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31st July 2007

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Dear Tim

Advanced Learning Centres – Barnsley
Noise & Vibration Report for Proposed Foulstone/Wombwell School

This report covers our findings and opinions for all significant aspects of the noise and vibration issues presented by the proposed Foulstone/Wombwell School.

Summary

At worst, the impact of traffic noise on the bypass will be negligible and completely imperceptible. The presence of the new access road will inevitably have a noticeable effect on the some houses but nowhere near what could be described as unacceptable.

Most construction will be on average about 70m from the nearest houses. Overall the noise impact should be very small but inevitably there short periods of increased noise. Straightforward attention to mitigation should be more than adequate to resolve this.

Vibration caused by traffic is utterly negligible and is likely to remain utterly negligible after the school is open. The vibration from construction is extremely unlikely to be perceptible, but we cannot be categorically sure until statements are submitted by contractors.

Introduction

ADC was asked to carry out a scope of work for three proposed schools in the Barnsley area, including:

- assessment of the existing noise climates around the schools
- assessment of traffic noise associated with the new schools
- assessment of construction noise
- comment on vibration

Originally, each of these four main items were to cover all three schools but, due to planning timescales, it was agreed that it would be more logical to cover all items under the heading of each school. So, for instance, instead of reports covering traffic noise for all three schools, this report is the second of three, one for each school, covering all these main topics.

We begin by describing the main criteria by which the noise climate should be assessed, followed by a brief description of our modelling methods and our survey details. After this we discuss in turn each of the aspects listed above.

Assessment Criteria

BS8233 is a wide-ranging document which covers many aspects of noise in buildings but includes recommended "Reasonable" and "Good" noise climates in its Table 5. Of most significance to these assessments are the levels given for living rooms which are up to 40 dB L_{Aeq} for reasonable conditions. For a partly open window this coincides with outdoor living area criteria of 55 dB L_{Aeq} cited in other documents such as the WHO Guide and PPG 24.

The above standards use absolute noise levels for a 16 hour day. (They also cite night time levels but these will not be considered in this report). For reasons which we will discuss later, it will be considerably more relevant to assess impact by considering how much the noise will increase as a result of the new proposals. All else being equal, an increase of up to 3 dB will have negligible impact and will be barely perceptible. An increase of 10 dB will be perceived as a doubling of noise. So, we can regard increases in traffic noise of up to 3 dB as being of negligible impact as far as noise is concerned.

Noise from construction activities is difficult to rate as acceptable or unacceptable, mainly because it is temporary and people are clearly more tolerant of a noise which they know will eventually cease. Conversations with the local authority brought to light their standard requirements for noise action plans which is copied in Appendix 2. The basic requirement is to submit an action plan prior to any works commencing on site. At the time of writing this report it is not possible to prepare an action plan in any detail as there is no information about significant noise generators. Levels at the nearest noise sensitive properties of 55 dB $L_{Aeq,1\ hr}$ are referred to, along with an alternative requirement to restrict noise to within 10 dB of the existing background noise level. The requirements, however, do not seem to refer to these levels as limits upon which planning consent will be based, which is encouraging as they are exceptionally stringent and almost certain to be exceeded. At this stage, there is no point in suggesting noise limits, as any such limits will need to be considered alongside estimates of durations before one can assess them as acceptable or otherwise. However, daytime noise no higher than 75 dB $L_{Aeq(1\ hour)}$ is very common as a noise limit. Construction noise is discussed further later.

Any perceptible vibration resulting from the operational activities of the school, including increases in traffic, would constitute a significant loss of amenity to residents. Vibration is not considered quantitatively in this assessment and so quantitative vibration criteria are not relevant. It was agreed that a reasonably argued statement will suffice. Vibration resulting from construction, like noise should be more tolerable as it will be temporary. However, perceptible vibration is unlikely to be acceptable other than for very exceptional activities such as piling, bedrock breaking, etc.

Guide to Modelling

We regret that it is unavoidable that this section is rather technical but its understanding is by no means essential to the overall understanding of this report and its conclusions. It is presented purely for those who wish to scrutinise the means by which we came to our conclusions. The calculations themselves are shown in Appendix 3.

By agreement with the local authority's Environmental Health Department traffic noise is assessed in terms of the dB L_{Aeq} over a 16 hour day (0700 to 2300 hours). The well-known Calculation of Road Traffic Noise (CRTN) uses the now rather outdated index and time period of dB L_{A10} over an 18 hour day. The difference in time period is negligible, and one can reasonably expect the dB L_{Aeq} index to be typically 2 to 3 dB below the dB L_{A10} index. See definitions of acoustic terms in Appendix 1.

We have used as a starting point the noise level measured on site in terms of dB L_{Aeq} during the middle of the day. This is assumed to be a reasonable indication of the level averaged over a 16 hour period, including noisier periods such as rush-hour, and quieter periods such as the late evening. This assumption has been tested on many occasions in the past and is also backed up here by comparison with a calculation using CRTN – see later. The basic level is then adjusted for percentage estimated increase in traffic flows (all else being equal, ie. without the school) as follows:

Estimated Level in 2009 (or 2017) = Level in 2006 + 10log(1+%increase/100) dB

A correction is then calculated for the effect of speed and the percentage of heavy goods vehicles using the following formula from the CRTN:

Correction = 33log(V+40+500/V) + 10Log(1+5p/V) - 68.8

Where V is the traffic speed in km/hr and p is the percentage of HGVs

By effectively removing this correction from the measured level (adjusted for 2009 and 2017), we arrive at the equivalent basic level required for a CRTN calculation, but expressed as a 16 hour L_{Aeq}, rather than the 18 hour L_{A10} used by CRTN. From here we can quickly model the impact of the new school.

First we increase the basic noise level for the additional vehicles the operation of the school will generate as follows:

Increase = 10Log(Flows with School/Flows without School)

Then we adjust for the speed and percentage of heavy goods vehicles, as per the formula above. Here, the percentage of heavy goods vehicles are estimated rather pessimistically and, along with speeds, are expected to stay the same.

On this site there are no further adjustments necessary as measurements were made at distances equivalent to existing houses and distances are nowhere near enough for us to be concerned about intervening obstacles, ground absorption, etc.

The above description, remember, uses a measured level as a starting point. As a backup, we have also used the theoretical source data of CRTN and the calculation procedure described above brings us to a predicted dB L_{A10} level 2 dB above the dB L_{Aeq} level predicted by our main method. As stated in the opening paragraph to this

section, this level of difference means that the two methods appear to back each other up a perfectly.

Please note some key assumptions which should make our assessment a robust worst-case:

- 100% of the school traffic is additional to the existing traffic - the reality is likely to be that some existing users of the road will be part of the school traffic.
- 100% of the school traffic goes past the prediction point - the reality is likely to be that some traffic will turn one way and some traffic will turn another way, etc such that only a percentage of the school traffic will go past the prediction point.
- 100% of the school traffic will use the access road.
- The access road will have a 40 mph speed limit – the reality is likely to be far less.

One aspect not accounted for, however, is the likelihood that there will be a degree of slowing down and accelerating away at positions are very close to the school entrance. It may be that the reduced noise of significantly slower speeds will be countered by increased noise of accelerating away. It is beyond the scope of this assessment to attempt to quantify these two opposing effects and so we simply recommend that it should be part of a qualitative consideration in the event of the impact appearing to be borderline (which will be shown later not to be the case).

Construction noise is briefly modelled using the guidance in BS 5228.

Vibration is assessed and discussed qualitatively only.

