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Noise Impact Assessment Report

43 Old Manor Road, Rustington, BN16 3QS

Report Reference 22047.NIA-RPT.01

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Principal Author	Duncan Arkley MIOA, Principal Acoustics Consultant
Report Checked By	Daniel J. Green MIOA, Director & Principal Acoustics Consultant

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Principal Author Contact Details		
Name	**Telephone No.**	**Email Address**
Duncan Arkley MIOA	02030 627 222	duncan.arkley@esacoustics.com

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LIST OF ATTACHMENTS

1 INTRODUCTION

ES Acoustics Ltd has been commissioned by Mitchell & Massey Ltd to prepare a noise impact assessment for 5 no. residential car parking garages at 43 Old Manor Road, Rustington, BN16 3QS.

The structure of this report is as follows:

- A review of site context and details of the assessment, including the location of the new parking garages proposed and associated access route, the location of the closest noise sensitive receptor relative to the parking locations, and typical vehicle noise emissions;
- A review of local planning policy and acoustic guidance relevant to the proposal; and
- The noise impact assessment considering relevant guidance and contextual factors of the scenario, with any mitigation advice if required.

2 SITE CONTEXT AND DETAILS OF PROPOSAL

2.1 Site Description

The application site is situated in a quiet residential area, with existing parking garages to the immediate southeast serving residential properties in the area. A satellite image of the site is shown below for context.

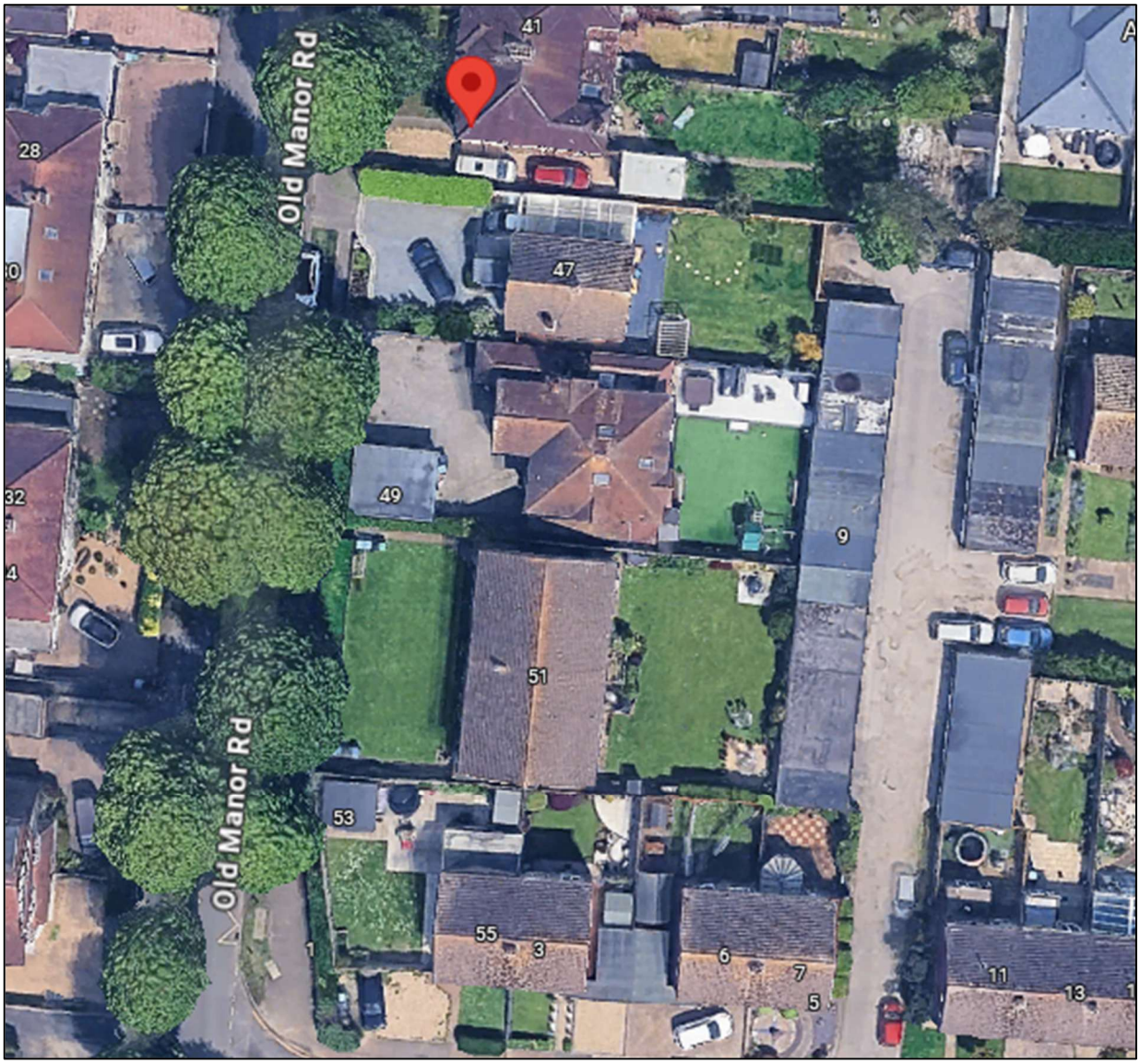

Figure 1 Satellite image showing site and existing garages. Ref: Google maps

2.2 Proposal

The scenario under assessment involves the construction of 5 no. parking garages, adjacent the existing parking garage avenue. The garages would be used by residents and are not commercial garages.

Figure 1 shows the application site boundary in red, and the existing parking garages in blue.

Figure 2 Indicative site plan showing application site boundaries. Ref: Mark Stevens Architects

Figure 3 Indicative site plan showing proposed garages in relation to site. Ref: Mark Stevens Architects

The closest noise sensitive receiver to the proposed garages is located at No. 10 Manor Road, to the east of the units proposed, as indicated in Figure 4.

