



Azymuth Acoustics UK

Professional Acoustic Services

Noise Impact Assessment

Ref: AA0406

Tootal Grove Development

Tootal Grove

Salford

M6 8DN

On behalf of

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1.0 Introduction

Azymuth Acoustics UK (henceforth Azymuth) has been contracted by Identity Consult to perform a baseline noise survey around the site at Tootal Grove, and report on the findings of that survey along with recommendations of assessment criteria and attenuation works to achieve those criteria.

2.0 Baseline Noise Survey

2.1 Measurement Procedure

The measurement procedure involved testing at multiple locations to provide an accurate picture of the noise climate at the site. These were all manned tests, each lasting 30 minutes or an hour, sampling at 5 minute intervals repeated throughout the measurement.

Azymuth performed daytime measurements at three locations:

- On site on Wednesday 13th January 2022 from 10:52 - 11:22
- In the nearby residential home garden on Wednesday 13th January 2022 from 11:43 - 12:43
- On the corner of Laurel Grove on Wednesday 19th January 2022 from 11:45 – 12:20

One night-time measurement was taken on the corner of Laurel Grove from 23:16 on Tuesday 18th January to 00:16 on Wednesday 19th January. This was the only secure location that a night-time measurement could be performed at.

The tests at Laurel Grove were different to the other locations in that the microphone was positioned at a higher elevation than the wall at the end of the street.

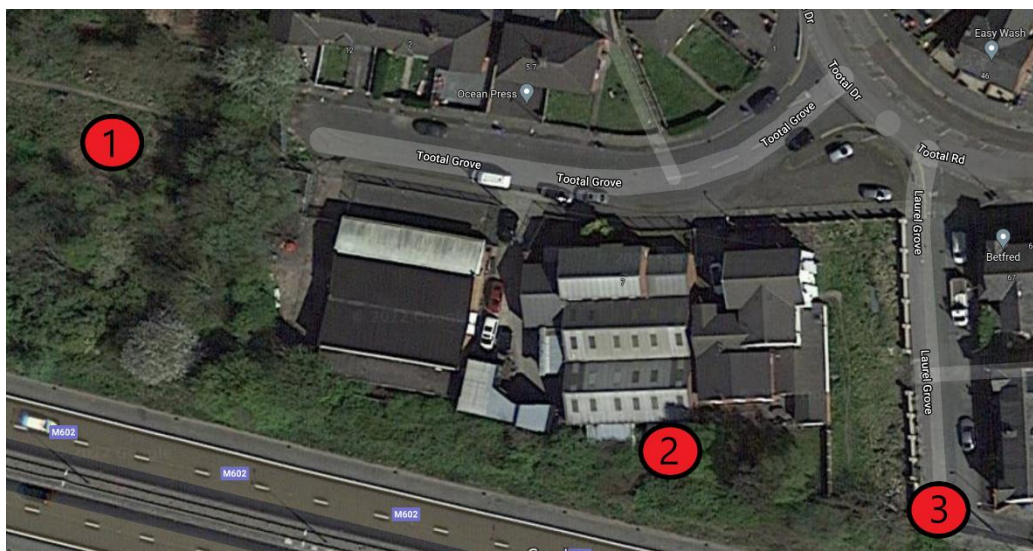


Figure 1 – The three measurement locations marked on a satellite image.

3.0 Results

3.1 Results of Noise Measurements

Location		L _{AFMax}	L _{Aeq}	L ₁₀	L ₅₀	L ₉₀
On-Site (Position 1)	Day	69.6	58.9	60.8	58.2	55.5
	Night (Estimated)	66.8	51.0	54.3		
Residential Home (Position 2)	Day	69.9	62.7	64.7	62.1	59.3
	Night (Estimated)	67.1	54.9	58.3		
Laurel Grove (Position 3)	Day	79.4	72.3	74.6	71.7	68.0
	Night	76.6	64.4	68.1	61.0	51.2

Table 1 - A table showing summary results of the various measurements taken. Full data can be found in Appendix B.

The results of the noise survey described in section 2 are presented in the table above. At the on-site location and the residential home, night-time measures have been estimated, based upon difference between night and day measurements taken at Laurel Grove. No reliable estimate can be provided for the LA50 and LA90 at locations where measurement was not possible.

A notable difference in Table 1 is that between the measurements at Laurel Grove compared to the other locations. It is likely due to the higher elevation of the microphone compared to the other locations and the consequent reduction in the acoustic screening from the edge of the motorway cutting / site embankment.

3.2 Noise Climate

At the location the noise climate is dominated by the nearby M602 motorway. Of note is the use of the area by pedestrians and dog-walkers, and a right of way will likely continue following the completion of works on this site.

4.0 Assessment Criteria

In order to assess the extent of any measures required in order to comply with suitable conditions relating to potential noise sources, Azymuth Acoustics UK has reviewed various guidance documents and standards, these include:

- ProPG: Professional Practice Guidance on Planning and Noise (New residential development)
- National Planning Policy Framework (NPPF 2018)
- British Standard 8233:2014
- World Health Organisation Guidelines on Community Noise
- British Standard 4142:2014
- Acoustics Ventilation and Overheating Residential Design Guide 2020

4.1 ProPG: Planning and Noise - May 2017

This Professional Practice Guidance on Planning and Noise (ProPG) has been produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England. The National Planning Policy Framework (NPPF) encourages improved standards of design. The CIEH, IOA and the ANC have worked together to produce this guidance which encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise.

