69 Avenue Road

London
NW8 6HP

Plant Noise Impact Assessment

On behalf of

Mr Goulandris

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1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned by Mr Goulandris to undertake an assessment to determine the impact of noise from proposed new plant at 69 Avenue Road, London NW8 6HP.

1.2. An environmental sound survey has been undertaken to establish the prevailing background sound pressure levels at a location representative of the sound levels outside the nearest noise sensitive receptors to the site.

1.3. Cumulative plant noise emission levels for the proposed plant have been predicted at the most affected noise sensitive receptors and assessed against the London Borough of Camden Council's typical requirements.

1.4. **Appendix A** contains a guide to common acoustic terminology. An in-depth glossary of acoustic terms can be viewed online at www.acoustic-glossary.co.uk.

2.0 Details of development proposals

2.1. The redevelopment of 69 Avenue Road includes the installation of two new air source heat pumps to serve the property. This plant is to be located within a basement plantroom.

2.2. Details of the proposed plant are given in **Appendix D**.

3.0 Nearest noise sensitive receptors

3.1. The site is in a residential area. The nearest noise sensitive receptor is understood to be the adjacent property (Receptor R1) at No 71 Avenue Road approximately 3m from the proposed plantroom ventilation louvres. It should be noted that the building at receptor R1 will not have direct line of sight exposure from the ventilation louvres. All other nearby residential premises are either further from the plant, are screened to a greater degree, or both.

3.2. **Appendix B** contains an aerial photograph showing the site and surrounding area, including the identified receptors and plant room location.

4.0 Existing noise climate

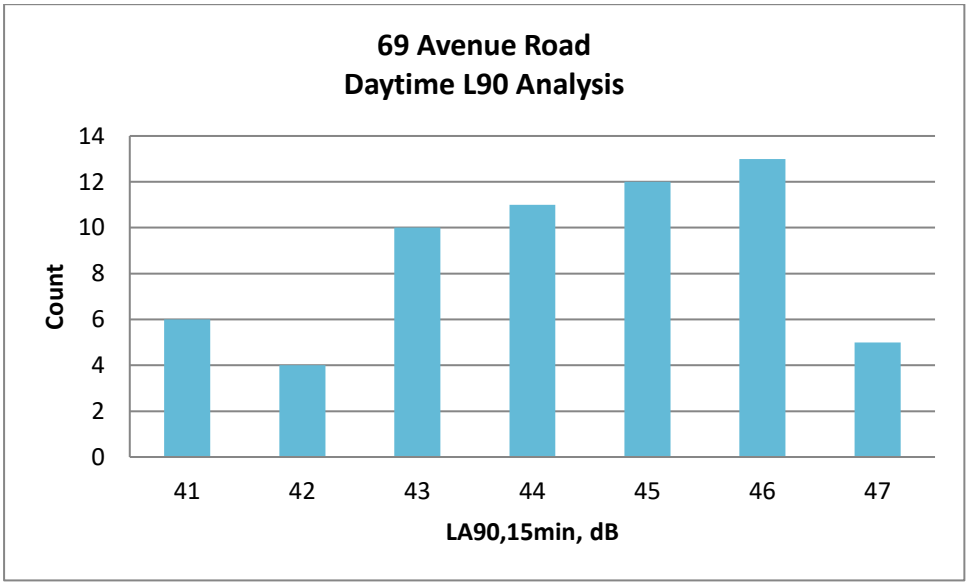
4.1. An environmental noise survey was undertaken to establish the typical background sound levels at a location representative of the noise climate outside the façades of the nearest noise sensitive receptors to the proposed plant area during the quietest times at which the plant will operate.

4.2. The results of the environmental sound survey are summarised in Table 1 below. The full set of measurement results and details of the survey methodology are presented in **Appendix C**.

Table 1 Summary of survey results at location L1

Measurement period	Range of recorded sound pressure levels (dB)			
	$L_{Aeq(15mins)}$	$L_{Amax(15mins)}$	$L_{A10(15mins)}$	$L_{A90(15mins)}$
Daytime (07.00 - 23.00 hours)	45-56	54-82	47-60	41-47
Night-time (23.00 - 07.00 hours)	40-57	51-76	43-56	29-42

