PROPOSED VEHICLE WORKSHOP (INCLUDING MOT INSPECTIONS) AT

STORE HOUSE FARM, HALL LANE, YAXLEY, EYE, IP23 8BY

NOISE IMPACT ASSESSMENT

On behalf of:

AL Engineering And Sons

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NOISE IMPACT ASSESSMENT

Report Issued by:
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On behalf of:
AL Engineering And Sons
Store House Farm
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This Report Is Believed To Be Accurate And True. However, Should A Mistake Be Found, Please Report It To Us As Soon As Possible. Distance Measurements Have Been Used From Online Mapping Solutions Where Necessary. However, The Accuracy Can Not Be Validated By Us.

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1.0 INTRODUCTION

1.1 Dynamic Response was commissioned by 'AL Engineering And Sons' to carry out a noise impact assessment in relation to the construction and operation of a passenger vehicle (car) workshop, with MOT bay, opposite existing client owned commercial operations at 'Store House Farm, Hall Lane, Yaxley, Eye, IP23 8BY', in connection with a planning application.

1.2 At this juncture, we understand that the client intends to operate the workshop between worst-case periods that of 08:00 – 17:00 hours, with all noise generating processes, repairs and activities occurring within the workshop itself i.e. external yard areas are for storage of vehicles awaiting repair/parts, or long term projects/repairs etc, which is already a consented use, and is of no change to the existing use. Equipment contained within the unit used during repairs is proposed to be a 4 post vehicle lift, generic hand tools and battery operated hand tools, with no external plant equipment proposed, and operations limited to general repairs/servicing and MOT inspections.

1.3 The proposed development location is South of the 'A140' and immediately West of 'Yaxley Hall Lane'. The nearest existing receptors un-associated with the site are 'The Old Store House' (Receptor 1) approximately 77m East of the proposed workshop, and 'The Lodge' (Receptor 2), approximately 62m West of the proposed workshop.

1.4 Figure 1 overleaf shows the proposed site layout plan, with a number of associated images to follow.

1.5 The assessment has included:

- An inspection of the site and surroundings;
- Daytime measurements of existing ambient background sound levels;
- Daytime measurements of proposed internal ambient noise levels;
- An assessment of the resultant noise break-out in accordance with BS 4142:2014+A1:2019;
- Recommendation of an appropriate mitigation scheme, if necessary and possible.

1.6 Noise levels referred to in this report, with exception of measurement results where deemed applicable, have been rounded to the nearest whole decibel (dB) as fractions of decibels are imperceptible.

