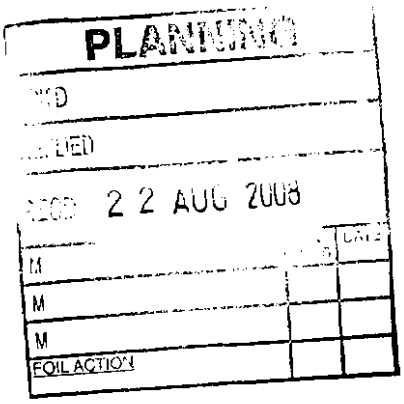

Druk Limited
Air permeability
Acoustic services

Ambient Noise Survey and Assessment of the Proposed Development at the K P Service Station, 355 Victoria Avenue, Blackley, Manchester

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Report Reference: DRUK/ACC/RS/ETKP/1017

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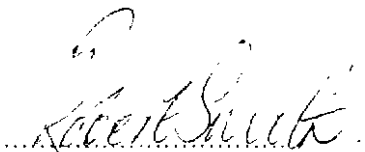
1.0 SUMMARY

An ambient noise survey has been conducted in the vicinity of the residential dwellings, on Northdale Road, that are nearest to the proposed three new units to the rear of the K P Service Station, 355 Victoria Avenue, Blackley. The measurements made during the week and at the weekend, indicate that the local noise climate is dominated by traffic noise from Victoria Road.

It is proposed that of the three new units, two will be used a tyre storage for the existing Tex's Tyres business, and one will house the existing car preparation business, both of which currently operate from the front of the service station. Noise measurements and observations of the businesses have highlighted that it would be highly unlikely that any noise emission associated with the tyre storage and retrieval would be audible above the existing ambient noise climate at the residential dwellings. With reference to the car preparation business, the vacuum cleaning of cars represented the noisiest operation undertaken in the existing location.

Based on the sound insulation provided by the cavity brick/block construction of the proposed new units, an assessment of the potential noise level at the nearest noise sensitive dwellings, as a consequence of the vacuum cleaning operations, has been undertaken in accordance with the provisions detailed within BS 4142:1997. The assessment has highlighted that the calculated resulting noise level at the nearest noise sensitive premises, numbers 6 and 26 Northdale Road, will fall into the 'complaints unlikely' category. As a consequence it is suggested that the activity within the new units will not affect the existing noise climate in the vicinity of the residential dwellings on Northdale Road.

Report Prepared by:



Robert Smith
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2.0 INTRODUCTION

Druk Limited was commissioned to evaluate what effect, if any, the use of the proposed three new units to the rear of the existing K P Service Station, 355 Victoria Avenue, Blackley, may have on the existing acoustic climate in the immediate vicinity of the proposal.

3.0 SITE DESCRIPTION

The K P Service Station is located on a parcel of land adjacent to Victoria Avenue, to the north, and between the two entrances to Northdale Road, which completely surrounds the service station, as detailed in Figure 1.

3.1 Overview of the Development

The proposal relates to the construction of three new units, to the rear of the existing service station, to provide addition accommodation for the businesses currently operating from the front of service station. The three businesses currently operating on the service station site comprise: a car valeting business, a tyre fitting business (Tex's tyres) and a business undertaking vehicle preparation and small scale repairs to cars ultimately offered for sale on the nearby car lot. The general arrangement of the units is detailed in Photograph 1 at the rear of this report. It is proposed that two of the units will be used by Tex's tyres for the storage of tyres only; no fitting operations will be undertaken in the new units. The remaining unit will be occupied by the vehicle preparation business.

4.0 ASSESSMENT CRITERIA

In order to evaluate what effect, if any, the proposed use of three new units may have on the existing noise climate, an assessment according with the provisions detailed within BS 4142:1997 "Rating Industrial Noise Affecting Mixed Residential and Industrial Areas", will be undertaken.

4.1 BS4142:1997

Currently, BS 4142 remains the only objective standard for assessing the likelihood of annoyance and consequent complaints that may be attributable to the operation of a noise source.

Briefly the standard may be thought of as procedures for the determination of:

a) External noise levels 'from factories, industrial premises, fixed installations and sources of an industrial nature in commercial premises'; and

b) the background noise level, this being measured in the absence of any noise from the premises in question.

Once the above noise levels have been established a method for comparing the data from (a) and (b) is detailed, the results of this comparison lead to conclusions as to the likelihood of complaints attributable to noise from the source.

It is generally accepted that for the introduction of a 'new' noise source to be unnoticeable in the presence of the pre-existing background noise, all other factors being equal, it should have an 'A' weighted noise level that is at least 10 dB below the existing background noise level. The above philosophy forms the basis of the BS 4142 assessment procedure.