Figure 1 Histogram of daytime L_{A90} background sound pressure levels



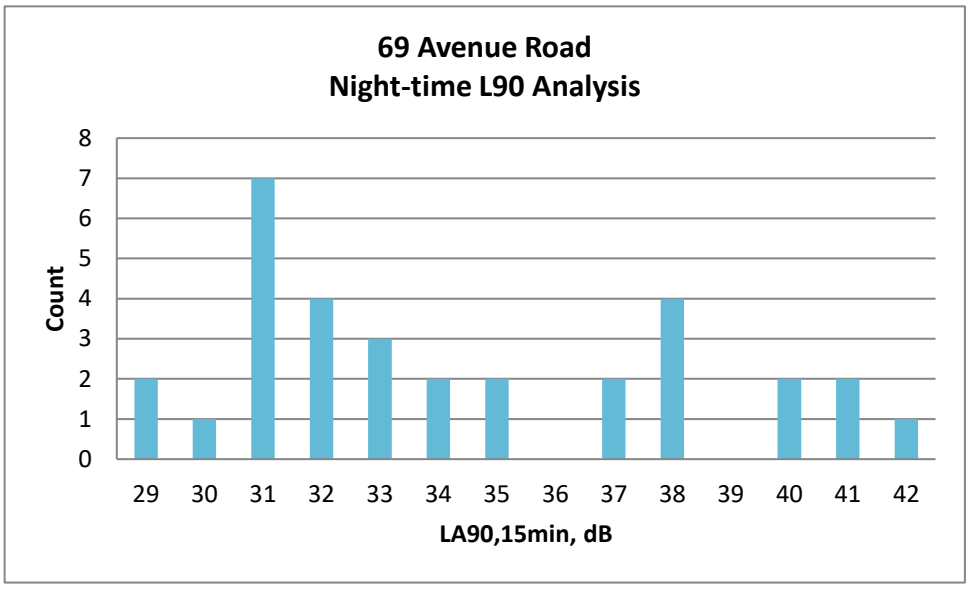
4.3. Additional statistical analysis has been undertaken. As shown in Table 2, the mean, median, and modal values have been calculated:

Table 1 Statistical analysis of $L_{A90,15min}$ levels during the daytime period

dB, L_{A90} daytime period	
Mean	44
Median	46
Mode	44

4.4. The mean, median and modal values range between 44 and 46dB L_{A90}. As shown in Figure 1, the background sound level only rarely falls below 42dB L_{A90}, so this has been considered as representative of the typical background sound level during the daytime period at Avenue Road.

Figure 2 Histogram of night-time L_{A90} background sound pressure levels



4.5. Additional statistical analysis has been undertaken. As shown in Table 2, the mean, median, and modal values have been calculated:

Table 3 Statistical analysis of $L_{A90,15min}$ levels during the night-time period

dB, L_{A90} night-time period	
Mean	34
Median	31
Mode	33

4.6. 31dB L_{A90} is considered as representative of the typical background sound level during the night-time period at Avenue Road.

4.1. Therefore, the following values are considered as representative of the existing background sound pressure levels at nearby noise sensitive premises:

- 42dB L_{90} during the daytime period; and
- 31dB L_{90} during the night-time period.

5.0 Plant noise design criteria

National Planning Policy Framework

5.1. A new edition of NPPF was published in February 2019 and came into effect immediately. The original National Planning Policy Framework (NPPF[1]) was published in March 2012, with a revision in July 2018 - this document replaced the existing Planning Policy Guidance Note 24 (PPG 24) "Planning and Noise." The 2019 revised edition contains no new directions or guidance with respect to noise, and hence, all previous references remain extant. The paragraph references quoted below relate to the February 2019 edition.

5.2. Paragraph 170 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by, (amongst others) *"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, water or noise pollution or land stability."*

5.3. The NPPF goes on to state in Paragraph 180:

" planning policies and decisions should ...

a) Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development, - and avoid noise giving rise to significant adverse impacts on health and quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason ..."

5.4. The NPPF document does not refer to any other documents or British Standards regarding noise other than the Noise Policy Statement for England (NPSE[2]).

5.5. Paragraph 2 of the NPPF states that *"planning law requires that applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise."*

5.6. Paragraph 12 of the NPPF states that "*The presumption in favour of sustainable development does not change the statutory status of the development plan as the starting point for decision making. Where a planning application conflicts with an up-to-date development plan (including any neighbourhood plans that form part of the development plan), permission should not usually be granted. Local planning authorities may take decisions that depart from an up-to-date development plan, but only if material considerations in a particular case indicate that the plan should not be followed*".

