of the runway has the potential to increase noise levels at the proposed development site and these effects have been requested to be considered by LBH's Environmental Protection Department.

The documents listed below have been consulted to establish the likely increases in noise that the new runway may have on the site:

- Heathrow's North West Runway Air and Ground Noise Assessment, AMEC Environment and Infrastructure UK Ltd – 18 June 2014; and
- Aviation Noise Modelling: Heathrow options, CAA ERCD – 16 May 2014.

The documents provide an in-depth assessment of the different expansion scheme options. The preferred option is the North-West runway option. Noise levels have been calculated for various receptor locations in the vicinity of the airport.

The following excerpt is considered the most relevant to this proposed development[3].

> *'In Sipson, properties will experience on average a 10 dB increase in airside ground noise exposure. Some properties at the boundary will see increases of at least 10 dB. Despite this, and through the inclusion of the perimeter mitigation, LAeq, 16hr noise exposure will be 63 dB or less for the majority of retained residential dwellings.'*

This is further supported by the noise contour maps which were produced as part of the AMEC study. Figures F2 and F3 indicate that the $L_{Aeq,16h}$ noise level at the development site will be 60 dB L_{Aeq} in the daytime and the L_{night} noise level 50 dB in 2040 due to the 3R North-West runway proposal.

We have therefore estimated that the noise levels affecting the development site will be increased by adding the levels generated by the airport expansion of 60 dB in the day and 50 dB at night to the existing levels of noise affecting the development site.

The estimated noise levels with the airport expansion are shown in Table 12.

[3] Page 246 - Heathrow's North West Runway Air and Ground Noise Assessment, AMEC Environment and Infrastructure UK Ltd

5.1 Estimated increase in noise

Table 12: Estimates of increased noise (3R North-West runway proposal)

Name	Floor	Increase from 3R 2040	
		Day	Night
		(dBA)	*(dBA)*
Elderly Home N 1	1	61	53
Elderly Home W 1	1	60	52
Elderly E 1	1	63	57
Elderly S 1	1	61	54
Plot 10 - 15 E 1	1	61	54
Plot 10 - 15 N 1	1	61	53
Plot 10 - 15 S 1	1	61	53
Plot 1-3 1	1	61	55
Plot 1-3 W 1	1	60	51
Plot 16 - 19 E 1	1	61	54
Plot 16 - 19 N 1	1	61	52
Plot 16 - 19 S 1	1	61	53
Plot 20 - 25 E 1	1	61	55
Plot 20 - 25 E 1	1	61	54
Plot 20 - 25 W 1	1	60	51
Plot 26 - 28 N 1	1	61	53
Plot 26 - 28 S 1	1	62	56
Plot 29 - 31 1	1	61	55
Plot 29 - 31 W 1	1	60	52
Plot 32 - 33 1	1	61	55
Plot 32 - 33 W 1	1	60	51
Plot 34 - 35 1	1	61	55
Plot 34 - 35 W 1	1	61	52
Plot 36 - 37 1	1	63	57
Plot 36 - 37 W 1	1	61	53
Plot 38 1	1	63	57
Plot 38 W 1	1	61	53
Plot 39 - 40 1	1	63	57
Plot 39 - 40 W 1	1	61	53
Plot 4 - 6 1	1	61	54
Plot 4 - 6 W 1	1	61	52
Plot 41 1	1	62	57
Plot 41 W 1	1	61	53
Plot 7 - 9 1	1	61	54
Plot 7 - 9 W 1	1	60	51

It is estimated that due to the 3R expansion, noise levels will be up to 63 dB L_{Aeq} during the day and 57 dB L_{Aeq} at night. This would correspond to Noise Exposure Categories of NEC C for the daytime and at night.

Indicative mitigation measures to achieve the internal noise criteria based on these predicted increased noise levels are provided in Section 6.

With the construction of the North-West runway option it is likely that noise levels in rear gardens and the Allotments will exceed 55 dB L_{Aeq}.

6. Mitigation measures

The internal noise criteria for the assessment are 30dB $L_{Aeq(8h)}$ in bedrooms at night and 35 dB $L_{Aeq(16h)}$ in bedrooms and other habitable rooms during the daytime. Maximum noise levels are not to regularly exceed 45 dB L_{Amax} in bedrooms during the night.

