APPENDIX FOUR – A1 /M1 LINK ROAD

Project:	**Aberford Masterplan**	Job No:	**60188363**
Subject:	**Noise Management Section of Aberford Masterplan**		
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Introduction

This section of the Masterplan discusses existing noise issues and considers what could be done to help reduce noise levels across Aberford and surrounding area.

Aberford's location, just to the west of the A1(M) means that the village, and particularly those properties closest to the A1(M), will be exposed to higher levels of noise than would typically be expected for a generally rural area. As would be expected, noise levels in the village are dominated by road traffic noise, in particular from the A1 (M). Traffic travelling through the village, along Main Street will also contribute to the ambient noise environment.

The Aberford and District Parish Plan identified noise as a problem throughout the village due to the proximity of the A1 and M1. The Aberford and District Parish Plant states '*This has been worsened considerably in recent years since the opening of the A1/M1 link road and consequent widening of the" by-pass" from A1(M)*'. The Review of the Aberford and District Parish Plan 2003 reiterated this view.

A key objective of the Aberford and District Parish Plan is to reduce the impact of the A1 (M) link road upon the village.

Methodology

A desk based assessment have been undertaken to identify the noise issues affecting the village of Aberford and surrounding areas. No noise monitoring or site visits have been undertaken. Using the information contained within the Aberford and District Parish Plan, Review of Aberford and District Plan 2003, aerial photographs, Noise Maps for Major Roads (source: Defra) and traffic flow data for A1/M1 and Main Road the potential noise issues have been identified. Possible mitigation measures to reduce the noise impact and recommendations for further studies have been made.

Appendix A gives some information about Noise Perception and Terminology.

Existing Noise Levels Around the Aberford and District Parish Council Study Area

No noise monitoring has been undertaken as part of this assessment; however road traffic noise is the dominant noise source across the village.

Due to the village's location next to the A1(M), noise is of potential concern for the majority of the residents of the village. The residential properties closest to the motorway, to the north of the village centre are likely to experience higher noise, in particular noise sensitive receptors on the following roads:

- Old Great North Road (the short section north of Haverthwaites Drive);
- Haverthwaites Drive;
- Greystone Park;
- Greystones Close;
- The Dale;
- Pinfold Rise.
- Rein Court
- Field Lane and
- Hayton Wood View

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There are also a small number of properties on the eastern side of the A1 (M), near to the south bound slip from the A64 (from York).

Properties which face Main Street are also likely to be affected by road traffic noise, but the impact will not be as great as from A1/M1

Noise maps are available on DEFRA website showing noise from major roads and major rail outside of the major agglomerations. The one for the M1/A1 link road shows that Aberford and surrounding area is subjected to high levels of ambient noise.

Noise Model

Using traffic data for the A1(M) between Junctions 43 and 44 and Main Street, a basic noise model has been produced to predict the noise levels across Aberford and the surrounding areas. The basic noise does not take into account any screening offered by the natural topography, cuttings in the road or buildings, therefore is a worst case scenario. Figure 1 below shows the noise contours from the model.