[1] National Planning Policy Framework, DCLG, March 2012
[2] Noise Policy Statement for England, DEFRA, March 2010

5.7. Paragraph 117 states that *"Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land"*.

London Borough of Camden

5.8. The Camden Local Policy document dated 2016 states in Policy A1 *'Managing the impact of development'* that for noise and vibration:

> *"Noise and vibration can have a major effect on amenity. The World Health Organisation (WHO) for example states that excessive noise can seriously harm human health, disturb sleep and have cardiovascular and behavioural effects. Camden's high density and mixed-use nature means that disturbance from noise and vibration is a particularly important issue in the borough.*
>
> *Where uses sensitive to noise are proposed close to an existing source of noise or when development that is likely to generate noise is proposed, the Council will require an acoustic report to accompany the application. Further detail can be found in Policy A4 - Noise and Vibration and our supplementary planning document Camden Planning Guidance 6: Amenity."*

5.9. Policy A4 *'Noise and Vibration'* states under the section titled *'Plant and other noise generating equipment'* that:

> *"Planning conditions will be imposed to require that plant and equipment which may be a source of noise is kept working efficiently and within the required noise limits and time restrictions. Air conditioning will only be permitted where it is demonstrated that there is a clear need for it after other measures have been considered (Policy CC2 Adapting to climate change). Conditions may also be imposed to ensure that attenuation measures are kept in place and are effective throughout the life of the development."*

5.10. The policy document goes on to describe noise thresholds in Appendix 2 and states in the *'Industrial and Commercial Noise Sources'* section:

> *"A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such*

cases a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion)."

5.11. Table C of the appendix states the criteria at which development related noise levels will be acceptable:

Table C: Noise levels applicable to proposed industrial and commercial development (including plant and machinery)

Existing Noise sensitive receptor	Assessment Location	Design Period	LOAEL (green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dBL_{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dBL_{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dBL_{Amax}

**10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.*

***levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.*

BS 4142:2014

5.12. BS 4142:2014 *'Methods for rating and assessing industrial and commercial sound'* is intended to be used to assess the likely effects of sound on people residing in nearby dwellings. The scope of BS 4142:2014 includes *"sound from fixed plant installations which comprise mechanical and electrical plant and equipment"*. The standard has been referenced as appropriate for the assessment of noise from plant.

5.13. The procedure contained in BS 4142:2014 provides an assessment of the likely effects of sound on people when comparing the specific noise levels from the source with representative

background noise levels. Where the noise contains *"a tone, impulse or other characteristic"* then various corrections can be added to the specific (source) noise level to obtain the *"rating level"*. Specifically, *"Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."*

5.14. The likely effects of sound on people are assessed by subtracting the background noise level from the rating level. BS 4142:2014 states the following:

- *Typically, the greater this difference, the greater the magnitude of the impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context;*
- *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*

5.15. BS 4142:2014 requires uncertainties in the assessment to be considered, and where the uncertainty is likely to affect the outcome of the assessment, steps should be taken to reduce the uncertainty.

Proposed criteria

5.16. Based on Camden Council's guidance it would be considered initially appropriate for noise from the plant to be at level that is lower than 10dB below the L_{A90} background level.

The cumulative noise rating level for the proposed plant at the nearest residential receptor should not therefore exceed the limits shown in the table below

Table 4 Plant noise emissions limits at nearest residential; windows

Period	Cumulative plant rating level, dB(A)
Daytime (07.00 – 23.00 hours)	32
Night-time (23.00 – 07.00 hours)	21

5.17. It should be noted that the limits apply to the adjacent garden during the daytime period, and to the nearest residential windows during the night-time period

6.0 Noise impact assessment

6.1. The cumulative plant noise level at the nearest noise sensitive receptors have been predicted. The assessment has taken into consideration distance attenuation and directivity and screening corrections.

6.2. In order to assess the worst case, predictions during both the daytime and night-time periods have been based on the proposed new plant operating at full capacity.

6.3. The predictions are inclusive of screening from the building envelope between the proposed plantroom ventilation louvres and the residential windows at receptor R1 during the night-time period. This screening does not apply during the daytime period as the daytime assessment location is the garden at receptor R1.

6.4. Predictions are inclusive of the following atmospheric-side attenuation fitted to the plant room louvres:

Table 5 Proposed attenuators

Attenuator	Insertion losses dB, at octave band centre frequencies (Hz)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Heat pump Intake	7	14	23	36	43	43	41	34
Heat pump Discharge	7	14	23	36	43	43	41	34

6.5. It should be noted that all proposed plant is high-quality and no impulsive characteristics are anticipated provided the equipment is well maintained. All plant items are inverter driven, which means the fans gently ramp to cope with system demands. As a result, the plant items are not considered to operate intermittently. Although 1/3-octave band data is not available from the unit manufacturers to assess tonality, experience of comparable plant operating at other sites indicates that no tonal components are present. In any case, in order to be robust, a +3dB feature correction has been applied to noise level predictions at residential receptors.

6.6. Table 6, below, summarises the results of the assessment at the nearest neighbouring premises. The full set of calculations can be found in **Appendix E**.

