

## Appendix A - Glossary of Acoustic Terminology

| Wording                            | Description                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sound Pressure                     | Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.                                                                                                                                                                                                                                                                                  |
| Sound Pressure Level (Sound Level) | The sound level is the sound pressure relative to a standard reference pressure of 20µPa (20x10 <sup>-6</sup> Pascal's) on a decibel scale.                                                                                                                                                                                                                                   |
| 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 <sub>10</sub> (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. |
| A-weighting, dB(A)                 | The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.                                                                                                                                                                                                                          |
| Noise Level Indices                | Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.                                                                                               |
| L <sub>eq,T</sub>                  | 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 <sub>max,T</sub>                 | A noise level index defined as the maximum noise level during the period T. L <sub>max</sub> is sometimes used for the Assessment of occasional loud noises, which may have little effect on the overall L <sub>eq</sub> noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.     |
| L <sub>90,T</sub>                  | A noise level index. The noise level exceeded for 90% of the time over the period T. L <sub>90</sub> can be considered to be the "average minimum" noise level and is often used to describe the background noise.                                                                                                                                                            |
| L <sub>10,T</sub>                  | A noise level index. The noise level exceeded for 10% of the time over the period T. L <sub>10</sub> can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.                                                                                                                                                                |
| Free-Field                         | Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m                                                                                                                                                                                                                                                                    |
| Facade                             | At a distance of 1m in front of a large sound reflecting object such as a building façade.                                                                                                                                                                                                                                                                                    |
| Fast Time Weighting                | An averaging time used in sound level meters. Defined in BS 5969.                                                                                                                                                                                                                                                                                                             |

## Appendix B - Policy and Assessment Methodology

## National Planning Policy Framework, 2019

The revised National Planning Policy Framework (NPPF) published on July 2018 and updated on 19 February 2019 sets out the Government's planning policies for England and how these are expected to be applied. It provides a framework within which locally prepared plans for housing and other development can be produced.

Planning law requires that applications for planning permission be determined in accordance with the development plan, unless material considerations indicate otherwise. The National Planning Policy Framework must be considered in preparing the development plan and is a material consideration in planning decisions.

The document states that the purpose of the planning system is to contribute to the achievement of sustainable development. At a very high level, the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs.

NPPF goes on to suggest that achieving sustainable development means that the planning system has three overarching and interdependent objectives: an economic objective, a social objective and an environmental objective.

Planning policies and decisions should play an active role in guiding development towards sustainable solutions, but in doing so should take local circumstances into account, to reflect the character, needs and opportunities of each area.

At the heart of the Framework is a presumption in favour of sustainable development, which for decision-taking it means:

- Approving development proposals that accord with an up-to-date development plan without delay; or
- Where there are no relevant development plan policies, or the policies which are most important for determining the application are out-of-date, granting permission unless:
  - i. The application of policies in this Framework that protect areas or assets of importance provides a clear reason for refusing the development proposed; or
  - ii. Any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole.

Under Section 11; Making effective use of land, the following is stated:

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.

Regarding noise pollution, the document states the following:

Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
- Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;
- The revised NPPF introduces the concept of 'agent of change' and states:

- Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

As stated above, this document makes reference to mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development, but does not set absolute criteria, so reference has been made to BS8233: 2014, which provides definitive guidance for amenity levels.

### Noise Policy Statement for England, 2010

The underlying principles and aims of existing noise policy documents, legislation and guidance are clarified in the Noise Policy Statement for England (NPSE). The NPSE sets out the 'Long Term Vision' of Government noise policy as follows: *"Promote good health and good quality of life through the effective management of noise within the context of Government policy on sustainable development"*.

The NPSE outlines the following three aims for the effective management and control of environmental, neighbour and neighbourhood noise:

- *"Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life"*.

The guidance defines three established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation (WHO):

- "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"; and
- "SOAEL (Significant Observed Adverse Effect Level) – This is the level above which significant adverse effects on health and quality of life occur".

The guidance also states that it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations and that not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.

### National Planning Practice Guidance, England

Further guidance in relation to the National Planning Policy Framework and the Noise Policy Statement for England has been published in the National Planning Practice Guidance in England: Noise (NPPG-Noise), which summarises the noise exposure hierarchy, based on the likely average response.

The National Planning Practice Guidance (NPPG) has been revised and updated to be easily accessible and available online.

The Noise Guidance advises on how planning can manage potential noise impacts in new development. It sets out when noise is relevant to planning and outlines the following Observed Effect Levels to determine the noise impact:

- Significant observed adverse effect level: This is the level of noise exposure above which significant adverse effects on health and quality of life occur;
- Lowest observed adverse effect level: this is the level of noise exposure above which adverse effects on health and quality of life can be detected;
- No observed effect level: this is the level of noise exposure below which no effect at all on health or quality of life can be detected.

The document recognises the subjective relationship between noise levels and the impact on those affected and advises on factors which may influence on whether noise could be a concern.

The significance criteria from NPPG-Noise is reproduced in Table B1 below.

| Table B4: Significance Criteria from NPPG In England: Noise |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                     |                                  |
|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----------------------------------|
| Perception                                                  | Examples of Outcomes                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Increasing Effect Level             | Action                           |
| Not noticeable                                              | No Effect                                                                                                                                                                                                                                                                                                                                                                                                                                                            | No Observed Effect                  | No specific measures required    |
| Noticeable and not intrusive                                | Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.                                                                                                                                                                                                                                                              | No Observed Adverse Effect          | No specific measures required    |
| Lowest Observed Adverse Effect Level (LOAEL)                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                     |                                  |
| Noticeable and intrusive                                    | Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.                                                          | Observed Adverse Effect             | Mitigate and reduce to a minimum |
| Significant Observed Adverse Effect Level (SOAEL)           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                     |                                  |
| Noticeable and disruptive                                   | The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area. | Significant Observed Adverse Effect | Avoid                            |

|                                |                                                                                                                                                                                                                                                                                        |                             |         |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|---------|
| Noticeable and very disruptive | Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory | Unacceptable Adverse Effect | Prevent |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|---------|

## London Plan

Policies D12 Agent of Change and D13 Noise of the plan are particularly relevant to this assessment. The policies are outlined below.

### Policy D12 - Agent of Change

The agent of change principle places the responsibility of mitigating impacts from existing noise generating activities or uses on the proposed new noise-sensitive development. Such developments should therefore be designed to ensure that established noise generating activities or uses remain viable and can continue to grow without unreasonable restrictions placed on them.

The agent of change principle also places the responsibility of noise mitigation and management on new noise generating developments proposed close to residential and other noise-sensitive uses.

The agent of change principle is also included in the NPPF (see Section 2.1.1).

### Policy D13 Noise

This policy states that:

*'In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:*

- 1) avoiding significant adverse noise impacts on health and quality of life*
- 2) reflecting the Agent of Change principle as set out in Policy D12*
- 3) mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses.*
- 4) improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity)*
- 5) separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening layout orientation uses and materials – in preference to sole reliance on sound insulation*
- 6) where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles*
- 7) promoting new technologies and improved practices to reduce noise at source and on the transmission path from source to receiver'*

## Haringey Local Plan

### ENV6: NOISE POLLUTION

The Council will ensure that new noise sensitive development is located away from existing, or planned sources of noise pollution. Potentially noisy developments should only be located in areas where ambient noise levels are already high and where measures are proposed to mitigate its impact.

Noise pollution has a major effect on amenity and health and therefore the quality of life in general. Its effect can be minimised by separating new noise sensitive development from major noise sources, by separating new noisy development from existing noise sensitive development and by taking measures to reduce any impact. The Council will support new technologies and encourage sensitive design and construction, for example by positioning buildings and landscaping as noise barriers. Noise sensitive development includes housing, schools and hospitals.

In assessing planning applications, the Council will have regard to PPG24 'Planning and Noise' (Annex 1), and the Mayor of London's Ambient Noise Strategy and the prevention of a gradual upward creep in background noise levels. Potentially noisy developments should only be located in areas where ambient noise levels are already high. In cases where separation is not possible, the impact of noisy development on ambient noise levels should be assessed, for example by an Environmental Assessment, the application of Best Available Techniques and relevant technology and design guidance. Where new noise-sensitive development is proposed in areas already exposed to high ambient noise levels, the Council may require the submission of an acoustic report to comply with PPG 24. Mitigation measures will be secured by planning conditions or planning obligations where appropriate. The issue of measures to control noise from restaurants, cafes, drinking establishments and hot food takeaways is addressed in Policy TCR5.

## British Standard BS 8233:2014

BS 8233:2014 provides guidance on internal acoustic environments in different types of space. The Standard advises that, for steady external noise sources, it is desirable for internal ambient noise levels to not exceed the guidance values, as detailed in Table B2 below.

Table B5: BS 8233:2014 Indoor Ambient Noise Levels (IANL)

| Activity                   | Location    | Daytime 07:00 – 23:00  | Night-time 23:00 – 07:00 |
|----------------------------|-------------|------------------------|--------------------------|
| Resting                    | Living room | 35 dB $L_{Aeq,16hour}$ | -                        |
| Dining                     | Dining room | 40 dB $L_{Aeq,16hour}$ | -                        |
| Sleeping (daytime resting) | Bedroom     | 35 dB $L_{Aeq,16hour}$ | 30 dB $L_{Aeq,16hour}$   |

BS 8233:2014 goes on to suggest that where a development is considered necessary or desirable, the residential internal target levels may be relaxed by up to 5 dB and reasonable internal conditions will still be achieved.

With regards to maximum noise levels, the Standard identifies that regular individual noise events (such as passing trains or scheduled aircraft etc.) can cause sleep disturbance. The Standard does not provide a guideline design target, but simply goes on to suggest that a guideline value may be set in terms of SEL or  $L_{AFmax}$ , depending upon the character and number of events per night. It goes on to suggest that more sporadic noise events could require separate values.