The Professional Practice Guidance on Planning and Noise States 'The recommended approach is intended to give the developer, noise practitioner, and decision maker an early indication of the likely initial suitability of the site for new residential development from a noise perspective and the extent of acoustic issues that would be faced'. It is important that acoustic design is reviewed at an early stage of the development process.

4.2 National Planning Policy Framework (NPPF) 2018

The NPPF provides guidance to local authorities taking into account noise in making planning decisions. Paragraph 180 of the National Planning Policy Framework (NPPF) states that planning policies and decisions should aim to:

- Avoid noise giving rise to significant adverse impacts on health and quality of life as a result of new development
- Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions

The National Planning Policy Framework states that the planning system should 'prevent both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability'.

4.3 British Standard 8233: 2014

BS 8233 provides a code of practice for the sound insulation of a variety of building types affected by general environmental noise. It provides recommendations for control of noise in and around buildings and suggests appropriate internal ambient noise level criteria / limits for a variety of different situations including residential properties.

The following table summarises the noise limits suggested by BS 8233 applying to residential properties:



Activity	Room	Good Design Range $L_{Aeq, T}$ dB	
		07:00-23:00hrs	23:00-07:00
Resting	Living Room	35	-
Dining	Dining Room / Area	40	-
Sleeping (daytime resting)	Bedroom (at night)	35	30

Table 2 – Noise Limits for Residential Properties Suggested in BS 8233

4.4 World Health Organisation Environmental Noise Guidelines (ENG) 2018

The main purpose of the 2018 WHO guidelines is to provide recommendations for protecting human health from exposure to environmental noise originating from the following sources: transportation (road traffic, railway and aircraft), wind turbines and leisure activities.

The guidelines set out to define recommended exposure levels for environmental noise in order to protect population health. Exposure limits are average levels defined over a period of one year, measured outdoors in free field at the most exposed façade. It should be noted that the document does not provide guideline limit values for multiple noise sources in combination.

The 2018 guidelines supersede the Community Noise Guidelines from 1999. Nevertheless, the document recommends that all CNG indoor guideline values and any values not covered by the current guidelines should remain valid. As such, the following guidance would remain appropriate:

For protection against sleep disturbance inside dwellings, night time noise levels should not exceed 30dB L_{Aeq} for continuous noise and 45dB L_{Amax} for typical single sound events (which are exceeded 15times or more per night – see ProPG Appendix A.12 for more details).

To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise (interpreted as noise from all sources combined) should not exceed 55dB L_{Aeq} on balconies, terraces and in outdoor living areas.

It should be noted that exposure levels defined in ENG and CNG are for guidance purposes as relates potential adverse health impacts and should not be interpreted as absolute limits or regulations.

4.5 British Standard 4142:2014

British Standard 4142: 2014 “Methods for assessing and rating industrial sound” describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

- Typically, the greater the difference between background sound and industrial/commercial noise, the greater the magnitude of the impact.
- 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.

- A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.
- A difference of around + 10dB or more is likely to be an indication of an adverse impact, depending on the context.

BS 4142 notes that: *“Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.”*

4.6 Acoustics Ventilation and Overheating Residential Design Guide 2020

The Acoustics, Ventilation and Overheating Guide (AVO) is intended to be used by acoustics practitioners as well as all those involved in the planning, development, design and commissioning of new dwellings.

It recommends an approach to acoustics assessments for new residential development that take due regard of the interdependence of provisions for acoustics, ventilation and overheating. Application of the AVO Guide is intended to demonstrate good acoustic design as described in the ProPG, when considering internal noise level guidelines.

4.7 Recommended Noise Assessment Criteria

Based on the guidance above it is recommended that the following criteria would be reasonable with the aim of minimising the impact of the environmental noise on the proposed new residential accommodation:

- Daytime noise levels not to exceed 35dB $L_{Aeq, 16hr}$ in living rooms / bedrooms
- Daytime noise levels not to exceed 40dB $L_{Aeq, 16hr}$ in dining room / kitchen
- Noise levels in bedrooms not to exceed 35dB $L_{Aeq, 16hr}$ for daytime periods
- Night-time noise levels in bedrooms not to exceed 30dB $L_{Aeq, 8hr}$
- Night-time single sound events in bedrooms not to exceed 45dB L_{Amax} more than 15 times a night

Table 4, Note 5 of BS 8233:2014 states: ‘If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level. If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment.’



5.0 Assessment of Results

5.1 Noise Risk Assessment

The risk assessment is based on survey data and incorporates a worst-case approach to potential night-time effects. Adverse effect risk levels affecting the façade facing the M602 are summarised in the table below.

Floor level	Time of Day	Calculated Noise Levels (dBA)	Risk of Adverse Effect
Ground Floor	Daytime $L_{Aeq, 16hr}$	66.0	Medium
	Night-time $L_{Aeq, 8hr}$	57.9	Medium
First Floor (calculated)	Daytime $L_{Aeq, 16hr}$	69.5	Medium/High
	Night-time $L_{Aeq, 8hr}$	61.4	High

Table 3 - A table showing the risk of adverse effect from noise as per ProPG

5.2 Motorway Noise Assessment

The highest level is on the motorway facing façade, on the first floor of any buildings in the area. The greatest reduction required to meet the criteria as laid out in section 4.7 will be during the day on the first floor, necessitating a minimum reduction of approximately 34.5dB.