To achieve these criteria we recommend the following measures:

- Where possible orientate the bedrooms of the proposed residential units to face away from the M4 spur to the east;
- Install 2 x layers of 12.5mm plasterboard to the ceilings to the first floor bedrooms to control noise from air traffic; and
- Implement the glazing and ventilation strategy outlined in section 6.1.

6.1 Glazing and ventilation specification

Noise break-in calculations have been undertaken to indicate the typical acoustic performance requirements for the glazing and ventilation elements to achieve these criteria. The predictions have used the following information:

- Noise break-in calculation method as outlined in BS 8233;
- Indicative layout as provided by Pro Vision;
- The floor to ceiling height has been assumed as 2.8 m and the reverberation time within the finished rooms is 0.5 seconds;
- Glazed areas are typically 1.2 m^2 with a floor area of 12 m^2 for bedrooms and 15 m^2 for Living Rooms;
- The noise levels as predicted from the noise modelling study plus the predicted increase due to the North-West 3R expansion of Heathrow in 2040 as detailed in Table 12; and
- The external facade has a sound insulation performance of typically R_w 52 dB (Brick / block cavity wall).

The following typical specifications in Table 13 for glazing and ventilation elements have been designed to achieve the proposed internal noise criteria, including noise from the proposed airport expansion. Typical acoustic performances for the glazing and ventilation requirements are provided in Section 6.1.

Table 13: Typical glazing and Ventilation schedule

Plot No's	Glazing	Ventilators
All bedrooms including Elderly Accommodation	R_w 37dB - Type 1	$D_{n,e,w}$ 43dB - Type 1
Living Rooms/habitable rooms, plots 1 – 51 and Elderly Accommodation	R_w 31dB - Type 2	$D_{n,e,w}$ 33dB - Type 2

These are indicative requirements based on the assumptions listed above. The final glazing and ventilation schedule should be refined once the internal layout dimensions are finalised.

6.1.1 *Glazing performance specifications*

Table 14: Acoustic performance specifications for windows

Reference	Example construction	Noise reduction, R (dB), at Octave Band Centre Frequency (Hz)						R_w ($C;C_{tr}$) dB
		125	250	500	1000	2000	4000	
Type 1	6mm glass/6-16 air gap/10+ mm (ISO 12354-3)	24	25	33	39	40	49	37 (-1;-5)
Type 2	6mm glass/6-16 air gap/6 mm (ISO 12354-3)	21	17	25	35	37	31	31 (-1;-4)

It should be noted that the above values relate to the combined acoustic performance of the glazing and frame. The framing method must not reduce the overall performance of the system below the minimum performance values.

Alternative products with the same, or better, acoustic performance values will also be acceptable.

6.1.2 *Ventilator performance specifications*

The trickle ventilators should achieve the following minimum acoustic performance values:

Table 15: Acoustic performance specifications for trickle ventilators

Reference	Example construction	Noise reduction, R (dB), at Octave Band Centre Frequency (Hz)						$D_{n,e,w}$ (dB)
		125	250	500	1000	2000	4000	
Type 1	Trox FSLB60-220 (8000mm²)	37	33	37	45	54	62	43
Type 2	Typical trickle ventilator (DEFRA)	32	38	33	32	35	35	33

Note that the acoustic performances above apply for all ventilators not per ventilator. If more than one ventilator is required, the performance of additional ventilators should increase by 10 log (N), where N = number of ventilators.

Alternative products with the same or better, acoustic performance values will also be acceptable.

7. Summary and Conclusions

A noise impact assessment has been undertaken for a proposed residential development at the former Sipson Garden Centre, Heathrow.

The proposed site is located within the London Borough of Hillingdon. The assessment has considered planning guidance documents such as the Local Development Framework Supplementary Planning Guidance Document (SPD) on Noise, and Policies OE3 and OE5 of the Hillingdon Local Plan, Part 2.

The assessment has considered the impact of noise from existing noise sources, M4 and Heathrow Airport. The possible future expansion of the airport has been included in the estimations of noise levels affecting the proposed development. The predicted levels of noise include the noise from the 3R North-West option at Heathrow for 2040.

The results of the noise modelling study predict noise levels of up to 63 dB L_{Aeq} during the day and 58 dB L_{Aeq} at night for the proposed dwellings. The maximum noise levels during the night-time are up to 79 dB L_{Amax}.