Figure 1 Noise Contour Map for Existing Traffic Flows

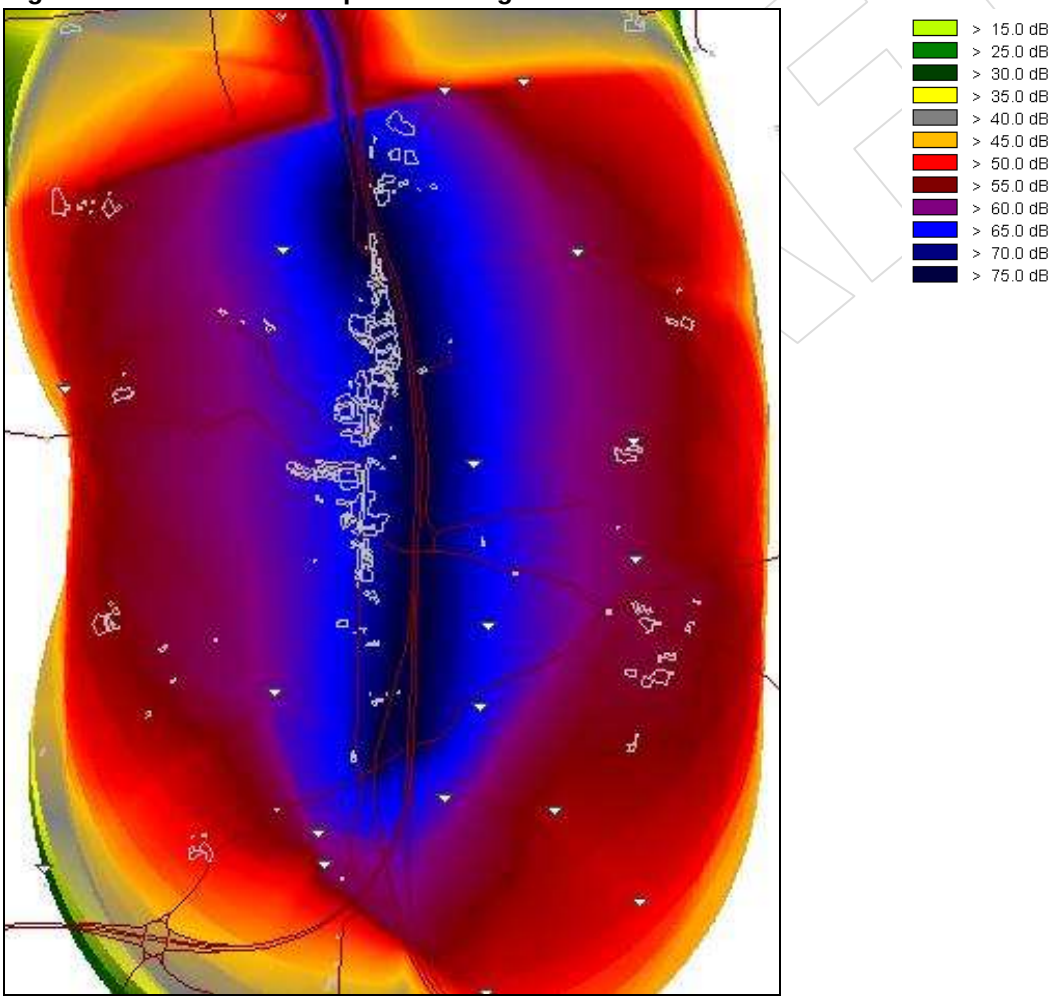

Figure 1 shows that the road traffic noise from the A1/M1 significantly affects the village of Aberford. Noise sensitive receptors closest to the motorway, experience the highest noise levels.

Future Noise Levels

Growth factors have been applied to the 2010 traffic flows for A1/M1 and Main Street to predict the future traffic flows. The Basic Noise Level (BNL) have been calculated for the A1/M1 and Main Street for 2010 and 2015 and 2020. Table 1 shows the difference in the BNLs between 2010 and 2015 and 2010 and 2020.

Table 1: Difference in BNL in Future Years

Road	Change in BNL (dB)	
	2010-2015	2010-2020
A1/M1	0.6	1.0
Main Street	0.5	0.9

Table 2 shows in the future years there will be a slight increase in noise levels due to increased traffic flows. It is generally accepted that changes in road traffic noise levels of up to 3 dB are not widely perceptible, confirmed in Department for Transport document Transport Analysis Guidance (TAG) Unit 3.3.2 (Department for Transport, 2007).

> *"For freely flowing traffic, a difference of about 3 dB in noise level is required before there is a statistically significant change in the average assessment of nuisance. The assessment of nuisance however could still be affected even if there is only a 1 dB change in the noise level if the change is associated with changes in the view of traffic, or if the change occurs suddenly."*

Possible Mitigation

A key objective of the Aberford and District Parish Plan is to reduce the impact of the A1/M1 upon Aberford.

The review of Aberford and District Parish Plan states that low noise surfacing has not been used to replace the concrete road to the south of the village. It also states that *'The village was promised that the old A1 North carriageway would be used to build a noise reduction mound but errors by the Highway Authority meant that not enough land was taken so the old northbound carriageway had to be used as a feeder lane for the now upgraded A1. An intermittent two metre high wooden fence was erected instead.'*

The use of a 'low noise' surface is now widespread in the UK for new or improved road schemes following substantial advances in wear and cost performance over the last 20 years, CRTN allows a noise reduction of 3.5 dB(A) (compared to a standard hot rolled asphalt surface) for a 'low noise' surface. In practice the benefits, particularly in the years while the surface is relatively new, can be greater with materials now in use.