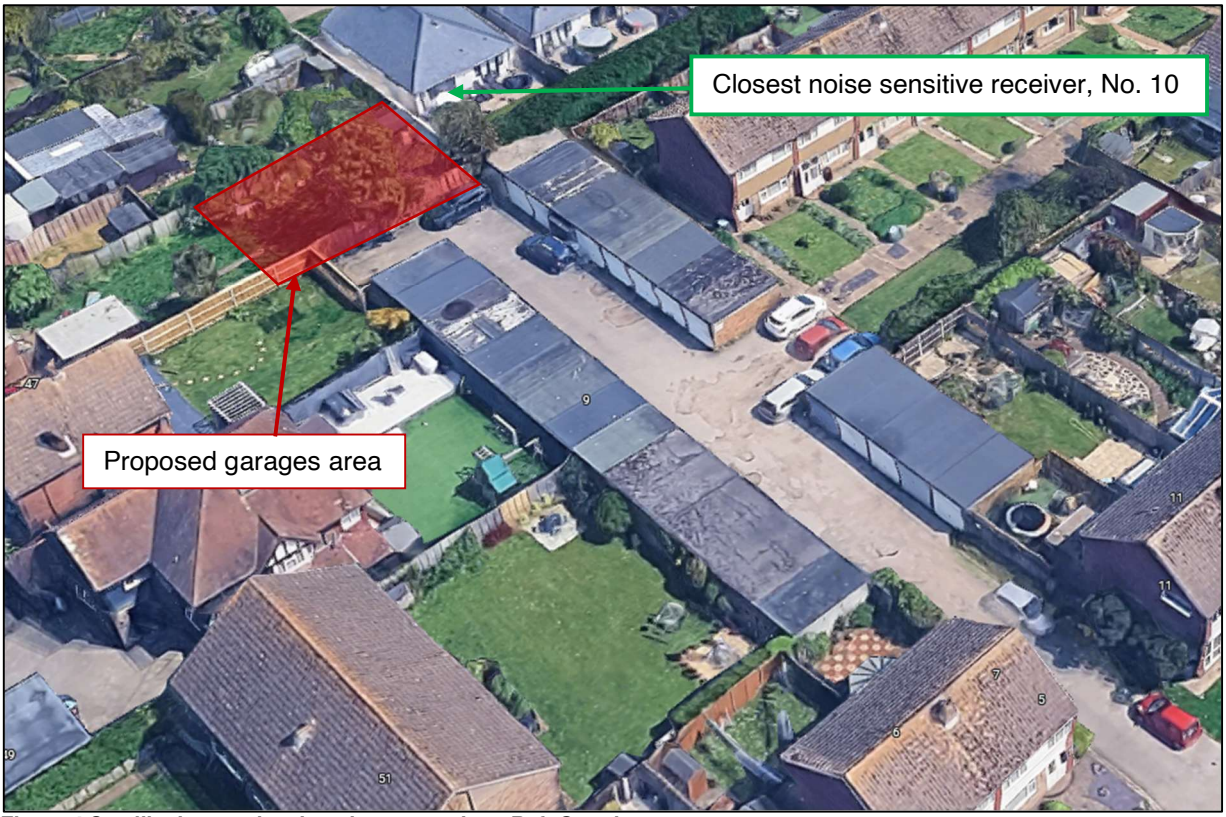

Figure 4 Satellite image showing closest receiver. Ref: Google maps

3 RELEVANT PLANNING POLICY AND GUIDANCE

This section of the report presents the key guidance and legislation relevant to the assessment.

All italicised text within this section is directly referenced from the document in question.

3.1 National Policy

3.1.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) superseded and replaced Planning Policy Guidance Note 24 (PPG24), which previously covered issues relating to noise and planning in England.

The paragraphs relating to noise state:

187. Planning policies and decisions should contribute to and enhance the natural and local environment by; […]

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans

198. 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:

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

b) Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; […]

200. 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.

3.1.2 Noise Policy Statement for England (NPSE)

The Noise Policy Statement for England (NPSE) was developed by DEFRA and published in March 2010. The long-term vision of the Government noise policy is to '*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 vision noted above is supported by the following 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*

The NPSE outlines observed effect levels relating to the above, as follows:

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

Noise effect levels are not set at absolute noise level targets, but instead vary depending on the context and character of the noise and site-specific factors which may impact on the severity of the effect. The NPSE states:

'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. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.'

3.1.3 National Planning Practice Guidance (NPPG)

The NPPG provides practical guidance on how the NPPF should be applied as well as and guidance on the factors influencing whether noise may be a concern at the planning stage and how adverse effects can be mitigated. The table below summarises the effect levels presented within the NPSE, as follows:

Response	Examples of Outcomes	Increasing Effect Level	Action
Not present	No Effect	No Observed Effect	No specific measures required
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific Measures required
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, 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 small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate & reduce to a minimum
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, 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
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 1 Noise exposure hierachy

3.2 Local Policy – Arun District Council

3.2.1 Arun District Council Correspondence

It is understood that a prior application on the same site was refused with the following commentary in the decision notice from Arun District Council:

1 The proposed garages by reason of their excessive number, siting in close proximity to the host and neighbouring residential properties and the significantly increased vehicular activity and disturbance will result in an unacceptable detrimental impact on the residential amenities of existing neighbouring residential occupiers in conflict with Policies D DM1 and QE SP1 of the Arun District Local Plan, the Arun Design Guide and the National Planning Policy Framework.

3.2.2 Arun District Local Plan Policy D DM1 - Aspects of form and design quality

When considering any application for development the Council will have regard to the following aspects:

…3. Impact

Have minimal impact to users and occupiers of nearby property and land. For example, by avoiding significant loss of sunlight, privacy and outlook and unacceptable noise and disturbance….

3.2.3 Arun District Local Plan Policy QE SP1 - Quality of the environment

The Council requires that all development contributes positively to the quality of the environment and will ensure that development does not have a significantly negative impact upon residential amenity, the natural environment or upon leisure and recreational activities enjoyed by residents and visitors to the District.

The location of existing industrial and commercial uses, including waste management uses, must be taken into consideration when assessing proposals for development sensitive to noise, light, odour and outputs to air. This is to ensure that land allocated for these uses are protected and to ensure that the amenity of new developments and facilities is safeguarded from the impacts of incompatible land uses.

