

Littlehampton | Wick Site

Noise Assessment



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QM

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1 Introduction

1.1.1 WSP Acoustics has been appointed by Development Securities to undertake a noise assessment for the proposed redevelopment of the Wick Site at the junction of the A259 and Lyminster Road in Littlehampton to accompany a planning application.

1.1.2 The redevelopment proposals include:

- the demolition of the two existing warehouses (4,713m² GIA and 2,539m² GIA);
- a 4,744m² GIA foodstore plus associated car parking (approximately 270 spaces);
- refurbishment and external works to the existing office building (3,368m² GIA) and associated car parking (approximately 90 spaces); and
- a petrol filling station, associated with the food retailer.

1.1.3 The purpose of this assessment is to determine the potential noise impact of the proposed development on the surrounding area. An assessment of noise from heavy goods vehicle deliveries, fixed plant items associated with the food store, the office building, the petrol filling station and the use of the customer and office car parks have been assessed.

1.1.4 Information regarding the delivery schedule to the store and the operational road traffic movements on the surrounding roads have been provided and used to inform this assessment.

1.1.5 This report is arranged as follows:

- Section 2 a description of the location of the site, the significant noise sources in the area surrounding it and the existing and proposed site operations;
- Section 3 relevant standards and guidelines for the assessment of noise;
- Section 4 noise survey methodology and results;
- Section 5 an assessment of the existing noise climate and the potential impact of deliveries to the food store;
- Section 6 requirements for fixed plant items associated with the food store, petrol filling station and the office building;
- Section 7 an assessment of noise levels generated by the use of the customer and office car parks;
- Section 8 an assessment of operational road traffic noise impacts;
- Section 9 best practice measures; and
- Section 10 conclusions.

1.1.6 The report includes some technical terminology and so a glossary is provided as Appendix A at the back of the report.



2 Description of the Site

2.1 EXISTING SITE

2.1.1 The site is in the north-west of Littlehampton in West Sussex. It is bounded to the south by the A259, to the east by Lyminster Road, to the north by Courtwick Lane and to the west by the western area of The Wick Site which is of commercial use and remains operational. There is a roundabout to the south-east of the site where the A259 and Lyminster Road meet. Hawthorn Road is an internal road running parallel to the southern site boundary which is accessed from the roundabout.

2.1.2 The site currently comprises a disused office building in the north-eastern area and two further disused buildings of commercial/industrial use in the southern and western areas of the site and associated car parking.

2.1.3 The noise climate on the site is currently dominated by road traffic from both the A259 and Lyminster Road. Vehicle movements associated with the area of The Wick Site to the west of the proposed development area which remains operational is also audible at times on the site, albeit a low level of noise.

2.1.4 The noise-sensitive receptors closest to the site are located on Courtwick Lane to the north, Lyminster Road to the east and on Colebrook Road which is immediately to the south of the A259.

2.1.5 The site location and existing layout are shown in Appendix B.

2.2 PROPOSED SITE

2.2.1 The proposals include a Morrisons food store with a service yard on the western side, a customer car parking area, a petrol filling station in the south-eastern corner and the refurbishment of the existing office building in the north-eastern area for which the car park is adjacent to the northern site boundary..

2.2.2 The site will be accessed (both entered and exited) by customers and heavy goods vehicles (HGV) making deliveries to the food store via the roundabout to the south-east of the site with HGVs turning left onto Hawthorn Road and customers bearing right into the car park. There will be no vehicular access to the food store from Courtwick Lane. However, the offices will be accessed from Courtwick Lane.

2.2.3 The timing of deliveries to the store is to still be discussed and agreed with Arun District Council (ADC). However, for the purpose of this assessment it has been assumed that deliveries could occur between 06:00 and 22:00 hours with approximately 12 HGVs scheduled per day. This is considered to represent a robust analysis.

2.2.4 It has been assumed that each delivery will take approximately 30 to 45 minutes and that the HGV's refrigeration units will be switched off prior to the vehicle accessing the site.



3 Assessment Methodology

3.1 CONSULTATION WITH ARUN DISTRICT COUNCIL

3.1.1 The environmental health department of Arun District Council (ADC) has been consulted during the undertaking of this assessment.

3.1.2 It was determined that for fixed plant items an assessment in accordance with British Standard 4142: 1997 *Method for rating industrial noise affecting mixed residential and industrial areas* should be undertaken with the rating level from fixed plant items being below the existing background noise level at the dwellings closest to the site. However, ADC did not state by how much the rating level should be below the background.

3.1.3 It was agreed that all other noise sources should be assessed against the existing ambient noise levels.

3.1.4 A summary of the relevant British Standards and guidance documents is shown below.

3.2 BS 4142: 1997 METHOD FOR RATING INDUSTRIAL NOISE AFFECTING MIXED RESIDENTIAL AND INDUSTRIAL AREAS

3.2.1 When assessing the potential noise impact from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, it is appropriate to refer to British Standard 4142:1997 *Method for rating industrial noise affecting mixed residential and industrial areas*.

3.2.2 The procedure contained in BS 4142 for assessing the likelihood of complaint is to compare the measured or predicted noise level from the source in question, known as the specific noise level ($L_{Aeq,T}$), immediately outside the receiver, with the background noise level ($L_{A90,T}$) that exists in the absence of the source in question.