Survey Details

The original survey was carried out, along with the two other sites in this project, on 28th March 2006 by Andrew Raymond of ADC Acoustics, author of this report. Since then some proposals have changed necessitating some up-dated survey work which was carried out on 17th July 2007 by Robert Porter of ADC Acoustics.

Equipment used was a CEL 593 Sound Analyser. This is a precision grade sound level meter which holds a current calibration certificate and which was field-calibrated as required.

The main assessment positions are shown in the attached plan. The microphone was approximately 1.5 m above the ground and well away from all other reflective surfaces.

Weather conditions were as follows:-

2006 Survey

No rain, dry roads
Wind below 5 m/s, from the SW
10 Celsius
40% Cloud

2007 Survey

No rain, dry roads
Wind below 5 m/s, from the W
17 Celsius
80% Cloud

Existing Noise and Climate

The noise climate were measured as follows:

Measured Levels - Littlefield Lane Position 1

Description and Comments	Meas't	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
Afternoon of 17 July 2007	14:10 to 14:20	Leq	**64**	69	63	57	59	62	55	45	38
		Lmax	**73**	83	75	72	71	70	63	59	57
		L90	**53**	62	56	50	49	50	43	30	21
	14:50 to 15:00	Leq	**64**	69	64	59	60	62	54	45	39
		Lmax	**78**	82	78	76	79	73	66	64	62
		L90	**53**	62	56	50	48	50	42	29	21
	Overall	Leq	**64**	69	64	58	59	62	55	45	39
		Lmax	**77**	83	77	74	76	71	65	62	60
		L90	**53**	62	56	50	49	50	43	30	21

Measured Levels - Littlefield Lane Position 2

Description and Comments	Meas't	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
Afternoon of 17 July 2007	14:30 to 14:40	Leq	**48**	60	52	50	44	43	37	32	28
		Lmax	**63**	69	63	64	58	55	57	52	48
		L90	**44**	57	47	40	39	41	34	29	25
	15:10 to 15:20	Leq	**48**	59	52	47	44	43	37	35	31
		Lmax	**64**	67	65	61	60	59	56	55	54
		L90	**44**	54	47	41	39	40	35	31	28
	Overall	Leq	**48**	59	52	48	44	43	37	34	30
		Lmax	**64**	68	64	63	59	57	57	54	52
		L90	**44**	56	47	41	39	41	35	30	27

Measured Levels - Pitt Street Position 3

Description and Comments	Meas't	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
Afternoon of 28 March 2006	14:00 to 15:00	Leq	**65**	73	68	66	62	59	56	50	42
		Lmax	**74**	79	78	72	69	69	67	60	56
		L90	**52**	63	57	53	47	47	44	37	26
	Overall	Leq	**65**	73	68	66	62	59	56	50	42
		Lmax	**74**	79	78	72	69	69	67	60	56
		L90	**52**	63	57	53	47	47	44	37	26

The most important column is the one headed dB(A), the other columns showing the noise levels across the audible frequency range, which can be used in later design work if necessary.

The levels of noise are fairly high, and L_{Aeq} level (the L_{eq} index in the dB(A) column) is completely dominated by passing traffic. This also creates the peaks shown by the L_{max} index. The L_{A90} level (the L_{90} index in the dB(A) column) is the underlying level, i.e. between the passing cars. This is dominated by more distant traffic.

Predicted Traffic Noise

Calculations are set out in Appendix 3. The following is a summary of existing and modelled noise levels affecting houses at equivalent positions to the measurement position.

Existing noise levels without the school operating

Position 1 (2007) 64.0 dB $L_{Aeq(0700 - 2300)}$
Position 2 (2007) 48.0 dB $L_{Aeq(0700 - 2300)}$

Predicted noise levels <u>without</u> the school operating

Position 1 (2009) 64.2 dB $L_{Aeq(0700 - 2300)}$
Position 2 (2009) 48.2 dB $L_{Aeq(0700 - 2300)}$

Position 1 (2017) 64.7 dB $L_{Aeq(0700 - 2300)}$
Position 2 (2017) 48.7 dB $L_{Aeq(0700 - 2300)}$

Predicted noise levels with the school operating

Position 1 (2009) 64.5 dB $L_{Aeq(0700 - 2300)}$
Position 2 (2009) 48.7 dB $L_{Aeq(0700 - 2300)}$

Position 1 (2017) 64.9 dB $L_{Aeq(0700 - 2300)}$
Position 2 (2017) 49.2 dB $L_{Aeq(0700 - 2300)}$

So, the predicted levels are above the absolute criteria discussed above but, then again, so are the existing levels. It obviously makes no sense, therefore, to use absolute levels. We also discussed above how an increase of up to 3 dB will have a *negligible impact. Here we have modelled tiny increase of 0.2 to 0.5 dB. There will* be no perceived or measurable change. One exception is that there may be a perceived impact for houses at position 2 which are a reasonable distance from the bypass and which may perceive the new access road as a minor new source of noise. Although it is new, and therefore perhaps noticeable, its impact will be negligible.

Construction Noise

The local authority's standard requirements for noise action plans were advised to us by e-mail on the 30th March 2006 and are copied in Appendix 2. Essentially the requirements are for the contractor to prepare a statement of the construction noise sources and how noise will be controlled to best practicable means. It all so states likely construction site time controls.

It is not clear what weight will be given to the noise levels suggested but they do not appear to be expressed as absolute limits. We have expressed in earlier sections our opinion that they are very stringent, given that construction noise is necessarily temporary. Limits will need to be considered alongside estimates of durations before one can assess them as acceptable or otherwise. However, daytime noise no higher than 75 dB $L_{Aeq(1\ hour)}$ is very common as a noise limit.

The requirements also refer to BS 5228 and it is with the use of this document that we have prepared an outline model/assessment of construction noise. Obviously we have no knowledge of what equipment the contractor will actually be using and so it must be taken only as a feasibility study and an indicative assessment of the noise which may be produced.

Construction Noise Affecting Houses on Pitt Street

Plant Items for Various Activities	Sound Power Level (dB LAeq)	Number of Items	% On Time	Effective Sound Power Level (dB LAeq)	Distance *	Level at Nearest Façade (dB LAeq)
Wheeled Loader	108	1	25	102	70	54
Tracked Loader	110	1	25	104	70	56
Tracked Excavator	106	1	25	100	70	52
Dump Truck	109	1	25	103	70	55
Lorries	112	1	10	102	70	54
Road Roller	108	1	25	102	70	54
Total				**110**		**64**

* approx 70m from centre of school building to nearest residential façade on Pitt Street

Note that this prediction is done to the nearest residential property and gives no consideration to any garden fencing or site hoarding which will almost certainly be in place. As per the well-known rule of thumb, a barrier which just breaks the "line of sight" between the source and receiver will provide around 5 dB reduction. Depending on the exact location of the sources, a reduction of 10 dB will be easy to achieve with, say, 2.4 m site hoarding.

The above model assumes that the sources will be located around the centre of the school building. Obviously the reality will be that some work takes place closer to the

houses and some further away. To a large extent, however, due to the simple fact that any site hoarding or garden fencing will be a more effective noise barrier for sources close to it, the differences in distance should make relatively small difference.

Vibration

It was agreed with Environmental Health that quantitative assessment of vibration was not necessary and that a reasonably argued qualitative assessment would be adequate.

Vibration caused by existing traffic is completely imperceptible. Increases due to the school operating will be tiny in relative terms and will still leave traffic flows well below levels which will come anywhere near to giving vibration problems, assuming the road is reasonably well built. There are many examples of considerably busier roads where vibration is not a problem.