5.3 Noise Impact Modelling

Azymuth has undertaken acoustic modelling with the SoundPlan noise modelling software to provide a visualisation of the data collected in the survey, and to demonstrate points made throughout the report. These will cover the site with no noise mitigation methods employed.

5.3.1 Noise Contour Maps

The figures below show the calculated sound levels as bands of levels on a 2D map. One has been produced for the site in the current state, and one has been produced for the site following the potential development. The calculations made have been used to produce recommendations specific to each façade of the development.

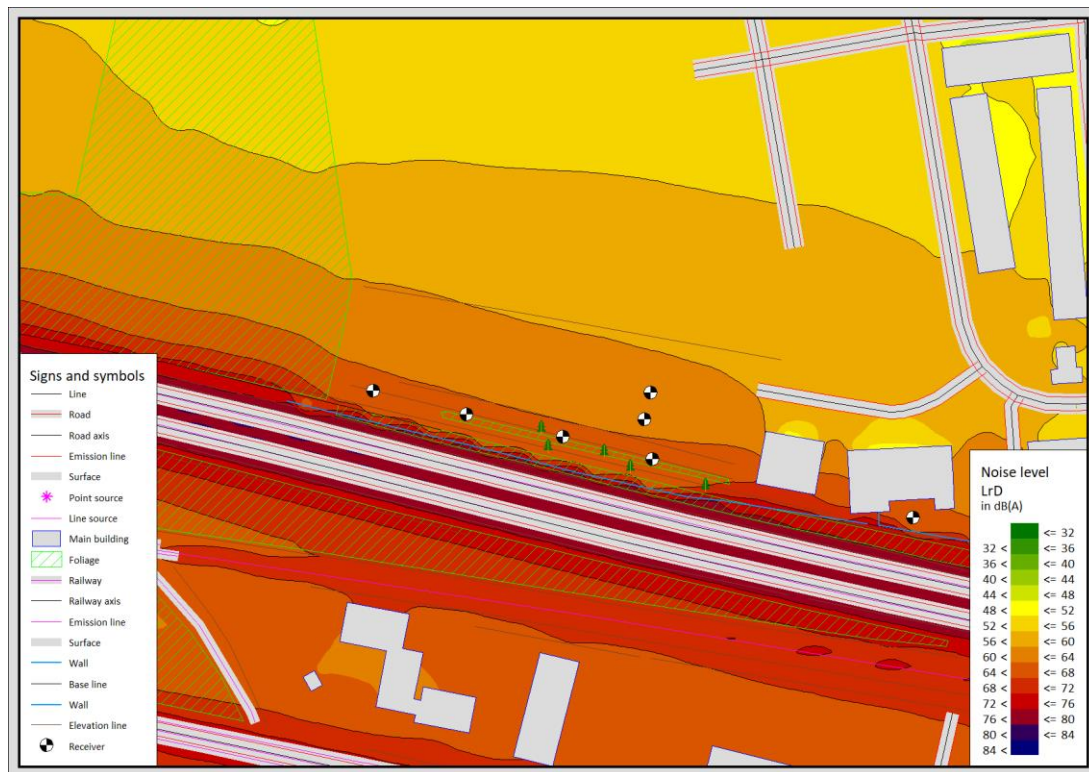


Figure 2 – A contour map showing daytime noise level at the Tootal Grove site, on the ground floor of a proposal development with no buildings.

