

Acoustic Report

**Noise Survey & Impact Assessment for
Used Car Sales and Valet Premises at
105 – 105A Warren Street, Dewsbury, WF12 9AS**

Our Reference – J2978

Survey Dates – 10th September 2020

Survey and Report by – Paul Horsley MIOA

Report compiled by: Paul Horsley MIOA

Date of Report: 06.10.2020

A handwritten signature in blue ink, appearing to read 'P. Horsley', with a long horizontal flourish extending to the right.

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1.0 Agent

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2.0 Subject

Noise Survey of 105A (Auto Trend) and 105 (Sky Autos) activities at Warren Street, Savile Town, Dewsbury, WF 12 9AS

3.0 Aims

The aim of this report is to determine the noise impact of the activities of the car sales and valet operations on the nearby residential premises from the daytime operations and advise on the likelihood of receiving justifiable complaints relating to noise from site.

Monitor and assess the noise output of the specific activities at the above site, in accordance with the requirements of BS4142: 2014+A1:2019.

Provide an impact assessment of the operations on the nearby residential premises.

Advise on the likelihood of justifiable complaints arising from local residents, with respect to the above standard, and provide mitigating noise control recommendations, should they be deemed necessary, in order to preserve the amenity of the nearby residential premise.

4.0 Location and Description of Existing Sources

105 A (Auto Trend) and 105 (Sky Autos) are both located mid-way along Warren Street on the western side of an established industrial area of Dewsbury.

The site is triangular measuring approximately 60m x 35m maximum dimensions and is on sloping ground down from west to east.

No 105A (Auto Trend) is positioned to the western side of the site having a terraced forecourt with a show room and office building to the north west of the site and cars of sale located on the lower terrace area. No 105 (Sky Autos) occupies the eastern side of the site and has a showroom and office positioned to the east of the site. Both sites have external parking areas for the sales vehicles and 3 No specified staff and visitor parking spaces. Both sites are surrounded by pallisade fencing with independent double steel security gates.

The sites are bounded to the north and east by an exceptionally large industrial factory building and the associated car parking area serving the factory, with Wharf Street bisection the area between car park and factory. The southern boundary is formed by Warren Street, with a high school and barge mooring area opposite. There is also a terrace of residential premises leading away from the site in a southerly direction along Scarborough Street, the gable end of which face the site. There is also a former coach hire company positioned directly opposite the site entrance, currently derelict / unoccupied. The western site boundary is formed by No 103 Warren Street, a residential semi-detached house, with a 2.5m high stone wall forming the boundary between the residence and the site.

The operations unit under consideration are the car sales and valeting of vehicles. The car sales are operated by a 'viewing by appointment' only, where customers are required to make a specific appointment to view and test drive the cars, with no unappointed drop-in or random inspections allowed. The valeting is for the preparation of the show room vehicles only and not available to the public. Therefore, the only noise associated with the 2 No sites with respect to valeting is due to the intermittent use of a car vacuum cleaner and pressure washer.

The existing noise climate is dominated by traffic flow along Warren Street running past site, with distant traffic noise also audible throughout.

The sites are open to the public, by appointment only, between 09.30 and 18.00, Monday to Saturday and closed Sunday.

5.0 Guidance on the Assessment of Noise Levels

The purpose of any criterion or standard for environmental noise should be to safeguard against unacceptable levels of community response, deemed as a feeling of annoyance during daytime or disturbance at night. WHO defines annoyance as "...a feeling of displeasure evoked by noise."

The main source of information relating to noise and the community response are field studies including noise measurements and social surveys. These studies then attempt to establish a correlation between the two sets of results.

In the absence of any definitive guidance and in order to establish suitable noise criteria, it is necessary to rely on general guidance and assessment methods used for community noise sources. Discussions on the current methods are given below.

5.1 BS4142:2014+A1:2019 'Method for Rating and Assessing Industrial and Commercial Sound'

This recently revised standard provides a method for rating and assessing sound of an industrial and/or commercial nature. The method uses outdoor sound levels to assess the likely effect of sound on people who might be inside or outside a dwelling or premises used for residential purposes. It is limited to applicable sounds and is not intended for noise amounting to nuisance or rating noise outside the scope of the Standard.

