

Bryn Lane, Wrexham
Air quality, noise and vibration assessment

Kingsmoor Properties Ltd

4 September 2008

Final Report

9T6615

Globe House
Moss Bridge Road
Kingsway West, Rochdale OL16 5EB
United Kingdom
+44 (0)1706 714575 Telephone
01706 714574 Fax
m.potts@royalhaskoning.com E-mail
www.royalhaskoning.com Internet

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Drafted by	Mike Potts / Neil Hutton / Stuart Bennett
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SUMMARY

An assessment has been undertaken of the potential air quality, noise and vibration impacts in respect of the proposed redevelopment of land off Bryn Lane, Wrexham for light industrial / commercial use.

The assessment identified that:

- None of the construction activities will exceed a suggested acceptable daytime noise level of 70 dB L_{Aeq} but, particularly on Bryn Lane, construction noise levels of more than 10 dB above existing measured background noise levels may occur. Mitigation was recommended to minimise the potential for noise disturbance and to reduce the noise levels by approximately 10 dB.
- A potentially moderate adverse noise impact, associated with daytime operational road traffic movements, may affect residential properties along Bryn Lane to the north of the proposed development site. No mitigation can be recommended for this aspect but it is suggested that the actual impact, in the context of the existing road use and noise environment, will be of no more than minor significance.
- Night time operational road traffic noise levels may be more significant but assessment was not possible due to lack of data; further assessment is recommended.
- Vibration associated with construction activities (piling) was not assessed and further study will be necessary. It is considered probable that the proximity of housing on Bryn Lane may require the use of alternative / quieter piling methods.
- Vibration associated with both construction and operational road traffic was qualitatively assessed and judged to be of negligible significance.
- Road traffic noise and vibration impacts for properties on Ridley Wood Road were judged to be of negligible significance.
- Further investigation of the Capita Symonds data, its methods and the derivation of the results are recommended.
- The impact of additional traffic generated by the development in 2010 on concentrations of NO_2 and PM_{10} , was judged to have a potential slight adverse air quality impact. It is recommended that a more detailed quantitative modelling study be undertaken to assess baseline 2008 levels of traffic generated pollution and to include other roads, not included in this study, where residential receptors are likely to be affected.

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1 INTRODUCTION

Royal Haskoning has been commissioned by Kingmoor Park to undertake an air quality and noise and vibration assessment in relation to a proposal for the development of land off Bryn Lane, Wrexham for light industrial / commercial use.

At this stage of the scheme, there is limited detailed information available regarding the scheme and the assessment therefore comprises a mix of quantitative and qualitative assessment. This report is thus intended to support an outline Planning Application to Wrexham County Borough Council and further more detailed assessment may be required, in support of a Reserved Matters Planning Application, once more detailed scheme design and operation information become available.

A glossary of acoustic terminology used in this report is presented at Appendix C.

2 EXISTING SITUATION AND PROJECT UNDERSTANDING

Currently, the development site is predominantly green-field agricultural land adjoining an established industrial area located to the east of Wrexham. The site is bounded to the north by Ridley Wood Road, an unclassified road, to the east by farm land, beyond which is the B5130 and along which are scattered agricultural and residential properties, to the south by an industrial complex belonging to TDG and to the west by Bryn Lane, beyond which is the Kellogs manufacturing facility.

Noise from the Kellogs facility, most likely from air cooling plant equipment, is dominant across the development site at all hours of the day and night with occasional contributions of mobile plant or impulsive noise events from the TDG site and other adjacent industrial and commercial uses, from road traffic on Bryn Lane and, to a lesser extent, Ridley Wood Road. The industrial noise contributions are also audible, but not dominant, at the properties along the B5130, to the east of the proposed development site.

Our understanding of the proposals is that the development will incorporate two light industrial / commercial buildings located close to Bryn Lane within the site boundary, with a strip of landscaped / tree-planted land along the site's eastern boundary with the neighbouring farm land. It is additionally proposed that an additional 2.49 hectare plot of land immediately to the west of the existing TDG facility will be developed for commercial / light industrial use. No further details are available at this time and the lack of adjacent potentially noise sensitive receptors and relatively limited size of this site suggests that there will be an insignificant noise impact associated with this element of the scheme: it is, therefore, not considered further in this report. The latest indicative layout of the main development site, from Fletcher Architects (drawing reference 26405-SK13 Rev C), is presented in Figure 1. We understand that the proposed occupiers of the two buildings (First Milk and TDG) will be operating as distribution centres, with both companies operating 24 hours per day but only First Milk undertaking night time vehicle movements to and from the site.

Potential 'sensitive receptors' with regard to air quality, noise and vibration impacts are:

1. Residential properties on Bryn Lane, opposite the northern end of the proposed development site, close to the junction with Ridley Wood Road and potentially affected by site construction and operation.
2. Residential property on Ridley Wood Road, close to the junction with the B5130, potentially affected by site construction and operation.
3. Residential properties along the B5130, potentially affected by site construction and operation.

3 NOISE AND VIBRATION

3.1 Potential impacts

The potential noise and vibration impacts associated with this development are associated with:

1. The movements of construction-related traffic, particularly heavy goods vehicles, on the principal site access route(s).
2. Construction activities such as piling.
3. The operation of the subsequent light industrial / commercial end-use of the site.
4. The movements of operational traffic, particularly heavy goods vehicles, on the principal site access routes.

3.2 Assessment methodology

The noise and vibration assessment determined the potential impacts of the proposed development at, or close to, existing potentially sensitive receptors 2 to 4, as identified in Section 2, and incorporated the following key tasks:

1. Consultation with local authority – liaison was undertaken prior to the baseline our survey and assessment methodology with the relevant Environmental Health Officer at WCBC before commencing the assessment.
2. Baseline assessment - a noise measurement survey of existing ambient noise levels at the identified receptors close to the site was undertaken.
3. Traffic noise and vibration impact assessment – this was based upon the initial traffic assessment data provided by Crowd Dynamics and extracts (provided by Crowd Dynamics) of a Capita Symonds assessment of the traffic levels associated with the proposed new Wrexham Industrial Estate access road; we understand that this development has received Planning Consent and the traffic flows associated with the access road were, therefore, included in the future year baseline (without Kingmoor Park's Bryn Lane development) traffic flows. The data from Crowd Dynamics was used to predict both the existing and potential operational traffic noise levels in the year 2025, 15 years after the proposed scheme opening year of 2010. The quantitative assessment was conducted in accordance with the guidance in the Department of Transport (Welsh Office) memorandum *Calculation of Road Traffic Noise, 1988* [CRTN].

