

24 MAR 2013
Hampshire

ENVIRONMENTAL REPORT

3 Elm Grove
Hayling Island
Hampshire
PO11 9EA

Predicted Noise Impact Assessment

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1 Introduction and survey brief

This work has been requested by Havant Borough Council in order to determine noise levels expected from the operation of an MOT test centre on land at 3 Elm Grove, Hayling Island, and the effect that this may have on the general noise of the surrounding area.

This work has been carried out in accordance with the British Standard for rating industrial noise, BS4142, and through reference to BS7445-1 and DEFRA Planning Policy Statement PPG24 (now withdrawn).

The overall aim of this work therefore is to make an assessment of the level of noise that may propagate away from the building for submission to the local planning authority.

The objectives therefore being as follows:

- to measure current background sound pressure levels in the area, (expressed as the L_{eq} , L_{max} , L_{95} , L_{90} , L_{50} , L_{10} and L_5);
- to measure sound pressure levels at the noise source as it is without the MOT centre activities, (expressed as the L_{eq} , L_{max} , L_{95} , L_{90} , L_{50} , L_{10} and L_5);
- to determine the predicted sound pressure levels which may result from activities undertaken in the MOT centre, using secondary data; and
- to undertake a BS4142 assessment accordingly.

2 Site description and expected operation specifics

The premises of 3 Elm Grove is located in the southern section of Elm Grove car park, located behind the main row of shops. The site has a 2m fence to the western and northern boundaries. To the south there is a 1m high wall and to the east there is no boundary between the premises and the patio area of nearby flats.

To the south of the premises there is a church, to the east is the rear of a post office and associated flats, and to the west is the entrance to the car park, which is accessed via Mengham Road. The car park itself covers an area of around 1,800m², and is surrounded with fencing or brick walls.

There are two nearby residential properties where the back of each house would be facing the entrance into the proposed MOT centre. These are both located in Elm Close. The corresponding back elevation of each of these properties would be approximately 41m and 46m west of the MOT centre respectively.

The row of shops running to the east of the proposed development have associated 1st floor living accommodation; the closest of which is located 18m to the east of the proposed premises front door. These flats are however located to the rear of the premises rear wall and are therefore less likely to be directly affected by noisy activities coming from within the premises.

The MOT centre is expected to have the following noise sources present:

- vehicle engines;
- general service work;
- break testing;
- closing of vehicle doors and bonnets;
- use of the vehicle lift ramp; and
- air compressor and associated tools

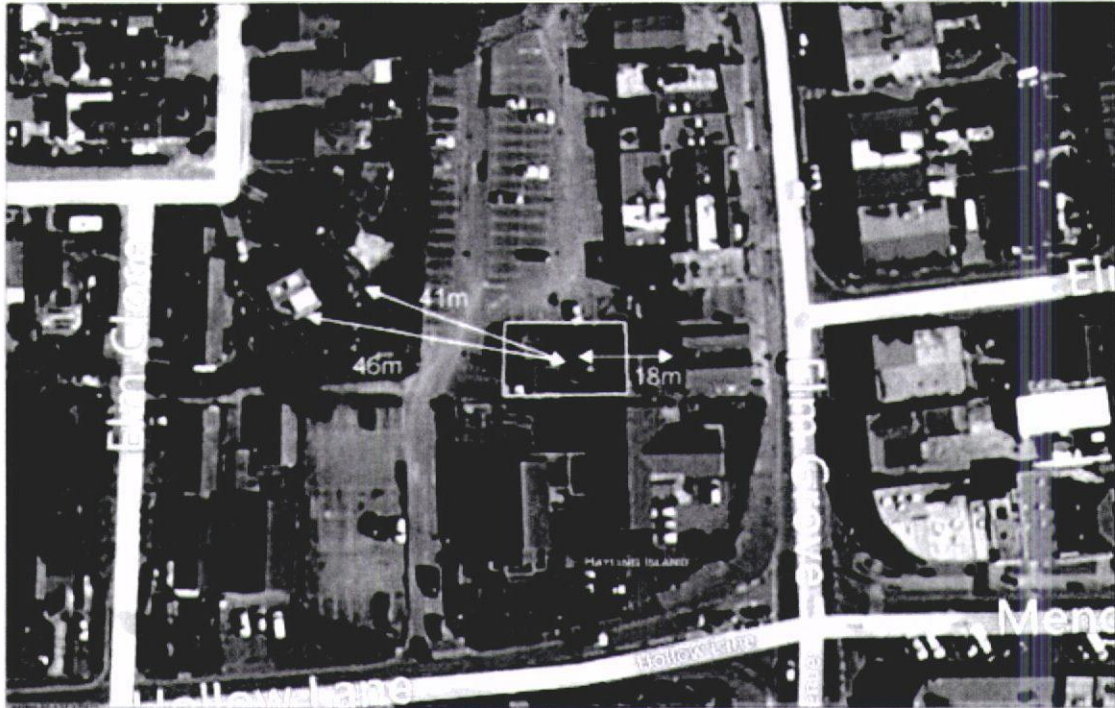
It is assumed for the purpose of this report that the doors to the MOT centre will be open during operation hours for health and safety reasons