Unlike the previous version of the Standard, rating levels are not prescriptive, but more context based, with the following applicable to rating values:

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

The Standard introduces additional rating elements, these being subject assessments of tonality, and impulsivity of a sound source, with weighted rating values accordingly applied at the judgment of the assessor.

The introduction of Uncertainty has been applied to the measured values; again, consideration of this is left to the professional executing the survey and assessment. However, steps are provided within the Standard for the reduction of uncertainty in both measurement and calculations of the sound source and rating value.

Actual meteorological conditions are now required to be recorded and reported upon for the survey and report.

5.2 National Planning Policy Framework, NPPF.

The National Planning Policy Framework, NPPF, provides advice to planning authorities in England on how they must seek to minimise the adverse impact of noisy activities on noise sensitive receptors. This NPPF, replacing PPG 24, is not prescriptive with respect to specific noise levels, and is mainly concerned with the advising on good practice for environmental noise assessment.

In the absence of definitive noise criterion within the NPPF most Local Authorities in England default to the daytime noise levels inside dwellings not to exceed NR 35; and NR 25, to be achieved inside dwellings at night to avoid sleep disturbance which is not applicable to this application as operations would only take place during daytime periods, based upon ingress of external noise sources.

5.3 World Health Organization 1999 "Guidance for Community Noise"

This document provides a review of the effects of noise and a description of the principles of the WHO health criteria and guidelines for Community Noise.

The effects of noise in dwellings are identified as sleep disturbance, annoyance and speech interference. For bedrooms, the critical effect is sleep disturbance. Indoor guideline values for bedrooms are 30 dB LAeq for continuous noise and 45 dB LAmax for sound events. At night time, outside sound levels about 1 metre from facades of living spaces should not exceed 45 dB LAeq, so that people may sleep with bedroom windows open. This value is equivalent to that specifies in the Criteria 12 document; however it is now assumed that the noise reduction from outside to inside with the window open is 15 dB. To enable casual conversation indoors during the daytime, the sound level of the interfering noise should not exceed 35 dB LAeq.

To protect the majority of people from being **seriously** annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB LAeq on balconies, terraces and in outdoor living areas. To protect the majority of people from being **moderately** annoyed during the daytime, the outdoor sound level should not exceed 50 dB LAeq.

Table 1 of the document summarises the guideline values for community noise in specific environments and includes the noise indices to be adopted. Significantly, the corresponding time base to be used for the assessment is also included.

The relevant extracts of Table 1 are reproduced thus:

Specific Environment	Critical health effect (s)	LAeq dB	Time Base hours	LAMax dB
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate Annoyance, Daytime and evening	50	16	-
Dwelling, Indoors	Speech intelligibility & moderate annoyance daytime & evening.	35	16	-
	Sleep Disturbance, night-time	30	8	45
Outside Bedroom	Sleep disturbance, window open (Outdoor Values)	45	8	60

5.4 Subjective Impression of Noise Changes

The following Table provides a semantic scale that may be used to “subjectively” rate changes in sound pressure level.

Table 1: Subjective effect of changes in sound pressure level

Change in sound level dB	Change in Power		Change in apparent loudness
	Decrease	Increase	
3	1/2	2	Just perceptible
5	1/3	3	Clearly noticeable
10	1/10	10	Half / Twice as loud
20	1/100	100	Much quieter / louder

After Bies and Hansen

The above table is taken from Professor Colin H Hansen’s publication “Fundamentals of Acoustics” page 41, for the Department of Mechanical Engineering, University of Adelaide. This table also appears in “Engineering Noise Control” by Colin Hansen and David Bies, a comprehensive reference book, amongst others.

6.0 Survey Equipment

Integrating Sound Level Meter, RION NA-27, Type 1, Serial No 431986

RION UC-53A Microphone Serial No 307060

RION NC-74 Calibrator Serial No 530712

Windshield

Tripod

7.0 Survey Method

The writer carried out attended noise monitoring for the boundary between No 103 Warren Street and the site, the most likely to be affected by the car sales and valet operations and therefore classified as the worst case position to the site.