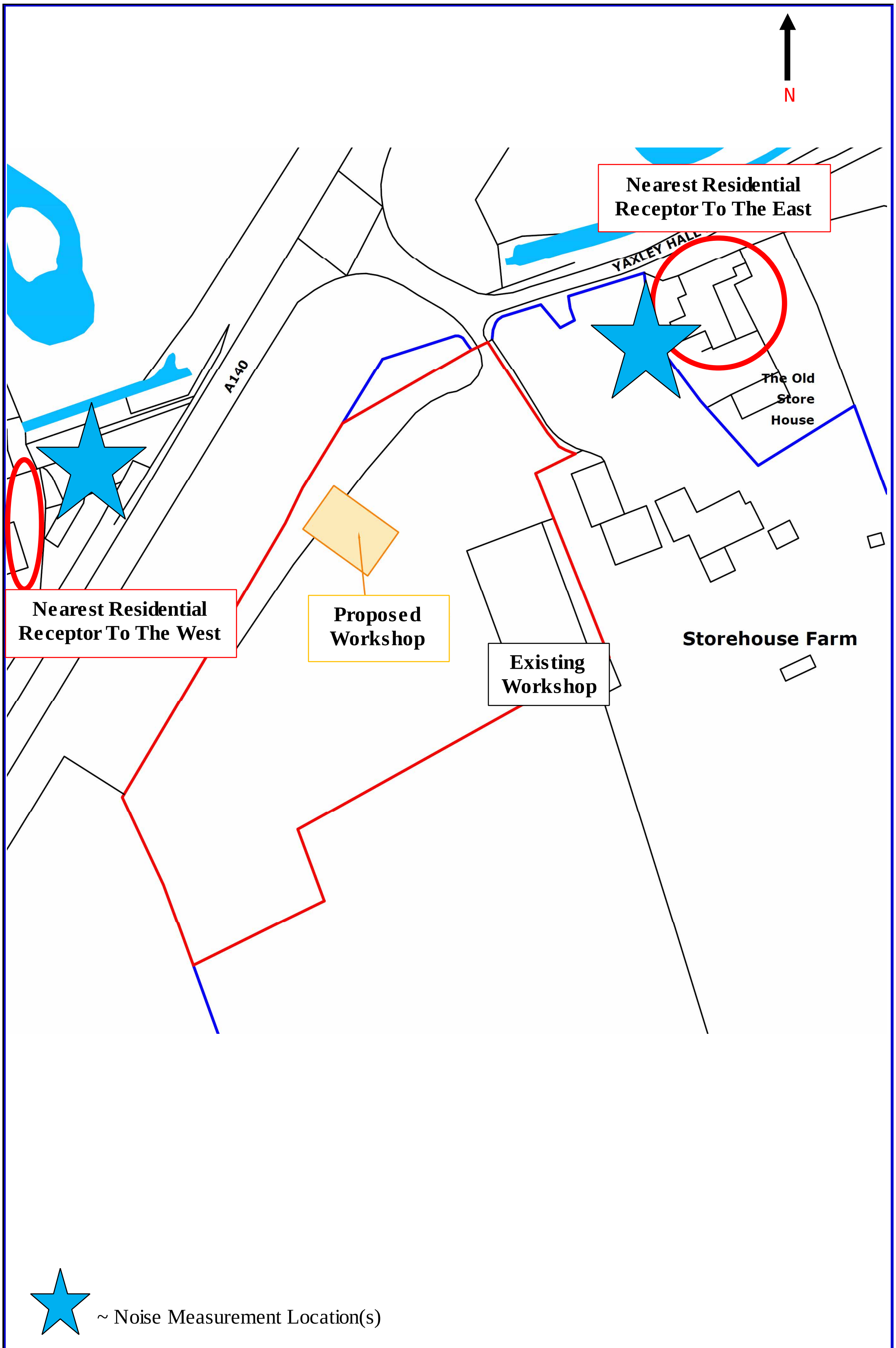

Figure 1 - Site Plan / Survey Locations

Report No. DYN160124A.1

*Images Provided By The Client (Or Representative) For Use In This Report

IMG-1: Proposed Development/Workshop Location

IMG-2: Nearest Existing Residential Receptor To The East

IMG-3: Nearest Existing Residential Receptor To The West

2.0 ACOUSTIC/NOISE DESIGN CRITERIA

2.1 The 'National Planning Policy Framework (NPPF) 2023' states in section 185:

"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[60];

2.2 In conjunction with the 'National Planning Policy Framework (NPPF) 2023', 'The Noise Policy Statement for England (NPSE)', dated March 2010, states the following regarding a long term vision of government noise policy:

"Noise Policy Aims: Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

Avoid significant adverse impacts on health and quality of life;

Mitigate and minimise adverse impacts on health and quality of life; and

Where possible, contribute to the improvement of health and quality of life."

2.3 In terms of the NPSE, the impact of noise can be categorised by the following terms:

NOEL - No Observed Effect Level - The level where no effect can be detected

LOAEL - Lowest Observed Adverse Effect Level - The level where adverse effects on health and quality of life can be detected

SOAEL - Significant Observed Adverse Effect Level - The level where significant adverse effects on health and quality of life may occur.

2.4 The NPSE further states that: *"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times."*

2.5 No specific guidance is detailed or given in the 'National Planning Policy Framework (NPPF) 2023', or 'The Noise Policy Statement For England (NPSE)' in terms of acceptable acoustic criteria/noise criteria in order to achieve the 'NOEL, LOAEL or SOAEL'. Therefore, it is considered necessary to refer to alternate national guidance, preferably standardised or regulated.

2.6 In terms of industrial/commercial development, guidance is set out in BS 4142: 2014+A1:2019, 'Methods for rating and assessing industrial and commercial sound'. BS 4142 requires the noise from the process/equipment (in L_{Aeq}) to be compared with the background sound level (L_{A90}) in the absence of any machine noise. In relation to BS 4142:2014+A1:2019, we have considered that the NOEL or 'No Observed Effect Level' may represent a 0 dB rating level above background sound level, the LOAEL or 'Lowest Observed Adverse Effect Level' may represent around a +5 dB rating level above background sound level, and the SOAEL or 'Significant Observed Adverse Effect Level' may represent a 10 dB or more rating level above background sound level.