4. Construction noise and vibration impact assessment – as detailed construction methodology and timescales are not available, an initial quantitative assessment of construction noise impacts was conducted based on our previous experience of assessing such schemes. Piling may be required but the details of this are not available and so qualitative assessment of the potential impacts from this element of the scheme was conducted. The assessment of on-site construction noise was based on the methods provided in British Standard (BS) 5228 *Noise and vibration control on construction and open sites* whilst off-site construction-related vehicle noise assessment was conducted using the calculation methods provided in CRTN.
5. Detailed operational site noise assessment – detailed information regarding the potential on-site locations of fixed and mobile plant equipment are not yet available and so it was agreed with HOW Planning that the assessment would calculate acceptable site boundary noise levels such that existing background noise levels at the nearest potentially noise sensitive receptors are not exceeded. The assessment concentrated on potential noise impacts on properties on the B5130 to the east of the site as it was judged that the existing ambient noise from traffic on Bryn Lane and the Kellogs facility was such that additional operational noise from the proposed First Milk and extended TDG operations would have no significant impact for the properties on Bryn Lane close to the junction with Ridley Wood Road.
6. Mitigation – the assessment addressed the need for appropriate mitigation, where necessary with an assessment of the residual (mitigated) impacts.

3.3 Impact significance criteria

There are no statutorily prescribed or standardised criteria within the UK by which relative changes in noise may be assigned ‘significance’. Partly this is because perception of the significance of noise level changes is very subjective and is itself determined by the nature and level of the existing local noise environment. For the purpose of this assessment, the impact significance of relative changes in noise level are described according to the criteria defined in Table 3.1.

Table 3.1: Noise impact significance criteria

Noise level impact	Significance
< 3 dB change	Negligible
3 < dB change ≤ 5	Minor
5 < dB change ≤ 10	Moderate
≥ 10 dB change	Major

The significance criteria are derived from two reference sources:

- BS 4142 which recommends that an increase in noise levels of 5 dB is of “marginal significance” whilst a 10 dB increase in noise levels indicates that complaints are likely.

- Research¹ which found that, for a person with normal hearing, 3 dB was the smallest audible change in general environmental noise levels. The research also found that a 5 dB change would be clearly audible and a 10 dB change would be perceived as a doubling or halving of the noise.

3.4 Baseline noise survey

A baseline noise survey was conducted on 15th and 16th August 2008 to establish both the qualitative and quantitative existing noise in the area surrounding the proposed development site. The survey was conducted using a Type 1 sound level meter, field calibrated before and after the measurement - no variation in calibration level was observed. The microphone was mounted on a tripod at a height of 1.3 metres above the ground, encased in a foam wind-shield and located well away from any reflecting surfaces, thereby ensuring 'free-field' noise measurements.

The measurement locations were chosen as representative of the sensitive receptors identified in section 2 above. Details of the noise measurement locations are presented in Table 3.2, and photographs of the equipment in position are presented in Appendix A.

Table 3.2: Noise measurement locations

Measurement location		Co-ordinates
P1	Bryn Lane	N53° 03.018' W2° 4.730'
P2	Ridley Wood Road	N53° 03.195' W2° 4.377'
P3	Marsh Lea (B5130)	N53° 03.001' W2° 4.053'

Wind speed during the noise measurement periods was monitored using a hand-held anemometer; the winds were generally southerly with an average wind speed was 2.2 m.s⁻¹ attaining a maximum (gust) of 4.9 m.s⁻¹. The weather was dry with mixed clear skies and high clouds.

The parameters recorded during the noise survey were the 'A-weighted' decibel (dB) continuous equivalent noise (sound pressure) level (L_{Aeq}), the 90th percentile noise level (L_{A90}) and the maximum noise level during each individual measurement (L_{Amax}).

Multiple measurements were taken at each location to ensure consistency of measurements. For measurements taken during the day, the measurement duration was set to 10 minutes, for night measurements the duration was 5 minutes. A summary of the noise level measured during the survey are presented in Table 3.3. The individual dB L_{Aeq} and L_{A90} noise levels at each location were averaged whilst the dB L_{Amax} noise level given is the highest noise level recorded at each location.

¹ Bies D.A. & Hansen C.H (2003) *Engineering noise control: theory and Practice* 3rd Edition, Spon Press.

Table 3.3: Noise levels measured during baseline noise survey

Measurement location		Measured noise levels (dB)					
		Day			Night		
		L _{A90}	L _{Aeq}	L _{Amax}	L _{A90}	L _{Aeq}	L _{Amax}
P1	Bryn Lane	53	67	83	50	52	77
P2	Ridley Wood Road	45	62	83	44	48	75
P3	Marsh Lea (B5130)	44	62	82	40	49	77

Table 1 and our on-site observations during the survey indicate that:

- Measurement location P1 on Bryn Lane had significantly higher background (L_{A90}) and L_{Aeq} noise levels than the other two locations. This was due to the noise emitted by existing facilities on the Wrexham Industrial Estate [WIE], particularly the continuous plant equipment noise from Kellogs, and the higher flows of traffic on Bryn Lane.
- The change in background noise level from day to night was less than 4 dB for all three measurement locations. This supports the observation that the existing noise climate in the vicinity of the proposed development site is dominated throughout the day and night by the facilities on the WIE, particularly the Kellogs plant, including contributions from the 24 hour movements of heavy goods vehicles associated with the WIE.

3.5 Assessment of construction noise impacts, mitigation and residual impacts

3.5.1 Impact assessment

The assessment of construction noise impacts examined both the noise and vibration emissions associated with the physical preparation and construction of the development site and associated buildings. It also includes assessment of off-site noise and vibration impacts associated with the movements of construction-related heavy goods vehicles on the public road network.

Both the on- and off-site noise emissions were quantitatively assessed. The on-site construction noise calculations used generic source noise data available in BS 5228 or the updated construction equipment noise database available on the DEFRA web-site² (DEFRA, 2005). The off-site noise impacts associated with the movement of additional numbers of construction-related HGVS were calculated using CRTN. The assessment also required the following assumptions, mainly based on our previous experience of such assessments:

1. Construction related heavy goods vehicles are assumed to number, on average, 12 per day (24 one-way movements) whilst peak periods of concrete pouring may require up to 50 HGVS per day for a period of one to two weeks.
2. The working day is taken to be of 12 hours duration from, 06:00 to 18:00.
3. The types of typical items of construction plant equipment that might be used are presented in Table 3.4.