In respect of external noise levels, the guidance in BS 8233:2014 suggests that *“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.”*

BS 8233:2014 provides a much more detailed narrative on noise levels in external amenity areas and acknowledges that it may not always be necessary or feasible to ensure that noise levels remain within these guideline values.

In respect of gardens and patios, BS 8233:2014 states; *“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 centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited.”*

It is clear from the narrative of BS 8233:2014, that proposed development within noisy environments should be designed to ensure that the recommended internal design standards are achieved, and that noise levels in external amenity areas are designed to effectively control and reduce noise levels, although it acknowledges that in certain circumstances meeting the external design recommendations may not be feasible, or necessary, especially where the provision of such spaces is desirable for other technical, planning or policy reasons.

## ProPG: Professional Practice Guidance on Planning & Noise

ProPG was published on 22 June 2017 and the scope is restricted to new residential development exposed predominantly to airborne noise from transport sources. The guidance encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise. The guidance was prepared by the Institute of Acoustics, the Association of Noise Consultants and the Chartered Institute of Environmental Health. It encourages a holistic design process where acoustics is integral to the living environment. This covers careful site layout and better orientation of rooms within dwellings. ProPG acknowledges and reflects the Noise Policy Statement for England, the National Planning Policy Framework and Planning Policy Guidance – Noise. The recommended approach for new residential development is in two stages; Stage 1 is an initial noise risk assessment of the proposed development site for an early indication of the initial suitability of the site for new residential development. Stage 2 is a systematic consideration of four key elements:

- Demonstrating a “Good Acoustic Design Process”;
- Observing internal “Noise Level Guidelines”;
- Undertaking an “External Amenity Area Noise Assessment”;
- Consideration of “Other Relevant Issues”.

For reference, the indicative noise levels for the initial site noise risk assessment as presented in ProPG are illustrated below.

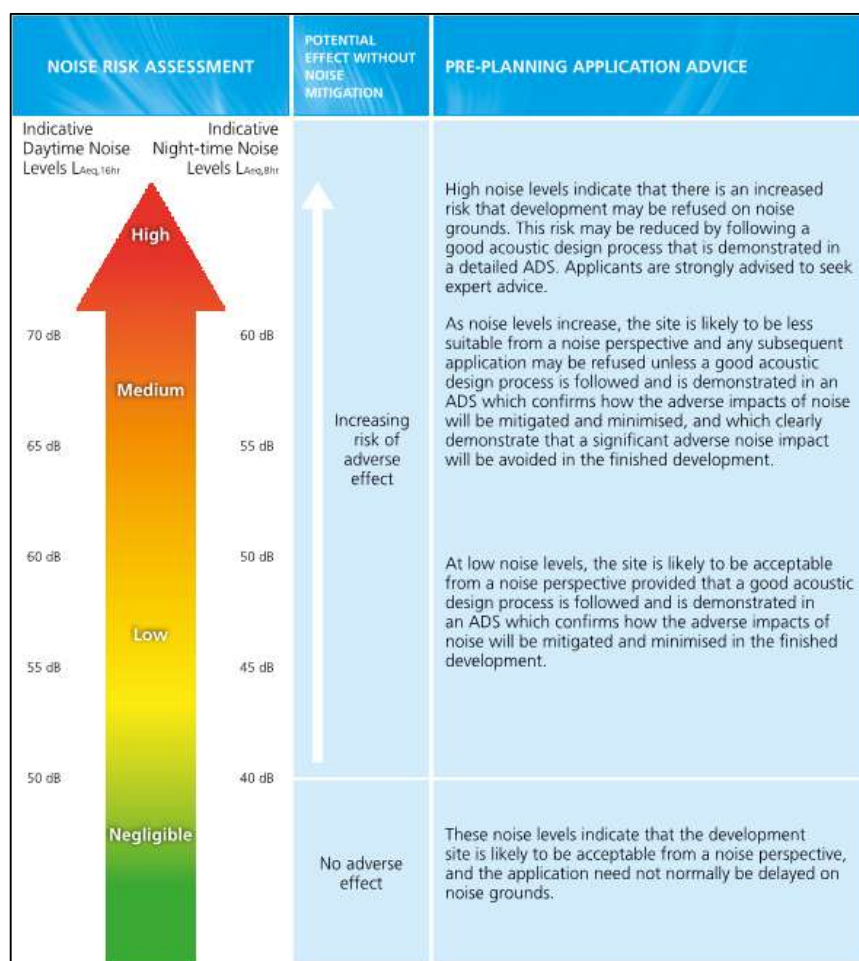


Figure B1: Stage 1 – Initial Site Noise Risk Assessment

## Good Acoustic Design Process

General principles (in order of preference):

- i. Maximising spatial separation of noise sources and receptors;
- ii. Reducing existing noise levels or relocating noise sources, if possible;
- iii. Using existing topography and existing structures;
- iv. Incorporating noise barriers as part of the scheme;
- v. Using layout to reduce noise propagation across the site;
- vi. Using orientation to reduce noise exposure of sensitive rooms;
- vii. Using building envelope to mitigate noise.

## Internal Noise Level Guidelines

This guidance is based on BS 8233:2014 and World Health Organisation recommendations. Internal ambient noise levels (IANL) are provided in Table B.1. In addition to these values, there is a recommendation for individual noise events to not normally exceed 45 dB  $L_{Amax,F}$  more than ten times a night in bedrooms.

ProPG guidance clearly states “designing the site layout and the dwellings so that the internal target noise levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet the internal target levels with windows open, internal noise levels can be assessed with windows closed, however, any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the open position and, in this scenario, the internal  $L_{Aeq}$  target levels should not normally be exceeded, subject to the further advice in Note 7.”

Note 7 from ProPG, states that “Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal  $L_{Aeq}$  target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal  $L_{Aeq}$  levels start to exceed the internal  $L_{Aeq}$  target levels by more than 5 dB, the more that most people are likely to regard them as “unreasonable”. Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal  $L_{Aeq}$  levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as “unacceptable” by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing “unacceptable” noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form”

## External Amenity Areas

External amenity areas which are an intrinsic part of the overall design should ideally not be above 50-55 dB  $L_{Aeq,16hr}$ , or designed to achieve the lowest practicable noise levels (BS 8233:2014).

If significant adverse noise impacts remain on any private external amenity space then this is partially off-set if residents are provided with access to a “relatively quiet” alternative external amenity space.

## Consideration of Other Relevant Issues

- Compliance with relevant national/local policy;
- Magnitude and extent of compliance with ProPG;
- Likely occupants of the development;
- Acoustic design versus unintended adverse consequences;
- Acoustic design versus planning objectives.

## ANC Guidance for Acoustics, Ventilation and Overheating

The Association of Noise Consultants (ANC) Acoustics, Ventilation and Overheating (AVO) guidance provides the following external noise level ranges which identify the risk category for the assessment of noise break-in during overheating ventilation conditions.

**Table B6: AVO Guidance for Level 1 assessment of noise from transport noise sources [Note 1] relating to overheating condition**

| External Free – Field noise                        |                                            |                                                                      | Examples of Outcomes                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Risk category for Level 1 assessment [Note 4] |
|----------------------------------------------------|--------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| $L_{Aeq,T}$ [Note 3]<br>during<br>07:00 –<br>23:00 | $L_{Aeq,8h}$<br>during<br>23:00 –<br>07:00 | Individual<br>noise<br>events<br>during<br>23:00 –<br>07:00          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                               |
| $\leq 53$ dB                                       | $\leq 48$ dB                               | -                                                                    | Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic environment inside the dwelling such that there is a perceived change in the quality of life.                                                | Low                                           |
| $> 53$ dB<br>and $\leq 63$<br>dB                   | $> 48$ dB<br>and $\leq 55$<br>dB           | Do not normally exceed $L_{AF,max}$ 78 dB more than 10 times a night | Increasing risk of adverse effect due to impact on reliable speech communication during daytime or sleep disturbance at night.<br><br>Although noise levels at the lower end of this category will cause changes in behaviour, they may still be considered suitable.<br><br>Noise levels at the upper end of this category will result in more significant changes in behaviour and are only likely to be considered suitable if they occur for limited periods.    | Medium                                        |
| $> 63$ dB                                          | $> 55$ dB                                  | -                                                                    | The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area. | High                                          |

Note 1 - The noise levels suggested assume a steady road traffic noise source but may be adapted for other types of transport.

Note 2 - The values presented in this table should not be regarded as fixed thresholds and reference can also be made to relevant dose-response relationships, such as those described in a DEFRA 2014 study.

**Table B6: AVO Guidance for Level 1 assessment of noise from transport noise sources [Note 1] relating to overheating condition**

| External Free – Field noise                  |                                      |                                              | Examples of Outcomes | Risk category for Level 1 assessment [Note 4] |
|----------------------------------------------|--------------------------------------|----------------------------------------------|----------------------|-----------------------------------------------|
| $L_{Aeq,T}$ [Note 3]<br>during 07:00 – 23:00 | $L_{Aeq,8h}$<br>during 23:00 – 07:00 | Individual noise events during 23:00 – 07:00 |                      |                                               |

Note 3 - A decision must be made regarding the appropriate averaging period to use. The averaging period should reflect the nature of the noise source, the occupancy profile and times at which overheating might be likely to occur. Further guidance can be found within the 2014 IEMA Guidelines.

Note 4 - The risk of an adverse effect occurring will also depend on how frequently and for what duration the mitigation of overheating is likely to result in increased internal noise levels. Refer to Figure 3.

The AVO guidance also provides risk categories for internal ambient noise levels during the overheating condition, as presented below.