2.7 Our assessment therefore considers the assessment criteria detailed above, at this juncture.

3.0 BACKGROUND NOISE LEVEL SURVEY

3.1 Measurements of the existing background sound levels were carried out at a position deemed representative of the nearest likely to be affected existing residential dwellings/noise sensitive receptors to the East and West. The measurement position was at the boundary of each property and was considered to be a free-field noise level, at the locations seen in Figure 1.

3.2 The background sound levels were measured from 12:30 – 15:35 split between receptors to the East and West, on Wednesday the 6th of March 2024, considering 15-minute sample durations, and included octave band level analysis.

3.3 All of the noise measurements within this report were carried out using a Norsonic Nor-140 Class/Type 1 precision integrating sound level meter (serial no. 1403571), and a Castle GA141 dB Air Type/Class 1 sound level meter (Serial No. 070731). The measurement height was set to be approximately 1.5m above ground level (unless otherwise stated). The calibration level of each meter was checked before and after the survey with a Norsonic Type 1251 sound calibrator (Serial No. 31829), with no significant drift (i.e. >0.1dB in the field-calibrated noise level observed). A wind shield was fitted to minimise any external metrological influences.

3.4 The weather conditions during the survey were dry, cool (ranging between approximately 9-10 degrees C during the daytime) and with a light breeze (<3.0 m/s) during all measurements. There was little cloud cover estimated to be 25-30% at the start of the survey building to approximately 75-80% coverage by the end of the survey, and no precipitation witnessed during the measurement period.

3.5 The dominant noise sources at the start and end of the survey (at both locations) appeared to road traffic on the 'A140' (including HGV passes), bird song and intermittent small aircraft, albeit with road traffic at a reduced level at Receptor 1 to the East, due to an increased distance between the property and road.

3.6 The results of the background noise survey have been summarised in Table 1, with the complete survey results detailed in Appendix II.

Table 1: Existing Ambient Noise Levels

Time (Hours)	Noise Levels, dB			Measurement Location
	L_{Aeq}	L_{A90}	L_{Amax}	
12:30 – 14:00	55-57	43-46	64-73	Receptor 1 To The East
14:05 – 15:35	64-66	51-53	75-79	Receptor 2 To The West

3.7 When considering the background sound level, British Standard 4142:2014+A1:2019, 'Methods for rating and assessing industrial and commercial sound' states that "the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular periods".

3.8 In this case, the typical background sound level was determined to be 44 dB L_{A90} at Receptor 1, and 51 dB L_{A90} at Receptor 2 and has therefore been used as a basis for our noise assessment in Section 5.0.

4.0 INTERNAL NOISE BREAK-OUT

4.1 In order to assess if the proposed building envelope design is likely to control noise break-out to a suitable level, it is considered necessary to predict the resultant noise levels at the nearest residential dwellings/noise sensitive receptors based on the proposed building usage and building constructions accordingly.

4.2 We understand that the noise levels likely to be created within the proposed workshop are expected to be similar to those contained within a current vehicle workshop on site. Therefore, we were able to survey the existing site in order to obtain internal source noise levels for use within our assessment. In order to provide a more robust noise assessment, consideration of historic noise surveys from previous work undertaken by ‘Dynamic Response’ have been considered, combined with the general workshop noise, to ensure aspects of an MOT Inspection are included.

4.3 A noise survey within the existing vehicle workshop was carried out from 12:25 to 15:25 on the 6th of March 2024 during a period of typical use with the results as seen in Table 2.

Table 2: Typical Internally Generated Noise – Frequency Spectra

Description	**Broadband Levels**	**L_{Amax}**
Measured vehicle workshop during typical use, ramps in operation, battery impact gun use, wheel removals and general inspection / servicing work	64-71 dB $L_{Aeq(1\ hour)}$	97-103 dB
Period 1: 12:25 – 13:25	70.7 dB $L_{Aeq(1\ hour)}$	97.9 dB
Period 2: 13:25 – 14:25	71.0 dB $L_{Aeq(1\ hour)}$	103.3 dB
Period 3: 14:25 – 15:25	64.3 dB $L_{Aeq(1\ hour)}$	96.6 dB
Historic MOT Inspection Centre Noise	75.3 dB $L_{Aeq(1\ hour)}$	73.7-96.7 dB