Construction activities can cause ground-borne vibration in exceptional circumstances, but these are unlikely here. Any large equipment will be slow-moving and, although some items may generate a fairly low frequency noise which could conceivably cause items around the home and garden to rattle in extreme circumstances, the chances of ground-borne vibration are very small. Exceptional circumstances might include breaking up underlying rock or piling. Such activities could cause some ground born vibration within 75 m. A statement will be required from the contractor.

Conclusions and Recommendations

We can conclude simply that

- the impact of traffic noise will be negligible
- the impact of construction noise will be small overall, although there will inevitably be periods of higher-level noise.
- the impact of traffic vibration will be negligible
- the impact of construction vibration will be negligible except in exceptional circumstances such as piling or breaking of the bedrock, etc

Traffic and construction noise and vibration, therefore, should not pose an obstacle to planning consent.

I hope this covers everything, but please call me with any queries.

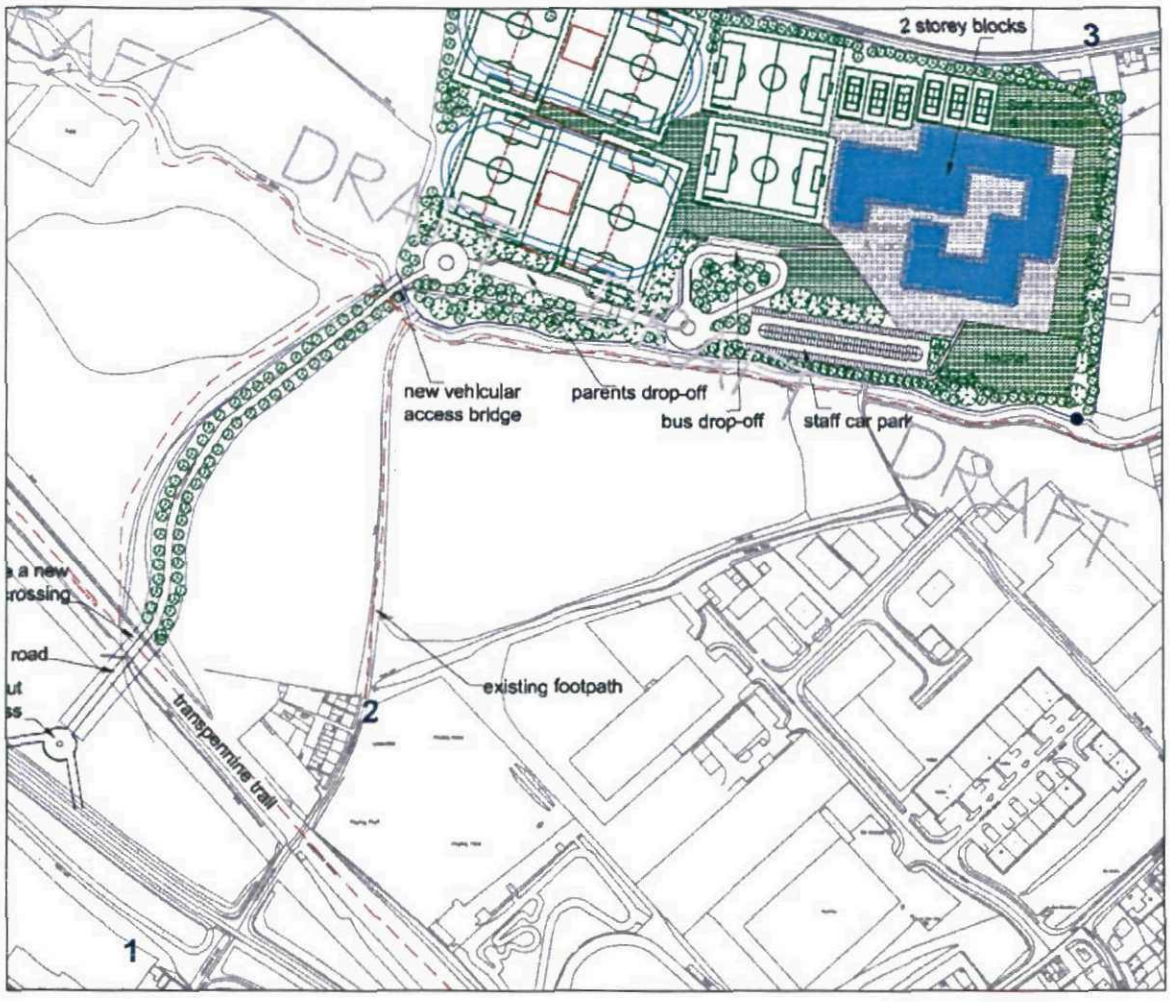
Yours sincerely



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Measurement Positions



Appendix 1

Definition of Acoustic Terms

The Decibel

The decibel is the basic unit of noise measurement and is denoted dB. Technically, it is a means of expressing the difference in noise level between the measured noise and a standard level of noise. Most often the threshold of human hearing is used as the standard reference but is really should be stated. The threshold of human hearing is a sound pressure of 20μPa or a sound power of 1pW.

A sound pressure level or SPL should be expressed in dB(re. 20μPa). A sound power level or SWL should be expressed in dB(re. 1pW). If the reference levels are omitted, it will often (but not always) be safe to assume that they are referenced to the threshold of human hearing.

A-Weighting and dB(A)

The human hearing system responds differently to different frequencies. The A-weighting system takes account of this by emphasising mid and high frequencies more than low frequencies to given an overall level. An A-Weighted noise level, therefore, reflects the way normal, healthy hearing would perceive the overall level of the noise. The basic unit is dB(A), although other systems of expressing an A-weighted level are discussed below.

Other weighting systems, such as C-Weighting, denoted dB(C), reflect the human hearing system's response at higher noise levels.

Equivalent Continuous Sound Level, L_{eq}

This is a kind of mean noise level.

The unit is dB L_{eq}. For A-weighted levels the unit is dB(A) L_{eq} or, in more modern units, dB L_{Aeq}.

Maximum Level, L_{max}

This is the maximum level reached (usually for a fraction of a second) in the measurement period.

The unit is dB L_{max}. For A-weighted levels the unit is dB(A) L_{max} or, in more modern units, dB L_{Amax}.

Statistical (Percentile) Levels, L_n

During a measurement of fluctuating noise, it is often useful to establish the levels exceed for a percentage of the time. L_n is the index representing the level exceeded for n% of the measurement period.

The unit is dB L_n. For A-weighted levels, the unit is dB(A) L_n or, in more modern units, dB L_{An}.

Common examples are as follows :-

dB L_{A90} is the A-weighted level exceeded for 90% of the time and is often used to describe the underlying background noise.

dB L_{A50} is the A-weighted level exceed for 50% of the time. Mathematically, it is the median, another kind of average.

dB L_{A10} is the A-weighted level exceeded for 10% of the time and has traditionally been used to describe the intermittent highs in the noise climate such as passing cars or aircraft.

Frequency Analysis

Here the audible frequency range is divided up into bands and the noise level is expressed in each frequency band form low pitches to high pitches.

Octave Band analysis is where the frequency range is divided into 8 bands from 63 Hz to 8kHz, or sometimes into 10 bands from 31.5 Hz to 16kHz.

1/3 Octave Band analysis provides more detailed subdivision into 24 bands from 50 Hz to 10kHz, or sometimes into 30 bands from 20Hz to 20kHz.

Narrow Band analysis takes this further with the possibility of many thousands of bands, possibly only 1Hz wide, or even less.

In all types of frequency analysis, the level in each band can be expressed in terms of L_{eq}, L_{max}, L_n, etc. as defined above.

