Paul Horsley Acoustics Ltd
Acoustics & Noise Control Consultancy

Acoustic Report

Environmental Noise Survey
Proposed Residential Development at
Land Adjacent to No 710 Bradford Road
Birkenshaw, BD11 2AE

Our Reference – J2765

Survey Dates –31st August to 1st September 2018

Survey and Report by – Paul Horsley MIOA

Report compiled by: Paul Horsley MIOA

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1.0 Agent

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2.0 Subject

Proposed Development of 2 No Residential Dwellings on land at land adjacent to No 710 Bradford Road, Birkenshaw, BD11 2AE.

3.0 Aims

The aim of this report is to determine the existing baseline background noise environment levels, over a typical weekday period, affecting the proposed development location to allow discharge of Planning Condition No 4 for Approval No 2018/62/91253/E in relation to noise, which states:-

> *4. Before development commences a report specifying the measures to be taken to protect the development from noise from road traffic on Bradford Road shall be submitted to and approved in writing by the Local Planning Authority.*
> *The report shall:*
> *(i) Determine the existing noise climate*
> *(ii) Predict the noise climate in gardens (daytime), bedrooms (night-time) and other habitable rooms of the development*
> *(iii) Detail the proposed attenuation/design necessary to protect the amenity of the occupants of the new residences (including ventilation if required).*
> *The development shall not be occupied until all works specified in the approved report have been carried out in full and such works shall be thereafter retained.*
> ***Reason**: In the interests of the amenity of the future occupiers of the properties and to accord with the aims of Policies D2, BE1 and EP4 of the Kirklees Unitary Development Plan, Policy PLP52 of the Kirklees Publication Draft Local Plan as well as the aims of chapter 11 of the National Planning Policy Framework.*

Provide an assessment of the results in accordance with the recommendations laid down in the National Planning Policy Framework, NPPF, for the proposed development site with respect to noise.

Provide mitigating noise control advice relating to the achievement of an acceptable internal environment for the development as recommended with World Health Organization's "Guidance for Community Noise, 1999".

4.0 Location and Description of Existing Noise Sources

The development site is positioned on land at adjacent to No 710 Bradford Road, Birkenshaw.

There is a proposal to develop the existing land to form 2 No residential dwellings on the site. Access to the site will be from Bradford Road via an existing site entrance road.

The site is positioned on flat land and is bounded to the north, east and south by existing residential premises. The western site boundary is formed by Bradford Road passing the site entrance road and runs in a north-south direction past the site. There are shops and retail properties along the length of Bradford Road forming Birkenshaw village.

The primary noise source within the vicinity of the site are predominantly due to traffic noise from vehicle movements along Bradford Road. Noise associated with birdsong and aircraft overhead was also significant during daytime periods.

5.0 Guidance on the Assessment of Noise Levels

The purpose of any criterion or standard for environmental noise should be to safeguard against unacceptable levels of community response, deemed as a feeling of annoyance during daytime or disturbance at night. WHO defines annoyance as "a feeling of displeasure evoked by noise"

The main source of information relating to noise and the community response are field studies including noise measurements and social surveys. These surveys attempt to establish a correlation between the two sets of results.

In the absence of any definitive guidance and in order to establish suitable noise criteria, it is necessary to rely on general guidance and assessment methods used for community noise sources. Discussions on the current methods are given below.

5.1 BS4142:2014 'Method for Rating and Assessing Industrial and Commercial Sound'

This recently revised standard provides a method for rating and assessing sound of an industrial and/or commercial nature. The method uses outdoor sound levels to assess the likely effect of sound on people who might be inside or outside a dwelling or premises used for residential purposes. It is limited to applicable sounds and is not intended for noise amounting to nuisance or rating noise outside the scope of the Standard.

Unlike the previous version of the Standard, rating levels are not prescriptive, but more context based, with the following applicable to rating values:

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

The Standard introduces additional rating elements, these being subject assessments of tonality, and impulsivity of a sound source, with weighted rating values accordingly applied at the judgment of the assessor.

The introduction of Uncertainty has been applied to the measured values; again, consideration of this is left to the professional executing the survey and assessment. However, steps are provided within the Standard for the reduction of uncertainty in both measurement and calculations of the sound source and rating value.

Actual meteorological conditions are now required to be recorded and reported upon for the survey and report.

5.2 British Standard 8233:2014

The scope of British Standard 8233: 2014: *Sound insulation and noise reduction for buildings* is the provision of guidance for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations; the primary intention of these is to guide the design of new buildings or refurbished buildings undergoing a change of use rather than to assess the effect of changes in the external noise climate.

The standard suggests suitable internal noise levels within different types of buildings, including residential dwellings, as shown in Table below.

Indoor Ambient Noise Levels in Spaces When They Are Unoccupied

Activity	Typical Situations	Design Range LAeq, T dB	
		0700h to 2300h	2300h to 0700h
Resting	Living rooms	35	--
Dining	Dining Room / Area	40	--
Sleeping	Bedrooms	35	30

BS8233 states in Note 4 that:

"Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values."

As such it has been considered appropriate to define a limit for regular maximum indoor noise levels of 45 dB(A) with sporadic events not exceeding 50 dB(A).

BS8233 also suggests noise limits for external areas or a property such as gardens or balconies. It states that:

'For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, 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 centre's 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.'

5.3 National Planning Policy Framework, NPPF.

The newly incumbent National Planning Policy Framework, NPPF, provides advice to planning authorities in England on how they must seek to minimise the adverse impact of noisy activities on noise sensitive receptors. This NPPF, replacing PPG 24, and is not prescriptive with respect to specific noise levels, and is mainly concerned with the advising on good practice for environmental noise assessment.

In the absence of definitive noise criterion within the NPPF most Local Authorities in England default to the daytime noise levels inside dwellings not to exceed NR 35; and NR 25, to be achieved inside dwellings at night to avoid sleep disturbance, based upon ingress of external noise sources.