	Sound Pressure Level (dB_{Leq}) @ Octave Band Centre Frequency (Hz)								**dB(A)**
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	
Highest Spectrum As Measured On Site	69	65	61	63	62	65	64	63	**71**
Historic MOT Spectrum	69	65	64	66	67	68	70	67	**75**
Combined Spectrum	72	68	66	68	69	70	71	68	**77**

4.4 We understand that a finalised construction detail is not yet known for the proposed workshop building. However, it is likely that as a bare minimum detail that a single 0.7mm metal skin roofing sheet is likely to be installed for all wall/roofing sections on z purlins and a steel frame, and it is assumed that any fire doors would be a minimum 43-45mm thickness (and be of a solid core timber fire door). Considering this, our assessment considers noise break-out from the Eastern façade in terms of noise transmission to receptor 1, (to the East), and noise break-out from the rear and side façade in terms of noise transmission to receptor 2, (to the West) i.e. on the basis that neither receptor has a direct line of sight to the main front facade, or being affected by façade transmission from this aspect. Both calculations also include noise break-out from the appropriate sections of roofing.

4.5 Based on the assumptions and construction details above and considering the combined internal frequency spectra as seen in Table 2, assuming there are no holes/gaps in the building construction, we have predicted the resultant noise levels at the nearest noise sensitive receptors/residential dwellings to be as seen in Table 3.

Table 3: Predicted Resultant Noise Levels From Noise Break-out

Location Of Noise	Description	Noise Break-out From Combined Elements
Nearest Noise Receptor East (@77m)	Considering Combined Workshop Noise (and MOT noise) – See Table 2	27.6 dB $L_{Aeq(1\ hour)}$
Nearest Noise Receptor West (@62m)	Considering Combined Workshop Noise (and MOT noise) – See Table 2	31.0 dB $L_{Aeq(1\ hour)}$

4.6 The resultant noise levels detailed in Table 3 and as calculated above, have been used as a basis of our noise assessment in Section 5.0.

5.0 NOISE ASSESSMENT AND RECOMMENDATION(S)

5.1 British Standard 4142: 2014+A1:2019, 'Methods for rating and assessing industrial and commercial sound' can be used by Local Authorities, regulatory bodies and other professionals to assess the levels of adverse impact due to nearby industrial/commercial noise sources.

5.2 BS 4142 requires the noise from the process/equipment (in L_{Aeq}) to be compared with the background noise level (L_{A90}) in the absence of any machine noise. A correction to the 'Specific Sound Level' is sometimes necessary considering the residual sound level, along with acoustic penalties which are added for any sound which is/or can be considered to be tonal, impulsive or have other characteristics, depending on the context.

5.3 British Standard 4142 states that if the rated noise level exceeds the L_{A90} background sound level by around +10 dB or more, then it is likely that the resultant noise may have a significant adverse impact, a difference of around +5 dB over the background sound level is likely to have an adverse impact, and where the rating level does not exceed the background sound level it is an indication that the resultant noise is likely to have a low adverse impact, depending on the context.

5.4 Adverse impact "may include, but not limited to, annoyance and sleep disturbance." However, "not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact." (as defined in BS 4142)

5.5 The background sound levels at the nearest noise sensitive receptors were concluded to be 44 dB L_{A90} at receptor 1, and 51 dB L_{A90} at receptor 2.

5.6 The subjective rating acoustic feature approach from BS 4142 has been considered in this assessment which establishes the following acoustic penalties as detailed in Table 4.

Table 4: Subjective Acoustic Feature Penalties BS 4142: 2014+A1:2019

Tonality		Impulsivity	
Correction	**Correction Criteria**	**Correction**	**Correction Criteria**
+2	Tone Just Perceptible	+3	Impulsivity Just Perceptible
+4	Tone Clearly Perceptible	+6	Impulsivity Clearly Perceptible
+6	Tone Highly Perceptible	+9	Impulsivity Highly Perceptible

If the intermittency is readily distinctive against the residual acoustic environment a penalty of 3 dB can be applied. Where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent though otherwise are readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied (From British Standard 4142:2014+A1:2019: Section 9.2)

5.7 Table 5 shows the resultant noise levels as measured or predicted, considering Table 3, assessed against BS 4142:2014+A1:2019. Where necessary, the measured ambient sound (commercial/industrial or fixed plant etc.) has been corrected for the effect of residual sound using the formula;

$$Ls = 10Log(10^{\frac{La}{10}} \quad 10^{\frac{Lr}{10}})$$

Where;

L_s is the specific sound;

L_a is the ambient sound level; and

L_r is the residual sound level.

