ACOUSTIC CONSULTANTS LTD

Noise Impact Assessment

Proposed Service Station Redevelopment
Moor Lane, South Sheilds

Reference: 10561/NIA/FD

Client
SRJ Energy Limited t/a Hedworth Services (Sunderland)

Document Control

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1.0	First Issue	16/02/2024	Sam Frankcom	Blake Lucas	Blake Lucas
Rev A	Addressed EHO comments regarding car park	09/01/25	Fergal Denman	Blake Lucas	Blake Lucas

The report has been prepared in good faith, with all reasonable skill and care, based on information provided or available at the time of its preparation and within the scope of work agreement with the Client. We disclaim any responsibility to the Client and others in respect of any matters outside the scope of the above. The report is provided for the sole use of the named Client and is confidential to them and their professional advisors. No responsibility is accepted to other parties.

The report limits itself to addressing solely on the noise, acoustic, and vibration aspects as included in this report. We provide advice only in relation to noise, vibration and acoustics. It is recommended that appropriate expert advice is sought on all the ramifications (e.g. CDM, structural, condensation, fire, legal, etc.) associated with any proposals in this report or as advised and concerning the appointment. It should be noted that noise predictions are based on the current information as we understand it and, on the performances noted in this report. Any modification to these parameters can alter the predicted level. All predictions are in any event subject to a degree of tolerance of normally plus or minus three decibels. If this tolerance is not acceptable, then it would be necessary to consider further measures.

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1. Introduction

SRJ Energy Limited t/a Hedworth Services (Sunderland) appointed Acoustic Consultants Limited (ACL) to undertake a noise impact assessment for the proposed redevelopment of Moor Lane Service Station, South Sheilds.

A noise impact assessment of the proposed new noise sources, fixed plant noise and noise from vehicles entering and exiting the car park is undertaken using on-site measured baseline noise data, provided plant noise data, provided trip counts to the development and guidance in the National Planning Policy Framework (NPPF), Noise Policy Statement for England (NPSE), Planning Practice Guidance (PPG) and British Standard 4142:2014+A1:2019 (BS4142).

This report has been prepared by a Technician Member of the Institute of Acoustics (TechIOA). This report has been reviewed and approved by a director of the company who is a full Member of the Institute of Acoustics (MIOA) with over 16 years' experience in the field of acoustics.

2. The Site

The proposed site is an existing service station, shop and vehicle garage to the south of Moor Lane, South Shields.

Existing residential receivers lie directly south of the proposed site on Moore Avenue.

New plant associated with the proposals is understood to be located within a dedicated plant room on the Northeast of the shop façade.

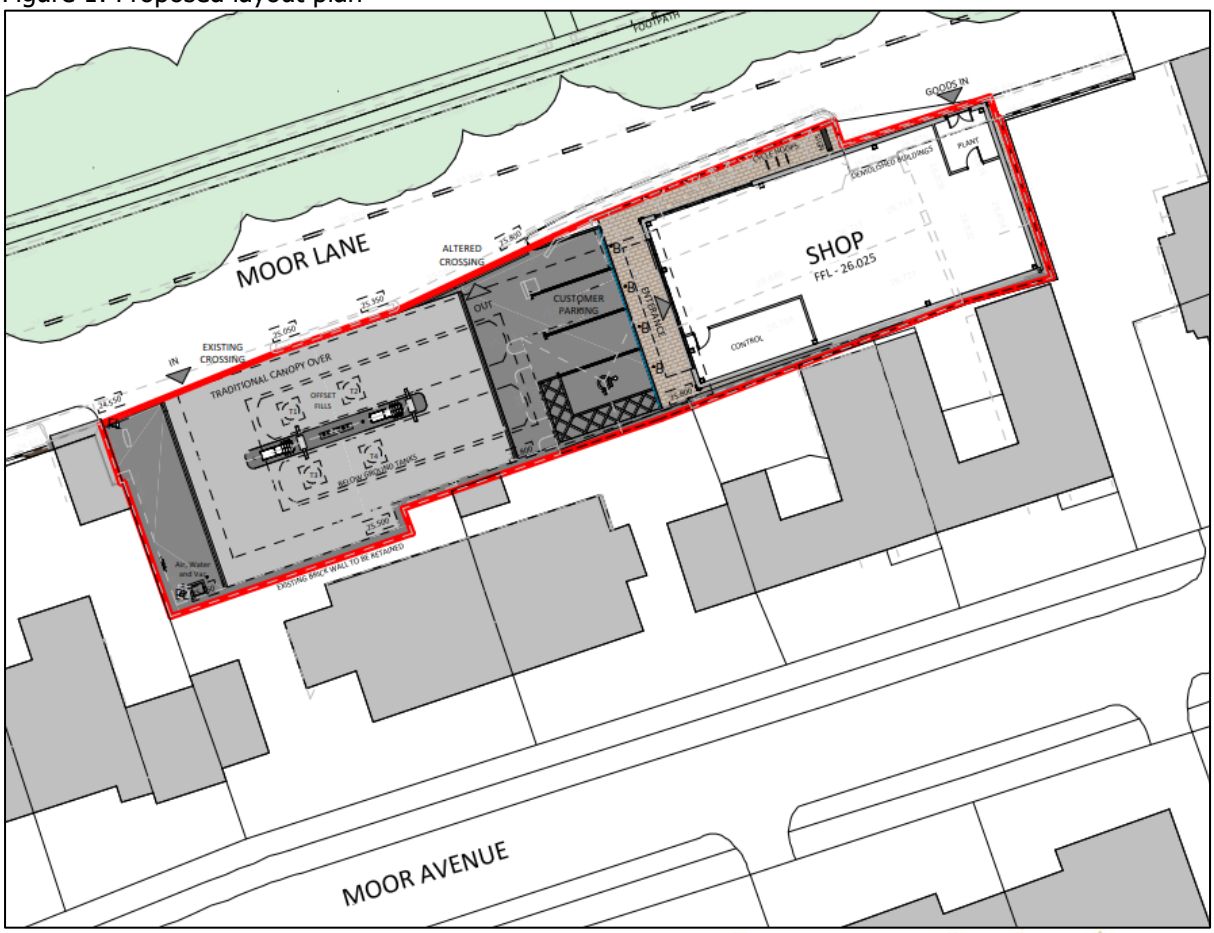
It is understood that there are to be 644 cars entering and exiting the site throughout the day, with a total of 49 vehicles entering and exiting the site during the worst-case period. No cars are expected to enter and exit the site during the night period.