3.2.4 Arun District Local Plan Policy QE DM1 – Noise Pollution

…2. New noise generating development

Developers proposing new noise generating development must seek advice from an early stage to determine the level of noise assessment required. Proposals will need to be supported by:

a. Evidence to demonstrate that there are no suitable alternative locations for the development.

b. A noise report which provides accurate information about the existing noise environment, and the likely impact of the proposed development upon the noise environment. The report must also demonstrate that the development meets appropriate national and local standards for noise, as set out in Annex 1 of the Planning Noise Advice Document: Sussex, and any mitigation measures required to ensure noise is managed to an acceptable level.

c. Evidence to demonstrate that the development will not impact upon areas identified and valued for their tranquillity, including Gaps Between Settlements which are important to the enjoyment of Arun's countryside, its habitats and biodiversity….

ESA Commentary on Local Authority Requirements

The guidance referenced in the above policies would largely relate to new developments or installations creating a specific noise source, such as a commercial unit or fixed mechanical plant. In this case, noise would be assessed based on the scenario as proposed, with no specific noise generating factors other than the potential for low-speed vehicle movements.

3.3 Best Practice and Guidance

3.3.1 BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings'

BS 8233:2014 provides guidance on recommended internal ambient noise levels in residential spaces based on World Health Organisation (WHO) research, as shown in Table 2.

Room	Daytime (07:00-23:00)	Night-time (23:00-07:00)
Living Room	≤ 35 dB $L_{Aeq,16hr}$	N/A
Dining Room	≤ 40 dB $L_{Aeq,16hr}$	N/A
Bedroom	≤ 35 dB $L_{Aeq,16hr}$	≤ 30 dB $L_{Aeq,8hr}$

Table 2 BS 8233:2014 indoor ambient noise levels for dwellings

Whilst it is accepted that the levels presented above are for steady external noise sources without a specific character, the guidance provides useful context as to what acceptable internal noise levels are in an ideal situation.

3.3.2 World Health Organization Guidelines

WHO Guidelines for Community Noise (1999) outlines guideline values with respect to critical health effects for residential properties, which are outlined in Table 3.

Specific Environment	Critical Health Effects	L_{Aeq} [dB]	Time [hrs]	L_{Afmax} [dB]
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	n/a
	Sleep disturbance night-time	30	8	45
Outside bedrooms (from noise sources other than road traffic, railways, aircraft or wind turbines)	Sleep disturbance, window open (outdoor values)	45	8	60

Table 3 Guideline Values from WHO Guidelines for Community Noise (1999)

The value of 45dB L_{Aeq} outside bedrooms assumes a partially open window provides 15dB attenuation from outside to inside i.e. 30dB acceptable internal level + 15dB attenuation provided by a partially open window = 45dB acceptable external noise level.

As with the BS 8233:2014 guidance, while this isn't specifically related to noise from plant installations, the guidance provides useful context as to what acceptable noise levels are in an ideal situation.

3.3.3 IEMA - Guidelines for Environmental Noise Impact Assessment

The ultimate aim of any noise assessment is to determine the effect of the expected change in the acoustic environment arising from a given development. The Institute of Environmental Management and Assessment (IEMA) have developed a comparative assessment methodology that involves comparing a 'noise scenario' against the existing ambient noise levels in an area. In this case, this would be applicable to the car park assessment.

The comparative assessment determines the noise level change as follows:

Case	Level
Before (Existing car parking)	A
After (With proposed car parking)	B
Change	**B minus A**

Table 4 IEMA Noise level change

The judgement that is required is whether or not the change in level of B – A i.e. the noise impact, causes a noise effect – and if so, the degree of that effect and whether or not that effect is significant. Typically, that judgement has been made solely on the basis of that difference (B – A), deciding:

- Whether the noise change is small enough such that it is likely to be unnoticeable or barely noticeable; or
- Whether it is large enough to be noticed and hence cause a noise impact but not so large as to cause that impact to be significant; or
- Whether it is so large that the noise impact causes a significant noise effect.

Despite previous established practice, the noise impact and the consequential effect can only rarely be properly determined solely by the simple numerical difference in the value of a particular noise indicator. Determining the simple numerical change of a particular noise indicator is only a starting point in describing the consequential effect on a receptor, and where relevant, evaluating the significance of that effect. When identifying the noise impact and the degree of the consequential effect, it is also necessary to consider, in qualitative terms, what might be the effect of any differences between the future and existing situations in either:

- the type of noise source, or
- the nature of the change, or
- other factors on the question of whether or not the conclusions initially drawn from the numerical change in noise level remain valid.

It is only by taking account of these factors that the magnitude of the effect of a given noise impact on sensitive receptors can be properly identified. The various factors that have been identified as influencing this process are:

- Averaging period;
- Time of day;
- Nature of the noise source (intermittency, etc);
- Frequency of occurrence;
- Spectral characteristics;
- Absolute level of the noise indicator; and
- Influence of the noise indicator used.

Finally, to determine the overall noise impact, the magnitude and sensitivity criteria are combined into a Degree of Effect matrix as shown in Table 5, with the corresponding descriptors in Table 6.

Degree of Effect Matrix		Importance / Sensitivity of the Receptor			
		High	**Medium**	**Low**	**Negligible**
Magnitude / Scale of Change	**Large**	Very Substantial	Substantial	Moderate	None
	Medium	Substantial	Substantial	Moderate	None
	Small	Moderate	Moderate	Slight	None
	Negligible	None	None	None	None

Table 5 IEMA 'degree of effect' matrix

Very Substantial	Greater than 10 dB L_{Aeq} change in sound level perceived at a receptor of great sensitivity to noise
Substantial	Greater than 5 dB L_{Aeq} change in sound level at a noise-sensitive receptor, or a 5 to 9.9 dB L_{Aeq} change in sound level at a receptor of great sensitivity to noise
Moderate	A 3 to 4.9 dB L_{Aeq} change in sound level at a sensitive or highly sensitive noise receptor, or a greater than 5 dB L_{Aeq} change in sound level at a receptor of some sensitivity
Slight	A 3 to 4.9 dB L_{Aeq} change in sound level at a receptor of some sensitivity
None/Not Significant	Less than 2.9 dB L_{Aeq} change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals

Table 6 IEMA 'effect descriptors' table

When considering the guidance above in the context of the assessment at hand, we would consider the type and nature of the proposed noise source to be similar to the existing noise profile of the site, in that the immediate area already includes garages with vehicle movements present. As such, the introduction of the new parking garages would not fundamentally alter the character in this regard.