The site is currently classified as NEC B for the daytime and NEC C for the night-time in accordance with the Noise Exposure Categories in PPG 24. If we include the predicted noise generated by the proposed airport expansion, the Noise Exposure Categories are NEC C for both the daytime and night-time.

Initial considerations for internal noise levels have been provided based on achieving the indoor ambient noise level criteria agreed with LBH.

Preliminary acoustic specifications for glazing and ventilation have been provided in order to achieve appropriate internal noise levels for both the daytime and at night. It is anticipated that acoustically attenuated trickle vents are required within bedrooms for background ventilation.

Based on the predicted noise levels, it is considered that with the mitigation measures specified in this report, suitable internal noise levels can be achieved for the proposed residential accommodation.

To reduce external noise levels where possible, a landscaped earth bund is proposed along the eastern boundary with the M4 spur, Tunnel Road. This will serve to reduce noise levels by 2 to 3dB around the garden areas.

The noise levels within external gardens areas are predicted at 44dB to 55dB L_{Aeq}. The noise levels will in some areas exceed the preferred level of 50 dB L_{Aeq} in the Hillingdon SPD on noise, but achieve the upper limit of 55 dB L_{Aeq} for outdoor recreation areas recommended by the WHO and in BS 8233.

If the expansion of Heathrow Airport follows the plans for the North-West runway option, noise levels in gardens are likely to increase to 60dB L_{Aeq}. British Standard 8233:2014 recognises that the preferred external noise criteria are *'not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to*

ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited'.

The external noise levels at the proposed development should be considered with regard to this guidance.

Appendix A Glossary of Terms

A-WEIGHTED LEVELS

The sensitivity of the ear is frequency dependent. Sound level meters are fitted with a weighting network which approximates to this response and allows sound levels to be expressed as an overall single figure value, in dB(A). For clarity and convenience, the 'A' is often included in the acoustic descriptor, e.g. L_{Aeq}, rather than in brackets after the units. For example, A-weighted levels can be quoted as 55 dB L_{Aeq}.

DECIBEL

The ratio of sound pressures which we can hear is a ratio of 10^6:1 (one million:one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound pressure level' (L_p) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply.

FREQUENCY

The repetition rate of a sound wave. The subjective equivalent in music is pitch. The unit of frequency is the Hertz (Hz), which is identical to cycles per second. A thousand hertz is often denoted kHz, e.g. 2 kHz = 2000 Hz. Human hearing ranges approximately from 20 Hz to 20 kHz. For design purposes, the octave bands between 63 Hz to 8 kHz are generally used. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it.

NOISE INDICES

$L_{Aeq,T}$	The A-weighted equivalent continuous sound pressure level over a period of time, T.
$L_{Amax,T(F,S)}$	The A-weighted maximum sound pressure level over period of time T, with fast or slow time weighting.
$L_{A1,T}$	The arithmetic mean of the A-weighted sound pressure level exceeded for 1% of the measurement period, T. Indicative of the maximum noise levels.
L_{A10}	The arithmetic mean of the A-weighted sound pressure level exceeded for 10% of the measurement period, T. L_{A10} is the index generally adopted to assess traffic noise.
$L_{A90,T}$	The A-weighted sound pressure level exceeded for 90% of the measurement period, T. L_{A90} is widely accepted as indicative of the background noise level.
SEL	Sound Exposure Level is a measure of the total sound energy during an event such as a train pass-by.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', e.g. L_{A90}) to approximate the frequency response of the human ear.

REVERBERATION TIME (RT60, T_{mf})

Reverberation time is the time taken in seconds for the sound level within a space to decay by 60 dB and an important indicator of the subjective acoustic quality within a room Reverberation time can be measured using the procedures set out in BS EN ISO 3382:2001 Acoustics – Measurement of the reverberation time of rooms with reference to other acoustical parameters.

AIRBORNE SOUND

Sound in the air is generated by a material vibrating which in turn causes air molecules to vibrate and create a sound wave. For example, sound produced by a loudspeaker in a room can be classified as 'airborne' sound.