More specifically BS 4142 requires, where the noise source in question produces discernible tonal elements, e.g. 'whines, hisses, hums etc.' that 5 dB(A) is added to the noise level, be this measured or calculated. Again where the noise in question contains distinct impulsive elements e.g. 'bangs, clicks, clatters or thumps', or where the noise is irregular enough to attract attention, BS 4142 again requires the addition 5 dB(A). If the noise in question is in possession of both tonal and impulsive characteristics, only one 5 dB(A) adjustment is made.

From the above the rating level is established, this being the value that is compared with the background noise.

According to BS 4142 a rating Level of:

a) 10 dB(A) or more above the background is a positive indication that complaints, attributable to the operation of the noise source, are likely.

b) 5 dB(A) above the background is of marginal significance.

c) 10 dB(A) below the background is a positive indication that complaints attributable to the operation of the noise source are unlikely.

5.0 SURVEY DETAILS

In this case, the survey included both an assessment of the existing ambient noise in the vicinity of the residential premises, on Northdale Road, nearest to the proposed units and measurement of the typical noise emission from the vehicle preparation business, currently operating from the units adjacent to the main service station.

5.1 Survey Times and Personnel

As the proposal mentions the possibility of working during the week, between 0800 – 1700 hours on Saturday, between 0800 – 1600 hours and Sunday, between 0900 – 1400 hours, ambient noise measurements were made during a weekday afternoon and on a Saturday and Sunday morning.

The ambient noise measurements were made between 1000 – 1200 hours on Friday 20th June, 1000 – 1200 hours on Saturday 28th June and between 1000 – 1200 hours on Sunday 29th June. Measurements of typical noise emission from the current vehicle preparation business were made after the ambient noise measurements. All measurements were fully attended for the duration and were undertaken by Mr. R Smith of Druk Limited.

5.2 Weather

Throughout the ambient noise survey the weather conditions were as follows:

20th June
All surfaces were dry, the temperature was 20°C, cloud cover was approximately 50% and the wind speed was 2.5m/s.

28th June
All surfaces were dry, the temperature was 17°C, cloud cover was approximately 100% and the wind speed was 1.0m/s.

29th June
All surfaces were wet from earlier rain, the temperature was 18°C, cloud cover was approximately 100% and the wind speed was 1.5m/s.

5.3 Equipment

Both the ambient noise surveys and the measurements of noise from the existing businesses were conducted using the equipment detailed in the table below.

Equipment description	Manufacturer	Model number	Serial number	Date of calibration
Sound level meter	Norsonic AS	Nor 140	1402738	07.05.2008
Microphone pre-amplifier	Norsonic AS	Nor 1209	12075	07 05.2008
Microphone	Norsonic AS	Nor 1225	72843	07.05.2008
Acoustic calibrator	Norsonic AS	Nor 1251	31522	06 05.2008

The sound level meter was field calibrated before, after and during the measurements as necessary, during which time no significant deviation in the calibrated level was observed.

A microphone windshield was used at all times and the sound level meter was tripod mounted such that the microphone was approximately 1.4 metres above the ground and at least 3 metres from all reflecting surfaces.

5.4 Measurement Procedure

Prior to undertaking any measurements, the nearest noise sensitive premises to the proposal units were identified as being numbers 6 and 26 Northdale Road. as detailed in Photographs 2 and 3 at the rear of this report. In both cases the rear facades of the dwellings faced the proposed units.

As it was not possible to gain access to the rear gardens of these private residential dwellings, measurements were made in positions that were believed to provide a very close approximation of the noise climate at the rear façade of the dwellings. In addition the selected measurement positions were shielded from noise emanating from the service station or the associated businesses, such that noise from these sources made no contribution to the measured levels. Both measurement positions are detailed on Figure 1 at the rear of this report.

With reference to the measurements of the existing noise climate, the measurement duration was 1 hour in each of the two positions, for each of the survey periods.

A number of separate measurements were made of operations within the existing unit housing the car preparation business. The measurements were made after the ambient and background noise surveys, and were made using a 20 minute spatial averaging technique, covering all the operations typical undertaken.

6.0 NOISE SURVEY RESULTS

6.1 Subjective Assessment

During both the weekday and weekend survey periods in the vicinity of the residential dwellings, the principal source of noise was that of road traffic on Victoria Avenue. Although the impression was gained that a difference in the overall levels existed between the two positions, it was felt that the overall level of traffic noise did not vary greatly between the weekday and weekend situations.