Table 6 Assessment of predicted plant noise levels at nearby receptor

Receptor	Period	Predicted plant noise level at receptor L_{Aeq} (dB)	Criterion, L_{Aeq} (dB)	Difference (dB)
R1	07.00 – 23.00	27	32	-4
	23.00 – 07.00	19	21	-2

6.7. The above assessment demonstrates that noise from the proposed new plant meets the London Borough of Camden Council's typical noise requirements at all times.

6.8. The assessment is undertaken at one metre inside the adjacent garden during the daytime period, and one metre from the façade of the nearest windows during the night-time period. The impact on all other nearby windows will be lower due to screening and distance attenuation.

6.9. As BS 4142:2014 advises, the impact must be considered within the context of the site and the surrounding acoustic environment. The following must, therefore, also be taken into consideration when determining the potential impact that may be experienced:

- The assessment is undertaken at the nearest residential windows. The impact on all other nearby residential windows will be lower due to screening and distance attenuation.
- It should be noted that the above assessment is based on all plant operating at maximum daytime/night-time duty. Given that the plant will not operate at maximum design duty all of the time (particularly in the evening and night-time when ambient temperatures are lower and demands are likely to be reduced) the above assessment is considered to be representative of the worst case.

6.10. Where possible uncertainty in this assessment has been minimised by taking the following steps:

- The measurement of the background sound levels was undertaken at a representative location. Care was taken to ensure the measurement position was representative of noise levels affecting the nearest residential windows.
- The meter and calibrator used have a traceable laboratory calibration and was field calibrated before and after the measurements.
- Uncertainty in the calculated impact has been reduced by the use of a well-established calculation method.

7.0 Summary

7.1. Noise Solutions Ltd (NSL) has been commissioned by Mr Goulandris to undertake an assessment to determine the impact of noise from proposed new plant at 69 Avenue Road, London NW8 6HP.

7.2. Environmental noise surveys have been undertaken to establish the existing prevailing noise levels at locations representative of the noise climate outside the nearest residential noise sensitive receptors to the proposed plant area.

7.3. The assessment has demonstrated that noise from the proposed new plant will meet London Borough of Camden Council's typical noise requirements and should therefore be acceptable.

Appendix A Acoustic terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 $\log_{10}$ (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa. 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).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A –weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$	A noise level index. The noise level that is exceeded for 90% of the measurement time interval, T. It gives an indication of the lower levels of fluctuating noise. It is often used to describe the background noise level and can be considered to be the "average minimum" noise level and is a term used to describe the level to which non-specific noise falls during quiet spells, when there is lull in passing traffic for example.

Appendix B Aerial photograph of site showing areas of interest

Appendix C Environmental sound survey

Details of environmental sound survey

C.1 Measurements of the existing background sound levels were undertaken from 14.00 hours on Thursday 23rd January to 13.00 hours on Friday 24th January 2020.

C.2 The sound level meter was programmed to record the A-weighted L_{eq}, L_{90}, L_{10} and L_{max} noise indices for consecutive 15-minute sample periods for the duration of the survey.

C.3 The noise meter was positioned in the garden of No 69 Avenue Road. The approximate location of the noise survey meter is indicated on the aerial photograph in Appendix B. In accordance with BS 7445-2:1991 *'Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use'*, the measurements were undertaken under free-field conditions.

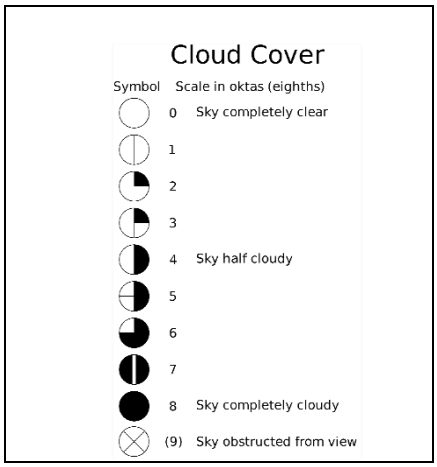
Equipment

C.4 Details of the equipment used during this survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change (+/-0.2 dB) in the calibration level was noted.

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 977/ 69747	26/09/2018	Factory conformity declaration
Condenser microphone	ACO Pacific 7052E / 70829		
Preamplifier	Svantek SV12L / 73687		
Calibrator	Svantek SV 40A / 10843	25/09/2019	14013292