Refer to Appendix A for a marked up locational plan of the site and survey position.

The attended survey was executed during a typical weekday on 10th September 2020 in accordance with the requirements of BS4142:2014+A1:2019. Noise monitoring was executed at relevant time periods to allow determination of the impact the activities were having on the background noise climate.

LA_{eq} , LA_1 , LA_{10} , LA_{90} and LA_{Max} indices sound measurements were taken using the sound analyser.

The measurement indices noted above are defined as follows:

LA_{eq}, T	the "A" weighted equivalent continuous noise level of sample period T
LA_1, T	the "A" weighted level exceeded for 1% of sample period T
LA_{10}, T	the "A" weighted level exceeded for 10% of sample period T
LA_{90}, T	the "A" weighted level exceeded for 90% of sample period T
LA_{max}	The "A" weighted maximum level during the sample period T

The Sound Level Meter was mounted on a tripod at a height of 1.5m above the floor. The meter was set to record continuous data over 5-minute periods during a full day, with reduced periods for the close quarter's monitoring of the specific operations.

The sound level meter was calibrated before and after the measurements using the calibrator to ensure accuracy of the results. No variations were noted between calibrations and the results obtained can be deemed to be an accurate representation of the levels recorded.

8.0 Prevailing Weather Conditions

10th September 2020 16°C, Clear sky, Wind 0-1 m/s W, 1021 mb, 59% rh.

9.0 Noise Survey Results

During the attended monitoring period noise samples were recorded, using 1/1 Octave Centre Band analysis. These monitoring samples were collected from the site boundary between the site and No 103 Warren Street and at close quarters to the specific car valet operations.

The table of results below indicate the noise levels recorded during the monitoring period, with a brief description of the noise sources contributing to the monitored noise levels recorded.

An overview of monitoring positions is given below:-

1. Location 1 relates to the western site boundary position between the site and No 103 warrens Street residential premises.

Note

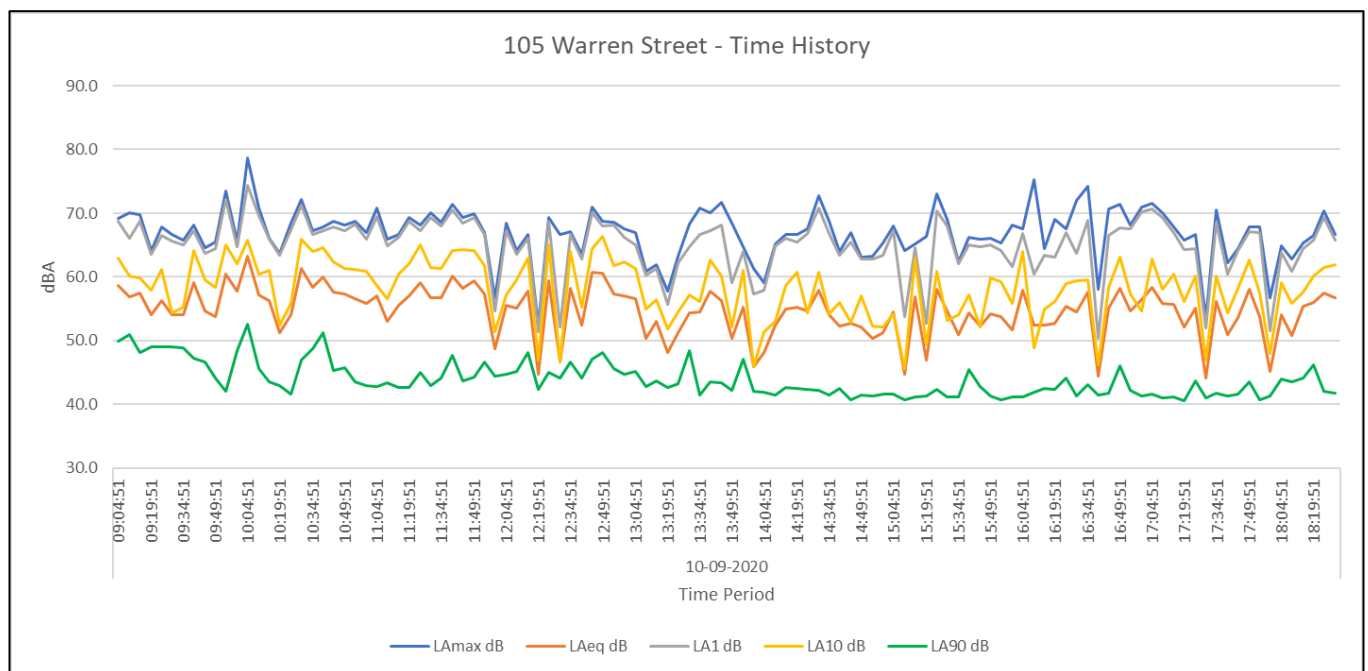
The above monitoring locations should be read in conjunction with the site layout appearing in Appendix A of this report.

