

# M20 Junction 10a

## TR010006

### Environmental Statement

### Chapter 11 Noise and Vibration

APFP Regulation 5(2)(q)

Revision A

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Infrastructure Planning (Applications: Prescribed Forms and  
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M20 Junction 10a

TR010006

# **Environmental Statement**

## **Chapter 11 Noise and Vibration**

Volume 6.1



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# 11 Noise and Vibration

## 11.1 Introduction

- 11.1.1 This chapter assesses both the temporary and permanent effects of noise and vibration as a result of both the Main and Alternative Schemes. Chapter 2 The Proposed Scheme, Volume 6.1 of this ES contains a description of both Schemes.
- 11.1.2 A further assessment in the form of a sensitivity analysis is made in Appendix 15.4, Volume 6.3 of Chapter 15 Combined and Cumulative Effects, which details the effects of additional traffic flows on the network associated with the development of the area to the south east of the new link road associated with the Alternative Scheme. A description of the traffic data scenarios used in this chapter is contained within Chapter 4 EIA Methodology, Volume 6.1 of this ES.
- 11.1.3 This chapter follows 'Detailed' assessment methodology as defined within the Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 7 Noise and Vibration, HD 213/11<sup>1</sup>.

## 11.2 Legislative and Policy Framework

### National Policy

- 11.2.1 Local Authorities have statutory controls on noise and vibration. Sections 60 and 61 of the Control of Pollution Act 1974<sup>2</sup> concern impacts relating to construction sites and the Environmental Protection Act 1990<sup>3</sup> places a duty on Local Authorities to serve abatement notices where noise from premises, vehicles and machinery is judged to constitute a statutory nuisance. Compliance with these controls is required although the requirements fall outside the planning system.
- 11.2.2 The Noise Insulation Regulations 1975 (amended 1988)<sup>4</sup> were made under Part 2 of the Land Compensation Act 1973<sup>5</sup> for the obligatory and discretionary provision of noise mitigation measures for dwellings adjacent to new highways.

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<sup>1</sup> DMRB (2011) Design Manual for Roads and Bridges Volume 11 Section 3 Part 7 HD213/11 Noise and Vibration.

<sup>2</sup> Parliament of the United Kingdom (1974) Control of Pollution Act – Part III Noise, C.40.

<sup>3</sup> Parliament of the United Kingdom (1990) Environmental Protection Act, C.43.

<sup>4</sup> Statutory Instrument (1975) The Noise Insulation Regulations. No. 1763 "Building and Buildings".

<sup>5</sup> Parliament of the United Kingdom (1973) Land Compensation Act – Part 1, C24.

### ***The National Policy Statement for National Networks 2014***

11.2.3 The Government has produced a series of National Policy Statements (NPS), including one on National Road and Rail Networks<sup>6</sup>

11.2.4 The National Policy Statement for National Networks (NPSNN) sets out the Government's vision and policy for the future development of nationally significant infrastructure projects on the national road and rail networks in England. The NPSNN provides guidance for promoters of Nationally Significant Infrastructure Projects (NSIP) and also provides the basis for examination by the examining authority and decision making by the Secretary of State for Transport (SoST).

11.2.5 NPSNN requires that:

*Paragraph 5.193 "Due regard must...be given to the relevant sections of the Noise Policy Statement for England, National Planning policy Framework and the Government's associated planning guidance on noise".*

*Paragraph 5.200 "Applicants should consider opportunities to address the noise issues associated with the Important Areas as identified through the noise action planning process".*

*Paragraph 5.198 "Mitigation measures for the project should be proportionate and reasonable and may include one or more of the following:*

- *Engineering: containment of noise generated.*
- *Materials: use of materials that reduce noise, (for example low noise road surfacing).*
- *Lay-out: adequate distance between source and noise-sensitive receptors; incorporating good design to minimise noise transmission through screening by natural or purpose built barriers.*
- *Administration: specifying acceptable noise limits or times of use(e.g., in the case of railway station PA systems)"*

### ***National Planning Policy Framework<sup>7</sup>***

11.2.6 The National Planning Policy Framework (NPPF) came into force in March 2012.

11.2.7 Paragraph 109 of the NPPF states that: "*the planning system should contribute to and enhance the natural and local environment by: .....preventing both new and existing development from contributing to or being put at*

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<sup>6</sup> Department of Transport, December (2014) National Policy Statement for National Networks

<sup>7</sup> Department for Communities and Local Government (2012) National Planning Policy Framework, available online at [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/6077/2116950.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf)

*unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability”.*

11.2.8 Paragraph 123 of the NPPF states that: “*Planning policies and decisions should aim to:*

- *Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development.*
- *Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions.*
- *Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions placed on them because of changes in nearby land uses since they were established.*
- *Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*
- *Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions.”*

### **The Noise Policy Statement for England**

11.2.9 The Noise Policy Statement for England (NPSE)<sup>8</sup> was issued by the Department for the Environment, Food and Rural Affairs (DEFRA) in 2010. Its purpose is to promote “*good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development*”. The 3 main aims are to:

- *“Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*
- *Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*
- *Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development”.*

11.2.10 Within the aims stated above there are several key phrases that lead to additional concepts now considered in the assessment of noise impact, including the following:

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<sup>8</sup> DEFRA, 2010. “The Noise Policy Statement for England”

- No Observed Effect Level (NOEL): this is the level below which no effect can be detected.
- Lowest Observed Adverse Effect Level (LOAEL): this is the level above which adverse effects on health and quality of life can be detected.
- Significant Observed Adverse Effect Level (SOAEL): this is the level above which significant adverse effects on health and quality of life occur.

11.2.11 There are no pre-defined values for these effect levels as it is acknowledged that they will be different for different sources, different receptors and at different times. The levels used in the assessment are defined in Section 11.3.

### ***The Environmental Noise (England) Regulations 2006<sup>9</sup>***

11.2.12 These Regulations implement European legislation requiring noise action plans to be developed on a five year rolling programme. Action plans have to be developed for the major noise sources and areas for which maps have been produced. The action plans seek to manage noise issues and effects including noise reduction if necessary, based on the results obtained through the mapping process. As a result of the process, the “Noise Action Plan: Roads (Including Major Roads)”<sup>10</sup> was published.

### ***National Planning Practice Guidance***

11.2.13 National Planning Practice Guidance (NPPG) is the web-based ‘home of the National Planning Policy Framework for England’. NPPG advises that:

*“Local planning authorities’ plan-making and decision taking should take account of the acoustic environment and in doing so consider:*

- *Whether or not a significant adverse effect is occurring or likely to occur.*
- *Whether or not an adverse effect is occurring or likely to occur.*
- *Whether or not a good standard of amenity can be achieved.*

*In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during construction wherever applicable) is, or would be, above or below the significant observed adverse effect level...”*

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<sup>9</sup> Environmental Noise Regulations available online at [http://www.legislation.gov.uk/ukxi/2006/2238/pdfs/ukxi\\_20062238\\_en.pdf](http://www.legislation.gov.uk/ukxi/2006/2238/pdfs/ukxi_20062238_en.pdf)

<sup>10</sup> Department for Environment and Rural Affairs Noise Action Plan: Roads (Including Major Roads); Environmental Noise (England) Regulations 2006 as amended; January 2014 available online at [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/276237/noise-action-plan-roads-201401.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/276237/noise-action-plan-roads-201401.pdf)

## Local Policy

- 11.2.14 The current Local Development Framework Core Strategy for Ashford Borough Council (ABC)<sup>11</sup> was adopted in July 2008 and sets out the overall vision and objectives for the growth within Ashford between 2006 and 2021. The planning policy team are currently reviewing this and preparing a new Local Plan for up to 2030. Currently the Core Strategy does not have a specific policy on noise. The preceding document, entitled the Ashford Borough Local Plan 2000<sup>12</sup>, lists policy DP6 in regards to noise generating developments which states the following:

*“Development proposals that generate significant levels of noise should be accompanied by a scheme to mitigate such effects, bearing in mind the character of surrounding uses, to ensure there would be no serious impact on noise sensitive uses.”*

## Guidance

### **The World Health Organisation's (WHO) "Guidelines for Community Noise" 1999**

- 11.2.15 The World Health Organization's (WHO) 'Guidelines for Community Noise'<sup>13</sup> are intended to guide the long-term management of community noise to help meet the WHO's core objective of *“the attainment by all peoples of the highest possible levels of health”*. They set out various noise guide values for specific activities. These values represent the onset of specific effects such as annoyance or sleep disturbance.
- 11.2.16 For night time noise, WHO gives an annual average level of 45dB  $L_{Aeq,8hours}$  and also recommends that for single events, *“For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB  $L_{Amax}$  more than 10-15 times per night.”* Allowing for a 15dB reduction through an open window gives an external level of 60dB  $L_{Amax}$  10-15 times per night. However, WHO also states: *“It is estimated that 80 – 90% of the reported cases of sleep disturbance in noisy environments are for reasons other than noise originating outdoors. For example sanitary needs; indoor noises from other occupants; worries; illness; and climate.”*

### **World Health Organisation “Night Noise Guidelines for Europe” 2009**

- 11.2.17 The WHO “Night Noise Guidelines for Europe” 2009<sup>14</sup> reviewed available evidence of health effects of night time noise across Europe, and derived

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<sup>11</sup> Ashford Borough Council (2008) Local Development Framework Core Strategy, available online at <http://www.ashford.gov.uk/core-strategy-2008>, last accessed 19/04/16.

<sup>12</sup> Ashford Borough Council (2000) Local Plan, available online at <http://www.ashford.gov.uk/borough-local-plan-2000>, last accessed 19/04/16.

<sup>13</sup> World Health Organisation (1999) Guidelines for Community Noise, available online at <http://www.devon.gov.uk/core-doc-n4-world-health-organisation-guidelines-for-community-noise-1999.pdf>, last accessed 19/04/16.

<sup>14</sup> World Health Organisation (2009) Night Noise Guidelines for Europe, available online at [http://www.euro.who.int/\\_data/assets/pdf\\_file/0017/43316/E92845.pdf](http://www.euro.who.int/_data/assets/pdf_file/0017/43316/E92845.pdf)

health-based guideline values. The guidelines recommended an interim target of 55dB  $L_{Night, outside}$  to protect the public. This target value is an annual average  $L_{Aeq, 8hours}$  from 23:00 to 07:00.

- 11.2.18 Under some circumstances it may be possible to relax guideline values. BS8233<sup>15</sup> notes: “*Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved*”.
- 11.2.19 Design criteria for external noise is also provided in BS8233, with the target levels applicable to amenity spaces associated with the residential properties (such as gardens and patios). In these areas it is desirable that the external noise level does not exceed 50dB  $L_{Aeq, T}$ , though a higher target level of 55dB  $L_{Aeq, T}$  is possible in noisier environments.
- 11.2.20 Where it is not possible to meet the external levels stated above, a development should be designed so that the external areas achieve the lowest practicable noise levels.