Appendix 2

Copy of Local Authority Standard Requirements for Noise Action Plans

1. Prior to any works commencing on the site the applicant shall submit a noise action plan detailing how noise will be controlled and kept to a minimum during remediation and construction phases of the development:

a. noise action plan

- *The noise action plan shall detail best practicable means to control the noise from the site's development and take account of the guidance contained in the* ***Guide to noise and vibration control on construction and open sites - BS 5228: Parts I & II: 1997.*** *The contents of the plan shall be approved by the Local Planning Authority prior to any works commencing on the site and the operations shall be undertaken in complete accordance with the approved scheme.*

The report shall:

- *identify noise reduction measures for individual items of plant and machinery, including the use of plant and machinery with low noise output and the proposed location of mobile plant e.g. generators, crushers; (the location of stock-piled material may be useful in screening potentially noise-sensitive premises from noise from the crusher)*
- *identify where the provision of acoustic shields, barriers or enclosures are necessary to safeguard the amenity of local residents;*
- *state the proposed hours of work (normally 08:00 - 18:00 Mondays to Fridays and 08:00 - 13:00 on Saturdays, with no Sunday or Bank Holiday working) which shall include all activities on site including deliveries;*
- *detail the site access route(s) for vehicles and the estimated number of vehicle movements per day; and*
- *state the estimated duration of the remediation and construction of the site.*

Noise measurements shall also be appropriate if the applicant wishes to demonstrate that:

- *the operations on site will not cause the LAeq, 1hr at the nearest noise-sensitive property to rise above 55dB LAeq,1hr (the equivalent continuous A-weighted sound pressure level);*
- *or where, given very high or low background noise levels, the operations on site will not cause the LAeq, 1hr at the nearest noise-sensitive property to give rise to an increase of 10dB or more over the background noise.*
- *The times and dates of any monitoring to determine background and the location of the monitoring sites shall be agreed with the Local Planning Authority prior to any works commencing on the site.*

2. Piling shall only be undertaken between the hours of 10:00 – 12:00 and 14:00 – 16:00 Monday – Fridays

Please note: *Any crusher used shall be under permit for processes requiring Pollution Prevention Control, as required by the Environmental Protection Act 1990.*

Appendix 3

Calculations of Traffic Noise

2009 Traffic on the Wombwell Bypass Affecting Littlefield Lane Position 1

16 Hour Flows for 2009

	Total	% HGV	HGV	Non HGV
Measured 2006	18553	10.0	1855	16698
Estimated 2009	19406	10.0	1941	17465
Percentage Increase	4.6	0.0	4.6	4.6
School only	1584	4.6	73	1511
Total with School	20990	9.6	2013	18977

Measured Noise Level	64.0 dB		
Estimated in 2009	64.2 dB		
Speed without School	40 mph	=	67 km/h
Speed with School	40 mph	=	67 km/h
2009 Without School			
Basic Noise Level	62.7 dB		
Correction for Speed and % HGV	1.5 dB		
Resultant	64.2	This should equal the estimated figure for 2009	
2009 School Only			
Basic Noise Level (dB)	51.8 dB		
Correction for Speed and % HGV	0.4 dB		
Resultant	52.2 dB		
2009 Total With School			
Basic Noise Level (dB)	63.0 dB		
Correction for Speed and % HGV	1.5 dB		
Resultant	64.5 dB		
Increase			
Basic Noise Level (dB)	0.3 dB		
Correction for Speed and % HGV	-0.1 dB		
Resultant	0.3 dB		

2017 Traffic on the Wombwell Bypass Affecting Littlefield Lane Position 1

16 Hour Flows for 2017

	Total	% HGV	HGV	Non HGV
Measured 2006	18553	10.0	1855	16698
Estimated 2017	21800	10.0	2180	19620
Percentage Increase	17.5	0.0	17.5	17.5
School only	1584	4.6	73	1511
Total with School	23384	9.6	2253	21131

Measured Noise Level	64.0 dB		
Estimated in 2017	64.7 dB		
Speed without School	40 mph	=	67 km/h
Speed with School	40 mph	=	67 km/h
2017 Without School			
Basic Noise Level	63.2 dB		
Correction for Speed and % HGV	1.5 dB		
Resultant	64.7	This should equal the estimated figure for 2017	
2017 School Only			
Basic Noise Level (dB)	51.8 dB		
Correction for Speed and % HGV	0.4 dB		
Resultant	52.2 dB		
2017 Total With School			
Basic Noise Level (dB)	63.5 dB		
Correction for Speed and % HGV	1.5 dB		
Resultant	64.9 dB		
Increase			
Basic Noise Level (dB)	0.3 dB		
Correction for Speed and % HGV	-0.1 dB		
Resultant	0.2 dB		

2009 Traffic on the Wombwell Bypass Affecting Littlefield Lane Position 2

16 Hour Flows for 2009

	Total	% HGV	HGV	Non HGV
Measured 2006	18553	10.0	1855	16698
Estimated 2009	19406	10.0	1941	17465
Percentage Increase	4.6	0.0	4.6	4.6
School only*	3168	4.6	146	3022
Total with School	22574	9.2	2086	20488

Measured Noise Level	48.0 dB		
Estimated in 2009	48.2 dB		
Speed without School	40 mph	=	67 km/h
Speed with School	40 mph	=	67 km/h
2009 Without School			
Basic Noise Level	46.7 dB		
Correction for Speed and % HGV	1.5 dB		
Resultant	48.2	This should equal the estimated figure for 2009	
2009 School Only			
Basic Noise Level (dB)	38.8 dB		
Correction for Speed and % HGV	0.4 dB		
Resultant	39.2 dB		
2009 Total With School			
Basic Noise Level (dB)	47.3 dB		
Correction for Speed and % HGV	1.4 dB		
Resultant	48.7 dB		
Increase			
Basic Noise Level (dB)	0.7 dB		
Correction for Speed and % HGV	-0.1 dB		
Resultant	0.5 dB		

2017 Traffic on the Wombwell Bypass Affecting Littlefield Lane Position 2

16 Hour Flows for 2017

	Total	% HGV	HGV	Non HGV
Measured 2006	18553	10.0	1855	16698
Estimated 2017	21800	10.0	2180	19620
Percentage Increase	17.5	0.0	17.5	17.5
School only*	3168	4.6	146	3022
Total with School	24968	9.3	2326	22642

Measured Noise Level	48.0 dB		
Estimated in 2017	48.7 dB		
Speed without School	40 mph	=	67 km/h
Speed with School	40 mph	=	67 km/h
2017 Without School			
Basic Noise Level	47.2 dB		
Correction for Speed and % HGV	1.5 dB		
Resultant	48.7	This should equal the estimated figure for 2017	
2017 School Only			
Basic Noise Level (dB)	38.8 dB		
Correction for Speed and % HGV	0.4 dB		
Resultant	39.2 dB		
2017 Total With School			
Basic Noise Level (dB)	47.8 dB		
Correction for Speed and % HGV	1.4 dB		
Resultant	49.2 dB		
Increase			
Basic Noise Level (dB)	0.8 dB		
Correction for Speed and % HGV	-0.1 dB		
Resultant	0.5 dB		

* note that the school traffic at this position is double as it assumes that all by pass traffic will use the access road, effectively passing the position twice, each time at a similar distance.

Key Assumptions :

Existing 16 hour noise climate is represented reasonably well by daytime measured levels
100% of the school traffic is additional to the existing traffic
100% of school traffic goes past the prediction points
100% of school traffic uses the access road
Access road traffic is at 40 mph
All traffic is at the same speed
Some allowance should be made for school traffic accelerating away

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31st July 2007

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Dear Tim

Advanced Learning Centres – Barnsley
Noise & Vibration Report for Proposed Foulstone/Wombwell School

This report covers our findings and opinions for all significant aspects of the noise and vibration issues presented by the proposed Foulstone/Wombwell School.