Upon visiting the site, the main background noises noted were as follows:

- wind (especially through vegetation);
- vehicles using the car park; and
- nearby traffic using Hollow Lane and Elm Grove

A map showing the proposed location of the MOT centre along with the nearest potentially affected building façades is shown below in Figure 1.

Figure 1 Proposed location of the MOT centre and the surrounding area



There are two ways in which sound can potentially be transmitted to receptors at this location:

- airborne sound from inside the MOT centre will transmit through the front elevation and the access doors. As previously stated in order to comply with health and safety regulations within the workshop, the doors will presumably remain open during operation hours. Consequently generated sound will theoretically be able propagate a distance of 40+m to reach the elevation of the nearest dwellings; and
- airborne sound will transmit through the front elevation and doors of the workshop, and potentially diffract over and around the building towards the residential buildings at the rear of the premises

3 Methodology

3.1 Background noise/ residual noise recording

Background noise monitoring was undertaken on the site, during the afternoon of Thursday 14th February 2013. In each instance a Rion integrating sound level meter was used. Each meter was externally calibrated both prior to, and after use, at 94 and 103dB respectively.

The instrument details and serial numbers are as shown below in Table 1.

Table 1 Sound level equipment used

Equipment	Description	Serial No.	Monitoring location
Rion NL-04	Type 2 sound level meter with NX-04 octave filter	10691109	N 01
Rion NL-04	Type 2 sound level meter with NX-04 octave filter	10542923	N 02, N 03
Rion NX-04	Octave filter	10740471	-
Castle GA607	IEC 942 Class 1 acoustic calibrator	035070	-

During monitoring, each sound level meter was positioned in open space (at least 1.5m from any reflective surface), and at a distance of 1.6m above ground level.

Measurements were made over a single continuous 30 minute period at one location close to the premises and a second location a little distance from the premises. One further measurement was made over a single continuous 15 minute period at a location situated within the area, but much further away from the premises.

The assessment was undertaken at a time when the noise levels were presumed to be typical of a normal weekday.

Each measurement for this assessment has been taken to the west of the site, as this is the direction the sound is expected to be propagating as the open doors will be facing west.