***British Standard (BS) 5228 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise***

- 11.2.21 BS 5228<sup>16</sup> provides a methodology for predicting noise levels generated by fixed and mobile plant used for a range of typical construction operations. The standard includes a database of noise levels at a reference distance of 10m from the source and a simple noise propagation model that can be used to make allowances for effects such as source-receiver distances, ground properties and utilisation time.

***BS 5228 Code of construction practice for noise and vibration control on construction and open sites – Part 2: Vibration***

- 11.2.22 BS 5228<sup>17</sup> provides guidance on the effect of vibration and the likelihood it will cause complaint and cosmetic damage to buildings. The assessment of vibration impacts arising due to the Main and Alternative Schemes has been carried out in accordance with this Standard.

***The Design Manual for Roads and Bridges***

- 11.2.23 The Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 7; HD213/11<sup>18</sup> describes a methodology for the assessment of road projects in the UK and best reflects conventional Environmental Impact

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<sup>15</sup> British Standard BS8233:2014 Guidance on sound insulation and noise reduction in buildings

<sup>16</sup> BSI (2009, amended 2014) British Standard BS 5228 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise.

<sup>17</sup> BSI, 2009, amended 2014. “British Standard BS 5228 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration.”

<sup>18</sup> DMRB (2011) Design Manual for Roads and Bridges Volume 11 Section 3 Part 7 HD213/11 Noise and Vibration.

Assessment (EIA) methodology. A method for assessment of both long and short-term impacts has been introduced where previously only long-term impacts were considered in evaluating impacts.

### **Calculation of Road Traffic Noise**

- 11.2.24 Calculation of Road Traffic Noise (CRTN)<sup>19</sup> provides procedures for predicting noise levels for a given flow of road traffic at sensitive receptors. These methodologies are used in the determination of entitlement under the Noise Insulation Regulations and for traffic noise change assessments undertaken in accordance with the DMRB methodology cited above.

### **IEMA Guidelines for Environmental Noise Impact Assessment**

- 11.2.25 The recently published Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Assessment<sup>20</sup> provide guidance on noise assessment in the EIA context. The guidelines define key methodologies used within the noise impact assessment process, and provide advice on their limitations. They are relevant to all scales of project. In the context of this assessment the IEMA Guidelines have been used to inform the definition of sensitivity of receptor and the relation between magnitude of impact and significance of effect of noise changes upon those receptors.

## **11.3 Method of Assessment**

- 11.3.1 The assessment has been undertaken in accordance with the methodology at the 'Detailed' level of assessment as described in HD 213/11<sup>21</sup>.
- 11.3.2 For the purposes of this assessment, 'impact' is defined as a tangible change to the baseline environment resulting from either the Main or Alternative Schemes. For example, an impact can be an increase in the level of road traffic noise due to an expected increase in traffic volumes. The consequence of change to the baseline environment on any environmental receptor is defined as the 'effect'. For example, the impact that is an increased level of road traffic noise may produce the effect of increased disturbance in a community.
- 11.3.3 For the majority of receptors, the significance of effects due to noise and vibration is generally a function of the magnitude of impact and the sensitivity of the receptor. Further to this concept the National Planning Policy Framework has introduced a quantifiable means of assessing significance for residential receptors based upon health effects – this is discussed further under 'Significance Criteria' paragraph 11.3.4 onwards. Residential receptors are regarded as receptors of the highest sensitivity and this assessment

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<sup>19</sup> Department of Transport (1988) Calculation of road traffic noise (CRTN), available at [http://www.noiseni.co.uk/calculation\\_of\\_road\\_traffic\\_noise.pdf](http://www.noiseni.co.uk/calculation_of_road_traffic_noise.pdf)

<sup>20</sup> Institute of Environmental Management and Assessment, 2009. "Guidelines for Environmental Impact Assessment".

<sup>21</sup> DMRB (2011) Design Manual for Roads and Bridges Volume 11 Section 3 Part 7 HD213/11 Noise and Vibration.

primarily considers these in order to provide a conservative and proportionate assessment.

11.3.4 The assessment of the effects on receptors arising from changes to levels of noise or vibration comprises the following elements:

- Identification of potential sources and prediction of noise and vibration likely to be received at nearby sensitive receptors including dwellings.
- Comparison of the predicted impacts with the baseline conditions and threshold criteria.
- Evaluation of the receptor sensitivity and the significance of effects.
- The consideration of noise mitigation measures incorporated within the design and an assessment of any residual effects.

### Value of Receptor

11.3.5 Noise affects people in a number of different ways. This may include factors such as annoyance and sleep disturbance, enjoyment of quiet spaces, ability to communicate with others, ability to concentrate at home or at work, participation in social and community activities.

11.3.6 Table 11.1 sets out typical classes of sensitive receptors. As a consequence, it is not appropriate to consider a single criterion when assessing the sensitivity of an existing noise environment, for the purposes of this assessment expressed as 'value'.

11.3.7 Table 11.2 sets out criteria to be used in determining the sensitivity of a receptor. It should be noted that, generally, the variation in the sensitivity of receptors in terms of noise impact is taken into account by applying different scales to classify magnitude of impact (e.g. by using different scales for day-time and night-time) rather than by varying the assignment of sensitivity to specific types of receptors.

Table 11.1 Noise and Vibration resources and receptors

Resource / Receptor	Description
Dwellings	Houses and any other building in residential use such as public houses, hotels etc.
Commercial premises	Shops, offices etc.
Community facilities	Libraries, public halls, sports centres, theatres, concert halls, places of worship etc.
Recreational facilities	Amenity areas, footpaths, sports grounds etc.
Educational establishments	Schools, university campus
Designated sites	If relevant, environmentally sensitive areas and buildings sensitive to the effect of noise and vibration
Other	Any other premises highly sensitive to noise and vibration such as laboratories etc.

Table 11.2 Sensitivity criteria

Sensitivity	Criteria
High	Receptors where occupants or activities are particularly susceptible to noise. Examples include: Residences, quiet outdoor areas used for recreation, conference facilities, auditoria / studios, schools in day-time, hospitals / residential care homes and religious institutions e.g. churches or mosques .
Medium	Receptors moderately sensitive to noise, where it may cause some distraction or disturbance. Examples include: offices, restaurants and sports grounds where spectator noise is not a normal part of the event and where quiet conditions are necessary (e.g. golf or tennis).
Low	Receptors where distraction or disturbance from noise is minimal. Examples include: residences and other buildings not occupied during working hours, factories and working environments with existing high noise levels and sports grounds where spectator noise is a normal part of the event.

11.3.8 The majority of the receptors that would be affected by noise and vibration impacts arising from either Main or Alternative Schemes are dwellings.

11.3.9 Under Directive 2002/49/EC<sup>22</sup> member states were required to draw up Action Plans for major roads to aid in management of environmental noise. As part of this process, 3 'Important Areas' have been identified in the vicinity of both the Main and Alternative Schemes. The first of these areas corresponds to a location adjacent to the A2070 already having existing acoustic barriers which were not incorporated into the study under the Directive. The second of these areas comprises part of Kingsford Street, adjacent to the M20 and the third area comprises an approximately 2km length of the M20 north of junction 10, to the north west of the Study Area (as defined in paragraph 11.3.37 onwards) for both the Main and Alternative Schemes. These Important Areas have been considered further in Section 11.7.2.

### Magnitude of Impacts

11.3.10 Both the Main and Alternative Schemes have the potential to give rise to both temporary and permanent noise and vibration impacts resulting in effects in the environment and community.

11.3.11 Potential temporary impacts arising from the construction phase include:

- Noise and vibration arising from construction of both the Main and Alternative Schemes.
- Noise and vibration arising from construction traffic using the public highways and access routes.
- Noise and vibration due to the use of site compounds.

11.3.12 Potential permanent impacts arising from the operation of both the Main and Alternative Schemes include:

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<sup>22</sup> European Commission (2002) Environmental Noise Directive 2002/49/EC.

- Changes in road traffic noise resulting from realignment of the A2070.
- Noise from road traffic using the new link road to the A2070.
- Noise from road traffic using the new M20 junction 10a to the south of the existing junction 10.

## Temporary Impacts

### **Construction Noise**

- 11.3.13 BS 5228 Part 1<sup>23</sup> does not define strict criteria to determine the significance of noise impacts although examples of how limits of acceptability have been applied historically and some examples of assessing significance are provided. 'Example Method 2 - 5 dB(A) change (Annex E 'Significance of Noise Effects' Section E.3.3) has been adopted for the assessment of effects at sensitive receptors as this approach considers the expected changes in ambient noise levels and better reflects conventional EIA methodologies compared with the use of fixed / absolute noise limits.
- 11.3.14 Noise levels generated by construction activities are deemed to be potentially significant if the total noise (pre-construction baseline noise plus construction noise) exceeds the pre-construction baseline noise by 5dB or more, subject to lower cut-off values of 65dB (day-time), 55dB (evening) and 45dB L<sub>Aeq</sub> (night-time) from construction noise alone; and a duration of 1 month or more, unless works of a shorter duration are likely to result in significant impact.
- 11.3.15 The day-time period is defined as 07:00 to 19:00, the evening period as 19:00 to 23:00 and the night-time period as 23:00 to 07:00.
- 11.3.16 BS 5228 - 1 does not qualify what might constitute a significant noise impact from works of shorter duration. However the Standard does provide an example of criteria for the significance of noise effects which might be used to determine whether a scheme for installation of noise insulation or temporary rehousing of occupants is appropriate. This example criteria cites the occurrence of the trigger noise levels reproduced in Table 11.3 subject to the following conditions:
- Predicted noise level exceeds the noise trigger level in Table 11.3.
  - The total noise (baseline plus construction noise) is 5dB above the existing baseline noise level (from Example Method 2).
  - The noise level exceeds the trigger level for 10 or more days of working in any 15 or for a total of days exceeding 40 in any 6 month period.

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<sup>23</sup> BSI (2009, amended 2014) British Standard BS 5228 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise.

