

SHARPS REDMORE

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Report

**Signature Care Home,
Henley Road, Caversham**
Façade Acoustic Assessment

Prepared by

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Project No 1918791

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1.0 Introduction

- 1.1 Sharps Redmore (SR) has been instructed by Signature Senior Lifestyle Developments to carry out a noise assessment for the development of a Care Home on land off Henley Road, Caversham.
- 1.2 The site is currently vacant residential land and is bounded by Henley Road to the North West, with existing residential properties to the North East and South West.
- 1.3 This report provides information on the existing noise climate around the site, and details of the assessments done to demonstrate that the design of the development can allow suitable internal and external noise levels to be achieved.
- 1.4 There is intent with the design of the building to allow as many of the rooms as possible to have open windows for ventilation, whilst still achieving the desired internal noise levels which are provided in guidance in BS8233:2014.
- 1.5 The report is structured as follows:
 - Section 2.0 - Discussion of assessment criteria.
 - Section 3.0 – Details of environmental noise survey
 - Section 4.0 – Noise assessment
 - Section 5.0 – Summary and Conclusions

2.0 Assessment methodology and criteria

National Guidance

- 2.1 The noise criteria to be achieved in the residential rooms as a result of external environmental noise are taken from BS8233:2014 *Guidance on sound insulation and noise reduction for buildings*.
- 2.2 Table 2.1 of this report provides the criteria shown in Table 4 of BS8233:2014.

Table 2.1 Indoor ambient noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

- 2.3 Additional criteria are provided for assessing maximum noise levels affecting residential development which are to not exceed the criterion provided in BS8233:2014 (45 dB L_{AFmax}).

3.0 Environmental Noise Survey Details

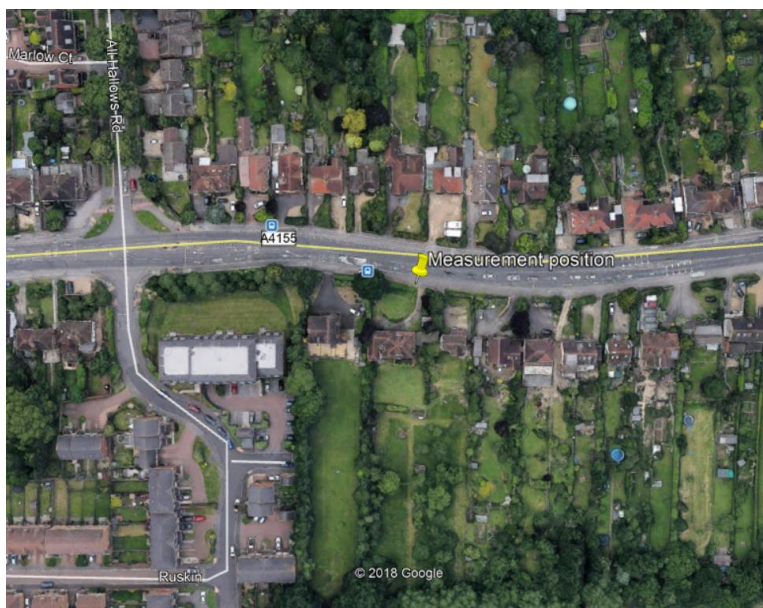
- 3.1 To determine the potential impact of noise sources on the proposed development, a noise survey was required. A noise survey has been completed by Sound Advice Acoustics Limited, the data from which is readily relied upon here for the necessary assessments. A summary of the data used in these assessments is shown below.

Table 3.1 – Noise data used in the assessments

	Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
Day 16hr L_{eq}	67	61	61	61	66	66	62
Night 8hr L_{eq}	57	56	54	54	59	59	56
Night design L_{max}	75	69	70	67	67	65	80

- 3.2 The monitoring location for the Sharps Redmore survey is shown in Figure 1 below. The survey was undertaken during the 14th April 2019 and was required to allow the collection of frequency information to expand on the data already collected.

Fig 1: Monitoring Location



The measurement position was at a height of 1.2-1.5m from the ground and approximately 3.5m from the centre line of the road.

- 3.4 The equipment used was a Norsonic 118 Class 1 Sound Level Meter which was calibrated before and after each survey. No drift was observed. The weather during the survey was dry, with a light breeze. The meter and calibrator had current calibration certificates at the time of the surveys.
- 3.5 Full details of the surveys, including data can be found in Appendix B. All assessments are based on the understanding that there are no known significant noise sources to the South of the site.

4.0 Noise Assessment

- 4.1 A 3D digital noise model of the site and proposed development has been created to allow an assessment of the predicted façade noise levels across the site. The results of these are found in Appendix C of this report. As would be expected, daytime noise levels on the site are significantly higher than night-time levels.
- 4.2 As such, the assessment of noise intrusion to the rooms is determined by the daytime noise levels, with internal noise levels at night being significantly lower than required. Therefore, only the Daytime model results are provided in Appendix C. The results for the night-time period can be provided separately.
- 4.3 As discussed above, the design intent for this development is to have as many rooms as possible ventilated by means of open windows rather than mechanical assistance. At the same time, there is a desire to still achieve the criteria provided in Table 2.1 of this report with the windows in the open position.
- 4.4 In line with typical industry practice, and based on previously-published guidance, it is considered acceptable to consider the noise reduction provided by an open window to be 10-15dB(A). It is considered reasonable in this case to take a value in the mid-range of this guidance. We therefore deem it acceptable to use a reduction of 13dB(A) in our assessments when considering an open window.
- 4.5 In using the assessed façade noise levels, and taking a 13dB(A) reduction for an open window, we have determined the windows which can be open whilst still achieving the required internal noise levels in Table 2.1. On this basis, Appendix D of this report provides marked-up GAs showing the facades where windows can be open for ventilation. The green lines on these drawings show the relevant facades.
- 4.6 Where windows cannot be open for ventilation whilst achieving the internal noise criteria provided in Table 2.1, an alternative scheme of ventilation will be required, along with a façade which achieves an appropriate level of sound insulation. The following advice applies to these rooms.
- 4.7 The minimum airborne sound reduction performance requirements of the façade elements have been calculated for rooms where windows cannot be open for ventilation and still achieve the requirements of Table 2.1. These are given below in terms of octave band 'R' values for specification purposes.
- 4.8 Suitable products shall provide evidence of compliance in accordance with BS EN ISO 10140/2:2010 and rated in accordance with BS EN ISO 717/1:1997, or equivalent or superseded version of the standard.
- 4.9 The façades as a whole need to achieve a sufficient sound insulation performance against measured ambient noise.

Non-glazed façade

- 4.10 The non-glazed elements of the façade system must meet the minimum sound insulation requirements detailed in Table 4.1.

Table 4.1 – Non-glazed wall specification to all rooms

Position	Octave band centre frequency Hz – R dB						
	63	125	250	500	1k	2k	4k
All elevations	25	30	35	40	40	40	40

This can typically be achieved by the use of a cavity wall construction using double masonry leaf or external cladding and internal plasterboard lining.

Window Systems

- 4.11 The window system must be considered as the glazing element, seals and frame combined. The chosen window systems must achieve the minimum sound reduction indices as detailed in Table 4.2.

Table 4.2 – Window system specifications for occupied rooms

Window System	R dB Octave band centre frequency Hz							R _w dB	Example of typical construction
	63	125	250	500	1k	2k	4k		
All windows which cannot be open for ventilation	21	25	25	33	44	44	49	38	8.4-12-6

- 4.12 The above sound insulation requirements are the overall performances for the window systems (including frame, seal and glass). The supplier will need to have data to demonstrate that the façade system as a whole achieves the requirements.
- 4.13 Please note that the R_w figure and the example constructions are given for indicative purposes only to help with initial selection of the window system. The supplier needs to demonstrate that their product meets the performance in all of the Octave Band Frequencies.

Ventilation

- 4.14 If the MEV option in Approved Document 'F' were adopted, we understand any trickle ventilators in the façade would need to have a free area of no more than 2500mm². Any increase in this size will mean the acoustic requirement for ventilators will need to be revised.
- 4.15 Assuming this to be the case, the following performances will be required for the ventilators to bedrooms.
- 4.16 Table 4.3 provides the minimum sound reduction specification (D_{ne}) for natural ventilators on the relevant façades.