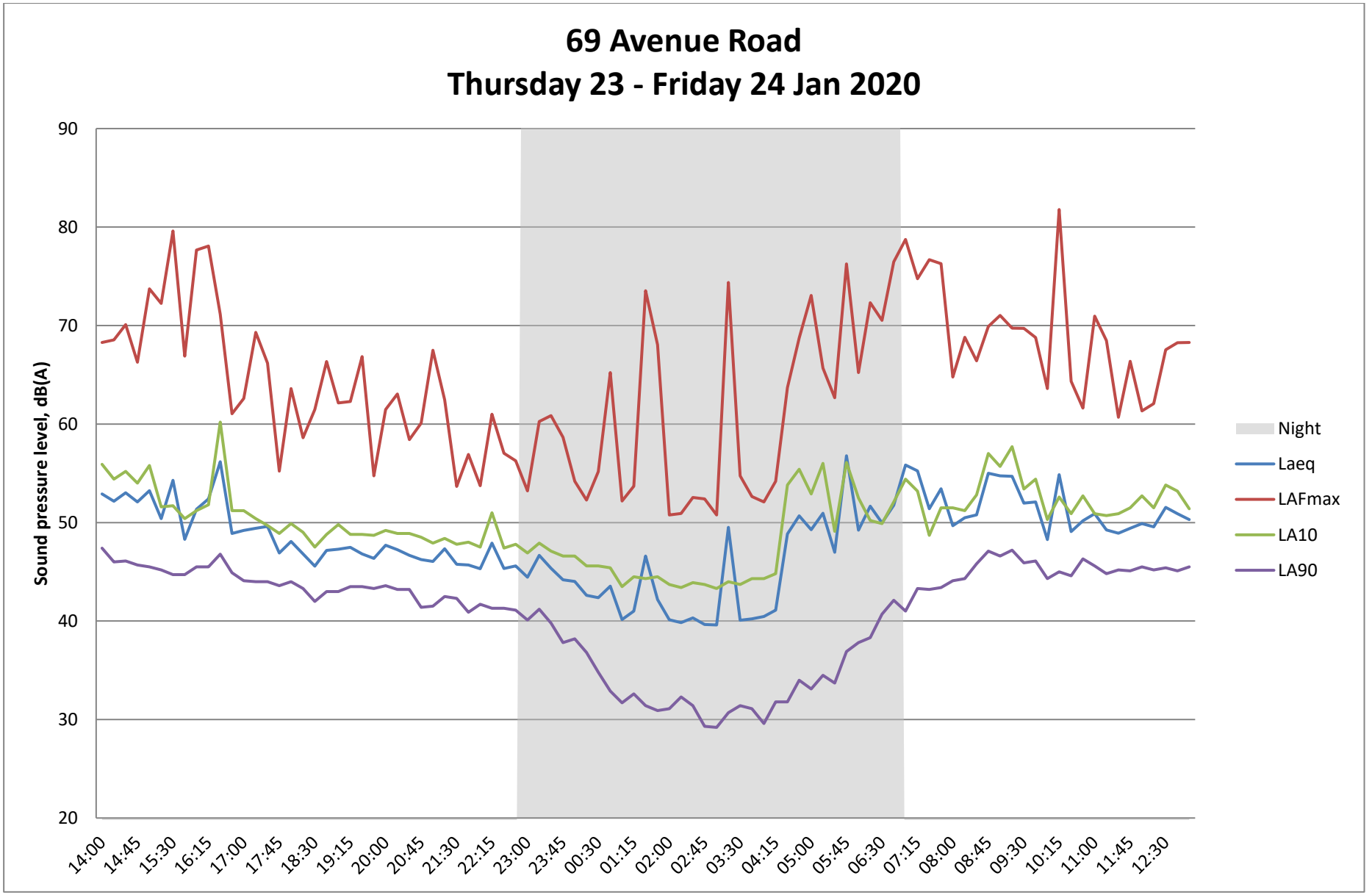
Weather conditions

C.5 Weather conditions were determined both at the start and on completion of the surveys. It is considered that the meteorological conditions were appropriate for environmental noise measurements. The table below presents the weather conditions recorded on site at the beginning and end of the survey.

Weather Conditions				
Measurement Location	**Date/Time**	**Description**	**Beginning of Survey**	**End of Survey**
As indicated on Appendix B	14:00 23/1/20 - 13:00 24/1/20	Temperature (°C)	10	8
		Precipitation:	No	No
		Cloud cover (oktas - see guide)	8	8
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	Yes	Yes
		Wind Speed (m/s)	0	0
		Wind Direction	-	-
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

Results

C.6 The results of the survey are considered to be representative of the typical background sound pressure levels at the neighbouring residential façades. The noise climate during the survey period was dominated by local road traffic. The results of the survey are presented in a time history graph overleaf.