Table 11.3 Examples of time periods, averaging times and noise levels associated with the determination of eligibility for noise insulation

Time	Relevant Time Period	Averaging Time, T	Noise Insulation Trigger Level dB LAeq,T
Monday to Friday	07:00 – 08:00	1h	70
	08:00 – 18:00	10h	75
	18:00 – 19:00	1h	70
	19:00 – 22:00	3h	65
	22:00 – 07:00	1h	55
Saturday	07:00 – 08:00	1h	70
	08:00 – 13:00	5h	75
	13:00 – 14:00	1h	70
	14:00 – 22:00	3h	65
	22:00 – 07:00	1h	55
Sunday and Public Holidays	07:00 – 21:00	1h	65
	21:00 – 07:00	1h	55

### **Construction traffic**

11.3.17 Construction traffic including both material deliveries and staff trips using the existing road network is evaluated based upon its likely contribution to increase in the overall traffic flows on approach routes. An increase in traffic flow of 25% would be required to increase noise levels by 1dB - the lowest change perceptible in the short term.

### **Construction Vibration**

11.3.18 In general, vibration arising from construction activities is ground-borne and, for example in the case of typical earthworks schemes, may be generated by operations such as ground compaction, piling and the movement of vehicles over irregular surfaces. It is generally recognised that it is not realistic to undertake a detailed prediction and assessment of construction vibration as it is a complex subject comprising many factors.

11.3.19 The Transport Research Laboratory (TRL) has published the results of a series of measurements of vibration levels at distances from a range of construction works<sup>24</sup>. The ground conditions in the area of the source and receiver position and of the intervening ground are not specified in that report, however, it is considered to be sufficiently accurate for the purposes of this assessment. The data is reproduced in Table 11.4 with vibration levels expressed as peak particle velocity (PPV). PPV is defined as the instantaneous maximum velocity reached by a vibrating element as it

<sup>24</sup> DoT (1986) Transport and Road Research Laboratory Report 53. Ground Vibration Caused by Civil Engineering Works.

oscillates about its rest position and is used in this assessment to assess construction vibration impacts with respect to disturbance and building damage.

Table 11.4 Estimated peak particle velocities at distances between construction plant and vibration measurement positions

Construction plant	Distance between construction Site and vibration measurement position in m	Peak particle velocity at measurement position in mm/s
General construction traffic including haul routes	1	0.60
	2	0.24
	4	0.14
	6	0.10
	≥8	<0.10
Heavy lorry on poor road surface	1	2.20
	2	0.80
	4	0.24
	6	0.16
	8	0.10
	≥10	<0.10

11.3.20 BS 5228 Part 2<sup>25</sup> provides empirical relationships for ground-borne vibration arising from a range of mechanised construction activities including vibratory compaction. Table 11.4 shows the level of vibration from typical construction plant expressed as peak particle velocity (mm/s) as a function of distance from the works. Construction vehicle vibration values from Table 11.4 have also been plotted on Figure 1.1 in Appendix 11.1, Volume 6.3.

11.3.21 BS 5228 Part 2<sup>26</sup> provides guidance on the effect of vibration and the likelihood they will cause complaint and cosmetic damage to buildings. BS 5228 Part 2<sup>27</sup> does not indicate whether particular vibrations are significant. The standard states:

*“Vibrations above these levels [0.14mm/s to 0.3mm/s] can disturb, startle, cause annoyance or interfere with work activities. At higher levels they can be described as unpleasant or even painful. In residential accommodation, vibrations can promote anxiety...”*

<sup>25</sup> BSI (2009, amended 2014) British Standard BS 5228 Code of practice for noise and vibration control on construction and open sites – Part 2.

<sup>26</sup> BSI (2009, amended 2014) British Standard BS 5228 Code of practice for noise and vibration control on construction and open sites – Part 2.

<sup>27</sup> BSI (2009, amended 2014) British Standard BS 5228 Code of practice for noise and vibration control on construction and open sites – Part 2.

11.3.22 In addition BS 5228 Part 2<sup>28</sup> provides the following guidance on effects:

- At a vibration level of 0.14mm/s vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction.
- At a vibration level of 0.3mm/s vibration might be just perceptible in residential environments.
- At a vibration level of 1.0mm/s *“It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents”*.
- At a vibration level of 10mm/s vibration is likely to be intolerable for any more than a very brief exposure to this level.

11.3.23 Generally, vibration from construction activities will be temporary and intermittent in nature. On this basis, in this assessment a PPV of 1.0 mm/s or more has been considered to have the potential to result in a significant adverse impact.

## Permanent Impacts

### Operational Noise

#### Day Time Road Traffic Noise Impacts

11.3.24 HD213/11<sup>29</sup> describes the impacts of road traffic noise in terms of the noise descriptors conventionally used for assessing the impact of road traffic in the UK, i.e. the statistical noise level LA<sub>10,18hr</sub> over an 18-hour period between 06:00 and 24:00 (the traffic noise index). CRTN methodology has been followed in the traffic noise calculations, which provide input to assessment of impact using HD213/11.

11.3.25 The level of road traffic noise from the road network has been predicted using traffic data provided in terms of 18 hour Annual Average Weekday Traffic (AAWT) flow between the hours of 06:00 to 24:00, along with average vehicle speed and percentage heavy vehicles.

11.3.26 Calculation of the road traffic noise levels has been carried out for 8 scenarios:

- Do Minimum option in the Baseline Year (Opening Year, 2018).
- Do Minimum option in the Design Year (2033).
- Do Something option in the Baseline Year (2018) for Main Scheme and the Alternative Scheme and for a further scenario in which traffic flows have incorporated additional flows arising from use of the development

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<sup>28</sup> BSI (2009, amended 2014) British Standard BS 5228 Code of practice for noise and vibration control on construction and open sites – Part 2.

<sup>29</sup> DMRB (2011) Design Manual for Roads and Bridges Volume 11 Section 3 Part 7 HD213/11 Noise and Vibration.

adjacent to the link road, the latter being reported in Appendix 15.5, Volume 6.3 of Chapter 15 Consideration of Combined and Cumulative Effects, Volume 6.1.

- Do Something option in the Design Year (2033) for both Main Scheme Alternative Scheme and for a further scenario in which forecast traffic flows incorporate additional flows arising from use of the development adjacent to the link road.

11.3.27 In the above scenarios, 'Do Minimum' means traffic growth with committed development only. 'Do Something' means traffic growth with committed development and with the Scheme.

11.3.28 In accordance with HD213/11<sup>30</sup> the assessment of road traffic noise impacts requires the following comparisons:

- The short-term change in road traffic noise upon operation of the project (Do Minimum option in the baseline year vs. Do Something option in the baseline year).
- The long-term change in road traffic noise assuming the project is built (Do Minimum option in the baseline year vs. Do Something option in the future assessment year).
- The long-term change in road traffic noise assuming the project is not built (Do Minimum option in the baseline year vs. Do Minimum option in the future assessment year).

11.3.29 For short-term changes in road traffic noise, the smallest change in road traffic noise level that is considered perceptible is 1dB  $L_{A10, 18h}$ . In the long-term, a change of 3dB  $L_{A10, 18h}$  in road traffic noise is considered to be the smallest perceptible change. Consequently, different scales are applied for assigning magnitude of impact for short and long term impacts due to changes in road traffic within HD 213/11<sup>31</sup>. These are presented in Table 11.5 and can be positive or negative.

Table 11.5 Classification of Magnitude of Short and Long Term Noise Impacts due to Changes in Road Traffic Noise

Magnitude of Impact	Noise Change, $L_{A10, 18h}$	
	Short term	Long term
No change	0	0
Negligible	0.1 to 0.9	0.1 to 2.9
Minor	1 to 2.9	3 to 4.9
Moderate	3 to 4.9	5 to 9.9

<sup>30</sup> DMRB (2011) Design Manual for Roads and Bridges Volume 11 Section 3 Part 7 HD213/11 Noise and Vibration.

<sup>31</sup> DMRB (2011) Design Manual for Roads and Bridges Volume 11 Section 3 Part 7 HD213/11 Noise and Vibration.

Magnitude of Impact	Noise Change, $L_{A10,18h}$	
Major	5+	10+

11.3.30 Paragraph 3.36 of HD 213/11<sup>32</sup> states that "*In terms of road traffic noise, a methodology has not yet been developed to assign significance according to both the value of a resource and the magnitude of the impact*".

11.3.31 For this reason the magnitude of the road traffic noise impact is reported rather than the significance of the impact. However, environmental assessment regulations do require the reporting of any significant effects, and DMRB does provide guidance on significance for other environmental topics, based upon sensitivity of receptor and magnitude of impacts. Significance is reported on the basis of NPPF guidance, and associated SOAEL values.

#### Night Time Road Traffic Noise Impacts

11.3.32 In addition to the day-time impact of both the Main and Alternative Schemes, it is recognised within HD213/11<sup>33</sup> that there is potential for a road scheme to result in increased levels of road traffic noise during the night-time. Whilst traffic levels during the night-time are generally lower than during the day-time, there is still a potential impact due to the heightened sensitivity of receptors during the night. The WHO Night Noise Guidelines for Europe<sup>34</sup> propose an Interim Target Level of 55dB  $L_{night,outside}$  and the assessment in this chapter considers where the proposed Scheme would result in night-time levels above this target. Note that this is considered in the long-term only in DMRB methodology.

11.3.33 Predictions of night-time noise level, expressed in terms of  $L_{night,outside}$ , have been carried out using forecast night-time traffic flows. Receptors have been identified where:

- The introduction of either the Main or Alternative Scheme could result in a receptor being exposed to night-time road traffic noise levels above the Interim Target level, where current exposure is below this level.
- A receptor already exposed to night-time road traffic levels in excess of the Interim Target Level and where exposure is predicted to increase.

#### Operational Vibration

11.3.34 Paragraph A5.26 of HD213/11<sup>35</sup> advises "*Significant ground-borne vibrations may be generated by irregularities in the road surface. Such vibrations are*

<sup>32</sup> DMRB (2011) Design Manual for Roads and Bridges Volume 11 Section 3 Part 7 HD213/11 Noise and Vibration.

<sup>33</sup> DMRB (2011) Design Manual for Roads and Bridges Volume 11 Section 3 Part 7 HD213/11 Noise and Vibration.

<sup>34</sup> World Health Organisation (2009) Night Noise Guidelines for Europe, available online at [http://www.euro.who.int/\\_data/assets/pdf\\_file/0017/43316/E92845.pdf](http://www.euro.who.int/_data/assets/pdf_file/0017/43316/E92845.pdf)

<sup>35</sup> DMRB (2011) Design Manual for Roads and Bridges Volume 11 Section 3 Part 7 HD213/11 Noise and Vibration (Paragraph A5.26).