Table 4.3: Natural Ventilators Specifications

Location	D _{ne} Octave band centre frequency Hz						Note
	125	250	500	1k	2k	4k	
Henley Road façade	31	34	34	32	37	37	1
All other façades	29	33	36	36	35	34	2

¹ This will require a high quality acoustic trickle ventilator in the window frame or through the wall. An alternative is to mechanically ventilate these rooms and have a sealed façade.

² This can be achieved with the use of a standard non-acoustic trickle ventilator. An alternative is to mechanically ventilate these rooms and have a sealed façade.

5.0 Assessment conclusions

- 5.1 An assessment of the proposed Care Home on Henley Road, Caversham has been done on behalf of Signature Senior Lifestyle Developments. The intention is to have as many rooms as possible ventilated through open windows.
- 5.2 Calculations with the use of a 3D digital model have demonstrated that a significant number of rooms can have open windows for ventilation whilst still achieving the desired internal noise levels.
- 5.3 Advice is also provided for the facades of rooms where windows need to be closed in order to achieve the desired internal noise levels.

APPENDIX A
SURVEY DETAILS

Survey details

Time and date of survey

Approx. 12:00 hours 11th April 2019 to approx. 13:00 hours 11th April 2019

Personnel

Michael Jenkins – Sharps Redmore Partnership Limited

Weather conditions

Weather conditions were dry with light winds during the survey.

Equipment used for the survey

Norsonic 118 Sound Level Meter

The sound level meter was calibrated before and after the survey and showed no drift during that time.

APPENDIX B

NOISE SURVEY RESULTS MANNED SURVEY

Date	Duration	L _{Aeq}	L _{f_{eq}}																							
			50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1.0 kHz	1.25 kHz	1.6 kHz	2.0 kHz	2.5 kHz	3.15 kHz	4.0 kHz	5.0 kHz	6.3 kHz	8.0 kHz	10.0 kHz
(2019/04/11 12:00:00.00)	(0:0:57.0)	68.6	67.2	62.7	57.3	55.5	55.4	55.1	56.4	59.5	59.1	57.1	58	58.3	60.8	62.4	60.3	58.9	56.8	52.5	48.4	44.9	41.7	39.1	36.8	34.6
(2019/04/11 12:01:00.00)	(0:0:58.0)	69.3	63	61.7	58.4	54.5	56.9	56.3	57.2	59.2	58.8	57.7	58.7	59.4	61.7	62.5	61.1	60	57.4	53.7	49.4	45.7	42.4	39.6	37.4	33.7
(2019/04/11 12:02:00.00)	(0:0:58.0)	72.4	66.3	67.6	66.1	62.3	63.5	60.9	62.8	62.1	61.8	61.8	61.6	61.9	63.4	63.4	61.9	61.5	59.4	56.6	64.3	56.6	56.8	49.2	47.5	46.1
(2019/04/11 12:03:00.00)	(0:0:58.0)	66.9	61.4	58.5	62.1	58.2	55.6	57.2	54.9	57.9	57.2	54.8	56.2	57.3	59.4	60.2	58.1	57.5	55.2	51.5	48.4	46.3	43.8	41.1	39.4	36.5
(2019/04/11 12:04:00.00)	(0:0:58.0)	71.7	65.3	65.6	61	58.3	57.7	57.6	58	60.4	60	59	60.5	61.6	64.4	65.1	63.6	62.4	59.7	55.5	51.5	47.9	44.5	42	39.9	36.2
(2019/04/11 12:05:00.00)	(0:0:58.0)	68.7	66.7	61.8	61.8	61	59.4	57.9	57.5	59	59.9	57.8	58.3	59	60.6	61.4	60.4	59.3	56.8	53.4	50	47.4	44.9	41.9	41.4	36
(2019/04/11 12:06:00.00)	(0:0:58.0)	70.6	65.8	58.7	58.2	58.1	56.9	58.2	59.2	60.6	60.1	59.4	60	60.4	62.6	64	62.4	61.2	58.7	54.7	51.1	48.1	44.9	42.3	40.5	36.7
(2019/04/11 12:07:00.00)	(0:0:58.0)	71.3	67.8	65.2	61	61.4	61.3	60.6	65.4	69	64.2	60.1	59.9	61.6	63	63.5	61.6	61.4	59.2	56.7	52.6	50.3	49.3	47.4	45	41.3
(2019/04/11 12:08:00.00)	(0:0:58.0)	69.2	64.5	65	62.1	58.7	58.1	57.1	57.3	59.9	59.7	57.5	58.4	58.8	61.2	62.6	61.1	59.6	56.9	53.6	50.2	46.9	43.9	42.3	40.2	37.8
(2019/04/11 12:08:59.00)	(0:0:58.0)	69.2	63.4	68.5	62.7	57.4	54.7	55.6	57.8	59.7	59.5	58.1	58.7	58.6	61.1	62.8	60.9	59.5	57.6	53.5	49.9	45.8	43.2	40.5	38	35.4
(2019/04/11 12:10:00.00)	(0:0:58.0)	60.1	66.1	78.4	61.5	56.8	50.6	49.9	48.9	50.3	53.2	49.8	51.3	49.3	48.8	49.3	50.7	50.5	48.4	44.2	43.1	42.6	43.1	39.5	34.2	31.5
(2019/04/11 12:11:00.00)	(0:0:58.0)	73.6	73	77.6	68.2	66.9	67.5	66.6	63.7	65.4	65.7	63.6	64.3	63.8	65.7	66	64.8	63.7	61.3	58.1	55.2	52.3	50.9	49.7	46.9	44.4
(2019/04/11 12:12:00.00)	(0:0:58.0)	67.8	64	59.5	61.5	57.5	56.3	56.8	57.7	59.1	58.6	56.5	57.4	58.3	60.5	60.9	59.5	58.7	55.6	51	46.8	43	40.2	37.8	35.6	32.7
(2019/04/11 12:13:00.00)	(0:0:58.0)	72.8	65.5	66.7	63.4	72.6	70.3	63.9	62.7	63.7	62.9	61.6	63.1	63.1	65.2	65.9	64.1	62.8	60.3	56.6	52.9	49.8	47.6	45.3	43.7	43.7
(2019/04/11 12:14:00.00)	(0:0:58.0)	69.4	64	67.8	59.9	58.8	61.6	57.4	57.7	59.9	59.9	57.5	58.7	58.9	61.5	62.9	61	60	57.7	53.6	49.9	46.2	43	40.6	38.6	36
(2019/04/11 12:15:00.00)	(0:0:58.0)	72.4	69.7	67.5	61.1	60.2	61.1	60.7	60.9	62.5	62.6	60.7	62.3	62.4	64.5	65.5	63.9	62.9	60.6	57.2	53.8	50.9	48.8	47.2	46.4	44.9
(2019/04/11 12:16:00.00)	(0:0:58.0)	66.3	71.6	61.9	62	60.1	56.4	55.9	56.3	58.7	58.3	55.5	56.9	56.9	58.1	57.7	56.8	56.2	54.1	52.4	50.5	49.1	48.6	48.3	46.1	45.2
(2019/04/11 12:17:00.00)	(0:0:58.0)	71.9	79.2	70	70.3	67.2	65.8	65	62.1	65.5	65.1	63	62.8	62.8	63.3	63.4	62.5	61.9	59.9	57.7	55.1	53.4	51.1	49.8	48.2	44.9
(2019/04/11 12:18:00.00)	(0:0:58.0)	68.9	64.8	59.5	58	63.6	54.1	56.5	59.7	61.5	59.5	58.5	58.1	58.7	61.6	62	60.2	59.4	57	53.3	49.9	45.6	43	42.2	40.2	38.2
(2019/04/11 12:19:00.00)	(0:0:58.0)	69.5	67.5	66.4	59.3	58.8	59.7	58.2	56.9	59.9	59	58	59	59.4	61.8	62.7	61.2	60.5	57.6	53.7	49.9	46.5	44.2	42.3	39.7	36.5
(2019/04/11 12:20:00.00)	(0:0:58.0)	67.7	65.6	57.5	55.9	55.7	53.1	54.3	55	57.4	56.9	55.3	56.9	57.3	60.3	61.5	59.6	58.1	55.3	51.1	47.1	43.6	41.2	38.3	36.4	34.2
(2019/04/11 12:21:00.00)	(0:0:58.0)	70	69.4	65	63.9	61.4	59	58.6	58.9	60.9	59.3	58.1	59.2	60.2	62.4	62.6	61.5	60.7	58.3	55.3	52	48.8	46.1	43.7	41.6	39.2
(2019/04/11 12:21:59.00)	(0:0:58.0)	65.6	65	60.7	58.3	56	54.8	53.1	53.1	56.7	56	53.8	55.1	55.8	59.1	58.4	56.9	56.3	52.6	49	45.9	42.9	40.1	38.2	36	35
(2019/04/11 12:23:00.00)	(0:0:58.0)	70.4	72.7	67.4	63	64.4	60.2	59.3	60.9	61.9	60.7	59.1	60	60.6	62.9	63.3	61.9	60.7	58.3	55	52.4	48.9	46.9	46	44.1	40.8
(2019/04/11 12:24:00.00)	(0:0:58.0)	68.9	69.6	64.1	60.5	60.4	57.4	57.2	57.6	58.7	58.7	56.8	57.5	58.3	59.8	61.4	59.8	58.6	56.2	53.1	50.7	49.8	56.2	43.7	47	46
(2019/04/11 12:25:00.00)	(0:0:58.0)	70.6	66.5	59.3	57.1	59.6	55.9	56.1	59	60.7	59.6	58.9	59.8	60.8	63.7	64.3	62.1	61	58.3	54.2	50.2	46.2	43.4	41	38.9	36.5