5.4 Noise Policy Statement for England, NPSE.

The document "Noise Policy Statement for England" sets out the following vision for ongoing noise policy:
"Promote good health and a quality of life through the effective management of noise within the context of Government policy on sustainable development."

This vision should be achieved through the following Noise 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."

To achieve this vision the Noise Policy Statement sets three noise levels to be defined by the assessor:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

The Noise Policy Statement considers that noise levels above the SOAEL would be seen to have, by definition, significant adverse effects and would be considered unacceptable. Where the assessed noise levels fall between the LOAEL and the SOAEL Noise levels, the Policy Statement requires that:
"all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development..... This does not mean that such adverse effects cannot occur."

Where noise levels are below the LOAEL it is considered there will be no adverse effect. Once noise levels are below the NOEL there will be no observable change.

5.5 World Health Organization 1999 "Guidance for Community Noise"

This document provides a review of the effects of noise and a description of the principles of the WHO health criteria and guidelines for Community Noise.

The effects of noise in dwellings are identified as sleep disturbance, annoyance and speech interference. For bedrooms, the critical effect is sleep disturbance. Indoor guideline values for bedrooms are 30 dB LAeq for continuous noise and 45 dB LAmax for sound events. At night time, outside sound levels about 1 metre from facades of living spaces should not exceed 45 dB LAeq, so that people may sleep with bedroom windows open. This value is equivalent to that specifies in the Criteria 12 document; however, it is now assumed that the noise reduction from outside to inside with the window open is 15 dB.

To enable casual conversation indoors during the daytime, the sound level of the interfering noise should not exceed 35 dB LAeq.

To protect the majority of people from being **seriously** annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55dB LAeq on balconies, terraces and in outdoor living areas. To protect the majority of people from being **moderately** annoyed during the daytime, the outdoor sound level should not exceed 50 dB LAeq.

Table 1 of the document summarises the guideline values for community noise in specific environments and includes the noise indices to be adopted. Significantly, the corresponding time base to be used for the assessment is also included.

The relevant extracts of Table 1 are reproduced thus:

Specific Environment	Critical health effect (s)	LAeq dB	Time Base hours	LAMax dB
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate Annoyance, Daytime and evening	50	16	-
Dwelling, Indoors	Speech intelligibility & moderate annoyance daytime & evening.	35	16	-
	Sleep Disturbance, night-time	30	8	45
Outside Bedroom	Sleep disturbance, window open (Outdoor Values)	45	8	60

5.6 Subjective Impression of Noise Changes

The following Table provides a semantic scale that may be used to "subjectively" rate changes in sound pressure level.

Table 1: Subjective effect of changes in sound pressure level

Change in sound level dB	Change in Power		Change in apparent loudness
	Decrease	Increase	
3	1/2	2	Just perceptible
5	1/3	3	Clearly noticeable
10	1/10	10	Half / Twice as loud
20	1/100	100	Much quieter / louder

After Bies and Hansen

This table is taken from Professor Colin H Hansen's publication "Fundamentals of Acoustics" page 41, for the Department of Mechanical Engineering, University of Adelaide.

This table also appears in "Engineering Noise Control" by Colin Hansen and David Bies, a comprehensive reference book, amongst others.

6.0 Survey Equipment

Integrating Sound Level Meter, RION NA-27, Type 1, Serial No 431986
RION UC-53A Microphone Serial No 307060
RION NC-74 Calibrator Serial No 530712
Windshield, Tripod

7.0 Survey Method

An attended pre-development environmental noise assessment survey was carried out encompassing daytime, evening and nighttime periods between 31st August and 1st September 2018 by the author.

LA_{eq}, LA_{90}, LA_{10}, and LA_{max} sound measurements were taken using the sound analyser.

The measurement indices noted above are defined as follows:

LA_{eq}, T — the "A" weighted equivalent continuous noise level of sample period T

LA_{10}, T — the "A" weighted level exceeded for 10% of sample period T

LA_{90}, T — the "A" weighted level exceeded for 90% of sample period T

LA_{max} The "A" weighted maximum level during the sample period T

Various sound measurements were taken using the sound analyser. The meter was calibrated before and after the measurements using the calibrator to ensure accuracy of the results. No fluctuations were noted between calibrations and the results obtained can be deemed to be an accurate representation of the levels recorded.

In order to ascertain the existing typical background noise climate, sound recordings were taken at over relevant sample periods during daytime and night.

The meter was mounted on the tripod at a height of 1.5m above ground and at least 3m from any reflective plain. Refer to Appendix A for a marked up locational sketch for the survey points.

8.0 Prevailing Weather Conditions

31st August 2018 - Daytime – 17°C, 10% cloud cover, wind SE 0-1m/s, 59% rh, 1025 mb
1st September 2018 - Nighttime – 11°C, 15% cloud cover, wind SE 0-2m/s, 80% rh, 1023mb

9.0 Pre-Development Noise Survey Results

During the monitoring period separate noise samples were recorded, using a 1/1 Octave Centre Band analysis. These monitoring samples were collected from the relevant site boundary positions, generally, at the same location for daytime and nighttime periods. This was to establish the general noise levels experienced externally by the site at the most exposed position to the proposed property and therefore likely to experience the worst case noise climate.

The table of results on the following page indicates the noise levels recorded for the site location selected during the monitoring period, with a brief description of the noise sources contributing to the individually monitored noise levels recorded.

The above monitoring locations should be read in conjunction with the site layout appearing in Appendix A of this report.

Refer to Appendix B for the survey results frequency analysis table.