*unlikely to be important when considering disturbance from new roads and an assessment will only be necessary in exceptional circumstances. Furthermore, as the irregularities causing ground-borne vibration can be rectified during maintenance work, relief of these vibrations should not be presented as a benefit of a new road project."*

- 11.3.35 For the above reasons, ground-borne vibration is scoped out of this assessment and has not been considered further.
- 11.3.36 Low frequency noise from vehicle exhausts may induce vibration (rattle) in light building elements such as windows i.e. airborne vibration. Paragraph A5.28 of HD213/11<sup>36</sup> advises that vibration disturbance most closely parallels exposure to traffic noise levels, and that subject to professional judgement relating to conditions under which the research was undertaken, disturbance from vibration may be quantified along similar lines to nuisance from noise (the original research was restricted to properties within 40m of the carriageways where there were no noise barriers or other screening). HD213/11 notes that traffic induced vibration is expected to affect a very small percentage of people at noise exposure levels below 58 dB LA10.

### Study Area

- 11.3.37 The study area for both the Main and Alternative Schemes can be expressed in terms of both temporary and permanent impacts (detailed below). The areas of Sevington, Willesborough, Willesborough Lees, Mersham are included within study area.

### Temporary Impacts

- 11.3.38 In terms of construction noise, the extent of the assessment is limited to areas where the calculated total noise (construction noise plus baseline noise) exceeds the baseline noise level by 5dB or more, subject to threshold values of 65dB(A) for day-time, 55dB(A) for evenings and weekends, and 45dB(A) for night periods. The day-time period is defined as 07:00 to 19:00, the evening period as 19:00 to 23:00, and the night-time period as 23:00 to 07:00.

### Permanent Impacts

- 11.3.39 HD213/11<sup>37</sup> describes a methodology for the assessment of road projects in the UK. The methodology requires that the study area is identified as an area within 1km of the physical works associated with both the Main and Alternative Schemes. Within this study area, road traffic noise predictions are performed at any sensitive receptor where there is the possibility of a change of 1dB LA10,18hr upon Scheme opening, or 3dB LA10,18hr in the long term.

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<sup>36</sup> DMRB (2011) Design Manual for Roads and Bridges Volume 11 Section 3 Part 7 HD213/11 Noise and Vibration (Paragraph A5.28).

<sup>37</sup> DMRB (2011) Design Manual for Roads and Bridges Volume 11 Section 3 Part 7 HD213/11 Noise and Vibration.

- 11.3.40 For potential effects due to road traffic noise outside of the 1km area, the methodology requires that sensitive receptors are identified adjacent to roads where the change in received road traffic noise level would, as a result of either the Main or Alternative Scheme, increase or decrease by at least 1dB LA10,18hr on opening or 3dB in the long term. Consequently, the spatial extents of the assessment extend beyond the physical works associated with both the Main and Alternative Schemes.
- 11.3.41 The study area has been defined in accordance with HD 213/11<sup>38</sup> by the calculation of expected road traffic noise impacts, using the procedures within the Department of Transport memorandum 'Calculation of Road Traffic Noise'<sup>39</sup> (1988) and based on road traffic data for the baseline, opening and design years.
- 11.3.42 Figure 11.1, Volume 6.2 indicates study areas for permanent effects for both the Main Scheme and the Alternative Scheme, and Figure 15.4, Volume 6.2 for permanent effects for Cumulative Effects.

### Significance Criteria

- 11.3.43 Environmental assessment regulations and the NPSNN require that the assessment considers the significance of effects on noise and vibration sensitive receptors resulting from predicted noise and vibration impacts. NPPF requirements regarding single objective noise-based measures are based upon those adopted for other recent infrastructure schemes. The concept of lowest observable adverse effect level (LOAEL) and significant observable adverse effect level (SOAEL), introduced by National Policy Statement for England (NPSE) and further elucidated in National Planning Policy Guidance (NPPG), have been defined for both the Main and Alternative Schemes based upon noise insulation threshold levels, WHO guidance<sup>40</sup>, and, for construction noise and vibration, guidance from BS5228 Parts 1 and 2<sup>41</sup>.
- 11.3.44 Residual effects have been considered significant only where, with incorporated mitigation, they exceed SOAEL. It is noted however that in order to address the second aim of NPSE, where impacts lie between LOAEL and SOAEL, "*reasonable steps to mitigate and minimise adverse effects on health and quality of life*", should be taken. Consideration is therefore given within this assessment to adverse impacts which are identified to occur between LOAEL and SOAEL. For the purposes of this assessment, adverse effects are regarded as those arising from "*moderate*" or "*major*" impacts.

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<sup>38</sup> DMRB (2011) Design Manual for Roads and Bridges Volume 11 Section 3 Part 7 HD213/11 Noise and Vibration.

<sup>39</sup> Department of Transport (1988) Calculation of road traffic noise (CRTN), available at [http://www.noiseni.co.uk/calculation\\_of\\_road\\_traffic\\_noise.pdf](http://www.noiseni.co.uk/calculation_of_road_traffic_noise.pdf), last accessed 19/04/16.

<sup>40</sup> World Health Organisation (1999) Guidelines for Community Noise, available online at <http://www.devon.gov.uk/core-doc-n4-world-health-organisation-guidelines-for-community-noise-1999.pdf>, last accessed 19/04/16.

<sup>41</sup> BSI (2009, amended 2014) British Standard BS 5228 Code of practice for noise and vibration control on construction and open sites – Parts 1 and 2.

- 11.3.45 The following sections set out LOAEL and SOAEL for each of the assessments described above.

### **Construction Noise**

- 11.3.46 LOAEL for construction noise is considered to be an external free-field level of 50dB  $L_{Aeq,16hour}$  during day-time consistent with the threshold for moderate annoyance, from the WHO Guidelines for Community Noise<sup>42</sup>.
- 11.3.47 LOAEL for construction noise is considered to be a free-field level of 45dB  $L_{Aeq,8hour}$  during the night-time consistent with the threshold for sleep disturbance from the WHO Guidelines for Community Noise<sup>43</sup>.
- 11.3.48 SOAEL for construction noise is derived from BS5228 Part 1 Table E2 and is based upon the noise insulation trigger levels for day-time. SOAEL will be regarded as a construction noise level at the façade of 75dB  $L_{Aeq,T}$  during the day-time and 55dB  $L_{Aeq,T}$  during the night-time.

### **Construction Vibration**

- 11.3.49 LOAEL for construction vibration is considered to be a PPV of 0.14mm/s, that considered by BS5228 Part 2<sup>44</sup> to be just perceptible in the most sensitive situations for most vibration frequencies associated with construction.
- 11.3.50 Generally, vibration from construction activities will be temporary and intermittent in nature. On this basis, in this assessment a PPV of 1.0 mm/s or more has been considered to have the potential to result in a significant adverse impact. SOAEL for construction vibration is considered to be a PPV of 1.0 mm/s, lasting for a minimum of 1 hour during the normal hours of working.

### **Operational noise**

- 11.3.51 LOAEL for the operational noise assessment based upon the DMRB methodology is considered to be a free-field level of 50dB  $L_{Aeq,18hour}$  during day time consistent with the threshold for moderate annoyance, from the WHO Guidelines for Community Noise<sup>45</sup>. It should be noted that the time base has been modified to 18 hours to align with the CRTN assessment methodology. The SOAEL value for outdoor living spaces and shared community open areas is designated as 55dB  $L_{Aeq}$ , based upon WHO Guidelines.

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<sup>42</sup> World Health Organisation (1999) Guidelines for Community Noise, available online at <http://www.devon.gov.uk/core-doc-n4-world-health-organisation-guidelines-for-community-noise-1999.pdf>

<sup>43</sup> World Health Organisation (1999) Guidelines for Community Noise, available online at <http://www.devon.gov.uk/core-doc-n4-world-health-organisation-guidelines-for-community-noise-1999.pdf>

<sup>44</sup> BSI (2009, amended 2014) British Standard BS 5228 Code of practice for noise and vibration control on construction and open sites – Part 2.

<sup>45</sup> World Health Organisation (1999) Guidelines for Community Noise, available online at <http://www.devon.gov.uk/core-doc-n4-world-health-organisation-guidelines-for-community-noise-1999.pdf>

- 11.3.52 LOAEL for the night time operational noise assessment is considered to be a free-field level of 45dB  $L_{Aeq,8hour}$  during the night time consistent with the threshold for sleep disturbance from the WHO Guidelines for Community Noise<sup>46</sup>.
- 11.3.53 Operational noise effects due to the Scheme will predominantly result from changes in vehicular traffic noise due to changes to the road network. SOAEL for day-time operational noise has been based upon the “specified noise level” from the Noise Insulation (Amendment) Regulations 1988<sup>47</sup> and will be 67.5dB  $L_{A10(18hour)}$ . This is the level at which properties become eligible for mitigation against traffic noise in the form of secondary insulation, subject to a 1dB increase from the new road, and is also the level above which “*the population...is likely to be at the greatest risk of experiencing a significant adverse impact to health and quality of life...*”, as defined within the Noise Action Plan.
- 11.3.54 SOAEL for night-time noise has been based upon the WHO Night Noise Guidelines for Europe proposed Interim Target Level of 55dB  $L_{night,outside}$ .
- 11.3.55 LOAELs and SOAELs thresholds for operational noise are summarised in Table 11.6 below.

Table 11.6 LOAEL and SOAEL thresholds for operational noise

Time Period	Adverse Effect Level	Noise Level	Criteria/Guidance
Day	LOAEL	50dB $L_{Aeq, 18hr}$	WHO Guidelines for moderate annoyance
Day	SOAEL, facade	68 dB $L_{A10 18hr}$	Noise Insulation Regulations
Day	SOAEL, outdoor living spaces	55dB $L_{Aeq,16hr}$	WHO Guidelines for outdoor living spaces and community open areas
Night	LOAEL	45dB $L_{Aeq, 8hr}$	WHO Guidelines for Sleep Disturbance
Night	SOAEL	55 dB $L_{night, outside}$	WHO Interim Target Level

## 11.4 Consultation

- 11.4.1 In the Scoping Opinion (Appendix 4.1, Volume 6.3) the following points were raised with respect to noise and vibration:
- Information should be provided on the types of vehicles and plant to be used during the construction phase, and the anticipated extent and

<sup>46</sup> World Health Organisation (1999) Guidelines for Community Noise, available online at <http://www.devon.gov.uk/core-doc-n4-world-health-organisation-guidelines-for-community-noise-1999.pdf>

<sup>47</sup> Parliament of the United Kingdom (1988) The Noise Insulation (Amendment) Regulations 1988.

duration of construction activities including demolition, excavation, and surfacing works (addressed in paragraphs 11.8.1 onwards).