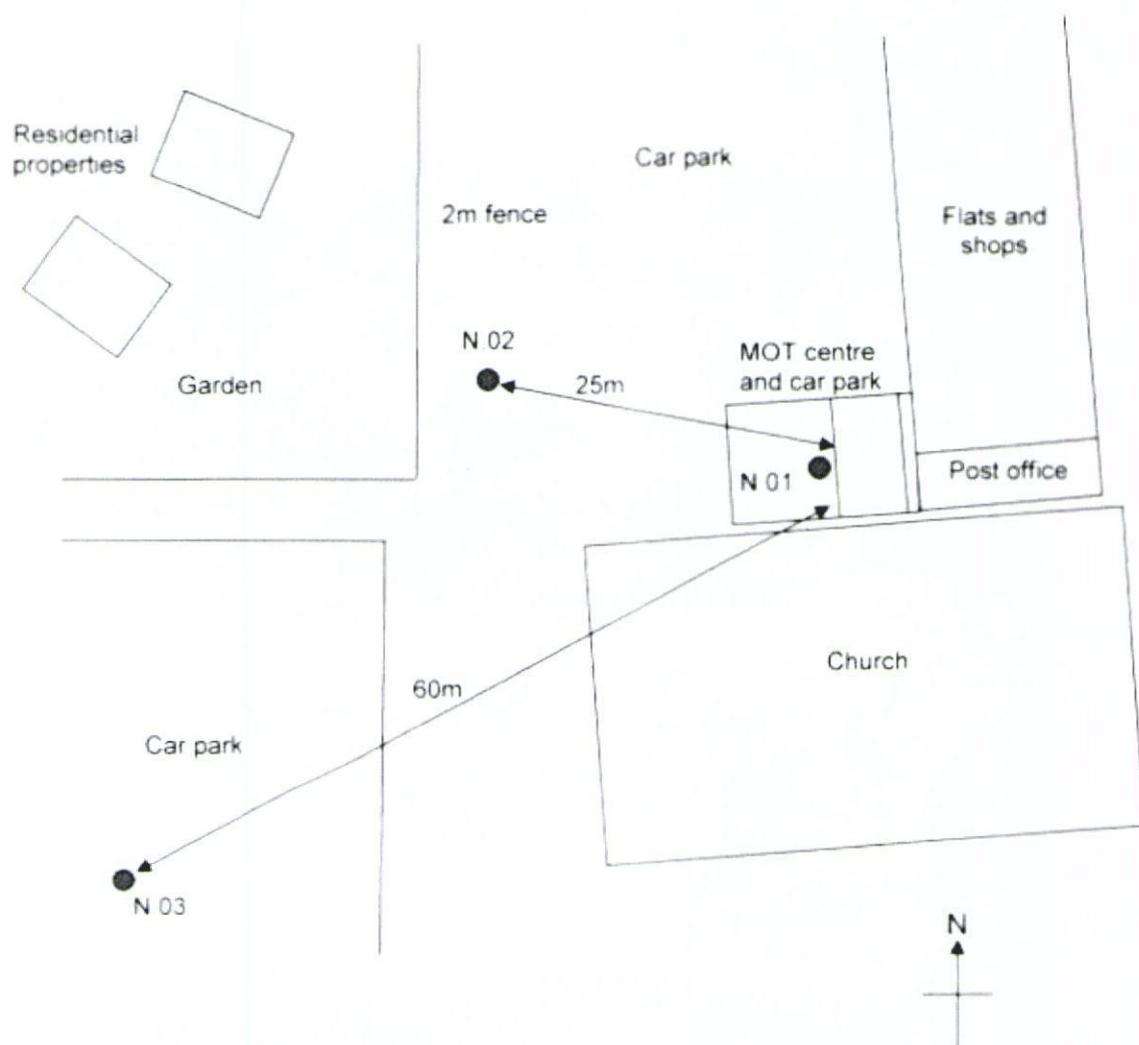
Local weather conditions were noted throughout the monitoring period and have been reproduced below in Section 4.

The following monitoring locations were therefore selected for this assessment:

- (N.01) At the proposed MOT centre premises,
- (N.02) 25m west from the premises; and
- (N.03) 60m southwest away from the premises.

The approximate position of each assessment point can be seen below in Figure 2.

Figure 2 Plan showing the noise monitoring locations



Photograph 1

Showing the proposed premises location from the west



Photograph 2

Showing the proposed premises location from the north



Photograph 3

Shows monitoring point N 03



3.2 Estimated noise from the proposed MOT centre

In view of the fact that the proposed MOT centre is currently not in operation, it is not possible to measure actual noise levels or use manufacturer sound power levels for machinery and tools. For the purposes of this assessment therefore secondary data has been referred to.

Data from a previous noise assessment carried out for an MOT test centre of similar design has been used. The premises are located at 22-28 Bawtry Road, Bramley, South Yorkshire. The noise assessment was carried out by G&D Garritt Limited (August 2011).

Similar to the Elm Grove location, there is the back elevation of a dwelling facing the open doors of this workshop of the MOT centre. This dwelling is 25m away from these doors. There is also a dwelling 6m away from the back of the MOT centre. Similarly the rear of the workshop does not have any doors or windows facing this dwelling. The site and surroundings were located in an industrial estate environment.

It was reported that the nearest dwelling located 25m away from the doors of the MOT workshop, would receive 43dB LAeq (1-hour) from the activities in the garage. The mean background noise at the dwelling was 55dB LAeq. This meant that the sound from the MOT centre was greater than 10dB below the background level here.