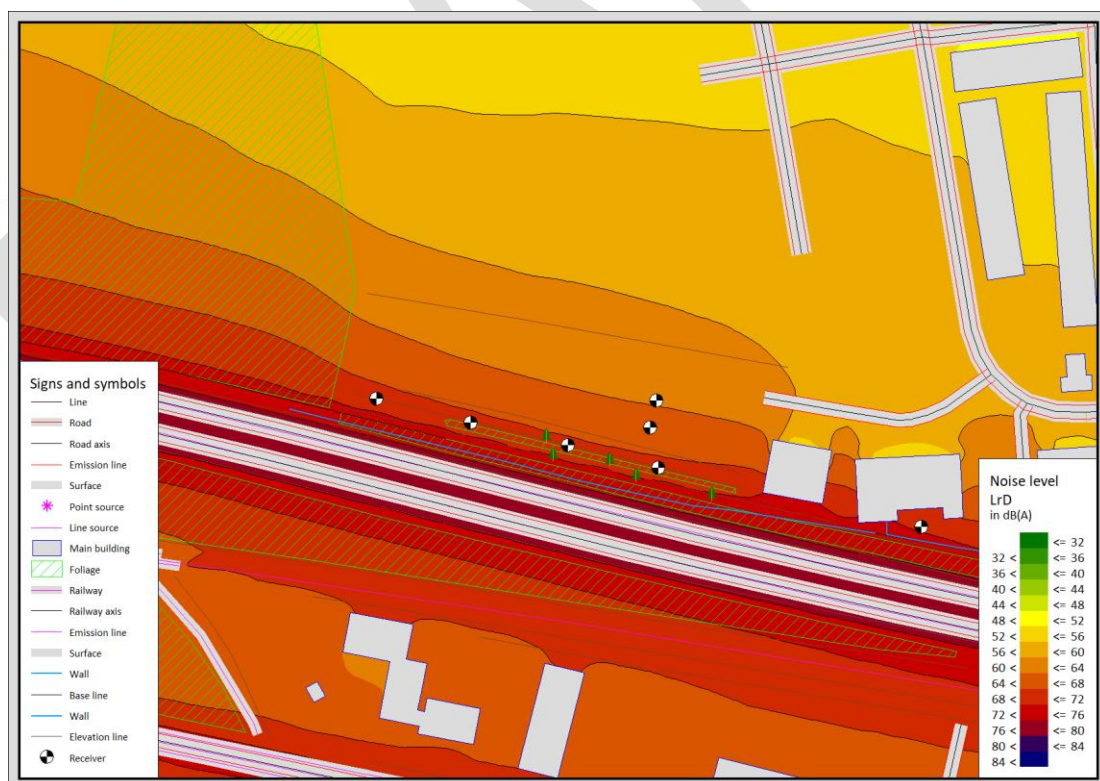


Figure 3 - A contour map showing daytime noise level at the Tootal Grove site, on the first floor of a proposal development with no buildings.

5.3.2 Façade Noise Map

The figure below shows a façade noise map, produced based on the proposed buildings on site. This does not include any mitigation measures. Models such as this are produced by calculating the sound level at multiple receivers across the façade of a building. This shows the difference in level between floors and façades.

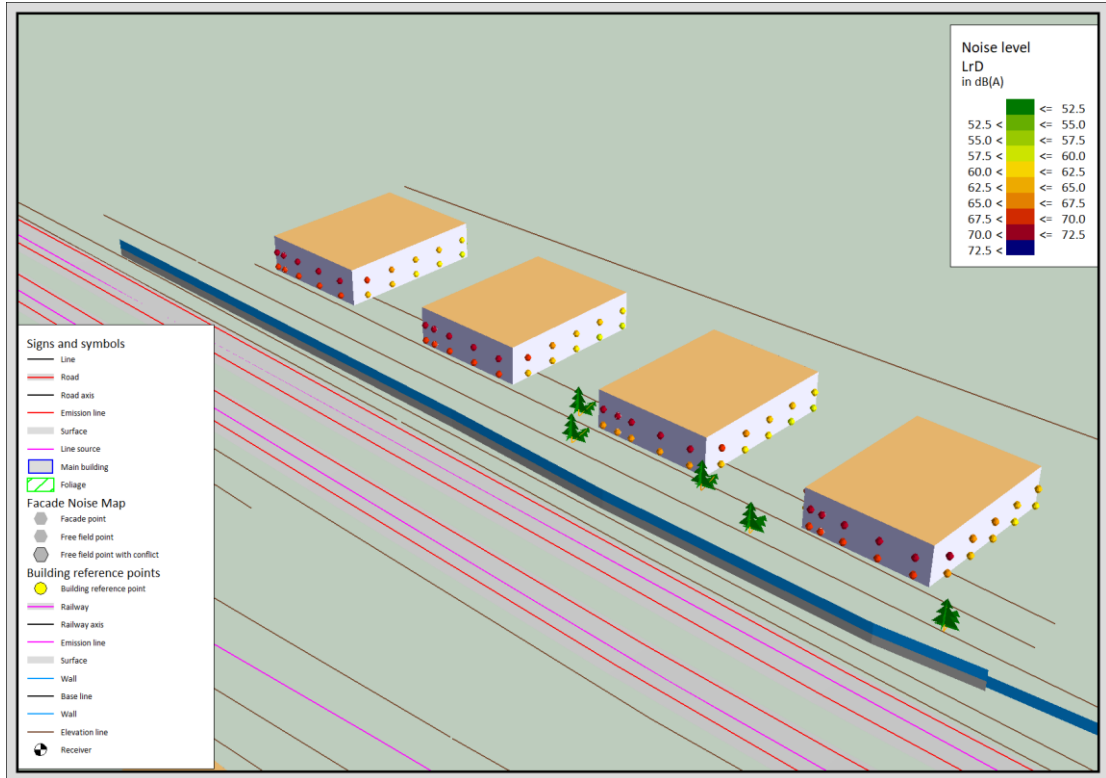


Figure 4 – A façade noise map showing the noise levels at different points on each façade of the proposed buildings.

6.0 Recommendations for Noise Mitigation

The following recommendations for noise mitigation have been produced by Azymuth based upon the drawing included below:

The façades are highlighted in red and green below to indicate the façades at risk.