Table 5: Assessment to British Standard 4142: 2014+A1:2019

What/Where	**Specific Noise Level L_{Aeq}**	**Correction(s)**	**Rating Level**	**Background Noise Level L_{A90}**	**Excess Of Rating Level Over Background Noise Level**
At Receptor 1 @77m East	27.6 dB	INT = +3 IMP = +3	33.6 dB	44 dB	-10.4
At Receptor 2 @62m West	31.0 dB	INT = +3 IMP = +3	37.0 dB	51 dB	-14.0

Where;

RN = Residual Noise Correction

TN = Tonal Correction

IMP = Impulsivity Correction

INT = Intermittency Correction

5.8 The result of our assessment in line with BS 4142:2014+A1:2019 demonstrates that based on the predicted/calculated rating noise levels (during a mixture of activities over a 1-hour period), it is likely that the rated noise will be well below the existing background sound level, and should meet the NOEL. By nature of garage repairs, activities could be impulsive and intermittent. Therefore, an acoustic feature correction has been considered by default to allow a more robust assessment, despite the predicted level being significantly below the residual ambient noise level. On the basis that the NOEL is met, no significant adverse impact is calculated, and further mitigation measures are not deemed to be required at this stage.

5.9 As with all predicted noise impact assessments there is a risk of uncertainty. However, considering off peak more sensitive background sound periods, and combining measured noise levels with historic MOT inspection activity noise levels to determine a more likely internal noise level, the risk of any uncertainty is expected to be at a reduced level, and not likely to influence the overall outcome of this assessment. Furthermore, as the rating level is more than 10 dB below the existing background sound level, there is room for fluctuation of internal noise (a tolerance level), without causing a significant adverse impact.

5.10 It is therefore considered that protection and safeguard of existing noise sensitive receptors should be possible by a suitably worded planning condition, which ensures that any proposed construction details conform to the minimum sound reduction index (SRI) detailed in this report (see Appendix III), or as amended and agreed in writing with the Local Planning Authority prior to the construction of the development.

6.0 SUMMARY AND CONCLUSION(S)

6.1 Dynamic Response was commissioned by 'AL Engineering And Sons' to carry out a noise impact assessment in relation to the construction and operation of a passenger vehicle (car) workshop, with MOT bay, opposite existing client owned commercial operations at 'Store House Farm, Hall Lane, Yaxley, Eye, IP23 8BY', in connection with a planning application.

6.2 This has involved carrying out a background noise survey representative of the nearest likely to be affected existing residential dwellings/noise sensitive receptor building façades, the measurement and calculation/prediction of resultant noise levels considering noise break-out from the proposed building envelope design, and an assessment of the noise impact in accordance with British Standard 4142: 2014+A1:2019, 'Methods for rating and assessing industrial and commercial sound'.

6.3 Based on our understanding of the supplied information and the noise levels recorded during our noise survey, our noise impact assessment demonstrates that provided appropriate sound insulation measures are considered in the building envelope design, that the predicted/calculated rating noise levels are expected to be well below the existing background sound level, and meet the NOEL.

6.4 Therefore, protection and safeguard of existing noise sensitive receptors should be possible by a suitably worded planning condition, which ensures any proposed construction details conform to the minimum sound reduction index (SRI) detailed in this report, or as amended and agreed in writing with the Local Planning Authority prior to the construction of the development. Attention to detail is vital with any sound proofing works and care must be taken to seal any holes or gaps in various constructions with the appropriate acoustic mastic or similar. Failure to do this may result in the predicted noise reduction not being achieved.

6.5 If any equipment/activity or the position/arrangement of any equipment/activity, enclosure constructions and/or structures etc., alter or differ from those detailed in this report for whatever reason, the noise impact at the nearest nearby residential dwellings/noise sensitive receptors should be re-assessed accordingly. Any recommendations in this report have been given for acoustical reasons only. Therefore if relevant, any other requirements, for example structural, fire or otherwise, should be checked by the relevant professional.