10.0 Noise Survey Results Tables

Daytime Assessed Results Values

L _A max	11th Highest L _A max	L _A eq	L _A 1	L _A 10	L _A 90
dB	dB	dB	dB	dB	dB
79	69	56	67	60	45

Time History Graph



Specific Source Results

Description	ID	L _A max	L _A eq	L _A 1	L _A 10	L _A 90	Measurement	Date	Time
		dB	dB	dB	dB	dB	Duration		
Car Vacuum at 1m	181	81.1	74.5	80.6	77.9	70.9	00:01:00.00	10-09-2020	09:00:58
Pressure Washer at 1m	182	84.9	84.3	84.9	84.8	84.2	00:00:15.00	10-09-2020	09:02:36

11.0 Impact Assessment

In order not to unduly affect the existing amenity of the nearby noise sensitive premises as a result of the Car Sales and valeting operations it is advisable to take reference from the available standards and guidance, noted in section 5 above.

If we consider BS4142:2014, we find that a noise level rating of a difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending upon the context. A difference of around +5 dB is an indication of an adverse impact, depending upon the context. The lower the rating level is relative to the measured sound level, the less it is that the specific sound source will have an adverse impact or a significant impact. Where the rating does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending upon context.

Taking reference from W.H.O., we find that the maximum allowable external noise level has been deemed as 35 LAeq dB for continuous sources internal within noise sensitive premises for daytime periods, equivalent to 50 LAeq dB in external spaces. However, this value does not take account of the actual context of the noise climate location and as such could be lower than the area sound level being considered, therefore a judgement is required.

As can be seen from 5.3 above, an increase in noise levels of up to +3 dB is just perceptible and not likely to give rise to complaints. However, the baseline should not be increased such that it exceeds the W.H.O or BS4142:2014 limits, and as such it is intended that the design target for the plant should be in line with context of the pre-existing noise climate to maintain the amenity of the nearby noise sensitive premises.

Taking account of the above standards and their recommendations and the actual noise climate for the area, it would be prudent to set output noise levels for the operations under consideration in accordance with the area noise climate less 5 dB to ensure that the activities do not give rise to loss of amenity.

Table of Recommended Noise Limits

Period	External Noise Limits
Daytime (0700 – 2300 Hrs)	LAeq, 16 Hours – 56 dB LAF _{Max} – 69 dB (11 th Highest Value)

The above limits are based upon assessed noise values for the area. If these limits are achievable, then it will have been proved that the amenity of the nearby residents is being preserved.

It should be noted that the 2 No car sales sites only ever operates during daytime periods.

As described within Section 4 above, the car sales business model is for a Viewing by Appointment Only'. This model ensures that the clients are provided with exclusive service as appointments are sequenced accordingly. Also, from a noise perspective only 1 No car is inspected at any one-time, minimising noise generation on site. The viewings take place with the vehicle inside the showroom with the doors closed.

To prepare the specific car for viewing, the vehicle may be valeted which could include using the pressure washer and vacuum cleaner to prepare the vehicle. Use of the pressure washer takes a maximum 3 minutes to complete a full car wash. The vacuum cleaning takes a maximum 7 minutes per car. At the busiest the site will prepare up to 5 cars per day, averaging 1 car every 2 hours.