- Once operational, noise sources generated should be identified and assessed (addressed in paragraphs 11.8.23 onwards).
  - Where appropriate, effective measures should be provided to mitigate against noise nuisance (addressed in Section 11.7).
  - Highlighted need to consult with Ashford Borough Council (addressed in paragraph 11.4.3).
  - Attention was drawn to comments from Mersham & Sevington Parish Council regarding noise impacts on Sevington Church (addressed in paragraph 11.7.2); and Highfield Estate (existing mitigation noted in Section 11.6.3).
  - Noise impacts on people should be specifically addressed; particularly any potential noise disturbance at night and other unsocial hours (operational impacts addressed in paragraphs 11.8.11 onwards).
  - Reference made to Ashford Borough Council's comments on the importance of considering impacts on local residents, including vulnerable residents of Pilgrims Hospice. Consideration should be given to monitoring noise complaints during construction and when the development is operational (mitigation discussed in Section 11.7).
  - The noise and vibration assessments should take into account of the traffic movements along access routes, especially during the construction phase (addressed in paragraphs 11.8.15 onwards).
  - An explanation of technical terms used within the Environmental Statement (ES) to assist readers with the technical terms used within the ES, to assist readers with the technical interpretation and understanding of the noise and vibration assessment should be provided (see Chapter 18 Glossary, Volume 6.1).
- 11.4.2 The assessment has therefore incorporated these comments into the assessment for both the Main and Alternative Schemes and it was ensured that the baseline survey sufficiently encompassed these areas for further consideration during this assessment.
- 11.4.3 A meeting was subsequently held with representatives of Ashford Borough Council on March 21st 2016 and the Main Scheme and Alternative Scheme were discussed more fully. During that meeting it was agreed, and stated as a preference of Ashford Borough Council, that construction would be managed through a Section 61 of the Control of Pollution Act 1974 application to Ashford Borough Council.
- 11.4.4 Given the similarity between the Main Scheme and Alternative Scheme in noise terms, above comments have been take to apply to either option in this assessment.

## **11.5 Assumptions and Limitations**

- 11.5.1 A baseline noise survey has been conducted across the area at representative locations and for periods sufficient to adequately capture representative data.
- 11.5.2 Best available construction information at the time of writing has been used in this assessment. Should this vary from that actually proposed at the time of construction then these changes and any associated mitigation, will be reflected in the Section 61 application. However the assessment has used realistic assumptions and demonstrated that the Scheme could be constructed and mitigated on this basis.
- 11.5.3 Traffic data used for noise predictions has been based upon traffic data supplied from a validated traffic model and UK standard prediction methodology. Chapter 4 EIA Methodology, Volume 6.1, discusses in more detail how the traffic data has been used for the purposes of this ES. For a 1dB change (all other variables being equal) traffic flows need to increase by 25% or decrease by 20%, thus small errors in forecasting or prediction are unlikely to significantly affect results.
- 11.5.4 The definition of residential receptors has been based upon OS Address-point data. Where buildings have been allocated more than one residential unit, these have been incorporated into the calculations.
- 11.5.5 DMRB advises on reductions of sound from thin surface courses. For the purposes of this assessment it has been assumed that by the Design Year (2033) in the do-minimum case, all existing trunk roads and motorways would be surfaced with thin surface course.
- 11.5.6 Within DMRB Assessment Summary Tables the separation between 'No Change' and 'Negligible' impacts is very low (0.1dB), however, the assessment does not draw a distinction between these categories, and the reporting of Adverse or Significant impacts is unaffected.

## **11.6 Baseline Information**

### **Local Environment**

- 11.6.1 The desktop study identified that the dominant source of environmental noise affecting the majority of the study area is road traffic on the M20, A2070, A291 and A20 and their connecting link roads. Noise from building services and activities associated with light industrial / commercial premises adjacent to the above road links are also expected to contribute to the baseline noise climate.
- 11.6.2 The desktop study has also identified that the area of Sevington within the 1km study area is mainly comprised mixed commercial and industrial land uses. Willesborough and Willesborough Lees is a predominantly residential area, but with 2 hospitals located at the north east. Mersham is predominantly a residential area.

- 11.6.3 From an initial examination of the area, there are absorptive acoustic barriers alongside the A2070 on its approach to junction 10 and continuing for some distance around the interchange towards Hythe Road. These barriers are of approximately 2m height.

### Baseline Survey

- 11.6.4 A baseline survey was conducted for the scheme and is reported in Section 1.2 of Appendix 11.1, Volume 6.3. Measurements comprised 3 unattended long-term measurements, selected to provide baseline data representative of the nearest noise sensitive receptors to the Main and Alternative Schemes. These locations were further supplemented by attended short-term measurements at 4 further locations. Results and profiles were typical of those for locations exposed to road traffic noise.

## 11.7 Mitigation and Compensation Measures

### Construction

- 11.7.1 Construction will be required to be undertaken under a formal Section 61 agreement under the Control of Pollution Act 1974. Reference will be made to mitigation strategies outlined within BS 5228:2009<sup>48</sup>, which offers detailed guidance on the control of noise and vibration from construction activities. In order to comply with noise limits mitigation will comprise the following:
- Control at source: shielding of noisy items of plant, appropriate siting of haul routes.
  - Control by specification of construction methodology.
  - Control by modification of plant.
  - Enclosures.
  - Use and siting of equipment.
  - Maintenance.
  - Screening – early construction of bunds, appropriate site layout – removal of direct line of sight; strategic placement of material.
  - Control by specification of noise limits, monitoring as a means to ensure compliance.

### Operation

- 11.7.2 Mitigation incorporated into the Scheme design would comprise the following:
- Thin surface course for all new road surfacing, with the exception of the A20, where at the request of the Local Authority this will remain hot rolled asphalt.

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<sup>48</sup>BSI (2009, amended 2014) British Standard BS 5228 Code of practice for noise and vibration control on construction and open sites.

- Acoustic bund 2m high adjacent to the new link road in the vicinity of Sevington Church.
- Acoustic bund 2m high to the rear of Summerhill Place, adjacent to the eastbound off slip.
- Acoustic barrier at Kingsford Street, part of which has been defined as a Noise Important Area. The barrier would follow the alignment of the M20 at the top of the cutting slopes for optimum performance. At the eastern end the barrier would terminate approximately where access to the new overbridge commences. At the western end, the barrier would follow the boundary of the property known as Highfield for a short distance. Owing to the need to provide pedestrian access there would be a small gap in the barrier in the vicinity of Lagonda Lodge - this would be offset by a small length of overlap barrier on the southeast boundary of the re-aligned Kingsford Street which would ensure continuity of screening against noise.

11.7.3 In deriving the optimum height barrier, noise reductions at adjacent receivers were examined against barriers of increasing height using WebTAG appraisal methodology<sup>49</sup>. These results are indicated in Table 11.7.

Table 11.7 Cost benefit analysis of varying barrier heights

Barrier Height (m)	Net Present Value of benefit	Properties remaining at, or above SOAEL	Approximate cost of 400m barrier*
0.5	£9,294.92	3	-
1.0	£14,348.60	3	-
1.5	£26,530.19	2	£50,000
2	£55,497.30	2	£60,000
2.5	£58,753.99	2	£70,000
3	£61,296.86	0	£80,000
3.5	£79,409.59	0	£90,000
4	£97,839.99	0	£100,000

\*Based upon 2m@£175/m thereafter £25 per 0.5m height increase

11.7.4 On the basis of the above analysis, a 3m height barrier would ensure no properties are at or above SOAEL and would be reasonably cost-effective. This may be optimised at detailed design to include elements of 2m height at either end of the extents.

11.7.5 Of further locations considered for mitigation, the following conclusions have been reached:

<sup>49</sup> Department for Transport (2015) WebTAG Unit A3 Environmental Impact Appraisal

- The Noise Important Area adjacent to the A2070 (IA\_ID:4509): In the year of opening, without either the Main Scheme or Alternative Scheme there would be no properties with noise levels at or above SOAEL i.e. 68dB<sub>LA10,18hour</sub>. With the Main Scheme or Alternative Scheme there would be noise reductions of less than 1dB, therefore with the Main or Alternative Scheme all properties would remain below 68dB and there would be no Adverse impacts. Therefore mitigation has not been considered further, consistent with the requirements of the Noise Action Plan.
- The Noise Important Area adjacent to the M20 (IA\_ID:4509), approximately 2km in length: This location is outside the noise study area as defined in Sections 11.3.39 – 11.3.42 and commences on the periphery of the DCO boundary. For noise mitigation to be effective in this location, mitigation would have to extend outside and beyond the DCO boundary. For this reason mitigation has not been considered further in this location, although as a result of the Main and Alternative Schemes, noise levels would reduce, albeit marginally in this location.

## **11.8 Predicted Noise and Vibration Effects**

### **Construction (Main and Alternative Schemes)**

- 11.8.1 The construction programme is described more fully in Section 2.6 of Chapter 2 The Proposed Scheme, Volume 6.1. Although a detailed construction methodology has not been defined, this assessment shows how both the Main and Alternative Schemes could be constructed and the likely impacts that would be generated. Variations to this construction method are likely but impacts will be controlled through the Construction Environment Management Plan and Section 61 permits (under the Control of Pollution Act). It is currently anticipated that construction of both the Main and Alternative Schemes would commence in January 2018, with completion being anticipated in May 2020.
- 11.8.2 The main activities during the construction phase which would generate noise and vibration are:
- Demolition of existing structures and carriageway.
  - Excavation, compaction and foundations works.
  - Construction of bridges, retaining structures, services, drainage and the new carriageway.
  - Surfacing.
  - Installation of noise barriers, signage, gantries and road markings.
  - Vehicles accessing the site and compounds for the delivery of materials and equipment, muck away.
- 11.8.3 Construction plant reference noise levels from Annexes C and D of BS 5228-1 have been assigned to plant used in the assessment. Conservative assumptions have been made regarding the likely percentage of any given construction day that plant of a particular type would be operating. This

- information, broken down by construction activity is incorporated in Table 1.4 in Appendix 11.1, Volume 6.3. Each activity has been provided with an assumed percentage operating time for any given hour of construction activity.
- 11.8.4 It is anticipated that the limits for normal working hours and levels of noise at nearby properties will be agreed by the Contractor in advance with ABC Environmental Health Officers and incorporated into the Construction Environment Management Plan (CEMP) for both the Main and Alternative Schemes, contained within Appendix 17.1, Volume 6.3. Current assumptions for standard working hours are between 07:00 and 18:00 on weekdays and from 07:00 to 13:00 on Saturdays with no works on Sundays and Bank Holidays. The exception to these hours would occur during bridge demolition, beam erection etc. which would have to be undertaken at night.
- 11.8.5 The Section 61 Application will require the use of best practicable means (BPM) for noise control at all times during construction. These should include the selection of the most appropriate method and plant for the job, adequate maintenance of plant, optimum siting of stationary plant, local screening and the education of the workforce. Restrictions may also be placed on early / late delivery times. Potentially affected residents should be kept informed in advance of the works and contact details be provided to request further information or to report disturbance.
- 11.8.6 Incorporated mitigation related to construction noise and vibration will be set out within the CEMP, a draft of which is contained within Appendix 17.1, Volume 6.3. This will identify the series of measures to reduce the environmental effects during the construction period and covers environmental and safety aspects affecting the interests of residents, businesses, all road users and the general public in the vicinity of the works. These measures will include considerations of the residents of early phases of both the Main and Alternative Schemes during the construction period for later phases.
- 11.8.7 The impacts of potential noise and vibration on affected communities can be mitigated by effective communication between the promoter, Contractor and the public. Prior notification of construction works to any potential affected residents will be required. Following that, investigation and remediation of noise issues during construction may also be required.
- 11.8.8 Where potentially significant effects of construction noise and vibration are predicted, the Contractor will consult ABC to determine potential additional mitigation measures for both the Main and Alternative Schemes.
- 11.8.9 As a worst case, no screening effect is assumed for intervening structures such as garden fences and walls. For receptors shielded from the construction works by the topography, or the massing of intervening buildings, a conservative shielding correction of -5dB in accordance with BS5228 has been assumed. In line with convention, where a shielding correction has been applied, ground conditions between the construction activity and NSR are assumed to be hard. The baseline measurement selected for calculations is

generally the lowest  $L_{Aeq,15min}$  recorded during standard working hours and is corrected to a façade level if the measurement was carried out in free field.