Additional noise sources included the sound of overflying aircraft. birdsong and the distant M60 motorway.

With reference to the business activities that would be transferred to the proposed new units, based on the existing situation within the Tex's Tyres unit, the levels of noise associated with the storage and retrieval of tyres was generally inaudible over the road traffic dominated background noise climate. Turning to the vehicle preparation activities, the majority of the work involved the thorough cleaning of the cars both inside and out and minor cosmetic repairs to trim and bodywork. Where tools were, infrequently, used, they were hand tools and so generated very little noise indeed. The exception to this rule

was the use of a vacuum cleaner, which was by far the noisiest piece of equipment used within the vehicle preparation unit.

6.2 Basic Results

The measured ambient noise levels are summarised in the tables below. The results are presented in terms of the L_{Aeq} and L_{A90} levels, necessary for the subsequent BS 4142 assessment, and are rounded to the nearest whole decibel, full data are presented in the tables at the rear of this report.

Table 1. Ambient Noise Levels, Position 1 (26 Northdale Road)

Day	Time	$L_{Aeq,\ (1\ hour)}$	$L_{A90,\ (1\ hour)}$
Friday 20th June	10 – 1100	58	54
Saturday, 28th June	10 – 1100	54	51
Sunday, 29th June	10 – 1100	53	49

Table 2. Ambient Noise Levels, Position 2 (6 Northdale Road)

Day	Time	$L_{Aeq,\ (1\ hour)}$	$L_{A90,\ (1\ hour)}$
Friday, 20th June	11 - 1200	62	54
Saturday, 28th June	11 - 1200	62	52
Sunday, 29th June	11 - 1200	61	52

As can be seen from the above tables the noise climate in the vicinity of measurement position 2 was slightly higher than position 1. In addition the noise climate in position 2 was very similar across the three days, whilst the weekday noise climate in position 1 was a little higher than the weekend noise climate.

7.0 NOISE TRANSMISSION CALCULATIONS

The transmission of noise from the proposed new units at the rear of the K P Service Station will depend on the sound insulation provided by the superstructure of the units, the dimensions of the units, the distance between the units/sound source and the noise reception points and the presence of any obstructions in the transmission path.

With reference to the size of the units and the separation distance between the units and the residential premises, the noise radiation pattern very close to the proposed facilities will be approximately equivalent to plane wave conditions. As the distance between the noise source and the residential premises

increases, so the noise transmission will approximate line source radiation, eventually point source radiation will be approximated.

All the results of the calculations, detailed in this section, have been produced with regard to the above noise radiation/transmission conditions detailed above. The 'break points' for the respective noise transmission conditions relate to the overall dimensions of the nominally radiating element, in this case the side walls of the proposed units, and the separation distance to the noise receptors.

All building dimensions and separation distances have been obtained from drawings produced by Thomason Architectural and Surveying Services.

7.1 Proposed New Units

The three new units will, at their nearest points, be approximately 18m from the rear façade of number 6 Northdale Road and approximately 25m from the rear façade of 26 Northdale Road. Between the proposed units and 26 Northdale Road is a concrete fence approximately 1.75m high (Photograph 3).

It is proposed that the units will be of cavity brick/block construction with a tile covered pitched roof, a steel roller shutter door to the front and a standard solid wooden door in both gables and one further door in the rear elevation. With respect to the sound insulation provided by the cavity brick/block wall and the door, test data suggests that the overall sound insulation will be equivalent to R_w 51 and 28dB respectively. The octave band sound insulation values for the respective elements are as detailed in the table below.

OBCF*, Hz	63	125	250	500	1k	2k	4k	8k	R_w
Wall SRI, dB	32	37	41	49	58	62	61	66	51
Door SRI, dB	20	21	26	29	29	33	35	37	28

* Octave Band Centre Frequency

For the purposes of the calculations the highest measured level of the noisiest operation, vacuum cleaning, from the car preparation business will be used, so representing a worst case. The highest measured levels for vacuum cleaning operations are detailed, rounded to the nearest whole decibel, are detailed in the table below.

Vacuum Cleaner Noise Source Data

OBCF*, Hz	63	125	250	500	1k	2k	4k	8k	*dB(A)*
Vacuum cleaner, L_{Aeq}	56	58	67	74	73	68	76	72	80

* Octave Band Centre Frequency

The calculations have been undertaken assuming that the principal noise source, the vacuum cleaner, will be located in one of the two outermost units, nearest the residential premises, again representing a worst case scenario.

During the calculations an allowance has been made for the additional attenuation that will be provided by the 1.75m high concrete fence between the proposed units and 26 Northdale Road, in which it has been assumed that the noise source height will be a maximum of 0.5 metres. All predicted levels have been calculated at the rear façade of the respective dwellings.