Test drives may follow the visual inspection. This entails opening the showroom doors and driving the vehicle out onto the main highway and away from the site. Upon return the vehicle is parked on site with the engine switched off. The passage of the vehicle to and from the site takes only 30 seconds in each direction maximum.

Based upon the above description of the site activities, the table below shows the operational noise levels.

Operation	Monitored Sound Level LAeq dB at 1m	Period of Use Per Hour, (s)	Reference Time Interval 1 Hour	Noise Level LAeq (1hour) dB
Pressure Washer	84.0	180	$-10 \log(3600/180)$ = -13.0 dB	71.0
Vacuum Cleaner	74.5	420	$-10 \log(3600/420)$ = -9.3 dB	65.2
Vehicle Passage in Yard	65.0	60	$-10 \log(3600/60)$ = -17.8	47.2
Simultaneous Operation of all Above Activity Contributions				72.0

11.1 BS4142:2014+A1:2019 Assessment – 103 Warren Street Residence

For robustness the following is an assessment in accordance with BS4142:2014+A1:2019, which has been based upon the results above for the site activities deemed as the output for all operations working simultaneously, defaulting to a 1 hour period since we are dealing with daytime periods only. All readings have been rounded to the nearest whole number.

BS4142:2014 Assessment Considered Outside No 103 Warren Street Premises

Description	Indices	Daytime	Comments
Total simultaneous site operations	L _{Aeq}	72 dB	Based upon calculated 1-hour contribution values at 1m
Distance correction to No 103 Warren Street at 8m = $20\log(r_1/r_2) =$		-18 dB	Activity contribution at 8m from location to residence with a direct line of sight
Barrier Attenuation		-15 dB	Boundary wall reduction
Resultant activity contribution		39 dB	Resultant from No 105A (Trend Autos)
Distance correction to No 103 Warren Street at 42m = $20\log(r_1/r_2) =$		-32 dB	Activity contribution at 42m from location to residence with a direct line of sight
Barrier Attenuation		-15 dB	Boundary wall reduction
Resultant activity contribution		25 dB	Resultant from No 105 (Sky Autos)
Total Activity Contribution		39 dB	Both Sites
Recorded Residual Sound Level	L _{Aeq}	56 dB	Traffic dominant source.
Recorded Background Level	L _{A90}	45 dB	Background level consisted of sources noted above.
Specific sound source correcting the ambient sound level to remove the residual sound level	L _{Aeq}	39 dB	Non applicable as this is a calculated value.
Acoustic feature correction		+3 dB +4 dB	Impulsivity perceptible Tonality clearly audible
Rating Level	(39 + 7)	46 dB	
Background Noise Level	L _{A90}	45 dB	Traffic dominant sources
Excess of Rating over background sound level	(46 – 45)	+1 dB	
The excess of +1 dB above background sound level from the worst case cumulative scenario of all activities simultaneously is just audible above existing background activities and is not likely to produce any justifiable adverse comment due to the operations when considered outside the neighbouring premises at No 103 Warren Street.			
Uncertainty of the assessment There is uncertainty in the calculation as it is based upon a measurement with a correction applied which may account for a minimal variation in the actual values for the car wash and valet operations at this location. The uncertainty is not significant as the rating is classified as low and the value is in context with the actual area. The measurements presented indicate that the confidence of the rating for the specific source.			

Upon inspection of the specific noise levels recorded, there is evidence of tonal output from the operation of the vacuum cleaner at 500Hz, hence the character correction forfeits in the assessment above. If we track the Octave band values this assertion is verified, as tonality is defined as a variance of more than 5 dB between adjacent frequency values between 500 Hz and 10 KHz.

A rating value of +1 dB for is proof of insignificant activity noise sources and not likely to give rise to adverse comment or justifiable complaints, and that further mitigation measures may not be necessary when considered at this location.

If we consider the design target to be achieved, 56 LAeq dB, we find that this has been achieved when considered outside the neighbouring residential premises of No 103 Warren Street due to the site activities, assessed as producing a direct contribution of 39 LAeq dB, equating to a -17 dB below target.

It should also be noted that the above assessment is based upon a worst-case scenario of the total activities associated with both sites operating simultaneously.

11.2 BS4142:2014 Assessment – No 1 Scarborough Road

As with the above assessment the worst-case scenario has been assessed.