69 Avenue Road
Thursday 23 - Friday 24 Jan 2020
Sound pressure level, dB(A)
90
80
70
60
50
40
30
20
14:00
14:45
15:30
16:15
17:00
17:45
18:30
19:15
20:00
20:45
21:30
22:15
23:00
23:45
00:30
01:15
02:00
02:45
03:30
04:15
05:00
05:45
06:30
07:15
08:00
08:45
09:30
10:15
11:00
11:45
12:30
Night
Laeq
LAFmax
LA10
LA90

Appendix D Manufacturer's plant noise data

Description	Model / Model	Parameter	Quantity	Sound level (dB) at octave band centre frequencies (Hz)								$L_{Aeq,T}$ (dB)
				63	125	250	500	1k	2k	4k	8k	
Air source heat pump	Daikin/ERLQ014CV3	Sound Pressure Level at 1m	2	56	56	54	52	48	44	37	30	53

Appendix E Noise level predictions

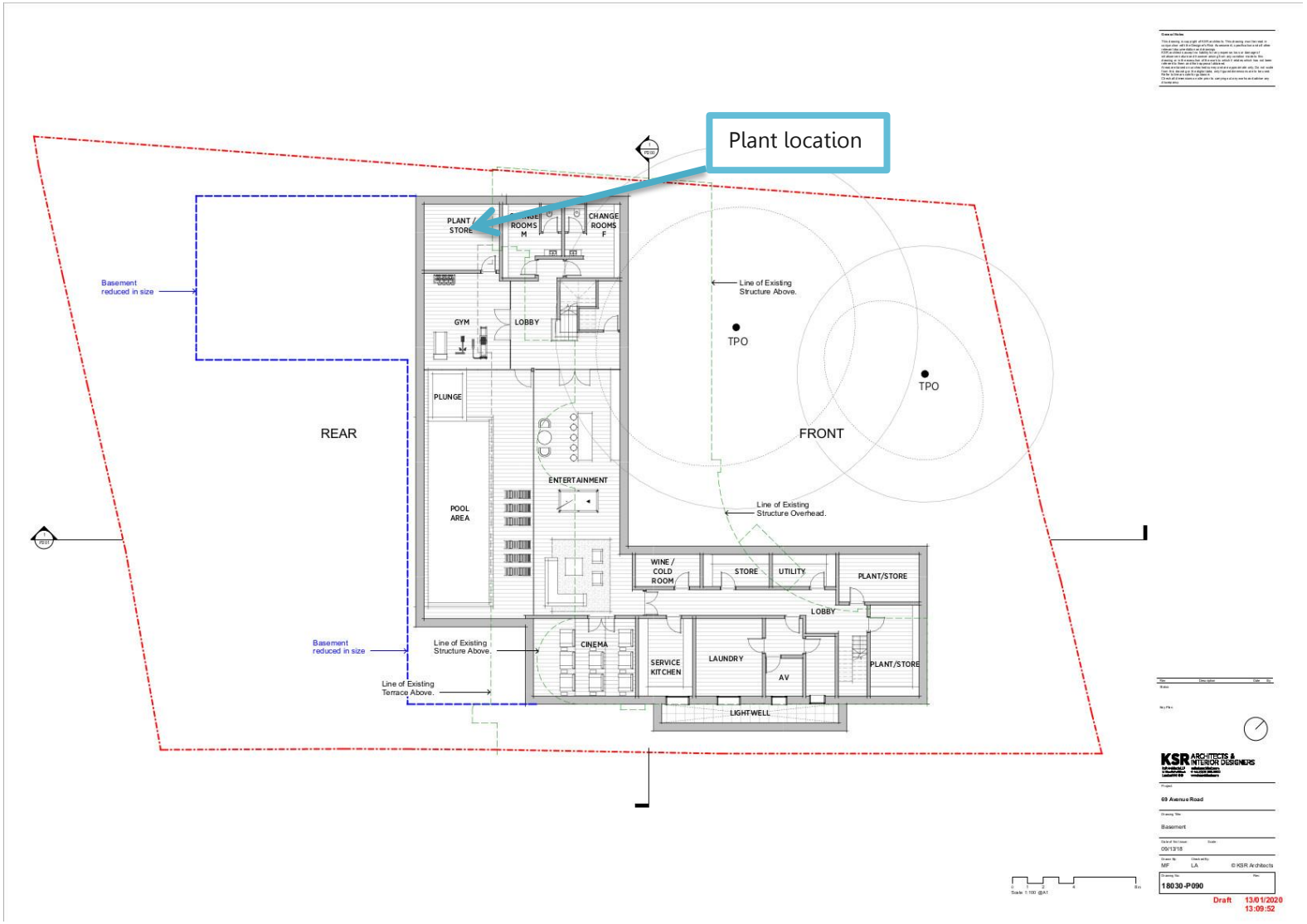
Description	Notes	Leq (dB)								L_{Aeq} (dB)
		63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	
Plant room										
Intake										
Reverberant level in plant room	Rev L_p	67	66	62	57	52	47	40	33	59
All plant running										
Opening area (m^2)	1.50	2	2	2	2	2	2	2	2	
SRI of opening	I.L.	-7	-14	-23	-36	-43	-43	-41	-34	
Inside-outside correction		-6	-6	-6	-6	-6	-6	-6	-6	
L_w of opening	L_w	56	48	35	17	5	0	-5	-5	35
R1 daytime (garden)										
Directivity correction	(1.5,0° x 1,90°)	1	1	1	-4	-7	-7	-7	-7	
Distance correction (m)	3	-18	-18	-18	-18	-18	-18	-18	-18	
Screening (δ = /m)	-	0	0	0	0	0	0	0	0	
Surface Directivity		0	0	0	0	0	0	0	0	
BS4142		3	3	3	3	3	3	3	3	
Resultant at receptor R1	L_p @ R1	42	34	21	-1	-16	-21	-26	-26	21
R1 night-time (building)										
Directivity correction	(1.5,0° x 1,90°)	1	1	1	-4	-7	-7	-7	-7	
Distance correction (m)	3	-18	-18	-18	-18	-18	-18	-18	-18	
Screening (δ = /m)	0.2	-7	-8	-9	-12	-14	-17	-20	-23	
Surface Directivity		0	0	0	0	0	0	0	0	
BS4142		3	3	3	3	3	3	3	3	
Resultant at receptor R1	L_p @ R1	35	26	12	-13	-30	-38	-46	-49	13