It was calculated that the dwelling at the rear of the MOT centre would receive noise levels of 35dB purely from activities therein. The background noise level recorded at this dwelling was 50dB. Therefore propagated noise from the MOT centre was around 15dB below the background level here.

The conclusion put forward within the corresponding assessment report was that the noise emanating from the MOT test centre was of an acceptable level. The BS 4142 calculation showed that complaints would be unlikely.

The noise levels included within this report can therefore be used in order to determine expected sound power levels at the source of the proposed MOT centre in Elm Grove. These values can then be used to ascertain likely noise exposure levels at the façade of each potentially affected dwelling, and subsequently enable the BS4142 calculation to be performed.

Considering the nearest dwelling at this other location, it was shown to receive a noise level of 43dB(A). Viewing this as emanating from a point source, the noise level would be expected to follow a reduction with distance in accordance with the inverse square law ($1/d^2$) which essentially will result in a decrease of 6dB for every doubling of distance.

Using the equation $SPL = SWL - 20\log(r) - 8$, where:

- SPL is the received sound pressure level;
- SWL is the sound power level of the source;
- r is the distance from the source;
- - 8 is used as the sound source is close to the ground surface (i.e. 1 reflective surface);

over a 25m distance this would therefore correspond to a sound power level at the source of 78.96dB(A), for a point source near the ground

Using the equation $SPL_2 = SPL_1 - 20\log(r_2/r_1)$, where:

- SPL_2 is the sound pressure level at the desired location;
- SPL_1 is the sound pressure level at the source (r_1);
- r_2 is the receiver distance; and
- r_1 is the measurement distance.

this noise source value of 78.96dB(A) can be used to calculate the expected sound pressure level at the two building façades at the Elm Grove site, follows:

- at 41m from the proposed open door the sound pressure level should be 38.70dB(A)
- at 46m from the proposed open door the sound pressure level should be 38.29dB(A)

For additional reference, sound power levels for individual equipment typically used within an MOT garage servicing environment has also been obtained. This data was obtained for Springer Commercial Services Limited (MOT Garage) by Martec Environmental Consultants Limited in May 2010.

This has been reproduced in Table 2 below.

Table 2 Data collected from a previous noise assessment of an MOT test centre

Condition	Use (mins/hour)	Octave Band Centre Frequency / Hz						
		125	250	500	1000	2000	4000	All
Compressor	10	69.7	66.0	68.5	67.9	62.7	60.8	71.4
Air gun	5	59.3	58.2	62.2	67.8	72.8	73.2	78
Angle grinder	5	51.6	56.6	68.4	71.4	77.4	81.5	85.1
Gas welder	5	59.7	54.6	56.7	53.4	55.3	50.0	62
Hand hammer	5	59.0	61.4	66.6	74.5	82.2	80.2	85.8
Exhaust gas Analyser	1	79.3	72.1	70.9	72.6	72.0	67.2	77.4
Horn test	1	62.5	63.7	87.1	93.8	92.9	84.4	97.3
Brake test	1	67.7	63.7	65.0	60.2	59.0	54.8	66.7
Combined based on hourly use		65.2	60.9	68.4	74.0	75.6	73.9	79.2

Through reference to the above table, this tends to suggest that a typical source noise level throughout the day (expressed as an hourly mean) may be around 79.2dB(A).

This value is seen to be markedly similar to the value obtained from the previous example in Bramley, South Yorkshire, where the SWL at the source was calculated to be 78.96dB(A).

In summary therefore, this may well be the level of noise expected to be produced at the proposed MOT station in Elm Grove.

In the absence of any other data (due to the current non-existence of the MOT centre here) this value of 79.2dB(A) will be used for the BS4142 assessment.

4 On-site monitoring results

For the purpose of this assessment, $L_{(A)eq(T)}$ values (equivalent continuous A-weighted sound pressure level) have been used as an indication of mean noise levels, where $T = 30$ minutes (as suggested by BS4142 where noise characteristics are unlikely to change throughout the operation).

In addition to these values, the maximum value has been shown (as L_{max}), the A-weighted sound exposure level (as $L_{(A)E}$), and a range of percentile measurements have been included for reference (L_5 , L_{10} , L_{50} , L_5 , L_{90} , and L_{95}).