It is also understood a new proposed air vac unit is to be located in the Southwestern corner of the site.

It should be noted that the hours of use are not proposed to change.

The proposed layout plan is provided below.

Figure 1: Proposed layout plan



3. Planning and Noise

3.1. National Planning Policy Framework

The National Planning Policy Framework (NPPF) was published in March 2012 and revised in December 2023. Section 15 entitled 'Conserving and enhancing the natural environment' addresses noise as a requirement of planning. Paragraph 180 states:

"180. 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; and f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate."

Paragraph 191 states:

"191. 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; and
c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation. "

The document does not prescribe any assessment methodology or criteria to assess the adverse effect of noise and refers you to the NPSE.

3.2. Planning Practice Guidance, Noise

The Planning Practice Guidance (PPG) on noise referred to here is based on the current version (January 2019) as provided on the Planning Guidance Website. It states that, *"Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment."*

It provides generic guidance on how to determine the noise impact and what factors could be a concern.

It includes the option types to mitigate any adverse effects of noise stating that there are four broad types of mitigation. These are engineering, layout, using planning conditions or obligations and noise insulation.

Paragraph 5 of the PPG provides a table identifying the effect level and examples of effect relating to the impact effect levels provided in the NPSE. The table is duplicated below:

Table 1: PPG Noise – Perception of Effect Levels

Perception	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
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
Lowest Observed Adverse Effect Level			
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 and reduce to a minimum
Significant Observed Adverse Effect Level			
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

The table does not provide any objective assessment which equates to the noted effect levels. However, the PPG identifies that where noise is audible, it is not necessarily intrusive. The effect and impact on people are based primarily on the level of noise.

3.3. Noise Policy Statement for England

The NPPF refers to the Noise Policy Statement for England (NPSE). This was published in March 2010 and aims to provide clarity regarding current policies and practices to enable noise management decisions to be made within the wider context, at the most appropriate level, in a cost-effective manner and in a timely fashion and applies to all forms of noise including environmental noise, neighbour noise and neighbourhood noise.
The NPSE sets out the long term vision of Government noise policy. This long term vision is supported by three noise policy aims as follows:

"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 introduces the concept of "Significant adverse" and "Adverse" impacts of noise which relate to the noise policy aims. These are applied as follows:

NOEL – No Observed Effect Level

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

LOAEL – Lowest Observed Adverse Effect Level

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

SOAEL – Significant Observed Adverse Effect Level

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

The Noise Policy Statement for England (NPSE) states that noise levels above the Lowest Observed Adverse Effect Level are acceptable in planning where reduced to a minimum.

With regard to where there is potential for noise impact it states the following in relation to the second noise policy aim:

"The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to

mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur."

The NPSE does not provide any assessment criteria for the noted effect levels and each case must be considered on its merits.

The NPSE does, however, emphasise that in dealing with noise Local Planning Authorities are required to take a balanced approach in considering the benefits of development as against any adverse effects which arise. Paragraph 2.18 of the NPSE is particularly relevant in this respect and states:

"There is a need to integrate consideration of the economic and social benefits of the activity or policy under examination with proper consideration of the adverse environmental effects, including the impact of noise on health and quality of life. This should avoid noise being treated in isolation in any particular situation, i.e. not focusing solely on the noise impact without taking into account other related factors."

The planning need is outside the scope of noise and acoustics and will need to be addressed by others.

4. Assessment Criteria

4.1. Fixed Plant and Deliveries

The following section identifies guidance which is considered to provide noise criteria equivalent to or below the LOAEL described in the PPG and NPSE, i.e. *"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."*

For industrial and commercial noise, the most relevant guidance is provided within British Standard 4142:2014+A1:2019. The methods described in the British Standard use outdoor sound levels to assess the likely effects of sound upon people who might be inside or outside a dwelling or other premises used for residential purposes.

The initial estimate principle is that of establishing the 'difference' between the 'rating level' and the 'background sound level'. The 'rating level' is the 'specific sound level' of the source over a period of one hour during the day (07:00 to 23:00 hours) and over a period of 15 minutes during the night (23:00 to 07:00 hours). Clause 9 entitled 'Rating Level' states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level."