The calculated resulting noise levels are summarised in the table below, full data being presented in the tables at the rear of this report.

Summary Results for the New Workshop – vacuum cleaning operations

Operation	Noise source level, dB(A)	Calculated noise level at 26 Northdale Road, dB(A)	Calculated noise level at 6 Northdale Road, dB(A)
Vacuum, used inside unit	80	8	21

The results demonstrate that that the sound insulation of the proposed new units will be sufficient to dramatically reduce the resulting noise levels, from vacuum cleaning, at the nearest noise sensitive dwellings. With reference to the result obtained for 26 Northdale Road, the calculated noise level at the rear façade also includes the additional attenuation provided by the 1.75m high concrete fence.

8.0 BS 4142 ASSESSMENT

In recognition of the potential intermittence of the potential noise source, the vacuum cleaner used in connection with the car preparation activities, the 5 dB acoustic feature correction will be applied in this assessment. With respect to the ambient, L_{eq}, and Background, L_{90}, levels used in the assessment, the lowest levels measured from the Sunday morning will be used.

The BS 4142 assessments for both 6 and 26 Northdale Road are summarised in the tables overleaf.

Car Vacuum Cleaning Operations, BS 4142 Summary, 6 Northdale Road

Calculated Noise level at residential facade, dB L_{Aeq}	21 dB
Residual level, 10 – 1100 hours, Sunday 29th June, dB $L_{Aeq, 1\ hour}$	61 dB
Specific noise level, dB	21 dB
Background level, 10 – 1100 hours, Sunday 29th June, dB $L_{90\ 1\ hour}$	52 dB
Acoustic feature correction, dB	+5 dB
Rating level, dB	26 dB
Rating – background level dB	-26 dB
Assessment	'complaints unlikely'

Car Vacuum Cleaning Operations, BS 4142 Summary, 26 Northdale Road

Calculated Noise level at residential facade, dB L_{Aeq}	8 dB
Residual level, 11 – 1200 hours, Sunday 29th June, dB $L_{Aeq\ 1\ hour}$	53 dB
Specific noise level, dB	8 dB
Background level, 11 – 1200 hours, Sunday 29th June dB $L_{90\ 1\ hour}$	49 dB
Acoustic feature correction, dB	+5 dB
Rating level, dB	13 dB
Rating – background level, dB	-36 dB
Assessment	complaints unlikely'

With respect to the BS 4142 assessments, these indicate that the calculated noise from the most significant noise source associated with the car preparation activities, the vacuum cleaner, will fall into the 'complaints unlikely' category at the rear facades of numbers 6 and 26 Northdale Road. It is therefore suggested that the proposed development will not affect the existing noise climate in the vicinity of the residential dwellings on Northdale Road.