3.2.3 Where the noise contains a "*distinguishable discrete continuous note (whine, hiss, screech, hum etc.)*" or if there are "*distinct impulses (bangs, clicks, clatters or thumps)*", or if "*the noise is irregular enough to attract attention*", then a correction of +5 dB is added to the specific noise level to obtain the rating level ($L_{Ar,T}$).

3.2.4 The likelihood of the noise giving rise to complaints is assessed by subtracting the background noise level from the rating noise level. BS 4142 states: "*A difference of around +10 dB or more indicates that complaints are likely. A difference of around +5 dB is of marginal significance. If the rating level is more than 10 dB below the measured background then this is a positive indication that complaints are unlikely.*"

3.2.5 BS 4142 is not acceptable for use when the background and rating levels are both very low. The standard states:

"For the purpose of this standard, background noise levels below about 30 dB and rating levels below about 35 dB are considered to be very low."

3.2.6 As specified by ADC, a rating level below the existing background noise levels is required for fixed plant items.

3.3 IOA/IEMA DRAFT GUIDELINES FOR NOISE IMPACT ASSESSMENT

3.3.1 Although the Institute of Environmental Management Assessment (IEMA) and Institute of Acoustics (IOA) Working Party guidelines are still only a consultation draft at this stage, they are of some assistance in this exercise. They provide an example of how changes in noise level can be categorised by significance. This example is included in Table 3.1 below.



Table 3.1 Example of Categorising the Significance of the Basic Noise Change

Noise Change (dB)	Category
0	No impact
0.1 - 2.9	Slight impact
3.0 - 4.9	Moderate impact
5.0 - 9.9	Substantial impact
10.0 or more	Severe impact

3.3.2 The draft guidelines state that the information contained in Table 3.1 is an example of how basic noise changes may be categorised and that in any assessment, the noise level threshold and significance statement should be determined by the assessor, based upon the specific evidence and likely subjective response to the noise.

3.3.3 It is considered that the above table is suitable for use in the assessment of delivery noise and car park noise and that a change in ambient noise levels of up to 3 dB is acceptable.



4 Baseline Noise Survey

4.1 METHODOLOGY

4.1.1 WSP Acoustics has undertaken a noise survey at the site from Thursday 19th May to Tuesday 24th May 2011 to establish representative daytime and night-time noise levels affecting the site.

4.1.2 Measurements were undertaken at two locations on the site, namely:

- Position 1: adjacent to the northern site boundary with Courtwick Lane; and
- Position 2: adjacent to the eastern site boundary with Lyminster Road.

4.1.3 At both positions the microphone was measuring free-field noise levels and was at a height of approximately 1.3 metres above the ground. The measurement positions are shown in Appendix B.

4.1.4 All equipment was calibrated at the start and end of the measurements and no significant drift in calibration was found to have occurred. A list of equipment used is given in Appendix C.

4.1.5 The noise levels measured at Position 1 are considered representative of the noise climate at the dwellings on Courtwick Lane and the noise levels measured at Position 2 are considered representative of the noise climate at dwellings on Lyminster Road and Colebrook Road.

4.2 RESULTS

4.2.1 The data gathered during the measurement periods have been analysed to determine the noise indices of $L_{Aeq,T}$, $L_{A90,T}$, $L_{A10,T}$, and L_{Amax} (fast response).

4.2.2 Table 4.1 below summarises the daytime (07:00 to 23:00 hours) and night-time (23:00 to 07:00 hours) noise levels. Appendix D shows the tabulated and graphical hourly values.

Table 4.1 Summary of Measured Levels, dB, Free-field

Position	Time Period	L_{Aeq}	L_{A10}	L_{A90}	L_{AFmax}
1	Daytime	59.8 – 61.6	60.5 – 63.0	41.9 – 48.4	91.7
	Night-time	52.8 – 53.6	46.9 – 49.7	31.5 – 37.9	84.3
2	Daytime	64.3 – 65.3	67.3 – 68.1	50.6 – 54.4	101.1
	Night-time	58.0 – 59.6	57.1 – 60.6	32.4 – 41.8	88.1

4.2.3 The noise climate at both positions consisted of road traffic from Lyminster Road and the A259. Position 1 was screened from the road traffic on Lyminster Road and at a distance from the A259 therefore measured noise levels are lower than at Position 2.

4.3 WEATHER CONDITIONS

4.3.1 The weather conditions during the survey were suitable for noise measurements, being dry with little or no wind.



5 Delivery Noise Assessment

5.1 EXISTING NOISE CLIMATE

5.1.1 From the data in Table 4.1 and the tabulated and graphical measurement data in Appendix D it can be seen that the existing noise climate is typical for a suburban environment.

5.1.2 At Position 1 the L_{AFmax} noise levels remain relatively high at all times. During the night-time (23:00 to 07:00 hours) the levels generally range from approximately 73 to 84 dB L_{Amax} . The daytime $L_{Aeq,1hour}$ values range from approximately 55 to 65 dB and during the night-time from approximately 44 to 55 dB.

5.1.3 At Position 2 the noise levels are generally higher than at Position 1 due to the eastern area of the site being more exposed to road traffic noise. The night-time L_{AFmax} noise levels remain relatively high ranging from approximately 73 to 86 dB. The daytime $L_{Aeq,1hour}$ values range from approximately 59 to 68 dB and during the night-time from approximately 49 to 65 dB.