² Department for the Environment Food and Rural Affairs (2005) *Update of noise database for prediction of noise on construction and open sites*. HMSO, London

4. No acoustic screening by buildings or other structures was allowed in the calculations and a conservative assessment was conducted by basing the assessment on the concurrent operation of all equipment within each separate activity, at a position on the site development boundary closest to the selected receptors. This noise level is therefore the highest that might occur for a relatively short duration: as construction progresses, activities occurring further into the development site, and further away from the receptors, will give rise to lower receptor noise levels.
5. The assessment conservatively assumed propagation of the construction noise over hard, acoustically-reflective ground.
6. Most construction activities were presumed to have an 'on time' of 30%; the on time is the duration of the working day that an item of equipment operates at full power. The exceptions are particularly noisy general site activities such as drilling into concrete, cutting concrete blocks and scaffolding activities, which were assigned an on time of 10%. The operation of diesel generators for power and lighting was assigned an on time of 100%.
7. An acceptable construction noise limit of 70 dB $L_{Aeq, 12h}$ at receptors was assumed; there are no specified acceptable construction noise limits in UK legislation or other Standards so this is a typical value assigned to such relatively temporary activities occurring during the day time only.

On- and off-site ground borne vibration impacts were qualitatively assessed. The only potential on-site vibration impacts will be associated with piling and it is not yet known if, or where on the site, this may be required nor what equipment will be used. Off-site ground-borne vibration will be associated with the movements of construction-related HGVs. The causes of the vibration are related to the interaction of the vehicle tyres with the road surface and jolting of the vehicles, both of which are significantly affected by factors such as surface irregularities, vehicle speed and whether the vehicle is fully laden or empty. In addition the propagation of vibration through the ground is dependant on a number of factors related to ground conditions that are unknown whilst the subsequent transmission into building structures is controlled by the nature and state of the foundations and of the above-ground structure. The level of detailed information necessary thus rules out quantitative assessment at this time.

Table 3.4 presents the assumed construction activities that might occur, the associated plant equipment that might be utilised and associated source noise levels (given as the sound pressure level at 10 m from the equipment), distances of receptors to the closest area of construction activity and the resultant receptor noise levels.

Table 3.4: Calculated traffic noise levels for peak PM traffic flows

Activity / Plant equipment	Source noise level (dB LAeq)	P1: Residential properties on Bryn Lane		P2: Residential property on Ridley Wood Rd		P3: Residential property to south of Marsh Lea	
		Distance to receptor (m)	Receiver noise level (dB LAeq)	Distance to receptor (m)	Receiver noise level (dB LAeq)	Distance to receptor (m)	Receiver noise level (dB LAeq)
Site preparation							
Wheeled Backhoe loader (62kW - 8t)	68	35	51.9	340	32.1	380	31.2
Dozer (142kW - 20t)	75	35	58.9	340	39.1	380	38.2
Art. Dump Truck (187kW - 23t)	81	35	64.9	340	45.1	380	44.2
Total:		66		Total:	46	Total:	45
Soft ground works							
Tracked Excavator (107kW - 22t)	71	35	54.9	340	35.1	380	34.2
Tracked Excavator (107kW - 22t)	71	35	54.9	340	35.1	380	34.2
Art. Dump Truck (187kW - 23t)	81	35	64.9	340	45.1	380	44.2
Art. Dump Truck (187kW - 23t)	81	35	64.9	340	45.1	380	44.2
Total:		68		Total:	49	Total:	48
Access road preparation							
Tracked Excavator (107kW - 22t)	71	55	51.0	570	30.7	640	29.6
Tracked Excavator (107kW - 22t)	71	55	51.0	570	30.7	640	29.6
Art. Dump Truck (187kW - 23t)	81	55	61.0	570	40.7	640	39.6
Art. Dump Truck (187kW - 23t)	81	55	61.0	570	40.7	640	39.6
Vibratory Roller (29kW - 4t)	74	55	59.0	570	38.7	640	37.6
Total:		65		Total:	45	Total:	44
Hard standing preparation							
Tracked Excavator (107kW - 22t)	71	70	48.9	340	35.1	380	34.2
Tracked Excavator (107kW - 22t)	71	70	48.9	340	35.1	380	34.2
Art. Dump Truck (187kW - 23t)	81	70	58.9	340	45.1	380	44.2
Art. Dump Truck (187kW - 23t)	81	70	58.9	340	45.1	380	44.2
Vibratory Roller (29kW - 4t)	74	70	56.9	340	43.1	380	42.2
Total:		63		Total:	50	Total:	49

Activity / Plant equipment	Source noise level (dB LAeq)	P1: Residential properties on Bryn Lane		P2: Residential property on Ridley Wood Rd		P3: Residential property to south of Marsh Lea	
		Distance to receptor (m)	Receiver noise level (dB LAeq)	Distance to receptor (m)	Receiver noise level (dB LAeq)	Distance to receptor (m)	Receiver noise level (dB LAeq)
Concrete for foundations							
Truck mounted concrete pump + boom arm (17t)	79	70	56.9	370	42.4	380	42.2
Total:			57	Total:	42	Total:	42
General building construction							
Cutting concrete blocks (petrol cutter)	79	70	57.1	370	42.6	380	42.4
Drilling into concrete	89	70	67.1	370	52.6	380	52.4
Scaffolding loading/unloading	80	70	58.1	370	43.6	380	43.4
Diesel Generator	74	70	62.1	370	47.6	380	47.4
Total:			69	Total:	55	Total:	54
Night time							
Diesel Generator	74	50	65.0	340	48.4	380	47.4
Total:			65	Total:	48	Total:	47

Table 4 shows that none of the on-site construction activities are predicted to exceed the suggested permissible 70 dB $L_{Aeq, 12h}$ noise limit. However, certain elements of the construction phase do exceed existing measured day time background noise levels by a potentially significant 10 dB or more and mitigation will be required.

With regard to construction-related HGV movements, the assumed HGV numbers were added to the existing baseline flows produced by Crowd Dynamics. The relative noise levels and associated changes were then calculated using the methods in CRTN, assuming a nominal receptor position 10 m from the carriageway edge. The results of the assessment are presented in Table 3.5.

Table 3.5: Construction traffic noise impacts on Bryn Lane

Construction traffic noise dB $L_{A10, 1h}$		Impact (dB)	Significance
Baseline	With construction traffic		
68.6	68.6	0.0	None
68.5	69.0	0.5	Negligible

The assessment indicates that general construction-related traffic, even at peak periods, will have a negligible impact for receptors adjacent to Bryn Lane.