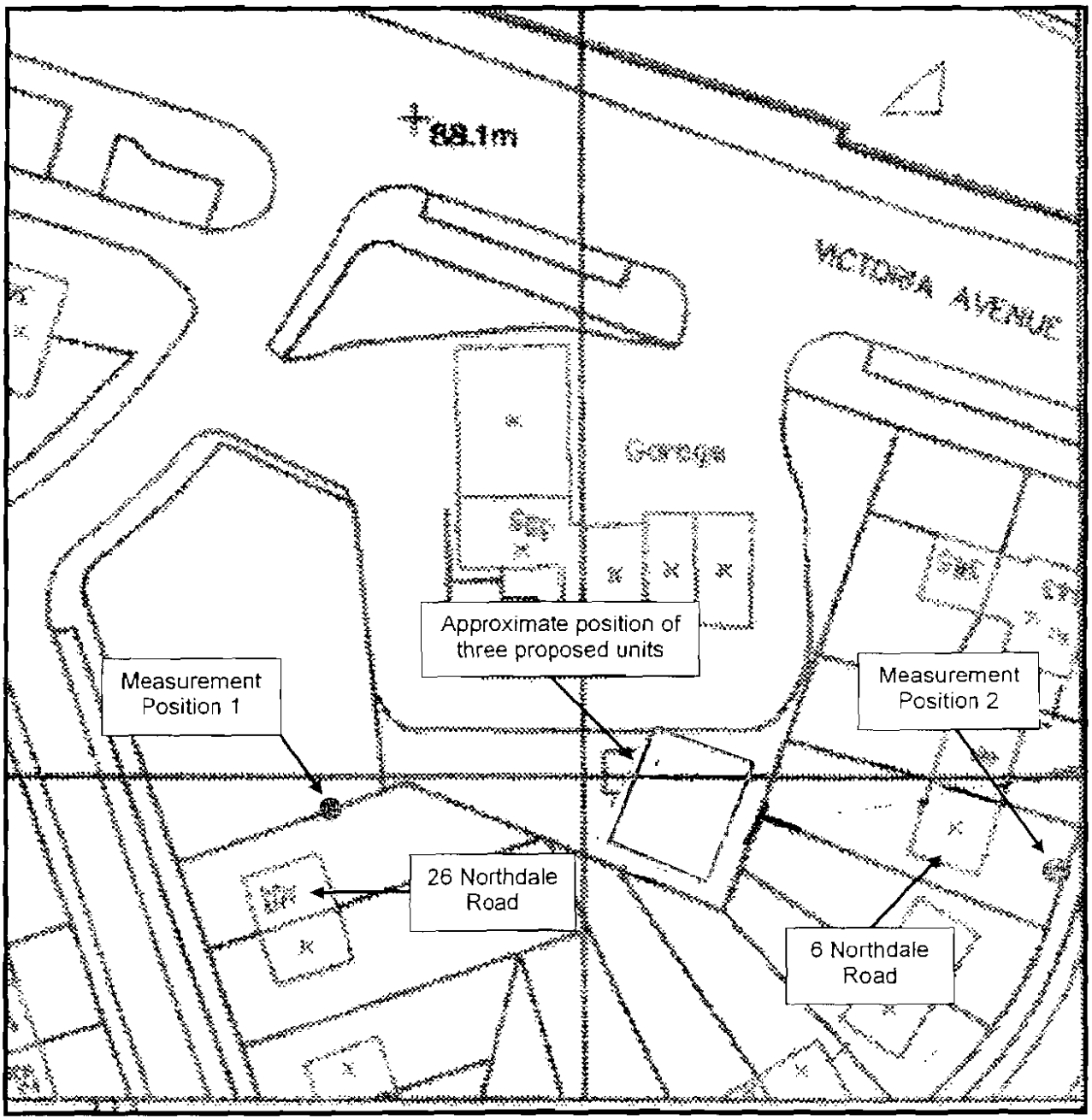
9.0 CONCLUSION

An ambient noise survey has been conducted in the vicinity of the residential dwellings on Northdale Road nearest to the proposed three new units to the rear of the K P Service Station, 355 Victoria Avenue, Blackley. Measurements made during a weekday afternoon and at the weekend indicate that the local noise climate is dominated by traffic noise from Victoria Road itself.

It is proposed that of the three new units, two will be used a tyre storage for the existing Tex's Tyres business, and one will house the existing car preparation business, both of which currently operate from the front of the service station. Noise measurements and observations of the businesses have highlighted that it would be very unlikely that any noise emission associated with the tyre storage and retrieval would be audible above the existing ambient noise climate at the residential dwellings. With reference to the car preparation business, vacuum cleaning the cars represented the noisiest operation undertaken in the existing location.

Based on the sound insulation provided by the cavity brick/block construction of the proposed new units, an assessment of the potential noise level at the nearest noise sensitive dwellings, as a consequence of the vacuum cleaning operations, has been undertaken in accordance with the provisions detailed within BS 4142:1997. The assessment has highlighted that the calculated resulting noise level at the nearest noise sensitive premises, numbers 6 and 26 Northdale Road, will fall into the 'complaints unlikely' category. As a consequence it is suggested that the activity within the new units will not affect the existing noise climate in the vicinity of the residential dwellings on Northdale Road.

FIGURE 1: Site Plan, Showing Measurement Position Locations and Approximate Position of the Three Proposed Units