5.1.4 As explained previously, deliveries could start from 06:00 hours (i.e. one hour prior to the start of the daytime period) and during this one hour it is appropriate to assess the L_{Amax} noise levels generated by HGV deliveries. This assessment has taken account of the existing L_{Amax} noise levels.

5.2 POTENTIAL IMPACT OF HGV DELIVERIES

5.2.1 Currently there are no British Standards or guidelines for calculating or assessing noise specifically from service yards/deliveries. However, noise levels can be calculated using standard acoustic propagation models and based on measurement data obtained by WSP from other similar facilities.

5.2.2 As detailed in Section 2, there could be 12 HGV deliveries to the site each day between 06:00 and 22:00 hours.

5.2.3 In calculating the noise level from a delivery, a number of component activities have been considered, as follows:

- the HGV arriving at the site and manoeuvring into the unloading position;
- unloading the goods from the HGV, which are transported in roll cages;
- the roll cages being transported from the HGV to the store (i.e. across the service yard area);
- loading empty cages onto the HGV; and
- the HGV departing.

5.2.4 In order to present a worst-case assessment, it has been assumed that roll cages will be transported to the store across the service yard, rather than the HGV being docked and unloaded within an enclosed environment.

5.2.5 The calculations also include gaps between the noise-generating activities for example where the driver/staff are inside the building.

5.2.6 The closest noise-sensitive receptors to the service yard area are the dwellings on Courtwick Lane. However, these dwellings will be screened from the unloading activities and from Hawthorn Road, the internal access road. Although the dwellings on Colebrook Road to the south of the A259 are at a greater distance to the service yard, they are considered to be the most exposed to the HGV delivery activities. Delivery noise levels have therefore been predicted at the dwellings on Colebrook Road.



5.2.7 In undertaking the calculations, it has been assumed that no more than two deliveries would occur in any one hour period.

5.2.8 With one delivery per hour the predicted noise levels at the dwellings on Colebrook Road are 44.7 dB $L_{Aeq,1hour}$ and 69.1 dB L_{AFmax} . For two deliveries in a one hour period, the noise level would increase to 47.7 dB $L_{Aeq,1hour}$.

5.2.9 To determine the potential increase in ambient noise levels during deliveries, it is appropriate to logarithmically add the delivery noise level and the existing one hour ambient noise level. In order to present a worst-case assessment the lowest measured one hour daytime (07:00 to 23:00 hours) ambient noise level (L_{Aeq}) and the lowest one hour ambient noise level measured between 06:00 and 07:00 hours have been used.

5.2.10 The noise levels measured at Position 2 are considered representative of the noise climate at Colebrook Road. However, the noise levels measured at Position 2 between 06:00 and 07:00 hours are high in comparison to the lowest one hour daytime noise level. As it is considered a noise-sensitive time of the day, it is appropriate to use the lowest measured noise level obtained during this period at Position 1 which is 53.7 dB $L_{Aeq,1hour}$.

5.2.11 The results of the assessments are shown in Table 5.1 and 5.2 below for the daytime and 06:00 to 07:00 hours period respectively.

Table 5.1 Daytime Delivery Noise Assessment at Colebrook Road, dB, Free-field

No of Deliveries/hour	Predicted Delivery Noise Level $L_{Aeq,1hour}$	Existing Ambient Noise Level $L_{Aeq,1hour}$	Future Noise Level	Difference
1	44.7	59.2	59.4	+0.2
2	47.7		59.5	+0.3

Table 5.2 Delivery Noise Assessment 06:00 to 07:00 Hours at Colebrook Road, dB, Free-field

No of Deliveries/hour	Predicted Delivery Noise Level $L_{Aeq,1hour}$	Existing Ambient Noise Level $L_{Aeq,1hour}$	Future Noise Level	Difference
1	44.7	53.7	54.2	+0.5
2	47.7		54.7	+1.0

5.2.12 It can be seen from Table 5.1 that the impact at Colebrook Road due to daytime deliveries would be +0.2 dB for one delivery and +0.3 dB for two deliveries. During the 06:00 to 07:00 hours period the impact would be +0.5 dB for one delivery and +1.0 dB for two deliveries. All impacts are predicted to be 'slight' (see Table 3.1).

5.2.13 A free-field L_{Amax} noise level of 69.1 dB has been predicted at Colebrook Road during deliveries and is due to the HGV arriving at the site. It can be seen from the tables and graph in Appendix D that at Position 2 the existing L_{Amax} levels are in the region of 80 dB from 06:00 to 07:00 hours and are therefore already in excess of the predicted level and that which the World Health Organisation (WHO) considers as the upper limit in terms of preventing sleep disturbance. Furthermore, the existing L_{Amax} noise levels are likely to be attributable to vehicle movements on surrounding roads therefore HGV noise is likely to form part of the existing noise climate during this period. The L_{Amax} levels from deliveries are therefore unlikely to cause an unacceptable impact at the dwellings on Colebrook Road.