Readings have been reproduced in Table 3, below. A meteorological summary is shown in Table 3.

Table 3 Noise readings obtained compared to predicted levels

	N.01	N.02	N.03
	Noise at proposed premises / dB(A)	Noise 25m from proposed premises / dB(A)	Noise 60m from proposed premises / dB(A)
$L_{(A)eq}$	62.1	57.8	62.7
$L_{(A)MAX}$	89.2	84.5	85.1
$L_{(A)5}$	66.0	62.5	67.6
$L_{(A)10}$	62.3	58.7	65.1
$L_{(A)50}$	52.0	49.6	56.5
$L_{(A)90}$	47.0	45.6	48.5
$L_{(A)95}$	46.3	45.7	47.0
Weather conditions	Dry, clear sky, 8°C, little breeze north-northwest at 3.06ms ⁻¹		
Any other notes	Nearby traffic was the dominant noise source. General noise could also be heard from birds and vegetation in the breeze.		

Table 4 Local weather conditions during the monitoring period

Parameter	Mean reading
Average temperature / °C	8
Average barometric pressure / hPa	1012
Average relative humidity / %	92
Total rainfall / mm	0
Average wind speed / ms ⁻¹	3.06
Mean wind direction	NNW

5 Evaluation

For the purposes of undertaking this evaluation, the following principles have been applied

- noise levels will diminish with distance from a point source in accordance with the inverse square law ($1/d^2$) which essentially will result in a decrease of 6dB for every doubling of distance;
- an increase in the background noise level by +3dB will be unnoticed by the human ear;
- an increase in the background noise level by +5dB is likely to be of marginal significance;
- an increase in the background noise level by +10dB is most likely to cause complaint.

The sound power level (SWL) is the uninfluenced sound energy of the source (Watts / $4 \pi r^2$).

The sound pressure level (SPL) is the value where the SWL has been influenced by both reflections and distance from the source.

i.e. $SPL = SWL - 20\log_{10} \dots$ – the reflective influence.

Using the formula $L_{(A)eq,T} = 10\log_{10}\{(1/T) \sum T_i 10^{0.1 L_{(A)eq,T_i}}\}$ the SWL can be determined (as detailed within BS4142, Para. 6.3.7).

Considering the estimated SWL of the proposed MOT station of 79.2dB(A), the expected noise levels at the façade of each of the dwelling directly facing the open doors can be calculated, along with the dwelling that is located to the rear of the MOT station.

The distance attenuation can therefore be calculated using the formula

$$SPL = L_1 - 20\log(r_2/r_1)$$

Where

- r_2 is the receiver distance, and
- r_1 is the measurement distance

The SPL of the source-calculated SWL at the closest dwelling façades are shown in below in Table 5.

Table 5 Calculated values with distance from source with MOT activities in operation

Details	Distance from source	Sound level / dB(A)
Source (SWL)	0	79.2
Calculated SPL (at front facing dwelling façade 41m from proposed open doors)	41	46.94
Calculated SPL (at front facing dwelling façade 46m from proposed open doors)	46	45.94
Calculated SPL (at rear facing dwelling façade 18m from proposed back wall)	18	54.09

The values in Table 5 above have been calculated as follows:

- The SPL at 41m from the source would be:

$$\text{SPL} = 79.2 - 20\log(41/1) = 46.94\text{dB(A)}$$

- The SPL at 46m from the source would be:

$$\text{SPL} = 79.2 - 20\log(46/1) = 45.94\text{dB(A)}$$

- The SPL at 18m from the source would be:

$$\text{SPL} = 79.2 - 20\log(18/1) = 54.09\text{dB(A)}$$

BS4142 assessments for this location are shown below in Tables 6, 7 and 8. The assessments have been undertaken using some of the calculated values previously quoted. Table 6 shows the excess of rating over the background level at the proposed noise source, whereas Tables 7, 8 and 9 show this at the dwelling façades 41m, 46m and 18m from the proposed MOT centre.