- 11.8.10 Noise-emitting construction activities will vary in location across the site for both the Main and Alternative Schemes. The assessment considers the noise source for prediction purposes to be located at the nearest point of the proposed works.

***Construction Noise Assessment (Main and Alternative Schemes)***

- 11.8.11 Construction noise calculations have been undertaken at representative receptors closest to the proposed construction works.
- 11.8.12 Table 11.8 shows the 14 noise sensitive receptors and the total noise level from the construction noise for each activity / phase within both the Main and Alternative Schemes. These levels were calculated by adding the predicted site specific noise to the existing ambient noise (baseline) to see any significant impacts.

Table 11.8 Total noise during construction phase at noise sensitive locations (Main and Alternative Schemes)

	Noise Sensitive Property	Baseline [in dB(A)]	Environmental Site Compound setup Phase 1	Environmental Site Compound setup Phase 2	Environmental Site Compound setup Phase 3	Main Site Compound setup Phase 1	Main Site Compound setup Phase 2	Main Site Compound setup Phase 3	Pond off new link road	Pond off Hythe Road	Pond near A2070	Highfield Lane/Kingsford Street Phase 1	Highfield Lane/Kingsford Street Phase 2	Highfield Lane/Kingsford Street Phase 3	A20 Hythe Road re-alignment, Swatfield Culvert	A20 Hythe Road re-alignment, diversion	A20 Hythe Road re-alignment Phase 1	A20 Hythe Road re-alignment Phase 2	A20 Hythe Road re-alignment Phase 3
1	Lagonda Lodge, Kingsford Street	58	58	58	58	58	58	58	58	58	58	68	61	64	58	58	59	58	58
2	Kenistone, Kingsford Street	58	58	58	58	58	58	58	58	58	58	77	69	72	58	58	60	58	58
3	Ransley House, Kingsford Street	58	58	58	58	58	58	58	58	58	58	79	70	74	58	58	59	58	58
4	Downs View, Kingsford Street	58	58	58	58	58	58	58	58	58	58	64	60	61	58	58	58	58	58
5	Redburr, Kingsford Street	58	58	58	58	58	58	58	58	58	58	63	59	60	58	58	58	58	58
6	Pilgrims Hospice	63	63	63	63	63	63	63	63	63	63	63	63	63	64	64	66	64	64
7	The Lilacs, Hythe Road	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	70	69	69
8	4 Summerhill Park, Hythe Road	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69
9	Warren Lodge, Hythe Road	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	64	63	63
10	Court Lodge, Bad Munstereifel Road	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61
11	16 Nightingale Close	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61
12	11 Nightingale Close	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61
13	30 Kingfisher Close	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61
14	38 Kingfisher Close	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61

Table 11.8 Total noise during construction phase at noise sensitive locations (Main and Alternative Schemes) (continued)

	Noise Sensitive Property	Baseline [in L <sub>Aeq</sub> dB(A)]	M20 Centre Reserve Bridge Piers	M20 Bridge abutments	Bridge deck - North and South	Demolition Highfield Lane Bridge	North ad South Slip Road Bridge	Southbound on slip	Southbound off slip	North-bound on slip	Northbound off slip	A2070 link road, south of gas main	A2070 link road, north of gas main	A2070 over gas main	Existing A2070 - roundabout	Existing A2070 southbound c/w	Barrey Road widening	Existing A2070 northbound c/w	Footbridge construction	
1	Lagonda Lodge, Kingsford Street	58	59	60	58	61	59	59	58	58	59	58	58	58	58	58	58	58	58	58
2	Kenistone, Kingsford Street	58	59	59	58	59	58	59	58	58	64	58	58	58	58	58	58	58	58	58
3	Ransley House, Kingsford Street	58	58	58	58	58	58	58	58	58	59	58	58	58	58	58	58	58	58	58
4	Downs View, Kingsford Street	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58
5	Redburr, Kingsford Street	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58
6	Pilgrims Hospice	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63
7	The Lilacs, Hythe Road	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69
8	4 Summerhill Park, Hythe Road	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69
9	Warren Lodge, Hythe Road	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63
10	Court Lodge, Bad Munstereifel Road	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	62
11	16 Nightingale Close	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	62	61	62	64
12	11 Nightingale Close	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	62	62
13	30 Kingfisher Close	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	63	61	62	61
14	38 Kingfisher Close	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61

- 11.8.13 For the majority of construction activities, the baseline noise levels do not increase significantly with the addition of construction noise.
- 11.8.14 The shaded cells within the table indicate where the total noise level exceeds the baseline by 5dB(A) or more. This is only predicted to affect properties on Kingsford Street during the 3 phases of works on Highfield Lane and Kingsford Street. Given that this particular construction activity involves sequential activities involving moving plant (therefore not at a permanent, fixed distance from each property), it is not considered that the threshold of significance will be exceeded when the activity is considered over its duration – i.e. noise levels will vary such that the overall level will not be significant. However, excessive short-term noise levels will be controlled through the Construction and Environmental Management Plan and a monitoring regime in such a way as to not exceed levels set out in Table 11.3.

### **Construction Traffic**

- 11.8.15 Estimated monthly vehicle movements are shown below in Table 11.9 associated with construction of the Scheme vary in each month, but range from approximately 4000 in September 2018 to 11700 in November 2019.

Table 11.9 Construction traffic movements

Month	Total Construction Traffic	Month	Total Construction Traffic
September 2018	3,636	August 2018	5,695
October 2018	8,046	September 2018	5,277
November 2018	8,046	October 2018	10,298
December 2018	8,046	November 2018	11,682
January 2018	8,837	December 2018	9,308
February 2018	8,838	January 2018	11,548
March 2018	8,838	February 2018	3,419
April 2018	8,838	March 2018	2,898
May 2018	10,746	April 2018	2,564
June 2018	8,841	May 2018	2,563
July 2018	8,673		

- 11.8.16 Approximately 50% of traffic entering / exiting site would be via the A2070, and approximately 50% entering / exiting site would be via the A20. Very little construction traffic will use Kingsford Street other than that associated with the re-alignment works in that area.
- 11.8.17 Existing hourly traffic flows are as follows:
- A20 - 728 vehicles per hour, 7% HGV;
  - A2070 – 2,076 vehicles per hour, 7.7% HGV;

- 11.8.18 Based upon current traffic flows and percentage of Heavy Goods Vehicles (HGVs), and on a worst-case assumption that all construction traffic comprises monthly movement of 11,700 HGVs (averaged across the working day), construction traffic will result in an increase in HGV traffic of approximately 2% and increase in total traffic of approximately 1%. These increases would result in noise changes of less than 1dB.
- 11.8.19 Based upon the above assumptions and analysis, and impacts as defined in Table 11.5, construction traffic would have a negligible impact and not be significant.

### ***Construction Vibration (Main and Alternative Schemes)***

- 11.8.20 From the consideration of LOAEL and SOAEL values presented in 11.3.49 and paragraph 11.3.50, and Figure 1.1 in Appendix 11.1, Volume 6.3, relevant distances at which each construction activities would result in an exceedance of SOAEL have been compared against actual distances from construction activity to receptors. It can be seen that SOAEL would be exceeded for vibratory piling at approximately 32m distant, but that nearest sensitive receptors are all at distances in excess of 32m from proposed piling activities.
- 11.8.21 In similar fashion to above, consideration of Figure 1.1 in Appendix 11.1, Volume 6.3 indicates that SOAEL values for vibratory rolling would be exceeded at distances at, or within 12m. Again, nearest properties to locations where vibratory rolling is likely to take place are greater than 12m, for example properties along Kingsford Street.
- 11.8.22 From the above it may be concluded that there would be no significant effects arising from construction activities for either the Main or the Alternative Schemes.