Ground borne vibration from the construction of the development may arise as a result of on-site piling activities. No details are yet available as to whether this will be required. If it is, further assessment may be required. It is, however, reasonable to assert that the proximity of the residential properties on Bryn Lane to the possible areas of piling, suggests that there is a significant potential for noise disturbance and a lesser potential for ground-borne vibration disturbance. There is, however, no likelihood of building damage due to ground borne vibration. Without wishing to pre-empt the results of any further assessment of this aspect, should further assessment of piling impacts indicate a significant potential for noise or vibration disturbance, the use of alternative piling methods such as pile-pressing or augered piling may be required.

Any such mitigation with respect to properties on Bryn Lane will, by default, provide sufficient protection of amenity for more distant properties.

Ground-borne vibration impacts may also arise due to the movements of additional construction-related traffic on the local road network. However, the noise assessment has shown that the numbers of vehicles involved is of negligible significance and this, combined with the separation distance between the road and the residential properties suggests that ground-borne vibration from the limited numbers of additional construction-related HGVs on the roads will be of no significance.

3.5.2 Mitigation

The assessment of on-site construction noise has demonstrated that mitigation will be required in order to minimise the likelihood of noise nuisance for residents close to the development.

Generic mitigation will be applied in the application of the principles of Best Practicable Means, as defined in BS 5228. This entails the use of the most modern equipment available, fitted with suitable noise attenuation measures, but also includes the use Best Practice in construction operations which will encompass staff training on the proper use of equipment and awareness raising of the need to minimise noise for local residents.

Mitigation can also be applied by way of an application for a Section 61 'Prior Consent', as permitted in the Control of Pollution Act, 1974. This requires the principal contractor to apply for an agreed consent to conduct the construction activities. Significantly, this document is produced through discussion between the contractor and the local authority and will include specified control measures or noise limits such that the construction noise is controlled and the potential for noise disturbance minimised.

Beyond this, the proximity of the housing on Bryn Lane to the construction area for the northern-most (First Milk) unit and the predicted construction noise levels suggest that a purpose built noise barrier should be constructed along the site boundary with Bryn Lane to screen this construction area from the housing. Typically, such a barrier may be constructed of ply-wood, with a minimum thickness of 18 mm and should completely obscure line of sight of the construction from the residential properties. This may therefore provide noise attenuation in the region of 10 dB.

The separation distance between the construction areas and the residential properties to the north east and east of the site indicates that the use of a noise barrier will not be necessary for these relatively temporary works.

3.5.3 Residual construction impacts

Table 3.6 presents the construction noise levels at the Bryn Lane properties following mitigation of the construction noise by 10 dB through the use of a noise barrier.

Table 3.6: Results of construction noise mitigation for Bryn Lane properties

Activity	Unmitigated receptor noise (dB L _{Aeq})	Mitigated receptor noise (dB L _{Aeq})
Site preparation	66	56
Soft ground works	68	58
Access road preparation	65	55
Hard standing preparation	63	53
Concrete for foundations	57	47
General building construction	69	59

The results of this simple mitigation measure result in temporary construction works of no more than 6 dB higher than the existing measured background noise levels at the properties on Bryn Lane closest to the development site.

3.6 Calculation of operational traffic noise

An initial traffic assessment was undertaken by Crowd Dynamics to assess the maximum traffic flows at road junctions and the potential development-generated traffic. This was limited to the peak hour PM traffic flows rather than potentially lower daily or hourly average flows. The prediction of road traffic noise levels was a therefore a conservative prediction.

Existing baseline traffic flows were based on data provided by Crowd Dynamics and related to a manual traffic survey carried out on the 20th August 2008. Future year baseline (without the Bryn Lane development) traffic data were taken from the Capita Symonds traffic assessment for the Industrial Estate access road (Figure 2.5). This used the 2025 “high” growth flows.

No details of speed of traffic or percentage of HGVs were available from the data supplied. For this assessment, traffic was assumed to be travelling at 50 km.h⁻¹, the figure recommended by CRTN for roads with a speed limit of 40 mph. The percentage of HGVs for the baseline (without development) traffic was set at 9% for both the Bryn Lane and Ridley Wood Road, based on the manual traffic survey by Crowd Dynamics on 20th August 2008.

With regard to the development traffic, this was assumed to include 20% HGV traffic based on the assessment by Crowd Dynamics which also indicated that, in 2010, 96.6% of the development traffic travelling north from the development would go along Bryn Lane whilst 3.4% would travel along Ridley Wood Road. This same split was applied to the 2025 development traffic.

The calculated noise levels were for a nominal receptor 10 m from the carriageway edge, and no correction was made for gradient, road surface or ground effects. The calculated traffic noise levels, noise change (impact) and significance are presented in Table 3.6.

Table 3.6: Calculated traffic noise levels for peak pm traffic flows

Road section	Operational traffic noise dB L _{A10, 1h}		Impact (dB)	Significance
	Baseline, 2025	With development, 2025		
Bryn Lane (west of junction with Ridley Wood Rd.)	71.5	75.0	3.5	Minor
Bryn Lane (south of junction with Ridley Wood Rd.)	71.5	75.1	3.6	Minor
Ridley Wood Road	64.2	65.1	0.9	Negligible

Using the impact criteria in Table 1, the predicted change in traffic noise level is of negligible significance on Ridley Wood Road and of moderate adverse significance for the three or four residential properties on Bryn Lane north of the development. This, however, is based on daytime peak traffic flows and night time noise impacts, related to vehicle movements from

the First Milk facility, may be greater. At this time, the lack of 24-hour traffic data does not allow assessment of this potential impact.

It is not possible to implement physical mitigation on this stretch of the road but the quantitative moderate significance of the impact should be viewed in the context of the character of the existing noise environment, namely a busy road serving an industrial area. It is likely that the local residents have become relatively habituated to the daily traffic movements. In this context it is likely, therefore, that the quantitative moderate impact may only equate to a qualitative (subjective) minor noise impact for the local residents, although this can not be empirically demonstrated. It is our judgement, therefore that mitigation of daytime traffic noise is not required.

Night time traffic noise will require further detailed assessment in order to quantify the potential night time impacts.

Ground-borne vibration associated with the movements of additional operational vehicles on the local road networks was not quantitatively assessed. Qualitatively, there is a possibility that the additional road traffic may lead to a slight increase in ground-borne vibration for properties close to the road. However, in this instance all properties are set back a good distance from the road and the number of existing HGVs currently using the roads indicates that there is unlikely to be any significant impact associated with the additional HGV traffic.

3.7 Calculation of permissible operational boundary noise levels

At this stage of the project there is insufficient design information available to allow a detailed calculation of site operational noise emissions. An alternative approach is to assign indicative permissible boundary noise levels such that the existing noise levels at the nearest potentially sensitive receptors are not increased. This assessment approach uses the measured baseline noise levels and the preliminary site plan (drawing reference 26405-SK31 rev C) and was based on eight suggested boundary noise assessment positions, each relating to a particular residential receptor to the proposed site.