AIRBORNE SOUND INSULATION

Airborne sound insulation is the ability of a material or room to contain sound within it, or exclude sound from it. his is commonly measured in terms of sound reduction index, being the ratio of sound transmitted by the material to that incident upon it. Airborne sound insulation can be measured using the procedures set out in BS EN ISO 140-3:1995 Acoustics – Laboratory measurement of airborne sound insulation of building elements and BS EN ISO 140-4:1998 Acoustics – Field measurements of airborne sound insulation between rooms

SOUND LEVEL DIFFERENCE (D)

The sound insulation required between two spaces may be determined by the sound level difference (D) between them. Single figure descriptors include the weighted sound level difference (D_w) and the normalised weighted sound level difference ($D_{nTw)}$ as defined in BS EN ISO 717-1:1997 Acoustics – Rating of sound insulation in buildings and of building elements. Part 1. Airborne sound insulation.

SOUND REDUCTION INDEX (R)

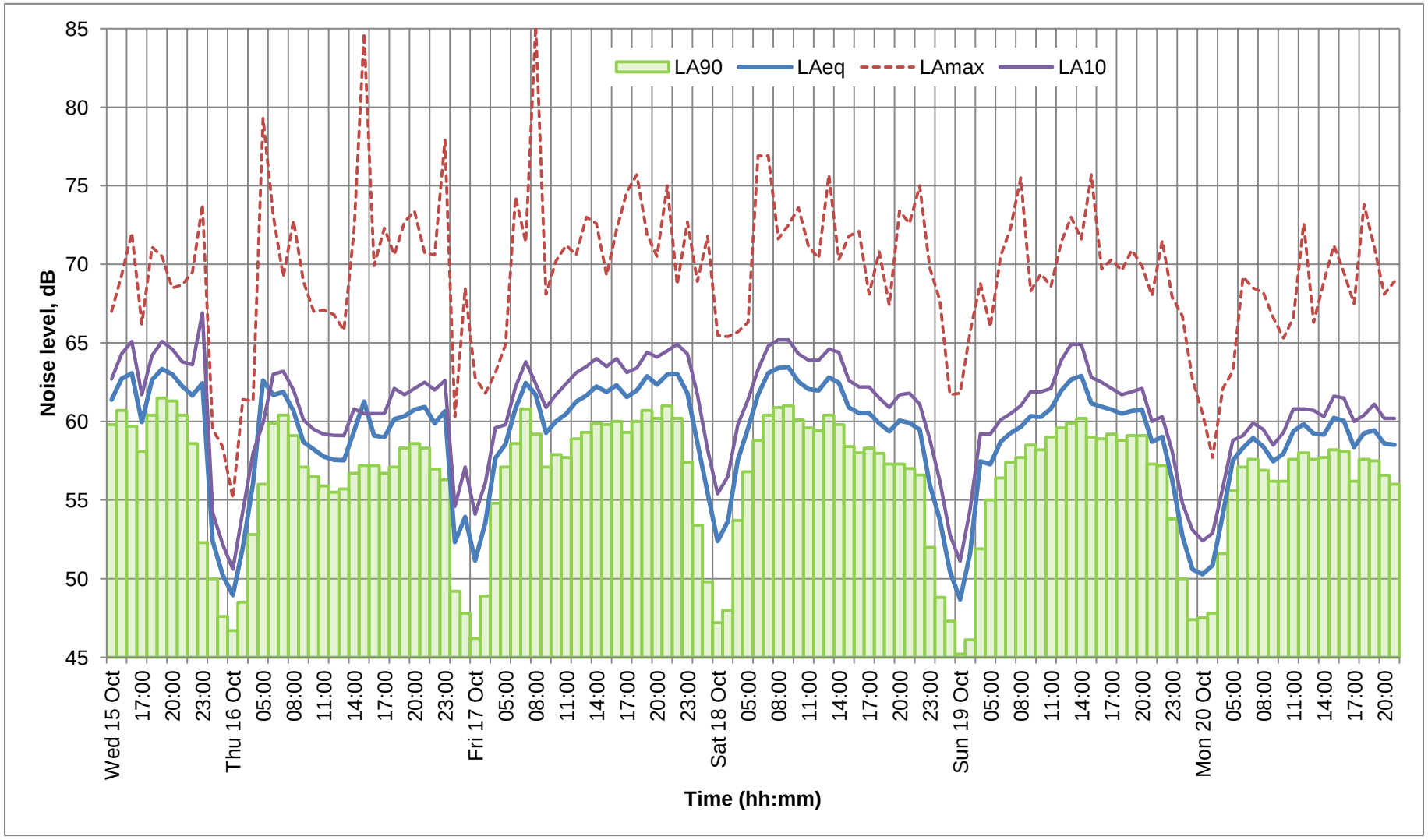
The sound reduction index, R, (or transmission loss) of a building element is a measure of the loss of sound through the material, i.e. its attenuation properties. It is a property of the component, unlike the sound level difference which is affected by the common area between the rooms and the acoustic of the receiving room. Airborne sound insulation can be measured using the procedures set out in BS EN ISO 140-3:1995 Acoustics – Laboratory measurement of airborne sound insulation of building elements.