## **Operation – Main Scheme**

### ***Airborne Noise from Road Traffic***

- 11.8.23 In terms of absolute noise levels and compliance with the aims of NPPF, the following exceedances of daytime SOAEL occur:
- DM opening year, 42 properties at or above 68dB;
  - DS opening year, 23 properties at or above 68dB;
  - DM design year, 45 properties at or above 68dB; and,
  - DS design year 32 properties at or above 68dB.
- 11.8.24 The number of night-time exceedances of SOAEL remain broadly unchanged across the DM / DS scenarios.
- 11.8.25 In the Do-Minimum opening year scenario, 42 properties are at or above SOAEL values. With the Scheme, in the opening year, this number reduces by 19, leaving 23 properties above SOAEL. These are predominantly those

- adjacent to the A20 Hythe Road and adjacent to the A2070. This reduction is eroded slightly by the design year owing to traffic growth. In all cases the properties remaining at or above SOAEL will have been subject to noise changes of less than 1dB.
- 11.8.26 Results of traffic noise calculations at potentially affected dwellings are presented in accordance with HD 213/11 procedure in the following tables. Calculation results presented represent noise changes at the worst-affected façade of each property, at a height equivalent to first floor level.
- 11.8.27 The results for noise impacts at dwellings within 600m of affected routes within 1km of both the Main Scheme, and adjacent to affected routes beyond 1km are presented in the Assessment Summary Tables in Table 11.10, Table 11.11 and Table 11.12. In terms of night-time impacts, traffic noise impacts are only assessed in the long-term.
- 11.8.28 Figures 11.2 and 11.3, Volume 6.2 show noise changes in the Opening Year and in the Design Year respectively.
- 11.8.29 The result for change in nuisance from noise is given in Assessment Summary Table 11.13 and Table 11.14.
- 11.8.30 It can be seen from a comparison between classification of impacts in Table 11.5 and calculated noise changes in Table 11.10 that 30 properties would receive Moderate Adverse Impacts, and 6 properties would receive Moderate Beneficial Impacts as a result of the Main Scheme in the Opening Year. These adverse impacts would occur in Mersham and are due to traffic changes in that village, while beneficial impacts are also partially due to traffic changes on the A20 and partially due to the acoustic barrier on Kingsford Street. Table 11.11 indicates that by the Design Year there would be 46 properties with the same level of noise increase, although this impact would now be described as minor as it is the long term change under consideration. However there would be 10 properties with Moderate impacts in the long term, again, all within Mersham and due to traffic increases. Figures 11.2 and 11.3, Volume 6.2 demonstrate the above changes.
- 11.8.31 From Table 11.12 it can be seen that long term changes without the Main Scheme would give rise to negligible increases at a large number of properties, as would be expected. Decreases in noise in the long term result from small changes in traffic flows and speeds, and from re-surfacing with a thin surface course.
- 11.8.32 Both Figure 11.2 and Figure 11.3, Volume 6.2 demonstrate noise decreases along Hythe Road associated with reductions in traffic, and noise increases in Mersham, associated with traffic increases. In the immediate vicinity of the new link road, noise increases are evident.

Table 11.10 Short term change in noise levels, Do Minimum 2018 - Do Something 2018

Change in noise level	Day-time		
		Number of dwellings	Number of other sensitive receptors
Increase in noise level, LA10,18h	0.1-0.9	365	43
	1.0-2.9	57	7
	3.0-4.9	30	0
	5.0+	0	0
No change	0	280	10
Decrease in noise level, LA10,18h	0.1-0.9	449	185
	1.0-2.9	54	1
	3.0-4.9	6	0
	5.0+	0	0

Table 11.11 Long term change in noise levels, Do Minimum 2018 - Do Something 2033

Change in noise level	Day-time		Night-time
		Number of dwellings	Number of other sensitive receptors
Increase in noise level, LA10,18h	0.1-2.9	922	177
	3.0-4.9	46	0
	5.0-9.9	10	0
	10.0+	0	0
No change	0	64	67
Decrease in noise level, LA10,18h	0.1-2.9	194	2
	3.0-4.9	5	0
	5.0-9.9	0	0
	10.0+	0	0

Table 11.12 Long term change in noise levels, Do Minimum 2018 - Do Minimum 2033

Change in noise level	Day-time		Night-time
		Number of dwellings	Number of other sensitive receptors
Increase in noise level, LA10,18h	0.1-2.9	1073	244
	3.0-4.9	2	0
	5.0-9.9	0	0
	10.0+	0	0

Change in noise level	Day-time		Night-time
		Number of dwellings	Number of other sensitive receptors
No change	0	70	1
Decrease in noise level, LA10,18h	0.1-2.9	96	1
	3.0-4.9	0	0
	5.0-9.9	0	0
	10.0+	0	0

11.8.33 HD213/11 clause A1.27<sup>50</sup> includes an assessment of nuisance and provides a relationship for noise level against change in people bothered very much, or quite a lot by noise. The relationship differs depending on whether short term or long term changes are considered, the former giving rise to greater changes in nuisance. Therefore short term changes in noise, as would be experienced on scheme opening, generally determine reported nuisance increases. For assessment purposes the worst-case change is considered and results are shown in Table 11.13 below. DMRB advises caution in interpretation of results as the surveys underpinning the relationship between noise and nuisance were conducted at locations within 18m of the carriageway edge, at noise exposure levels of 65 – 78dB and noise changes of up to 10dB. It should also be borne in mind that the results represent change in percentage of people bothered very much, or quite a lot by noise. Therefore total numbers are in effect a percentage of a percentage as the degree of nuisance felt towards traffic noise varies amongst the population.

Table 11.13 Summary of nuisance calculations for road traffic noise

Change in nuisance level	Do-Minimum		Do-Something
		Number of dwellings	Number of dwellings
Increase in nuisance level	<10%	1319	850
	10<20%	0	220
	20<30%	0	63
	30<40%	0	33
	>40%	0	0
No change	0%	71	150
Decrease in nuisance level	<10%	97	171

<sup>50</sup> DMRB (2011) Design Manual for Roads and Bridges Volume 11 Section 3 Part 7 HD213/11 Noise and Vibration (Paragraph A1.27).

Change in nuisance level	Do-Minimum		Do-Something	
		Number of dwellings		Number of dwellings
	10<20%	0		0
	20<30%	0		0
	30<40%	0		0
	>40%	0		0

- 11.8.34 A further set of noise contours has been provided to demonstrate the effect of the Main Scheme on the area immediately adjacent to the A2070. In this area there will be some loss of space, both temporary and permanent associated with construction and use of Church Road footbridge, and some corresponding increase in space resulting from the re-alignment of the A2070.
- 11.8.35 Figure 11.4 and Figure 11.5, Volume 6.2 show the noise levels in the vicinity of the 2 areas of lands. In general noise levels across the open space lost to the scheme are in the range 55dBA to 65dBA and noise levels across the replacement land will be in the range 65dBA to 75dBA with the scheme. From the figures it is clear that the replacement land will be noisier than the open space lost.
- 11.8.36 Table 11.2 within Section 11.3 discusses value of receptor and associated sensitivity. From Table 11.2 it is evident that the area lost to the scheme should be considered as having ‘high sensitivity’ and any noise changes associated with the land exchange viewed in terms of impact and significance.
- 11.8.37 As a means of determining impact, NSPNN references the Noise Policy Statement for England which introduces the concept of LOAEL and SOAEL (see Section 11.3). Paragraph 5.188 says “*Factors that will determine the likely noise impact include...the proximity of the proposed development to noise sensitive premises....including certain parks and open spaces*”.
- 11.8.38 Table 11.6 in Section 11.3 summarises LOAEL and SOAEL values used within this assessment based upon WHO guidelines. The SOAEL value for outdoor living spaces and shared community open areas is designated as 55dB LAeq, based upon WHO Guidelines.
- 11.8.39 Noise levels on the replacement land would represent a 10dB increase over those on the open space lost to the scheme, and would be above the SOAEL value for community open areas, representing a significant adverse impact.
- 11.8.40 Chapter 2 The Proposed Scheme, Volume 6.1 and DCO document number 4.1 include a more detailed discussion on the loss of space and proposed replacement land.

### **Noise Insulation**

- 11.8.41 Under the Main Scheme no properties meet the requirements of the Noise Insulation Regulations, therefore no properties would be eligible for secondary insulation.

### ***Airborne Vibration from Road Traffic***

- 11.8.42 The results of the airborne noise calculations are used to compare the estimate percentages of people annoyed in the Design Year with and without the Main Scheme, as shown in Table 11.14.
- 11.8.43 DMRB advises caution in interpreting the results as the survey upon which the relationship was based was restricted to within 40m of the carriageway. From Table 11.14 it can be seen that changes in people bothered very much or quite a lot by vibration are relatively low, because the majority of changes are small.

Table 11.14 Summary of nuisance calculations for airborne vibration from road traffic noise

Change in nuisance level	Do-Minimum		Do-Something	
		Number of dwellings		Number of dwellings
Increase in nuisance level	<10%	443		287
	10<20%	0		1
	20<30%	0		0
	30<40%	0		0
	>40%	0		0
No change	0%	962		1028
Decrease in nuisance level	<10%	82		171
	10<20%	0		0
	20<30%	0		0
	30<40%	0		0
	>40%	0		0

### **Operation - Alternative Scheme**

#### ***Airborne Noise from Road Traffic***

- 11.8.44 In terms of absolute noise levels and compliance with the aims of NPPF, the following exceedances of SOAEL occur for the Alternative Scheme:
- DM opening year, 42 properties at or above 68dB.
  - DS opening year, 21 properties at or above 68dB.
  - DM design year, 45 properties at or above 68dB.
  - DS design year 27 properties at or above 68dB.
- 11.8.45 Night-time exceedances of SOAEL remain broadly similar across the DM / DS scenarios.

- 11.8.46 In the Do-Minimum opening year scenario, 42 properties are at or above SOAEL values. With the Scheme, in the opening year, this number reduces by 21, leaving 21 properties above SOAEL. These are predominantly adjacent to the A20 Hythe Road and adjacent to the A2070. This reduction of 21 is eroded slightly by the design year owing to traffic growth. In all cases the properties remaining at or above SOAEL will have been subject to noise changes of less than 1dB.
- 11.8.47 Results for noise impacts at dwellings within 600m of affected routes within 1km of the Alternative Scheme, and adjacent to affected routes beyond 1km, are presented in the Assessment Summary Tables in Table 11.15 and Table 11.16.
- 11.8.48 In terms of night time impacts, traffic noise impacts are only assessed in the long-term, as required in DMRB.
- 11.8.49 Figures 11.6 and 11.7, Volume 6.2 show noise changes in the Opening Year and in the Design Year respectively for the Alternative Scheme. The alignment of roads within the area of the proposed development associated with the Stour Park Development is nominal – as can be seen from the contours – and may be considered conservative, however forecast traffic flows within the Development are considerably below those of the surrounding road network and as a consequence exert only a very marginal influence on adjacent receptors.
- 11.8.50 The result for change in nuisance from noise is given in Assessment Summary Table 11.18 and Table 11.19.
- 11.8.51 It can be seen from a comparison between classification of impacts in Table 11.16 and calculated noise changes in Table 11.15 that 8 properties would receive Moderate Adverse impacts as a result of the Alternative Scheme, while 7 properties would receive Moderate Beneficial impacts. These adverse impacts would occur in Mersham and are due to traffic changes in that village, whilst the beneficial impacts would occur adjacent to the A20 where traffic will reduce, and adjacent to Kingsford Street adjacent to the proposed noise barrier.
- 11.8.52 Table 11.16 indicates that by the Design Year there would be 14 properties with the same level of noise increase, although this impact would now be described as Minor as it is the long term change under consideration. There would be 1 property with Moderate Adverse impacts in the long term due to traffic increases, and 2 properties with Moderate Beneficial impacts. Figures 11.6 and 11.7, Volume 6.2 demonstrate these changes
- 11.8.53 From Table 11.17 it can be seen that long term changes without the Alternative Scheme would give rise to negligible increases at a large number of properties, as would be expected. Decreases in noise in the long term result from small changes in traffic flows and speeds, and from re-surfacing with a thin surface course.