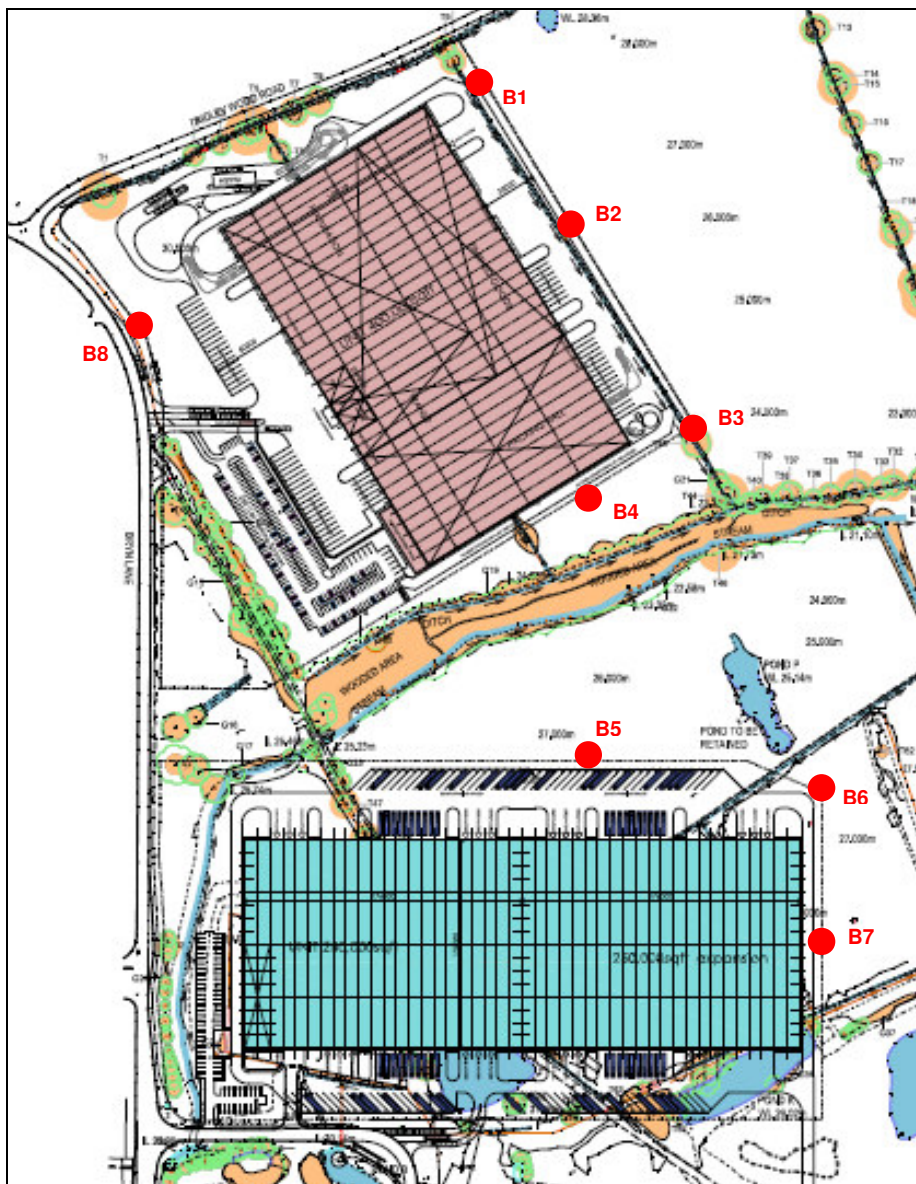
In setting the 'permissible' boundary noise limits, it was necessary that the resultant receptor 'rating' noise level ($\text{dB } L_{A_{r, Tr}}$) should be 10 dB lower than the existing measured background noise level ($\text{dB } L_{A90}$). Conservatively, the background noise level used was the marginally lower night time value. This should ensure that existing noise levels are not increased and follows the guidance contained in BS 4142 which additionally states that a difference between background and rating noise level of + 5 dB is of marginal significance whilst a rating level 10 dB below existing background indicates that complaints are unlikely.

The following assumptions regarding the characteristics of noise sources within the site and the propagation of the noise from the site to the receptor point were made:

- An arbitrary noise source was located at the façade of each of the proposed buildings at a position closest to the nearest residential receptor.
- The noise emissions from each 'source' were assumed to propagate over hard, acoustically-reflective ground.

- Each boundary noise limit was derived from a single noise source - each noise source was considered individually.
- No allowance was made for the attenuation of the source noise by ground interference or atmospheric absorption effects.

Figure 1: Positions for calculation of boundary noise limits



The distance of each of boundary point from the receptor positions P1, P2 and P3 was estimated, together with the distance from the boundary point to the nearest building façade 'source'. A nominal sound power level was then allocated to each source and the noise emitted from each source was used to calculate the sound pressure level at the boundary

and receptor positions. The noise emitted by the source was then adjusted downwards until the predicted receptor level was 10 dB below the measured background noise levels which then produced the resultant 'permissible' boundary noise level at each of the eight boundary positions.

The distance data used and the calculated boundary noise limits are presented in Table 3.7.

Table 3.7: Calculated boundary noise limit values

Boundary point		Distance from receptor to site boundary			Distance from 'source' to site boundary (m)	Permissible boundary noise level (dB $L_{Ar, Tr}$)
		P1	P2	P3		
B1	North site - N corner (angle of road)	-	305 m	571 m	40 m	52
B2	North site - Halfway along building	-	243 m	488 m	40 m	51
B3	North site - E corner	-	344 m	388 m	40 m	50
B4	North site - SE boundary	-	472 m	455 m	25 m	55
B5	South site - N boundary	-	560 m	494 m	50 m	50
B6	South site - NE corner	-	575 m	376 m	36 m	50
B7	South site - E boundary	-	670 m	538 m	15 m	61
B8	North site - Bryn Lane boundary	45 m	-	-	76 m	44

It should be noted that the limit values given in Table 6 are a rating level as defined in BS4142. If the noise from the site is irregular, contains discrete tones or impulses then the boundary noise level would have to be 5 dB lower.

The results of this assessment indicate that a relatively low boundary noise level will be required along the site boundary opposite the nearest properties on Bryn Lane. This is not surprising considering the proximity of the residential properties and it is almost certain that an acoustic noise barrier will be necessary along the boundary of the development, between the northern access road and Ridley Wood Road.