10.0 Noise Survey Results Table

Location	Period	Data ID	LAmax dB	LAeq dB	LA10 dB	LA90 dB	Measurement Duration	Date	Time	Comment
1	Daytime	1	75.4	55.6	59.5	44.6	00:15:00.00	31-08-2018	10:02:23	Traffic along Bradford Road dominant. Aircraft. Birdsong.
		2	75.7	55.6	58.9	44.6	00:15:00.00	31-08-2018	10:17:23	
		3	67.7	55.3	59.0	46.6	00:15:00.00	31-08-2018	10:32:23	
		4	70.6	55.4	58.9	46.7	00:15:00.00	31-08-2018	10:47:23	
		5	71.7	55.8	58.9	46.0	00:15:00.00	31-08-2018	11:02:23	
		6	64.1	54.4	57.7	46.8	00:15:00.00	31-08-2018	11:17:23	
		7	73.5	54.6	57.9	46.5	00:15:00.00	31-08-2018	11:32:23	
		8	66.8	56.9	60.4	51.9	00:15:00.00	31-08-2018	11:47:23	
		9	72.8	55.4	58.6	46.8	00:15:00.00	31-08-2018	17:02:23	
		10	64.4	55.7	58.9	49.0	00:15:00.00	31-08-2018	17:17:23	
		11	66.5	55.7	59.2	48.6	00:15:00.00	31-08-2018	17:32:23	
		12	75.0	59.9	59.4	49.3	00:15:00.00	31-08-2018	17:47:23	
	Evening	13	68.5	55.8	59.2	46.9	00:15:00.00	31-08-2018	21:35:44	Traffic noise along Bradford Road. Aircraft. Pedestrians passing
		14	70.3	56.3	59.6	48.0	00:15:00.00	31-08-2018	21:50:44	
		15	71.5	56.6	60.0	46.4	00:15:00.00	31-08-2018	22:05:44	
	Nighttime	16	70.1	55.9	60.4	45.1	00:15:00.00	31-08-2018	23:38:03	Traffic noise along Bradford Road only source.
		17	72.4	56.3	60.3	44.8	00:15:00.00	31-08-2018	23:53:03	
		18	66.3	55.4	60.5	45.1	00:15:00.00	01-09-2018	00:08:03	
		19	65.6	55.1	60.4	44.7	00:15:00.00	01-09-2018	00:23:03	
		20	69.4	55.5	60.0	44.6	00:15:00.00	01-09-2018	00:38:03	
		21	70.2	56.2	60.8	44.6	00:15:00.00	01-09-2018	00:53:03	
		22	67.8	55.6	60.8	44.3	00:15:00.00	01-09-2018	01:08:03	
		23	66.8	54.1	59.3	44.5	00:15:00.00	01-09-2018	01:23:03	
		24	70.0	55.5	60.1	44.0	00:15:00.00	01-09-2018	01:38:03	
		25	69.1	56.5	60.9	44.5	00:15:00.00	01-09-2018	01:53:03	

11.0 Results Analysis

The above noise survey, carried out between 31st August and 1st September 2018, was chosen as a representative weekday period to reflect the typical noise climate for the area surrounding the proposed development site.

The noise survey results obtained for the site can, therefore, be deemed to be representative of normal activities for the area and will be used as the base for analysis and assessment purposes below.

Assessments of the individual results indicate that the monitoring positions selected are affected primarily by traffic noise sources from the movements locally along Bradford Road. Birdsong and aircraft noise was also a significant source in the area.

From the data acquired during the various assessment periods the following exposure noise levels have been established for the site.

Table of Exposure Levels

Period	**Noise Level**
Daytime (0700 – 2300 Hrs)	LAeq, 16 Hours – 56 dB
Night-time (2300 – 0700 Hrs)	LAeq, 8 Hours – 56 dB LAFmax - 72 dB Ave LAFmax – 68 dB

12.0 Mitigating Circumstances

The proposal for the development site is to form 2 No residential premises on site. The site will be accessed from Bradford Road to the north, via the existing access road, as indicated on the site proposal sketch. See Appendix A-2 for details.

There are 4 main areas to consider within the development to ensure that the building provides adequate attenuation against the ingress of external noise sources that are likely to affect the comfort and amenity of the residents.

- Construction Phase (Temporary)
- Building Fabric Construction
- Glazing Units
- External Recreational Areas

12.1 Construction Phase Noise (Temporary)

It is common practice that construction will take place during typical daytime hours only, assumed to be 07.30 to 18.00 hours during week days only and Saturday 08.00 to 13.00 hours. No construction work assumed for Sunday or Public Holidays.

There are items of plant, such as generators that may operate 24 hours dependent upon their function and these plant items may unduly affect the existing amenity of the nearby residential premises.

Noise generated by construction work has the potential to increase the noise levels at the nearby noise sensitive residential premises due to the operation of plant and equipment associated with the construction phase of the development. The level of potential increase will depend on many factors, including locality of the activities on site relative to the recipient, type of activity being undertaken and control measures implemented.

To minimize the potential impact of the noise impact mitigation measures are proposed for the construction phase as noted below.

12.1.1 Construction Noise Mitigation

Construction noise is an inevitable part of any development, however, the change in noise levels is usually short term and temporary during the construction phase of the project only.

12.1.2 Noise Action Plan

It is recommended that a Noise Action Plan is implemented for the development, addressing all aspects of the construction, including mitigation measures and procedures for dealing with on-site activities and complaints, should any arise.

The Control of Pollution Act and BS 5228 define a set of Best Practice working methods and mitigation measures, referred to as Best Practicable Means (BPM).

The following are examples of what could be included within a Noise Action Plan.

- Selective location temporary plant so that it is screened by on-site structures, such as site cabins;
- Using modern equipment and ensuring such equipment is properly maintained and correctly operated by trained staff;
- Acoustically enclosing noisy equipment if possible;
- Ensure that mobile plant is well maintained and there are no excessive rattles or vibrations that can be addressed;
- Ensuring plant machinery is turned off when not in use;
- Provide local residents with 24-hour contact details for a site representative;
- Inform local residents about the works advising of any specific noisy events and provide a contact telephone number, as noted above;
- Keep noisy deliveries to the midday period where possible.