11.8.54 Both Figure 11.6 and Figure 11.7, Volume 6.2 demonstrate noise decreases along Hythe Road associated with reductions in traffic, and noise increases in Mersham, associated with traffic increases. In the immediate vicinity of the new link road, noise increases are evident.

Table 11.15 Short term change in noise levels, Do Minimum 2018 - Do Something 2018

Change in noise level	Day-time		
		Number of dwellings	Number of other sensitive receptors
Increase in noise level, LA10,18h	0.1-0.9	241	45
	1.0-2.9	27	1
	3.0-4.9	8	0
	5.0+	0	0
No change	0	311	10
Decrease in noise level, LA10,18h	0.1-0.9	582	190
	1.0-2.9	65	0
	3.0-4.9	7	0
	5.0+	0	0

Table 11.16 Long term change in noise levels, Do Minimum 2018 - Do Something 2033

Change in noise level	Day-time		Night-time
		Number of dwellings	Number of dwellings
Increase in noise level, LA10,18h	0.1-2.9	923	177
	3.0-4.9	14	0
	5.0-9.9	1	0
	10.0+	0	0
No change	0	57	67
Decrease in noise level, LA10,18h	0.1-2.9	238	2
	3.0-4.9	6	0
	5.0-9.9	2	0
	10.0+	0	0

Table 11.17 Long term change in noise levels, Do Minimum 2018 - Do Something 2033

Change in noise level	Day-time		Night-time
		Number of dwellings	Number of other sensitive receptors
Increase in noise level, LA10,18h	0.1-2.9	1066	244
	3.0-4.9	2	0
	5.0-9.9	0	0
	10.0+	0	0
No change	0	74	1
Decrease in noise level, LA10,18h	0.1-2.9	99	1
	3.0-4.9	0	0
	5.0-9.9	0	0
	10.0+	0	0

11.8.55 HD 213/11 clause A1.27<sup>51</sup> includes an assessment of nuisance and provides a relationship for noise level against change in people bothered very much, or quite a lot by noise. The relationship differs depending on whether short term or long term changes are considered, the former giving rise to greater changes in nuisance. Therefore short term changes in noise, as would be experienced on scheme opening, generally determine reported nuisance increases. For assessment purposes the worst-case change is considered and results are shown in Table 11.18 below. DMRB advises caution in interpretation of results as the surveys underpinning the relationship between noise and nuisance were conducted at locations within 18m of the carriageway edge, at noise exposure levels of 65 – 78dB and noise changes of up to 10dB. It should also be borne in mind that the results represent change in percentage of people bothered very much, or quite a lot by noise. Therefore total numbers are in effect a percentage of a percentage as the degree of nuisance felt towards traffic noise varies amongst the population. The greater percentage increases in nuisance with the scheme are a result of the influence of small changes in on opening discussed above.

Table 11.18 Summary of nuisance calculations for road traffic noise

Change in nuisance level	Do-Minimum	Do-Something
	Number of dwellings	Number of dwellings
Increase in nuisance level	<10%	1312
	10<20%	0
	20<30%	0

<sup>51</sup> DMRB (2011) Design Manual for Roads and Bridges Volume 11 Section 3 Part 7 HD213/11 Noise and Vibration; Clause A1.27.

Change in nuisance level	Do-Minimum		Do-Something	
		Number of dwellings	Number of dwellings	
	30<40%	0	8	
	>40%	0	0	
No change	0%	75	134	
Decrease in nuisance level	<10%	100	217	
	10<20%	0	0	
	20<30%	0	0	
	30<40%	0	0	
	>40%	0	0	

- 11.8.56 A further set of noise contours has been provided to demonstrate the effect of the Alternative Scheme on the area immediately adjacent to the A2070. In this area there will be some loss of space associated with construction of Church Road footbridge, and some corresponding increase in space resulting from the re-alignment of the A2070.
- 11.8.57 Figure 11.4 and Figure 11.5, Volume 6.2 show the noise levels in the vicinity of the 2 areas of lands. In general noise levels across the open space lost to the scheme are in the range 55dBA to 65dBA and noise levels across the replacement land will be in the range 65dBA to 75dBA with the scheme. From the figures it is clear that the replacement land will be noisier than the open space lost.
- 11.8.58 Table 11.2 within Section 11.3 discusses value of receptor and associated sensitivity. From Table 11.2 it is evident that the area lost to the scheme should be considered as having 'high sensitivity' and any noise changes associated with the land exchange viewed in terms of impact and significance.
- 11.8.59 As a means of determining impact, NSPNN references the Noise Policy Statement for England which introduces the concept of LOAEL and SOAEL (see Section 11.3). Paragraph 5.188 says "*Factors that will determine the likely noise impact include...the proximity of the proposed development to noise sensitive premises....including certain parks and open spaces*".
- 11.8.60 Table 11.6 in Section 11.3 summarises LOAEL and SOAEL values used within this assessment based upon WHO. The SOAEL value for outdoor living spaces and shared community open areas is designated as 55dB LAeq, based upon WHO Guidelines.
- 11.8.61 On the basis of the discussion above it is clear that that noise levels on the replacement land would represent a 10dB increase over those on the open space lost to the scheme, and that noise levels would be above the SOAEL value for community open areas, representing a Significant Adverse impact.

11.8.62 Chapter 2 The Proposed Scheme, Volume 6.1 and DCO document number 4.1 include a more detailed discussion on the loss of space and proposed replacement land.

**Noise Insulation**

11.8.63 Under the Alternative Scheme no properties meet the requirements of the Noise Insulation Regulations, therefore no properties would be eligible for secondary insulation.

**Airborne Vibration from Road Traffic**

11.8.64 The results of the airborne noise calculations are used to compare the estimate percentages of people annoyed in the Design Year with and without the Alternative Scheme. These are shown in Table 11.19.

11.8.65 Table 11.19DMRB advises caution in interpreting the results as the survey upon which the relationship was based was restricted to within 40m of the carriageway. From

11.8.66 Table 11.19 it can be seen that changes in people bothered very much or quite a lot by vibration are relatively low, and that the majority of changes remain neutral.

Table 11.19 Summary of nuisance calculations for airborne vibration from road traffic noise

Change in nuisance level		Do-Minimum	Do-Something
		Number of dwellings	Number of dwellings
Increase in nuisance level	<10%	433	254
	10<20%	0	0
	20<30%	0	0
	30<40%	0	0
	>40%	0	0
No change	0%	975	1031
Decrease in nuisance level	<10%	79	200
	10<20%	0	2
	20<30%	0	0
	30<40%	0	0
	>40%	0	0

## 11.9 Conclusions

- 11.9.1 A noise and vibration assessment has been undertaken of impact and effects arising from both the Main and Alternative Schemes. The assessment has been undertaken in accordance with HD 213/11<sup>52</sup>, and has also had regard to the requirements of the National Planning Policy Framework. A baseline noise survey has been undertaken at representative locations within the Study Area.
- 11.9.2 For both the Main Scheme and for the Alternative Scheme, the construction noise and vibration assessments indicate that with mitigation there would be no significant effects.
- 11.9.3 Impacts for both Main Scheme and Alternative Scheme have been summarised in Table 11.20.
- 11.9.4 It can be seen from Table 11.20 that there are more Moderate Adverse impacts associated with the Main Scheme than with the Alternative Scheme in the short term and long term. However, in the long term, Moderate Adverse impacts for both the Main and Alternative Schemes would reduce compared with the short-term.
- 11.9.5 Mitigation has been provided in order to reduce adverse impacts, although these would occur on the existing network as a result of traffic changes.
- 11.9.6 Two Noise Important Areas are contained within the DCO boundary. An acoustic barrier has been included as part of the Main Scheme and the Alternative Scheme at the Noise Important Area located along Kingsford Street, while at the Noise Important Area adjacent to the A2070 noise levels will reduce with both the Main Scheme and Alternative Scheme and the existing acoustic barrier is considered sufficient.
- 11.9.7 As part of the Main and Alternative Schemes it is proposed to exchange an area of open space land for and an area of replacement open space land. Although noise levels will be greater on the replacement land, no additional mitigation has been proposed. Further considerations associated with this issue are outlined in Chapter 2 The Proposed Scheme, Volume 6.1 and DCO document number 4.1.

Table 11.20 Summary of impacts

Impacts	Main Scheme		Alternative Scheme	
	Adverse	Beneficial	Adverse	Beneficial
<b>Short term, with scheme</b>				
Minor	54	53	27	65
Moderate	30	6	8	7

<sup>52</sup> DMRB (2011) Design Manual for Roads and Bridges Volume 11 Section 3 Part 7 HD213/11 Noise and Vibration.

Impacts	Main Scheme		Alternative Scheme	
	Adverse	Beneficial	Adverse	Beneficial
Major	0	0	0	0
<b>Long term, with scheme</b>				
Minor	46	5	14	6
Moderate	10	0	1	2
Major	0	0	0	0
<b>Long term, without scheme</b>				
Minor	2	0	2	0
Moderate	0	0	0	0
Major	0	0	0	0

11.9.8 Table 11.21 summarises the quantity of receptors at or above SOAEL with and without both Schemes in the opening and design years.

11.9.9 For both the Main Scheme and the Alternative Scheme it can be seen that the overall number of properties at, or above SOAEL would reduce with the introduction of the Schemes.

11.9.10 For those properties remaining at or above SOAEL for both Schemes, noise changes would be less than 1dB.

Table 11.21 Summary of receptors at or above SOAEL

Scenario	Main Scheme	Alternative Scheme
DM opening year	42	42
DS opening year	23	21
DM design year	45	45
DS design year	32	27

11.9.11 It is thus considered that where significant adverse impacts have been predicted in the vicinity of both Schemes, these have been avoided through design and mitigation in the form of the acoustic barriers and a thin road surface course. As such the first aim of the NPPF with respect to noise would be achieved to the extent that the total number of properties at or above SOAEL would reduce in number. However, it has to be acknowledged that for both Schemes there would be residual numbers of properties at or above SOAEL which are located on the existing road network although these would be subject to noise increases of less than 1dB.

11.9.12 Similarly, it is considered that while adverse impacts have been predicted in the vicinity of both Schemes, these have been mitigated through design and mitigation in the form of barriers and a thin surface course. As such, the second aim of the NPPF is achieved in the vicinity of the scheme. However, it has to be acknowledged that there will be properties adjacent to the existing

road network which would receive adverse impacts in the long term, and that there are more of these with the Main Scheme than with the Alternative Scheme.