**Table B7: AVO Guidance for Level 2 assessment of noise from transport noise sources [Note 1] relating to overheating condition**

| Internal ambient noise Level [Note 2]        |                                   |                                                                        | Examples of Outcomes                                                                                                                                                                                                                                                                                                                                                                                                  | Risk category for Level 2 assessment [Note 4] |
|----------------------------------------------|-----------------------------------|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| $L_{Aeq,T}$ [Note 3]<br>during 07:00 – 23:00 | $L_{Aeq,8h}$ during 23:00 – 07:00 | Individual noise events during 23:00 – 07:00                           |                                                                                                                                                                                                                                                                                                                                                                                                                       |                                               |
| $\leq 35$ dB                                 | $\leq 30$ dB                      | Do not normally exceed $L_{AF,max}$ , 48 dB more than 10 times a night | Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.                                                                                                                                                                                                              | Negligible                                    |
| $> 35$ dB and $\leq 40$ dB                   | $> 30$ dB and $\leq 35$ dB        | -                                                                      | Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic environment inside the dwelling such that there is a perceived change in the quality of life. | Low                                           |
| $> 40$ dB and $\leq 50$ dB                   | $> 35$ dB and $\leq 42$ dB        | Do not normally exceed $L_{AF,max}$ , 65 dB more than 10 times a night | Increasing risk of adverse effect due to impact on reliable speech communication during daytime or sleep disturbance at night.<br><br>Although noise levels at the lower end of this category will cause                                                                                                                                                                                                              | Medium                                        |

**Table B7: AVO Guidance for Level 2 assessment of noise from transport noise sources [Note 1] relating to overheating condition**

| Internal ambient noise Level <sup>[Note 2]</sup>        |                                   |                                              | Examples of Outcomes                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Risk category for Level 2 assessment <sup>[Note 4]</sup> |
|---------------------------------------------------------|-----------------------------------|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| $L_{Aeq,T}$ <sup>[Note 3]</sup><br>during 07:00 – 23:00 | $L_{Aeq,8h}$ during 23:00 – 07:00 | Individual noise events during 23:00 – 07:00 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                          |
|                                                         |                                   |                                              | <p>changes in behaviour, they may still be considered suitable.</p> <p>Noise levels at the upper end of this category will result in more significant changes in behaviour and are only likely to be considered suitable if they occur for limited periods.</p>                                                                                                                                                                                                             |                                                          |
| > 50 dB                                                 | > 42 dB                           | -                                            | <p>The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.</p> | High                                                     |

Note 1 - The noise levels suggested in Tables 3-2 and 3-3 assume a steady road traffic noise source but may be adapted for other types of transport.

Note 2 - The values presented in this table should not be regarded as fixed thresholds and reference can also be made to relevant dose-response relationships such as those described in a DEFRA 2014 study [19]. Internal ambient noise levels would normally be applied to living rooms and bedrooms during the daytime. At night, the levels would normally only be applicable to bedrooms.

Note 3 - A decision must be made regarding the appropriate averaging period to use. The averaging period should reflect the nature of the noise source, the occupancy profile and times at which overheating might be likely to occur. Further guidance can be found within the 2014 IEMA Guidelines.

Note 4 - The risk of an adverse effect occurring will also depend on how frequently and for what duration the mitigation of overheating is likely to result in increased internal noise levels. Refer to Figure B2.

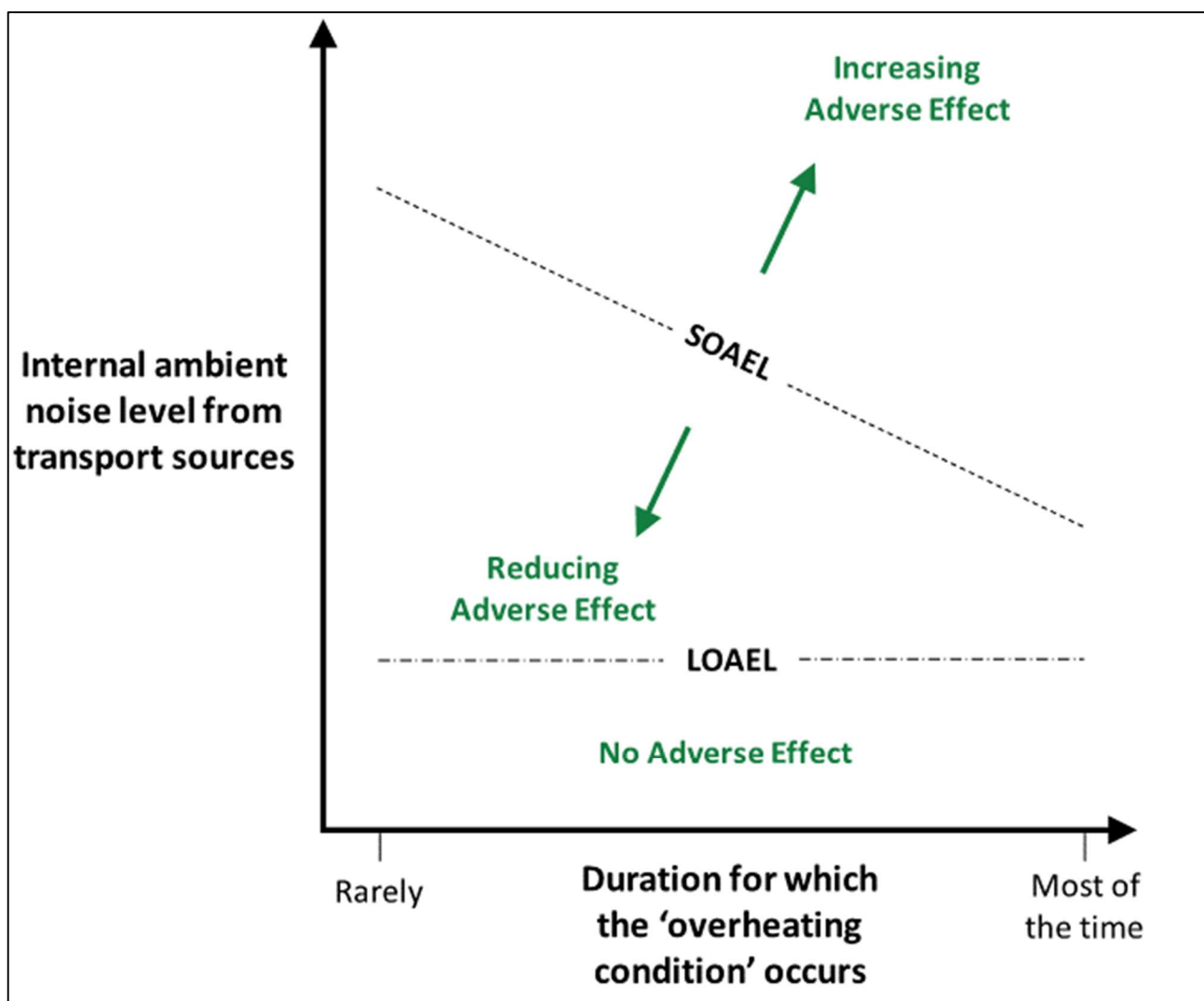


Figure B2: Qualitative Guidance on Combined Effect of Internal Ambient Noise Level & Duration for the Overheating Condition

The AVO guidance detailed above allows for relaxations in the levels of internal ambient noise level, depending on the amount of time that higher noise levels will be experienced for. The assessment relies upon data from a TM59 overheating assessment to determine the impact on users in terms of both acoustics and overheating.

## British Standard BS 4142:2014

BS 4142 sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS 4142 for assessing the effect of sound is to compare the measured or predicted sound level from the source in question, the  $L_{Aeq,T}$  'specific sound level', with the  $L_{A90,T}$  background sound level at the assessment location.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the  $L_{A,r,Tr}$  'rating sound level'. A correction to include consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

BS 4142 states: *"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs"*. An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

Table B8: Classification of Industrial/Commercial Noise Impacts

| Difference Between Rating Sound Level and Background Sound Level (dB) | Impact Category (depending on the context) |
|-----------------------------------------------------------------------|--------------------------------------------|
| + 10 dB or more                                                       | Significant adverse impact                 |
| + 5 dB                                                                | Adverse impact                             |
| Equal or less than                                                    | Low impact                                 |

For the daytime, the assessment is typically carried out over a reference time period of one hour, but at night-time it is carried out over a 15-minute period. The periods associated with day or night, for the purposes of the Standard, are 07.00 to 23.00 and 23.00 to 07.00, respectively.

Interpreting the guidance given in BS4142:2014, with consideration of the guidance given in the NPSE and NPPG Noise, an estimation of the impact of the rating sound is summarised in the following text:

- A rating sound level that is +10 dB above the background sound level is likely to be an indication of a Significant Observed Adverse Effect Level;
- A rating sound level that is +5 dB above the background sound level is likely to be an indication of a Lowest Observed Adverse Effect Level;
- The lower the rating sound 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 sound level does not exceed the background sound level, this is an indication of the specific sound source having a low impact and would therefore be classified as a No Observed Adverse Effect Level.