WEIGHTED SOUND REDUCTION INDEX (R_w) AND APPARENT WEIGHTED SOUND REDUCTION INDEX (R'_w)

The weighted sound reduction index, R_w, is a single figure description of sound reduction index which is defined in BS EN ISO 717-1: 1997. The R_w is calculated from measurements in an acoustic laboratory to BS EN ISO 140-3:1997 and ratings to BS EN ISO 717-1:1997. Sound insulation ratings derived from site (which are invariably lower than the laboratory figures) are referred to as the R'_w ratings and measured to BS EN ISO 140-4:1998.

Appendix B Noise Survey Results

Figure 6: Noise levels measured at Position A



Appendix C Noise modelling calculation results

Figure 7: Layout of plot numbers for calculations

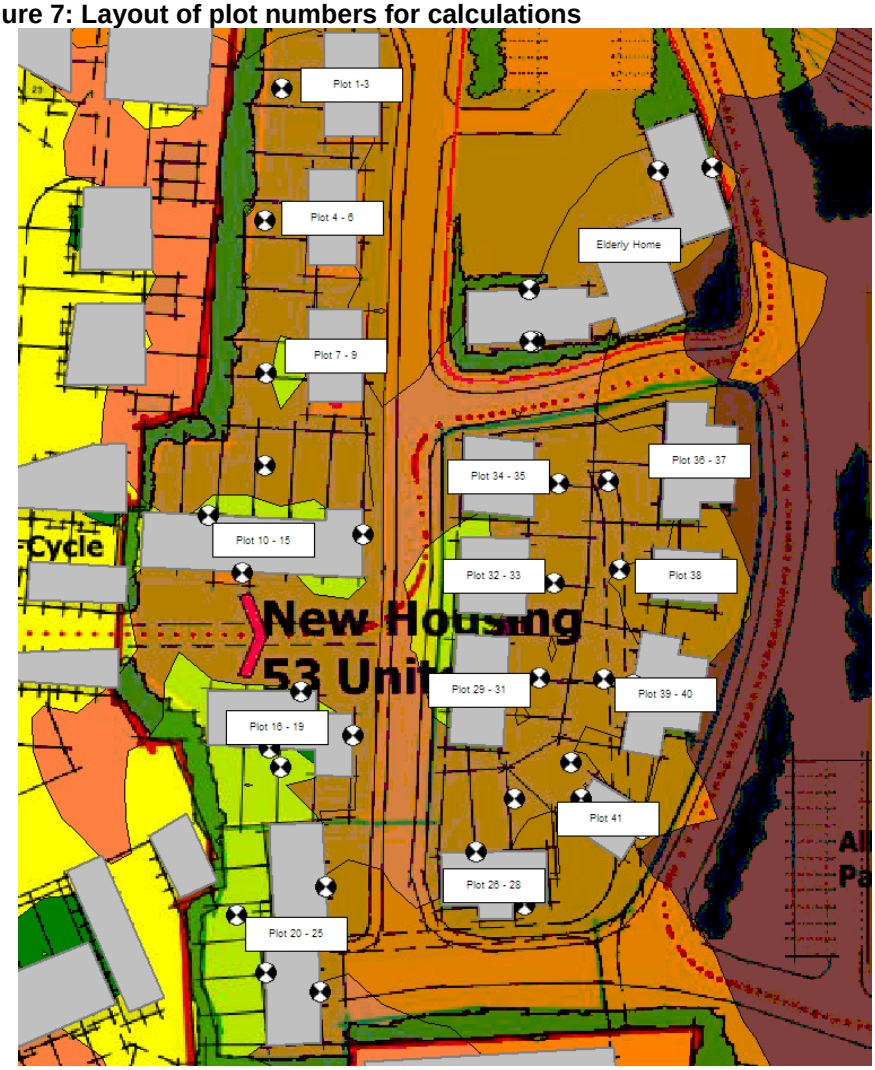


Table 16: Detailed noise modelling calculation results

Name	Floor	Dir.	Unmitigated		Mitigated	
			Day	Night	Day	Night
			(dBA)	*(dBA)*	*(dBA)*	*(dBA)*
Elderly Home N 0	0	N	55	52	53	50
Elderly Home N 1	1	N	55	52	54	51
Elderly Home W 0	0	W	52	49	50	47
Elderly Home W 1	1	W	53	50	50	47
Elderly E 0	0	E	62	59	59	56
Elderly E 1	1	E	62	59	59	56
Elderly S 0	0	S	55	52	51	48
Elderly S 1	1	S	57	54	54	51
Plot 10 - 15 E 0	0	E	51	48	50	47
Plot 10 - 15 E 1	1	E	55	52	54	51
Plot 10 - 15 N 0	0	N	49	46	48	45
Plot 10 - 15 N 1	1	N	54	51	52	49
Plot 10 - 15 S 0	0	S	49	46	48	45
Plot 10 - 15 S 1	1	S	54	51	53	50
Plot 1-3 E 0	0	E	57	54	56	53
Plot 1-3 E 1	1	E	58	55	56	53
Plot 1-3 W 0	0	W	48	45	47	44
Plot 1-3 W 1	1	W	51	48	49	46