An acoustic character correction should be added to the 'specific sound level' if it exhibits any tonality, impulsivity, other specific characteristics and/or intermittency at the assessment location. The value of the character correction varies, dependent on the prominence of the character of the sound source at the assessment location. In Clause 11 of the Standard, entitled 'Assessment of the Impacts', it states:

"Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (see Clause 8) from the rating level (see Clause 9), and consider the following.

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

Based on the initial assessment outcomes of BS4142, and depending on context, it is our opinion that the NOEL, LOAEL and SOAEL levels stated in the Noise Policy Statement for England would generally fall within the following categories when considered in conjunction with the effect levels of the PPG Noise.

Table 2: BS4142 Difference in Relation to Effect Levels

BS4142 Assessment Difference	Corresponding Effect Level*	Action*
≤-10 dB	No Observed Effect	No specific measures required
-9.9 dB to 0 dB	No Observed Adverse Effect	No specific measures required
	Lowest Observed Adverse Effect Level	
0.1 dB to 5 dB	Observed Adverse Effect	Mitigate and reduce to a minimum
	Significant Observed Adverse Effect Level	
5.1 dB to 10 dB	Significant Observed Adverse Effect	Avoid
≥10.1 dB	Unacceptable Adverse Effect	Prevent

* BS4142 states that "where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration". Therefore, the assessment levels and effect levels above are not definitive and can be modified due to context.

It should be noted that the numerical outcome only represents the initial estimate of impact, as stated in the first paragraph of Clause 11, and that contextual matters should be considered before determining what the potential impact is. This paragraph 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 effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.*
>
> *Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (see Clause 8) from the rating level (see Clause 9).*
>
> *NOTE 1 More than one assessment might be appropriate.*

The second part of Clause 11 sets out three contextual matters that should be taken into account once the initial numerical estimate has been determined. It is important to note that the three listed is not exhaustive and all pertinent factors should be considered. BS 4142:2014 states:

"Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.

1) *Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night. Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.*

2) *The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.*

   NOTE 3 Consideration ought to be given to evidence on human response to sound and, in particular, industrial and/or commercial sound where it is available. A number of studies are listed in the "Effects on humans of industrial and commercial sound" portion of the "Further reading" list in the Bibliography.

4.2. Car Park Use

4.2.1. World Health Organisation 'Guidelines for Community Noise'

For noise levels internally and externally to dwellings it states:

"In Dwellings. The effect of noise in dwellings, typically, are sleep disturbance, annoyance and speech interference. For bedrooms the critical effect is sleep disturbance. Indoor guideline values for bedrooms are 30 LAeq for continuous noise and 45 LAmax for single sound events. Lower noise levels may be disturbing depending on the nature of the noise source. At night-time, outside sound levels about 1 metre from façades of living spaces should not exceed 45 dB LAeq, so that people may sleep with bedrooms open. This value was obtained by assuming the noise reduction from outside to inside with the window open is 15 dB. To enable casual conversation indoors during daytime, the sound level of interfering noise should not exceed 35 dB LAeq. The maximum sound pressure level should be measured with the sound pressure meter set at "fast"."

Based on the same methodology used to determine the night time noise level (with a 15 dB(A) for an open window) outside a residential property, the daytime noise level about 1 metre from façades of daytime living spaces should not exceed 50 dB L_{Aeq}.

The WHO criteria were reviewed in a report by the National Physical Laboratory (reference CMAM16) which states:

"Exceedance of the WHO guideline values does not necessarily imply significant noise impact and indeed, it may be that significant impacts do not occur until much higher levels of noise exposure are reached."

Therefore, it is not necessarily the case that where these levels are exceeded the noise will adversely affect nearby residential properties.

4.2.2. Comparative Assessment

The criteria set out above is an absolute level in a dwelling. As such, it does not consider existing noise levels on or around the site. However, for certain applications it may be more suitable to consider a comparative assessment as part of the overall impact assessment.

The Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment, Version 1.2 published in November 2014 categorises the significance of a change in noise level, this is summarised as follows and taken from Table 7-14 of the guidance.

Table 3: IEMA Impact from the Change in Sound Levels (Table 7-14)

Sound Level Change LpT	Long-term impact classification	Short-term impact classification
≥ 0 dB and < 1 dB	Negligible	Negligible
≥ 1 dB and < 3 dB		Minor
≥ 3 dB and < 5 dB	Minor	Moderate
≥ 5 dB and < 10 dB	Moderate	Major
≥ 10 dB	Major	

Where noise from the proposed development does not exceed the existing noise climate, the increase in noise will be no more than 3 decibels. It is expected there will be no observed effect on nearby residential properties. This would be applicable where noise levels currently exceed the WHO guidelines which would be used as a lower limit.

Where noise levels do not exceed the WHO guidelines, a higher change could be considered acceptable without having an observed adverse effect as the noise levels are suitably low.

5. Baseline Noise Survey

A baseline noise survey was undertaken at the site between the 26th and 28th of January 2024.

5.1. Monitoring Equipment

Sound Pressure Levels were measured using a Sound Level Analyser with half-inch condenser microphones using the "fast" setting. The equipment is checked annually using a Quality System meeting the requirements of British Standard EN ISO/IEC 17025:2005 and in accordance with British Standard EN 10012:2003 and traceable to the National Standards. This equipment was checked and calibrated as noted below.