5.2.14 No mitigation measures are considered necessary.

6 Fixed Plant Items

6.1.1 The proposals may include external fixed plant items associated with the food store, petrol filling station and/or the office building such as air conditioning units or jet washing facilities. At this stage, there are no details such as type and noise emission level for these items of plant. It is therefore appropriate to set an overall plant noise limit in accordance with British Standard 4142: 1997 *Method for rating industrial noise affecting mixed residential and industrial areas* and the requirements of ADC.

6.1.2 The measured background noise levels (L_{A90}) at Position 1 adjacent to the northern site boundary have been analysed to obtain the lowest one hour daytime (07:00 to 23:00 hours) level and the lowest five minute night-time (23:00 to 07:00 hours) noise level. The same has been done for the noise levels measured at Position 2 adjacent to the eastern site boundary.

6.1.3 These levels are set out in Table 6.1 below.

Table 6.1 Lowest Measured Background Noise Levels, dB,

Position	Time Period	Lowest L_{A90}
1 – North of site	Daytime (07:00 to 23:00 hours)	36
	Night-time (23:00 to 07:00 hours)	23
2 – East of site	Daytime (07:00 to 23:00 hours)	39
	Night-time (23:00 to 07:00 hours)	23

6.1.4 It can be seen that the night-time background noise levels at both positions are below 30 dB and that the noise limit (in the form of a rating level) would therefore be below 20 dB. As both levels are so low, BS 4142 is not appropriate for use in determining night-time noise limits (see Section 3).

6.1.5 Table 6.2 below sets out the daytime noise limits which have been derived in accordance with BS 4142.

Table 6.2 Daytime Plant Noise Limits, dB,

Position	Plant Noise Limit $L_{Ar,T}$
Dwellings on Courtwick Lane	26
Dwellings on Lyminster Road and Colebrook Road	29

6.1.6 The above plant noise limits are set as a rating level which may include a +5 dB correction where the noise contains a "*distinguishable discrete continuous note (whine, hiss, screech, hum etc.)*" or if there are "*distinct impulses (bangs, clicks, clatters or thumps)*", or if "*the noise is irregular enough to attract attention*".

6.1.7 Table 6.3 below shows the night-time noise limits which have been derived considering the measured background noise levels. Note that these limits are set in terms of a L_{Aeq} level, where the acoustic correction described in the paragraph above does not apply.



7 Car Park Noise Levels

7.1.1 Noise levels from the use of the food store customer car park and the office car park have been calculated over a one hour period for comparison with the existing ambient noise levels.

7.1.2 In calculating noise from the use of the car park, a number of component activities have been considered, as follows:

- vehicle manoeuvring into car parking space;
- car door slam – driver;
- car door slam – passenger; and
- vehicle starting up and pulling away.

USE OF THE FOOD STORE CAR PARK

7.1.3 In order to provide a worst-case indication of the noise levels that may be generated, the highest peak hour flow (Saturday 11:30 to 12:30 hours) of 757 vehicles has been used.

7.1.4 The closest noise-sensitive receptors to the main car parking area are the dwellings on Lyminster Road to the east of the site which are in the region of 40 metres away. A noise level of 53.5 dB $L_{Aeq,1hour}$ has been predicted at these dwellings.

7.1.5 The ambient noise level at Position 2 during this time is 64.9 dB $L_{Aeq,1hour}$.

7.1.6 The impact at the dwellings on Lyminster Road as a result of the use of the customer car park would therefore be +0.3 dB, resulting in a slight impact.

USE OF THE OFFICE CAR PARK

7.1.7 During the peak hour flow (Friday 17:00 to 18:00 hours) 59 vehicles will access the office car park via Courtwick Lane generating a noise level of 48.4 dB at the closest dwellings.

7.1.8 The ambient noise level measured at Position 1 during this time is 61.1 dB $L_{Aeq,1hour}$.

7.1.9 The impact at the dwellings on Courtwick Lane as a result of the use of the office car park would therefore be +0.2 dB, resulting in a slight impact.

7.1.10 No mitigation measures are considered necessary.

8 Operational Road Traffic Noise

8.1.1 This assessment considers the potential impact of the proposed development on the wider road network. The assessment has been carried out for the year 2016 and considers the surrounding roads used by develop-related traffic.

8.1.2 The assessment has been undertaken using traffic flow data provided by WSP Property and Development. These data include flows associated with two committed developments – a residential development at the western end of Courtwick Lane and a mixed use urban extension to the north of Littlehampton. The latter relies on a new rail bridge and bypass which results in a reduction in traffic flows on parts of the surrounding road network due to traffic rerouting.

8.1.3 The Basic Noise Level (BNL) has been calculated in accordance with the former Department of Transport/Welsh Office technical memorandum Calculation of Road Traffic Noise (CRTN).

8.1.4 Table 8.1 below presents the assessment showing the difference between the 'with' and 'without' development traffic noise levels therefore showing the effects attributable to the proposed development only.

Table 8.1 Operational Road Traffic Noise Assessment, dB L_{A10,18hour}

Road	2016 Predicted Noise Levels		Difference
	Without Development	With Development	
A259	68.6	69.1	+0.5
A284	64.9	64.1	-0.8
Wick Street	63.4	63.9	+0.5
Worthing Road	67.4	68.0	+0.6
Courtwick Lane	56.5	57.3	+0.8

8.1.5 It can be seen that, with the exception of the A284, the operational road traffic impacts are predicted to be slight and in each instance will be no greater than 0.8 dB. There will be a reduction in road traffic noise levels on the A284 of 0.8 dB.