(2019/04/11 12:26:00.00)	(0:0:58.0)	69.3	65.5	64.8	61.4	68.8	59.2	59	58.8	60.5	59.2	58	59.7	60.1	62.3	62.2	60.8	59.4	56.6	52.9	49.8	46.3	44	41.7	39	39.9
(2019/04/11 12:27:00.00)	(0:0:58.0)	70.5	67.8	66.2	59.8	64.6	64	60.3	59	60.5	59.5	58.2	59.3	60.2	63.2	63.6	62.2	61.2	58.7	54.9	51.3	47.7	44.9	42.9	40.2	37.4
(2019/04/11 12:28:00.00)	(0:0:58.0)	71	68.6	60.4	60.9	61.7	61.2	60.5	61.6	66.7	61.4	60.9	63.7	63.1	63.4	63.1	61.3	60.5	58.1	55.9	52.1	49.3	47.3	45.4	45.1	43.5
(2019/04/11 12:29:00.00)	(0:0:58.0)	70.9	71.5	75	66.2	67.2	67	61.1	63.1	65.5	61.3	59.8	60.5	61.1	62.4	62.2	62.1	61.7	57.9	55.4	55	53.8	52.7	50.2	49.4	46.9
(2019/04/11 12:30:00.00)	(0:0:58.0)	69.2	67.2	63.3	59	56.7	57.2	56.1	57	59.9	59	57.5	58.6	59.1	61.4	62.6	61.1	60.1	57.3	53.4	49.6	46.4	43.7	41.7	39.3	36.2
(2019/04/11 12:30:59.00)	(0:0:58.0)	69.4	62.9	65.3	58.6	56.2	55.1	55.1	56.7	59.8	58.7	57.6	58.5	59.6	62.1	63	60.9	60	57.7	53.6	49.2	45.7	42.3	39.8	36.9	34.1
(2019/04/11 12:32:00.00)	(0:0:58.0)	66.9	63.8	59.4	56.7	60.3	55.8	53.5	54.8	57.2	56.6	55.2	56.3	57.3	59.9	59.6	58.7	57.8	54.5	50.6	47	43.6	40.7	38	34.8	32
(2019/04/11 12:33:00.00)	(0:0:58.0)	71.6	71.2	66.6	56.5	58.5	58.2	57.4	58.9	61.9	61	59.7	60.8	61.7	64.6	64.8	63.5	62.5	59.4	55.5	52	48.7	45.8	43.6	42	39.1
(2019/04/11 12:34:00.00)	(0:0:58.0)	68	66.8	61.9	57.2	59.2	56.6	58	56.2	58.7	58.7	56.1	57.1	57.4	59.4	61.8	59.9	58.5	56.3	52.2	48.3	45.2	43.4	40.8	38.4	36.3
(2019/04/11 12:35:00.00)	(0:0:58.0)	71.7	69.5	65.1	59.4	61.8	60.6	64.1	60.5	61.2	63.5	61.8	63.5	63.2	63.6	64	63.1	61.7	60	56.4	52.5	49.4	46.8	44	41	38.8
(2019/04/11 12:36:00.00)	(0:0:58.0)	72.2	68.2	63.2	59.6	59.4	60	66.6	61.6	61.4	63.6	60.7	62.5	62.5	64	65.5	63.9	62.7	60.3	56.7	53	49.6	46.3	44.2	42	39.3
(2019/04/11 12:37:00.00)	(0:0:58.0)	63.8	58.6	60	54.6	54.3	49	50.4	51.6	55.1	54.6	51.6	52.5	53.3	55.5	57.7	56.1	54.3	51.6	47.6	43.2	39.4	37.3	34.5	33.4	30.1
(2019/04/11 12:38:00.00)	(0:0:58.0)	70.7	71	65.7	63.9	65	64.2	62	61.7	62.4	61.9	60.8	62.3	63	63.5	63	61	59.7	58.3	54.9	52.3	50.5	48.5	45.7	43	40.9
(2019/04/11 12:39:00.00)	(0:0:58.0)	67.2	58.8	53.5	54.7	54.8	53.7	52.9	54	57.4	56.8	54.9	56.9	57.6	58.9	59.7	59	58	55.2	51.3	47.1	43.3	40.2	38	46.9	33.9
(2019/04/11 12:39:59.00)	(0:0:58.0)	71.1	69.8	67.6	63.9	61.6	63.9	62	62.1	61.2	62.1	61.1	62.2	62.6	63.9	63.8	62.1	60.7	58.4	55.5	52	50	48.8	46.2	45.2	41.6
(2019/04/11 12:41:00.00)	(0:0:58.0)	68.9	62.3	58.8	58.4	59.1	58.5	57.5	57.7	57.7	57.4	57.2	57.4	58.6	61.5	62.1	60.9	59.4	57	53.3	49.6	46.9	43.6	41.2	39.7	48.2
(2019/04/11 12:42:00.00)	(0:0:58.0)	70.3	68.6	63.8	63.5	69.2	61.5	58.5	60.8	62	60.2	59	60.3	60.8	63.3	63.4	61.8	60.4	57.5	53.7	50.6	49.1	46.3	44.7	42.9	38.8
(2019/04/11 12:43:00.00)	(0:0:58.0)	69.4	68.3	59.1	61.2	59.8	54.3	56	58.1	59.1	57.9	58	58.8	59.5	61.8	62.6	61	60.2	57.6	53.3	50.4	48	44.5	41.7	40.9	35.7
(2019/04/11 12:44:00.00)	(0:0:58.0)	67.6	68.3	63.6	65	60.3	58.3	58.7	58.9	59.5	58	57.1	56.9	57.7	59.5	60.9	59	57.5	55.5	51.6	48.6	47.5	45.9	43.9	41.3	37.2
(2019/04/11 12:45:00.00)	(0:0:58.0)	63.3	62.8	60	61.5	58.4	56.5	57.5	56.9	58.1	56.9	53.2	54.4	54.1	55.3	54.4	52.9	53	50.1	46.7	46.5	47.5	46.8	43.7	42.3	37.2
(2019/04/11 12:46:00.00)	(0:0:58.0)	76.5	72.8	74.7	68.8	67.9	68.1	69.6	69.5	75.2	76.2	68.9	68.3	67.6	66.6	66.5	64.8	63	61.7	60.3	59	56.3	54.4	52.3	51	49.5
(2019/04/11 12:47:00.00)	(0:0:58.0)	69.1	65.3	63.1	61.3	59.2	55.7	57	58.1	58.3	58.5	57.9	58.3	59.4	61.4	62.6	60.5	59.7	57.2	53.2	50.7	48.4	45.2	42.8	40.4	35.8
(2019/04/11 12:48:00.00)	(0:0:58.0)	70.8	62.9	65.3	61.5	64.3	70.7	67.2	60	59.5	61.7	60.9	61.1	61.3	61.8	63	61.9	60.7	58.9	57.2	54.8	51.8	50.7	48	44.6	41.5
(2019/04/11 12:49:00.00)	(0:0:58.0)	68.3	67.5	63.8	62.7	61	58.3	58.9	58.1	56.9	57.5	58.2	57.2	58.3	60.4	61.7	59.8	59.1	56.4	52.5	49.3	46.9	43.6	41.4	39.2	35.2
(2019/04/11 12:50:00.00)	(0:0:58.0)	68.6	64.4	59.4	60.5	57.8	54.4	57.6	57.8	57.3	57.6	57.7	57.4	58.7	60.6	61.9	60.7	59.4	56.5	52.5	48.3	45.8	41.5	39.3	37.7	32.2
(2019/04/11 12:51:00.00)	(0:0:58.0)	72.3	68.5	67.3	66.5	62	61.8	71.2	61.5	61	65.6	62	63.7	63.9	64.2	64.9	63.4	61.8	59.2	55.5	52.4	49.6	47.7	45.1	42.7	40
(2019/04/11 12:52:00.00)	(0:0:58.0)	66.8	67.4	61.6	60.2	58.6	56.1	55.5	56.3	55.7	56.1	55.7	55.8	56.9	58.6	60.1	58.2	56.8	54.6	52.1	50.3	48.5	45.6	44.7	43.8	39.8
(2019/04/11 12:53:00.00)	(0:0:58.0)	70.9	70.5	68.2	62	67.2	65.1	67.3	62.7	63.9	65.2	64.1	61.2	60.6	62.8	63.2	61.1	60.4	58.2	54.9	52.5	50	47.8	46.1	43.5	41.7
(2019/04/11 12:53:59.00)	(0:0:58.0)	68.5	72.2	68.6	64.4	64.4	58.9	59.4	59.5	58.9	60.5	59	59.5	60.4	60	60.6	59	58	56.5	53.5	51.2	49.7	48.2	48.2	47.3	47.3