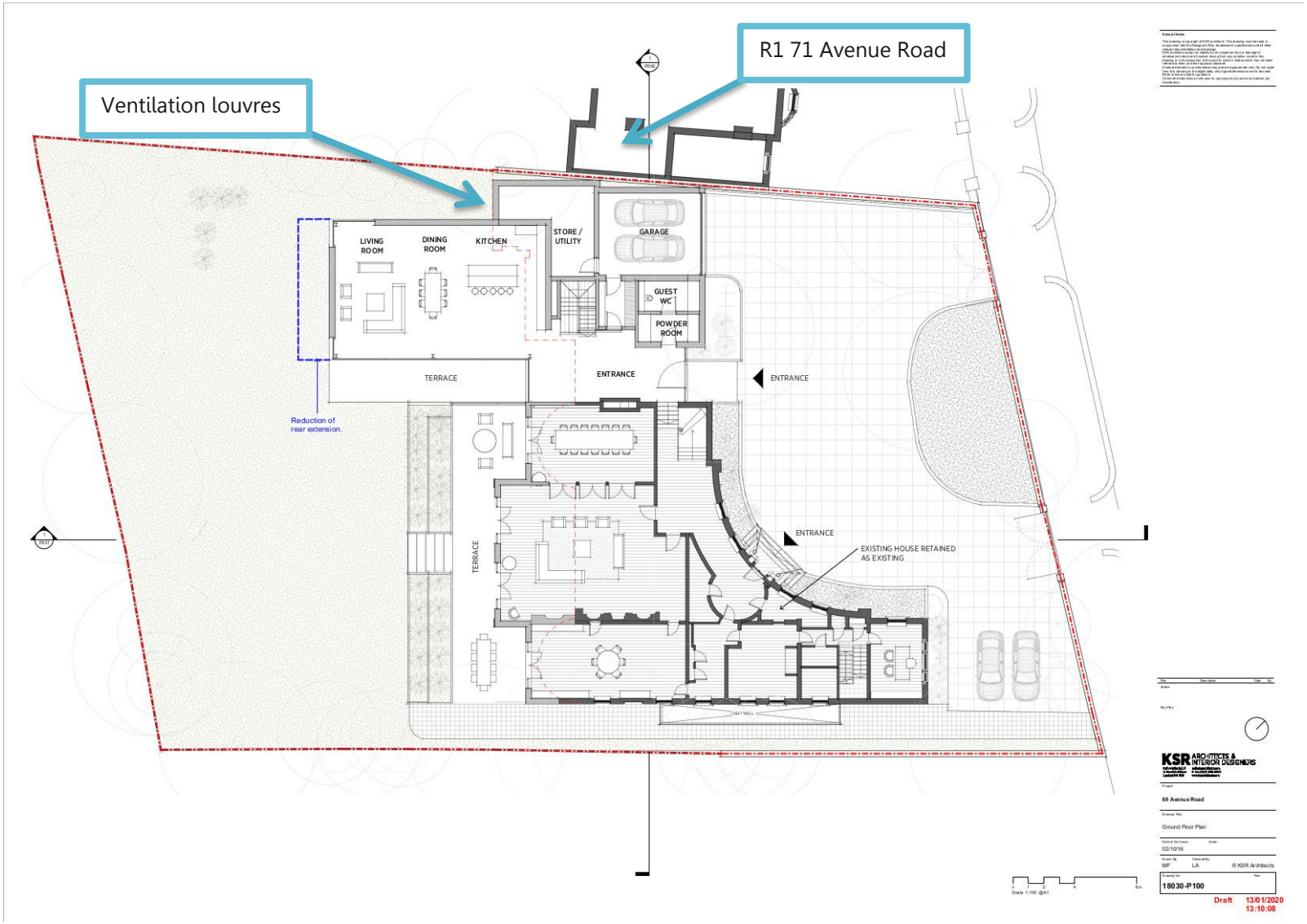
Discharge										
Heat pump 1 discharge										
Sound power	L_w	67	67	65	63	59	55	48	41	64
End reflection	0.75	-3	-1	0	0	0	0	0	0	
SRI of opening	I.L.	-7	-14	-23	-36	-43	-43	-41	-34	
L_w of opening		57	52	42	27	16	12	7	7	38