APPENDIX I – NOISE UNITS AND INDICES

dB

The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. When measuring sound (or noise) levels, it usually ranges from 0 dB (the threshold of hearing) to 140 dB (the threshold of pain).

dB(A)

Are decibels measured using a sound level meter using a frequency rating which relates sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) generally agree with peoples assessment of loudness.

Hz

Is a unit of frequency which is equal to one cycle per second. The frequency is related to the pitch of a sound.

L_{Aeq}

This is the A-weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period.

L_{Amax}

This is the maximum A-weighted noise level that was recorded during the monitoring period.

L_{A10}

Is the A-weighted noise level exceeded for 10% of the measurement duration (T).

L_{A90}

Is the A-weighted noise level exceeded for 90% of the measurement duration (T) and is generally used to define the background noise level.

SEL

This is the ‘sound exposure level’ of a single event (such as a passing train) and is the L_{Aeq} value of the whole event normalised to a 1 second period level of a sound.

Insertion Loss

This is the measure of the effectiveness of an enclosure, silencer or product/device, in dB, considering the difference between the noise level with and without the product/device present.

APPENDIX II – RESULTS OF NOISE SURVEYS

Dates: 6th March 2024

Equipment(s): Norsonic Nor-140 Class/Type 1 Sound Level Meter (Serial No. 1403571)
Castle GA141 dB Air Type/Class 1 Sound Level Meter (Serial No. 070731)

Weather: See Section 3.0.

Measurement Location(s): Boundary Of Nearest Receptors East/West – See Figure 1

Table A1: Background Noise Levels

Date	Time	dB L_{Aeq}	dB L_{Amax}	dB L_{A10}	dB L_{A90}
06/03/24	12:30	55.5	66.1	59.3	43.7
06/03/24	12:45	56.8	72.8	59.8	44.4
06/03/24	13:00	56.1	65.6	59.9	42.6
06/03/24	13:15	56.4	64.4	59.6	46.0
06/03/24	13:30	56.4	67.5	59.7	44.1
06/03/24	13:45	55.4	68.2	58.9	44.4
06/03/24	14:05	64.1	76.3	68.2	51.2
06/03/24	14:20	64.8	74.7	68.0	52.9
06/03/24	14:35	64.9	75.0	68.8	51.4
06/03/24	14:50	65.8	75.8	69.6	53.4
06/03/24	15:05	65.6	78.3	69.5	51.0
06/03/24	15:20	65.2	78.9	68.8	50.8

APPENDIX III – CALCULATION(S)

Noise Break-out Calculation – Nearest Eastern Receptor @ 77m Distance

Noise Break-out Spreadsheet

Project Number	**160124A**
Description	Proposed Vehicle Workshop (Inc. MOT) - East

	63	125	250	500	1k	2k	4k	8k	A	Element details
SPL_{int}	**72**	**68**	**66**	**68**	**69**	**70**	**71**	**68**		

Wall

		63	125	250	500	1k	2k	4k	8k	A	
SPL_{int}		72	68	66	68	69	70	71	68	**77**	
Element SRI		7	11	15	14	16	20	23	23	→	0.7mm Corrugated Box Profile Sheet
Area (S) =	**95.4**	20	20	20	20	20	20	20	20		
Distance (r) =	**77**	-38	-38	-38	-38	-38	-38	-38	-38		
At receiver		33	25	19	22	21	18	16	13	**26**	$= SPL_{int} \quad SRI + 10\log S \quad 20\log(r) \quad 14$

Roof

		63	125	250	500	1k	2k	4k	8k	A	
SPL_{int}		72	68	66	68	69	70	71	68	**77**	
Element SRI		7	11	15	14	16	20	23	23	→	0.7mm Corrugated Box Profile Sheet
Area (S) =	**108**	20	20	20	20	20	20	20	20		
Distance (r) =	**77**	-38	-38	-38	-38	-38	-38	-38	-38		
At receiver		31	23	16	20	18	15	14	11	**23**	$= SPL_{int} \quad SRI + 10\log S \quad 20\log(r) \quad 17$