(2019/04/11 12:55:00.00)	(0:0:58.0)	70.9	70.2	77	72	70.5	67.4	66.5	60	60.4	60.9	60.6	61.1	60.9	62.9	63.6	62.4	61.2	58.6	55	51.9	49.1	46.8	45.7	44.7	42
(2019/04/11 12:56:00.00)	(0:0:58.0)	68.3	64.5	63.2	63.5	59.9	57	57.5	57.4	58.2	58.1	57.6	58	58.5	60.2	61.3	59.9	59.1	56.5	52.7	49.4	46.5	43.2	41.4	39.2	37.1
(2019/04/11 12:57:00.00)	(0:0:58.0)	70.1	65.9	66.8	62.5	60	60	61.4	64.2	60.8	61.2	60.5	60.4	61.2	62.4	62.8	61.6	60.3	57.6	54	51.4	48.3	45.5	43.7	41.1	38.6
(2019/04/11 12:58:00.00)	(0:0:58.0)	69.4	74.5	60	59.8	61.2	58.4	57.9	58.3	59	60.2	58.5	58.5	60.3	61.8	62.1	60.8	59.7	57.4	54.6	52.6	48.2	46.1	42.5	40.7	36.9
(2019/04/11 12:59:00.00)	(0:0:58.0)	67.1	67.8	63.6	63.7	61.7	58.1	60	58.6	56.3	56.9	57.7	56.9	57.6	59	59.9	58	57	54.7	51.3	48.5	46.1	43.4	47.2	55.1	37.1
(2019/04/11 13:00:00.00)	(0:0:14.0)	67.6	73.4	65	63.3	61.6	64	65.4	58.5	60.6	59	58	57.9	58.8	60	59.9	59	57.6	54.3	50.6	47.2	44.4	40.7	38.9	39.2	33.5