8.1.6 The reduction in noise levels on the A284 are a result of traffic being rerouted due to the urban extension to the north of Littlehampton.



9 Best Practice Measures

9.1.1 It is considered appropriate to set out best practice measures to minimise the likelihood of complaint and for Morrisons to be a good neighbour. The measures below should be followed, where practicable.

- Where possible, only one HGV should be unloaded at any time. Vehicles waiting to be unloaded should not have their engines or refrigeration units running whilst on site.
- All refrigeration units should be switched off prior to arriving on-site and should not be switched back on until after leaving the site (and preferably the surrounding residential areas).



10 Conclusions

10.1.1 WSP Acoustics has undertaken a baseline survey to assist in determining the potential impact of the proposed food store, office and petrol filling station at The Wick Site in Littlehampton.

10.1.2 The baseline survey has shown that existing levels are typical for a semi-urban location with both L_{Aeq} and L_{Amax} levels remaining fairly high during both the daytime and night-time periods.

10.1.3 The assessment of noise levels during HGV deliveries to the food store has shown that two deliveries in the same one hour period would result in an increase in noise levels of up to 1 dB which is considered a slight impact. The predicted L_{Amax} noise levels will be no greater than the existing levels.

10.1.4 Details of the fixed plant items associated with the proposed food store, petrol filling station and the office are not available at this stage therefore plant noise limits have been set.

10.1.5 The use of the customer car park has been assessed and is predicted to cause an impact in the region of +0.2 dB which is considered a slight impact.

10.1.6 To conclude, the assessment of noise from deliveries and the use of the customer car park has identified no more than slight impacts, in each case no greater than +1 dB. No mitigation measures are considered necessary and it is concluded that noise levels generated by the use of the proposed development are unlikely to be detrimental to the existing noise climate.

10.1.7 Limitations to this report are shown in Appendix E.



Appendix A Glossary of Technical Terms

A-WEIGHTING

The human ear is not equally sensitive to all frequencies of sound. It is relatively much less sensitive to very low frequencies such as 'mains hum', and to very high frequencies such as the call of a bat, than to the 'mid-frequencies' important for human voice communication. In order to make sound level meters, which would otherwise be indiscriminate in registering sound pressures, respond in a way which reflects human perception of sound, they usually are fitted with a set of filters to progressively filter out the high and low frequency energy. The filters are made to an internationally standardised specification and the filtered noise level is said to be 'A-weighted'.

Sometimes A-weighted decibel levels are denoted 'dB(A)', but the correct, internationally standardised format for reporting requires the 'A' to be appended to the noise descriptor e.g. $L_{Aeq,T}$, L_{Amax} , etc.

AIRBORNE SOUND

Sound transmitted through the air rather than through the structure of a building or the ground.

AMBIENT NOISE

This is the totally encompassing sound at the measurement position over a specified time interval and usually comprises sound from many different sources both near and far.

ATTENUATION

A general term used to indicate the reduction of noise or vibration, or the amount (in decibels) by which it is reduced.

AVERAGING

In the absence of a dominant steady source, the sound level at a point, indoors or outdoors, varies continuously. For example, the variation may be over a few dB about an average value in a quiet room, or over 10 dB or more in a noisy outdoor environment. In order to define a level to represent the noisiness of the space it is necessary to define that average value. The most common averaging methods are energy averaging (L_{Aeq}) and statistical averaging (L_{AN} where N is a percentage between 1 and 100).

BACKGROUND NOISE LEVEL, $L_{A90,T}$

Background noise level is a term used to describe that level to which the noise falls during quiet spells, when there is lull in passing traffic for example. It is quantified by the $L_{A90,T}$ which is the noise level that is exceeded for 90% of the measurement time interval, T.

DECIBELS

Noise conventionally is measured in decibels (dB). The decibel is a logarithmic unit and decibel levels do not add and subtract arithmetically. An increase or decrease of 3 dB in the level of a steady noise is about the smallest that is noticeable. It represents a doubling or halving of noise energy. An increase or decrease of 10 dB represents a ten-fold change in noise energy, and is perceived as a doubling or halving of loudness.

The threshold of hearing for a typical young, healthy adult is 0 dB A-weighted sound pressure level. A noise level of 140 dB(A) can cause physical pain. Most people listen to their televisions at about 60 to 65 dB(A). Alongside a busy main road the ambient noise level may be in the 70 to 80 dB(A) range; on a quiet day in the country it might be as low as 30 dB, in town 40 to 50 dB(A).



DECIBEL ADDITION

If two similar noise sources operate together their combined noise level at an observer's position some distance away is 3 dB higher than the noise level generated by just one of them. If two further machines are switched on the noise level generated by all four at the observer's position is 3 dB higher than the level generated by the two. If the number of machines is again doubled, to eight, the noise level increases by another 3 dB, and so on.

EQUIVALENT CONTINUOUS A-WEIGHTED SOUND PRESSURE LEVEL,

$L_{Aeq,T}$

The 'equivalent continuous A-weighted sound pressure level' is an average of the fluctuating sound energy in a space. It is the value of the A-weighted sound pressure level of a continuous, steady sound that, over the specified time period, T seconds, has the same root mean square sound pressure as the varying sound. It can be likened to the mean petrol consumption of a car over a specific journey during which the instantaneous consumption peaked during periods of acceleration and fell during periods of coasting or braking.

