

PART 7 : TRAFFIC NOISE AND VIBRATION

7.1 Methodology

- 7.1.1 A noise impact assessment has been undertaken in accordance with guidance in the Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 7 'Traffic Noise and Vibration', August 1994.
- 7.1.2 In accordance with DMRB an assessment is made of noise levels and nuisance levels ('number of people bothered very much or quite a lot') in relation to property numbers.
- 7.1.3 Road traffic noise levels have been predicted at local representative receptors using Computer Aided Noise Abatement (CADNA) noise modelling software, which incorporates the methodology outlined in the Department for Transport's Calculation of Road Traffic Noise (CRTN).
- 7.1.4 The model for the baseline conditions (to evaluate 2006 'existing' noise levels) was verified using data from noise monitoring surveys undertaken at thirty-four locations along the length of the A453 between 31st May 2006 and 20th July 2006 and between 3rd September 2006 and 27th September 2006.
- 7.1.5 Model calculations produce an $L_{A10(18\text{ hour})}$ value for the receiving point of interest (in this case 1 m from first floor windows). This is the index commonly used when describing road traffic noise and can best be explained as the noise level in decibels (dBA) exceeded for 10% of the measurement period; in this case for the 18 hours between 06:00 and 00:00 (refer to Section 5 Part 2: Glossary for a more detailed explanation of the terms used).
- 7.1.6 The results of the predictions have been used to assess the likely effect of the proposed scheme. Four separate assessments have been undertaken:
- An assessment of the effects of noise from construction of the scheme.
 - An assessment of 'key receptors'; residences believed to represent the most sensitive properties to the proposed scheme, schools and recreational areas.
 - A broader assessment of both noise and vibration for all residents and other relevant locations within 300 m of the highway improvements in accordance with the methodology in the DMRB.
 - An assessment of potential mitigation and consideration of properties that may qualify for mitigation under the Noise Insulation Regulations 1975.
- 7.1.7 For the purposes of assessing the magnitude of any impacts, the criteria in Table 2.7.1 below has been used:

Table 2.7.1: Classification of Magnitude of Noise Impact Criteria

Variation in Road Traffic Noise Levels $L_{A10(18\text{ hr})}$ (dB)	Magnitude of Impact
> +10.0	Very Large Negative
+5.0 – +9.9	Large Negative
+3.0 – +4.9	Moderate Negative
+1.0 – +2.9	Slight Negative
+0.9 - -0.9	Neutral
-1.0 – -2.9	Slight Positive
-3.0 – -4.9	Moderate Positive
-5.0 – -9.9	Large Positive
<-10.0	Very large Positive

7.1.8 The classification above only relates to the magnitude of impact, taking into account proposed mitigation, and not the significance of effects. Professional judgement and reasoned argument is applied to conclude whether a noise change is significant or not, given the environmental value of sensitive receptors and other scheme-specific factors (such as duration of impact and time of day).

7.2 Key Guidance and Legislation

7.2.1 BS5228: Part 1: 1997 'Noise and vibration control on construction and open sites' gives recommendations for basic methods of noise and vibration control relating to construction and open sites where work activities/operations generate significant noise and/or vibration levels. The standard also provides guidance concerning methods of predicting and measuring noise and assessing its effect on those exposed to it.

7.2.2 On construction sites, noise limits for construction works are generally set with reference to the need to avoid speech interference in buildings adjacent to the site. Advisory Leaflet 72: 'Noise Control on Building Sites' (AL72) gives advice on maximum levels of construction site noise during daytime hours (taken to be 0700 to 1900 hours) as 75 dBA in urban areas near main roads and 70 dBA in rural and suburban areas.

7.2.3 The 1975 Noise Insulation Regulations (as amended) provide criteria for assessing the eligibility for noise mitigation or properties based on variations in traffic noise due to a new or improved road scheme. Noise level criteria are given within the Regulations which, if satisfied, indicate whether properties in the vicinity may be entitled to the installation of additional noise insulation or to a grant to cover the cost of the noise insulation.

7.3 Consultations

- 7.3.1 Consultations relating to the scope and methodology used for the noise assessment have been undertaken with Rushcliffe Borough Council, North West Leicestershire District Council, and Nottingham City Council (NCC). Further consultation was undertaken with NCC on the initial findings of the assessment and potential mitigation measures to reduce impacts within the urban area.