Date	Duration	L _{Afmax}	L _f max																							
			50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1.0 kHz	1.25 kHz	1.6 kHz	2.0 kHz	2.5 kHz	3.15 kHz	4.0 kHz	5.0 kHz	6.3 kHz	8.0 kHz	10.0 kHz
(2019/04/11 12:00:00.00)	(0:0:57.0)	75	80.5	75.8	69.6	64.7	64.7	65.5	65.7	67.6	68.9	64.9	66.3	66.1	70.9	69.2	67	65.9	63.5	60.9	56.7	54.3	51.6	50	47.5	48.2
(2019/04/11 12:01:00.00)	(0:0:58.0)	78.2	76	76.5	71.1	66.4	66.6	65.9	68	72	69.9	68.6	68.9	70.2	72.5	73.1	71.1	69.9	67.4	64	59.6	55.7	53.9	51.4	49.5	48.7
(2019/04/11 12:02:00.00)	(0:0:58.0)	90.1	77.4	81.1	77.8	75.1	73.3	70.3	74.2	75.1	73.7	72.2	69.8	71.8	72	70.5	70.3	70.5	67.6	70.2	87.7	79.3	79.5	69.1	64.6	65.3
(2019/04/11 12:03:00.00)	(0:0:58.0)	75.5	71.9	68.9	74.6	69.4	65.8	71.7	64.9	67.4	66.9	64.4	65.6	68.3	69.2	69.7	66.7	66.8	65.1	62.6	61	59	57.6	55.5	53.3	50.5
(2019/04/11 12:04:00.00)	(0:0:58.0)	77.4	77.9	81.4	74.6	73.1	68.6	66.3	67	69.1	68.1	66.3	68.6	69.3	71.7	72.3	69.6	68.4	66.8	61.8	58.8	55.5	51.6	49.8	50.3	47.4
(2019/04/11 12:05:00.00)	(0:0:58.0)	79	82.3	74.2	76.6	75.3	78.3	74.7	72.2	71	71.9	69.3	68.9	72.6	73	72.9	71.6	68.9	67.6	66.2	62.6	61.2	59.4	55.5	56.7	49.8
(2019/04/11 12:06:00.00)	(0:0:58.0)	79.6	82.3	71.3	72	69.5	68.4	70.4	71.2	70	69.6	70.8	69.9	71.4	72.1	73.1	72.2	69.4	69.3	65.8	60	56.6	55.1	53.3	52	47.1
(2019/04/11 12:07:00.00)	(0:0:58.0)	87	84.5	79.3	75.6	78.1	79.2	79.4	85.5	89	83.6	76.9	76.2	80.7	75.5	76.4	75.8	77	74.9	74.8	68.1	66.5	66.1	64.1	62.5	59.1
(2019/04/11 12:08:00.00)	(0:0:58.0)	79.7	75.3	79.8	76.8	73.6	73.4	68.5	69.5	70.2	74.1	72.6	69.3	69.7	69.3	75.2	71.7	68.3	65	68.5	66.2	62.9	54.5	53.9	50.8	48.4
(2019/04/11 12:08:59.00)	(0:0:58.0)	76.2	73.6	80.5	77.5	70.3	63	67.7	73.2	71.9	69.9	67.8	67.4	67.6	70.2	70.9	69.6	66.6	64.9	62.8	60.5	55	55.7	53	50.1	49.2
(2019/04/11 12:10:00.00)	(0:0:58.0)	65.8	73.6	80.6	67.2	61.1	58.6	55.5	55.7	58.9	60.5	60.6	63.7	59.9	62.7	60.6	58.1	56	54.6	51.2	50.4	48.9	47.9	45.4	40.1	39.7
(2019/04/11 12:11:00.00)	(0:0:58.0)	78.4	84.3	92	78.5	79.8	80.7	76.9	72.5	78.1	77.3	72.6	71.9	71.2	73	71.3	69.9	69	66.5	65	61.8	60.7	61.2	60	56.7	54.8
(2019/04/11 12:12:00.00)	(0:0:58.0)	78.2	79.9	70.9	69.2	66.5	66.6	66.3	67.7	68.9	70	65	68.2	69.5	71.2	71.6	69.9	70.2	66.7	62.7	59	55.4	52.9	50.5	48.8	45.4
(2019/04/11 12:13:00.00)	(0:0:58.0)	80.8	75.7	76.7	80.8	94	89.6	81.3	78.1	79.4	73.3	72	76.4	72.6	73.7	75.3	73.1	69.7	68.9	65.4	61.4	60.8	59.7	58.4	57.8	60.3
(2019/04/11 12:14:00.00)	(0:0:58.0)	76	74	83.5	68.6	71.5	78	67.4	66.8	69.2	69.5	65.8	66.7	67.7	69.8	71.1	68.5	66.3	65	61.8	58.2	53.9	51.6	49.4	49.5	49.1
(2019/04/11 12:15:00.00)	(0:0:58.0)	78.5	82.4	80.4	69.6	69.6	69.6	69.3	71.2	71.4	73	67.6	70.3	70.2	72.6	72.1	69.6	69	68.1	65.9	62.9	61.4	60	59.2	59.5	57.7
(2019/04/11 12:16:00.00)	(0:0:58.0)	75.8	86.1	73.4	72.4	72.7	66.9	66.2	66.2	69.5	67	65.3	68.6	68.2	70.2	67.6	67.7	67.3	62.5	62.9	60.6	63.4	65.8	67.3	59.4	61.1
(2019/04/11 12:17:00.00)	(0:0:58.0)	79.2	94.2	83.4	81.4	77.6	77	76.7	70.1	81.8	77.6	74.8	72.6	72.4	70.8	69.7	70.2	70	68.3	67	64.5	63.6	61.7	62.2	60.5	58.3
(2019/04/11 12:18:00.00)	(0:0:58.0)	79.6	80.8	71.6	69.6	80.4	65.7	70.1	74.1	78	74.1	72.2	69.6	70.7	74.3	73.4	69.7	70.6	68.8	64.9	62.3	56.6	54.8	56.6	54.9	53.7
(2019/04/11 12:19:00.00)	(0:0:58.0)	75.6	79.3	80.4	72.9	71.3	73.1	70	66.2	67.9	68.1	65.5	66	67	68.5	68.4	67.3	68.9	65.2	62	57.5	57.2	56.5	54.9	51.6	46.7
(2019/04/11 12:20:00.00)	(0:0:58.0)	75.8	78.6	70	64.3	69.4	64.8	65.4	66.3	69	67.2	66	67.4	65.9	69.1	71.2	68.3	66.1	63.3	61.2	56.2	53.4	51.2	49.3	49.2	46.6
(2019/04/11 12:21:00.00)	(0:0:58.0)	77.6	83.4	79.3	78.6	74.3	71.1	69.8	66.7	69.9	69.5	65.5	66.8	68.6	71.2	70	69.2	68.6	67.6	66.5	63.2	60.9	58.6	56.6	55.6	53
(2019/04/11 12:21:59.00)	(0:0:58.0)	76.1	76.7	73.6	73.3	71.7	68.5	64.3	65.3	69.4	67.3	65.6	68	67.6	72.7	69.7	66.5	66.3	62.7	60.4	58.6	57.5	53	51.7	49.8	49.5
(2019/04/11 12:23:00.00)	(0:0:58.0)	76.4	84.7	79.9	76.5	78.4	73.9	67.5	72.7	71.9	68.5	66.5	69.1	68	70.2	71.4	68.8	68.1	65.1	64.4	63.4	60.1	58.9	60	58.7	54.8
(2019/04/11 12:24:00.00)	(0:0:58.0)	78.7	84.1	80.9	73.4	75.1	69.9	69.5	70.8	70.1	70.6	66.9	69.3	69.6	68.1	70.6	68	67.6	66.9	65.8	65.6	65.8	73.5	58.8	65.3	67.6
(2019/04/11 12:25:00.00)	(0:0:58.0)	78.2	79.6	73.2	68.8	72.5	65.4	66.8	71.7	73	69.2	66.8	69.7	68	72.7	73.4	70.1	68.7	65.8	62.5	57.7	53.6	51.9	49.3	47	46.3