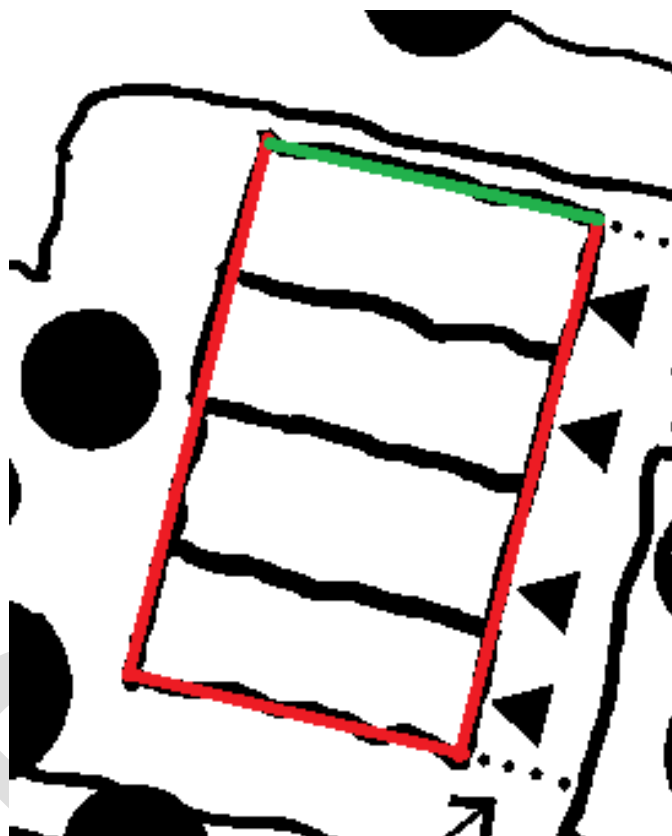


Figure 5 - Drawing of site taken from proposal presentation, with different glazing specifications indicated with either red or green.

6.1 Glazing Strategy

The below table outlines the glazing specifications Azymuth recommends for each façade of the building.

Location (Habitable Spaces)	Glazing Specifications	Appropriate Glazing Types
North, East and West façades (Red)	Airborne sound insulation min. R_w 39dB and R_w+C_{tr} 33dB	Acoustically rated double glazing (e.g. 6 mm / 16 mm argon / 6.8 mm Pilkington Optiphon™)
South façade (Green)	Airborne sound insulation min. R_w 31dB and R_w+C_{tr} 26dB	Good quality standard thermal double glazing

Table 4 - A table with recommendations of glazing specification for each façade of the proposed buildings.

6.2 Ventilation Strategy

The table below indicates the recommended ventilation that should be paired with the glazing specification to maintain the sound insulation.



Location (Habitable Spaces)	Ventilation Specifications	Window slot vent trickle ventilation (where applicable)
North, East and West façades (Red)	System 4 MVHR mechanical (windows can be opened but MVHR has purge vent for acoustics)	No Trickle Vents Required – MVHR
Dwellings with windows on South façade only (Green)	Any building regulations approved	Standard ventilation types

Table 5 - A table with recommendations of glazing specification for each façade of the proposed buildings

6.3 Other Elements of Building Envelope

Other elements of the building envelope should have the following minimum sound insulation performance:

- External Walls: minimum sound insulation R_w 52dB. This minimum is likely to be significantly exceeded by a normal brickwork façade. Where alternative external wall types are proposed on habitable areas it will be appropriate to check that they comply with the R_w 52dB target.
- Roof: minimum sound insulation R_w 45dB. This minimum would likely be exceeded with a traditional slate tile roof with mineral wool loft insulation above plasterboard ceilings or by a suitably insulated concrete roof or composite flat roof. (NB for composite flat roof build-ups a minimum 200mm roof void and 100mm mineral wool insulation would be recommended over and above the rigid insulation required to provide the required levels of thermal insulation).

6.4 Noise Barrier along M602 Boundary

In addition to the above specification, Azymuth recommends constructing a noise barrier along the boundary with the M602. A noise barrier of height 2.5-3.5 metres is recommended, with the recommended height being dependent on the precise location of the proposed dwellings.

Preliminary noise model calculations indicate that the (2.5 – 3.5m high) noise barrier is able to provide approximately 6dB attenuation of the noise from the M602 motorway.

A detailed recommendation of the position and height of the noise barrier will require precise plans for the dwellings (e.g. height of windows, location of habitable rooms, etc.) and a topographical survey of the site to assist in further noise modelling work.

A 3D model showing the view of the potential noise barrier from the motorway has been included below:

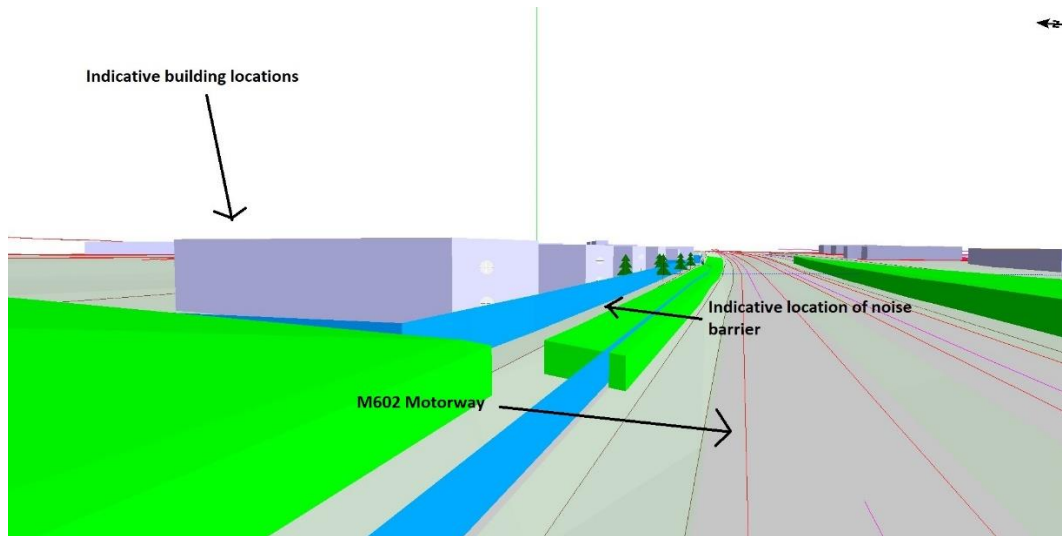


Figure 6 - A 3D model of the proposed dwellings and noise barrier, with locations approximated given the position of the buildings in relation to the site boundary in the rough sketch provided by Identity.