Table 4: Monitoring equipment

Equipment Description	Serial Number	Date of Calibration	Calibration Certification Number
SLM, NTI, XL2	A2A-18928-E0	10/05/2023	UK-23-059
Pre-Amp, NTI, MA220	9785	10/05/2023	UK-23-059
Microphone, NTI, MC230A	A20919	10/05/2023	UK-23-059
Calibrator, Larson Davis, CAL200	17656	07/02/2023	44552-17656-CAL200

The measuring systems were checked for calibration before and after the tests and no significant drift was detected.

5.2. Weather Conditions

Below were the weather conditions over the duration of the survey at the monitoring location.

Table 5: Weather conditions during the survey period

Date	Wind Speed (m/s)	Wind Direction	Temperature (°C)	Precipitation Time (hrs)	Cloud cover (%)
26th January 2024	≤5	SW	5 - 7	0	50
27th January 2024	≤5	SW	6 - 10	0	40
28th January 2024	≤8	S	6 - 11	0	70

Wind speeds on the 29th may have had an adverse effect on the collected data during that period; this has been omitted from the assessed dataset.

5.3. Monitoring Procedure

The microphone was situated in a free field position, secured to a lamppost, at an approximate height of 3 metres. Traffic on the surrounding road network formed the baseline noise climate.

The monitoring location, proposed site and nearest noise sensitive receivers are provided on the figure below.

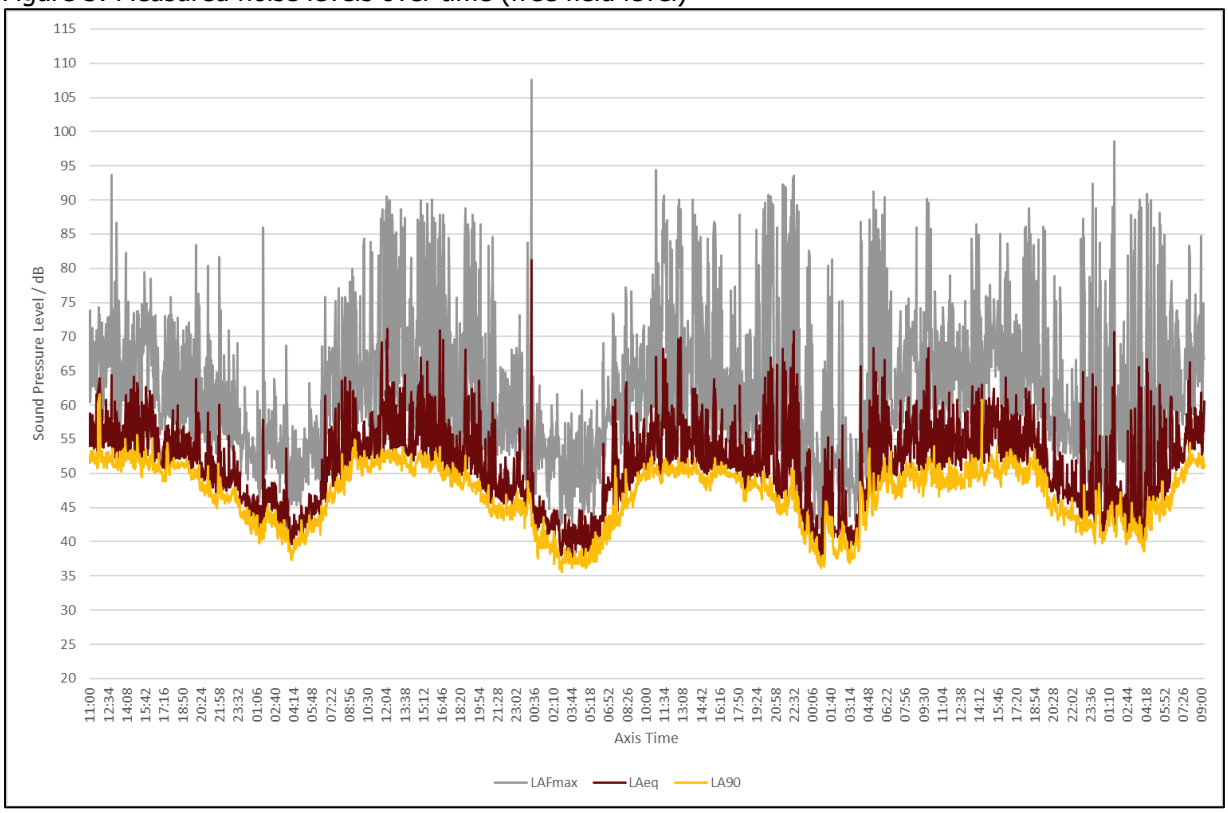
Figure 2: Monitoring location



5.4. Measured Noise Levels

The chart below details the measured maximum (L_{AFmax}), equivalent (L_{Aeq}) and background (L_{A90}) noise levels measured over the survey period. Measurements below are detailed in 2-minute intervals.

Figure 3: Measured noise levels over time (free field level)



The table below details the measured 15-minute daytime and night time background and residual noise levels, representative of existing residential receivers.

Table 6: Measured representative residual and background noise levels (free field)

Period	Background, dB $L_{A90,15minutes}$		Equivalent, dB $L_{Aeq,15minutes}$	
	Range	Typical	Range	Typical
Daytime, 0700 – 2300hrs	44 - 53	46	47 - 67	57
Night Time, 2300 - 0700hrs	38 - 47	43	41 - 55	46

6. Plant Assessment

6.1. Proposed Air Vac

The use of the proposed air vac is not expected to change with the proposals as the existing site included a similar unit in the same location. As such, this unit is excluded from the assessment.