7.4 The Study Area

- 7.4.1 The effects of traffic noise within 300m from all roads where traffic is predicted to increase by a minimum of 25% or reduce by at least 20% has been undertaken in accordance with DMRB methodology.

7.5 Baseline Conditions

- 7.5.1 Background noise levels along the A453 are currently dominated by road traffic on the trunk road. Additional noise sources in the area included pedestrian activity, noise from the railway and aircraft noise; however it is not considered that these are significant noise sources.
- 7.5.2 Noise levels from the baseline measurements undertaken as described in paragraph 7.1.3 above show that there is currently a range of ambient and background noise levels. Noise levels used in the computer model range from 53.3 dB – 68.3 dB in the rural area and between 56.6dB – 78.5dB in the urban area (all levels are $L_{A10(18\text{ hour})}$ dB levels as described further in Section 5 Part 2: Glossary).

7.6 Potential Impacts

- 7.6.1 A number of key locations were selected to enable a 'worse-case' assessment to be undertaken of potential noise and vibration effects on residential properties in the vicinity. Potential impacts can occur during construction of the road and from the stream of traffic once the road is open. Key receptor locations are illustrated in Figure 2.7.1 in the ES Volume 2.
- 7.6.2 Construction-related impacts, which would occur between the start of pre-construction works (such as vegetation removal) and the end of the project contract period, are temporary but nevertheless could be significant. Typical construction impacts might include a localised increase in noise, vibration, dust and dirt, and a loss of amenity due to the presence of heavy construction traffic. Further details of this type of impact are given in Section 2 Part 3 Disruption due to Construction.
- 7.6.3 Noise levels from construction works are not likely to exceed the AL72 level in the rural area (70 dBA). In the urban area it is likely that noise from construction above the AL 72 level (75 dBA) would be experienced by properties at the Farnborough Road junction. Noise levels from the urban compound are expected to be within the criteria and thus surrounding sensitive receptors should not be unduly affected.

7.6.4 Noise arising once the road is open has two main components. Firstly, noise generated by the engine, exhaust and transmission systems which is the dominant source of noise when traffic is travelling at fairly low speeds, or in a low gear. Secondly, noise generated by the interaction of tyres and the road surface which is the dominant noise source when traffic is flowing freely at moderate to high speeds.

7.6.5 The main factors influencing the average traffic noise level are traffic volume, speed, composition (% heavy vehicles), and the road gradient and surface characteristics.

7.6.6 Traffic vibration is a low frequency disturbance producing physical movement in buildings and their occupants. Vibration can be transmitted through the air, for example by engines or exhausts, or through the ground by the interaction between rolling wheels and the road surface.

7.7 Design and Mitigation Measures

7.7.1 During construction it is considered that temporary screening could be used to attenuate noise levels to within AL72 noise target levels at the Farnborough Road Junction and at Morgan Mews.

7.7.2 Given the rural environment and the proximity of local residents to some portions of the proposed scheme, one of the most important mitigation measures is likely to be the control of night-time working. Wherever possible those activities likely to cause the highest levels of noise would be scheduled to occur at the times when they will cause the least disturbance to local residents. Mitigation measures controlling the hours of working would be detailed within the scheme Construction Environmental Management Plan (CEMP).

7.7.3 Noise mitigation and minimisation has been considered throughout the design of the scheme and has been influential in decision making including route alignment. Low noise surfacing would be used throughout the scheme to help reduce traffic noise. A detailed appraisal of potential noise barriers has been undertaken in conjunction with the landscape assessments and detailed feasibility reviews. The effectiveness of various barriers at reducing noise has been assessed by including such barriers in the noise model. The following noise mitigation measures are included within the scheme design:

- A fence 1.8 m high will be erected to replace that taken out by the road widening adjacent to Meden Close in Clifton.
- A 2.5 m high fence will be erected to replace the 1.8m high fence taken out by the road widening adjacent to Morgan Mews/Cavell Close.
- An additional 3m high barrier will be constructed on top of the cutting slope to the north-east of the proposed Mill Hill roundabout to reduce noise levels

in the grounds of the Lark Hill Retirement Village. This barrier will consist of a 1.5 m earthwork topped with a 1.5 m fence.