BS4142:2014 Assessment Considered Outside No 1 Scarborough Road Premises

Description	Indices	Daytime	Comments
Total simultaneous site operations	L _{Aeq}	72 dB	Based upon calculated 1-hour contribution values at 1m
Distance correction to No 103 Warren Street at 35m = $20\log(r_1/r_2) =$		-31 dB	Activity contribution at 35m from location to residence with a direct line of sight
Barrier Attenuation		-15 dB	Boundary wall reduction
Resultant activity contribution		26 dB	Resultant from No 105A (Trend Autos)
Distance correction to No 103 Warren Street at 33m = $20\log(r_1/r_2) =$		-30 dB	Activity contribution at 33m from location to residence with a direct line of sight
Barrier Attenuation		-15 dB	Boundary wall reduction
Resultant activity contribution		25 dB	Resultant from No 105 (Sky Autos)
Total Activity Contribution		29 dB	Both Sites
Recorded Residual Sound Level	L _{Aeq}	56 dB	Traffic dominant source.
Recorded Background Level	L _{A90}	45 dB	Background level consisted of sources noted above.
Specific sound source correcting the ambient sound level to remove the residual sound level	L _{Aeq}	29 dB	Non applicable as this is a calculated value.
Acoustic feature correction		+3 dB +4 dB	Impulsivity perceptible Tonality clearly audible
Rating Level	(29 + 7)	36 dB	
Background Noise Level	L _{A90}	45 dB	Traffic dominant sources
Excess of Rating over background sound level	(36 – 45)	-9 dB	
The excess of -9 dB below the background sound level from the worst case cumulative scenario of all activities simultaneously is likely to be inaudible against the existing background activities and is not likely to produce any justifiable adverse comment due to the operations when considered outside the nearby premises at No 1 Scarborough Road.			
Uncertainty of the assessment There is uncertainty in the calculation as it is based upon a measurement with a correction applied which may account for a minimal variation in the actual values for the car wash and valet operations at this location. The uncertainty is not significant as the rating is classified as low and the value is in context with the actual area. The measurements presented indicate that the confidence of the rating for the specific source.			

A rating value of -9 dB for is proof of an insignificant noise source and not likely to give rise to adverse comment or justifiable complaints, and that further mitigation measures may not be necessary.

If we consider the design target to be achieved, 56 LAeq dB, we find that this has been achieved when considered outside the neighbouring residential premises of No 1 Scarborough Road due to this activities of the sites assessed as producing a direct contribution of 29 LAeq dB, equating to a -27 dB below target.

It should also be noted that the above assessment is based upon a worst-case scenario of the total activities associated with both sites operating simultaneously.

11.3 Impact Assessment Overview

The above BS4142:2014+A1:2019 assessments have provided rating values for the activities on both sites. Below is an overview of the results

Location	Specific Operations Rating Level dBA	Existing Background Level LA90 dB	BS4142 Rating Value dB	Calculated Direct Contribution dBA	Design Target	Variance dB
No 103 Warren Street (West)	46	45	+1	39	56	-17
No 1 Scarborough Road (South)	36	45	-9	29	56	-27

As can be seen from the above calculation summary, the rating values are classified as low when compared against the pre-existing background when considered at all the premises close to the sites. The values are in context with the noise climate and as such additional mitigation will not be necessary to preserve the amenity of the residents.

12.0 Mitigation Recommendations

It has been demonstrated through the use of BS4142:2014+A1:2019 assessments that the worst-case simultaneous activities are not producing sound that is significant or likely to produce an adverse comment or justifiable adverse impact due to their operations, when considered at the closest noise sensitive residential locations.

Based upon the above, no additional mitigation measures are recommended for these sites to maintain the existing amenity of the noise sensitive locations.

13.0 Report Summary

A noise impact assessment has been completed for the noise associated with the car sales and valet operations at 105A (Auto Trend) and 105 (Sky Autos) Warren Street, Savile Town, Dewsbury.

The pre-existing noise climate for the area is assessed as being due primarily to traffic movements along Warren Street and the surrounding road network.