Summary

At worst, the impact of traffic noise on the bypass will be negligible and completely imperceptible. The presence of the new access road will inevitably have a noticeable effect on the some houses but nowhere near what could be described as unacceptable.

Most construction will be on average about 70m from the nearest houses. Overall the noise impact should be very small but inevitably there short periods of increased noise. Straightforward attention to mitigation should be more than adequate to resolve this.

Vibration caused by traffic is utterly negligible and is likely to remain utterly negligible after the school is open. The vibration from construction is extremely unlikely to be perceptible, but we cannot be categorically sure until statements are submitted by contractors.

Introduction

ADC was asked to carry out a scope of work for three proposed schools in the Barnsley area, including:

- assessment of the existing noise climates around the schools
- assessment of traffic noise associated with the new schools
- assessment of construction noise
- comment on vibration

Originally, each of these four main items were to cover all three schools but, due to planning timescales, it was agreed that it would be more logical to cover all items under the heading of each school. So, for instance, instead of reports covering traffic noise for all three schools, this report is the second of three, one for each school, covering all these main topics.

We begin by describing the main criteria by which the noise climate should be assessed, followed by a brief description of our modelling methods and our survey details. After this we discuss in turn each of the aspects listed above.

Assessment Criteria

BS8233 is a wide-ranging document which covers many aspects of noise in buildings but includes recommended "Reasonable" and "Good" noise climates in its Table 5. Of most significance to these assessments are the levels given for living rooms which are up to 40 dB L_{Aeq} for reasonable conditions. For a partly open window this coincides with outdoor living area criteria of 55 dB L_{Aeq} cited in other documents such as the WHO Guide and PPG 24.

The above standards use absolute noise levels for a 16 hour day. (They also cite night time levels but these will not be considered in this report). For reasons which we will discuss later, it will be considerably more relevant to assess impact by considering how much the noise will increase as a result of the new proposals. All else being equal, an increase of up to 3 dB will have negligible impact and will be barely perceptible. An increase of 10 dB will be perceived as a doubling of noise. So, we can regard increases in traffic noise of up to 3 dB as being of negligible impact as far as noise is concerned.

Noise from construction activities is difficult to rate as acceptable or unacceptable, mainly because it is temporary and people are clearly more tolerant of a noise which they know will eventually cease. Conversations with the local authority brought to light their standard requirements for noise action plans which is copied in Appendix 2. The basic requirement is to submit an action plan prior to any works commencing on site. At the time of writing this report it is not possible to prepare an action plan in any detail as there is no information about significant noise generators. Levels at the nearest noise sensitive properties of 55 dB $L_{Aeq,1\ hr}$ are referred to, along with an alternative requirement to restrict noise to within 10 dB of the existing background noise level. The requirements, however, do not seem to refer to these levels as limits upon which planning consent will be based, which is encouraging as they are exceptionally stringent and almost certain to be exceeded. At this stage, there is no point in suggesting noise limits, as any such limits will need to be considered alongside estimates of durations before one can assess them as acceptable or otherwise. However, daytime noise no higher than 75 dB $L_{Aeq(1\ hour)}$ is very common as a noise limit. Construction noise is discussed further later.

Any perceptible vibration resulting from the operational activities of the school, including increases in traffic, would constitute a significant loss of amenity to residents. Vibration is not considered quantitatively in this assessment and so quantitative vibration criteria are not relevant. It was agreed that a reasonably argued statement will suffice. Vibration resulting from construction, like noise should be more tolerable as it will be temporary. However, perceptible vibration is unlikely to be acceptable other than for very exceptional activities such as piling, bedrock breaking, etc.

Guide to Modelling

We regret that it is unavoidable that this section is rather technical but its understanding is by no means essential to the overall understanding of this report and its conclusions. It is presented purely for those who wish to scrutinise the means by which we came to our conclusions. The calculations themselves are shown in Appendix 3.

By agreement with the local authority's Environmental Health Department traffic noise is assessed in terms of the dB L_{Aeq} over a 16 hour day (0700 to 2300 hours). The well-known Calculation of Road Traffic Noise (CRTN) uses the now rather outdated index and time period of dB L_{A10} over an 18 hour day. The difference in time period is negligible, and one can reasonably expect the dB L_{Aeq} index to be typically 2 to 3 dB below the dB L_{A10} index. See definitions of acoustic terms in Appendix 1.

We have used as a starting point the noise level measured on site in terms of dB L_{Aeq} during the middle of the day. This is assumed to be a reasonable indication of the level averaged over a 16 hour period, including noisier periods such as rush-hour, and quieter periods such as the late evening. This assumption has been tested on many occasions in the past and is also backed up here by comparison with a calculation using CRTN – see later. The basic level is then adjusted for percentage estimated increase in traffic flows (all else being equal, ie. without the school) as follows:

Estimated Level in 2009 (or 2017) = Level in 2006 + 10log(1+%increase/100) dB

A correction is then calculated for the effect of speed and the percentage of heavy goods vehicles using the following formula from the CRTN:

Correction = 33log(V+40+500/V) + 10Log(1+5p/V) - 68.8

Where V is the traffic speed in km/hr and p is the percentage of HGVs

By effectively removing this correction from the measured level (adjusted for 2009 and 2017), we arrive at the equivalent basic level required for a CRTN calculation, but expressed as a 16 hour L_{Aeq}, rather than the 18 hour L_{A10} used by CRTN. From here we can quickly model the impact of the new school.

First we increase the basic noise level for the additional vehicles the operation of the school will generate as follows:

Increase = 10Log(Flows with School/Flows without School)

Then we adjust for the speed and percentage of heavy goods vehicles, as per the formula above. Here, the percentage of heavy goods vehicles are estimated rather pessimistically and, along with speeds, are expected to stay the same.

On this site there are no further adjustments necessary as measurements were made at distances equivalent to existing houses and distances are nowhere near enough for us to be concerned about intervening obstacles, ground absorption, etc.

The above description, remember, uses a measured level as a starting point. As a backup, we have also used the theoretical source data of CRTN and the calculation procedure described above brings us to a predicted dB L_{A10} level 2 dB above the dB L_{Aeq} level predicted by our main method. As stated in the opening paragraph to this

section, this level of difference means that the two methods appear to back each other up a perfectly.

Please note some key assumptions which should make our assessment a robust worst-case:

- 100% of the school traffic is additional to the existing traffic - the reality is likely to be that some existing users of the road will be part of the school traffic.
- 100% of the school traffic goes past the prediction point - the reality is likely to be that some traffic will turn one way and some traffic will turn another way, etc such that only a percentage of the school traffic will go past the prediction point.
- 100% of the school traffic will use the access road.
- The access road will have a 40 mph speed limit – the reality is likely to be far less.

One aspect not accounted for, however, is the likelihood that there will be a degree of slowing down and accelerating away at positions are very close to the school entrance. It may be that the reduced noise of significantly slower speeds will be countered by increased noise of accelerating away. It is beyond the scope of this assessment to attempt to quantify these two opposing effects and so we simply recommend that it should be part of a qualitative consideration in the event of the impact appearing to be borderline (which will be shown later not to be the case).

Construction noise is briefly modelled using the guidance in BS 5228.

Vibration is assessed and discussed qualitatively only.