Table 6 BS4142 assessment at the noise source

Expected noise level L_{eq} (presumed SWL whilst operating)	BS4142 Clause 6.3	79.2
Residual noise level L_{eq} (measured SPL whilst not operating)*	BS4142 Clause 6.3	62.1
Background level (L_{eq} measured 60m away)	BS4142 Clause 7.3	62.7
Correction made (from BS4142 Table 1)	BS4142 Table 1	0
Specific noise level (presumed SWL - correction)	BS4142 Clause 8.1	79.2
Acoustic feature correction (from BS4142 s.8.2)	BS4142 Clause 8.2	5
Rating level (presumed SWL + acoustic feature correction)	BS4142 Clause 8.2	84.2
Excess of rating over background level (84.2 – 62.7)		21.5

* Measured value at proposed site location - see Table 3

As shown above in Table 6, differences in specific and background noise levels have been calculated by means of BS4142. In doing so the excess of rating over the background noise level at the source has been calculated as 21.5dB.

Consequently in accordance with BS4142 (Para 9), under normal circumstances as the rating level is greater than 10dB the difference here is expected to be noticeable.

Table 7 BS4142 assessment at the façade of the dwelling 41m from the proposed source

Presumed noise level L_{eq} (presumed SPL whilst operating)	BS4142 Clause 6.3	46.9
Residual noise level L_{eq} (measured SPL whilst not operating)*	BS4142 Clause 6.3	57.8
Background level (L_{eq} measured 60m away)	BS4142 Clause 7.3	62.7
Correction made (from BS4142 Table 1)	BS4142 Table 1	0
Specific noise level (presumed SPL - correction)	BS4142 Clause 8.1	46.9
Acoustic feature correction (from BS4142 s.8.2)	BS4142 Clause 8.2	5
Rating level (presumed SPL + acoustic feature correction)	BS4142 Clause 8.2	51.9
Excess of rating over background level (51.9 – 62.7)		-10.8

* Measured value at 25m from proposed site location - see Table 3

As shown above in Table 7, differences in specific and background noise levels have been calculated by means of BS4142. In doing so the excess of rating over the background noise level at the façade of the dwelling 41m from the proposed source has been calculated as -10.8dB.

Consequently in accordance with BS4142 (Para.9), the noise difference here is expected to be unnoticeable.

Table 8 BS4142 assessment at the façade of the dwelling 46m from the proposed source

Presumed noise level L_{eq} (presumed SPL whilst operating)	BS4142 Clause 6.3	45.9
Residual noise level L_{eq} (measured SPL whilst not operating)	BS4142 Clause 6.3	57.8
Background level (L_{eq} measured 60m away)	BS4142 Clause 7.3	62.7
Correction made (from BS4142 Table 1)	BS4142 Table 1	0
Specific noise level (presumed SPL - correction)	BS4142 Clause 8.1	45.9
Acoustic feature correction (from BS4142 s.8.2)	BS4142 Clause 8.2	5
Rating level (presumed SPL + acoustic feature correction)	BS4142 Clause 8.2	50.9
Excess of rating over background level (50.9 – 62.7)		-11.8

* Measured value at 25m from proposed site location - see Table 3

As shown above in Table 8, differences in specific and background noise levels have been calculated by means of BS4142. In doing so the excess of rating over the background noise level at the façade of the dwelling 41m from the proposed source has been calculated as -11.8dB.

Consequently in accordance with BS4142 (Para.9), the noise difference here is expected to be unnoticeable.

Table 9 BS4142 assessment at the façade of the dwelling 18m from the proposed source

Presumed noise level L_{eq} (presumed SPL whilst operating)	BS4142 Clause 6.3	54.1
Residual noise level L_{eq} (measured SPL whilst not operating)*	BS4142 Clause 6.3	62.1
Background level (L_{eq} measured 60m away)	BS4142 Clause 7.3	62.7
Correction made (from BS4142 Table 1)	BS4142 Table 1	0
Specific noise level (presumed SPL - correction)	BS4142 Clause 8.1	54.1
Acoustic feature correction (from BS4142 s.8.2)	BS4142 Clause 8.2	5
Rating level (presumed SPL + acoustic feature correction)	BS4142 Clause 8.2	59.1
Excess of rating over background level (59.1 – 62.7)		-3.6

* Measured value at proposed site location - see Table 3

As shown above in Table 9, differences in specific and background noise levels have been calculated by means of BS4142. In doing so the excess of rating over the background noise level at the façade of the dwelling 41m from the proposed source has been calculated as -3.6dB.