4 INITIAL APPRAISAL

An initial, high-level appraisal of the scenario in this case relates to the existing use of the site, and the proposals for new garages in relation to the existing scenario.

The site currently includes 29 no. parking garages serving residential properties in the area, used ostensibly for car parking, but also for storage. Access to such garages is typically infrequent, however it is hypothetically possible for each garage to be in use up to twice per day to facilitate normal commuting.

In this, a total of 58 no. “parking events” could occur, including people getting into their cars, closing doors etc, and driving away (or indeed, the opposite).

The proposed garages would be located immediately adjacent to the existing garages, with the closest existing garages sited only 2-3m further from the closest noise sensitive receiver at no. 10 (NSR). At face value, this would increase the number of potential parking events in a day to 68 by allowing for 2 movements for each of the 5 garages.

This would result in a net increase of 0.7dB at the closest noise sensitive receiver at no. 10. This does not include differences created by distance and screening relative to the vehicle movements, but does indicate the types of negligible differences in noise levels expected through the relatively small expansion of the existing site use.

5 SOURCE NOISE LEVELS

5.1 Car parking noise levels

The key activities associated with car parking are defined below:

- Vehicles as they enter and exit the site to park via the existing access road
- Vehicle doors and boots opening and closing

Sound pressure levels associated with basic car parking operations have been measured off-site for a representative sequence of events over a 1-minute cycle. This included: car start up, idle, manoeuvring, and door opening/closing. This has been captured for both a small petrol car, and a medium diesel car, to represent a realistic impression of typical cars attending the site. Electric and hybrid vehicles are inherently quieter during slow movements, and would not be specifically considered in order to present a worst-case assessment.

To present a robust assessment and consider the impulsive nature of car door closures, the L_{max} value as measured over the 1-minute measurement window will be used for the car noise emissions assessment.

Unit	Octave band centre frequency sound pressure levels at 1m, dB								Overall dB(A)
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
Diesel car cycle of events	83	81	79	72	70	71	65	64	77
Petrol car cycle of events	86	79	76	75	66	59	60	60	75

Table 7 Measured car noise levels, Sound Pressure Level $L_{max:1min}$

In terms of the use of this site, the existing site features 29 no. garages, and it is proposed that 5 more will be added. In worst-case use, it is anticipated that up to 2 vehicle movements may occur in a given day for each garage.

6 CAR PARK NOISE IMPACT ASSESSMENT

In the following section of the report, the source noise levels for the garage use are assessed according to IEMA guidelines, as the variation of use is in keeping with the previous use for the area.

The assessment of impact according to IEMA guidelines takes into account the sensitivity of the closest noise sensitive receivers in question. In the case of introducing a new noise source to a sensitive area, residential receivers would typically be considered to be highly sensitive.

The initial step would be to estimate the existing noise levels received as a worst-case scenario from the existing garages. The predicted noise levels would then be estimated from the proposed garages, to allow the values to be compared and indicate the difference anticipated.

In both scenarios, noise levels are predicted at the closest residential receiver to the proposed site. This is the rear façade of no. 10 Manor Road, which is a bungalow to the north of the existing garages, and east of the proposed units.

Nominal screening is allowed for the presence of the garden fencing and garages obstructing the line of sight between the existing garages and the residence. For new garages, a new 2.5m fence is considered, as already proposed by the Client and shown in Figure 3 – this would obstruct all lines of sight not otherwise screened by the presence of the garages themselves.

Noise levels are considered over a 24-hour period, as the garages serve residential uses and have no time restrictions, but in theory would be used for only 2 minutes per day for vehicle movements. In practice, for the comparative assessment, the operational period is not relevant to the assessment, provided that the operational periods for both comparative scenarios are the same.

6.1 Existing Scenario, Received Noise Levels

As the existing site is orientated north-south and approximately 45m in length, noise levels predicted from the existing garages would be considered in groups of 4-6 units at a time to present a practical approach to estimating noise levels received.

Figure 5 Satellite image showing garage groups. Ref: Google maps

Figure 6 Satellite image showing garage groups. Ref: Google maps

Predicted noise levels are calculated in Appendix B for the existing scenario, which results in a level of 37dB(A) at the closest noise sensitive receiver.

6.2 Proposed Scenario, Received Noise Levels

The same calculations have been repeated with the additional events considered for the use of the new garages. These calculations include the 2.5m perimeter fencing proposed by the client as indicated in Figure 3.

Calculations are shown in Appendix C, resulting in a level of 29dB(A).

6.3 Comparative Assessment

The assessment scenario compares the predicted vehicle noise during opening hours, and ambient noise levels as measured during the proposed operational hours. Noise levels are predicted to both noise sensitive receivers previously discussed in the report.

Existing Scenario Noise Level **dB $L_{Aeq, T}$**	**Calculated additional noise from proposed garages** **dB $L_{Aeq, T}$**	**Combined Noise Level** **dB $L_{Aeq, T}$**	**Change against existing noise profile** **dB**
37	29	38	+1dB

Table 8 Comparison of predicted levels for each assessment scenario

When assessing the potential severity of impact according to the IEMA guidelines, the increase in ambient noise level compared with the noise tolerance of the receiver would indicate None/Not Significant impact as a result of vehicle noise, even in the worst-case scenario of all garages being used twice per day.

In practice, the actual use of the garages is expected to be much less, resulting in even lower noise levels received.