6.2. Proposed New Plant

It is understood that a single condenser unit is to be located within the plant room on the northern façade of the shop.

The proposed condenser is a Danfoss OP-MSXM046MLW05E. The provided datasheet for this unit states a Sound Power Level of 72 dBA.

Please advise of any discrepancies in the determination of the above. Any additional plant, relocation of plant or changes to proposed plant will require reassessment.

6.2.1. Predicted Specific Sound Level

The reverberant sound pressure level within the plant room is expected to be 73 dBA.

The nearest noise-sensitive receiver window is approximately 13 metres from the louvered door of the plant room.

It should also be noted that the receiver lies behind the plant room and therefore the plant room wall will act as a noise barrier.

Accounting for distance and barrier attenuation the predicted specific sound level of plant at the NSR is 43 dB $L_{Aeq,15minutes}$.

6.3. British Standard 4142:2014 Assessment

A British Standard 4142:2014 assessment has been undertaken at the sensitive receivers on the site.

6.3.1. Background Sound Level

From the measured data we have determined a background sound level of 46 dB $L_{A90,1hour}$ during the day and a level of 43 dB $L_{A90,15minutes}$ during the night.

6.3.2. Specific Sound Level

The predicted specific sound level of noise from proposed plant at the NSR is 43 dB $L_{Aeq,15\ minutes}$. It is assumed plant will run 24/7.

6.3.3. Character Corrections

Character corrections should be added to the 'specific sound level' if it exhibits any tonality, impulsivity, other specific characteristics and/or intermittency at the assessment location. Based on our understanding of proposed plant type, character corrections are as follows.

- ***Tonality*** – The plant proposed is not considered tonal. The plant supplier should confirm this is the case.
- ***Impulsivity*** – Plant such as this is not normally impulsive. The plant supplier should confirm this is the case.
- ***Intermittency*** – We do not expect that the intermittency of the plant will be distinguishable at the sensitive receiver over the residual noise climate, and we have not applied correction for intermittency. We have also assumed all plant is running continuously.
- ***Other Sound Characteristics*** – We do not believe any correction is due to other characteristics.

6.3.4. Initial Estimate of Impact

The British Standard 4142:2014 initial estimate at the most sensitive location is as follows:

Table 7: British Standard 4142:2014 initial estimate for NSR

Parameter	Day	Night
Background Level, $L_{A90,T}$	46 dB	43 dB
Specific Sound Level, $L_{Aeq,T}$	43 dB	43 dB
Character Correction	0 dB	0 dB
Rating Level, $L_{Ar,T}$	43 dB	43 dB
Excess of rating over background level	-3 dB	0 dB

The plant rating noise level is 3 dB below the design background noise level during the day and is equal to the design background noise level during the night. Noise is expected to have no impact on the NSR during both the day and night.

6.3.5. Context

With regard to context, BS4142 states *"Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following:"*

Absolute Levels

With regard to 'absolute levels', the most relevant guidance is British Standard 8233:2014. Section 7.7.2 Table 4 of the British Standard provides internal ambient noise levels for dwellings from noise sources 'without a specific character'. We would advise the rating level is considered to allow for the character of the source.

The guideline states that noise levels should not exceed 35 dB $L_{Aeq(16hr)}$ within habitable rooms during the day, and 30 dB $L_{Aeq(8hr)}$ within night-time rooms. The internal level is approximately 15 dB quieter than the external free-field level (as stated by the BS8233:2014 and WHO 1999) allowing for the attenuation of a partially open window. Therefore, based on the predicted rating levels noted above, the internal absolute levels are as follows.

Table 8: Comparison with British Standard 8233:2014 at Worst-Case Receiver

Parameter	Predicted Level dB L_{Ar}	Open Window Correction dB(A)	Predicted Internal Level dB(A)	Within BS8233 Criteria?
Daytime, 0700 – 2300hrs	43	-15	28	YES
Night Time, 2300 – 0700hrs	43	-15	28	YES

As can be seen from the above table, the predicted level internally to the NSR is within the internal limits stated within British Standard 8233.

6.4. Summary of Assessment

Noise from proposed plant is expected to be of no impact during both day and night when assessed to British Standard 4142:2014+A1:2019.

On this basis, we would consider the noise impact of the proposed plant to fall in the No Observed Effect Level (NOEL) of the NPSE and PPG and achieves the aims of National Planning Policy Framework (NPPF).

7. Car Park Assessment

7.1. Local Authority Comments

The local authority has provided us the following comments on our initial report.

"A noise assessment has been provided in support of this application.

The noise assessment has considered a new source that is introduced as a result of this application, namely new external plant.

The consultant has carried out a suitable assessment using the most appropriate methodology and I am satisfied with the outcome that this will have no impact on neighbouring residents, mainly as a result of the location of the plant which is inside a dedicated plant room and some distance away from the properties on Moor Lane, the closest sensitive receptors.

However, I do believe that an additional noise source should have been included in the assessment as a result of parking spaces being proposed on site where previously there have not been.

The application site lies very close to residential receptors, and we have received complaints in the past relating to the comings and goings of cars and people late at night and into the early hours of the morning. As the proposal includes parking spaces in proximity to residential properties, I would ask that the acoustic assessment is updated to included analysis of potential noise impact at residential properties as a result of additional comings and goings and car doors slamming. I believe that the petrol station is open 24 hours and I would like confirmation that these potential new noise sources will not impact on neighbouring residents."