7.7.4 In other locations where there are predicted to be significant noise increases, noise attenuation barriers have not been included in the scheme design where they would create unacceptable impacts in their own right i.e. landscape/townscape impact, visual impact and on personal security grounds. For example at the Farnborough Road junction noise fencing would reduce noise at some properties but would be visually intrusive, a maintenance liability and would confine views out from the properties and front gardens where currently views are open. During consultations with Nottingham City Council they stressed that these issues should be carefully considered.

7.8 Magnitude of Impacts

Noise

7.8.1 Noise levels from construction works are not likely to exceed the AL72 level in the rural area (70 dBA). In the urban area it is likely that noise from construction above the AL72 level (75 dBA) would be experienced by properties at the Farnborough Road junction. Noise levels from the proposed urban compound are expected to be within the criteria and thus surrounding sensitive receptors would not be significantly affected.

7.8.2 This assessment compares the modelled existing noise levels with the noise levels as a result of proposed road improvements on worst case receptors. The modelling results are given in Tables 2.7.2 below. The difference in predicted noise levels in 2027 (when noise would be highest due to the predicted increase in traffic levels) between the 'do minimum' situation (without the scheme) and 'do something' (with the scheme) are shown in Figure 2.7.1 in the ES Volume 2. Figure 2.7.2 shows the Do-Minimum/Do-Something noise contours

Table 2.7.2: Traffic Modelling Results, $L_{A10, 18 \text{ hr}}$, dB

Key Receptors		Noise Levels 2012			Noise Levels 2027		
		Minimum Do	Something Do	Difference	Minimum Do	Something Do	Difference
R0	Dowell's Barn, Kegworth	67.9	71.8	3.9	68.5	72.4	3.9
R1	Long Lane Farm, Long Lane, Kegworth	62.2	65.8	3.6	62.7	66.4	3.7
R2	Cedar Isle, Clifton Road	66.7	70.0	3.3	67.2	70.6	3.4
R3	Manor Cottage, Ratcliffe-on-Sour	61.6	64.9	3.3	62.2	65.4	3.2

Key Receptors		Noise Levels 2012			Noise Levels 2027		
		Do Minimum	Do Something	Difference	Do Minimum	Do Something	Difference
R4	Riverside Farm, Ratcliffe-on-Sour	68.5	69.5	1.0	69.1	70.0	0.9
R5	Winking Hill Farm, West Leake lane	62.9	67.3	4.4	63.6	67.8	4.2
R6	Hillside Cottage, Clifton Road, Thrumpton	57.7	61.2	3.5	58.2	61.7	3.5
R7	Manor Farm Cottage, Barton Lane, Thrumpton	74.7	76.9	2.2	75.2	77.4	2.2
R8	Fields Farm, Barton Lane, Thrumpton	64.7	68.5	3.8	65.2	68.9	3.7
R9	Glebe Farm, Clifton Road, Thrumpton	58.0	62.9	4.9	58.5	63.3	4.8
R10	Top Farm Cottage, Barton Lane, Barton in Fabis	67.7	59.8	-7.9	69.1	60.2	-8.9
R11	Barton Lodge, New Lane, Barton in Fabis	71.4	70.2	-1.2	71.9	70.8	-1.1
R12	Plumtree Cottage, New Lane, Barton in Fabis	54.8	57.2	2.4	54.8	57.6	2.8
R13	26 Barbury Drive, Clifton	68.1	67.0	-1.1	68.9	67.1	-1.8
R14	Burrow Farm, Clifton Road, Clifton	51.7	52.7	1	52.2	53.1	0.9
R15a	Todd Court, Clifton	61.1	61.5	0.4	61.5	61.9	0.4
R15b	9 Todd Close, Clifton	75.0	75.3	0.3	75.4	75.6	0.2
R16	3 Krebs Close, Clifton	74.3	74.6	0.3	74.8	74.9	0.1
R17	60 Jasmine Close, Clifton	64.4	66.8	2.4	64.8	67.3	2.5
R18	133 Gardendale, Clifton	60.9	60.9	0.0	61.2	61.8	0.6
R19a	3 Fleming Gardens, Clifton	66.0	65.7	-0.3	66.5	66.3	-0.2
R19b	53 Pieries Drive, Clifton	70.2	73.8	3.6	70.6	74.2	3.6
R20	22 Wilkins Gardens, Clifton	60.3	61.4	1.1	60.5	62.2	1.7
R21	14 Lindon Avenue, Clifton	69.7	73.6	3.9	70.2	74.0	3.8
R22	13 Richardson Close, Clifton	70.1	73.3	3.2	70.6	73.6	3.0
R23	Crusader Public House	72.8	74.7	1.9	73.4	75.1	1.7
R24	53 Gardendale Road, Clifton	67.4	69.1	1.7	67.9	69.5	1.6
R25	17 The Leys, Clifton	69.6	70.7	1.1	70.1	71.1	1.0
R26	33 Gardendale Road, Clifton	67.3	68.8	1.5	67.8	69.2	1.4
R27	1 Dalehead Road, Clifton	62.9	66.9	4.0	63.6	67.8	4.2
R28	12 Morgan Mews, Clifton	75.1	76.7	1.6	75.8	77.1	1.3
R29a	Clapton School, Clapton Lane,	55.8	58.8	3.0	56.3	59.4	3.1