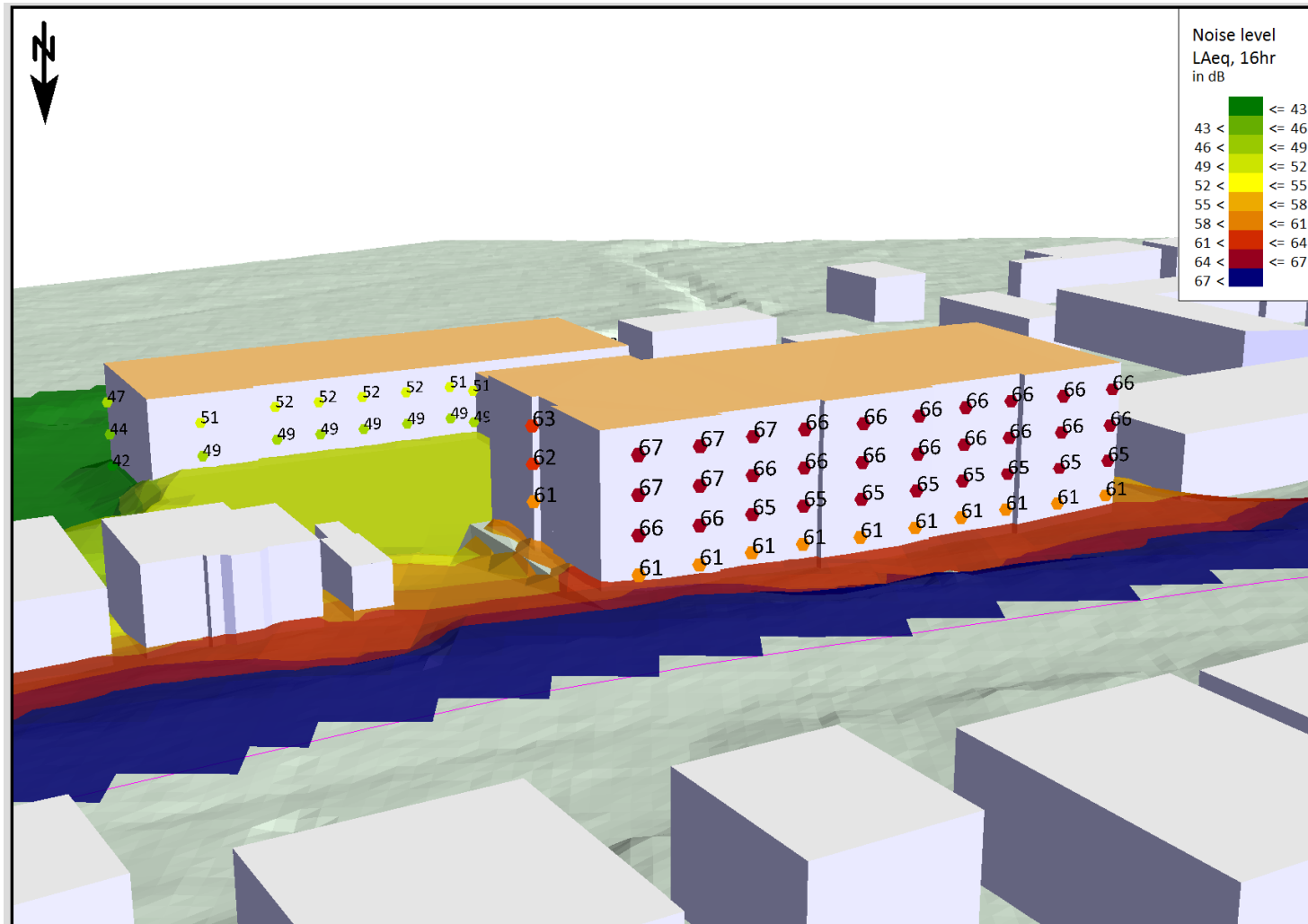
(2019/04/11 12:26:00.00)	(0:0:58.0)	76.8	76.3	75.5	75.8	84.7	73.4	70.1	69.5	72.1	69.2	68	70.2	70.1	71.3	71.1	68.3	66.1	63.8	61	58.1	55.8	53.1	50.4	49.2	60.7
(2019/04/11 12:27:00.00)	(0:0:58.0)	78	84.6	80.9	75.1	81.7	79.9	76	71.2	72.5	68.8	68.5	69.3	70.7	73.5	70.9	70.9	69.2	67.6	65.2	60.5	59.7	58.1	59.3	55.3	52.6
(2019/04/11 12:28:00.00)	(0:0:58.0)	83	80.7	70.7	73.6	75	75.9	75.4	76.5	84.4	75.4	75.1	80.7	77	76.2	74	72.3	70.9	68.6	66.7	63.6	61.5	60.2	58.5	64.5	61.7
(2019/04/11 12:29:00.00)	(0:0:58.0)	84.1	85.3	88.7	77.3	85.8	86.4	71.7	76.6	79.4	71.8	69.3	70.4	70.6	71.8	71.1	77.5	78.5	71.5	70.3	71	70.1	69.8	66.8	67	64.2
(2019/04/11 12:30:00.00)	(0:0:58.0)	77.7	81	77	69.7	67.6	66.8	65.3	67.3	72.2	69.2	67.5	68.1	68.2	70.4	71.8	69.8	69.9	66.5	63.4	58.2	55.3	51.9	51.1	48.6	46.6
(2019/04/11 12:30:59.00)	(0:0:58.0)	76.9	77.5	80.2	73.2	66.5	66.7	64.2	67	71.2	67.7	68.7	67.1	69.2	70.2	71.8	68.7	67.4	65.8	61.7	57.7	54.2	51.2	48	46.2	43.4
(2019/04/11 12:32:00.00)	(0:0:58.0)	77.8	76.9	74.4	67.3	71.2	65.6	62.5	64.8	69	65.5	63.9	67.3	68.2	74.5	68.6	68.4	69	63.9	61.8	57.9	54.2	50.8	48.9	45.7	43.6
(2019/04/11 12:33:00.00)	(0:0:58.0)	79.6	85.4	79.2	67.5	71.2	73.1	66	68.8	72.1	69.6	72.2	70.7	71.8	73.9	73.7	71	69.8	66.8	62.7	59.5	57.9	56.1	54.9	55.8	53.7
(2019/04/11 12:34:00.00)	(0:0:58.0)	76.5	81	75.2	69.5	72.5	69.9	71.6	66.3	69.3	68.8	65.7	67.5	66.3	69	70.5	68.5	67.6	66.5	62.8	59.7	58.8	58.2	56.3	54.6	50.9
(2019/04/11 12:35:00.00)	(0:0:58.0)	80.7	82	77.6	70.1	78	72	80.1	71.6	71.3	77	73.8	75.4	74.5	72.5	72.4	72.6	69.2	70.8	67	61.9	61	58.4	55.2	52.1	52
(2019/04/11 12:36:00.00)	(0:0:58.0)	81.8	83.2	76	74.2	74.8	74	83.2	73.4	72.7	79.5	72.6	75.1	74.3	74.6	74.2	72.8	72.3	69.5	66.1	64.3	61.8	57.6	56.9	57.1	56
(2019/04/11 12:37:00.00)	(0:0:58.0)	74.2	72.1	76.7	69.6	68.3	60.7	61.7	64	67.2	67.6	62.6	64.6	65.1	66.4	68.2	68.1	64.9	61.6	59.6	54.6	51.1	48.8	48	46.9	45.4
(2019/04/11 12:38:00.00)	(0:0:58.0)	81	83.3	80.4	74.2	79.7	75.5	74	74.2	75	72.2	71.4	74.9	75	73.9	73.5	70.9	68.9	71.3	67.5	65.1	64.3	61.4	57.5	53.4	50.7
(2019/04/11 12:39:00.00)	(0:0:58.0)	77	72.6	66.6	66.8	70.1	65	64.6	66.7	71.5	67.9	65.6	68	69.6	69.6	68.9	68.2	67.6	65.2	61.6	57.9	53.2	51.3	50.3	68.1	49.3
(2019/04/11 12:39:59.00)	(0:0:58.0)	80.5	82.1	83.3	76	71.9	79.4	71.9	72.7	72.7	73	72.4	74.9	72	75.5	71.4	69.5	68.3	66.6	66.6	64.9	63.6	64.5	61.9	60.2	56.7
(2019/04/11 12:41:00.00)	(0:0:58.0)	79.4	76.4	73.9	71.5	73.2	72.2	67.9	67.2	67.2	67.7	67.3	67	70	72.6	74.1	72.6	69.7	69	65.5	59.9	58.9	55.8	55.3	54.3	68.5
(2019/04/11 12:42:00.00)	(0:0:58.0)	77.3	80.1	73.3	71.6	83.9	72.2	67.8	71.6	73.4	68	69.6	69.3	69.3	72.3	71	69	67.9	64.7	60.9	58.1	58.8	55.3	57.6	54.3	51.7
(2019/04/11 12:43:00.00)	(0:0:58.0)	76.8	82.9	72.3	73.7	71.8	64.6	68.1	72	69.7	66.7	67.8	68	68.9	71	70.9	68.9	68	65.8	61.7	59.9	57.1	55.8	53.3	54.4	46.7
(2019/04/11 12:44:00.00)	(0:0:58.0)	77.3	81.6	76	77.9	70.1	73.6	76	73.8	71.3	69.5	70.4	67.5	69	70.2	72.2	68.5	66.8	64.6	61.4	56.7	57.7	56.6	56.8	55.5	51.2
(2019/04/11 12:45:00.00)	(0:0:58.0)	73.4	77.3	74.3	71	66.6	66.8	66.9	69.9	69.2	66.3	65.1	66.8	63.6	66.1	65	63.5	64.4	62.2	58.3	60.4	61	60.5	56.6	56	50.1
(2019/04/11 12:46:00.00)	(0:0:58.0)	89.6	85.4	86.8	77.6	79.8	80.6	84.7	82.5	93.7	91.9	83.8	83.3	82.3	79.5	78.8	76.2	73.8	73.7	72.1	70.7	69.1	67.7	65.3	63.6	63.8
(2019/04/11 12:47:00.00)	(0:0:58.0)	77.4	78.6	75.9	71.7	68.6	65.2	67.9	68.5	68.4	69.6	68.2	68.2	71	71.2	70.8	68.5	67.2	64.6	61.2	60.6	62.7	57.8	57.2	54.4	49.7
(2019/04/11 12:48:00.00)	(0:0:58.0)	82	76.7	82.3	75.5	79.3	88.6	83.8	74.1	72.7	76.4	74.9	74.1	73.8	73	73.2	72.9	72.3	71.1	71.1	68.4	65.3	67.1	65	60	56.9
(2019/04/11 12:49:00.00)	(0:0:58.0)	76.5	78.5	76.2	73.2	73.3	70.2	67.2	66.9	65.7	66.8	68.8	66.2	69.3	70.1	71.2	69.2	67.9	64.5	61.4	58.7	55.7	55.9	52.9	51.2	49.8
(2019/04/11 12:50:00.00)	(0:0:58.0)	78.5	77.4	71.6	70.3	67.8	64.5	67.8	68.5	68.3	69.8	70.2	68.8	73.1	71.9	71.9	70.7	69.7	66.1	62	58.5	55.4	51.9	49.9	50.9	44.4
(2019/04/11 12:51:00.00)	(0:0:58.0)	84.5	79.1	80.2	79.8	72.3	75.9	90.5	73.1	72.3	84.7	74.5	78.7	78.5	77.4	75.3	75.1	73.5	68.8	65.8	63.4	61.9	61.2	57.3	55.1	54
(2019/04/11 12:52:00.00)	(0:0:58.0)	73.4	82.2	74.6	68.5	69.3	70.4	66.8	67.5	65.5	65.4	64.8	64.3	65.7	66.8	70	65.7	65.8	63	63.5	62.3	61.8	59.3	59.7	59.5	55.6
(2019/04/11 12:53:00.00)	(0:0:58.0)	79.9	79.9	82.9	72.1	81.8	80.4	83	76.2	79.3	81.5	80.1	71.9	66.3	69	68.6	66.2	66.5	67.1	65.8	65.7	63.2	61.7	60	55.3	53.6
(2019/04/11 12:53:59.00)	(0:0:58.0)	79.3	87.1	80.5	79.4	77.7	69.8	71.6	71.2	73.5	75.8	70.2	70.8	70.1	68.6	72.2	66.7	67.9	69.6	67.5	64.9	64.5	63.5	64.7	63.8	64.6