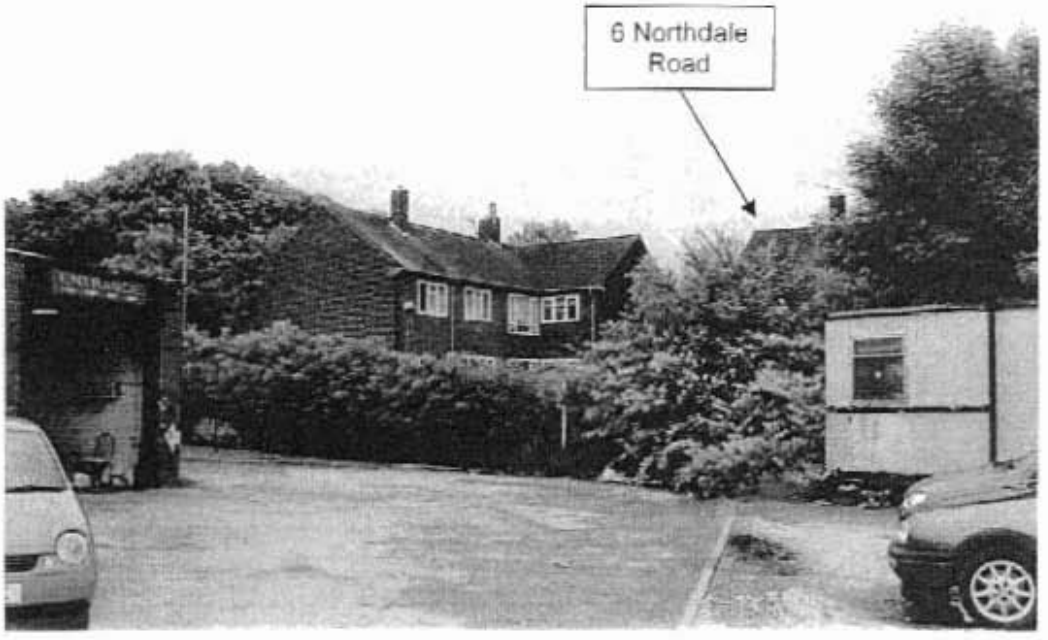


PHOTOGRAPHS

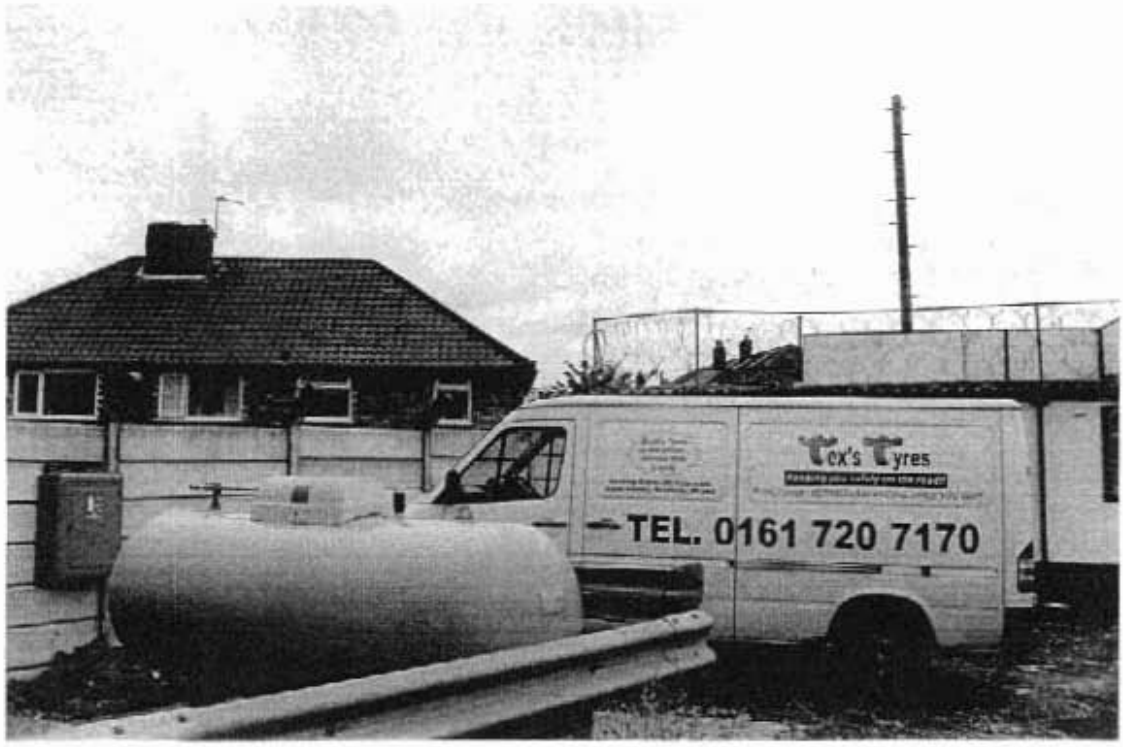
Photograph 1. Existing Businesses to the Front of the K P Service Station



Photograph 2. Position of 6 Northdale Road Relative to the Site of the Proposed Units



Photograph 3. Position of 26 Northdale Road Relative to the Site of the Proposed Units



AMBIENT NOISE SURVEY RESULTS

K P Service Station, 355 Victoria Avenue Blackley
Ambient Noise Survey
Residual and Background Noise Levels - as per BS4142:1999