3.8 Conclusions

The assessment has demonstrated that the construction of the development, whilst not exceeding a suggested permissible noise limit of 70 dB L_{Aeq} , may give rise to noise disturbance for properties on Bryn Lane close to the development. Generic mitigation in the application of the principles of Best Practicable Means and the application by the Contractor for a Section 61 Prior Consent are recommended along with the construction of a noise barrier along a section of the Bryn Lane site boundary closest to the residential properties. This will minimise the possibility of noise disturbance from the site.

Piling, if required, may have adverse effects for the nearby residential properties on Bryn Lane and further detailed assessment will be required once more detailed information is available. It is likely that quieter methods of piling, such as pile pressing or augered piling, may be necessary to minimise the likelihood of noise and ground-borne vibration disturbance.

Construction-related traffic has been shown to be of no significance with regard to either noise or ground borne vibration disturbance.

Off-site day time road traffic impacts of the development have been shown to have a potentially moderate quantitative adverse noise impact for properties on Bryn Lane but it is our judgment that the existing nature of the area and the prevailing noise environment indicate that the impact may be of no more than a minor significance, although this can not be empirically demonstrated. Physical mitigation has not been specified as the specification of mitigation on the public road network or at private residences is beyond the control of the Applicant.

Night time operational traffic noise may, however, have a greater impact; it has not been possible to assess this impact at this stage due to a lack of available data and this aspect may require further investigation.

There is predicted to be a negligible operational traffic noise impact for properties on Ridley Wood Road.

Assessment of site operational noise emissions has not been possible and an alternative approach of setting permissible site boundary noise levels has been taken. The boundary levels have been set such that site noise levels affecting the nearest residential properties will be 10 dB below the existing measured background noise levels. This will result in no significant increase in background noise levels at these properties.

The assessment has indicated that it is unlikely that ground-borne vibration associated with operational traffic on the local roads will have any significant impact for the residential properties on Bryn Lane.

It is recommended that further assessment will be required with regard to the potential for night time noise disturbance associated with additional operational road traffic. There will also need to be an assessment of the potential impacts from piling, should it be required on site.

It is also recommended that further investigation be undertaken into the Capita Symonds traffic data used in order to verify the methodologies and derivation of the data used.

4 AIR QUALITY

4.1 Potential impacts

The potential air quality impacts associated with this development are:

1. Construction dust and fine particulate matter affecting existing properties.
2. Emissions from construction traffic affecting existing properties adjacent to the public road network.
3. Road traffic air quality impacts associated with occupation of the development and the subsequent increased numbers of vehicles on the public road network.

4.2 Proposed assessment methodology

The air quality assessment determined the impacts on local air quality of the proposed development and incorporated the following key tasks:

1. Consultation with local authority – we undertook liaison with the relevant Environmental Health Officer at WCBC before commencing the assessment. This consultation covered the scope of the assessment, the study area and the model and meteorological data to be used.
2. Baseline assessment –existing air quality data was obtained from sources such as WBDC monitoring network and the UK Air Quality Archive; the assessment identified the local sensitive receptors, including those to be created within the development itself.
3. Modeling study – the air quality assessment determined the impacts on local air quality of the proposed facility, based on a qualitative assessment of the construction activities and screening assessment of the predicted traffic exhaust emissions. The study utilised traffic data provided by Crowd Dynamics which was, at this time limited to the extent of Bryn Lane. Further study data will be required to include traffic air quality impacts on the B5130, and possibly beyond on the main arterial routes to Wrexham centre, the A534 and A525. The assessment used the Highways Agency's Design Manual for Roads and Bridges, 'DMRB' methodology, which is recommended in DEFRA guidance for use in the assessment the impact of emissions from road sources. Data on traffic flows (split between 'light' (petrol) and 'heavy' (diesel) vehicles), respective speeds and the distance to sensitive receptors are used to calculate the likely pollutant concentrations at these receptors, and when added to background contributions these levels can be compared to the relevant health-based air quality 'Objectives'. The model can be used for the existing case and for the future scenarios with and without the development to determine the overall impact.
4. The impacts were assessed against national air quality Objectives and European limit values in the context of existing baseline conditions, and the future 'no-development' and 'with-scheme' scenarios.

4.3 Quantitative Screening Assessment

A quantitative screening modelling study was undertaken to predict the likely impact of development generated traffic pollutants on baseline concentrations at residential receptors

near roads serving the Bryn Lane development. The assessment acts as a precursor to an expanded assessment of the impacts of development generated traffic and of construction traffic and dust. The study is based on national background air pollution data and traffic flow information provided by Capita Symonds and Crowd Dynamics traffic consultants.

4.3.1 Legislative Framework

The Environment Act 1995 introduced a framework of Local Air Quality Management (LAQM) and placed a duty on local authorities to formally assess air quality in their area. The Government published statutory guidance detailing how local authorities were to undertake the 'review and assessment' (R&A) process, in consideration of Objectives in the Air Quality Regulations first laid down in 1997, revised in 2000³ and amended in 2002⁴.

The Air Quality Strategy takes into account the European and wider international context in which the UK domestic policy is set. As a member of the European Union, the UK is required to meet EU Limit Values⁵ set for individual pollutants. Limit values are made up of a concentration value, an averaging time over which it is to be measured, the number of exceedences allowed per year, if any, and a date by which it must be achieved. Some pollutants have more than one limit value covering different endpoints or averaging times.

The current Objectives laid down in England and Wales for nitrogen dioxide (NO₂) and fine particles (particulate matter PM₁₀) are shown in Table 4.1.

³ Department of the Environment, Transport and the Regions (2000). *The Air Quality (England) Regulations 2000 (SI2000 No 928)*; London, The Stationery Office.

⁴ Department for Environment, Food and Rural Affairs (2003). *The Air Quality (England)(Amendment) Regulations 2002 (SI 2002 No 3043)*; London, The Stationery Office

⁵ EU Limit Values are legally binding EU parameters that must not be exceeded

Table 4.1: The Air Quality (England) Regulations 2000 as amended by the Air Quality (England) (Amendment) Regulations 2002

Pollutant	Objective		Date to be achieved by
	Concentration	Measured as	
Objectives for the protection of human health			
Nitrogen dioxide ^a	200µg/m ³ not to be exceeded more than 18 times a year	Hourly mean	31/12/2005
	40µg/m ³	Annual mean	31/12/2005
Particles, PM ₁₀ (gravimetric)	50µg/m ³ not to be exceeded more than 35 times a year	24 hour mean	31/12/2004
	40µg/m ³	Annual mean	31/12/2004

If a local authority predicts that any of the Objectives are not likely to be achieved, the location must be designated as an Air Quality Management Area (AQMA). Whilst the existence of an AQMA is not necessarily a presumption against development, the potential air quality impact of a scheme within or around a designated AQMA will be subject to detailed consideration by the local planning authority.