R1 daytime (garden)										
Directivity correction	(0.75,0° x 1,90°)	0	0	-1	-5	-8	-7	-7	-7	
Distance correction (m)	3	-18	-18	-18	-18	-18	-18	-18	-18	
Screening (δ = /m)	-	0	0	0	0	0	0	0	0	
Surface Directivity		0	0	0	0	0	0	0	0	
BS4142		3	3	3	3	3	3	3	3	
Resultant at receptor R1	L_p @ R1	42	37	26	7	-7	-10	-15	-15	23
R1 night-time (building)										
Directivity correction	(0.75,0° x 1,90°)	0	0	-1	-5	-8	-7	-7	-7	
Distance correction (m)	3	-18	-18	-18	-18	-18	-18	-18	-18	
Screening (δ = /m)	0.2	-7	-8	-9	-12	-14	-17	-20	-23	
Surface Directivity		0	0	0	0	0	0	0	0	
BS4142		3	3	3	3	3	3	3	3	
Resultant at receptor R1	L_p @ R1	35	29	17	-5	-21	-27	-35	-38	15
Heat pump 2 discharge										
Sound power	L_w	67	67	65	63	59	55	48	41	64
End reflection	0.75	-3	-1	0	0	0	0	0	0	
SRI of opening	I.L.	-7	-14	-23	-36	-43	-43	-41	-34	
Lw of opening		57	52	42	27	16	12	7	7	38
R1 daytime (garden)										
Directivity correction	(0.75,0° x 1,90°)	0	0	-1	-5	-8	-7	-7	-7	
Distance correction (m)	3	-18	-18	-18	-18	-18	-18	-18	-18	
Screening (δ = /m)	-	0	0	0	0	0	0	0	0	
Surface Directivity		0	0	0	0	0	0	0	0	
BS4142		3	3	3	3	3	3	3	3	
Resultant at receptor R1	L_p @ R1	42	37	26	7	-7	-10	-15	-15	23
R1 night-time (building)										
Directivity correction	(0.75,0° x 1,90°)	0	0	-1	-5	-8	-7	-7	-7	
Distance correction (m)	3	-18	-18	-18	-18	-18	-18	-18	-18	
Screening (δ = /m)	0.2	-7	-8	-9	-12	-14	-17	-20	-23	
Surface Directivity		0	0	0	0	0	0	0	0	
BS4142		3	3	3	3	3	3	3	3	
Resultant at receptor R1	L_p @ R1	35	29	17	-5	-21	-27	-35	-38	15

	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	L_{Aeq}
Receptor R1 day									
Intake	42	34	21	-1	-16	-21	-26	-26	21
Discharge	42	37	26	7	-7	-10	-15	-15	23
Discharge	42	37	26	7	-7	-10	-15	-15	23
Cumulative	**47**	**41**	**30**	**11**	**-3**	**-7**	**-12**	**-12**	**27**
Receptor R1 night									
Intake	35	26	12	-13	-30	-38	-46	-49	13
Discharge	35	29	17	-5	-21	-27	-35	-38	15
Discharge	35	29	17	-5	-21	-27	-35	-38	15
Cumulative	**40**	**33**	**21**	**-1**	**-17**	**-24**	**-32**	**-35**	**19**

Appendix F Site layout




R1 71 Avenue Road
Ventilation louvres
LIVING ROOM
DINING ROOM
KITCHEN
STORE / UTILITY
GARAGE
GUEST WC
POWDER ROOM
TERRACE
ENTRANCE
ENTRANCE
Reduction of rear extension.
ENTRANCE
EXISTING HOUSE RETAINED AS EXISTING
TERRACE
KSR ARCHITECTS & INTERIOR DESIGNERS
69 Avenue Road
Ground Floor Plan
02/10/16
MF
LA
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