FAÇADE SOUND LEVELS

Road and railway traffic noise levels often are specified in terms of the sound level at a position 1 m in front of the most exposed façade of potentially noise sensitive premises. Such levels are assumed to be 3 dB(A) higher than sound levels measured at an equivalent position away from the reflections from the building and any other surfaces (excluding the ground).

FREE-FIELD SOUND LEVELS

The free-field refers to sound level measurement positions in an open area well away from any buildings or other sound reflecting surfaces other than the ground. Generally the minimum distance from building facades for free-field measurements is taken to be 3.5 m.

MAXIMUM SOUND LEVEL, L_{Amax}

This is the maximum instantaneous sound level occurring during the measurement period. Because of the standardised response time characteristics of the sound level meter a L_{Amax} level measured on Slow response normally will be a lower value than the same noise measured using Fast response.

In cases where the sound level in a single 1/3 octave band is at least 5 dB higher than the level in the frequency band on either side of it, this may be an indication of tonal character in a noise (clause 4.1.3 of BS 7445:Part 2:1991).



Appendix B Site and Surrounding Area





Appendix C List of Equipment

Position	Equipment	Manufacturer and Type	Serial Number	Date of Next Calibration
1	Sound Level Meter	01dB-Stell Solo Master	10717	17 February 2012
	Pre-amplifier	01dB-Stell PRE 21 S	11139	
	Microphone	G.R.A.S Type 40AE	93763	
2	Sound Level Meter	01dB-Stell Solo Master	10712	3 December 2011
	Pre-amplifier	01dB-Stell PRE 21 S	11447	
	Microphone	Microtech Gefell GmbH MK250	51863	

Appendix D Measured Noise Levels

Table D/1 Position 1 – Adjacent to Northern Site Boundary, Freefield, dB

Date	Period Start Time	Sound level in dB			
		L _{Aeq,1hour}	L _{A90}	L _{A10}	L _{Amax}
19/05/2011	15:00	64.0	46.4	65.1	89.7
	16:00	60.6	47.3	63.1	86.9
	17:00	62.7	47.3	67.2	84.7
	18:00	61.4	45.6	64.4	92.3
	19:00	59.9	42.7	62.6	81.8
	20:00	59.3	42.2	61.6	82.3
	21:00	57.6	41.0	56.9	86.7
	22:00	56.2	38.1	52.9	83.8
	23:00	51.3	31.1	47.0	75.6
20/05/2011	00:00	51.6	27.3	41.1	79.0
	01:00	49.7	27.6	40.7	79.2
	02:00	45.1	24.4	37.8	75.5
	03:00	51.1	25.2	47.1	77.8
	04:00	50.8	35.2	53.2	75.7
	05:00	56.8	39.5	56.4	78.7
	06:00	58.5	41.3	58.5	80.1
	07:00	61.3	44.6	64.7	82.6
	08:00	62.0	44.4	65.8	83.7
	09:00	60.9	42.5	62.8	84.1
	10:00	60.1	43.4	61.9	82.6
	11:00	59.5	44.2	61.5	79.6
	12:00	60.7	44.8	63.2	83.3
	13:00	61.6	47.9	65.5	80.7
	14:00	61.0	49.0	64.1	83.8
	15:00	61.6	47.3	64.4	86.5
	16:00	61.3	46.8	65.4	81.6
	17:00	61.1	47.7	65.2	80.6
	18:00	61.7	47.3	64.7	86.9
	19:00	60.5	44.5	64.1	78.8
	20:00	59.7	42.8	61.1	85.6
	21:00	57.9	42.0	59.2	77.3
	22:00	56.0	38.6	54.8	76.3
	23:00	54.8	35.5	51.6	75.8
21/05/2011	00:00	53.9	30.4	47.0	83.1
	01:00	51.0	28.0	43.8	76.8
	02:00	50.1	26.2	42.3	76.2
	03:00	51.1	28.0	45.6	75.3
	04:00	51.4	36.5	52.9	78.1
	05:00	52.9	39.1	52.2	75.5
	06:00	54.8	40.7	53.6	78.9
	07:00	57.5	39.1	57.6	82.5
	08:00	59.2	40.7	59.7	82.0
	09:00	60.5	42.1	62.9	89.4
	10:00	60.1	42.1	62.6	84.8
	11:00	61.3	43.0	64.1	87.8
	12:00	59.8	42.9	62.2	80.4
	13:00	60.6	43.2	63.9	83.5