The following section addresses this comment.

7.2. Typical Trip Numbers

Based on the supplied information, it is expected that a total of 644 cars will be entering and exiting the site over a typical 24-hour period, with a total of 49 vehicles entering and exiting the site during the worst-case day period, between 16:00-17:00 and 26 vehicles entering and exiting the site during the worst-case night period, between 06:00-07:00.

7.3. Noise Generated from Vehicle Movements

ACL's in-house library data is provided below and was an attended measurement exercise of a petrol Fiat Punto car (2007 model) manoeuvring around a car park, making typical movements within a car park setting.

Table 9: Typical Car Movement Operation Noise Emission

$L_{Aeq(T)}$ (dB)	Activity
56	Car Moving 10 km/h (at 5m)

7.4. Noise Generated from Car Doors Slamming

ACL's in-house library data is provided below and was an attended measurement exercise of a Volkswagen Polo (2015 model) door being slammed shut multiple times, from which we have taken the loudest measurement.

Table 10: Typical Car Door Slamming Noise Level

$L_{Aeq(T)}$ (dB)	Activity
83	Car Door Slamming (at 5m)

7.5. Noise Modelling

7.5.1. Modelling Parameters

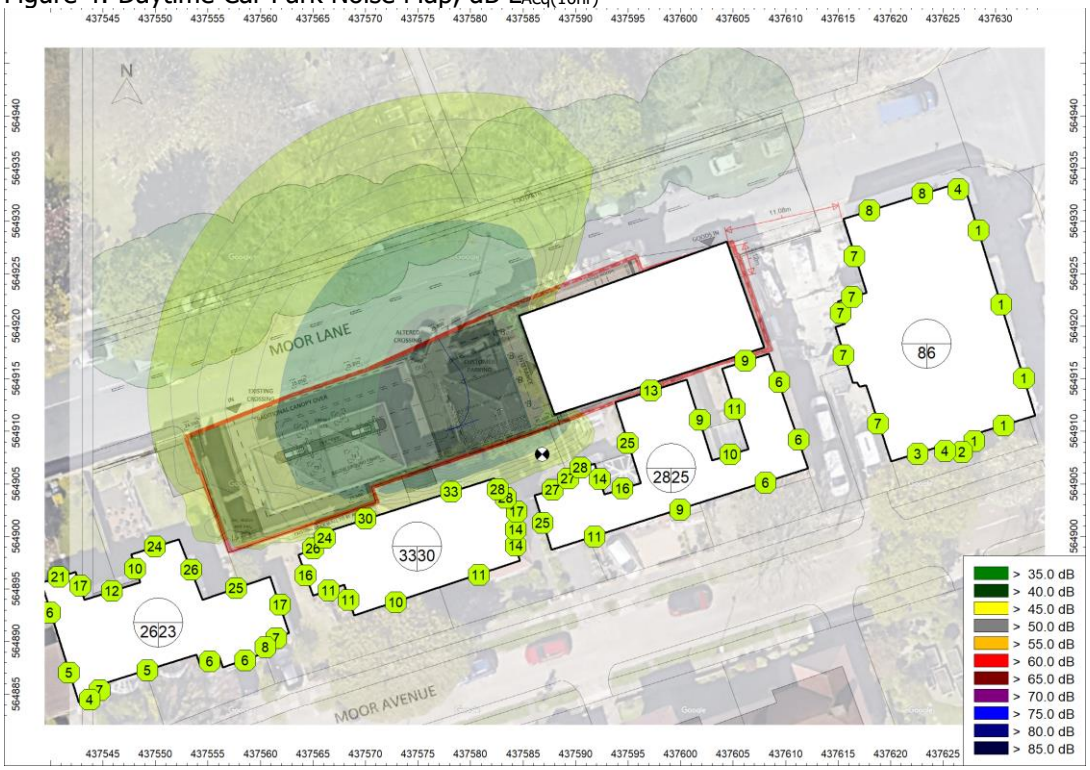
Noise emission prediction calculations have been carried out for the potentially most sensitive locations to delivery noise (as stated above). The delivery operation has been modelled in the noise modelling software Cadna:A by DataKustik. The parameters within the Cadna:A model are as follows:

- The building height is based on the provided drawings, the existing buildings have been based on Google Street View imagery.
- The order of reflections is 3, and all buildings are considered reflective.
- The ground across the site and surrounding area is considered hard and reflective.
- The topography of the site is assumed to be flat.
- The predictions are based on the provided trip numbers and noise levels of vehicle movements and car door slams noted above.
- The predicted building noise map level at each receiver is the highest predicted level per storey of each façade.
- The noise map is predicted at second storey height.
- Patron vehicle noise accessing the site have been input as a line source at 0.5m high with the details as above.

7.5.2. Modelling Results

The following noise map displays the predicted noise levels due to the noted operations above. Noise maps are provided for the daytime and night-time period assessment.