Octave Band Centre Frequency Hz	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k	16k
Friday 20th June 2008											
Position 1 (10 - 1100 hours)											
L_{Aeq}	58.4	63.7	66.1	60.0	56.2	54.9	55.4	47.7	41.7	32.5	0.0
L_{max}	7.2										
L_{10}	61.0	67.0	68.0	63.0	59.0	58.0	58.0	50.0	44.0	35.0	0.0
L_{90}	54.1	56.0	58.0	53.0	50.0	50.0	52.0	43.0	33.0	0.0	0.0
Position 2 (11 - 1200 hours)											
L_{Aeq}	62.0	63.1	66.0	61.6	59.1	57.7	59.2	53.0	45.9	37.2	29.4
L_{max}	7.2										
L_{10}	65.2	65.0	69.0	64.0	61.0	60.0	63.0	56.0	47.0	38.0	26.0
L_{90}	53.5	56.0	58.0	53.0	50.0	49.0	51.0	44.0	35.0	27.0	0.0
Saturday 28th June 2008											
Position 1 (10 - 1100 hours)											
L_{Aeq}	54.3	60.6	62.3	54.1	49.6	49.9	51.8	44.1	40.3	30.7	0.0
L_{max}	64.0	75.0	77.0	67.0	62.0	61.0	59.0	55.0	52.0	43.0	39.0
L_{10}	56.6	63.0	65.0	57.0	52.0	52.0	54.0	46.0	44.0	34.0	0.0
L_{90}	51.1	54.0	54.0	48.0	45.0	47.0	49.0	41.0	32.0	0.0	0.0
Position 2 (11 - 1200 hours)											
L_{Aeq}	61.7	64.0	66.2	59.2	56.9	56.4	59.1	53.6	46.1	37.5	26.3
L_{max}	75.4	64.0	84.0	74.0	68.0	69.0	70.0	70.0	66.0	59.0	46.0
L_{10}	65.3	65.0	68.0	62.0	60.0	60.0	63.0	57.0	48.0	38.0	26.0
L_{90}	51.6	55.0	57.0	51.0	48.0	47.0	49.0	43.0	34.0	25.0	0.0
Sunday 29th June 2008											
Position 1 (10 - 1100 hours)											
L_{Aeq}	53.3	61.6	62.4	53.4	48.6	49.0	50.5	44.0	38.8	31.3	0.0
L_{max}	62.7	78.0	77.0	69.0	60.0	59.0	57.0	55.0	48.0	43.0	39.0
L_{10}	55.8	65.0	65.0	56.0	51.0	51.0	53.0	47.0	42.0	35.0	0.0
L_{90}	49.2	52.0	54.0	47.0	44.0	45.0	47.0	39.0	32.0	0.0	0.0
Position 2 (11 - 1200 hours)											
L_{Aeq}	61.3	62.0	64.5	59.9	57.2	56.0	56.8	53.0	44.3	35.0	26.2
L_{max}	73.4	81.0	81.0	76.0	69.0	68.0	70.0	66.0	59.0	53.0	46.0
L_{10}	65.0	64.0	67.0	62.0	60.0	59.0	63.0	56.0	47.0	37.0	25.0
L_{90}	51.7	54.0	55.0	51.0	48.0	46.0	49.0	44.0	35.0	26.0	0.0

Noise Level Calculation Results

Thomason Architectural and Surveying Services
K P Service Station, 355 Victoria Avenue, Blackley, Manchester

Calculation of Proposed Car Preparation Noise Levels at the rear façade of number 26 Northdale Road (circa 25m distant)