(2019/04/11 12:55:00.00)	(0:0:58.0)	78.2	84.6	93.6	85.4	85.3	79.9	80.2	72.4	72.1	72.4	71.7	71.8	69.3	71.5	72.4	71.2	69.5	66.1	63.8	60.6	57.7	58.2	58.7	59	57.4
(2019/04/11 12:56:00.00)	(0:0:58.0)	77.8	74.6	74.5	75	67.8	67.3	67.4	71.3	67.1	68.8	68.3	67.4	68.1	71.5	71.7	71.5	67.6	66.1	63	58.6	54.3	52.3	50	48.3	50.6
(2019/04/11 12:57:00.00)	(0:0:58.0)	82.4	79.2	79.5	69.1	71.7	71.9	74.9	82.1	76.3	73.4	75.1	74.5	76.5	74.3	73.7	74	70.9	68.7	66.2	62.3	59.6	57.7	55.4	52.8	50.7
(2019/04/11 12:58:00.00)	(0:0:58.0)	80.6	92.5	72	74.2	72.7	69.9	73.3	70.8	70.1	74.5	69.7	69.2	71.3	71.5	72	71.9	68.5	68.6	67.7	73.2	62.9	62.4	57.4	58.7	55
(2019/04/11 12:59:00.00)	(0:0:58.0)	79.8	81.3	78.2	74.5	72.3	70	69.6	68.2	65.3	66.2	70.6	67.7	68.9	69.9	69	68.2	68.6	66.8	63.5	60.5	57.1	54.9	70.5	79.2	51.5
(2019/04/11 13:00:00.00)	(0:0:14.0)	75.6	86.1	78.7	74.3	78.7	82.2	72.9	69.5	70.8	67.5	65.7	65.3	67.8	67.8	67.5	67.1	67.7	65.5	62.1	57.8	54.3	50.4	50	53.6	44.4