There is currently wooden fencing, approximately 6ft high, running in separate sections along the east side of Aberford. As can be seen from **Figure 1**, this mitigation is proving inadequate. Consequently a continuous noise barriers or bund could be employed to attenuate road traffic noise levels for properties closest to the motorway. Noise barriers typically reduce noise levels by 5-10 dB, depending on a range of factors including barrier height and location and local topography. Barriers are of particular benefit to receptors nearest the noise source or receptors which are elevated above the noise source. They are of lesser benefit when the noise source is already screened by the landform or by other properties.

A detailed noise assessment and modelling of the noise from the Motorway would need to be undertaken to determine the exact location, height and performance of the barrier.

Where properties are exposed to high levels of road traffic noise, acoustic glazing can be used to reduce the level of noise inside. Alternative ventilation methods would also need to be considered so that windows can be kept closed.

Recommendations for further studies

It is strongly recommended at discussions are held with the Highways Agency and Leeds City Council to arrange for noise monitoring to be undertaken to determine the existing noise levels affecting the village of Aberford.

It is also recommended that detailed noise modelling is undertaken which will take into consideration the screening offered by topography and existing buildings. The noise model can be used to assess the effectiveness of various potential mitigation measures including noise barriers.

Appendix A Noise Perception and Terminology

Noise Perception and Terminology

Between the quietest audible sound and the loudest tolerable sound, there is a ten million to one ratio in sound pressure (measured in Pascal's, Pa). Because of this wide range, a noise level scale based on logarithms is used in noise measurement called the decibel (dB) scale. Audibility of sound covers a range of approximately 0 to 140 dB.

The human auditory system does not respond uniformly to sound across the detectable frequency range and consequently instrumentation used to measure noise is weighted to represent the performance of the ear. This is known as the 'A weighting' and annotated as dB L_A.

The effects of noise on man can be divided into two categories, physiological damage and annoyance. The physiological aspects of noise include hearing damage, sleep disturbance, and stress effects; whilst annoyance includes speech and activity interference and interference with well-being. able 2 shows typical sound levels experienced in common environments.

Table 2: Sound Pressure Level in dB L_A. for Common Situations

Typical Noise Level, dB L_A.	Example
0	Threshold of hearing
30	Rural area at night, still air
40	Public library Refrigerator humming at 2 m
50	Quiet office, no machinery Boiling kettle at 0.5 m
60	Normal conversation
70	Telephone ringing at 2 m Vacuum cleaner at 3 m
80	General factory noise level
90	Heavy goods vehicle from pavement Powered lawnmower, operator's ear
100	Pneumatic drill at 5 m
120	Discotheque – 1 m in front of loudspeaker
140	Threshold of pain

Road Traffic Noise

In terms of noise, road traffic noise can be separated into two components. The first is generated by the engine, exhaust system and transmission and is the dominant noise source when traffic is not freely flowing. This is particularly apparent from heavy vehicles, when accelerating, braking or changing of gears, and this contributes a significant proportion of low frequency noise. The second noise source component is generated from the interaction of tyres with the road surface. This is the dominant noise source under free flow traffic conditions at moderate to high road speeds and contributes a significant proportion of higher frequency noise.

The sound from a stream of traffic at a reception point is an aggregation of noise from each of a number of vehicles at various distances. The factors that influence the noise level experienced by any listener include the volume of traffic, vehicle speed, the composition of the traffic (i.e. the percentage of heavy goods vehicles (HGVs)), the gradient and the surface characteristics of the carriageway. In addition to the aforementioned variables there is the actual propagation of the sound from the source to the receiver to consider. The propagation is affected by characteristics, such as the distance of the receptor from the source, the topography and characteristics of the ground between the source and receptor, the presence of any screening or barrier effects, and the wind strength and direction.

Measurement of Road Traffic Noise

Noise from traffic on a road will change as traffic flows alter during the day and will also fluctuate within shorter time periods as vehicles pass the reception point. In order to compare different road traffic scenarios it is necessary to use a noise index that provides a single value that represents the predicted road traffic noise level. The index used in the UK for road traffic noise is $L_{A10\ (18\ hour),}$ which is the arithmetic mean value of the 'A' weighted noise levels, which are exceeded for 10% of the time in each of the 18 one-hour periods between 06:00 hours and 00.00 hours (midnight). A reasonably good correlation has been shown to exist between traffic noise levels expressed in $L_{A10\ (18\ hour)}$ and residents' dissatisfaction with the noise over a wide range of values. In general, environmental noise is described in terms of the equivalent continuous sound pressure level L_{Aeq}.