6.4 Absolute Noise Level Assessment

The resultant noise level expected over a given daily exposure period would be 29dB(A) for the use of the new garages. This level is calculated outside the closest receiver window, however already falls lower than the *internal* noise levels recommended for resting conditions by WHO. A partially open window typically provides 10-15dB attenuation, leading to further reduced internal noise levels.

7 CONCLUSION

A desktop noise impact assessment has been undertaken for the site at 43 Old Manor Road, Rustington, BN16 3QS to establish the potential noise impact of 5 no. proposed parking garages adjacent to 29 existing similar units.

Existing noise data has been used to predict the change in ambient noise profile in the area as a result of car parking operations in line with IEMA guidance.

It has been concluded that noise emissions from the use of the car parking garages as proposed are not anticipated to create any significant change in the noise profile of the area, and would create no adverse impact.

APPENDIX A

GLOSSARY OF ACOUSTIC TERMINOLOGY

Decibel scale - dB

The decibel (dB) is a relative unit of measurement used in acoustics. The dB is a logarithmic ratio between a measured level and a reference level of 0 dB (i.e the threshold of human hearing). Simply put, the decibel compresses the wide range of sounds we hear into more manageable numbers.

Addition of noise from several sources

Sound produced by multiple sound sources are added logarithmically e.g. power ratio of 2 = 3dB, power ratio of 10 = 10dB. Therefore, two equally intense sound sources operating simultaneously produce a sound level which is 3dB higher than a single source e.g. 60dB + 60dB = 63dB.

Subjective impression of noise

Human response to sound is highly individualized and often based on psychological factors such as emotion and expectation. Sensitivity to sound typically depends on the loudness, pitch, duration of the occurrence, and time of occurrence (e.g. a sound source could cause annoyance during the night where it would not during the day). The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level	Change in perceived loudness
1 dB	Imperceptible
3 dB	Just barely perceptible
6 dB	Clearly noticeable
10 dB	About twice as loud

'A' Weighted Frequency Filter - dB(A)

The human ear is not equally sensitive in all frequencies. The A-weighting filter was devised to take this into account when undertaking noise measurements and allows a sound level meter to replicate the human ears response to sound.

$L_{Aeq, T}$

Sound can fluctuate widely over a given period. L_{Aeq} is the A-weighted equivalent continuous sound level, with T denoting the time period over which the fluctuating sound levels were averaged e.g. $L_{Aeq,16h}$ is the equivalent continuous noise level over an 16 hour period.

L_{A90}

A-weighted sound level exceeded for 90% of the measurement period, calculated via statistical analysis. The L_{A90} descriptor is typically used to establish background sound levels for noise impact assessments

L_{A10}

A-weighted sound level exceeded for 10% of the measurement period, calculated via statistical analysis.

L_{AFmax}

A-weighted sound level maximum sound pressure level that has been measured over a given time period

APPENDIX A

GLOSSARY OF ACOUSTIC TERMINOLOGY

Octave Bands

The audio or frequency spectrum of the human ear is in the range of 20Hz to 20 kHz. The spectrum tells how the energy of the sound signal is distributed in frequency. Octave bands divides the audio spectrum into 10 equal parts. The International Standards Organisation defines the centre frequency of these bands as 31.5Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1kHz, 2kHz, 4kHz, 8kHz and 16kHz.

Noise Rating (NR) Curves

A method of rating noise using a set of curves relating octave band sound pressure levels. Typically used for building services systems within offices

Airborne sound

Sound radiated from a source into the surrounding air e.g. musical instruments, tv/radio, machinery/equipment. Airborne sound insulation refers to the reduction or attenuation of airborne sound, usually via a solid partition between a source and receiver.

Impact sound

Sound resulting from the impact between colliding objects, e.g. footfall impact upon a floor. Impact sound insulation refers to the resistance of a floor to the transmission of impact sound, typically via the installation of a ‘resilient layer’

Flanking sound

The transmission of airborne sound between two adjacent rooms by paths other than via the separating partition between the rooms, e.g. the abutment point of a wall and floor.

Structure-borne noise

Noise caused by the vibration of elements of a structure. This can result in reradiated noise, whereby the vibrating element transmits airborne sound into a space e.g. vibration caused by mechanical plant installed within a plant room which is not adequately isolated from the structure, or construction/demolition work in an adjacent building.

Reverberant sound

Sound in an enclosed space (usually a room), which results from repeated reflections at the boundaries. Reverberation time is the time taken for a steady sound level in an enclosed space to decay by 60dB, measured from the moment the sound source is switched off. A example of a typically reverberant space would be a classic church. Absorptive materials can be used to reduce reflections and reverberation times.

APPENDIX B
NOISE EMISSIONS CALCULATIONS

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Source: Car parking garages group 1 Receiver: NSR - No 10. Manor Road	Frequency, Hz 63	125	250	500	1k	2k	4k	8k	dB(A)
Car operation cycle, diesel cars (Sound pressure level, LAFmax:1min, at 1m)	83	81	79	72	70	71	65	64	**77**
Correction for number of events over 24 hour period (assumed to be 6 no. for 3 cars)	8	8	8	8	8	8	8	8	
Correction for total event time over 24 hour period (6 mins)	-24	-24	-24	-24	-24	-24	-24	-24	
Minimum attenuation provided by distance (15m), dB	-24	-24	-24	-24	-24	-24	-24	-24	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from diesel vehicle movements, dB	38	36	34	27	25	26	20	19	33
Car operation cycle, petrol cars (Sound pressure level, LAFmax:1min, at 1m)	86	79	76	75	66	59	60	60	**75**
Correction for number of events over 24 hour period (assumed to be 4 no. for 2 cars)	6	6	6	6	6	6	6	6	
Correction for total event time over 24 hour period (4 mins)	-26	-26	-26	-26	-26	-26	-26	-26	
Minimum attenuation provided by distance (15m), dB	-24	-24	-24	-24	-24	-24	-24	-24	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from petrol vehicle movements, dB	37	30	27	26	17	10	11	11	26
Total noise level of daily car activities at Receiver	**41**	**38**	**35**	**30**	**26**	**27**	**21**	**20**	**34**