Plot 16 - 19 E 0	0	E	51	48	50	47
Plot 16 - 19 E 1	1	E	57	54	55	52
Plot 16 - 19 N 0	0	N	48	45	48	45
Plot 16 - 19 N 1	1	N	53	50	52	49
Plot 16 - 19 S 0	0	S	49	46	48	45
Plot 16 - 19 S 1	1	S	54	51	52	49
Plot 20 - 25 E 0	0	E	55	52	53	50
Plot 20 - 25 E 0	0	E	56	53	52	49
Plot 20 - 25 E 1	1	E	57	54	56	53
Plot 20 - 25 E 1	1	E	58	55	55	52
Plot 20 - 25 W 0	0	W	45	42	44	41
Plot 20 - 25 W 1	1	W	49	46	49	46

Name	Floor	Dir.	Unmitigated		Mitigated	
			Day	Night	Day	Night
			(dBA)	*(dBA)*	*(dBA)*	*(dBA)*
Plot 26 - 28 N 0	0	N	50	47	49	46
Plot 26 - 28 N 1	1	N	55	52	53	50
Plot 26 - 28 S 0	0	S	59	56	57	54
Plot 26 - 28 S 1	1	S	59	56	58	55
Plot 29 - 31 E 0	0	E	53	50	52	49
Plot 29 - 31 E 1	1	E	58	55	56	53
Plot 29 - 31 W 0	0	W	48	45	47	44
Plot 29 - 31 W 1	1	W	52	49	51	48
Plot 32 - 33 E 0	0	E	54	51	53	50
Plot 32 - 33 E 1	1	E	58	55	56	53
Plot 32 - 33 W 0	0	W	46	43	45	42
Plot 32 - 33 W 1	1	W	50	47	48	45
Plot 34 - 35 E 0	0	E	54	51	52	49
Plot 34 - 35 E 1	1	E	58	55	56	53
Plot 34 - 35 W 0	0	W	51	48	51	48
Plot 34 - 35 W 1	1	W	53	50	52	49
Plot 36 - 37 E 0	0	E	62	59	59	56
Plot 36 - 37 E 1	1	E	62	59	60	57
Plot 36 - 37 W 0	0	W	51	48	50	47
Plot 36 - 37 W 1	1	W	55	52	54	51
Plot 38 E 0	0	E	62	59	59	56
Plot 38 E 1	1	E	62	59	59	56
Plot 38 W 0	0	W	51	48	50	47
Plot 38 W 1	1	W	55	52	54	51
Plot 39 - 40 E 0	0	E	62	59	59	56
Plot 39 - 40 E 1	1	E	62	59	59	56
Plot 39 - 40 W 0	0	W	52	49	50	47
Plot 39 - 40 W 1	1	W	55	52	53	50
Plot 4 - 6 E 0	0	E	55	52	54	51
Plot 4 - 6 E 1	1	E	56	53	55	52
Plot 4 - 6 W 0	0	W	49	46	49	46