Octave Band Centre Frequency, Hz.	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k
Current Car Preparation Noise Levels										
Vacuum cleaning of car interiors, L_{Aeq}	**80.1**	55.9	57 8	66.9	74.2	72.6	67.6	71 2	76.3	72 3
Vacuum cleaning of car interiors, L_{Aeq}	**80.1**	55.9	57.8	66.9	74.2	72 6	67.6	71.2	76 3	72.3
Composite SRI of brick/block wall and door		15.8	20.8	21.8	26.8	29.8	29.8	33.8	35.8	37.8
-6		-6 0	-6 0	-6 0	-6 0	-6 0	-6.0	-6 0	-6 0	-6.0
L_{Aeq} just outside wall	**40.7**	34.1	31 0	39 1	41.4	36.8	31.8	31.4	34.5	28.5
Transmission to the rear façade of number 26 Northdale Road (circa 25m distant)										
Vacuum Cleaning Operations										
Lp @ 0 99m from rear façade	**40.7**	34.1	31.0	39.1	41 4	36.8	31.8	31.4	34 5	28.5
Lp @ 3 4m from rear façade	**35.4**	28.8	25.7	33 7	36.1	31.4	26.4	26.0	29.1	23.1
Barrier attenuation		5.1	5.3	5 8	6.7	8.0	9 8	12.1	14 7	17.5
Lp @ rear façade	**8.3**	6.4	3.0	10.6	12.0	6 1	-0.7	-3 4	-2.9	-11.7
Current lowest ambient noise level at front façade - Weekday afternoon	**62.0**	63.1	66.0	61.6	59.1	57 7	59.2	53.0	45.9	37.2
Current lowest background noise level at front façade - Weekday afternoon	**53.5**	56.0	58 0	53.0	50.0	49.0	51 0	44.0	35.0	27.0
Current lowest ambient noise level at front façade - Saturday morning	**61.7**	64.0	66.2	59.2	56.9	56.4	59.1	53.6	46 1	37.5
Current lowest background noise level at front façade - Saturday morning	**51.6**	55 0	57 0	51.0	48.0	47.0	49.0	43.0	34.0	25.0
Current lowest ambient noise level at front façade - Sunday morning	**61.3**	62.0	64 5	59.9	57.2	56.0	58.8	53.0	44.3	35.0
Current lowest background noise level at front façade - Sunday morning	**51.7**	54.0	55.0	51.0	48.0	46.0	49.0	44.0	35 0	26 0

Thomason Architectural and Surveying Services
K P Service Station, 355 Victoria Avenue, Blackley, Manchester

Calculation of Proposed Car Preparation Noise Levels at the rear façade of number 6 Northdale Road (circa 18m distant)

Octave Band Centre Frequency, Hz.	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k
Current Car Preparation Noise Levels										
Vacuum cleaning of car interiors, L_{Aeq}	**80.1**	55.9	57.8	66.9	74.2	72.6	67.6	71.2	76 3	72.3
Vacuum cleaning of car interiors, L_{Aeq}	**80.1**	55 9	57.8	66.9	74.2	72.6	67.6	71.2	76.3	72.3
Composite SRI of brick/block wall and door		15.8	20.8	21.8	26.8	29.8	29.8	33.8	35.8	37.8
-6		-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0
L_{Aeq} just outside wall	**40.7**	34.1	31.0	39.1	41.4	36.8	31.8	31 4	34.5	28.5
Transmission to the rear façade of number 6 Northdale Road (circa 18m distant)										
Vacuum Cleaning Operations										
Lp @ 0 99m from rear façade	**40.7**	34.1	31.0	39.1	41.4	36.8	31.8	31.4	34.5	28.5
Lp @ 3.4m from rear façade	**35.4**	28.8	25.7	33.7	36.1	31.4	26 4	26.0	29.1	23.1
Lp @ rear façade	**20.9**	14 3	11.2	19 3	21.6	17.0	11 9	11.5	14 6	8.6
Current lowest ambient noise level at front façade - Weekday afternoon	**62.0**	63.1	66.0	61.6	59 1	57.7	59 2	53.0	45 9	37 2
Current lowest background noise level at front façade - Weekday afternoon	**53.5**	56.0	58.0	53.0	50.0	49.0	51.0	44.0	35 0	27.0
Current lowest ambient noise level at front façade - Saturday morning	**61.7**	64.0	66 2	59 2	56.9	56 4	59.1	53.6	46.1	37.5
Current lowest background noise level at front façade - Saturday morning	**51.6**	55 0	57.0	51.0	48.0	47.0	49 0	43.0	34.0	25.0
Current lowest ambient noise level at front façade - Sunday morning	**61.3**	62.0	64 5	59.9	57 2	56 0	58 8	53.0	44.3	35.0
Current lowest background noise level at front façade - Sunday morning	**51.7**	54.0	55 0	51 0	48 0	46.0	49.0	44 0	35.0	26.0

Barrier Calculation

K P Service Station
355 Victoria Avenenue, Blackley
Barrier Attenuation - Maekawa (Shadow Zone only)
$E_b = 10\log(3 + 40\,\delta/\lambda)$

Octave Band Centre Frequency, Hz.		dB(A)	31.5	63	125	250	500	1000	2000	4000	8000	16000
Barrier height, m	1.75											
Brrier distance from source, m (d_1)	9.6											
Barrier distance from receiver, m (d_2)	12.5											
Height of source above ground, m	0.5											
Height of receiver, m	1.6											
a	9.681											
b	12.5009											
c	22.127											
δ	0.055											
λ			10.48	5.24	2.64	1.32	0.66	0.33	0.17	0.08	0.04	0.02
Eb			5.06	5.34	5.83	6.68	8.00	9.83	12.10	14.69	17.48	20.37