Key Receptors		Noise Levels 2012			Noise Levels 2027		
		Do Minimum	Do Something	Difference	Do Minimum	Do Something	Difference
	Clifton						
R29b	7 Clapton Lane, Clifton	69.5	72.4	2.9	70.0	72.7	2.7
R30	23 Kinsdale Walk, Clifton	69.9	71.5	1.6	70.3	71.7	1.4
R31a	7 Clevely Way, Clifton	69.4	70.9	1.5	69.9	71.2	1.3
R31b	Gleadthorpe House, Nottingham Trent University	66.8	70.2	3.4	67.4	70.4	3.0
R32	47 Rivergreen, Clifton	69.9	72.0	2.1	70.4	72.3	1.9
R33	1 Medan Close, Clifton	68.4	71.0	2.6	69.0	71.2	2.2
R34	19 Rivergreen, Clifton	70.0	72.2	2.2	70.6	72.5	1.9
R35	4 Farnborough Drive, Clifton	70.1	73.6	3.5	70.6	74.2	3.6
R36	8 Fleam Road, Clifton	65.6	67.8	2.2	66.1	68.4	2.3
R37	1 Farnborough Road, Clifton	73.1	75.7	2.6	73.6	76.3	2.7
R38	16 Tywford Gardens, Clifton	69.4	70.7	1.3	69.9	70.9	1.0
R39	66 Sturgeon Avenue, Clifton	71.3	72.2	0.9	71.8	72.4	0.6
R40	15 Westerfield Way	69.5	70.2	0.7	69.9	70.7	0.8
R41	Lark Hill Retirement Village 1	60.8	61.4	0.6	61.2	61.7	0.5
R42	Lark Hill Retirement Village 2	49.7	52.0	2.3	50.5	52.4	1.9
R43	Lark Hill Retirement Garden 1	60.8	61.4	0.6	61.3	61.7	0.4
R44	Lark Hill Retirement Garden 2	54.5	56.0	1.5	55.0	56.5	1.5
R45	Canal Towpath	62.6	65.2	2.6	63.1	65.8	2.7
R46	Playground, Pieris Drive	64.6	67.9	3.3	65.1	68.3	3.2
R47	Clifton Green, by Dovecote	65.9	67.3	1.4	66.4	67.9	1.5

Note: All values are sound pressure levels in dB re: 2×10^{-5} Pa

7.8.3 Property receptors R0 – R14, and receptor R45 are within the rural section, whilst receptors R15 – R44 are within the urban section. Increases and decreases in noise levels generally follow the change in the alignment of the A453. However, there are also effects as a result of changes in traffic flows and speeds over time. For example, changes in noise level at Top Farm Cottage (R10) are predicted as a result of the re-routing of traffic from Barton Lane (i.e. this route would no longer be used by traffic to avoid congestion on the A453) which would be 'Large Positive' in 2012 and in 2027 in accordance with the criteria in Table 2.7.1. The noise level at Plumtree Cottage (R12) in Barton in Fabis is predicted to increase, due to changes in HGV activity on New Lane. In 2027, increases in traffic noise in the 'do something' scenario are matched with increases in the 'do minimum' scenario and therefore changes to the differences between the 'do something' and 'do minimum' scenario are marginal.