Source: Car parking garages group 2 Receiver: NSR - No 10. Manor Road	Frequency, Hz 63	125	250	500	1k	2k	4k	8k	dB(A)
Car operation cycle, diesel cars (Sound pressure level, LAFmax:1min, at 1m)	83	81	79	72	70	71	65	64	**77**
Correction for number of events over 24 hour period (assumed to be 4 no. for 2 cars)	6	6	6	6	6	6	6	6	
Correction for total event time over 24 hour period (4 mins)	-26	-26	-26	-26	-26	-26	-26	-26	
Minimum attenuation provided by distance (27m), dB	-29	-29	-29	-29	-29	-29	-29	-29	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from diesel vehicle movements, dB	29	27	25	18	16	17	11	10	24
Car operation cycle, petrol cars (Sound pressure level, LAFmax:1min, at 1m)	86	79	76	75	66	59	60	60	**75**
Correction for number of events over 24 hour period (assumed to be 4 no. for 2 cars)	6	6	6	6	6	6	6	6	
Correction for total event time over 24 hour period (4 mins)	-26	-26	-26	-26	-26	-26	-26	-26	
Minimum attenuation provided by distance (27m), dB	-29	-29	-29	-29	-29	-29	-29	-29	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from petrol vehicle movements, dB	32	25	22	21	12	5	6	6	21
Total noise level of daily car activities at Receiver	**34**	**30**	**27**	**23**	**18**	**18**	**13**	**12**	**26**

Source: Car parking garages group 3 Receiver: NSR - No 10. Manor Road	Frequency, Hz 63	125	250	500	1k	2k	4k	8k	dB(A)
Car operation cycle, diesel cars (Sound pressure level, LAFmax:1min, at 1m)	83	81	79	72	70	71	65	64	**77**
Correction for number of events over 24 hour period (assumed to be 6 no. for 3 cars)	8	8	8	8	8	8	8	8	
Correction for total event time over 24 hour period (6 mins)	-24	-24	-24	-24	-24	-24	-24	-24	
Minimum attenuation provided by distance (45m), dB	-33	-33	-33	-33	-33	-33	-33	-33	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from diesel vehicle movements, dB	29	27	25	18	16	17	11	10	23
Car operation cycle, petrol cars (Sound pressure level, LAFmax:1min, at 1m)	86	79	76	75	66	59	60	60	**75**
Correction for number of events over 24 hour period (assumed to be 4 no. for 2 cars)	6	6	6	6	6	6	6	6	
Correction for total event time over 24 hour period (4 mins)	-26	-26	-26	-26	-26	-26	-26	-26	
Minimum attenuation provided by distance (45m), dB	-33	-33	-33	-33	-33	-33	-33	-33	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from petrol vehicle movements, dB	28	21	18	17	8	1	2	2	17
Total noise level of daily car activities at Receiver	**32**	**28**	**26**	**21**	**17**	**17**	**12**	**11**	**24**

Source: Car parking garages group 4 Receiver: NSR - No 10. Manor Road	Frequency, Hz 63	125	250	500	1k	2k	4k	8k	dB(A)
Car operation cycle, diesel cars (Sound pressure level, LAFmax:1min, at 1m)	83	81	79	72	70	71	65	64	**77**
Correction for number of events over 24 hour period (assumed to be 6 no. for 3 cars)	8	8	8	8	8	8	8	8	
Correction for total event time over 24 hour period (6 mins)	-24	-24	-24	-24	-24	-24	-24	-24	
Minimum attenuation provided by distance (23m), dB	-27	-27	-27	-27	-27	-27	-27	-27	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from diesel vehicle movements, dB	35	33	31	24	22	23	17	16	29
Car operation cycle, petrol cars (Sound pressure level, LAFmax:1min, at 1m)	86	79	76	75	66	59	60	60	**75**
Correction for number of events over 24 hour period (assumed to be 4 no. for 2 cars)	6	6	6	6	6	6	6	6	
Correction for total event time over 24 hour period (4 mins)	-26	-26	-26	-26	-26	-26	-26	-26	
Minimum attenuation provided by distance (23m), dB	-27	-27	-27	-27	-27	-27	-27	-27	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from petrol vehicle movements, dB	34	27	24	23	14	7	8	8	23
Total noise level of daily car activities at Receiver	**37**	**34**	**32**	**26**	**22**	**23**	**17**	**16**	**30**

Source: Car parking garages group 5 Receiver: NSR - No 10. Manor Road	Frequency, Hz 63	125	250	500	1k	2k	4k	8k	dB(A)
Car operation cycle, diesel cars (Sound pressure level, LAFmax:1min, at 1m)	83	81	79	72	70	71	65	64	**77**
Correction for number of events over 24 hour period (assumed to be 6 no. for 3 cars)	8	8	8	8	8	8	8	8	
Correction for total event time over 24 hour period (6 mins)	-24	-24	-24	-24	-24	-24	-24	-24	
Minimum attenuation provided by distance (33m), dB	-30	-30	-30	-30	-30	-30	-30	-30	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from diesel vehicle movements, dB	32	30	28	21	19	20	14	13	26
Car operation cycle, petrol cars (Sound pressure level, LAFmax:1min, at 1m)	86	79	76	75	66	59	60	60	**75**
Correction for number of events over 24 hour period (assumed to be 4 no. for 2 cars)	6	6	6	6	6	6	6	6	
Correction for total event time over 24 hour period (4 mins)	-26	-26	-26	-26	-26	-26	-26	-26	
Minimum attenuation provided by distance (33m), dB	-30	-30	-30	-30	-30	-30	-30	-30	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from petrol vehicle movements, dB	31	24	21	20	11	4	5	5	20
Total noise level of daily car activities at Receiver	**34**	**31**	**28**	**23**	**19**	**20**	**14**	**13**	**27**