	14:00	59.1	44.0	60.9	78.8
	15:00	59.5	44.9	61.5	82.0
	16:00	61.3	44.3	63.6	87.1
	17:00	62.0	44.0	61.9	90.7
	18:00	61.1	43.4	62.7	91.4
	19:00	60.7	42.4	62.4	88.0
	20:00	58.5	38.8	59.2	79.9
	21:00	57.4	37.9	56.6	80.0
	22:00	57.3	37.3	55.4	82.4
	23:00	54.3	36.9	49.3	76.6
22/05/2011	00:00	54.6	36.6	49.6	78.1
	01:00	52.7	34.4	45.9	76.9
	02:00	50.8	36.4	46.4	77.6
	03:00	46.3	37.0	45.9	75.1
	04:00	52.7	40.4	54.7	75.0
	05:00	53.1	41.4	55.6	75.2
	06:00	53.7	40.4	50.1	78.7
	07:00	55.0	42.5	52.6	76.6
	08:00	57.6	44.9	57.5	79.4
	09:00	60.4	47.9	63.5	79.6
	10:00	62.3	51.2	66.0	78.0
	11:00	61.4	50.7	65.2	79.1
	12:00	61.8	52.0	65.1	80.5
	13:00	60.1	50.1	62.5	78.3
	14:00	60.9	51.9	63.7	78.8
	15:00	61.3	51.8	63.9	86.1
	16:00	60.1	50.6	62.5	79.1
	17:00	59.6	49.3	61.6	77.0
	18:00	59.1	47.0	60.6	80.0
	19:00	58.5	44.4	59.3	80.4
	20:00	56.9	42.0	56.0	80.5
	21:00	60.1	38.2	56.5	91.3
	22:00	54.5	36.5	51.8	78.7
	23:00	51.3	31.4	45.4	80.8
23/05/2011	00:00	48.9	27.0	43.3	78.6
	01:00	44.7	25.9	39.2	74.2
	02:00	43.7	26.6	39.0	74.2
	03:00	47.7	27.8	43.0	75.3
	04:00	52.3	35.6	52.1	79.6
	05:00	56.1	42.0	53.3	80.0
	06:00	59.1	46.1	59.5	80.8
	07:00	61.1	49.4	63.9	80.5
	08:00	62.1	50.4	65.8	83.4
	09:00	62.3	50.2	64.1	87.0
	10:00	60.4	49.9	62.6	79.3
	11:00	65.4	51.8	66.5	90.7
	12:00	60.9	50.2	63.7	80.4
	13:00	61.3	50.0	63.7	83.5
	14:00	61.7	51.4	64.3	87.6
	15:00	62.4	51.5	65.7	82.6
	16:00	61.9	51.8	65.4	83.4
	17:00	62.9	52.1	66.4	88.5
	18:00	62.6	50.0	65.5	87.4
	19:00	59.1	47.7	60.9	81.8



	20:00	57.9	42.0	57.4	79.5
	21:00	60.2	39.4	56.2	91.7
	22:00	54.8	36.2	51.6	77.7
	23:00	52.8	33.7	47.8	78.0
24/05/2011	00:00	49.5	30.8	45.5	73.0
	01:00	45.8	27.6	40.2	77.0
	02:00	43.8	27.0	40.1	73.6
	03:00	50.1	29.7	44.1	78.5
	04:00	52.7	37.2	53.0	77.4
	05:00	56.3	39.8	55.0	81.7
	06:00	58.7	43.7	58.1	84.3
	07:00	62.0	46.1	66.3	80.6
	08:00	62.9	47.6	66.6	84.7
	09:00	60.6	45.7	62.4	81.8
	10:00	60.3	45.9	61.6	81.8
	11:00	60.7	45.4	63.0	83.4



Table D/2 Position 2 – Adjacent to the Eastern Site Boundary, Freefield, dB

Date	Period Start Time	Sound level in dB			
		L _{Aeq,1hour}	L _{A90}	L _{A10}	L _{Amax}
19/05/2011	15:00	65.8	56.5	68.6	83.2
	16:00	65.8	55.6	68.0	88.5
	17:00	64.5	55.3	67.2	89.3
	18:00	64.5	53.1	67.6	87.5
	19:00	63.5	48.5	67.1	82.4
	20:00	62.8	46.3	66.5	81.9
	21:00	60.6	42.9	65.1	77.2
	22:00	60.8	41.2	65.1	90.7
	23:00	59.6	34.3	63.3	85.6
20/05/2011	00:00	56.1	27.1	58.4	80.4
	01:00	54.0	26.6	54.2	82.0
	02:00	50.8	25.2	45.6	79.2
	03:00	54.5	25.7	55.6	75.5
	04:00	58.1	35.3	60.8	81.0
	05:00	61.7	40.0	66.1	79.8
	06:00	64.7	44.9	68.9	81.8
	07:00	65.2	52.8	68.6	80.0
	08:00	65.0	54.7	68.1	81.8
	09:00	65.4	54.2	68.5	84.0
	10:00	65.5	55.6	68.5	83.9
	11:00	65.0	56.2	67.8	81.9
	12:00	65.6	56.6	68.6	82.1
	13:00	65.5	57.0	68.6	79.8
	14:00	66.7	57.1	68.2	96.2
	15:00	65.1	56.2	68.0	91.3
	16:00	65.0	57.0	67.9	84.2
	17:00	66.7	55.8	67.3	99.7
	18:00	64.6	55.3	67.7	84.1
	19:00	63.7	52.3	67.2	78.2
	20:00	62.9	47.3	66.7	80.7
	21:00	61.9	45.8	65.5	88.4
	22:00	60.6	41.6	65.2	77.2
	23:00	59.0	37.3	63.9	76.8
21/05/2011	00:00	58.6	33.7	63.0	82.0
	01:00	54.2	29.5	56.3	73.5
	02:00	54.6	28.3	56.7	77.4
	03:00	53.3	28.4	55.5	75.0
	04:00	57.9	38.2	60.0	79.7
	05:00	59.7	39.4	63.8	77.1
	06:00	61.5	41.5	66.0	79.7
	07:00	62.8	44.6	67.2	79.3
	08:00	64.2	49.8	68.0	79.2
	09:00	65.6	53.6	68.5	91.3
	10:00	64.9	55.7	68.2	78.0
	11:00	65.3	56.4	68.2	79.8
	12:00	65.1	54.7	68.3	83.1
	13:00	64.8	55.3	67.9	81.3
	14:00	63.9	53.0	67.2	78.3
	15:00	63.9	52.4	67.3	79.9
	16:00	67.6	53.3	67.6	99.5
	17:00	63.6	52.1	67.0	82.9