A BS4142:2014+A1:2019 assessments have been made of the specific operations, deemed as the simultaneously car wash and valet of vehicles being prepared for appointment viewings by customers, and found to provide rating values ranging between +1 dB to -9 dB below the pre-existing background, dependent upon location assessed and time period. These rating values are insignificant with respect to receipt of adverse comment or justifiable complaints from the nearby residential premises and in keeping with the context of the area noise climate.

No further mitigation measures are required to allow the operations of the car sales and valet whilst demonstrating that the noise produced has maintained the existing amenity of the nearby noise sensitive residential premises.

Appendix A Locational Outline and Monitoring Points



Appendix B Noise Survey Results Octave Band Frequency Analysis Table

Description	ID	Linear Leq (dB) in Frequency Centre Bands (Hz)										LA1	LA10	LA90
		LAmx	LAeq	63	125	250	500	1	2	4	8			
		dB	dB	Hz	Hz	Hz	Hz	kHz	kHz	kHz	kHz	dB	dB	dB
Car Vacuum at 1m	181	81.1	74.5	65.5	63.2	64.9	74.6	67.5	66.0	63.7	62.4	80.6	77.9	70.9
Pressure Washer at 1m	182	84.9	84.3	71.0	64.9	69.2	72.1	73.6	76.9	78.6	79.5	84.9	84.8	84.2

Appendix C Barrier Calculation

Project: **Boundary Wall Barrier Calculation - 105A**

SWL	63	125	250	500	1k	2k	4k	8k
Existing Sound Pressure Level at Receiver (A)	44	39	42	47	49	45	41	37

POSITIVE SCREEN

Source to Barrier	6	
Barrier to Receiver	2	(estimated distance to receiver)
Barrier Height	2.5	
Source Height	0.5	
Receiver Height	2	(direct line of sight assumed between source & receiver)
Path Difference	0.37	

Attenuation due to Screens

Path Difference	63	125	250	500	1k	2k	4k	8k
-0.30	1	0	0	0	0	0	0	0
-0.20	2	1	0	0	0	0	0	0
-0.10	3	2	1	0	0	0	0	0
-0.05	3	3	2	1	0	0	0	0
-0.01	4	4	4	3	3	2	1	1
0.00	5	5	5	5	5	5	5	5
0.01	5	6	6	6	7	8	8	8
0.05	7	7	8	9	10	12	13	13
0.10	7	8	9	10	11	14	16	16
0.20	8	9	10	11	14	16	19	19
0.30	8	9	10	13	16	18	20	20
0.40	9	10	12	14	17	20	22	22
0.50	9	10	12	15	18	20	23	23
1.00	11	12	14	18	20	23	25	25
2.00	14	15	18	20	24	27	29	29
3.00	15	17	20	22	25	28	30	30
4.00	16	18	20	24	26	30	31	31
5.00	16	18	21	25	27	30	32	32

Screening Effect from above table (B):	9	10	12	14	17	20	22	22
SRI of Screen Panels (C):	20	20	20	20	30	20	20	20
Level at Receiver due to Screening Effect (A - B)=D:	35	29	30	33	32	25	19	15
Level at Receiver due to Direct Transmission (A - C)=E:	24	19	22	27	19	25	21	17
Resultant Level at Receiver (log add'n of D & E):	35	29	31	34	32	28	23	19
NR Level Required:	nr25	55	44	35	29	25	22	17
Additional Attenuation Required:	-20	-15	-4	5	7	6	3	2

dBA Correction:	-26	-16	-9	-3	0	1	1	-1
A-Weighted Equivalent:	9	13	21	30	32	26	20	14
dBA Level at Receiver (with no additional attenuation):	35	dBA						
NR65	87	78	72	68	65	62	61	59
NR60	83	74	68	63	60	57	55	54
NR55	79	70	63	58	55	52	50	49
NR50	75	65	59	53	50	47	45	43
NR45	71	61	54	48	45	42	40	38
NR40	67	57	49	44	40	37	35	33
NR35	63	52	45	39	35	32	30	28
NR30	59	48	40	34	30	27	25	23
NR25	55	44	35	29	25	22	20	17

Completed By: Paul Horsley

Date: 06.10.2020