Source: Car parking garages group 6 Receiver: NSR - No 10. Manor Road	Frequency, Hz 63	125	250	500	1k	2k	4k	8k	dB(A)
Car operation cycle, diesel cars (Sound pressure level, LAFmax:1min, at 1m)	83	81	79	72	70	71	65	64	**77**
Correction for number of events over 24 hour period (assumed to be 6 no. for 3 cars)	8	8	8	8	8	8	8	8	
Correction for total event time over 24 hour period (6 mins)	-24	-24	-24	-24	-24	-24	-24	-24	
Minimum attenuation provided by distance (46m), dB	-33	-33	-33	-33	-33	-33	-33	-33	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from diesel vehicle movements, dB	29	27	25	18	16	17	11	10	23
Car operation cycle, petrol cars (Sound pressure level, LAFmax:1min, at 1m)	86	79	76	75	66	59	60	60	**75**
Correction for number of events over 24 hour period (assumed to be 4 no. for 2 cars)	6	6	6	6	6	6	6	6	
Correction for total event time over 24 hour period (4 mins)	-26	-26	-26	-26	-26	-26	-26	-26	
Minimum attenuation provided by distance (46m), dB	-33	-33	-33	-33	-33	-33	-33	-33	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from petrol vehicle movements, dB	28	21	18	17	8	1	2	2	17
Total noise level of daily car activities at Receiver	**31**	**28**	**26**	**21**	**17**	**17**	**12**	**11**	**24**

Combined sound level received from existing daily vehicle movements	**37**

APPENDIX C
NOISE EMISSIONS CALCULATIONS

es acoustics

Source: Car parking garages group 1 Receiver: NSR - No 10. Manor Road	Frequency, Hz 63	125	250	500	1k	2k	4k	8k	dB(A)
Car operation cycle, diesel cars (Sound pressure level, LAFmax:1min, at 1m)	83	81	79	72	70	71	65	64	**77**
Correction for number of events over 24 hour period (assumed to be 6 no. for 3 cars)	8	8	8	8	8	8	8	8	
Correction for total event time over 24 hour period (6 mins)	-24	-24	-24	-24	-24	-24	-24	-24	
Minimum attenuation provided by distance (15m), dB	-24	-24	-24	-24	-24	-24	-24	-24	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from diesel vehicle movements, dB	38	36	34	27	25	26	20	19	33
Car operation cycle, petrol cars (Sound pressure level, LAFmax:1min, at 1m)	86	79	76	75	66	59	60	60	**75**
Correction for number of events over 24 hour period (assumed to be 4 no. for 2 cars)	6	6	6	6	6	6	6	6	
Correction for total event time over 24 hour period (4 mins)	-26	-26	-26	-26	-26	-26	-26	-26	
Minimum attenuation provided by distance (15m), dB	-24	-24	-24	-24	-24	-24	-24	-24	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from petrol vehicle movements, dB	37	30	27	26	17	10	11	11	26
Total noise level of daily car activities at Receiver	**41**	**38**	**35**	**30**	**26**	**27**	**21**	**20**	**34**

Source: Car parking garages group 2 Receiver: NSR - No 10. Manor Road	Frequency, Hz 63	125	250	500	1k	2k	4k	8k	dB(A)
Car operation cycle, diesel cars (Sound pressure level, LAFmax:1min, at 1m)	83	81	79	72	70	71	65	64	**77**
Correction for number of events over 24 hour period (assumed to be 4 no. for 2 cars)	6	6	6	6	6	6	6	6	
Correction for total event time over 24 hour period (4 mins)	-26	-26	-26	-26	-26	-26	-26	-26	
Minimum attenuation provided by distance (27m), dB	-29	-29	-29	-29	-29	-29	-29	-29	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from diesel vehicle movements, dB	29	27	25	18	16	17	11	10	24
Car operation cycle, petrol cars (Sound pressure level, LAFmax:1min, at 1m)	86	79	76	75	66	59	60	60	**75**
Correction for number of events over 24 hour period (assumed to be 4 no. for 2 cars)	6	6	6	6	6	6	6	6	
Correction for total event time over 24 hour period (4 mins)	-26	-26	-26	-26	-26	-26	-26	-26	
Minimum attenuation provided by distance (27m), dB	-29	-29	-29	-29	-29	-29	-29	-29	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from petrol vehicle movements, dB	32	25	22	21	12	5	6	6	21
Total noise level of daily car activities at Receiver	**34**	**30**	**27**	**23**	**18**	**18**	**13**	**12**	**26**

Source: Car parking garages group 3 Receiver: NSR - No 10. Manor Road	Frequency, Hz 63	125	250	500	1k	2k	4k	8k	dB(A)
Car operation cycle, diesel cars (Sound pressure level, LAFmax:1min, at 1m)	83	81	79	72	70	71	65	64	**77**
Correction for number of events over 24 hour period (assumed to be 6 no. for 3 cars)	8	8	8	8	8	8	8	8	
Correction for total event time over 24 hour period (6 mins)	-24	-24	-24	-24	-24	-24	-24	-24	
Minimum attenuation provided by distance (45m), dB	-33	-33	-33	-33	-33	-33	-33	-33	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from diesel vehicle movements, dB	29	27	25	18	16	17	11	10	23
Car operation cycle, petrol cars (Sound pressure level, LAFmax:1min, at 1m)	86	79	76	75	66	59	60	60	**75**
Correction for number of events over 24 hour period (assumed to be 4 no. for 2 cars)	6	6	6	6	6	6	6	6	
Correction for total event time over 24 hour period (4 mins)	-26	-26	-26	-26	-26	-26	-26	-26	
Minimum attenuation provided by distance (45m), dB	-33	-33	-33	-33	-33	-33	-33	-33	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from petrol vehicle movements, dB	28	21	18	17	8	1	2	2	17
Total noise level of daily car activities at Receiver	**32**	**28**	**26**	**21**	**17**	**17**	**12**	**11**	**24**