There are currently no AQMAs in the Wrexham County Borough Council boundary.

4.3.2 Background Environment

The Bryn Lane development lies in a semi-rural setting on the outskirts of Wrexham. It can therefore be expected that background levels of key atmospheric pollutants will be typical of a semi-rural area. In order to predict the impacts of traffic generated pollution on air quality on a site specific basis, estimates of background pollutant concentrations were obtained from the UK Air Quality Archive (<http://www.airquality.co.uk/archive/index.php>), a gridded data set of background pollutant values. Annual mean 2004 background NO_x⁶, NO₂ and total PM₁₀ values were used for grid square (339500, 350500) containing the application site.

For NO₂ and NO_x, projected background pollution values were then derived for 2008 and 2010 using a Year Adjustment Factors spreadsheet⁷.

The primary and secondary PM₁₀ values used to calculate total PM₁₀, came from the 'Estimated Background Air Pollution Data for 2004' spreadsheet for WCBC⁵. This followed the methodology outlined in the 'Updated 2006 Guidance Note for Use of the Year Adjustment Factors for Background and Roadside Annual Mean Pollutant Concentrations' in conjunction with the same adjustment factors. The background values used in the study are outlined in Table 4.2:

⁶ Background NO_x is required to derive the road traffic component of the total NO₂ concentration.

⁷ <http://www.airquality.co.uk/archive/laqm>

Table 4.2: Estimated total background concentrations ($\mu\text{g.m}^{-3}$)

Year	NO _x	NO ₂	PM ₁₀
2008	16.3	13.6	17.1
2010	15.8	12.4	16.8
Annual mean Objective ($\mu\text{g.m}^{-3}$)	40		

The background pollutant concentrations in Table 4.2 indicate that levels of NO₂ and PM₁₀ are below the annual mean air quality Objectives in 2008 and 2010. 2008 is taken as the base year for the scheme and 2010 is the year set for compliance with the EU Limit value for NO₂⁸. PM₁₀ background concentrations are also predicted to be below the 2004 and 2010 annual mean air quality Objective in 2008 and 2010. Background concentrations of NO₂ and PM₁₀ are predicted to decrease marginally over the period 2008-2010.

4.3.3 The DMRB screening model

The screening model process followed the methodology of the Environmental Protection UK (EPUK formerly NSCA^{9,10} and Department for Environment, Food and Rural Affairs (DEFRA)¹¹. The model used was the Design Manual for Roads and Bridges (DMRB) Screening Tool, published by the Highways Agency. In addition to background pollutant values, the DMRB model requires input data on annual average daily traffic flow (AADT), annual average speeds, the proportion of different vehicle types, the type of road and the distance from the centre of the road to the receptor. The model outputs provide predicted pollutant concentrations for direct comparison with the relevant Objectives. It is generally considered to be a conservative methodology.

4.3.4 Modelling Scenarios

The concentrations of key pollutants associated with vehicle exhaust gases were modelled according to preliminary traffic data provided by Crowd Dynamics. In the absence of traffic flow information for current year 2008, the impact of traffic generated pollutants was modelled in 2010 as the most likely opening year of the scheme:

1. Without development (2010) - estimated 2010 background concentration plus the predicted pollutant from 2010 forecast AADT flows
2. With development (2010) - estimated 2010 background concentration plus the predicted pollutant from 2010 forecast AADT flows and the traffic generated by the development.

⁸ The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2007)

⁹ NSCA (2004). Development Control: Planning for Air Quality

¹⁰ Now known as 'Environmental Protection UK.'

¹¹ DEFRA (2003). Local Air Quality Management Technical Guidance TG(03)

4.3.5 Sensitive Receptors

To quantify the impact of development generated traffic on roadside air quality, four sensitive receptors were selected at locations along Bryn Lane and Ridley Wood Road.

Table 4.3 shows the location of the sensitive receptors and the distance from the centre of the nearest road:

Table 4.3: Sensitive receptor locations

Receptor number	Road	X	Y	Distance from centre road (m)
R1	Bryn Lane (east / west)	338455	350910	23
R2	Bryn Lane / Ridley Wood Road Intersection	338870	350765	17
R3	Ridley Wood Road	339385	351150	12.5
R4	Ridley Wood Road	339450	351035	18

4.3.6 Traffic Data

For the 2010 'without' development scenario, two way peak hour flows were taken from the Capita Symonds Traffic Assessment of the expanded 2010 road network. For the 2010 'with' scenario, the 2010 'without' development scenario two way peak hour flows were added to the forecast development generated flows estimated by Crowd Dynamics.

The 2010 peak hour flows were converted to AADTs using the following algorithm¹²:

$$AADT = (F_{am} + F_{pm}) * 6.25$$

where:

AADT = annual average daily traffic flow (two way)

F_{am} = peak morning traffic flow (one way)

F_{pm} = peak afternoon traffic flow (one way)

Traffic was assumed to be travelling at 50 km.h⁻¹, which is the figure recommended by CRTN for roads with a speed limit of 40 mph. In the 2010 'without' development scenario, the percentage of HGVs was set at 9%, derived from results of a traffic survey on Bryn Lane undertaken by Crowd Dynamics on 20th August 2008. In the 2010 'with' scenario, 20% of all generated traffic was represented as HGVs in the screening model¹³.

Two other key assumptions were made about the traffic data:

¹² Algorithm provided by the Denis Wilson Partnership

¹³ Verbal communication with Crowd Dynamics on 4th September 2008.

- The generated development traffic provided by Crowd Dynamics was for the afternoon peak hour. It was assumed that this was the same as the morning peak hour before conversion to AADT;
- The baseline flow of 700 vehicles per hour (8525 AADT) was applied to Bryn Lane the north of node 711. Therefore, the flow of vehicles past receptors R1 and R2 was the same.

Appendix B shows the conversion of the peak hour traffic flow figures to AADTs, and Table 4.4 shows the two way AADTs used as DMRB input:

Table 4.4: AADT traffic flow figures at the nearest road to the receptors

Scenario	R1	R2	R3	R4	% HGV
2010	4375	4375	813	813	9
2010 with	8525	8525	956	956	14
% difference	95	95	18	18	5

The largest change in AADT traffic flow is forecast to be on Bryn Lane where traffic increases by 95%.

Bryn Lane and Ridley Wood Road were represented as 'B' roads in the DMRB model.