12.1.3 Site Training / Instruction

The site training and induction programme, including site specific rules will include good working practice instructions for site staff, managers, visitors and contractors to minimise noise whilst working on the site. Good working practice guidelines/instructions should include the following points as a minimum requirement:

- Avoid unnecessary revving of plant and equipment engines;
- Intermittently used plant should be isolated between operational periods;
- Avoid reversing unnecessarily using tonal reverse horns, fit broad band warning horns where possible;
- Report any defective equipment/plant immediately so that corrective maintenance can be completed; and
- Minimise noise when handling or moving materials on site.

12.1.4 Plant Maintenance

All temporary plant items arriving on site should be in good working order and have written proof of maintenance prior to use.

Maintenance of temporary plant on site should be carried out routinely and in accordance with the manufacturers' guidance and recommendations.

Regular inspection of all plant and equipment must be undertaken to ensure that:

- all plant is in a good state of repair and operating correctly;
- any plant found to require maintenance has been identified and isolated until maintenance has been completed;
- acoustic enclosures fitted to plant are in a good state of repair and correctly fitting;
- doors and covers remain closed during operation; and
- all repairs should be completed by a fully qualified maintenance engineer for the specific plant item under consideration.

Although the above are mainly procedural recommendations and not fully quantifiable it is possible that they could reduce perceived noise levels on the site by about 5 dB.

12.2 Building Fabric Construction

The Building Regulation, relating to the minimum acoustic requirements for the various areas of the development, must be met.

Actual verification of the acoustic properties of the buildings fabric will need to be executed by pre-completion sound testing prior to occupation, or through certified test data with a Robust Details construction method.

12.2.1 Building Fabric Construction

Based upon the external baseline noise levels recorded, primarily due to traffic noise, the minimum weighted sound reduction, Rw, of the external façades will need to be Rw 45 dB to ensure that an internal specification of 30 $L_{Aeq,\ 8hours}$ dB maximum, (equivalent to NR 25), is met within the noise sensitive dwelling areas during nighttime periods, as determined within the WHO recommendations. The LAFmax of 70 dB will be attenuated such that the internal level will be up to a maximum value of 25 LAFmax dB, again in line with the specific requirements of WHO.

Based upon the potential wall construction, comprising an internal leaf of concrete block, lined externally with brick and a cavity between of at least 75mm, the following performance would be expected from the external façade construction:

Frequency in Hz	125	250	500	1000	2000
R_W of Facade	41	45	45	54	58

The roof of the building should be refitted to provide the necessary sound insulation to meet the Building Regulations with respect to the passage of sound. It is recommended that the ceiling of the premises are lined with 2 No layers of 15mm sound block plasterboard to minimize noise transmission possibilities into the formed bedroom areas below.

12.2.2 Party Walls and Floors

All party walls or floors will need to provide the minimum acoustic requirements necessary to meet with the Building Regulations, Resistance to the Passage of Sound, Approved Document E of $D_{nT,w} + C_{tr}$ 45 dB for airborne noise transmission when considered between all attached residential dwellings for new building applications.

Compliance will need to be demonstrated either by use of Robust Details or via a sound insulation Pre-Completion Test upon completion for the party walls for new build applications as directed by your Building Control officer dealing with the project.

12.2.3 Glazing Units

The primary weakness in any building envelope is usually due to windows, ventilation louvres and other apertures.

The development will not have air conditioning installed within the noise sensitive residential areas of this development, other than extraction from bathrooms which are not within the noise sensitive bedroom areas and therefore the only area of concern are the proposed window systems.

In order to provide adequate attenuation against the sound levels in the area and achieve the Building Regulations and WHO criteria, it is recommended that the formed apertures are fitted with suitable acoustic glazing units.

Using the sound exposure levels assessed for the site the minimum recommended Rw dB rating for the glazing systems for the site should be as follows.

Period	Noise Exposure Level	Internal Living Space / Bedroom Target Level	Minimum Rw Values Required
Daytime (0700 – 2300 Hrs)	LAeq, 16 Hours – 56 dB	LAeq, 16 Hours – 35 dB	**Rw 21 dB**
Night-time (2300 – 0700 Hrs)	LAeq, 8 Hours – 56 dB LAmax - 70 dB	LAeq, 8 Hours – 30 dB LAmax - 45 dB	**Rw 26 dB** **Rw 25 dB**

Based upon generic data for glazing systems, it is possible to provide the necessary sound insulation using a glazing system consisting of a 4mm Glass – 20mm wide Argon Filled Airspace – 4mm Glass. This system has certified acoustic values of Rw 30 dB, with an R_A 30 dB and $R_{A,tr}$ 27 dB.

This is the recommendation for all elevations of the development.

The acoustic properties of this type of glazing is provided below for reference.

Glazing type	Frequency in Hz	63	125	250	500	1000	2000	4000
4/20/4	R_W of Facade	18	24	20	25	34	37	43

12.2.4 Ventilation Considerations

If we consider opening a window within a bedroom to provide additional room ventilation, the accepted attenuation value of the open window is -15 dB, this would allow for an internal noise level within a bedroom of up to 35 LAeq dB at nighttime for northern elevations of the development. This level of ingress is deemed as likely to result in sleep disturbance due to external sources, set at 30 LAeq dB within WHO.

If we also consider to intermittent noise source, deemed as the LAFMax dB, recorded at 70 dB, we find that the ingress with a window open scenario will be 55 LAFMax dB. This level of ingress is again deemed as likely to result in sleep disturbance due to external intermittent sources, set at 45 LAFMax dB, as per WHO.