6.4.3 Noise Contour Modelling

Azymuth has modelled the area with the proposed buildings and noise barrier added.

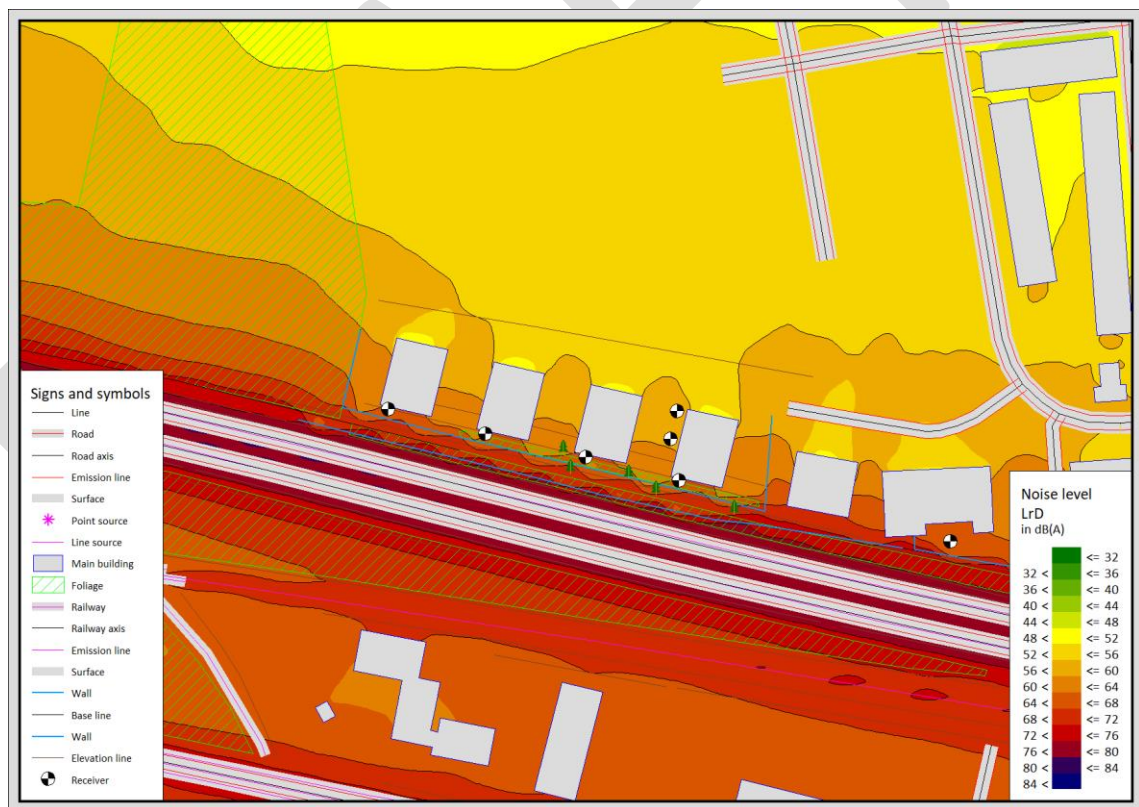


Figure 7 - A contour map showing daytime noise level at the Tootal Grove site, on the ground floor of a proposal development with proposed buildings and noise barrier added.