4.4 Impact Assessment

The significance of impacts on air pollution associated with the development was assessed following the guidance of EPUK.

DMRB results showing the impact of traffic generated by the development on annual mean NO₂ and PM₁₀ pollutant levels in 2010, are shown in Table 4.5. All results are inclusive of background concentration.

Table 4.5: Impact of the development on annual mean NO₂ and PM₁₀ (µg.m⁻³)

2010												
Pollutant	R1			R2			R3			R4		
	2010	2010 with	Impact	2010	2010 with	Impact	2010	2010 with	Impact	2010	2010 with	Impact
NO ₂	13.6	15.3	1.7	13.8	15.8	2.0	12.7	12.9	0.2	12.7	12.8	0.1
PM ₁₀	17.1	17.6	0.5	17.2	17.7	0.5	16.9	16.9	<0.1	16.9	16.9	<0.1
Annual mean UK Objective							40.0					

In 2010, without traffic generated by the development, the highest concentrations of NO₂ and PM₁₀ are predicted to be at receptor R2 on Bryn Lane / Ridley Wood Road intersection.

However, the concentrations of NO₂ (13.8 µg.m⁻³) and PM₁₀ (17.2 µg.m⁻³), are less than half the annual mean Objective value of 40 µg.m⁻³.

With the addition of traffic generated by the development, the largest impact is again predicted to be at receptor R2. The impact is forecast to be an increase of 2.0 µg.m⁻³ (14%) for NO₂ and 0.5 µg.m⁻³ (3%) for PM₁₀. The highest predicted values continue to be at receptor R2 with forecasts of 15.8 µg.m⁻³ for NO₂ and 17.7 µg.m⁻³ for PM₁₀. Therefore, with the addition of traffic from the development, the Objective value is achieved met at all receptors.

The results of the screening assessment show that for NO₂ and PM₁₀, the background contribution is the dominant factor in pollutant concentrations at residential receptors at roadsides serving the Bryn Lane development.

Therefore, the impact of additional traffic generated by the development in 2010, on concentrations of NO₂ and PM₁₀, is likely to be **slight adverse**¹⁴.

4.5 Discussion and Summary

A quantitative screening modelling study has been undertaken to predict the likely impact of development generated traffic pollutants on baseline concentrations at residential receptors near roads serving the Bryn Lane development. The assessment acts as a precursor to an expanded assessment of the impacts of development generated traffic and of construction traffic and dust. However, the study undertaken thus far is considered robust and suitable for the purposes of supporting an Outline Planning Application. The study is based on national background air pollution data and traffic flow information provided by Capita Symonds and Crowd Dynamics traffic consultants.

Peak hour traffic data, provided by Crowd Dynamics, were used with local background pollutant values to calculate pollutant concentrations using the DMRB screening tool.

With the addition of traffic generated by the development, it was shown that the NO₂ and PM₁₀ Objective value is likely to be achieved at all roadside receptors. The background contribution is the dominant factor in pollutant concentrations at residential receptors at roadsides serving the Bryn Lane development.

The screening assessment shows that the impact of additional traffic generated by the development in 2010 on concentrations of NO₂ and PM₁₀, is likely to be **slight adverse**¹⁵.

However, it is intended that a more detailed quantitative modelling study will be undertaken at a later date to assess baseline 2008 level of traffic generated pollution and to include other roads where residential receptors are likely to be affected. Such roads are the A534 Wrexham Road to the north of the site and the B5130 which runs to the east. These roads

¹⁴ The increase of 5-10% is small in magnitude and predicted concentrations remain below the Objective value with and without the scheme.

¹⁵ The predicted concentrations are well below the Objective value with and without the scheme.

are likely to carry traffic associated with the construction of the development, which will also be modelled. The impact of the deposition of dust associated with the construction of the development on local residential receptors will be assessed qualitatively.

5 APPENDICES

APPENDIX A: PHOTOGRAPHS OF NOISE MEASUREMENT POSITIONS

Figure A1 Noise measurement location P1 – Bryn Lane close to Kellogs factory and approximately opposite proposed northern site access



Figure A2 Noise measurement location P2 – Ridley Wood Road



Figure A3 Noise measurement location P3 – Marsh Lea (B5130)



APPENDIX B

Derivation of AADTs

Peak hour 2-way flow vehicles (high value used from Capita Symonds)

Assumptions

Development PM peak represents daily peak hour

Baseline percentage of HGVs = 9%, obtained from traffic data in survey on Bryn Lane undertaken by Crowd Dynamics on 20.8.08.

Traffic was assumed to be travelling at 50 km/h (= 40mph (CRTN)).

Generated traffic 20% HGV

Baseline flow for 2010 of 700 vehicles applied to Bryn Lane north of node 711 and therefore applies to receptors 1 and 2

Peak Hour-2 way flow

	R1	R2	R3	R4	% HGVs
Distance (m)	23	17	12.5	18	
2010 without flow	700	700	130	130	9
2010 with flow	1364	1364	153	153	14

AADT-2 way flow

Calculated using DW conversion used in Rome Street Carlisle project ((AM+PM)*6.25)

	R1	R2	R3	R4	%HGVs
Distance (m)	23	17	12.5	18	
2010 without flow	4375	4375	813	813	9
2010 with flow	8525	8525	956	956	14
% increase	195	195	118	118	

Derivation of %HGVs in 2010 'with' scenario

Number of HGVs in without scenario	861
Number of generated HGVs in with scenario	1689
Total HGVs in with scenario	2549
%HGV in with scenario	14

APPENDIX C: GLOSSARY OF ACOUSTIC TERMINOLOGY

Decibel (dB): a unit of noise level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 μPa , the threshold of normal hearing is in the region of 0 dB, and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.

dB(A): decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).

$L_{A10, T}$: the A weighted level of noise exceeded for 10% of the specified measurement period (T). It gives an indication of the upper limit of fluctuating noise such as that from road traffic. $L_{A10, 18h}$ is the arithmetic average of the 18 hourly $L_{A10, 1h}$ values from 06.00 to 24.00.

$L_{A90, T}$: the A weighted noise level exceeded for 90% of the specified measurement period (T). In BS 4142: 1990 it is used to define background noise level.

$L_{Aeq, T}$: the equivalent continuous sound level - the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). $L_{Aeq, T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter. It is written as L_{eq} in connection with aircraft noise.

L_{Amax} : the highest A weighted noise level recorded during a noise event. The time weighting used (F or S) should be stated.

Rating level ($L_{Ar, Tr}$): the noise level of an industrial noise source which includes an adjustment for the character of the noise. Used in BS 4142: 1990.