Door

		63	125	250	500	1k	2k	4k	8k	A	
Is door lobbied?				**No**							
SPL_{int}		72	68	66	68	69	70	71	68	**77**	
Element SRI		13	17	21	26	29	31	34	32	→	Solid Hardwood 43-45mm
Area (S) =	**1.8**	3	3	3	3	3	3	3	3		
Distance (r) =	**77**	-38	-38	-38	-38	-38	-38	-38	-38		No Lobby $= SPL_{int} \quad SRI + 10\log S \quad 20\log(r) \quad 14$
Lobby absorption (A) =	**0**										
At receiver		10	2	-5	-7	-10	-10	-12	-13	**-3**	~~Lobby~~ $= SPL_{int} \quad 2 \times SRI + 20\log S \quad 20\log(r) \quad 14 \quad 10\log(A)$

Glazing

		63	125	250	500	1k	2k	4k	8k	A	
SPL_{int}		72	68	66	68	69	70	71	68	**77**	
Element SRI		200	200	200	200	200	200	200	200	→	Ignore
Area (S) =	**0**	-200	-200	-200	-200	-200	-200	-200	-200		
Distance (r) =	**10000**	-80	-80	-80	-80	-80	-80	-80	-80		
At receiver		-422	-426	-429	-426	-426	-424	-423	-426	**-417**	$= SPL_{int} \quad SRI + 10\log S \quad 20\log(r) \quad 14$

Overall Results

	63	125	250	500	1k	2k	4k	8k	A
Resulting	35	27	21	24	23	20	18	15	**27.6**

Noise Break-out Calculation – Nearest Western Receptor @ 62m Distance

Project Number	**160124A**
Description	Proposed Vehicle Workshop (Inc. MOT) - West

Noise Break-out Spreadsheet

		63	125	250	500	1k	2k	4k	8k	A	Element details
SPL_{int}		**72**	**68**	**66**	**68**	**69**	**70**	**71**	**68**		

Wall

		63	125	250	500	1k	2k	4k	8k	A	
SPL_{int}		72	68	66	68	69	70	71	68	**77**	
Element *SRI*		7	11	15	14	16	20	23	23		0.7mm Corrugated Box Profile Sheet
Area (*S*) =	**159**	22	22	22	22	22	22	22	22		
Distance (*r*) =	**62**	-36	-36	-36	-36	-36	-36	-36	-36		
At receiver		37	29	23	26	25	22	20	17	**30**	$= SPL_{int}\ SRI + 10\log S\ 20\log(r)\ 14$

Roof

		63	125	250	500	1k	2k	4k	8k	A	
SPL_{int}		72	68	66	68	69	70	71	68	**77**	
Element *SRI*		7	11	15	14	16	20	23	23		0.7mm Corrugated Box Profile Sheet
Area (*S*) =	**108**	20	20	20	20	20	20	20	20		
Distance (*r*) =	**62**	-36	-36	-36	-36	-36	-36	-36	-36		
At receiver		32	25	18	21	20	17	16	13	**25**	$= SPL_{int}\ SRI + 10\log S\ 20\log(r)\ 17$

Door — Is door lobbied? **No**

		63	125	250	500	1k	2k	4k	8k	A	
SPL_{int}		72	68	66	68	69	70	71	68	**77**	
Element *SRI*		13	17	21	26	29	31	34	32		Solid Hardwood 43-45mm
Area (*S*) =	**1.8**	3	3	3	3	3	3	3	3		
Distance (*r*) =	**73**	-37	-37	-37	-37	-37	-37	-37	-37		No Lobby $= SPL_{int}\ SRI + 10\log S\ 20\log(r)\ 14$
Lobby absorption (*A*) =	**0**										
At receiver		10	2	-4	-7	-9	-10	-12	-13	**-2**	~~Lobby~~ $= SPL_{int}\ 2\times SRI + 20\log S\ 20\log(r)\ 14\ 10\log(A)$

Glazing

		63	125	250	500	1k	2k	4k	8k	A	
SPL_{int}		72	68	66	68	69	70	71	68	**77**	
Element *SRI*		200	200	200	200	200	200	200	200		Ignore
Area (*S*) =	**0**	-200	-200	-200	-200	-200	-200	-200	-200		
Distance (*r*) =	**10000**	-80	-80	-80	-80	-80	-80	-80	-80		
At receiver		-422	-426	-429	-426	-426	-424	-423	-426	**-417**	$= SPL_{int}\ SRI + 10\log S\ 20\log(r)\ 14$

Overall Results

	63	125	250	500	1k	2k	4k	8k	A
Resulting	38	31	24	27	26	23	22	19	**31.0**