Figure 4: Daytime Car Park Noise Map, dB $L_{Aeq(16hr)}$



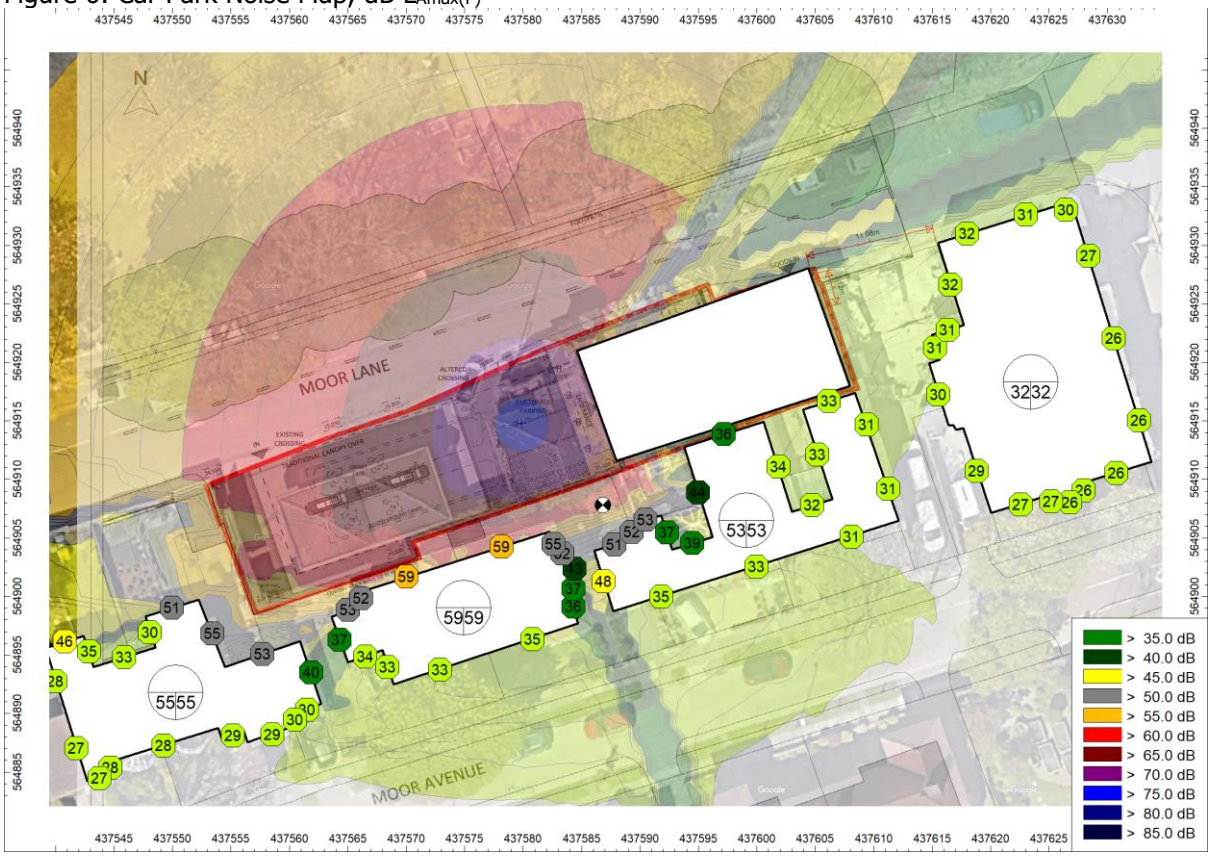
The specific noise level at the worst-case residential façade is 33 dB $L_{Aeq,1hour}$ during the daytime period.

Figure 5: Car Park Noise Map, dB $L_{Aeq(8hr)}$



The specific noise level at the worst-case residential façade is 30 dB $L_{Aeq,1hour}$ during the daytime period.

Figure 6: Car Park Noise Map, dB $L_{Amax(F)}$



The maximum noise level at the worst-case residential façade is 59 dB L_{AFmax}.

7.6. WHO:1999 Assessment

The predicted noise levels are below the proposed criterion of 50 dB $L_{Aeq,1hour}$ during the day, 45 dB $L_{Aeq,15mins}$ during the night from WHO 1999 as being the threshold for the onset of moderate community annoyance.

The World Health Organisation provides a sound reduction through an open window of 15 dB(A) which results in a predicted internal equivalent noise level of 18 dB $L_{Aeq\ (16\ hour)}$ in the houses during the day, 15 dB $L_{Aeq\ (8hr)}$ and a maximum noise level of 44 dB L_{AFmax} in the houses during the night.

7.7. Comparative Assessment

A comparison with the existing noise climate and the predicted noise levels of the proposed car park operations has been conducted.

The table below shows the impact on the existing noise climate around the site over the most sensitive day time period based upon our long-term monitoring at the site.

Table 11: Change in noise levels at the NSRs

Time Period (hh:mm)	Existing Lowest Noise Level, $L_{Aeq,T}$	Predicted Noise Level, $L_{Aeq,T}$	Cumulative Noise Level, $L_{Aeq,T}$	Change	Long Term Impact
Day (07:00-23:00)	47	33	47	0 dB	Negligible
Night (23:00-07:00)	41	30	41	0 dB	Negligible

As can be seen above the introduction of the car park would results in a negligible effect on the existing noise climate based on the IEMA guidelines. Please note this is also when assessing the worst-case hour in terms of vehicle trips to the site against the quietest hour of residual noise which may not happen concurrently.

8. Summary & Conclusions

SRJ Energy Limited t/a Hedworth Services (Sunderland) appointed Acoustic Consultants Limited (ACL) to undertake a noise impact assessment for the plant and car park associated with the proposed redevelopment of Moor Lane Service Station, South Sheilds in support of a planning application.