Based upon the above further mitigation measures would be necessary to provide rapid ventilation for the occupants other than opening a window along the northern elevation of the premsies. All other elevations

of the premises will achieve the lower exposure values to allow opening of a window for ventilation purposes.

In order to provide additional ventilation without the need to open a window along the northern elevations of the premises the the use of a trickle ventilation system could be considered. The use of trickle ventliation provides both adequate background ventilation in accordance with Approved Document F1 and the minimum acoustic properties to maintain the internal noise characteristics of a closed window using a through ventilator. The Rw values quoted above do not include for the trickle vent combination within their values and as such inclusion of a standard trickle vent will diminish the Rw values quoted.

The combined acoustic properties of the acoustic trickle vent system proposed for use on this site, Greenwood 5000EA achieve a specified sound reduction of 46 Dn,e,w dB through the ventilator in the open position, assuming it is fitted though a 300mm thick wall. This level of attenuation is achieving the minimum requirements necessary to ensure that the internal noise levels inside the bedrooms are maintained for all elevations of this project. Other manufacturers could be considered provided that the Dn,e,w dB value is maintatined.

An alternative to a trickle vent system would be the use of a forced ventilation system, either attending to the dwelling spaces only or a "Whole House" system that would remove the need for opening windows during nighttime periods. This type of system is ususally located within the roof space of the dwelling and as such not likley to give rise to noise issues from its own operation, when considered either for the internal residents or the external amenity of the the nearby noise sensitive residential premises. An acceptable system would be the Seigenia-Aubi EUROPAC which is a forced vent specifically designed for this purpose.

Another alternative to passive "background" ventilation or whole house ventilation would be rapid ventilation via wall mounted acoustic extract fans positioned within the individual bedrooms and living spaces of the dwellings. In the case of this site this includes all the bedrooms and living spaces with facades overlooking the noisiest southern elevation. The fan assembly should provide at least a 43 dBA acoustic performance level difference when not in operation. This type of extraction allows for the windows of the property to remain closed whilst still providing adequate forced ventilation during the summer periods. These acoustic ventilation systems are available from various suppliers, an example being the Greenwood Airvac AAF/S Acoustic Extract Ventilator unit, providing manual control of the fan operation.

12.2.5 External Recreational Areas

If the development is to include external recreational areas, these areas would be subject to the recorded noise climate for the site. The recorded external levels range between 54 LAeq dB and 59 LAeq dB with an average of 56 LAeq dB applicable to the site due to traffic sources.

A noise level of this magnitude is above the recommended noise criteria for outdoor spaces and as such specific mitigation would be required to achieve the limits of 50 LAeq dB for external spaces as indicated within WHO in section 5 above.

The 56 LAeq dB average noise climate would be applicable to external recreational areas if they were placed along the northern elevation of the site, however, this is not going to be the case, with recreational areas deemed as being on the opposite side of the properties along the southern side of the site. Based upon the positioning of the external recreational areas, the actual buildings will form a barrier against the direct transmission of the traffic noise from reaching the gardens.

Based upon the buildings forming a barrier against the direct transmission of traffic noise the calculated resultant in the gardens will be 45 LAeq dB, a noise level that is below the volume at which annoyance would be experienced by the incumbent residents.

12.3 BS8233:2014 Assessment

To provide further evidence that the above recommended mitigation measures will be adequate to achieve a comfortable internal environment within the dwellings once occupied, a BS8233:2014 assessment will be completed.

This assessment will account for the daytime, nighttime and maximum nighttime values recorded for the worst case northern facade of the development and compare the results against the limiting criteria necessary to demonstrate an acceptable internal environment without giving rise to any undue loss of amenity to the incumbent residents.

Below is an overview of the results of the calculations completed.

Location	Daytime	Nighttime	Nighttime Maximum	Comments
Limiting Values	35 dBA (NR 30)	30 dBA (NR 25)	45 dBA (NR 40)	
All Elevations	28.5 dBA (NR 23)	25.3 dBA (NR 20)	42.4 dBA (NR 38)	Design Target Met

As can be seen from the above overview the mitigation recommendations will allow the internal noise criterion to be fully achieved.

Refer to Appendix C for details of the full calculation data sheets.

13.0 Report Summary

An attended pre-development acoustic assessment of the existing noise levels at land adjacent to No 710 Bradford Road, Birkenshaw has been undertaken in support of the planning application for the site with respect to noise.

The noise survey established the pre-existing noise climate and sources for the area; which are primarily due to traffic movements along Bradford Road.

In order to achieve an acceptable and comfortable internal noise climate for the potential residents the WHO guidance community noise has been utilized for the acoustic target levels for the internal criteria of the dwelling areas of the development. The National Planning Policy Framework has been considered, with NR 30 daytime and NR 25 nighttime internal limits being utilized since the NPPF is not prescriptive in its noise limits and there is a potential for music event noise from the nearby club.

Mandatory mitigating recommendations are necessary to provide adequate protection against intrusion from external noise sources and achieve the WHO guidelines for the internal noise climate of the residences.