## Appendix C - Environmental Noise Survey

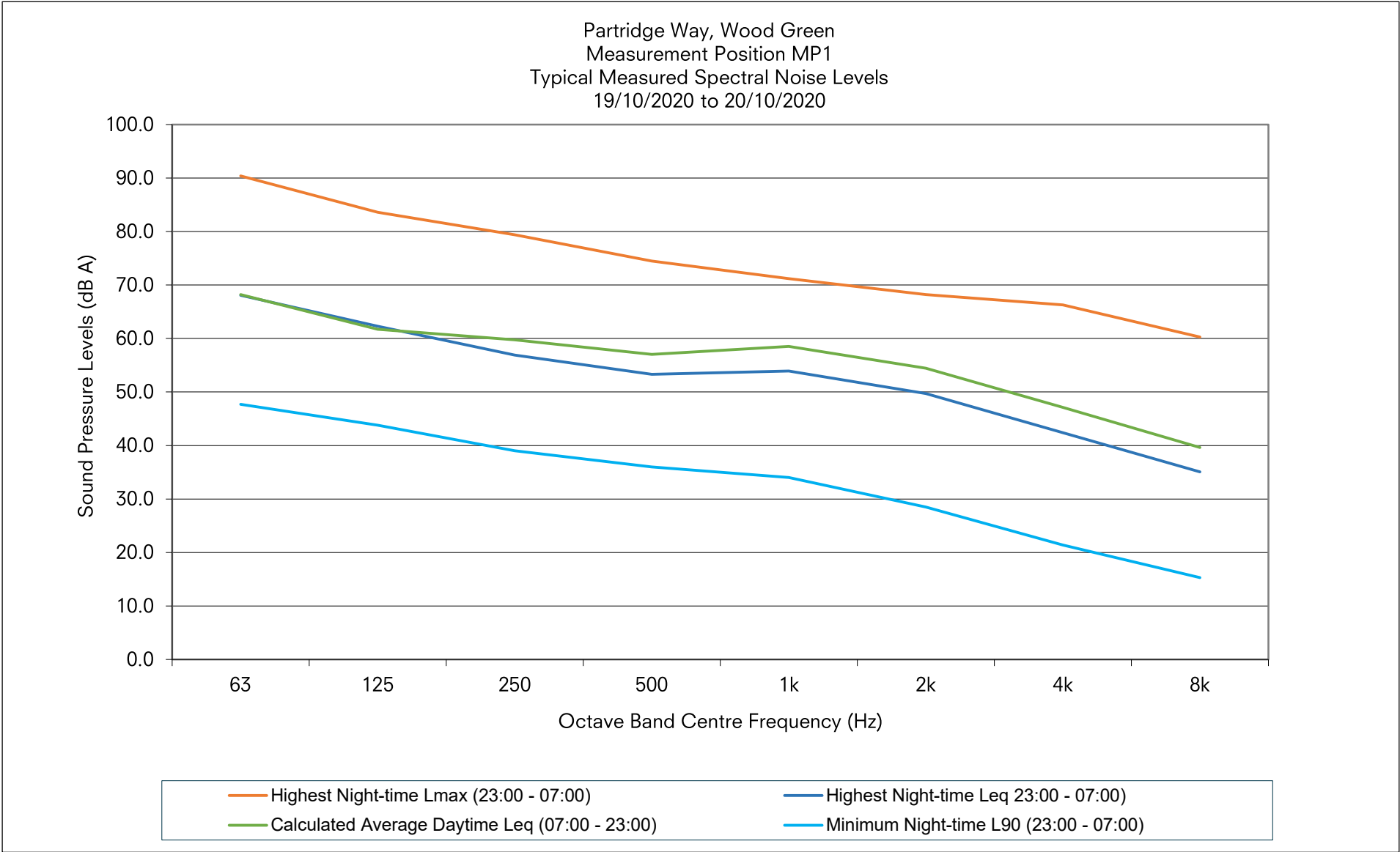


Figure C1: Measurement Position 1 – Typical Spectral Noise Levels

## Appendix D – Noise Maps

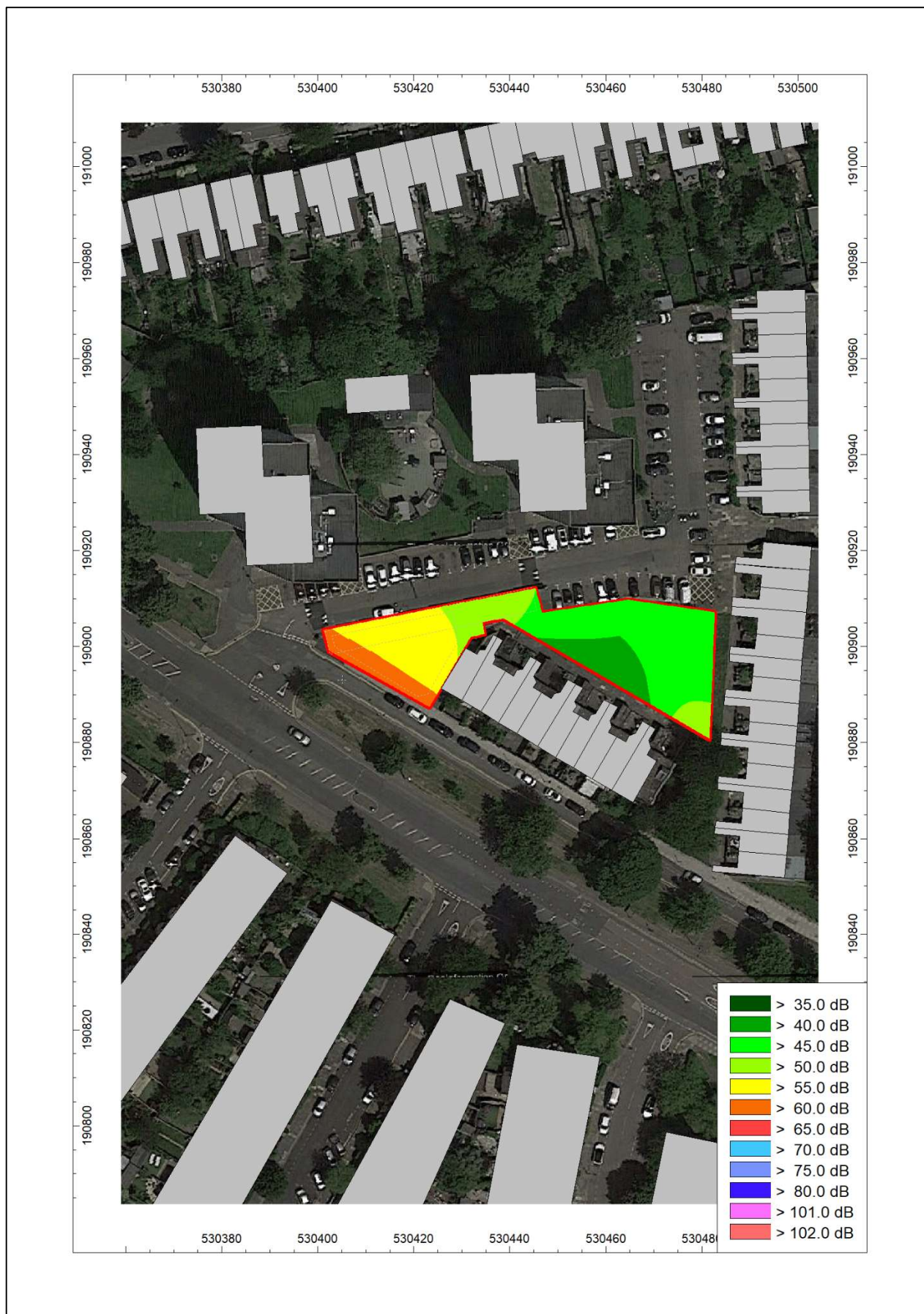


Figure D1: Site-Wide Daytime  $L_{Aeq,16 \text{ hour}}$  Noise Levels

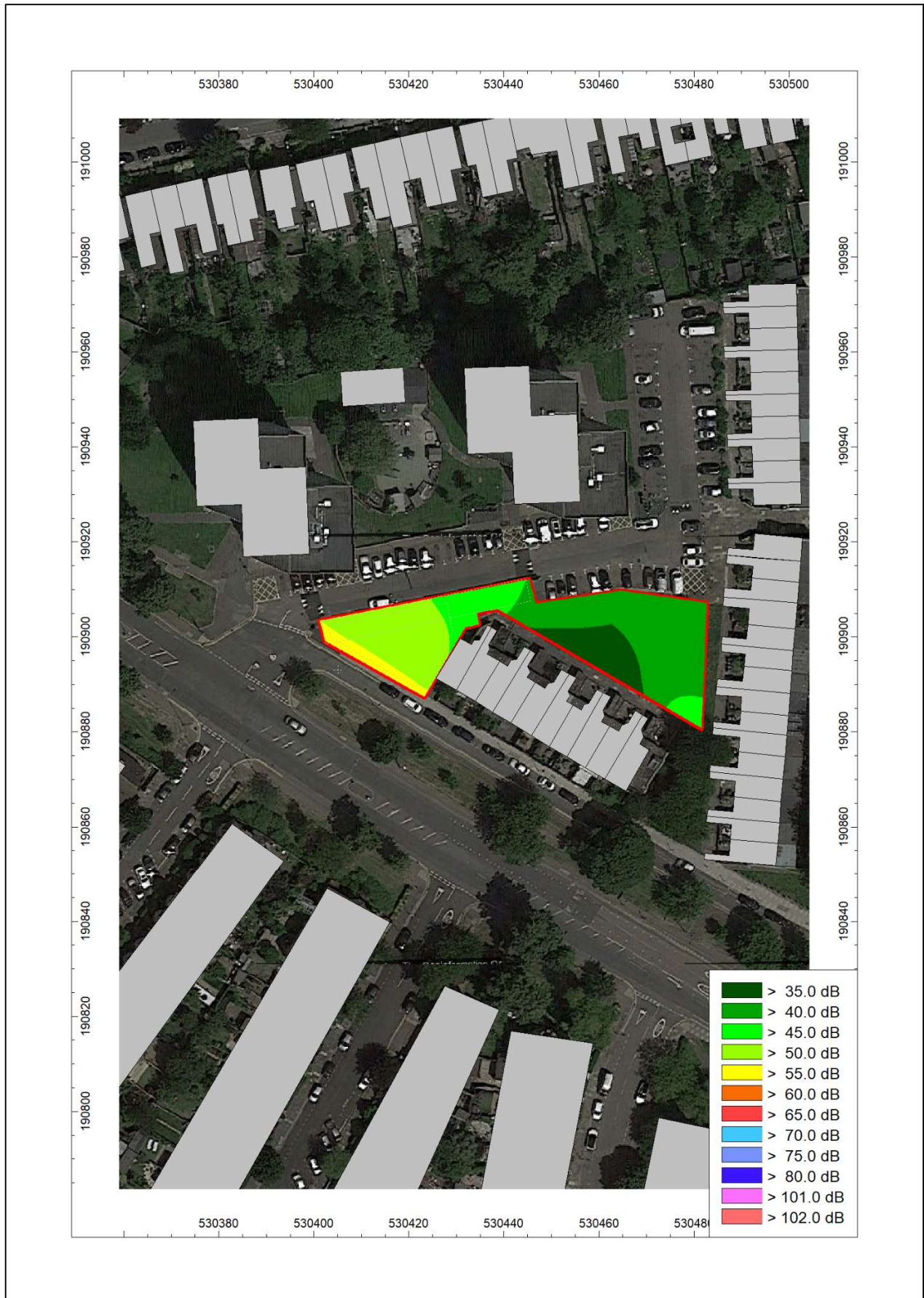


Figure D2: Site-Wide Night-time  $L_{Aeq,8 \text{ hour}}$  Noise Levels