7.8.4 The widening of the A453 within Clifton would result in higher noise levels. Footpaths extend both sides of the road and noise levels from the 'do something' scenario on paths to the north of the A453 would generally be lower than the 'do minimum' scenario and higher than the 'do minimum' scenario to the south of the A453.

7.8.5 Tables 2.7.3 and 2.7.4 below provide a summary of the changes in noise and noise nuisance levels respectively ('number of people bothered very much or quite a lot' in relation to property numbers) respectively for the proposed scheme in 2027:

Table 2.7.3: Noise Level Assessment Summary Table

Assessment		Number of Properties & Other Relevant Locations Affected at Different Noise Bands							
		< 50 dB		50 < 60 dB		60 < 70 dB		> 70 dB	
		Minimum Do	Something Do	Minimum Do	Something Do	Minimum Do	Something Do	Minimum Do	Something Do
Increase in noise level (L _{A10} 18h dB)	1<3	8	428	74	3587	154	645	252	57
	3<5	0	54	9	143	2	147	1	9
	5<10	0	0	1	13	0	44	0	3
	10<15	0	0	0	0	0	0	0	0
	15+	0	0	0	0	0	0	0	0
Decrease in noise level (L _{A10} 18h dB)	1<3	0	1	1	4	1	146	0	5
	3<5	0	0	0	5	0	1	0	0
	5<10	0	0	0	0	0	25	0	0
	10<15	0	0	0	0	0	0	0	1
	15+	0	0	0	0	0	0	0	0

Table 2.7.4: Noise Nuisance Assessment Summary Table

Assessment		Number of Properties and Other Relevant Locations Affected at Different Noise Bands							
		< 50 dB		50 < 60 dB		60 < 70 dB		> 70 dB	
		Minimum	Do Something	Minimum	Do Something	Minimum	Do Something	Minimum	Do Something
Increase in nuisance level (% of people bothered)	<10%	468	0	2914	5	1034	24	72	4
	10<20 %	0	2	0	0	0	186	0	20
	20<30 %	0	424	0	3606	0	667	0	8
	30<40 %	0	0	0	4	0	17	0	0
	40+	0	0	0	0	0	0	0	1
Decrease in nuisance level (% of people bothered)	<10%	7	0	298	29	119	24	63	4
	10<20 %	0	2	0	0	0	74	0	20
	20<30 %	0	1	0	21	0	176	0	8
	30<40 %	0	0	0	4	0	17	0	0
	40+	0	0	0	0	0	0	0	0

7.8.6 Table 2.7.3 indicates that increases in noise levels in the 'do something' scenario mainly fall within the 1-3 dBA band, which would be considered a 'slight negative' effect in accordance with the criteria given in Table 2.7.1. A number of locations would experience increases of between 3-4.9 dBA considered to be of 'moderate negative' magnitude and a small number of locations would experience a 'large negative' increase in noise of between 5-9.9 dBA. Beneficial effects of traffic decreases would result in decreased noise levels experienced by 188 locations in the 'do something' scenario in comparison with 2 in the 'do minimum' scenario. Beneficial effects would range from 'slight' to 'very large positive' magnitude.

7.8.7 Where there would be a decrease in nuisance levels as shown in Table 2.7.4, this is predicted to be more pronounced in the 'do something' scenario than the 'do minimum' scenario. Where there would be an increase in nuisance levels this is also predicted to be more pronounced in the 'do something' scenario than the 'do minimum' scenario. Overall the results show that the proposed scheme is predicted to increase the percentage of people 'bothered very much or quite a lot' by the scheme in comparison to the 'do minimum' scenario.