Survey Details

The original survey was carried out, along with the two other sites in this project, on 28th March 2006 by Andrew Raymond of ADC Acoustics, author of this report. Since then some proposals have changed necessitating some up-dated survey work which was carried out on 17th July 2007 by Robert Porter of ADC Acoustics.

Equipment used was a CEL 593 Sound Analyser. This is a precision grade sound level meter which holds a current calibration certificate and which was field-calibrated as required.

The main assessment positions are shown in the attached plan. The microphone was approximately 1.5 m above the ground and well away from all other reflective surfaces.

Weather conditions were as follows:-

2006 Survey

No rain, dry roads
Wind below 5 m/s, from the SW
10 Celsius
40% Cloud

2007 Survey

No rain, dry roads
Wind below 5 m/s, from the W
17 Celsius
80% Cloud

Existing Noise and Climate

The noise climate were measured as follows:

Measured Levels - Littlefield Lane Position 1

Description and Comments	Meas't	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
Afternoon of 17 July 2007	14:10 to 14:20	Leq	**64**	69	63	57	59	62	55	45	38
		Lmax	**73**	83	75	72	71	70	63	59	57
		L90	**53**	62	56	50	49	50	43	30	21
	14:50 to 15:00	Leq	**64**	69	64	59	60	62	54	45	39
		Lmax	**78**	82	78	76	79	73	66	64	62
		L90	**53**	62	56	50	48	50	42	29	21
	Overall	Leq	**64**	69	64	58	59	62	55	45	39
		Lmax	**77**	83	77	74	76	71	65	62	60
		L90	**53**	62	56	50	49	50	43	30	21

Measured Levels - Littlefield Lane Position 2

Description and Comments	Meas't	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
Afternoon of 17 July 2007	14:30 to 14:40	Leq	**48**	60	52	50	44	43	37	32	28
		Lmax	**63**	69	63	64	58	55	57	52	48
		L90	**44**	57	47	40	39	41	34	29	25
	15:10 to 15:20	Leq	**48**	59	52	47	44	43	37	35	31
		Lmax	**64**	67	65	61	60	59	56	55	54
		L90	**44**	54	47	41	39	40	35	31	28
	Overall	Leq	**48**	59	52	48	44	43	37	34	30
		Lmax	**64**	68	64	63	59	57	57	54	52
		L90	**44**	56	47	41	39	41	35	30	27

Measured Levels - Pitt Street Position 3

Description and Comments	Meas't	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
Afternoon of 28 March 2006	14:00 to 15:00	Leq	**65**	73	68	66	62	59	56	50	42
		Lmax	**74**	79	78	72	69	69	67	60	56
		L90	**52**	63	57	53	47	47	44	37	26
	Overall	Leq	**65**	73	68	66	62	59	56	50	42
		Lmax	**74**	79	78	72	69	69	67	60	56
		L90	**52**	63	57	53	47	47	44	37	26

The most important column is the one headed dB(A), the other columns showing the noise levels across the audible frequency range, which can be used in later design work if necessary.

The levels of noise are fairly high, and L_{Aeq} level (the L_{eq} index in the dB(A) column) is completely dominated by passing traffic. This also creates the peaks shown by the L_{max} index. The L_{A90} level (the L_{90} index in the dB(A) column) is the underlying level, i.e. between the passing cars. This is dominated by more distant traffic.

Predicted Traffic Noise

Calculations are set out in Appendix 3. The following is a summary of existing and modelled noise levels affecting houses at equivalent positions to the measurement position.

Existing noise levels without the school operating

Position 1 (2007) 64.0 dB $L_{Aeq(0700 - 2300)}$
Position 2 (2007) 48.0 dB $L_{Aeq(0700 - 2300)}$

Predicted noise levels without the school operating

Position 1 (2009) 64.2 dB $L_{Aeq(0700 - 2300)}$
Position 2 (2009) 48.2 dB $L_{Aeq(0700 - 2300)}$

Position 1 (2017) 64.7 dB $L_{Aeq(0700 - 2300)}$
Position 2 (2017) 48.7 dB $L_{Aeq(0700 - 2300)}$

Predicted noise levels with the school operating

Position 1 (2009)	64.5 dB $L_{Aeq(0700 - 2300)}$
Position 2 (2009)	48.7 dB $L_{Aeq(0700 - 2300)}$
Position 1 (2017)	64.9 dB $L_{Aeq(0700 - 2300)}$
Position 2 (2017)	49.2 dB $L_{Aeq(0700 - 2300)}$

So, the predicted levels are above the absolute criteria discussed above but, then again, so are the existing levels. It obviously makes no sense, therefore, to use absolute levels. We also discussed above how an increase of up to 3 dB will have a negligible impact. Here we have modelled tiny increase of 0.2 to 0.5 dB. There will be no perceived or measurable change. One exception is that there may be a perceived impact for houses at position 2 which are a reasonable distance from the bypass and which may perceive the new access road as a minor new source of noise. Although it is new, and therefore perhaps noticeable, its impact will be negligible.

Construction Noise

The local authority's standard requirements for noise action plans were advised to us by e-mail on the 30th March 2006 and are copied in Appendix 2. Essentially the requirements are for the contractor to prepare a statement of the construction noise sources and how noise will be controlled to best practicable means. It all so states likely construction site time controls.

It is not clear what weight will be given to the noise levels suggested but they do not appear to be expressed as absolute limits. We have expressed in earlier sections our opinion that they are very stringent, given that construction noise is necessarily temporary. Limits will need to be considered alongside estimates of durations before one can assess them as acceptable or otherwise. However, daytime noise no higher than 75 dB $L_{Aeq(1\ hour)}$ is very common as a noise limit.

The requirements also refer to BS 5228 and it is with the use of this document that we have prepared an outline model/assessment of construction noise. Obviously we have no knowledge of what equipment the contractor will actually be using and so it must be taken only as a feasibility study and an indicative assessment of the noise which may be produced.

Construction Noise Affecting Houses on Pitt Street

Plant Items for Various Activities	Sound Power Level (dB LAeq)	Number of Items	% On Time	Effective Sound Power Level (dB LAeq)	Distance *	Level at Nearest Façade (dB LAeq)
Wheeled Loader	108	1	25	102	70	54
Tracked Loader	110	1	25	104	70	56
Tracked Excavator	106	1	25	100	70	52
Dump Truck	109	1	25	103	70	55
Lorries	112	1	10	102	70	54
Road Roller	108	1	25	102	70	54
Total				**110**		**64**

* approx 70m from centre of school building to nearest residential façade on Pitt Street

Note that this prediction is done to the nearest residential property and gives no consideration to any garden fencing or site hoarding which will almost certainly be in place. As per the well-known rule of thumb, a barrier which just breaks the "line of sight" between the source and receiver will provide around 5 dB reduction. Depending on the exact location of the sources, a reduction of 10 dB will be easy to achieve with, say, 2.4 m site hoarding.

The above model assumes that the sources will be located around the centre of the school building. Obviously the reality will be that some work takes place closer to the

houses and some further away. To a large extent, however, due to the simple fact that any site hoarding or garden fencing will be a more effective noise barrier for sources close to it, the differences in distance should make relatively small difference.

Vibration

It was agreed with Environmental Health that quantitative assessment of vibration was not necessary and that a reasonably argued qualitative assessment would be adequate.

Vibration caused by existing traffic is completely imperceptible. Increases due to the school operating will be tiny in relative terms and will still leave traffic flows well below levels which will come anywhere near to giving vibration problems, assuming the road is reasonably well built. There are many examples of considerably busier roads where vibration is not a problem.