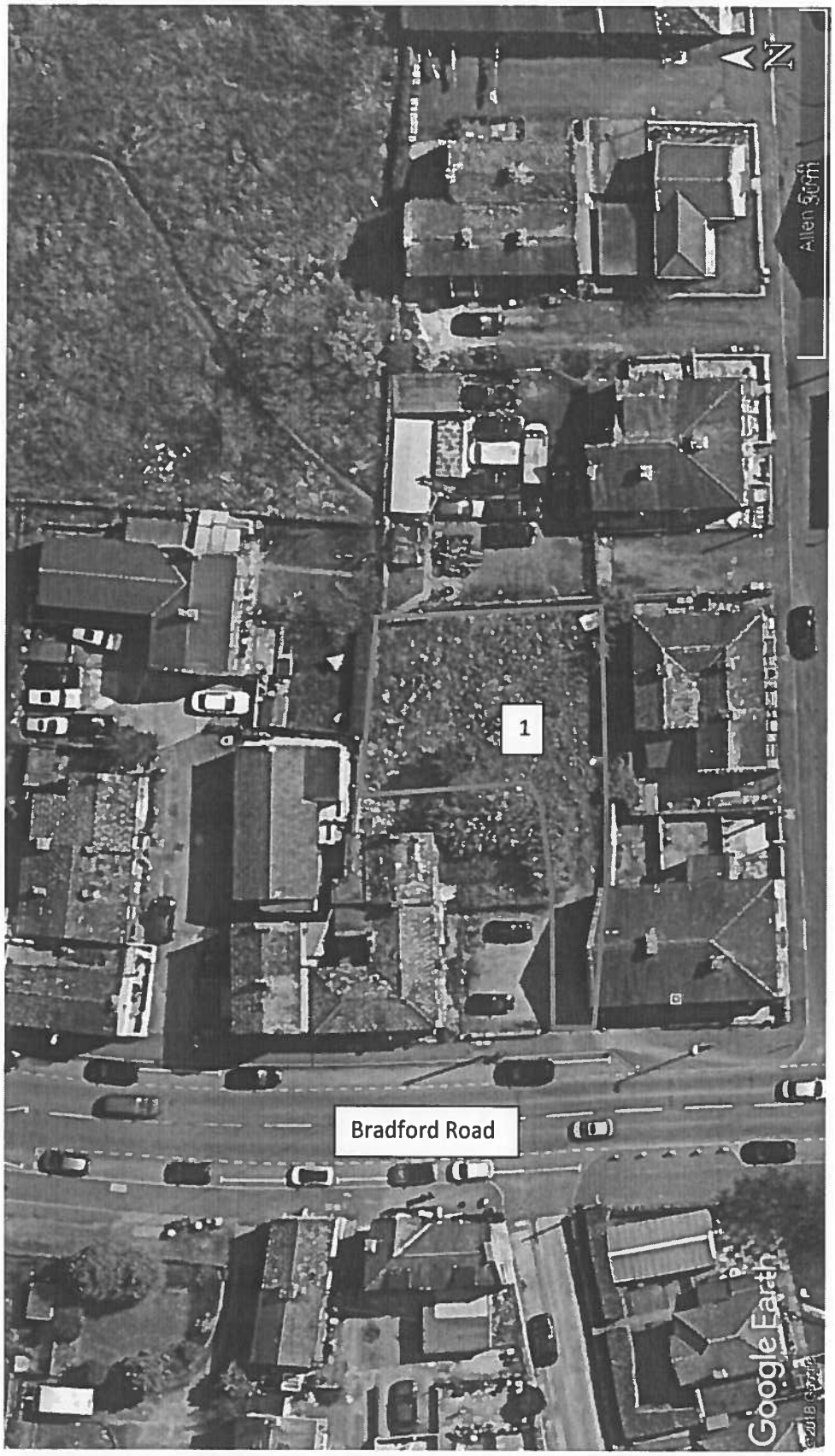
Recommendations have been proposed for the glazing systems to be employed on this development, in order to achieve the internal dwelling room design target exposure levels as determined within WHO recommendations.

To provide background ventilation opening windows is not recommended and suggestions have been provided for options of either acoustic passive or forced ventilation to be used on the development throughout as an alternative.

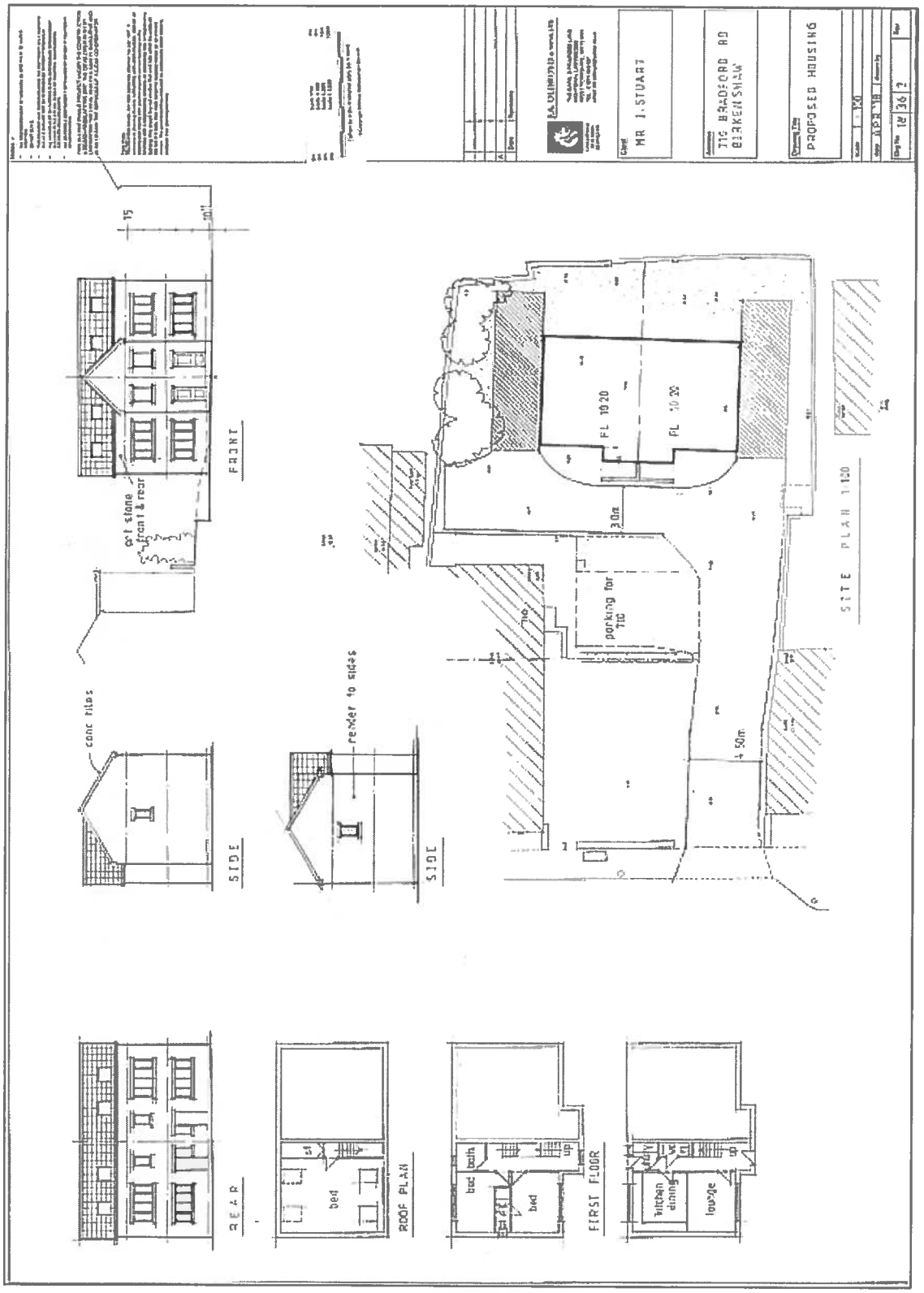
The development may have external recreational areas however this will be at the southern side of the site behind the buildings and as such acoustically shielded from the direct transmission of the traffic noise from affecting the amenity of the gardens.