Consequently in accordance with BS4142 (Para.9), the noise difference here is expected to be unnoticeable.

6 Summary

In the absence of the MOT centre actually being present, secondary data has been referred to in order to make a prediction regarding the likely noise emanating from the premises during normal use.

This data has subsequently been used to determine likely noise levels at the façade of each of the closest dwellings.

In doing so it has been calculated that considering the distance from source to receptor, the noise would be expected to reduce from 79.2dB(A) to 46.9dB(A) at the closest dwelling to the open front doors of the MOT centre, and down to 54.1dB(A) at the closest dwelling to the rear of the MOT centre.

In actuality the reduction in noise at the façade of the dwelling to the rear would presumably be lower than this value as the rear of the MOT centre will be a brick wall with no openings, whereas the noise will be generated at the front of the building.

In reality however, these reductions will not occur as the general background noise levels in this area are currently in excess of these calculated levels.

Consequently the calculations imply that the current noise levels at the façade of each building are expected to be relatively unchanged.

In order to support this assumption, BS4142 calculations were performed at the proposed noise source, as well as at the façade of the two closest dwelling to the front and at the one to the rear.

In doing so it was shown that the increase in noise levels at the source will be noticeable, where a calculated excess of rating value over background level of 21.5dB(A) was obtained.

However at each of the three dwelling façades the calculated excess of rating value over background levels were all found to be negative.

Consequently this tends to confirm the suggestion that any increase in noise levels at the source should go unnoticed at these dwellings while the MOT centre is operating.

7 References

- 1 BS7445-1:2003 Description and measurement of environmental noise
- 2 BS4142:1997 Rating industrial noise affecting mixed residential and industrial areas
- 3 The Little Red Book of Acoustics 2nd Ed R.Watson and O.Downey
- 4 Planning Policy Guidance 24 (Planning and Noise):1994 - DEFRA
- 5 http://roam.rotherham.gov.uk/PlanNet/documentstore%5C5662507-5-00015_110920_50_01_A.PDF

APPENDIX

Calibration certification

CERTIFICATE OF CALIBRATION

Issued By: Pullman Instruments UK Ltd

Date of Issue: 17 August 2012

Certificate Number
1201134

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Approved Signatory

A J Cox

M Conboy

Customer: APPLE ENVIRONMENTAL LTD
 UNIT 3, ESTEVAN FARM, STONEY LANE
 MEDSTEAD, ALTON HANTS GU34 5EL

Date Received: 16 August 2012

Instrument:	System ID	035070	Job Number	251925-1
	Description	Sound Level Calibrator	Ref. Number	035070
	Manufacturer	CASTLE		
	Model Number	GA807		
	Serial Number	035070	Last Certificate Number	1111376
	Procedure Version	S/4624/S	Last Calibration Date	23/07/2011

Environmental Conditions

Temperature	20°C +/- 2°C	Mains Voltage	230V +/- 20V
Relative Humidity	50% +/- 15%	Mains Frequency	50Hz +/- 0.1Hz

Comments

No calibration adjustments or repairs were made to unit.
 All measurements traceable to national standards.
 Unit tested to manufacturers specification.

Traceability Information

Instrument description	Serial number	Certificate number	Cal Date	Cal Period
C087 - Cirrus CRL2 22 & BK 4230 S/L Kit	009492	1180823	08/09/2011	52

Calibrated By: N Bowman

Date of Calibration: 17 August 2012

This certificate provides traceability of measurement to recognised National Standards, and to the units of measurement required at the National Physical Laboratory or other recognised National Standards laboratories.
 Copyright of this certificate is owned by the issuing laboratory and may not be reproduced or copy without the prior written approval of the issuing laboratory.
 This certificate complies with the requirements of BS EN ISO 10012:2003

CERTIFICATE OF CALIBRATION

Certificate Number
1201134

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Test Title	Tolerance	Applied Value	Reading	Pass/Fail
Tet Results				
Measured Output dB				
94.0dB	0.30dB	94.0dB	94.0dB	Pass
104.0dB	0.30dB	104.0dB	104.1dB	Pass
Output Frequency				
1 kHz	10Hz	1.000.0kHz	1.000.0kHz	Pass
End of Results				

Uncertainties

Sound Meas/Gen: $\pm 0.3dB$
Time/Frequency Meas: $\pm 3.0E-11$