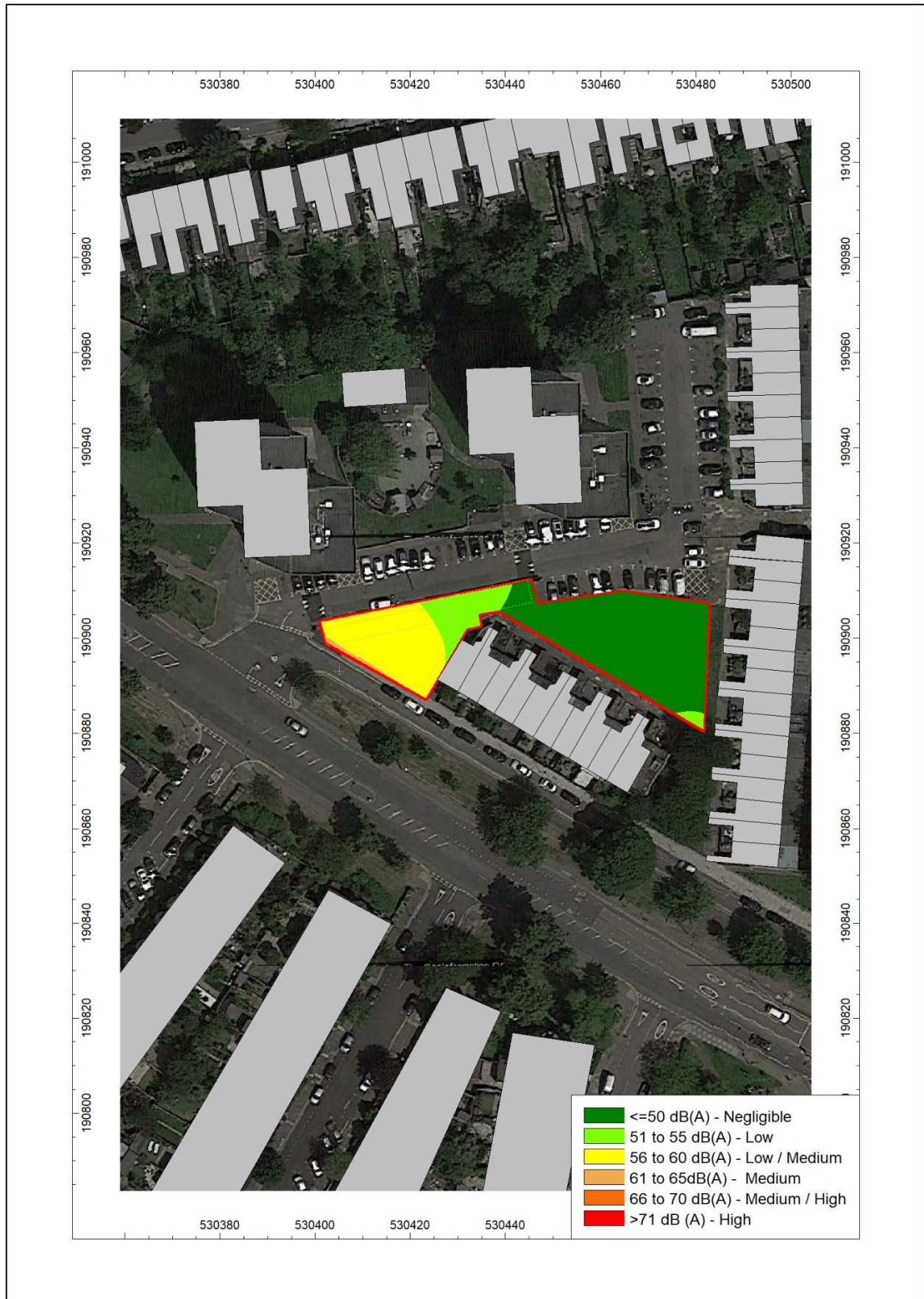


Figure D3: Initial Open-Site Noise Risk Assessment – Daytime (1.5m above ground level)

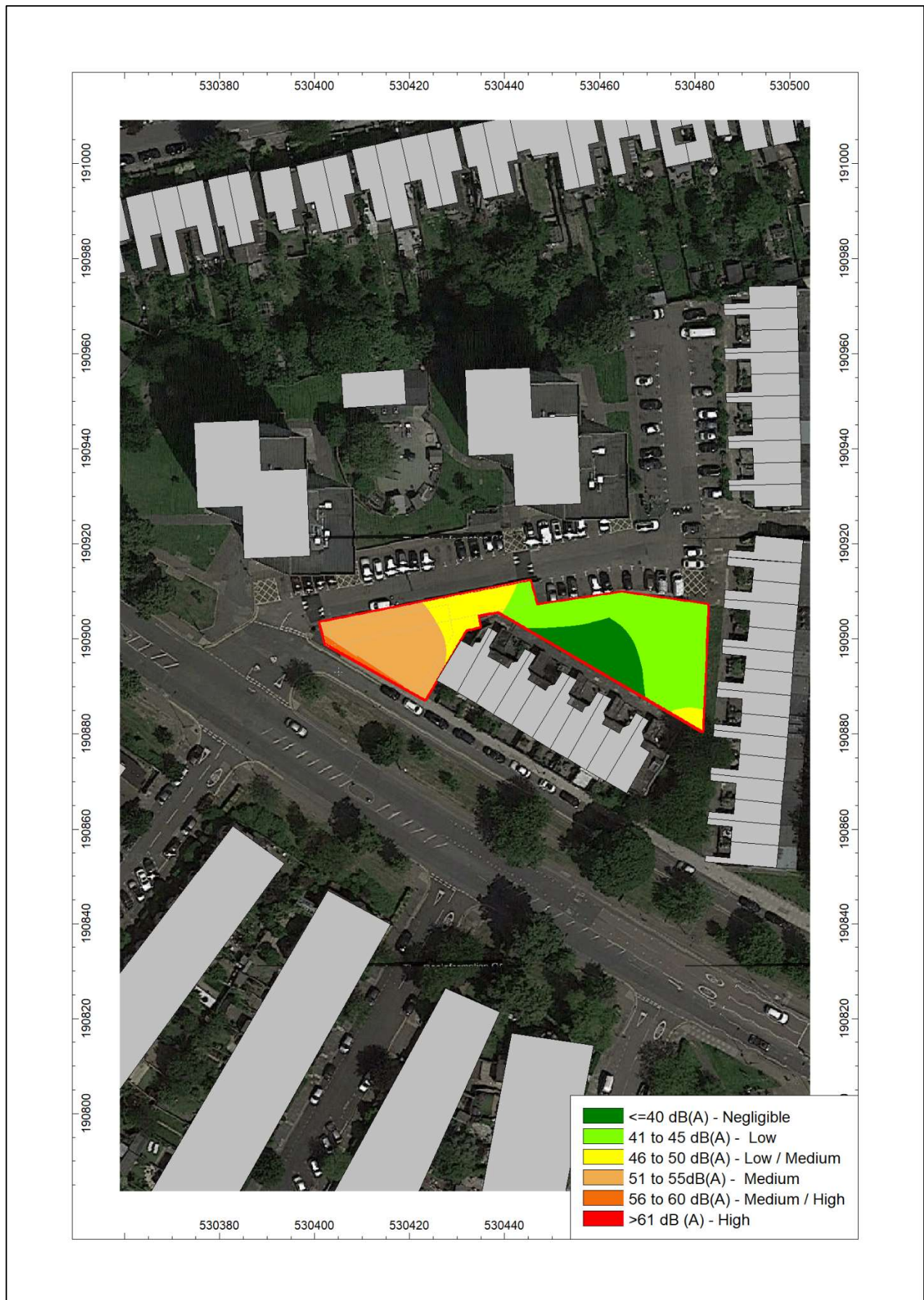


Figure D4: Initial Open-Site Noise Risk Assessment – Night-time (1.5m above ground level)



Figure D5: Predicted Daytime Façade Incident Noise Levels – Southern & Western Façades