Source: Car parking garages group 4 Receiver: NSR - No 10. Manor Road	Frequency, Hz 63	125	250	500	1k	2k	4k	8k	dB(A)
Car operation cycle, diesel cars (Sound pressure level, LAFmax:1min, at 1m)	83	81	79	72	70	71	65	64	**77**
Correction for number of events over 24 hour period (assumed to be 6 no. for 3 cars)	8	8	8	8	8	8	8	8	
Correction for total event time over 24 hour period (6 mins)	-24	-24	-24	-24	-24	-24	-24	-24	
Minimum attenuation provided by distance (23m), dB	-27	-27	-27	-27	-27	-27	-27	-27	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from diesel vehicle movements, dB	35	33	31	24	22	23	17	16	29
Car operation cycle, petrol cars (Sound pressure level, LAFmax:1min, at 1m)	86	79	76	75	66	59	60	60	**75**
Correction for number of events over 24 hour period (assumed to be 4 no. for 2 cars)	6	6	6	6	6	6	6	6	
Correction for total event time over 24 hour period (4 mins)	-26	-26	-26	-26	-26	-26	-26	-26	
Minimum attenuation provided by distance (23m), dB	-27	-27	-27	-27	-27	-27	-27	-27	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from petrol vehicle movements, dB	34	27	24	23	14	7	8	8	23
Total noise level of daily car activities at Receiver	**37**	**34**	**32**	**26**	**22**	**23**	**17**	**16**	**30**

Source: Car parking garages group 5 Receiver: NSR - No 10. Manor Road	Frequency, Hz 63	125	250	500	1k	2k	4k	8k	dB(A)
Car operation cycle, diesel cars (Sound pressure level, LAFmax:1min, at 1m)	83	81	79	72	70	71	65	64	**77**
Correction for number of events over 24 hour period (assumed to be 6 no. for 3 cars)	8	8	8	8	8	8	8	8	
Correction for total event time over 24 hour period (6 mins)	-24	-24	-24	-24	-24	-24	-24	-24	
Minimum attenuation provided by distance (33m), dB	-30	-30	-30	-30	-30	-30	-30	-30	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from diesel vehicle movements, dB	32	30	28	21	19	20	14	13	26
Car operation cycle, petrol cars (Sound pressure level, LAFmax:1min, at 1m)	86	79	76	75	66	59	60	60	**75**
Correction for number of events over 24 hour period (assumed to be 4 no. for 2 cars)	6	6	6	6	6	6	6	6	
Correction for total event time over 24 hour period (4 mins)	-26	-26	-26	-26	-26	-26	-26	-26	
Minimum attenuation provided by distance (33m), dB	-30	-30	-30	-30	-30	-30	-30	-30	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from petrol vehicle movements, dB	31	24	21	20	11	4	5	5	20
Total noise level of daily car activities at Receiver	**34**	**31**	**28**	**23**	**19**	**20**	**14**	**13**	**27**

Source: Car parking garages group 6 Receiver: NSR - No 10. Manor Road	Frequency, Hz 63	125	250	500	1k	2k	4k	8k	dB(A)
Car operation cycle, diesel cars (Sound pressure level, LAFmax:1min, at 1m)	83	81	79	72	70	71	65	64	**77**
Correction for number of events over 24 hour period (assumed to be 6 no. for 3 cars)	8	8	8	8	8	8	8	8	
Correction for total event time over 24 hour period (6 mins)	-24	-24	-24	-24	-24	-24	-24	-24	
Minimum attenuation provided by distance (46m), dB	-33	-33	-33	-33	-33	-33	-33	-33	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from diesel vehicle movements, dB	29	27	25	18	16	17	11	10	23
Car operation cycle, petrol cars (Sound pressure level, LAFmax:1min, at 1m)	86	79	76	75	66	59	60	60	**75**
Correction for number of events over 24 hour period (assumed to be 4 no. for 2 cars)	6	6	6	6	6	6	6	6	
Correction for total event time over 24 hour period (4 mins)	-26	-26	-26	-26	-26	-26	-26	-26	
Minimum attenuation provided by distance (46m), dB	-33	-33	-33	-33	-33	-33	-33	-33	
Nominal attenuation provided by partial fence screening, dB	-5	-5	-5	-5	-5	-5	-5	-5	
Total Noise Emissions from petrol vehicle movements, dB	28	21	18	17	8	1	2	2	17
Total noise level of daily car activities at Receiver	**31**	**28**	**26**	**21**	**17**	**17**	**12**	**11**	**24**

Combined sound level received from existing daily vehicle movements	**37**

Source: New garages, cars parking Receiver: NSR - No 10. Manor Road	Frequency, Hz 63	125	250	500	1k	2k	4k	8k	dB(A)
Car operation cycle, diesel cars (Sound pressure level, LAFmax:1min, at 1m)	83	81	79	72	70	71	65	64	**77**
Correction for number of events over 24 hour period (assumed to be 6 no. for 3 cars)	8	8	8	8	8	8	8	8	
Correction for total event time over 24 hour period (6 mins)	-24	-24	-24	-24	-24	-24	-24	-24	
Minimum attenuation provided by distance (13m), dB	-22	-22	-22	-22	-22	-22	-22	-22	
Nominal attenuation provided by full screening as proposed, dB	-6	-7	-8	-10	-12	-15	-18	-21	
Total Noise Emissions from diesel vehicle movements, dB	39	36	33	24	20	18	9	5	28
Car operation cycle, petrol cars (Sound pressure level, LAFmax:1min, at 1m)	86	79	76	75	66	59	60	60	**75**
Correction for number of events over 24 hour period (assumed to be 4 no. for 2 cars)	6	6	6	6	6	6	6	6	
Correction for total event time over 24 hour period (4 mins)	-26	-26	-26	-26	-26	-26	-26	-26	
Minimum attenuation provided by distance (13m), dB	-22	-22	-22	-22	-22	-22	-22	-22	
Nominal attenuation provided by full screening as proposed, dB	-6	-7	-8	-10	-12	-15	-18	-21	
Total Noise Emissions from petrol vehicle movements, dB	38	30	26	23	12	2	0	-3	23
Total noise level of daily car activities at Receiver	**41**	**37**	**34**	**26**	**20**	**18**	**9**	**5**	**29**

Sound level received from additional daily vehicle movements	**29**
Combined sound level received from all daily vehicle movements	**38**
Increase in sound levels received	**1**