Construction activities can cause ground-borne vibration in exceptional circumstances, but these are unlikely here. Any large equipment will be slow-moving and, although some items may generate a fairly low frequency noise which could conceivably cause items around the home and garden to rattle in extreme circumstances, the chances of ground-borne vibration are very small. Exceptional circumstances might include breaking up underlying rock or piling. Such activities could cause some ground born vibration within 75 m. A statement will be required from the contractor.

Conclusions and Recommendations

We can conclude simply that

- the impact of traffic noise will be negligible
- the impact of construction noise will be small overall, although there will inevitably be periods of higher-level noise.
- the impact of traffic vibration will be negligible
- the impact of construction vibration will be negligible except in exceptional circumstances such as piling or breaking of the bedrock, etc

Traffic and construction noise and vibration, therefore, should not pose an obstacle to planning consent.

I hope this covers everything, but please call me with any queries.

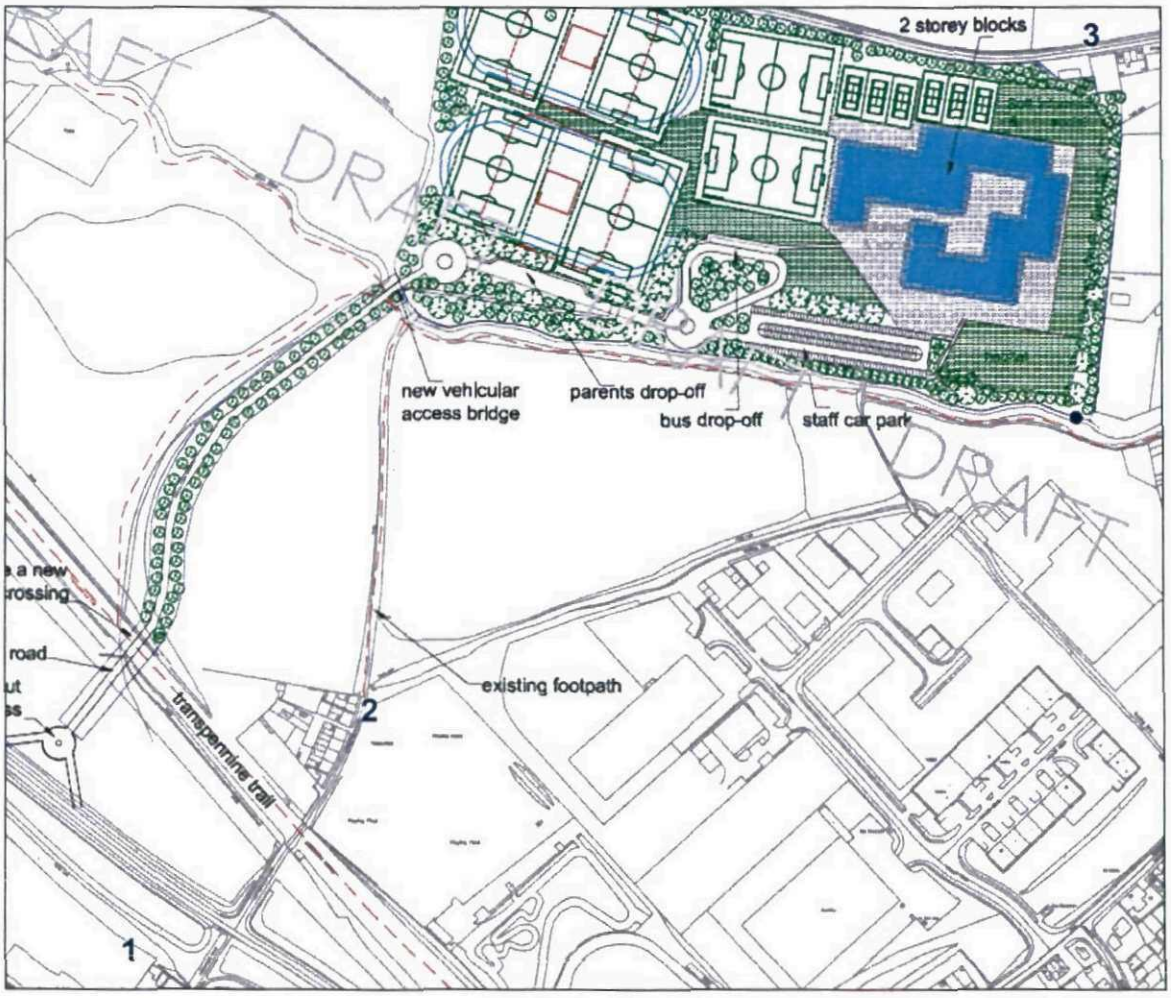
Yours sincerely



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Measurement Positions



Appendix 1

Definition of Acoustic Terms

The Decibel

The decibel is the basic unit of noise measurement and is denoted dB. Technically, it is a means of expressing the difference in noise level between the measured noise and a standard level of noise. Most often the threshold of human hearing is used as the standard reference but is really should be stated. The threshold of human hearing is a sound pressure of 20μPa or a sound power of 1pW.

A sound pressure level or SPL should be expressed in dB(re. 20μPa). A sound power level or SWL should be expressed in dB(re. 1pW). If the reference levels are omitted, it will often (but not always) be safe to assume that they are referenced to the threshold of human hearing.

A-Weighting and dB(A)

The human hearing system responds differently to different frequencies. The A-weighting system takes account of this by emphasising mid and high frequencies more than low frequencies to given an overall level. An A-Weighted noise level, therefore, reflects the way normal, healthy hearing would perceive the overall level of the noise. The basic unit is dB(A), although other systems of expressing an A-weighted level are discussed below.

Other weighting systems, such as C-Weighting, denoted dB(C), reflect the human hearing system's response at higher noise levels.

Equivalent Continuous Sound Level, L_{eq}

This is a kind of mean noise level.

The unit is dB L_{eq}. For A-weighted levels the unit is dB(A) L_{eq} or, in more modern units, dB L_{Aeq}.

Maximum Level, L_{max}

This is the maximum level reached (usually for a fraction of a second) in the measurement period.

The unit is dB L_{max}. For A-weighted levels the unit is dB(A) L_{max} or, in more modern units, dB L_{Amax}.

Statistical (Percentile) Levels, L_n

During a measurement of fluctuating noise, it is often useful to establish the levels exceed for a percentage of the time. L_n is the index representing the level exceeded for n% of the measurement period.

The unit is dB L_n. For A-weighted levels, the unit is dB(A) L_n or, in more modern units, dB L_{An}.

Common examples are as follows :-

dB L_{A90} is the A-weighted level exceeded for 90% of the time and is often used to describe the underlying background noise.

dB L_{A50} is the A-weighted level exceed for 50% of the time. Mathematically, it is the median, another kind of average.

dB L_{A10} is the A-weighted level exceeded for 10% of the time and has traditionally been used to describe the intermittent highs in the noise climate such as passing cars or aircraft.

Frequency Analysis

Here the audible frequency range is divided up into bands and the noise level is expressed in each frequency band form low pitches to high pitches.

Octave Band analysis is where the frequency range is divided into 8 bands from 63 Hz to 8kHz, or sometimes into 10 bands from 31.5 Hz to 16kHz.

1/3 Octave Band analysis provides more detailed subdivision into 24 bands from 50 Hz to 10kHz, or sometimes into 30 bands from 20Hz to 20kHz.

Narrow Band analysis takes this further with the possibility of many thousands of bands, possibly only 1Hz wide, or even less.

In all types of frequency analysis, the level in each band can be expressed in terms of L_{eq}, L_{max}, L_n, etc. as defined above.