Provided that the recommended mitigation measures have been incorporated into the development of the site, Planning Condition No 4 will be deemed to the have been discharged accordingly.

Appendix A-1 **Locational Outline and Monitoring Position**



Appendix A-2 Proposal Outline Drawing



Appendix B Noise Survey Frequency Analysis Results Table

					Leq dB in Freqency Bands Hz									
Location	Period	Data ID	LAmax	LAeq	63	125	250	500	1	2	4	8	LA10	LA90
			dB	dB	Hz	Hz	Hz	Hz	kHz	kHz	kHz	kHz	dB	dB
1	Daytime	1	75.4	55.6	68.0	58.9	53.4	51.1	52.2	47.1	40.1	32.5	59.5	44.6
		2	75.7	55.6	64.2	57.9	56.3	50.1	52.4	46.1	38.3	28.2	58.9	44.6
		3	67.7	55.3	64.7	58.4	53.6	51.1	52.2	46.2	37.8	28.6	59.0	46.6
		4	70.6	55.4	65.5	58.0	53.5	50.9	52.4	46.7	38.7	32.2	58.9	46.7
		5	71.7	55.8	69.2	60.2	53.8	51.2	52.4	46.6	39.0	29.6	58.9	46.0
		6	64.1	54.4	64.3	54.9	51.8	49.0	51.9	45.5	37.2	27.4	57.7	46.8
		7	73.5	54.6	64.0	54.7	52.2	51.6	51.2	45.3	36.1	29.1	57.9	46.5
		8	66.8	56.9	68.8	60.1	55.3	52.3	53.5	48.1	40.9	37.0	60.4	51.9
		9	72.8	55.4	64.9	56.1	53.4	50.9	52.4	46.4	38.5	29.6	58.6	46.8
		10	64.4	55.7	67.5	57.3	53.4	50.8	52.4	47.2	40.1	31.1	58.9	49.0
		11	66.5	55.7	66.9	57.6	53.2	50.8	52.7	47.0	40.2	31.2	59.2	48.6
		12	75.0	59.9	66.8	62.0	57.2	55.1	56.8	51.7	41.2	32.4	59.4	49.3
	Evening	13	68.5	55.8	68.4	57.3	53.2	51.1	53.0	46.4	38.4	30.8	59.2	46.9
		14	70.3	56.3	68.2	59.3	54.5	51.6	53.4	47.1	39.1	30.8	59.6	48.0
		15	71.5	56.6	66.3	59.1	54.5	52.3	53.8	46.9	38.5	30.5	60.0	46.4
	Nighttime	16	70.1	55.9	58.7	53.8	51.4	50.1	53.7	47.5	37.2	27.6	60.4	45.1
		17	72.4	56.3	63.3	56.1	52.8	52.0	53.6	47.3	37.7	27.9	60.3	44.8
		18	66.3	55.4	60.3	53.4	51.6	50.1	53.1	46.7	36.4	27.9	60.5	45.1
		19	65.6	55.1	61.5	53.7	51.4	49.8	52.6	46.6	37.9	29.1	60.4	44.7
		20	69.4	55.5	64.1	59.7	53.5	49.8	52.7	46.6	36.0	25.8	60.0	44.6
		21	70.2	56.2	59.5	60.1	51.7	50.3	53.7	47.8	38.1	29.5	60.8	44.6
		22	67.8	55.6	58.6	55.4	51.4	50.1	53.3	47.0	37.1	28.0	60.8	44.3
		23	66.8	54.1	59.3	53.0	50.1	49.0	51.8	45.3	34.5	24.5	59.3	44.5
		24	70.0	55.5	61.0	55.5	53.1	50.6	53.1	46.3	35.5	25.7	60.1	44.0
		25	69.1	56.5	61.2	58.9	53.4	51.1	53.9	48.2	38.6	28.2	60.9	44.5