	18:00	65.1	52.2	67.7	92.1
	19:00	63.1	49.7	66.8	82.9
	20:00	62.1	43.6	66.5	82.9
	21:00	60.7	41.9	65.4	78.9
	22:00	60.8	41.1	65.2	77.9
	23:00	60.1	40.4	64.7	88.1
22/05/2011	00:00	59.4	40.9	64.2	79.9
	01:00	56.5	37.8	60.7	77.7
	02:00	53.6	39.3	53.9	75.4
	03:00	54.7	40.2	56.2	76.7
	04:00	56.9	44.4	59.1	82.3
	05:00	58.8	47.5	62.5	75.8
	06:00	59.7	44.0	63.8	78.2
	07:00	61.2	46.3	65.7	76.2
	08:00	63.6	50.9	67.5	81.0
	09:00	68.2	55.7	68.6	101.1
	10:00	66.0	58.8	68.9	77.3
	11:00	65.8	58.9	68.7	78.4
	12:00	66.6	60.4	69.1	88.8
	13:00	65.9	57.7	68.6	88.5
	14:00	65.9	58.7	68.6	84.7
	15:00	65.9	58.7	68.9	87.5
	16:00	65.6	57.4	68.4	85.3
	17:00	65.0	56.4	68.3	79.3
	18:00	64.1	53.1	67.7	78.4
	19:00	63.3	49.4	67.3	85.0
	20:00	62.1	47.3	66.4	79.0
	21:00	60.8	43.0	65.3	81.1
	22:00	59.9	40.6	64.3	83.3
	23:00	57.3	34.6	61.5	75.5
23/05/2011	00:00	56.1	29.4	58.3	80.0
	01:00	52.9	27.0	51.9	73.3
	02:00	48.5	28.4	41.6	73.1
	03:00	50.0	30.9	47.6	75.8
	04:00	58.9	40.5	61.0	82.5
	05:00	61.9	44.3	66.3	81.8
	06:00	64.5	50.8	68.7	79.3
	07:00	65.8	54.6	69.2	80.3
	08:00	65.9	56.5	69.2	80.1
	09:00	66.1	56.9	69.1	83.4
	10:00	66.5	57.9	69.4	81.4
	11:00	67.0	58.9	69.4	84.5
	12:00	65.7	56.9	68.5	81.8
	13:00	65.8	57.4	68.7	78.9
	14:00	66.2	57.9	69.1	79.9
	15:00	65.9	58.0	68.8	81.7
	16:00	65.5	58.3	68.3	78.6
	17:00	66.3	58.5	68.7	93.9
	18:00	65.1	56.5	68.1	80.5
	19:00	64.1	53.6	67.7	84.2
	20:00	61.4	46.8	65.6	76.6
	21:00	61.3	42.9	65.8	81.3
	22:00	59.2	39.1	63.7	78.8
	23:00	57.8	36.8	61.5	79.2



24/05/2011	00:00	55.3	33.3	56.9	76.6
	01:00	52.0	29.8	50.7	75.8
	02:00	50.4	29.1	45.2	74.4
	03:00	56.1	33.5	53.0	81.8
	04:00	58.6	39.2	60.6	81.2
	05:00	61.7	41.1	65.7	81.2
	06:00	65.5	48.3	69.4	85.5
	07:00	65.8	53.7	69.3	78.4
	08:00	66.2	56.3	68.9	87.0
	09:00	65.6	55.5	68.9	80.7
	10:00	66.1	55.4	69.0	86.0
	11:00	65.3	54.5	68.5	81.1



Appendix E Limitations to this Report

This report has been prepared for the titled project or named part thereof and should not be used in whole or part and relied upon for any other project without the written authorisation of WSP Environmental Limited. WSP Environmental Limited accepts no responsibility or liability for the consequences of this document if it is used for a purpose other than that for which it was commissioned. Persons wishing to use or rely upon this report for other purposes must seek written authority to do so from the owner of this report and/ or WSP Environmental Limited and agree to indemnify WSP Environmental Limited for any and all loss or damage resulting therefrom. WSP Environmental Limited accepts no responsibility or liability for this document to any other party other than the person by whom it was commissioned.

The findings and opinions expressed are relevant to the dates of the site works and should not be relied upon to represent conditions at substantially later dates. Opinions included therein are based on information gathered during the study and from our experience. If additional information becomes available which may affect our comments, conclusions or recommendations WSP Environmental Limited reserve the right to review the information, reassess any new potential concerns and modify our opinions accordingly.