Prediction of Road Traffic Noise

The Department of Transport, Welsh Office, document "Calculation of Road Traffic Noise" (CRTN) provides standard methodologies for measuring and predicting $L_{A10,18h}$ road traffic noise levels. The CRTN methodology can be used to predict the Basic Noise Level (BNL) generated by a stream of traffic based on traffic flow, percentage of HGV, traffic speed, road gradient and road surface type

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Introduction

This section of the Masterplan discusses existing air quality and considers what could be done to better understand, and potentially improve, the situation.

Aberford's location, just to the west of the A1(M) means that the village, and particularly those properties closest to the A1(M), will be exposed to higher pollutant concentrations than would ordinarily be expected for a largely rural area. Air quality in the village is dominated by the proximity of the A1(M); pollutants emitted from vehicles travelling through the village will most likely be minor in comparison. Outside of the village there are only a small number of properties near to the A1(M), on the eastern side, within approximately 50 m.

The pollutants of concern with regard to road vehicles are primarily nitrogen dioxide (NO_2) and fine particulate matter (PM_{10}/$PM_{2.5}$ (particulate matter of under 10 and 2.5 µm in diameter respectively)). These pollutants are known to have adverse health impacts and consequently there are national objectives and EU Limit Values in force in the UK.

The Aberford and District Parish Plan[1] identified air quality as a concern, and the Review of the Aberford and District Parish Plan 2003[2] reiterated this view.

Existing Air Quality

Due to the village's location next to the A1(M), air quality is of potential concern for some of the inhabitants of the village. The area of concern is likely to be restricted to the properties closest to the motorway, to the north of the village centre, on the following roads:

- Old Great North Road (the short section north of Haverthwaites Drive);
- Haverthwaites Drive;
- Greystone Park;
- Greystones Close;
- The Dale; and
- Pinfold Rise.

There are also a small number of properties on the eastern side of the A1 (M), near to the south bound slip from the A64 (from York).

Local Air Quality Management

Leeds City Council (LCC) are responsible for local air quality management (LAQM) within Aberford. Elsewhere within the local authority area LCC have declared air quality management areas (AQMAs), due to monitored concentrations of NO_2 being in excess of the mandatory EU Limit Value of 40 µg/m^3. However, based on their reviews of local air quality (the most recent being the 2010 Air Quality Progress Report[3]) LCC have not declared Aberford or any nearby areas as an AQMA; air quality has not been raised as a concern in their reports. As discussed below, the Council have undertaken monitoring of NO_2 in the village in the past.

There is less concern regarding PM_{10}; no AQMAs have been declared for the pollutant.

Estimated Background Concentrations

Nationwide estimates of background pollutant concentrations are available on the Defra website[4]. Data are available for every one kilometre square in the UK. Data for the square centred on Aberford (downloaded 3 December 2010) are as follows:

- NO_2: 19.5 µg/m^3 in 2010 reducing to 14.3 µg/m^3 in 2015
- PM_{10}: 17.4 µg/m^3 in 2010 reducing to 16.5 µg/m^3 in 2015

These figures are well below the respective air quality objectives and EU Limit Values, nevertheless they are higher than would be expected for a rural area, due to the influence of the motorway. These figures are 'background' data and so are not representative of pollutant concentrations on a local scale (i.e. adjacent to the motorway).

Pollutant Monitoring

Aberford is located near the eastern boundary of Leeds City Council. Pollutant monitoring has been undertaken by LCC in Aberford, but no monitoring has been undertaken in the neighbouring district of Selby.