Appendix C BS8233:2014 Noise Ingress Assessment Calculation - 1 of 2

BS8233:2014 NOISE INGRESS CALCULATION - NORTHERN FAÇADE ONLY

Position Assessment - Ground Floor Living Space	Leq Octave band noise levels (dB)							dBA
	63 Hz	125 Hz	250 Hz	500 Hz	1K Hz	2K Hz	4K Hz	
Ground Floor Façade - Daytime								
Average façade noise levels	69.2	60.2	53.8	51.2	52.4	46.6	39.0	**55.9**
Noise reduction through façade elements								
SRI External solid wall	-36	-44	-43	-49	-57	-66	-70	
absorption area	-3	-3	-3	-3	-3	-3	-3	
noise level through wall	30.2	13.2	7.8	0.0	0.0	0.0	0.0	9.0
SRI windows - glazing (4 - 20 - 4)	-18	-24	-20	-25	-34	-37	-43	
absorption area - Window 2.4m x 2.1m	-3	-3	-3	-3	-3	-3	-3	
noise through windows	48.2	33.2	30.8	23.2	15.4	6.6	0.0	27.1
SRI acoustic ventilator - Trickle Vent	-30	-34	-27	-37	-35	-34	-38	
absorption area - N/A	0	0	0	0	0	0	0	
noise level through vent	39.2	26.2	26.8	14.2	17.4	12.6	1.0	22.8
Total noise internally								
through wall	30.2	13.2	7.8	0.0	0.0	0.0	0.0	9.0
through glazing	48.2	33.2	30.8	23.2	15.4	6.6	0.0	27.1
through vent	39.2	26.2	26.8	14.2	17.4	12.6	1.0	22.8
Combined total	48.6	33.9	32.7	23.5	19.6	14.0	5.1	**28.5**
Criteria - Living Room - Daytime								**35.0**
NR 30 Criteria	**59**	**48**	**40**	**34**	**30**	**27**	**25**	
Variance and Actual NR Value Acieved	-10.4	-14.1	-7.3	-10.5	-10.4	-13.0	-19.9	**NR 23**

Position Assessment - 1st Floor Bedroom	Leq Octave band noise levels (dB)							dBA
	63 Hz	125 Hz	250 Hz	500 Hz	1K Hz	2K Hz	4K Hz	
1st Floor Façade								
Nighttime façade noise levels	64.1	59.7	53.5	49.8	52.7	46.6	36.0	**55.5**
Noise reduction through façade elements								
SRI External solid wall	-36	-44	-43	-49	-57	-66	-70	
absorption area	-3	-3	-3	-3	-3	-3	-3	
noise level through wall	25.1	12.7	7.5	0.0	0.0	0.0	0.0	7.8
SRI windows - glazing (4 - 20 - 4)	-18	-24	-20	-25	-34	-37	-43	
absorption area - Window 1.8m x 1.2m	-6.6	-6.6	-6.6	-6.6	-6.6	-6.6	-6.6	
noise through windows	39.5	29.1	26.9	18.2	12.1	3.0	0	22.1
SRI acoustic ventilator - Trickle Vent	-30	-34	-27	-37	-35	-34	-38	
absorption area - N/A	0	0	0	0	0	0	0	
noise level through vent	34.1	25.7	26.5	12.8	17.7	12.6	0.0	22.3
Total noise internally								
through wall	25.1	12.7	7.5	0.0	0.0	0.0	0.0	7.8
through glazing	39.5	29.1	26.9	18.2	12.1	3.0	0.0	22.1
through open window	34.1	25.7	26.5	12.8	17.7	12.6	0.0	22.3
Combined total	40.5	30.7	30.1	19.2	18.8	13.5	4.8	**25.3**
Criteria - Living Room - Daytime								**30.0**
NR 25 Criteria	**55**	**44**	**35**	**29**	**25**	**22**	**20**	
Variance and Actual NR Value Acieved	-14.5	-13.3	-4.9	-9.8	-6.2	-8.5	-15.2	**NR 20**

Appendix C BS8233:2014 Noise Ingress Assessment Calculation - 2 of 2

BS8233:2014 NOISE INGRESS CALCULATION - NORTHERN FAÇADE ONLY

Position Assessment - 1st Floor Bedroom	Leq Octave band noise levels (dB)							dBA
	63 Hz	125 Hz	250 Hz	500 Hz	1K Hz	2K Hz	4K Hz	
1st Floor Façade								
MAX façade noise levels	78.7	74.0	70.6	70.5	68.5	64.0	56.7	**72.7**
Noise reduction through façade elements								
SRI External solid wall	-36	-44	-43	-49	-57	-66	-70	
absorption area	-3	-3	-3	-3	-3	-3	-3	
noise level through wall	39.7	27.0	24.6	18.5	8.5	0.0	0.0	20.7
SRI windows - glazing (4 - 20 - 4)	-18	-24	-20	-25	-34	-37	-43	
absorption area - Window 1.8m x 1.2m	-6.6	-6.6	-6.6	-6.6	-6.6	-6.6	-6.6	
noise through windows	54.1	43.4	44.0	38.9	27.9	20.4	7.1	39.6
SRI acoustic ventilator - Trickle Vent	-30	-34	-27	-37	-35	-34	-38	
absorption area - N/A	0	0	0	0	0	0	0	
noise level through vent	48.7	40.0	43.6	33.5	33.5	30.0	18.7	39.2
Total noise internally								
through wall	39.7	27.0	24.6	18.5	8.5	0.0	0.0	20.7
through glazing	54.1	43.4	44.0	38.9	27.9	20.4	7.1	39.6
through vent	48.7	40.0	43.6	33.5	33.5	30.0	18.7	39.2
Combined total	55.1	45.0	47.2	39.8	34.6	30.7	19.0	**42.4**
Criteria - Living Room - Daytime								**45.0**
NR 40 Criteria	**67**	**57**	**49**	**44**	**40**	**37**	**35**	
Variance and Actual NR Value Acieved	-11.9	-12.0	-1.8	-4.2	-5.4	-6.3	-16.0	**NR 38**