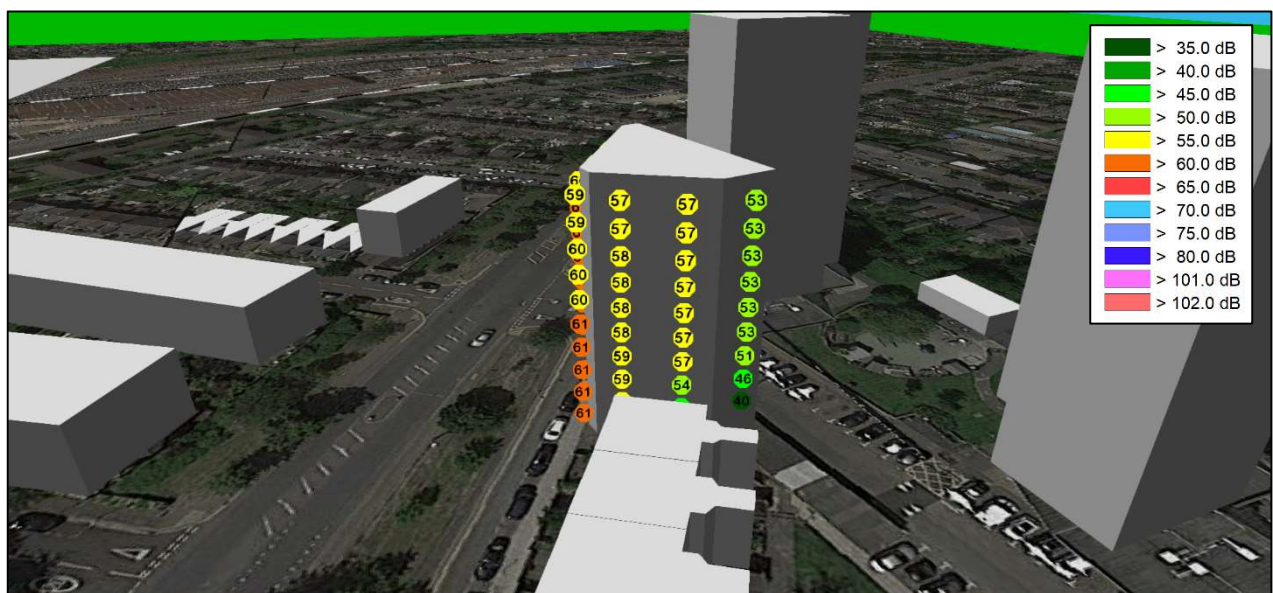


Figure D6: Predicted Daytime Façade Incident Noise Levels – Eastern Façade

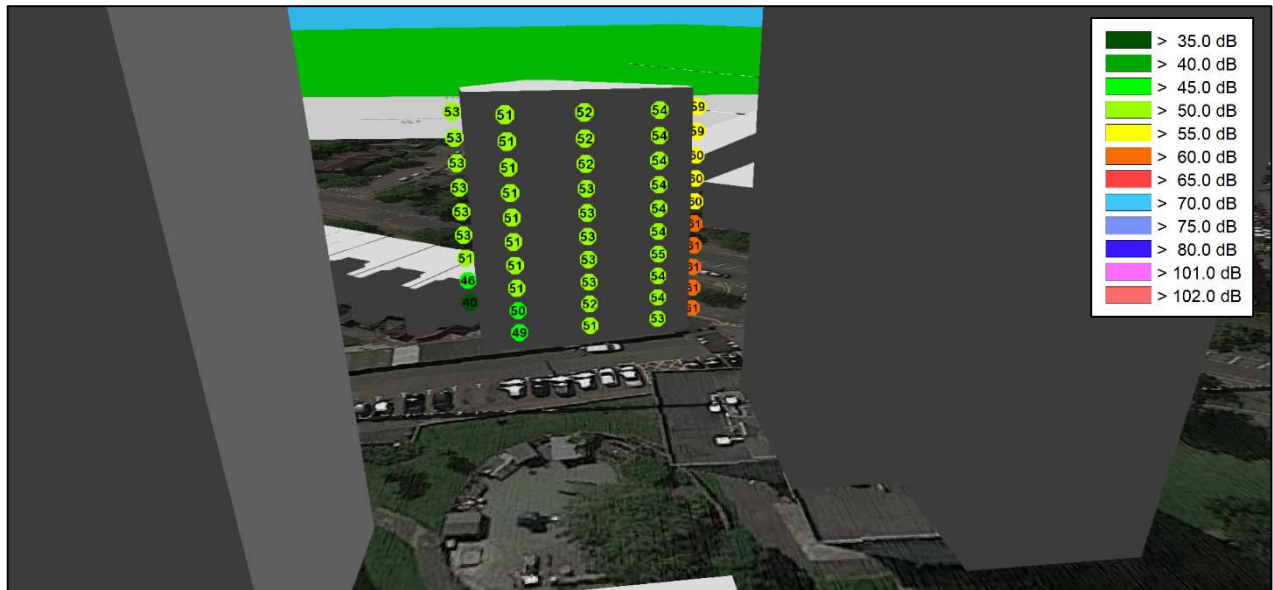


Figure D7: Predicted Daytime Façade Incident Noise Levels – Northern Façade



Figure D8: Predicted Night-time Façade Incident Noise Levels – Southern & Western Façades