Name	Floor	Dir.	Unmitigated		Mitigated	
			Day	Night	Day	Night
			(dBA)	*(dBA)*	*(dBA)*	*(dBA)*
Plot 4 - 6 W 1	1	W	52	49	51	48
Plot 41 E 0	0	E	61	58	58	55
Plot 41 E 1	1	E	61	58	59	56
Plot 41 W 0	0	W	50	47	48	45
Plot 41 W 1	1	W	54	51	53	50
Plot 7 - 9 E 0	0	E	56	53	54	51
Plot 7 - 9 E 1	1	E	57	54	55	52
Plot 7 - 9 W 0	0	W	47	44	46	43
Plot 7 - 9 W 1	1	W	50	47	49	46

Appendix D Noise Contour Plots

Project: Heathrow Garden Centre, Option A

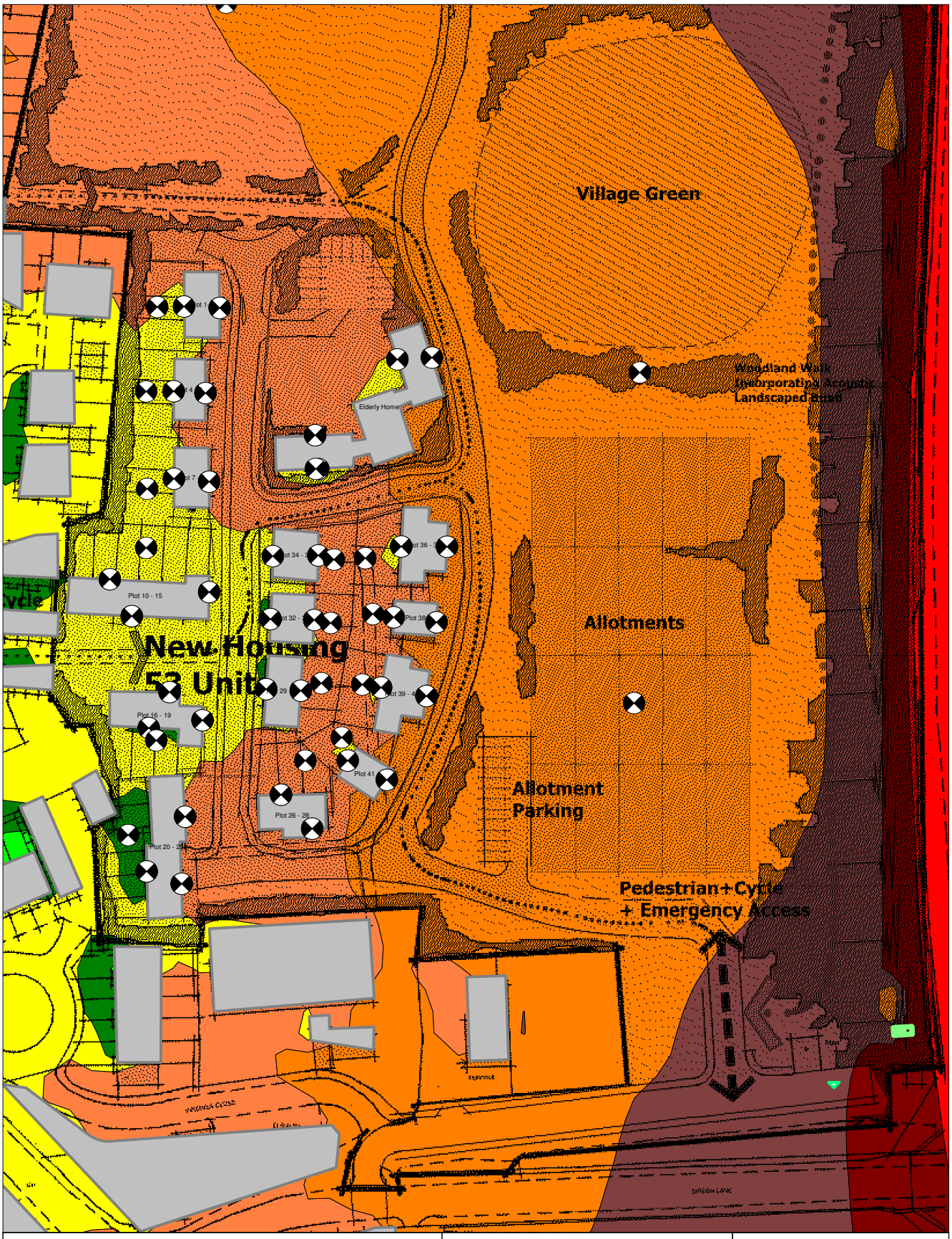
Noise Contour Plot - LAeq
Daytime

By: PPS
Date: 10/06/15
1:1250

- Line Source
- Building
- Barrier
- Embankment
- Ground Absorption
- Height Point
- Contour Line
- Receiver
- Building Evaluation
- Calculation Area

- ... < 35.0 dBA
- 35.0 <= ... < 40.0 dBA
- 40.0 <= ... < 45.0 dBA
- 45.0 <= ... < 50.0 dBA
- 50.0 <= ... < 55.0 dBA
- 55.0 <= ... < 60.0 dBA
- 60.0 <= ... < 65.0 dBA
- 65.0 <= ... < 70.0 dBA
- 70.0 <= ... < 75.0 dBA
- 75.0 <= ... < 80.0 dBA
- 80.0 <= ... dBA

CAPITA



Project: Heathrow Garden Centre, Option A

Noise Contour Plot - LAeq
Night-time

By: PPS
Date: 10/06/15
1:1250

- Line Source
- Building
- Barrier
- Embankment
- Ground Absorption
- Height Point
- Contour Line
- Receiver
- Building Evaluation
- Calculation Area

- ... < 35.0 dBA
- 35.0 <= ... < 40.0 dBA
- 40.0 <= ... < 45.0 dBA