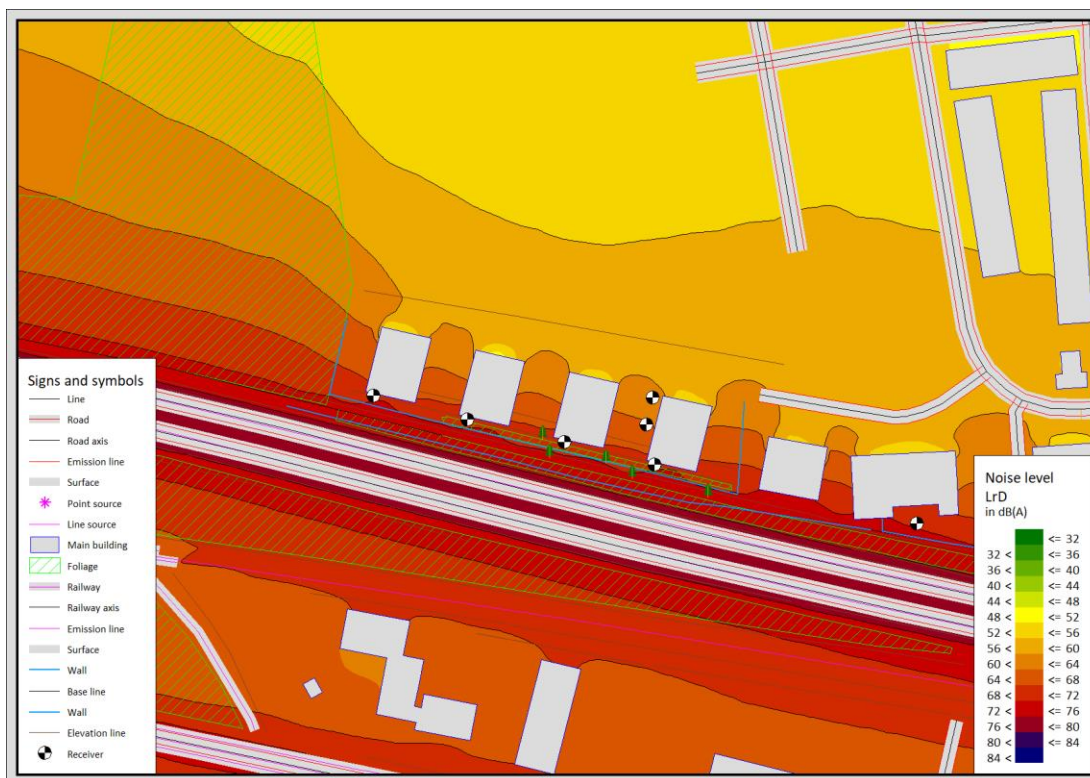


Figure 8 - A contour map showing daytime noise level at the Tootal Grove site, on the first floor of a proposal development with proposed buildings and barrier added.

6.4.4 Façade map with noise barrier

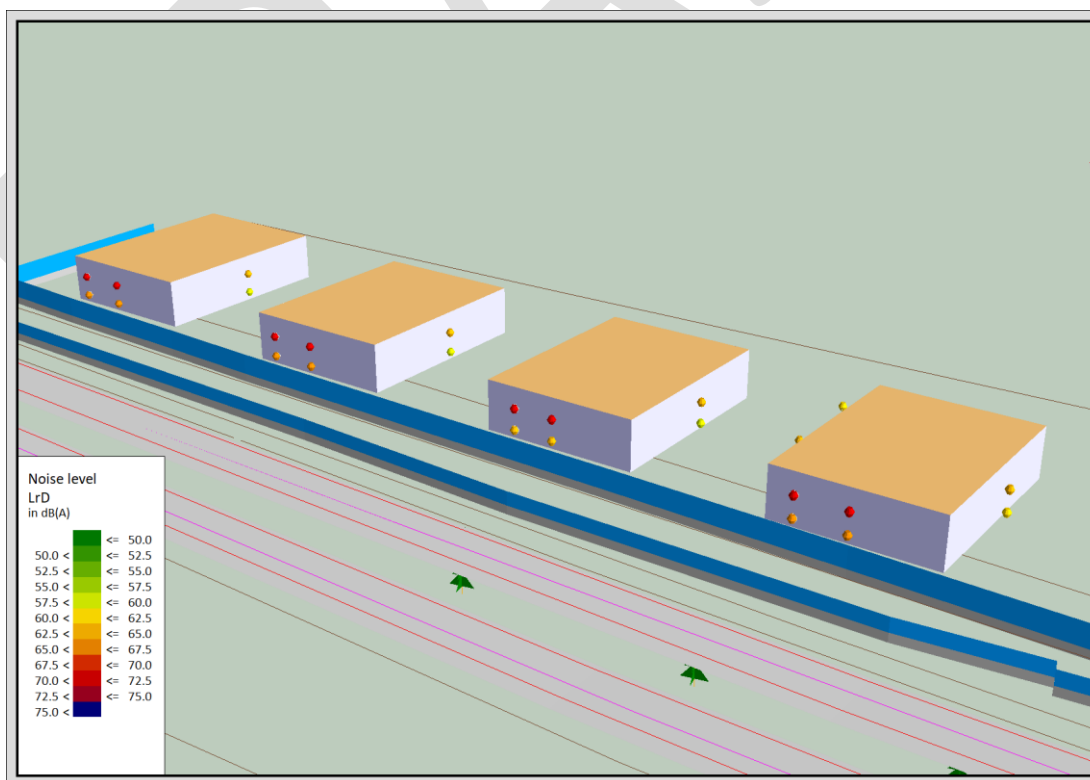


Figure 9 – A façade noise map showing the noise levels at different points on each façade of the proposed buildings with the noise barrier added.

7.0 Summary

- Azymuth recommends the following criteria:
 - Daytime noise levels not to exceed 35dB LAeq, 16hr in living rooms / bedrooms
 - Daytime noise levels not to exceed 40dB LAeq, 16hr in dining room / kitchen
 - Noise levels in bedrooms not to exceed 35dB LAeq, 16hr for daytime periods
 - Night-time noise levels in bedrooms not to exceed 30dB LAeq, 8hr
 - Night-time single sound events in bedrooms not to exceed 45dB L_{Amax} more than 15 times a night
- The existing noise climate on the site is dominated by traffic noise associated with the M602 motorway. The existing noise levels can be characterised as follows:
 - Daytime noise levels at 1.5 above ground vary between 66dBA close to the edge of the site closest to the M602 and 57dBA towards the rear of the site.
 - Daytime noise levels at a height of ~4.0m above ground (equivalent to 1st floor level) are calculated / extrapolated at 69dBA at the approximate location of the proposed buildings
 - Night-time noise levels at ground floor level (1.5m above ground) vary between 58dBA close to the edge of the site closest to the M602 and 50dBA towards the rear of the site.
- Based on these findings the following noise mitigation are recommended:
 - Glazing on the south facing and side (east and west facing) façades have airborne sound insulation min. R_w 40dB and R_w+C_{tr} 33dB
 - System 4 MVHR ventilation in all apartments with windows on the front and side façades
 - A noise barrier between 2.5 and 3.5 metres (exact details to be confirmed subject to topographic surveys)

Appendix A – Glossary of Acoustic Terms

Decibel (dB)

This is the unit used to measure sound. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro Pascal to 100 Pascal).

dB (A)

This is a measure of the overall noise level of sound across the audible spectrum with a frequency weighting (i.e. A-weighting) to compensate for the sensitivity of the human ear to sound of different frequencies. The A-weighting curve is implemented in sound level meters using an electronic filter that approximately corresponds to the frequency response of the ear.