A noise impact assessment of the proposed new noise sources, fixed plant noise, noise from vehicles entering and exiting the car park and car doors slamming is undertaken using on-site measured baseline noise data, provided plant noise data, provided trip counts to the development and in-house noise data and guidance in the National Planning Policy Framework (NPPF), Noise Policy Statement for England (NPSE), Planning Practice Guidance (PPG) and British Standard 4142:2014+A1:2019 (BS4142).

Noise from proposed plant is expected to be of no impact during both day and night when assessed to British Standard 4142:2014+A1:2019 and therefore will achieve the aims of the National Planning Policy Framework (NPPF).

Noise from vehicles entering and exiting the car park and car doors slamming are expected to be of no impact during the day and night when assessed to the WHO:1999 guidelines. Additionally, when compared to the existing noise climate at the site the noise from vehicle movements associated with the car park are expected to be negligible.

We consider that noise should not be considered a material constraint in determining the planning application.

9. Appendix 1 – Glossary of Acoustic Terminology

A-weighted sound pressure pA – value of overall sound pressure, measured in pascals (Pa), after the electrical signal derived from a microphone has been passed through an A-weighting network.

A-weighted sound pressure level, L_{pA} - quantity of A-weighted sound pressure given by the following formula in decibels (dBA)

$L_{pA} = 10 \log_{10} (p_A/p_0)^2$

where:

p_A is the A-weighted sound pressure in pascals (Pa);
p_0 is the reference sound pressure (20 µPa)

Background sound level, $L_{A90,T}$– A-weighted sound pressure level that is exceeded by the residual sound assessment location for 90% of a given time interval, T, measured using weighting F and quoted to the nearest whole number of decibels

Break-in - noise transmission into a structure from outside.

Decibel (dB) – The decibel is the unit used to quantify sound pressure levels. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). Therefore, a logarithmic scale is used to describe sound pressure levels and also sound intensity and power levels. The logarithms are taken to base 10. Hence an increase of 10 dB in sound pressure level is equivalent to an increase by a factor of 10 in the sound pressure level (measured in Pascals). Subjectively, this increase would correspond to a doubling of the perceived loudness of sound.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$ – value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, T = t2 – t1, has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation:

$$L_{AeqT} = 10\lg_{10}\left\{(1/T)\int_{t_1}^{t_2}[p_A(t)^2/p_0^2]dt\right\} \quad (1)$$

where:

p_0 is the reference sound pressure (20 µPa); and
$p_A(t)$ is the instantaneous A-weighted sound pressure (Pa) at time t

NOTE The equivalent continuous A-weighted sound pressure level is quoted to the nearest whole number of decibels.

Facade level – sound pressure level 1 m in front of the façade. Facade level measurements of L_{pA} are typically 1 dB to 3 dB higher than corresponding free-field measurements because of the reflection from the facade.

Free-field level – sound pressure level away from reflecting surfaces. Measurements made 1.2 m to 1.5 m above the ground and at least 3.5 m away from other reflecting surfaces are usually regarded as free-field. To minimize the effect of reflections the measuring position has to be at least 3.5 m to the side of the reflecting surface (i.e. not 3.5 m from the reflecting surface in the direction of the source).

Octave and Third Octave Bands – The human ear is sensitive to sound over a range of frequencies between approximately 20 Hz to 20 kHz and is generally more sensitive to medium and high frequencies than to low frequencies within the range. There are many methods of describing the frequency content of a noise. The most common methods split the frequency range into defined bands, in which the mid-frequency is used as the band descriptor and in the case of octave bands is double that of the band lower. For example, two adjacent octave bands are 250 Hz and 500 Hz. Third octave bands provide a fine resolution by dividing each octave band into three bands. For example, third octave bands would be 160 Hz, 250 Hz, 315 Hz for the same 250 Hz octave band.

Sound pressure level – Sound pressure level is stated on many of the charts. It is the amplitude of the acoustic pressure fluctuations in a sound wave, fundamentally measured in Pascals (Pa), typically from 20 micro-Pascals to 100 Pascals, but commonly simplified onto the decibel scale.

Sound reduction index, R – laboratory measure of the sound insulating properties of a material or building element in a stated frequency band.

Specific sound level, $L_s = L_{Aeq,Tr}$ – equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r.

Structure-borne noise – audible noise caused by the vibration of elements of a structure, the source of which is within a building or structure with common elements.

Rating level, $L_{Ar,Tr}$ – Specific sound level plus any adjustment for the characteristic features of the sound.

Reverberation Time, T – The reverberation time is defined as the time taken for a noise level in an enclosed space to decay by 60 dB from a steady level once the noise source has stopped. It is measured in seconds. Often a 60 dB decay cannot be measured so the reverberation time is measured over a lesser range and corrected back to the time for a 60 dB drop assuming a constant decay rate. Common parameters are T20 (time taken for a 20 dB decay multiplied by three) and T30 (time taken for a 30 dB decay multiplied by two).

Vibration Dose Value, VDV – measure of the total vibration experienced over a specified period of time.

Estimated Vibration Dose Value, eVDV – estimation of the total vibration experienced over a specified period of time. This is usually based on the number of events and shortened measurement data.

Weighted sound reduction index, R_w – Single-number quantity which characterizes the airborne sound insulating properties of a material or building element over a range of frequencies. The weighted sound reduction index is used to characterize the insulation of a material or product that has been measured in a laboratory (see BS EN ISO 717-1).



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