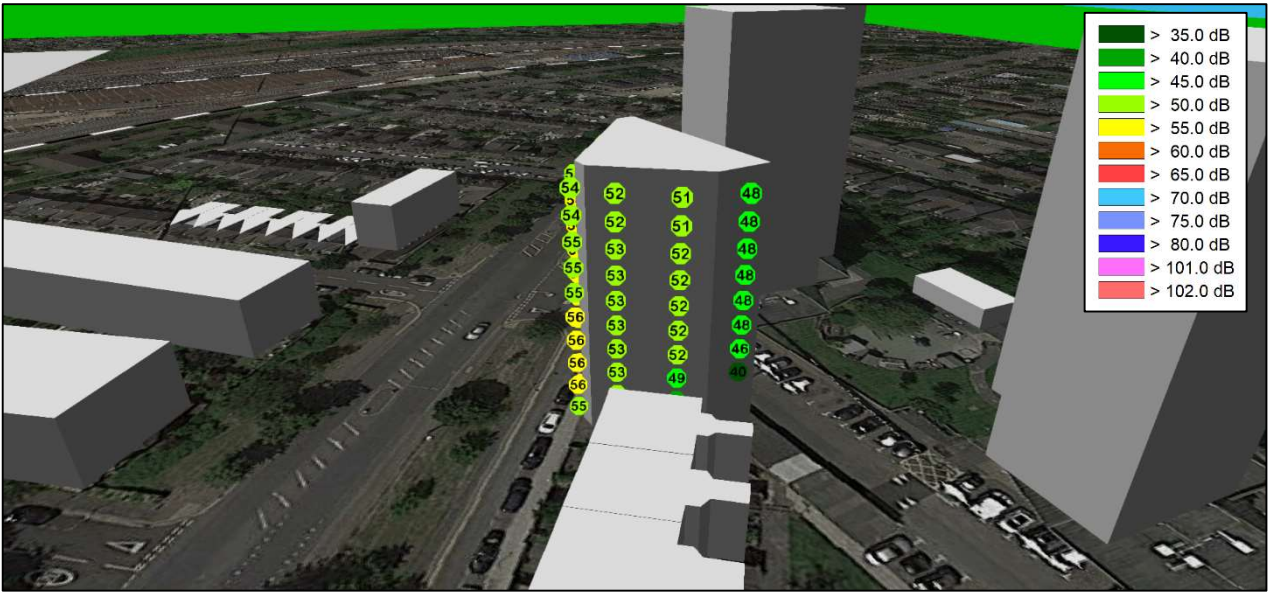


Figure D9: Predicted Night-time Façade Incident Noise Levels – Eastern Façade

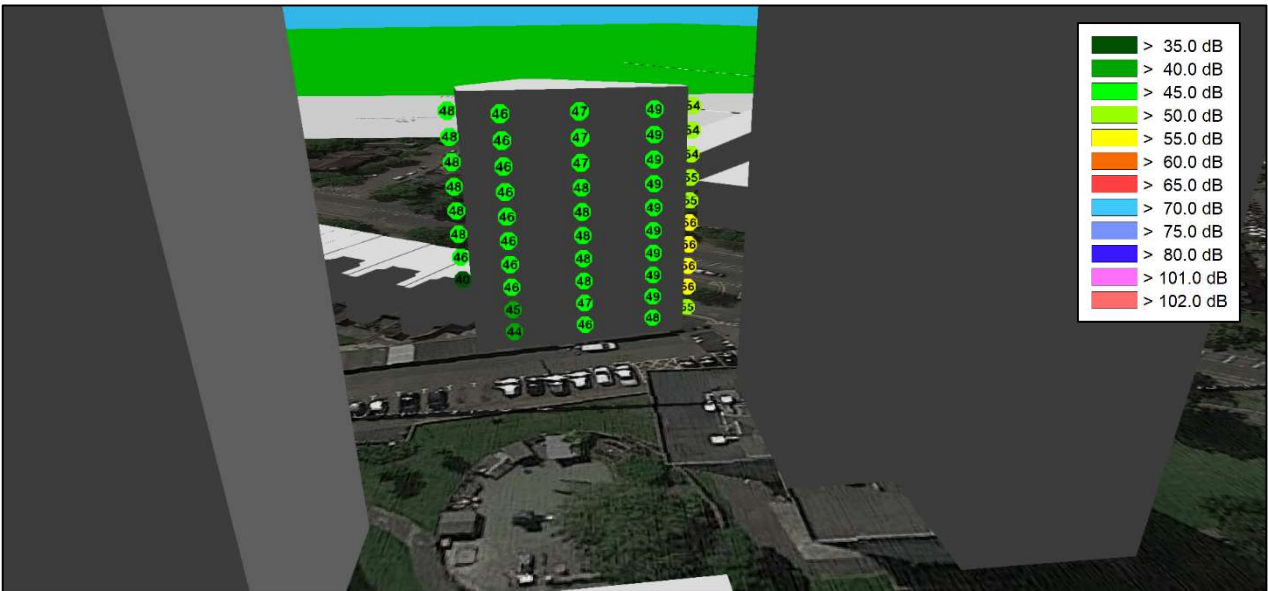


Figure D10: Predicted Night-time Façade Incident Noise Levels – Northern Façade

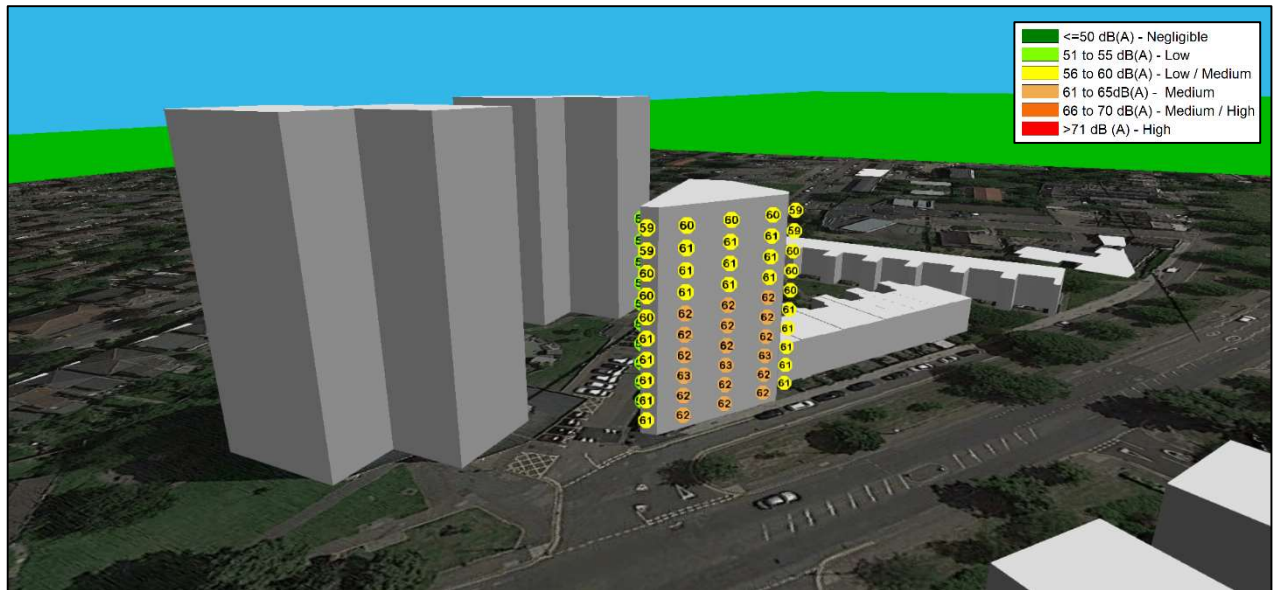


Figure D11: Daytime ProPG Risk Categories – Southern & Western Façades



Figure D12: Daytime ProPG Risk Categories – Eastern Façades

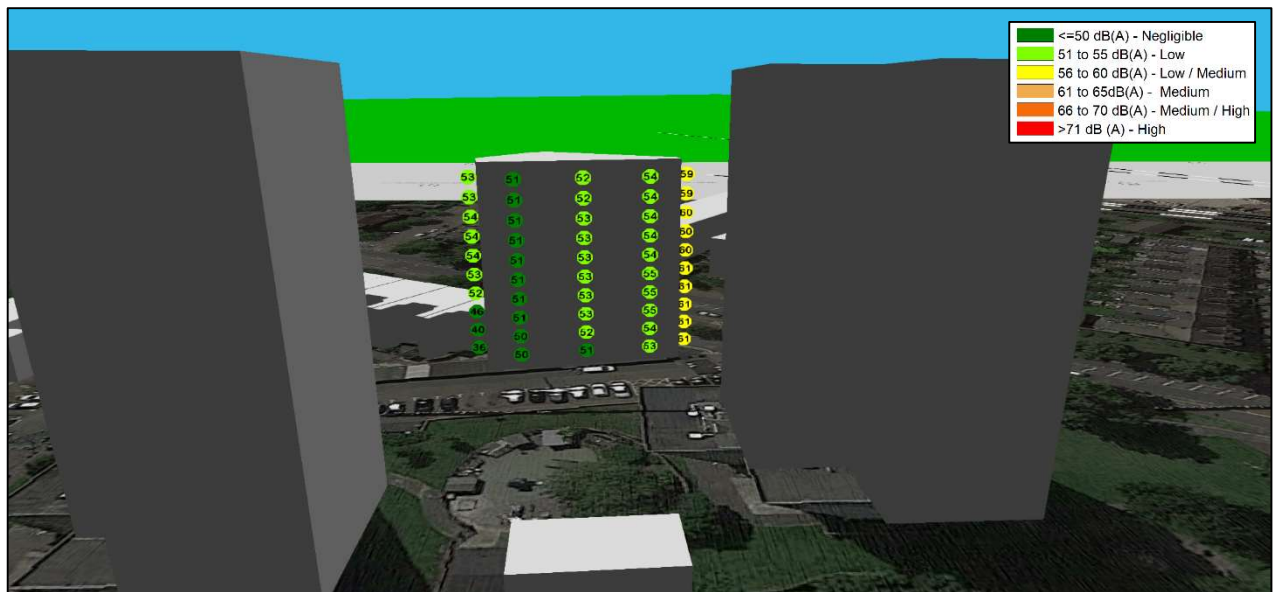


Figure D13: Daytime ProPG Risk Categories – Northern Façades



Figure D14: Night-time ProPG Risk Categories – Southern & Western Façades

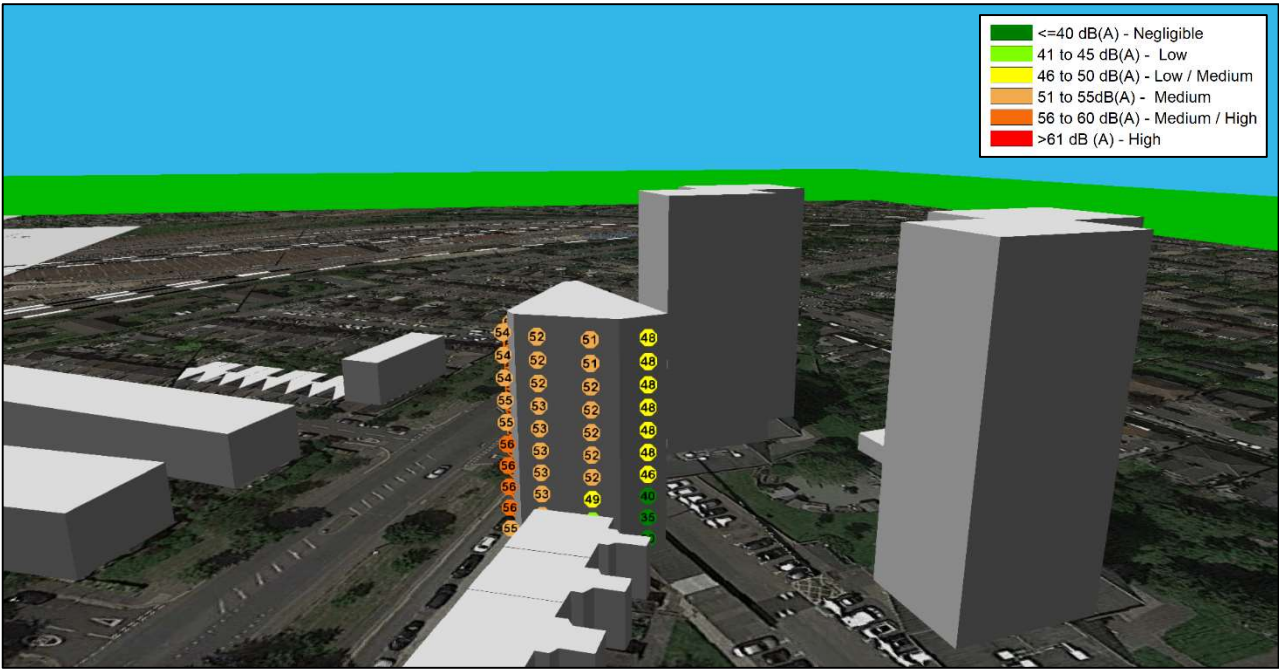


Figure D15: Night-time ProPG Risk Categories – Eastern Façades



Figure D16: Night-time ProPG Risk Categories – Northern Façades

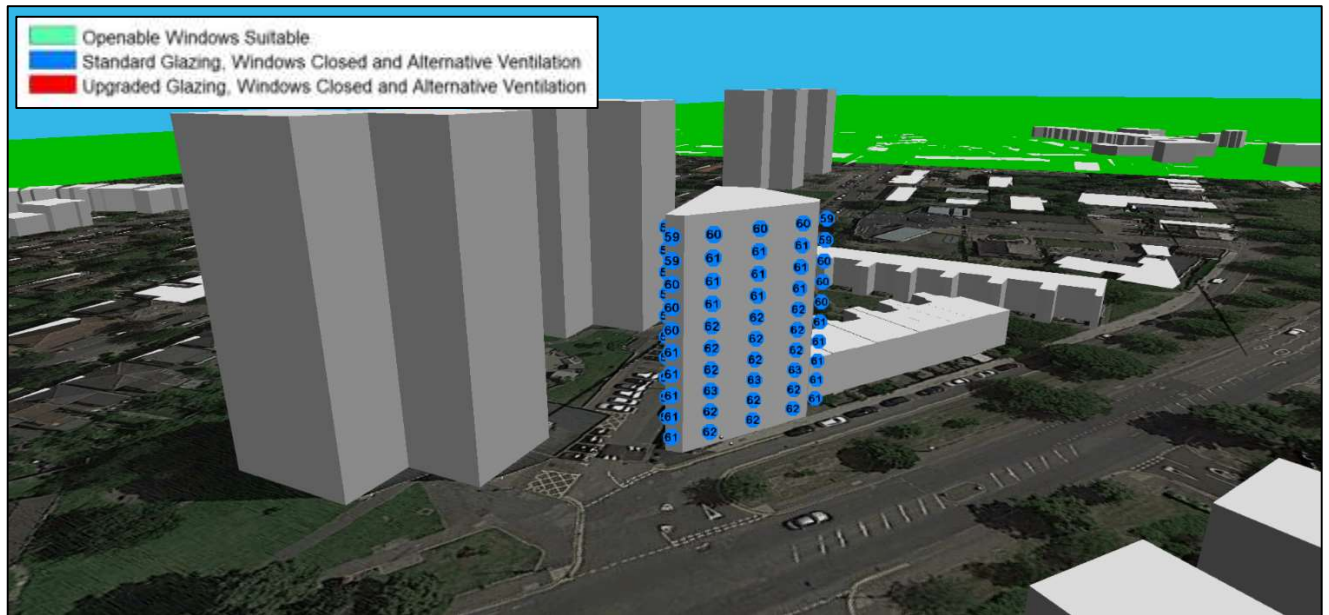


Figure D17: Daytime BS8233 Internal Amenity Constraints – Southern & Western Façades