Octave Band Noise Level

The human ear is sensitive to sound over a range of frequencies between approximately 20 Hz to 20 kHz. The ear is also generally more sensitive to medium and high frequencies than to low frequencies. In order to define the frequency content of a noise, the spectrum can be divided into frequency bands. The most commonly used frequency bands are octave bands, in which the mid-frequency of each band is twice that of the band below it.

L_{Aeq}

This is the equivalent steady sound level in dB (A) containing the same acoustic energy as the actual fluctuating sound level over a given time period.

Reverberation Time (RT or sometimes T₃₀ or T₆₀)

This is the time taken for the reverberant sound energy in an enclosure to decay one millionth of its equilibrium value, i.e. by 60 dB, after the source has been switched off, is known as the reverberation time. The reverberation time is frequency dependent and it is customary to measure its value in octave or one-third octave bands. Reverberation occurs when sound waves are repeatedly reflected from each surface of the room.

Sound Reduction Index (SRI)

Difference measured between the amount of energy flowing towards the wall in the source room and the total amount of energy flowing towards the wall in the source room and the total amount of energy entering the receiving room (usual range 100 - 3150 Hz for one third octave band values). The SRI varies with frequency and is measured in a laboratory in either octave or one-third octave bands.

$SRI = L1 - L2 + 10 \log (S/A)$, where:

L1 = Noise level in the source room

L2 = Noise levels in the receiving room

S = Surface area of test specimen

A = Equivalent acoustic absorption area in the receiving room

Weighted Sound Reduction Index (R_w)

This is a weighted single figure descriptor of the sound insulation performance of a partition measured under laboratory conditions. The procedure used to quantify the R_w is to compare the sound reduction index (SRI) in each of the one-third octave bands from 100Hz to 3150Hz against a set of standard reference curves.



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Appendix B1 – Measurement Position 1 Data

Time	L _{AFMax}	L _{Aeq}	L _{A10}	L _{A50}	L _{A90}
10:52	79.5	59.5	60.7	58.2	55.7
10:57	67.1	58.6	60.7	58.2	55.7
11:02	65.7	58.5	60.7	58.2	55.7
11:07	74.0	59.0	60.8	58.2	55.2
11:12	64.8	58.5	60.8	58.2	55.2
11:17	66.5	59.0	60.8	58.2	55.2

Appendix B2 – Measurement Position 2 Data

Date & Time	L _{AFMax}	L _{Aeq}	L _{A10}	L _{A50}	L _{A90}
11:43	70.3	62.7	64.8	62	58.6
11:48	72.6	63.1	65.6	62.2	58.6
11:53	68.3	62.3	64.3	61.9	59
11:58	68.4	62.5	64.3	62.1	59.8
12:03	68.7	62.5	64.5	62.1	59.8
12:08	69.3	62.4	64.7	61.8	58.6
12:13	69.8	62.8	64.8	62.4	59.4
12:18	69.7	62.9	64.9	62.2	60
12:23	69.1	63	65	62.5	60
12:28	69.1	63.1	65.3	62.5	59.6
12:33	69.1	62.2	64.1	61.7	59.1
12:38	74.8	62.8	64.6	61.9	58.9

Appendix B3 – Measurement Position 3 Data (Day)

Time	L _{AFMax}	L _{Aeq}	L _{A10}	L _{A50}	L _{A90}
11:45	80.9	72.8	75	72.2	68
11:50	80.1	72.3	74.7	71.4	67.8
11:55	78.6	71.9	74.3	71.3	67.2
12:00	79	72.1	74.4	71.5	68
12:05	79.8	72.3	74.5	71.8	68.8
12:10	78.8	71.9	74.4	71.3	67.6
12:15	78.8	72.5	74.8	72.1	68.3



Appendix B4 – Measurement Position 3 Data (Night)

Time	L _{AFMax}	L _{Aeq}	L _{A10}	L _{A50}	L _{A90}
11:45	80.9	72.8	75	72.2	68
11:50	80.1	72.3	74.7	71.4	67.8
11:55	78.6	71.9	74.3	71.3	67.2
12:00	79	72.1	74.4	71.5	68
12:05	79.8	72.3	74.5	71.8	68.8
12:10	78.8	71.9	74.4	71.3	67.6
12:15	78.8	72.5	74.8	72.1	68.3
23:16	74.5	65	68.7	63.2	52.3
23:21	77.7	65.8	69.4	62.6	53
23:26	77.3	65.3	69.1	62.8	52.5
23:31	77.7	65.1	68.9	62.3	53
23:36	75.9	65.8	69.3	64.4	53
23:41	76.6	64.2	68.2	61.7	50.9
23:46	73.7	64	68.2	61.2	51.1
23:51	74.6	63	66.9	60.1	49.7
23:56	79.9	63.9	67.7	60	49.7
00:01	79.5	63.4	66.4	55.2	48.2
00:06	77.6	63.1	67.4	57.4	50.1
00:11	74.2	63.2	67.3	60.7	50.8