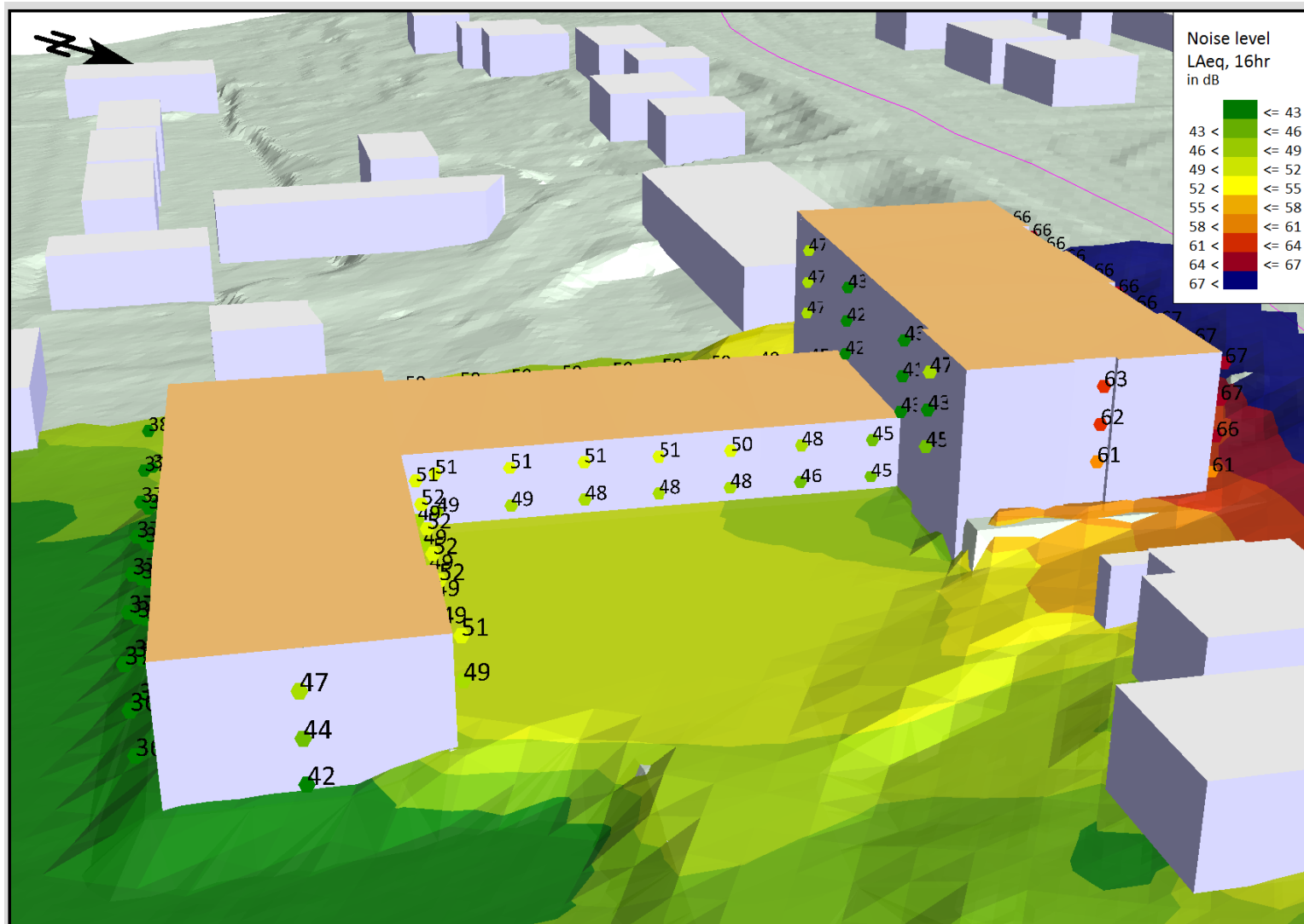
APPENDIX C

3D MODELLING RESULTS

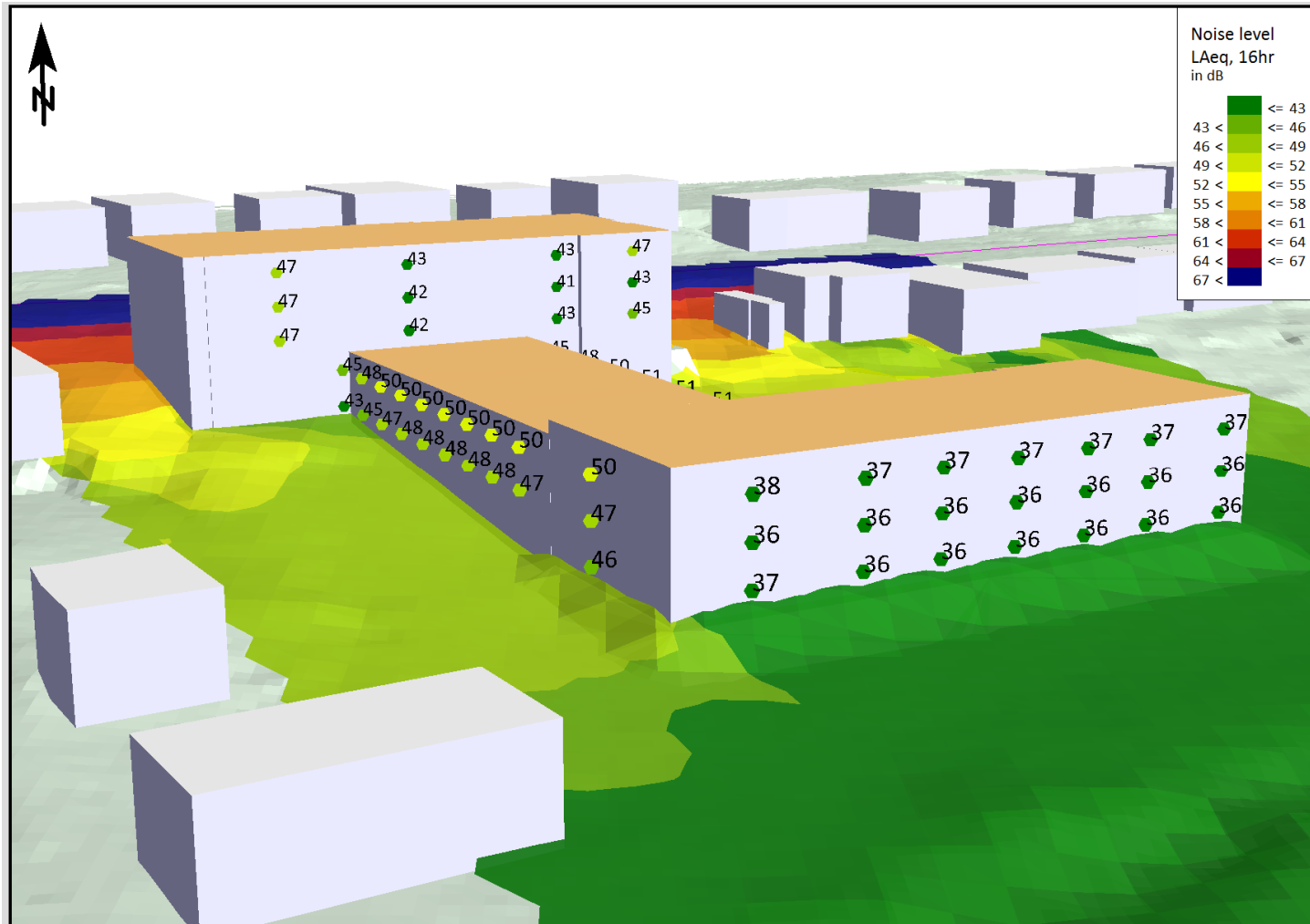
North facing façades



East facing façades



South West facing façades



APPENDIX D

LOCATIONS OF FACADES WHERE WINDOWS MAY BE OPEN FOR VENTILATION

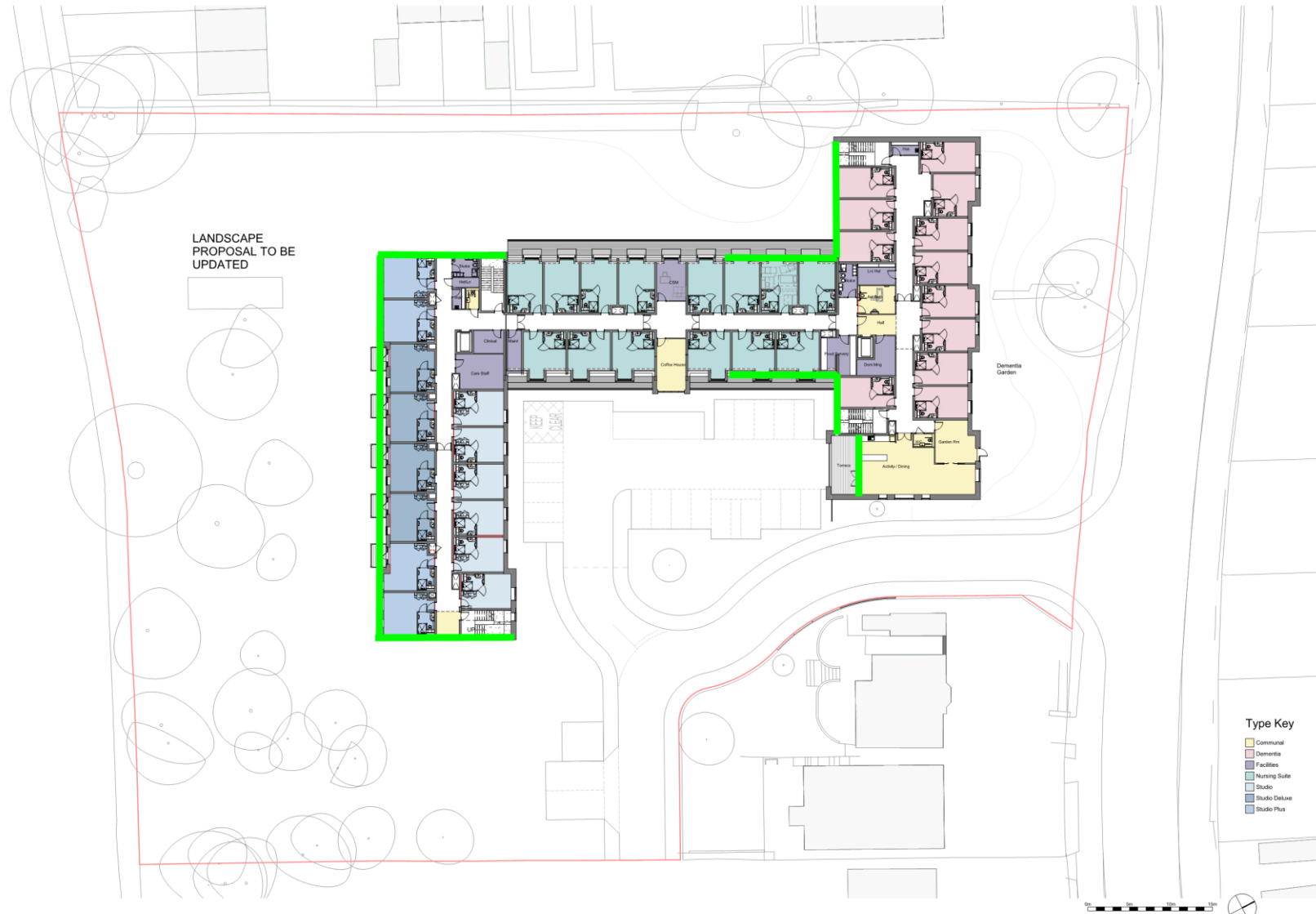
Lower Ground Floor



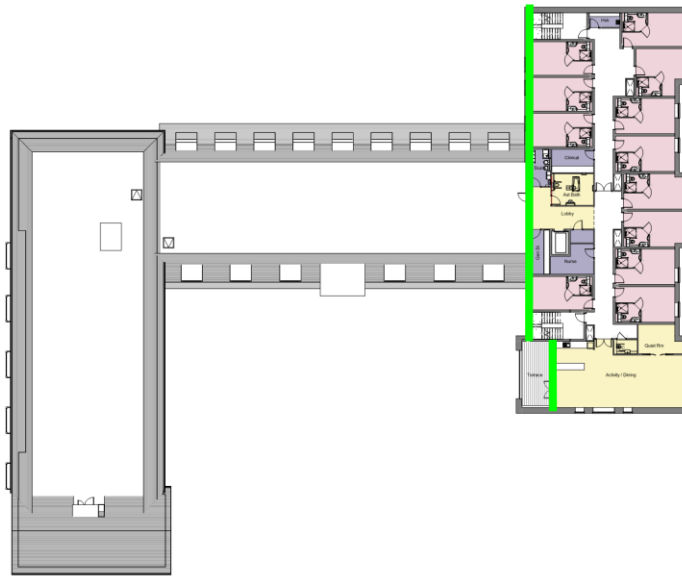
Ground Floor



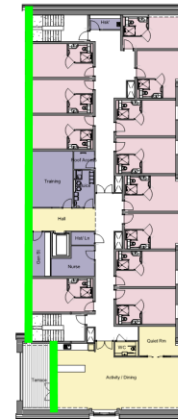
First Floor



Second and Third Floors



Second Floor Plan
1:200



Third Floor Plan
1:200

Signature

CDM REGULATIONS 2015. All current drawings and specifications for the project must be read in conjunction with the Designer's Report and

Designed with reference to the services, information and reports listed in the Designer's Report and the Designer's Report and

Rev: Date Description

Drawn	Checked	By
20/03/19	20/03/19	20/03/19

Henley Road, Caversham
Proposed Second & Third Floor

DRAFT



PRP