[1] Aberford and District Parish Council (2003), *The Aberford and District Parish Plan.*
[2] Aberford and District Parish Council (2009), *Review of the Aberford and District Parish Plan 2003*
[3] Leeds City Council (2010), *Air Quality Progress Report*
[4] http://laqm1.defra.gov.uk/review/tools/background.php

LCC undertook monitoring of PM_{10}, SO_2 (sulphur dioxide) and NO_2 using a continuous analyser between 28 July 2000 and 9 February 2001. The monitoring was undertaken on open land adjoining the bus turn-round area on Haverthwaites Drive, near to the A1. Whilst concentrations of PM_{10} and SO_2 were well within the relevant national objectives, the average NO_2 concentration was equal to the annual mean objective (40 µg/m^3)[5]. It is likely that concentrations have fallen since 2000/01 (as has been the case nationally), although no analysis has been undertaken of changes in traffic flow on the A1 since 2000/01, and the degree by which concentrations may have fallen is highly uncertain.

LCC undertook monitoring of NO_2 using passive diffusion tubes (less accurate but far less expensive than continuous monitoring) on Haverthwaites Drive in 2005 and 2006. Average values of 29 µg/m^3 and 28 µg/m^3 were recorded[6]. The exact location cannot be confirmed[7] and therefore it is possible that the site was not at a worst-case location (i.e. on a residential facade facing the A1(M)).

These data indicate that NO_2 concentrations at those properties closest to the A1(M) are unlikely to significantly exceed 40 µg/m^3. However it is not possible to rule out the possibility that NO_2 concentrations in excess of 40 µg/m^3 may be experienced at the facades of properties closest to the A1(M) (i.e. on Haverthwaites Drive).

The Highways Agency undertake NO_2 monitoring at several locations throughout England, near to motorways and trunk roads. However they do not undertake any monitoring near Aberford.

Local Factors

As discussed above the area of most concern is to the north of the village centre where the properties are closest to the motorway. It is important to note that the motorway is in a cutting at this point which is likely to alter the normal dispersion of pollutants. Another important point is that the motorway is on a fairly steep gradient, meaning that vehicle engines will be under constant load on the north bound carriageway. Lastly, the prevailing wind is from the west, and therefore pollutant concentrations are likely to be higher on the eastern side of the motorway than the west. There are few properties in close proximity to the motorway on its eastern side, the nearest approximately 35 m away. near to the south bound slip from the A64 (from York).

Discussion

Based on the available pollutant monitoring data, it is likely that the vast majority of the inhabitants of the village will be exposed to pollutant concentrations well below (less than 75% of) the NO_2 annual mean objective. Concentrations of PM_{10}, the other main pollutant of concern from vehicles, are very unlikely to be at risk of exceeding national or European objectives. At a relatively small number of residential properties (those facing the A1(M)), NO_2 concentrations may be higher, and there is a possibility that the annual mean objective may be exceeded. However, based on the available information this is deemed unlikely.

Nationally (and at a European level), there is currently uncertainty about the rate at which roadside NO_2 concentrations will decrease in future years. Nevertheless, for locations alongside largely free-flowing roads, concentrations of NO_2 are considered likely to decrease in future years.

Recommendations

There is still a degree of uncertainty regarding NO_2 concentrations at worst case locations (property facades facing the A1(M)) due to the uncertainty regarding the location of the diffusion tube monitoring undertaken in 2005/06, and the fact that almost five years have passed since then. The Highways Agency undertake monitoring nationwide near to motorways and Trunk Roads; given the risk of NO_2 concentrations in excess of mandatory EU NO_2 limits it would be appropriate for them to start monitoring at worst case locations facing the A1(M) in Aberford.

[5] e-mail communication with LCC Environmental Protection (8 December 2010)

[6] e-mail communication with LCC Environmental Protection (8 December 2010)

[7] The grid reference provided in LCC LAQM reports is suspected to be inaccurate, and the officer familiar with the location of the tube has subsequently left the Council.

Whilst LCC are responsible for air quality in Aberford, there is little they can do because the main source of air pollution is the A1(M), a Highways Agency road. There may also be few opportunities for the HA to improve air quality, other than to ensure they do not implement any scheme that causes at air quality to deteriorate. To better understand the existing air quality, it is therefore recommended that the HA extend their national monitoring network to include the A1(M) at Aberford.

Despite the contribution to air pollution from local traffic being most likely minor in comparison to motorway traffic, there are options that could be pursued to improve air quality within the village, such as:

- Car-sharing scheme (or similar): such a scheme could reduce traffic and hence emissions in the village.
- Public transport improvements: encouraging greater use of public transport will reduce private car movements through the village.
- Improved footpaths and pedestrian crossings: encouraging walking will reduce the use of cars for short journeys, when engines may be cold and will emit more pollutants.