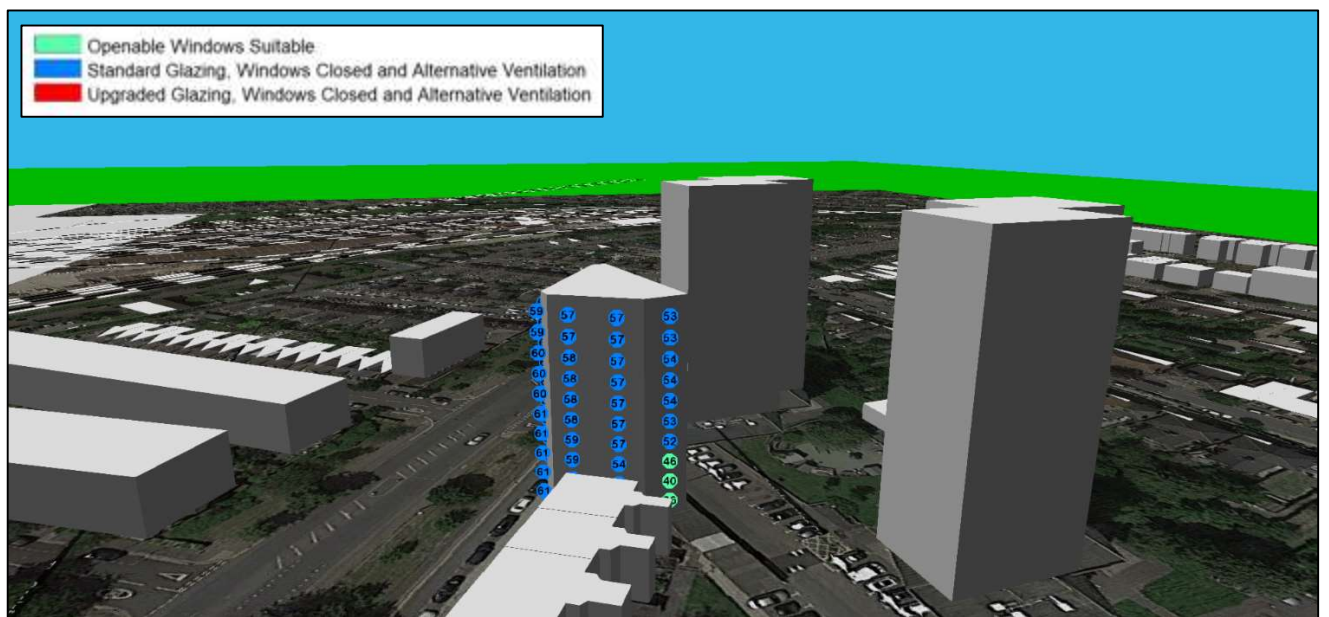


Figure D18: Daytime BS8233 Internal Amenity Constraints – Eastern Façades



Figure D19: Daytime BS8233 Internal Amenity Constraints – Northern Façades

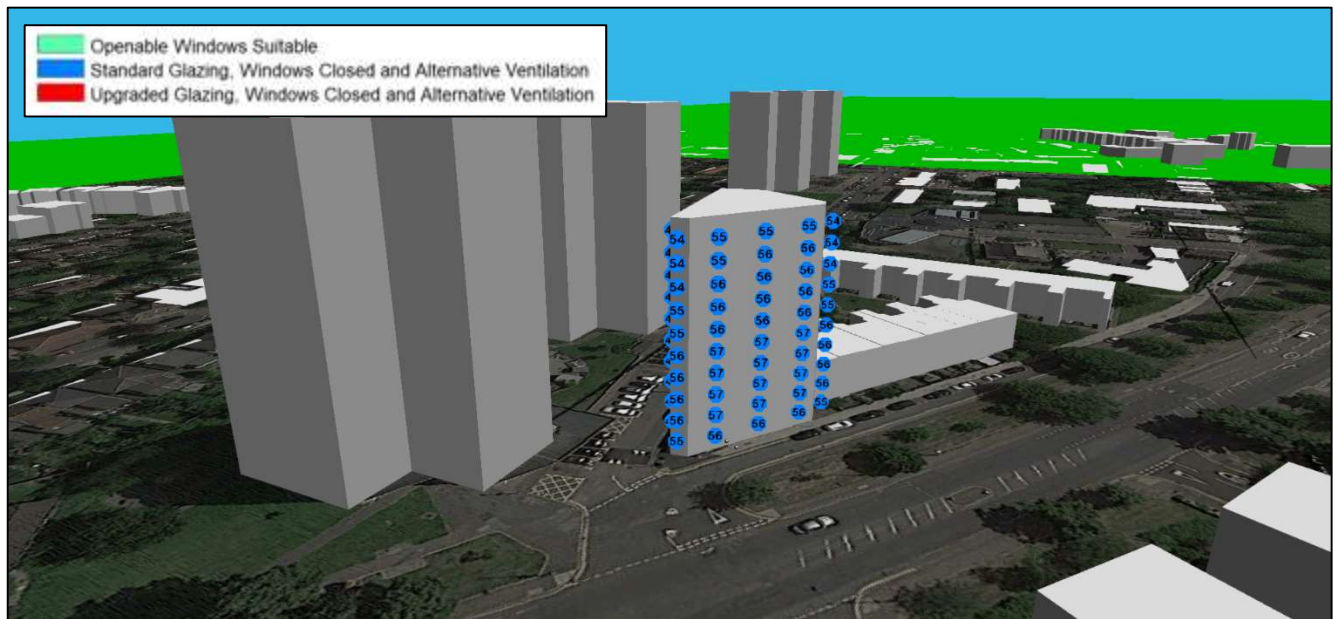


Figure D20: Night-time BS8233 Internal Amenity Constraints – Southern & Western Façades



Figure D21: Night-time BS8233 Internal Amenity Constraints – Eastern Façades



Figure D22: Night-time BS8233 Internal Amenity Constraints – Northern Façades



Figure D23: Daytime Overheating Condition Noise Risk Assessment – Southern & Western Façades



Figure D24: Daytime Overheating Condition Noise Risk Assessment – Eastern Façades



Figure D25: Daytime Overheating Condition Noise Risk Assessment – Northern Façades

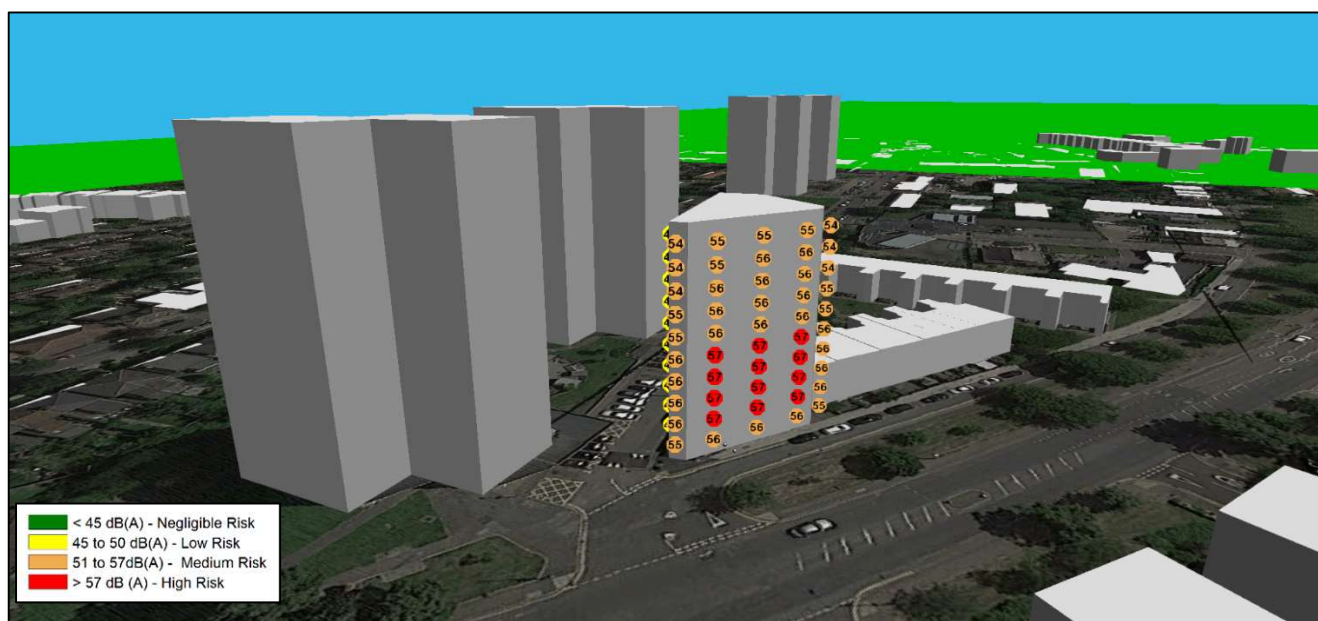


Figure D26: Night-time Overheating Condition Noise Risk Assessment – Southern & Western Façades



Figure D27: Night-time Overheating Condition Noise Risk Assessment – Eastern Façades



Figure D28: Night-time Overheating Condition Noise Risk Assessment – Northern Façades



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