Appendix 2

Copy of Local Authority Standard Requirements for Noise Action Plans

1. Prior to any works commencing on the site the applicant shall submit a noise action plan detailing how noise will be controlled and kept to a minimum during remediation and construction phases of the development:

a. noise action plan

- *The noise action plan shall detail best practicable means to control the noise from the site's development and take account of the guidance contained in the* ***Guide to noise and vibration control on construction and open sites - BS 5228: Parts I & II: 1997.*** *The contents of the plan shall be approved by the Local Planning Authority prior to any works commencing on the site and the operations shall be undertaken in complete accordance with the approved scheme.*

The report shall:

- *identify noise reduction measures for individual items of plant and machinery, including the use of plant and machinery with low noise output and the proposed location of mobile plant e.g. generators, crushers; (the location of stock-piled material may be useful in screening potentially noise-sensitive premises from noise from the crusher)*
- *identify where the provision of acoustic shields, barriers or enclosures are necessary to safeguard the amenity of local residents;*
- *state the proposed hours of work (normally 08:00 - 18:00 Mondays to Fridays and 08:00 - 13:00 on Saturdays, with no Sunday or Bank Holiday working) which shall include all activities on site including deliveries;*
- *detail the site access route(s) for vehicles and the estimated number of vehicle movements per day; and*
- *state the estimated duration of the remediation and construction of the site.*

Noise measurements shall also be appropriate if the applicant wishes to demonstrate that:

- *the operations on site will not cause the LAeq, 1hr at the nearest noise-sensitive property to rise above 55dB LAeq,1hr (the equivalent continuous A-weighted sound pressure level);*
- *or where, given very high or low background noise levels, the operations on site will not cause the LAeq, 1hr at the nearest noise-sensitive property to give rise to an increase of 10dB or more over the background noise.*
- *The times and dates of any monitoring to determine background and the location of the monitoring sites shall be agreed with the Local Planning Authority prior to any works commencing on the site.*

2. Piling shall only be undertaken between the hours of 10:00 – 12:00 and 14:00 – 16:00 Monday – Fridays

Please note: *Any crusher used shall be under permit for processes requiring Pollution Prevention Control, as required by the Environmental Protection Act 1990.*

Appendix 3

Calculations of Traffic Noise

2009 Traffic on the Wombwell Bypass Affecting Littlefield Lane Position 1

16 Hour Flows for 2009

	Total	% HGV	HGV	Non HGV
Measured 2006	18553	10.0	1855	16698
Estimated 2009	19406	10.0	1941	17465
Percentage Increase	4.6	0.0	4.6	4.6
School only	1584	4.6	73	1511
Total with School	20990	9.6	2013	18977

Measured Noise Level	64.0 dB		
Estimated in 2009	64.2 dB		
Speed without School	40 mph =		67 km/h
Speed with School	40 mph =		67 km/h
2009 Without School			
Basic Noise Level	62.7 dB		
Correction for Speed and % HGV	1.5 dB		
Resultant	64.2 This should equal the estimated figure for 2009		
2009 School Only			
Basic Noise Level (dB)	51.8 dB		
Correction for Speed and % HGV	0.4 dB		
Resultant	52.2 dB		
2009 Total With School			
Basic Noise Level (dB)	63.0 dB		
Correction for Speed and % HGV	1.5 dB		
Resultant	64.5 dB		
Increase			
Basic Noise Level (dB)	0.3 dB		
Correction for Speed and % HGV	-0.1 dB		
Resultant	0.3 dB		

2017 Traffic on the Wombwell Bypass Affecting Littlefield Lane Position 1

16 Hour Flows for 2017

	Total	% HGV	HGV	Non HGV
Measured 2006	18553	10.0	1855	16698
Estimated 2017	21800	10.0	2180	19620
Percentage Increase	17.5	0.0	17.5	17.5
School only	1584	4.6	73	1511
Total with School	23384	9.6	2253	21131

Measured Noise Level	64.0 dB		
Estimated in 2017	64.7 dB		
Speed without School	40 mph =		67 km/h
Speed with School	40 mph =		67 km/h
2017 Without School			
Basic Noise Level	63.2 dB		
Correction for Speed and % HGV	1.5 dB		
Resultant	64.7 This should equal the estimated figure for 2017		
2017 School Only			
Basic Noise Level (dB)	51.8 dB		
Correction for Speed and % HGV	0.4 dB		
Resultant	52.2 dB		
2017 Total With School			
Basic Noise Level (dB)	63.5 dB		
Correction for Speed and % HGV	1.5 dB		
Resultant	64.9 dB		
Increase			
Basic Noise Level (dB)	0.3 dB		
Correction for Speed and % HGV	-0.1 dB		
Resultant	0.2 dB		

2009 Traffic on the Wombwell Bypass Affecting Littlefield Lane Position 2

16 Hour Flows for 2009

	Total	% HGV	HGV	Non HGV
Measured 2006	18553	10.0	1855	16698
Estimated 2009	19406	10.0	1941	17465
Percentage Increase	4.6	0.0	4.6	4.6
School only*	3168	4.6	146	3022
Total with School	22574	9.2	2086	20488

Measured Noise Level	48.0 dB		
Estimated in 2009	48.2 dB		
Speed without School	40 mph =		67 km/h
Speed with School	40 mph =		67 km/h
2009 Without School			
Basic Noise Level	46.7 dB		
Correction for Speed and % HGV	1.5 dB		
Resultant	48.2 This should equal the estimated figure for 2009		
2009 School Only			
Basic Noise Level (dB)	38.8 dB		
Correction for Speed and % HGV	0.4 dB		
Resultant	39.2 dB		
2009 Total With School			
Basic Noise Level (dB)	47.3 dB		
Correction for Speed and % HGV	1.4 dB		
Resultant	48.7 dB		
Increase			
Basic Noise Level (dB)	0.7 dB		
Correction for Speed and % HGV	-0.1 dB		
Resultant	0.5 dB		

2017 Traffic on the Wombwell Bypass Affecting Littlefield Lane Position 2

16 Hour Flows for 2017

	Total	% HGV	HGV	Non HGV
Measured 2006	18553	10.0	1855	16698
Estimated 2017	21800	10.0	2180	19620
Percentage Increase	17.5	0.0	17.5	17.5
School only*	3168	4.6	146	3022
Total with School	24968	9.3	2326	22642

Measured Noise Level	48.0 dB		
Estimated in 2017	48.7 dB		
Speed without School	40 mph =		67 km/h
Speed with School	40 mph =		67 km/h
2017 Without School			
Basic Noise Level	47.2 dB		
Correction for Speed and % HGV	1.5 dB		
Resultant	48.7 This should equal the estimated figure for 2017		
2017 School Only			
Basic Noise Level (dB)	38.8 dB		
Correction for Speed and % HGV	0.4 dB		
Resultant	39.2 dB		
2017 Total With School			
Basic Noise Level (dB)	47.8 dB		
Correction for Speed and % HGV	1.4 dB		
Resultant	49.2 dB		
Increase			
Basic Noise Level (dB)	0.6 dB		
Correction for Speed and % HGV	-0.1 dB		
Resultant	0.5 dB		

* note that the school traffic at this position is double as it assumes that all by pass traffic will use the access road, effectively passing the position twice, each time at a similar distance

Key Assumptions :

Existing 16 hour noise climate is represented reasonably well by daytime measured levels
100% of the school traffic is additional to the existing traffic
100% of school traffic goes past the prediction points
100% of school traffic uses the access road
Access road traffic is at 40 mph
All traffic is at the same speed
Some allowance should be made for school traffic accellerating away.