- 45.0 <= ... < 50.0 dBA
- 50.0 <= ... < 55.0 dBA
- 55.0 <= ... < 60.0 dBA
- 60.0 <= ... < 65.0 dBA
- 65.0 <= ... < 70.0 dBA
- 70.0 <= ... < 75.0 dBA
- 75.0 <= ... < 80.0 dBA
- 80.0 <= ... dBA

CAPITA

Project: Heathrow Garden Centre, Option A

Noise Contour Plot - LAeq
Daytime
2.5m Bund
By: PPS
Date: 10/06/15
1:1250

- Line Source
- Building
- Barrier
- Embankment
- Ground Absorption
- Height Point
- Contour Line
- Receiver
- Building Evaluation
- Calculation Area

- ... < 35.0 dBA
- 35.0 <= ... < 40.0 dBA
- 40.0 <= ... < 45.0 dBA
- 45.0 <= ... < 50.0 dBA
- 50.0 <= ... < 55.0 dBA
- 55.0 <= ... < 60.0 dBA
- 60.0 <= ... < 65.0 dBA
- 65.0 <= ... < 70.0 dBA
- 70.0 <= ... < 75.0 dBA
- 75.0 <= ... < 80.0 dBA
- 80.0 <= ... dBA

CAPITA

Project: Heathrow Garden Centre, Option A

Noise Contour Plot - LAeq
Night-time
2.5m Bund
By: PPS
Date: 10/06/15
1:1250

- Line Source
- Building
- Barrier
- Embankment
- Ground Absorption
- Height Point
- Contour Line
- Receiver
- Building Evaluation
- Calculation Area

- ... < 35.0 dBA
- 35.0 <= ... < 40.0 dBA
- 40.0 <= ... < 45.0 dBA
- 45.0 <= ... < 50.0 dBA
- 50.0 <= ... < 55.0 dBA
- 55.0 <= ... < 60.0 dBA
- 60.0 <= ... < 65.0 dBA
- 65.0 <= ... < 70.0 dBA
- 70.0 <= ... < 75.0 dBA
- 75.0 <= ... < 80.0 dBA
- 80.0 <= ... dBA

CAPITA