Vibration

7.8.8 Table 2.7.5 below indicates the predicted changes in percentage of people likely to be bothered by road traffic induced airborne vibration:

Table 2.7.5: Vibration Nuisance Assessment Summary Table

Assessment		Number of Properties & Other Relevant Locations Affected at Different Vibration Bands					
		58 < 60 dB		60 < 70 dB		> 70 dB	
		Minimum Do	Something Do	Minimum Do	Something Do	Minimum Do	Something Do
Increase in nuisance level (% of people bothered)	<10%	738	2	1034	24	72	1
	10<20%	0	29	0	186	0	41
	20<30%	0	894	0	667	0	60
	30<40%	0	28	0	176	0	7
	40+	0	0	0	0	0	0
Decrease in nuisance level (% of people bothered)	<10%	64	17	119	15	63	3
	10<20%	0	20	0	59	0	15
	20<30%	0	12	0	161	0	14
	30<40%	0	5	0	63	0	0
	40+	0	0	0	0	0	0

7.8.9 The results show that the percentage of people likely to be bothered by airborne vibration from traffic is predicted to increase in the 'do something' scenario from the 'do minimum'. There is expected to be an increase in vibration nuisance levels to 271 properties and other relevant locations and a reduction to 138 locations, but increases would be well below the level likely to cause any damage to buildings. The magnitude of impact is assessed as slight negative.

Noise Insulation Regulations

7.8.10 The 1975 Noise Insulation Regulations and subsequent amendment provide criteria for assessing the eligibility for noise mitigation for properties based on variations in traffic noise due to a new or improved road scheme. Noise level criteria are given within the Regulations which, if satisfied, indicate whether properties in the vicinity may be entitled to the installation of additional noise insulation or to a grant to cover the cost of the noise insulation.

7.8.11 The entitlement conditions of the Noise Insulation Regulations are triggered when:

- (i) 'the L_{A10} (18 hour) predicted figure is greater by at least 1 dB than the prevailing noise level';

- (ii) 'the $L_{A10(18\text{ hour})}$ predicted figure is not less than the specified level ($L_{A10(18\text{ hour})} = 68\text{ dB}$);
- (iii) 'the noise caused, or expected to be caused, by traffic using or expected to use the new highway makes an effective contribution to the $L_{A10(18\text{ hour})}$ predicted figure of at least 1 dB'

7.8.12 A preliminary estimate of properties likely to be eligible for noise insulation shows that 222 properties are likely to qualify under the Noise Insulation Regulations. A detailed assessment would be undertaken based upon flows immediately prior to construction of the road.

7.9 Significance of Effects

7.9.1 The assessment indicates that in some locations noise levels will reduce, particularly along Barton Lane and Clifton Lane, by up to almost 10dB. Elsewhere there will be an increase in traffic noise levels by up to almost 5dB, typically between the 50dB – 60dB bands. This is to be expected because of the predicted increase in the number of vehicles that will use the improved A453.

7.9.1 Overall in 2027 there will be a net increase in the population annoyed by traffic noise. The vast majority of noise increases will be within the 1-3dBA noise band, considered to be a 'slight negative' impact, with most of the remaining increases being within 3-5dBA band which will result in 'moderate negative' impact. Overall the increase in noise levels is assessed as being of slight to moderate significance.

7.10 Summary

7.10.1 Noise mitigation and minimisation has been considered throughout the design of the scheme and has been influential in decision making including route alignment. Noise mitigation measures are included within the scheme design, namely fencing to properties backing on to the road at Medan Close, Morgan Mews and Cavell Close, and mounding and fencing around the proposed Mill Hill Roundabout to reduce noise levels in the grounds of Lark Hill Retirement Village. Low noise surfacing would be used throughout the scheme to help reduce traffic noise.

7.10.2 Noise levels from construction works are not likely to exceed the AL72 level in the rural area (70 dBA). In the urban area it is likely that noise from construction above the AL72 level (75 dBA) would be experienced by properties at the Farnborough Road junction. Noise levels from the proposed urban compound are expected to be within the criteria and thus surrounding sensitive receptors would not be significantly affected.

7.10.3 It is predicted that some properties will benefit from reduced noise whilst for others there will be an increase in noise levels. In particular some properties on the Nottingham Road-Clifton Lane route to the Crusader Roundabout and on the Barton-in-Fabis turn off from the A453 would benefit from reduced noise, whereas

largest increases are predicted at properties close to the Farnborough Road junction. Overall it is predicted that there will be a net increase in properties experiencing increased traffic noise as a result of the predicted increase in traffic using the improved A453.

7.10.4 Overall there is expected to be an increase in vibration nuisance levels to 271 properties and a reduction to 138 properties, but increases would be well below the level likely to cause any damage to buildings.